Ouriginal by Turnitin

Document Information

Analyzed document	PGGR_6_A.pdf (D165449291)
Submitted	2023-04-29 12:01:00
Submitted by	Library NSOU
Submitter email	dylibrarian.plagchek@wbnsou.ac.in
Similarity	12%
Analysis address	dylibrarian.plagchek.wbnsou@analysis.urkund.com

Sources included in the report

SA	**MGDSE - 2.5 - Evolution of Geographical Thought.pdf** Document MGDSE - 2.5 - Evolution of Geographical Thought.pdf (D155224129)	4
SA	**combined thought final.pdf** Document combined thought final.pdf (D118996980)	56
W	URL: https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570 Fetched: 2021-11-01 17:52:19	18
W	URL: https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html Fetched: 2022-09-22 11:36:08	14
W	URL: http://uafulucknow.ac.in/wp-content/uploads/2020/05/B.A.-B.Sc_.-II-Semester-generic.pdf Fetched: 2021-06-09 04:20:21	3
SA	**MGEOS-31 Geographical Thought_all units1.pdf** Document MGEOS-31 Geographical Thought_all units1.pdf (D164796522)	7
SA	**2131687.pdf** Document 2131687.pdf (D25894597)	2
SA	**Exceptionalism.docx** Document Exceptionalism.docx (D30268332)	9
SA	**2135579 - Question2 - Final.docx** Document 2135579 - Question2 - Final.docx (D24056280)	1
SA	**2013_ThmosKhun.pdf** Document 2013_ThmosKhun.pdf (D153447298)	7

Entire Document

[1] PREFACE In the curricular structure introduced by this University for students of Post Graduate degree programme, the opportunity to pursue Post Graduate course in Subject introduced by this University is equally available to all learners. Instead of being guided by any presump- tion about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely in keeping with the objectives of open education which does not believe in artificial differentiation. Keeping this in view, study materials of the Post Graduate level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analyses. The accepted methodology of distance education has been followed in the preparation of these study materials. Co-operation in every form of experienced scholars is indispensable for a work of this kind. We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing and devising of a proper lay-out of the mate- rials. Practically speaking, their role amounts to an involvement in invisible teaching. For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other. The more a learner would seriously pursue these study materials the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self- learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University. Needless to add, a great deal of this efforts is still experimental—in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned. Professor (Dr.) Subha Sankar Sarkar Vice-Chancellor
[2] Fourth Reprint : February, 2022 Printed in accordance with the regulations of the Distance Education Bureau of the University Grants Commission.
[3] POST GRADUATE GEOGRAPHY [M. Sc] PAPER : GROUP PGGR-06 : A Course Writing Prof. Sudipto Adhikari Notification

56% **MATCHING BLOCK 1/124** SA MGDSE - 2.5 - Evolution of Geographical Though ... (D155224129)

Kishore Sengupta Registrar
[4]
[5] NETAJI SUBHAS OPEN UNIVERSITY Group – A Unit 1 ? Dichotomies in Geography : Physical and Human, Systematic and Regional, Determinism and Possibilism Unit 2 ? Landscape Morphology – Cultural Expression of Carl Sauer Unit 3 ? Hartshorne – Schaefer Debate on Regional Differential and Spatial Organization Unit 4 ? Nomothetic and Idiographic Approaches in Geography; System and Ecological Approaches in Geography Unit 5 ? Radicalism Unit 6 ? Geography of Inequality and Geography of Gender Unit 7 ? Post Modernism Unit 8 ? Recents Trends in Geography in Methods and Contents PGGR – 06 Geographical Thought 7–21 26–30 31–43 44–48 49–59 60–66 67–71 22–25
[6]

7 UNIT 1 ? DICHOTOMIES IN GEOGRAPHY : PHYSICAL AND HUMAN, SYSTEMATIC AND REGIONAL, DETERMINISM AND POSSIBILISM Structure 1.1 Dichotomies and Dualism in Geography 1.1.1 Dualism between Physical vs. Human Geography 1.1.2 Followers of the Physical Geography 1.1.3 Followers of the Human Geography 1.1.4 Conclusion 1.2 Systematic Geography vs. Regional Geography 1.2.1 Followers of the Systematic Geography 1.2.2 Followers of the Regional Geography 1.3 Determinism verses Possibilism 1.3.1 Supporters of Determinism 1.3.2 Supporters of Possibilism 1.4 Suggested Reading 1.1 DICHOTOMIES AND DUALISM IN GEOGRAPHY Introduction— Dualism means the existence of two fundamental principles or concepts often in opposition to each other. The development of dualism and dichotomies in geography has classical antiquity and can be seen in the works of ancient Greek, Arab and Roman geographers. After the post renaissance period, the apparent dichotomies were developed for the different methodologies in the study of geography .Actually, dualism is characteristics of any field of learning, this learning could be diverted to different paths through their distinctive methodologies and give birth to a new form of dualism. In geography of ancient time there were two main themes of study. First, the study of unique things that means about different phenomena in particular places and second, the formulation of general concept by studying particular types of phenomena on the earth surface. So, naturally these two forms of study within a single field gave rise to methodological problem. As Geography is dynamic and complex in nature, its scope to exhibit dichotomies and dualism also increased with the span of time.

63% **MATCHING BLOCK 2/124** **SA** MGDSE - 2.5 - Evolution of Geographical Though ... (D155224129)

Some of the important dichotomies in geography are- 8 1 General geography vs. Regional geography 2 Physical geography vs. Human geography 3

Deterministic geography vs. Possibilistic geography 4 Historical geography vs. Contemporary geography 5 Study of formal region vs. Functional region. 1.1.1 Dualism between Physical vs. Human Geography The dichotomy between physical and human geography most probably started from the works of ancient Greek geographers like Hectaeus, Aristotle, Herodotus, Polybius, Strabo etc. Although the basic traditions in ancient Greek worlds were mathematical and literary but in that time scholarly writers also produced topographical descriptions of places in the known world, discussing both natural condition and cultural and the way of life of people living there, (Holt-Jenson,1981, 9). Division of geography into physical and human branches takes place because of their different methodologies. In studies of natural phenomena, including climate, geology and landforms, it is possible to use the methods of natural science; however, they do not lead themselves very well to the study of social and cultural phenomena. Our generalizations about human groups must be limited in time and space, and must relate to statements of probability rather than certainty (Holt-Jenson, 1981, 13). The trend of dichotomy between physical and human geography was initiated by the Greeks. In ancient Greek, Hectaeus gave more importance to physical geography, which is clear from his remark that 'we should

97% **MATCHING BLOCK 3/124** **SA** combined thought final.pdf (D118996980)

take stock of what is around us and put the accumulated knowledge about the world together in usable form' .

But Herodotus and Strabo were more interested in human geography .According to Strabo 'the geographer must take his point of departure from the man who has measured the earth as a whole.' Varenius in his 'Geographia Generalis' (1650) first attempted to make essential differences between physical and human geography. Geography, he wrote

87% **MATCHING BLOCK 4/124** **SA** combined thought final.pdf (D118996980)

focuses attention on the surface of the earth, where it examines such things as climate, surface features, water, forests and deserts, mineral, animals, and the human inhabitants.

The human habitats of a place include "

91%	MATCHING BLOCK 5/124	SA	combined thought final.pdf (D118996980)

a description of the inhabitants, their appearances, arts, commerce, culture, language, government, religion, cities, famous places and famous

men."(Dickinson and Howarth, 1933, 101) 1.1.2 Followers of the Physical Geography Kant was considered as one of the supporters of physical geography because of his lectures on physical geography at University of Konigsburg in Germany between 1756 and 1796.But physical geography, as the term was commonly used in Kant's time included not only the features of the earth produced by natural processes, but
9 also the races of man, and the changes on the face of the earth resulting from human action. Kant saw man and his works in time association with the physical surroundings and he also recognized human action as one of the principle agencies but he made no distinction between them. Geography, which Humboldt called 'Erdeschreibung' (earth description), dealt with

90%	MATCHING BLOCK 6/124	SA	combined thought final.pdf (D118996980)

variety of different kinds of interrelated phenomena that exist together in areas or segments of earth

space. Carl Ritter also believed in Unity of Nature as Humboldt but he gave more importance to humans. Elisee Reclus, was the most famous disciple of Carl Ritter .Reclus was credited with his work on systematic physical geography called 'La Terra' (1866-67).His geography put major emphasis on the study of the physical features of the earth's surface .After Reclus, Guyot worked in the field of physical geography, who was the first

100%	MATCHING BLOCK 7/124	SA	combined thought final.pdf (D118996980)

professor of physical geography and geology at the college of New Jersey (Princeton)

from 1854 to1880 .In the time of Julius Frobel (1805-1893) , geography was not merely dualistic but was separated into two branches. In geography, Darwinism was interpreted primarily as an evolution which was applied in both physical and human geography. The emergence of new geography in Germany had led great development in physical geography. Works of Peschel, Richthofen, Ratzel, Penck, and Hettner enriched this branch. Peschel was the professor of geography at Leipzig in 1871, and his morphological research created an academic stir in physical geography. He seemed to have recognized the dualism in geography .Peschel excluded the study of man from it, but devoted his scientific energies and his teaching to both. Richthofen was one of the followers of physical geography; to

73%	MATCHING BLOCK 8/124	SA	MGDSE - 2.5 - Evolution of Geographical Though ... (D155224129)

him geography is the science of earth surface and the things and phenomena that are

casually interrelated with it. Albert
Penck is long

63%	MATCHING BLOCK 9/124	SA	combined thought final.pdf (D118996980)

remembered for his valuable contribution to the development of modern physical geography. He first coined the term geomorphology to refer the origin and development of earth's

landform. After that Koppen, Mill, Mortonne, and Davis, were great scholars who put more emphasis on landforms and climates as the major concerns of geography. Koppen made several attempts to provide a satisfactory classification of climates, using temperature distinctions only. William Morris Davis was the professor of physical geography at Harvard university .According to Davis the study of geography is a means for introducing many kinds of physical sciences in a simple coherent frame work. Davis learned from Shaler to see organic life, including man, as a part of the whole physical landscape and thus he began to seek an even larger conceptual structure for geography. He formulated the concept of the cycle of erosion in 1899 to explain the landform development.Mackinder, Chislom, and Herbertson also recognized physical geography as the main field for geographers.
10 Voeikev and Dokuchaiev were the two most prominent pre-revolutionary Russian geographers who advocated in favour of physical geography, that geographers' should concentrate on the physical aspects of earth's surface. The pre revolutionary tradition of physical geography was carried by I. P. Gerasimov. Systematic studies of climatographic analogue, soil geography, glaciology, geomorphology, and bio geography, accompanied with the universal and generic concepts, appeared to have given a distinct status to physical geography in the Soviet Union. However, geographers like Wrigley have mentioned that, in physical geography, law statements assume paramount importance in contrast to human geography where these are irrelevant. 1.1.3 Followers of the Human Geography : Human geography is originated because the geographers were not fully satisfied to consider man as a part of nature but they also wanted to show that the man has the power to change the earth and have the realization of these changes. Ratzel and Ritter were first to support this view. Ritter's regional geography was centred on men, the aim was to study the earth surface from the anthropocentric standpoint, to seek to relate man and nature and to see the relationship between man and his history and the ground on which he lived (Tatham, 1967, 44). Ratzel first separated human geography from regional studies. He wrote 'Anthropogeographie' (1882) in which he attempted to develop the new method of natural science with in geography.Ratzel saw man as the end product of evolution, an evolution in which the emphasis was on the natural selection of types according to their capacity to adjust themselves to the physical environment .Kirchhoff studied human geography by the reverse method- by considering human condition in relation to natural condition. He gave more attention to the culture of human groups than to the physical aspects of the earth. This approach was adopted by Ratzel in his

69%	MATCHING BLOCK 13/124	SA	combined thought final.pdf (D118996980)

second volume of Anthropogeographie (1891) as he attempted to discuss the concentration and distribution of population, settlement, migration and diffusion of cultural

characteristics. French geographer Comte de Buffon in his book "Historic Naturelle" attempted to emphasize

100%	MATCHING BLOCK 14/124	SA	combined thought final.pdf (D118996980)

the change on the face of the earth by the action of man, in the process of developing civilization.

In geography, according to Febvre, "We deal with man's work, man's calculation, man's movement, the perpetual ebb and flow of humanity, man not the soil or climate -is ever in the forefront." Vidal de la

100%	MATCHING BLOCK 10/124	W

Blache is regarded as one of the founding fathers of modern human geography.

78%	MATCHING BLOCK 11/124	W

Blache pointed out the inherent weakness of the geographic concept of environmental determinism. He realized the futility of setting man's natural surroundings in opposition to his social milieu and of regarding one as dominating 11 other.

His 'Principles de Geographie Humaine'is regarded by geographers as classic. The book deals with study of

95%	MATCHING BLOCK 12/124	W

population density, clusters, major agglomerations in Europe, movements of population in Europe,

man- milieu relationship, transport and communications etc. Blache regarded human geography as a natural science (Jenston, 1986, 207) Jean Brunhes, was one of the out standing pupils of Vidal. He elaborated Blache's idea about human geography. His major work appeared in 1910 with the title "Geographie Humanie: essi de classification positive"

55%	MATCHING BLOCK 15/124	SA	combined thought final.pdf (D118996980)

He divided the essential facts of human geography into three categories-1. The facts of the unproductive occupation of the soil: houses and roads (including rural). 2. The facts of plant and animal conquest: the cultivation of the plant and raising of animals. 3. The facts of destructive exploitation: plant and animal devastation, mineral exploitation. (

Preston .E James, 1981,250). Albert Demengeon was one of the students of Vidal de la Blache,

90%	MATCHING BLOCK 16/124	SA	combined thought final.pdf (D118996980)

Human geography according to him, is the study of human groups and societies in their relationships to the physical environment or geographical milieu. He emphasized the work of man in modifying his environment

by means of communication, artesian wells, and

93%	MATCHING BLOCK 17/124	SA	combined thought final.pdf (D118996980)

the control of rivers and the evolution of new plants for human food. The study

has four main aspects- 1. The influence of the

92%	MATCHING BLOCK 18/124	SA	combined thought final.pdf (D118996980)

geographical milieu on modes of life 2. The changes in the genre de vie under the impact of human milieu. 3. The distribution of human groups as the result of the natural milieu, and the degree of civilization. 4. The establishment in the landscape, due to the impact of the human groups on the land (

Adhikari.S.1992, 147). This dichotomy has worried the German geographers for a long time, but the French geographers stopped worrying about methodological questions of this sort after the death of Vidal in 1920. In America Mark Jefferson, was the pioneer, with such papers as that of 1909 which dealt with the 'Anthropogeography' of some of the Great Cities .He brought the idea of 'Central places', 'The Primate City', and 'the Civilizing rails' in the field of human and urban geography. 1.1.4 Conclusion From this discussion it can be properly understood that the human geography

12 basically deals with the mutual man -nature relationship which is interdependent. Geography studies the "observable-interrelated phenomena" occurring in different locations, on account of man environment relationship on the earth's surface. Human geography is inseparable from physical geography because the various phenomena on the spatial section of the earth's surface have human elements. So, the dichotomy of physical verses human geography is artificial and illogical. The study of only the physical part or only the human part is not possible, because man can modify his physical environment. Without the reference of human activity, study of physical geography remains incomplete and the study of human geography mostly depend on the physical effects on human beings .So, both are interrelated. For the survival of geography this dichotomy between physical geography vs. human geography should be eliminated. 1.2 SYSTEMATIC GEOGRAPHY VS. REGIONAL GEOGRAPHY Systematic and regional geography were formally known as general and special geography. These two terms were first used by Bartholomew Keckermann in his lecture at Dazing in 1603. It is commonly believed that Varenius made use of Keckermann's work in an organized manner and provided a clean demonstration of the relation between these two points of view (Barker, 1963, 113). Basically this intellectual problem became of major importance in the early pre classical period of modern geography, as a result of the redundance of new information about specific places and the efforts to generalize this information. Bernhard Varenius (1622-1650) first raised the dichotomy between systematic and regional geography. Varenius

91%	MATCHING BLOCK 19/124	SA	combined thought final.pdf (D118996980)

set forth the relationship between geographical writings that describe the characteristic of particular places and those that

apply to all places.Varenius in his 'Geographia Generalis' (1650) divided geography into general or universal and special or particular branches. In special or regional geography what Varenius intended was that with the exception of celestial features (climate) things must be proved by experience (by direct observation through the senses).But in systematic geography most things could be proved by mathematical or astronomical laws .Regional has particular importance for government and commerce but it leaves out the fundamentals of this field of study. It was rather

71%	MATCHING BLOCK 20/124	SA	combined thought final.pdf (D118996980)

difficult to establish laws in regional geography, for explanation must be descriptive where people are involved .

Systematic geography provides all the fundamental which regional geography is lacking of, but to be of maximum utility they must be applied .After Varenius, this distinction between the two aspects of
13 geography was more explicitly stated by Gatter (1773-75), Kurg (1800) and particularly by Bucher (1812). 1.2.1 Followers of the Systematic Geography Kant (1724-1804) was considered as one of the supporters of systematic geography. According to him Geography is an empirical science, seeking to present a "system of nature" and is a law finding discipline (May, J.A.1970, 147-151). The leading German scholar Alexander Von Humboldt pointed out that in order to establish the unity of the total cosmos; it seemed more important to make systematic studies of particular kinds of phenomena in their interrelations in areas, than to prepare complete studies of individual areas. Humboldt pointed out that geography regarded all the objects as a natural whole as they stood in areal connection, in part with the earth body, in part with the universe (Hartshorne, 1976, 76-78).Humboldt put more stress on empirically observed facts and followed inductive method which means the logical process using observation of particular initial case in order to infer a general law from them. Humboldt strongly held the concept of 'Unity of Nature'. The phenomena of nature were studied in order to establish the coherence and unity. Humboldt can also be described as a regionalist, his 'Essai politique su le ile de Cuba' are the major works in regional geography but he always gave greater emphasis on scientific process to indicate the interrelationship of different phenomena in areas. He is credited with having made geography an original and distinctive science, rather than a collection of facts from he physical and biological senses. In the late nineteenth century, because of the Darwinian influence, geographers made significant contribution to systematic studies in geography. Oscar Peschel seemed to have recognized the dualism in geography. To

52%	MATCHING BLOCK 21/124	SA	combined thought final.pdf (D118996980)

Peschel, geography was to be a systematic, emperical science, its method, and observation, drawing induction from those observations, and correcting these by still new observation.

His enormous respect for natural law led him to attempt causal classification of the life features of the earth's surface. Richthofen

97%	MATCHING BLOCK 22/124	SA	combined thought final.pdf (D118996980)

followed the precedent of Humboldt, attempted to revive the close connection of geography to the natural sciences,

and at the same time restored the Ritterian tradition .

71%	MATCHING BLOCK 23/124	SA	combined thought final.pdf (D118996980)

According to Richthofen geography is the science of the earth's surface and the things and phenomena that are

casually interrelated with it.

100%	MATCHING BLOCK 25/124	SA	combined thought final.pdf (D118996980)

Richthofen attempted to distinguish between the general geography and special geography .

According to him general geography is not progressive, it is rather regressive; since it passes from the particular to general, from the condition to cause .It is analytical. Special geography is primarily descriptive and synthetic. To him, the essential observation on which any framework of concepts must be built had to be made in the field in particular areas where the features are unique.
14 Friedrich Ratzel provided the guideline for a comparable systematic study of human geography. The brilliant generalizations of Ratzel's work was the application of Darwin's biological concepts to human societies. This analogy

100%	MATCHING BLOCK 24/124	W

suggested that groups of human beings must struggle to survive in

the particular environments as much as plant and animal organisms must do. Thus, Ratzel initiated a new ground in demonstrating that cultural and natural phenomena that could be subject to systematic study. During1950's, systematic studies became much more important in the research and teachings of America geographers. Schaefer, Ullman and Ackerman were the precursors of this new paradigm. According to Schaefer, a science is characterized by its explanations and explanation requires
laws. In geography, the major regularities which are described refer to spatial patterns and

91%	MATCHING BLOCK 26/124	W

hence geography has to be conceived as the science concerned with the formulation of the laws governing the spatial distribution of certain features on the surface of the

earth.

95% **MATCHING BLOCK 33/124** **SA** combined thought final.pdf (D118996980)

Edward Ullman (1953) a professor of geography at University of Washington, thought that geography as areal differentiation implies that 'we are not seeking principles or generalizations or similarities, the goal of all sciences'.

In article in Geographical Review on the distribution of population in earth space, the astronomical physicist John, Q.Stewart (1947) told, ' there was no longer excuse for ignoring the fact that human being obey mathematical rules resembling the 'Primitive laws of physics'. He said Geography as the study of regional uniqueness could never use the methods of physics which depend fundamentally on the recognition of regulates. For geography to be modern science it had to be redefined away from the irregular and towards the study of space as regularity that is space had to be reconceptualized not as the irregular characteristics of natural environments describable in metaphorical, poetical terms, but as distance pure, simple, and quantifiable. Von Thunen, (1966), Christaller (1933), Alfred Weber (1929) etc. also expressed the notions of spatial regularity. 1.2.2 Followers of the Regional Geography Ritter was a contemporary of Humboldt .Most of Ritter's earlier works point towards his zeal in the systematic studies. But latter he was one of the founders of regional geography and stressed that geography should first concentrate on the study of all the interrelated phenomena to be found in each of all the areas of the world, and then on their basis systematic studies could be made on the relations of individual type of the phenomena. According to the Ritter the aim of geography should be "to get away from mere description to the law of the thing, described, to reach not a mere enumeration of
15 facts and figures, but together local and general phenomena of the earth surface." Ritter
was a regional geographer who gave weight to man as an important component of the physical surroundings.
Hettner was one of the significant regional geographer .He

100% **MATCHING BLOCK 27/124** **W**

defined geography as the chorological science of the earth's surface,

92% **MATCHING BLOCK 28/124** **W**

or in other words, geography is the study of the earth (eardkunde) according the causally related differences -the science of areal differentiation of the earth's surface .

Actually "

98% **MATCHING BLOCK 29/124** **W**

the goal of the chorological point of view is to know the character of region and places through comprehension of the existence together and interrelation among the different realms of reality and their varied manifestations, and to comprehend the earth's surface as a whole in its actual arrangement in continents, larger and smaller regions and places" (Hartshorne, 1959, 13). He

pointed out that

100% **MATCHING BLOCK 30/124** **W**

the systematic sciences ignore the temporal and spatial relationships and find their unity in the objective likeness or similarity of the subjects with which they are concerned.

But

100% **MATCHING BLOCK 31/124** **W**

it is mainly due to Hettner that dualism, which so long hampered geography has been successfully overcome

the problem.

100% **MATCHING BLOCK 32/124** **W**

However some writers have accused Hettner of defining geography as essentially idiographic (

regional) but it is

90% **MATCHING BLOCK 41/124** **SA** combined thought final.pdf (D118996980)

not true. He attempted to make it clear that geography is both idiographic and nomothetic.

100% **MATCHING BLOCK 34/124** **W**

Vidal de la Blache seeks to establish geography as a distinct discipline.

He rejected the deductive approach of Ratzel and supported inductive and historical method. He studied small natural regions (pays) which

100% **MATCHING BLOCK 35/124** **W**

are manifestations of intimate relationship between man and nature that developed through the

century's. He argued that

74% **MATCHING BLOCK 36/124** **W**

the study of such small natural region, each of which is unique, should be the task of the geographers. So, he opted for regional geography as the core of the discipline. Man -nature relationship cannot be studied along systematic lines.

Demangeon in support of regional geography wrote 'every region has its unique character to which contribute the features of the soil, atmosphere, plants and man, The aim of all geographical research consists in the analysis of these features. The aim of description in to synthesized these and to show the interlocking of all the phenomena which comprise regional type (Demangeon, 1905). Jean Brunhes, Sten de Geer etc were the other supporters of regional geography. In the first half of twentieth century the great supports for regional geography came from the works of Carl O Sauer, Richard Hartshorne and Robert Platt etc. In that time regional geography was transformed from indispensable part of geography to the culminating branch. According to Wooldridge and East, for the general reader, regional geography is and always has been geography par excellence. In Annals of the Association of American geographers (1919) Nevin Fenneman wrote that "The one thing that is first, last and always geography and nothing else, is the study of areas in their compositeness or complexity that is regional geography."

16 The leading form of regional geography in the Anglo -American tradition was theorized by the eminent geographer Richard Hartshorne (1899-1992). Hartshorne's 'The Nature of Geography' (1939) was symbolic of a particular style of descriptive regional geography. The main features of Hartshorne's conception of geographical part of knowledge are as follows— He emphasized that

65% **MATCHING BLOCK 37/124** **W**

geography seeks to acquire a complex knowledge of the areal differentiation of the world .....Phenomena significant to areal differentiation having areal expression ..... (

Hartshorne, 1939, 463-5). He again pointed out that

91% **MATCHING BLOCK 38/124** **W**

the things geographers deal with on the face of the earth are not uniformly distributed over it.

92% **MATCHING BLOCK 39/124** **W**

The phenomena associated in a particular place are unsystematically related because they are produced by different processes. So, the

task for

88% **MATCHING BLOCK 40/124** **W**

the geographer is to study each process as it operates in particular places.

At last, after long discussion, Hartshorne and Ackerman decided that systematic and regional geography are not separate disciplines rather the parts of geography .Berry does not considered any conflict that

90% **MATCHING BLOCK 42/124** **SA** MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

exists between regional and systematic geography because they lie at the two extremes of a continuum.

Some geographers considered regional geography as the traditional component of geography which was until recently widely considered sine qua non of the discipline. But another groups of geographers also considered that the regional concept is experiencing a reappraisal. Thus the dichotomy of systematic and regional therefore, falls as they do not oppose but support each other in the final analysis, of the subject matter of geography. 1.3 DETERMINISM VERSES POSSIBILISM Geography is the study of the relationship between man and environment and from ancient time geographers have engaged themselves to study impact of man on environment and vice versa. This study is still relevant for better understanding of the changing pattern of man -environment relationship. Environmental determinism and possibilism are the two mutually exclusive philosophies in human geography, cen- tered on man, whether man is to be looked upon as a 'passive being' or as

100% **MATCHING BLOCK 43/124** **SA** combined thought final.pdf (D118996980)

an 'active force', reacting to his environment and changing it.

The philosophy of environmental determinism is, perhaps, the oldest surviving philosophy that can be traced back to the classical antiquity. This idea has been inherited from Greek philosophy that nature is all powerful and not only directed but determined all the human activities. According to Haggett, 'environmentalism is the view

55%	MATCHING BLOCK 44/124	SA	MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

that natural environment plays the major role in determining the behaviour patterns of man on the earth's surface'.

After Second World War this dichotomy started. On the other hand philosophy of possibilism reflects the view that the pattern of human activity

100%	MATCHING BLOCK 45/124	SA	MGDSE - 2.5 - Evolution of Geographical Though ... (D155224129)

on the earth's surface is the result of the

initiative and mobility of man operating within a frame of natural
17 forces. Without denying the limits every environment sets to man's ambition, they emphasize the scope of man's action rather than these limits. Haggett has defined it as follows, "Possiblism, in contrast to environmentalism, stresses the freedom of man to choose alternative patterns of behaviour despite geographic location (Haggett, 1972, 591). 1.3.1 Supporters of Determinism Determinism is the oldest surviving philosophy so, it has classical antiquity. First, Greek and Roman scholars attempted to study the impact of nature on man. Hippocrates (420BC) in his 'Airs, Waters and Places' compared the easy going Asiatic living in a very favourable region with the penurious Europeans, with a hard hand of nature upon them. Aristotle in his Politics also showed the difference of colder Europeans with Asians in terms of courage, technical skill, and spirit. The people of Asia are thoughtful, skillful but without spirit. Where as Europeans are brave so they remain free longer than others. Plato (428-348 BC)

100%	MATCHING BLOCK 46/124	SA	combined thought final.pdf (D118996980)

insisted that the observable things on the earth were only poor copies of ideas or perfect predicates from which observable things had degenerated or were in the process of

degeneration. Eratosthenes, Strabo, and Ptolemy were the eminent supporters of this view at that time. The Middle Ages were dark periods for the development of sciences in Europe. But various supports came from Albertis Magnus, Cardinal Pierre d' Ailly, Ibn- Hawqal, Al Masudi, Al- Biruni, Ibn-Batuta, and specially from Ibn-Khaldun, who was the first scholar to have turned his attention specially to man- environment relations. His book 'Muquaddimah' in 1377 begins with a discussion of man's physi- cal environment and its influence and with man's characteristics that is related to his culture or way of living rather than to the environment. During renaissance empha- sizing the impact of environmental factors Bodin in 1566 described the peoples of northern lands as brutal, cunning, but gifted with the capacity for separating truth from falsehood. Inhabitants of temperate regions are more talented than those of the north, more energetic than those of the south and they alone posses the prudence necessary for command. Montesquieu, a century later, explained the determining effect of climate and soil on the character of the people as a guide to the law giver. People in cold climate are stronger physically, more courageous, more frank, less suspicious and less cunning than those of the south who are like old men, timorous, weak in body, indolent and passive. The hot climate is the cause of immutability of religion, manners, customs and laws in the eastern countries. He was of the opinion that island peoples are more zealous of their liberties than those of the continents. Kant also described that all inhabitants of hot lands are exceptionally lazy, they are also timid and the same two traits characterize also folks living in the a north. From

18 these basic concepts inherited from Greek philosophers, the nineteenth century geog- raphers developed the concept of deterministic study in a systematic way. Two of such geographers of the early part of the century Carl Ritter and Alexander Von Humboldt known for their 'positivist' approach based on empiricism, had attempted to give a new dimension to the idea of determinism and such hypotheses. Alexander Von Humboldt (1769-1859) ,a German geographer ,was considered as the pioneer of determinism in geography .In his book Cosmos , he described the effect of configuration of the Mediterranean on the evolution of early civilization. He wrote, " the influence of the sea was speedily manifested in the growing power of the Phoenicians and in the rapid extension of the sphere of general ideas." He believed that the phenomena on the earth's surface were governed by laws, but all these would only become apparent when all facts and relationship had been observed in all parts of the earth. Carl Ritter (1779-1859) a German geographer propounded the influence of environmental factors not only on human activities but also on human character. He was a teleologist, and his views seem to be a manifestation of an implied determinist. Many people said that Ritter was not a determinist because he was much cautious to indulge in facile generalizations. Furthermore, though he was interested in the effect of the earth on man, the reciprocal action of man on earth was to him equally significant. Ritter in fact, pursued 'idealism' in his explanation to this concept of unity of nature vis-a-vis the hypothesis of determinism. Darwins ideas revolutionized the early nineteenth century hypothesis on determinism. William Morris Davis, Haeckel, Herbert Spencer, and Ratzel developed the concept of Darwin and established a relationship between Darwinism and Determinism. Fredric Ratzel may be considered as leader of environmentalism. In his 'Anthropogeographie', he showed the influences of the geographical environment upon history. In 1897 Ratzel published his work on political geography where he attempted to show that

89% **MATCHING BLOCK 47/124** **SA** combined thought final.pdf (D118996980)

a state like some simple organisms, must either grow or die and can never

stand still, it is the reflection of Darwinian idea of 'selection and struggle'. Frederic Le Play, Buckle, and Demolins were the great contributors of this approach. The most influential determinist of the early twentieth century, belonging to the Darwinian- Ratezelian heritage was the American geographer Miss Ellen Semple. In her classical work, 'Influence of geographic Environment' (1911) she noted- "Man

74% **MATCHING BLOCK 51/124** **SA** combined thought final.pdf (D118996980)

is a product of the earth's surface. This means not merely that he is a child of the earth, dust of her dust, but that earth has mothered him, fed him, set him tasks, directed his thought, confronted him with difficulties that have strengthened his body and sharpened his wits, given him his problems of navigation or irrigation and at the same time whispered hints for their solution"(

Semple,
EC, 1911, P-1-2). Huntington was often described as an imaginative thinker and interpreter of the
19 effects of climate on human life. His view is also known as climatic determinism. E C. Dexter, Albert Brigham, H.J.Mackinder, Mechni Kov, Baranskily, Plekhanov supported the deterministic approach. Apart from above geographers, several other scholars have supported fully or partially the concept of environmentalism. But with the advancement of knowledge, scientific and technological developments it was realized that man can use nature for his comforts. According to Tatham, although environment undoubtedly influences man, man in turn changes his environment, and the interaction is so intricate that it is difficult to know when one influence ceases and the other begins (Tatham, 1952, P-148). The possibilist paradigm

92% **MATCHING BLOCK 52/124** **SA** combined thought final.pdf (D118996980)

views that the, Physical environment tends to provide the opportunity for a range of possible human responses and that people have considerable discretion to choose between them through their creative genius and creativity(

Adhikari.S.2006, P-207). 1.3.2. Supporters of Possibilism It was not until 1899 that a new dimension to the philosophy of possibilism was added by Paul Vidal de la Blache by the work of other geographers like Montesquieu, Comte de Buffon, George Perkins Marsh and Alfred Kirchoff. As opposed to the environmental determinism of the Darwinian-Ratzelian heritage, Blache set forth a conceptual frame work of possibilism which was later fully developed by a critical historian Lucien Febvre.Blache said that

81% **MATCHING BLOCK 48/124** **W**

the physical environment provided a range of possibilities which man turned to his use according to his needs, wishes and capabilities in creating his habitat.

He also said that

89% **MATCHING BLOCK 49/124** **W**

in an area of human settlement, nature changed significantly because of the presence of man, and these changes were greatest where the level of material culture of the community

was highest. According to him "nature is never more than an advisor." Febvre in his book 'Geographical Introduction to History' explained the man -environment relationship in a new form, when he wrote 'man is a geographical agent and not the least. He everywhere contributes his share towards investing the physiognomy of the earth with those 'changing expressions' which is the special charge of geography to study. He again proposed that 'there are no necessities but everywhere possibilities, and man as a master of these possibilities is the judge of their use.' According to Brunhes 'we must add to the group of material forces whose incessant interplay we have seen this new force, human activity, which is not only a material thing, but which also expresses itself through material effects'(Brunhes, p27). American geographer Isaiah Bowman was a staunch admirer of the French possibilist paradigm. In his 'geography and the Social Sciences', Bowman stated '

89% **MATCHING BLOCK 50/124** **W**

as knowledge of the world spread ,the association of event or condition with place widened, they became more complex, they had less or more significance with respect to mankind.' 20

Carl .O Sauer, and V.Whittlesey also supported the view of Possibilism, but like determinism, Possibilism is also an extreme concept and soon people realized that the impact of nature cannot be ignored. Man can use nature but there is a certain limit to such utilization. Striking a balance between extreme Determinism and extreme Possibilism, Griffith Taylor developed a new philosophy, called 'stop and go determinism' or 'neo-determinism', in the early 1940's.It may be, he stated that the well endowed parts of the world offer a number of different possibilities for making a living, but in some nine tenths of the earth's land area nature speaks out clearly: This land is too dry, too cold or too wet, or too rugged. Any settlers who fail to heed this nature-given limitation must face disaster. Debate on environmental determinism and Possiblism continued into 1960's, 1970's and 1980's and was actively pursued in the United Kingdom in the first decade after the Second World War. O.H.K. Spate in 1957 proposed the philosophy of Probabilism in which physical environment is not considered as powerful to determine every human actions, it does, nevertheless make some responses more likely than others- '
human action was represented as not choice or compulsion, but a balance of probabilities.
Haggett said '

94% **MATCHING BLOCK 53/124** SA MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

Probabilism is a compromise position between environmentalism and possibilism that assigns different probabilities to alternative patterns of geographic behaviour in a particular location or environment.'

Fleure, Spate, Woolridge and East, Roxby and Herbertson have expressed their ideas on man-environment relationship in terms of man's adjustment to nature and have also given due weightage to the modern scientific development. Thus the debate among geographers about whether people are free agents in their use of earth (environment) or whether there is a 'nature's plan slowly dissolved as the antagonists realized the merits in each case. 1.4 SUGGESTED READING 1. Holt-Jenson, Arild, 1981: Geography: Its History and Concepts-a students guide, London Harper& Row.(P-9) 2. Ibid.(P13) 3. Dickinson, R.E and Howarth, O.J.R, 1933, The making of Geography.Oxford, The clarendon press (P101) 4. Tatham,G,1952 (reprint 1967): Environmentalism and Possibilism. In G Taylor(ed), Geography in Twentieth Century, London, Methuen, (p-44) 5. Johnston R J .et al (ed) 1986: The dictionary of Human Geography (2nd ed.) Oxford, Basil Blackwell. 6. Preston E James (1980) All Possible World ,a history of Geographical Ideas, Sachin Publications, Jaipur-Delhi.
21 7. Adhikari. S. 1992. Fundamentals of Geographical Thoughts. Chaitanya Publishing house, Allahabad-2 8. Barker, J.N.L 1963 'Major James Rennel, 1742-1830, and His Place in the History of Geography'. In The History of Geography. New York: Barnes & Noble (p-113) 9. May J. A.1970: Kant's concept of Geography and Its Recent Geographical Thought, Toronto: University of Toronto, Department of Geography, Research paper no 4. 10.

54% **MATCHING BLOCK 54/124** SA MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

Hartshorne, 1939 (new print 1976): The Nature of Geography, Lancaster, Pensylvania, Association of American Geographers, (p 75-76) 11. Hartshorne, 1959: Perspective on nature of geography, Chicago,

Rand Mc Nally, (p-13, 463-5) 12. Haggett.P., 1972(new edns. 1975, 1979): Geography, A modern synthesis, New York Harper and Row (p-591) 13. Semple, E.C., 1911: Influences of geographic environment, New York Henry Holt (p, 1-2) 14. Tatham, G., 1952(reprint,1967): Environmentalism and Possibilism. In G Taylor (ed), Geography in Twentieth Century. London, Methuen, (p-148) 15. Adhikari, S.,1992(new edition 2006): Fundamentals of Geographical Thought, Chaitanya Publishing House, Allahabad-2 (p-207) 16. Brunhes, J., 1910:La Geographic humaine. Paris, Armand Colin. (p-27)
22 UNIT 2 ? LANDSCAPE MORPHOLOGY—CULTURAL EXPRESSION OF CARL SAUER Structure 2.1 The Morphology of Landscape 2.2 Concept 2.3 Conclusion 2.4 Selected Reading 2.1 THE MORPHOLOGY OF LANDSCAPE Introduction—Landscape is a polysemic term referring to the appearance of an area, the assemblage of objects used to produce that appearance and the area itself. Carl O Sauer (Dec 24, 188 9 July, 18 1975) an American geographer introduced the term 'Morphology of landscape' in 1925.The influential article drew on the concept of 'land schaft' developed by German geographers most predominantly Passarge and Schulter.Carl Sauer used the term 'landscape' to denote the concept of geography to characterize the particularly geographic association of facts and suggested that equivalent term for landscape might be area or region. Sauer's thinking about cultural particularism and relativism was influenced by the work of Alfred Kroeber (1876-1960) and Robert Lowie (1883-1957).They were the members of the anthropology faculty at University of California. Kroeber was keen to explore how the particular associations of cultural traits are mapped the distinctive feature of particular people, but also how those traits interacted to map the total way of life, of a tribe of Californian Indians or the first peoples to domesticate plants. Kroeber put it this way. The concept of cultural area is a means to an end. The end may be the understanding of cultural processes as such ,or of the historic events of cultures. A few years later Carl Sauer echoed these words precisely -a geographer 'is interacted in discovering different patterns of living as they are found over the world -cultural areas. Geographer is, therefore, properly engaged in charting the distribution over the earth of the arts and artifacts of man to learn whence they came and how they spread what their contexts are in cultural and physical environments. Sauer went back to the writing of Passarge's land chaft, chorology (the science of region) associated with Richthofen, and studies of how natural landscape are transformed into cultural ones, associated with Hettnerto conceive geography as a cultural history in its regional articulation.

23 2.2 CONCEPT Sauer used the term 'landscape' to denote the unit concept of geography, to characterize the particularly geographic association of facts and suggested that equivalent terms for landscape might be area or region. Sauer was a fierce critic of environmental determinism, which was the prevailing theory in geography when he began his career. He proposed instead an approach variously called 'Landscape Morphology or 'Cultural history'. This approach involved the inductive gathering of facts about human impact on the landscape over time. His goal was to re-establish geography as a respective science - a task all the more important because no other discipline had claimed for itself the 'section of reality' that comprise geography. That section of reality -one that he asserted was 'naively given' by the very nature of the world -was the landscape (Leighly,1963,316-17) Sauer therefore argued that the task of geography was to establish 'a critical system which embraces the phenomenology (science of phenomena which can be perceived as objects, occurrences or facts) of landscape in order to grasp in all of its meaning and colour the varied terrestrial scene' (Leighly, 1963,320). The first step in the Morphology of Landscape approach was to make an elementary distinction between the cultural and natural landscape. According to him - "The design of landscape includes 1. The features of the natural area and 2. The forms superimposed on the physical landscape by the activities of man, the cultural landscape. The man is the latest agent in fashioning of the landscape"(Sauer: 1927,186) In the Morphology of Landscape, Carl Sauer presented his model on the derivation of a cultural landscape. In this model it is shown that the culture is the factor that begins the process. Sauer downplayed the subjective aspects of the concept of landscape and stressed that landscape was an objective area to be studied scientifically through observation .In case of landscape morphology it has to be studied as an area made up of a distinct association of forms both physical and cultural. Sauer's position was that geographers should proceed genetically and trace the development of a natural landscape into a cultural landscape. Actually the natural landscape existed as pure natural only before the introduction of man's activity in a particular area .Any natural scene Sauer averred, begins as a set of factors, geognostic (the underlying geology), climate, vegetation and so on. Over time these factors interact with each other to create the specific landscape forms (climate, geomorphic features, soil, specific association of vegetations etc.) that comprise the morphology -the shape and structure of the natural landscape itself. Such description of natural landscape (including the description of the processes a work overtime that give shape and structure to them) was according to Sauer, merely preliminary. The natural landscape is being subject to transformation at the hands of
24 man, the last and for us(geographer)the most important morphological factor which can change the shape and structure of physical landscape. By his culture man makes use of the natural forms, in many cases alters them, and in some destroys them. The cultural landscape is fashioned from a natural landscape by cultural groups. Sauer wrote, '

97%	MATCHING BLOCK 56/124	SA	combined thought final.pdf (D118996980)

Culture is the agent, the natural area is the medium and the cultural landscape is the result.....

The natural landscape of course is of fundamental importance ,for it supplies the materials out of which the cultural landscape is formed. The shaping force however lies in the culture itself. Every social group imparts its cultural imprint on the natural landscape. In time this imprint produces what Sauer called a cultural landscape, which includes settlement patterns, distinctive structures, and transportation systems, all attributes of a society. The cultural landscape is therefore an effect and culture (working with and against nature) is a cause upon which we look. Sauer developed a powerful methodology for understanding the processes through which landscape is developed. FACTOR MEDIUM FORMS Culture -time- Natural landscape ...Population density, mobility, housing ...Cultural Plan, structure, Landscape production, Communication etc. Carl Sauer's schematic representation of the morphology of landscape (Mitchell, 2000, 29) notes that in contrast to environmental determinism, 'culture' becomes the primary agent of change and the results of that change -the cultural landscape is what is to be explained. Over time the cultural landscape has changed and has become complex with each 'introduction of a different- that is alien culture' in an area a "rejuvenated of the cultural landscape sets in, or a new landscape is superimposed on remnants of an older one" (Leighly, 1963, 343). Sauer and his numerous students developed the methodology laid down in The Morphology and Landscape' to show how cultural development and transformation is (including conquest of indigenous peoples by impartial powers) constantly created and recreated at the places and landscapes where people live. According to Mitchell, if Sauer's 'morphology' directed geographers to a more subtle notion of causality then that espoused by environmental determinism a notion that sought to understand how people lived in place and thus shaped it, rather than vice- versa - and if it also directed attention to the agency of human cultures ,it also reasserted a renewed importance for descriptive studies. After all, one of the purposes of studying the landscape was to determine just what the evidence of 'culture' was.

25 Sauer himself suggested that geographers needed to concern themselves with the description of cultural forms that comprise the landscape. This is a strictly geographic way of thinking of culture. 2.3 CONCLUSION Time and change are basic concepts of Carl Sauer's cultural landscape. The roots of Sauer's anti-evolutionism are found in his early rejection of environmental determinism for an empiricist and chorology of material culture traits and in his connection with contemporary anthropologies. 'The morphology of landscape' is of great importance because it essentially ended with the influence of environmental determinism in American geography. Sauer was the important founder of two geographical sub disciplines, cultural ecology and cultural geography. He was also one of the first geographers to express concern about the negative impacts of cultures on the natural environment. At his death in 1975, the American people as a whole lost one of the most articulate scholars this century has yet produced. 2.4 SUGGESTED READING 1. Leighly, J.ed. 1963, Land and Life, A selection from the writing of Carl Ortwin Sauer, Berkeley and Los Angeles: University of California press, (p 316-317) 2. Ibid. (320 and 343) 3. Sauer, C.O, 1927: Recent developments of Cultural geography. In E. C Hayes(ed), Recent developments in the social sciences .Philadelphia: J.B Lippincott (p 186) 4. Mitchell, Don, (2000): Cultural Geography: A Critical Introduction, Blackwell Publishing, UK (P 27-29)

26 UNIT 3 ? HARTSHORNE—SCHAEFER DEBATE ON REGIONAL DIFFERENTIAL AND SPATIAL ORGANIZATION Structure 3.1 Hartshorne—Schaefer Debate (Regional tradition : Areal differentiation) 3.2 Spatial tradition 3.3 Conclusion 3.4 Suggested Reading 3.1 HARTSHORNE—SCHAEFER DEBATE (Regional tradition : Areal differentiation) The significance of the Hartshorne-Schaefer debate in the development of tradition in geography after World War -II focused on a shift from a more idiographic, specific perspective to a more nomothetic, law making, and generalized perspective. Regional tradition : Areal differentiation-during 1920's the focus of many American geographers moved away from man land relationship to a concern with regional studies. In the late 1930's, Richard Hartshorne wrote a monograph '

100%	MATCHING BLOCK 61/124	SA	2131687.pdf (D25894597)

The Nature of Geography : A critical survey of current thought in the light of the past' (1939)

which sought a logical rationale for geography as an academic study. For nearly two decades this work was cited as defining areal differentiation as the main stream of geographical scholarship. According to Nicholas Entrikin (1989) it was symbolic of

75% **MATCHING BLOCK 55/124** W

a particular style of descriptive regional geography with roots in German geography, especially the ideas of Alfred Hettner. Hettner defined geography as the study of the earth's surface,

according to the causally related differences— the science of areal differentiation of the earth's surface.
According to Hartshorne- "

75% **MATCHING BLOCK 57/124** W

Geography seeks to acquire a complex knowledge of the areal differentiation of the world .....phenomena significant to areal differentiation having areal expression. Consequently, geography depends first and fundamentally on the comparison of maps. In systematic geography, each particular element or element complex, that is geographically significant, is studied in terms

of
it's

97% **MATCHING BLOCK 58/124** W

relation to the total differentiation of areas. In regional geography, all the knowledge of the interrelation of all features at given places— obtained in part from the different systems of systematic geography is integrated, in terms of the interrelations which 27 these features have with each -other, to provide the total geography of those places(Hartshorne 1939, 463-5).

He stated that

98% **MATCHING BLOCK 59/124** W

geography is basically a regional study dealing with unique combination (interrelations) of characteristics in specific areas of the earth's surface; it is also largely descriptive 'no universals need to be evolved', other than the general law of geography that all areas are unique', (Hartshorne 1939, 468).

Hartshorne contented that the purpose of geography

95% **MATCHING BLOCK 60/124** W

is to provide accurate, orderly and rational descriptions and interpretations of

areal or regional variability, it seeks to acquire a complete knowledge of the areal differentiation of the world, and therefore discriminates among the phenomena that vary in different parts of the world in terms of the geographic significance, i.e. their relation to the total differentiation of areas. The principal purpose of the geography, according to this tradition, is synthesis, as an integration of relevant characteristics to provide a total description of a place - a region -which is identifiable by its peculiar combination of those characteristics. There is a close parallelism between history and geography. While history organizes facts chronologically, geography organizes them chorologically. So, history provides a synthesis for temporal sections of reality where as geography studies the spatial sections of the earth's surface. This regional tradition became very popular and man research works emerged in the fields of urban geography, political geography, and social geography. While defining the 'new' field of social geography, Watson (1953) saw it 'as the identification of different regions of the earth's surface according to associations of social phenomena related to the whole environment. 3.2 SPATIAL TRADITION This tradition had faced sudden death because of the emergence of a new research tradition in the mid 1950's, in the form of the single Annals article published in 1953 by a scholar Fred Schaefer, entitled '
Exceptionalism in geography, A methodological examination. (In the Annals of the Association of American Geographers 43. 226- 244)
In
his paper he argued that the regional tradition implied the study of inherently unique or exceptional objects, regions and science is about the construction of generalization that cover groups of objects. He then pointed out that the object of such geographical study "to claim that findings of the individual systematic sciences were arrogant and that in any case its products were somewhat lacking in .....startlingly newer and deeper insights". So, from regional traditions all of us can construct different boundaries to any region, such as the Great Central Valley (e.g. fluvially, structurally and politically);
28 and justify our choices logically and there is no universal way to choose one set of boundaries over another. Schaefer believed that as a social science, geographic research should explore regularities in spatial patterns. The definition of geography should not emphasize chorology as advocated by Hartshorne, but rather it should

60% **MATCHING BLOCK 62/124** **SA** Exceptionalism.docx (D30268332)

be developed as a science of those factors governing the spatial distribution of certain features on the surface of the earth. It is the spatial arrangement of phenomena, not the phenomena themselves,

that Schaefer believed should be the subject of the geographers' search for generalizations. Geographic methodology should be the basis for formulating generalization that can be stated as hypotheses to be tested against a large number of cases. If the hypotheses can be verified, it should be possible to formulate geographic theory. Debate Hartshorne claimed

72% **MATCHING BLOCK 63/124** **SA** Exceptionalism.docx (D30268332)

that geography does not share the methodology of other sciences because of the peculiar nature of its subject matter which include the study of unique places or

region. But

96% **MATCHING BLOCK 64/124** **SA** Exceptionalism.docx (D30268332)

Schaefer opined that geography is not peculiar in its focus on unique phenomena; all sciences deal with unique events which can only be accounted for by an integration of laws from various systematic sciences, but this does not prevent the development of those laws.

In case of history, historians must integrate laws of social science to explain what happened at a certain time. Schaefer also pointed out some problems of applying nomothetic approach to geography as a spatial social science. These problems include experimentation, quantification and methodological selection. In the three of his major publications (1955, 1958 and 1959), Hartshorne expressed

100% **MATCHING BLOCK 66/124** **SA** Exceptionalism.docx (D30268332)

his reaction to Schaefer's attack and criticism to his regional

paradigm. He claimed that Schaefer's view ignores the normal standards of critical scholarship, and in effect offers nothing more than personal opinion, thinly disguised as literary and historical analysis (S.
A.P.207).
Hartshorne's most bitter rebuttal of Schaefer's criticism was published in his monograph entitled 'Perspective
on the Nature of Geography' (1959)
in which he defined geography as that discipline which "seeks to describe and interpret the variable character from place to place of the earth as the world of
man." He considered that human and natural factors do not have to be identified separately - any prior insistence on this was a function of the arguments of environmental determinism. He made an important distinction between 'expository' description and 'explanatory' description. 'Geography is primarily concerned to describe the variable character of areas as formed by existing features in interrelationships.....

100% **MATCHING BLOCK 65/124** **W**

explanatory description of features in the past must be kept subordinate to the primary purpose'.

Thus historical geography
29 should be the expository description of the historical present but the purpose of such dips into the past is not to trace developments or seek origins but to facilitate comprehension of the present. But the spatial tradition of Schaefer encourages the kind of specialization that can get you to the research frontier in a particular topic. The particular spatial distributions can be strictly human phenomena (language, religions, etc.), strictly natural phenomena (earthquake epicenter, vegetation association etc) or some sort of relationship between society and nature. So, any geographer does not have to learn about everything else in a region. On the question raised by Schaefer 'Does geography seek to formulate scientific laws or to describe individual cases ? Hartshorne replied in the negative and pointed out the following difficulties in establishing such laws through geographical investigation- 1. Scientific laws must be based on large number of cases, but geographers study complex integrations in unique places. 2. Scientific laws can be best established in laboratory experiments which allow only a few independent variables to vary, but such type of work is impossible in geography. 3. Interpretation requires skills in the systematic sciences which are beyond the capacity of geographers and 4. Scientific laws suggest some kind of determinism but this is inappropriate to the human motivations which are in part the causes of landscape variation. For these reasons the search for laws is irrelevant to geography.
Hartshorne'
s was a

100% **MATCHING BLOCK 67/124** **SA** Exceptionalism.docx (D30268332)

positive view of geography; geography is what geographers have made it. Schaefer's was

a

100% **MATCHING BLOCK 68/124** **SA** Exceptionalism.docx (D30268332)

normative theory of what geography should be, irrespective of what it had been (Johnston, 1983). 3.3

CONCLUSION 'Universities were expected to produce problem-solvers.....Statistics and models were ideal tools.....' Hence the shift to Schaefer's utilization of numbers and laws- making from Hartshorne's observational approach. Academia wanted more concrete proof of data and theory than the earlier approach could provide and wanted to complete more 'scientific' in their approaches to problem solving. After the Hartshorne- Schaefer debates of the early 1950's there began an evolution from the qualitative approach to quantitative approach in geography. Geography was able to expand to a larger degree with the invention of new technology, most notably GIS (Therston). This spatial tradition enjoyed the dominance from the late 1950's to the mid 1970's but this dominance has been challenged since the 1970's by various radical, post
30 modern, and deconstructionist approach, many forms which attack the legitimacy of science it self. 3.4 SUGGESTED READING 1. Entrikin, J.N.1989.

83% **MATCHING BLOCK 69/124** **SA** 2131687.pdf (D25894597)

Introduction: The Nature of Geography in perspective. In N. Entrikin and S.Brunn (eds), Reflections on Richard Hartshorne's "The nature of Geography" Washington: Association of American Geographers, (

P, 1-15). 2.

87% **MATCHING BLOCK 70/124** **SA** 2135579 - Question2 - Final.docx (D24056280)

Hartshorne, R.1939. The Nature of Geography: A critical survey of Current Thought in the Light of the Past. Lancaster, Penn: Association of American Geographers. (

P, 463-5) 3. Adhikari.S, 1992. (New print 2004) Fundamental of Geographical Thought, Chaitanya Publishing House, Allahabad, (P, 207-8) 4.

90% **MATCHING BLOCK 71/124** **SA** 2013_ThmosKhun.pdf (D153447298)

Johnston, R.J. 1983: Geography and geographers: Anglo- American human geography since 1945 (2nd eds.) London, Arnold. 31

UNIT 4 ? NOMOTHETIC AND IDIOGRAPHIC APPROACHES IN GEOGRAPHY ; SYSTEM AND ECOLOGICAL APPROACHES IN GEOGRAPHY. Structure 4.1 Nomothetic and Idiographic approaches in Geography 4.1.1 Development of Idiographic approach 4.1.2 Development of Nomothetic approach 4.1.3 Conclusion 4.2 Ecological approaches in Geography 4.3 Concept and Meaning of Ecology. 4.3.1 Geography and Ecology 4.4 Systems approach in Geography 4.4.1 Application of Systems in Geography 4.4.2 Conclusion 4.5 Suggested Reading 4.1 NOMOTHETIC AND IDIOGRAPHIC APPROACHES IN GEOGRAPHY Geography deals with the phenomena which occur in association on the Earth's surface, with distinct areal expressions and variations. But to study these phenomena some specific approaches are needed. More than twenty four centuries ago different ancient Greek scholars from Miletus like Thales, Anaximander, and Hactaeus represented the apparent dualism between those who seek to formulate generalizations and those who seek to describe unique things. In modern times these two points are described as nomothetic meaning law seeking and idiographic, meaning descriptive things. There was a great controversy among the historians about the methodology of study. In the latter part of the nineteenth century Windelband, Dilthey, Rickert and other historians, chose to differentiate between those subjects which they regarded as idiographic method (the exploration of particular connection) and those which were

32 concerned with establishing generalization and were nomothetic in character. The term 'idiographic and nomothetic'were first used by Wilhelm Windelband in 1894. In geography, although these two approaches appeared at Miletus more than twenty four centuries ago but the dualism developed only in the late eighteenth century in an organized manner. The idiographic or empirical approach places primary
emphasis on the description of particular grouping of nations and people in terms of
lands, seas, countries and places. It does not seek to develop laws but to find out how phenomena account for the genus loci, the character of a place and its relation with other places. The nomothetic approach seeks to establish theories relevant to the location and interrelation of places and to establish laws
and make deduction on the basis of laws. These are the basic and traditional approaches in all geographical inquiry and their contrast and conflict have become more marked and difficult to bridge as knowledge of the surface of the earth has increased (Adhikari, S. 1992, p-65). 4.1.1 Development of Idiographic Approach Immanuel Kant (1724-1804) is regarded as father of exceptionalism. Exceptionalism is

96%	MATCHING BLOCK 72/124	SA	Exceptionalism.docx (D30268332)

the belief that geography and history are methodologically distinct from other sciences because they are peculiarly concerned with the study of the unique and particular.

Kant apparently characterized the position of both geography and history in relation to the other sciences as follows: 'We may classify our empirical knowledge in either of two ways; either according to conceptions or according to time and space in which they are actually found .....Through the former we obtain a system of nature, such as the Linnaeus, through the latter, a geographical description of nature.....Geography and history

88%	MATCHING BLOCK 76/124	SA	Exceptionalism.docx (D30268332)

fill up the entire circumference of our perception: Geography that of space, history that of time (Hartshorne, 1939, 134-5)'.

Kant opined that geography is a spatial science and deals with particular things rather than mere descriptions for generalization or explanation. The Kantian thesis was apparently used by Hettner to establish that geography, along with history and certain other disciplines, was an idiographic rather than a nomothetic science. In the nineteenth century's Germany, there emerged a new concept of new Kantianism, the followers of it, made a distinction between the cultural and historical sciences with physical sciences. The cultural and historical sciences deal with an intelligible world of 'non sensuous object of experience' which have to be understood so, they are idiographic. The natural sciences deal with the 'sensible world of science' which could be explained and which is thus concerned with the nomothetic. But the Kantian thesis became important during the 1920's and 1930's because of
33 the strong reaction against so called determinist school and a consequent rejection of crude laws put forward as aids to explanation by writers such as Semple , Huntington and Griffth Taylor. Research thus tended to focus on small areas and this type of research generally included the uniqueness of areas and the idiographic method as its major tool. French geographer Vidal de la Blache adopted this method and

96%	MATCHING BLOCK 73/124	W

supported the idea of small natural regions (pays). Such small natural regions are manifestations of intimate relationship between man and nature that is developed through the centuries. The study of such small natural regions, each one of which is unique, should be the task of

geographers. Lucien Gallois, Jean Brunhes, Camille Vallan etc were the supporters of Vidal. According to Hartshorne, the ultimate purpose of geography is to study of areal differentiation of the world. Phenomena significant to areal differentiation have areal expression—not necessarily in terms of physical extent over the ground, but as a characteristic of an area of more or less definite extent.

87% **MATCHING BLOCK 74/124** **W**

Some writers have accused Hettner of defining geography as essentially idiographic. Both Hettner and Hartshorne considered region to be a functional unit -an organism which was more than the sum of its parts.

95% **MATCHING BLOCK 75/124** **W**

Sauer pointed out in 1925 that although geography was formerly devoted to descriptions of unique places as such the geographers had for a long time been seeking to formulate illuminating generalizations about the

earth and man's place on it (Sauer 1925, 27). 4.1.2 Development of Nomothetic Approach During the latter half of the nineteenth century, research workers attempted to develop the subject as a nomothetic science to a greater extent than might have been expected because of the Darwinian impact on geographical research. Scientists were looking for the governing laws of nature (and the materially conditioned social laws) and to considerable extent adopted a nomothetic or law - making approach. The contributions of Peschel, Richthofen, Ratzel, Gerald and Partsch etc are important in this sense. At that time the inductive explanation was replaced by hypothetic -deductive method, which was especially a characteristic of the natural sciences. Scientific knowledge, obtained through the hypothetic -deductive explanation is a kind of controlled speculation. The method, known as positivism, was developed by a group of philosophers working in Vienna during the 1920's and 1930's (Harvey, 1969, 35). It is based on a conception of an objective world in which there is order, waiting to be discovered. According to Schaefer, geography should

91% **MATCHING BLOCK 77/124** **SA** Exceptionalism.docx (D30268332)

be conceived as the science concerned with formulation of the laws governing the spatial distribution of certain features on 34 the surface of the earth. It is these spatial arrangements of phenomena and not the phenomena themselves,

about which geographers should
be seeking to, make law like statements. Schaefer, with his 'spatial organization paradigm'

87% **MATCHING BLOCK 82/124** **SA** 2013_ThmosKhun.pdf (D153447298)

initiated what may be called the quantitative and theoretical revolution in geography

which replaced an earlier idiographic concern with areal differentiation by a nomothetic search for models of spatial structure. E.LUllman, Garrison, Jhon.Q.Strewart, Christaller, Zipf, B.L.J. Berry, M.Dacey, R.Morrill, W.Tobler, W.Warntz etc were important researchers who attempted to make geography as a law making discipline by producing different theories and models. So, the new quantitative geography aimed at analyzing spatial data, development of spatial theory, construction and testing of mathematic models of spatial process - reflective of a paradigm-shift from the earlier regional inductive approach to systematic and deductive nomological approach (Fotheringhaur,2000). 4.1.3 Conclusion Despite the dichotomies, the period from 1960 experienced a vigorous expansion of geographical research using quasi-scientific methods with emphasis on the law- seeking approaches and model based paradigms. Geographers were over many years concerned with the term 'uniqueness' because geographical phenomena on the surface of the earth are unique and distinguishable, as well as complex in character and causation. It is the idiographic attitude (Hartshorne, 1939/1961, 378-97). But this approach is not totally correct because a collection of unique causes might nevertheless confirm or reject a hypothesized relationship. If the causal relationships were themselves unique and changed inconsistently from place to place and from time to time then hypothesis testing would not be possible and in case of nomothetic or law seeking approach, generalization considering geographical system is always not possible because it is a dynamic system and change in all the variables are not equal.

96% **MATCHING BLOCK 78/124** **W**

Every observation has to do with things that are unique in time and place. But it is not even possible to identify any other feature as unique until there is some kind of empirical generalization with which to compare it.

100% **MATCHING BLOCK 79/124** **W**

A very fundamental part of the scientific method consists in learning how to distinguish the relevant from the irrelevant, and this cannot be done

with out a frame work of ideas. Geographers have always observed unique

100% **MATCHING BLOCK 80/124** **W**

things, but they have also sought to formulate those illuminating concepts that make sense out of the apparent disorder of indirectly related parts.

So, according to Hettner and Hartshorne

100% **MATCHING BLOCK 81/124** **W**

geography is both idiographic and nomothetic, as indeed almost all other fields of learning must be (

Hartshorne, 1959, 146-172).
35 4.2 ECOLOGICAL APPROACH IN GEOGRAPHY Ecological approach is considered as recent progeny of geographical approaches and the main theme of this approach is to view the man -environment relationship in a single frame work of organic system. This organic system or ecosystem have been present since the non human world .In geography organic analogies have been considered antiquity but its application increased after the Darwinian revolution .Organic theories of the state go back at least to Plato and formed the basis of Hobbes's Leviathan in pre Darwinian times. After Darwin, Freidrich Ratzel in Ger- many, E.C.Semple in the USA, and E. Huntington in great Britain used the natural laws over every thing else. As against this environmental deterministic view another view was also developed stating

91% **MATCHING BLOCK 83/124** **SA** combined thought final.pdf (D118996980)

that the physical environment tends to provide the opportunity for a range of possible human responses and

on the basis of intelligence, creativity people have to choose between them. This is known as possiblism and the supporters of this view were Vidal de la Blache, Jean Brunhes, Lucien Febvre etc. So, from this two opposite views another view is developed as alternative ap- proach to central theme in geographical inquiry, that of the relationship of man and environment in area. This approach is not similar to environmentalism rather it should be viewed in the sense that man and environment are inseparable and are constituents of the same organic system. One of today's major problems concerns the influence of scientific and technological progress of the environment or biosphere. As a result of revolution in science and technology, mankind's interaction with its environment is becoming complex, and due to the rapid industrialization, advance- ment of civilization, urbanization etc. one can observe shortage of natural resources, decline in their reproduction ,and a deterioration in their quality that exert a toxic influence on living organisms including man. In Justice, Nature and the Geography of Difference (1996) David Harvey draws our attention to four facets of the interactions among living organism that create the complexity of the world. These are— 1. Competition and the struggle for existence (the production of hierarchy and homogeneity) 2. Adaptation and diversification into environmental niches (the production of diversity) 3. Collaboration, Cooperation and mutual aid (the production of social form) 4. Environmental transformation (the production of nature) (Harvey 1996, p 190)[1] Man as one of the parts of natural environment so, thus requires a clarification of the meanings which are attached to the concept of ecological approach. 36 4.3 CONCEPT AND MEANING OF ECOLOGY In 1859 St. Hilaire Isodore Geoffory, a French Zoologist proposed the term 'ethol- ogy' for the study of the relations of organisms within the family and society in the aggregate and in the community. The term ecology was coined by combining two Greek words 'okios' (meaning house or dwelling places) and 'logos' (meaning the study of) to denote the relationship between the organisms and their environment .Although there is some controversy about the original coining of the term but there is consensus that German biologist Ernest Haeckel first gave substances to this term. He used this first in 1886 but defined for the first time in1870. Some of the important definitions of ecology are- 1. Ecology is defined as the study of the relations of the organisms or groups of organisms to their environment or the science of the interrelations between living organism and their environment (Odum). 2. Ecology is the study of plants and animals in relation to their environment (Haggett) 3. Ecology is the science of the mutual relationship of organisms to their environ- ment (Monkhouse and Small). The term ecosystem was proposed by A.G Tansley in 1935 in his book 'Ecology' and once again in 1946 in his book 'Plant ecology' .He said "ecosystem as a general term for both the biome the whole complex of organism -both animals and plants - naturally living together as a sociological unit [2] and its habitat .All the parts of such an ecosystem organic and inorganic ,biome and habitat ,-may be regarded as inter- acting factors which in a mature ecosystem ,are in approximate equilibrium : it is through their interaction that the whole system is maintained[3]." From the concept of ecosystem we can get four properties or pillars of geographi- cal investigations. These are - 1. Monistic view : Because ecosystem brings environment, man, plant and animal world in a single frame work, so it is considered as monistic and closes the age old dualism between determinism and possibilism. 2. Structure : Ecosystem is structured in a more or less orderly, rational and comprehensible way .From geographical point of view if the structures are identified then they may be investigated and studied. 3. Function : In ecosystem, there is continuous flow of matter and energy. So, from the input and output of matter and frame work of the system we can quantify the interactions and interchanges between component parts. 4. General system : Ecosystem is an open system and in a steady state possesses the property of self regulation, i.e. homeostatic mechanism. In geography, the study of ecosystem is important to explain the cause —effect relationship. 37 The evolution of the concept of "ecology" appears to have passed through the followings stages. Stage -1 : In the second half of the nineteenth century (1859) Darwin's second major theme which made significant contribution to geography was the idea of organization and ecology which dealt with the interrelationship between all living things and their environment. Huxley in his 'Man's Place in Nature' (1863) attempted to show how man had emphatically become a subject for scientific speculation, and Darwin treated modern man on the same level as other living things. [4] Stage -2 : Marxism, which created a scientific understanding of the laws that govern social development, distinguishes between man and the remaining world of animals. It views man as a socio biological phenomenon and human population above all as social formation. In this way it placed boundaries on the sphere to which a bio ecological approach may be applied in explaining the conditions of man's existence and especially the major characteristic of social life. [5] Stage -3 : Recent studies of the substance of the present revolution in science and technology and its influence on environment have widened the concept of ecology and have led to the use of different terms like Human Ecology, Social Ecology, and Political Ecology etc. The term Human Ecology was proposed by Harlan H Barrows in his presidential address before the Association of American Geographers in 1922. '

felt however, that although the subject matter of geography had been lost in other disciplines, so, he sought for

Preston .E.James) [6] The concept of Social Ecology came in to scientific uses in 1920's by the work of American urban sociologist R E Park and E W Burgess. Social ecology is defined as a set of socio-ecological laws which may not fit into the old scheme of hard and first divisions of laws in to social and natural. These may be termed as socio-natural laws, maintaining the integrity of society-nature system. This society-nature relationship is viewed as constant rise and resolution of an ecological contradiction by ever better means leading to the gradual evolution of the organic world. [7] Political ecology looks ecology to provide both knowledge about nature and theoretical analogies that can be applied to the study of culture and society, this has not led to much conversation between the disciplines.
38 Stage-4 : The ecological approach has gained momentum during late 1960's to 1970's .In that time there was a great controversy developed between environmental protection and development. People began to think that the human existence would be threatened unless they adjust their relationship with environment. Different conventions and conferences have increased the importance of ecological approach in geography .Among those the most important are Stockholm conference (1972), Rio de Janeiro (1992), Kyoto Protocol (1997), Johannesburg earth summit (2002) etc. The public representation has been crucial to its successful vascularisation and its expanding influence. Ecology has entered the public imagination through a number of routes - popular books like Rachel Carson's Silent Spring (1962), Paul and AnneEhrlich's work, natural history, documentary film and television (Mitman, 1999). [8] Because of the impact of this awareness programme, the direction of researches in ecological studies in geography inclined around some of the comprehensive fields like bio diversity, climatic change assessment, Environmental Impact Assessment (EIA), Carrying Capacity, Sustainability etc. 4.3.1 Geography and Ecology Geography has always studied the environment taken as a whole (as a system) including its natural and anthropogenic (technogenic) components. Ecological ap- proach in geography means to look the whole things on the earth surface including society, culture, institution, and economy at ecological point of view to over come the problems of resource crisis, adverse environmental conditions etc. Geographers have suffered from tensions between nomothetic and ideographic commitments be- cause theoretical statements are now often made in mathematical form. So geogra- phers should have their own contribution in the sense that ecology is not totally similar with geography though they are interrelated. Actually ecology deals with natural systems, where as geography deals with man's interactions with natural sys- tem. Harvey's suggestion that we can find a common language in recognizing compe- tition, adaptation, and the productions of the social forms and environmental trans- formation as points of shared insight should be pursued. So, as a geographer we can engage with ecologists as potential allies in a wide range of conscious socio-ecological projects because many ecologists have aban- doned the imaginary world in which humans are not found. Only with the help of geographers, ecologists can say biodiversity is a process, not a state and that to protect and maintain that process will require substantial changes in the practice and rules that structure human life. Geographers work has a purpose, not to understand the world but to change it. As Harvey (2000) suggests.

39 “To continue ourselves (geographers) as ‘architects of our own faith and fortunes’ is to adopt the figure of the architect as a metaphor for our own agency as we go about our daily practices and through them effectively preserve, construct and recon- struct our life world” [9] 4.4 SYSTEMS APPROACH IN GEOGRAPHY Geographers have certainly made couriderable use of systems since the beginning of the discipline of geography. But the system approach related to the abstraction rather than reality appeared to have developed before the twentieth century because of its complex nature. During twentieth century the systems concept appears absolutely central for methodological and empirical explanations in Geography. The concept of systems is often associated with particular theorizing styles, i.e. positivism or functionalism. However, Williams (1983) observes the relationship between systems concepts and structuralism. At a time when geography appears to be adopting the new systems based paradigm, it seems quite important to evaluate the concept for its ambiguity .So, the theory of systems, particularly the interpretation given in General systems. Theory which is the framework for unifying all scientific thinking is therefore relevant, nevertheless, it is useful to identify some points where misunderstanding can arise and to attempt some evaluation of the claims of General System Theory as a unifying framework for all scientific thought and in particular, for geographical thought. Ludwig Von Bertalanffy (1950) is credited with the development of the general systems theory. According to James, a system may be defined as a whole (a person, a state, a culture, a business) which functions as whole because of the inter-dependence of its parts. A system comprises of three components - (a) a set of elements; (b) a set of links (relationships) between those elements; and (c) a set of links between the system and its environment.

93% **MATCHING BLOCK 86/124** **SA** combined thought final.pdf (D118996980)

Every system has three basic aspects: structure, function and development. The structure is the sum of the elements and the connections between them. Functions concern the flows (exchange relationships) which occupy the connections. Development represents the changes in both structure and function which may take place over time. (Johnston, 1983, Holt-Jenson-1981).

The structure of the system can be treated in two separate frameworks - closed system and open system. CLOSED SYSTEM : There is no input and output of matter.
40 [E]——— ——— [E] Closed system OPEN SYSTEM : These systems have both inputs and outputs of energy to maintain the system. Input through put output. [E] — [E] —— [E] —— Open system TYPES OF SYSTEM : There are various types of systems but we will concentrate only on those types of systems which are more suitable for analyzing complex spatial interactions. These systems include homeostatic, adaptive, dynamic and control systems. HOMEOSTATIC SYSTEM : Homeostatic systems are one

81% **MATCHING BLOCK 87/124** **SA** combined thought final.pdf (D118996980)

that maintains a constant opening environment in the face of random external fluctuation (Rose, 1967, 106). Such systems resist any alteration in environmental conditions and exhibit a gradual return to equilibrium or steady state

behaviour after such an alteration. ADAPTIVE SYSTEM : These systems are similar to homeostatic systems in much respect, but possess some special characteristics. The study of such systems provides a mode of approach to systems that are usually thought of as ‘goal - seeking’ or teleological sense. Such systems clearly rely upon feedback mechanisms of some kind in order to achieve the preferred state. This feedback may operate in a number of ways. Most analytic studies have conceptualized the problem by postulating that feedback effects the condition of the environment and thus alters the inputs until the desired responses (or preferred output) are achieved.

83% **MATCHING BLOCK 88/124** **SA** combined thought final.pdf (D118996980)

DYNAMIC SYSTEM : Both homeostatic and adaptive systems show a change of state overtime as they move towards steady or preferred state. In truly dynamic

systems,

that is

this is a characteristics of the learning process itself). Economic growth models, such as the circular and cumulative causation model, may be regarded as dynamic system. CONTROLLED SYSTEM : In these systems

are of major concern for cybernetics (Harvey, 1969).
41 4.4.1 Application of Systems in Geography The notion of system is not new in geographical thought. In geography from the very beginning systems are used in the form of functional approach, organismic analogy, and in the concept of regions as complex interrelated wholes and also in the ecological approach etc. But in the classical period the concept of systems remains on the periphery not at centre because elements of systems is identified in the work of Ritter, Vidal de la Blache, Brunhes, Sauer and others. The cause -effect relationships lead to the concept of systems and during the last few decades the position of systems concept has changed from the periphery to the centre. The ecological approach is a good example of systematic view, Hartan Barrows (1923) claims that geography is the science of human ecology. Tansley in developing the concept of ecosystem as a fundamental organizing concept in geography, identifies the major characteristics of it and say: (a) it is monistic and brings the man, environment, animal world in a single frame-work for which interaction between component can be analyzed; (b) ecosystem has structure and (c) function, that involves continuous through-put of matter and energy (d) ecosystem is an open system tending towards a steady state under the laws of open system thermo-dynamics. R.J. Chorley is
the first geographer to have introduced general systems theory in geography. His paper 'Geomorphology and General Systems Theory' (1962)
was the first major contribution devoted exclusively to a systems approach. He attempts to reformulate thinking in geomorphology in terms of open-system thermo-dynamics. More recently Woldenberg and Berry (1967) have used systems concepts to analyze central place and river patterns, while Curry (1967) has also attempted to analyze settlement locations patterns in a systems framework. 'Spatial organization' of Haggett is also related with systematic view.
The most comprehensive attempt to forge a systems approach to geographical study has been done by Bennett and Chorley in their book entitled 'Environmental
system: Philosophy, Analysis and Control' (1978) with the
intention of providing unified multi-disciplinary approach to the interfacing of 'man' with 'nature'. The
book was prepared for three main reasons - 1.to explores the capacity of systems approach to provide an inter-disciplinary focus on environmental structures and techniques. 2. to examine the manner in which a systems approach aids in developing the interfacing of social and economic theory and also physical and biological theory. 3. to explore the implications of these inter-facings in relation to the response of man to his current environmental dilemmas. It is hoped to show that the systems approach provides a powerful vehicle for the statement of environmental situation of ever-growing temporal and spatial magnitudes,

42 and for reducing the areas of uncertainly in our increasingly complex decision-making arenas (Adhikari, S 1992-233). This approach is widely used in both human and physical geography. 4.4.2 Conclusion : Systems approach in geography is very essential because it gives a framework from which we can analyze the interaction pattern or study the 'organized complexity with which geographers deal.

100% **MATCHING BLOCK 92/124** **SA** combined thought final.pdf (D118996980)

Once the system has been successfully modeled, it can be manipulated using control theory which is a dynamic optimization technique permitting optimal allocation along the time horizons, and shifts emphasis from mere model construction to

model to use. (
Haggett, 1980) Systems analysis thus provides us with a convenient calculus for examining geographical problems. Gregory (1978) attempts to criticize both systems
analysis and general

100% **MATCHING BLOCK 93/124** **SA** combined thought final.pdf (D118996980)

systems theory on the ground that they are intrinsically associated with positivism. The concept of

one

100% **MATCHING BLOCK 94/124** **SA** combined thought final.pdf (D118996980)

systems theory which is relevant for all the sciences may be seen as a fruit of the positivist concept of one science, one method. He

further said
that prominence given to control system may lead to instrumentalism. 4.5
SUGGESTED READING : 1. Adhikari, S, (1992), 4th Ed 2004: Fundamentals of Geographical Thought, Chaitanya Publishing house, University Road, Allahabad-2(P-65). 2.

87% **MATCHING BLOCK 95/124** **SA** 2191457W .pdf (D31575447)

Hartshorne, R.(1939): The nature of geography, Lancaster, Pensylvania; Association of American Geographers (

P, 134-5). 3.

100% **MATCHING BLOCK 96/124** **SA** 2013_ThmosKhun.pdf (D153447298)

Sauer, C.O. (1925): The morphology of landscape, University of California Publications in Geography (

P-27). 4. Harvey D. (1969): explanation in Geography, London Edward Arnold (P-35). 5. Fotheringham, A.S.etal (eds), 2000: Quantitative Geography: Perspective on Spatial Data Analysis, London, Saga Publication. 6. Hartshorne R, 1954: Perspective on nature of geography Chicago, Rand Mc Nally. 7. Harvey, D (1996) Justice, Nature and the Geography of Difference, Oxford; Blackwell p190 8. Transley, A.C, (1946) Introduction to Plant Ecology, London, Allen Unwin, P 206 9. Ibid, p 207. 10. A. Adhikari, S. (1992) Fundamental of Geographical Thought, Chaitanya publishers, Allahabad, P 90
43 11. Gerasimov, I.P, Geography and ecology, (1983), Progress Publishers, Moscow, p 35 12. Munshi, S.K, Geographical Review of India (1992) Sept, Vol 54, No 3 13. Mitman G (1999) Reel Nature: America's Romance with Wildlife on Flim, Cambridge, MA: Harvard University Press, 14. Harvey, D (2000) Spaces of Hope, Berkeley; University of California

Press 200 15.

Johnston, R.J. 1983: Geography and Geographers: Anglo- American human 'geography since 1945(2nd edn.) London Arnold. 16.

Holt-Jenson, Arild, 1981 Geography: Its History and Concepts —a students' guide. London, Harper & Row. 17. Rosen, R. 1967, Optimality principles in biology (London). 18. Ashby, W.R. 1963: An introduction to cybernetics, Wiley Sciences Editions New York. 19. Harvey, David. 1969 (Indian reprint 2003), Explanations in Geography, Rawat publications, Jaipur, India. 20. Adhikari, S. 1992 (new print 2006) Fundamentals of Geographical Thought, Chaitanya Publishing House, Allahabad.

44 UNIT 5 ? RADICALISM Structure 5.1 Radicalism in Geography 5.2 Effects of radicalism in Geographical studies 5.3 Radical stream 5.4 Conclusion 5.5 Suggested Reading 5.1 RADICALISM IN

GEOGRAPHY Radicalism refers to political and social movements and ideologies that aim at fundamental change in the structure of the society. The

advent of radicalism in Geography in the late 1960's marked the return of a 'dissenting tradition (Blaunt, 1979). Radicalism in geography offers both revolutionary theory and revolutionary practice. RISE OF RADICALISM Geography was by the late 1960's developed as a well established university discipline, part of the settled fabric of 'normal' educational life in most western countries. But the middle and late 1960's was an era of protest related with inequality, racism, sexism, environment, and many incidents like civil unrest, student riots, anti- war campaigns, anti colonial struggles have taken place due to many causes. One of the major causes of dissatisfaction was the American involvement in Vietnam War which increased the unrest among young generation because they considered the government decision as imperialist and anti freedom. These struggles were held not only in America but also in France, Britain and other countries. It was this difference between academic geography and real world socio-economic problems and struggles that inspired the early radical geographers like William Bunge, Blaut, and Richard Peet to call for a people oriented geography in which geographers would - (i) study for crucial social, economic and environmental problems with (ii) an eye to devising viable solution in (iii) a way that included the ordinary people subject to those problem and solution. So, Frustration with the apparent instability of conventional geographic theory to provide a meaning foundation for a more relevant and more radical geography led a number of geographers towards an engagement with theories of social justice and ultimately Marxism with in human geography can be attributed to the dearth of

45 alternative within the discipline and the fact that prior to the 1960's —especially in comparison with other social with other social sciences -there was little in the way of social theory in geography beyond positivist idealism. This then was a form of geographic activism in which research was focused on politically charged questions and solutions and in which geographers actively involved themselves with the people and communities. The first conspicuous attempt to radicalize human geography research was pioneered by the American geographer William Bunge, who in 1968 founded the 'Society for Human Exploration' at Detroit .It was believed that by becoming a person of the region in question, the geographer, by virtue of the experience gained, shall be able to appreciate better the kind of inputs required to improve the lot of the local residents. Such a participatory field work prepares the geographer to take the planning with the people rather than planning for them (R.D. Dikshit-1997). 5.2 EFFECTS OF RADICALISM IN GEOGRAPHICAL STUDIES The radical movement had taken a number of different forms, leading to the inevitable division between liberals and radicals. The former stream supported the policy of incremental change within 'the system' where as the latter group of scholars held on the view that nothing short of revolutionary socialism could create a just society out of the modern capitalist corporate state. Radical geography was the impetus for two subsequent types of development regarding academy and activism. LIBERAL STREAM Among the academically oriented geographers, there was a concreted effort aimed at changing the focus of our discipline from earlier involvement in the study to the study of urgent problems of the day. So, the less radical welfare geography emerged which sought to use existing scientific geographical theories and methods in a more socially relevant and useful way (Smith, 1977) .Welfare Geography deals with problems of inequality, poverty, hunger, discrimination, crime, racial tension and access to social service. The concept of welfare was divided into three sets by Knox in 1975.According to him these included

100% **MATCHING BLOCK 97/124** **W**

physical needs (nutrition, shelter, and health), cultural needs (education, leisure, recreation, and security) and higher needs (

that could be purchased with surplus income).

85% **MATCHING BLOCK 99/124** **SA** combined thought final.pdf (D118996980)

Smith and Knox set forth the tradition of the welfare approach in geography in an organized manner.

A number of

95% **MATCHING BLOCK 100/124** **SA** combined thought final.pdf (D118996980)

such works, suggesting spatial policies for social improvement, were done in 1970's.Harries (1974) studied spatial variation in crime rates and the administration of justice, and argued that predictive models of criminal patterns could aid in the organization of police activities.

86% **MATCHING BLOCK 101/124** **SA** combined thought final.pdf (D118996980)

Morrill and Wohlenberg (1971) 46 investigated the spatial variation in poverty in the united state, providing both social policies and spatial policies. Bunge (1971) prepared a 'geobiography'for a part of the black ghetto of Detroit, which has a deep humanitarian orientation for the future of mankind, which

he

100% **MATCHING BLOCK 102/124** **SA** combined thought final.pdf (D118996980)

interprets as a need to ensure a healthy existence for children.

Richard Morrill, who

92% **MATCHING BLOCK 103/124** **SA** combined thought final.pdf (D118996980)

criticized the revolutionary premises of the New Left, still maintained that the academic's role was "to help bring about a more just, equal and peaceful society "and search for more 'radical' ways and means to achieve change. From the middle of 1960'

s and onwards, articles dealing with more 'socially relevant' geographical topics began to appear in some of the discipline's main stream journals, and

88% **MATCHING BLOCK 104/124** **SA** combined thought final.pdf (D118996980)

in 1969, 'Antipode', a radical journal of geography was founded at Clark University in Worcester, Massachusetts. According to

Smith (1994a) 'The welfare approach logically requires an holistic social science perspective' because it extends beyond the limits of a single discipline (Smith, 1994 a, P.676). 5.3 RADICAL STREAM Among the activist, the dominant focus was on the search for more suitable models of organizational change. This stream was developed in the 1970's and 1980's with a number of full blown critical paradigms like Marxist and Feminist geography. There have been many milestones in the march of activism with in geography over the part 30 years. To name a few, we might include, the formation of the Journal Antipod (1969), the Detroit/Toronto Geographical Expeditions (1973, 1975) pio- neered by Bill Bunge, the organization of the union of socialist Geographers in the early 1970's, the formation of the I BG women and Geography Study Group in the same decade, the establishment of Gender, place and culture, and the fronting of a range of political, social and cultural issues of note to geographers in the Environ- ment and Planning series, the creation of a range of specially groups with in the Association of American Geographers to nurture critical interests, the recents forma- tion of the International Critical Geographers etc. The first geographer to initiate Marxist thought and new trend in geography was David Harvey (1972). To Harvey, Marxist theory provides the key to understand capitalist production from the position of those not in controls of the means of production -an enormous threat to the power structure of the capitalist structure. It is helpful for understanding of the origin of the present system, with its many faceted inequalities, but also propounded alternative practices which would avoid such in- equalities. For Peet (1977), the Marxist science begins with a

However, Peet (1977) has
argued that the early 'radical' work by geographers in the late 1960's was liberal in its attitude
and with changing time he also moved to a Marxism position replacing his earlier paper on poverty by a Marxism interpretation, based on assumption that inequality is inherent in the capitalist mode of production. David Harvey in his book 'Social Justice and the city' (1973) made a major contri- bution to the case for Marxism inspired, materialism theory development within geography. Marxism and the knowledges of environment and space (hardly the least significant of human understandings) produced powerful theoretical insights into profound issues of human existence, and these in turn produce disciplinary power in its many guises. Neil Smith's Uneven Development (1984) can be taken as symptom- atic of the best of Marxist geography. 'Political ecology' emerged from Marxism inspired theories of society - nature relation in 1970's and early 1980's. Many of the Marxist concepts survive into the present geographical status and activist geogra- phers continue to work with unions, farm, workers, homeless people, prison popu- lations, high schools around issues of racism, classism, sexism, post colonialism, imperialism and many other forms of oppression, precisely because of deep personal and long term connections that draw people to particular activities and communities. Ruth Gilmore's work with prison population, Bennett Harrison's work with unions, David Slater's work with the Third world NGOs, Jan Monk's work with women's organizations and NGOs in both the Third and First world, Audrey Kobayashi's work against racism, Nick Bloomley's work with neighbourhoods on the eastside of Vancouver, Don Mitchell's work with high school teachers, Linda Peake's work with the women of Red Thread in Guyana to name a few - all works are developed due to effect of radicalism in geography. 5.4 CONCLUSION According to Bloomley (1994), in the early 1990's, some leftist geographers were once more complaining of a chasm between geographical 'activism and the acad- emy'. Some geographers advocated a return to grass -root involvement, while other like Tickell (1995) argued that geographer should more actively involve them in the local, and national 'state apparatus' in order to influence public policy. The radical geography characterized by social relevance and intense political activism, thus at- tempted to change the extent of the subject. The critique of conventional geography commented that it was an irrelevant gentle manly concern and also about its spatial fetishism - that is geography's restriction of causality to the spatial realm. But accord- ing to radicalists, geography could not conceptualize natural causation without resort- ing to a mechanical version of environmental determinism, because it lacked too the mediation of production as the main focus of nature society relation .According to Peet, reeling from criticisms of environmental determinism, lost for years in the by

48 ways of regional description, geographers in the 'quantitative revolution' rushed into a spatial 'science' which discovered and increasingly significant of life (space) only to fail to link it with other 'equally' important aspects of existence. This failure of linkage produced continued (if ameliorated) intellectual and theoretical isolation for the discipline of geography. So, for all its supposed deficiencies, Marxism saved geography from extinction, irrelevance or worse still, becoming a poor relative of regional science (Peet 1998). 5.5 SUGGESTED READING 1. Blaut, J. 1979: The dissenting tradition, Annals of the Association of Ameri- can Geographers, 69, 157-64. 2. Gary L. Gaile, Cort, J.Willmott 2006: Geography in America at the Dawn of 21st century Oxford University press (P.210-11). 3. Dikshit, R.D. 1997(3rd print 2001):

80%	MATCHING BLOCK 106/124	SA	MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

Geographical Thought: A contextual History of Ideas, Prentice Hall of India Private Limited, New Delhi, (

P-165). 4. Smith, D.M. 1997: Human Geography: A Welfare approach, London, Ed- ward Arnold. 5. Smith, D. M. (1994a) Welfare geography, in Johnston, R. J. Gregory, D and Smith (Eds): The Dictionary of Human Geography (3rd ed.) Oxford, Basil Blackwell (P-674-676). 6. Bloomley .N (1994) 'Editoria: Activism and the Academy', Environment and Planning D: Society and Space, Vol. 12, 383-385. 7. Tickell A (1995) 'Reflection on "Activism and Academy" Environment and Planning D: Society and Space, Vol.13. 235-237. 8. Peet Richard, 1998(Indian reprint 2004): Modern Geographical Thought, Rawat Publications, Jaipur (P-109-110).

49 UNIT 6 ? GEOGRAPHY OF INEQUALITY AND GEOGRAPHY OF GENDER Structure 6.1 Geography of Inequality 6.2 Causes of Inequality 6.3 Types of inequality 6.3.1 Economic inequality 6.3.2 Social inequality 6.3.3 Political inequality 6.3.4 Educational & Cultural inequality 6.3.5 Gender inequality 6.4 Geography and inequality 6.5 Geography of Gender 6.6 Development of Geography of Gender 6.6.1 The first wave of feminism 6.6.2 Second wave of feminism 6.6.3 Third wave of feminism 6.6.4 Liberal feminism 6.6.5 Marxist and socialist feminism 6.6.6 Radical feminism 6.6.7 Eco feminism 6.7 Conclusion 6.8 Suggested Reading 6.1 GEOGRAPHY OF INEQUALITY Introduction— During the 1960's and the 1970's geography experienced what has been called a 'conceptual revolution' .

81%	MATCHING BLOCK 107/124	SA	combined thought final.pdf (D118996980)

One of the distinct consequences of the conceptual revolution in the contemporary human geography was the

emergence of welfare geography

89%	MATCHING BLOCK 108/124	SA	combined thought final.pdf (D118996980)

in 1970's. It is an approach to human geography that stresses on 50 questions of

inequality. Inequality implies distinctiveness along a dimension where one position is graded as better, bigger, larger or somehow superior to another. But what are the key dimensions of inequality? In sociology classical writings provide clear messages on this topic. There are three fundamental aspects of inequality -class, power and status. Class conceptions are widely derived from Marxist idea about a person, position with regard to process. Simply, two classes are mentioned -Bourgeoisie (who own means of production) and Proletariate. Power is to get others to act in a way that is your own best interests, even though they might not wish resources (money, employee etc) for resources need to be used to achieve desired goals, and there is unevenness in the ability to use resources effectively to achieve desired ends. In contrast with class and power, status refers to social prestige or respect. But despite their centrality to conceptualizations of social hierarchies and the complex debates over their interrelations ,these concepts still omit much which is clearly evident from the publication of social well being concept. According to Coates et al. (1977, p -9)social well being refers to a family of overlapping concepts that include level of living ,quality of life ,social satisfaction, social welfare, and standard of living etc. Nine basic components of social well being were identified-nutrition, shelter, social stability, the physical environment and surplus income. So, inequality does not mean the difference only produced from class, power and status but it can also be developed from uneven use of space. As for example women commonly feeling excluded from particular places, at least of at specific time of the day for fear of violent crime (Pain, 1997). This brings out a combination of insights of inequality in living conditions ranging from their uneven impact on people in same location ,their temporal specificity and also the way in which non events are integral to inequalities(Martin Phillips,2005 p-481) 6.2 CAUSES OF INEQUALITY There are many reasons for the inequalities growing in societies. These causes are not distinct rather interrelated, non-linear and complex. Economic, political and social structures and their interrelation may produce different types of inequalities. In all complex societies, the total stock of valued goods is distributed unequally. The term social stratification refers to the complex of social institutions that generate observed inequalities of this sort. Acknowledged factors that impact inequalities in society include income, education, race, gender, culture, wealth consideration and development pattern. As for example, education is responsible for different types of inequalities. Education has resulted in an increase in wages for those with higher education, but has not increased the wages for those without an education. This may lead to greater inequality .Access to education may be able to transform the culture of society which

51 play a crucial role for societal development in terms of living standard, housing, medical facilities etc. Gender inequality also results from lack of education and psycho social factors. In many countries individuals belonging to certain racial and ethnic minorities are more likely to be poor. Proposed causes include cultural differences amongst different races or educational achievement gap and racism. Power is the ability to exercise, power takes a number of different forms but all involve the idea that it means the ability to get your own way with others regardless of the ability to resist you. Power can produce inequality in large scale. Out of the power various social systems are produced, with power some groups have the right to oppress another group which is powerless. Now a days the impact of globalization increases inequality in between rich and poor and in between developed and developing countries. In a recent reviewed article on globalization Mauro Geeillen writes that the evidence unambiguously indicates that there are more inequality across countries than ten, twenty, fifty or even hundred years ago. According to him, the widening gap across countries is caused by rising incomes, not by rising income inequalities. Not only the economic, political and social structures are responsible for inequality but also physical environment is one of the main causes to produce inequality. Different environment gives different types of opportunities or possibilities and material circumstances are also not same to all environmental conditions. So there are differences in nature, life style, working ability etc as well. According to Richard Lynn, the working ability is partially responsible for producing race and gender group difference in wealth, though this assertion is highly controversial. At last, Global society at the twenty first century is rapidly moving towards social, economic and political integration. The rapidity of this development has caused many clashes and difficulties for nations, states as well as for groups, organizations, citizens for individual countries. 6.3 TYPES OF INEQUALITY On the basis of social stratification we may classify inequality into different types, although the inequalities are not caused for one reason but it is very complex in nature. It has multiple and quasi independent dimension. The broad subdivisions of inequality are— 6.3.1 Economic inequality It is expressed through the unequal distribution of wealth in society. This has obvious ramications in terms of the location, is limited. Developed and developing countries are the results of economic inequality which have divided the whole world into haves and have nots. The core aspects economic inequalities are distribution of production and exchange process. According to Marx, there are two classes, one is

52 Master or owner and another is Labour. Now the advancement of civilization, globalization and free trade decreases the wage of labour and created a situation of vast unemployment which again develops inequality and poverty in a society. As for the possibility of the disadvantaged seeking better opportunities elsewhere, for most people the capacity to change their place, from poorly endowed to richly resourced location or state may be limited. 6.3.2 Social inequality Sexism, racism, discrimination on the grounds of ethnic groups, faith, political opinion, social status or sexual orientation is clear indicators of social inequality. No society can survive sustainable or allow its members to live in dignity if there is prejudice and discrimination of any social group. Social inequality is the expression of lack of access of housing, healthcare, education, employment, opportunities and status. It is exclusion of people from full and equal participation. Because of the nature of our society in post industrial, competitive, capitalist, and commercially driven and consumer oriented- economic inequality and social inequality are inextricably linked. Social inequality is also produced by the impact of culture, religion and racism. Division of caste and their status may form psycho-social inequality, untouchability etc. So, our social system and structure is also responsible for inequality to some extent. Racial discrimination is also an important injustice which produces inequalities. There is some inbuilt inequalities in our society to maintain system of it self. As for example, the work forces the government, legislation and legislature. 6.3.3 Political inequality The important goal of any political system is to be gain effectiveness in terms of superiority and power concentration which has opposite sense to equality. These concentrations are more in those countries where population is large and management system is complex. Although everyone has the right to vote to select representatives, but there is great division between powered people and general citizens. According to Anderson (1999) democratic equality is a need which aims to abolish socially created oppression, rather than following luck egalitarianism in correcting what is taken to be injustice generated by the natural order, a relational theory against the concern of the equality of the fortune perspective with a pattern distribution. In the countries where democracy is transformed into military power or religion power, inequalities increase rapidly. Afghanistan, Pakistan etc. are examples. 6.3.4 Educational and Cultural inequality There is distinction in terms of education and culture in every society. Educational and cultural inequality has great interrelation with economic opportunity. Rate of development is more in rich or economically supported countries, because they can afford the cost of higher education and technology from those countries where more
53 advanced culture emerged. In the same way culture and education also required for better economic support. On the basis of high technology and educational facility 'digital gap' has originated which is also a type of inequality. The countries with high information technology may differ from those countries of low access of these technologies, giving rise to digital gap. 6.3.5 Gender inequality Social equality is fundamentally linked to gender equality. Global statistics place women behind men in relation to health, education, nutrition levels, political participation, legal rights, equal pay for equal work, amongst many other aspects of life. Gender in equality remains pervasive in all countries of the world. 6.4 GEOGRAPHY AND INEQUALITY Social inequalities are mirrored in unequal access to space and desirable location so that social and spatial inequalities go together. As a result a number of geographers adopted a more humanistic approach in geography and concern for welfare geography. Bunge (1971) was so struck by the inequalities from his study of Detroit that he adopted rather emotive terms for his division of the city and emphasised the ways in which the poorer income groups and ethnic minorities of the city, were being exploited by the rest of the city, particularly by the elite business, entrepreneurial and professional classes who occupied his city of superfluity-pleasant suburbs and rural dormitory areas.

91%	MATCHING BLOCK 109/124	SA	combined thought final.pdf (D118996980)

Cox (1973) investigated the urban crisis in the light of racial tension and riots, municipal bankruptcies and the role

of government in the urban economy. In fact,

85%	MATCHING BLOCK 110/124	SA	combined thought final.pdf (D118996980)

he presented his analysis in terms of conflict over access to sources of power.

This concern for social inequalities what Harvey called 'Social Justice and the city' is not new. Burgess and Park, two eminent sociologists who studied the social problems of Chicago during 1920's, such as housing, racial tension, and social deprivation.

100% **MATCHING BLOCK 111/124** SA combined thought final.pdf (D118996980)

Harries (1974) studied spatial variation in crime rates and the administration of justice, and argued that predictive models of criminal patterns could aid in the organization of police activities. An interesting work on variations

as

100% **MATCHING BLOCK 112/124** SA combined thought final.pdf (D118996980)

the provision of health care facilities was done by Shannon and Dever (1974) who also suggested

for

81% **MATCHING BLOCK 113/124** SA combined thought final.pdf (D118996980)

spatial planning for the improvement of medical services being offered to the sick. Morrel and Wohlemberg (1971) investigated the spatial variations in poverty in the United States, providing both social policies and spatial policies [

Adhikari, S.2006, P.263]. But despite long standing engagement with matters of social concern, it is only recently that geographers in Britain and elsewhere have begun to explore links with the subject of ethics (Smith, 2003). This conception may right or wrong, good or bad is implicated in any human activity, all geographers are in some sense moral creations.

54 However the term 'moral geography' has been adopted in recent years as a label for a particular style of geographical investigations with a moral dimension. A major feature of geography's recent moral turn has been resurrection of interest in social justice (Smith 2000). In this approach the term equalization is used and they recognize that achieving equality is virtually impossible, but the moves in this direction are possible and morally justifiable. The process of equalization might be constrained by the 'difference principle' proposed by John Rawl (1971, P 302) which requires social and economic inequalities to be arranged so that they are 'to the greatest benefit of least advantaged. 6.5 GEOGRAPHY OF GENDER Geographers have sadly not given much recognition to the concept of gender. It is a phenomenon of remarkable variation from place to place, as well as from time to time and class to class. Despite geographical variations, class variations and individual variations, the world wide theme of the geography of gender is female subordination. Gender is a social phenomenon which is socially created. Some people consider gender as a purely social construction, independent of biology, while others define it as derived, directly or indirectly, from the interactions of material culture with the biological differences between the sexes. In either case, gender is socially constituted while sex is biologically determined (Oakley, 1972, Rogers 1980). As it is socially determined, the meaning will vary with society yet in the history of geography of humanity, women's subordination is omnipresent, no society has so constituted gender as to produce male subordination. The forms of subordination differ greatly, but all over the world, women's work tends to be defined as of less value than men's and women tend to have far less access to all forms of social, economic and political powers. Feminine Geography was developed by the impact of radical-Marxist approach in geography.

The women and Geography study Group of the Institute of British Geographers (IBG)

collectively had written introductory text on feminine geography. The main theme of them was to remove gender inequality through social changes which might express long term real equality between men and women in terms of economic; political and social activities and profession. Since 1960's there has been a great upsurge in feminist writing and feminist thought has become much wider in scope and much profound in its impact. In terms of academic geography, an analytical focus on the intersection of production and reproduction spaces allowed geographers to incorporate gender as a fundamental parameter in environmental process (Rose 1984). Women and Geography study Group advocated 'change' not simply by adding women to geography, but by developing 'an entirely different approach to geography as a whole' .Feminine Geography looks at how socially created gender structures

55 from and transform space in a project dedicated to ending gender inequalities through social change. The geography of gender has a vital role to play in improving our understanding of the rapidly changing spatial mosaic of gender relations in world. Geography has lagged far behind the other social sciences in its appreciation of the impact of gender. Zelinsky, Monk and Hansen (1982) suggest two reasons for these both related to the nature of the subject: much of the work on women is done by women scholars and the proportion of women in geography is very low (Henshall Momsen 1980). Secondly, many geographers were unlikely to come face to face with women's issue in their research. The period of middle to late 1980's saw two kinds of divides opening in feminist radical geography, which are outlined by Mc Dowell. The differences are between feminist and masculinist and between perspectives within geography especially as post structural or post modern theory entered in the geographical scene. According to Mc Dowell the three central themes of Feminist approaches in geography are space, place and nature. The geography of gender involves spatial variation in gender relations, the social construction of gender identities in particular milieu, the ways nature is related to gendered distinctions and similar issues. 6.6 DEVELOPMENT OF GEOGRAPHY OF GENDER Feminist theory and feminist geography grew together; history of women's movement has great influence on feminist geography, which is divided into three waves— 6.6.1 THE FIRST WAVE OF FEMINISM According to Jane Freedman '
in the 1840's the women's rights movement has started to emerge
in the United States with the Seneca Falls convention of 1848 and resulting Declaration of Sentiments which claimed for women the principles of liberty and equality, right to earn equal wages, inherit property and right to vote expounded in American Declaration of Independence. Rupp quotes the arguments of Chaftz and Dwarkin (1986) that industrialization and urbanization play a critical role in the emergence of women's movements. In industrialized and urbanized societies, a large middle class develops, women get access to education, married women enter the labour force in large numbers and the resulting role expansion and conflict results in the gender based and ultimately feminist consciousness (Rupp-2001, 5470) 6.6.2 SECOND WAVE OF FEMINISM The second wave of feminism began with radicalization of women during the anti-
56 Vietnam war and civil rights movements of the 1960's. The main theme of first wave feminism was equal rights and for second wave feminism it may be termed as 'feminism of women's liberation'. The First National Liberation women's Conference was held in Ruskin College, Oxford. This was a time of optimize, debate and the publication of feminism's formative literature. As for example Germine's. The Female Eunuch'(1970) Eve Figes's, 'Patriarchal attitudes'(1970), Shulamith Firestone's 'The Dialectic of sex'(1970), Kate Mittett's 'sexual politics'(1970), Betty Friedan's 'The Feminine Mystique'(1963), Gayle Rubin's essay '
The Traffic in women: Notes on the Political Economy of Sex'(1975). 6.6.3 THIRD WAVE
OF FEMINISM
Third wave is a continuation of the first and second wave
but there is a shift from logo centric to pluralistic approach to feminism. A number of factors shaped the development of the third wave known as 'Post feminism'. Women in the third world have been involved with issues like economic, environmental, legal, military, cultural and physical threats and violence against women. Their inclination has been only towards feminine agenda but they organize around different environmental issues as well. On the basis of theoretical families, development of feminism may be classified into three groups. Liberal feminism, Socialist or Marxist feminism, and radical feminism. This classification has reproduced many research activities like psycho- feminism Post modern; post structural feminism, eco-feminism and so on. 6.6.4 LIBERAL FEMINISM Based on the classical theoretical tradition of liberalism which views man as active, rational, and independent to have free choice to from government and enjoy- ing equal rights and opportunities inherited not from any human authority or from God but from nature by birth, classical liberal feminist claim equal social and politi- cal rights for women. They did not claim any special privilege for women but asked only for equality. Contemporary liberal feminists have switched from equality to inclusion. Main supporters of this view were Mary Wollstonecraft (1759-97), J.S.Mill (1806-73), and Harriet Taylor (1807-1858), Elizabeth Cady Ctanton (1815-1902) and Virgina Woolf(1882-1941)[Classical liberal feminists] Betty Frieden(1963), Radcliffe Richards(1982), Okin(1989,1990) [contemporary liberal feminists]. 6.6.5 MARXIST AND SOCIALIST FEMINISM Socialist and Marxist feminists believed that women's subordination is a socio- economic product, without abolishing capitalist society or establishing socialist society women's emancipation is not possible. To Engles,

women's subordination results from the institution of class society and is maintained because it serves the interests 57 of capital.

Socialist feminism calls for reproductive democracy, including family and procreative decisions, as well as control over commodity production. The socialist feminists claim that capitalism and patriarchy are mutually interdependent and there- fore, women's subordination is to be understood by both class and gender dynamics. Juliet Mitchell in Women's Estate (1971) states that women's position is determined by four structures-(i) Production - as member of work force (ii) Reproduction - reproduce human species. (iii)Socialization - caring and socialization of children. (iv) Sexuality - as sex object. Hartmann (1976) views women's subordination as a result of the interlocking of the system of capitalism with patriarchy. He opines 'the same features such as divi- sion of labour, often reinforces both patriarchy and capitalist society, it is difficult to isolate it from the mechanism of patriarchy. 6.6.6 RADICAL FEMINISM Radical feminism considered that patriarchy is the root cause of women's oppres- sion and subordination. Figes (Patriarchal Attitudes, 1970) pointed out that it is the patriarchal system which pervades the culture, philosophy, religion, and morality of the society and gives to the women an inferior status. In 'Sexual polities' (1969) Kate Millett commented that relation between sexes is based on power, so it is political and from ancient time it is socialized through the family. So, it is natural and in order to destroy patriarchy, family is to be destroyed because they are based on power and not on love. Fire's tone (The Dialectics of Sex 1970) put more emphasis on biology rather than social condition for subordinate position. The natural capacity of women is to bear and rear babies. She believes modern technology may relieve women from the burden of pregnancy by artificial production in test tubes and in the way genuine sexual equality is established. Radical feminism differs from Marxist feminism in the view that problem of Women can never be solved either by legislation or by revolution because both are controlled and led by man. According to Pratt feminist geographers are also expanding their consideration of geography including environmental concerns. 6.6.7 ECO-FEMINISM Eco-feminism is a movement that sees a connection between the exploitation and degradation of the natural world and the subordination and oppression of women. French feminist Francoise d' Eubonne [Eaubonne 1980; 44-45] first coined the term eco-feminism in 1974. Eco-feminists consider women and nature both as subject to the destructive socio- economic and technological systems of modern male-dominated
58 society. Eco-feminism became popular only in the context of numerous protests against environmental destruction. The conference at Mile Island in the 80s prompted large number of women in the USA to come together in the first eco-feminist conference. In patriarchal thought, women are identified as being closer to nature and men as being closer to culture. Nature is seen as inferior to culture. Maria Mies and Vandana Shiva, the famous eco-feminist want to propound the need for a new cosmology, different from capitalist patriarchy, in which life in nature is maintained by means of cooperation, mutual care and love. Only in this way it can be possible to respect and preserve the diversity of all life forms as true sources of well being and happiness of all. 6.7 CONCLUSION Feminist study in geography is not very old rather it is in early stage of development with more theoretically oriented. It is now entering a new phase. The recognition of feminist geographers is increased for variety of work related to women's experience of oppression. The crude dichotomy of polar opposites -male and female, nature and culture, hetero and homo-sexuality, public and private, production and reproduction -are now being challenged in feminist theory and practice .New areas of theory and research are beginning to have an impact upon the discourse of feminist geography. McDowell and Ford identified three areas of emerging focus in research, namely (i) analyses of cultural representation (ii) works on sexuality, subjectivity and social relations and (iii) new developments in studies of the interrelationship of race, class and gender [R.D, Dikshit, 267]. Gender geography is related with class, religion, race, gender that means with whole social environment. It needs to develop alternate theories of space, place and environment which speaking the experience of oppressed peoples despite the problems of speak for other. 6.8 SUGGESTED READING 1. Oakley (1972) Sex Gender and Society, London, Temple Smith. 2. Rogers. B (1980) The domestication of women: Discrimination in developing societies. London; Tavistock publications. Rose, D.1984. Rethinking gentrification: beyond the uneven development of Marxian urban theory, Society and Space2: (P,47) 3. Henshall Momsen 1980 'Women in Canadian Geography' Professional Geography, 32(3), (P-365-9) 4. Rupp, L.J. (2001) 'Feminist Movement' in Noli J. Smelser and P.B, Baltes(eds)

59 International Encyclopedia of the Social and Behavioural Sciences, Oxford, vol-8, Elsevier (P-5470) 5. Eaubonne, D(1980) 'Feminism or Death' in Elaina Marks and Isabella de Courtvron (ed) New French Feminism: An Anthology Amherst, Amherst University Press, (P-44-45) 6.

68%	MATCHING BLOCK 115/124	SA	MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

Dikshit, R.D. 1997 (reprint-2001): Geographical Thought, A Contextual History of Ideas, Printice Hall of India private limited, New Delhi. (

P-267). 7. Coates, B.E. et al, 1997 : Geography and Inequality. London, Oxford University, Press. 8. Martin Phillips., 2005 : 'Contested World : An education to Human Geography. Ashgate publishing Ltd. UK. 9. Adhikari. S. 2006 (New edition); Fundamentals of geographical Thought, Chaitanya Publishing house, Allahabad. (P-263) 10. Smith, DM (2003) 'geographers, ethics and social concern', in Johnston, R J and Williams, M (eds) A Century of British Geographers, Oxford; Oxford University Press for The British academy, (in press) 11. Smith D.M (2000) 'Social justice revisited' Environment and planning A, 32, 1149-1162. 12. Rawls, J (1971) A theory of Justice, Cambridge, Mass, : Harvard University Press (P-302)

60 UNIT 7 ? POST MODERNISM Structure 7.1 Concept of Post modernism 7.2 Modernism and Post modernism 7.3 Main features of Post modernism 7.3.1 Basic concepts of Post modernism 7.4 Post modernism in Geography 7.5 Criticism 7.6 Suggested Reading 7.1 CONCEPT OF POST MODERNISM Post modernism is a complicated term or set of ideas, that emerged in academic studies in the mid 80's of the last century. It is also hard to define, because it is a term which appears in many different disciplines, such as art, architecture, music, film, literature, sociology, communication, fashion, and technology.

According to the Oxford Dictionary of Geography (2nd edition, 1997, 338) the term 'post modernism' refers to an architectural style which is composite of past styles, characterized by a variety of colours, stylistic details from many periods and what is claimed to be a return to a vernacular type..... It is a

philosophical stance which claims that it is impossible to make grand statements—meta narratives-about the structures of society or about historic causation because everything

we perceive, express and interpret is influenced

by our gender, class and culture .....No interpretation is superior

to another. It has brought to geographers recognition that space, place, and scale and social constructs, not external givers. Some geographers

claim the post modernism

challenges the dominance of time and history in social theories and instead stresses the significance of geography and spatiality.

For Lyotard, Post modernism is to be seen as a state of mind, as a way of describing the social, cultural and intellectual changes since the turning point of the 1950's, which marked the end of the post war period and opened a period of expansion in all fields of activity and generalized social change. This state of mind encourages rejection, be it of one way representations of the world, of totalizing visions of dogmas and also of the effort to identify articulate meaning. It manifests itself as an erosion of landmarks, a blurring of established ways of seeing and understanding and a loss of confidence in theories. In Lyotard's view, the priority for philosophy is to

61 avoid both the ambient positivist pragmatism and dogmatism; both are hegemonic, for moment the only solution is to operate by micrology [Benko, Strohmayer, 1997, P 8]. Post modernism may be said to represent a radical attack upon the mimetic theory of representation and search for truth. According to Duncan and Ley (1993) -It is anti foundational in that it explicitly rejects totalizing ambitions of modern social sciences. Such as epistemology, if taken seriously, is inescapable and radically relativist. Post modernism presents itself as a movement of deconstruction, intents on dismantling the hierarchy of knowledge and values, undermining all that gives meaning and all that has been developed as paradigm or model. It has been said that it is possible to live happily in a universe without explanation. For its detractors, Post modernism represents a cynical brand of compromise and opportunism, a widespread and affected nihilism, and acceptance born of passivity and common place effects, it is content with ambiguity, and has nothing to contribute to a political or Utopian programme. As a method, post modernism is critical of the idea of totality and assumes that meaning is produced in language, not reflected by it, that meaning is not fixed but is constantly on the move and that subjectively does not imply a conscious, unified and rational human subject but instead a kaleidoscope of different discursive practices. In turn, the kind of method needed to get at these conceptions will need to be very flexible, able to capture a multiplicity of different meaning without reducing them to the simplicity of single structure. Derrida's deconstruction, Foucault's genealogy, Leotard's paralogism, the post modern ethnography of anthropologist such as Clifford (1988), the discourse analysis of various social psychologists .....all these are attempts to produce a method that can capture history as a set of overlapping and interlocking fields of communication and judgement. 7.2 MODERNISM AND POST MODERNISM The period of modernity started in the 16th century at the time of the renaissance and the emergence of capitalism. The philosophical movement of modernism arose in the time of Enlightment (18th century) where the belief in universal human progress and sovereignty of scientific reasoning became important. The philosophers were searching universal laws and modernism was dominant until the 60's of 20th century. Knox and Marshton (2004) defined modernity as a forward looking view of the world that emphasizes reason, scientific rationality, creativity, novelty and progress. At the time Scientists were more interested to disclose the truth. Another important thing of modernism has been the growth of dichotomies and going out of boundaries of the main subject matter of geography.

62 According to Lyotard, modernism was based on three starting points or 'grand recits'- 1. The subjection of and total control over nature (economic rationalization) 2. The subjection of and total control over politics (Political rationalization) 3. The possibility of gaining objective knowledge (Scientific rationalization) According to modern philosophical thought as people could think rationally, they could obtain objective knowledge (positivism) from which it was possible to create their best living environment and at least complete rational society would be developed and also history would be conquered. To understand post modernism, it is necessary to know what Lyotard (1984) means by the term modern. According to him modern means 'to designate any science that legitimates itself with reference to a meta discourse- making an explict appeal to some grand narrative, such as the dialectics of the spirit, the hermeneutics of meaning, the emancipation of rational or working subject or creation of wealth' or to put it in another way. Societies which anchor the discourses of truth and justice in the great historical and scientific narratives (recits) can be called modern (Adhikari, S.-2006, P-345). In the space of 20 yrs. post modernity has became one of the most widely used concepts in discussions about art, literature and social theory. Geography, sociology, philosophy, literature, architecture, the plastic arts -all have entered their post modern period. It is hardly surprising that the term 'post'-is ambiguous in all these contexts. The term can imply continuity or change. But if it is continuity then why use a prefix to form a new term? Objectively, it separates, yet semantically it fails to establish a difference. 'Post' is suggestive for continuous and the liner-To break with modern, the post modern has to repeat the modern. As an umbrella term for a wide variety of tendencies, post modern suffers from a definitional imprecision that reflects its heterogeneous content. As one of the leading theorists of post modernism has explained, it is an equivocal, disjunctive category, doubly modified by the impetus of the phenomena itself as by the shifting perceptions of its critics (Benko, Strohmayer, 1997, P-10). Post modernism emphasizes the unclearness, the fragmented, and the multiformity, the missing of real conformity and of big ordering principle in society. This is not one universal truth, but there are multiple views or theories which always are bounded to place and time. Post modernists think the past as manifold of events; one event can't be seen separately because every event is not the same as the other, and these events also happened in another time where the world was different. There is no universal best culture, but there is a best culture for each individual.

63 7.3 MAIN FEATURES OF POST MODERNISM Fredric Janeson (1984) has identified two significant features of post modernism:

Pastiche and Schizophrenia. He said that the great modernisms were predicted on the invention of a personal, private style.
But
in a world in which stylistic innovation is no longer possible, all that is left is pastiche. The imitation of
dead style can be seen in the 'nostalgia film'. We have lost our ability to locate ourselves historically. Post modernism has a peculiar notion of time. Janeson (1991) seeks to explain what he means in terms of Lacan's theory of Schizophrenia. The originality of Lacan's thought in this area is to have considered Schizophrenia as a language disorder. It emerges from the failure of the infant to enter fully into realm of speech and lan- guage.
It is because language has a past and future, because the sentence moves in time, that we can have what seems to us a concrete
or lived experience of time. The schizophrenic, in short, experiences a fragmentation of time, a series of perpetual presents. Jameson (1991) contends that experiences of temporal discontinuity, similar to those maintained above, are evoked in post modernist works. Derek Gregory (1989) has also identified three basic features of post modernism in geographic perspective—(i) post modernism is another type of post paradigm because
post modern writers are immensely suspicious of any attempt to construct a system of thought which claims to be complete and comprehensive. (
ii) Post modern writers are hostile to the totalizing ambition of the conventional social sciences. (iii) Post modernism has sensitivity to heterogeneity, particularly and uniqueness. Difference is a 'leit motif' of the post modernism. 7.3.1 Basic concepts of Post modernism : 1. Deconstruction : In Post modernism according to Acques Derrida deconstruction of language occurs which means that every single word in a text can have thousand different meanings. In other words, the text has been seen to fail by its own criteria, the standards or definitions which the text set up were used reflexively to unsettle and shatter the original distinction. 2. Phonocentrism Logocentrism : Speech has been regarded as prior because it is closer to the possibility of presence than writing. Derrida called it phonocentrism. Besides being 'phonocentric' western philosophy is also logocentric. Logocentric is a substitute for meta-physics in order to foreground that which has determined metaphysical systems of thought (which depends on a foundation, a ground or a principle) their dependence on a 'logos'. 'Logos' is an essence or truth which acts as the foundation of our entire beliefs- example, Idea, Matter, the World Spirit, God etc.
64 Derrida developed a concept which he called 'difference' and that referred 'to differ' -to be unlike or dissimilar in nature, quality or from- and 'to differ' to delay, to postpone. Language is the play of difference which are generated by those differences. Derrida attempted to incorporate into the meaning of 'Difference' the sense of deferring. Difference is itself endlessly deferred. 3. Metaphor : In the past metaphor was often studied as an aspect of the expressive function of language, but it is actually one of the essential conditions of speech. An influential post structuralist thinker Michel Foucault was particularly fond of using geographical metaphors such as territory, domain, soil, horizon, geopolitics etc. Spatial metaphors include position, field etc. Metaphor determines to a large extent what we can think in any field. 4. Spatiality and historicism : Foucault suggested earlier that there has been a devaluation of space. Space was treated as the dead, the fixed, the undialectical, the immobile, time, on the contrary, was richness, fecundity, life, dialectical (Foucault, 1980). From the epistemological view point the single most important contribution of post modernism has been to connect the bias towards historicism 'by putting spatial at the centre of explanation, spatial dialectic along the historical dialectics. The historical imagination is never completely space less. Historicism has been defined in three different ways by Raymond Williams (1983)— i) Neutral - a method of study using facts from the past to trace the precendents of current events, ii) Deliberate- an emphasis on variable historical conditions and contents as privileged frameworks for intrer preting all specific events, iii) Hostile an attack on all interpretations and prediction which is based on notion of historical necessity or general laws of historical development. Lefebvre's spatial project provides a new dimension about spatialized dialectic, an insistent demand for a fundamental change in the ways we think about space, time and being about geography, history and society, about the production of space, the making of history and the constituting social relations and practical consciousness. Heterotopia Foucault clarified its concept of heterotopia which means the characteristics of spaces of the modern world. The heterogeneous spaces of sits and relations, called heterotopias' are constituted in every society but take quite varied forms and change over time, as history unfolds in its adherent spatiality.

65 Convergence of three spatiazation Soja (1993, 61) identifies three different paths of spatialization that tend towards a creative convergence: 'Post historian', 'post Fordism' and 'post modernism'. The first is rooted in the fundamental reformation of nature and conceptualisation of social being that reassert space, challenging the dominance of history. The second spatialization is directly attached to the political economy of the material world and the most recent phase of socio- spatial restructuring of post Second World War era. The third spatialization has a framework of a cultural and ideological reconfiguration with recognition of a new post modern culture of space and time. It overlaps with post historicism and post Fordism as a theoretical discourse. 7.4 POST MODERNISM IN GEOGRAPHY Post modernism is a way of thinking came after modernism. This was also the case in geography. The post modern way a thinking in geography was also a sort of reaction on the modernistic way. Post modernism has taught geographers a lot. The most important, that is learned from it is that 'observation are steered and selected, colored and organized by the ideas, expectations of the observer'. Post modernism lays the emphasis on the meaning of Geography instead of the material aspects of geography. In correlation with the shift to the meaning of geography is the rise of the cultural geography. Since the rise of Post modernism, the interest in aspects of the daily life in the Western culture was rising first, and thus also cultural geography was rising. Through cultural geography, some new themes are introduced in geography, as for example race, gender, sexuality, language, subcultures and identity. Some works related with post modernism are-Post industrial society (Bell, 1973; Touraine, 1969), post development (Escobar 1992), Post urban (Kling etal.1991), Post capitalist (Vakaloulis1994), and such as Post Marxist (Peet, Watts, 1993). Many theories have been modernized by becoming 'Post'; post modernized simmel (Weinstein, 1993), Post Weberian industrial location (Scott, 1988, Benko 1991), Post television culture (D.Agostino, Tafter) and even public administration and marketing have become post modern. Post modernity has become coupled with feminism (Bondi 1990, Nicholson 1990, Soper 1990), ecology (Ferry 1992), Environmental Problems (Grandy 1996), religion (Bhatt 1996, Gellner 1992), Planning (Dear 1986, 1991, Soja 1993), and space (Bonnet, 1992, Harvey 1990).

66 7.5 CRITICISM The impact of post modernism in geography and many other social sciences and humanities have been considerable. Five philosophical arguments associated with post modernism are - (a) Distrust of metanarrative and grand theory (b) emphasis on difference, (c) the problematisation of representation (d) recognition of situatedness of knowledge (e)its particularization social critique - each of these has been the subject of criticism [p,71] Harvey for example, has been highly critical of post modernism particularization of social critique, claming that post modern thinking shut -off other voices from access to more universal sources of power by ghettoizing them with in an opaque otherness (Harvey, 1989 P, 117) Harbermas who claimed post modernists such as Lyotard and Foucault were guilty of peformative contradiction in that they often failed to enact their own argument fully. He suggests that while post modernists disparage meta narrative and grand theories, they often employ them in their own writing. Kellner argued that Lyotard's account of post modernism employs a master narrative of the decline of the meta narrative of modernity and set up a grand, totalizing concept namely the local knowledges can not communicate with each other. Honneth rejection of meta- narratives is contradicted by the repeated emphasis on respecting difference and local knowledge. The emphasis given to notions of difference, otherness and the incommensurability of language has also been criticized for neglecting other aspects of social life, such as commonality and collectively.

Post -modernists insist that the field of the social science is heterogeneous and nontotalizable. as a result, they rule out sort of critical social theory which employs general categories like gender, race and class.

In their view there is nothing to be gained in the critical analysis of large -scale institutions and social structures. 7.6 SUGGESTED READING 1. Benlc, G. And Strohmayer, U. (1997) : Space and social theory, Interpreting Modernity and Post modernity, Blackwell Publishing (P, 8-10) 2. Adhikari S., 2006(New edition):Fundamentals of Geographical Thought, Chaitanya Publishing house, University Road, Allahabad, (P-345) 3. Gregory D., 1989: 'Areal Differentiation and Post-modern Human Geography', in D. Gregory and R. Walford (eds), Horizons in Human Geography, London, Macmillian. 4. Martin Phillips ; 2005 : 'contested World. An introduction to Human Geography. Ashgate Publishing Ltd. UK,(P-71) 5. Harvey D., 1989:

100%	MATCHING BLOCK 116/124	SA	combined thought final.pdf (D118996980)

The condition of Post modernity: An enquiry into the origins of cultural change,

Oxford (P-117).

67 UNIT 8 ? RECENTS TRENDS IN GEOGRAPHY IN METHODS AND CONTENTS Structure 8.1 Introduction 8.2 Geographical trends from late 19th century to 1940's. 8.3 Geographical trends in 1950's and 1960's. 8.4 Geographical trends in 1970's and 1980's. 8.5 Geographical trends after 1980's. 8.6 Suggested Reading 8.1 INTRODUCTION All academic disciplines evolve and geography is not an exception. Geography is a unique science because it integrates various disciplines like physical, economics, social, political, historical and medical sciences in relation to space and environment .Education philosophers and theorists such as Kuhn (1962) and Schlanger (1983) have developed models to understand how academic disciplines and fields come into existence and how they change over time. Kuhn in his classic

83% **MATCHING BLOCK 117/124** **SA** combined thought final.pdf (D118996980)

book. 'The Structure of Scientific Revolutions' defined paradigm as the entire constellation of beliefs, values, techniques and so on shared by the members of a given community (

Kuhn 1970,p-175)In the traditional Kuhnian formulation, it is not the accumulation of knowledge that causes changes in science, such changes are caused by a revolution. In this formulation change is effected through a linkage of events : Paradigm A ——< Normal science——< Anomalies——< Crisis——< Revolution ——< Paradigm B Methodology of a discipline is the logic used in the explanation. The major philosophical, methodological, theoretical view points in a discipline at any given time constitute the thought of the discipline .Whether that discipline is paradigmatic or not depend on the degree of dominance of any specific view point or view points. The dominance of view points are called as trends. 8.2 GEOGRAPHICAL TRENDS FROM LATE 19TH CENTURY TO 1940's.

67% **MATCHING BLOCK 118/124** **SA** Paradignmatic Shifts in Geographic Development.pdf (D125925498)

The scientific milieu in the latter half of 19th century and early twentieth centuries 68 was dominated by

Darwinian ideas and hypothesis of determinism received a new scientific dimension and became a law making approach from generalization. This new scientific method gradually replaced the inductive teleological philosophy of Ritter and sought to offer a mechanical explanation or more precisely the hypothetic deductive method. Deductive, Newtonian cause and effect and systematic study were important methods at that time. The nineteenth century's Darwinian tradition seems to have well continued to the first half of twentieth century with much scientific precision, explanation and validation. William Morris Davis stated that geography was concerned with the analyses of the relationships between inorganic control and organic response which was again the notion of Newtonian cause and effect relationship. Concept of ecology was also developed at that time. But with the advancement of society and material culture of people, there has been a reaction to the extreme generalization of the environmental determinism which doubted their universal application. Therefore an alternative approach 'possiblism'was developed revolving around Vidal's works of the lifestyles (generes de vie) that developed in different geographic environment .So, the method of field work and case studies were applied hereby so that in same environment the causes of difference between groups could be explained. Although Possiblism and regional geographical school established a new trend, but it did not immediately displace its predecessor and survived side by side up to 1960's. During the period 1919 -22, works of Sauer ('Economic Problems of Ozsark High land of Missouri' in 1919, 'Geography as Regional Economies' in 1920, Problems of Land Classification' in 1920 and 'Objectives of Geographical Study' in 1922) were regarded as significant contribution to geography .His ideas fully developed in 'The Morphology of Landscape'. According to him

94% **MATCHING BLOCK 119/124** **SA** MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

geographer's role is to investigate and understand the nature of transition from natural to the cultural landscape

and the successive stages through which the cultural landscape has passed during its transformation. The concept of Chorology as an approach to study geography was first developed by Richthofen and redefined by Alfred Hettner.Hartshorne was a supporter of regional geography.

98% **MATCHING BLOCK 120/124** SA 2013_ThmosKhun.pdf (D153447298)

Hartshorne used the term 'areal differentiation' to characterize the way in which geographers dealt with the wide variety of phenomena, physical ,economic and social which exist together in area and distinguish them from other areas (

Taaffe, 1974 p-6). Hartshorne believed in synthesis method based on field work and mapping. It should be noted that these debates and different approaches occurred without any revolution. The modification of both chorology and landscape view gave rise and spatial organizational trend in 1950's and 1960's.
69 8.3 GEOGRAPHICAL TRENDS IN 1950's AND 1960's. 1950's and 1960's were characterized by great changes in both methods as well as contents in geography. Taaffe described the background for these changes .According to him "as the integrative studies of the forties and fifties produce, the absurdity of attempting genuinely holistic studies with and without clearly stated selection criteria soon become evident .....Most geographers were not really trying to synthesize everything in an area ,nor were they trying to synthesize all phenomena of significance to man which had significant spatial expression. These increased awareness of spatial bias in the selection of problems led in the fifties and sixties to increasingly explicit statements of the spatial view in geography"(Taaffe, 1974,6-7). Schaefer brought this paradigm shift by criticizing the exceptionalists's claims made for the regional paradigm.

83% **MATCHING BLOCK 121/124** SA 2013_ThmosKhun.pdf (D153447298)

Bunge's Theoretic Geography' (1962), Haggett's Vocational Analysis in Human Geography' (1966) and David Harvey's 'Explanations in Geography' (1969)

were basically elaborations of Schaefer's original criticisms. Subsumed under the umbrella of spatial organization, numerous studies on spatial interaction, spatial system, social planning and regional taxonomies were developed.Scheafer, with his spatial organization, paradigm,

81% **MATCHING BLOCK 122/124** SA 2013_ThmosKhun.pdf (D153447298)

initiated what may be called the quantitative and theoretical revolution in geography This spatial organization paradigm

associated with a specific philosophy oh logical positivism. The method of study persisted in this time included the mathematics and statistical techniques to formulate models and laws for the explanation of phenomena. It is applicable to those phenomena that can be expressed in terms of quantity. It is an analytical method of enquiry related to geographical problems. At the same time the development of information technology, use of computers; GIS techniques etc were able to change the sphere of geography. So, the methods behind the geographical research changed rapidly and led

87% **MATCHING BLOCK 123/124** SA Paradignmatic Shifts in Geographic Development.pdf (D125925498)

to a shift from a descriptive type to an empirical law making

scientific study. Due to the methodological change, geographical contents became rich with the inclusion of many scientific theories and models like gravity model (Reilly), Principle of Least Effort (Zipf), Diffusion model(Hagerstrand),Theory of Games and Economic Behaviour. Von Neuman, Morgenstern, The volume on cybernetics (Nobert weiner) Bunge's monograph on Theoretical Geography, etc.According to Gould the major development and respectability that geography has are due to the elucidating works by mathematically talented geographers. Tobler's work led to the development of true cartographic research, Darcy's work have extended geographic theories, Wilson's work in entropy maximization models has changed the way we look at the world.(Gould,1979, p148-9). He commends Webber's ability to translate geographic observation and hypothesis from the verbal to the more manipulatable language of mathematics(Gould,1979, p148)

70 8.4 GEOGRAPHICAL TRENDS IN 1970's AND 1980's. As a result of dissatisfaction from spatial analysis, many geographers of 1970's and 1980's sought alternative approaches to geographic problems .Methodologically quantitative techniques were not valid in human geography; it obscures the more fundamental social questions. To replace it, humanistic and behavioural geography were emerged. Because of the weakness of positivism, many geographers have suggested alternate philosophical approach to study the spatial system. During the 1980's, geographical thinking truly got revolutionalised as increasingly geographers got engaged in research on not only the relationship between space and society or space and social theory but went further to establish the significance of theory and philosophy as the basic identity of the discipline (Dear and Flusty 2002). Pragmatism provided a suitable philosophy in the 1980's for those who would like to use value based scientific methodology to solve human problems. In the view of Pragmatism, space is functional; and the meaning of space is functional of the practical consequences of that space. Space is a composite of error and knowledge. But a credible alternative to positivism is phenomenology. It is a philosophy that seeks to disclose the world as it shows itself before scientific inquiry, as that which is pre-given and pre supported by the science. Idealism, on the other hand accepts that there is a real world outside the individuals'consciousness.

Idealism implies one type of Hermeneutic approach which is the theory of interpretation and clarification of meaning. Realism is a alternative explanation to idealism. On the basis of these philosophical changes, methodologies of the geographical study transformed. It turns inductive from hypothesis-deductive and the main aim of these studies is

Inductive method involves moving from particular instances of relations among variables to the formulation of hypotheses and from these to the development of propositions. Many scientists had claimed that laws and theories were derived from the observation of repeated regularities, and historical dialectical method. Different trends developed because of critical revolution in geography in 1970's will continued to be important in the 1980's .Among them the most important are Environmental causation, Sustainable development, welfare approach, Marxism, Feminism, Globalization and International Trade. 8.5 GEOGRAPHICAL TRENDS AFTER 1980's. By the late 1980's a new issue had arisen in geographical thought. It can be summerised under the heading of post modernism. Post modernism is a confusing term because it represents a combination of different ideas. As method it is critical of the idea of totality. In particular, this body of work assumes the following : that

71 meaning is produced in language ,not reflected by it; that meaning is not fixed but is constantly on the move and that subjectivity does not imply a conscious ,unified and rational human subject but instead a kaleidoscope of different discursive practices. In turn, the kind of method needed to get at these conceptions will need to be very supple, able to capture a multiplicity of different meanings without reducing them to the simplicity of a single structure. Derrida's deconstruction, Foucault's generology, Lyotards paralogism,the discourse analysis of various social psychologists-all these are attempts to produced a method that can capture history as a set of overlapping and interlocking fields of communication and judgement.In the 1990's, both inside and outside Marxist geography, initiatives started building up to initiate debates on critical studies in theory and practice. For the first time, such a move extended beyond the Anglo -Saxon coverage, incorporating Europe, Latin America and Asia. These endeavours joining with other contemporary geographical praxis [Harvey 2000, 2001, Dear, Flusty, 2002. Jhonston, Taylor and Watts, 2002, Amin and Thrift ,2002,Smith 2000] have been raising crucial questions about the relevancy of the subject in the Post Fordist ,Post Modernist world and focusing on the significance of space in social theory(Guha,Banerjee.S, 2004). The scientific and technological revolution can release man from the bondage of space allowing the whole land to be his home, as boundaries demarcation groups of men disappear as faster modes of transportation and communication come into existence. Geography at the end of the 20th century was engaged in fathoming the depth of disparity on a world scale and even with in states, its spread and nature and ways to overcome it. So, sustainable development became the main issue. In the 21st century the world may witness globalization of a different kind-uneven distribution of resources and development leading not to dominance but to cooperation at a much higher level. Geography as a regional science will have moved miles from what Isard (1960) made it look like when he created the idea of such science linking geography, economics and planning. 8.6 SUGGESTED READING 1. Kuhn, T.S., 1962, 1970: The Structure of Scientific Revolutions, Chicago, Maaroufa Press. (P-175) 2. Taaffe, E.J., (eds.) 1970: Geography, Englewood Cliffs, N.J., Prentice Hall. (P-6) 3. Ibid. 4. Gould.(1979) : Geography (1957-1977):The Augean Period, Annals of the Association of American Geographers, vol, 69 (p. 48-9) 5. Guha-Banerjee. S. (ed.) 2004 : Space, society and geography, Rawat Publications, Jaipur and New Delhi (p. 18-9).

Hit and source - focused comparison, Side by Side

Submitted text As student entered the text in the submitted document.

Matching text As the text appears in the source.

1/124	SUBMITTED TEXT	24 WORDS	56%	MATCHING TEXT	24 WORDS

All rights reserved. No part of this study material may be reproduced in any form without permission in writing from Netaji Subhas Open University.

SA MGDSE - 2.5 - Evolution of Geographical Thought.pdf (D155224129)

2/124	SUBMITTED TEXT	20 WORDS	63%	MATCHING TEXT	20 WORDS

Some of the important dichotomies in geography are- 8 1 General geography vs. Regional geography 2 Physical geography vs. Human geography 3

SA MGDSE - 2.5 - Evolution of Geographical Thought.pdf (D155224129)

3/124	SUBMITTED TEXT	19 WORDS	97%	MATCHING TEXT	19 WORDS

take stock of what is around us and put the accumulated knowledge about the world together in usable form' .

SA combined thought final.pdf (D118996980)

4/124	SUBMITTED TEXT	25 WORDS	87%	MATCHING TEXT	25 WORDS

focuses attention on the surface of the earth, where it examines such things as climate, surface features, water, forests and deserts, mineral, animals, and the human inhabitants.

SA combined thought final.pdf (D118996980)

5/124	SUBMITTED TEXT	17 WORDS	91%	MATCHING TEXT	17 WORDS

a description of the inhabitants, their appearances, arts, commerce, culture, language, government, religion, cities, famous places and famous

SA combined thought final.pdf (D118996980)

6/124	SUBMITTED TEXT	16 WORDS	90%	MATCHING TEXT	16 WORDS

variety of different kinds of interrelated phenomena that exist together in areas or segments of earth

SA combined thought final.pdf (D118996980)

7/124	SUBMITTED TEXT	13 WORDS	100%	MATCHING TEXT	13 WORDS

professor of physical geography and geology at the college of New Jersey (Princeton)

SA combined thought final.pdf (D118996980)

8/124	SUBMITTED TEXT	15 WORDS	73%	MATCHING TEXT	15 WORDS

him geography is the science of earth surface and the things and phenomena that are

SA MGDSE - 2.5 - Evolution of Geographical Thought.pdf (D155224129)

9/124	SUBMITTED TEXT	25 WORDS	63%	MATCHING TEXT	25 WORDS

remembered for his valuable contribution to the development of modern physical geography. He first coined the term geomorphology to refer the origin and development of earth's

SA combined thought final.pdf (D118996980)

10/124	SUBMITTED TEXT	13 WORDS	100%	MATCHING TEXT	13 WORDS

Blache is regarded as one of the founding fathers of modern human geography.

Blache is regarded as one of the founding fathers of modern human geography.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

11/124	SUBMITTED TEXT	34 WORDS	78%	MATCHING TEXT	34 WORDS

Blache pointed out the inherent weakness of the geographic concept of environmental determinism. He realized the futility of setting man's natural surroundings in opposition to his social milieu and of regarding one as dominating 11 other.

Blache pointed out the inherent weakness of the geographic concept of 'environmental determinism' which was prevalent at the time as a Darwinian heritage. He realised the futility of setting humankind's natural surroundings in opposition to his social milieu and of regarding one as dominating other.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

12/124	SUBMITTED TEXT	12 WORDS	95%	MATCHING TEXT	12 WORDS

population density, clusters, major agglomerations in Europe, movements of population in Europe,

population density, clusters, major agglomerations in Europe and movements of population in Europe.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

13/124	SUBMITTED TEXT	20 WORDS	69%	MATCHING TEXT	20 WORDS

second volume of Anthropogeographie (1891) as he attempted to discuss the concentration and distribution of population, settlement, migration and diffusion of cultural

SA combined thought final.pdf (D118996980)

14/124	SUBMITTED TEXT	19 WORDS	100%	MATCHING TEXT	19 WORDS

the change on the face of the earth by the action of man, in the process of developing civilization.

SA combined thought final.pdf (D118996980)

15/124	SUBMITTED TEXT	49 WORDS	55%	MATCHING TEXT	49 WORDS

He divided the essential facts of human geography into three categories-1. The facts of the unproductive occupation of the soil: houses and roads (including rural). 2. The facts of plant and animal conquest: the cultivation of the plant and raising of animals. 3. The facts of destructive exploitation: plant and animal devastation, mineral exploitation. (

SA combined thought final.pdf (D118996980)

16/124	SUBMITTED TEXT	31 WORDS	90%	MATCHING TEXT	31 WORDS

Human geography according to him, is the study of human groups and societies in their relationships to the physical environment or geographical milieu. He emphasized the work of man in modifying his environment

SA combined thought final.pdf (D118996980)

17/124	SUBMITTED TEXT	15 WORDS	93%	MATCHING TEXT	15 WORDS

the control of rivers and the evolution of new plants for human food. The study

SA combined thought final.pdf (D118996980)

18/124	SUBMITTED TEXT	51 WORDS	92%	MATCHING TEXT	51 WORDS

geographical milieu on modes of life 2. The changes in the genre de vie under the impact of human milieu. 3. The distribution of human groups as the result of the natural milieu, and the degree of civilization. 4. The establishment in the landscape, due to the impact of the human groups on the land (

SA combined thought final.pdf (D118996980)

19/124	SUBMITTED TEXT	17 WORDS	91%	MATCHING TEXT	17 WORDS

set forth the relationship between geographical writings that describe the characteristic of particular places and those that

SA combined thought final.pdf (D118996980)

20/124	SUBMITTED TEXT	16 WORDS	71%	MATCHING TEXT	16 WORDS

difficult to establish laws in regional geography, for explanation must be descriptive where people are involved .

SA combined thought final.pdf (D118996980)

21/124	SUBMITTED TEXT	24 WORDS	52%	MATCHING TEXT	24 WORDS

Peschel, geography was to be a systematic, emperical science, its method, and observation, drawing induction from those observations, and correcting these by still new observation.

SA combined thought final.pdf (D118996980)

22/124	SUBMITTED TEXT	17 WORDS	97%	MATCHING TEXT	17 WORDS

followed the precedent of Humboldt, attempted to revive the close connection of geography to the natural sciences,

SA combined thought final.pdf (D118996980)

23/124	SUBMITTED TEXT	18 WORDS	71%	MATCHING TEXT	18 WORDS

According to Richthofen geography is the science of the earth's surface and the things and phenomena that are

SA combined thought final.pdf (D118996980)

24/124	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

suggested that groups of human beings must struggle to survive in

suggested that groups of human beings must struggle to survive in

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

25/124	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

Richthofen attempted to distinguish between the general geography and special geography .

SA combined thought final.pdf (D118996980)

26/124	SUBMITTED TEXT	27 WORDS	91%	MATCHING TEXT	27 WORDS

hence geography has to be conceived as the science concerned with the formulation of the laws governing the spatial distribution of certain features on the surface of the

Hence geography has to be conceived as the science concerned with the formulation of the laws governing the spatial distribution of certain features on the earth's surface. (Schaefer 1953). The

W http://uafulucknow.ac.in/wp-content/uploads/2020/05/B.A.-B.Sc_.-II-Semester-generic.pdf

27/124	SUBMITTED TEXT	10 WORDS	100%	MATCHING TEXT	10 WORDS

defined geography as the chorological science of the earth's surface,

defined geography as the chorological science of the Earth's surface.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

28/124	SUBMITTED TEXT	26 WORDS	92%	MATCHING TEXT	26 WORDS

or in other words, geography is the study of the earth (eardkunde) according the causally related differences -the science of areal differentiation of the earth's surface .

Or, in other words, geography is the study of the Earth (Erdkunde) according to the causally related differences—the science of areal differentiation of the Earth's surface.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

29/124	SUBMITTED TEXT	55 WORDS	98%	MATCHING TEXT	55 WORDS

the goal of the chorological point of view is to know the character of region and places through comprehension of the existence together and interrelation among the different realms of reality and their varied manifestations, and to comprehend the earth's surface as a whole in its actual arrangement in continents, larger and smaller regions and places" (Hartshorne, 1959, 13). He

The goal of the chorological point of view is to know the character of region and places through comprehension of the existence together and interrelation among the different realms of reality and their varied manifestations, and to comprehend the Earth's surface as a whole in its actual arrangement in continents, larger and smaller regions and places'. Hartshorne, he

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

30/124	SUBMITTED TEXT	25 WORDS	100%	MATCHING TEXT	25 WORDS

the systematic sciences ignore the temporal and spatial relationships and find their unity in the objective likeness or similarity of the subjects with which they are concerned.

The systematic sciences ignore the temporal and spatial relationships and find their unity in the objective likeness or similarity of the subjects with which they are concerned.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

31/124	SUBMITTED TEXT	17 WORDS	100%	MATCHING TEXT	17 WORDS

it is mainly due to Hettner that dualism, which so long hampered geography has been successfully overcome

It is mainly due to Hettner that dualism, which so long hampered geography, has been successfully overcome.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

32/124	SUBMITTED TEXT	12 WORDS	100%	MATCHING TEXT	12 WORDS

However some writers have accused Hettner of defining geography as essentially idiographic (

However, some writers have accused Hettner of defining geography as essentially idiographic,

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

33/124	SUBMITTED TEXT	31 WORDS	95%	MATCHING TEXT	31 WORDS

Edward Ullman (1953) a professor of geography at University of Washington, thought that geography as areal differentiation implies that 'we are not seeking principles or generalizations or similarities, the goal of all sciences'.

SA combined thought final.pdf (D118996980)

34/124 **SUBMITTED TEXT** 13 WORDS **100%** **MATCHING TEXT** 13 WORDS

Vidal de la Blache seeks to establish geography as a distinct discipline.

Vidal de la Blache seeks to establish geography as a distinct discipline.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

35/124 **SUBMITTED TEXT** 13 WORDS **100%** **MATCHING TEXT** 13 WORDS

are manifestations of intimate relationship between man and nature that developed through the

are manifestations of intimate relationship between man and nature that developed through the

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

36/124 **SUBMITTED TEXT** 37 WORDS **74%** **MATCHING TEXT** 37 WORDS

the study of such small natural region, each of which is unique, should be the task of the geographers. So, he opted for regional geography as the core of the discipline. Man -nature relationship cannot be studied along systematic lines.

The study of such small natural regions, each one of which is unique, should be the task of the geographer. Blache, therefore, argued for regional geography and against systematic geography as the core of the discipline. Man-nature relationship cannot be studied along systematic lines.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

37/124 **SUBMITTED TEXT** 22 WORDS **65%** **MATCHING TEXT** 22 WORDS

geography seeks to acquire a complex knowledge of the areal differentiation of the world .....Phenomena significant to areal differentiation having areal expression ..... (

Geography seeks to acquire a complex knowledge of the areal differentiation ..... phenomena significant to areal differentiation have areal expression...

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

38/124 **SUBMITTED TEXT** 16 WORDS **91%** **MATCHING TEXT** 16 WORDS

the things geographers deal with on the face of the earth are not uniformly distributed over it.

The things geographers deal with on the surface of the earth are not uniformly distributed over it.

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

39/124 **SUBMITTED TEXT** 19 WORDS **92%** **MATCHING TEXT** 19 WORDS

The phenomena associated in a particular place are unsystematically related because they are produced by different processes. So, the

The phenomena associated in a particular place are unsystematically related because they are produced by different processes.....the

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

40/124 **SUBMITTED TEXT** 12 WORDS **88%** **MATCHING TEXT** 12 WORDS

the geographer is to study each process as it operates in particular places.

the geographer's particular mission is to study each process as it operates in particular places,

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

41/124 **SUBMITTED TEXT** 14 WORDS **90%** **MATCHING TEXT** 14 WORDS

not true. He attempted to make it clear that geography is both idiographic and nomothetic.

SA combined thought final.pdf (D118996980)

42/124 **SUBMITTED TEXT** 16 WORDS **90%** **MATCHING TEXT** 16 WORDS

exists between regional and systematic geography because they lie at the two extremes of a continuum.

SA MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

43/124 **SUBMITTED TEXT** 10 WORDS **100%** **MATCHING TEXT** 10 WORDS

an 'active force', reacting to his environment and changing it.

SA combined thought final.pdf (D118996980)

44/124 **SUBMITTED TEXT** 17 WORDS **55%** **MATCHING TEXT** 17 WORDS

that natural environment plays the major role in determining the behaviour patterns of man on the earth's surface'.

SA MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

45/124 **SUBMITTED TEXT** 9 WORDS **100%** **MATCHING TEXT** 9 WORDS

on the earth's surface is the result of the

SA MGDSE - 2.5 - Evolution of Geographical Thought.pdf (D155224129)

46/124 **SUBMITTED TEXT** 28 WORDS **100%** **MATCHING TEXT** 28 WORDS

insisted that the observable things on the earth were only poor copies of ideas or perfect predicates from which observable things had degenerated or were in the process of

SA combined thought final.pdf (D118996980)

47/124 **SUBMITTED TEXT** 14 WORDS **89%** **MATCHING TEXT** 14 WORDS

a state like some simple organisms, must either grow or die and can never

SA combined thought final.pdf (D118996980)

48/124 **SUBMITTED TEXT** 24 WORDS **81%** **MATCHING TEXT** 24 WORDS

the physical environment provided a range of possibilities which man turned to his use according to his needs, wishes and capabilities in creating his habitat.

The physical environment provides a range of possibilities which Man turns to his use according to his needs, wishes and capacities, in creating his habitat.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

49/124 **SUBMITTED TEXT** 28 WORDS **89%** **MATCHING TEXT** 28 WORDS

in an area of human settlement, nature changed significantly because of the presence of man, and these changes were greatest where the level of material culture of the community

In an area of human settlement, nature changes significantly because of the presence of man and these changes are greatest where the level of material culture of the community

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

50/124 **SUBMITTED TEXT** 28 WORDS **89%** **MATCHING TEXT** 28 WORDS

as knowledge of the world spread ,the association of event or condition with place widened, they became more complex, they had less or more significance with respect to mankind.' 20

As knowledge of the world spread, the associations of events or conditions with place widened, they became more complex, they, had less or more significance with respect to mankind.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

51/124 **SUBMITTED TEXT** 64 WORDS **74%** **MATCHING TEXT** 64 WORDS

is a product of the earth's surface. This means not merely that he is a child of the earth, dust of her dust, but that earth has mothered him, fed him, set him tasks, directed his thought, confronted him with difficulties that have strengthened his body and sharpened his wits, given him his problems of navigation or irrigation and at the same time whispered hints for their solution"(

SA combined thought final.pdf (D118996980)

52/124 **SUBMITTED TEXT** 30 WORDS **92%** **MATCHING TEXT** 30 WORDS

views that the, Physical environment tends to provide the opportunity for a range of possible human responses and that people have considerable discretion to choose between them through their creative genius and creativity(

SA combined thought final.pdf (D118996980)

53/124 **SUBMITTED TEXT** 23 WORDS **94%** **MATCHING TEXT** 23 WORDS

Probabilism is a compromise position between environmentalism and possibilism that assigns different probabilities to alternative patterns of geographic behaviour in a particular location or environment.'

SA MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

54/124 **SUBMITTED TEXT** 25 WORDS **54%** **MATCHING TEXT** 25 WORDS

Hartshorne, 1939 (new print 1976): The Nature of Geography, Lancaster, Pensylvania, Association of American Geographers, (p 75-76) 11. Hartshorne, 1959: Perspective on nature of geography, Chicago,

SA MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

55/124 **SUBMITTED TEXT** 28 WORDS **75%** **MATCHING TEXT** 28 WORDS

a particular style of descriptive regional geography with roots in German geography, especially the ideas of Alfred Hettner. Hettner defined geography as the study of the earth's surface,

a particular style of descriptive regional geography with roots in German Geography, especially the ideas of Alfred Hettner (1895 - 1941). For Hettner (1927), geography is the study of distribution of phenomena spread over the entire earth's surface (

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

56/124 **SUBMITTED TEXT** 16 WORDS **97%** **MATCHING TEXT** 16 WORDS

Culture is the agent, the natural area is the medium and the cultural landscape is the result.....

SA combined thought final.pdf (D118996980)

57/124 **SUBMITTED TEXT** 47 WORDS **75%** **MATCHING TEXT** 47 WORDS

Geography seeks to acquire a complex knowledge of the areal differentiation of the world .....phenomena significant to areal differentiation having areal expression. Consequently, geography depends first and fundamentally on the comparison of maps. In systematic geography, each particular element or element complex, that is geographically significant, is studied in terms

Geography seeks to acquire a complex knowledge of the areal differentiation ..... phenomena significant to areal differentiation have areal expression...consequently in studying the interrelation of these phenomena, geography depends first and fundamentally on the comparison of In systematic geography each particular element , or element complex, that is geographically significant, is studied in terms

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

58/124 **SUBMITTED TEXT** 54 WORDS **97%** **MATCHING TEXT** 54 WORDS

relation to the total differentiation of areas. In regional geography, all the knowledge of the interrelation of all features at given places— obtained in part from the different systems of systematic geography is integrated, in terms of the interrelations which 27 these features have with each -other, to provide the total geography of those places(Hartshorne 1939, 463-5).

relation to the total differentiation of areas.....In regional geography all the knowledge of the interrelations of all features at given places - obtained in part from the different systems of systematic geography - is integrated, in terms of the interrelations which these features have to each other, to provide the total geography of those places. (Hartshorne 1939)

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

59/124 **SUBMITTED TEXT** 43 WORDS **98%** **MATCHING TEXT** 43 WORDS

geography is basically a regional study dealing with unique combination (interrelations) of characteristics in specific areas of the earth's surface; it is also largely descriptive 'no universals need to be evolved', other than the general law of geography that all areas are unique', (Hartshorne 1939, 468).

geography is basically a regional study dealing with unique combinations (interrelations) of characteristics in specific areas of the earth's surface; it is also largely descriptive: "no universals need to be evolved, other than, than the general law of geography that all areas are unique" (Hartshorne 1939:468).

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

60/124 **SUBMITTED TEXT** 11 WORDS **95%** **MATCHING TEXT** 11 WORDS

is to provide accurate, orderly and rational descriptions and interpretations of

is concerned to provide accurate, orderly and rational descriptions and interpretations of

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

61/124 **SUBMITTED TEXT** 18 WORDS **100%** **MATCHING TEXT** 18 WORDS

The Nature of Geography : A critical survey of current thought in the light of the past' (1939)

SA 2131687.pdf (D25894597)

62/124 **SUBMITTED TEXT** 30 WORDS **60%** **MATCHING TEXT** 30 WORDS

be developed as a science of those factors governing the spatial distribution of certain features on the surface of the earth. It is the spatial arrangement of phenomena, not the phenomena themselves,

SA Exceptionalism.docx (D30268332)

63/124 **SUBMITTED TEXT** 26 WORDS **72%** **MATCHING TEXT** 26 WORDS

that geography does not share the methodology of other sciences because of the peculiar nature of its subject matter which include the study of unique places or

SA Exceptionalism.docx (D30268332)

64/124 **SUBMITTED TEXT** 42 WORDS **96%** **MATCHING TEXT** 42 WORDS

Schaefer opined that geography is not peculiar in its focus on unique phenomena; all sciences deal with unique events which can only be accounted for by an integration of laws from various systematic sciences, but this does not prevent the development of those laws.

SA Exceptionalism.docx (D30268332)

65/124 **SUBMITTED TEXT** 15 WORDS **100%** **MATCHING TEXT** 15 WORDS

explanatory description of features in the past must be kept subordinate to the primary purpose'.

explanatory description of features in the past must be kept subordinate to the primary purpose

W http://uafulucknow.ac.in/wp-content/uploads/2020/05/B.A.-B.Sc_.-II-Semester-generic.pdf

66/124 **SUBMITTED TEXT** 11 WORDS **100%** **MATCHING TEXT** 11 WORDS

his reaction to Schaefer's attack and criticism to his regional

SA Exceptionalism.docx (D30268332)

67/124 **SUBMITTED TEXT** 13 WORDS **100%** **MATCHING TEXT** 13 WORDS

positive view of geography; geography is what geographers have made it. Schaefer's was

SA Exceptionalism.docx (D30268332)

68/124 **SUBMITTED TEXT** 15 WORDS **100%** **MATCHING TEXT** 15 WORDS

normative theory of what geography should be, irrespective of what it had been (Johnston, 1983). 3.3

SA Exceptionalism.docx (D30268332)

69/124 **SUBMITTED TEXT** 24 WORDS **83%** **MATCHING TEXT** 24 WORDS

Introduction: The Nature of Geography in perspective. In N. Entrikin and S.Brunn (eds), Reflections on Richard Hartshorne's "The nature of Geography" Washington: Association of American Geographers, (

SA 2131687.pdf (D25894597)

70/124 **SUBMITTED TEXT** 23 WORDS **87%** **MATCHING TEXT** 23 WORDS

Hartshorne, R.1939. The Nature of Geography: A critical survey of Current Thought in the Light of the Past. Lancaster, Penn: Association of American Geographers. (

SA 2135579 - Question2 - Final.docx (D24056280)

71/124 **SUBMITTED TEXT** 16 WORDS **90%** **MATCHING TEXT** 16 WORDS

Johnston, R.J. 1983: Geography and geographers: Anglo-American human geography since 1945 (2nd eds.) London, Arnold. 31

SA 2013_ThmosKhun.pdf (D153447298)

72/124 **SUBMITTED TEXT** 23 WORDS **96%** **MATCHING TEXT** 23 WORDS

the belief that geography and history are methodologically distinct from other sciences because they are peculiarly concerned with the study of the unique and particular.

SA Exceptionalism.docx (D30268332)

73/124 **SUBMITTED TEXT** 42 WORDS **96%** **MATCHING TEXT** 42 WORDS

supported the idea of small natural regions (pays). Such small natural regions are manifestations of intimate relationship between man and nature that is developed through the centuries. The study of such small natural regions, each one of which is unique, should be the task of

supported the idea of small natural regions ('pays'). Such small natural regions are manifestations of intimate relationship between man and nature that developed through the centuries. The study of such small natural regions, each one of which is unique, should be the task of

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

74/124 **SUBMITTED TEXT** 31 WORDS **87%** **MATCHING TEXT** 31 WORDS

Some writers have accused Hettner of defining geography as essentially idiographic. Both Hettner and Hartshorne considered region to be a functional unit -an organism which was more than the sum of its parts.

some writers have accused Hettner of defining geography as essentially idiographic, Both Hettner and Hartshorne considered region to be a functional unit —an organism which was more than the sum of its parts.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

75/124 **SUBMITTED TEXT** 32 WORDS **95%** **MATCHING TEXT** 32 WORDS

Sauer pointed out in 1925 that although geography was formerly devoted to descriptions of unique places as such the geographers had for a long time been seeking to formulate illuminating generalizations about the

Sauer pointed out in 1925 that although geography was formerly devoted to descriptions of unique places as such, the geography had for a long time been seeking to formulate illuminating generalizations about the 1950

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

76/124 **SUBMITTED TEXT** 18 WORDS **88%** **MATCHING TEXT** 18 WORDS

fill up the entire circumference of our perception: Geography that of space, history that of time (Hartshorne, 1939, 134-5)'.

SA Exceptionalism.docx (D30268332)

77/124 **SUBMITTED TEXT** 35 WORDS **91%** **MATCHING TEXT** 35 WORDS

be conceived as the science concerned with formulation of the laws governing the spatial distribution of certain features on 34 the surface of the earth. It is these spatial arrangements of phenomena and not the phenomena themselves,

SA Exceptionalism.docx (D30268332)

78/124 **SUBMITTED TEXT** 39 WORDS **96%** **MATCHING TEXT** 39 WORDS

Every observation has to do with things that are unique in time and place. But it is not even possible to identify any other feature as unique until there is some kind of empirical generalization with which to compare it.

every observation has to do with things that are unique in time and place. But it is not even possible to identify any one feature as unique until there is some kind of empirical generalization with which to compare it.

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

79/124 **SUBMITTED TEXT** 23 WORDS **100%** **MATCHING TEXT** 23 WORDS

A very fundamental part of the scientific method consists in learning how to distinguish the relevant from the irrelevant, and this cannot be done

A very fundamental part of the scientific method consists in learning how to distinguish the relevant from the irrelevant, and this cannot be done

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

80/124 **SUBMITTED TEXT** 22 WORDS **100%** **MATCHING TEXT** 22 WORDS

things, but they have also sought to formulate those illuminating concepts that make sense out of the apparent disorder of indirectly related parts.

things; but they have also sought to formulate those illuminating concepts that make sense out of the apparent disorder of indirectly related parts.

W https://pdfcoffee.com/human-geography-optional-notes--pdf-free.html

81/124 **SUBMITTED TEXT** 16 WORDS **100%** **MATCHING TEXT** 16 WORDS

geography is both idiographic and nomothetic, as indeed almost all other fields of learning must be (

geography is both idiographic and nomothetic, as indeed almost all other fields of learning must be.

W https://www.geographynotes.com/geographers/6-eminent-geographers-of-the-world-world-geography/3570

82/124 **SUBMITTED TEXT** 12 WORDS **87%** **MATCHING TEXT** 12 WORDS

initiated what may be called the quantitative and theoretical revolution in geography

SA 2013_ThmosKhun.pdf (D153447298)

83/124 **SUBMITTED TEXT** 17 WORDS **91%** **MATCHING TEXT** 17 WORDS

that the physical environment tends to provide the opportunity for a range of possible human responses and

SA combined thought final.pdf (D118996980)

84/124 **SUBMITTED TEXT** 19 WORDS **90%** **MATCHING TEXT** 19 WORDS

Adjustment' as Barrows used the word was not caused by physical environment but was a matter of human choice. Barrows

SA combined thought final.pdf (D118996980)

85/124 **SUBMITTED TEXT** 25 WORDS **94%** **MATCHING TEXT** 25 WORDS

a unifying theme that would bring coherence to the study of geography. The unifying thing, he argued, could be provided by restricting attention to human ecology (

SA combined thought final.pdf (D118996980)

86/124 **SUBMITTED TEXT** 48 WORDS **93%** **MATCHING TEXT** 48 WORDS

Every system has three basic aspects: structure, function and development. The structure is the sum of the elements and the connections between them. Functions concern the flows (exchange relationships) which occupy the connections. Development represents the changes in both structure and function which may take place over time. (Johnston, 1983, Holt-Jenson-1981).

SA combined thought final.pdf (D118996980)

87/124 **SUBMITTED TEXT** 32 WORDS **81%** **MATCHING TEXT** 32 WORDS

that maintains a constant opening environment in the face of random external fluctuation (Rose, 1967, 106). Such systems resist any alteration in environmental conditions and exhibit a gradual return to equilibrium or steady state

SA combined thought final.pdf (D118996980)

88/124 **SUBMITTED TEXT** 24 WORDS **83%** **MATCHING TEXT** 24 WORDS

DYNAMIC SYSTEM : Both homeostatic and adaptive systems show a change of state overtime as they move towards steady or preferred state. In truly dynamic

SA combined thought final.pdf (D118996980)

89/124 **SUBMITTED TEXT** 16 WORDS **73%** **MATCHING TEXT** 16 WORDS

however, feedback operates to keep the states of the systems changing through a sequence of unrepeated states

SA combined thought final.pdf (D118996980)

90/124 **SUBMITTED TEXT** 23 WORDS **71%** **MATCHING TEXT** 23 WORDS

usually termed the trajectory or line of the system (Ashby, 1963, 25). Feedback may, for example, cause new preferred states to be identified (

SA combined thought final.pdf (D118996980)

91/124 **SUBMITTED TEXT** 21 WORDS **92%** **MATCHING TEXT** 21 WORDS

the operator has some level of control over the inputs. The controlled systems are of great interest in systems engineering and

SA combined thought final.pdf (D118996980)

92/124 **SUBMITTED TEXT** 33 WORDS **100%** **MATCHING TEXT** 33 WORDS

Once the system has been successfully modeled, it can be manipulated using control theory which is a dynamic optimization technique permitting optimal allocation along the time horizons, and shifts emphasis from mere model construction to

SA combined thought final.pdf (D118996980)

93/124 **SUBMITTED TEXT** 14 WORDS **100%** **MATCHING TEXT** 14 WORDS

systems theory on the ground that they are intrinsically associated with positivism. The concept of

SA combined thought final.pdf (D118996980)

94/124 **SUBMITTED TEXT** 25 WORDS **100%** **MATCHING TEXT** 25 WORDS

systems theory which is relevant for all the sciences may be seen as a fruit of the positivist concept of one science, one method. He

SA combined thought final.pdf (D118996980)

95/124 **SUBMITTED TEXT** 12 WORDS **87%** **MATCHING TEXT** 12 WORDS

Hartshorne, R.(1939): The nature of geography, Lancaster, Pensylvania; Association of American Geographers (

SA 2191457W .pdf (D31575447)

96/124 **SUBMITTED TEXT** 13 WORDS **100%** **MATCHING TEXT** 13 WORDS

Sauer, C.O. (1925): The morphology of landscape, University of California Publications in Geography (

SA 2013_ThmosKhun.pdf (D153447298)

97/124 **SUBMITTED TEXT** 16 WORDS **100%** **MATCHING TEXT** 16 WORDS

physical needs (nutrition, shelter, and health), cultural needs (education, leisure, recreation, and security) and higher needs (

physical needs" (nutrition, shelter, and health), "cultural needs" (education, leisure, recreation and security), and "higher needs" (

W http://uafulucknow.ac.in/wp-content/uploads/2020/05/B.A.-B.Sc_.-II-Semester-generic.pdf

98/124 **SUBMITTED TEXT** 15 WORDS **90%** **MATCHING TEXT** 15 WORDS

Johnston, R.J. 1983: Geography and Geographers: Anglo- American human 'geography since 1945(2nd edn.) London Arnold. 16.

SA 2013_ThmosKhun.pdf (D153447298)

99/124 **SUBMITTED TEXT** 16 WORDS **85%** **MATCHING TEXT** 16 WORDS

Smith and Knox set forth the tradition of the welfare approach in geography in an organized manner.

SA combined thought final.pdf (D118996980)

100/124 **SUBMITTED TEXT** 38 WORDS **95%** **MATCHING TEXT** 38 WORDS

such works, suggesting spatial policies for social improvement, were done in 1970's.Harries (1974) studied spatial variation in crime rates and the administration of justice, and argued that predictive models of criminal patterns could aid in the organization of police activities.

SA combined thought final.pdf (D118996980)

101/124 **SUBMITTED TEXT** 44 WORDS **86%** **MATCHING TEXT** 44 WORDS

Morrill and Wohlenberg (1971) 46 investigated the spatial variation in poverty in the united state, providing both social policies and spatial policies. Bunge (1971) prepared a 'geobiography'for a part of the black ghetto of Detroit, which has a deep humanitarian orientation for the future of mankind, which

SA combined thought final.pdf (D118996980)

102/124 **SUBMITTED TEXT** 11 WORDS **100%** **MATCHING TEXT** 11 WORDS

interprets as a need to ensure a healthy existence for children.

SA combined thought final.pdf (D118996980)

103/124 **SUBMITTED TEXT** 39 WORDS **92%** **MATCHING TEXT** 39 WORDS

criticized the revolutionary premises of the New Left, still maintained that the academic's role was "to help bring about a more just, equal and peaceful society "and search for more 'radical' ways and means to achieve change. From the middle of 1960'

SA combined thought final.pdf (D118996980)

104/124 **SUBMITTED TEXT** 17 WORDS **88%** **MATCHING TEXT** 17 WORDS

in 1969, 'Antipode', a radical journal of geography was founded at Clark University in Worcester, Massachusetts. According to

SA combined thought final.pdf (D118996980)

105/124 **SUBMITTED TEXT** 28 WORDS **94%** **MATCHING TEXT** 28 WORDS

material analysis of society, proceeds through a critique of capitalist control of the material base of society and proposes solution in terms of social ownership of that material base. 47

SA combined thought final.pdf (D118996980)

106/124 **SUBMITTED TEXT** 15 WORDS **80%** **MATCHING TEXT** 15 WORDS

Geographical Thought: A contextual History of Ideas, Prentice Hall of India Private Limited, New Delhi, (

SA MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

107/124 **SUBMITTED TEXT** 16 WORDS **81%** **MATCHING TEXT** 16 WORDS

One of the distinct consequences of the conceptual revolution in the contemporary human geography was the

SA combined thought final.pdf (D118996980)

108/124 **SUBMITTED TEXT** 15 WORDS **89%** **MATCHING TEXT** 15 WORDS

in 1970's. It is an approach to human geography that stresses on 50 questions of

SA combined thought final.pdf (D118996980)

109/124 **SUBMITTED TEXT** 19 WORDS **91%** **MATCHING TEXT** 19 WORDS

Cox (1973) investigated the urban crisis in the light of racial tension and riots, municipal bankruptcies and the role

SA combined thought final.pdf (D118996980)

110/124 **SUBMITTED TEXT** 13 WORDS **85%** **MATCHING TEXT** 13 WORDS

he presented his analysis in terms of conflict over access to sources of power.

SA combined thought final.pdf (D118996980)

111/124 **SUBMITTED TEXT** 32 WORDS **100%** **MATCHING TEXT** 32 WORDS

Harries (1974) studied spatial variation in crime rates and the administration of justice, and argued that predictive models of criminal patterns could aid in the organization of police activities. An interesting work on variations

SA combined thought final.pdf (D118996980)

112/124 **SUBMITTED TEXT** 16 WORDS **100%** **MATCHING TEXT** 16 WORDS

the provision of health care facilities was done by Shannon and Dever (1974) who also suggested

SA combined thought final.pdf (D118996980)

113/124 **SUBMITTED TEXT** 32 WORDS **81%** **MATCHING TEXT** 32 WORDS

spatial planning for the improvement of medical services being offered to the sick. Morrel and Wohlemberg (1971) investigated the spatial variations in poverty in the United States, providing both social policies and spatial policies [

SA combined thought final.pdf (D118996980)

114/124 **SUBMITTED TEXT** 19 WORDS **100%** **MATCHING TEXT** 19 WORDS

women's subordination results from the institution of class society and is maintained because it serves the interests 57 of capital.

SA combined thought final.pdf (D118996980)

115/124 **SUBMITTED TEXT** 19 WORDS **68%** **MATCHING TEXT** 19 WORDS

Dikshit, R.D. 1997 (reprint-2001): Geographical Thought, A Contextual History of Ideas, Printice Hall of India private limited, New Delhi. (

SA MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

116/124 **SUBMITTED TEXT** 13 WORDS **100%** **MATCHING TEXT** 13 WORDS

The condition of Post modernity: An enquiry into the origins of cultural change,

SA combined thought final.pdf (D118996980)

117/124 **SUBMITTED TEXT** 26 WORDS **83%** **MATCHING TEXT** 26 WORDS

book. 'The Structure of Scientific Revolutions' defined paradigm as the entire constellation of beliefs, values, techniques and so on shared by the members of a given community (

SA combined thought final.pdf (D118996980)

118/124 **SUBMITTED TEXT** 18 WORDS **67%** **MATCHING TEXT** 18 WORDS

The scientific milieu in the latter half of 19th century and early twentieth centuries 68 was dominated by

SA Paradignmatic Shifts in Geographic Development.pdf (D125925498)

119/124 **SUBMITTED TEXT** 17 WORDS **94%** **MATCHING TEXT** 17 WORDS

geographer's role is to investigate and understand the nature of transition from natural to the cultural landscape

SA MGEOS-31 Geographical Thought_all units1.pdf (D164796522)

120/124 **SUBMITTED TEXT** 34 WORDS **98%** **MATCHING TEXT** 34 WORDS

Hartshorne used the term 'areal differentiation' to characterize the way in which geographers dealt with the wide variety of phenomena, physical ,economic and social which exist together in area and distinguish them from other areas (

SA 2013_ThmosKhun.pdf (D153447298)

121/124 **SUBMITTED TEXT** 16 WORDS **83%** **MATCHING TEXT** 16 WORDS

Bunge's Theoretic Geography' (1962), Haggett's Vocational Analysis in Human Geography' (1966) and David Harvey's 'Explanations in Geography' (1969)

SA 2013_ThmosKhun.pdf (D153447298)

122/124 **SUBMITTED TEXT** 15 WORDS **81%** **MATCHING TEXT** 15 WORDS

initiated what may be called the quantitative and theoretical revolution in geography This spatial organization paradigm

SA 2013_ThmosKhun.pdf (D153447298)

123/124 **SUBMITTED TEXT** 12 WORDS **87%** **MATCHING TEXT** 12 WORDS

to a shift from a descriptive type to an empirical law making

SA Paradignmatic Shifts in Geographic Development.pdf (D125925498)

124/124 **SUBMITTED TEXT** 10 WORDS **100%** **MATCHING TEXT** 10 WORDS

to build general statements out of observations of ongoing processes.

SA combined thought final.pdf (D118996980)

Ouriginal by Turnitin

Document Information

Analyzed document	PGGR_7_A.pdf (D165449292)
Submitted	2023-04-29 12:01:00
Submitted by	Library NSOU
Submitter email	dylibrarian.plagchek@wbnsou.ac.in
Similarity	0%
Analysis address	dylibrarian.plagchek.wbnsou@analysis.urkund.com

Sources included in the report

Entire Document

PREFACE In the curricular structure introduced by this University for students of Post- Graduate diploma programme, the opportunity to pursue Post-Graduate Diploma course in any Subject introduced by this University is equally available to all learners. Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely in keeping with the objectives of open education which does not believe in artificial differentiation. Keeping this in view, study materials of the Post-Graduate Diploma level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis. The accepted methodology of distance education has been followed in the preparation of these study materials.
Cooperation in every form of experienced scholars is indispensable for a work of this kind. We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing and devising of a proper lay-out of the materials. Practically speaking, their role amounts to an involvement in 'invisible teaching'. For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other. The more a learner would seriously pursue these study materials, the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self-learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University. Needless to add, a great deal of these efforts is still experimental—in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned. Professor (Dr.) Subha Sankar Sarkar Vice-Chancellor
Fourth Reprint : February, 2022 Printed in accordance with the regulations of the Distance Education Bureau of the University Grants Commission.
POST GRADUATE GEOGRAPHY [M.Sc.] PAPER : GROUP PGGR-07 : A : Course Writing : : Editing : Prof. Guruprasad Chattapadhyay Prof. Sukla Bhaduri Notification Kishore Sengupta Registrar
.

NETAJI SUBHAS OPEN UNIVERSITY Unit 1.1.1 ? Geographer's Approach to Environmental Studies; Physical Components of Environment 7-14 Unit 1.2 ? Socio-cultural Components of Environment 15-19 Unit 1.3 ? Concept of Holistic Environment, Degradation, Hazards and Disaster 20-39 Unit 1.4 ? Global Resource Crisis and Sustainable Development 40-51 Unit 2.1 ? Soil, Air, Water and Noise Pollution 52-84 Unit 2.2 ? Conservation of Forests, Wetlands and Biodiversity 85-89 Unit 2.3 ? Important Protocols at the International Level 90-99 Unit 2.4 ? Environmental Impacts of Big Dams and Urban-Industrial Expansion 100-119
PGGR-07 Group A
.
7
Unit 1.1.1 ❑ Geographer's Approach to Environ- mental Studies; Physical components of Environment Structure 1.1.1 Geographer's approach to environmental studies 1.1.1.1 Definition of the term 'Environment* 1.1.1.2 Classification of Environment . 1.1.1.3 Definition of Environment given by European Commission 1.1.1.4 Ecology versus Environment 1.1.1.5 Scope of the study 1.1.1.6 Contents of the environmental issues 1.1.2 Physical Components of Environment 1.1.2.1 Atmosphere 1.1.2.2 Hydrosphere 1.1.2.3 Lithosphere 1.1.2.4 Biosphere 1.1.3 Model Questions 1.1.4 Select Readings 1.1.1.1 Definition of the term 'Environment' Environment in broad sense means everything that surrounds us. It also means the conditions under which any individual or thing sustains to live and develop. The surrounding conditions (Gilpin, 1990) are : i) the sum total of physical conditions which affect and influence the growth and development of individual or community. ii) the social and cultural conditions which affect the nature of an individual or community, and iii) the surrounding of an inanimate object of intrinsic value.
8 1.1.1.2 Classification of Environment Human environment is classified as a) biotic and b) abiotic. Biotic environment encompasses human beings, flora, fauna, bacteria, viruses, ecology and all the social factors that constitute the quality of life, while abiotic environment includes land, water, atmosphere, climate, sound, odour and tastes. The concept of environment emerged from an assembly of living and inanimate objects. 1.1.13 Definition of Environment given by European Commission The European Commission defined 'Environment' as "the combination elements whose complex inter-relationships make up the settings, surroundings and the condition of life of the individual and society as they are felt". If we consider all approaches of defining environment it would appear that humanity has been put at the centre stage of all things. If practical orientation has to be given in defining 'Environment' one must.take into account the following ingredients of the word 'Environment' as laid down in the national legislations of most of the countries : i) each and every aspect of surroundings of human beings which affects human beings as an individual groupings, ii) air, water and land representing the gamut of natural resources, iii) ecosystem and biological diversity, iv) economic, social and cultural circumstances, v) anthropogenic activities directly or indirectly producing any solid, liquid, gaseous, odour, heat, noise, vibration and radiation. vi) natural assets, such as natural beauty, outlook and scenic routes, vii) historical, cultural, religious and heritage assets, viii) public health characteristics, ix) environmental planning, protection and management of pollution control, nature conservation and other mitigation measures. Tire word 'Environment' used in other situations are built environment, geo- environment, business environment, economic environment, political environment etc.
9 1.1.1.4 Ecology versus Environment The concept of environment is based upon the themes of ecology. In 1859 St. Hilarie, the French Zoologist proposed the term Ethology. Later in 1868 Charles Ritter, the German Scientist, proposed the term Oikology derived from the Greek words oikos (meaning house) and logos (meaning a study); the literal meaning of which is 'organisms at home'. But it was not until 1869 that Earnest Haeckel, the English Biologist elaborated the meaning of the term Ecology by saying "Ecology is the study of totality of pattern or relations between organisms and their environment. There is a certain relationship between ecology and environment. Basically Ecology is the study of structure and function of nature, mankind being a part of the nature; and Ecosystem is
a self-sustaining community organisms, plants and animals taken together with its inorganic environment.

In this unit there exists an interrelationship between biotic and abiotic factors through a system of exchange of energy and matter. The living and non-living in an ecosystem exist in a symbiotic relationship where a state of equilibrium is always maintained. Environmental science on the other hand is the aspect of science, which deals with environment, both biotic and abiotic, their impact on other and their interaction and cohesion which result in various ecosystems both terrestrial and marine. 1.1.1.5 Scope of the study Scope of the study of environmental issues and awareness about it gradually developed since the termination of the Second World War in the mid-forties of the 20th century when, through practical experiences, man realized that some serious threats already started emerging from his physical and socio-economic surroundings owing to uncontrolled and excessive interference in the biosphere. This concern grew largely as a result of : i) Calamities and catastrophes occurred under the direct impact of the war, viz., explosion of atom bombs in Japan and other environmental degradation occurred in the aftermath of the war. ii) Rapid growth of population as well as expansion of urbanization. The Southeast Asian, African and Latin American countries experienced rapid growth of population and faced food shortage. iii) Interference and mass exploitation of natural resources in the so far untouched virgin lands (the Biomes of Tropical and Temperate forests, Arctic and Alpine environments), and
10 iv) Increasing use of chemical products in agriculture as fertilizer and in industry as dyers and petroleum products (for vehicles) discharging lethal wastes that become detrimental to the so far maintained quality of the nature (land, water, vegetation and atmosphere). 1.1.1.6 Contents of the environmental issues Contents of the environmental issues in geography are multidimensional. They can be summarized as follows : First, the concepts relate to the understanding of the classified form of environment, viz., natural and human environments are very important. This covers man-environment interrelationships with respect to population growth, human occupation, economy and technology. Second, is the study of natural resources—their exploitation and management. Third, the study of environmental hazards and disasters affecting the human beings is very important Fourth, comes the study of the varied nature in physical, economic and human environments covering primary activities, social and demographic disparities and economic inequalities—their causes and consequences. Fifth, is the study of emerging environmental issues like population explosion, deforestation, global wanning and the need and suggested pattern of biodiversity conservation. Sixth, comes the important aspect of environmental management for sustainable development This covers planning for local regional and national development with special reference to our country India. 1.1.2 PHYSICAL COMPONENTS OF ENVIRONMENT Physical system of the environment has four basic components, viz. atmosphere, hydrosphere, lithosphere and biosphere. Continuous interactions are going on among these components. These interactions involve the transport or transformation of elements, compounds and also various energy forms. 1.1.2.1 Atmosphere The atmosphere, as we observe today, is the gaseous envelope around the earth.

11 Although the fluid system forms gaseous envelope around the earth, its boundaries are not easily defined. They can be arbitrarily defined as the earth's atmosphere interface and the space interface. The gases like Nitrogen, Oxygen, Carbon dioxide; Argon, Neon, water vapour etc together make up the total volume of atmosphere. Together with suspended particles, viz., dust and soot, constitute the gaseous turbidity particularly in Troposphere. In terms of temperature condition, depth and vertical extension atmosphere has two major successions : 1) Homosphere, and 2) Heterosphere. From the surface of the earth upto about 100 km the chemical composition, i.e., the proportion of different gases remains unchanged; this part is called Homosphere. Beyond this the proportion various widely and this part is called Heterosphere. The lower zone of the Homosphere is referred to as Troposphere and the upper is the Mesosphere. These are separated by a little mixing in which the atmosphere tends towards a layered structure referred to as the Stratosphere. Between the Troposphere and the Stratosphere is the Tropopause which marks the approximate upper limit of mixing in the lower atmosphere. The average height of Troposphere is about 11 km, but this varies over the earth. In tropical latitude its average height is 16 km and in polar latitude it is only 10 km there is one further zone of heating, above the Mesosphere, and more than 90 km above the earth's surface, where short wave ultra-violet radiation is absorbed by any oxygen molecules present at this height. This is referred to as hermosphere. Beyond the Thermosphere at a height of approximately 700 km, lies the exposure where the atmosphere has an extremely low density. About 99% of the total mass of the atmosphere lies within the Troposphere and Stratosphere. Concentration of O 3 forms a layer extending from the upper part of the Troposphere (at about 15 km above the earth's surface) throught the lower half of the Stratosphere (up to about 28 km above the earth's surface). This is known as Ozone Layer and it protects the entire Biosphere by absorbing the incoming Ultraviolet Ray from the sun. 1.1.2.2 Hydrosphere It includes the surface water and its surrounding interface. It is vital for life molecule to survive. Water possesses a number of physical and chemical properties that help the molecule to act as best suited medium for life activities. The movement of water from earth surface to atmosphere through hydrological cycle appears to be a close system. Water is the most abundant substance on the earth's surface. The oceans cover approximately 71% of the planet, glaciers and ice caps cover additional areas; and water is also found in lakes and streams, in soils and underground reservoirs, in the atmosphere, and in the bodies of all living organisms.

12 Humans use water in the home, in industry, in agriculture and for recreation. These applications differ widely in the quantities and quality of the water that they require. ID one way or another, we use all available sources—inland waters, ground water, and even ocean water. The demand for global water resources increased day by day through pure fresh water availability decreased severely. 1.1.2.3 Lithosphere It is the outer boundary layer of solid earth and the discontinuity within the mantle. The outer boundary forms a complex interface with the atmosphere and hydrosphere and is also the environment in which life has evolved. The inner boundary is adjacent to rock, which is near its melting point and is capable of motion relative to the Hthosphere above. Basically Hthosphere is nothing but a crucial system composed of various layers; core mantle and outer crust. Various elements constitute such crustal layer in mixture of different proportion. In general the earth's crust is composed of three major classes of rocks : igneous rocks, sedimentary rocks and metamorphic rocks. There are two types of crusts—continental crust which is composed of granitic rocks in silicon aluminium and with a mean density of 2.8, the other, oceanic crust with is basaltic in composition, consisting of more basic minerals and has a mean density of 3.0. Overall, the average density of the earth is 5.5 gm/cc. Interaction between the crustal system of the Hthosphere and the atmosphere and biosphere takes place where continental crust is exposed above sea level. At the land- air interface crustal material becomes exposed to inputs of solar radiant energy, precipitation and atmospheric gases. Under the influence of these inputs, crustal rocks are broken down by weathering processes and are transformed to fine porous layer called soil. 1.1.2.4 Biosphere The Biosphere encompasses all the zones on the earth in which life is present, i.e., entire bio-resources of the earth. It developed on the earth since 4.5 billion years through evolutionary processes. At the top of the Hthosphere, throughout the hydrosphere and into the lower atmosphere life of diverse type exists. These bio-resources and their surrounding constitute the Biosphere, where mankind is acting as the most evolved creature. The steps involved in the origin of life on earth are very complex and requires several centuries. Considerable uncertainty surrounds the details of atmospheric composition, the processes involved and even the sequence of some events leading to

13 formation of living cells. The conventional view has been that the earliest organism on the plant was a heterotrophic prokaryotic bacterium. Subsequently autotrophic prokaryotes and eukaryotes start appearing as stepwise evolutionary changes. Life on earth requires water, a source of energy (sun light) and variour nutrients found in the soil, water and air. Suitable comination of these essentials can not be found high in the upper atmosphere or deep underground. They exist only in a narrow layer near the surface of the earth. This biosphere layer extends over most of the surface of the earth. It includes the upper layers of the earth's crust and the thin layer of the soil that supports plants life. The zone of life also extends about 8 km up into the atmosphere (air biome biota) and as much as 8 km down into the depths of the sea. Living organisms are not distributed uniformly on globe; only a few organisms survive on polar ice caps and glaciers, where as a wide range of them live in tropical rainforests. Within the biosphere there are several major regions containing specific types of ecosystems. These major regions are called biomes. Biomes are then recognized by the types of dominant ecosystems—tropical rainforests, temperate forests, prairies, deserts, and arctic tundra. The ecosystem is again composed of population and population is composed of individuals. The following table gives details of the number of species exist in the biosphere : Class Identified species Estimated species Mammals 4,170 43,000 Birds 8,715 9,000 Reptiles 5,115 6,000 Amphibians 3,125 3,500 Fishes 21,000 23,000 Investebrates 13,00,000 4,40,000 Vascular plants 2,50,000 2,80,000 Non-vascular plants 1,50,000 2,00,000 Rounded Total 17,42,000 49,26,000 Source : World Resource Institute, 1986

14 1.1.3 Model Questions 1) Give definition of the term 'Environment and discuss the ingredients of it as proposed by the European Commission. 2) Make a discussion on Ecology vs. Environment. 3) Describe the physical components of the environment. 1.1.4 Select Readings ● Golly Frank B : A Primer for Environmental Literacy, University Press, Hyderabad ● Mukhopadhyay, A. D. (2003): Perspectives and Issues in Environmental Studies, Vidyasagar University, Medinipur ● Santra, S. C. (2001) : Environmental Science, New Central Book Agency, Kolkata ● Sharma, P. D. (2000) : Ecology and Environment, Rastogi Publications, Meerut ● Singh Savindra (2000) : Environmental Geography, Prayag Pustak Bhawan, Allahabad

15 Unit 1.2 ❑ Socio-cultural Components of Environment Structure 1.2.1 Introduction 1.2.2 Human forces behind environmental issues 1.2.2.1 Housing and Sanitation 1.2.2.2 Health and Nutrition 1.2.2.3 Health Hazards 1.2.2.4 Levels of Income and Education 1.2.3 Model Questions 1.2.4 Select Readings 1.2.1 Introduction Knowledge of the physical environment can illuminate only one-half of any environmental issue. Hence after assuming the conditions and aspects of physical environment it is essential to have a clear about the human environment. As because it is always important to know the extent to and pattern of which the human beings respond to the physical environmental conditions in which they live. Relationships between human activity and the natural world have changed greatly in the relatively short time that people have been present on the earth. A very large increase in human population, along v'ith widespread urbanization associated with advances in technology and related developments of economic, political and social structures have all combined to make the interaction between humankind and nature very different from the situation just a few thousand years ago. Pre-historic human inhabitants responded to the physical environmental conditions, to large extent, morbidly and instinctively and to a limited extent cautiously. With the passage of time the development of ability of humans to conceive environment allowed them to formalize their view of the interactions with the physical environment 1.2.2 Human forces behind environmental issues The interactions between humankind and the physical environment result from our attempts to satisfy real and perceived needs and wants. The specific actions include such

16 things as modifying natural distributions of vegetation and animal, overusing soils, polluting water and air and living in hazardous areas. 1.2.2.1 Housing and Sanitation Housing is the prime need of the human beings. In the primary stage of civilization when he lived on hunting and food gathering, he did not have any permanent shelter. Afterwards he learn the art of farming and started living permanently in favourable places. He learnt how to build proper shelters in the form of huts and cottages. Later with development of civil engineering technology he improved housing conditions with proper sanitation systems. The remains of ancient civilizations, tike those of Indus valley (Mahendjo daro and Harppa), Nile valley (Egypt) bear the evidences of highly improved housing as well as sanitation systems of the urban areas with which they substantially improved their life style in the ancient days thus dominated over the natural environmental conditions. In the present day development of proper housing and sanitation system is the prime need of the mankind living in both rural and urban areas of the society. The housing and sanitation are also conditions for human health and hygiene, these reflect the income and education levels of the people. Higher the education and income level (as in the developed countries) better is the housing conditions of the people. Thus developed countries are ahead of the rest of the world in exercising controls over the physical environmental conditions of the earth. 1.2.2.2 Health and Nutrition Man's victory over his physical environment has become possible largely due to the improvement in health during the past century. Health is directly associated with nutrition and again nutrition depends upon the status and condition of food supply. Physical factors of environment, like air, water, climate, light, noise etc. influence the health status in any community. Human resource in any country is largely dependent upon nutrition and health. In most developing countries, defective environment continues to be the main reason of health problem. Man has partially altered almost everything in his physical environment including hydrosphere, lithosphere, biosphere and atmosphere for his temporary benefits. In doing so, he has created for himself a host of new health problems such as pollutions on soils, water, air and others. In 1072 WHO (World Health Organisation) has compiled a wide ranging survey on
17 environmental hazards to human health. On this survey, a new branch of social medicine has developed which is known as Environmental Sanitation. The term 'Environmental Sanitation' has been defined by WHO as "the control of all those factors in man's physical environment which exercise or may exercise a deleterious effect on his physical environment, health and survival". The demographic growth and fast urbanization all over the world have been making profound changes on the socio-economic and socio-cultural environments. Therefore the attainment of a healthy environment becomes increasingly complex. 1.2.2.3 Health Hazards Throughout the developing world, the greatest environmental health threats tend to be those closer to home. Many of these countries live in situations that imperil their health through steady exposure to biological pathogens in the immediate environment. More than one billion people in the developing countries live without adequate shelter or in unacceptable housing, more than 1.4 billion lack accesse to safe water, and more than 2.9 billion people have no access to adequate sanitation—all of which are essential for good hygiene. Unable to afford clean fuel, the poor rely instead on biomass fuel for cooking and heating. Inside the smoky dwellings of developing countries air pollution is often higher than it is outdoors in the world's most congested cities. Such problems, historically considered rural, have now become urban as well, as sprawling slum settlements surround the world's major cities. Risks are compounded in these peri-urban settlements where garbage collection is often non-existent and drainage tends to be poor, creating ideal conditions for insects and other disease vectors. Overcrowding increases the risk of disease transmission. In developing countries, the poorest strata are often excluded from the benefits of emerging prosperity and may also face a disproportionate share of health risks related to economic growth. Urban slums may be located near major roads and factories where waste disposal and polluted air cause serious health hazards. 1.2.2.4 Levels of Income and Education The levels of income and education finally determine the status of socio-cultural environment. Education makes decisive improvements of the cultural level of the society. This helps man to perceive the natural ecosystem gives him expertise to keep up with

18 the system in the best possible way. Thus better the education level of man, higher is man's ability to adjust with the environmental condition and utilize environmental elements to improve his living condition. Education also teaches man how to handle the hazard situation, manage the disasters in the human environment. Teducation and income are to a great extent complementary to each other. While education makes up gradation of the society, the status of the society income supports man make his living condition better. The level of income is much higher in the educated society. Hence capacity of handling the environmental adversities and expertise in making best use of the natural environment for the betterment of the living condition increase. In terms of economic development, today's world is quite sharply divided between economically backward (poor) and economically developed (wealthy) countries. As the disproportionate burden of ill health in the poorest country shows, a clear correlation between health and wealth. By and large wealthier a country, or the higher its average per capita income, the healthier would be its population. Why is the link between health and wealth so strong? At the most fundamental level many of the world* s poorest of the poor, the 1.3 billion who live on less than Rs. 15/ - a day, are unable to secure even the bare necessities for a healthy life—adequate food, water, clothing, shelter and health care. One of the major causes of ill health globally is malnutrition, which are an issue of poverty and rarely an indicator of actual food shortages. Most recent estimates indicate that globally there are 158 million children under age 5 who are malnourished. By one estimate, malnutrition accounted for roughly 12 percent of all dathsin'1990. 1.2.3 Model Questions 1) Discuss the importance of human forces behind the environmental issues. 2) Discuss the role of conditions of housing, sanitation health and nutrition in reforming the structure of the socio-cultural components of the environment. 3) Discuss the impacts of health, hygiene, levels of Income and Education on the human society.

19 1.2.4 Select Readings ● Mukhopadhyay, A. D. (2003): Perspectives and Issues in Environmental Stadies, Vidyasagar University, Medinipur. ● Population and Development Goals, Oxford University Press, Kolkata. ● Santra, S: C. (2001) : Environmental Science, New Central Book Agency, Kolkata. ● Sharma, P. D. (2000) : Ecology and Environment, Rastogi, Publications, Meerut. ● Singh Savindra (2000) : Environmental Geography, Prayag Pustak Bhawan, Allahabad ● United Nations Population Fund (1997) : India : Towards.

20 Unit 1.3 ❑ Concept of Holistic Environment, Degradation, Hazards and Disaster Structure 1.3.1 What is a Holistic Environment 1.3.2 Comprehensive Integral Design 1.3.3 Environment Degradation, Hazard and Disaster 1.3.4 Types and nature of various Natural and Man-made Hazards causing Disasters in Human Environment 1.3.4.1 Earthquake 1.3.4.2 flood 1.3.4.3 Drought 1.3.4.4 Landslides 1.3.4.5 Severe Storms (Tropical Cyclones) 1.3.5 Man-induced (Anthropogenic) Hazards and Disasters 13.6 Distinct types of Man-made Environmental Degradation 1.3.7 Degradation and Hazards due to Social problems 1.3.7.1 Poverty 1.3.7.2 Urban Poverty 1.3.7.3 Poverty and crime 1.3.7.4 Poverty and social risks 1.3.7.5 Urbanisation and Unemployment problems 1.3.8 Model Questions 1.3.9 Select Readings 1.3.1 What is a Holistic Environment A Holistic Environment is a building or location that does not need extra ordinary adaptation for any "Special" Group of people. It is a place that has been modified or predestined for everyone's use and enjoyment throughout their life times.

21 An environment for ones lifetime includes way finding, multi-model transportation, building, auditing and environmental impact analysis and understanding, and comprehensive integral design concepts. 1.3.2 Comprehensive Integral Design Working with the engineers and architects to assist in using the above elements in an environment in order to create a holistic environment that can support the conceptual design of the architect and engineer without compromising the importance and inclusion of the holistic elements of a design. The inclusion of holistic environmental design concepts leads to a more universal configuration by : 1. Comprehensive thinking by engineers, designers and architects. 2. Fostering development for a continuing culture of understanding that values the holistic vision of human communities by municipal, state and federal entities. 3. Stringent enforcement of public that address holistic design. New aspects that are missing from most programs include 1. Tactile Way finding 2. Full Sensory Signage 3. Sound, vibration and the impact of sound distribution within environments 4. Textural surfacing for natural environments 5. Studies of how people have navigated natural environments by reading the lay of the land 6. The physiology of motion in a designed environment 1.3.3 Environmental Degradation, Hazard and Disaster Any kind of quality deterioration of the environment is called Environmental degradation. Environmental degradation occurs in most cases due to undue interference in the environmental system by the human being. Thus it is more of anthropogenic than a natural process. As general people assumes Disaster is a state of total devastation in the existing environment, which extensively affects human beings as well as all living beings on the

22 earth. These events, whether caused by natural processes or through human interferences, are virtually the extreme events, which occur very rarely and
aggravate natural environmental processes to cause disaster for human society
such as sudden tectonic movements causing earthquake and volcanic eruption, continued dry conditions or heavy rains leading to droughts or devastating floods etc. In real sense disasters are brought by some environmental hazards. It is also understood that Environmental Hazard is that extreme event, either natural or man-made which exceeds the tolerance limit
within or beyond certain time limits, make adjust difficult, and in total, result in catastrophic loses of property and lives. Therefore two alternative terms, viz., Environmental hazards and Environmental disasters are used today to deal with the extreme events whether natural or man-made. Hazards are generally taken to be the processes, both natural and anthropogenic, which cause an accident or danger, whereas Disasters are sudden extreme events which cause greater and large-scale damages to. the human beings as well as the entire natural environmental system. Hence it can be stated that the environmental hazards are the process where as the environmental disasters are the result or responses of the environmental hazards. 1.3.4 Types and nature of various Natural and Man-made Hazards causing Disasters in Human Environment The type and nature of various natural ad made hazards, which eventually cause disasters in the human environment, are discussed below : 1.3.4.1 Earthquake Earthquake is a natural phenomenon; which is unparallel in the suddenness of its occurrence as well as its fury. It is actually a tremor through the earth's crust, which rocks the surface. Huge destruction can be caused in a matter of a few seconds without any prior warning. Earthquakes can neither be prevented nor reliably predicted at the present state of knowledge. They occur repeatedly at regular interval of and with varying intensities in certain areas on the earth, called as seismic belts, which according to present hypothesis, lie on peripheral contacts of large tectonic plate of earth's lithosphere. These plates are constantly subjected to huge tectonic forces tending to move towards or away from the adjoining ones, releasing large amounts of stain energy in the process in the form of earthquake waves. Though not very common as the plate marginal ones,
23 intra-plate earthquakes also occur due to tectonic adjustment within the plate and sometimes they also become catastrophic. In India, earthquake activity largely affects the areas of the Himalayan mountain region and in the northeastern India (the North-Eastem Hill States. However, intra-plate earthquakes are also common in peninsular shield area of India, especially the area of Gujarat, Maharashtra and Madhya Pradesh. Earth quake hazards : The primary hazards caused by earthquakes in a few seconds ground shaking, ground settlement, land and mud slides, soil liquefaction, avalanches etc. These are responsible for collapse and destruction of house, road bridges, railway lines etc.; damage to property and public utility services and finally death and injury to man and animal. The secondary effects of earthquake results in a few days time, in Tsunamis and seiches for submarine earthquakes, floods due to failure of both artificial and natural dams and levees, across and along the rivers, respectively. It has been observed that during severe earthquakes in the higher reaches of river regime natural darns, are created across the river due to landslides and mass movements, to the downstream of which water level is lowered very rapidly after the earthquake. When the pressure of the impounded water overcomes the strength of such natural damming the dam bursts and the downstream area received flash flood of very high intensity creating havoc. This had happened in the upstream of Brahmaputra River during 1950 in great Assam earthquake. After a violent submarine earthquake the seismic energy, traveling along the interface of sea bottom and water column towards the coast, generates catastrophic Tsunamis in the coastal area. Another important secondary adverse effect of disastrous earthquake is the psychological changes and traumatic among the survivors requiring counseling and speedy settlement. Mitigative measures : A number of mitigative measures are to be taken to combat the earthquake disaster. They are as follows i) Collection of all past historical earthquake data; ii) identification of all seismogenic and neo-tectonic faults, their rupture length, periodicity of their episodic movements; iii) preparation of seismogenic and seismic zoning maps; iv) establishment of close network of seismic monitoring stations in vulnerable areas and the data thus generated to be analyzed regularly; v) related studies towards earthquake prediction; vi) study of physical effects of past earthquakes—their spatial and temporal variations, including the study of paleoseismicity; vii) in situ stress measurements; viii). estimation of risk and vulnerability to disaster; ix) adopting proper landuse method and regulation, proper

24 design parameters, enforcing strict building code based on probabilistic analysis of maximum credible earthquake of the area and x) finally, creating awareness among people and preparedness for timely relief and rehabilitation. Though pioneering scientific studies of earthquake have been carried out in India after the 1897 Assam earthquake, a lot has remained to,be done based on the state of art of knowledge towards the study for understanding the cause of earthquake, determination of source, predictive research and for mitigative measures even today. 1.3.4.2 Flood The flood is a condition of partial or complete inundation of normal dry land in a river valley of coastal plain. There are various types of floods, such as, flash or reverie flood, coastal and shoreline flood induced by wave action and tidal effects and backwater flooding induced by variety of conditions that led to damming of rivers. Flash or riverine flood, the most common type of flood, develops from concentrated rainfall or melting of snow into the headwater tributaries, which merge the tributary floods into a single flood-wave along the main channel. Coastal flooding occurs as a result of a) inundation of stream flooding, b) coastal wave action including high tides and c) storm surges. Backwater flood is abrupt waveforms as dammed waters are suddenly released from a dam break or generated as splash wave by a landslide in to the reservoir. In majority of cases, flooding is caused by a river over spilling its banks/levee due excessive precipitation in a short period in the catchment area combined with inadequate channel capacity associated with aggradation of river bed and inadequate waterways at rail and road crossings. Most important cause of flood hazard is unplanned encroachment of flood plains and lack of control of proper lands. Deforestation and lack of soil conservation and watershed management are causes contributory to flash flood and soil erosion. Structural measures adopted for flood hazard mitigation or for flood control frequently enhance the risk of more severe flood damage. Out of 329 hectares of land areas of our country, about 44 million hectares is estimated to be liable to flood hazard, thus constituting 13% of the country's geographical area. Though so far reasonable protection measures have been provided to about 10 million hectares, the intensity of damage due to floods in terms of human lives and area affected has been increasing alarming. The National Flood Commission had estimated in 1978, that the flood-prone area has increased from 25 million hectares at the end of 1960s' to about 40 million hectares by the mid- 1970s'. Using the same methodology, Centre for science and Environment has found that flood-prone area in
25 the country by 1984 was 59 million hectares—an extraordinary increase in just six years since 1978. Mitigation of Flood Hazard : So far in India flood control and protection measures include two major aspects, viz. construction of retention structures and storage reservoirs, drainage channel improvement, flood diversion, protective embankments, and b) flood warning and evacuation. These efforts carried out so far have not borne much fruit probably due to the fact that these measures are not planned on the basis of validated data on surface hydrology, climatic conditions, geo-factors of terrain and natural resources of the project area, so that protective structures and their locations can be harmonious with nature. Though we have no control on the vagaries of nature connected with heavy rains in a very short period. Upliftment of catchment area and subsidence of river basins etc. through understanding of these processes should be attempted and actions be taken. Best way of flood mitigation is to avoid the flood prone area for settlement and for any development activities. Strictly prohibit deforestation in catchment area with simultaneous whole hearted effort to afforestation. It may be mentioned here a good forest canopy removes 40% of precipitation through transportation and canopy interception, and increases the infiltration of water into the soil and decreases soil erosion and mass movement substantially thus reducing silt load of the river channel. 1.3.43 Drought According to the National Commission on Agriculture (1976) drought is of three types : i) Meteorological drought : It is a situation when there is a significant (<25%) decrease of rainfall from normal value over an area. ii) Hydrological drought : Meteorological drought when prolonged, results in hydrological drought with a marked depletion of surface water and consequent drying up of reservoirs, lakes, streams and rivers, cessation of spring flows and also fall in ground water level. iii) Agricultural drought : It occurs when soil moisture and rainfall are inadequate during the growing season to support healthy crop growth to maturity and causes crop stress and wilting. Almost all the area in the country, which received a normal rainfall of less than 700 mm, can be classified as drought prone. This is about 35% of the country's area. Another 18.5% of the country, which receives a normal rainfall of 750-1,000 mm, can be described as

26 transitional zone. Thus over a half of the country, without irrigation would be drought prone. Causes of drought : As is evident from the definition, drought is a natural phenomenon which results from reduction in the usual rainfall in an area; sometime reduction of rainfall in proper season or time. However, there is indirect correction between certain human activities and occurrence of drought viz., deforestation, over exploitation of grazing land* over exploitation of groundwater, neglect of tanks/water reservoirs, inequitable distribution of canal irrigation water. Therefore it is believed that drought is the combined effect of neglect and over exploitation of common environmental resources, essentially the system that provide a cushion against the problems caused by dry periods. Drought mitigative measures : The following measures are recommended for mitigation of drought : i) It is estimated that about 28.75% of rain and snow melt water received in the country, flows to ocean as surface runoff. Therefore utmost effort will be to retain as much as possible the surface runoff by way of water harvesting especially in the drought prone areas. ii) To increase the measure of afforestation and development of grassland which help in retaining the soil moisture and water percolation during the rains. in) Measures leading to regeneration of ground water and controlled exploitation of ground water in problem areas. iv) Increase the storage capacity of all water retention structures by way of enlargement and desalinization. v) In some places ground reservoirs must be maintained as ground water sanctuaries and to be used only for drinking water during the period of acute drought. vi) Effort towards regeneration of all wasteland produced by over exploitation and prevents all types of land degradation in drought prone area. vii) Mixed cropping to be encouraged in dry land agriculture to reduce risk of crop failure. Thus it is seen that as the tree cover declines and ecological imbalance grows, this inevitably affects the marginal crop lands, by adversely exposing them to increased floods and droughts. 1.3.4.4 Landslides A landslide is an event in which surface materials of earth move outward and
27 downward from their underlying and stable floors in response to the force of gravity. Such movement includes falls, creeps, flows and slides which may be triggered by various factors. Down slope movement of large volumes of surface materials under gravitational influences-poses a serious threat of environmental hazard, especially in mountainous terrain. Rapid movements cause loss of life and damage; slow movements on the other hand have less potential to kill but can be costly for the economic life of the country. In recent years, landslide risk is increasingworldwide as land hunger forces new developments onto unstable slopes. According to Jones (1992) it is under-recognised threat because the impacts tend to be frequent and small scale, whilst the process itself is often attributed to other hazards, such as earthquakes and rainstorms. During the early 1970s an average of nearly 600 people per year were killed by slope failures worldwide, with som 90% of these deaths occurring around the Pacific Ocean Rim. This zone is particularly susceptible to mass movements because of the combinations of rock type, steep terrain, heavy typhoon rainfall, rapid landuse change and high population density. However, it is likely that most of these deaths would be associated with slope failures caused by seismic events. As with many other environmental hazards, it is urban areas which are most vulnerable because of the large populations at risk (Alexander, 1989). Economic losses due to landslides have been estimated at more than US $ 1 billion per year in several countries. In India, numerous urban centres and transport networks over the Himalayan region stretching from Kashmir in the west to the Arunachal Pradesh in the east are threatened by landslide activity. In addition to direct damage, mass movement hazards cause a variety of indirect losses such as road blockages, flooding due to landslide dams across rivers, reduced agricultural and industrial production. Sensitive zones for landslide hazards : Jones (1995) claimed that landslides would become an increasingly important hazard, especially in the developing countries and drew attention for several types of terrain where the greatest physical threat exists. These are as follows : 1) Areas subject to seismic shaking : An earthquake can trigger widespread mass movements in thousands of individual slides, as in 1950 Assam (in eastern India) earthquake when over 50 × 109 m 3 of material was dislodged over a total area of 15,000 km 2 . Major landsides were also a feature of the 1988 Armenian and the 1990 Iranian earthquakes. 2) Mountain environments with high relative relief : Environmentalists all over the world have estimated that the high-energy mountains such as the Himalaya or the Andes mountain chains produce extensive catastrophic rock fall. These

28 slope failures comprise huge masses of material (up to 100 × 106 m 3) which at least at the initial stages of movement travel near-vertically at very high velocities and cover long run out distances. 3) Areas of moderate relief suffering severe land degradation : Readily erodable soils on slopes subject to land degradation resulting from deforestation, overgrazing and other poor management practices create the potential for gully expansion and land slipping. 4) Areas covered with thick sheets of loess : Any mantling of an existing surface with finely grained material such as windblown loess is likely to lead to a shear zone with the old surface. Slope failure occurs in the loose cohesion less deposit, often in the form of flow or slides. 5) Areas subject to high rainfall inputs : In tropical areas subject to monsoon or cyclonic rainfall weathering can penetrate tens of metres below the ground surface. Throughout the humid tropics intensively weathered soils produce a relatively deep and porous mantle, which is prone to landslides. Causes of landslides : Causes of landslide include a variety of events that combine .either to increase the driving force or to reduce the shear resistance on a slope. Factors that increase the driving forces may be either physical or human aid include: 1. An increase in slope angle, which may occur if a stream erodes the bottom of a slope or if the slope is steepended by building work. 2. Removal of any lateral support at the foot of the slope again caused either by natural mass wasting processes or by building activity. 3. Any additional weight placed on the slope, as through the dumping of waste or . house construction. Residential development not only adds weight to the slope through the buildings themselves but also through excess water supplied from landscape irrigation and sewage effluent systems. 4. Removal of vegetation, which can occur naturally from forest fire or through human activities such as logging, overgrazing or construction. 5. Local shocks and vibrations, which can occur naturally from seismic activity or from the operation nearby of heavy construction machinery. Factors that leas to a reduction in the shear resistance on a slope : a) An increase in pore-water pressure in slope materials, especially along a slip surface. This is the most important single factor and explains the close relationship, which exists between shallowseated landslides, debris flows and rainstorms.

29 b) An increase in slope angle. Many developed slopes are over-steepended by - cutting into the base, a process, which increases the driving force. c) A combination of weathering and other natural processes. These include the physical and chemical breakdown of slope materials. In most urban areas landslides may be attributed to a combination of the above factors. The progressive human invasion of landslide hazard zones is not confined to the wealthy developed world. The need for improved transportation is leading to new road construction in terrain with a high probability of slope movement throughout the developing world. In mis world limited resources may lead to inadequate hazard protection. Event Modification Adjustments : The ability to assess the probability of landslide risk at specific sites is of considerable assistance in implementing mitigation strategies. General indicators include the structure and lithology of slopes, including the presence of weak rock types, clay-rich soils and slopes generally in excess of 25°. Property damage from landslides usually leads to demands for engineering works to stabilise the slope. However, the human response to slope failure is often complicated by statutory and funding distinctions, which are made between emergency and permanent works. If the problems can be overcome, the stability of the slope may be improved by a variety of engineering techniques : ● Excavation and filling method can be used to produce a more stable average slope. This type of reshaping is usually successful but becomes more difficult and expansive as the slide area increases. Specific techniques include unloading the head of the slide and loading the toe, with the replacement of failed material with lighter loads. ● Drainage, especially sub-surface drainage, can be equally effective where changes in pore-water pressure have been cause by the rise in the water table. Properly designed and constructed drainage systems work well but others soon become clogged by fine particles. ● Vegetation of slopes performs several functions. Plant roots help to bind soil particles together, the vegetation canopy protects the soil surface from rain- splash impact and transpiration processes aid in drying out the slope. ● Restraining structures—such as piles, buttresses and retaining walls—can be helpful for slides covering limited areas. But they are generally too expensive for large, unstable slopes and the location of property boundaries may also restrict the approach.

30 ● Other methods include the chemical stabilisation of slopes and the use of grouting to reduce soil permeability and increase its strength. Slope stabilisation, along with hazard-resistant construction techniques, appears to be the most effective preventive strategy for controlling new development 1.3.4.5 Severe Storms (Tropical Cyclones) Tropical cyclones are among the most destructive hazards around the globe. Strong winds, heavy rains, give rise to development of storm surge, flood and landslide. As a result considerable amount of loss of life and property takes place. Such natural hazards set back social and economic advancement of country like India; e.g., devastating storms around the Paradwip coastal tract of Orissa in 1999. The hazards become even worse due to lack of appropriate warning and preparedness system. To reduce loss of lives, suffering and property damage, the nation shall have to strengthen her capability to provide timely warning of occurrence and impact of cyclone and associated phenomena such as floods and storm surges, as well as to organise and execute the related disaster prevention and preparedness measures. Tropical Cyclones in India: Tropical cyclones over the Bay of Bengal and Arabian Sea are of major concern to coastal people in and around west and east coast of India. Each year considerable number of cyclonic storms hit these coasts. Seven percent of the global tropical cyclones form over the Bay of Bengal and Arabian Sea. Formation of cyclones in these regions is related to seasonal migration of ITCZ. Ratio of cyclones in Bay of Bengal and Arabian Sea is 4 : 1. Tropical cyclones over Bay of Bengal form during pre-monsoon and post-monsoon seasons. During premonsoon phase, they form in The North Bay and travel northwards. Few of them attain the structure of tropical cyclone as the time available for their formation is small. During monsoon phase prevalent high wind shear inhibits their formation. During post-monsoon phase, the available time being sufficient, the depressions turned out to be a cyclonic storm often imparts severe disastrous effect. In post-monsoon phase, the average life of these storms is 4-5 days. Storms of hurricane intensity has average life of 2-4 days (>6 days for global average). Factors responsible for generation of storm surge and cyclone : The following factors are responsible for generation of storm surge and cyclone : 1. In the location of tropical storm, the low-level velocity is twice that in non- developing disturbances. This increases upward motion, cumulus convection and as a result, release of more latent heat. Increased heating due to latent heat release increases horizontal convergence, which again increases relative velocity.

31 2. Near-equator Carioles parameter is very small. For this reason they do not form between 00 and 6° N latitude. 3. Above and around the zone of formation of vertical wind shear should be low. Otherwise latent heat released through convection will be advected away. If during formation upper level divergence is above the lower level convergence, intensification takes place rapidly. 4. Sea-surface temperature should normally be above 27° around the zone of formation. 5. For the formation mature tropical cyclone, the vertical gradient of equivalent potential temperature should be very high. The equivalent potential temperature at sea surface level should higher than that 6. Relative humidity should be high in lower and middle troposphere. Disaster management on cyclone-affected areas : Disaster management on cyclones can be done in two separate and systematic ways : a) by Hazard and Risk Mapping and b) by making Disaster Management and Preparedness Programme. Through risk mapping potential losses in hazardous areas can be identified. A hazard index is devised to indicate intensity of a hazard. Usually it is numerical grading on the basis of the area's history of past disasters. Real time risk assessment is related to estimation of risk due to impending cyclone and storm surge. On the basis of this assessment, evacuation programmes, arrangement for relief and rehabilitation measures can be undertaken. In such cases, it is needed to forecast the magnitude of wind speed, storm surge height and amount of associated flood accuracy. Better the forecasting capability; the less is the loss of life and property. Disaster management and preparedness programme covers all the activities of collecting information related to disaster comprising : i) collection and analysis of data on past disasters, ii) risk assessment, iii) prevention and preparedness programme, iv) relief, v) reconstruction, vi) rehabilitation, vii) policy planning and viii) action plan. Our objective of tropical cyclone and storm surge disaster mitigation programme should be to strengthen the capability of providing: a) Reliable forecast of tropical cyclone track and intensity and related forecasts of strong winds, quantitative timely assessment of heavy rainfall, quantitative forecast and simulation of storm surge and timely warning to all hazard-prone areas. b) Promote response to warning and carry out activities at the interface between warning system and users of warning.

32 c) The required meteorological and hydrological data and assessment of risk and disaster. d) National disaster preparedness and prevention measures. Natural Disaster Reduction and Management The reduction of natural hazards and disasters and their management involves : 1) provision of immediate relief measures to disaster affected people, 2) prediction of hazards and disasters and 3) measures of adjustment to natural hazards. The provision of relief measures to the disaster victims involves several steps to be followed such as i) there should be correct picture of the nature and magnitude of disasters. Very often the news media report their own misconception instead of reporting the real events. This is not done deliberately. The misconceptions about a particular natural event arise because of the personal opinion of the observer or analyzer. It is, therefore desirable for the international communities to respond to the official requests of the concerned government only; ii) priorities must be decided before undertaking the remedial and relief measures. For example,
relief measures must be concentrated in the high-density areas of the affected locality. Special resource tools, communication
equipment, heavy machines to remove debris, water pumps, cement and technicians are more important than drugs and doctors because the health dangers after disasters are predominantly environmental in character and not medical. Management of natural hazards involves disaster research and
disaster predictions. The predictions of natural hazards may be made on the basis of
the study of the past history of the area prone to a particular natural hazard in terms of frequency, recurrence intervals, magnitude and dimension of events, precursor events, nature of causative factors (e.g., possible floods may be forecast on the basis of amount and intensity of rainfall in the catchment area; spotting of the tropical cyclones and local storms near their sources). Mapping and Monitoring of Natural Hazards and Disasters and global changes in the environmental conditions are very important aspects of disaster management Tliis requires in-depth study of hazard-prone areas at global, regional and local levels. The INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS (ICSU) and other organizations have launched several research programmes to study the environmental changes caused by human activities and natural disasters in terms of the mechanisms involved in the genesis of such disasters, their monitoring and mitigation.
33 1.3.5 Man-induced (Anthropogenic) Hazards and Disasters Environmental degradation may also occur as a result of undue interference of man on the nature. Any environmental degradation induced by man becomes hazard and disaster when it assumes alarming proportion and causes irreparable loss to human society. Man-induced environmental hazards and disasters may be caused through a variety of human activities both of intentional and unintentional character. The man-induced environmental hazards and disasters may be classified in three broad categories i) Man-induced Physical Hazards such as earthquakes, landslides and accelerated rate of soil erosion; ii) Man-induced Chemical Hazards such as release of toxic chemicals and dumping and exposure at later date of toxic chemicals, nuclear explosion, leakage of crude oil from oil tankers into the oceanic water etc. and iii) Man-induced Biological Hazards such as population explosion, eutrophication etc. Earthquakes are certainly natural phenomena and are caused by the endogenetic forces coming from within the earth but certain human activities, such as pumping of water and oil, deep underground mining, blasting of rocks by dynamites for constructional purposes, nuclear, explosion, storage of huge volume of water hi big reservoirs etc. also cause earth tremors of serious consequences. The introduction of additional artificial superintendent load through the construction of large dams and impounding of enormous volume of water in big reservoirs behind the dam causes disequilibria of already isostatically adjusted rocks below the reservoirs or further augment the already fragile structures due to faults and fractures underneath. The process causes earthquakes of varying intensity, which inflict damage to human life and property. Many major seismic events have been correlated with dams and reservoirs all over the world, such as i) earthquake of 1931 hi Greece due to Marathon Darn constructed in 1929; ii) start of earth trarnours since 1936 around Hoover Darn USA due to creation of Mead Lake in 1935; iii) Koyna earthquake of 1967 (Koyna, Maharashtra in India) due to Koyna reseryoir constructed in 1962; other examples of significant earthquakes caused by dams and reservoirs are of Monteynard and Grandvale in France, Mangla in Pakistan, Kariba in Zambia etc. Underground disturbance due to hydrostatic pressure of water in the reservoirs also causes landslides and earth-flow

34 along the natural and artificial walls of the reservoirs. It may be pointed out that the intensity of earthquakes has been positively correlated with the levels of the water in the reservoirs. Dumping of toxic chemical substances in the ground may become hazardous to subsequent colonization of the area concerned by human beings. For example, the ditch dug out in 1892 for the construction of Love Canal in USA was later abandoned, and was thereafter continued to be used as dumping ditch for the industrial wastes. The process of 'dumping of chemical substances went on till 1952 when this dumpsite was colonized by 200 houses as the suburb of Niagara Falls city. The 'TIME BOMB' in the form of toxic chemicals hidden in the dumped canal suddenly burst during the winter of 1976-77 due to heavy rainfall and heavy snow fall which resulted into severe health bazard of alarming proportion as the residents of newly built suburb suffered from higher rate of abortions (among women), blood an liver abnormalities, birth defects, and several kinds of physiological disorders. Spilling of immense quantity of crude oil from oil tankers into sea water causes rapid rate of spreading of oil slicks which creates disastrous hazard for marine organisms and the human population faces the shortage of food supply. For example the great marine disaster was created because of leakage of 100,000 tons of crude oil from the huge oil tanker, which stnicke the Spanish coast near the Port of La Corunna and exploded on May 12,1976. The oil slicks killed most of the sea organisms meant for human food such as mussels, oysters and clams. Another incident of leakage of crude oil occurred on June 24, 1989 when 5,000,000 tons of crude oil leaked from an oil tanker into Atlantic Ocean. Unintentional disaster of nuclear establishment becomes most lethal hazards because its adverse effects not only affect plants and animals including man at the time of disaster but they are perpetuated for several years to come and many generations of human beings may continue to suffer from radioactive substances. The disaster of nuclear installation of Ghernobyl (USSR) in 1986 is burning example of such man- induced environmental disaster. The Bhopal (M.P.) Gas Tragedy of Union Carbide Factory in 1984 is another example of lethal environmental hazard caused due to improper maintenance of the gas containers. The dropping of atom bombs on the cities of Nagasaki and Hiroshima (Japan) by the USA in 1945 and resultant nuclear disaster affecting millions of Japanese population is the example of environmental hazard caused by man's intentional actions.

35 1.3.6 Distinct types of Man-made Environmental Degradation 1. Degradation of Wildlife : India presently has more than 15,000 species of higher plants and 80,000 species of animals, constituting respectively 5.2% and 4.3% of all the knowi plants and animals of the world. About 134 species of plants (99 species in the Himalayan region alone), 29 species of mammals, 29 species of birds and three species of reptiles are threatened. Deforestation has destroyed the habitats of birds and other vertebrates and also threatened the survival of many secies of birds and mammals in particular. Significantly the extinction of birds and animals is directly related to the increase in human population in earth planet It is a certain fact that in India the extermination of rich wild life is due to the demands of the first multiplying hungry human population. 2. Depletion of Ozone layer : Depletion of Ozone layer in the Stratosphere has become a serious concern in recent years. The phenomenon is the formation of Ozone hole, which has been occurring locally over the Antarctic continent in the Austral spring, between September and November each year since about 1979. Stratospheric Ozone is very important because it acts as a Ultra-violet Filter, cutting out short-wave ultraviolet radiation from the sun which otherwise would be damaging plants and animals as they have evolved on Earth. In addition, as a result of absorbing this short wave, highly energetic radiation ozone causes a wanning of the upper stratosphere, which influences global air motions. Increase in man-made pollution of atmosphere by nitrogen oxides and more seriously by CFG and CH 4 has given rise to fears that the delicate ozone balance might be shifted, with possibly serious consequences. The processes leading to the ozone hole formation particularly in the Antarctic region. 3. The Greenhouse effect : The greenhouse effect arises because the atmosphere is largely transparent to incoming solar radiation, while being quite heavily absorbing to outgoing thermal radiation from the planetary surface and the atmosphere. Of course, the greenhouse effect is a perfectly natural process, which exists whether or not mankind is thought to be modifying the climate. It is the enhancement to the greenhouse effect resulting from man's activities that is liable to destabilize the natural balance. Many different gases in the atmosphere contribute to the greenhouse effect. Among the greenhouse gases CO 2 has a major effect, in that a temperature rise of 0.53-0.79 k is predicted for just a 25% increase in concentration.

36 4. El Nino : The El Nino phenomenon, e.g. 'El Nino is a warm oceanic current affecting the Peruvian coast every 10 years or so*. It is not a process with a clear beginning and end, at least not on the basis of our present understanding. It is system of several coupled phenomena; each interacting with and driving the others and what is not clear is just how a particular cycle of events is triggered. This phenomena occurring as an anomaly of warming atmosphere. 5. Acid rain and industrial pollution : With rise of global industrialisation, increasing acidity in natural waters and soils has become a problem. The acidity is associated with the transport and subsequent deposition of sulfur dioxide, nitrogen oxides and their acid oxidation products. Thus much concern was raised in the international platform about the future strategies for combating industrial emission of pollutants, regionally and locally. 6. Problems with toxic waste, chemicals and radioactive substance disposal: with gradual rise of mining industries, nuclear power plants and production on of hazardous chemicals all over the world an arena of environmental hazards started during past couple of decades. Hazards related to toxic substances are already exposed after a number of disasters like the Bhopal gas tragedy, Chernobyl nuclear power plant accident etc. Chemical and biological weapons used in wars also significantly deteriorate the global environment Intensive agricultural practices over the past three-four decades also added newer chemicals like insecticides and pesticides in the cropping areas. Many of these chemicals are not only hazardous to biological system but also non-biodegradable, so that they accumulate in biological systems slowly and finally cause long-term damage to the systems. 1.3.7 Degradation and Hazards due to Social problems 13.7.1 Poverty In terms of economic development, today's world is quite sharply divided between economically backward (poor) and economically developed (wealthy) countries. As the disproportionate burden of ill health in the poorest country shows, a clear correlation exists between health and wealth. By and large wealthier a country becomes, or the higher its average per capita income, the healthier its population becomes, by several measures. Why is the link between health and wealth so strong? At the most fundamental level many of the world's poorest poor, the 1.3 billion who live on less than Rs. 15/- a day, are unable to secure even the bare necessities for a healthy life—adequate food, water,
37 clothing, shelter and health care. One of the major causes of ill heaUn globally is malnutrition, which is an issue of poverty and rarely an indicator of actual food shortages. Most recent estimates indicate that globally there are 158 million children undfr age 5 who are malnourished. By one estimate, malnutrition accounted for roughly 12 percent of all deaths in 1990. 1.3.7.2 Urban poverty Traditionally poverty has been concentrated in rural areas. Yet as the bulk of the world's population shifts from rural to urban areas, poverty is becoming an increasingly urban phenomenon. The World Bank estimates that in 1988 approximately one quarter of the developing world's absolute poor was living in urban areas. By this year of 2000, half of the developing world's absolute poor will be in urban areas. Several factors, including structural adjustment programs, economic crisis, and massive rural-to-urban migration, have contributed to an increasing number of urban poor since the 1980. Urban poverty is especially pronounced in Latin America. In this region, the absolute number of urban poor already surpasses the number of rural poor. Between 1970 and 1990, the number of urban poor increased from 44 million to 115 million, while the number of rural poor increased from 75 million to 80 million. In Asia, large decreased in the proportion of the population living in poverty were reported for the rapidly growing economies, such as Malaysia, the Republic of Korea and Indonesia. However South Asia is expected to continue to house a large share of the world's urban poor. Poverty has also risen steeply in the countries of Central and Eastern Europe as they struggle with the transition toward a market economy. Cities that relied heavily on industrial production are experiencing record numbers of unemployed as factories shut down and production is curtailed. In North America and industrial Europe most of the population, and thus most of the poverty, has been concentrated in urban areas since the beginning of the 20th century. The characteristics of urban poverty, however, are changing. As the manufacturing base of many cities has declined and the middle class has fled to the suburbs, urban poverty has become concentrated in the inner cities and among ethnic minorities, especially hi North America. 1.3.73 Poverty and crime In the economically backward countries, poverty not only brings health hazards but also ensures series of social problems, particularly crimes. Crime may be fantasy for

38 groups of young stars in the rich urban sectors of the wealthy countries, but in the economically backward countries steadily growing population aggravates unemployment problem, more numbers of jobless persons generally get involved in crimes like burglary, mugging, robbery etc. In the periurban areas of the rich countries as well where mainly labour-class prople live (like the Ghetto areas around New York and Chicago metropolitan cities in U.S.A.) this problem is obvious, this problem is particularly acute in the slum areas where groups of young unemployed persons, in order to earn money, commit regular violence and crimes around their own areas and alsa spread their icy hands in the other sectors of the city. 13.7A Poverty and social risks Health hazards : Poverty influences health because it largely determines an individual's environmental risks, as well as assess to resources to deal with those risks. Throughout the developing worlck the greatest environmental health threats tend tobe those closest to home. Many of these countries live in situations that imperil their health through steady exposure tobiological pathogens in the immediate environment. More than one billion people in the developing countries live without adequate shelter or in unacceptable housing, more than 1.4 billion lack access to safe water, and more than 2.9 billion people have no access to adequate sanitation - all of which are essential for good hygiene. Unable to afford clean fuels, the poor rely instead on biomass fuels for cooking and heating. Inside the smoky dwellings of developing countries air pollution is often higher than it is outdoors in the world's most congested cities. Such problems, historically considered rural, have now become urban as well, as sprawling slum settlements surround the world's major cities. Risks are compounded in these peri-urban settlements where garbage collection is often non-existent and drainage tends to be poor, creating ideal conditions for insects and other disease vectors. Overcrowding increases the risk of disease transmission. In developing countries the poorest strata are often excluded from the benefits of emerging prosperity and may also face a disproportionate share of health risks related to economic growth. Urban slums may be located near major roads and factories where waste disposal and polluted air cause serious health hazards. 13.7.5 Urbanisation and Unemployment problems : Unemployment is a significant problem in most cities in developing countries, because the formal economies of Africa, Asia and Latin America are unable to absorb the enormous influx or workers. Given the urbanisation rates, these cities are now experiencing the demand for new jobs which will be intense: Starting in 1990, it is

39 estimated that an additional 35 million jobs per year will be required to provide employment to all new labour force participants. As a result, substantial number of the developing world's urban poor makes their living through subsistence activities or informal jobs - namely, production and exchange outside of the formal market. These jobs run the gamut from providing services such as garbage collection and domestic help, to provide goods such as food and building materials in small stores, to small-scale clothing manufacturing. Informal jobs make up an estimated 75 percent of urban employment in many countries in sub-Saharan Africa and between 30 and 50 percent in Latin America. 1.3.8 Model Questions 1) What do you mean by Holistic Environment? Suggest for a Comprehensive Integral Design of holistic environment 2) Make brief discussion on the terms: Environmental Degradation, Hazard and Disaster. 3) Discuss upon causes, consequences and mitigative measures of earthquakes. 4) Make a concise discussion on the environmental hazards created by floods and droughts and suggest for their mitigative measures. 5) Make a concise discussion on the environmental hazards created by landslides and suggest for their mitigative measures. 6) Make a concise discussion on the environmental hazards created by severe storms and suggest for their mitigative measures. 7) Describe some typical hazards and disasters that may be of anthropogenic origin and show their extent of impacts upon the human beings. 1.3.9 Select Readings ● Mukhopadhyay, A. D. (2003) : Perspectives and Issues in Environmental Stadies, Vidyasagar University, Medinipur. ● Population and Development Goals, Oxford University Press, Kolkata. ● Santra, S. C. (2001) : Environmental Science, New Central Book Agency, Kolkata. ● Sharma, P. D. (2000) : Ecology and Environment, Rastogi, Publications, Meerut. ● Singh Savindra (2000) : Environmental Geography, Prayag Pustak Bhawan, Allahabad ● United Nations Population Fund (1997); India: Towards.

40 Unit 1.4 ❑ Global Resource Crisis and Sustainable Development Structure Part-I. 1.4.1 Introduction 1.4.2 Need of Sustainable Development 1.4.3 Key Elements 1.4.4 Major Transformation in Society 1.4.5 Global Dimensions 1.4.6 Sustainable future Part-II. 1.4.7 Concept of Tourism & Eco-tourism 1.4.8 Tourism versus Eco-Tourisra: A conceptual framework 1.4.9 Model Questions 1.4.10 Select Readings 1.4.1 Introduction of Global Resource Crisis and the Need of Sustainable Development Sustainable Development is a system of development with which a Nation or Society can be able to satisfy its requirements - social, economic and others without jeopardizing the interest of future generations. Sustainability is a concept on which social and natural scientists, and philosophers have expressed their views from time to time. It is long term as against short-term development, which is to be addressed. The concept of long term overlapping generations brings in certain difficulties in understanding development However, for all operational and practical purposes, policy options and empirical content can determine and justify the length of the time horizon. Sustainable Development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and the institutional change are all in harmony and enhance both current and future potential to

41 meet human needs and aspirations (WCED-1987, Report). The focus in this manner of characterising sustainable development is on a process which links exploitation of resources, investments, technology and institutions with human needs and aspirations. Operationalising sustainable development within this framework is the responsibility of policy makers and administrators. In order to translate policies expressed as employment programmes investments, price supports and transfer of technology, into sustainable development indicators, they need to have information on the current state of production, consumption, employment, prices, distribution of income, and so on. In addition, to conceptualise the links of economic variables with sustainable development, it is essential that the information is supplemented with measures of the services supplied and welfare augmented by non-market assets such as environmental goods and resources, as well as the utility provided by the level.and the quality of their stock, should be monitored carefully. Only then can it be ascertained whether the economic performance of a region or a area is becoming more or less sustainable overtime. Thus Sustainable Development has been defined in terms of meeting

the needs of present generation without compromising the ability of future generations to meet their own needs (WCED, 1987). According to this anthropocentric definition, sustainability becomes meaningless when human survival is under threat Development may be unsustainable due to various reasons such as socio-economic transformation, unequal access to resources and localisation of growth, etc. The basic rule of sustainable development is to harvest the renewable resources at an optimum rate which should not exceed its generation rates (Rennings and Wiggering, 1996). Resource utilisation at a rate higher than its generation rate will be ecologically unsustainable. But, resource utilisation and a rate below its regeneration capacity may cause economic unsustainability on a regional scale. Therefore, sustainable development could be defined as the management and the conservation of natural resources base and the orientation of technological and institutional change, in such a manner as to ensure the attainment and continued satisfaction of human needs for the present and future generations. Such development conserves land, water, plant and animal genetic resources, is environmentally non- degrading, technologically appropriate, economically viable and socially acceptable. 1.4.2 Why the need of Sustainable Development has been felt During the last centuries population of the world has been growing rapidly. Since

42 1900 the rate of growth of population declined in Europe, North America and Oceania. But in Africa, Asia and Central and Southe America the population growth has increased. The rapid growth of world population prompted the growth of global production and consumption. Thus a need for immediate and rapid development has been felt aiming at controlling world population growth. Countries with higher population growth rates experienced faster conservation of land to agricultural uses putting additional pressure on land and natural habitats. It is in fact that in comparison to the demands of world population there is shortage of natural resources. The carrying capacity of the earth is already over-sought and as a consequence citizens of the world must find ways to reduce material consumption. In other words, citizens should try to reduce total resource use taking into account sustainable life style. Sustainable development stresses the need for the people to live within the capacity of nature. The pursuit for development in such a scenario of population growth vis-a-vis high consumption is only oriented towards a short-term economic goal and is not a sustainable one. Economic Boom and its result on the environment can be understood from the following : 1) Protest against a dam to be built on prime farmland led to killing of four villagers in Madura off Eastern Java. 2) More than one million farmers in Thailand were faced with massive displacement to make way for large-scale tree plantation to supply pulp for the global industry. 3) More than 400 villagers were arrested since 1987 for defending ancestral lands against logging of Sarawark, Malaysia. 4) HOECHST threatened a lawsuit against indigenous workers who decry toxic pesticide poisoning in Philippines. 5) Such instances for instance tussle over land rights and access to natural resources, livelihood and health are erupting more and more in the cauldron of rapidly industrialising south-east Asia in its transformation from traditionally agricultural societies to intensive export oriented economics. 6) Structural shifts in resource use and perceptions of nature, and escalating materialism among a growing urban middle class are driving to the surface fundamental clashes between those who benefit from the economic success and those who are victimised.
43 7) When primary resources were first exploited population who traditionally lived in forests and coastal areas were direct victims. 8) The countries like Thailand and Philippines have logged so much forests that they have not only a valuable heritage of biodiversity but face severe water shortages and regular floods. They deprive the forests to play their ecological functions 9) The FAO and International Rice Research Institute have in the past year, officially acknowledged that the Green Revolution has failed and rice production has dropped by 1-3% per year. 10) Industrialisation itself has spread pollution in the unprecedented scale in the regions like Bangkok, Djakarta and Manila. 1.4.3 Key elements of Sustainable Development In the context of the discussion upon Sustainable Development it is worth mentioning that the word “development” so frequently been used in the context of the term “Economic Development”. The word Sustainable Development (SD) carries the meaning of the word’ “Development” quite different from’ ‘Economic Development:’’ Development (D) encompasses three sources of development: 1) Social (W) 2) Economic (I) and Environmental (N). This is indicated as D = WIN. This is indicative of the fact that development takes place when social, economic and environmental objectives or any grouping is present in dominant form. Wide recognition of the concept of SD came with the publication of Brutland Commission Report on “Our Common Future” in 1980. Brutland Commission reaffirmed the basic promises of the UN Declaration on the right to development that “right to development is inalienable human right and human personis the central subject of development”. Club of Rome highlighted a further dimension to SD “a sustainable society implicitly connects one that is based on a long-term vision. In that it must foresee the consequence of its diverse activities to ensure that they do not breach the cycles of renewal. a) Key elements of the concept of Sustainable Development ILA’s (1993) NIEO Committee in its Cairo Conference (UN) noted the following key elements of the concept of sustainable Development : i) The concept of SD dows not imply limits - not absolute limits but limitations imposed by the present state of technology and social organizations and environmental resources and by the ability of the biosphere to absorve the effect of human activities;

44 ii) SD requires the needs of all and extending to all the opportunity to fulfill their aspirations for a better life i,e., world in which poverty is endemic and will always be prone to ecological and other catastrophe; iii) SD requires meeting essential needs that requires not only a new era of economic growth for nations in which the majority are poor, but an assurance that those poor get their full shoe of the resources required to attain their growth. iv) SD requires that equity would be aided by political systems that secure effective citizens participation in decision making and by greater democracy in international decision making; and v) SD requires that those who are more affluent adopt life style within the planet's ecological means - their use of energy. For example, rapidly growing populations can increase the pressure on resources A significant achievement for the Rio conference is the setting up of institutional machinery "Sustainable Development Commission (SDC)" and the adoption of Agenda 21 by different countries into national policies. b) Principal features of Sustainable Development SD implies integrated human development It means meeting the basic needs of all and extending opportunity to all to fulfill their aspirations for better life. SD seeks to provide poor with an assurance for full share of resources required to attain the growth. SD symbolizes effective citizen's participation to decision-making and greater democratic process for formulation of international norms and conventions. Thus SD means allround development without causing environmental disaster. SD is not a static concept or static state of harmony but rather a process of change in which the use of resources, the diversions of investments, the orientation of technological developments an institutional changes are made consistent with future as well as present needs. SD is a relational notion, related to pattern of investment, state of technological development and trend in international change. In fact SD rests on political will/system in international decision-making. SD is viewed as the mutually beneficial interaction between the legitimate interests of business and the economy, government and the policy, civil society and culture. From this perspective, five dimensions of sustainable development are clearly visible - these are i) Human being, ii) Culture, iii) Polity and iv) Economy and v) Nature. SD emanates from basic principles of a) equity, b) solidarity and c) duty to cooperate for global development. The principle of Equity aims to achieve a balance between
45 converging and diverging interests of developed and developing countries. 1.4.4 Sustainable Development – Major transformation in society To act in a sustainable fashion involves a major transformation in society, focusing on the following actions: (a) Population stabilizations; (b) Efficient and effective use natural resources; (c) Determining environmental limits; (d) Refining market economies; (e) Waste reduction and pollution prevention; (f) New technologies and technology transfer; (g) Perception attitude and behavioural changes; (h) Social and cultural development; (i) Education for all; (j) Women empowerment; (k) Integrated environmental system management Development to be sustainable must meet three fundamental objectives : 1) An economic objective : Production of goods and service through efficiency. 2) An environmental objective : The conservation and prudent management of natural resources (preserving biodiversity and maintaining biological integrity). 3) A social objective : The maintenance and enhance of quality of life (equity being the main characterization). These objectivesshould take into account the inter-relationship between people, resources, environment and development. 1.4.5 Global Dimensions of Sustainable Development Numerous international attempts to promote conservation and sustainable development have already been mentioned. These include the establishment of 'UN Environment Programme', the recommendations of organizations, such as the World Commission on

46 Environment and Development, and many international agreements such as the conventions on biological diversity and climate changed signed at UNCD. These and other initiatives have all made a positive contribution, but they have done little to address one of the major underlying difficulties in achieving global sustainability: poverty and the unequal distribution of resources. Inequalities exist at all levels, but on the global scale an obvious imbalance is evident between North and South. Some minor, if insignificant, attempts have been made to address both debt problems and environmental problems in developing countries by covering part of the external debt of a country into a domestic obligation to support a specific programme. 1.4.6 The Sustainable future It is important to realize that sustainable development does nit mean no human impact on the environment. Such a situation is impossible to achieve so long as there are people on the planet The ideal scenario to strive for is one in which all environmental impacts can be undertaken consciously, in the full knowledge of the costs and consequences, even though this situation is a long way off, not least because we still have much to learn about the operation of nature. There is a considerable debate over the limits of sustainability but there is a general consensus that we must learn to live together within the means of nature. Ecological sustainability is the simple part of SD concept But socio-economic sustainability is more difficult and potentially contentious concept. The question who gets what (and how) raises the spectre of potential conflict both within and between nations. So far as the sustainability question is concerned the need for shared justice and associated conflict is the scariest and politically taxing part. In other words SD means achieving in an integrated comprehensive pattern the economic health, environmental protection and social equity objectives. SD is in reality concerned about equal consideration between : i) economic development and environmental quality ii) technological innovation and community stability iii) investment in people and investment in infrastructure Above all it is important to realize that a sustainable future lies in our hands. The need to alter values, beliefs and behaviour should by now be clear. As a part of Agenda 21 of Rio Summit 1992 the global plan for sustainable development was emphasized as development that embraces economic growth, social

47 development and environmentl protection. During the Johannesburg Summit (August, 2002) on SD according to the UN Secretary Kafl Annan's report it was highlighted "Progress towards to goals established at Rio has been slower than anticipated and in some respects conditions are worse than they were ten years ago". In Johannesburg Conference UN Secretary General Kafi Annan calling political will "the key issue* said "it was necessary to find practical steps and partnerships, combined with a renewed spirit of global cooperation and solidarity, to create major changes in the way policies and programmes for SD are designed and implemented*'. The Johannesburg Summit report also found that many steps can be taken to make globalisation work for and SD and to jump start implementation efforts. The report also provides a ten-point programme that countries business leaders, non-governmental organizations and leaders of other stakeholders could consider during the preparatory negotiations of the summit. The report put forward the following main factors for which implementation of Agenda 21 have been hampered : (i) Lack of integrated approach towards policies and programmes related to economic, social and environmental concerns. (ii) Global utilization of resources beyond the carrying limits of the ecosystem, (iii) In coherent policies in areas of finance, trade, investment and technology. (iv) Difficulties in obtaining new technologies by developing countries and fall in developmental assistance. A large trend of disparities detrimental to the concept of equity, solidarity and global cooperation has been emphasized in the report. These include: (i) 15% of the world's population who live in high-income countries account for 56% of all the world's consumption, while poorest 40% live in the developing countries account for only 11% consumption. Average household expenses in Africa are 20% less than it was 25 years ago. (ii) 1.1 billion people still lack access to safer drinking water and about 2.4 billion lake adequate sanitation. Infant death in developing countries amount to 8% of the children population. (iii) 113 million primary-age school children in developing countries (60% of them girls) are not in school. (iv) 815 million people in the world are undernourished out of which 777 million in developing regions. The number is declining in Asia but increasing in Africa. (v) More than 80% of all disease in developing countries are caused by contaminated water, and inadequate sanitation.

48 (vi) The world will need 17% more fresh water to grow food for growing populations in developing countries and total water use will increase by 40% (vii) By 2025 two-thirds of the world would live in areas facing moderate to severe water stress. (viii) 500% of world's major fisheries are fully utilized and 25% are over fished. (ix) The estimated rate of present day deforestation is 14.6 million hectare a year. Net deforestation rates are highest in South America and in Africa. (x) Use of energy in developed countries is ten times as much person as people in developing countries. (xi) Globalisation is yet to be made to work for SD. (xii) Improvement of livelihood and eradication of poverty in rural and urban areas are essential for SD. (xiii) Unsustainable pattern of productionand consumption needs to be changed. (xiv) Improvement health through safe and affordable access to fresh water, a reduction in lead in gasoline and improved air quality. (xv) Development ofmore renewable and energy efficient technologies and providing access to energy. (xvi) Fresh water supply improvement, management and its equitable distribution. (xvii) Providing financial resources and environmentally sound technologies. (xviii) Strengthening international governance for SD. Part - n : Ecotourism 1.4.7 Concept of Tourism & Eco-tourism History of the development of Tourism as an industry : The two words 'Travel' and Tour' maynot be synnymous but they mean almost the same and the most common hobby of man. Traveling is perhaps the oldest hobby and certainly the common habit of human beings maintained ever since the beginning of civilisation. In the ancient times groups of people traveled from place to place in search of better life conditions. Thereafter came the period when many travelers started moving round the world through the continents and over the oceans to discover lands for trading as well as to find better places to live. In the 18th and 19th centuries many geo-scientists and scholars conceded to extensive traveling to enrich their geographical knowledge. German scientist Alexander
49 Humboldt traveled round the world and wrote as many as forty books. In his famous book Cosmos he explained geographically everything he explored in different places. Afterwards his follower Carl Ritter also traveled extensively and on the basis of his wide range of findings composed the famous book Erdkunde. The studies concerning travel and tour have attracted contemporary geo-scientists, sociologists and economists because of their close association with socio-economic aspects. Today the scientists have identified some basic difference between the usages of the words 'travel' and 'tour'. While travel has some association with activities related with earning, tour is organized purely for enjoyment and pleasure of visiting places of interest Tourism is recognised as the outcome of leisure but all travels cannot be taken as tour. The concept of tourism in true sense developed in 1937 when a committee of statistical experts of the League of Nations as this committee defined tourists' as people who travel for a period of one day or more in a country other than that in which they reside, and the persons visit a place outside his residential area for a period of less than 24 hours would be identified as *excursionists'. First authentic book on tourism was published in Switzerland (now the universally famous country for tourism) in 1942 by Prof. Hunzlkar and Prof, Krapf. In 1963, at the UN Conference on Travel and Tourism, held in Rome the basic difference between tourists and excursionists was recommended as follows: a) Tourists - those making overnight stay at a place on travel for visit b) Excursionists - Those making only a day visit to a place The World Tourism Organisation (WTO) in 1990 identified the following five motivations for travel and tourism : a) Educational and Cultural, b) Social and Historical, c) Religious and Ethnic, d) Health and Sports, e) Relaxation and pleasure. 1.4.8 Tourism versus Eco-Tourism : A conceptual framework Up till 1950s tourism as a moneymaking industry for many countries (Viz. Switzerland, Scotland etc. in Europe and many South-East Asiatic countries) maintained a reasonably clean and attractive image as a harmless business that could bring financial benefits to

50 their places of origin. However, from 1960s numerous case snidies uncovered the fact that tourism could also upset the ecosystem balance of the environment of a given area. Although apparently tourism is a harmless industry it cannot be considered as completely pollution-free. Uncontrolled tourism can create two-fold environmental pollution : a) physical, as well as b) sodo-cultural. Physical environmental pollution due to tourism is obvious, as influx of a large number of tourists (i.e. temporary visitors with little care for maintenance of the place to visit) means dumping of additional garbage in the environment in the form of litters on the land surface, destruction of surface vegetation and emissions in the atmosphere. Environmental pollution at the sodo-cultural leel is alarming. If tourism is viewed as a phenomenon of interaction between host and guest cultures, it makes little effect on the culture of guests but the culture of guests leave considerable impression on the host's mind. The structure of society and economy in a particular tourist location, particularly in the developing countries, have been found to be changing rapidly under the growing pressure of high spending and free-living affluent tourists from the developed parts of the world. Escalation of concern of the quality deterioration of the total environment prompted the WTO (World Tourism Organisation) to make a joint declaration with UNEP (United Nation's Environment Programme) in-1982 as: "The protection, enhancement and improvement of the various components of man's environment are among the fundamental conditions for the harmonious development of tourism. Similarly, rational management of tourism may contribute to a large extent to protecting and developing the physical environment and cultural heritage as well as improving the quality of life'' The concept of eco-tourism is the outcome of this global concern over tourism. In true sense all forms of tourism appreciating and preserving the environmental quality without disturbing the maintained resource base are considered to be eco-tourism. Thus eco-tourism is the development of tourism in a place of interest by maintainingits ecological set up; hence the influx of tourists at any given time must not exceed its total carrying capacity. Eco-tourism offers a form of tourism development, which accepts the principles of sustainability as well as offers economic opportunities. At present tourism is the largest growing industry in the world accounting for 11% of the world's GDP but India's share is only 0.04% in total international arrivals. In order to earn formidable amount of foreign exchange from tourism to upgrade the country's economy India should concentrate on catering eco-tourists. The concept of eco-tourism generates a new tourist group in the global tourism

51 market. These eco-tourists would be the travelers who would be more interested in people, place, customs and culture rather than instant comforts (air-conditioned hotels and bars). Through eco-tourism tourists learn to leave sites of their visits undisturbed and it will be possible to keep tourist places eco-friendly. 1.4.9 Model Questions 1) Describe the need for Sustainable Development in the context of the present resource crisis of the world. 2) Discuss the key elements of Sustainable Development. 3) Make a discussion on the key elements inthe context of themajor transformation in the present society. 4) Write an essay on the global dimension of Sustainable development 5) Discuss the background in which the concept and need of Ecotourism has developed. 6) Assess the key elements and directives to promote ecotourism. 1.4.10 Select Readings ● Bezbaruah, M.P. (1999) : Tourism: Current Scenario and Future Prospects, Yojana, 43(8), 7-14. ● Bhatia, A.K. (1992) : International Tourism; Fundamentals and Practices, Sterling, New Delhi ● Fennel, D.A. (1999) : Eco-tourism: An Introduction, Routledge, London ● Foster, p. (1985) : Travel and Tourism Management, Macmillan, London ● Golly. Frank B : A Primer for Environmental Literacy, University Press, Hyderabad ● Sharma P.D. (2000) : Ecology and Environment, Rastogi Publication, Meerut.

52 Unit 2.1 ❑ Soil, Air, Water and Noise Pollution Structure 2.1.1 Soil Pollution 2.1.1.1 Ecosystem effects 2.1.1.2 Cause & Sources 2.1.1.3 Cleanup Options 2.1.1.4 How to reduce 2.1.2 Water Pollution 2.1.2.1 Categories 2.1.2.2 Identification of Sources 2.1.2.3 Ground Water Pollution 2.1.2.4 Marine Pollution 2.1.2.5 Mercury Pollution 2.1.2.6 Lead Pollution 2.1.2.7 Fluoride Pollution 2.1.2.8 Biological Pollution 2.1.2.9 Prevention and Control 2.1.3 Air Pollution 2.1.3.1 Sources & types 2.1.3.2 Categories 2.1.3.3 Major Gases and Matters 2.1.3.4 Air pollution in Urban areas 2.1.3.5 Factors considered Potential for Urban air pollution 2.1.3.6 Controlling measures of Urban air pollution 2.1.3.7 Condition in the developing Countries 2.1.3.8 Suggested measure 2.1.3.9 Laws of Air Pollution Control 2.1.4 Noise Pollution 2.1.4.1 Measurement

53 2.1.4.2 Sources 2.1.4.3 Human health effects of Noise Pollution 2.1.4.4 Environment effects 2.1.4.5 Mitigation and control of noise 2.1.4.6 Legal control 2.1.4.7 Conclusions 2.1.5 Questions 2.1.6 Select Readings The present generation and the coming generations have to solve three grave problems, namely, population, poverty and pollution if they have to survive. Pollution being the most dangerous problem likes cancer in which death is sure but slow. Environment pollution is assuming dangerous proportions all through the globe and India is not free from this poisonous disease. This is the gift of modern living, industrialization and urbanization. Unless timely action is taken we have a forbid and bleak future for the world. 2.1.1 Soil Pollution As the demand for food has grown very high, there is an increase in field size and mechanization. The increase in Meld size makes it economically viable for the fanner but results in loss of habitat and shelter for wildlife, as hedgerows and copses disappear. When crops are harvested, the naked soil is left open to wind after the heavy machinery has compacted it. Another consequence of more intensive agriculture is the move to monoculture. This is unnatural; it depletes the soil nutrients, allows diseases and pests to spread and, in short, brings into play the use of chemical substances foreign to the environment. Hence
Soil pollution is caused by the presence of man-made chemicals or other alteration in the natural soil environment. This type of contamination typically arises from the rupture of underground storage tanks, application of pesticides, percolation of contaminated surface water to subsurface strata, oil and fuel dumping, leaching of wastes from landfills or direct discharge of industrial wastes to the
soil. The most common chemicals involved are petroleum hydrocarbons, solvents, pesticides, lead and other heavy metals.
The
occurrence of this phenomenon is correlated with the degree of industrializations and intensities of chemical usage. The concern over soil contamination stems primarily from health risks, both of direct contact and from secondary contamination of water supplies. Mapping of contaminated soil sites and the resulting cleanup are time consuming and expensive tasks, requiring
54 extensive amounts of geology, hydrology, chemistry and computer modeling skills. 2.1.1.1 Ecosystem effects Not unexpectedly, soil contaminants can have significant deleterious consequences for ecosystems. There are radical soil chemistry changes which can arise from the presence of many hazardous chemicals even at low concentration of the contaminant species. These changes can manifest in the alteration of metabolism of endemic microorganisms and arthropods resident in a given soil environment. The result can be virtual eradication of some of the primary food chain, which in turn have major consequnces for predator or consumer species. Even if the chemical effect on lower life forms is small, the lower pyramid levels of the food chain may ingest alien chemicals, which normally become more concentrated for each consuming rung of the food chain. Many of these effects are now well known, such as the concentration of persistent DDT materials for avian consumers, leading toweakening of egg shells, increased chick mortality and potentially species extinction. Effects occur to agricultural lands which have certain types of soil contamination. Contaminants typically alter plant metabolism, most commonly to reduce cro yields, This has a secondary effect upon soil conservation, since the languishing crops cannot shield the Earth's soil mantle from erosion phenomena. Some of these chemical contaminants have long half-lives and in other cases derivative chemicals are formed from decay of primary soil contaminants. 2.1.1.2 Causes and Sources of Soil Pollution ● Pesticides A pesticide is a substance or mixture of substances used to kill a pest A pesticide may be a chemical substance, biological agent (such as a virus or bacteria), antimicrobial, disinfectant or device used against any pest Pests include insects, plant pathogens, weeds, molluscs, birds, mammals, fish, nematodes (roundworms) and microbes that compete with humans for food, destroy property, spread or are a vector for disease or cause a nuisance. Although there are benefits to the use of pesticides, there are also drawbacks, such as potential toxicity to humans and other animals. Pesticides are used to control organisms which are considered harmful. For example, they are used to kill mosquitoes that can transmit potentially deadly diseases like west nile virus, yellow fever, and malaria They can also kill bees, wasps or ants that can cause allergic reactions. Insecticides can protect animals from illnesses that can be caused by parasites such as fleas. Pesticides can prevent sickness in humans that could be caused by mouldy food or diseased produce. ● Herbicides Herbicides are used to kill weeds, especially on pavements and railways. They are

55 similar to auxins and most are biodegradable by soil bacteria. However one ?roup derived from trinitrophenol (2:4 D and 2:4:5 T) have the impurity dioxin, which is very toxic and causes fatality even in low concentrations. It also causes spontaneous abortions, haemorrhaging and cancer. Agent Orange (50% 2:4:5 T) was used as a defoliant in Vietnam. Eleven million gallons were used and children born since men to America! soldiers who served in mis conflict, have shown increased physical and mental disabilities compared to the rest of the population. It affects the head of the sperm and the chromosomes inside it. Another herbicide, much loved by murder story writers, is Paraquat. It is highly toxic but it rapidly degrades in soil due to the action of bacteria and does not kill soil fauna. ● Insecticides Insecticides are used to rid farms of pests which damage crops. The insects damage not only standing crops but also'stored ones and in the tropics it is reckoned that one third of the total production is lost during food storage. As with fungicides, the first insecticides used in the nineteenth century were inorganic e.g. Paris Green and other compounds of arsenic. Nicotine has also been used since the late eighteenth century. There are now two main groups of synthetic insecticides– OrganoMorines : Organochlorines include DDT, Aldrin, Dieldrin and BHC. They are cheap to produce, potent and persistent DpT was used on a massive scale from the 1930s, with a peak of 72,000 tonnes used 1970, Then usage fell as the harmful environmental effects were realized, ft was found worldwide in fish and birds and was even discovered in the snow in the Antarctic. It is only slightly soluble in water but is very soluble in the bloodstream. It affects the nervous and endocrine systems and causes the eggshells of birds to lack calcium causing mem to be easily breakable. It is thought to be responsible for the decline of the numbers of birds of prey like ospreys and peregrine falcons in the 1950s - they are now recovering. As well as increased concentration via the food chain, it is known to enter via permeable membranes, so fish get it through thir gills. As it has low water solubility, it tends to stay at the water surface, so organisms that live there are most affected. DDT found in fish that formed part of the human food chain caused concern, but the levels found in the liver, kidney and brain tissues was less than Ippm and in fat was 10 ppm which was below the level likely to cause harm. However, DDT was banned in Britain and America! to stop the further build up of it in the food chain. The USA exploited this ban and sold DDT to developing countries, who could not afford the expensive replacement chemicals and who did not have such stringent regulations governing the use of pesticides. Some insects have developed a resistance to insecticides. Organopbosphates : Organophosphates, e.g. parathion, methyl parathion and about
56 40 other insecticides are available nationally. Parathion ishighly toxic, methyl-parathion is less so and Malathion is generally considered safe as it has low toxicity and is rapidly broken down in the mammalian liver. This group works by preventing normal nerve transmission as cholinesterase is prevented from breaking down the transmitter substance acetylcholine, resulting in uncontrolled muscle movements. Entry of a variety of pesticides into our water supplies causes concern to environmental groups, as in many cases the long term effects of these specific chemicals is now known. Restrictions came into force in July 1985 and were so frequently broken that in 1987, formal proceedings were taken against the British government. Britain is still the only European state to use Aldrin and organochlorines, although it was supposed to stop in 1993. East Anglia has the Worst for pesticide contamination of drinking water. Of the 350 pesticides used in Britain, only 50 can be analyzed, which is worrying for the global community. ● Mining Modern mining projects leave behind distrupted communities, damages landscapes, and polluted water. Mining also affects ground and surface waters, the aquatic life, vegetation, soils, animals, and the human health. Acid mine drainage can cause damage to streams which in return can kill aquatic life. The vast variety of toxic chemicals released by mining activities can harm animals and aquatic life as well as their habitat The average mine disturbs over a thousand acres of land. ● Burial Burial is the technique used by Jews, Muslims, Christians and other religions with Abrahamic influence, to dispose off the corpse of dead humans and animals. This process leads to regular soil erosiondue to loosening of soil. Also, the decomposing fluids act as poisonous herbicides, pesticides and may even lead to epidemics in surrounding areas. It leads to soil pollution, soil erosion and even water pollution. ● Construction Construction often puts sediments in rivers and bodies of water. By doing this, natural water filters are damaged. Natural water filters help break down many pollutants before they reach other water bodies. Some harmful chemicals that may run off with water and sediments from construction sites are oils, debris, and paint This can cause damage to soil, aquatic life, and promote hazordous chemicals toget into drinking water. California Integrated Waste Mnagement Board provides more "green building basics" that educates readers about healthy construction. ● Increased waste disposal In Scotland in 1993,14 million tons of waste was produced. 100,000 tons was special waste and 260,000 tons was controlled waste from other parts of Britain and

57 abroad 45% of the special waste was in liquid form and 18% was asbestos - radioactive waste was not included. Of the controlled waste, 48% came from the demolition of buildings, 22% from industry, 17% from households and 13% business - only 3% were recycled. 90% of controlled waste was buried in landfill sites and produced2 million tons of methane gas. 1.5% was burned in incinerators and 1.5% were exported to be disposed of or recycled. There are 748 disposal sites inScotland. Landfills produce leachate, which has to be recycled to keep favourable conditions for microbial activity, methane gas and some carbon dioxide. There are very few vacant or derelict land sites in the north east of Scotland, as there are few traditional heavy industries or coal/mineral extraction sites. However some areas are contaminated by aromatic hydrocarbons (500 cubic meters). The Urban Waste Water Treatment Directive allows sewage sludge to be sprayed onto land and the volume is expected to double to 185,000 tons of dry solids in 2005. >!-information should be updated-< This has good agricultural properties due to the high nitrogen and phosphate content In 1990/1991,13% wet weight was sprayed onto 0.13% of the land, however this is expected to rise 15 fold by 2005. There is a need to control this so that pathogenic microorganisms do not get into water courses and to ensure that there is no accumulation of heavy metals in the top soil. 2.1.13 Cleanup options Cleanup or remediation is analyzed, by environmental scientists who utilize field measurement of soil chemicals and also apply computer models for analyzing transport and fate of soil chemicals. Thousands of soil contamination cases are currently in active cleanup across the U.S. as of 2006. There are several principal strategies for remediation : ● Excavate soil and take it to a disposal site away from ready pathways for human or sensitive ecosystem contact. This technique also applies to dreadging of bay muds containing toxins. ● Aeration of soils at the contaminated site (with attendant risk of creating air pollution) ● Thermal remediation by introduction of heat to raise subsurface temperatures sufficiently high to volatiz chemical contaminants out of the soil for vapour extraction. Technologies include ISTD, electrical resistance heating (ERH), and ET-DSP tm . ● Biorernedianon, involving microbial digestion of certain organic chemicals. Techniques used in bioremediation include landfarming, biostimulation and bioaugmentating soil biota with commercially available microflora. ● Extraction of groundwater or soil vapour with an active electromechanical system, with subsequent stripping of the contaminants from the extract. ● Containment of the soil contaminants (such as by capping or paving over in place).
58 2.1.1.4 How to Reduce Land Pollution There are many ways to help reduce land pollution. Some ideas are listed below. ● Use reusable materials ● Do not litter ● Recycle ● Purchase products with little packaging to throw away (buy in bulk if possible) ● Use safer alternative pesticides ● Buy organic grown fruits ● Buy biogradeable products 2.1.2 Water

Pollution Water pollution is the contamination of water bodies
such as lakes, rivers, oceans, and groundwater.
All water pollution affects organisms and plants that live
in these water bodies and in almost all cases the effect is damaging either to individual species and populations but also to the natural biological communities.

It occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful constituents. Water pollution is a major problem in the global context. It has been suggested that it is the leading worldwide cause of deaths and diseases, and that it accounts for the deaths of more than 14,000 people daily. In addition to the acute problems of water pollution in developing countries, industrialized countries continue to struggle with pollution as well. In the most recent national report on water quality in the United States, 45 percent of assessed stream miles, 47 percent of assessed lake acres, and 32 percent of assessed bay and estuarine square miles were classified as polluted. Water is typically referred to as polluted when it is impaired by anthropogenic contaminants and either does not support a human use, like serving as drinking water, and/ or undergoes a marked shift in its ability to support its constituent biotic communities, such as fish. Natural phenomena such as volcanoes, algae blooms, and earthquakes also cause major changes in water quality and the ecological status of water. Water pollution has many causes and characteristics. 2.1.2.1 Water pollution categories Surface water and groundwatr have often been studied and managed as separate resources, although they are interrelated. Sources of surface water pollution are generally grouped into two categories based on their origin.

59 ● Point source pollution Point source pollution refers to contaminants that enter a waterway through a discrete conveyance, such as a pipe or ditch. Examples of sources in this category include discharges from a sewage treatment plant, a factory, or a city storm drain. The U.S. Clean Water Act (CWA) defines point source for regulatory enforcement purposes. ● Non-point source pollution Non-point source (NFS) pollution refers to diffuse contamination that does not originate from a single discrete source. NFS pollution is often accumulative effect of small amounts of contaminants gathered from a large area. Nutrient run off in storm- water from "sheet flow" over an agricultural field or a forest are sometimes cited as examples of NFS pollutioa Contaminated storm-water washed off of parking lots, roads and highways, called urban runoff, is sometimes included under the category of NFS pollution. However, this runoff is typically channeled into storm drain systems and discharged through pipes to local surface waters, and is a point source. The CWA definition of point source was amended in 1987 to include municipal storm sewer systems, as well as industrial storm- water, such as from construction sites. ● Groundwater pollution Interactions between groundwater and surface water are complex. Consequently, groundwater pollution, sometimes referred to as groundwater contamination, is not as easily classified as surface water pollution. By its very nature, groundwater aquifers are susceptible to contamination from sources that may not directly affect surface water bodies, and the distinction of point vs. non-point source may be irrelevant. A spill of a chemical contaminant on soil, located away from a surface water body, may not necessarily create point source or non-point source pollution, but nonetheless may contaminate the aquifer below. Analysis of groundwater contamination may focus on soil characteristics and hydrology, as well as the nature of the contaminant itself. The substances which degrade water quality are known as water pollutants. The major sources of pollutants are: 1) Natural sources, and 2) Anthropogenic sources. Natural sources of water pollutants include soil erosion, landslides, coastal and cliff erosion, volcanic eruption and decomposition of plant and animal bodies. Anthropogenic sources are the real sources of water pollution today. These include industrial, urban and agricultural sources. Urban sources contributes water pollutants such as sewage, huge quantity of municipal and domestic garbage, and industrial effluents from the industrial units located in the urban centres, fallouts of paniculate matter at automobile exhausts etc. Various types of chemicals used in the chemical fertilizers, pesticides and herbicides

60 are the pollutants, which are derived from agricultural sources. These chemical substances are brought to the rivers and lakes through surface runoff caused by rainfall and are also moved downward by infiltrating rainwater to reach ground water. Industrial sources pollute streams, rivers, lakes and coastal waters through industrial effluents, solid and dissolved chemical pollutants and numerous metals. Besides, fallout of radioactive substances is very dangerous source of both air and water pollution. 2.1.2.2 Identification of Sources of Pollution The important sources of water pollution, as have been identified, are (i) sewage and other waste, (ii) industrial effluents, (iii) agricultural discharges, and (iv) industrial wastes from chemical industries, fossil fuel plants (thermal power plants) and nuclear power plants. Each of these sources of pollution carries a variety of pollutants that enter our water bodies. Following are the sources of water pollution and kind of the pollutants spread by them : (i) Sewage and other waste Sewage is the watr borne waste derived from domestic waste

and animal or food processing plants. It includes human excreta, paper, cloth, soap, detergents etc. These are a major proportion of pollutants

entering in our

water. There is

uncontrolled dumping of wastes of rural areas, towns and cities into ponds, lakes,

streams or rivers.

Due to continuous accumulation of sewage and other wastes in these water bodies, they loose the ability to recycle them and self-regulatory capability is lost Decomposition of these wastes by aerobic microbs decreases due to higher level of pollution. The self-purifying ability of the water is lost and water becomes unfit for drinking and other domestic uses. Phosphates are the major ingredients of most detergents. They favour the luxuriant growth of algae which form water blooms. This extensive algal growth also consumes most of the available oxygen from water. This decrease in O 2 level becomes detrimental to growth of other organisms, which produces a foul smell upon decay. Some decomposing plants are known to produce toxins as strychnine, which kills animals including cattle. One of the most common primary sources of water pollution is the discharge of untreated or partly treated sewage in water bodies, sometimes due to improper sewage handling procsses of municipal bodies. This is not uncommon in major cities. Such adischarge of sewage and other wastes in water results into depltion of oxygen levels of water, and stimulation of algal growth. Biological oxygen demand (BOD) BOD is the amount of oxygen

required for biological oxidation by microbes in any unit volume of water. The test is done at 20°C for at least five days. BOD values generally approximate the amount of oxydisable organic matter, and are therefore, used a measure of 61 degree of water pollution and waste level. Thus mostly
BOD value is proportional to the amount of organic waste present in water.
Hence due to addtion of sewage and waste, oxygen level declines, which is reflected in terms of BOD value of water. BOD values are thus useful in evaluation of self-purification capacity of a water body and for possible control measures of pollution. The quantity of oxygen in water (Dissolvd Oxygen—DO) along with BOD is indicated by the kind of organisms present in water. Thus fish becomes rare at DO value of 4 to 5 ppm of water. Further decrease in DO value may lead to increase in anaerobic bacteria. Eutrophication Due to addition of domestic waste (sewage), phosphates, nitrates etc. form wastes or their decomposition products in water bodies, toey become rich in nutrients, phosphates and nitrate ions. Thus with the passage of these nutrients through such organic wastes the water bodies become highly productive or eutrophic and the phenomenon is known as eutrophication. It must be remembered that
ponds lakes etc. during their early stages of formation are relatively barren and
nutrient-deficient thus supporting no or very poor aquatic life. This state of these bodies is known as oligotrophic. With the addition of nutrients, there is stimulated luxuriant growth of algae in water. There is
also generally a shift in algal flora, blue-green algae begin to predominate. These start forming algal blooms, floating scum or blankets of algae.
The algal blooms compete with other aquatic plants for light for photosynthesis. Thus oxygen level is depleted. Moreover, these blooms also release some toxic chemicals, which kill fish, birds and other animals, thus water begins to stink. (ii) Industrial effluents : A wide variety of both organic and inorganic pollutants are present in effluents from breweries, tanneries, dying textiles, paper and pulp mills, steel industries, mining operations etc.. The pollutants includes oils, gases, plastics, plasticisers, metallic wastes, suspended solids, phenols, toxins, acids, salts, dyes, cyanides, DDT etc, many of
which are not readily susceptible to degradation and thus cause serious pollution problems. (
iii) Agricultural discharges : These include chiefly the chemicals used as fertilizers and the pesticides used in disease control. Their discharges reach into the water bodies. As compared to developed countries India has relatively a low use of these chemicals, thus discharges into water are still low. But the rate at which their use is being increased now it is apparent that this would enhance pollution in the coming years. a) Artificial Fertilisers : Modem agriculture rely heavily on a wide range of synthetic chemicals which include different types of fertilizers and biocides (pesticides, herbicids 62 etc). These chemicals along with waste are wasted off lands through irrigation, rainfall, drainage etc. reaching into the rivers, lakes streams etc. where they disturb the natural ecosystem. Artificial fertilizers crowd out useful minerals naturally present in the topsoil. The microbes (bacteria, fungi, worms etc) in top soil enrich the humus and help to produce nutrients to be taken up by the plant and later by animals. But fertiliser-enriched soil cannot support microbial life and hence there is less humus and less nutrients and the soil can easily become poor and eroded by wind and rain. b) Pesticides and biocides : Pesticides are the chemicals used with water for killing the plant and animal pests. It is a general term that includes bactericides, fungicides, nematicides, insecticides and herbicides. .The long-range effects of such biocides are in fact a threat to our ecological security. (iv) Industrial wastes The two chief water pollutants of this category are heat and radioactive substances. These are the wastes chiefly from power plants—
thermal and nuclear, which use large quantities of water. Some other industries also give
of wastewater after use. Nuclear power plants are the source of radionuclide. The quantity of wastewater is highest in the thermal power plants in the country. This waste water is returned after use at very high temperatures to the
streams, rivers and lakes. This affects the aquatic life in these water bodies. This is also known as thermal pollution since heat acts as a pollutant. Similarly nuclear power plants, besides causingfallout problems, also release waste heat. This also contributes to thermal pollution. Some plants and animals are killed outright by the very hot water.
Though wastewater from nuclear power plant not as hot, but still has adverse effects on aquatic life. 2.1.2.3
Ground Water Pollution As the industrialisation progressed most of the underground sources of drinking water, especially in
the outskirts of larger cities and villages of the developing countries have become polluted to a certain extent. For instance Trans-Yamuna areas of Delhi face drinking water pollution problem at regular intervals. There had been epidemics of cholera, dysentery and other diseases over the last five years. This has been mainly due to inadequate water supply system in these areas. Ground water is

now threatened with pollution from seepage pits, refuse dumps, septic tanks
and different other pollutants. Important sources of ground watr pollution are sewage and other water otherwise. Raw sewage is dumped in shallow soak pits. This gives birth go cholera, hepatitis, dysentery etc, especially in areas with high water table. The industries of woolens, bicycles in aras of Punjab (Ludhiana) and Haryana (Ambala, Sonepat) contribute high amounts of Ni,
63 Fe, Cu, Cr and Cyanides to ground water. 2.1.2.4 Marine Pollution The condition of marine pollution continues to aggravate in the present day. The main source of marine pollution (pollution in the coastal water) is the rivers discharging waters in the sea.
All that what do rivers carry ultimately ends up in the seas. On their way
to the sea, rivers receive huge amounts of sewage, garbage, agricultural discharge, and biocides, including heavy metals. These all are added to the
sea. Besides this
discharge of oils and petroleum products and dumping of radionuclides waste into sea
also cause marine pollution. Huge quantity of planstic is being added to sea and oceans. Over 50 million pounds plastic packing material is being dumped in
the sea of commercial fleets, whereas over 300 million pounds entering through inland waterways in USA. Many marine birds ingest plastic that causes gastrointestinal disorders. The chemical principle in PCBS causes more damage as thinning of eggshell and tissue damage of egg. Radionuclide waste in sea includes Sr-90, Csl37, Pu-239 and Pu-240.
In marine water the most serious pollutant is oil, particularly when afloat on sea.
Spill in oil
and petroleum product due to accidents or due to deliberate discharge of oil- polluted waste brings about pollution. About 285 million gallons of oil are spilled in the ocean each year, mostly from transport tankers. This is enough to coat a beach 20 ft wide with half an inch oil layer for 8,633 miles. Oil pollution cause damage to marine flora and fauna including algae, fish, birds, and invertebrates. About 50,000 to 25,000 birds are killed every year by oil. Hydrocarbons and benzpyrene accumulate in food chain and consumption of fish by man may cause cancer. 2.1.2.5
Mercury Pollution Mercury enters water naturally as well as through industrial effluents. It is a potent hazardous substance. Both inorganic and organic forms are highly poisonous. Methyl mercury gives off vapours. Mercury was responsible for the Mina Mata epidemic that caused several deaths in Japan and Sweden. The tragedy had occurred due to consumption of heavily mercury-contaminated fish by the villagers. The source of mercury
to the bay was a single chloride producing plant, using Hgel2 as a catalyst. In Sweden many rivers and lakes are already polluted due to
widespread use of mercury compounds as fungicides and algaecides in paper and pulp industries
and in agriculture. Chloral alkali plants sem to be the chief source of mercury contaminating effluents. Paper and pulp industries of Japan and Canada also cause mercury pollution.
Effluents of industris making switches, batteries, thermometer, fluorescent light tubes and high intensity street lamps also contain mercury. The
symptom of Mina Mata includes
malaise, numbness, visual disturbance, dysphasia, ataxia, mental deterioration, convulsions and finally death. Mercury readily
64 penetrated
in the central nervous system of children born in Mina Mata causing teratogenic effects. Methyl mercury penetrates through placenta. Swedish fish eaters have high mercury content in blood. 2.1.2.6 Lead Pollution
The chief source of lead to watris the effluents oflead and lead processing industries.
The children may chew lead toys.
Painters also have a risk oflead consumption. In some plastic pipes lead is used as stabiliser. The water may become contaminated in these pipes. Lead is also used in insecticides, food, beverages, ointments and medicinal concoctions for flavouring and sweetening. Lead pollution causes damage to liver and kidney, reducing in hemoglobin formation, mental retardation and abnormalities in fertility and pregnancy. Chronic lead poisoning may cause three general disease syndromes: i) gastrointestinal disorders, ii) neuromuscular effects (
leadlapsy)-

weakness, fatigue, muscular atrophy, and iii) central nervous system effects or CNS Syndrom that may result to coma and death. 2.1.3.7
Fluoride Pollution Fluoride, as in the case of air, may
regularly present in water and soil. In nature it is found as fluoride. The crop plants grown in high-fluoride soils in agricultural, non- industrial areas had fluoride content as high
as
high as 300 ppm. In Haryana and Punjab consumption of fluoride-rich water from wells caused epidemic fluorisis. In Andhra Pradesh also high fluoride content caused dental
fluorisis. In our country this problem has more severe in Rajasthan. This has already crippled about 3.5 lakh persons in state. Many people in Rajasthan have humped back due to high fluoride content in water sources in arid and semi-arid zopes. Prolonged intake of fluoride containing water stiffens the bone joints, particularly of spinal cord. 2.1.2.8 Biological Pollution There are three main sources of Biological Pollution : i) urban liquid and solid waste (largest amount of pollution), ii) dead bodies of animals and humans, and iii) wallowing of cattle. The urbanwaste is mostly in the form of shear faucal matter that also goes into the river as surface run off. Since the river is used for mass bathing at Rishikesh, Hardwar and Allahabad, there is problem of water-borne diseases. The problem is particularly serious with downstream of Kanpur. 2.1.2.9 Prevention and control of Water Pollution Biodegradable pollutants alone are not responsible for water pollution though these indicate level of pollution (through BOD values). Besides these a substantial pollution
65 load is contributed by non dgradable and slow degrading pollutants, such as heavy metals, mineral oils, biocides, plastic materials etc. that are dumped into water. For biodegradable pollutants, pollution may be controlled at sources by their treatment for rescue and recycling. The non-degradable toxic substances can be removed from water by suitable method. In addition to these methods, some standards, conditions and requirements are to be legally enforced by the government through Acts. The various ways and
techniques suggested for control of water pollution are as follows : a) Stabilisation of the ecosystem This is the most scientific way to control water pollution.
The basic principles involved are the reduction in waste input (thus control at source),
harvesting and removal of biomass, trapping of nutrients, fish management and aeration.
Various methods may be used (biological as well as physical) to restore species diversity and ecological balance in the water body to prevent pollution. b) Re-utilisation and recycling of waste Various kinds of waste which, include industrial effluents (as paper pulp or other industrial chemicals), sewage of municipal and other systems and thermal pollutants (waste water etc) may
be recycled to beneficial use. For instance urban waste may be recycled to generate cheaper fuel gas and electricity. The NEERI, Nagpur could develop technology .for management of radioactive wastes and chemical wastes of atomic power plants, reclamation of wastewater and to supply cheap piped gas and generate electricity by recycle of urban waste. In Okhla, New Delhi one large treatment plant for sewage recycles is already in operation. NEERI is also involved in development of suitable technology for wastewater reclamation through aquaculture, utilisation of domestic and industrial wastewaterin agriculture and detoxification of phenol and cyanides in waste by biological means. One distillery of Gujarat is able to treat 450,000 litres of waste daily and generating energy equal to the produced by ten tons of coal.
c) Removal of pollutants Various pollutants (radioactive, chemical, and biological) present in the water body can be removed by appropriate methods-such as adsorption, electro dialysis,
ion exchange, reverse-osmosis etc. Reverse-osmosis is based on the removal of salts and other substances by forcing the
water through a semi permeable membrane under a pressure exceeding the osmotic pressure. Due to this, flow occurs in reverse direction. For this, we use a powers membrane that attracts the solvent and repulses the solute. Reverse osmosis is commonly used to desalinate the brackish water and can also be used to desalinate the brackish Water and can also be used for purifying water from sewage.
66 2.1.3 Air Pollution
Our atmosphere is a gaseous envelope which surrounds the earth and air is a

mechanical mixute of a number of gases, mainly nitrogen (78.09), oxygen (20.95%), argon (0.93%) and carbon dioxide (0.03). The atmosphere has always been a sink or a place for deposition and storage for gaseous or paniculate wastes. When the amount of waste entering the atmosphere in an area exceeds the ability of the atmosphere to disperse or degrade the pollutants, problems occur. In general sense air pollution may be defined as the disequilibria condition of the air caused due to introduction of foreign elements from natural as well as anthropogenic sources to the air so that the air looses its freshness and become injurious to communities of biosphere in general and human community in particular. The main target of this module is to explain: ● to find the major categories and sourcs of air pollutants. ● to find the conditions of how air pollution problems vary from place to place. ● to find the conditions of human activities polluting the air exceeding the natural abilities of atmosphere to remove wastes. ● to find the environmental impacts of the acid rain and discover the controlling condition for its reduction ● to find the methods which are useful in the collection, capture or retention of pollutants before they ener the atmosphere. 2.1.3.1 Sources and Types of Air Pollutants Many of the pollutants in our atmosphere have natural as well as human rlated origins. Major sources of air pollution are Natural Sources (volcanic eruption, deflation of sands and dusts, wild firs etc.) and Man-made Sources (industries, urban centres, automobiles, aircrafts, agriculture, power plants etc, A General outline of the pollutants of natural and anthropogenic (man-made) sourcs is given below : (I) Pollutants from natural sources : Pollutants from natural sources can be classified as follows: a) from volcanoes : dust, ashes, smoke, carbon dioxide, and other gases. b) from extra-terrstrial bodies : cosmic dust, dust produced due to collision of asteroids, meteors, comets etc. with the earth. c) from green plants : vapour through evaporation, pollen of plant flowers, carbon dioxide from bacteria. d) From fungi : fungal spores; viruses. 67 e) From land surface : salt spray from seas and oceans, dusts and soil particles from ground surface. (II) Pollutants from anthropogenic sources : Pollutants from man-made sourcs are the following : a) gases from kitchen and domestic hating, industries, incineration of domestic and municipal garbage, automobiles, mostly from coals and diesel engines, air crafts etc. b) solid or particulat matter from industries, mines and urban centres c) radio-active substancs from nuclear plants, nuclear fuel releases, nuclear explosions. d) heat from industries and domestic kitchens. 2.13.2 Categories on the basis of the nature of pollutants Air pollutants can also be divided in terms of categories on the basis of the nature of pollutants. They are : 1) Particulate matter pollutants, and 2) Gaseous pollutants. 1. Particulate air pollutants Particulate air pollutants are identified as a) Aerosols, those fine particls which are around one micron to 10 microns in size; these are added to the atmosphere by industry, power generation, automobiles, space heating, agricultural activities; b) Smokes, Soot and Fumes are smaller than aerosols in size and are added to the atmosphere through the incineration of municipal and domestic wastes, power plants and almost all types of manufacturing procsses; and, c) Dusts, include those solid particles which are larger than aerosols in size. These are added to the atmosphere from all types of combustions and agriculture. Particulate pollutants are also divided into i) viable of living type (such as bacteria, pollen grain, fungal and other spores, all of which belong to the category of natural air pollutants), and ii) non-living type (all of the pollutants whether gases or particulat from man-made sources as referrd to above). 2. Gaseous air pollutants These are identified as a) Carbon dioxid (CO_2), Carbon monoxide (CO) from combustion of fossil fuls; transportation, industrial processes and garbage disposal; b) Hydrocarbons, from incomplete combustion of fuels; c) Fluorocarbons from aerosol cans, and refrigration systems; d) Sulfur compounds such as sulfur dioxide (SO_2) and sulfur trioxide (SO_3), Hydrogen Suiphid (H_2S) and H_2SO_4 (sulfuric acid) from the burning of sulfur containing fossil fuls; e) Nitrogen oxides and other nitrogenous compounds such, as Nitrous oxide (N_2O), Nitric oxide (NO), nitrogen oxide (NO_2) and Nitrogen trioxide (NO_3) from high-flying air crafts, combustion of fuels and chemical fertilizers; f) Aldehydes from thermal decomposition of fats, oils or glycerol and g) Chlorine from bleaching cotton cloths and flour and many other chemical procsses.

68 It may be pointed out that burning of fossil fuels (coal, petroleum and natural gas) in the factories, in the automobiles, diesel rail engines, air crafts and at homes releases most of the gaseous pollutants such as carbon monoxide (CO), carbon dioxide (CO 2), various oxides of nitrogen (NO, NO 2 , NO 3) and particulate matter such as ash, dusts, moke, soot, water vapour into the atmosphere and thus these pollutants constitute major portion of air pollutants. 2.1.3.3 Major Gases and Matters Contributing to Air Pollution Air polluting gases are usually classified in terms of their levels of influence, thy are : Primary land secondary. Primary pollutants arc those emitted directly into the air. They include participates, sulfuric oxid, carbon monoxide, nitrogen oxides and hydrocarbons. Secondary pollutants are pollutants produced through reactions btween primary pollutants and normal atmospheric compounds. For exampl, ozone forms over urban areas through reactions of primary pollutants sunlight and natural atmospheric gases. Thus ozone is a secondary pollutant that is producd on bright sunny days in areas where there is much primary pollution. Again the primary pollutants that account for nearly all air pollution problems are carbon monoside, particulates, hydrocarbons, nitrogn oxids, and sulfur oxides. Each year well over a billion metric tons of these materials enter the atmosphere from human- relatedprocsses. Typical air pollutants have been discussed below : ● Sulfur Dioxide (SO 2) Sulfur dioxide (SO 2) is a colourless and odorless gas normally present at the earth's surface at low concentration. One of the significant featurs of SO 2 is that one it is emitted into
the atmosphere it may be converted through complex reactions to fine particulate
sulfate (SO 4). The major anthropogenic source of sulfur dioxid is the burning of fossil fuels, mostly coal in power plants. Another major source comprises of a variety of industrial processes, ranging from petroleum refining to the production of paper, cement and aluminum. Adverse effects associated with sulfur dioxide depend on the dose or concentration present and include corrosion of paint and metals and injury or death to animals and plants. Crops such as alfalfa, cotton and barley are espcially susceptible. Sulfur dioxide is capable of causing sever damage to human and other animal lungs, particularly in the surface form. It is also an important precursor to acid rain. ● Nitrogen Oxides (NO X) Nitrogen Oxides (NO X) are emitted in several forms (NO, NO 2 , NO 3 and NO X refers to the number of oxygen atoms present in the gas molecule). The most important of these is nitrogen dioxide (NO 2), which is a visible yellow brown to reddish brown gas. 69 A major concern with nitrogen dioxide is that it may be converted by complex reactions in the atmosphere to fine paniculate nitrate (NO 3). Additionally nitrogen dioxide is one of the main pollutants that contribute to the development of smog, as is nitrogen dioxide, NO. Nearly all nitrogen dioxide is emitted from anthropogenic sources: the two major contributors are automobiles and power plants that bum fossil fuels. The environmental effects of nitrogen dioxides on humans are variabl but include the irritation of eyes, nose, throat, and lungs and increased suscptibility to viral infections, including influenza. Nitrogen oxides suppress plant growth and damage leaf tissue.
When the oxides are converted to their nitrate form in the atmospher, they impair visibility. However, when nitrat is deposited on the soil, it can promote plant growth. ●
Carbon Monoxide (CO) Carbon monoxide (CO) is a colourless odorless gas that at very low concntrations is extremely toxic to humans and other animals. The high toxicity results from a striking physiological effect, namely, that carbon monoxide and hemoglobin in blood have strong natural attraction for one another. Hemoglobin in our blood will take up carbon monoxide nearly 250 times more rapidly than oxygen. Therefore, if there is any carbon monoxide in the vicinity, a person will take it in very rapidly with potentially dire effects. Many people have been unintentionally asphyxiated by carbon monoxide produced from incomplete combustion of fuels in campers, tents and houses. The effect depends on the dose or concntration of exposur and range from dizziness and hadaches to death. Carbon monoxid is particularly hazardous to people with known heart disease, anemia, or respiratory disease. In addition it may cause birth defects, including mental retardation and impairment of growth of the fetus. Finally, the effects of carbon monoxide tend to be worse at higher altituds, where oxygen lvels are naturally lower. Approximately 90% of the carbon monoxide in the atmosphere comes from natural sourcs, and the other 10% comes mainly from fires, automobiles and otheer sourcs of incomplt burning of organic compounds. Concntrations of carbon monoxide can build up and cause serious health effects in a localized area. ● Photochemical Oxidants Photochemical oxidants result from atmospheric interactions of nitrogen dioxide and sunlight. The most common photochemical oxidant is ozone (03), a colourless gas with a slightly sweet odor. In addition to ozone, a number of photochemical oxidants known as PANs occur with photochemical smog. Ozone is a form of oxygen in which three atoms of oxygen occur togther rathr than the normal two. Ozone is relatively unstable and reeleases its third oxygen atom readily, so that it oxidizes or burns things more readily and at lower concntrations than does normal oxygen. Ozone is sometimes used to sterilize; for example, bubbling ozone gas

70 through water is a method used to purify water. The ozone is toxic to and kills bacteria and other organisms in the water. When it is realised into the air or produced in the air, ozone may injure living things. Chemically ozone is very active, and it has a very short average lifetime in the air. Because of the effect of sunlight on normal oxygen, ozone forms a natural layer high in the atmosphere (Stratosphere). This ozone layer protects us from harmful ultraviolet radiation from the sun. Ozone is considered a pollutant when present above the National Air Quality Standard threshold concentration of 0.12 ppm in the lower atmosphere, but is beneficial in the stratosphere. The major sources of the chemicals that produce oxidants, and particularly ozone, ate automobiles, fossil fuel burning, and industrial processes that produce nitrogen dioxide. The adverse environmental effects of ozone and other oxidants, as with other pollutants, depend in part on the dose or concentration of exposure and include damage to plants and animals as well as to materials such as rubber, paint and textiles.
The effects of ozone on plants can be subtle. At very low concentrations,
ozone
can reduce growth rates while not producing any visible injury. At higher concentrations, ozone kills leaf tissues, eventually killing entire leaves and
if the pollutant levels remain high, killing whole plants.
Ozone's effect on animals, including man involves various kinds of damage, especially to the eyes and the respiratory system. ●
Hydrocarbons Hydrocarbons are compounds composed of hydrogen and carbon. There are thousands of such compounds, including natural gas or methane (CH 4), butane (CH 4 H 10) and propane (CH 3 H 8). Analysis of urban air has identified manydifferent hydrocarbons, some of which are much more reactive with sunlight: producing photochemical smog) than others. The potential adverse effects of hydrocarbons are numerous: many at a specific dose or concentration are toxic to plants and animals or may be converted to harmful compounds through complex chemical changes that occur in the atmosphere. Over 80% of the hydrocarbons (which are primary pollutants) that enter the atmosphere are emitted from natural sources. The most important anthropogenic source is the automobile.
Hydrocarbons may also escape to the atmosphere when a car's tank is being filled with gasoline or gasoline
or gasoline is spilled and it evaporates. Vapour recovery systems on the hoses that feed the gasoline to the tank are now required in many urban areas and heelping to reduce the problem of hydrocarbons escaping while tanks are being filled.
● Hydrogen Sulfide Hydrogen sulfied (H 2 S) is a highly toxic and corrosive gas, easily identified by its rottenegg odor. Hydrogen sulfide is produced from natural sources, such as geysers, swamps, and bogs, as well as from human sources, such as petroleum refining and metal

71 smelting. The potential effects of hydrogen sulfide include functional damage to plants and health problems ranging from toxicity to death for humans and other animals. ● Hydrogen Fluoride Hydrogen fluoride (HF) is a gaseous pollutant that is released primarily by aluminum production, coal gasification, and the burning of coal in power plants. Hydrogen fluoride is extremely toxic, and even a small concntration (as low as 1 ppb) may cause-problems for plants and animals. ● Other Hazardous Gases It is almost a regular feature that the newspapers carry stories of truck or train accident that releases toxic chemicals in a gaseous form into the atmosphere. In these incidents it is often necessary to evacuate people from the area until the leak is repaired. Chlorine gases are often the culprits, but a variety of other materials used in chemical and agricultural processes may be involved. Another source of air pollution is sewage treatment plants. Urban sewer systems deliver a termendous variety of organic chemicals, including paint thinner, industrial solvents, chloroform and methyl chloride for treatment plants. These materials are not removed in the treatment plants; in fact the treatment processes facilitate the evaporation of the chemicals into the atmosphere, where people may inhale them. Many of the chemicals are toxic or are suspected of causing cancer. It is an alarmingly real fact that treatment plants designed to control water pollution are now becoming sources of air pollution. This situation adds to our understanding that although some pollutants can be moved from one location to another and can even change form (from liquid to gas), we really can not get rid of them as easily as once we thought. Some chemicals are so toxic that extreme care must be taken to ensure that they do not enter the environment. The danger of such chemicals was tragically demonstrated on December 3, 1984, when a toxic chemical (stored in liquid form) at a pesticide plant leaked, vaporized and formed a toxic cloud that settled over a 641 cm2 area of Bhopal in Madhya Pradesh. The gas leak lasted less than one hour, yet over 2,000 people were killed and more than 15,000 were injured by the gas, which causes severe irritation (burns on contact) to eyes, nose, throat and lungs. Breathing the gas, in concentrations of only a few parts per million, causes violent coughing, swelling of the lungs bleeding and death. Exposure to lower concentrations can cause a variety of problems, including loss of sight. ● Paniculate Matter Paniculate matter encompasses the small particles of solid or liquid substances that ate releases in to the atmosphere by many activities. Modern farming adds considerable amounts of particulate matter to the atmosphere, as do desertification and volcanic eruptions. Nearly all industrial processes, as well as the burning of fossil fuels, release

72 pariculate into the atmosphere. Much particulate matter is easily visible as smok, soot or dust; other particulate matter is not easily visible. Included with the particulates are materials such as airborne asbestos particles and small particles of heavy metals, such as arsenic, copper, lead and zinc, which are usually emitted from industrial facilities such as smelters. Of particular importance with reference to particulates are the very fine particle pollutants less than 2.5 Jim in diameter (2.5 millionths of ammeter). Among the most significant of the fine particulate pollutants are sulfurs and nitrates. These are mostly secondary pollutants produced in the atmosphere through chemical reactions between normal atmospheric constituents and sulfur dioxide and gen oxides. These reactions are particularly important in the formation of sulfuric and nitric acids in the atmosphere. When measured, particulate matter is often referred to as total suspended particulates (TSP). Particulates affect human health, ecosystems, and the biosphere profoundly. Particulates that enter the lungs may lodge there and have chronic effects on respiration. Certain materials, such as asbestos, are particularly dangerous in this way. Dust raised byroad building and deposited on the surface of green plants may interfere with their absorptions of carbon dioxide and oxygen and their release of water. Heavy dust may affect th breathing animals. Particulates associated with large construction projects may kill organisms and damage large areas, changing species composition, altering food chains and generally affecting ecosystems. In addition, modem industrial processes have greatly increased the total suspended particulates in the earth's atmosphere. Particulates block sunlight and may cause changes in climate. Such changes have lasting effects on the biosphere. 2.1.3.4 Air Pollution in Urban Areas Wherever there are many sources of air pollutants over a wide area—if we talk about automobile emissions in the great city of Kolkata, mere is a potential for the development of smog. Formation of pollution depends on the topography and on weather conditions, because these factors determine the rate at which pollutants are transported away from their sources and converted to harmless compounds in the air. Influences of weather condition and topography : Weather conditions can determine whether air pollution is a nuisance or a major health problem. The primary adverse effects of air pollution are damage to green plants and aggravation of chronic illness in people; most of these effects are due to relatively low-level concentrations of toxins over a long period of time. In the lower atmosphere, restricted circulation associated with inversion layers may lead to pollution events. An atmospheric inversion occurs when wanner air is found above cooler air, and it poses a particular problem when there is a stagnated air mass. Evaluating meteorological conditions can be extremely helpful in predicting which areas

73 have potential smog problems. Cities situated in a valley or topographic bowl surrounded by mountains are more susceptible to smog problems than are cities in open plains. Surrounding mountains and the occurrence of temperature inversions prevent the pollutants from being transported by winds and weather systems. 2.1.3.5 Factor considered potential for Urban Air Pollution The potential for air pollution in urban areas is determined by the following factors: i) the rate of emission of pollutants per unit area, ii) the distance of downwind tha a mass of air may move through an urban area, iii) the average speed of the wind, and finally iv) the height to which the potential pollutants may be thoroughly mixed in the lower atmosphere. The concentration of pollutants inthe air is directly proportional to the first two factors as entioned above. That is, as either the emission rate or downwind travel distance increases so will the concentration of pollutants inthe air. The Los Angeles basin in the western U.S.A. provides a good example. If there is a wind from the ocean the coastal side of cities such as Santa Monica or Malibu will experience much less air pollution man will the inland side of those cities. Conversely, if there is a Sana Ana wind coming off the desert and down from the mountains the air will be more polluted at the coast. Smog (mixture of smoke and fog): There are two major types of smog: Photochemical smog, which is sometimes called L.A.-type smog, or brown air, and sulfurous smog, which is sometimes referred to as London-type smog, gray air, or' industrial smog. Solar radiation is particularly important in the formation of photochemical smog. The reactions occuring in the development of photochemical smog are complex and involve both nitrogen oxides (NO) and organic compounds (hydrocarbons). The development of photochemical smog is directly related to automobile use. Early in the morning when commuter traffic begins to build up, the concentrations of nitrogen oxide (NO) and hydrocarbons begin to increase, At the same time, the amount of nitrogen dioxide NO2 may decrease, because sunlight breaks it down to NO plus atomic oxygen (NO + 0). The atomic oxygen (0) is then free tocombine with molecular oxygen (02) to form ozone (03), so the con concentration of ozone also increases after sunrise, Shortly thereafter, oxidized hydrocarbons react with NO to increase the concentrations of NO2 by mid morning. This reaction causes the NO concentration to decrease and allows ozone to build up, producing the mi-day peakin ozone and minimum in NO. As the smog matures visibility may be greatly reduced owing to light scattering by aerosols. Sulfurous smog is produced primarily by burning of coal andoil at large power plants. Sulfur oxides and particulartes combine under certain meteorological conditions

74 to produce concentrated sulfurous smog. 2.1.3.6 Controlling Measures of Air Pollution in Urban Areas The optimistic view concerning future air pollution in urban areas is that air quality will improve because we know so much about the sources of air pollution and have developed effective ways to reduce pollution. The pessimistic view, however, is that even though we know a lot about the sources and how to reduce pollution, population pressure and econouiics will dictate what is likely to happen hi many parts of the world, and the result will be poorer air quality (more airpollution) in many locations. The actual situation in the beginning of this 20th century and onwards is likely to be a mixture of the optimistic and pessimistic points of view. Large urban areas in developing countries like India will probably experience a reduction in air quality even as they attempt to improve the situation, because the population and economic factors will likely outweigh pollution abatement Larger urban areas in developed and more affluent countries, however, may well experience improved air quality in thecoming years. A new multifaceted air quality plan involves the entire urban region and includes the following aspects. ● Strategies to discourage automobile use and reduce the number of cars; ● Stricter emission controls for automobiles; ● A requirement for a certain number of zero-pollutant automobiles (electric cars); ● A requirement for gasoline to be reformulated to burn cleaner; ● Improvements in public transportation and incentives for people to use it; ● Mandatory carpooling; and ● Increased controls on industrial activities and household activities that are known to contribute toair pollution. ● Use of clean fuel in cars. ● More use of mass transport. At the household level, for example, common materials such as paints and solvents will be reformulated so that their fumes will cause less air pollution, and eventually there may be a ban on certain equipment', such as gasoline-powered lawn mowers. 2.1.3.7 Condition of air pollution in the Developing Countries Cities in the developing countries with burgeoning populations are particularly susceptible to air pollution now and in the future. They do not have adequate financial base to fight air pollution because they are more concerned with basic survival and finding ways to house and feed their growing populations. A good example is the metropolitan city of kolkata with a present population over 16 millions is the largest

75 urban complex in India next to Mumbai. Cars, buses, trucks, industry and power plants in the Greater Kolkata Metropolitan City emit hundreds of thousands of metric tons of pollutants into the atmosphere each year. It is becoming a rare day, particularly in the drier months of the year, when the stars in the night sky can be seen- clearly, and physicians report that there has been a steady increase in respiratory diseases. Headaches, irritated eyes and sore throats are common when the pollution settles in. 2.13.8 Suggested measures to Control Air Pollution For both stationary and mobile sources of air pollutants, the most reasonable strategies for control have been to reduce, collect, capture or retain pollutants before they enter the atmosphere. From an environmental viewpoint, reduction of emissions via energy efficiency and conservation measures (burning less fuel) is the preferred strategy. Pollution problems vary in different regions of the world; reducing air pollution requires that strategies that is to be specific sources and type of pollutants. 1) Control on emission of Participates : Particulates emitted from fugitive, point or area stationary sources are much easier to control than are the very small particulates of primary or secondary origin released from mobile sources, such as automobiles.

A variety of settlling chambers or collectors are used to control emissions of coarse particulates from power plants and industrial sites

by providing a mechanism that causes particles in gases to settle out in location where they may be collected for disposal in landfills.

Particulates from fugitive sources (such as a waste pile) must be controlled on site so that the wind does not blow them into the atmosphere. 2) Control on Automobile Pollution : Control of pollutants such as carbon monoxide, nitrogen oxides, and hydrocarbons in urban areas is best achieved through pollution- controlled measures for automobiles. Control of these materials will also regulate the ozone in the lower atmosphere, where it forms by reactions with nitrogen oxides and hydrocarbons in the presence of sunlight.

The control of nitrogen oxides from automobile exhausts is accomplished by recalculating exhaust gas, diluting the air-to-fuel mixture being burned in the engine. The dilution reduces the temperature of combustion and decreases the oxygen concentration in

the burning mixture thus producing fewer nitrogen oxides. The most common device used to remove carbon monoxide and hydrocarbon emissions from automobiles is the exhaust system's catalytic coverter. Another approach to reducing urban air pollution produced by vehicles revolves around a

number of options, most of which aim to reduce the number of cars on the roads. 3)

Control on Acid Rain : Acid rain is a particularly troublesome problem because the pollutants that cause it may be emitted long distances—sometimes across national boundaries, from where the actual acid rain falls. The cause of acid precipitation is known. It is known that the only long-term solution involves decreasing emissions of

76 sulfur dioxide and nitrogen oxides. From an environmental point of view the best strategy is increasing energy efficiency and conservation measures that result in burning less coal in power plants and utilizing nonpolluting alternative energy sources. 4) Control on emission of Sulfur dioxide : Sulfur dioxide emissions can be reduced by abatement measures performed before, during or after combustion. The technology to clean up coal so that it will burn cleanly is already available, although the cost of removing th sulfur makes the fuel more expensive. Cleaning from higher-sulfur coal to lower-sulfur coal seems an obvious solution to reducing the emissions of sulfur dioxide into the atmosphere. 2.1.3.9 Laws of Air Pollution Control Clean Air Act Amendments of 1990 are comprehensive regulations that address acid rain, toxic emissions, ozone depletion, and automobile exhaust. In confronting acid deposition (acid rain), the amendments establish limits on the maximum permissible emission of sulfur dioxide from utility companies burning coal. The legislation gave the mandate that the emissions be reduced by about 50% to 10 million tons a year by 2000. Toxic emissions into the atmosphere are targeted to be reduced by as much as 90%. Toxins targted are those thought to have the mosf potential for damaging human health, including cancer. Abatement depends heavily on pollution control equipment that will be required for large manufacturers and small businesses alike. Certainly this requirement would undoubtedly result in an increase in the cost of many goods and services, there should be a compensating improvement in the health of people. Regarding ozone depletion in the atmosphere, the Clean Air Amendments have the goal of ending the production of all chloflurocarbons (CFCs) and other chlorine chemicals in steps from the year 2000 to the year 2030. Airpollution in urban areas is most commonly related to automobile exhaust, Strategis outlined in the legislation include more stringent emission controls on automobiles and requiring cleaner-burning fuels. The aim is to reduce the occurrence the urban smog. Expected impacts of the legislation include increases in the cost of automobile fuels and the price of new automobiles. 2.1.4

Noise Pollution Noise pollution (or Environmental noise) isdispleasing human-, animal- or machine- created sound that disrupts the activity or balance of human or animal life.
A common form of noise pollution is from transportation, principally motor vehicles. The word noise cornes from the Latin word nausea meaning seasickness.
77 The source of most noise worldwide is transportation systems, motor vehicle noise, but also including aircraft noise and rail
noise. Poor urban planning may give rise to noise pollution, since side-by-side industrial and residential buildings can result in noise pollution in the residential
area. Other sources are ear alarms, emergency service sirens, office equipment, factory machinery, construction work, groundskeeping equipment, barking dogs, appliances, power tools, lighting hum, audio entertainment systems, loudspeakers and noisy people. 2.1.4.1 Measurement of Noise Pollution
A decibel is the standard for the measurement of noise. The zero on a decibel scale is at the threshold of hearing, the lowest sound pressure that can be heard,
on the scale. According to Smith, 20
db is whisper, 40 db the noise in a quiet office, 60 db is normal conversation, 80 db is the level at which sound becoms physically painful. The Noise quantum of some of the cities in our country indicate their pitch in dcibel in the noisiest areas of corresponding cities, e.g. Delhi - 80 db, Kolkata-87, Bombay-85, Chenai-89 db etc. Three sources of Noise Pollution :- Noise pollution
like other pollutants is also a byproduct of industrialization, urbanizations and modern civilization.
Boadly speaking, the noise pollution has two courcs, i.e. industrial and non- industrial. The industrial source includes the noise from various industries and big machines working at a vry high speed and high noise intensity. Non-industrial source of noise includes the noise includes the noise created by transport/vhicular traffic and the neighborhood noise. Noise pollution can also be divided in to two categories, namely, natural and manmad. Most leading noise sources will fall into the following categories: roads traffic, aircraft, railroads, construction, industry, noise in buildings, and consumer products. 2.1.4.2 Sources of
Noise Pollution Following are the major sources of noise pollution: 1.
Road Traffic Noise In the city, the main sources of traffic noiseare te motors and exhaustsystem of autos, smaller trucks, buses, and motorcycle. This type of noise can b augmented by narrow streets and tall buildings, which produce a canyon in which traffic noise reverberates 2. Air Craft Nouse Now-a-days, the problem of low flying military aircraft has added a new dimension to community annoyance,
as the nation seeks to improve its nap-of the earth
aircraft operations over national parks, wilderness areas, and other areas previously unaffected by aircraft noise has claimed national attention over recent years.
78 3. Noise from railroads The noise from locomotive engines, horns and whistles, and switching and shunting operation in rail yards can impact neighboring communities amd railroad workers. For example, rail car retarders can produce a high frequency, high level screech that can reach peak levels of 120 dB at a distance of 100 feet,
whicfc translate to levels as high as 138, or 140 dB
at the railroad worker's ear. 4. Construction Noise The noise from the construction of highways, city streets, and building is a major contributor to the urban scene. Construction noise sources include pneumatic hammers, air compressors, bulldozers, loaders, dump trucks (and their back-up signals), and pavement breakers. 5. Noise in Industry Although industrial noise is one of the less prvalent community noise problems, neighbors of noisy manufacturing plants can b disturbed by sources such as fans, motors, and compressors mounted on the outside of buildings Interior noise can also be transmitted to the community through open windows and doors, and even through building walls. These interior noise sources have significant impacts on industrial workrs, among whom noise induced beaming loss is unfortunately common. 6. Noise in building
Apartment dwellers are often annoyed by noise in their homes, especially when the building is not well designed and constructed. In this case,

internal building noise from plumbing, boilers, generators, air conditioners, and fans, can be audible and annoying. Improperly insulated walls and ceilings can reveal the sound of amplified music, voices, footfalls and noisy activities from neighborning units. External noise from emergency vehicles, traffic, refuse collection, and other city noises can be a problem for urban residents, especially when windows are open or insufficiently glazed. 7. Noise from Consumer products Certain household equipment, such as vacuum cleaners and some kitchen appliances have been and continue to be noismakers, although their contribution to the daily noise dose is usually not very large. 4

Harmful Effects On Human Being, Animal and Property : Noise has always been with the human civilization but it was never so obvious, so intense, so varied & so pervasive as it is seen in the last of this century. Noise pollution makes men more irritable. The effect of noise pollution is multifaceted & intr related. The effects of noise pollution on human being, animal and property are as follows :

79 2.1.43 Human health effects of Noise Pollution Noise affects health and behaviour. The unwanted sound is called noise. This unwanted sound can damage physiological and psychological health. Noise pollution can cause annoyance and aggression, hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances, and other harmful effects. Furthermore, stress and hypertension are the leading causes to health problems, whereas tinnitus can lead to forgetfulness, severe depression and at times & panic attacks. Chronic exposure to noise may cause noise-induced hearing loss. Older males exposed to significant occupational noise demonstrate significantly reduced hearing sensitivity than their non-exposed peers, though differences in hearing sensitivity decrease with time and the two groups are indistinguishable by age 79. A comparison of Maaban tribesmen, who were insignificantly exposed to transportation or industrial noise, to a typical U.S. population showed that chronic exposure to moderately high levels of environmental noise contributes to hearing loss. High noise levels can contribute to cardiovascular effects and exposure to moderately high levels during a single eight hour period causes a statistical rise in blood pressure of five to ten points and an increase in stress and vasoconstriction leading to the increased blood pressure noted above as well as to increased indidenceof coronary artery disease. Noise pollution is also a cause of annoyance. A 2005 study by Spanish researchers found that in urban areas households are willing to pay approximately four Euros per decibel per year for noise reduction. 2.1.4.4 Environmental effects Noise can have a detrimental effect on animals by causing stress, increasing risk of mortality by changing the delicate balance in predator/prey detection and avoidance, and by interfering with their use of sounds in communication especially in relation to reproduction and in navigation. Acoustic overexposure can lead to temporary or permanent loss of hearing. An impact of noise on animal life is the reduction of usable habitat that noisy areas may cause, which in the case of endangered species may be part of the path to extinction. One of the best known cases of damage caused by noise pollution is the death of certain species of beached whales, brought on-by the loud sound of military sonar. Noise also makes species communicate louder, which is called Lombard vocal response. Scientists and researchers have conducted experiments that show whales' song length is longer when submarine-detectors are on. If creatures don't "speak" loud enough, their voice will be masked by anthropogenic sounds. These unheard voices might be wanings, finding of prey, or preparations of net-bubbling. When one species begins louder,

80 it will mask other species' voice, causing the whole ecosystem to eventually speak louder. European Robins living in urban environments are more likely to sing at night in places with high levels of noise pollution during the day, suggesting that they sing at night because it is quieter, and their message can propagate through the environment more clearly. Interestingly, the same study showed that daytime noise was a stronger predictor of nocturnal singing than night-time Light pollution, to which the phenomenon is often attributed. Zebra finches become less faithful to their partners when exposed to traffic noise. This could alter a population's evolutionary trajectory by selecting traits, sapping resourcs normally devoted to other activities and thus lead to profound genetic and evolutionary consequences. 2.1.4.5 Mitigation and control of noise Technology to mitigate or remove noise can be applied as follows : There are a variety of strategies for mitigating roadway noise including: use of noise barriers, limitation of vehicle speeds, alteration of roadway surface texture, limitation of heavy vehicles, use of traffic controls that smooth vehicle flow to reduce braking and acceleration, and tyre design. An important factor in applying these strategies is a computer model for roadway noise, that is capable of addressing local topography, meteorology, traffic operations and hypothetical mitigation. Costs of building-in mitigation can be modest, provided these solutions are sought in the planning stage of a roadway project. Aircraft noise can be reduced, to some extent by design of quieter jet engines, which was pursued vigorously in the 1970s and 1980s. This strategy has brought limited but noticeable reduction of urban sound levels. Reconsideration of operations, such as altering flight paths and time of day runway use, have demonstrated benefits for residential populations near airports. FAA sponsored residential retrofit (insulation) programs initiated in the 1970s has also enjoyed success in reducing interior residential noise hi thousands of residences across the United States. Exposure of workers to Industrial noise has been addressed since the 1930s. Changes include redesign of industrial equipment, shock mounting assemblies and physical barriers in the workplace. 2.1.4.6
Legal Control a) Constitution of India Right to life : - Article 21 of the Constitution guarantees life and personal liberty to all persons. It is well settled by repeated pronouncements of the Supreme Court that right to life enshrined in Article 21 is not of mere survival or existence. It guarantees a
81 right of persons to life with human dignity. Any one who wishes to live in peace, comfort and quiet within his house has a right to prevent the noise as pollutant reaching him.
Right to Information :- Every one has the right to information know about the norms and conditions on which Government permit the industry which effect the environment. Right to Religion and Noise :- Right to religion does not include right to perform religious activities on loud speaker and electronic goods which produce high velocity of noise. Directive Principal of State Policy :- The state has the object to make the environment pollution tree. Fundamental Duties :- every citizen of the country has the fundamental duty to keep clean environment b) Cr. P.C. Section 133 Here Section 133 is of great importance. Under Crpc. Section 133 the magisterial court have been empowered to issue order to remove or abate nuisance caused by noise pollution Sec 133 empower an executive magistrate to interfere andremove a public nuisance in the first instance with a conditional order and then with a permanent one. The provision can be utilized in case of nuisance of environment nature. He can adopt immediate measure to prevent danger or injury of a serious land to the public. For prevention of danger to human life, health or safety the magistrate can direct to abstain from certain acts. c) LP.C. Public Nuisance 26S-29S Chapter IV of Indian Penal code deals with offences relating to public health, safety, ...decency, morals under Sections 268, 269, 270, 279, 280, 287, 288, 290, 291, 294. Noise pollution can be penalized with the help of above section. Private remedies suits in the area may related to public nuisance under A299. This article includes punishment in case of Public nuisance law of torts covers. A person is guilty of public nuisance who does any act or is guilty of an illegal omission which causes any common injury, danger, or annoyance to the public or to the people in general who dwell or occupy property in the vicinity or which must necessarily cause injury, obstruction danger or annoyance to persons who may have occasion to use any public right A common nuisance is not excused on the ground that it causes some convenience or advantage. Who ver commits a public nuisance in any case not otherwise punishable by this code, shall be punished with fine, which may extend to Rs. 200/-. d) Law of Torts Noise pollution is considered as civil wrong Under law of torts, a civil suit can be filed claiming damages for the nuisance. For filing a suit under law of torts a plaintiff is required to comply with some of th requirement of tort of nuisance

82 e) Factories Act Reduction of Noise and Oil of Machinery The Factories Act does not contain any specific provision for noise control However, under the Third Schedule Sections 89 and 90 of the Act, noise induced hearing losses mentioned as notifiable disease. Similarly, under the Modal Rules, limits for noise exposure for work zone area have been prescribed. f) Motor Vehicle Act. Provision Relation to use of horn and change of Engine In-Motor vehicle Act, rules regarding use of horns and any modification in engine are made. g) Noise Pollution Control Rule 2000 under Environment Protection Act 1996 Further for better regulation for noise pollution there are The Noise Pollution (Regulation and Control) Rules, 2000 - in order to curb the growing problem of noise pollution the government of India has enacted the noise pollution rules 2000 that includes the following main provisions : ● The state government may categories the areas in the industrial or commercial or residential. ● The ambient air quality standards in respect of noise for different areas have been specified. ● State government shall take measure for abatement of noise including noise emanating from vehicular movement and ensure that the existing noise levels do not exceed the ambient air quality standards specified under these rules. ● Areas not less than 100m around hospitals, educations institutions and court may declare as silence area for the purpose of these rules. ● A loud speaker or a public address system shall not be used except after obtaining written permission from the authority and the same shall not be used at night. Between 10 pm to 6 am. ● A person found violating the provisions as to the maximum noise permissible in any particular area shall be liable to be punished for it as* per the provision of these rules and any other law in force. 2.1.4.7 Conclusions We have made the law relating to noise pollution but there is need to create general awareness towards the hazardous effects of noise pollution. Particularly, in our country the people generally lack consciousness of the ill effects which noise pollution creates and how the society stand to beneficiary preventing generation and emission of noise pollution. The target area should be educational institutions and more particularly school. The young children of impressionable age should be motivated to desist from
83 playing with firecrackers, use of high sound producing equipments and instruments on festivals, religious and social functions, family get-togethers and clebrations etc. which cause noise pollution. Suitable chapters can be added into textbooks, which teach civic sense to the children and teach them how to be good and responsible citizen which would include learning by heart of various fundamental duties and that would obliviously include learning not to create nose pollution and to prevent if generated by others. Holding of specil talks and lectures can be organized in the schdbls to highlight the menace of noise pollution and the role of the children in preventing it For these purpose the state must pay its role by the support and cooperation of non-government organizations (NGOs) can also be enlisted. 2.1.5 Model Questions 1) Describe the sources and ecosystem effects of soil pollution. 2) Discuss the role of pesticides, herbicides and insecticides on soil pollution. 3) Discuss how mining, burial, construction and unplanned waste disposal contribute to soil pollution. 4) Suggest the measures of a clean-up operation and reduction of soil pollution. 5) Describe the categories of water pollution with particular reference to ground water. 6) Identify the different sources and their gravity in water pollution. 7) Discuss the characteristics of mercury, lead and fluoride pollution and their impacts on human health. 8) Suggest the measures to control water pollution. 9) Describe the different sources and types of air pollution. 10) Make a discussion on the major gases and matters contributing to air pollution. 11) Discuss the characteristics of air pollution in urban areas and suggest measures of control. 12) What is noise pollution? How is it measured? Identify the major sources of noise pollution. 13) Discuss the effects of noise pollution on human health and suggest mitigative measures and control of noise pollution. 2.1.6 Select Readings ● Mukhopadhyay A.D., (2003): Perspectives and Issues in Environmental Studies, Vidyasagar University, Medinipur
84 ● Santra S.C., (2001): Environmental Science : New Central Book Agency, Kolkata ● Sharma P.D., (2000) : Ecology and Environment : Restogi Publications, Meerut. ● Environmental Geography - Savindra Singh, (2000) : Prayag Pustak Bhawan, Allahabad ● Frank B. Golly. A Primer for Environmental Literacy : Universities Press, Hyderabad. ● Noise Pollution World Health Organisation Report. ● Karl D. Kryter (1985), The Effects of Noise on Man : Academic Press. ● Hesketh, HE. (1998) : Air Pollution Control, traditional and Hazardous Pollutants: Technomic Publ. Co., Lancaster, U.S.A. ● Kryter, Karl D. San Diego, Calif (1994) : The Handbook of Hearing and the Effects of Noise : Physiology, Psychology, and Public Health, Academic Press, 1994.

85 Unit 2.2 ❑ Conservation of Forests, Wetlands and Biodiversity Structure 2.2.1 Forest Conservation 2.2.2 Watland Conservation 2.2.2.1 Definition of Wetlands 2.2.2.2 Importance of Wetlands 2.2.2.3 Conservation and Management of Wetlands 2.2.3 Biodiversity and Its Conservation 2.2.4 Model Questions 2.2.5 Select Readings 2,2.1 Forest Conservation The word forest was borrowedby Noddle Englshfrom Old Frenchand Medieval Latin foresis, literally meaning "outside". Uses of the word "forest" in English to denote any uninhabited area of non-enclosur are now considered archaic. The word was introduced by th Norman rulers of England as a legal trm (appearing in Latin texts like the Magna Carta) denoting anuncultivatd ara lgally set aside for hunting by feudal nobility. Thes hunting forests were not necessarily wooded land. However, as hunting forests did often include considerable areas of woodland, the word "forest" eventually came to mean wooded land more generally. By the start of the fourteenth century the word appeared in English texts, indicating all three senses : the most common one, the legal term and the archaic usage. The scientific study of forest species and their interaction with the environment is referred to as forest ecology, while the management of forests is often referred to as forestry. Forest management has changed considerably over the last few cnturies, with rapid changes from the 1980s onwards culminating in a practice now referred to as sustainable forest management, Forest ecologists concentrate on forest patterns and processes, usually with the aim of elucidating cause and effect relationships. Foresters who practice sustainable forest management focus on the integration of ecological, social and economic values, often in consultation with local communities and other stakeholders. Anthropogenic factors that can affect forests include logging, human-caused forest fires, acid rain, and introduced species, among other things. There are also many natural

86 factors that can cause changes in forsts over time including forest tires, insects, diseases, weather, competition between species, etc. In 1997, the World Resources Institute recorded that only 20% of the world's original forests remained in large intact tracts of undisturbed forest. More than 75% of these intact forests lie in three countries - the Boreal forests of Russia and Canada and the rainforest of Brazil. In 2006 this information on intact forests was updated using latest available satellite imagery. Natural forests contain mainly natural patterns of biodiversity in established serial patterns, and they contain mainly species nativ to the region and habitat. The natural formations and processes have not been affected by humans with a frequency or intnsity to change the natural structure and components of the habitat. Anthropogenic forests have been created by humans or sufficiently affected by humans to change or remove natural serial patterns. They often contain significant elements of species which were originally from other regions or habitats. 2,2,2 Wetland Conservation 2.2.2.1 Definition of Wetlands In true sense, Wetlands are swamps and marshes formed in low-lying areas but can not be called permanent water bodies. There is much ambiguity about the definition of wetlands. In England, wetlands comprises of large tracts and therefore are synonymous with the name of the region itself like the Fens, Broads, Carrs, Mosses and Levels. Terms such as moors and bogs were often used to describe a particular landscape comprising peat lands and swamps. 2.2.2.2 Importance of Wetlands Wetlands are one of the most productive ecosystems, comparable to tropical evergreen forests in the biosphere and play a significant role in the ecological sustainability of a region. They are an essential part of human civilisation meeting many crucial needs for life on earth such as drinking water, protein production, water purification, energy, fodder, biodiversity, flood storage, transport, recreation, research-education, sinks and climate stabilizers. The values of wetlands though overlapping, like the cultural, economic and ecological factors, are inseparable. The geomorphological, climatic, hydrological and biotic diversity across continents has contributed to wetland diversity. Across the globe, they are getting extinct due to manifold reasons, including anthropogenic and natural processes. Burgeoning population, intensified human activity, unplanned development, absence of management structure, lack of proper legislation, and lack of awareness about the vital role played by these ecosystems (functions, values, etc.) are the important causes that have contributed to their decline and extinction, With these,

87 wetlands are permanently destroyed and lose any potential for rehabilitation. This has led to ecological disasters in some areas, at large-scale devastations due to floods etc. 2.2.2.3 Conservation and Management of Wetlands From the above discussions itcan be realized that with increase in knowledge on wetlands and simultaneous realization that they are rather invaluable to mankin. Thus sonservation and management of wetlands are absolute essential. A range of policies has been adopted depending upon the state of knowledge and the scientific and human capabilities. The UNCED conference on environment and development as well as global conservation organizations, including RAMSAR convention, have identified the aquatic biodiversity tobe the most threatened of all biodiversities. There is, therefore, an urgent and felt need to conserve the aquatic biodiversity including the ecosystem processes. Wetlands cover an area of about 5.5 million ha, of which 1.5 million ha enjoy complete protection and 1.6 million ha partial protection. India being a developing country supporting the second largest population in the world, having mainly agrarian economy, has a significant impact on all natural resources including that of wetlands. It is in this context, an inventory of th important wetlands is essential. The directory of Asian Wetlands (1989) lists 93 Wetlands of International importance in India. Information on the type and extent of wetlands is lacking in India. Hence, this information is a baseline requirement for forming protected area ntwork and conservation. However, so far in India there has been no systematic attempt to evolve conservation prserves analogous to terrestrial protected areas. While many developing countries such as China and south-ast Asian countries have progrssed substantially in formulating an action plan for conserving aquatic biodiversity, similar task of identifying such reserves for India is lacking. While acountry like UK could dsignate 161 Ramsar sites, obviously India beinga mga diverse country will have have many morethan the 20 stes presently identified by the national wetland programme. Such a task is daunting given the size, diversity of India. In this paper, we outline a possible approach for identifying important wtland sites taking into account the trmendous advancs made in spatial technology tools. In particular, we demonstrate how tools of remote sensing and geographic information system combined with an extremely well coordinated and organised field programme could contribute to formation of viable national level wetland conservation and monitoring programme. 2.2.3 Biodiversity and Its Conservation Biotechnology involves the use of all life forms for human welfare. Therefore, extinction of wildspecies and destruction of ecosystms has been a major concern of policy makers and biotechnologists alike. One of the major efforts has been to conduct a survey
88 and conserve country's biodiversity, so as to save, wild plants andanimals from extinction. National parks and sanctuaries have been established in many countries to meet this objective. Undere the auspices of the United Nations also, funds are being established and other efforts being made for conservation of germless at the global level. Biodiversity studies thus include the following : (i) a systematic examination of the full array of organisms on this globe and (ii) a study of the methods by which diversity can be maintained and used for the benefit of mankind. A discussion on biodiversity in a book on biotechnology is relevant, because biodiversity is being utilized to provide genes from wild species for biotechnology exercises. In recent years, a discussion on biodiversity has become important also because countries in the North of the hemisphere (developed countries) have been utilizing biodiversity available in the South (developing countries) without paying any compensation. Several Biodiversity Conventions* were held in 1992 for discussions on measures required to be taken by developing developed countries to preserve the biodiversity at the global level. In this connection the latest Biodiversity Convention was held in May, 1992 at Nairobi to formulate a treaty that was desired to be signed at the UN Conference on Environment and Development (UNCED) later held in Brazil in June 1992. In this treaty, an agreement was sought by the developed countries to allow, as a matter of right, access of every on the germless or biodiversity available anywhere in the world. Since tropical countries are far richer than temperate countries, such a treaty would benefit only the developed nations. In view of this, the South (particularly India) had rejected such a treaty desired to be signed in this convention. Such a rejection was also based on the argument that while the convention was meant to globalize the natural resources, it did not want to globalize the benefit derived from biotechnology inventions. Instead, the developed countries wanted to privatize biotechnology through patents and other intellectual property right (IPR; consult next two chapters for details). Similarly, to the disadvantage of developing poor countries, the concept of Plant Breeder's Rights (PBRs) was recognized in the North ignoring the Farmers' Rights for compensation desired to be given to poor farmers in the developing countries. Although, most countries agree to the need of preserving biodiversity, there is disagreement on the issue of who will pay for it. Ecological Reasons for the need of Biodiversity conservation Individual species and ecosystems have evolved over millions of years into a complex interdependence. This can be viewed as being akin to a vast jigsaw puzzle of inter-locking pieces. If you remove enough of the key pieces on which the framework

89 is based then the whole picture may be in danger of collapsing. We have no idea how many key 'pieces' we can afford to lose before this might happen, nor even in many cases, which are the key pieces. The ecological arguments for conserving biodiversity are therefore based on the premise that we need to preserve biodiversity in order to maintain our own life support systems. Two linked issues which are currently of greeat ecological concern include world- wide deforestation and global climate change. Forests not only harbour untold numbers of different species, but also play a critical role in regulating climate. The destruction of forest, particularly by burning, results in great increases in the amount of carbon in the atmosphere. This happens for two reasons. Firstly, there is a great reduction in the amount .of carbon dioxide taken in by plants for photosynthesis and secondly, burning rleases huge quantities of carbon dioxide into the atmosphere. (The 1997 fires in Indonesia's rain forests are said to have added as much carbon to the atmosphere as all the coal, oil and gasoline burned that year in western Europe.) This is significant because carbon dioxide is one of the main greenhouse gases implicated in the current global warming trend. 2.2.4 Model Questions 1) Examine the need and suggest the measures for forest conservation. 2) Discuss upon the need and management of wetland conservation for maintaining natural and biological ecosystems. 3) Make a discussion on the need and suggested process for Biodiversity conservation 2.2.5 Select Readings ● Mukhopadhyay, A. D. (2003) : Perspectives and Issues in Environmental Stadies, Vidyasagar University, Medinipur. ● Santra, S. C. (2001) : Environmental Science, Nfew Central Book Agency, Kolkata. ● Sharma, P. D. (2000) : Ecology and Environment, Rastogi, Publications, Meerut. ● Singh Savindra (2000) : Environmental Geography, Prayag Pustak Bhawan, Allahabad. ● Frank B. Golly : A Primer for Environmental Literacy. Universities Press, Hyderabad.

90 Unit 2.3 ❑ Important Protocols at the International Level Structure 23.1 Kyoto Protocol 2.3.1.1 Definition and Introduction 2.3.1.2 Objectives 2.3.1.3 Details of the agreement 2.3.1.4 Common but differentiated responsibility 2.3.1.5 Financial commitments 2.3.1.6 Emissions trading 2.3.1.7 Rvisions 2.3.1.8 Enforcement 2.3.2 Montreal Protocol 2.3.2.1 Definition and Introduction 23.2.2 Terms and purposes of this treaty 2.3.2.3 Ratification 2.3.2.4 Impact 2.3.3 Model Questions 2.3.4 Select Readings 2.3.1 Kyoto Protocol 2.3.1.1 Definition and Introduction

The Kyoto Protocol is a protocol to
the United Nations Framework Concention on Climate Change (UNFCCC
or FCCC), an international environmental treaty
with the goal of achieving stabilization of
greenhouse gas concentrations in the atmospher at a level that would prevent dangerous anthropogenic interference with the climate system. The
Kyoto Protocol
establishes legally binding commitment for the
reduction of four greenhouse gases (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride), and two groups of gases (hydrofluorocarbons and perfluorocarbons) produced by "
annex I" (industrialized) nations, as well as general commitments for all member countries. As of
91 January 2009, 1 83 parties have ratified the protocol, which was initially adoptd for use on 11 December 1997 in Kyoto, Japan and which entered into force on 16 Febiuary 2005. Under the Kyoto Protocol, industrialized countries agreed to reduce their collective gren house gas (GHG) emissions by 5.2% from the level in 1990. National limitations range from the
reduction of 8% for the European Union and others to 7% for the United Scales, 6% for Japan, and 0% for Russia. The treaty
permitted the emission incrases of 3% for Australia and 10% for Iceland. Kyoto includes defind "flexible mechanisms" such a;
Emissions Trading, the Clean Development Mechanism and Joint Implementation to allow annex I economies to meet their GHG emission limitations by purchasing GHG emission reductions credits from elsewhere, through financial exchanges, projects that reduce emissions in non-annex I economies, from other annex I countries, or from annex I countries with excess allowances.

In practice this means that non-annex I economies have no GHG emission restrictions, but have financial incentives to develop GHG emission reduction projects to receive “carbon. credits” that can then be sold to annex I buyers, encouraging sustainable development. In addition, the flexible mechanisms allow annex I nations with efficient, low GHG-emitting industries, and high prevailing environmental standards to purchase carbon credits on the world market instead of reducing greenhouse gas emissions domestically. Annex I entities typically will want to acquire carbon credits as cheaply as possible, which non-annex I entities want to maximize the value of carbon credits generated from their domestic Greenhouse Gas Projects.

Among the annex I signatories, all nations have established

Designated National Authorities to manage their greenhouse gas portfolios; countries including Japan, Canada, Italy, the Netherlands, Germany, France, Spain and others are actively promoting government carbon funds, supporting multilateral carbon funds intent on purchasing carbon credits from non-annex I countries, and are working closely with their major utility, energy, oil and gas and chemicals conglomerates to acquire greenhouse gas certificates as cheaply as possible. Virtually all of the non-annex I countries have also established Designated National Authorities to manage the

Kyoto process, specifically the “CDM process” that determines which GHG Projects they wish to propose for accreditation by ifce CDM Executive Board. 23.1.2

Objectives Kyoto is intended to cut global emissions of greenhouse gases. The objective is the stabilization and reconstruction of

greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

Th objective of the Kyoto climate change conference was to establish a legally binding international agreement, whereby all the participating nations commit themselves

92 to tackling the issue of global wanning and greenhouse gas emissions. The target agreed upon was an average reduction of 5,2% from 1990 levels by the year 2012.

The Intergovernmental Panel on Climate Change (IPCC) has predicted an average global rise in temperature of 14°C (2.5°F) to 5.8°C (10.4°F) between 1990 and 2100.

Proponents also note that Kyoto is a first step as requirements to meet the UNFCCC will be modified until the objective is met, as required by UNFCCC Article 4.2 (d). The

treaty was negotiated in Kyoto, Japan in December 1997, opened for signature on 16 March 1998, and closed on 15 March 1999. The agreement came into force on 16 February 2005 following ratification by Russia on 18 November 2004. As of 14 January 2009, a total

of 183 countries and one regional economic organization (the EC) have ratified the agreement (representing over 63.7% of emissions from annex I countries).

According

to

article 25 of the protocol, it enters into force on the ninetieth day after the date on which not less than 55 Parties to the Convention, incorporating Parties included in annex I which accounted in total for at least 55% of the total carbon dioxide emissions for 1990 of the

Parties included in

annex I, have deposited their instruments of ratification, acceptance, approval or accession.

Of the two conditions, the “55 parties” clause was reached on 23 May 2002 when Iceland ratified The ratification by Russia on 18 Novmber 2004 satisfied the 55% clause and brought the treaty into force, effective 16 February 2005. Australian Prime Ministr Kevin Rudd ratified the Kyoto protocol on 3 December 2007. This came into effect after 90 days (the end of March 2008), as is stated in the guidelines set by the United Nations.

The five principal concepts of the Kyoto Protocol are : ● commitments to reduce greenhouse gases that are legally binding for annex I countries, as well as general commitments for all member countries; ● Implementation to meet the Protocol objectives, to prepare policies and measures which reduce greenhouse gases; increasing absorption of these gases and use all mechanisms available, such as joint implementation, clean development mechanism and emissions trading; being rewarded with credits which allow more greenhouse gas emissions at home; ● minimizing impacts on developing countries by establishing an adaptation fund for climate change; ● accounting, reporting and review to ensure the integrity of the Protocol; ● compliance by establishing a compliance committee to enforce

compliance with the commitments under the Protocol. 23.13
Details of the agreement According to a press release from the United Nations Environment Programme :
93 After 10 days of tough negotiations, ministers and other high-level officials from 160 countries reached agreement this morning on a legally binding Protocol under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2%. The agreement aims to lower overall emissions from a group of six greenhouse gases by 2008-12, calculated as an average over these five years. Cuts in the three most important gases -
carbon dioxide (CO 2), methane (CH 4), and nitrous oxide (N 2 O) -
will be measured against a base year of 1990. Cuts in three long-lived industrial gases - hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and Sulphur hexafluoride (SFs) can be measured against either a 1990 or 1995 baseline. National limitations range from 8% reductions for the European Union and others, to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland. The agreement
is an amendment
to
the United Nations Framework Convention on Climate Change (UNFCCC,
adopted at the Earth Summit in Rio de Janeiro
in 1992).
All parties to the
UNFCCC can sign or ratify the Kyoto Protocol, while non-parties to
the
UNFCCC cannot. The Kyoto Protocol was adopted at the third session of the Conference of Parties to the UNFCCC (COP3) in 1997 in Kyoto, Japan. Most provisions of the Kyoto Protocol apply to developed countries, listed in annex I to
the
UNFCCC. Emission figures exclude international aviation and shipping. 23.1.4 Common but differentiated responsibility
The United Nations Framework Convention on Climate Change agreed to a set of a
common but differentiated responsibilities. The parties agreed that: 1. the largest share of historical and current global emissions of greenhouse gases originated in developed countries; 2. per capita emissions in developing countries are still relatively low; 3. the share of global emissions originating in developing countries will grow to meet social and development needs. China, India, and other developing countries were not included in any numerical limitation of the Kyoto Protocol, because they were not main contributors to the greenhouse gas emissions in the pre-treaty industrialization period China has since become the largest, greenhouse gas emitter. However, even without responsibility under the Kyoto target, developing countries were to shar the common responsibility of
the
countries to reduce emissions. The protocol defines a mechanism of compliance as a monitoring compliance with the commitments and penalties for non-compliance.
94 2.3.1.5 Financial commitments The Protocol also reaffirms the principle that developed countries have to pay billions of dollars, and supply technology to other countries for climate-related studies and projects. The principle was originally agreed in
the

UNFCCC. 2.3.1.6 Emissions trading Kyoto provides for a 'cap and trade' system which imposes national caps on the emissions of annex I countries. On average, this cap rquires countries to reduce their emissions 5.2% below their 1990 baseline over the 2008 to 2012 period. Although these caps are national-level commitments, in practice, most countries will evolve their emissions targets to individual industrial entities, such as a power plant or paper factory. One example of a 'cap and trade' system is the EU ETS. Other schemes may follow suit in time. The ultimat buyers of credits are often individual companies that expect emissions to exceed their quota, their assigned allocation units, AAUs or 'allowances' for short. Typically, they win purchase credits direectly from another party with excess allowances, from a broker, from a JI/CDM developer, or on an exchange. National governments, some of whom may not have devolved responsibility for meeting Kyoto obligations to industry, and that have a net deficit of allowances, will buy credits for their own account, mainly from JI/CDM developers. These deals are occasionally done directly through a national fund or agency, as in the case of the Dutch government's ERUPT programme, or via collective funds such as the World Bank's Prototype Carbon Fund (PCF). The PCF, for example, represents a consortium of six governments and 17 major utility and energy companies on whose behalf it purchases credits. Since allowances and carbon credits are tradable instruments with a transparent price, financial investors can buy them on the spot market for speculation purposes, or link them to futures contracts. A high volume of trading in this secondary market helps price discovery and liquidity, and in this way helps to keep down costs and set a clear price signal in COj which helps businesses to plan investments. This market has grown substantially, with banks, brokers, funds, arbitrageurs and private traders now participating in a market valued at about $60 billion in 2007. Emissions Trading PLC, for example, was floated on the London Stock Exchange's AIM market in 2005 with the specific remit of investing in emissions instruments. Although Kyoto created a framework and a set of rules for a global carbon market, there are in practice several distinct schemes or markets in operation today, with varying degrees of linkages among them. Kyoto enables a group of several annex I countries to create a market-within-a-market together. The EU elected to be treated as such a group, and created the EU Emissions Trading Scheme (ETS). The EU ETS uses EAUs (EU Allowance Units), each
95 equivalent to a Kyoto AAU. The scheme went into operation on 1 January 2005, although a forward market has existed since 2003. The
UK established its own learning-by-doing voluntary scheme, die UK ETS, which ran from 2002 through 2006. This market existed alongside the EU's scheme, and participants in the UK scheme have the option of applying to opt out of the first phase of the EU ETS, which lasts through 2007.
The sources of Kyoto credits are the Clean development Mechanism (
COM)
and Joint Implementation (JO) projects. The COM allows the creation of new carbon credits by developing emission reduction projects in non-annex I countries, while JI allows project-specific credits to be converted from existing credits within annex I countries. CDM projects produce Certified Emission Reductions (CERs), and JI projects produce Emission Reduction Units (ERUs), each equivalent to one AAU. Kyoto CERs are also accepted for meeting EUETS obligations, and ERUs will become similarly valid from 2008 for meeting ETS obligations (although individual countries may choose to limit the number and source of CER/JIs they will allow for compliance purposes starting from 2008). CERs/ ERUs are overshelmingly bought from project developers by funds or individual entities rather than being exchange-traded like allowances. Since the creation of Kyoto is subject to a lengthy process of registration and certification by the UNFCCC, and the projects themselves require several years to develop, this market is at this point largely a forward market where purchases are made at a discount to their equivalent currency, the EUA, and are almost always subject to certifications and delivery (although up-front payments are sometimes made). According to IETA, the market value of CDM/JI credits transacted in 2004 was EUR 245 m; it is estimated that more than EUR 620 m worth of credits were transacted in 2005. Several non-Kyoto carbon markets are in existence or being planned, and these are likely to grow in importance and numbers in the coming years. These include the New South Wales Greenhouse Gas Abatement Scheme, the Regional Greenhouse Gas Initiative and Western Climate Initiative in the United States and Canada, the Chicago Climate Exchange and the State of California's recent initiative to reduce emissions. These initiatives taken together may create a series of partly linked markets, rather than a single carbon market The common theme is the adoption of market-based mechanisms centered on carbon credits mat represent a reduction of CO 2 emissions. The fact that some of these initiatives have similar approaches to certifying their credits make it possible that carbon credits in one market may in the long run be tradable in other schemes. The scheme would broaden the current carbon market far more than the current focus on the CDM/ JI and EU ETS domains. An obvious precondition, however,

in
a realignment of penalties and fines to similar levels, since these create an effective ceiling for each market.
96 2.3.1.7 Revisions The protocol left several issues open to be decided later by the sixth Conference of Parties (COP). COP6 attempted to resolve these issues at its meeting in the Hague in late 2000, but was unable to reach an agreement due to disputes between the European Union on the one hand (which favoured atougher agreement) and the Unitd States, Canada, Japan and Australia on the other (which wanted the agreement to be less demanding and mor flexible). In 2001, a continuation of the previous meeting (COP6) was held in Bonn where the required decisions were adopted. After some concessions, the supporters of the protocol (led by the European Union) managed to get Japan and Russia in as well by allowing more use of carbon dioxide sinks. COP7 was held from 29 October 2001 through 9 November 2001 in Marrakech to establish the final details
of the protocol. The first Meeting of the Parties to the Kyoto Protocol (MOP1) was held in Montreal from 28 Nobember to 9 December 2005, along with the 11th conference of the Parties to the
UNFCCC (COP11).
See United Nations Climate Change Conference. The 3 rd
December 2007, Australia ratified the protocol during the first day of the COPlSinBali. Of the signatories, 36 developed C.G. countries (plus the EU as a party in the European Union) agreed to a 10% emissions increase for Iceland; but, since the EU's member states each have individual obligations, much larger increases (up to 27%) are allowed for some of the less developed EU countries. 23.1.8 Enforcement If the enforcement branch determines that an annex I country is not in compliance with its emissions limitation, then that country is required to make up the difference plus an additional 30%. In addition, that country will be suspended from making transfers under an emissions trading program. 2.3.2
Montreal Protocol 23.2.1 Definition and Introduction
The Montreal Protocol on Substances that Deplete the Ozone Layer (
a protocol to the Vienna Convention for the Protection of the Ozone Layer)
is an international treaty designed
to protect the ozone layer by phasing out the production of
a number of substances
believed to be responsible for ozone depletion.
The treaty was opened for signature on September 16,1987 and enterd into force on January 1,1989 followed by
a first meeting in Helsinki, May 1989. Since then, it has undergone seven revisions, in
97 1990 (London), 1991 (Nairobi), 1992 (Copenhagen), 1993 (Bangkok), 1995 (Vienna), 1997 (Montreal),
and 1999 (Beijing). It is believed that if the international agreement is adhered to,
the ozone layer is expected to recover by 2050. Due to its widespread adoption and implementation it has been hailed as an example of exceptional international co-operation
with Kofi Annan quoted as saying that perhaps the single most successful international agreement to date has been the Montreal Protocol. 2.3.2.2
Terms and purposes of this treaty The treaty is structured around several groups of halogenated hydrocarbons that have been shown to play a role in ozone depletion. All of these ozone depleting substances contain either chlorine or bromine (substances containing only fluorine do not harm the ozone layer). For
a table of ozone-depleting substances see:
For each group, the treaty provides a timetable on which the production of those substances must be phased out and eventually eliminated. ● Chlorofluorocarbons (CFCs) Phase-out Management Plan The stated purpose of the treaty is mat the signatory states recognizing that worldwide emissions of certain substances can significantly deplete and otherwise modify the Ozone layer in a manner that is likely to result in adverse effects on human health and the environment
This trteaty is
determined to protect the ozone layer by taking precautionary measures to control equitably total global emissions of substances that deplete it, with the ultimate objective of their elimination on the basis of developments in scientific knowledge. It has acknowledged that special provision is required to meet the needs of developing countries
and

shall accept a series of stepped limits on CFC use and production, including: from 1991 to 1992 its levels of consumption and production of the controlled substances in Group I of Annex A do not exceed 150 percent of its calculated levels of production and consumption of those substances in 1986; from 1994 its calculated level of consumption and production of the controlled substances in Group I of Annex A does not exceed, annually, twenty-five percent of its calculated level of consumption and production in 1986, from 1996 its calculated level of consumption and production of the controlled substances in Group I of Annex A does not exceed zero. There is a slower phase-out (to zero by 2010) of other substances (halon 1211,1301, 2402; CFCs 13, 111, 112, etc) and some chemicals get individual attention (Carbon tetrachloride; 1,1,1- trichloroethane). The phasing-out of the less active HCFCs started only in 1996 and will go on until a complete phasing-out is achieved in 2030. ● Hydrochlorofluorocarbons (HCFCs) Phase-out Managment Plan (HPMP)
Under
the Montreal Protocol on Substances that Deplete the Ozone Layer,
expecially Executive Committee (ExCom) 53/37 and ExCom 54/39, Parties to this Protocol
agreed to set year 2013 as the time to freeze the consumption and production of HCFCs.
They
98 also agreed to start reducing its consumption and production in 2015. 'Hie time of freezing and reducing HCFCs is then known as 2013/2015.
The HCFCs are transitional CFCs replacements, used as refrigerants, solvents, blowing agents for plastic foam manufacture, and fire extinguishers.
In trem of Ozone Depleting Potential (OOP), in comparison to CFCs that have ODP 0.6 - 1.0, these HCFCs ODP have less OPD, i.e. 0.01 - 0.5. Whereas in term of Global Wanning Potential (GWP), in comparison to CFCs that have GWP 4,680-10,720, HCFCs have less GWP, i.e. 76 -2,270. There are a few exceptions for essential uses, where no acceptable substitutes have been
found (for example, in the metered dose inhalers commonly used to treat asthma and other respiratory problems) or "Halon fire suppression systems used in submarines and aircraft (but not in general industry).
The
provisions of the Protocol include the requirement that the Parties to the Protocol base their future decisions on the current scientific, environmental, technical, and economic information mat is assessed through panels drawn from the worldwide expert communities. To provide that input to the dcision making process, advances in understanding on these topics were assessed in 1989,1991,1994,1998 and 2002 in a series of reports entitled Scientific assessment of ozone depletion. Several reports have fcfeen published by various governmental and non-governmental organizations to present alternatives to the ozone depleting substances* since the substances have been used in various technical sectors, like in refrigerating, agriculture, energy production, and laboratory measurements. 2.3.2.3
Ratification At present, 195 of 196 United Nations member states have ratified the original Montreal Protocol (see external link below). That one that has not as of April 2009 is Timor-Leste.
Fewer countries have ratified each consecutive amendment Only 154 countries have signed the Beijing Amendment. In the United States, the Clean Air Act Amendments of 1990 (P.L. 101-549) contain provisions for implementing the Montreal Protocol, as well as explicit, separate authority for the EPA to regulate ozone depleting chemicals. 2.3.2.4
Impact Since the Montreal Protocol came into effect, the atmospheric concentrations of the most important chlorofluorocarbons and related chlorinated hydrocarbons have either leveled off or decreased. Halon concentrations have continued to increase, as the halons presently stored in fire extinguishers are released, but their rate of increase has slowed and their abundances are expected to begin to decline by about 2020. Also, the concentration of the HCFCs increased drastically at least partly because for many uses CFCs (e.g. used
99 as solvents or refrigerating agents) were substituted with HCFCs. While there have been reports.of attempts by individuals to circumvent the ban, e.g. by smuggling CFCs from undeveloped to developed nations, the4overall level of compliance has been high. In consequence, the Montreal Protocol has often been called the most successful international environmental agreement to date. In a 2001 report, NASA found the ozone thinning over Antarctica had remained the same thickness for the previous three years. However, in 2003 the Ozone hole grew to its second largest size. The most recent (2006) scientific evaluation of the effects of the Montreal Protocol states. The Montreal Protocol is working. There is clear evidence of a decrease in the atmospheric burden of ozone-depleting substances and some early signs of stratospheric ozone recovery. Unfortunately, the hydrochlorofluorocarbons, or HCFCs, and hydrofluorocarbons, of

HFCs, are now thought to contribute to anthropogenic global warming. On a molecule-for- molecule basis, these compounds are up to 10,000 times more potent greenhouse gases than carbon dioxide. The Montreal Protocol currently calls for a complete phase-out of HCFCs by 2030, but does not place any restriction on HFCs. Since the CFCs themselves are equally powerful as greenhouse gases, the mere substitution of HFCs for CFCs does not significantly increase the rate of anthropogenic global warming, but over time a steady increase in their use could increase the danger that human activity will change the climate. 2.3.3
Model Questions 1) Discuss the main theme and objectives of Kyoto Protocol. 2) Account for the details of agreement reached under the Kyoto Protocol. 3) What is the main theme of Montreal Protocol? Examine the terms and purposes of Montreal Protocol. 2.3.4 Select Readings ● Mukhopadhyay, A. D. (2003): Perspectives and Issues in Environmental Stadies, Vidyasagar University, Medinipur. ● Santra, S. C. (2001): Environmental Science, New Central Book Agency, Kolkata. ● Sharma, P. D. (2000): Ecology and Environment, Rastogi, Publications, Meerat ● Singh Savindra (2000): Environmental Geography, Prayag Pustak Bhawan, Allahabad. ● Frank B. Golly : A Primer for Environmental Literacy. Universities Press, Hyderabad
100 Unit 2.4 ❑ Environmental Impacts of Big Dams and Urban-Industrial Expansion Structure 2.4.1 Environmental Impacts of Big Dams 2.4.1.1 Introduction 2.4.1.2 Benefits of big dams 2.4.1.3 Environmental Impacts of Big Dams 2.4.1.4 Political Impacts of Big Dams 2.4.2 Environmental Impacts o Hi ban-Industrial Expansion 2.4.2.1 Introduction 2.4.2.2 Possible environmental problems with the Urban-industrial expansion 2.4.2.3 Surface water resources 2.4.2.4 Ground Water 2.4.2.5 The urban atmospher? 2.4.2.6 Garbage 2.4.2.7 Hazards and Catastrophes 2.4.3 Model Questions 2.4.4 Select Readings 2.4.1 Environmental Impacts of Big Dams 2.4.1.1 Introduction The main purposes for which big dams are constructed upon major rivers are: 1) to control flood and ensure perennial supply of water for irrigation in agriculture an 2) to generate hydroelectricity for industrial and domestic purposes. People have constructed dams to harness water resources for at least 5,000 years. The most active phase of large dam construction, defined by the International Commission on Large Dams as structures above 15 m in height, was in the 1950s, 1960s and early 1970s, when 373 dams were completed each year. At the end of 1960, there were 7,408 such dams registered. By 1986, the total had reached 36,562. Of those constructed, 64 per cent were in Asia, with no less than half of the would total in China.
101 Excluding China, most of the new structures have been built in the temperate zone, but tropical and subtropical countries such as Brazil, Mexico, India, Thailand, Indonesia, Zimbabwe, Nigeria, Cote d'Ivoire and Venezuela have also become prominent in dam construction. Seventy-nine per cent of these dams are less than 30m in height, and only 4 per cent exceed 60m. 2.4.1.2 Benefits of big dams There is no doubt mat many big dam schemes have been successful in achieving their primary objectives. Egypt's Aswan High Dam, completed in 1970, illustrates some of the benefits of big dam construction. Hydroelectricity generated by the dam, a renewable energy source which does not produce any harmful atmospheric pollution, is cheap to operate after the initially high capital costs of dam construction and saves on the purchase of fossil fuels from abroad. Hie Aswan High Dam generates about 20 per cent of Egypt's electricity. The natural discharge of the Nile is subject to wide seasonal variations, with about 80 per cent of the annual total received during the flood season from August to October, and marked high and low flows depending upon climatic conditions in the main catchment area in the Ethiopian highlands. The dam allows management of the flow of the Nile's discharge, evening out the annual flow below the dam and protecting against floods and droughts. Management of the Nile's flow has also had benefits for navigation and tourism, rsulting from the stability of water levels in the river's course and navigation channels. Irrigation water for cropland is also provided by the dam's reservoir storage, which has allowed 400000 hectares of cropland to convert from seasonal to perennial irrigation and the expansion of agriculture onto 490000 ha of new land, a particularly important aspect for a largely hyper-arid country with just 3 per cent of its national area suitable for cultivation. Large dams are often seen as symbols of economic advancement and national prestige for many developing nations but the huge initial capital outlay needed for construction often means that agendas are set to varying extents by foreign interests. A key element in the financing of Ghana's Akosombo Dam, completed in 1965, was the sale of cheap electricity to die Volta Aluminium Company, a consortium with two US- owned companies that produces aluminium from imported alumina, despite the fact that Ghana has considerable reserves of alumina of her' own. The construction of the Cahora Bassa Dam in Mozambique in the 1970s, when the country was still a Portuguese colony, was also largely catering to outside interests. Most of the electricity is sold to South African industry, and part of the original reason for flooding the 250 km-long Lake Cahora Bassa was to establish a physical barrier against Frelimo guerillas seeking independence. The plan for the dam also envisaged the settlement of up to 1 million white farmers in the region, who, it was thought, would fight to protect their new lands.

102 Within the country, too, concerns have often been raised about the main benefits of a new dam being directed towards urban areas. Wall (1988) points out that although the Bayano Hydroelectric Complex in Panama provides 30 per cent of the country's electricity; no less than 83 per cent of national production is consumed in Panama City and Colon, so that the dam is reinforcing the concentration of wealth in the urban areas. Hence, it is clear that the undoubted benefits of big dams are not always gained solely by the country where the dam is located, and that within the country concerned, the demands of urban populations can outweigh those of rural areas. Many of the drawbacks of such structures, however, are borne by the rural people of the country concerned. Despite the success of many big dams in achieving their main economic- aims, their construction and associated reservoirs create significant changes in the pre-existing environment, and many of these changes have proved to be detrimental. It is the negative side of environmental impacts that have pushed the issue of big dams to a prominent position in the eyes of environmentalists and many other interest groups. 2.4.13 Environmental Impacts of Big Dams The environmental impacts of big dams and their associated reservoirs are numerous, and environmental scientists have outlined the main areas that they influence (Table 1). Table 1 : Areas of influence of dam and reservoir projects Serial Aspects 1. The catchments contributing to the reservoir or project area and the area below the dam to the estuary, coastal zone and offshore 2. All ancillary aspects of the project such as power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas and construction camps, as well as unplanned developments stimulated by the project (e.g. logging or shifting cultivation along access roads') 3. Off-site areas required for resettlement or compensatory tracts 4. The air-shed, such as where air pollution may enter or leave the area of influence 5. Migratory routes of humans, wildlife or fish, particularly where they relate to public heath, economics, or environmental conservation Scarce : Goodland (1990) The temporal aspect of environmental impacts within a certain area is also important The river basin itself can be thought of as a system which will respond to a major change, such as the construction of a dam, in many different ways and on a variety of timescales. While the creation of a reservoir creates an immediate environmental change,

103 the permanent inundation of an area not previously covered in water, the resulting changes in other aspects of the river basin, such as floral and faunal communities, and soil erosion, will take a longer time to readjust to the new conditions. The range of environmental impacts consequent upon dam construction, and their effects on human communities, can be considered under the following three headings which reflect the broad spatial regions associated with any dam project : a) the dam and its reservoir; b) the upstream area; and c) the downstream area. i) The Dam and its Reservoir The creation of a reservoir results in the loss of resources in the land area inundated. Flooding behind the Balbina Dam north of Manaus, Brazil has destroyed much of a centre of plant endemism. In some cases the loss of wilderness areas threatened by new dam projects has raised considerable debate, both nationally and internationally. A case in point was the Nam Choan Dam Project on the Kwae Yai River in western Thailand, first proposed in 1982. The proposed reservoir lay largely within the Thung Yai Wildlife Sanctuary; one of the largest remaining relatively undisturbed forest areas in Thailand, containing all six of the nation's endangered mammal species. Debate over the destructive impact of the project resulted in it being shelved indefinitely in 1988. Some resources, such as trees for timber or fuel wood, can be taken from the reservoir site prior to inundation, although this is not always economically feasible in remote regions. There are dangers inherent in not removing them, however. Anaerobic decomposition of submerged forests produces hydrogen sulphide which is toxic to fish and corrodes metal that comes into contact with the water. Corrosion of turbines in Surinam's Brakopondo reservoir has been a serious problem. In a similar vein, decomposition of organic matter by bcteria in the La Grande 2 reservoir in Quebec, Canada has released large quantitis of mercury by methylation. Mercury has bioaccumulated in reservoir fish tissue to levels often exceeding the Canadian standard for edible fish of 0.5 mg/kg. Cultural property may also be lost by the creation of a reservoir twenty-four archaeological sites dating from 70-1000 AD were inundated by the Tucurui Dam reservoir in Brazil, for example - although in some cases such property is deemed important enough to be preserved. Lake Nasser submerged some ancient Egyptian monuments but major ones - including the temples of Abu Simbel, Kalabsha and Philae were moved to higher ground prior to flooding. Big dams often necessitate resettlement programmes if there are inhabitants of the area to be inundated, and the numbers of people involved can be very large. Some of the biggest projects in this respect have been in China. The Sanmen Gorge Project on the Huang Ho River involved moving 300,000 people and the proposed Three Gorges Dam on the Yangtze River may involve the displacement of up to 1.2 million people. Some

104 indication of the trade-off between land lost, people displaced and power generated is indicated in Table 2 for a selection of big dam projects. Table 2; Hydel power generated per hectare inundated, and mimbr of people displaced for selected big dam projects in the world Projects and Approx rated Normal area of Kilowatts per People relocated country capacity (MW) Reservoir (ha) hectare Pehuenchi (Chile) 500 400 1250 Guavio (Columbia) 1,600 1,500 1067 Itaipu (Brazil & Paragua 12,600 1,35,000 93 8,000 families Syaonogorsk (Russia) 6,400 80,000 80 Churchill Falls (Canada) 5,225 66,500 79 Tarbela (Pakistan) 1,750 24,300 72 86,000 Grand Cuelee (USA) 2,025 32,400 63 Tucurui (Brazil) 6,480 2,16000 30 30,000 Keban (Turkey) 1,360 67,500 20 30,000 Three Gorges (China) 13,000 1,10,000 12 1,300,000 Batang Ai (Sarawak, Borneo) 92 8,500 11 3,000 Cahora Bassa (Mozambique) 2,075 2,66,000 8 25,000 Aswan High Dam (Egypt) 2,100 40,000 5 1,00,000 BHA (Panama) 150 35,000 4 4,000 Kariba (Zimbabwe & Zambia) 1,500 5,10,000 3 50,000 Akosombo (Ghana) 833 8,48,000 09 80,000 Brokopondo (Surinam) 30 1,50.000 02 50,000 Source: Barrow (1981), Goldsmith A Hildyard (1984), Wall (1988), Dixon et.ai (1089) A Goodland (1990) For people who are displaced, the move can be a traumatic one. The resettlement of 57000 members of the Tonga tribe from the area of the Kariba Dam on the Zambezi illustrates some of the adverse effects for the people concerned. Some scientists describe the culture shock suffered in moving to very different communities and environments. Drawn-out conflicts over land tenure resulted between the new settlers and previous residents, and since the resettlement area was drier than the Tongan homelands, problems with planting and the timing of harvests were faced. Deprived of fish and riverbank rodents which traditionally supplemented their cultivated diet, the Tongas faced severe food shortages. When the government sent food aid to relieve the suffering, the food distribution centres became transmission sites for trypanosomiasis. Development following the construction of big dams can also act as a pull for migrants, bringing associated problems of pressure on local resources. The influx of migrants to the Aswan area has led to an increase in population from 2,80,000 in 1960 in 1960 to more, than 1 million by the late 1980s, mainly due to the increase in job opportunities.

105 Over the longer term, other effects of reservoir inundation become evident. The alteration of the environment can have significant impacts on local health conditions. In some cases these can be beneficial. Onchocerciasis or river blindness, for example, a disease which is common hi Africa, is caused by a small worm transmitted by a species of blackfly. The blackflies breed in fast-running, well-oxygenated waters and dam construction can reduce the number of breeding sites by flooding rapids upstream. This has been the case in Ghana's Akosombo and Nigeria's Kainji dams although the flies may find alternative breeding sites hi new tributary streams. Malaria, conversely, is likely to increase as a result of water impoundment, since the mosquitoes which transmit the disease breed in standing waters. Local malaria incidence has increased around Tucurui, Brazil, although management by fluctuating water levels and stranding larvae can help as in the USA's Tennessee Valley Authority water management complex. Schistosomiasis, also known as bilhania, a very debilitating though rarely fatal disease which is widespread throughout the Third World, is transmitted in a different way: by parasitic larvae that infect a certain aquatic snail species as the intermediate host Incidence of schistosomiasis was considerably increased by the construction of the Akosombo Dam, with infection rates among 5-19 year old children rising from 15 per cent to 90 per cent within 4 years of its completion. Similar figures have been repelled from other large dams, such as Kariba hi Zambia. Other biological consequences of large reservoirs include the rapid spread of water- weeds that cause hazards to navigation and a number of secondary impacts, notably water losses through evapo-transpiration. Water-fern appeared hi Lake Kariba 6 months after the dam was closed and after 2 years had covered 10 per cent of the 420 km 2 lake area. More dramatic still was the spread of water hyacinth on Surinam's Brokopondo reservoir, which covered 50 per cent of the lake's surface within 2 years. Similar serious difficulties have been encountered at Aswan and Pa Mong in Viet Nam. New reservoirs also have effects on geomorphological and, in some cases, tectonic processes. The trapping of sediment is a particularly important aspect of reservoir impoundment The siltation of reservoirs has a number of knock-on effects downstream of the dam (see below), but it can also seriously affect the useful life of the dam itself. Some examples of sedimentation rates in Chinese reservoirs are shown in Table 3. An extreme example of rapid sedimentation behind a dam is provided by China's Sanmenxia reservoir. River impoundment began in I960, but within just 7.5 years of operation the reservoir had lost 35 per cent of its total storage capacity of 9,700 million m 3 due to sedimentation.

106 Table 3: Rate of sedimentation in some Chinese reservoirs Name of Reservoir Name of River Total amount of Period of Storage lost sediment deposited record (years) (%) (million m 3) Sanmeroda Huang Ho 3391 7.5 35 Quingtongxia Huang Ho 527 5 84 Yanguoxia Huang Ho 150 4 68 Liujiaxia Huang Ho 522 8 11 Darjiangkou Hangsuui 625 15 4 Guanting Yongdinghe 553 24 24 Hongshan Laohe 440 15 17 Gangnan Hutuobe 185 17 12 Xingqiao Hongliuhe 156 14 71 Source : Biswas (1990) A wide range of techniques is available for reservoir de-siltation, the cost of which needs to be budgeted for. Scientists have document the case of the Sefid-Rud reservoir in northwestern Iran which lost over 30 per cent of its storage capacity in the first 17 years after construction. Desiltation successfully restored about seven per cent of total capacity in seven years, but the reservoir had tobe emptied during the non-irrigation season to enable sediment flushing. Emptying the reservoir released a highly erosive flow downstream of the dam and hydroelectricity generation was prevented during the operation. Local heightening of water tables following reservoir impoundment can have deleterious affects .on new irrigation schemes through water logging and salinisation. Water logging is an occasional problem around the Kuban reservoir on the River Kuban, near Krasnodar in southern Russia, when the reservoir is filled above its maximum normal level to aid navigation and benefit rice cultivation. The result has been the ruin of over 100,000 ha of crops, and water damage to 130 communities, including 27,000 homes, 150 km of roads and even the Krasnodar airport. Local changes in groundwater conditions have also affected slope stability, causing landslides around some reservoirs. Water displaced by a landslip at the Vaiont Dam in Italy in 1963 overtopped the dam, killing more than 2,000 people in the resulting disaster. The sheer size of some reservoirs can also create new gee-morphological processes. Artificial lakes behind dams on the Volga River are so large that storms can produce ocean-like wavs which easily erode the fine wind-blown soils lining the shores. When this process undercuts trees, or creates shoals, navigational hazards result. The stress changes on crustal rocks induced by huge volumes of water impounded behind major dams have been suspected of inducing earthquakes in some regions. Nurek Dam on the Vakhish River in central Tajikistan is the best-documented example of a

107 large dam, in this case a 315-m-high earth dam, causing seismic activity. Filling of the dam, located in a thrust-faulted setting, began in 1967 and substantial increass in water level were mirrored by significant increases in earthquakes per quarter (3 months) during the first 8 years of the dam's lifetime. The reservoirs behind the Hoover Dam in the USA and Canada's Manic 3 have also induced local seismic activity, although earthquake incidents suspected to have been caused by other big dams, such as those at the Kenya Dam near Bombay in India, Egypt's Aswan High Dam, and at the Kurobe Dam on Honshu Island, Japan are unlikely to be due to reservoir-induced stresses. The creation of new water bodies with large surface areas is thought by many to affect local climate. Tharth and Tarn (1990) suggest that Lake Volta has shifted the peak rainfall season in central Ghana from October to July/August, for example, but few monitoring programmes have proved such effects conclusively, to date. Changes in th local temperature regime have, however been observed at the 45,000 ha Rybinsk reservoir north of Moscow in Russia, where the frost-free period has been extended by 5-15 days per year on average in an area of influence that extends for 10 km around the reservoir's shoreline. Evaporation from reservoir surfaces may affect local humidity and the incidence of fog has been observed to rise in some areas. ii) The upstream area A variety of upstream impacts can be induced or, exacerbated by big dam projects. Some of these, hi turn, may impact the dam project itself. Notable in this respect is the improved access to previously remote areas. Deforestation in the watershed above the Ambukloo Dam in the Philippines has led to sedimentation of the reservoir, reducing its useful life from 60 years to 32 years (UNEP, 1989b). Conversely, afforestation of catchments above dams has been carried out in many areas specifically to limit sediment accumulaton in reservoirs. In the UK, for example, many water authorities have bought land in upper catchments to plant new forests. Hi) The downstream area Downstream of a reservoir, hydrological regime of a river is modified. Discharge, velocity, water quality and thermal characteristics are all affected leading to changes in geomorphology, flora and fauna, both on the river itself and in estuarine and marine environments. The trapping of sediment behind dams leads to reduced loads in the river downstream. The resulting flow downstream of the dam is highly erosive, with degradation of the bed and banks observed 480 km below the dam at Xiantao. Similar effects on the River Nile have been noted, downstream of the Aswan High Dam, and the lack of silt arriving at the Nile delta has had effects on coastal erosion,

108 salinisation through marine intrusion and a decline in the eastern Mediterranean sardine catch. Expected further changes due to these factors are also shown, To some extent the loss of fisheries off the Nile delta has been offset by a new fishing industry in Lake Nasseiv which has provided employment to 7,000 fishermen. Downstream changes in salinity due to construction of the Cahora Bassa Dam in Mozambique are also threatening mangrove forests at the mouth of the Zambezi. Mangroves provide the breeding grounds for prawn and shrimp, amajor source of foreign currency, but strategic water release from the dam could be used to offset the possible deleterious effects on shrimp and prawn catches. The absolute reduction in volumes of flow following dam construction also affects the ecology of downstream seas, as the example of the Black Sea illustrates well. Dam can also affect marine and lake fish populations through the barrier they create which effectively cuts off access to spawning grounds. This effect has been evident on salmon and aloses in the River Garonne and its tributaries in southwestern France since the middle Ages. In the twentieth century, decline in the landed catches of Caspian Sea sturgeon, a source of caviar, from 40,000 tons early this century to just 11,000 tons in the 1970s, is attributable primarily to large hydroelectric dams on the Volga and the consequent loss of spawning grounds. However, catches had largely recovered to pre-dam levels in the 1980s with the establishment of new sturgeon farms on the Caspian shores. 2.4.1.4 Political Impacts of Big Dams Increasing public awareness of the environmental and social implications of big dams has generated some heated debates in recent years, in some cases leading to the shelving of construction plans. The Nam Choan Dam. Project in Thailand has been mentioned in this, respect. Another example is the Tasmanian Franklin River Project which was stopped on environmental grounds in 1983. India's Narmada and Tehri Dams and the Chinese Three Gorges Project have also come under severe criticism over their anticipated impacts. In such cases, the obvious benefits of dam construction must be carefully weighed against the costs measured in environmental and social terms, and the potential impacts predicted and ameliorated by sensible planning. There is little doubt that many of the adverse impacts of dams can be reduced greatly by good planning and anticipation, and aid agencies that finance such projects now require an Environmental Impact Assessment before approval of funding is given. Progress has also been made in the widening scope given to consultation prior to dam construction. Nevertheless a sensible operating schedule is also a key factor - many of the problems caused by dams are the result of operators aiming to maximise water use, through releases for hydroelectricity generation and irrigation, for example, to such an extent that other concerns are given too little consideration. The building of dams on rivers flowing through more than one country brings

109 international political considerations onto the agenda of big dam issues. Such considerations are particularly pertinent in dry land regions where rivers represent a high percentage of water availability to many countries. The main issues at stake here are those of water availability and quality. In several international river basins, peaceful cooperation over the use of waters has been achieved through international agreement. One such agreement, between the USA and Mexico over use of the Rio Grande, was signed in 1944 and is operated by the International Boundary and Water Commission. This body ensures equal allocation of the annual averapv flow between the two countries. In other international basins, such as the Tigris-Euphrates in the Middle East, the lack of agreement represents a significant potential for conflict While there is currently a water surplus hi this region, the scale of planned developments raises some concern. Turkey's Southeastern Anatolian Project, a regional development scheme on the headwaters of the two rivers, centres on twenty-two dams. In early 1990, when tilling of the Afamnt Dam reservoir commenced, stemming the flow of the Euphrates, immediate alarm was expressed by Syria and Iraq, despite the fact mat governments in both countries had been alerted and discharge before the cut-off had been enhanced in compensation. Syria and Iraq nearly went to war when Syria was filling its Euphrates Dam. Full development of the Southestern Anatolian Project could reduce the flow of the Euphrates by as much as 60 per cent, which could severely jeopardise Syrian and Iraqi agriculture downstream. The three Tigris- Euphrates riparian have tried to reach agreements over the water use from these two rivers, and the need for such an agreement is becoming ever more pressing. 2,4.2 Environmental Impacts of Urban-Industrial Expansion 2.4.2.1 Introduction Large numbers of people have lived in close proximity to each other in cities for thousands of years. The first urban cultures began todevelop about 5,000 years ago in Egypt, Mesopotamia and India, but the size of cities and their geographical distribution expanded dramatically after the Industrial Revolution in the present millennium. The growth rates of cities in recent decades have been unprecedented. In 1970, four world cities had a population of more than 10 million people; by the year 2010 there will be mor than 30 such cities. While there were thirty-five cities of greater than 3 million people in 1970, by 2020 that total will cross 100 by which time 60 per cent of the world's population will be living in urban areas. Many cities in the developed world, such as New York and London, will have grown little in the last 30-50 years of the prsent century, but cities in the industrialising world show remarkable growth over the same period. Estimates indicate that the populations of Mexico City, Sao Paulo, Karachi and Seoul will have grown by

110 more than 800 per cent in the second half of the twentieth century. The phenomenal growth of some cities, and the high concentrations of people they represent (the urban density of Mexico City in 1980 was 14 082 people/km 2), has created some acute environmental problems both outside and within the city limits. Fig. 1: Population growth pattern of 20 mega-cities in 1950,1970,1990 and 2000 (From UN Report) 2.4.2.2 Possible environmental problems with the Urban-industrial expansion Cities represent a completely artificial environment; they absorb vast quantities of resources from surrounding areas and create high concentrations of wastes to be disposed of. The degree to which cities impinge on their hinterlands is indicated by a few examples. About 10 per cent of prime agricultural land has been lost to urbanisation in Egypt. The twentieth century growth of Sao Paulo was fuelled by the expansion of coffee plantations in south-east Brazil which reduced the forest cover of Sao Paulo State from 81 per cent in 1860 to 6 per cent in the late 1980s. The demand for water in Tehran spurred the construction of a series of dams and canals in the early decades of this century, to bring watr 50 km from the River Karaj to the west, reducing the watr available for rural agriculture. By the 1970s, supplies were again running low, so water was diverted more than 75 km from the River Lar to the north-east. In Rio de Janeiro's Guanabarra Bay, pollution from two oil refineries, two ports, 6000 industries, twelve shipyards, sixteen oil terminals, sewage and garbage dumps has reduced commercial 20 25 15 10 5 0 1950 1970 1990 2000 Popullation (millions) Mexico City Sao Paulo Tokyo/Yokohama New York Calcutta Greater Bombay Shanghai Jakarta Buenos Aires Rio de Janeiro Seoul Delhi Gairo Giza Karachi Manila/Quezon Beijing Los Angeles London Bangkok Moscow

111 fishing by 90 per cent, mangrove cover by 90 per cent, led to outbreaks of water-borne diseases such as infectious hepatitis and typhoid, and is silting the bay by 81 cm/100 years. The acute environmental problems that occur within many cities, particularly in the developing world, their underlying reasons, andihe scale of the clean-up task faced by urban authorities are well summarised hi the case of Manila Metro, capital of the Philippines. A 1990 population of 8 million rose to 13 million by the year 2000. All the city's rivers are biologically dead. Each day, 2000 tons of solid waste is left uncollected, to be burnt, thrown into waterways or moulder on the ground. Much of the garbage which is collected is dumped on 'Smokey Mountain', a 23-hectares open tip which represents a severe health hazard to the 20,000 people who reside oh its fringes and earn a living by scavenging from the dump. About 65 per cent of the country's 1,500 recognised industrial enterprises are locatedin the Manila Metro area, and only one-third to one-half of them are thought to comply with minimal air and water pollution emission standards. One million vehicles, more than half country's total, operate in the Manila Metro area. Just half of these vehicles are thought to meet even minimal emission standards. The annual cost to the economy due to congestion alone is estimated to be more than US$50 million, which is low by the standards of other Asian capitals, while the economic burden of air pollution may be an order of magnitude higher. The basic cause of Manila Metro's severe environmental problems is that 8 million people are using infrastructure, much of which dates from the US colonial period, estimated to be adequate for about 2 million people, at most. A large proportion of the solid and liquid wastes are simply inaccessible for collection by virtually any means due to the density of squatter settlements, inappropriate collection systems and the simple lack of services such as septic tank dislodging. The problems of physical infrastructure are exacerbated by the government's inability to stop polluters, largely a function of serious understaffing at the metropolitan regulation agency (World Bank Report 1989). 2.4.2.3 Surface water resources One of the most important environmental issues that stems from urban modifications to the hydrological cycle is that of poor water quality. Runoff from developing urban areas is usually choked with sediment during constructionphases, when soil surfaces are stripped of vegetation, and a finished urban zone greatly increases runoff due to widespread impermeable city surfaces of tarmac and concrete, and networks of storm drains and sewers. This drastically modified urban drainage network feeds large amounts of urban waste products into rivers and ultimately into oceans. Many rivers that flow through urban areas are biologically dead. Hardoy et.al (1992- 73) sum up the state of urban rivers in developing countries as follows: 'Most rivers in

112 Third World Cities are literally large open sewers'. They go on to point out that of India's 3,119 towns and cities, only 209 have partial sewage treatment facilities and just eight have full facilities. India's Jamuna Rivre, for example, contains 7,500 coliform organisms per 100 ml of water on entering New Delhi, a figure which rises to 24 million conform organisms per 100 ml after flowing through the city. For comparison, the WHO guidelines for such microbiological pollution are >10 coliform organisms per 100 ml for drinking water and >1000 per 100 ml for irrigation purposes. Industrial effluents combine with this domestic source of riverine pollution to make urban rivers the most polluted freshwater sources on Earth. All the rivers flowing through Jakarta, Indonesia, are heavily polluted from numerous, mostly untreated, discharge sources: household drams and ditches, overflows and leaks from septic tanks, commercial buildings, and industries. Water-related diseases such as typhoid, diarrhoea and cholera increase in frequency downstream across th metropolitan are. Untreated sewage and discharge from 20000 classified water-polluting industries which feed into Bangkok's canal system have created a distinct sag in the dissolved oxygen profile of the Chao Phraya where the canals feed the river. Although the example of the Thames at London shows how such near-anaerobic river conditions can be improved, neither the money nor the political will are currently as forthcoming in Thailand. The local hydrological impact of the Saudi capital, Riyadh, provides a very contrasting example to the depressing catalogue of river-incorporated disaster areas typically associated with large, rapidly growing cities. Discharge of Riyadh's wastewater feeds the Riyadh River, which scarcely existed 20 years ago, but now flows throughout the year down what was the seasonal Wadi Hanifa. The water, which is originally derivedfrom desalinated Gulf sea water, is partially treated before being released to flow down the steep-sided Wadi and enters open countryside, eventually disappearing 70 km from Riyadh. The new flow has created an attractive valley lined by tamarisk trees and phragmites which is becoming an important recreational site for Riyadh's 2.3 million populations. Beyond the Wadi, significant irrigated agriculture has grown up, drawing on the groundwatr around the river. This unique new feture is, however, under some threat from needs to further recycle the much-needed water resource. Different types of environmental problems are encountered in permafrost areas where surface water and soil moisture is frozen for much, and in some places all, of the year. Frozen rivers and lakes mean that many of the uses such water bodies are commonly put to at more equable latitudes, such as sewage and other waste disposal, are not always available. The low temperatures characteristic of such regions also means mat biological degradation of wastes proceeds at much slower rates than those elsewhere. Hence, the impacts of pollution in permafrost areas tend to be more long-lasting than in other environments.

113 The nature of the permafrost environment also presents numerous environmental challenges to the construction and operation of settlements, challenges which have been encountered in urban developments associated with the exploitation of hydrocarbons and other resources in Alaska, northern Canada and northern Russia. Disturbance of the peimafosttrieniial equilibrium - irregular, hummocky ground. The heaving and subsidence caused can disrupt building foundations and damage pipelines, roads, rail tracks and airstrips. Terrain evaluation prior to development is now an important procedure in the development of these zones, following expensive past mistakes. Four main engineering responses to such problems have been developed: permafrost can be neglected, eliminated, preserved, or structures can be designed to take expected movements into account Preservation of the thermal equilibrium is achieved in numerous ways, such as by insulating the permafrost with vegetation mats or gravel blankets, and ventilating the underside of structures which generate heat (e.g. buildings and pipelines). 2.4.2.4 Ground Water The water needs of urban population and industry is often supplemented by pumping from ground-water, and pollution of this source is another problem of increasing concern in many large cities. Seepage from the improper use and disposal of heavy metals, synthetic chemicals and other hazardous wastes such as sewage is a principal origin of groundwater pollution. The quantity of such compounds reaching groundwater from waste dumps in Latin America, for example, is thought to be doubling every 15 years (World Bank Report). Aquifers do not have the self-cleansing capacity of rivers and, once polluted, are difficult and costly to clean. A frequent outcome of overusing groundwater is a lowering of water-table levels and consequent ground subsidence. In Mexico City, use of subterranean aquifers for rpore than 100 years has caused subsidence of up to 9 m in some central areas (Schteingart, 1989), greatly increasing the flood hazard in the city and threatening the stability of some older buildings, notably the sixteenth century cathedral. Marked subsidence episodes in Tokyo have mirroDed phases of economic find industrial growth. The Tokyo Metropolitan Government suggests mat ground subsidence began in the city as economic activity grew after the First World War and came toa halt for some years in other coastal cities; depletion of aquifers has created problems of seawatar intrusion. Over pumping of groundwater hi the Tel Aviv urban area depleted groundwater levels to below sea level over an area of 60 km2 in the 1950s, requiring a programme of feeriwater injection along a line of wells parallel to the coast in an attempt to redress the saltwater/freshwater balance. The programme was successful, effectively stabilishing the aquifer and preventing saltwater intrusion.

114 A similar pattern of events occurred in Brooklyn, New York City, although here no attempt was made to prevent seawater intrusion. By 1947, pumping of the increasingly saline groundwater had ceased and all freshwater supplies were provided by surface sources. Cessation of pumping gradually allowed the water table, which had been reduced to about 1 1m below sea level, to rise again. During the half century of pumping however, deep basements, building foundations and subways had been sunk, and these were subject to flooding as die groundwater levels rose, necessitating expensive remedial measures. Rising groundwater levels have become a critical problem for many 'post-industrial* cities as manufacturing industries have given way to service industries which are much less demanding of watr, and legislation has been introduced to control subsidence problems. In London, where loss of water from aged pipes is an additional reason for groundwater levels rising, the period of change from a generally failing to a rising water table occurred in die late 1970s. The potential effects upon the fabric of London's urban environment are now being assessed, with particular interest being shown by the insurance industry. A report issued by the Construction Industry Research and Information Association estimated that the cost of puming to maintain groundwater levels below the level at which serious damage would occur was up to 30 million. The rising groundwater problem has ateo been reported from many Middle Eastern cities where rainfall is commonly low, potential evaporation high, and natural recharge small and sporadic. Inadvertent artificial recharge from leaking potable supplies, sewerage systems and irrigation schemes has caused widespread and costly damage to structures and services and represents a significant hazard to public health. 2.4.2.5 The urban atmosphere Urban areas have a diverse catalogue of effects on local elements of climate which are well documented (e.g. Landsberg, 1981), but the most serious environmental issue pertaining to the urban atmosphere is that of quality. The principal sources of air pollution in urban areas are derived from the combustion of fossil fuels for domestic heating, for power generation, in motor vehicles, in industrial processes and in the disposal of solid wastes incineration. These sources emit variety pllutants the most common of which have long been sulphur dioxide (SO 2), oxides of nitrogen (NO and NO 2 , collectively known as NQ x), carbon monoxide (CO), suspended 'articulate matter (SPM) and lead (P b). Ozone (O 3), another 'traditional' air pollutant assoited with urban areas and the main constituent of photochemical smog, is not emitted directly by combustion, but is formed photochemically in the lower atmosphere from NO X and volatile organic compounds (VOCs) in the presence of sunlight Sources of the VOCs include road traffic the production and use of organic chemicals such as solvents and the use of oil and natural gas. These atmospheric pollutants affect human health, directly through inhalation, and

115 indirectly through such exposure routes as drinking water and food contamination. Most traditional air pollutants directly affect respiratory and cardiovascular systems. For example, CO has a high affinity for haemoglobin and is able to displace oxygen in the blood, leading to cardiovascular and neurobehavioural effects. High levels of SO2 and SPM have been associated with increased mortality, morbidity and impaired pulmonary function, and O 3 is known to affect the respiratory system and irritate the eyes, nose and throat andto cause headaches. Certain sectors of the population are often at greater risk: the young, the elderly and those weakened by other debilitating ailments, including poor nutrition. Elements of the natural and build environment can also be adversely affected Sulphur and nitrogen oxides are principal precursors of acid deposition (see Chapter 9), SO 2 , NO 2 and O 3 are phototoxic - O 3 , in particular, has been implicated in damage to crops and forests and damage to buildings, works of art and materials such as nylon and rubber have been attributed to SO 2 and O 3 . In more recent times, these traditional urban air pollutants have been supplemented by a large number of other toxic and carcinogenic chemicals which are increasingly being detected in the atmospheres of major cities. They include heavy metals (e.g. beryllium, cadmium and mercury), trace organics (e.g. benzene, formaldehyde and vinylchloride), radionuclides (e.g. radon) and fibres (e.g. asbestos). The sources of these pollutants are diverse, including waste incinerators, sewage treatment plants, manufacturing processes, building materials and motor vehicles. Concentrations of these chemicals are generally low, where they are measured, but this occurs at few sites to date. Few long-term air quality monitoring programmes have been implemented in cities, and runs of available data are often characterised by changes in the location of sample stations, but data from the former Soviet Union indicate that urban areas with high concentrations of heavy industry using outdated technology have had a 'calamitous* effect on air quality (Shahgedanova and Burt, 1994). Some of the commonest pollutants present in excessive concentrations are highly toxic: benzopyrene, a carcinogenic coal- tar by-product, phenol and formaldehyde. However, it seems unlikely that the acute air pollution problems of these urban areas" will receive much attention as long as financial resources are limited and more pressing national problems such as housing and food supply continue to head government priorities. Monitoring of urban air quality has been undertaken at a global network of mega- cities by-UNEP and the WHO since 1974. Available data indicate that while cities in the industrialised countries have made significant reductions in air pollution during the past four decades, rapidlygrowing urban areas in the industrialising countries pose serious threats to the millions of people who live in them. The clear distinction in urban air quality between rich and poor countries is indicated in Figure below.

116 Figure—2 : Air quality in 20 world mega-cities (WHO 1992) Mexico City emerges as the worst affected city, with WHO guidelines exceeded by a factor of two or morefor levels of SO2 (see Fig. 14.4), SPM, CO and O 3 . Levels of P b and NO 2 are almost as bad, exceeding WHO limits by up to two times. The city's poor air quality is exacerbated by location, in an elevated mountain-rimmed basin where temperature inversions occur on average 20 days per month from November to March, which impairs dispersion of pollutants. Although data are sparse, no particular trends in the ,sjx pollutants monitored are discernible in Mexico City, despite the city's rapid growth. This can be attributed to use of cleaner fuels, better emission control, replacement of old industries, and technological improvements (Reports - UNEP/WHO, 1992). Older taxis, for example, are being replaced with newer models equipped with catalytic converters. Not all efforts to control air pollution in the city hav been successes however. Concern over rising atmospheric P b levels, which averaged 8 gm 3 in 1986 (five times the national standard), resulted in the national oil company reducing the lead content of gasoline sold in the city in September of that year. An unexpected side-effect was a dramatic increase in ozone concentrations, a result of the reaction between atmospheric oxygen and the replacement gasoline additivs in ultraviolet sunlight. 1. Ozone 2. Sulpher dioxide 3. Nitrogen dioxide 4. Suspended particular matter 5. Lead Serious pollution, WHO guidelines exceeded by more than a factor of two Moderate to heavy pollution, Who guide- lines exceeded by to a factor of Two Low pollutions WHO guidelines are normally met No data available

117 The severe pollution conditions observed at several mega cities could have been much worse if control measures had not already been introduced. Examples include Beijing, Delhi, Seoul and Shanghai, and the need for such measures is well illustrated at Shanghai where the male lung cancer mortality rate has doubled from twenty-one to forty-four per 100 000 men from 1963 to 1985. The beneficial effects of tighter legislativ controls on air quality are indicated by London's annual mean SO concentrations, which have fallen from 300 - 400 g/m 3 in the mid 1960s to around 20 - 30 g/m 3 in the late 1980s. The introduction and enforcement of 'Smoke Control Orders' under the 1956 clean Air Act (amended in 1964 and 1968), a response to the infamous London smog of the 1950s, is the most important factor responsible for this steady 30-year fell in ambient concentrations. Similar successes have been recorded for most of the six pollutants measured in Los Angeles, New York and Tokyo, although Los Angeles still has the most serious O3 problem in the USA. Pollution rises with initial industrial development, to be brought under control through legislation on emissions. Air quality then stabilises and improves as development proceeds, to be reduced to below acceptable standards by high technology applications. 2.4.2.6 Garbage The rapid, and often unauthorised, growth of urban areas has in many cases outpaced the ability of urban authorities to provide adequate facilities, such as the collection of household garbage. Many other urban areas similarly afflicted are not included due to lack of adequate information. Although the environmental problems associated with garbage do not disappear with its collection uncollected garbage exacerbates many of the environmental hazards covered in this chapter. It can be a serious fire hazard; it attracts pests and disease vectors, creating health hazards; and local disposal by burning or dumping adds to pollution loads and clogs waterways, so increasing the dangers of flooding. Several animal species, particularly rats, have become adapted to the urban environment by scavenging from urban refuse. Larger species, too, have been drawn to garbage bins and dumps, and are also regarded as pests, such as the urban foxes which inhabit many British cities and polar bears in Churchill, Manitoba, northern Canada. In Uganda's capital city Kampala, carnivorous Marabou storks roam about in the streets like normal citizens, living off garbage and doing a useful job in controlling smaller pests. Some degree of waste recovery occurs in most cities. In many cities of the ceveloping countries, large numbers of residents are self-employed in the business of garbage recycling. Mexico City and Cairo are just two exampls where large squattr communities live and work on official or unofficial rubbish dump sites. In the case of Cairo, the Zabbaleari religious sect has cornered the market in garbage collection, scavenging and recycling, feeding edible portions to their domestic livestock and selling inorganic materials to dealers.

118 Elsewhere, metropolitan authorities run similar programmes. In Beijing, for example, a state-run recycling scheme has been in operation since the 1950s, and in New York City, Local Law 19, brought into force in 1989, requires all residents, institutions and businesses to separate a variety of materials for collection and recycling. 2.4.2.7 Hazards and Catastrophes The high concentrations of people and physical infrastructure in cities make them distinctive in several ways with regard to hazards. Where money is available, cities are worth protecting because of the large financial and human investment they represent. Adequate provisions of water supply and sanitation are designed to offset the risks of disease, and other infrastructure, such as expensive flood protection schemes, protects against geophysical hazards. In developing countries, where escalating urban growth rates and a lack of finance make such provisions inadequate, it is usually the poorest sectors of urban society that are most at risk from environmental hazards. Rapid urban growth and rising land prices have used up the most desirable and safest sites in most Third World cities, leaving increasingly hazard-prone land for poorer groups. Such hazards include the pervasive dangers of high pollution levels and the intensive dangers of industrial accidents. The accidental discharge from a pesticide production plant in Bhopal, northern India in 1984, for example, killed more than 3,000 shanty-town dwellers. It was primarily caused by inadequate management and lax safety procedures. High concentrations of poor housing are built on slopes on hillsides prone to sliding (e.g. Caracas), or in deep ravines (e.g. Guatemala City); on river banks susceptible to flooding (e.g. Delhi), and on low-lying coastlines prone to marine inundation (e.g. Rio de Janeiro). Even the destruction caused by citywide hazards, such as earthquakes, can be magnified in these unstable sites: in Guatemala, 65 per cent of deaths in the capital caused by the 1976 earthquake occurred in the badly eroded ravines around the city. In other situations, however, the damage and loss of life caused by earthquakes can be greatest in more built-up parts of the urban environment, when buildings themselves become hazardous if they are not constructed to withstand earth tremors. The widespread failure of relatively new constructions in urban areas of Armenia in the 1988 earthquake echoed the experiences of Mexico Cityin 1985. Seemingly, more sophisticated technology able to withstand tremors had not been incorporated into new buildings for reasons of cost Failure of urban infrastructure following earthquakes is one of the commonest causes of damage and loss of life. The most serious earthquake disaster in the USA, in San Francisco in 1906, was largely a function of infrastructural failure. Disruption of gas distribution and service lines caused the outbreak of many fires and interrupted water distribution, so making it difficult to put the fires out.
119 The most critical environmental problems faced in urban areas of the developing world, however, stem from the disease hazards caused by a lack of adequate drinking waer and sanitation. In 1990, at least 170 million people in urban areas worldwide lacked a source of potable water near their homes and 375 million did not have adequate sanitation (World Bank, Report in 1992). Water-borne diseases (e.g. diarrhoea, dysentry, cholera and guinea worm), water- hygiene diseases (e.g. typhoid and trachoma) and water-habitat diseases (e.g. malaria and schistosomiasis) both kill directly and debilitate sufferers to the extent that they die from other causes. Again, it is the less-well-off sectors of urban society that are most at risk. The effect of improvements to water supply and wastewajer disposal on life expectancy have been clearly shown in the industrial countries, when services wee improved during the nineteenth and twentieth centuries, The trend shown for three major French cities is typical in this respect, with life expectancy increasing from about 32 years in 1850 to about 45 years in 1900, with the timing. 2.4.3 Model Questions 1) Make a discussion on the significant environmental impacts of the big dams. 2) Discuss the ways in which the big dams can be beneficial as well as detrimental for the natural and human environments. 3) Discuss the main problems with the big dams and their impacts upon the environments of the upstream and downstream areas of a river basin. 4) What do you consider the political impacts of the big dams? 5) Assess the major environmental problems that normally occur due to urban- industrial expansion. 6) Discuss the possible environmental hazards created by the urban expansion with particular reference to surface water resources, ground water and atmosphere. 7) Discuss with examples the problems of urban-industrial expansion that associate the problems of atmosphere and garbage. 2A4 Select Readings ● Cadman D. and Payne G. eds. (1990) : The living city: towards a sustainable future, Routledge, London. ● Hough M. (1989) : City from and natural process, Routledge, London. ● Hardoy J.E. and Milton D : Environmental problems in Third World cities, London, Eazthscan.
120

Hit and source - focused comparison, Side by Side

Submitted text	As student entered the text in the submitted document.
Matching text	As the text appears in the source.

Ouriginal by Turnitin

Document Information

Analyzed document	PGGR_7_B.pdf (D165449293)
Submitted	4/29/2023 12:01:00 PM
Submitted by	Library NSOU
Submitter email	dylibrarian.plagchek@wbnsou.ac.in
Similarity	0%
Analysis address	dylibrarian.plagchek.wbnsou@analysis.urkund.com

Sources included in the report

Entire Document

PREFACE In the curricular structure introduced by this University for students of Post- Graduate diploma programme, the opportunity to pursue Post-Graduate Diploma course in any Subject introduced by this University is equally available to all learners.

Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely

in keeping with the objectives of open education which does not believe in artificial differentiation.

Keeping this in view, study materials of the Post-Graduate Diploma level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis.

The accepted methodology of distance education has been followed in the preparation of these study materials. Cooperation in every form of experienced scholars is indispensable for a work of this kind.

We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing and devising of

a

proper lay-out of the materials. Practically speaking, their role amounts to an involvement in 'invisible teaching'.

For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other.

The more a learner would seriously pursue these study materials, the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self-learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University. Needless to add, a great deal of these efforts is still experimental—in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned.

Professor (Dr.) Subha Sankar Sarkar Vice-Chancellor

Fourth Reprint : February, 2022

Printed in accordance with the regulations of the Distance Education
Bureau of the University Grants Commission.
Fifth Reprint :
February, 2022 Sixth
Reprint : February, 2022
POST GRADUATE GEOGRAPHY [M.Sc.] PAPER : GROUP PGGR-7 : B Course Writing Editing Prof. Chittaranjan Pathak
Biraj Kanti Mondal
Notification All rights reserved. No part
of this study material
may be reproduced in any form without permission in writing from Netaji Subhas Open University.
Kishore Sengupta Registrar
.
NETAJI SUBHAS OPEN UNIVERSITY
Group - B
Unit 1 ?
Concept of
Region and Regional Planning 7-18 Unit 2 ? Concept of Multilevel Planning 19-48 Unit 3 ? Economic Base Theory & Theory of Growth Centre & Growth Pole 49-57 Unit 4 ? Metropolitan Concept, Metropolis, Metropolitan Area & Metropolitan Regions, Mega City and Megalopolis 58-68 Unit 5 ? Basic Principles of Regional Planning 69-112 Unit 6 ? Indicators of Regional Development 113-145 Unit 7 ? Integrated Regional Development 146-167 Unit 8 ? Concept of Regional Disparity and Imbalances 168-188 PGGR 7 Regional Planning and Development
.

Hit and source - focused comparison, Side by Side

Submitted text	As student entered the text in the submitted document.
Matching text	As the text appears in the source.

Ouriginal by Turnitin

Document Information

Analyzed document	PGGR_8_A.pdf (D165449295)
Submitted	4/29/2023 12:01:00 PM
Submitted by	Library NSOU
Submitter email	dylibrarian.plagchek@wbnsou.ac.in
Similarity	2%
Analysis address	dylibrarian.plagchek.wbnsou@analysis.urkund.com

Sources included in the report

SA	**MGEOS-22 Urban Geography_All Unit.pdf** Document MGEOS-22 Urban Geography_All Unit.pdf (D135361638)	7
SA	**THESISS_49_2019_GEO.pdf** Document THESISS_49_2019_GEO.pdf (D147801394)	1
SA	**term paper Guoping Zhang.doc** Document term paper Guoping Zhang.doc (D919602)	1
W	URL: https://quizlet.com/584232126/unit-7-vocab-ap-human-flash-cards/ Fetched: 9/17/2021 6:10:27 PM	1
W	URL: https://quizlet.com/fr/519922561/g1-urbanization-flash-cards/ Fetched: 12/8/2021 8:55:05 PM	3
W	URL: https://quizlet.com/83664347/7-combo-with-7-aphg-chapters-12-13-urban-patterns-kbat-and-8-othe... Fetched: 11/12/2021 7:00:15 PM	2
W	URL: https://quizlet.com/889728/ap-human-geography-unit-6-flash-cards/ Fetched: 12/10/2021 9:11:23 AM	1
SA	**A Review Report.docx** Document A Review Report.docx (D113957614)	1
SA	**Rama Subramanian.doc** Document Rama Subramanian.doc (D61516814)	1
SA	**Urban Geography.docx** Document Urban Geography.docx (D57573963)	3

SA	**pallavi-MA.doc** Document pallavi-MA.doc (D53496895)	5
SA	**Introduction new.docx** Document Introduction new.docx (D47319546)	2
W	URL: https://quizlet.com/280238262/vocab-13-urbanization-a-m-flash-cards/ Fetched: 9/25/2021 1:09:28 AM	3

Entire Document

PREFACE In the curricular structure introduced by this University for students of Post Graduate degree programme, the opportunity to pursue Post Graduate course in Subject introduced by this University is equally available to all learners. Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely in keeping with the objectives of open education which does not believe in artificial differentiation. Keeping this in view, study materials of the Post Graduate level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analyses. The accepted methodology of distance education has been followed in the preparation of these study materials. Co-operation in every form of experienced scholars is indispensable for a work of this kind. We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing and devising of a proper lay-out of the materials. Practically speaking, their role amounts to an involvement in invisible teaching. For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other. The more a learner would seriously pursue these study materials the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self- learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University. Needless to add, a great deal of this efforts is still experimental—in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned. Professor (Dr.) Subha Sankar Sarkar Vice-Chancellor

Fourth Reprint : February, 2022 Printed in accordance with the regulations of the Distance Education Bureau of the University Grants Commission.

POST-GRADUATE GEOGRAPHY [M. Sc] Paper : Group PGGR : 08 : A Course Writing Dr. Lakshmi Sivaramakrishnan Notification

62% **MATCHING BLOCK 1/31** SA MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

Kishore Sengupta Registrar

5

NETAJI SUBHAS OPEN UNIVERSITY Group A Unit 1 ? Concept of Urban 7–25 Unit 2 ? Urban Structure 26-45 Unit 3 ? Urban Space 46-58 Unit 4 ? Urban Internal Structure 59-88 PGGR-08 Urban Geography

6

7 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 UNIT 1 ? CONCEPT OF URBAN Structure 1.1 Concept and Definition 1.2 Different Approaches—Changing Emphasis-Recent Trends— Perception of Urban space 1.3 Growth of Urban Settlements —Processes of Urbanisation—Stages of Urban Development 1.4 Third World Urbanisation 1.5 Questions 1.1. Concept and Definition : Urban, Urbanization, Urban Systems, Urban Pattern, Urban Ecology, Urban Sprawl. URBAN : A settlement is an organized colony of human beings including the buildings in which they live or work and the tracts of streets over which their movements take place. Settlements modify the natural environment by imposing a cultural element. In the beginning, these settlements bear simpler forms, but with the growth of civilization and technical knowledge the degree of variability in their size and complexity of their relationships become overwhelmingly greater. Settlements are often divided into two types—rural and urban. Definition of Urban : The term 'Urban' is usually applied to a spatial or areal unit having certain specific characteristics which differentiate it from a rural unit. An urban unit may take the form of a town, city, or metropolis, while a rural unit is a village, administratively defined as a mouza in India. Jones (1966, also cited in Hudson, 1976; p, 79) has defined an urban settlement as a physical conglomeration of houses and streets or it is a centre of exchange and commerce or it is a kind of society. The sociologist, Wirth has defined a city as a relatively large, dense and permanent settlement of socially heterogeneous individuals. According to him, towns and cities have a social framework characterized by anonymity and lack of personal and their replacement of allegiance to diverse groups which by their multiplicity encourage mobility and social instability. In most of the Central American Republics, Brazil and Bolivia all administrative centers even the minor civil divisions were labeled as towns. In the
8 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 UK prior to the local government reform, the urban population covered all those who lived in the country and municipal boroughs, and in the urban districts (i.e. those who did not reside in rural districts). Considerable amount of variation and controversies exist in the specification of characteristics which would identify and delimit the boundary of urban units. The selected criterion has varied over time and space. Different countries have used different criteria for delimiting the urban areas of various spatial dimensions which have also modified from time to time, thus making comparisons difficult. Sorokin and Zimmerman have assembled eight characteristics in which urban world differ from rural world (Sombart, 1939). They are ; 1. Occupation 2. Environment 3. Size of Community 4. Density of Population 5. Heterogeneity or homogeneity of population 6. Social differentiation and stratification 7. Mobility 8. 'System of Interaction' (i.e, number and type of contacts). The Census of India has used a multiple or compound criteria for defining Urban areas. According to the 1991 census (series 1, VoLl 1, p3-4) an Urban place is defined as : 1. All statuary towns, i.e.

100% **MATCHING BLOCK 2/31** **SA** MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

all places with a municipality, corporation, cantonment board, or notified town area committee etc

which in essence is an administrative criterion. 2.
All other places which satisfy the following criteria a.

79% **MATCHING BLOCK 3/31** **SA** THESISS_49_2019_GEO.pdf (D147801394)

A minimum Population of 5000, b. At least 75 percent of the male working population is engaged in non agricultural pursuits. c. A density of population of at least 400/sq.km (1000/

sq.miles) The
U.S Census Bureau recognizes four distinct kinds of units (Carter, 1989:p. 21-22, Dickinson, 1955:p, 306-310) ; 1. An "urban place' (i.e. a place with at least 2500 inhabitant) 2. an "incorporate city'(i.e. a town with at least 2500 people and separate political identity) 3. An "urbanized area 'centered on a city of at least 50000 people and including the city's urban fringe or suburban area, i.e. i) incorporated places with 2500 inhabitants or more, ii) incorporated place with less than 2500 inhabitants provided that each has a closely settled area of 100 dwelling or more,

9 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 iii) Enumeration districts in unincorporated territory with a population density of 1000 inhabitants or more per sq. miles. iv) Enumeration district with less than 1000 persons /sq.miles ,if they are a) eliminated enclaves , b) closed indentation in the urbanized area of 1 mile or less across the open end, c) link outlying enumeration districts of qualifying density that were no more than 1 and 1/2 miles from the main urbanized area, 4. A "Standard Metropolitan Statistical Area" (SMSA) - a group of counties containing a population nucleus at the core say at least 1 city of 50000, or more people, together with that part of the surrounding area which is socially and economically integrated with it. Standard definitions of metropolitan areas were first issued in 1949 by the then Bureau of the Budget (predecessor of OMB), under the designation "standard Metropolitan area" (SMA). The term was changed to "standard metropolitan statistical area" in 1959, and to "metropolitan statistical area" (MSA) in 1983. URBANIZATION Urbanization is defined as the increase in the proportion of population residing in towns, brought about by migration of rural populations into town and cities and /or the higher urban levels of natural increase resulting from the greater proportion of people of child bearing age in cities. Urbanization indicates a change in employment structure from agriculture and cottage industry to mass production and service industries. This backs up the view that urbanization results from, rather than causes social change. This is most notable in the development of capitalism and the resultant industrialization. It is said that the development of landless labourer and the concentration of wealth into few hands encourages urbanization. Others argue that urbanization is the inevitable result of economic growth, with the rise of the specialized craftsmen, merchants and administrators. A further view stresses the importance of the agglomeration economies; cities offer market, labour and capital with a well developed infrastructure, all of which increases their comparative advantage. In addition, Clark observes that the effect of globalization compound rather than replace, local processes of urban development. They introduce reasons of urban growth and urbanization, which add to the traditional attraction of the cities as central places. Urbanization is relatively a recent process of third world where it is even more rapid than population growth and where the largest agglomeration are growing even more rapidly. The negative effect of Urbanization includes the loss of agricultural land coupled with the problems of urban food supply, the destruction of habitats and urban diseconomies.

10 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 Urbanization Curve: It is a model of progress of Urbanization, based on empirical evidence fromEurope. In a traditional society Urbanization is below 20% and the rate of Urbanization is slow, so the curve starts gently. With industrialization and the rise in the importance of manufacturing and services the pace of Urbanization quickens, but the curve slackens after about 75%. While most of the developed countries have reached this third stage, the countries of the developing world are still on the rising curve of Urbanization, often with a steeper gradient than is the characteristic of advanced economies. Some geographers believe that counter urbanization constitutes a fourth stage when urban population falls; other feels that counter urbanization is temporary. Urbanization Economies is defined as the advantages gained from an urban location, these include proximity to market, labour supply, good communications, financial and commercial services such as auditing stock broking, advertising, investment, industrial cleaning and maintenance. Large cities have a greater comparative advantage than the small ones and the relationship between the city size and urbanization economies is non linear. Urbanization Today The 2005 revision of the UN World Urbanization Prospects Report described the 20th century as witnessing "the rapid urbanization of the world's population", as the global proportion of urban population rose dramatically from 13% (220 million) in 1900, to 29% (732 million) in 1950, to 49% (3.2 billion) in 2005. The same report projected that the figure is likely to rise to 60% (4.9 billion) by 2030. Urbanization rates vary across the world. The United States and United Kingdom have a far higher urbanization level than China, India, Swaziland or Niger, but a far slower annual urbanization rate, since much less of the population is living in a rural area Urbanization Projections According to the UN-HABITAT 2006 Annual Report, sometime in the middle of 2007, the majority of people worldwide will be living in towns or cities, for the first time in history; this is referred to as the arrival of the "Urban Millennium". In regard to future trends, it is estimated 93% of urban growth will occur in Asia and Africa, and to a lesser extent in Latin America and the Caribbean. By 2050 over 6 billion people, i.e. two thirds of humanity, will be living in towns and cities. Economic effects : Over the last few years urbanization of rural areas has increased. As agriculture, more traditional local services, and small-scale industry give way to modern industry the urban and related commerce with the city drawing on the resources of an ever-widening area for its own sustenance and goods to be traded or processed into manufactures.

11 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 Research in urban ecology finds mat larger cities provide more specialized goods and services to the local market and surrounding areas, function as a transportation and wholesale hub for smaller places, and accumulate more capital, financial service provision, and an educated labor force, as well as often concentrating administrative functions for the area in which they lie. This relation among places of different sizes is called urban hierarchy. As cities develop, its effects can include a dramatic increase in rents, often pricing the local working class out of the market, including such functionaries as employees of the local municipalities. For example, Eric Hobsbawm's book "The age of the revolution : 1789-1848" (published 1962 and 2005) chapter 11, stated "Urban development in our period [1789-1848] was a gigantic process of class segregation, which pushed the new labouring poor into great morasses of misery outside the centers of government and business and the newly specialized residential areas of the bourgeoisie. The almost universal European division into a 'good' west end and a 'poor' east end of large cities developed in this period." This is likely due the prevailing south-west wind which carries coal smoke and other airborne pollutants downwind, making the western edges of towns preferable to the eastern ones. Changing form of urbanization Traditional urbanization exhibits a concentration of human activities and settlements around the downtown area. When the residential area shifts outward, this is called suburbanization. A number of researchers and writers suggest that suburbanization has gone so far to form new points of concentration outside the downtown. This networked, poly-centric form of concentration is considered by some as an emerging pattern of urbanization. It is called variously as exurbia, edge city (Garreau, 1991), network city (Batten, 1995), or postmodern city (Dear, 2000). Los Angeles is the best-known example of this type of urbanization Planning for urbanization : Urbanization can be planned or organic in nature. Planned urbanization, i.e. new town or the garden city movement is based on an advance plan, which can be prepared for military, aesthetic, economic or urban design reasons. Unplanned (organic) cities are the oldest form of urbanization. Examples can be seen in many ancient cities; although with exploration came the collision of nations, which meant that many invaded, cites took on the desired planned characteristics of their occupiers. Many ancient organic cities experienced redevelopment for military and economic purposes, new roads carved through the cities, and new parcels of land were cordoned off serving various planned purposes giving cities distinctive geometric shape. UN agencies prefer to see urban infrastructure installed before urbanization occurs, landscape planners are responsible for landscape infrastructure (public parks, sustainable urban drainage systems, greenways etc) which can be planned before 12 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 urbanization takes place, or afterward to revitalize an area and create greater livability within a region. New Urbanism New Urbanism was a movement which started in the 1980s. New Urbanism believes in shifting design focus from the car-centric development of suburbia and the business park, to concentrated pedestrian and transit-centric, walk able, mixed- use communities. New Urbanism is an amalgamation of old-world design patterns, merged with present day demands. It is a backlash to the age of suburban sprawl, which splintered communities, and isolated people from each other, as well as had severe environmental impacts. Concepts for New Urbanism include people and destinations into dense, vibrant communities, and decreasing dependency on vehicular transportation as the primary mode of transit. Thus it may be concluded by saying that urbanization means the removal of the rural character of a town or area, a process associated with the development of civilization. Demographically, the term denotes redistribution of population from rural to urban settlements URBAN SYSTEM Urban System is any network of towns and cities, and their hinterlands, which can be seen as a system, since it depends on the movement of labour, goods and services, ideas and capital through network. Crucial to the interaction within the system is efficient systems of transport and communication. With improved technology it is possible to see urban system which transcends national boundaries. All the surrounding landscape is a multidimensional organization system. This frames the basis to consider the human settlement system having to basic kinds of components. 1. Spatial structural components 2. Spatial interaction components Doxiadis through the study of Ekistics provided a theoretical framework for understanding the complex system ranging from man to universal city. It comprises several sets and closed subjects containing five elements, i.e. nature, man, society, shell and networks. As regard to urban settlement the structure of the city can be seen in terms of population activities (e.g. having jobs, various services, etc) and organizational or more normally economical activities together with physical infrastructure and the transport system which support these. Main Components of Urban System Residential Location Infrastructure Job Location POPULATION Job Choice Transport Economy Use of Service Service Location ? ? ? ? ? ? ? ? ? ? ? ? ?

13 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 URBAN ECOLOGY Urban ecology is the subfield of ecology which deals with the interaction of plants, animals and humans with each other and with their environment in urban or urbanizing settings. Analysis of urban settings in the context of ecosystem ecology (looking at the cycling of matter and the flow of energy through the ecosystem) can result in healthier, better managed communities. Studying the factors which allow wild plants and animals to survive (and sometimes thrive) in built environments can also create more livable spaces. Urban ecology also involves the study of the effects of urban development patterns on ecological conditions. Emphasis is also placed on planning communities with environmentally sustainable methods via design and building materials in order to promote a healthy and biodiversity urban ecosystem Just as the ecologist study the way in which an ecosystem seeks to re-establish equilibrium after certain alteration, so an urban ecologist assume that people will try to re- establish equilibrium after sudden changes. Urban Ecology posits that the urban realms are made up of four interrelated variables: a functionally integrated population, a self sustaining system of relationships, an urban environment and the technology and the tools which sustain the community. A change in one will bring the change in the other three. Urban Ecology has been criticized for focusing too much on competition at the expense of the cultural and subjective forces which shape the city. It flourished in 1920s and 1930s, went through a period of neglect was revived in the late 1950s and early 1960s, but is no longer seen at the centre of urban studies. The term is so applied to the sum of societal relations with nature and restoration of non human nature in cities. URBAN SPRAWL

100% **MATCHING BLOCK 4/31** **SA** term paper Guoping Zhang.doc (D919602)

Urban sprawl, also known as suburban sprawl, is the spreading out of a city and its suburbs over rural land at the fringe of an urban area.

Residents of sprawling neighborhoods tend to live in single-family homes and commute by automobile to work. Low population density is an indicator of sprawl. Urban planners emphasize the qualitative aspects of sprawl such as the lack of transportation options and pedestrian friendly neighborhoods. Before the introduction of planning controls in the UK, Urban Sprawl went largely unchecked, and ribbon developments along major routes like London's Great West Road , was rife .In an attempt to check further growth, Conservationists tend to focus on the actual amount of land that has been urbanized by sprawl and established Green Belts around Britain Cities.

86% **MATCHING BLOCK 6/31** **SA** MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

The term urban sprawl generally has negative connotations due to the health and environmental issues

that sprawl create. Residents of sprawling neighborhoods tend
14 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5

90% **MATCHING BLOCK 8/31** **SA** MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

to emit more pollution per person and suffer more traffic fatalities. Sprawl is controversial, with supporters claiming that consumers prefer lower density neighborhoods and that sprawl do not necessarily increase traffic.

Sprawl is also linked with increased obesity since walking and bicycling are not viable commuting options. Sprawl negatively impacts land and water quantity and quality and may be linked to a decline in social capital. 1.2 DIFFERENT APPROACHES - CHANGING EMPHASIS- RECENT TRENDS PERCEPTION OF URBAN SPACE The body of theories which have been applied by geographers to urban areas has varied over time. The changing approaches of Urbanization are depicted in the following paragraphs. Early Approaches : Positivist approach- this philosophy dates back to the 1820s it significantly influenced Urban Geography only from 1950s. The positive philosophy is based upon the belief that human behavior is determined by universal laws and displays fundamental regularities. It can be subdivided into two types— 1. Ecological Approaches and 2. Neo-Classical Approaches Ecological Approaches were based upon the belief that human behavior is determined by ecological principles namely that the most powerful groups (however this was defined in terms of their incomes).This approach grew out of the work of the Chicago based sociologist in the early part of the century. The work of Burgess and Park was concerned with applying the principles of ecology to the urban areas. Particular emphasis was placed on the study of specific neighborhoods and on identifying the spatial patterns of urban social structure. The best known example of this approach is the concentric model formulated by Burgess. Ecological tradition has also concentrated on identifying different sub areas of the city. Neo-Classical Approaches take its basic orientation from Neo-Classical economics which picture the economy as the harmonious system in which firm seeks to maximize the profits and households maximize their net benefits. This approach seeks to understand how the distribution of different land uses in social groups in the city deals with profit maximization on the part of the firms and utility maximization on the part of the households. Behavioral and Humanistic Approaches - Both of these approaches developed as criticism of the failings of the positivist approaches. They were united in their belief that the people and the ways in which they made sense of their environment,
15 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 should be central to their approach. Behavioralist approaches can be regarded as an extension of positivist approach. They sought to expand positivism narrow conception of human behavior and to articulate more richly the values, goals and motivations underpinning human behavior, Humanistic approaches stemmed from a very different philosophical background. They sought to understand the deep subjective and very complex relationship between individuals, groups, places and landscapes. The best developed application of the humanistic perspective in this regard is Edward Ralph's "Place & Placelessness" (1976) Structuralist Approaches - Structuralist approaches in the social sciences generally and in Urban geography can be recognized through their conviction that social relations and spatial relations are either determined or are same way influenced by the imperative of capitalism as the dominant mode of production. Structuralist approach have been accused of treating humans as mere passive agents of economic structures. Mordern Approaches - Site and Situation - Studies in early 20th century were concerned primarily with physical characteristics as the determined factor in location and development of settlements. Urban Morphology This was an important root of Urban Geography. It developed particularly strongly in German Universities in the early 20th century. It was a descriptive approach that sought to understand urban development through examination of the phases of the growth of urban areas. This concept has undergone heavy criticism in 1950s and 1960s. As a result recent work has concentrated on the roles of architects, planners other urban managers in the production of the form and design of urban areas. The two approaches mentioned above were associated primarily with infancy of urban geography. Basically, they have all sought to examine the ways in which the urban pattern and processes are the outcome of the combination of human choice and action and wider social processes which place constrain upon this human action. Firstly, they all have considered the ways in which human makes choices about a variety of things and the ways in which the discussion may influence Urban Pattern and processes. Secondly, they have all explored the constrains that might impinge upon this human choice and the ways that these constrains might influence the urbanization. Finally they have considered the outcome of the relationships between choice and constraints. Choice and Constraints are the dominant theme of Urban Geography in the post 1950 period. 1.3 GROWTH OF URBAN SETTLEMENTS - PROCESSES OF URBANISATION -STAGES OF URBAN DEVELOPMENT The most important problem in identifying the origin of urban settlements is the

16 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 difficulty in establishing the beginning in time and the place of the first urban settlement. Much of the available evidences for very early forms of settlement is archeological and goes back to several million years. Various theories have been put forward to describe the origin of the earliest urban settlement forms over the world. Among these the most established theory of the origin of cities is the traditional or ecological or environmental theory. The basic tenet for the emergence of cities according to this theory was a consequence of the process of agricultural change .A Neolithic revolution which advanced society from a stage of primitive hunting and gathering one to food producing one was necessary precondition for the emergence of towns. The second theory for origin of cities was the concept of surplus. This was postulated by Harvey (1973) that an agricultural surplus was necessary for the emergence of city forms However it is doubtful if a single autonomous causative factor can ever be identified in the nexus of social economic and political transformation which resulted in the emergence of urban forms and the catalyst was probably the intricately related role of temple fortress and market place. THE FIRST URBAN REVOLUTION-the earliest Towns The earliest towns arose during the later part of the Neolithic period when early farmers, after experiencing settled agriculture and village life began to produce with the aid of the newly invented plough producing surplus foodstuff and thus allowing part of society to free itself from work on the land. From about the 4th millennium B.C. in certain fertile riverside plains of the near east where irrigation water was available mainly in Egypt, Mesopotamia and lower Indus valley it became possible to spare some people for non-agricultural work which benefited the society like hand manufacturing, trade and community organization etc. Thus there arose a group of specialized artisans, merchants, priests etc. Along with a proportion of the agricultural community these people gathered themselves together in close knit societies which probably came to form the first towns. Thus during this period village increased in size and changed in function. Some of them also became centers of administration and were used for the exchange, storage and redistribution of goods. The rise of social factors like temples and religion also marked the beginning of urban life. So there was a flowering of towns between 4 millennium B.C. and 3r millennium B.C. which included Eridu, Erech, Lagash Ur in ancient Sumeria (Tigris-Euphrates Delta) Babylon further north, Memphis and Thebes in Nile Valley and Harappa and Mohenjodaro in the Indus Valley. Such towns were generally walled for defense and dignified by temples, pyramids and palaces. But these towns continued for long to depend for their food supplies upon the productivity of the immediately surrounding land so they could not grow into large cities and seem to have had an upper population limit of about 20,000.

17 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 From the alluvial plains of the near east the idea of the city filtered through to Phoenecia, Asia Minor and Crete. In these areas during the Bronze age a number of new trading centers came into being as for example, Byblos, Ugarit, Tyre and Sidon. All were able to benefit from Mediterranean Sea trade though like the earliest towns they were primarily tied to their own restricted areas of agricultural land which severely limited their growth as population centers. At about the same time or somewhat later a few caravan centers dependent on overland trade were established in the desert oases of Syria on the margin of the fertile crescent example, Damascus and Aleppo. Further away in the Wei ho Valley in northern China, other towns similar in character to the riverside settlements of Near East emerged and with this the concept of city was gradually diffused into Central and South China. THE SPREAD OF TOWNS IN GREEK AND ROMAN TIMES The cultural and financial capital acquired by the early near Eastern cities was gradually transmitted into Greece and Italy by traders and colonist who also introduced the cult of the city into north-west Africa and Spain during the 2nd and 1st millennium B.C. There were similar extensions of urban societies into Persia, Central Asia, Peninsular India and Ceylon (now Sri Lanka). The Greek city state consisted of a city and the rural area from which it obtained its essential supplies. Most of the Greek cities had a hill-top site and were in close contact with the sea. They were therefore able to import luxuries and other specialized products without difficulty and it became possible for them to outgrow to a limited extent their own narrow rural base. As the population grew it became common for the go-ahead to establish colonies and secondary trading stations in other parts of the Mediterranean world where they were able to find similar geographical conditions as those of the homeland. Thus came into being cities like Paestum, Neapolis, Cyrene, Alexandria, Marsielles etc in the T1 millennium B.C. Thus by about 500 B.C. examples of urban forms mostly based on the ancient rectangular grid plan found at Harappa could be found in a broad belt extending from Atlantic Coast of Iberia to Pacific Coast of China. Use of iron tools had come in along with improved ships and land vehicles. All these development facilitated ever widening commercial contacts and allowed towns to expand beyond the resources of their immediate environment. Even then only a few settlements seem to have exceeded 10,000 people. Rome had been founded in the 8th century B.C. It was from this political centre when its power had made it into an imperial city that urban settlements and the civilizations associated with them were gradually propagated north of the Alps. Then came Alexandria founded in 4th century B.C. which became the second city of Roman empire and a centre of government education and culture. Other notable cities which grew within the shelter of Roman Empire included Ostia, Turin, Aries, Lyons,

18 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 Strasbury, Cologne, London Lincola, York etc. As strategic bases, administrative centers and commercial emporia all these towns became the springboards from which Roman architecture, sculpture, law and language leapt into prominence in Western Europe and came to dominate the lives of non Italian people. These towns were probably much smaller than those in Italy and Southern France some of which probably attained a population of 30,000 with Rome probably with 250,000 persons. URBANISM IN THE MEDIEVAL PERIOD The collapse of the Roman Empire in the 5th century A.D. and the ensuing period of confusion and insecurity caused urban life, no longer supported by Roman troops and officials to contract in Northern and Western Europe though it was able to maintain itself to some extent in Southern France and Italy and to a greater degree in the east Byzantium.The New Rome flourished with the help of sea power. The Dark ages in Europe set in with the coming of barbarians mainly peasant communities who disposed the cultural legacy of Rome and ignored its towns. It was not until the 11th century that town life centered upon a market place began markedly to revive as security returned and trade began to flow again following the more thorough agricultural colonization of forest and marsh. The typical medieval town was walled for defense and often acted as a refuge not only for foreign traders and artisan but also for people from the open country around. Its nucleus was often a monastery, important church, feudal castle or guild hall. Other buildings spread outward from the market place to the walls and left room for formless groups of gardens courts and winding irregularly aligned streets. By 1400 A.D the human habitat in Western Europe and the Central parts of European Russia was covered with compact villages and towns. Not until later were there many effective urban settlements in the lower Danube lowlands and the Steppes of Southern Russia. Between 1500 and 1750 many cities in the previously urbanized parts of Europe under the initial impetus of voyages and discoveries and the growing prestige of their rulers expanded considerably. Now far more than previously a few great cities began to tower over the rest as a result of amalgamation under single rulers of large tracts of territory and of the burgeoning trade. The rise of nation states in Europe was accompanied by the acquisition of new wealth from which stemmed growing princely prestige. It was also the age of expanding ocean ports like Antwerp, Lisbon and Amsterdam. London both the capital of a great state and a leading commercial city grew to 700,000 people by 1700 when it outstripped Paris(500,000) Moscow and Vienna both nodal centers which had become the centralized capitals of powerful empires, were now entering upon a period of rapid growth. The small market towns however continued to dominate the urban scene. SECOND URBAN REVOLUTION: INDUSTRIAL TOWNS Although the rise of capital cities in classical antiquity and in Renaissance Europe

19 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 had produced occasional large cities the complex technical and economic changes which were the bases of the Industrial Revolution instituted a much more profound alteration in the size of cities in the proportion of people who lived in them and in the rate at which urbanization was taking place. The industrial revolution which took place in England, spread to other parts, and the Commercial Revolution which accompanied it made it possible for the production of a greater multiplication of towns and a more marked expansion in the size of towns than any event which had gone before. It also gave birth to a new kind of town which was dominated by industrial function. Manufacturing had long held a place in most towns, but the concentration of this activity in urban settlements some of which had formerly been mere villages was as new as the power driven machines and the factories which housed them. Fundamental to urban growth were the great improvements in agriculture. Open fields were enclosed and farms reorganized and wastelands reclaimed. New implements were invented and mechanical power to drive them hence increasing the output of individual agricultural labourer. The greater productivity of agricultural workers reduced the number of workers in agriculture and encouraged many workers to seek employment in growing towns. They were also attracted by better paid jobs in towns. So there was movement of population from rural to urban areas. The need for coal to raise steam in the early factories was the main locating influence on the new industrial towns. In 1901 of the 33 towns in Britain with more than 100,000 people, 20 were situated on or close to coalfields. The construction of improved roads, canal and later the invention of rail transport and the motor vehicle allowed such settlements to develop as hubs of communication even when they possessed little or no natural location or nodality. The population of industrial and commercial cities grew not so much by natural increase but more by immigration from rural areas, which was facilitated by improved agricultural techniques and reduced the demand for labour on the land. Some cities like London, Calcutta and Shanghai became “super cities”. In Europe between 1800 and 1890 the number of towns with population exceeding 100,000 increased from 22 to 120. Most of them were primarily concerned with large scale factory industry or international commerce. However these industrial towns were not a beautiful sight. They have been long condemned because of the squalor produced by hasty, haphazard growth and the squatter of the working class streets. Most of the 20th century planners are still trying through urban renewal projects and with the aid of modern transport and electric power, to change the face of these congested industrial towns to clean them up and make them more worthy of their inhabitants. The proliferation of towns continues in almost all countries. New urban settlements mushroom like are appearing overnight. In areas with longer history of urban expansion

20 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 many existing towns are becoming multifunctional, others more highly specialized. Urban sprawl is becoming endemic in most developed countries and more and more conurbations are coming into being. The various activities associated with very large c,, ,s like administration, manufacturing, commerce, residence are becoming increasingly segregated probably for the general good but urban life is thereby becoming less integrated and is splitting up into a series of compartments. In the 20th century however there have been two further development in growth of urban settlements which have had important geographical results. The first is the development of motor transport which has encouraged urban dispersal and the second recent development, the spread of large cities to tropical lands and urban growth is taking place at a faster rate in tropical lands than in Western Europe. In conclusion it may be said that urban settlements of some kind have been found on earth for at least 5000 years or possibly even longer. There have been variations in urban forms at various periods but the great contrast is between the smaller cities of the past and the great extent of the largest modem cities, a phenomenon which is merely 100 years old. Before even in exceptional cities like Imperial Rome building was compact and there was always a visible distinction between urban areas and the surrounding countryside. But modern metropolises, which are attracting the greatest absolute increase in population are steadily dominating the urban geography of the world are radically different. The growing number of people who live in large cities is one of the most important factors shaping the human geography of the modern world. As nodal points in local, national and international network of communication they provide vital links for economic functioning of regions of all sizes STAGES OF URBAN DEVELOPMENT The stages of urban development are envisaged as follows: 1. Urbanization, when certain settlements grow at the cost of their surrounding countryside. 2. Suburbanization or extra urbanization, when the urban ring (commuter belt) grows at the cost of the urban core (physically built-up city). 3. Disurbanization or counter urbanization, when the population loss of the urban core exceeds the population gain of the ring, resulting in the agglomeration losing population overall and, 4. Re-urbanization, when either the rate of population loss of the core or the core starts regaining population with the ring still losing population. 5. Ex-urbanization takes place due to continued deconcentration of employment and the rise of exurban industrialization. Latent and anti-urban feelings and rural local preferences with improved technology have helped to make ex-urbanization possible

21 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 1.4 THIRD WORLD URBANISATION Since 1950, urbanization has become a worldwide phenomenon. Although the phase of change has varied considerably between countries and regions, virtually every country of the third world has been urbanizing rapidly. Recent evidence of a slowdown in the rate of growth of some of the largest cities and of polarization is reversal or spatial de-concentration into concentric metropolitan forms does not contradict the conclusion that the Third World is becoming surprisingly urbanized. The process of Third World urbanization and its effects on urban structure are analyzed in historical context from the early period of mercantile colonialism to the present day is characterized by high levels of urbanization of phenomena such as exo- urbanization. Urbanization in the First and Third Worlds: Urbanization in the Third World exhibits number important characteristics with the earlier process in First World. 1. Urbanization taking place in countries with the lowest level of economic development rather than the highest as was the case when accelerated urbanization began in Western Europe and North America. 2. It involves countries in which people have the lowest levels of life expectancy at birth, the poorest nutritional levels, the lowest energy consumption levels and the lowest levels of education. 3. It involves greater numbers of people than it did in the developed world. 4. Migration is greater in volume and more rapid. 5. Industrialization lags far behind the rate of urbanization, so that most of the migrants find at best marginal employment in cities. 6. The environment in cities of the Third World is usually more healthy than in their rural hinterlands, unlike in the industrial cities of the West. Urban fertility is greater in Third World cities and net reproduction rates are higher than they ever were in most of the industrial countries. 7. Massive slum areas of spontaneous settlements characterize most like cities of the Third World. 8. Rising expectations mean that pressures for rapid event change are greater than they were in the West. 9. Political circumstance conductive evolutionary takeovers of government are then present as a result of the recent colonial Neo-Colonial status of land of the Third World nations. Notwithstanding these general differences between the urbanization process in the two world realms it is essential to recognize that urbanization is not a uniform

22 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 process that all countries go through in the course of development. Although there are similarities at a general level, the process of urbanization in different parts of the world is a complex interplay of global and local economic and political, technological and geographical and agricultural factors. In many Third world countries most large scale modern activities are located in a single major city which dominates all others. The relationship between urban primacy and economic development is inconclusive. Some researchers believe that primate cities in the Third World are 'parasitic' and retard development. Their reasons are as follows: 1. The cost of supporting a large city, especially in an agriculturally based economy, drains resources from development activities. 2. The power of the primate city to attract migrants from rural areas, many of whom remain unemployed and constitute a non-productive population and a cost to the national economy. 3. The Concentration of government, investment in the primate city reduces the growth prospects of other parts of the country. 4. The focus of national, political and economic in a primate city creates major social divisions between urban and rural areas. 5. As cities grow beyond a certain size, diseconomies of scale may arise, including increased land and service costs, extended transportation lines, and environmental problems such as congestion and pollution. An alternative view is that primate cities provide an environment necessary for development. To compete successfully in the global market, Third world countries must develop the financing, marketing and management patterns that the world economic community demands. Only in the primate cities is the necessary infrastructure to be found, along with the skilled labour. Primate cities also offer agglomeration economies that attract enterprises and stimulate a cycle of growth. While the international division of labour is not a new phenomenon (throughout the colonial era the metropolitan power undertook manufacturing of raw materials produced by the colony). The major factor underlying the new international division of labour (NIDI) was the rise of finance capital comprising investment funds accumulated by organizations (such as banks and insurance companies) concerned with the management of money. The reasons why the bulk of these investment funds have gone to organizations operating in the Third World include the following. 1. Cost of production has risen in Europe and North America. 2. Cheap labour is available in Third World cities as a result of rural-urban migration.

23 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 3. A large informal sector (or reserve army of labour) is present in the Third World urban economy which helps keep down demand for wage increases. 4. Technological advances have permitted the spatial segregation of the production and management processes. Use of computers, satellite links and containerization has made it possible for the labour-intensive parts of the production process to be located in the Third World while specialist management, research and development are retained in the home country. 5. The N1DL has also been encouraged by international agencies and national governments anxious to bring employment to burgeoning Third World cities in order to forestall possible political instability. The Impact of the NIDL on Third World cities has been mixed: 1. Most importantly, the changes have been selective, with only a small number of Third World countries such as Taiwan and South Korea, rapidly expanding their industrial economy. However, as labour costs rise in these locations, so the multinational corporations look elsewhere for new supplies of cheap urban labour. 2. Generally, it is the already large cities that have received the bulk of investment. 3. The social impact has been seen in class formation. A waged working class has appeared in many cities. Being more privileged than many other citizens, they form a conservative labour group. By contrast, the informal sector of the urban economy continues to grow, leading to some instance to fears of political instability. Another significant social phenomenon has been the greater incorporation of women into the urban workforce. Fundamentally, the urban transformation of the Third World in the post war period has led to unprecedented demands for basic services and infrastructure the most governments have been unable or unwilling to meet. These are related social, economic and political difficulties in infrastructure of the phenomenon of peripheral organization.

Peripheral Urbanization: The Model of peripheral urbanization is an extension of dependency / world systems theory which employs a political economy perspective to provide a generalized description of the impact of global capitalism into peripheral areas is seen to generate a strong process of urbanization. This may be depicted in a number of stages.

24 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 1. First, city ward migration increases, owing to the disruption of pre-capitalist forms of agriculture by commercial agriculture, and the competitive impact of cheap imports on traditional craft industry. 2. Second, surplus generated in rural/peripheral areas is extracted by national bourgeois groups and representatives of foreign capital interests based in the main urban centers. The process of extraction leads to the expansion of the main transportation and market centers, and to the rapid growth of the national capital and main ports. 3. Third, the growth of manufacturing within the national economy concentrates production still further in the largest cities, stimulates the growth of a national state bureaucracy to encourage the process of industrialization and leads to the concentration of higher income groups in the major centers where the surplus is accumulated. 4. Fourth, labour is attracted to the largest cities in search of work and produces a surplus through both wage labour and petty community production, which supports the expansion of the capitalist sector. 5. Fifth, the state acts to support industrial expansion by providing infrastructure in these main urban centres, and by legitimizing the continued functioning of the capitalist system. Urban Economy and Employment The economy of cities in the Third World is based on peripheral capitalism. This mode of production consists of two interrelated parts: a capitalist sector integrated into the world economy, and a range of petty capitalist forms of production oriented more towards the domestic economy. These have been described as a 'firm-centered economy' and 'bazaar economy', or the formal and informal sectors. Santos (1979) refers to the upper circuit and lower circuit, in order to highlight the dependence of the traditional informal sector upon the modern formal sector. The well being of individuals and households is dependent on their position within this dual-sector or bipolar urban economy. The law of primate city : The law of the primate city refers to a situation in which a single city accommodates a disproportionately large number of a countries population. In some instances the primate city size; distribution is the result of outside or foreign influences on the settlement pattern. In many present day Third World countries, for example, primate cities developed as a result of the intervention of a colonial power. Bangkok is one such example. Jefferson (1939) argued that in the early stages of a country's urban development, the city that emerges as larger than the rest develops an impetus for self sustaining

25 M-2\D:\Netaji 05\Urban Geo\Unit-1.pm6.5 growth that enables it, over time, to attract economic and political functions to the extent that it dominates the national urban system. Capital cities, such as Paris or Vienna, occupy this niche. In some countries a variety of forces, such as nationalism in Spain and territorial size in the USA, have led to several cities growing to comparable size rather than the emergence of a single primate city. The law of primacy is most relevant to countries that have a relatively simple economy and spatial structure, a small area and population, low incomes, economic dependence upon agriculture, and a colonial past. 1.5 Questions : 1. Distinguish between urbanization and urbanism? Discuss the definitional problems associated with urban areas. How does it wary from one country to another. 2. What do you mean by urban systems ? Bring out the relationship between urban ecology an sprawl in developing countries. 3. Give an account of the processes and stages involved in growth and development of urban settlements. 4. Bring out the characteristic features of third world urbanisation. How does it differ from the developed countries ? 5. Discuss the different approaches to the study of urban geography ? How has this change been associated with the changing economic structure of the world ?

26 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 UNIT 2 ? URBAN STRUCTURE Structure 2.1 City size distribution 2.2 The City Region 2.3 Aspects of Urban Economic Base, Basic and Non-Basic 2.4 Theories of Urban structure 2.5 Questions 2.1 City size distribution- Rank Size Rule and Primacy, Central Place Theory and its extension City Size Distribution : (SITE. SITUATION, SIZE, TYPES AND SPACING OF SETTLEMENT) Site and situation refer to the position or location of a town in relation to its total surroundings. A human settlement grows up in a place which is favorable for living. The position on the ground with relation to physical conditions is referred to as site. Thus, depending on site, a village may have a valley location or a dry point location. There are also piedmont towns and riverside cities. The term situation, however, has a wider meaning Situation covers economy, culture and political importance of a place. All settlements need some site advantage initially. This need is greater for rural settlements than for urban ones. Villages specially require a careful selection of site since in rural areas man interacts closely with his physical environment, areas prone to floods usually have dry point settlements, while mountainous regions have spur- line settlements where the slope in gentler. These however are examples of site advantages. All sites may not be this advantageous. This can be due to two reasons :i) a change in the condition may remove the original advantage, for example, a shifting river course or drying up of springs, and ii) Socio-economic pressures may force the weaker section of the society to occupy less favorable sites. The history of occupancy of the lower Ganga Plain shows how the people of higher castes occupies the sloping drier grounds (Rarh) while the lower castes were forced to occupy the marshy floor of the delta. Availability of water, protection from floods, sunlight etc. are some site advantages. Cities are less dependent on site factors except in certain cases, water can be
27 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 transported through pipes and air-conditioning can modify any climatic extremes. Once developed, a city has little dependence on site conditions. The expectations are the fort cities and the tourist centers that are located near places of scenic beauty. Port-cities are dependent on coastal features, especially those with natural harbors and river points. Tamralipta, the modern town of Tamluk in West Bengal was a busy port city, in the fifth century A.D. A shifting river course and subsequent silting has changed site conditions thereby leading to its decline as a port city. Situation of villages does not affect growth as much as site does. The only two aspects of situation that affect villages are a) nearness to urban centers and b) degree of connectivity. Towns and cities grow due to situational advantages. Even though the origin of the city may be attributed to an advantageous site, (such as the riverside for Calcutta and the Coast for New York), cities flourish only if there are situational advantages. These include the economy of the hinterland, close location of other cities and good transport routes. Thus Calcutta backed by a rich industrial hinterland and Rotterdam facing major sea routes, has flourished fast. The size of a settlement can be expressed in terms of its area and its population. A large area need not necessarily contain a large population. The size of a settlement more often refers to its population and not just to its aerial extent. The growth of a settlement therefore means a greater density of population. The population density of a village is often related to the carrying capacity of the land. Generally speaking where land is flat and fertile and agriculturally rewarding., villages tend to be larger, for example, those on the river valleys of China and India as compared to those found on rough terrain. In India, the regional variation of village is large. While the average population of a village in the Himachal region is 208, some villages in eastern Uttar Pradesh have population of over 10,000. The national average according to the 1991 census is about 630 persons per village. The size of urban settlements results from more complex reasons. The minimum size of a settlement necessary to call it urban varies from one country to the other. It is 2500 persons in the United States and Thailand, while it is as low as 250 in Denmark and Sweden. In India, the required population is 5000, although under certain conditions settlements with even smaller population are called towns. The population growth of urban centers depends on the functions of the city. Today, the largest cities, the mega cities with population over five million are the main business and financial centers of the world. The terms pattern, form and type have been used differently by different geographers. The term pattern indicates inter-building distances (e.g. clustered, dispersed patterns). Form is used to describe geometric shapes of villages such as rectangular, radial or linear. Some Indian scholars however use type to distinguish between compact and dispersed settlements and pattern to describe shape. Thus three distinct patterns of

28 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 settlements are identified within the clustered type — (i) nucleated, (ii) linear and (iii) ring while, two distinct patterns of settlement are closely identified with dispersed type — i) evenly dispersed and ii) unevenly dispersed. Nucleated pattern of settlement is that which arises out of close agglomeration of a number of settlements around a common point — a cross road point or a point of easy availability of drinking water. Sometimes village settlements from alignment i.e. they spread along the leagues of a river valley, road, embankment, railway and coastline. These are called linear settlements. Habitats forming ring round tanks and enclosed by trees may also be found occasionally in plain areas. These are called ring settlements. When the separating distance between individual homesteads is almost uniform in a dispersed type of settlement, it is called evenly dispersed settlement; if the distance varies from one part of the distribution to the other, it is called unevenly dispersed settlements. Rank Size Rule and Primacy : A study of available information on city-size distribution shows that within a given area there develops a regular hierarchy of urban centers consisting of a few large cities, many towns of intermediate size and a still larger number of similar towns. This empirical regularity between number and population size of urban centers has resulted in a number of attempts to define this number-size relationship in precise terms and the concept of the rank-size rule may be considered as a natural outcome of such attempts. The rank-size rule is an empirical rule used to describe city-size distributions of different countries and regions. Zipf was the first to designate the relationship formally as the rank-size-rule. Most of the scholars have accepted the rule and gathered further evidence in its support. The rank-size-rule is given by the formula, Pi = P 1 / i Where, Pi is the population of the ith town in the series 1, 2, 3, ... n in which all the urban centers in the region are ranked by population size and pi in the population of the largest town. The rule suggests that the size of a particular town can be predicted by observing its rank and the size of the largest city in the area. The town's population is derived by dividing the largest city's population by the town's rank. Thus, the second-ranked city

100% **MATCHING BLOCK 5/31** **W**

should have a population one-half the size of the

first ranked, while the tenth ranked city should be one tenth of the size of the first ranked. According to the rule, an inverted J shaped curve is produced by plotting a town's population against its rank, using arithmetic scales for both the areas. If the rule is taken in logarithmic form (bare 10), that is, Log Pi = log p 1 – log i
29 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 Then, this curve becomes a straight line. The rank-size rule may also be written as a general Pareto distribution Pi = a (i) –b Where the population of the ith ranking city (pi) is a function of that rank and a and b are the constants; for computational puiposes the relationship may be written in a logarithmic form: log Pi = log a – b log i And values of a and b may be found as in simple linear regression with the help of the following equations, ? log Pi = n log a – b ? (log i) 2 ? log Pi log i = log a ? log i – b ? (log i) 2 Mark Jefferson (1939) introduced the concept of primate city. According to him, primary is present when population of the largest city in several times larger than that second in rank. On his paper he discussed the situation in several countries of the world and thus suggested a primacy index in which he considered the population of three largest cities of each country as percentages of the value of highest ranking city and which were arranged in order of relative importance of the city. Berry using a somewhat similar primacy index, namely the ration of the popula- tion of the largest city to the total population of the first four cities arrived at the conclusion that countries with the highest values have primate city-size distribution. The Primacy index in this context of the rank-size-rule may be given by 11-P1 /P2 Where, PI and P2 are the population of the 1 st and 2 nd ranked cities respectively, Similarly 12 = P1/P3, where PI and P2 are the population of the l st and 3 rd ranking cities. If the rank-size-rule holds good then 11 = 2, 12 = 3 and so on. If, on the other hand, 11 is greater than 2, primacy may be said to exist. It is also possible to find out whether the largest city of the region under study has an optimum population in the following way: the sum of the reciprocates of the ranks of all the urban centers of the region (El/R) are found and the total urban population (EP) is divided by El/R. This will give the expected population of the premier city (Pie) on the basis of the total urban population (EP) and number of urban centers (N) of the region. If Pie is smaller than the actual population (Pia), then the distribution may be said to be primate and vice versa. If Pie and Pia are almost equal then the premier city may be said to have an optimum population. Pie = EP/ (El/R) If, Pia < Pie — Primacy of the largest city of a region is found.

30 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 Central Place Theory : A theoretical study of the spacing of settlements within a system was done by Walter Christaller his Book "Die Zentralen Orte in Sudentchland" (Central Places in Southern Germany), written in 1933. This theory still remains the single most important basis for analyzing settlement systems. The essence of Christaller's theory is that a certain amount of productive land supports a settlement. This in turn provides essential services to this land, referred to as its complementary area. It is also sometimes called the tributary area or service area. The settlement itself is a central place (this term was first used by Mark Jefferson in 1931). The extent of the tributary area varies with the size of the central place. Size in this case actually relates to the functions performed and not nearly to population, though ultimately the idea of threshold population show that both are related. A large tributary area will include several small ones and smaller central places will depend on larger ones for higher order functions. He will or its own accord creates a nested hierarchy of service areas. Ideally each central place should have a circular tributary area around it, since it ensures a perfect central position. This kind of geometry will either create overlapping portions or leave no service areas. This problem can be solved by flattening the perimeters to form hexagons that fit against each other without overlaps or banks. Christaller identified seven orders of central places in south Germany and estimated their distance from each other as well as the population and size of their complementary areas. The fact, that there is no rural urban dichotomy and settlements are considered as part of a continuum, makes this the most complete theory in settlement study till now. On a flat uniform surface with a perfectly regular distribution of settlements, the corners of the smallest hexagon are occupied by villages which perform no function such a settlement will have the option of availing of the services of any of the three central places which are equidistant from it. Thus the central place which are equi-distant from it. Thus the central place A is assumed to be serving 1/3 of the total population of such a settlement. Since there are six such places here the total number of settlements actually served by any central place of the lowest order is 6 X 1/3 + 1 (the C. P. itself) = 3 This was taken as a constant to denote the ration of increase in the number of settlements served by each higher order. That is order one serves 3 Order 2 serves 9 Order three serves 27 and so on
31 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 This hexagonal packing of trade areas, each tangential to the other, is mathemati- cally the most efficient system. This is the K = 3 principle of Christaller where K is a constant. The principle is based on market optimization where each customer remains as close as possible to each level of C. P. This means that central places from the same level are equidistant while distances between central places increases with each succeeding level. The theory thus explains the location of central places in a system of settlements based on the idea of minimizing the distance traveled by any customer for a service. The K = 3 principle undergoes modifications, however if the "most efficient traffic'1 principle is considered. This visualizes the situation of settlements along traffic routes so that they lie along the edges rather than the corners of the hexagon. This leads to a constant of K = 4. A central place serves 1 / 2 of the population of 6 lower order centers and its own population i.e. in total serves (6 X 1 / 2) +1=4. Under what has been called the administrative principle this relationship further changes to K = 7. For administrative functions the entire population of one settlement must depend on one central place only. The principle lines, therefore, pass midway between the dependent settlements clearly demarcating the population of the tributary area. The different K values can be applied to the same region. This only affects the size of the complementary areas and should not affect func- tional hierarchy. The central place theory identifies the hierarchy of settlements based on function and considers their location in space. This is a deductive theory based on certain assumption :— a) One is dealing with an area topographically a plain with uniformly productive soil. b) There exists no economic disparity due to the localization of resources or technology. c) There exists also a homogeneous evenly distributed population who are commercially motivated economic men, interested in maximizing profits. d) All functions found in the lower-order central places are also found in the higher order central places. e) The central places are service centers which depend entirely upon the trade of their zone of influences. Under these circumstances the population will have a tendency to gravitate towards a nucleus, the central place. The sequence of events that follows then produces nested hierarchy of C. P. along with their complementary areas. The entire principle can be explained with reference to the concept of threshold population and range of goods and services.

32 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 The threshold population is the minimum population necessary to support the service activity. It may be as low as 50 for a corner shop or as high a 1, 50,000 for a theatre. If the population falls below the threshold level, the activity will run at a loss and will face closure in the long run. If the population increases above the minimum, the profits, which may also lead to increase competition through increased provision of service activities. The hexagonal geometry of this model and the concept of K values or nesting are outdated now as they fail to satisfy empirical test. However, the basic concepts formulated in the central place theory are still valuable for students of geography. Later August Losch has modified it and made it less rigid. Christaller has recognized typical size settlements, computed their average population their distance apart and the size and population of their tributary areas in accordance with Ms hexagonal theory as the table shows. He also states that the number of central places follows a norm from largest to smallest in the following order 1 : 2 : 6 : 18 : 54 etc. Central Place Towns Distance apart Population Market Hamlet (Marketort) 7 800 Township Centre (Asmtsort) 12 1,500 Country Seat (Kreiadt) 21 3,500 District City (Bezirksstadt) 36 9,000 Small State Capital (Gaustadt) 62 27,000 Provincial Head City (Provinzhauptstadt) 108 90,000 Regional Capital City (Landeshauptstadt 186 3,00,000 Formula of Centrality of Place Z 2 = Tz – [Ez X (T g /E g)] Z = Degree of centrally (weightage) Tz = Number of telephone in that place Ez = Number of inhabitants in z Tg = Number of telephone areas served Eg = Inhabitants the area served by z Tg/Eg = Telephone density of whole area T7 = Actual Importance CHR1STALLER CRITICISM 1. Hexagons are not exist in reality

33 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 2. Theory is static; increase in service actively in one sector incorporate the change in other section. 3. Uniform population distribution and rationality of consumer said in this theory do not support reality. 4. Hierarchy of settlement distorted by domination of large cities which have shadow effect and prevented growth of smaller settlement. 5. Harvey Carter raised issues that this model is more optimum than practicable in developing fields; equally the model was questioned on the basis of its functional linkage density and sequence. 6. In reality unequal traveling facility to different directions variations in functioning power and spreading pattern, non service function of many urban settlements may be noticed. 7. Christaller's central place theory is concerned only with one certain place activity that of the servicing functions for the hinterland. Other aspects such as places of residence or industrial centers are not considered. 8. The theory does not work well in areas where the industries are expanding or retarding. Therefore Christaller's concept of rank is not totally acceptable 2.2 The City Region— Regional Capitals, the Metropolis, the Megalopolis and Ecumenopolis. Conurbation- Rural Urban Continuum City Region : Various terms have been used to describe the area linked economically and socially to a town, the word 'umland' has been widely used by German and Scandinavian geographers; some likening all towns to commercial ports prefer the term 'hinterland'. Other terms include 'sphere of influence', 'Zone of influence', 'catchment area', 'and tributary area 'and'urban field'. The term 'city region" is generally reserved to describe a similar situation on a much larger scale. Each town owes its sustenance to the patronage of the city region which supplies it with a proportion of its workers and shoppers and others who wish to take advantage of its cultural, recreational, and professional and health services. The town thus acts as a collecting, marketing and general service centre for a wider area than the town itself. Virtually, all large cities, especially capital cities, have more than one city-region. Certainly their contacts with the surrounding area diminish in intensity as distance increases. In the sphere of central government, entertainment, luxury goods of the highest value, and certain specialist functions, including those of a financial and

34 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 medical character, capital cities, for example New Delhi serves the whole country, but on a lower level of services, their city regions are restricted to their own regions. Thus a large political capital has both a primary and a secondary city region. The size of an urban field depends essentially on the degree of development of the town as a central place. Thus, the urban field of an industrial town which has not grown up specifically to serve the surrounding population will tend to be more restricted than that of a market town of equivalent size. The spacing of neighboring towns will also have an important effect on the size of a city region. A service centre of moderate importance may have a relatively large city region if there are no competing centers located nearly. Comparatively few city regions assume the neatly shaped hexagon as postulated by Christaller. Some are elongated in the direction of important roads. Others may be restricted in one direction by physical barriers, e.g. a mountain range or a sea coast. Relation between a Town and its city-region; R. E. Dickinson has divided the principal regional associations of a city into four categories:— 1) Trade relations, which provide a series of trading areas growing out of different trading activities, e.g. retailing and wholesaling. 2) Social Relations, which produce a social area comprising people who seek to benefit from the various entertainments and cultural activities a town provides. 3) Commuting relations, which produce an area of settlement round a town and perhaps a series of dormitory towns, and also a zone of movement through which people pass on their way to and from work. 4) Agricultural relations, which lead to the development of particular area of farming near a city, which itself acts as a convenient market. Characteristically, dairy fanning and market-gardening activities, the latter in part in glass houses are often associated with city margins, because milk and vegetables not only deteriorate quickly, they are also fairly bulky commodities which are demanded daily at cheaper prices by city shoppers. There also exist of course, industrial relations between towns and the city region. Urban geographers have paid considerable attention to the problems of delimiting city regions. Among the most commonly used indices are the following. a) Newspaper Circulation b) Public transport services c) Retail transport services
35 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 d) Higher educational catchment areas and e) Commuter range. f) Miscellaneous criteria like range of hospital treatment, local radio stations, telephone etc. The theoretical position of the margin of a city-region can be calculated by using a technique known as breaking point theory. The breaking point between two towns divides the people who will travel to one town from those who will travel to another town for similar services. If enough breaking points can be established around a town theoretical city region can be delimited in that way. The position of the breaking point (x) between two towns (i and j) can be calculated using the formula djx = dij / lt (? pi / pj) In which Pi and Pj are the populations of the two towns, dij is the distance between two towns and djx is the distance of the breaking point from the town j When the fields of influence of a number of major urban centres are put together on a single map, it will be seen that there are zones of overlap of the various urban fields. This is in fact, a normal state of affairs, especially is highly urbanized countries. The reverse situation, a zone of vacuum, where the urban fields of two towns fail to meet an leave a zone with no urban allegiance, is quite rare. This is most typical of developing countries where the process of urbanization is little advanced and towns are still widely spaced. In view of the problems of delimitation and the complications produced by zones of overlap between city regions should be thought of as a series of zones rather than a single area. A.E. Smailes has suggested that any urban field can be divided into three zones:— i) A Core Area: Which largely corresponds with the contiguous built up area of the town and in which the majority of the population look to the town for shopping, entertainment and employment. ii) An Outer Area: In which the town is used for high-order services and local centers for low order, day to day services; and iii) A Fringe Area: in which the town is the place of work for only a small proportion of the employed population but is still utilized for high-order functions, such as higher education and specialized professional sendees. Metropolitan area A metropolitan area is a large population centre consisting of a large metropolis and its adjacent zone of influence, or of more than one closely adjoining neighboring central cities and their zone of influence. One or more large cities may serve as its hub or hubs, and the metropolitan area is normally named after either the largest or most important central city within it.
36 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 Mega city A mega city is usually defined as

100% **MATCHING BLOCK 7/31** **W**

a recognized metropolitan area with a total population in excess of 10 million people.

Some definitions

also set a minimum level for population density (at least 2,000 persons/square km). A mega city can be a single metropolitan area or two or more metropolitan areas that converge upon one another. The terms conurbation and metroplex are also applied to the latter. The terms megapolis and megalopolis are sometimes used synonymously with mega city. The term Meta city is also sometimes used to describe cities with more than 20 million people.

95% **MATCHING BLOCK 11/31** **SA** A Review Report.docx (D113957614)

In 1800 only 3% of the world's population lived in cities. By

the 20th century's close, 47% did so. In 1950, there were 83 cities with populations exceeding one million; but by 2007, this had risen to 468 agglomerations of more than one million. If the trend continues, the world's urban population will double every 38 years, say researchers. The UN forecasts that today's urban population of 3.2 billion will rise to nearly 5 billion by 2030, when three out of five people will live in cities. The increase will be most dramatic in the poorest and least-urbanized continents, Asia and Africa. Surveys and projections indicate that all urban growth over the next 25 years will be in the developing countries. One billion people, one-sixth of the world's population, now live in shanty towns which are seen as "breeding grounds" for social problems such as crime, drug addiction, alcoholism, poverty and unemployment. In many poor countries overpopulated slums exhibit high rates of disease due to unsanitary conditions, malnutrition, and lack of basic health care.By 2030, over 2 billion people in the world will be living in slums. Already over 90% of the urban population of Ethiopia, Malawi and Uganda, three of the world's most rural countries, live in slums. In 2000, there were 18 mega cities - conurbations such as Tokyo, Mexico City, Bombay, Sao Paulo and New York City - that have populations in excess of 10 million inhabitants. Greater Tokyo already has 35 million, more than the entire population of Canada. By 2025, according to the Far Eastern Economic Review, Asia alone will have at least 10 hyper cities, those with 20 million or more, including Jakarta (24.9 million people), Dhaka (25 million), Karachi (26.5 million). Shanghai (27 million) and Bombay (with a staggering 33 million). Lagos has grown from 300,000 in 1950 to an estimated 15 million today, and the Nigerian government estimates that city will have expanded to 25 million residents by 2015. Chinese experts forecast that Chinese cities will contain 800 million people by 2020 Mega cities around the world In 1950, New York was the only urban area with a population of over 10 million.Geographers have identified 25 such areas as of October 2005 as compared
37 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 with 19 mega cities in 2004 and only nine in 1985. This increase has happened as the world's population moves towards the high (75-85%) urbanization levels of North America and Western Europe. Today, the largest mega city is the Greater Tokyo Area. The population of this urban agglomeration includes areas such as Yokohama and Kawasaki, and is estimated to be between 30 and 34 million. The variation in estimates can be accounted for by different definitions of what the area encompasses. While the prefectures of Tokyo, Chiba, Kanagawa, and Saitama are commonly included in statistical information, the Japan Statistics Bureau only includes the area within 50 kilometers of the Tokyo Metropolitan Government Offices in Shinjuku, thus arriving at a smaller population estimate. The ten largest mega cities, according to this criterion are, in decreasing order of population: 1.

100% **MATCHING BLOCK 9/31** **W**

Tokyo, Japan (35,197,000) 2. Mexico City, Mexico (25,600,000) 3. Seoul, South Korea (23,100,000) 4. New York City, USA (21,800,000) 5.

Mumbai (Bombay), India (21,100,000) 6. Delhi, India (20,800,000) 7. Sao Paulo, Brazil (20,300,000) 8. Osaka-Kobe-Kyoto, Japan (19,900,000) 9. Shanghai, China (18,600,000) 10. Los Angeles, USA (17,900,000) Source : Th. Brinkhoff: The Principal Agglomerations of the World, 2006-11-22 Megalopolis (city type) A megalopolis, or megapolis. is defined as an extensive metropolitan area or a long chain of roughly continuous metropolitan areas in the United States and Canada. The term was first used in the United States by Jean Gottmann in 1957, to describe the huge urban area along the Eastern

83% **MATCHING BLOCK 10/31** **W**

seaboard of the U.S. from Boston, Massachusetts to Washington, D.C.

According to Gottmann, it resulted from changes in work and social habits. A megalopolis is also frequently a mega city, megapolitan area, or

100% **MATCHING BLOCK 13/31** **SA** Rama Subramanian.doc (D61516814)

a metropolitan area with a total population in excess of 10 million people.

Modern interlinked ground transportation corridors, such as rail and highway, often aid in the development of megalopolises. Some examples of major megalopolis of the world are given below: ? Rio de Janeiro-Sao Paulo-Campinas, in Brazil, with approx 43 million inhabitants (includes the Volta Redonda, Campos dos Goytacazes, Juiz de Fora areas) ? Taiheiyo Belt in Japan (roughly 82.9 million); dense with no rural areas at all in between.
38 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 ? Beijing-Tianjin-Tangshan in China (23 million, all other Hebei cities excluded) ? Jakarta-Depok-Bogor-Tangerang-Bekasi (Jabotabek)-Bandung in Indonesia (28 million) ? West coast of Taiwan, from Taipei to Kaohsiung (18 million) ? Most of South Korea (Incheon-Seoul-Daejon-Daegu-Busan) (32 million) ? Mexico City-Toluca-Puebla-Cuemavaca-Pachuca-Tulancingo-San Juan del Rio- Queretaro-Celaya-Salamanca-Irapuato-Leon Mexico (34 million) ? Delhi-New Delhi, India (18 million) ? Cairo-Giza-Kalyoubia (Greater Cairo), Egypt (16 million) ? Los Angeles-Riverside—San Bernardino—Orange—Ventura—San Diego— Santa Barbara—Imperial counties-Tijuana, Mexicali and Ensenada, Mexico, collectively known as Southern California (24 million; 21 million in S. Cal; 3+ million in Baja California, Mexico) ? Kolkata-Asansol, India (20 million) ? Mumbai-Pune, India (25 million) ? Lagos-Ibadan-Cotonou, including Porto Novo and Abeokuta, Nigeria (22 million) Ecumenopolis Ecumenopolis (from Greek words oiKouuevn/ecumen), meaning world, and 7t6A,ic; (polis) meaning city, thus a city made of the whole world) is a word invented in 1967 by the Greek city planner Constantinos Doxiadis to represent the idea that in the future urban areas and megalopolises would eventually fuse and there would be a single continuous worldwide city as a progression from the current urbanization and population growth trends. Before the word ecumenopolis had been coined, the American religious leader Thomas Lake Harris (1823-1906) mentioned city-planets in his verses, and science fiction author Isaac Asimov uses the city-planet Trantor as the setting of some of his books. Doxiadis also created a scenario based on the traditions and trends of urban development of his time, predicting at first a European eperopolis (“continent city”) which would be based on the area between London, Paris, and Amsterdam (or the Blue Banana). Conurbation A conurbation is an urban area comprising a number of cities, towns and villages which, through population growth and expansion, have physically merged to form one continuous built up area. It is thus a polycentric form of agglomeration. This term is commonly used in the United Kingdom. A metropolitan area usually combines one or several conurbations with peripheral zones not themselves necessarily urban in character, but closely dependent on the conurbation(s) in terms of employment and commerce. The word conurbation is not
39 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 used in the United States; the term metropolitan area is used instead. The San Francisco Bay Area, which is a cluster of cities, towns, and villages surrounding the San Francisco Bay, is an example. The Randstad, which is a densely populated area in the Netherlands consisting of a cluster of the four biggest cities of the country and several smaller cities, towns and urbanized villages, is another appropriate example of a conurbation. The Brussels- Capital Region in Belgium, by contrast, is an ordinary type of agglomeration centered on one city. Edge city is an American term for a relatively new concentration of business, shopping, and entertainment outside a traditional urban area in what had recently been a residential suburb or semi-rural community. The term was first used in Tom Wolfe’s 1968 novel The Electric Kool-Aid Acid Test and popularized in a 1991 book of that title by Joel Garreau, who established its current meaning while working as a reporter for the Washington Post. Garreau argues that the edge city

94% **MATCHING BLOCK 12/31** W

has become the standard form of urban growth worldwide, representing a 20th-century urban form unlike that of the 19th-century central downtown. Other terms for the areas include suburban activity centers, megacenters, and suburban business districts .

Garreau established five rules for a place to be considered an edge city: ? It must have more than five million square feet (465,000 m 2) of office space. This is enough to house between 20,000 and 50,000 office workers, as many as some traditional downtowns. ? It must have more than 600,000 square feet (56,000 m 2) of retail space, the size of a medium shopping mall. This ensures that the edge city is a center of recreation and commerce as well as office work. ? It must be characterized by more jobs than bedrooms. ? It must be perceived by the population as one place. ? It must have been nothing like a city 30 years earlier. Since Garreau wrote in the early 1990s, a statement better suited for the 2000s is that it must have been nothing like a city in 1960. Most edge cities develop at or near existing or planned freeway intersections, and are especially likely to develop near major airports. They rarely include heavy industry. They often are not separate legal entities but are governed as part of surrounding counties. They are numerous almost 200 in the United States, compared to 45 downtowns of comparable size and are large geographically because they are built at automobile scale. Spatially, edge cities primarily consist of mid-rise office towers (with some skyscrapers) surrounded by massive surface parking lots and meticulously manicured lawns, almost reminiscent of the designs of La Corbusier. Instead of a traditional street grid, their street networks are hierarchical, consisting of Winding parkways
40 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 (often lacking sidewalks) that feed into arterial roads or freeway ramps. However, edge cities are of similar job density to the secondary downtowns found in places such as Newark and Pasadena; indeed, Garreau writes that edge cities' development proves that "density is back NIMBY (an acronym of Not in My Backyard) describes the phenomenon in which residents oppose the nearby location of something they consider undesirable, even if it is clearly a benefit for many. Examples might include an incinerator, an ethanol plant, a nuclear power plant, or a prison. The term has been applied in debates over developments in various situations, including : ? when parties advocate infrastructure development such as highways, power plants, electrical transmission lines, wastewater treatment plants, landfills, sewerage outfalls or prisons ? when parties build, operate, or advocate culturally unfamiliar functions, such as subsidized housing, halfway houses, or homeless shelters ? when a government or private party advocates development of residential or commercial property Streetcar suburb A streetcar suburb is a community whose growth and development was strongly shaped by the use of streetcar lines as a primary means of transportation. The earliest suburbs were served by horsecars, but by the late 1800s cable cars and electric streetcars, or trams, were used, allowing residences to be built further away from the urban core of a city. Streetcar suburbs, usually called additions or extensions at the time, were the forerunner of today's suburbs in the United States and Canada 2.3 Aspects of Urban Economic Base, Basic and Non-Basic Types of Linkages: The rural hinterland of an urban centre may be defined by the spatial extent of different linkages from the urban centre. Such linkages are of different types: 1. Physical Linkage in terms of connecting roads, railways, telephone lines, etc. 2. Commodity Linkage which include flow of commodity to and from the spatial units under consideration. 3. Service Linkage i.e. the provision of services like health, insurance, electricity, sewage lines, etc. from an urban centre to the surrounding rural areas. 4. Human Linkage which consist of i) Commuters ii) Migrants

41 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 Linkage development via commuters and migrants may result from the motivation of purchasing and /or selling commodities, services or from other types of occupational or social motivation like marriage. 5. Monetary Linkage or the flow of capital in exchange of commodities, services or labour, flow of capital in exchange of labour can take from the remittances which may be defined as personal income transferred to the areas outside the spatial unit. 6. Information Linkage can play a very important part in diffusion of new ideas, technology and development. The development of commodity, human and monetary linkages depend to a great extent on the access of infonnation regarding the demand and supply of commodities, different type of labour (skilled and unskilled), finance, etc. Technological invention and innovation which can lead to changes in the productivity; which depends on exchange of ideas. These linkages create an impact in the development of economy through socio- economic and physical terms, therefore these type of linkages are required to be implied in the theories of economic growth. Theories of economic growth are: 1. Economic base theoiy 2. Export base model 3. Sector and stage theory Economic Base Theory : According to economic base concept, the regional economy can be gradually subdivided into two sectors: 1 Basic Activity 2 Non-Basic Activities The basic activities are those which exports goods and services to points outside the economic confines of the community for example large scale industries like iron and steel industry, the products of which are supplied to different regions. The non- basic activities are those which provide for the need of the residents within the communities economic limits such as services provided by the local barbers, tailors, retail shop,etc. An increase in the amount of the basic activity within a region will increase in the flow of income into the region which in turn will result in an increase in the demand for goods and services within it and affecting a corresponding increase in the volume of non-basic activity. Alternatively a decrease in basic activity would lead to a fall in income coming to the region, a decline of demand for the product of the non-basic sector. Hence, basic activity as its name suggest has the prime mover role with any changes having a multiplier effect on the regional economy.
42 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 The economic base multiplier is usually calculated in the terms of employment and can be expressed as: Total employment in basic and non-basic activities Total employment in basic activities For example, a region with 500000 person in employment, 250000 in basic activity and 250000 in non basic activity, that is a 1:1 basic: non-basic ratio, will have a multiplier of : 250000 + 250000 250000 = 2 Extensive use has been made the employment multiplier for projection purposes. By evaluating the future prospect of the basic activities in the regional economy and then applying the employment multiplier derived from the total, basic ratios relating to the existing industrial composition, future employment totals have been forecast. This predictive role can be illustrated by considering the impact of an increase in employment in a basic industry in the above region. With an employment multiplier of 2, an extra 20000 non-basic jobs will be created and total employment will increase from 500000 to 540000, that is: 1 T = l B(k) 40000 = 20000(2) where, IT = change in total employment 1B = change in basic employment k = employment multiplier. There will also be a simpler relationship between total employment and regional population. Unfortunately, an attractive simplicity of the economic base theory can be deceptive and misleading, and there are several technical and conceptual problems which although do not disapprove the theoiy, cast some doubt on the use of economic base studies in forecasting changes in the regional economy.
43 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 2.4 Theories

100%	MATCHING BLOCK 14/31	SA	Urban Geography.docx (D57573963)

of Urban structure Urban structure is the arrangement of land use in urban areas.

Sociologists,

92%	MATCHING BLOCK 15/31	SA	Urban Geography.docx (D57573963)

economists, and geographers have developed several models, explaining where different types of people and businesses tend to exist within the urban setting. Urban structure can also refer to

the

100% **MATCHING BLOCK 16/31** SA Urban Geography.docx (D57573963)

urban spatial structure, which concerns the arrangement of public and private space in cities and the degree of connectivity and accessibility.

The Concentric ring model also known as the Burgess model was the first to explain distribution of social groups within urban areas. Based on one single city, Chicago, it was created by sociologist B. W. Burgess in 1925. This concentric ring model depicts urban land use in concentric rings: the Central Business District (or CBD) was in the middle of the model, and the city expanded in rings with different land uses. The centre was the CBD, followed by the transition zone otherwise known as the Inner City, then by low-class residential homes and Inner Suburbs, the fourth ring would be that of better middle-class homes also known as the Outer Suburbs; the last and fifth zone was known as the "commuters' zone". Burgess observed that there was a correlation between the distance from the CBD and the socio-economic status of the citizens; richer families tended to live further away from the CBD. As the city grew, Burgess also observed that the CBD would cause it to expand outwards; this in turn forced the other rings to expand outwards as well Limitations of the Model: ? Physical features-land may restrict growth of certain sectors ? Commuter villages - commuter villages defy the theory since they are located far away from the city ?

61% **MATCHING BLOCK 17/31** SA MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

Decentralization of shops, manufacturing industry, and entertainment ? Urban regeneration and gentrification - More expensive property can be found in 'low class' housing areas ?

Many new housing estates were built on the edges of cities in Britain Sector model: It is Proposed in 1939 by economist Homer Hoyt, the sector model also known as the Hoyt model in urban land use and demography modified the concentric zone model of city development. The benefits of the application of this model include the fact it allows for an outward progression of growth however, like all models of urban form its validity is limited Explanation of the Model While accepting the existence of a central business district, Hoyt suggested that various socio-economic groups expand outward from the city center along railroads,

44 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 highways, and other transportation arteries. Using Chicago as a model, an upper class residential sector evolved outward along the desirable Lake Michigan shoreline north of the central business district, while industry extended southward in sectors that followed railroad lines. In developing this model Hoyt observed that it was common for low-income households to be near railroad lines, and commercial establishments to be along business thoroughfares. Recognizing that the various transportation routes into an urban area, including railroads, sea ports, and tram lines, represented greater access, Hoyt theorized that cities tended to grow in wedge-shaped patterns ~ or sectors ~ emanating from the central business district and centered on major transportation routes. Higher levels of access meant higher land values, thus, many commercial functions would remain in the CBD but manufacturing functions would develop in a wedge surrounding transportation routes. Residential functions would grow in wedge- shaped patterns with a sector of low-income housing bordering manufacturing/industrial sectors (traffic, noise, and pollution makes these areas the least desirable) while sectors of middle- and high-income households were located furthest away from these functions. Hoyt's model attempts to broadly state a principle of urban organization The model applied: To a certain extent, this model can be applied to Calgary, Canada. The layout of Calgary indicates the majority of the city's high cost housing in a narrow wedge with growth along the Elbow Valley, part of a good transport route. Admittedly, the aesthetic values of the valley also make this area desirable. It can also be seen that most of the low cost housing is adjacent to industrial areas; Smith (1962) attributes this to the depreciation and deteriaton of the housing caused by industrial expansion. The author also points out, however, that there are also areas of new, middle cost adjoining the industrial sectors caused by a lack of low cost housing in the city. This is not a perfect application of the model as market forces have influenced expansion outside of the city, in out of town malls and around the university with the new layout tending towards a multiple nuclei model. Limitations of the Model The theory is based on nineteenth century transport and does not make allowances for private cars that enable commuting from cheaper land outside city boundaries. This occurred in Calgary in the 1930s when many near-slums were established outside the city but close to the termini of the street car lines. These are now incorporated into the city boundary but are pockets of low cost housing in medium cost areas. ?

100% **MATCHING BLOCK 18/31** **SA** MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

Physical features - physical features may restrict or direct growth along

certain wedges ? The growth of a sector can be limited by leapfrog land use ? No reference to out of town development. 45 M-2\D:\Netaji 05\Urban Geo\Unit-2.pm6.5 Multiple nuclei model : In demography, the multiple nuclei model is an ecological model put forth by Chauncy D. Harris and Edward L. Ullman in the 1945 article "The Nature of Cities." While a city may have started with a central business district, similar industries with common land-use and financial requirements are established near each other. These groupings influence their immediate neighborhood. Hotels and restaurants spring up around airports, for example. The number and kinds of nuclei mark a city's

97% **MATCHING BLOCK 19/31** **SA** MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

growth. The theory was formed based on the idea that people have greater movement due to increased car ownership.

This increase of movement allows for the specialization of regional centers (eg. heavy industry, Business Park). There is no clear CBD (Central Business District) in this type of model. 2.5 Questions 1. What are the major factors influencing the spacing of sculements in any area ? Explain how city size distribution can be studies with the help of Rank size Rule. 2. What do you mean by Central Place ? Discuss the Central Place Theory and bring out it weaknesses. 3. What do you mean by urban field ? What are the distinctive zones of the city and its region ? 4. What do you mean by "city region" ? Bring out the relationship between town and its city region ? 5. What do you mean by urban structure ? Discuss two important models used to describe the structure of cities. 6. Differentiate between Mega city, Megalopolis and Conurbation ?

46 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 UNIT 3 ? URBAN SPACE Structure 3.1 Urban Social Space 3.2 Urban Land use 3.3 Structural Elements of C.B.D. 3.4 Suburbs—Rural Urban Fringe 3.5 Questions 3.1 Urban Social Space Urban space is an agglomeration of people, objects and events. Colquhoun (1989) defines the term Urban space in two perspectives: Social space and built space; which in combination forms Urban Social Space. The Urban Social space is "the spatial implication of the social institutions" and is studied by sociologists and geographer. This is the viewpoint that tends to see the physical characteristics of the built environment as "epiphenomcnal". The built space within the Urban space on the other hand Ibcuscs on the 'Physical space'," its morphology the way it affects our perception , me way it is used and the meaning it can elicit, which is concern of architecture. Thus Urban social space is the interconnection of "function and form"; which includes the disciplines of Geographers and Sociologists. Urban Social Space is identiiied as the "External Space", by Rob Krier (1979). According to him, Urban Social Space includes all types of spaces between buildings in towns and localities. Thus, this perspective of urban space is purely physical in nature, which is geometrically hounded by a variety of elevations. His analysis ol" Urban Social Space is thus confined to morphology, enumerating the basic elements of Urban Space, streets, and square and its basic forms squares and triangle with a number of possible variations and combinations. Colquhoun reasserts the conventional distinction between physical and social aspects of urban space by reliance on the role of social functions. He critici/es the modernist tendency "to take a historicist and relativist of architecture and to regard the city as an epiphenomenal of social function, resulting in a particular kind of Urban Space". In explaining this aspect of Urban Social Space, he takes the side with the post- modern critics who tends to dissociate the physical and social space, by concentrating on the former "as an autonomous formal system". The relationship between Physical and Social Space within the Urban Space i.e between form and function in modernist architectural language become one of the

47 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 key themes of Post- Modem challenge to modernism. The Modernist formula, regarding Urban Social Space is "the form which follows function". In other words it is relate the social and physical space in rather simplistic and deterministic way within an urban environment. The post modem attempt in contrast has attempted to disengage this relationship and to concentrate on physical space. Thus it may be concluded by emphasizing that. Urban Social Space is the combination of both the physical and social space which is not only combined with modem architecture and planning hut also the political escapism associated with post-modernist disregard of social space; which can be maintained in socially concerned approach to Urban Environment. 3.2 Urban Land Use Four basic types of Urban Land Use can be identified (i) Central Business, (ii) Industrial, (iii) Residential and (iv) Open Areas. The historical core of the metropolis, the original City, tends to remain its centre. With the main lines of the transportation system oriented to it, this centre remains the point most accessible to all parts of the metropolis and, therefore, attracts all those functioned which serve the entire area. Partly all acted by those, partly for historical reasons, all those functions which require mutual contact also concentrate here, typically in office buildings. These two basic central functions attract other which service them, such as eating and drinking places and parking facilities. The resulting competition for space, both within the centre and on the transportation facilities leading to it, leads to a displacement from the centre of all those uses which require relatively much space and can also function elsewhere. These are priority those dealing with goods, manufacturing and warehouses, but also retail stores, consumer services and residents. As the metropolitan population grows and speaks out outgoing sectors accidental, suffocation population and purchasing paper to support Second order services of their son, naturally retail, but also consumer and home business services. With continuing growth the quality of the second order moves up, bearing a narrow range of the highest order in the central. Similarly, second order routine office functions also move out, bearing only the highest order contract functions in the centre. However, with the overall growth of the metropolis, both types of highest order functions are growing and are being augmented by others of still higher order, which can only exist when the size of the total market has reached a higher threshold. Thus, the centre is undergoing a process of continuous selection adaptation to the office functions for which it is uniquely suited. Surprisingly thus unending change in quality series produce stability of quantity.

48 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 From the centre outward, density of population and of all activities decreased. Once time, this serve undergoes two typical modifications — (a) it becomes flatter, and (b) it becomes smoother. The increasing smoothness seems to indicate that the centre despite its relative decrease in quantity, increasingly dominates the entire area, superceding the influence of other pre-existing centre. The flattening results from a slow decrease of density in the inner and a rapid increase in the outer zones, each of which, however, finally stabilizes at a lower density than the previous one. Within this basic pattern, modifications are brought about by topography and by transportation. Whenever individual transportation predominates, long distances tend to be proportional to straight-line distances, and the over-all form of the settlement tends to be circular. This was the case in the foot-and-hoof city. The development of suburban railroads brought a change, because trips made by their passengers were performed by two means of radically different speeds — a train at 30 miles an hour and walking at 3 miles per hour. As the technology of steam railroads dictated few and widely spaced stations, a pattern of small circular developed strung out over a considerable length of railroad line, with a small commercial centre at each station. With the electric structure, stops were for more frequent, and the speed was only three lines walking speed. So, the dots varied into solid and shorter lines, with commercial concentrations at their intersection. When the automobile brought about a sudden and unpredictable reversal of the secular brand from individual to collective transportation, the use of one means of transportation for the entire trip and at fairly uniform speed reproduced on a vastly large scale, the circular form of the foot-and-hoof city. The structural pattern of developed and open land, which had began to emerge in the railroad and street car areas, has submerged in universal sprawl. Developments were scattered all over the metropolitan area, cutting up the open space into smaller and oddly shaped remnants. The developments are of two types mainly — Industrial and residential. The former used for manufacturing, warehousing and transportation, need relatively large areas of level land with good access to transportation by water, car, rail and road. Residential areas are practically unrestricted in their choice of location and cover much more extensive areas. They are patterned by several actors in particular by family composition, income and race. 3.3 STRUCTURAL ELEMENTS OF C.B.D. Definition : The Central Business District, which is variously referred to as the CBD, downtown district, urban core, central area or city centre, is that part of the city which contains 49 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 the principal commercial streets and main public building. It is essentially the core of the city's business and civic life. Characteristics : The characteristics of the CBD have been described as follows : i) It lies central, at least in terms of its accessibility. ii) It has a greater concentration of tall buildings than any other region of the city. iii) Since it normally includes most of the city's offices and largest retail stores. iv) It is the area where ventricular and pedestrian traffic are likely to be most concentrated. v) It averages higher assessed land values and taxes paid than any other part of the city. vi) It draws its business from the whole urban area and from all ethnic groups and classes of people. Land Use : In earlier times the CBD was a district of varied land use, containing residential, commercial, administrative and even industrial premises. However, over the years the rising value of CBD land and property has forced out most residential and industrial users leaving a district dominated by retail business premises, officials and industrial buildings. In a pioneer CBD study two American Geographers R.E. Murphy and J.E. Vance attempted to provide a uniform method for the physical delimination of the CBD. Undoubtedly, the major problem in this exercise resides in the most appropriate criteria to be used. a) Murphy and Vance identified some special types of land uses as the essential characteristics. So, the collected data on such criteria as (1) Building Heights, (2) Accessibility, (3) Traffic, (4) pedestrian flows, (5) building used for residential and commercial purposes, (6) Load and property values, (7)Wholesale and departmental stores etc. b) Having identified central uses, then, from the detailed land use map which was made for all floors to include total use, not merely the ground floor, the amount of floor space devoted to each use category is collected. The unit for this process was the city block. c) For each of the blocks a series of ratios or indices were then calculated. These are : i) Total height index (HI) = Total floor space / Ground floor space

50 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 This is the height of each block in floors if all this space, whatever its use, were to be spread evenly over the whole block. ii) Central Business Height Index (CBH1) = Total CB uses floor space / Ground floor space This is the height of each block in floors if all the Central Business uses were spread over the whole block. iii) Central Business Intensity Index (CBII) = Total Business floor space/ Total floor space x 100 This measures the proportion (%) of all available floor space in the total business uses. iv) Central Business Index (CBI) = Sum of above three indices. To define the CBD Murphy and Vance took a composite measure as indicated above and called it the CBI. AH blocks meeting the requirement were regarded as part of the CBD. Internal Structure of the CBD : Land use in the CBD shows a tendency towards an ordered arrangement which is determined by the pattern of land values. Land values reach a grand peak at the city centre and declame by varying amounts in different directions from the centre. Because of the high land values and property rentals around the peak land value intersection, only companies with a large turnover and high profits can afford to conduct their business on these prestige sites at the heart of the CBD. Thus, at the core of the CBD there are departmental stores, major chain stores, supermarkets, headquarters offices while the small traders with only modest profits, is forced out towards the edge of the central area. A technique of CBD land use analysis was devised by Murphy and Vance in the 1950's and has subsequently been applied with various modifications to numerous towns and cities. The original study method consisted of drawing up four concentric zones, each 100 yards in width, around the peak land value intersection and then calculating the percentages of the build up area in each zone devoted to specific types of land use, both at street level and upper floor levels. The various establishments were divided up into three main groups as below : Retail Business Uses Service-finance Official uses Non-CBD uses Food Financial Residential Clothing Service trades Industrial Household goods Headquarter Office Wholesale Car sales & Services Govt. and Legal Vacant Miscellaneous Transport residence Cultural Entertainment Electrical Feelesidential

51 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 Working in this way it has been shown that the hypothesis outlined above is broadly correct, namely, the CBD land use patterns tend to show on ordered adjustment to land values and distance from the peak land value intersection. Offer prices of retail, office and residential uses with distance from the city centre : a) Section across the urban value surface. b) Plan of the urban value surface. 3.4 Suburbs—Rural Urban Fringe Suburbs : Suburbs are the regions outside the centrality of urban settlement in the periphery. It is a belt of continuity between urban proper and rural area. It is a mysterious phenomena Suburbs, is an outer district lying with easy communicating range of an area. Urban in nature often exist as a separate political jurisdiction. Like what we have in K.M.A. In many industrialized countries, construction of suburban elite residential environment distant from the crowding and pollution was in practice in early 19* . By the late 19th and early 20th century, urbanization became a mass phenomena, as the middle class and skilled working class families woned in residential complex, located in such area. After the World War II, the trend was magnified in many countries. R. Silverstone —said that "Suburb is an attempt to 'marry' a town and country and to create for middle classes, middle cultures in wild spaces in middle America, Britain or Australia. Accordingto feminist geo,"suburb is a place of consumption as well as production& reproduction which restrain women's acess to services & paid unemployment." Marxist geographers believe that "Suburbs are the means of slowing of an accumulation crisis and mechanization of ideological incorporation." Thus, as one goes down the scale from the largest metropolis or indeed from megapolis, to the single isolated farm it is impossible to identify a climbing line which is conceptually meaningful. This is reflected in the fact that there is a variety of names for the settlements near the assumed border. The oldest is "Superb" although its original meaning was somewhat different but in addition the terms 'subtown' or 'urban village' & 'rurban' have been employed. There are considerable variety in post war western suburbs, growing diversity in housing typoes classes and ethnic groups. "Suburbs are often called 'edge cities' and at present in the Western countries are characterized by their clustering office and retail spaces together with large number of high aged while collar jobs."

52 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 RURAL-URBAN FRINGE IT CANNOTES marginal areas of rural as well as urban. In other words rural- urban fringe is an area which lies at the rear end or the urban centre. It is a transitional zone, where the characteristics of both urban and rural settlements are found in a mixed form. Ruraji and Piltcher (1958) have established difference between rural- urban fringe, suburb, Pseudo-suburb, Satellite and Pseudo-Sattelite. Some other words used for rural-urban fringe are outer linked areas, sub-urban zone and extended fringe, etc. Recently, the study of rural-urban fringe has gained importance because the research scholars of urban geography, sociology, land economics, authorities of town administration and planners have give due attention about the study of rural-urban fringe. Rural-urban fringe in a quasi-urban area, where the experiment here of both rural and urban development have been gaining ground especially for the construction of roads, houses, rise in literacy including the dumping ground of wastes, increased amount of juvenile delinquency and suffer from present form of urban development. Ideas and Concepts : The conceptof rural-urban fringe has been first of all developed by Thunen in A.D. 1826 who devised the concentric development of the use zones around an urban centre, hi the year 1925 Jonasson, while studying the European cities, revealed that landuse in the suburban area fulfils the ...ed of the town. In 1928, Mackangie first of all expresses in "The New Exploration" that town recklessly uses the surrounding area with the establishment of Bungalow, Godown, factories. Bill-board Gas Filling Station and residential houses. Some Important Works Done in India : In 1955 R.L. Singh studied about the rural-urban fringe of Varanasi. He tried to show that fringe area is dependent upon the urban centre for some of the urban facilities. In this regard he has done the sample of Sundarpur Village. U. Singh studied about the rural-urban fringe of KAVAL towns in Uttar Pradesh. He observed the construction of residential houses even in industrial area due to expanding city limit. The area under urban functions and fringe zone could be seen in Table 34.1.
53 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 TABLE 34.1 : Fringe Area of City Level Centres City Village Considered into Area in KM2 of the Village The urban Boundary included in the towns Kanpur 157 204.80 Agra 44 23.04 Varanasi 93 20.18 Allahabad 55 15.36 Lucknow 47 48.64 Total 386 312.32 The inclusion of villages into the urban fold have covered almost 53.65 per cent of land under rural-urban fringe. In 1972 R.C. Gupta studied about the rural-urban fringe after considering Sahadara a sub-town of Delhi in this group He also categorized it is a rurban fringe. In the same year Hiralal studied about the concentric development of rural-urban fringe around the city of Bareilly, where he demarcated the Primary and Secondary zone. In 1980, M.M.P. Sinha studied about the rural-urban fringe of the city of Patna where he demarcated the primary and secondary fringe The variations in the fringe is due to the physical, cultural and economic differentiation of the area. As the urban facilities are changing their intensity and areal extent so the characteristics of the fringe also gets change. In 1976 S. Nangia in her books Delhi Metropolitan Region : A Study in Settlement Geography studied about the rural-urban fringe of Delhi. Here the fringe zone extended over an area of 212 Km and included 177 villages in its fold. This zone is not concentric in nature rather it is polygonal in shape. In Western side the fringe extends over 18 kilometers in the east in north western the higher development of fringe is found towards Sonmarg whereas Faridabad in the south-east. The characteristic of the fringe of Delhi is that it commands a lot of industrial nucleus in its fold such as Nazafgarh, Azadpur, Okhla, Sahadara and Ghaziabad. It commands sewerage treatment plant and recreation centres as well. Definition Rural-urban fringe has mixed characteristics of both rural and urban. Some of the definitions are as follows. 1. "

93% **MATCHING BLOCK 20/31** **SA** pallavi-MA.doc (D53496895)

Rural-urban fringe is an area with distinctive characteristic which is only partly assimilated into the urban complex which is still partly rural." —

H. Carter 2. "Where the urban influences are essentially mingled with rural forces often
54 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 withgout striking a proper adjustment as in the case of unplanned growth designates the nature of the rural-urban fringe." — R.L. Singh 3. "The urban fringe from the active expanding sector of the compact economic city and it lies at the periphery of urban areas.'1 — Andrews 4. "Fringe Settlement as a two directional movement reiterates that new residents converge upon the fringe both from urban places and rural areas." — Roadhaver 5. "In the fringe area there is a mingling of people

90% **MATCHING BLOCK 21/31** **SA** pallavi-MA.doc (D53496895)

of some of whom work in and are oriented towards agriculture while at the same time the remainder pursue urban occupations and

at urban way of life." — Dewey 6. "Rural-urban fringe is really an extension of the city itself present and potential and since the city or cities of a metropolitan area and the suburban or fringe areas are a commercial&social, the entire area should be thought of a planted unit." — G.s.Wehrwein 7. "The fringe is the zone between the country and the city." — R.R.Mayer and J. A. Beegle 8. "Rural-urban fringe is that area adjoining the inner fringe outward from the economic city in which there is an intermingling of characteristics of agriculture and urban languages." — R. B. Andrew 9. "The urban fringe is defined as the land surrounding the town which is not considered as a part of it but whose use is influenced directly by the town." — Lewis Keeble 10. "The urban fringe is a mixture of land uses — rural and urban and classified it into a series of belts surrounding the city by the analysis of land-use characteristics. Such area is full of serious and complex problems and needs proper planning the solution."— Solter 11. "Rural-urban fringe is the rural land with urban phenomenon. The rural land is forced into urban uses prematurely and is almost frozen rarely being restored to agricultural uses." — R. L. Singh 12. "Urban fringe is a zone of cultural development that has taken place outside the political boundaries of central cities and extends to the areas of agricultural activities." — F. Arpke 13. "The

55% **MATCHING BLOCK 22/31** **SA** pallavi-MA.doc (D53496895)

fringe is the extension of housing estates of buildings along the main arterial roads, and by the location of new factories, golf courses, water- works, cemeteries . . .

and the like." — R. E. Dickinson 14. "

66% **MATCHING BLOCK 23/31** **SA** Introduction new.docx (D47319546)

The rural-urban fringe is an area of transition between well-recognised urban land-use and the area devoted to agriculture." —

G. S. Wehrwein
55 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 15. "The rural-urban fringe is a 'suburb which begin where the continuous build- up town ends. First, there is the

90% **MATCHING BLOCK 24/31** **SA** Introduction new.docx (D47319546)

built-up area of houses with small gardens, forming dormitory communities from which more than half the active populations work in

the town." — Gamier and Chabot 16. "The space into which the town extends as the process of dispersion creates the concepts of rural-urban fringe. The centrifugal forces impel functions to migrate from the central zone of a city towards its periphery." — Hiralal Yadav Characteristics and Problems: It is quiet apparent that rural-urban fringe is a transitional zone between urban and rural areas. The urban fringe suffers from the problems of urban expansion where the extension of buildings on road side, the establishment of new industries and several urban functions and characteristics features develop. Sometimes even the cremation ground, burial places, dump of urban refuse, park, garden, water works and golf- course find their place amidst agricultural fields on the fringe area. A study of American city gives us an idea that a motorway has helped much in fringe development in comparison with railways. This area also favours the construction of human settlements and the establishment of factories at slow pace. In this zone a fast change of land use pattern could be seen which is a sort of premature urban development. Residents of the fringe area have to manage drinking water, latrines, electricity and gas on self-help basis. Generally, the municipal authorities consider this area outside the municipal limits. Here the plan of Industrial establishment could be managed well on the open land.The fringe area arebutchekhana, petrol depot, cremation ground, aerodrome, sewage plant, dumb places of urban refuge besides brewery industries which spells out bad smell. For this fact, G. S. Wehrwein has considered it as a area of present and future development of urban settlement. Walter Firey has studied the characteristics and problems of Flint city of Michigan State of U.S.A. and he has drawn the following conclusions :— a) Fringe withdraw the land from agricultural production ; b) A lot of differences are found in the distribution of plots and industries cropped up here and there. c) One has to pay a heavy taxes in order to manage urban amenities in the fringe area; d) Due to construction of houses the price of the land shoots up very high which favours withdrawal of the land from agriculture and; e) One could observe a shift change in the characteristics of population.

56 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 In 1960 Golledge has shown the characteristics of Sydney city's rural-urban fringe which are as follows : a) It is a zone of fast changing ownership of the land; b) The plot of the land is of small size; c) A zone of intensive agricultural operation; d) Population is dynamic but the density is low; e) The expansion of residential houses took place fast; f) Municipal facilities are almost non-existent, and g) The house rent is commonly very high. In 1965 R. E. Pahl has shown the characteristicccs of rural-urban fringe under four heads : a) Segregation of plots and buildings; b) Selective immigration by dynamic people; c) It is a commuting zone of workers of industries and commercial centres of the city; and d) It is a meeting point of geographical and social forces for human occupation. Pryor (1968) has considered the land closer to the city as social and economic unit of the town. The tax for this rural sector areas and facilities of electricity, gas, drinking water and transport and communication have been availed by the urban areas. From the point of land utilization and demographic characteristics the rural- urban fringe availed facilities of both the world. The other characteristics of rural- urban fringe are as follows : a) The urban facilities are always inadequate by any means. b) The zonal arrangement is not interlinked c) The areal extent covers the land even beyond the city boundary. d) There is always chance of the increase of population density. The residents of rural-urban fringe are wholly dependent upon urban area for employment, retail business along with the dearth of transport and mass communication. Sudesh Nangia (1976) while studying the rural-urban fringe of Delhi Metropolitan region highlighted the following characteristics and problems : a) Rural-urban fringe is full of huts, slums and squatter settlements and the construction of buildings going on unawaited without any proper plan. b) A mixed form of land-use is found here. c) It is difficult to continue agricultural land-use on a permanent basis;

57 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 d) The area suffers from urban facilities; e) It is difficult to provide facilities at this place due to dispersed location of settlements and huge costs involved; and f) In rural-urban fringe the living conditions of both rural and urban areas are found. M.M.P. Sinha (1980) has highlighted the rural-urban fringe of Patna in detail. He concluded that rural-urban fringe has varying width found as a narrow zone at the rear end of the urban centre. It has been found that the rural scenario dominates the scene towards villages and urban scenario dominates the scene towards urban area Causes of the Development of Rural-Urban Fringe : In India the expansion of urban core adds dynamic character in the fringe development., whereas in the western world the expansion of fringe area takes place along the transport routes. In 1978 K. N. Goni has analyzed are Process of Urban Fringe Development: A Model Centre, and he observed the similarities of urban fringe of the west and the east in terms of the availability of race-course, industries, sewerage plant along with the open space and land reserves. Types and Demarcation :

of the two types : a) Primary Urban Fringe : This area is found towards the

the town; and (b) Rural-urban fringe — closer to the village In 1967 Whiteland has classified fringe as : Inner Fringe Zone, Middle Fringe zone and Outer Fringe Zone.
58 M-2\D:\Netaji 05\Urban Geo\Unit-3.pm6.5 In 1968, R. J. Pryor has classified fringe as : Urban Fringe and Rural Fringe. For the delimitation of rural-urban fringe the following measures may be considered: (a) Changes in the land-use; (b) Changes in the built-up area; (c) Occupational structure; (d) House types; (e) Distribution of industrial and non-agricultural activities. (f) Distribution of educational institutions. M.M.P. Sinha (1978) has considered the following facts for the delimitation of rural fringe :: (a) Time taken to journey in work; (b) Urban habit; (c) Land value; (d) Public utility services; (e) Immigrant population; (f) Non-agricultural activities; (g) Population density; (h) Primary activities; (i) Built-up area; (j) Age-sex ratio; (k) Literacy rate; and (1) Agricultural activities. 3.5 Questions 1. Identify the major land use of urban areas ? Enumerate the internal structure and characteristics of the CBD ? 2. What do you mean by rural-urban fringe ? Bring out the characteristic features of the rural urban fringe. 3. What are the major factors leading to the development of rural urban corridor around cities ? Identify the problems of these settlements 4. What are suburbs ? Discuss the factors leading to the development of suburbs I developing countries.
59 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 UNIT 4 ? URBAN INTERNAL STRUCTURE Structure 4.1 Definition of towns 4.2 Factorial ecology, Neighbourhood Analysis 4.3 Social Area Analysis 4.4 Inner City & associated Problems 4.5 Questions Suggested Readings 4.1 Definition of towns - physical, social, functional, human ecology of cities Physical City The most basic elements of physical space of a city are structures and land use. Study of land use is what geographers and physical planners, in particular have meant when they have talked of the “Urban Pattern”. Four basic types of land use can be identified, (i) Central business, (ii) Industrial, (iii) Residential, and (iv) open areas. The historical case of the metropolis, the original city, tends to remain in its centre. With the main lines of the transportation system oriented to it, this centre remains the point most accessible to all parts of the metropolis and therefore attracts all those functions which serve the entire area. Partly attracted by these, partly for historical reasons, all these functions which require mutual contract also concentrate here, typically in office buildings. These two basic central functions attract others which serve them, such as eating and drinking places and parking facilities. The resulting competition for space, both within the centre and on the transportation facilities leading to it, leads to a displacement from the centre of all those uses which require relatively mud space and can also function elsewhere. These are primarily those dealing with goods, manufacturing and warehouses, but also retail stores, consumer services and residence. As the metropolitan population grows and spreads out, outlying sectors accommodate sufficient population and purchasing power to support “Second order” services of their own, notably retail, but also most consumer and some business services. With continuing growth, the quality of the Second order moves up, leaving a narrowing range of the highest order in the centre.

60 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 From the centre outward density of population and of all activities decreases. Over time, this curve undergoes two typical notifications: it becomes flatter, and it becomes smoother. The increasing smoothness seems to indicate that the centre, despite its relative decrease in quality, increasingly dominates the entire area, superseding the influence of other preexisting centers. The flattering results from a slow decrease of density in the inner and a rapid increase in the outer zones, each of which, however, finally stabilizes at a lower density than the previous one. Within this basic pattern, modifications are brought about by topography and by transportation. Whenever individual transportation predominates, train distances lead to be proportional to straight-line distances, and the over-all form of the settlement tends to be circular. Social City Social city denotes social space of that particular city. Social space is one which is used and perceived by those inhabiting it. It is originally a mosaic of areas, each of which is perceived as homogeneous by its residents. Each social space is, therefore, identified with a specific social group whose values, preferences and aspirations are replaced in that space. Social space ties the activities and values of a group to a place, suggesting that our activities are discrete and appear therefore as discontinuous units. The conceptual value of social space lies in its condition of the use and perception of space say distinctive social groups. It is possible to combine the ethnic variable with socioeconomic status — including the lowest groups living in the so-called slum — and family status and to adopt Murdie's model as an indicator of the essential-claimants in the residential structure of the city. This can be stated in terms of the hypothesis that Murdie proposed. 1. Economic status tends to be associated with measures of income, occupation and education and tends to be distributed sectorially. 2. Family status tends to be associated with fertility, type of household and labour force participation by women and tends to be distributed concentrically. 3. Ethnic status tends to form 'grouping' which can be superimposed upon the cellular structure created by combinations of sectorial and concentric patterns. Functional City Functional city means the townscape produced by the interplay of different urban functions. Function is one of those important aspects in which a town differs from the other. Recently, urban geographers are becoming increasingly concerned with these features associated with functions, while discussing the physical and social characteristics of a city. While discussing urban functions, C. D. Harries identified the following nine functions, (i) missing, (ii) Manufacturing, (iii) transport, (iv) wholesale, (v) retail, (vi) educational, (vii) resorts, (viii) diversified, (ix) others (this includes political).

61 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 Howard J. Nelson recognized much the same major classes of functions as Harris. But, instead of the last four functions, be considered (i) finance, (ii) personal, (iii) professional, and (iv) public administration. It is time that more than one function is usually performed by a city. There is hardly any city that performs only one function. Different functions are generally performed in different parts of the city. It is, therefore, possible to divide a city into different parts on the basis of different functions. In fact, different functions create a functional mosaic in a city. This is known as functional city. Functional Classification of towns There are three closely related aspects of defining towns, that can be distinguished for analytical purpose. Like : 1) The Physical growth of individual cities in a "brick and mortar" sense. 2) The emergence of functional specification of cities. 3) And distinctive social and economic changes that characterize a city. There may be two types of cities according to Redfield, (a) the orthogenetic cities — that carry forward systematic and reflective dimensions of old culture, (b) And, the heterogenetic cities where "now status of mind become prominent." So, a town is a point of specialized activity carrying out tasks which are best performed here, and that should be highly accessible, and demands a higher degree of population concentration from the economic point of view. In the 'general description' phase, where M. Aurrousseow in his paper "The Distribution of Population : A Constructive Problem" recognized six classes of active towns like : Functions Class I Administration Capital City, Revenue Towns Class II Defence Fortless town Garrisson Town Class III Culture University town Cathedral town Pilgrimage town Class IV Production Manufacturing towns Class V Communication a) Collection Mining towns Fishing towns Forest towns b) Transfer Market towns Fall-line towns Break of Bulk towns c) Distribution Export town

62 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 Import town Supply town Class VI Recreation Health Resorts Tourist resorts However such descriptive use of fimctions lack sufficient theoretical base though. Whereas in the Statistical description phase there was the introduction of statistical technique into the problem of classification. Like in 1943, Chauncy D. Harris attempted a functional classification of cities of the USA. And eight classes of towns were recognized like manufacturing, retailing, wholesaling, transport, mining, university, resort (and retirement) and diversified. One example will be sufficiently describe the principle used. Transport towns were defined as where 'transportation' and communication contain at least 11% of the gainful workers, and workers in this sector should at least equal 1/3 the member in manufacturing, and 2/3 the member in the trading. Again, these definition are the result of subjective definitions, and although dispersion graphs are used, yet the decisions are personal. In the Statistical Analysis phase however, H. J. Nelson cause up with a service classification of the American towns, where he worked out the percentage of each occupation to the total labour- force of each city. The 'mean' or normal value and standard deviation 'as a measure of the departure from the mean condition of any occupation'. Any towns which then shows a percentage employment of more than mean plus one standard deviation, then it is said to be significantly characterized by that functions. This is further developed by recording how many times, the employment ratio in one town is above the mean for all towns in term of standard deviations, and not more than thrice standard deviations are measured. The percentage of function less than its mean and SD ranges were considered insignificant. And, he mentioned 'diversified' function where no single service employed a sufficiently higher proportion of labour force. However, this analysis was indeed questioned of its applicability in the third world countries like India. Further, Homer Hoyt in 1939 used Urban-Economic base studies, while functionally classifying the cities. He classified the city as Basic (or city forming) city which meet non local needs contributing to the national economy. And another type of city was 'non basic' (or city servings, which meets local and internal demand like educational and health activities. Hoyt himself proposed a cumbersome procedure by which local and non-local destinations of goods & services were determined by questionnaire. But this was very clumsy and unrealistic in case of large number of cities. Whatever functions do the cities perform it is essential to note that how far the town plays role. In the national or regional economy and there should be redistributional

63 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 characteristics of town in similar functional classes, and yet peculiar to those classes in questions. HUMAN ECOLOGY OF CITIES It was work in plant ecology at the University of Chicago that provided inspiration for fruitful urban research by sociologists and geographers at Chicago in the years between World Wars I and II. In Robert Park's essay on Human Ecology the analogies are direct. He talks about competition between various population or interest groups in the metropolis, the dominance of one group in the natural or functional areas of a metropolitan community, and the invasion of a natural area by a competing group, leading to succession and to the dominance of the area by a new group. Park points out, however, that though competition is relatively unrestricted in the biological world, in the human world it is restricted by conventions, laws and institutions. These urban ecological processes — competition, dominance, invasion and succession — derived their energy, according to Park, from the expansion of the city population and the city's area in a concentric ring-like fashion over time. Observation of Chicago revealed that the process of upward social mobility invaded geographic migration — the population group which had resided in the city for the longest like world move from their original homes to newer homes in the city's periphery as their economic status improved. They would be replaced at the centre of the city by new arrivals, to whom the older housing stock woned filter down. Thus, a distinctive special pattern of activity and residence zones, Burgess's concentric zone emerged, the definitions of which are based on principal load use (Zone - I, Commercial; Zone - Ila , Indistrial, Zone - lib, to v, residential) and within the residential category by the type of resident (Zone -III, Zone of workingmen's homes; Zone - V, Computer's zone) both use and tenants changing in the as a result of the filtering town of prosperity. At the centre of the city is the central business district (CBD, Zone - I), the focus of commercial, social and civic life. Increasingly this theme is normally an area of transistor, which is being invaded by business and light manufacture. A third area is inhabited by the workers in industries who have located from the area of deterioration but who desire to live within easy access of their work. Beyond this zone is the residential area high class apartment buildings or of exclusive restricted districts of single family dwellings. Still further, out beyond the city limits, is the commuter's zone -suburban areas or satellite towns. This stretch of the concentric zones is linked with a historical process — the tendency of each inner zone to extend its area by the invasion of the neat outer zone. 4.2 Factorial ecology, Neighbourhood Analysis Factorial Ecology Factor analysis as applied to the study of man's relation with urban environment. Urban ecology is known as factorial ecology. Factor analysis, in contract to social

64 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 area analysis, derives factors, which can be regarded as equivalent to constructs, by an objective statistical procedure. These factors are derived from an input of variables designed to cover as wide a range of urban characteristics as possible. The basic purpose of factor analysis, as applied in urban ecology; is to reduce a matrix of n tracts by m variables to one of n tracts and r factors, where the number of significant factors r is less than m. The r factors summarize the common patterns of variability in the data and make possible more concise statements about the population under consideration. The variables that are most usually included in social area analyses are those that describe the characteristics of population groups living in small areas (i.e., causes tracts) The characteristics which are regarded as important are (1) education, (2) occupation, (3) income, (4) sex, (5) age, (6) membership, (7) in an ethnic or racial group - measures which apply to people themselves and (2) the value of the home (or its rent), state of repair, plumbing facilities and so forth - measures that apply to the dwelling unit. The physical and mental characteristics of individuals have not usually been included. The nature of each factor derived out of the variables can be identified from its association with the original variables, expressed through a measure known as factor loadings within the range of -1.0 to +1.0. These are similar in form to correction coefficients. The square of these correlation coefficients or factor loadings, indicates the proportion of variation in the variables that is associated with the variation in the factor, and the sum of the squared factor loadings, which is referred to as an eigenvalue, is used to determine the proportion of total variation summarized by this factor. The factor scares of each observation unit on each factor are then calculated. In effect, these factors can be regarded as variables, that effectively summarize such of the variation in the data, and so the scares of the observations provide the data that can be utilized for a mapped special representation. The flowchart of factor analysis is as follows. * (a diagram to be given) The relation that the variables have with the factors then these relation is known as factor loadings. 4.3 Social Area Analysis Social area is a part of social space. There may be more than social areas within a social space. The term “Social Area Analysis”, strictly speaking, applies only to that mode of analysis originally. Outlined by Eshref, Shavky, Marianne Williams and Wendell Bell in their studies of Los Angeles and San Francisco. From a number of postulates concerning industrial society they derived three basic constructs which, they considered, described the way in which urban populations are differentiated. The three constructs

65 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 were called social Rank by Shevky (and Economic status by Bell), Urbanization (Family Status), and Segregation (Ethnic Status). They then proposed three indices, the constructs are one per construct, made up of from one to three census variables — designed to measure the position of census tract populations on scales of (1) economic, (2) family, and (3) ethnic status and to make possible the classification of census tracts into social areas based upon their scores in the indices. The basic principle on which the key variables were selected is contained in the sentence, “We conceive of the city as a product of the complex whole of the modern society. Thus the social forms of urban life are to be understood within the context of the changing character of the larger containing society. From this three aspects, called three postulates, were isolated epitomizing this changing character, these were : 1. Change in the range and intensity of relations. 2. Differentiation of functions 3. Complexity of organization The first postulate, i.e., change in the range and intensity of relations, was transformed Shevky and Bell, into the first construct — Social Rank (Economic Status) -considering changes in the arrangement of occupations based on function. Sample statistics used by them for the purpose were (i) years of schooling, (ii) employment status, (iii) Class of worker, (iv) major occupation group, (v) value of home, (vi) rent by dwelling unit, (vii) plumbing and repair, (viii) persons per room, (ix) heating and refrigeration. They derived three measures - (a) occupation, (b) schooling and (c) rent, which combined together formed the first index. Shevky and Bell transformed the Second postulate i.e., differentiation of function into the second construct - Urbanisation (family status) considering changes in the ways of living, movement of women into urban occupations and spread of alternative family patterns. Sample statistics related to this construct were (i) age and sex, (ii) owner or tenant, (iii) house structure and, (iv) persons in household. Derived measures out of these sample statistics were (a) fertility rate (member of children under 5 years per 1000 females aged 15 - 44), (b) Women in labour force (member of females in the labour force per 1000 females 14 year and over), and (c) single-family detached dwelling units ratio (member of single family dwelling units per 1000 dwelling units os all types). These three measures form the second index. The third postulate, i.e., complexity of organization, was transformed into the third construct - segregation (ethnic status) - upon consideration of redistribution in space -changes in the proportion of supporting and dependent population and isolation and segregation of group. Simple statistics used in this case were (i) race and nativity, (ii) country of birth, (iii) citizenship. They derived one measure out of these statistics, e.g. racial and national groups in relative isolation, that formed the third index.

66 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 For derivation of social areas, urbanization is plotted against social rank is plotted and divisions drawn two standard errors away, This gives nine divisions. (* here a diagramjojbe given) Social area analysis, strictly defined, has been criticized both on theoretical grounds (the theory underlying the constructs) and for empirical reasons (the method of dimensioning the constructs.) It has been urged that it has no theoretical background and is merely an attempt to delimitate areas for their own sake. If the whole notion of the constructs is open to question, so is the selection of the statistical measures, For example, in most subsequent studies rental has been eliminated from the measure of social rank. In considering the whole range of possible parameters which might be selected as measures of aspects of urban social structure one might, therefore, have even greater doubts as to the validity of isolating those few indices which Shevky suggested. The third line of criticism, relates to the unidimensional nature of the indices, that is whether the three are discrete and unrelated to each other and net in fact, overlapping measures of the same thing. Thus, it can be shown that fertility is closely associated with occupation and education and hence has a significant linkage with social rank. 4.4 The General Nature of Problems of City : Inner city decay (Urban Decay)- Slums Inner city: An inner city is

75% **MATCHING BLOCK 26/31** **W**

the central area of the major city. In the United States and United Kingdom, the term often applied to the poorer parts of the city centre and is some times used as ‘euphemism’ with the connotation of being an area , perhaps a Ghetto, where people are less educated and wealthy and where there is more crime .

These connotation is less common in other Western Countries, where deprived areas may be located in outlying parts of cities .For instance in Paris, Vienna, or Amsterdam, the inner city is the richest part of the metropolis ,where housing is most expensive,and where elites and high income individuals dwell. Urban decay is a process by which a city, or a part of a city, falls into a state of disrepair. It is characterized by depopulation, property abandonment, high unemployment, fragmented families, political disenfranchisement, crime, and desolate and unfriendly urban landscapes. Urban decay was associated with Western cities, especially North America and parts of Europe during the 1970s and 1980s. During this time period major changes in global economies, transportation, and government policies created conditions that fostered urban decay. Although not uniquely a North American experience, the effects of urban decay

67 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 run counter to the development patterns found in most cities in Europe and the rest of the world, where slums are usually located on the outskirts of major metropolitan areas while the city center and inner city retain high real estate values and a steady or increasing population. In contrast, North American cities often experience an outflux of population to city suburbs or exurbs, as in the case of white flight, and can lead to phenomena such as squatting'2'. There is no single cause of urban decay, though it may be triggered by a combination of interrelated factors, including urban planning decisions, the development of freeways^, suburbanisation, redlining'41, immigration restrictions^ and racial discrimination Background Since antiquity some people have chosen to live in citiesl6] for financial, social, religious or cultural reasons. Urban areas encourage the economical use of infrastructure, transportation and space. Urban areas offer the widest variety of opportunities for education and financial betterment. They are the meeting places where business is conducted and goods are exchanged. They are the ports of entry for immigrants and the seats of power for governments. Urban places are held together by the human desire to form societies, celebrate culture and establish meaningful social relations. Cities are the essential element of most civilizations. The very word "civilization" shares the same root as "city." During the Industrial Revolution, people moved from the countryside into cities to find employment in the manufacturing sector. Industrial manufacturing was largely responsible for the population boom cities experienced during this time period. Industrial manufacturing and the failures of city planning to keep up with the sudden changes during the late 19th and first part of the 20th century contributed to a poor and unhealthy urban environment. The population of cities increased dramatically and the infrastructure that was in place was visibly inadequate. Changes in transportation (specifically the private motor car) and communications eliminated much of the cities' advantages. With the end of World War II in particular many political decisions were employed that favored suburban development that further encouraged suburbanisation. Such decisions have drawn the financial resources from the cities in favour of providing infrastructure for remote suburban areas. Racial discrimination, in this context known as "white flight" in the United States, also played a part, as many chose to abandon cities and take part in an urban sprawl. After World War Two, Western economies lifted tariffs and outsourced most manufacturing. During the change from a manufacturing to a service-based economy, the need for centralisation, and thus cities, has been reduced somewhat. Jobs no longer had to be centralisedland private motor transportation was growing in availability. Even for manufacturing workers, the process of suburbanisation was attractive because it allowed workers work at their factories, while commuting between their place of work and their larger suburban homes.

68 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 In the United States, the federal government aided the suburbanization process by mandating discriminatory lending practices through the FHA in the form of redliningLater, under President Dwight D. Eisenhower urban centers were drained further through the building of the interstate highway system. In North America this shift has manifested itself in strip malls, suburban retail and employment centers, and very low-density housing estates. Large areas of many northern cities in the United States have experienced population decreases and a degradation of urban areas. Inner- city property values declined and economically disadvantaged populations moved in. In the U.S., the new inner-city poor were often black African-Americans who were migrated from the south in the 20s and 30s. As they moved into traditional white European-American neighborhoods, ethnic frictions served to accelerate flight to the suburbs. In Western Europe the experience differs in that the effect was often unknowingly assisted by public sector policies designed to clear 18th and 19th century slum areas and movements of people out into state subsidised lower density suburban housing. On continental Europe and Oceania the historical core of major cities usually remains relatively affluent; it is generally the inner city districts and the edge of town suburbs made up of single-class state subsidised housing, such as the French 'cites' and British 'council estates', which suffer the worst decay and blight. Simple economies of land mean that extremely low density housing in Europe is not practical due to higher population densities. Examples of decay The car manufacturing sector was the base for Detroit's prosperity and employed the majority of its residents. When this industry began relocating outside of the city, it experienced population loss with associated urban decay, particularly after the 1967 riots. In 1950 the city's population was, according to US census, around 1.85 million; by 2003 this had declined to 911,000, a loss of nearly 940,000 people (52%). Britain experienced severe urban decay in the 1970s and 1980s. Major cities like Glasgow in Scotland, the towns of the South Wales valleys, and the major English cities like Birmingham, Manchester, Liverpool, Newcastle, and the East of London all experienced population decreases with very large areas of 19th-century housing experiencing market price collapse. Large French cities are often surrounded by decayed areas. While the city center tends to be occupied mostly by middle- as well as upper-class residents, the city is often surrounded by very large mid to high-rise housing projects. The concentration of poverty and crime radiating from the developments often cause the entire suburb to fall into a state of urban decay as more affluent citizens seek housing in the city, or further out in semi-rural areas. In early November 2005, the decaying northern suburbs of Paris were the scene of severe riots sparked in part by the substandard living conditions in public housing projects

69 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 Remedy The main responses to urban decay have been through positive public intervention and policy, through a plethora of initiatives, funding streams, and agencies, using the principles of New Urbanism (or through Urban Renaissance as its UK / European equivalent). The importance of gentrification should not be underestimated and remains the primary means of a'natural'remedy. In the United States, early government policies included "Urban renewal" and building of large scale housing projects for the poor. Urban renewal demolished entire neighbourhoods in many inner-cities; in many ways it was a cause of urban decay rather than a remedyHousing projects became crime infested mistakes. These government efforts are thought by many now to have been misguided.112J'31 Some cities have rebounded in spite of these policy mistakes for multiple reasons. Today however with many people interested in moving back to the inner cities, gentrification has renewed and restored some of these neighborhoods. Meanwhile some of the inner suburbs built in the 1950s and 60s are beginning the process of decay. In Western Europe, where land is much less in supply and urban areas are generally recognised as the drivers of the new information and service economies, urban regeneration has become a quasi industry in itself, with hundreds of agencies and charities set up to tackle the issue. European cities have the benefit of historical organic development patterns already concurrent to the New Urbanist model, and although derelict, most cities have attractive historical quarters and buildings ripe for redevelopment. In the suburban estates and cites the solution is often more drastic with 1960/70 state housing projects being totally demolished and rebuilt in a more traditional European urban style, with a mix of housing types, sizes, prices, and tenures, as well as a mix of other uses such as retail or commercial. One of the best examples of this is in Hulme, Manchester, which was cleared of 19th century housing in the 1950s to make way for a large estate of high-rise flats. During the 1990s it was cleared again to make way for new development built along new urbanist lines. The area is held up as an excellent example of Urban Renaissance SLUM The United Nations agency UN-HABITAT defines a

88% **MATCHING BLOCK 27/31** W

slum as a heavily populated urban area characterized by substandard housing and squalor.

The tenn traditionally referred to housing areas that were once respectable but which deteriorated as the original dwellers moved on to newer and better parts of the city, but has come to include the vast informal settlements found in cities in the developing world. The word may come from the slang tenn 'Slams' (pronounced slums and short for Islam) referring to the poor and crowded Muslim suburbs of early 19th century Cape Town. Although their characteristics vary between geographic regions, they are usually
70 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 inhabited by the very poor or socially disadvantaged. Slum buildings vary from simple shacks to permanent and we 11-maintained structures. Most slums lack clean water, electricity, sanitation and other basic services. Slums may be distinguished from ghettos in that ghetto refers to a neighborhood based on shared ethnicity. Other terms which are sometimes used interchangeably with slum include favela and shanty town Characteristics The characteristics associated with slums vary from context to context. Slums are usually characterized by urban blight and by high rates of poverty and unemployment. They are commonly seen as "breeding grounds" for social problems such as crime, drug addiction, alcoholism, high rates of mental illness, and suicide. In many poor countries they exhibit high rates of disease due to unsanitary conditions, malnutrition, and lack of basic health care. A UN Expert Group has created an operational definition of a slum as an area that combines to various extents the following characteristics: i) Inadequate access to safe water; ii) Inadequate access to sanitation and other infrastructure; iii) Poor structural quality of housing; iv) Overcrowding; and v) Residential status. To these one might add the low socioeconomic status of its residents. In many slums, especially in poor countries, many live in very narrow alleys that do not allow vehicles (like ambulances and fire trucks) to pass. The lack of services such as routine garbage collection allows rubbish to accumulate in huge quantities. The lack of infrastructure is caused by the informal nature of settlement and no planning for the poor by government officials. Additionally, informal settlements often face the brunt of natural and man-made disasters, such as landslides, as well as earthquakes and tropical storms. Many slum dwellers employ themselves in the informal economy. This can include street vending, drug dealing, domestic work, and prostitution. In some slums people even recycle trash of different kinds (from household garbage to electronics) for a living -selling either the odd usable goods or stripping broken goods for parts or raw materials Map showing the percentage of each country's urban population living in slums (according to UN-Habitat definition): >10%; 10- 20%; 20-30%; 30-40%; 40-50%; 50-60%; 60-70%; 70-80%; 80-90%; <90%; N/A Growth and countermeasures Recent years have seen a dramatic growth in the number of slums as urban populations have increased in the Third World. According to a 2006 UN-HABITAT report, 327 million people live in slums in Commonwealth countries - almost one in

71 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 six Commonwealth citizens. In a quarter of Commonwealth countries (11 African, 2 Asian and 1 Pacific), more than two out of three urban dwellers live in slums and many of these countries are urbanizing rapidly. Many governments around the world have attempted to solve the problems of slums by clearing away old derelict housing and replacing it with modern housing with much better sanitation. The displacement of slums is aided by the fact that many are squatter settlements whose property rights are not recognized by the state. This process is especially common in the Third World. Slum clearance often takes the form of eminent domain and urban renewal projects, and often the former residents are not welcome in the renewed housing. Moreover new projects are often on the semi-rural peripheries of cities far from opportunities for generating livelihoods as well as schools, clinics etc. At times this has resulted in large movements of inner city slum dwellers militantly opposing relocation to formal housing on the outskirts of cities. In some countries, leaders have addressed this situation by rescuing rural property rights to support traditional sustainable agriculture; however this solution has met with open hostility from capitalists and corporations. It also tends to be relatively unpopular with the slum communities themselves, as it involves moving out of the city back into the countryside, a reverse of the rural-urban migration that originally brought many of them into the city. Critics argue that slum clearances tend to ignore the social problems that cause slums and simply redistribute poverty to less valuable real estate. Where communities have been moved out of slum areas to newer housing, social cohesion may be lost. If the original community is moved back into newer housing after it has been built in the same location, residents of the new housing face the same problems of poverty and powerlessness. Income disparity According to the UNDP 1997 Human Development Report, and the 2004 United Nations Human Development (UNHDP) report, Malaysia has the highest income disparity between the rich and poor in Southeast Asia, greater than that of Philippines, Thailand, Singapore, Vietnam and Indonesia. The UNHDP Report shows that the richest 10% in Malaysia control 38.4% of the economic income as compared to the poorest 10% who control only 1 .7%. Kuala Lumpur as the capital of Malaysia has an increasing number of squatters, shanty towns and slums, and is also seeing an increase in criminal acts such as snatch theft, robberies and rape Slums versus ghettos Many times people use the term ghetto when they are actually referring to a slum. To qualify as a ghetto, an area must contain certain aspects :
72 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 ? There must be a majority of one group of people over the rest of a population in an area. ? This majority group must be a racial, ethnic or religious group that is a minority compared to the major population. ? This group must have been discriminated against, when it comes to housing, in the past and possibly currently. A ghetto is not based on the population's social-economic level, amount of crime or amount of unemployment. A person who lives in a ghetto chooses not to leave the ghetto because of past discrimination and/or is unable to leave because of current discrimination. The first ghetto was a Jewish ghetto located in Venice, Italy. In the United States, census tracts are used to detennine if an area is a ghetto. By contrast, identification of an area as a slum is not based on the race, ethnicity or religion of the people in the area. Refugee shelter Refugee shelters include the most basic kind of structure created in the aftermath of a conflict or natural disaster as a temporary residence for victims who have lost or abandoned their homes. There is a continuum ranging from the most temporary tent accommodation through transitional shelter to rebuilding houses and settlements. Land tenure issues often play a large role in the planning and categorization of settlements as temporary, though many settlements subsist for years. The materials and technology used to create these shelters have advanced as a result of worldwide news coverage of natural disasters in the new millennium. Simple tent structures, grouped together to form a "tent city", are commonly made of canvas military issue tents which are criticized for being heavy, bulky, uninsulated, expensive, and for rotting in under a year. There are scores of innovative approaches to constructing temporary shelters, but few make it to the field. Architect Shigeru Ban has designed temporary (and permanent) structures with paper tubes as the underlying structure, used after the Kobe earthquake . Cal-Earth Institute has also developed "superadobe" which makes use of sandbags and barbed wire to form an emergency shelter for disaster relief. The main difficulty with refugee shelters is transporting the materials to areas with damaged infrastructure, so the overall cost of deploying a shelter is largely proportional to its weight. Disaster responses are increasingly focusing on supporting victims to build their own shelters as this stimulates the local economy, maintains dignity, gives victims something other than their grief to focus on, and encourages a sense of ownership of the shelter and of the materials.

73 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 Squatting Squatting is the act of occupying an abandoned or unoccupied space or building that the squatter does not own, rent or otherwise have permission to use. Squatting is significantly more common in urban areas than rural areas, especially when urban decay occurs. According to author Robert Neuwirth, there may be as many as one billion squatters globally, or about one of every seven people Example: In Mumbai, there are an estimated 10 to 12 million inhabitants and six million of them are squatters. The squatters live in a variety of ways. Some possess two or three story homes built out of brick and concrete which they have inhabited for years. Geeta Nagar is a squatter village based beside the Indian Navy compound at Colaba. Squatter Colony in Malad East has existed since 1 962 and now people living there pay a rent to the city council of 100 rupees a month. Dharavi is a community of one million squatters. The stores and factories situated there are mainly illegal and so are unregulated, but it is suggested that they do over $1 million in business every day. Other squatters live in shacks, situated literally on a pavement next to the road, with very few possessions. Tent City The term tent city covers a wide variety of usually temporary housing made of tents. Tent cities may originate spontaneously or be planned. Tents may or may be not comfortable but usually lack plumbing and sanitary facilities which tend to be communal. Tent cities may be the beginning of a permanent settlement, such as Anchorage, Alaska, encampments of homeless people, or structures temporarily erected to accommodate a large number of visitors, workers, or soldiers. Tent cities can be quickly erected and taken down, and differ from shanty towns which are less organized, more permanent, often unsanitary and made from a variety of materials Skid row The term skid or skid road is used to refer to a run-down or dilapidated urban area. There are formally recognized neighborhoods named Skid Row in Seattle and Los Angeles. Informally, there is an identified skid-row neighborhood in almost every major North American city, such as The Bowery in New York City and the Downtown Eastside in Vancouver, which like Seattle's, was one of the original locations where the term was first coined. The origins of the term 'skid row1 date back to the 19th century. The source of the term as an urban-landscape reference is heavily debated, and is generally identified as originating in either Vancouver, British Columbia or Seattle, Washington, where it was adapted from the term "skid road", a corduroy road made of logs, used to skid or drag logs through woods and bog. The term did not become popular until well into the 20th century, while the 74 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 incorporation dates either postdate or coincide with the earliest estimates of the term's origins, mid 1800's. In what is now Seattle, the logs were floated from the foothills of the Cascade Mountains across Lake Washington to Skid Road. The logs were then "skidded" by attaching a "choke" chain, or cable, to one end of the log. The log was then pulled by overhead cables, dragging or skidding the other end over the hill to the Seattle Waterfront, to a saw mill owned by Henry Yesler. The Vancouver Skid Road was part of a complex of such roads in the dense forests surrounding the Hastings Mill and adjacent to the settlement of Granville, Burrard Inlet (aka Gastown. Murray Cromwell Morgan, in his 1952 book "Skid Road", described how the loggers spent the summers in the mountains cutting down trees and how the winter snow and mud hampered operations. The out-of-work loggers would hang out on Skid Road hoping to find work and would often run out of money, sleep on the streets, and beg for food or money. This is where the connection between the operation of skidding logs and being poor and unemployed originated. The term "Skid Road" was in common usage in the mid 1800's, and referred to logging camps and mills all along the Pacific Coast. Vancouver, British Columbia started off as a sawmill settlement called "Granville," in the early 1870s. By the 1960s, "Skid Road" was commonly used to describe the more dilapidated areas in the city's Downtown Eastside, which is focussed on the original "strip" along East Hastings Street due to a concentration of single-room occupancy hotels (SROs) and associated bars in the area. 4.4 Inner city & associated Problems ? Definition of Inner City ? An inner city is

100% **MATCHING BLOCK 28/31** **W**

the central area of a major city. In the United States,

United Kingdom and Ireland,

66% **MATCHING BLOCK 29/31** W

the term is often applied to the poorer parts of the city centre and is sometimes used as a euphemism with the connotation of being an area, perhaps a ghetto or slum, where people are less educated and impoverished and where there is more crime.

These connotations are less common in other Western countries, as deprived areas are located in varying parts of other Western cities. In fact, with the gentrification of some formerly run-down central city areas the reverse connotation can apply. In Australia, for example, the term "outer suburban" applied to a person implies a lack of sophistication. In Paris, the inner city is the richest part of the metropolitan area, where housing is the most expensive, and where elites and high-income individuals dwell. In the developing world, economic modernization brings poor newcomers from the countryside to build haphazardly at the edge of current settlement (see favelas, shacks and shanty towns).
75 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 The United States, in particular, has a culture of anti-urbanism that dates back to colonial times. The American City Beautiful architecture movement of the late 1800s was a reaction to perceived urban decay and sought to provide stately civic buildings and boulevards to inspire civic pride in the motley residents of the urban core. Modern anti-urban attitudes are to be found in America in the form of a planning profession that continues to develop land on a low-density suburban basis, where access to amenities, work and shopping is provided almost exclusively by car rather than on foot. However, there is a growing movement in North America called "New Urbanism" that calls for a return to traditional city planning methods where mixed-use zoning allows people to walk from one type of land-use to another. The idea is that housing, shopping, office space, and leisure facilities are all provided within walking distance of each other, thus reducing the demand for road-space and also improving the efficiency and effectiveness of mass transit. ? Problems of Inner City: ? Environmental Racism & Pollution ? Ghetto ? Homelessness ? Urban decay ? Shanty town ? Gentrification Environmental Racism & Pollution : Environmental racism is intentional or unintentional racial discrimination in the enforcement of environmental rules and regulations, the intentional or unintentional targeting of minority communities for the siting of polluting industries such as toxic waste disposal, or the exclusion of people of color from public and private boards, commissions, and regulatory bodies, as defined and coined by Reverend Dr. Benjamin F. Chavis, Jr. Executive Director and CEO of the United Church of Christ Commission for Racial Justice in 1981. (Background : In the United States Since the term "environmental racism" was coined in 1987, researchers have investigated why minorities are more likely than whites to reside in areas where there is more pollution. Some social scientists suggest that the historical processes of suburbanization and decentralization are instances of white privilege that have contributed to contemporary patterns of environmental racism. In the United States, the wealth of a community is not nearly as good a predictor
76 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 of hazardous-waste locations as the ethnic background of the residents, suggesting that the selection of sites for hazardous-waste disposal involves racism. Researcher James T. Hamilton studied American zip codes targeted for capacity expansion in plans by commercial hazardous waste facilities from 1987 to 1992. Locations for hazardous waste facilities had an average nonwhite population of 25 percent, versus 18 percent for those areas without net expansion. Hamilton suggests that differences in the probability that residents will raise a firm's expected location costs by engaging in successful collective action to oppose expansion offer the best explanation for which neighborhoods are targeted by polluting industries. Another study centered around Los Angeles in 1997 found that working-class communities of color are most affected by hazardous waste treatment, storage, and disposal facilities United States organizations working for environmental justice include: Greenaction, Center for Health, Environment and Justice, and the Coalition Against Environmental Racism. In response to public concerns raised by these groups, the United States Environmental Protection Agency created the Office of Environmental Justice in 1992. According to the EPA, "

75% **MATCHING BLOCK 30/31** W

Environmental Justice is the fair treatment and meaningful involvement of all people—with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

EPA has this goal for all communities and persons across this Nation. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work." On 11 February 1994 President Bill Clinton signed Executive Order 12898, which directed federal agencies to develop strategies to help federal agencies identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Clinton also intended the Order to provide minority and low-income communities with access to public information and opportunities for public participation in matters relating to human health or the environment. A 2007 study by the University of Colorado at Boulder showed that although the average black or Hispanic resident of a major U.S. city lives in a more polluted part of town than the average white person, the levels of inequality vary widely between cities. The study found that black/white environmental inequality levels were highest in Orlando, Fla., Norfolk, Va.y Louisville, Ky., and Portland, Ore., and weakest in Baltimore, Las Vegas, Boston and Nassau/Suffolk, N.Y. Urban minority communities may also face environmental racism in the form of parks that are smaller, less accessible and of poorer quality than those in more affluent or white areas in some cities. This may have an indirect impact on health since young people have fewer places to play and adults have fewer opportunities for excercise.
77 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 Policies related to redlining and urban decay can play a role in environmental racism, and in turn have an impact on public health. For example, Robert Wallace writes that the pattern of the AIDS outbreak during the 80s was affected by the outcomes of a program of 'planned shrinkage' directed in African-American and Hispanic communities, and implemented through systematic denial of municipal services, particularly fire extinguishment resources, essential for maintaining urban levels of population density and ensuring community stability.I81 International Environmental racism also exists at an international scale. American corporations often continue to produce dangerous chemicals banned in the United States and export them to developing countries. Additionally, the developed world has shipped large amounts of toxic waste to developing countries for less-than-safe disposal. At a waste site in Giuyu, China, laborers with no protective clothing regularly bum plastics and circuit boards from old computers. They pour acid on electronic parts to extract silver and gold, and crush cathode ray tubes from computer monitors to remove other valuable metals, such as lead. According to the United States ERA, the six most prominent examples of environmental hazards include: ? Lead - There is a particularly high concentration of lead problems in low- income and culturally diverse populations, who live in the inner city where the public housing units were built before 1970. ? Waste Sites - Low income, and quite often culturally diverse populations, are more likely than other groups to live near landfills, incinerators, and hazardous waste treatment facilities. ? Air Pollution - 57 percent of all whites, 65 percent of African Americans, and 80 percent of Hispanics live in communities that have failed to meet at least one of EPA's ambient air quality standards. ? Pesticides - Approximately 90 percent of the 2 million hired farm workers in the United States are people of color, including Chicano, Puerto Ricans, Caribbean blacks and African Americans. Through direct exposure to pesticides, farm workers and their families may face serious health risks. It has been estimated that as many as 313,000 farm workers in the U.S. may suffer from pesticide-related illnesses each year. ? Wastewater (City Sewers) - Many inner cities still have sewer systems that are not designed to handle storm overflow. As a result, raw sewage may be carried into local rivers and streams during storms, creating a health hazard. ? Wastewater - (Agricultural Runoff) - It is suspected that the increased use of commercial fertilizers and concentrations of animal wastes contribute to

78 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 the degradation of receiving streams and rivers in rural areas, with communities that are often low income and culturally diverse.) Pollution : Pollution is the introduction of pollutants (whether chemical substances, or energy such as noise, heat, or light) into the environment to such a point that its effects become harmful to human health, other living organisms, or the environment. The major forms of pollution are listed below along with the particular pollutants relevant to each of them : ? Air pollution, the release ot chemicals and particulates into the atmosphere. Common examples include carbon monoxide, sulfur dioxide, chlorofiuorocarbons (CFCs), and nitrogen oxides produced by industry and motor vehicles. Photochemical ozone and smog are created as nitrogen oxides and hydrocarbons react to sunlight. ? Water pollution via surface runoff, leaching to groundwater, liquid spills, wastewater discharges, eutrophication and littering. ? Soil contamination occurs when chemicals are released by spill or underground storage tank leakage. Among the most significant soil contaminants are hydrocarbons, heavy metals, MTBEW, herbicides, pesticides and chlorinated hydrocarbons. ? Radioactive contamination, added in the wake of 20th century discoveries in atomic physics. (See alpha emitters and actinides in the environment.) ? Noise pollution, which encompasses roadway noise, aircraft noise, industrial noise as well as high-intensity sonar. ? Light pollution, includes light trespass, over-illumination and astronomical interference. ? Visual pollution, which can refer to the presence of overhead power lines, motorway billboards, scarred iandforms (as from strip mining), open storage of trash or municipal solid waste. ? Thermal pollution, is a temperature change in natural water bodies caused by human influence, such as use of water as coolant in a power plant. The Blacksmith Institute issues annually a list of the world's worst polluted places. In the 2007 issues the ten top nominees are located in Azerbaijan, China, India, Peru, Russia, Ukraine and Zambia. Sources and causes Motor vehicle emissions are one of the leading causes of air pollution.t5ll6H7l China, United States, Russia, Mexico, and Japan are the world leaders in air pollution emissions; however, Canada is the number two country, ranked per capita. Principal stationary pollution sources include chemical plants, coal-fired power plants, oil

79 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 refineries,!3! petrochemical plants, nuclear waste disposal activity, incinerators, large livestock farms (dairy cows, pigs, poultry, etc.), PVC factories, metals production factories, plastics factories, and other heavy industry. Some of the more common soil contaminants are chlorinated hydrocarbons (CFH), heavy metals (such as chromium, cadmium-found in rechargeable batteries, and lead- found in lead paint, aviation fuel and still in some countries, gasoline), MTBE, zinc, arsenic and benzene. Ordinary municipal landfills are the source of many chemical substances entering the soil environment (and often groundwater), emanating from the wide variety of refuse accepted, especially substances illegally discarded there, or from pre-1970 landfills that may have been subject to little control in the U.S. or EU. There have also been some unusual releases of polychlorinated dibenzodioxins, commonly called dioxins for simplicity, such as TCDD.P! Pollution can also be the consequence of a natural disaster. For example, hurricanes often involve water contamination from sewage, and petrochemical spills from ruptured boats or automobiles. Larger scale and environmental damage is not uncommon when coastal oil rigs or refineries are involved. Some sources of pollution, such as nuclear power plants or oil tankers, can produce widespread and potentially hazardous releases when accidents occur. In the case of noise pollution the dominant source class is the motor vehicle, producing about ninety percent of all unwanted noise worldwide. Effects Human health Adverse air quality can kill many organisms including humans. Ozone pollution can cause respiratory disease, cardiovascular disease, throat inflammation, chest pain, and congestion. Water pollution causes approximately 14,000 deaths per day, mostly due to contamination of drinking water by untreated sewage in developing countries. Oil spills can cause skin irritations and rashes. Noise pollution induces hearing loss, high blood pressure, stress, and sleep disturbance. Ecosystems ? Sulfur dioxide and oxides of nitrogen can cause acid rain which reduces the pH value of soil. ? Soil can become infertile and unsuitable for plants. This will affect other organisms in the food web. ? Smog and haze can reduce the amount of sunlight received by plants to carry out photosynthesis. ? Invasive species can out compete native species and reduce biodiversity. Invasive plants can contribute debris and biomolecules (allelopathy) that can

80 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 alter soil and chemical compositions of an environment, often reducing native species competitiveness. ? Biomagnification describes a situation where toxins may be pass through trophic levels, becoming exponentially more concentrated in the process. Ghetto : A ghetto is a section of a city occupied by a minority group who live there especially because of social, economic, or legal pressure. The word was originally used to refer to the Venetian Ghetto in Venice, Italy, where Jews were required to live. The corresponding German term was Judengasse. In Moroccan Arabic, ghettos were called me//ah. The term came into widespread use during World War II to refer to Nazi ghettos. The term "Ghetto" is now commonly used to refer to any. "Rural ghetto" is used to describe mobile home parks, farm labor housing tracts, and Indian reservations. Urban neighborhoods where Hispanic immigrants settled in the late 20th century (called barrios) are said to be comparable to ghettos, because most immigrants are clustered in culturally isolated enclaves. Ghettos are formed in three ways : [1] ? As ports of entry where minorities, and especially immigrant minorities, voluntarily choose to live with their own kind. ? When the majority uses compulsion — typically violence, hostility, or legal barriers — to force minorities into particular areas. ? When the majority is willing and able to pay more than the minority to live with its own kind. "Ghetto" is also used figuratively, in a classist manner, to indicate geographic areas with a concentration of any type of person (e.g. gay ghetto, student ghetto). "Ghetto" is also used in slang as an adjective to describe how city-like or thug-like something is. It can also be a place where the housing is cheap and people can barely live off their paychecks. Homelessness : The U.S. Department of Housing and Urban Development (HUD) defines the term "homeless" or "homeless individual or homeless person" as - (1) an individual who lacks a fixed, regular, and adequate nighttime residence; and (2) an individual who has a primary nighttime residence that is: A) supervised publicly or privately operated shelter designed to provide temporary living accommodations (including welfare hotels, congregate shelters, and transitional housing for the mentally ill); B) an institution that provides a temporary residence for individuals intended to be institutionalized; or C) a public or private place not designed for, or ordinarily used

81 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 as, a regular sleeping accommodations for human beings, in different languages, the term for homelessness reveals the cultural and societal perception and classification of a homeless person: ? Britain : "rough sleeper" (person who sleeps "in the rough" i.e. outdoors) ? Spanish : "persona sin hogaf', (person without a home], "sfn fecho" or "sfntecho" (person without roof above) ? French : "sans domicile fixe" (SDF, without a fixed domicile) ? German : "obdachlos" (without a shelter) ? Italian : "senzatetto" (without a roof) ? Swedish : "uteliggare" (someone lying outside), "fod/s"/"todare", luffare. ? Portuguese: "sem-abrigo" (without a shelter) or "sem-fefo" (without a roof) ? Polish, Russian, Slovene: "bezdomny", "6e3AOMHbiti", or in more frequent use, "6oMx", standing for without fixed place of living (6e3 onpAeAennoro Mecro "brezdomec" respectively (without a house) Voluntary homelessness A small number of homeless people choose to be homeless, living as nomads. "Nomadism has been a way of life in many cultures for thousands of years" either due to the "...seasonal availability of plants and animals" or by "their ability to trade." A 2001 study on homelessness issues in Europe noted that "Urban transience [e.g., homelessness] is different from nomadism/rootlessness or travelling.." in that nomads and Gypsy travellers in caravans have "planned mobility" rather than forced mobility.!7^ In Britain, most nomadic people are Roma (or Gypsy) people, Irish travellers, Kale from North Wales, and Scottish travellers. Many of these people"... continue to maintain a semi-nomadic lifestyle and live in caravans"; however, "others have chosen to settle more permanently in houses." [8JSome European countries have developed policies that acknowledge the unique nomadic (or "travelling") life of Gypsy people'9!!^]; similar work has also been done by the Australian government, regarding the subgroup of Aborigine people who are nomadic. In large Japanese cities such as Toyko, the "many manifestations of urban nomadism" include day laborers and subculture groups t] ^ (e.g., street punks). Assistance and resources available to the homeless : Refuges for the homeless There are many places where a homeless person might seek refuge. ? Outdoors: In a sleeping bag, tent, or improvised shelter, such as a large cardboard box, in a park or vacant lot. ? Hobo jungles: Ad hoc campsites of improvised shelters and shacks, usually near rail yards.

82 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 ? Derelict structures: abandoned or condemned buildings, abandoned cars, and beached boats ? Vehicles: cars or trucks are used as a temporary living refuge, for example those recently evicted from a home. Some people live in vans, covered pick- up trucks, station wagons, or hatchbacks. ? Public places: parks, bus or train stations, airports, public transportation vehicles (by continual riding), hospital lobbies, college campuses, and 24- hour businesses such as coffee shops. Public places generally use security guards or police to prevent people from loitering or sleeping at these locations for a variety of reasons, including image, safety, and comfort. ? Homeless shelters ranging from official city-run shelter facilities to emergency cold-weather shelters opened by churches or community agencies, which may consist of cots in a heated warehouse, or temporary Christmas Shelters. ? Inexpensive Boarding houses called flophouses offer cheap, low-quality temporary lodging. ? Residential hostels, where a bed as opposed to an entire room can be rented cheaply in a dorm-like environment. ? Inexpensive Motels also offer cheap, low-quality temporary lodging. However, some who can afford housing live in a motel by choice. For example, David and Jean Davidson spent 22 years at a UK Travelodge ? 24-hour Internet cafes are now used by over 5,000 Japanese "Net cafe refugees". An estimated 75% of Japan's 3,200 all-night internet cafes cater to regular overnight guests, who in some cases have become their main source of income. ? Friends or family: Temporarily sleeping in dwellings of friends or family members ("couch surfing"). Couch surfers may be harder to recognize than street homeless people Health care for the homeless Health care for the homeless is a major public health challenge. Homeless people are more likely to suffer injuries and medical problems from their lifestyle on the street, which includes poor nutrition, substance abuse, exposure to the severe elements of weather, and a higher exposure to violence (robberies, beatings, and so on). Yet at the same time, they have little access to public medical services or clinics, in many cases because they lack health insuranceor identification documents. I24i Free-care clinics, especially for the homeless do exist in major cities, but they are usually overburdened with patients. The conditions affecting the homeless are somewhat specialized and has opened

83 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 a new area of medicine catering to this population. Skin diseases and conditions abound, because homeless people are exposed to extreme cold in the winter and they have little access to bathing. Homeless people also have much more severe dental problems than the general population. Specialized medical textbooks have been written to address this for providers.!26! There are many organizations providing free care al! over the world for the homeless, but the services are in great demand given the limited number of medical practitioners helping. For example, it might take months to get a minimal dental appointment in a free-care clinic. Communicable diseases are of great concern. especially tuberculosis, which spreads in the crowded homeless shelters in high density urban settings. Income sources Many non-profit organizations such as Goodwill Industries maintain a mission to "provide skill development and work opportunities to people with barriers to employment", though most of these organizations are not primarily geared toward homeless individuals. Many cities also have street newspapers or magazines: publications designed to provide employment opportunity to homeless people or others in need by street sale. While some homeless have paying jobs, some must seek other methods to make money. Begging or panhandling is one option, but is becoming increasingly illegal in many cities. Despite the stereotype, not all homeless people panhandle, and not all panhandlers are homeless. Another option is busking: performing tricks, playing music, drawing on the sidewalk, or offering some other form of entertainment in exchange for donations. In cities where pharmaceutical companies still collect paid blood plasma, homeless people may generate income through frequent visits to these centers. Homeless people have been known to commit crimes just to be sent to jail or prison for food and shelter. In police slang, this is called "three hots and a cot" referring to the three hot daily meals and a cot to sleep on given to prisoners. Similarly a homeless person may approach a hospital's emergency department and fake a physical or mental illness in order to receive food and shelter Main causes of homelessness The major reasons and causes for homelessness as documented by many reports and studies include: ? Lack of affordable housing ? Substance abuse and lack of needed services ? Mental illness and lack of needed services

84 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 ? Domestic violence ? Poverty, caused by many factors ? Prison release and re-entry into society ? Lack of affordable healthcare ? Natural Disaster Other major causes ? Adjusting from forces to civilian life ? fleeing care ? asylum seekers The high cost of housing is a by-product of the general distribution of wealth and income. The rate of homelessness has also been impacted by the reduction of household size witnessed in the last half of the 20th century. Individuals who are incapable of maintaining employment and managing their lives effectively due to prolonged and severe drug and/or alcohol abuse make up a substantial percentage of the U.S. homeless population.f30! The link between substance abuse and homelessness is partially caused by the fact that the behavioral patterns associated with addiction can alienate an addicted individual's family and friends who could otherwise provide a safety net against homelessness during difficult economic times. increased wealth and income inequality have caused distortions in the housing market that push rent burdens higher, thereby decreasing the availability of affordable housing. There is an initiative in the United States, to help the homeless get re-integrated into society, and out of homeless shelters, called "Housing First". It was initiated by the federal government's Interagency Council on Homelessness. It asks cities to come up with a plan to end chronic homelessness. In this direction, there is the belief that if homeless people are given independent housing to start off with, with some proper social supports, then there would be no need for emergency homeless shelters, which it considers a good outcome. This is a very controversial position.P'l In Boston, Massachusetts, in September 2007, an outreach to the homeless was initiated in the Boston Common, after some arrests and shootings, and in anticipation of the cold winter ahead. This outreach targets homeless people who would normally spend their sleeping time on the Boston Common, and tries to get them into housing, trying to skip the step of an emergency shelter. Applications for Boston Housing Authority were being handed out and filled out and submitted. This is an attempt to enact by outreach the Housing First initiative, federally mandated. Boston's Mayor, Thomas Menino, was quoted as saying 'The solution to homelessness is permanent
85 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 housing". Still, this is a very controversial strategy, especially if the people are not able to sustain a house with proper community, health, substance counseling, and mental health supportive programs. Most researchers attempt to make a distinction between: 1) why homelessness exists, in general, and 2) who is at-risk of homelessness, in specific. Homelessness has always existed since urbanization and industrialization. Factors placing an individual at high-risk of homelessness include: ? Poverty : People living in poverty are at a higher risk of becoming homeless. ? Drug or alcohol addiction : It is common for homeless to suffer from a substance abuse problem. [Debate exists about whether drug use is a cause or consequence of homelessness. However, regardless when it arises, an untreated addiction "makes moving beyond homelessness extremely difficult."!35! Substance abuse is quite prevalent in the homeless population.P6l ? Serious Mental Illness and Disability : It has been estimated that approximately one-third of all adult homeless persons have some form of mental illness and/or disability. In previous eras, these individuals were institutionalized in state mental hospitals. According to the National Alliance for the Mentally III (NAM1), there were 50,000 mentally ill homeless people in California alone because of deinstitutionalization between 1957 and 1988 and a lack of adequate local service systems.!37^ Various assertive outreach approaches, including a mental health treatment approach known as Assertive Community Treatment and the Path Program, have shown promise in the prevention of homelessness among people with serious mental illness.psh^jbq] ? Foster Care background : This population experienced rates of homelessness nearly 8 times higher than the non-foster care population. ? Escaping domestic abuse : including sexual, physical and mental abuse: Victims who flee from abuse often find themselves without a home. Abused children also have a higher chance of succumbing to a drug addiction, which contributes to difficulties in establishing a residence. t4]i In 1990 a study found that half of homeless women and children were fleeing abuse.I42i ? Prison discharge : Often the formerly incarcerated are socially isolated from friends and family and have few resources. Employment is often difficult for those with a criminal record. Untreated substance abuse and mental illness also may put them at high risk for homelessness once discharged.!43! ? Civilian during war : Civilians during war or any armed conflict are also are at a higher risk for homelessness, because of possible military attacks on their property, and even after the war rebuilding their homes is often costly, and most commonly the government is overthrown or defeated which is then unable to help its citzens/

86 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 Urban decay: Urban decay is a process by which a city, or a part of a city, falls into a state of disrepair. It is characterized by depopulation, property abandonment, high unemployment, fragmented families, political disenfranchisement, crime, and desolate and unfriendly urban landscapes. Urban decay was associated with Western cities, especially North America and parts of Europe during the 1970s and 1980s. During this time period major changes in global economies, transportation, and government policies created conditions that fostered urban decayci. The effects of urban decay run counter to the development patterns found in most cities in Europe and countries outside of North America, where slums are usually located on the outskirts of major metropolitan areas while the city center and inner city retain high real estate values and a steady or increasing population. !n contrast, North American cities often experienced an outflux of population to city suburbs or exurbs, as in the case of white flight. There is no single cause of urban decay, though it may be triggered by a combination of interrelated factors, including urban planning decisions, the development of freeways, suburbanisation, redlining!4!, immigration restrictionsand racial discrimination. Shanty towns : Shanty towns (also called squatter camps, barrios, or favelas) are illegal or unauthorized settlements of impoverished people who live in improvised dwellings made from scrap plywood, corrugated metal, and sheets of plastic. Shanty towns, which are usually built on the periphery of cities, often do not have proper sanitation, electricity, or telephone services. Shanty towns are mostly found in developing nations, or partially developed nations with an unequal distribution of wealth. In extreme cases, shanty towns have populations approaching that of a city. Gentrification : Gen trifle a tion, or urban gentrification, is a phenomenon in which low-cost, physically deteriorated neighborhoods undergo physical renovation and an increase in properly values, along with an influx of wealthier residents who may displace the prior residents. Proponents of gentrification focus on the benefits of urban renewal, such as renewed investment in physically deteriorating locales, improved access to lending capital for low-income mortgage seekers as their property values increase, increased rates of lending to minority and first-time home purchasers to invest in the now-appreciating area and improved physical conditions for renters. Often initiated by private capital,
87 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 gentrification has been linked to reductions in crime rates, increased property values, increased tolerance of sexual minoritiesand renewed community activism. Critics of gentrification often cite the human cost to the neighborhood's lower- income residents when debating the topic. They expound that the increases in rent often spark the dispersal of communities whose members find that housing in the area is no longer affordable. Additionally, the increase in property taxes may sometimes force or give incentive for homeowners to sell their homes and seek refuge in less expensive neighborhoods. While those who view gentrification as a positive phenomenon praise its effect on neighborhood's crime rates, those with different paradigms believe that the crime has not truly been reduced, but merely shifted to different lower-income neighborhoods. 4.5 Questions 1. Define towns on the basis of their physical, social and functional characteristics. What do mean by ecology of cities ? 2. Discuss two methods used in identifying social areas of cities. 3. Bring out the characteristic features and problems of the inner city. 4. What do you mean by urban decay ? How is it reflected over urban space. Suggested Readings Berry and Horton 1970 : geographical perspectives of urban systems Carter, H. 1981 : Urban Geography, 3rd edition Arnold-Hcinemann, New Delhi: 434p. Dickinson, R.E. 1968 : City and Region: A Geographical Interpretation, Routledge and Kegam Paul Ltd. London. Diddee, Jaymala 1997 : Indian Medium Towns, Rawat Publications, Jaipur. Flint C and Flint.D(1999):Urbanisation Changing Environments, Collins, London Ghosh, S. 1998 : Introduction to Settlement Geography, Orient Longman Ltd.. Calcutta: 158p. Gibbs.J (1961) : Urban Research Methods.Last-West Press Pvt Ltd. ,Ne\\ Delhi Hardoy, J, L., Mittiti, D. & Salterthwaite, D. 1992 : Environmental Problems in the World Cities, Earthscan Pub. Ltd. London. Hudson, F.S. 1970 : Geography of Settlements, Macdonald and Lvans Ltd., Plymouth: 3-12,61-70,79-101, Herbert, David and Thomas, Colin, 1982 : Urban Geography A First Approach, John Wiley & Sons, New Delhi

88 M-2\D:\Netaji 05\Urban Geo\Unit-4.pm6.5 Johnslon. R. J (2000) : The Dictionary of Human Geography,Blackwell. UK Kaplan.D and Wheeier.J (2008):Urban Geographyjohu Wiley Knox, P. 1982: Urban Social Geography, Longman Scientific and Technical, Harlow. Mandal, R.B. 2000: Urban Geography: A Textbook, Concept Pub. Co., New Delhi. Pacione, Micheal, 2001: Urban Geography, Routledge, London Misra. II. N. (ed) 1987 : Contributions to Indian Geography, Volume 9: Rural Geography, Heritage Pub., New Delhi, Mohan Sudha 2005 : Urban Development and New Localism. Rawat Publications, Jaipur. Maycr and Kohn : reading in Urban Geography Racine, J. (ed) : Calcutta 1981, Concept Pub. Co., New Delhi. Rarnachandran R. 1989 : Urbanisation arid Urban Systems in India, Oxford University Press, New Delhi. Rao, R. Rammohan and S. Simhadri 1999 : Indian Cities: Towards Next Millenium, Rawat Publications, Jaipur. Sharma, R.N. and FC. Sita 2001 : issues in Urban Development, Rawat Publications, Jaipur. Short John, 1984 : An introduction to Urban Geography, Routledge , London Singh, R.L. et. al. (ed) 1976 : Geographic Dimensions of Rural Settlements. National Geographical Society of India, Varanasi. Singh, R. Y. 1994 : Geography of Settlements, Rawat Pub. Co., New Delhi: 335p. Singh, Ravinder Sandhu (ed) 2003^Urbanisation in India, Sage Publications. New Delhi. Taylor, Griffith 1949: Urban Geography, M emu en and Co. Ltd., London. Tewari, V. Weinston, J. and Prakash Rao, V.L.S. 1986 : Indian Cities: Ecological Perspectives, Concept Pub. Co., New Delhi, pp 1-2, 85, 221-273. Toyne.P and Newby.P (1971) Tcchniques in Human Geography,Macmillian,London Vishwanadhan, G. (ed) 1986 : Readings in Urban Structure of India, Ajanta Publications, Delhi

Hit and source - focused comparison, Side by Side

Submitted text As student entered the text in the submitted document.

Matching text As the text appears in the source.

1/31 **SUBMITTED TEXT** 24 WORDS **62%** **MATCHING TEXT** 24 WORDS

All rights reserved. No part of this study material may be reproduced in any form without permission in writing from Netaji Subhas Open University.

SA MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

2/31 **SUBMITTED TEXT** 14 WORDS **100%** **MATCHING TEXT** 14 WORDS

all places with a municipality, corporation, cantonment board, or notified town area committee etc

SA MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

3/31 **SUBMITTED TEXT** 28 WORDS **79%** **MATCHING TEXT** 28 WORDS

A minimum Population of 5000, b. At least 75 percent of the male working population is engaged in non agricultural pursuits. c. A density of population of at least 400/sq.km (1000/

SA THESISS_49_2019_GEO.pdf (D147801394)

4/31 **SUBMITTED TEXT** 27 WORDS **100%** **MATCHING TEXT** 27 WORDS

Urban sprawl, also known as suburban sprawl, is the spreading out of a city and its suburbs over rural land at the fringe of an urban area.

SA term paper Guoping Zhang.doc (D919602)

5/31 **SUBMITTED TEXT** 10 WORDS **100%** **MATCHING TEXT** 10 WORDS

should have a population one-half the size of the

should have a population one-half the size of the

W https://quizlet.com/584232126/unit-7-vocab-ap-human-flash-cards/

6/31 **SUBMITTED TEXT** 15 WORDS **86%** **MATCHING TEXT** 15 WORDS

The term urban sprawl generally has negative connotations due to the health and environmental issues

SA MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

7/31 **SUBMITTED TEXT** 14 WORDS **100%** **MATCHING TEXT** 14 WORDS

a recognized metropolitan area with a total population in excess of 10 million people.

a recognized metropolitan area with a total population in excess of 10 million people.

W https://quizlet.com/fr/519922561/g1-urbanization-flash-cards/

8/31 **SUBMITTED TEXT** 30 WORDS **90%** **MATCHING TEXT** 30 WORDS

to emit more pollution per person and suffer more traffic fatalities. Sprawl is controversial, with supporters claiming that consumers prefer lower density neighborhoods and that sprawl do not necessarily increase traffic.

SA MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

9/31 **SUBMITTED TEXT** 17 WORDS **100%** **MATCHING TEXT** 17 WORDS

Tokyo, Japan (35,197,000) 2. Mexico City, Mexico (25,600,000) 3. Seoul, South Korea (23,100,000) 4. New York City, USA (21,800,000) 5.

Tokyo, Japan; Mexico City, Mexico; Seoul, South Korea; New York City, USA;

W https://quizlet.com/83664347/7-combo-with-7-aphg-chapters-12-13-urban-patterns-kbat-and-8-others- ...

10/31	SUBMITTED TEXT	10 WORDS	83%	MATCHING TEXT	10 WORDS

seaboard of the U.S. from Boston, Massachusetts to Washington, D.C.

seaboard of the U.S. extending from Boston, MA to Washington, D.C.

W https://quizlet.com/889728/ap-human-geography-unit-6-flash-cards/

11/31	SUBMITTED TEXT	13 WORDS	95%	MATCHING TEXT	13 WORDS

In 1800 only 3% of the world's population lived in cities. By

SA A Review Report.docx (D113957614)

12/31	SUBMITTED TEXT	33 WORDS	94%	MATCHING TEXT	33 WORDS

has become the standard form of urban growth worldwide, representing a 20th-century urban form unlike that of the 19th-century central downtown. Other terms for the areas include suburban activity centers, megacenters, and suburban business districts .

has become the standard form of urban growth world-wide, representing a 20th century urban form unlike that of the 19th century central downtown. Other terms for the areas include suburban activity centers, megacenters, and suburban business districts -

W https://quizlet.com/fr/519922561/g1-urbanization-flash-cards/

13/31	SUBMITTED TEXT	13 WORDS	100%	MATCHING TEXT	13 WORDS

a metropolitan area with a total population in excess of 10 million people.

SA Rama Subramanian.doc (D61516814)

14/31	SUBMITTED TEXT	15 WORDS	100%	MATCHING TEXT	15 WORDS

of Urban structure Urban structure is the arrangement of land use in urban areas.

SA Urban Geography.docx (D57573963)

15/31 **SUBMITTED TEXT** 27 WORDS **92%** **MATCHING TEXT** 27 WORDS

economists, and geographers have developed several models, explaining where different types of people and businesses tend to exist within the urban setting. Urban structure can also refer to

SA Urban Geography.docx (D57573963)

16/31 **SUBMITTED TEXT** 20 WORDS **100%** **MATCHING TEXT** 20 WORDS

urban spatial structure, which concerns the arrangement of public and private space in cities and the degree of connectivity and accessibility.

SA Urban Geography.docx (D57573963)

17/31 **SUBMITTED TEXT** 41 WORDS **61%** **MATCHING TEXT** 41 WORDS

Decentralization of shops, manufacturing industry, and entertainment ? Urban regeneration and gentrification - More expensive property can be found in 'low class' housing areas ?

SA MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

18/31 **SUBMITTED TEXT** 11 WORDS **100%** **MATCHING TEXT** 11 WORDS

Physical features - physical features may restrict or direct growth along

SA MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

19/31 **SUBMITTED TEXT** 18 WORDS **97%** **MATCHING TEXT** 18 WORDS

growth. The theory was formed based on the idea that people have greater movement due to increased car ownership.

SA MGEOS-22 Urban Geography_All Unit.pdf (D135361638)

20/31	SUBMITTED TEXT	23 WORDS	93%	MATCHING TEXT	23 WORDS

Rural-urban fringe is an area with distinctive characteristic which is only partly assimilated into the urban complex which is still partly rural." —

SA pallavi-MA.doc (D53496895)

21/31	SUBMITTED TEXT	21 WORDS	90%	MATCHING TEXT	21 WORDS

of some of whom work in and are oriented towards agriculture while at the same time the remainder pursue urban occupations and

SA pallavi-MA.doc (D53496895)

22/31	SUBMITTED TEXT	28 WORDS	55%	MATCHING TEXT	28 WORDS

fringe is the extension of housing estates of buildings along the main arterial roads, and by the location of new factories, golf courses, water- works, cemeteries . . .

SA pallavi-MA.doc (D53496895)

23/31	SUBMITTED TEXT	19 WORDS	66%	MATCHING TEXT	19 WORDS

The rural-urban fringe is an area of transition between well-recognised urban land-use and the area devoted to agriculture." —

SA Introduction new.docx (D47319546)

24/31	SUBMITTED TEXT	19 WORDS	90%	MATCHING TEXT	19 WORDS

built-up area of houses with small gardens, forming dormitory communities from which more than half the active populations work in

SA Introduction new.docx (D47319546)

25/31 **SUBMITTED TEXT** 17 WORDS **100%** **MATCHING TEXT** 17 WORDS

The boundary of Rural-urban fringe changes continuously along with the expansion of urban limits. It may be

SA pallavi-MA.doc (D53496895)

26/31 **SUBMITTED TEXT** 54 WORDS **75%** **MATCHING TEXT** 54 WORDS

the central area of the major city. In the United States and United Kingdom, the term often applied to the poorer parts of the city centre and is some times used as 'euphemism' with the connotation of being an area , perhaps a Ghetto, where people are less educated and wealthy and where there is more crime .

the central area of a major city; in the United States the term is often applied to the poorer parts of the city center and is sometimes used as a euphemism with the connotation of being an area, perhaps a ghetto, where people are less educated and wealthy and where there is more crime.

W https://quizlet.com/280238262/vocab-13-urbanization-a-m-flash-cards/

27/31 **SUBMITTED TEXT** 13 WORDS **88%** **MATCHING TEXT** 13 WORDS

slum as a heavily populated urban area characterized by substandard housing and squalor.

Slum a heavily populated urban area characterized by substandard housing and squalor

W https://quizlet.com/fr/519922561/g1-urbanization-flash-cards/

28/31 **SUBMITTED TEXT** 12 WORDS **100%** **MATCHING TEXT** 12 WORDS

the central area of a major city. In the United States,

the central area of a major city; in the United States

W https://quizlet.com/280238262/vocab-13-urbanization-a-m-flash-cards/

29/31 **SUBMITTED TEXT** 42 WORDS **66%** **MATCHING TEXT** 42 WORDS

the term is often applied to the poorer parts of the city centre and is sometimes used as a euphemism with the connotation of being an area, perhaps a ghetto or slum, where people are less educated and impoverished and where there is more crime.

the term is often applied to the poorer parts of the city center and is sometimes used as a euphemism with the connotation of being an area, perhaps a ghetto, where people are less educated and wealthy and where there is more crime.

W https://quizlet.com/280238262/vocab-13-urbanization-a-m-flash-cards/

30/31	SUBMITTED TEXT	24 WORDS	75%	MATCHING TEXT	24 WORDS

Environmental Justice is the fair treatment and meaningful involvement of all people—with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Environmental Justice EPA definition: "The fair treatment and meaningful involvement of all people regardless of race, color, national origin.". With respect to the development, implementation, and enforcement of environmental laws, regulation, and policies.

W https://quizlet.com/83664347/7-combo-with-7-aphg-chapters-12-13-urban-patterns-kbat-and-8-others- ...

31/31	SUBMITTED TEXT	72 WORDS	57%	MATCHING TEXT	72 WORDS

urban centre. It has been called by different names by different authors. Author Term Andrews Urban Fringe Reinemann Outlaying Adjacent Zone Myres and Beegle True Fringe Whitehard Inner Fringe belt M.M.P. Sinha Sub-urban Fringe R.B. Mandal Sub-urban Zone/ Rurban Zone b) Secondary Urban Fringe : This area is found around the primary urban fringe. It is known as rural fringe, suburban zone, partial zone, rurban fringe and outer fringe. In 1942 Richard Andrews has classified fringe as : (a) Urban fringe — closer to

SA pallavi-MA.doc (D53496895)

Ouriginal by Turnitin

Document Information

Analyzed document	PGGR_9B.pdf (D165634546)
Submitted	5/2/2023 9:29:00 AM
Submitted by	Library NSOU
Submitter email	dylibrarian.plagchek@wbnsou.ac.in
Similarity	10%
Analysis address	dylibrarian.plagchek.wbnsou@analysis.urkund.com

Sources included in the report

SA	**MGEOS-23 Remote Sensing_ALL Unit.pdf** Document MGEOS-23 Remote Sensing_ALL Unit.pdf (D137281283)	5
W	URL: https://ncert.nic.in/textbook/pdf/kegy306.pdf Fetched: 11/7/2020 11:04:09 AM	3
SA	**GIS 502.pdf** Document GIS 502.pdf (D125058113)	26
SA	**07180462.pdf** Document 07180462.pdf (D102287107)	1
SA	**07170409.pdf** Document 07170409.pdf (D102312712)	2
W	URL: https://remotesensingtechnique.blogspot.com/ Fetched: 12/17/2021 4:06:14 PM	10
SA	**rana-9.docx** Document rana-9.docx (D54864731)	7
SA	**GMT_301_07180464.docx** Document GMT_301_07180464.docx (D102243546)	1
SA	**Unit-1.doc** Document Unit-1.doc (D109130277)	5

Entire Document

PREFACE In the curricular structure introduced by this University for students of Post- Graduate Degree Programme, the opportunity to pursue Post-Graduate course in subject introduced by this University is equally available to all learners. Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely in keeping with the objectives of open education which does not believe in artificial differentiation. Keeping this in view, study materials of the Post Graduate level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis. The accepted methodology of distance education has been followed in the preparation of these study materials. Co-operation in every form of experienced scholars is indispensable for a work of this kind. We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing and devising of a proper lay-out of the materials. Practically speaking, their role amounts to an involvement in 'invisible teaching'. For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other. The more a learner would seriously pursue these study materials, the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self-learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University. Needless to add, a great deal of these efforts is still experimental-in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned. Professor (Dr.) Subha Sankar Sarkar Vice-Chancellor

First Edition : November, 2018 Printed in accordance with the regulations of the Distance Education Bureau of the University Grants Commission.

NETAJI SUBHAS OPEN UNIVERSITY Post-Graduate Geography [M.Sc] Paper : PGGR 09 Group : B Course Writer Unit 1 : Dr. Asit Kumar Sarkar Unit 2 : Dr. Asit Kumar Sarkar Unit 3 : Dr. Asit Kumar Sarkar & Dr. Biraj Kanti Mondal Editor Professor Soumendu Chatterjee Editing : Professor Radharaman Chakrabarti Editorial Assistance, Formatting & Co-ordination : Professor Debnarayan Modak & Dr. Barnana Guha Thakurta (Banerjee) Notification

Mohon Kumar Chottopadhaya Registrar

Netaji Subhas PGGR on Open University Remote Sensing & Geographic Information System Unit 1 ˆ Visual Image Interpretation 7-60 Unit 2 ˆ Digital Image Processing 61-81 Unit 3 ˆ GIS Data Processing 82-104

7 UNIT:1 ❒VISUAL IMAGE INTERPRETATION Structure: 1.1 Introduction 1.2 Objectives 1.3 Comparative assessment of topographical maps, aerial photographs and satellite images in representation of geographical data 1.4 Geometry of aerial photographs and satellite photo products 1.5 Principles of mosaicing. 1.6 Preparation of Thematic overlays from aerial photographs and satellite images. 1.7 Summary 1.1 Introduction Maps are the best tools available to geographers for portraying the geographical information into graphical formats. It is said that maps should be self explanatory. But for practical purposes, it is observed that the map reader should acquire certain skill so that the map may be read at ease. More over, by interpreting the base map, variety of maps may be prepared. Now a days with the advancement of various technologies, base maps are also considered as data. Initially traditional ground survey techniques were in use to prepare topographical sheets. Now a days remote sensing products in the form of aerial photograph and satellite imagery are extensively used for preparation and revision of topographical sheets. The main advantage of the toposheet is its annotation part. Moreover, with the help of conventional symbols it is easy to read the map. On the other hand, the identification and recognition of objects from aerial photograph or satellite imagery depends upon the readers' knowledge about the characteristics of the photo/image recorded in terms of tone, texture, pattern, shape, size, shadow, situation, resolution and Fig. 1.1

8 spectral sensitivity, etc. Different colour clues are also important to open the secrecy of colour images. Repetitive coverage, synoptic view and uniform data set are the main advantages of satellite images. But spatial resolution is the main constrain for such products. Moreover, neither aerial photograph nor satellite imagery contains any annotation. A topographical map is a map that represents the form of Earth's surface. It is available in different scales. For example, Survey of India publishes toposheets in different scales covering the entire country (Figure 1.1) The scale of such sheets may be 1: 250, 000, 1:50,000, 1:25,000. etc. (Figure 1.2). A topographical map contains information related to physical parameters like drainage, natural vegetation, topography, etc. along with man made features like communication network, settlement pattern, etc. Geographical coordinates in terms of latitude and longitude, administrative boundaries, contour values, spot heights, etc. are also available in a topographical sheet. Amenities and facilities like hospital, places of work ship, rest house and bunglow, market place, etc. also find place in a topographical sheet. All these information are represented in terms of different colours, symbols and texts (Figure 1.3). Thus to interpret a Fig.1.2
9 Fig.1.3 Town or Village: inhabited: deserted. Fort.....
10 1.Topographical map is the product of man's choice of things to be depicted on the map by using conventional symbols on principles of mapping Topographical map Aerial Photograph Satellite Imagery 1. Aerial photographs are of different earth surface features seen and detectable by the eye of the camera fitted in an aircraft at the time exposure. It is the product of a natural process and chemical and physical laws of imagery. 1. Satellite data or images are collected from the space borne sensors. Mounted sensors record electronic signals of different wave lengths of various earth surface features. topographical map one should thoroughly acquire the knowledge of map reading skill, which is available as marginal information in each and every map. One can identify the adjacent map with the help of map index. The legend helps the reader to understand different features within the map area. Thus proper interpretation of a topographical map would help the map reader to understand the grass root information of the topography under investigation. It is also possible to prepare series of maps and diagrams based on a particular topographical sheet to extract specific information. Thus apart from preparation of Broad Physiographic Divisions, other specific maps and charts like vegetation map, ruggedness index, dissection index, relative relief, transact chart (to show the relationship between different topographic features), long and cross profiles, etc, can also prepared with the help of a topographical sheet. 1.2 Objectives This unit will help you to understand: z Different types of data products concerning geographical resources and their comparative assessment. z Geometry of aerial photograph and satellite imagery. z Principles of mosaicing of aerial photograph and satellite images. z Visual interpretation of topographical map, aerial photograph and satellite images. 1.3 Comparative assessment of topographical maps, aerial photographs and satellite images
11 2. Map distinguishes the features by various symbols, colours, annotations, etc. For artificial presentation, the differentiation of features is not clear on the map. 2.Differentiate the recorded features by the clues, e.g. tone, texture, size, shape, shadow, pattern, situation, resolution & spectral sensitivity. 2. Satellite images are also identified and dictated by the same elements. Quantitative analysis of tonal variations for image interpretation can be done which is not possible on aerial photograph. 3.Toposheet depict the average natural conditions. It is better to say that map contributes a spatial generalization of a particular place. 3. Aerial photographs are the natural image of the concern area in original, as it appreard before camera at the time of exposure. 3. Satellite remote sensing do not give natural image. It collects signals from objects belonging to several visible or pre-selected bands of EMR for distinguishing & characterizing different features. 4. In topo maps, no such features of natural & man introduced environmental hazards are depicted. 4. In aerial photo any transient things like a cloud speck, etc are found. Besides, it can assess the nature & extent of sudden changes, e.g. damages due to flood, landslide, earthquake, cyclone, etc. 4.Thermal sensing can record the images day & night long. It has the capability in delineating & detecting forest fire to assess the environmental change. 5. There is an absolute index numbering system of topographical sheets for a given map which helps to identify the different regions properly. 5. There is a task number for aerial photo which is secret & not openly available. But with the help of index map, if available, the task no, strip no and photo no can help to identify the actual area of the photograph. 5. There is international index number for satellite images. Each satellite has a separate index number. With the help of row and path, it is possible to identify the area of interest. 6. Topographical sheets represent the two dimensional reality. Heights, depths, slopes, etc. are not visualized but they can be understood by the trained & efficient interpreters. 6. Stereoscopic view of different photo pairs gives 3D impression. The three dimension impression of landscape is properly visualized on the photograph. Slopes can be determined by using parallax bar. 6. All the satellite images do not have the capability of stereo viewing. However, SPOT is the first Satellite to provide with stereo viewing. Indian satellite like IRS 1C, ID, Cartosat-1,2,2A etc. could capture stereo images.

12 7. The scale is constant on topographical sheets. 7. Scale of vertical photo is variable due to point displacement for height variations & tilting of the camera axis. Scale is greatly variable in oblique photo also. 7. In satellite remote sensing one of the major limitation is the poor spatial resolution or the pixel size.(e.g. 80 m for Landsat MSS, 30m for TM, 36.5m for LISS II of IRS 1A &B & 10m for SPOT PAN.) 8. Features in minute details are not found in topographical maps because these are manually produced & there is scope for manipulation. 8. All the physical & cultural features exposed to the camera may be seen in the photo, although it depends on camera angle, sunlight & atmospheric condition. 8. Where existing weather conditions restrict the use of aerial cameras for taking the photographs, RADAR sensing is used in such case to record the image of the concerned area. 9. Topographical sheets of highly inaccessible areas, e.g. mountains, oceans, etc. are not available. 9. Aerial photograph of inaccessible areas are available. 9. Satellite remote sensing is in a position to collect information from inaccessible areas. 10. Topographic surveying for the preparation of topographical maps needs a lot of survey instruments and huge technical staff. 10. Aerial survey necessitates heavy financial investment for specially designed air craft, aerial camera, photogrammetric equipment & the most efficient technical staff. 10. Satellite remote sensing is a high tech affair which also needs large amount of money & also efficient technical personnel, but it becomes cheaper in the long run for its diversified use. 11. Topographic survey is generally conducted in a long interval of time which provides all old and backdated information of a particular region. 11. Aerial survey is conducted in a comparatively short interval of time which provides more or less up to date information. 11. Satellite images of different modes and of a very short time span are available which can give changing scenes of a particular region. 12. Preparation of topographical map takes much more time. 12. It is less time consuming. 12. It saves money, time & energy than traditional maps and photographs.
13 1.4 Geometry of aerial photographs and satellite photo products To know the geometry of aerial photographs, we are to know the basic concept of aerial photography, which is being described herein below. 1.4.1 Aerial Photography: Photographs taken from an aircraft are commonly termed as aerial photographs. Aerial photographs are considered as remotely sensed data products.

100% **MATCHING BLOCK 2/60** **SA** MGEOS-23 Remote Sensing_ALL Unit.pdf (D137281283)

Remote sensing is the science and art of obtaining information about an object, area or phenomenon through the analysis of data acquired by a device that is not in contact with the object, area or phenomenon under investigation.

Thus broadly speaking both photographic as well as non photographic detectors are included with the perview of remote sensing. At this stage it is better to distinguish the difference between photographic and non photographic sensing systems. In case of an ordinary photograph, reflected energy directly acts upon the chemical emulsion producing an image of the object. On the other hand, in case of non-photographic remote sensing system, the sensed energy gives the result of the detection of emitted or reflected energy which are converted into signals in a digital recorder, which may ultimately be used for producing picture like formats known as images. 1.4.1.1 Brief History of Aerial Photography: First photographs were taken in 1839 by Nicephore Niepce, Williams Henry Fox Talbot and Louis Jacques Mande Daguerre. In the year 1840 Argo, Director of the Paris Observatory, expressed his opinion in favour of use of aerial photography for topographical survey. The first known photograph was taken by Gasperd-felix Tournachon, a Parisian photographer, in the year 1858, known as “Nadar”. Balloon was used as the platform for taking the photograph near Paris. A photograph over Boston taken from a balloon by James Wallace Black in the year 1860, is considered as the earliest existing aerial photograph. In the year 1882, kites were used to take aerial photographs, particularly for collecting meteorological data. World War I was a major impetus for development of aerial photography mainly for military reconnaissance purposes. In the mean time there were steady improvements in case of version of aircraft, camera, filter, film emulsion, etc. However, after the war the technology was in place to begin large scale aerial surveys. Moreover, the greatest stimulation to the photo interpretation occurred during World War II. 1.4.1.2 Types of photographs: Photographs which are used for mapping and photo-interpretation can be divided into the following main classes according to the direction of the camera axis:

14 a) Vertical photographs b) Horizontal or terrestrial photographs c) Oblique photographs The term 'vertical' and 'horizontal' refer to the direction in which the camera axis was pointing at the time of exposure. Vertical Air photographs: These are taken with the axis of the aerial camera vertical or nearly vertical (Figure 1.4 a). A vertical photograph closely resembles a map and is particularly suitable for obtaining uniform coverage. As these photographs can be obtained with reasonable low tilt (tilt is deviation of the camera axis from the vertical), they are generally used for mapping and photo-interpretation works. Terrestrial / Horizontal photographs: These are taken with photo-theodolites from camera station on the ground with the axis of the camera horizontal and they present the more familiar elevation view. This type of photographs are used for survey of structures and monuments of architectural or archeological value. Terrestrial photographs taken with normal good cameras can also be of considerable use in supplementing photo-interpretation of vertical aerial photographs particularly so in geology and forestry, where study of a profile may be needed. Oblique photographs:Aerial photographs taken with the optical axis of the aerial camera tilted from the vertical are known as oblique photographs. These photographs cover large areas of ground but clarity of details diminishes towards the far end of the photograph. Aerial photographs on which the horizon does not appear are known as Low Oblique (Figure 1.4b) and are, sometimes, used to compile reconnaissance map Fig.1.4 (b) Low oblique photograph (c)
15 Fig. 1.4d in inaccessible areas, High Oblique photographs (Figure 1.4c & d), which are tilted sufficient to contain the horizon, were previously used for extension of planimetric and height control, when the available ground control was insufficient to provide necessary accuracy. These have very limited use at present. There are combinations of above types of photography taken with two or more cameras in a single camera unit in the photographic air plane. Convergent Photographs: These are low oblique photographs taken with two cameras exposed simultaneously at successive exposure stations, with their axis tilted at a fixed inclination from vertical in opposite directions in the direction of the flight line so that the forward exposure of the first station forms a stereo-pair with the backward exposure of the next station (Figure 1.5). Special plotting instruments are required for compiling topographical maps from convergent photographs. Trimetrogon photography: Another important type of photography which is a combination of a vertical and two oblique photographs is trimetrogon photography, in which the central photograph is vertical and the side ones are oblique (Figure 1.6). This photography can be used for rapid production of reconnaissance maps on small scales. 1.4.1.3 Geometry of aerial photographs Geometry of aerial photograph is related to different aspects of photography like, Fig. 1.5 Convergent
16 projection, tilt, swing, scale of photographs, image displacement, etc. Prior to that it is better to know about stereoscopic vision and exaggeration of aerial photograph. Stereoscopic vision: When we look at objects with two eyes, our eyes give us two slightly different views, which are fused physiologically by the brain, and result in a sensation of sensing model having three dimensions. This third dimension is only provided when objects are viewed with both eyes. This is called binocular or stereoscopic vision. It is also possible to get a three dimensional impression if we offer to each of our eyes, instead of nature, a photograph taken from different points, a so called stereopair. For the three dimensional study of stereopairs usually stereoscopes are used. Stereoscopic exaggeration: The appearance of the stereoscopic image is that of a relied -model or stereo-model, giving the impression of solidity and depth. For vertical photos, having 60% overlap, the vertical scale of the model appears to be considerably exaggerated, and the impression of relief is far greater than that which an observer in the stereoplane would have received visually. Mountains and hills appear higher and their slopes steeper than they really are in nature. This vertical exaggeration is due to the much greater angular difference between the rays from any given ground-point to two successive exposure stations, as compared to that between rays to the observer's eyes from the same ground-point. Fig.1.6 Trimetrogon L (a) Parallel Projection (b) Orthogonal Projection (c) Central Projection
17 Projection: In order to understand the geometric qualities of a photograph,

45% **MATCHING BLOCK 6/60** **SA** GIS 502.pdf (D125058113)

it is necessary to understand what projection means in terms of geometry. In the example given below the triangle ABC and the line (LL 1) on which the projection is made are in the same plane. (a) Parallel Projection: In this projection, the projecting rays are parallel (Figure 1.7a). The triangle ABC is projected on the line LL 1 . The projection of the triangle is 'abc'. The projecting rays Aa, Bb, Cc, are all parallel

in this case. (b) Orthogonal Projection: In this case,

57%	MATCHING BLOCK 7/60	SA	GIS 502.pdf (D125058113)

the projecting rays are all perpendicular to the line LL 1 (Figure 1.7b). This is a special case of parallel projection. Map is an orthogonal projection of the ground

on a certain scale.

87%	MATCHING BLOCK 3/60	W

The advantage of this projection is that the distances, angles and areas

in the

100%	MATCHING BLOCK 4/60	W

plane are independent of the elevation differences of the objects. (

c) Central Projection: In case

72%	MATCHING BLOCK 5/60	W

of central projection, the projecting rays Aa, Bb, Cc pass through one point O, called the Projection Centre

or Perspective Centre (Figure 1.7c). The image projected by a lens system is treated as a central projection. Tilt It is the angle between the optical axis of the camera and the plumb line. It is also Fig.1.8
18 the angle between the ground plane and the photo plane. Tilt can be resolved into two components, one in the direction of flight (the X-axis) and the other perpendicular to it (the Y-axis). The component about the Y-axis, i.e. in the direction of X is called Longitudinal Tilt or X -tilt or Fore and Aft Tilt or Tip. It is denoted by letter θ (Phi). The component about X-axis, i.e. in the direction of Y is called Lateral Tilt or Y-tilt or simply Tilt. It is denoted by letter ω (Omega). In Figure 1.8 the vertical ON through the perspective centre O meets the photo plane at point 'n' called the Photo nadir point and the ground plane at N the Ground nadir point. These points are also called plumb points. The foot of the perpendicular (p) from O on the photo plane is called the Principal point. The length of this perpendicular (Op) is called Principal distance. The approximate position of the principal point of a photograph is determined by joining the opposite fiducial marks (Figure 1.9). The point of intersection of the fiducial axis is called fiducial centre (f) and is coincident with the principal point (p). Reasons for Photo Tilt: (a) Atmospheric conditions (air pockets or currents). (b) Human error of the pilot fails to maintain a steady flight. (c) Imperfections in the camera mounting, etc. Swing Swing is the angular measurement in the plane of the photograph between the fiducial axis in the direction of flight and the actual flight line (Figure 1.10). The angle is denoted by χ (Kappa). Scale of Photographs: Scale is the relationship between distance on a map or photo and the actual ground distance. Scale is represented in two ways: (a) Equating different units of measure on map and ground, e.g. 1 cm to 2 km, 1 cm. to 10 km., etc. Fig.1.9

19 (b) As R.F. (representative fraction) in which the numerator is unity, e.g. 1:10,000 or 1/10,000 which means 1 unit on the map or photo represents 10,000 units on the ground. Methods of scale determination: There are three methods to determine scale of aerial photographs: (i) By establishing the relation of photo to ground: If the distance between the same two points on the photo as well as on the ground can be measured, R.F. can be set up: R.F. = Photo distance Group Distance (ii) By establishing the relation of photo to ground with the help of a map: If the distance between two points on a photo which can be located on the map as well, is measured, the horizontal measurements of these distances form a ratio, which when multiplied by the R.F. of the map gives the R.F. of the photo. If g be the ground distance between two points, m the map distance and p the photo distance then R.F. of map is m/g and R.F. of photo is p/g. R.Fof photo p/g p R.Fof map m/g m = = ∴ = × p R.F. of photo R. f. of map. m (iii) By establishing the relation between focal length of the Camera and flying altitude: In a true vertical photograph of flat terrain the scale of photograph is the ratio f/H. In figure 11 (a) distance 'AB' is imaged as 'ab' on the photo. Scale of the photo = Photo Distance Group Distance = ab AB = f H Fig. 1.11 Lens Distortion

20 If the terrain is not flat, the scale of the photograph is not uniform. In Figure 11 (b) Hm is the flying height above the average height of the terrain photographed. Then the average scale of the photograph = f/Hm. The scale of photo for a point A which is at a height of h' metre/ft, above the average ground level = –m h f H (the units of the focal length and the height being in the same terms) Similarly the scale for another point B which is at a vertical distance 'd' meters/ft, below the average terrain level. = +m h f H Thus the scale of a photograph is not uniform if there is irregular terrain. We can determine either the average scale of the photograph as a whole or the scale of the photograph at a particular point or elevation. It should be noted here that the scale of aerial photograph changes irregularly due to height differences in the terrain but continuously due to inclination of the camera axis. Image Displacement: On a planimetric map all features are shown in their correct horizontal position on a certain scale. This is not so in the case of aerial photographs due to image displacement or distortion. A disturbance of the principle of geometry is called distortion. There are three major sources of distortion which are due to

Figure 1.11 shows distortion due to a lens. Object point O is imaged at 1 1 instead of its correct position I on the image plane. Δd is the image displacement in this case. In a modem aerial lens this type of distortion is negligible. (b) Image displacement due to relief: Relief is the most significant source of image displacement. In Figure 1.12 O is the camera station. NA is a flat plain on which stands a tower AB with its base at B. The image of B on the truly vertical positive photographic plane is b. This is the correct planimetric position (orthogonal) of the image of the tower AB. Top A is imaged as 'a'.

21 The image of A is thus displaced from its correct planimetric position b, as 'A' is vertically above 'B', on the photograph. This shift of'a' from 'b' represented by distance ba is called relief displacement. (c) Image displacement due to tilt: In case of flat terrain, for example in case of Figure 1.13, let O be the perspective centre and 1 and II be the positive planes for a truly vertical and tilted photographs respectively. The figure shows a cross-section in the principal plane. For a point 'A', which appears at a' in I and at a in II, the displacement is equal to 1a ` –'2a. 1.4.2 Geometry of satellite images: Images from across-track scanning systems exhibit two main types of geometric distortion. They too exhibit relief displacement, similar to aerial photographs, but in only one direction parallel to the direction of scan. There is no displacement directly below the sensor, at nadir. As the sensor scans across the swath, the top and side of objects are imaged and appear to lean away from the nadir point in each scan line. Again, the displacement increases, moving towards the edges of the swath. Another distortion occurs due to the rotation of the scanning optics. As the sensor scans across each line, the distance from the sensor to the ground increases further away from the centre of the swath. Although the scanning mirror rotates at a constant speed, the IFOV of the sensor moves faster (relative to the ground) and scans a larger area as it moves closer to the edges. This effect results in the compression of image features at points away from the nadir and is called tangential scale

distortion. All images are susceptible to geometric distortions caused by variations in platform stability including changes in their speed, altitude, and attitude (angular orientation

with respect to the ground) during data acquisition. These effects are most pronounced when using aircraft platforms and are alleviated to a large degree with the use of satellite platforms, as their orbits are relatively stable, particularly in relation to their distance from the Earth. However, the eastward rotation of the Earth, during a satellite orbit causes the sweep of scanning systems to cover an area slightly to the west of each previous scan. The resultant imagery is thus skewed across the image. This is known as skew distortion and is common in imagery obtained from satellite multispectral scanners. Fig. 1.13 Flat Terrain

22 The sources of geometric distortion and positional error vary with each specific situation, but are inherent in remote sensing imagery. In most instances, these distortions may be removed, or at least reduced, but they must be taken into account in each instance before attempting to make measurements or extract further information. 1.5 Principles of mosaicing Mosaicing means joining together, the exercise may be related to either aerial photographs or satellite images. 1.5.1 Mosaicking of Aerial photographs: A mosaic is a photographic reproduction of a series of aerial photographs put together in such a way that the detail of one photograph matches the detail of all adjacent photographs. Mosaics are, for the most part, reproduced at a much smaller scale than the original photography, and consist of three main types: uncontrolled mosaics, semi-controlled mosaics and controlled mosaics. Uncontrolled Mosaics • Prints are laid out so as to join together in a “best fit” scenario. Prints may be tone-matched. Semi-Controlled Mosaics • The prints used in the mosaic are tone-matched but not rectified. Prints are laid down to fit a map base of the same scale. A title and scale may be added. Controlled Mosaics • For controlled mosaics the base map with minimum of three (3) ground control points per print need to be provided with. Prints are tone-matched and rectified to fit the map base. 1.5.2 Mosaicking of satellite images: Mosaicking is joining together several overlapping images to form a uniform image as shown in Figure Fig. 1.14

23 1.14. Basically, it is similar to creating a jigsaw puzzle with your images, and then making the joints disappear. For the mosaic to look like one image instead of collage of images, it is important that the images fit well together. You will achieve better results if you orthorectify your images. Using a rigorous math model ensures the best fit not only for the individual images, but for all the images united as a whole. Starting a Project to Mosaic Raw Images: Since raw (unreferenced) images contain the distortions inherent to the sensor, it is unlikely that features will align well in the overlapping areas without compensating for these distortions. If you are lacking the ground control needed to correct your images, you can adjust the alignment of the features in the raw images by building a math model based on images (pixel and line) coordinates. To create a mosaic with raw images, you have to build a project using polynomial or Thin Plate Spline math model, collect ground control points, geometrically correct the images, and then mosaic them. To start the Project in Geometica : On the OrthoEngine window in the File menu, click New On the Project Information window in the Filename box, type a file name for your project. This will be the name used when you save your project In the name box, type a name that you want to appear on the title bar of the OrthoEngine window. In the Description box, type a description of the project that will help you to identify its contents Under Math Modelling Method, click Polynomial or Thin Plane Spline. Click OK Starting a Project to Mosaic Existing Georeferenced Images: Instructions would be as above, excepting under Math Modelling Method, click None (mosaic only) instead of Polynomial or Thin Plane Spline. Defining a Mosaic Area: The Mosaic Area determines the extents of the mosaic file. The images are added to the Mosaic Area like pieces of a puzzle. On the Define Mosaic Area window, the footprints of the images in your project are displayed as they overlap. The crosshairs represent the principal point of each image. Click one of the crosshairs to reveal the footprint of an individual image. The background value of the Mosaic Area is zero by default.

24 To open the Define Mosaic Area window: On the OrthoEngine window in the Processing step list, select Mosaic Click the Define mosaic icon To define the Mosaic Area: By default the bounds of the Mosaic Area are the maximum extents of the images in the project. You can: Place the cursor over the side or corner of the frame and move it to change its size and shape. In the list under Mosaic Extents, click UL & LR corner. Type new x and y coordinates for the upper left and lower right corners of the frame. In the list under Mosaic Extents, click UL & Size. Type new x and y coordinate for the upper left corner of the frame. Type the number of pixels in X Size and the number of lines in Y Size to specify the size of the frame. In the list under Mosaic Extents, click Centre & Size. Type new x and y coordinates for the centre of the frame. Type the number of pixels in X Size and the number of lines in Y Size to specify the size of the frame. In the list under Mosaic Extents, click Centre & Size. Type new x and y coordinates for the centre of the frame. Type the number of pixels in X Size and the number of lines in Y Size to specify the size of the frame. Click Select Existing Mosaic File to open an existing mosaic file. Under Mosaic File Information in the Channels list, click any of the following: 8 Bit Unsigned 16 Bit Signed 16 Bit Unsigned 32 Bit Real If you select None (Mosaic only) when you set up the project, Input Image Background Value becomes available. Type the background value of the images that you want to mosaic or click to clear the check mark if the background value is zero. Click Create Mosaic File Click Close. Mosaicking Images Automatically: Although you can create your mosaic one image at a time by using Manual Mosaicking, most of the time you will use Automatic Mosaicking to do the bulk of the work, and you will use Manual Mosaicking to edit portions of the mosaic file. To open the Automatic Mosaicking window: On the OrthoEngine window in the Processing step list, select Mosaic. Click the Automatic mosaicking icon

25 To automatically mosaic your images: In the Automatic Mosaicking window, click in the Use column to select or clear the images. The images with check marks in the Use column will be mosaicked. You can also use the Orthos in mosaic button to select or clear the images, Click: All to select all the available images. Gray check marks indicate images outside the difined mosaic area. None to clear all the images selected in the Use column All in mosaic to select only the images that appear in the region that you set in Define Mosaic Area Normalization is used to even out the brightness in the images to achieve a more pleasing mosaic. You can select Regenerate offline orthos to generate orthorectified images with a Stale or Offline status Clear mosaic file before mosaicking deletes existing data from the mosaic file. In the Starting Image list, select the corrected image on which you want to build the mosaic, the colour balancing, and the cutline selection. In the Color balance list, select a method (for example None, Entire image or Overlap area) In the Trim histogram (%) box, type a number representing the percentage or mention default 2 percent, which is recommended for most data sets Select the Ignore pixels under bitmap mask check box to disregard the pixel values under the mask when calculating the colour balancing histogram Cutlines are drawn in areas where the seams are the least visible based on the radiometric values of the overlapping images. Select an appropriate method If you want to use existing or imported cutlines, select Use existing cutlines In the Preview file box, type the path and file names In the box under Directory files, type the path for the temporary working files Under Generate Start Time, click Start now or start at specific time Click Generate Preview Click Generate Mosaic 1.6 Preparation of Thematic overlays from aerial photographs and satellite images In the following paragraphs examples regarding preparation of thematic overlays from aerial photographs and satellite images are described in brief. 1.6.1 Preparation of Thematic overlays from aerial photographs For preparation of thematic overlays from aerial photographs, it is essential to know about characteristics of photo images, which is being described herein below.

26 1.6.1.1 Characteristics of photo images: The identification and recognition of objects are helped by a knowledge of the characteristics of the photo-image as recorded by black and white panchromatic film. Most important characteristics are : tone, texture, pattern, shape, size, shadow, situation and resolution & spectral sensitivity. Tone: Tone means the black and white range (i.e. grey scale variation) of a (panchromatic) photograph. The grey tone of a particular object depends on how much light is reflected from it into the camera, and thus onto the film. The more light that is reflected, the lighter the tone on the photograph. Some of the clues are as follows: Water surfaces usually have a fairly dark tone (Figure 1.14a), but if the water contains much sediment, the tone becomes more light. Un-vegetated dry sand is usually light. Surfaced roads are generally light. Railways are normally dark, It may be noted here that generally these are the examples - there will always be exceptions. Moreover, different prints of one photograph are not always identical to another in tonal density, due to differences in film processing and printing. Fig. 1.14 (a) Tone Fig. 1.14 (b) Texture

27 Texture: Texture may be defined as the product of an aggregates of uniform features which are too small to be clearly discerned individually. Texture will be depicted as a repetition of tonal changes. Forest is the best example in this regard, e.g., in large scale photographs the big trees appear in a coarse texture, whereas in case of small scale photographs they appear as fine texture (Figure 1.14b). Pattern: Pattern stands for the spatial arrangement of objects in a repeated sequence and / or in a characteristics order. Examples are: orchards, where trees are planted in lines (Figure 1.14c) or drainage patterns like dendritic, radial, etc. Shape: Shape is defined as the form or topographic expression of an object as can be observed in the two-dimensional photo-image. Rectangular shaped houses, circular shaped water tank, typical shape of a stadium (Figure 1.14d) is best example in this regard. Size: Size means the volume dimension of an object as may be observed in the three-dimensional Fig.1.4(c) Fig. 1.14 (e) Fig. 1.14 (d)
28 (stereo) photo-model. Dwelling houses, school, factory, office building, etc. can be identified in terms of size differences (Figure 1.14e). Shadow: Shadow is the obscurity within an area from which direct rays, from a source of light, are excluded by an interposed opaque body. Shadow can be very important to the interpreter by giving clues as to the profile or shape of an object (e.g. a building bridge or tree) through the shadow it casts on the ground (Figure 1.14f). Situation: Situation means the location of one place, relative to the location of other places, e.g. building beside a railway line generally represents the railway station. The runway and standing aircrafts signifies the airpor (Figure 1.14g) Resolution and spectral sensitivity of film types: Recognition of features' quality depends on the type of photographic film. Film emulsions like panchromatic, infra-red, etc. have different spectral sensitivity. Resolution or resolving power refers to the sharpness of detail afforded by the combination of film quality and the camera lens system. It is subjective measure of the image "sharpness", expressed as the maximum number of lines per millimetre that can be resolved or seen as individual lines. The net effect of a low resolving power is a loss of detail. Small objects cannot be distinguished individually anymore. Films may be made with several types of emulsions. These emulsions are sensitive for different wavelengths of the spectrum: each different emulsion has its own spectral sensitivity. In aerial photography normally two types of black and white films are used: a) Panchromatic film: Sensitive for all wavelengths of the visible spectrum. This type of film is mostly used for aerial mapping and interpretation. Panchromatic photos show varying shades of grey, with each tone comparable to the density of an object's colour as seen by the human eye. Panchromatic film is Fig. 1.14 (g) Fig. 1.14 (f)
29 superior for distinguishing objects of truly different colours, but its lack of high sensitivity to green light makes separation of vegetative types (e.g. tree species).difficult. b) Infrared film: Sensitive to violet, blue and red light of the visible spectrum in addition to infrared. It has been generally assumed that the grey tones on infrared film result from the degree of infrared reflectiveness of an object rather than from its true colour. According to this theory, broad-leaved vegetation is highly reflective and therefore gives light tones on the photographs; coniferous or needle-leaf vegetation tends to absorb infrared radiation and consequently gives much darker tones. Bodies of water absorb infrared light to a high degree and usually give quite dark tones on the film (unless the water bodies are heavily silt laden). This characteristic is useful for determining and mapping the extent of river tributaries, tidal marshes, shorelines and canals. On the other hand, the dark tone often prevents detection of such underwater hazards as reefs, shoals, and channel obstructions, which are visible on panchromatic film. Infrared film is also useful in detecting variations in moisture contents of soils; the higher the moisture content, the darker the tone. Another advantage of infrared photography is the fact that it normally penetrate haze better than panchromatic photography, but it will not penetrate extremely dense haze or moist cloud. Clear photographs can be obtained when conventional photographs are obscure. Colour film: Although black and white panchromatic film has long been the standard film types for aerial photography, many remote sensing applications currently involve the use of colour film. The major advantage to the use of colour is the fact that the human eyes can discriminate many more shades of colour than it can to with tones of gray. Colour infrared film: In contrast to "normal" colour film, colour IR film is manufactured to record green, red, and the panchromatic portion (0.7-0.9 μ m) of the near -IR scene energy in its three emulsion layers. The dyes developed in each of these layers are again yellow, magenta, and cyan. The result is false colour film in which blue images result from objects reflecting primarily green energy, green images result from objects reflecting primarily red energy, and red images result from objects reflecting primarily in the near IR portion of the spectrum. 1.6.1.2 Visual Interpretation of Aerial Photograph: In the following paragraph a model interpretation of aerial photograph has been presented.
30 The given aerial photographs bear numbers The middle photograph, (Figure 1.16) i.e. is to be interpreted. The Fig. 1.16 518A −−−−−−−, 287–29 518A −−−−−−−, 287–30 & 518A −−−−−−− 287–31 518A −−−−−−− 287–30

31 interpretation of photographs can be seen as a process that can be divided into number of phases. For all purpose we can say that it is a three phase operation. Firstly, the examination of the photographs. Secondly, the identification of objects or features. Thirdly, the classification of objects identified. Procedure: 1) Placing photographs under the stereoscope with overlapping parts of the photographs next to each other. 2) Locating & marking of principal point on each of photograph. This is done by aligning opposite sets of fiducial marks with a straight edge & the intersecting point is considered as principal point 3) Transferring of principal point from the adjacent overlapping photograph with the help of a mirror stereoscope. By connecting the principal point & the transferred principal point the flight line may be obtained. 4) Placing the stereoscope over the stereo pair in such a way that the line joining the center of the stereoscopic lenses is parallel to the flight line. 5) Although the photographs should be seen three dimensionally now, a little adjustment in distance between the photographs may still be necessary. So the photographs may be moved side ways until the spacing between the corresponding images produce comfortable stereoscopic viewing. Reference Data: Survey of India topographical sheet number 73E/15 & 73I/3 with scale of 1: 50,000 have been used as reference data. Administrative Index: From the topographic maps & the photo index it is known that the area under investigation covers parts of Puruliya district of West Bengal and Ranchi District of Jharkhand. Scale : The scale of the photograph is 1:60,000 Landforms: So far as the broad physiographic unit is concerned, the area covered by photograph belongs to Ranchi Plateau. Except the narrow strip of land along the both sides of river Subarnarekha, the entire region is a plateau fringe. Based on image characteristics the following landforms can be identified in the photographic region (Figure 1.17).
32 Fig. 1.17 1) Hills, 2) Monadnocks, 3) Uplands, 4) Undulating Plains and 5)Gully. 1. Hills : The hilly areas are well marked in the north western part and also in the south, south eastern part . In the north west there is a dome shaped hill with appreciable height. In the southern and south eastern portion there are hilly areas characterized by appreciable length and height. It appears that constituent hard rocks resisted erosion thus ultimately isolated the area from the surrounding erosional landscape. 2. Monadnocks : Maximum number of monadnocks are found in the central portion of the mapped area. According to Davisian concept of cycle of erosion,
33 the monadnocks are residual parts of hard rocks which were influenced by fluvial action. They are the remnants of peneplain formation. Fig. 1.18 3. Upland : The areas which are higher in elevation but the surface is not plain is upland. This landform is the result of fluvial erosion conducted by Salda Nadi and its tributaries. The area is almost covered by hard rocks. 4. Undulating Plain : Major part of the photograph is covered by undulating plains. This region is characterized by uneven plain topography which is rolling in nature.
34 5. Gully : Particularly in the north and central part of the map where the 1 st order streams have been originated, such landforms may be identified. The topography has been well dissected due to erosion. Small streams follow the direction of slopes in straight fashion. Land use : Information regarding different land use pattern have been extracted from the same photograph, i.e. 518A/287:30. The following land use features (Figure 1.18) have been identified based on characteristics of image pattern. Settlement : Settlements are found scattered all over the area. Most of them have been developed along the roads but they are not linear in pattern. Sometimes they have been formed at the junction of roads. The availability of water is also a predominating factor controlling the development of settlements. Most of the settlements are rural in character. Patjhalida. Masina, Khatjuri, Bengo, etc. are some of the important rural settlements. At the center of the photograph, the only compact urban settlement Jhalida can easily be identified. Forest : The southern portion of the mapped area is characterized by dense forests. Extension of forest areas are also noticed in the north western part. Moreover, isolated hills or monadnocks located at the central or west central parts are covered with open mixed jungle. The vegetative cover can be recognized easily with the help of photographic tone, which is dark enough due to chlorophyll content denoting health vegetative cover. Arable land : Arable land can be recognized with the help of photographic tone as well as field pattern. Such areas are confined mostly to the northern part of the photographic region. At places, tanks are used to irrigate arable land. Waste land: Waste lands are found either in rocky waste parts or along gully erosion areas. The former has been caused by deforestation where as the later is the result of fluvial erosion. Water bodies: There are numerous streams along with their tributaries traversing the photographic region. Sapahi Nadi and Salda Nadi are the major rivers, which flow almost parallel to each other. Both of them originate from the east and ultimately join Subarnarekha River further south (out side the photographic area). Scattered tanks are found in different parts of the area. It may be mentioned here that water bodies are recognized with the help of dark tonal expression of the photo image. Communication systems: Communication network in the form of railway and road traverse the photographic region. They may be recognized by means of tonal variations along with geometric shape. South eastern railway passes along the central part of the photograph, parallel to the main highway.

35 1.6.2 Preparation of Thematic overlays from satellite images For preparation of thematic overlays from satellite images, it is essential to know about basic concept of remote sensing, which is being described herein below. Brief history of the evolution of remote sensing technology has also been discussed. 1.6.2.1 Remote Sensing: The Basic Concept: Lillesand defines

100% **MATCHING BLOCK 11/60** **SA** MGEOS-23 Remote Sensing_ALL Unit.pdf (D137281283)

remote sensing is the science and art of obtaining information about an object, area or phenomenon through the analysis of data acquired by a device that is not in contact with the object, area or phenomenon under investigation.

Thus broadly speaking both photographic as well as non photographic detectors are included with the perview of remote sensing. At this stage it is better to distinguish the difference between photographic and non photographic sensing systems. In case of an ordinary photograph, reflected energy directly acts upon the chemical emulsion producing an image of the object. On the other hand, in case of non-photographic remote sensing system, the sensed energy gives the result of the detection of emitted or reflected energy which are converted into signals in a digital recorder, which may ultimately be used for producing picture like formats known as images. Electromagnetic Radiation: The earth receives the solar energy in the form of insolation and again radiates it back to the atmosphere. An object can be visualised because of the existence of light. When there is no light, i.e. in complete darkness, nothing can be visualised. Due to illumination and casting of shadow, information regarding object's size, shape and texture can be recognised. On the other hand, object's brightness and colour can be distinguished due to reflection and absorption of light as acted upon. Electromagnetic Energy: Each photon, i.e. quantum of electromagnetic energy, has a unique pair of electrical and magnetic field. They vibrate at right angles to each other to the direction in which they travel (Figure 1.19). The vibration can be recognised by means of wave length or frequency. Wave length stands for the distance between two successive peaks in the electromagnetic fluctuations, whereas frequency means the number of wave that pass a point in a particular time span. Thus shorter the wave length, higher the frequency or vice versa. Normal human eyes are sensitive to only some of the electromagnetic energy, emitted and reflected by objects. The visible spectrum is confined within the wavelength ranging between 0.4-0.7 µm, which is almost equally divided into blue (0.4-0.5 (µm), green
36 (0.5-0.6 µm) and red (0.6-0.7 µm) spectral ranges. By mixing these primary colours additively (i.e. by throwing beam of light), any other colour including white can be created. However, visible spectrum occupies only a very small part of the entire electromagnetic spectrum. Atom, gama ray, x ray, ultraviolet ray are shorter wave lengths compared with visible spectrum, whereas infra-red (which may either be divided into reflected infra-red and thermal infra-red or near infra-red, middle infra-red and far infra-red) thermal (heat), micro-wave, etc. are the much longer wave lengths (Figure: 1.20). All these energies are included within electromagnetic spectrum because they are basically similar in nature and radiate energy in accordance with the basic principle of wave theory. It may be mentioned here that electromagnetic energy travels

100% **MATCHING BLOCK 10/60** **SA** GIS 502.pdf (D125058113)

in a harmonic, sinusoidal fashion at the velocity of light.

Scattering and absorption of light in the atmosphere: All materials at temperature above absolute zero (0° K = -273°C) emit electromagnetic radiation. A hypothetical black body, which is an ideal radiator, that totally absorbs and re-emits all energy, is considered as standard to compare emittance of radiation (Figure Fig. 1.19 Fig.1.20
37 1.21). But the amount of available energy may be affected due to various factors including atmospheric conditions causing scattering and absorption.

75% **MATCHING BLOCK 12/60** **SA** MGEOS-23 Remote Sensing_ALL Unit.pdf (D137281283)

Molecules and other tiny particles which are smaller in dimension than the wavelength of

the interacting radiation cause Rayleigh scattering. It is one of the reasons for causing haze, which diminishes the contrast in the imagery. Mie scattering results due to existence of water vapour or dust in the atmosphere, the dimension of the particle size being equal to the energy wave lengths being sensed. Overcast is the result on the imagery. Non-selective scattering is caused due to existence of different sizes of particles like water droplets, the diameter being much larger than the energy wave length to be sensed. The resultant effect is fog or cloud which appear as white patch in the imagery. On the other hand, different elements are responsible for atmospheric absorption resulting effective loss of energy to atmospheric constituents. Water vapour, carbon dioxide, ozone, etc. are the important absorbers of solar radiation. Atmospheric window: Due to such blocking effects of the earth's atmosphere, it is not possible to use the entire electromagnetic spectrum for remote sensing purposes. Actually the bands of the spectrum i.e. the wavelength ranges, where the atmospheric attenuation is slight, are known as Windows. These are the regions used for remote sensing purposes. Fig. 1.21

38 Use of spectral band: Normal human eyes are sensitive to only a small portion of the entire electromagnetic spectrum which ranges from 0.4 to 0.7 μm. Gama rays and x rays are very short, the length dimensions being around 0.2 μn Ultraviolet sensitive emulsions react within the range of 0.3 to 0.4 μm of the electromagnetic spectrum. Infra-red emulsions extend sensing possibilities up to 1.2 μm. Thus photographs are in a position to record wavelengths from 0.2 to 1.2 μm, i.e. three times more than the range of the normal human eyes can visualise. However, to sense wavelengths longer than 1.2 μm, instruments other than photographic cameras are in use. Spectral reflectance of different earth surface features: It has been observed that different types of earth surface features may be identified on the basis on their specific spectral characteristics. In the following paragraphs, an attempt has been made to analyse spectral reflectance of three typical earth surface features, i.e. vegetation, soil and water. Figure 1.22 shows typical spectral reflectance curves for three basic types of earth features : healthy green vegetation, dry bare soil (gray-brown loam), and clear lake water. The lines in this figure represent average reflectance curves compiled by measuring a large sample of features. Spectral reflectance curves for healthy green vegetation almost always manifest the "peak-and-valley" configuration. The valley in the visible portion of the spectrum are directed by the pigments in plant leaves. Chlorophyll, for example, strongly absorbs energy in the wave length bands centered at about 0.45 and 0.67μm (often called the "chlorophyll absorption bands"). Hence our eyes perceive healthy vegetation as green in colour because of the very high absorption of blue and red energy by plant leaves and the very high reflection of green energy. If a plant is subject to some form of stress Fig.1.22

39 that interrupts its normal growth and productivity, it may decrease or cease chlorophyll production. The result is less chlorophyll absorption in the blue and red bands, Often, the red reflectance increases to the point that we see the plant turn yellow (combination of green and red). As we go from the visible to the near - IR portion of the spectrum at about 0.7 μm, the reflectance of healthy vegetation increases dramatically. In the range from about 0.7 to 1.3μm, a plant leaf typically reflects 40 to 50 percent of the energy incident upon it. Most of the remaining energy is transmitted, since absorption in this spectral region is minimal (less than 5 per cent). The soil curve in the figure shows considerably less peak- and - valley variation in reflectance. That is, the factors that influence soil reflectance act over less specific bands. So of the factors affecting soil reflectance are moisture content, soil texture, surface roughness, presence of iron oxide, and organic matter content. These factors are complex, variable and interrelated. For example, the presence of moisture in soil will decrease its reflectance. Soil moisture is strongly related to the soil texture : Coarse, sandy soils are usually well drained, resulting in low moisture content and relatively high reflectance; poorly drained fine-textured soils will generally have lower reflectance. Considering the spectral reflectance of water, probably the most distinctive characteristic is the energy absorption at near - IR wavelengths and beyond. Clear water absorbs relatively little energy having wavelengths less than about 0.9μm. High transmittance typifies these wavelengths with a maximum in the blue-green portion of the spectrum. However, as the turbidity of water changes, transmittance - and therefore reflectance - changes dramatically. For example, water containing large quantities of suspended sediments resulting from soil erosion normally has much higher visible reflectance than other clear water. Remote sensing platform: Platforms refer to the structures or vehicles on which the sensing instruments are mounted, e.g. pigeon, kite, balloon, rocket, aeroplane, space shuttle, satellite, etc.

96% **MATCHING BLOCK 14/60** **SA** GIS 502.pdf (D125058113)

The platform on which a particular sensor is housed determines a number of attributes, which may dictate the use of particular sensors. These attributes include: distance the sensor is from the object of interest, periodicity of image acquisition, timing of image acquisition,

and location
and extent of coverage. There are three broad categories

93% **MATCHING BLOCK 13/60** **SA** GIS 502.pdf (D125058113)

of remote sensing platforms: ground based, air borne and space borne. Ground based — A wide variety of ground based platforms are used in remote sensing. Some of the more common ones are hand held devices, tripods, towers and cranes. Instruments that are ground-based are often used to measure the quantity and quality of light coming from the sun or for close range characterization of objects. For 40 example, to study properties of a single plant or a small patch of grass, it would make sense to use a ground based instrument. Laboratory instruments are used almost exclusively for research, sensor calibration, and quality control. Much of what is learned from laboratory work is used to understand how remote sensing can be better utilized to identify different materials. This contributes to the development of new sensors that improve on existing technologies. Field instruments are also largely used for research purposes. This type of remote sensing instrument is often hand-held or mounted on a tripod or other similar support.

100% **MATCHING BLOCK 15/60** **SA** GIS 502.pdf (D125058113)

Permanent ground platforms are typically used for monitoring atmospheric phenomenon although they are also used for long-term monitoring of terrestrial features. Towers and cranes are often used to support research projects where a reasonably stable, long-term platform is necessary. Towers can be built on site and can be tall enough to project through a forest canopy so that a range of measurements can be taken from the forest floor, through the canopy and from above the canopy.

Airborne —

98% **MATCHING BLOCK 16/60** **SA** GIS 502.pdf (D125058113)

Airborne platforms were the sole non-ground-based platforms for early remote sensing work. The first aerial images were acquired with a camera carried aloft by a balloon in 1859. Balloons are rarely used today because they are not very stable and the course of flight is not always predictable, although small balloons carrying expendable probes are still used for some meteorological research. At present, airplanes are the most common airborne platform. Nearly the whole spectrum of civilian and military aircraft

are

100% **MATCHING BLOCK 18/60** **SA** GIS 502.pdf (D125058113)

used for remote sensing applications. When altitude and stability requirements for a sensor are not too demanding, simple, low-cost aircraft can be used as platforms. However, as requirements for greater instrument stability or higher altitudes become necessary, more sophisticated aircraft must be used.

Aircraft are divided into three categories (low, mid, and high) based on their altitude restrictions. In general, the higher an aircraft can fly, the more stable a platform it is, but correspondingly more costly to operate and maintain. Low altitude aircraft typically fly below altitudes where supplemental oxygen or pressurization are needed (12,500 feet above sea level). They are good for acquiring high spatial resolution data limited to a relatively small area. Helicopters are usually used for low altitude applications where the ability to hover is required. Helicopters are quite expensive to operate and they are typically used only when needed. Ultra-light aircraft are a class of aircraft that is gaining popularity. These small, often portable, aircraft are inexpensive and are able to take off and land where larger aircraft cannot. They are limited to flying at lower elevations and at slow speeds. Mid-altitude aircraft have an altitude limit under 30,000 feet above sea level. This class of airplane is used when stability is more important and when it is necessary or desired to acquire imagery from a greater distance than available from low altitude
41 aircraft. These aircraft can obtain greater areal coverage more quickly than low altitude platforms. High altitude aircraft can fly at altitudes greater than 30,000 feet above sea level. This class of airplane is usually powered by jet engines and is used for specialized tasks, such as atmospheric studies, research to simulate satellite platforms, and other applications where a high altitude platform is required. High altitude aircraft are good for acquiring large areal coverage with typically lower spatial resolutions. Another class of aircraft that has been in use for many years is remote control aircraft, or drones. Remotely controlled aircraft are often used for conditions when it may be too hazardous to fly. They have been used extensively by the military. Space borne—

100% **MATCHING BLOCK 17/60** **SA** GIS 502.pdf (D125058113)

The most stable platform aloft is a satellite, which is space borne. The first remote sensing satellite was launched in 1960 for meteorology purposes. Now, over a hundred remote sensing satellites have been launched and more are being launched every year. The Space Shuttle is a unique spacecraft that functions as a remote sensing satellite and can be reused for a number of missions.

100% **MATCHING BLOCK 19/60** **SA** GIS 502.pdf (D125058113)

The payload for remote sensing satellites can include photographic systems, electro- optical sensors, microwave or lidar systems. For applications benefiting from simultaneous coverage by different sensors, more than one sensing system can be mounted on a single satellite.

Fundamental Sensor Types: Sensor means the sensing or recording device.

100% **MATCHING BLOCK 20/60** **SA** GIS 502.pdf (D125058113)

There are several broad categories of basic sensor system types such as passive vs. active, and imaging vs. non imaging. Passive vs. active refers to the illumination source of the system; imaging vs. Non imaging refers to the form of the data. A variety of different sensors fit in these categories, which are not mutually exclusive.

Passive vs. active sensors—

100% **MATCHING BLOCK 21/60** **SA** GIS 502.pdf (D125058113)

Passive sensors measure light reflected or emitted naturally from surfaces and objects. Such instruments merely observe, and depend primarily on solar energy as the ultimate radiation source illuminating surfaces and objects.

100% **MATCHING BLOCK 22/60** SA GIS 502.pdf (D125058113)

Active sensors (such as radar and lidar systems) first emit energy (supplied by their own energy source) and then measure the return of that energy after it has interacted with a surface.

100% **MATCHING BLOCK 23/60** SA GIS 502.pdf (D125058113)

Use of data collected by passive sensors often requires accurate measurements of solar radiation reaching the surface at the time the observations were made. This information allows for the correction of "atmospheric effects" and results in data or images that are more representative of actual surface characteristics.

Imaging vs. Non imaging sensors — Remote sensing data are the recorded representation of radiation reflected or emitted from an area or object. When measuring the reflected or emitted energy, either imaging or non imaging sensors can be used. Data from imaging sensors can be processed to produce an image of an area, within which smaller parts of the sensor's whole view are resolved visually. Non imaging
42 sensors usually are hand held devices that register only a single response value, with no finer resolution than the whole area viewed by the sensor, and therefore no image can be made from the data. These single values can be referred to as a type of "point" data, however some small area is typically involved depending on the sensor's spatial resolution. Image and non image data each have particular uses. Non-image data give information for one specific (usually small) area or surface cover type, and can be used to characterize the reflectance of various materials occurring in a larger scene and to learn more about the interactions of electromagnetic energy and objects. Image data provide an opportunity to look at spatial relationships, object shapes, and to estimate physical sizes based on the data's spatial resolution and sampling. Image data are desirable when spatial information (such as mapped output) is needed. Images produced from remote sensing data can be either analog (such as a photograph) or digital (a multidimensional array or grid of numbers). Digital data can be analyzed by studying the values using calculations performed on a computer, or processed to produce an image for visual interpretation. Image interpretation is used to decipher information in a scene. In the past, image interpretation was done largely using subjective visual techniques, but with the development and ongoing advancement of computer technology, numeric or digital processing has become a powerful and common interpretation tool. In many cases, image interpretation involves the combination of both visual and digital techniques. These techniques utilize a number of image features including tone and color, texture, shape, size, patterns, and associations of objects. The human eye and brain are generally thought to more easily process the spatial characteristics of an image, such as shape, patterns and how objects are associated with one another. Computers usually are better suited for rapid analysis of the spectral elements of an image such as tone and color. Sophisticated computer software that can perform like the human eye and brain may be more commonly available in the future. Passive Sensors

98% **MATCHING BLOCK 24/60** SA GIS 502.pdf (D125058113)

Passive sensors are the most common sensor type for vegetation related remote sensing. This is not only because passive sensor systems are generally simpler in design (built only to receive energy) but also because portions of the solar spectrum provide very useful information for monitoring plant and canopy properties. A major limitation of passive systems is that in most cases they require sunlight in order for valid and useful data to be acquired. Consequently, deployment of or data acquisition by passive sensors is very dependent on lighting (time of day, time of year, latitude) and weather conditions, since cloud cover can interfere with the path of solar 43 radiation from the sun to the surface and then to the sensor. The signals detected by passive sensors can be greatly altered due to atmospheric effects, especially in the shorter wavelengths of the solar spectrum that are strongly scattered by the atmosphere. These effects can be minimized (but not eliminated) by collecting data only under very clear and dry atmospheric conditions. Sophisticated atmospheric correction routines now exist to remove

atmospheric effects from data acquired by passive sensors. Photographic — The most common sensor system is the photographic camera — a simple passive sensor. Many of the historic developments in remote sensing were directly related to the development of photographic systems. Camera systems are similar in design to the human eye. Both have a lens at one end of an enclosed chamber and a light-sensitive material (film for a camera and the retina for an eye) at the other. In both systems, an iris is used to control the amount of light that can strike the film/retina. In a camera, a shutter is placed between the lens and film to control how long the light can strike the film. Filters can be attached in front of a lens to restrict the wavelength of light permitted to strike the film. There are three basic elements of photographic systems — optics, film, and filters. Optics refer to lenses and the geometry of light retrieval in a camera. The lenses in a camera are responsible for focusing and zooming on an object. Before light reflected from an object strikes the film, it must pass through one or more lenses. As light passes through a lens, it is bent to focus the imaged object on the film. To minimize distortions associated with the use of single lenses, most camera lenses are actually composed of multiple lenses that work in concert to form an image onto the film. The amount of image detail that can be recorded on film is directly related to the distance between the lens and the film, referred to as the focal length. As the focal length increases, the detail that can be seen on the film increases. Increasing the focal length is commonly called zooming in on an object. Film in a camera is used to record the image that passes through the lens. Photographic film is composed of a durable base, which is coated with a light-sensitive layer know as the emulsion. During the short time that a shutter is open, light strikes the film and leaves a latent image on the emulsion. This image can be made visible by the process of developing and printing. Emulsions are made of materials sensitive to particular regions of the electromagnetic spectrum. For example, some film is only sensitive to visible light, whereas other film is sensitive to near-infrared light. In color film, the emulsion is composed of three layers, with each being sensitive to different wavelengths of light, normally blue, green and red light. With black and white film, the emulsion is sensitive to a broad spectrum of light. Film emulsions are generally limited to recording wavelengths between 0.4 to
44 0.9 micrometers. Black and white film sensitive to visible light and black and white film sensitive to infrared wavelengths can also be used for remote sensing purposes. Film speed is another quality of emulsions that is important for aerial photography. Film speed refers to the quantity of light than is needed to expose the emulsion. Fast film requires less light than slow film to record the same image. If the camera platform is moving, one would want to use a high speed film to reduce the blurring effects of the moving camera. In many remote sensing applications, it is important to restrict the light entering the camera by the use of filters. Color filters work by absorbing a range of wavelengths while allowing other wavelengths to pass through. Another filter type, known as neutral color filters, do not alter the spectral composition of light, but instead reduce the amount of light of all wavelengths that pass through. Perhaps the most common color filter is an antihaze filter. These are clear or yellow filters, which absorb out the shorter ultraviolet and blue wavelengths that are substantially scattered by particulates in the atmosphere. Another filter used for monitoring vegetation is an infrared filter, which absorbs visible light and only allows infrared light to pass through. Aerial photography is one of the oldest forms of remote sensing and it is still used extensively today. It is usually the choice if great spatial detail is needed. For example, photography can be used to identify individual tree species (based on the shape of individual trees) and measure tree heights using special photographic techniques. Because of the detail that can be discerned on a photograph, aerial photography is used extensively for mapping vegetation classes. Aerial photography is also used as a reconnaissance tool to provide overview information for a particular area. For instance, if there has been an outbreak of a disease that is killing a certain tree or agricultural species, aerial photography using infrared film (to locate trees that are being stressed) can monitor areas for signs and extent of the disease. Electro-optic radiometers — A radiometer is an instrument designed to measure the intensity of electromagnetic radiation in a set of wavebands ranging from the ultraviolet to microwave wavelengths. Radiometers are similar in design to a camera in that they have an opening for the light to enter, lenses and mirrors for the light to pass through, but instead of film, they have an electronic detector to record the intensity of electromagnetic energy. As energy hits the detector, a signal proportional to the incoming irradiance is processed to either a digital or analog output that can be recorded. Detectors for radiometers have been devised to measure wavelengths from 0.4 to 14 micrometers. Although some radiometers can detect this entire range of wavelengths,

45 most only measure selected wavebands in this range. Radiometers that measure more than one waveband are called multispectral radiometers. For this type of radiometer, the light must be separated into discrete wavebands so that multiple waveband or multichannel readings can be taken. This separation can be done using filters, prisms or other sophisticated techniques. Non imaging radiometers are commonly used as research tools to better understand how light interacts with objects, for spectral characterization of a variety of surfaces, and for atmospheric measurements. Another common use is to measure the quantity and quality of solar energy. These measurements can in turn be used to correct other imaging and non imaging measurements for atmospheric effects. Passive microwave systems — Passive microwave systems are based on a type of radiometer that detects wavelengths in the microwave region of the spectrum. Because of the nature of microwave radiation, optical systems cannot be used for the detection of this range of wavelengths. As with optical systems though, both non imaging and imaging systems are available. The components of a microwave radiometer are an antenna, receiver, and recording device. Microwave energy emitted from Earth's surface is collected by an antenna, converted by a receiver into a signal, and recorded. The features of electromagnetic energy measured by microwave radiometers are polarity, wavelength, and intensity. These properties provide useful information about the structure and composition of an object. Most of the applications of passive microwave radiometers have been in the fields of atmospheric and oceanographic research. It has also proven to be an effective tool for the measurement of soil moisture, an important parameter in studying vegetation. Visible, infrared, and thermal imaging systems— By combining a number of detectors or radiometers into detector arrays, it is possible to create a sensor that can acquire a 2D image of an area. There are three basic designs for imaging sensors: frame, pushbroom, and mechanical scanner. The first two designs are similar. The frame sensor is a 2D array of detectors that acquires an entire image in one exposure similar to the way a camera captures an image on film. A push broom sensor is a 1D array that obtains an image one line at a time. Each new data line is added as the platform moves forward, building up an image over time. In a mechanical scanner system the sensor acquires only one or several pixels in any given instant, but since the scanner physically sweeps or rotates the sensor (a radiometer) or a mirror back and forth, an image is produced. This category of sensor (passive visible, infrared and thermal imaging systems) contains numerous instruments that have been deployed on a wide variety of platforms and used for many applications. Most modern imaging systems are multispectral (acquiring data for more than one limited spectral area). The recording of each discrete spectral sampling is referred to as an image band or channel. Using image processing techniques, multiple (usually three)
46 bands selected from a multispectral image database can be combined to make a single color composite image.
Active Sensors

99%	MATCHING BLOCK 25/60	SA	GIS 502.pdf (D125058113)

Active systems supply their own illumination energy which can be controlled. Some advantages active systems have over passive sensors are they do not require solar illumination of surfaces or perfect weather conditions to collect useful data. Consequently they can be deployed at night or in conditions of haze, clouds, or light rain (depending on the wavelength of the system). Radar — Radar (radio detection and ranging) systems use microwaves (wavelengths ranging from 1 millimeter to 1 meter). Microwave pulses are transmitted at a target or surface, and the timing and intensity of the return signal is recorded. Transmission characteristics of radar depend on the wavelength and polarization of the energy pulse. Common wavelength bands used in pulse transmission are K-band (11-16.7 mm), X-band (24-37.5 mm), and L-band (150-300 mm). The use of letter codes to designate the wavelength range for various radar systems originated when radar was being developed during World War II.

Information

97%	MATCHING BLOCK 26/60	SA	GIS 502.pdf (D125058113)

about the structure and composition of objects and surfaces can be detected with radar. Radar has been used in a number of fields, including geology, snow and ice studies, oceanography, agriculture, and vegetation studies. Radar has been especially useful in areas with nearly constant cloud cover. Lidar — Lidar (light detecting and ranging) systems use

laser light as an illumination source. A short pulse of light is emitted from a laser and a detector receives the light energy (photons) after it has been reflected, or absorbed and remitted, by an object or surface. Lidar systems emit pulses at specific, narrow wavelengths that depend on the type of laser transmitter used. The possible wavelengths range from about 0.3 to 1.5 micrometers, which covers the ultraviolet through near-infrared spectral range.

98% **MATCHING BLOCK 27/60** **SA** GIS 502.pdf (D125058113)

The simplest lidar systems measure the round trip travel time of a laser pulse, which is directly related to the distance between the sensor and the target. Basic distance measuring lidars are often referred to as rangefinders or as laser altimeters if deployed on an aircraft or spacecraft. These systems typically measure elevation, slope, and roughness of land, ice. or water surfaces. More advanced lidars measure the received intensity of the backscattered light as a function of travel time. The intensity of the signal provides information about the material that reflected the photons. Such backscatter lidar systems are often used for atmospheric monitoring applications concerned with the detection and characterization of various gases, aerosols and particulates. Lidar methods have recently been adapted to measure tree heights and the vertical distribution of canopy layers with great accuracy and precision. Lidar instruments have flown on the Space Shuttle, and Vegetation Canopy Lidar (VCL) and Ice, Cloud, and land Elevation Satellite (ICESat). 47 Lidar systems can also make fluorescence measurements. Fluorescence refers to the process where a material absorbs radiant energy at one wavelength and then emits it at a different wavelength without first converting the absorbed energy into thermal energy. The wavelengths at which absorption and emission occur are specific to particular molecules. Fluorescence data can identify and quantify the amount of plankton and pollutants in the marine environment. Leaf fluorescence can also help to identify plant species.

Orbiting satellites

97% **MATCHING BLOCK 28/60** **SA** GIS 502.pdf (D125058113)

Satellites can be classified by their orbital geometry and timing. Three orbits commonly used for remote sensing satellites are geostationary, equatorial and Sun synchronous. A geostationary satellite (Figure 1.23) has a period of rotation equal to that of Earth (24 hours) so the satellite always stays over the same location on Earth.

In other words, Geostationary orbit means an orbit at an altitude of 36,000 / 40,000 km above the surfac of the earth in the direction of the earth's rotation, which matches the speed so that a satellite remains over a fixed point on the earth's surface.

100% **MATCHING BLOCK 29/60** **SA** GIS 502.pdf (D125058113)

Communications and weather satellites often use geostationary orbits with many of them located over the equator.

INSAT is an example of Geostationary satellite.

92% **MATCHING BLOCK 30/60** **SA** GIS 502.pdf (D125058113)

In an equatorial orbit, such a satellite circles Earth at a low inclination (the angle between the orbital plane and the equatorial plane). The Space Shuttle uses an equatorial orbit with an inclination of 57 degrees. Fig.1.23 48 Sun synchronous satellites (

Figure 1.23)

100% **MATCHING BLOCK 31/60** **SA** GIS 502.pdf (D125058113)

have orbits with high inclination angles, passing nearly over the poles. Orbits are timed so that the satellite always passes over the equator at the same local sun time. In this way the satellites maintain the same relative position with the sun for all of its orbits. Many remote sensing satellites are Sun synchronous which ensures repeatable sun illumination conditions during specific seasons. Because a Sun synchronous orbit does not pass

100% **MATCHING BLOCK 32/60** **SA** GIS 502.pdf (D125058113)

directly over the poles, it is not always possible to acquire data for the extreme polar regions. The frequency at which a satellite sensor can acquire data of the entire Earth depends on sensor and orbital characteristics. For most remote sensing satellites the total coverage frequency ranges from twice a day to once every 16 days.

These satellites are placed at an altitude ranging from 600 to 800 kilometres. LANDSAT, SPOT, IRS, etc. are examples of sun synchronous satellite.

100% **MATCHING BLOCK 38/60** **SA** GIS 502.pdf (D125058113)

Another orbital characteristic is altitude. The Space Shuttle has a low orbital altitude of 300 km whereas other common remote sensing satellites typically maintain higher orbits ranging from 600 to 1000 km.

Brief history of the evolution of remote sensing technology: In the following paragraphs, a brief discussion is made about various types of resource satellites launched by different countries of the world. The world Scenario LANDSAT: NASA of United States launched the LANDSAT-1 on July23, 1972. Initially it was known as ERTS-1. Until now seven landsat satellites have been launched successfully while one of them LANDSAT-6 suffered a launch failure on October 5, 1993. The most recent being the LANDSAT-8 launched on February 11, 2013. The series Landsat 1,2,3 orbited the earth in sun synchronous orbit at a height of about 900 km. After every 18 days it passed over the same place on earth to provide repetitive coverage. Landsat 4,5 were at an altitude of 700 km with a revisit period of 16 days. The Landsat programme is the oldest Earth observation programme. It started in 1972 with the Landsat-1 satellite carrying the MSS (Multispectral sensor). After 1982, the Thematic Mapper (TM) replaced MSS sensor. In April 1999 Landsat-7 was launched carrying the ETM+ scanner. There are many applications of Landsat Thematic Mapper data : land cover, mapping, land use mapping, soil mapping, geological mapping, sea surface temperature mapping, etc. Landsat Thematic Mapper is the only non-meteorological sensor that has a thermal infrared band. Thermal data are required to study energy processes at the Earth's
49 surface, for instance, the crop temperature variability within irrigated areas. A number of sensors have been put onboard Landsat series satellites, which include

82% **MATCHING BLOCK 37/60** **SA** rana-9.docx (D54864731)

Return Beam Vidicon (RBV), Multispectral Scanner (MSS), Thematic Mapper (TM), Enhanced Thematic Mapper (ETM),

etc. Each of these sensors collected data over a swath of 185 km. MSS had 4 spectral bands at spatial resolution of 80 m and a radiometric resolution of 6 bits. TM sensors has an improvement over MSS in terms of resolution. TM has 7 bands. For six bands the spatial resolution is 30 m and it has a thermal band at 120 m resolution. ETM has 8 bands. SPOT: SPOT stands for Systeme Pour la Observation de la Terre. SPOT is owned by a consortium of French, Swedish and Belgium governments. SPOT-1 was launched on 22 February, 1986. At that time, the 10 m panchromatic spatial resolution of SPOT-1 was unprecedented. Spot-2 was launched on 22 January, 1990; SPOT-3 was launched on 26 September, 1993. On 24 March 1998 a significant improved SPOT-4 was launched: the HRVIR sensor had 4 instead of 3 bands and the VEGETATION instrument was added. VEGETATION was designed for frequent (almost daily) and accurate monitoring of the globe's landmasses. SPOT-5 is the fifth satellite in the SPOT series which has successfully been placed in the orbit on 4 May, 2002 from Guiana Space Centre, Kourou, French Guyana. The new SPOT-5 satellite offers improved ground resolutions of 10 metres in multispectral mode and 2.5 to 5 metres in panchromatic and infrared mode. Higher 2.5 metre resolution is achieved using an innovative sampling concept called supermode. SPOT-5 also features a new a HRS instrument (High Resolution Stereoscopic) operating in panchromatic mode and able to point forward and aft of the satellite. In a single pass, the forward-pointing camera acquires images of the ground, then the rear ward- pointing camera covers the same strip 90 seconds later. HRS is thus able to acquire stereopair images almost simultaneously to map relief and also produce Digital Elevation Models (DEMs) of wide areas. SPOT-6 and SPOT-7 were launched on 9 September 2012 and 30 June 2014 respectively. IKONOS: The IKONOS satellite is a high resolution satellite operated by GeoEye. IKONOS-1 failed during launch on 27 April, 1999. However IKONOS-2 was delivered to Space Imaging (now GeoEye) on 24 September, 1999 and was successfully placed in the orbit at an altitude of 681 kilometre. Its capabilities include capturing a 3.2 metre multi- spectral, Near-Infrared (NIR) and also 0.82 metre panchromatic resolution at nadir.

85% **MATCHING BLOCK 33/60** **SA** 07180462.pdf (D102287107)

The swath of the satellite is 11.3 km at nadir and 13.8 km at 26° off-nadir.

The satellite
50 provides with 11 bit data in terms of radiometric resolution. The spectral resolutions of panchromatic mode is 450-900 nanometre, whereas the same for multispectral mode is 445-516 nm (Blue), 506-595 nm (Green), 632-698 nm (Red) and 757-853 nm (NIR). The revisit period of the satellite is 3 days whereas the operating life is more than 7 years. Its applications include

100% **MATCHING BLOCK 34/60** **SA** 07170409.pdf (D102312712)

both urban and rural mapping of natural resources and of natural disasters, tax mapping, agriculture and forestry analysis, mining, engineering, construction and change detection.

In addition to mapping of small to medium scale mapping, IKONOS data can also be used for updating existing topographic maps.

100% **MATCHING BLOCK 39/60** **SA** GMT_301_07180464.docx (D102243546)

It can yield relevant data for nearly all aspects of environmental study.

89% **MATCHING BLOCK 41/60** **SA** 07170409.pdf (D102312712)

IKONOS images have also been produced by SIC for use in the media and motion picture industries, providing aerial views and satellite photos for many areas around the world. Its high resolution data makes an integral contribution to homeland security, coastal monitoring and facilitates 3D Terrain

analysis. QuickBird: The highest resolution satellite imagery currently available to the public is provided by QuickBird-2. It may be mentioned here that QuickBird-1 failed to attain earth orbit during the 22 November, 2000 launch. However, launched on 18 October, 2001 QuickBird-2, operated by DigitalGlohe, is one of the first commercial remote sensing satellites capable of gathering sub-metre resolution data over a very wide swath. The orbital altitude of the satellite is 450 km and is expected to operate for seven years long with revisit time of 1 to 3.5 days with up to 30° off-nadir viewing. The QuickBird satellite incorporates on ITT designed and built sensor subsystem, consisting of the focal plane array, image compression and electronics. The subsystem captures 0.61 metre spatial resolution panchromatic imagery and 2.4 metre multispectral imagery. The swath of the satellite is 16.5 km with radiometric resolution of 11 bits per pixel. It produces 11x11 km snapshots to 11x225 km strip maps. In addition to green, red and near-infrared wavelengths, the multispectral sensor can also process a blue channel enabling true colour imaging from space.

98% **MATCHING BLOCK 35/60** **W**

QuickBird's, global collection of panchromatic and multispectral imagery is designed to support applications ranging from map publishing to land asset management to insurance risk assessment.

Orbview: Orbview-3 has been successfully launched on 26 June, 20003 by Orbimage (now GeoEye), U.S.A. It is the third space born satellite that provides imagery products up to a spatial resolution of 1 metre in the panchromatic channel. The system can also provide multispectral images with a spatial resolution of 4 metres. Orbview-3 collects one metre panchromatic and four metre multispectral imagery at a swath width of 8 km. One metre imagery enables the accurate viewing and mapping of
51 houses, automobiles and aircraft and make it possible to create highly precise digital maps. Four metre multispectral imagery provides colour and infrared information to further characterize cities, rural areas and undeveloped land from space. The satellite revisits each location on earth in less than three days with its ability to collect data up to 50 degree off-nadir. Orbview-3 provides imagery products useful for a variety of applications such as utilities, telecommunications, oil and gas, mapping, surveying, agriculture, forestry, security, etc. It may be mentioned here that Orbview-4 failed to orbit on 21 September, 2001. EROS: EROS (Earth Remote Observation Satellite), is an Israeli commercial/military photo-imaging satellite. Successfully launched on 5 December, 2000, EROS A has been commercially operated since 1 January, 2001. However on 25 April, 2006 ImageSat launched the second very high resolution satellite in the EROS family, EROS-B, the launch took place at the cosmodrome in Svobodni, Siberia by a Starl launcher. The satellite is expected to provide services for 8-10 years. It has

88% **MATCHING BLOCK 36/60** **W**

larger camera of CCD/TDI (Charge Coupled Device/Time Delay Integration), with standard panchromatic resolution of 0.70 metre at an altitude of 500 km.

Resurs: Resurs-DKl was launched from Baykonur launch area on June 15, 2006 with Soyz carrier vehicle. The 6570 kg satellite was placed into elliptical orbit at an altitude of 360-604 km. With 6 days revisiting frequency, the satellite is having a life span of 5 years. It is able to collect 1 m spatial resolution imagery in panchromatic mode. The major tasks of the satellite include data supply for resource management and economical activity including inventory of natural resources, topographic and thematic mapping, etc. Moreover the sensors attached to the satellite are in a position to monitor the pollution sources of the atmosphere, water and soil with the view of providing Federal and regional environmental authorities with the relevant information to management decisions. It is also possible on-line monitoring of man-caused and natural emergencies for the purpose of effective planning and timely performing of measures to eliminate damages. Ofek: Ofek-7, also known as Ofeq-7, is part of the ofeq family of earth observation satellites designed and built by Israel Aerospace Industries (IAI) for the Israel Ministry of Defence. The first Ofek-7 was launched by a Shavit space launch on June 11, 2007. Equipped with advanced technology and a series of new enhancements to provide improved imagery, it is placed into an elliptical orbit of 300 x 600 kilometres. Three

52 days after its launch, IAI/MBT Space Division received the first image taken by the satellite. The Ofek-7 is a follow-on spacecraft to Ofek-5 that was placed into orbit in 2002. The latest Ofek-7 was launched on September 17, 2007 from Palmahim Air Force Base atop a Shavit missile. It's elliptical orbit reportedly takes it over Iran, Iraq and Syria every 90 minutes. It has an expected life of four to six years. Ofek-7 contains notable improvements over the Ofek-6 satellite, which crashed into the Mediterranean shortly after launch in 2004. Defense officials of Israel said that the new satellite was by far the most advanced satellite the country has ever launched into space. It is further stated that the satellite was superior to the Eros-B, which has the ability to identify objects on the ground as small as 70 centimetres. World View: WorldView-1 was successfully launched into orbit on 18 September, 2007. It is a high resolution imaging satellite launched and operated by DigitalGlobe, has reached its operational state. The satellite has met all requirements and is delivering imagery to the US National Geospatial-Intelligence Agency (NGA) as part of its Nextview programme. Following a controlled rollout with NGA, DigitalGlobe began taking orders for WorldView-1 imagery on 3 January, 2008. The majority of the imagery captured for the NGA will also be available for distribution through DigitalGlobe's ImageLibrary. The deployment of this satellite frees capacity on the company's QuickBird satellite to meet growing commercial demand for multi-spectral geospatial imagery. GeoEye-1: GeoEye-1 was launched on 06 September, 2008, which provided with the highest spatial resolution of any commercial imaging system during that time by acquiring imagery with a ground resolution of 41 cm and 1.65 metre in panchromatic mode and multi-spectral mode respectively. It makes 12 to 13 orbits per day flying at an altitude of 684 kilometres with an orbital velocity of about 7.5 km/sec. In the panchromatic mode GeoEye-1 is capable of collecting up to 700,000 sq kilometres per day, and in the multi-spectral mode 350,000 sq kilometers per day. This capacity is ideal for large- scale mapping projects. Geo-Eye-1's optical telescope, detectors, focal plane assemblies and high-speed digital processing electronics are capable of processing 700 million pixels per second. The satellite's agile camera allows for side-to-side extensions of the camera's 15.5 kilometres swath width or multiple images of the same target during a single pass to create stereo picture. It may be mentioned here that GeoEye-1 customers have a choice of ordering basic, ortho-rectified, or stereo imagery as well as imagery-derived products, including Digital Elevation Models (DEMs), large area mosaics and feature maps. The satellite provides with 11 bit data in terms of radiometric resolution and the expected life span of the satellite is around 10 years.
53 The Indian Scenario: In the area of resource satellite based remote sensing in India,

83% **MATCHING BLOCK 42/60** **SA** Unit-1.doc (D109130277)

the first generation satellites 1RS-1A and 1-B were designed, developed and launched successfully during 1988 and 1991 equipped with

two Linear Imaging and Self Scanning sensors (LISS- I and LISS-II) on board for providing data in four spectral bands (visible and near infra red regions) with skatial resolutions of 72.5 m and 36.25 m. These satellites were launched on 17 March 1988 and 29 August 1991 respectively.

71% **MATCHING BLOCK 45/60** **SA** Unit-1.doc (D109130277)

Subsequently the second generation remote sensing resource satellite IRS-IC and 1- D with improved spatial resolutions

of 70 m in multi-spectral and 5.8 m in panchromatic mode and a Wide Field Sensor (WiFS) with 188 m resolution with a wide ground swath of 810 km have been developed and successfully launched on 29 December, 1995 and 29 September, 1997 respectively. It may be mentioned here that IRS-IC was launched from Baikonur whereas IRS-1D was launched from Sriharikota with the help of PSLV. The specifications for both the satellites were more or less the same. Placed onto a 817 km orbit, IRS-IC used to take only 93 minutes to go round the earth and surveying the whole surface of the earth in just 24 days. The PAN was designed to provide data with a very high spatial resolution of 5.8 m and a ground swath of 70 km. The sensor used to collect data in the visible region (0.50-0.75 micron). The added advantage of the PAN camera is its steerability. The camera can be steered to + 26 degree which in tern increases revisit capability to 5 days. The LISS III sensor provides multispectral data collected in four bands, two in the visible (0.52-0.59 and 0.62-0.68 microns), one in the near infra-red (0.77-0.86 micron), and one in shortwave infra-red (1.55-1.70 microns) regions of the electromagnetic spectrum. While the spatial resolution and swath in case of visible and near infra-red regions are 23.5 m and 141 km respectively, they are 70.5 m and 148 km for the data collected in shortwave infra-red region. The LISS-1V is a high spatial resolution multi-spectral camera operating in three bands (B2, B3, B4). LISS-IV provides a ground resolution of 5.8 m which can be operated in either single band mono mode or multi-spectral mode. In the multi-spectral mode (MX), a swath of 23 km (selectable out of 70 km total swath) is covered

83% **MATCHING BLOCK 43/60** **SA** rana-9.docx (D54864731)

in three bands, while in mono mode (Mono), the full swath of 70 km can be covered in any one single band,

which is selectable by a ground command (B3-Red band). The LISS-IV camera can be tilted up to +26° in the across track direction thereby providing a revisit period of 5 days and 70 x 70 km stereo pairs. The WiFS collects data in two spectral bands, visible (0.62-0.86 microns) and near infrared (0.77-0.86 microns). It may be mention here that to prepare a FCC with the help of WiFS data, one is the repeated one of the two bands to generate RGB colour separates. These satellites have become the principle components in the National Resource Management System and the data have been used in various applications, viz. agriculture and soil, land form and land use studies, water resource, forestry, drought and flood monitoring, cartography, town planning and coastal zone monitoring. Specially IRS 1C and ID data have been used for cartographic and town planning applications up to

54 1:10,000 scale. These satellites also provide stereo pairs of imageries to get height information to an accuracy of approximately 10 meters. It may be mentioned here that between 1995 and 1999 i.e. till the launch of 1KONOS, this was the highest spatial data available in civilian domain in global perspective: IRS-P-4, also known as Oceansat-1, was launched successfully into the space on 26 May, 1999 by PSLV-C2. It has a Multi-frequency Scanning Microwave Radiometer (MSMR) and a nine band Ocean Colour Monitor (OCM). The resolution of the satellite is 250 metres at nadir with a swath width of 1500 km. The main applications of this is for gathering information related to water vapour and carrying out ocean colour monitoring. The data collected from ocean colour monitoring are used for conducting fisheries survey and also for development of fisheries forecast model based on the data. Oceansat-2, also known as IRS-P-4 was launched on 23 September, 2009, which is a continuation of Oceansat-1 RESOURCESAT-1 (also known as IRS-P6), has been launched from Satish Dhawan Space Centre-SHAR on 17 October, 2003 with the help of PSLV-C5. The sensors onboard include besides the improved LISS-III, newly designed LISS-IV and uniquely designed AWiFS to provide the data in a better way. With the unique combination of cameras providing imageries with high spatial, spectral, temporal and radiometric resolutions, RESOURSESAT-1 aims at continuity to the existing data with superior capabilities and also to provide better application possibilities related to agriculture, land and water resource and disaster management. RESOURCESAT-2 has been launched on 20 April, 2011. The AWiFS (Advanced Wide field Sensor) camera is an improved version compared to the WiFS camera mounted in IRS-1C/1D. AWiFS operates in four spectral bands identical to LISS-III, providing a spatial resolution of 56 m and covering a swath of 740 km. It provides enhanced capabilities compared to WiFS onboard IRS-1C/1D, in terms of spatial resolution (56 m Vs 188 m), radiometric resolution (10 bits Vs 7 bits) and spectral bands (4 Vs 2). The spectral bands of AWiFS are the same as those of LISS- III. The availability of AWiFS data with improved spatial and spectral resolution help in better classification accuracy of all agricultural related applications. It is a unique sensor with its high resolution and large swath, enabling monitoring of large areas for flood inundation, vegetation stress, etc. which are very much essential for a country like India. CARTOSAT: Cartosat-1 is a state of the art remote sensing satellite built by ISRO and is mainly intended for cartographic applications. It is the eleventh satellite built by NRSA satellite series. Cartosat-1 has been launched on 5 May, 2005 into a 618 km high polar sun- synchronous orbit by PSLV-C6. The satellite

93% **MATCHING BLOCK 40/60** **W**

carries two state of the art panchromatic (PAN) cameras that take black and white stereoscopic pictures of the earth in the visible region of the electromagnetic spectrum. The swath covered by the high resolution PAN camera is 30 km and their spatial resolution is 2.5

metre. The
cameras are mounted on
55 the satellite in such a way that near simultaneous imaging of the same area from two different angles is possible. This facilitates the generation of accurate three dimensional maps. So far as different applications of Cartosat-1 data are concerned, the unique high resolution along track stereo imaging capability carried out for the first time anywhere in the world, enables generation of Digital Elevation Models (DEM) and other value added products.

88% **MATCHING BLOCK 44/60** **SA** Unit-1.doc (D109130277)

The data from Cartosat-1 is expected to provide enhanced inputs for large scale mapping applications and stimulate newer applications in the urban and rural development,

land and water resources management, disaster assessment, relief planning, and management, environment impact assessment and various other GIS applications. The data can be used for updating topographical maps, besides generation of large scale topographical maps. Cartosat-2 was launched into the intended 639 km high polar obrit by PSLV-C7 from Satish Dhawan Space Centre (SICS), SHAR, Sriharikota on 10 January, 2007. This

panchromatic (PAN) camera on board the satellite can provide imagery with a spatial resolution of better than one metre and a swath of 9.6 km. It carries two PAN cameras to acquire two images simultaneously. The PAN fore (looking forward) mounted within a tilt +25° and the PAN aft mounted with a tilt of -5° to generate stereoscopic images.

IS. Cartosat-2A, first dedicated military reconnaissance satellite of India, has been launched on 30 April, 2008. CARTOSAT-2A with a single panchromatic camera capable of providing scene specific spot imageries for cartographic applications, have high agility with capability to steer along and across the track up to + 45 degrees. It has been placed in a sun-synchronous polar orbit at an altitude of 630 km. It has a revisit period of 4 days, which can be improved to one day with suitable orbit manoeuvres. The panchromatic camera is design to provide better than 1 m spatial resolution imagery with a swath of 10 km. Cartosat-2B, Cartosat-2C and Cartosat-2D have been launched on 12 July, 2010, 22 June, 2016 and 15 February, 2017 respectively. It may be mentioned here that satellite imagery consists of images of Earth or other planets collected by satellites. Satellite images have many applications in meteorology, oceanography, fishing, agriculture, biodiversity conservation, forestry, landscape, geology, cartography, regional planning, education, intelligence and warfare. Images may be acquired from visible spectrum or from any other part of the electromagnetic region. There are also elevation maps, usually made by radar images. Interpretation and analysis of satellite imagery is conducted using specialized remote sensing applications. In the following table, a comparative statement has been presented regarding various high resolution resource satellite systems.
56 Table: 1.1 Major High Resolution Earth Observation Satellites Organisation Digital Gobe ORBIMAGE, Sapce Imaging Imagestal IRSO, India CNES, (Earth Watch) USA USA USA International France (West Indian Space), Isreal System QuickBird 1 &2 Orb View 3 & 4 IKONOS 1 & 2 EROS-A & B Cartosal 1&2 SPORQT 5A On-Orbit Date QB 1-Nov 2000 OV -End 1999 1-1 Arp 1999 A:#-Dec 2000 #2003-04 May 2002 QB 2-Oct 2001 OV 4-Sep 2000 1-2 Sep 2000 # 2-Sep 2000 #2-2004 B: #3-#8 Dec 02- Dec '04 Spatial 0.61 PAN OV-3&4 1.0 PAN 1.0 PAN #A. 1.8 PAN #C1-250 PAN 2.5 PAN Resolution 2.50Ms OV-3&4 4.0 MS 4.0 MS #B 0.82 PAn #C2-1.0 PAN 10 HRG (Meters) OV-4 8.0 HS 3.28 MS 20 SWIR Revisit Interval 1-3.5 Days Less than 3 days 1-3 days 3 days #1-5 days 5 days #2-4 days Altude (km) 600 470 680 480 & 600 #2-600 Septral band 045-0.52 200 0.45-052 #B-MS PAN PAN Width, urm 0.45- 0.52-0.60 bands 0.45-0.9 0.5200.60 A & B 05.-07 051-0730 0.90 0.45- 0.45 2.50 PAN 0.63-0.69 PAN 3bands or PAN 0.76-0.89 0.90 0.90 80 bands 0.76-0.89 0.5-0.9 more MS 3.0-5.0 MS Imaping System Pushbroom Pushbroom Pushbroom Pushbroom CCD NA Swath Width 16.5 8.0 Pan 5.0 Hs 11-11.0 EROS A-12.6 #C1-30 60 (km) 12-12.6 EROS B-16.4 #C2-10 System Life 5 yrs 5 yrs 7 yrs #A-4 yrs 5yrs 5yrs #B-6 yrs Stereo Along & Across. Along & Across. Along & Across. Along +45 0 #1-Along Across +26 0 +38 0 & +30 0 +45 0 & +45 0 +45 0 & +45 0 +26 0 %5 0 #2-Along & Across +45 0 (Source: Geospatial Today, Vol.1, Issue 2, 2002) 1.6.2.2 Preparation of Thematic overlays from satellite images Visual Interpretation of Satellite imagery: The satellite imagery under investigation is a typical geo-coded image (Figure 1.24) which has been generated matching with Survey of India topographical Map No. 73M/ 7. It is a merged data of SPOT (PAN) and Landsat-5 TM where high degree of spatial resolution of SPOT (PAN) has been merged with Landsat TM's colour mode, thus different object's spatial detail can be visualized in false colours. Here it may be mentioned that Landsat TM's Band 2,3, and 4 have been viewed with the help of blue, green and red colours respectively.
57 Fig. 1.24
58 Fig. 1.25

59 The data was acquired on 8 November, 1991, whereas the image was generated by NRSA on 4 May, 1992. By applying different rules of image characteristics, various features within the area under investigation could be identified. Here it may be noted that SOI toposheet No. 73 M/7 has been used as reference data for extraction of information related to annotation, etc. Ultimately the Land use/Land cover Map (Figure 1.25) has been prepared by interpreting the geo-coded hard copy out put. Here land use refers to man made features like road, railway, arable land, settlement, etc., whereas land cover denotes natural features like forest cover, scrub areas, river system, wet land, etc. Due to good amount of chlorophyll content, healthy vegetation absorbs energy strongly and appears as deep red in FCC. Bilaspur protected forest, situated at the north eastern corner of the image is a typical examples in this regard. At places, forest areas have been degraded and they appear in terms of lighter tone. These are typical examples of fairly dense scrub (scrub forest) areas. Other wise small patches of scrub lands are scattered, particularly to the western part of the area under investigation. Water bodies appear either as deep blue/blackish or powder blue in colour depending upon depth/clearness of water. In case of deep/clear water, absorption of light is more, hence the apparent colour is blue/blackish blue. On the other hand in case of turbid/ shallow water, the reflection of light is more and the appearance of the object is powder blue. To the south-western corner, Damodar River can easily be identified. The channel of the river is characterized by braided nature with numerous bars and spits. The water is mostly sediment laden and the apparent colour is powder blue. Sand deposits within the course of the river reflect more light, hence they appear in terms of light tone/white colour. Due to sediment deposit, even an island has been formed inside the river, where crops are grown. However, in the present image, the DVC Left Bank Main Canal enters the region from the west and passes through the central part and curves towards the south. At the extreme western part of the image, Damodar Branch. Canal originates from DVC Left Bank Main Canal and moves northward. Panagarh Branch Canal branches off from Damodar Branch Canal and runs in between the railway line and the Grand Trunk Road. Actually several linear features, viz. DVC Left Bank Main Canal, Eastern Railway Main Line and Grand Trunk Road run parallel to each other from north-west to south-east. The canal, if contains water, can be recognized with the help of dark blue colour, fine texture and also the typical geometric shape. Generally speaking, the tonal expressions of railway lines and road ways are darker and lighter respectively. Moreover, unlike road, railway takes typical curvature at the turning point and tries to avoid rural settlements. On the other hand roads link up different settlements and can take any type of turning. Both sides of highways are generally associated with trees. All these factors provide clues to recognize different types of linear features.

60 However, these are the general rules, and exceptions are there, depending upon the real world situation and also quality of the hard copy out put. Good or moderately good agricultural lands are wide spread within the area under investigation, which appear as light pink colour with fine or medium texture. In case of poor agricultural land the appearance is in terms of whitish gray with coarse texture. Rural settlements are associated with water bodies and vegetation cover and they are represented in terms of dark blue with fine to medium texture. Sonal and Gopalpur are two examples of rural settlements, which are easily identifiable to the east-central and north-western parts of the image. On the other hand, in case of urban areas, due to Rayleigh scattering blue or gray cast appear on the image. Panagarh, located at the center of the map is an example of urban settlement, although gray/blue casting is not that prominent for this urban area. 1.7 Summary Topographical maps, aerial photographs and satellite images provide with different types of resource condition available on earth surface. In topographical maps, in addition to portraying geographical information, different types of annotations are also available. Thus we may know the name of a particular settlement, river or even administrative block. Geographical coordinates in terms of latitude/ longitude are also marked in topographical maps. In case of aerial photograph, the camera 'sees' the surface condition and records according. Thus the collection of precise information depends on lens of camera and other parameters of the sensor and platform. The orbiting satellites go on collecting resource information of the earth surface, with temporal information at specific location. The visual interpretation of all these products help us to prepare maps for graphical presentation of the available resource condition. Exercises 1. What type of information are available in a topographical map? 2. Define Remote Sensing. 3. What are the different types of aerial photograph? 4. Distinguish between high oblique and low oblique photograph. Selected Readings Kraak, Menno-Jan & Ormeling Ferjan, Cartography, Visualization of Geospatial Data, First Indian Reprint, Pearson Education, Delhi, 2004 Kumar, Meenakshi, Remote Sensing, National Council of Educational Research and Training, New Delhi, 2001 Lillesand, T.M., et al., Remote Sensing and Image Interpretation, Fifth Edition, Wiley, New-York, 2004

61 UNIT : 2 ❒ DIGITAL IMAGE PROCESSING Structure: 2.1 Introduction 2.2 Objectives 2.3 Image rectification and enhancement techniques 2.4 Identification of Individual features from IRS LISS bands spectral signatures 2.5 Identification of Individual land use / land cover features 2.6 Preparation of Standard FCCs and identification of individual features 2.7 Georeferencing of satellite images 2.8 Image Classification 2.9 Change Detection 2.10 Summary 2.1 Introduction Visual interpretation techniques have certain disadvantages, because the users may require extensive training and are labour intensive. In addition, spectral characteristics are not always fully evaluated in visual interpretation efforts. This is partly because of the limited ability of the eye to discern tonal values on an image and the difficulty for an interpreter to simultaneously analyze numerous spectral images. In applications where spectral patterns are highly informative, it is therefore preferable to analyze digital, rather than analog or pictorial image data. A particular digital image is actually composed of a two dimensional array of discrete picture elements or pixels. The intensity of each pixel corresponds to the average brightness, or radiance, measured electronically over the ground area corresponding to each pixel. The representation of the energy measured at a point is usually expressed as a Digital Number or DN value. At this stage, it is better to discuss in brief about resolution of satellite images. In broad sense, resolution means the resolving power of the sensor. Actually, resolution is a system which refers to the ability to record and display fine details by the sensor. In remote sensing we deal with four types of resolutions viz. spatial, spectral, radiometric and temporal resolution. Spatial Resolution: The details visible

100%	MATCHING BLOCK 48/60	SA	rana-9.docx (D54864731)

in an image is dependent on the spatial resolution of the sensor and refers to the size of the smallest possible feature that can be detected.

In other words the spatial resolution is a measure of

100%	MATCHING BLOCK 50/60	SA	rana-9.docx (D54864731)

sensors ability to image (record) closely 62 spaced objects so that they are distinguishable as separate objects.

A sensor with a 1m resolution can reproduce finer details compared to a sensor with a 10m resolution. It is the ground area sensed at any instant time. It

95%	MATCHING BLOCK 52/60	SA	GIS 502.pdf (D125058113)

is dependent on the Instantaneous Field of View (IFOV) of the sensor (

Figure 2.1). The IFOV may be described as

62%	MATCHING BLOCK 53/60	SA	rana-9.docx (D54864731)

the angular cone of the sensor (A), which determines the area on the surface of the earth as viewed from a given altitude (B). The size of the field recorded is determined by multiplying the IFOV by the distance from the ground to the sensor (

C).

92%	MATCHING BLOCK 49/60	W

Images where only large features are visible are said to have low resolution,

where as in high resolution images, small objects can be detected.

92% **MATCHING BLOCK 51/60** **W**

Images where only large features are visible are said to have low resolution.

Where as in case of

100% **MATCHING BLOCK 58/60** **SA** rana-9.docx (D54864731)

high resolution images, small objects can be detected. Military sensors for example, are designed to view as much detail as possible, and therefore have very fine resolution. Commercial satellites provide imagery with

resolution

90% **MATCHING BLOCK 60/60** **SA** rana-9.docx (D54864731)

varying from a few metres to several kilometers. Generally the finer the resolution, the less total ground area can be seen.

100% **MATCHING BLOCK 54/60** **W**

Spectral Resolution: Spectral resolution describes the ability of a sensor to define fine wavelength intervals. The finer the spectral resolution, the narrower the wavelength ranges for a particular channel or band.

The spectral ranges of Landsat MSS and TM are shown in the following table: Fig. 2.1
63 Table: 2.1 Spectral range of different bands of Landsat MSS and TM Landsat -1 (MSS) Landsat - 4(TM) Band Code Spectral range (μm) Band Spectral range (μm) Code 4 0.5-0.6 Blue 1 0.45-0.52 Blue 5 0.6-0.7 Green 2 0.52-0.60 Green 6 0.7-0.8 Red 3 0.63-0.69 Red 7 0.8-1.1 Infra Red 4 0.76-0.90 Near Infra Red 5 1.55-1.75 Mid Infra Red 6 10.4-12.50 Thermal Infra Red 7 2.08-2.35 Mid Infra Red

100% **MATCHING BLOCK 55/60** **W**

Radiometric Resolution: While the arrangement of pixels describes the spatial structure of an image, the radiometric characteristics describe the actual information content in an image. Every time an image is acquired on film or by a sensor, its sensitivity to the magnitude of the electromagnetic energy determines the radiometric resolution. The radiometric resolution of an imaging system describes its ability to discriminate very slight differences in energy. The finer the radiometric resolution of a sensor, the more sensitive it is to detecting small differences in reflected or emitted energy. Imagery data are represented by positive digital numbers which vary from 0 to (one less than) a selected power of 2. This range corresponds to the number of bits used for coding numbers in binary format. Each bit records an exponent of power 2 (e.g. 1 bit=2 1 =2). The maximum number of brightness levels available depends on the number of bits used in representing the energy recorded. Thus, if a sensor used 8 bits to record the data, there would be 2 8 =256 digital values available, ranging from 0 to 255. However, if only 4 bits were used, then only 2 4 =16 values ranging from 0 to 15 would be available. Thus, the radiometric resolution would be much less. Image data are generally displayed in a range of grey tones, with black representing a digital number of 0 and white representing the maximum value (for example,

quantization range of 256 digital numbers in 8 bit data / DN value). (IKONOS 11 bit / 2048 gray level data). Temporal Resolution Temporal resolution refers to the frequency of obtaining data over a given area. It is related to

100% **MATCHING BLOCK 56/60** W

revisit period, which refers to the length of time it takes for a satellite to complete one entire orbit cycle. The revisit period of a satellite sensor is usually several days. Therefore the absolute temporal resolution of a remote sensing system to image the exact same area at the same viewing angle a second time is equal to this period. 64

100% **MATCHING BLOCK 57/60** W

The actual temporal resolution of a sensor depends on a variety of factors, including the satellite/sensor capabilities, the swath overlap, and latitude,

etc. Now a days remote sensing data are mostly available in digital format in multiple band. Thus, an image consisting of four spectral channels can be visualized as four superimposed images with corresponding pixels in one band registering exactly to those in the other bands. These are digitally processed with the help of appropriate image processing software along with compatible hardware system. The common image processing functions are: (1) Pre-processing, performed prior to Digital Image Processing to make the necessary radiometric and geometric corrections. (2) Image enhancement, to improve the appearance of the image. (3) Image transformation: involves the combined processing of data from multiple spectral bands and (4) Image classification and analysis: uses mathematical algorithms to assign individual pixels to specific classes; accuracy of the classification is then assessed by ground truthing. 2.2 Objectives This unit will help you to understand: z Rectification process of satellite images. z Enhancement techniques of satellite images. z Preparation of False Colour Composites . z Use of different LISS spectral bands of IRS images to identify surface features. Georeferencing of satellite images 2.3.1 Image Rectification: The raw image recorded in terms of MSS (i.e. Multi Spectral scanner) usually contains some radiometric and geometric distortions. These distortions are caused by platform effects, sensor effects, scene effects and atmospheric effects. Corrective measures are therefore needed to reduce the distortions. The required operations aim to correct distorted or degraded image data and create a more faithful representation of the original scene. The radiometric correction is required to obtain the accurate radiance value for each picture element, while the geometric correction is required to obtain accurate geometric representation of the earth. The introduction of such corrective measures is known as image restoration. It may be mentioned here that image rectification and restoration procedures are also known as preprocessing operations, because they normally precede further manipulation and analysis of the image data to extract specific information. 2.3.2 Image Enhancement: Image enhancement is the digital technique to improve the appearance of an image. In remote sensing, reflected or emitted energy from different features on earth surface is recorded. Under ideal conditions one object may reflect large amount of energy at a

65 certain wavelength while the other may reflect very less energy in the same wavelength. This results in the objects getting high and low values and correspondingly bright and dark areas. It happens that different features reflect different wavelengths regions resulting in similar tones or colours, which is known as low contrast image. To improve contrast of the image, the entire brightness range of display device is utilized. These procedures are applied to image data in order to more effectively display or record the data for subsequent visual interpretation. Normally image enhancement involves techniques for increasing the visual distinctions between features in a scene. The objective is to create ‘‘new” images from the original image data in order to increase the amount of information that can be visually interpreted from the data. Commonly applied digital enhancement techniques are categorized as contrast manipulation, spatial feature manipulation, or multi-image manipulation. Contrast manipulation include gray-level thresholding, level slicing, and contrast stretching. Grey level Thresholding is used to segment an input image into two classes, one for those pixels having values below an analyst defined grey level and one for those above these values. Level slicing is an enhancement technique whereby the DNs distributed along x axis of an image histogram are divided into a series of analyst specific intervals or slices. Density slicing is used mainly to display thermal infrared images to show discrete temperature ranges. It is observed that the dynamic range of a sensor is never fully utilized. As a result Fig. 2.2

66 a dull image is commonly produced. The contrast stretching technique allows to expand the narrow range of brightness values to a wider range of grey value. For example, in case of 8 bit data, image output levels can vary from 0 to 255. If in a particular case histogram shows scene brightness values occurring only in the limited range of 60 to 158, display levels 0 to 29 and 159 to 255 would not be utilized. A more expressive display would result if one expand the range of image levels present in the scene (60 to 158) to the full range of display value (0 to 255). Contrast stretching may be classified into three classes: linear, histogram equalization and Gaussian. In case of linear stretch the image data is mapped to the fullest range of the display device (Figure 2.2). In case of histogram equalization, the range of pixel values in the input image is spread over the fullest range of the display device so that each level in the displayed image contains an approximately equal number of pixel values and the histogram becomes almost uniform. Gaussian stretch involves the fitting of the observed histogram to a normal Gaussian histogram. Spatial feature manipulation includes spatial filtering, edge enhancement, and fourier analysis. Spatial filtering process emphasizes or deemphasizes image data of various spectral ranges. Spatial frequency means the roughness of the tonal variations occurring in an image. Image areas of high spatial frequency are tonally rough, which means that the grey levels in these areas change abruptly over a relatively small number of pixels. Examples are across roads or field border areas. Smooth image areas refer to low spatial frequency areas, where gray levels vary only gradually over a relatively large number of pixels. Large agricultural fields, water bodies are examples of such areas. Low pass filters are designed to emphasise low frequency features, whereas high pass filters do the other way round. Convolution Spatial filtering is but one special application of the generic image processing operation called convolution. Convolving an image involves the following procedures: 1. A moving window is established that contains an array of coefficients or weighting factors. Such arrays are referred to as operators or kernels, and they are normally an odd number of pixels in size, e.g. 3x3, 5x5, 7x7. 2. The kernel is moved throughout the original image, and the DN at the centre of the kernerl in a second output image is obtained by multiplying each coefficient in the kernel by the corresponding DN in the original image and adding all the resulting products. This operation is performed for each pixel in the original image (Figure 2.3). Edge Enhanced images attempt to preserve both local contrast and low frequency brightness information. They are produced by adding back all or a portion of the gray values in an original image to a high frequency component image of the same scene. In case of Fourier Analysis, an image is separated into its various spatial frequency

67 components through application of a mathematical operation known as the Fourier transform. Actually after an image is separated into its component spatial frequencies, it is possible to display these values in a two-dimensional scatter plot known as a Fourier spectrum. Multi-image manipulation include multispectral band ratioing and differenencing, principal components, canonical components, vegetation components, intensity-hue- saluration (HIS) colour space transformations, and decorrelation stretching. In case of Spectral Ratioing, ratio images are enhanced resulting from the division of DN values in one spectral band by corresponding values in another band. Canonical Component analysis is also known as multiple discriminant analysis. Canonical component axes are transformed to maximize the separability of different user defined feature types. Spectrally adjustment bands in a multispectral remote sensing image are often highly correlated. PCA is used to remove this redundancy and enhance the image, reduce the dimensionality and fix coefficients that specify the axis pointing to the directions of greatest variability. Principal components are simply the statistical abbreviation of the variability inherent in the original band set and are more interpretable. Vegetation components: AVHRR data have been used extensively for large area vegetation monitoring. Typically the spectral bands used for this purpose have been the channel 1 visible band (0.58 to 0.68 μm) and the channel 2 near -IR band (0.73 to 1.10 μm). Various mathematical combinations of the AVHRR channel 1 and 2 data have been found to be sensitive indicators of the presence and condition of green vegetation. These mathematical Fig. 2.3

68 quantities are thus referred to as vegetation indices. Two such indices have been routinely calculated from AVHRR data, a simple vegetation index (VI) and a normalized difference vegetation index (NDVI). These indices are computed from the equations: VI=Ch 2 -Ch 1 and NDVI= 2 1 2 1 Ch Ch Ch Ch – + where Ch 1 and Ch 2 represent data from AVHRR channels 1 and 2. Digital images are typically displayed as additive colour composites using the three primary colours: red, green and blue. Figure 2.4 represents the RGB colour cube, which is defined by the brightness levels of each of the three primary colours. For a display with 8-bit- per-pixel data encoding, the range of possible DNs for each colour component is 0 to 255. Hence there are 256 3 or 16,777,216 possible combinations of red, green blue DNs that can be displayed by such a device. An alternative to describing colours by their RGB components is the use of the intensity-hue-saturation (HIS)system. Intensity relates to the total brightness of a colour. Hue refers to the dominant or average wavelength of light contributing to a colour. Saturation specifies the purity of colour relative to gray. Decorrelalion stretching is a form of multi- image manipulation that is particularly useful when displaying multispectral data that are highly correlated. Data from the NASA Thermal Infrared Multispectral Scanner (TIMS) and other hyperspectral data collected in the same region of the spectrum often fall into this category. As with HIS transformations, decorrelation stretching is is applied in a transformed image space, and the results are then transformed back to the RGB system for final display. 2.4 Identification of Individual features from IRS LISS bands spectral signatures There is a tendency of steady improvement of different sensors of Indian Resource satellites. In the following tables, information related to band width, nominal spectral location and also principal applications of different bands of various IRS sensors are described in brief. Fig. 2.4

69 Table: 2.2 Spectral band of LISS III image and relative applications Band Wavelength Nominal Principal Applications (Micrometer) Spectral location 1 0.45-0.52 Blue Designed for water body penetration, making it useful for coastal water mapping. Also useful for soil/vegetation discrimination, forest type mapping, and cultural feature identification. 2 0.52-0.60 Green Designed to measure green reflectance peak of vegetation for vegetation discrimination and vigor assessment. Also useful for cultural feature identification 3 0.63-0.69 Red Designed to sense in a chlorophyll absorption region aiding in plant species differentiation. Also useful for cultural feature identification. 4 0.76-0.90 Short wave Useful for determining vegetation types, Infrared (SWIR) biomass content, for delineating water bodies and for soil moisture discrimination. 2.5 Identification of Individual land use / land cover features With the help of IRS data, it is possible to identify different land cover features, and in the following table typical examples in this regard are presented for ready reference. Table: 2.3 Land cover classes as identifiable in LISS-III images Land Cover Classes Description Characteristics on LISS-III data Dense Forest Tall dense trees Dark red with rough texture Sparse Vegetation Low vegetation density Dull red to pinkish with exposed ground surface Agriculture Crops on hill terraces Dull red and smooth appearance as step cultivation

70 Fallow Land Agriculture fields Bluish/greenish gray with smooth without crops texture Barren Land Exposed rocks without Yellowish vegetation Settlements Town and villages; Bluish block like appearance Fresh sediments Fresh landslides debris Cyan and river sediments on the blank Water bodies Rivers and lakes Cyan blue to blue according to the depth of water Snow Snow covered areas on Very bright white high altitude mountains 2.6 Preparation of Standard FCC Three band satellite data are used to generate colour composites. The channel selection is restricted to three additive primary light beams i.e. blue, green and red. True colour representation for visual display of an image can be made by using three band satellite data representing blue, green and red channels. In such a case blue band is projected in blue, green band is projected in green and red band is projected in red for preparation of the output image. But such true colour composites are having some constrains in terms of inadequate contrast, clarity problem, interpretability problem, etc. Hence images are generated in terms of False Colour Composite or FCC (Figure: 2.5). Any combination of bands not representing the true colour of the objects in the output Fig. 2.5

71 image is termed as FCC. They are generated with the purpose of better interpretation of the multi-band satellite data. In case of standard false colour composite, the combination of bands and the respective colour assignments are well defined. Hence they are known as standard FCC. The most commonly seen standard false colour images display the very near infrared as red, red as green and green as blue. Satellite images are available to the user either in terms of digital format or hard copy out put. The user may make various experiments by using digital data with the help of available image processing software. On the other hand, by means of visual interpretation of the hard copy out put, the interpreter can identify different types of features available in the image. To create FCC of image in Geomatica, following commands are to be given: Layer → RGB Mapper Red column → check the row for 'Near Infra Red' channel Green column → check the row for 'Red' channel Blue column → check the row for 'Green' channel Click → close From the Enhancement button of Focus -→ choose 'Linear' enhancement. 2.7 Georeferencing of satellite images When an image is created, it is stored in row and column geometry in raster format. There is no relationship between the rows and columns and the real world coordinates. In a process called geo- referencing the relation between row and column numbers and real world coordinates are established (Figure 2.6). The simplest way to link an image to a map projection system is to use a geometric transformation. A transformation is a function that relates the coordinates of two systems. A transformation, relating (x,y) to (i,j) is typically defined by linear equations, such as: x=3+5i, and y=-2+2.5j (Figure 2.7). Using the above transformation, for example, image position (i=5, j=8) relates to map Fig. 2.6 Original image Geometrically corrected and map projected image

72 coordinates (x : =28,y=18). Once such a transformation has been determined, the map coordinates for each image pixel can be calculated. The resulting image is called georeferenced image. The process of georeferencing includes two steps : selection of the appropriate type of transformation (e.g. polynomial) and determination of the parameters. The transformation parameters can be determined by means of ground control points (GCPs). GCPs are points that can be clearly identified in the image and in a source, which is in the required map projection system. By using the following commands in Geomatica, georeferencing of an image can be done: Open OrthoEngine OrthoEngine <File <New Project information dialogue box comes Browse to give a file name (example: Georeferencejmagel.prj) for OrthoEngine project -image 1. pr) Choose Polynomial math model Click OK Set Projection dialogue box comes On the output projection click the drop down arrow and choose Lat/Long projection Click Earth Model. Earth Model dialogue box comes Click Datum tab and choose appropriate datum Put appropriate output pixel spacing Click Set GCP Projection Based on output projection Click OK Set Projection dialogue box closed and OrthoEngine main panel comes OrthoEngine < File < Save From the drop down list in the Processing Step, choose GCP Collection Click the first tool (i.e. open a new or existing image). Open image dialogue box will come Click New Image and browse to choose image 1 file Fig. 2.7

73 Click open in the file selection window The image 1 file will come on the Open image dialogue box Select the image 1 file. Now the open tool is active. Click Quick Open & Close Image viewer opened with imagel file. Enhance the file if the file is not properly visible In the OrthoEngine main panel, click 2 nd tool (i.e. collect GCP manually) GCP collection panel will come In the image viewer locate the point with appropriate Longitude and Latitude values Click Use Point First GCP id (G0001) will appear on the image viewer Come to the GCP Collection panel and put the longitude and latitude in the appropriate place Accept You have collected the first GCP In the same way you have to collect at least 4 GCPs Save the project in the OrthoEngine main panel Close the image viewer and GCP collection panel In the processing step from the drop down menu choose Geometric Correction Click 3 rd tool to open Geometric Correction dialogue box On the available image click over the file (imagel: No Ortho) Click on the arrow to take the file to image to process box. In the uncorrected image keep everything default In the Corrected image browse to give an output file name (Corrected imagel.pix) Set Sampling Interval as 1 Keep all others default Click Correct Images Geometric correction progress window will come with task bar On completion of the Geometric correction the Geometric correction dialogue box will come again Geometric Correction has been completed Save the project in the OrthoEngine main panel and close OrthoEngine Open the Corrected_imagel .pix file on the focus viewer to check the georeference. 2.8 Image Classification As soon as a satellite image is georeferenced, it is possible to do various exercises like image classification, change detection with periodic data, etc. It may be mentioned here that in the real world the human being is used to categorize all the objects on the earth's surface cover by describing them for example forest, agriculture field, river, residential building, etc. We do not label areas by numbers as is the case in digital images.

74 Digital image classification is the process of assigning pixels to classes. Each pixel in a digital image is treated as an individual unit having different wavelength region or spectral band. By comparing pixels to one another and to those of known identity, it is possible to group pixels of similar classes of interest to user. These classes are represented by suitable colours assigned by the user. Actually, digital image classification, also known as spectral pattern recognition, uses the spectral information for each pixel in an image file to group pixels into common spectral themes. Classified images are, in effect, thematic maps containing a mosaic of pixels belonging to different classes. The objective of the classification process is to assign all pixels in an image to a finite number of categories, or classes of data, based on their data file values. If a pixel satisfies a certain set of criteria, then it is assigned to the class that corresponds to that criteria. There are two different image classification methods: unsupervised and supervised. Unsupervised Classification: This is a highly computer-automated procedure. It allows the user to specify parameters that the computer uses as guidelines to uncover statistical patterns in the data. In an unsupervised classification the software automatically divides the range of spectral values, contained in an image file, into classes or clusters (Figure 2.8). These natural clusters are then related to actual land use/ land cover categories after a very careful ground truthing. With Focus of Geomatica, the user can choose the number of classes the data is divided into. The classified results report the proportions of spectral values in the image and can therefore indicate the prevalence of specific ground covers. In Geometica, the following steps are involved to get the result through unsupervised classification: File → Open → Desktop → (e.g.) image 1 .pix → Open Right click Sundarban.pix 1,2,3 → Image classification → Unsupervised New session Description box → Type → (any name) unsuper Input channel → check 1,2,3 Add Layer → Add 2 number of 8 bit channel → Add Output Channel → Check Empty channel → OK → OK Supervised Classification: Supervised classification is more closely controlled by the supervisor than unsupervised classification. In this process, the user, i.e. the supervisor select recognizable regions within an image, with the help of other sources, to create sample area called training sites. These training sites are then used to train the computer system to identify pixels with similar characteristics.

75 Knowledge of the data, the class desired, and the algorithm to be used, is required before the user begin selecting the training sites. By setting priorities to the classes, the user supervise the classification of pixels as they are assigned to a class value. If classification is accurate, each resulting class corresponds to a pattern that the user originally identified (Figure 2.8). Fig. 2.8 .....Old Mangrove .....New Mangrove .....Settlement with Vegetation .....Salt Deposition .....Water .....Arable Land

76 Typical supervised classification involves three stages: The training stage, wherein the multi-spectral parameters are extracted for various classes from training sites identified in the image The classification stage, wherein each pixel is assigned to a class to which it probably belongs The output stage, where the presentation of the data is in the form of maps, tables, graphs, etc. In geomatica, the following steps are involved to prepare supervised classification Open → Sundarban.pix Right click Sundarban.pix → Image classification → Supervised New session Description → Type → super → Add Layer → Add 3 number of 8 bit channel Add Input channel → check 1,2,3 Training channel → Check (9) Empty channel Output channel → Check Empty channel Ok Class → New → Class-1= New Mangrove → Change colour → New shape poly → digitize New Mangrove Class → New → Class-2= Old Mangrow → Change colour → New shape poly → digitize Old Mangrove Class → New → Class-3=Salt deposition→ Change colour → New shape poly → digitize Salt deposition Class → New → Class-4= settlement with vegetation→ Change colour → New shape poly → digitize settlement with vegetation Class → New → Class-5 = Water → Change Colour → New shape poly→ digitize water Class → New → Class-6 = Arable land → Change colour → New shape poly → digitize Arable land Right click classification Metal layer → Run classification → Minimum Distance→ Classify 2.9 Change Detection The temporal satellite data helps us to detect changing scenario in any part of the world. It may be growth of crop, process of desertification, natural disaster, etc. In this context an example is cited herein below regarding super cyclone which occurred in odisha coast in the year 1999. The temporal data was provided by IRS 1 D satellite. (Figure 2.9 & 2.10).

77 Fig. 2.9 Fig. 2.10

78 2.10 Summary Visual image interpretation has some inherent shortcoming, which may be overcome with the help of digital image processing systems. But to undertake such exercises, there are some preconditions like image rectification, image enhancement etc. After passing through these processes, it is possible to play with digital data with the help of appropriate image processing software. It is possible to generate False Colour Composites by selecting appropriate band combinations. To perform such exercises, Geometica software has been uses. Exercises 1. What are the different types of distortions available in a raw image? How to rectify them? 2. What do you mean by image enhancement? What are the different types of contrast manipulation techniques? 3. What is FCC? Prepare a FCC with the help of available satellite image by choosing appropriate bands using Red, Green and Blue light beams. 4. Georeference the available satellite image by using appropriate inputs. 5. Why image rectification is necessary? What are the steps to be followed in Geometica for rectifying a satellite image? 6. What is the spectral range of Band 1 of 1RS LISS -III sensor? What are the principal applications of the same band? Selected Readings Guha. P.K., Remote Sensing for the Beginner, Affiliated East-West Press Pvt. Ltd, New Delhi, 2003 Janssen L.E.F., ed. Principles of Remote Sensing, International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede, 2000 Joseph, George, Fundamentals of Remote Sensing, Second Edition, Universities Press, Hyderabad, 2005 Kraak, Menno-Jan & Ormeling Ferjan, Cartography, Visualization of Geospatial Data, First Indian Reprint, Pearson Education, Delhi, 2004 Kumar, Meenakshi, Remote Sensing, National Council of Educational Research and Training, New Delhi, 2001 Lillesand, T.M., et al., Remote Sensing and Image Interpretation, Fifth Edition, Wiley, New York, 2004 Pal, D.K., Proceedings on Remote Sensing & Geographic Information System - Principle

79 & Applications, Vidyasagar University, Medinipur, 2004 PCI Geomatics: Geomatica 10 : Focus User Guide: Richmond Hill, Canada 2005 PCI Geomatics: Geomatica 10: OrthoEngine User Guide'. Richmond Hill, Canada 2005 Sarkar, Ashis, Practical Geography : Systemic Approach, Orient Eongman Private Eimited, Kolkata, 2008 Robinson, A.H., Morrison, J.E., Muehrcke, P.C., Kimerling, A.J., Guptili, S.C.: Elements of Cartography, 6 th Edition, Wiley India, New Delhi, 2016 Sarkar, Asit Kumar, Study Material: UG Geography: Paper-12, Practical Geography- 3, Field Report, Rocks and Minerals, Geological Maps, Remote Sensing, Aerial Photography, Netaji Subhas Open University, Kolkata, 2008 Sarkar, Asit Kumar, Study Material: PG Geography: Paper-5, Group. A & B Preparation of Thematic Maps, Map Interpretation and Field Technique, Netaji Subhas Open University, Kolkata, 2008 Sarkar, Asit Kumar, Study Material: PG Geography: Paper-IX, Part-11, Module-18, Geographical Information System and Remote Sensing, Directorate of Distance Education, Rabindra Bharati University, Kolkata, 2014

80 UNIT : 3 ❒ GEOGRAPHIC INFORMATION SYSTEM Structure: 3.1 Introduction 3.2 Objectives 3.3 The Basic Concept of GIS 3.3.1 Raster and Vector data Format 3.3.2 Generation of vector layers 3.3.3 Attachment of attribute data 3.3.4 Creation of Buffers and attribute tables from images and/or map data 3.4 Editing attribute tables using demographic and/or land use data 3.5 Preparation of Annotated maps 3.6 Summary 3.1 Introduction A Geographic Information System (GIS) is a system which is designed to capture, store, manipulate, analyse and present geographical data in different graphical and tabular forms. Actually it describes such an information system that interacts, stores, edits, analyses and displays different types of geographical information. The data may be spatial or aspatial, i.e. attribute in type. It is possible to make analysis with GIS data in terms of overlay or proximity (buffer), allows to make query, and also can display the information in the form of thematic maps and diagrams. 3.2 Objectives This unit will help you to understand: z Basic concept of GIS. z Raster and Vector data format. z Generation of Vector layers z Attachment if attribute data. z Editing of spatial/data z Preparation of Thematic Maps

81 3.3 The Basic Concept of GIS Geographic Information System (GIS) is an organised collection of computer hardware, software, geographic data and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information. It is also said that GIS is computer system that records, stores, and analyses information about the features that make up the earth's surface. A GIS can generate two or three dimensional images of an area, showing such natural features as hills and rivers with artificial features such as road and power lines. Scientists use GIS images as models, making precise measurements, gathering data, and testing ideas with the help of the computer. It may be mentioned here that a working GIS integretes five key components: hardware, software, data, people and methodology. 3.3.1 Raster and Vector Data Format Geographic information systems work with two fundamentally different types of geographic models - the vector model and the raster model (Figure: 3.1). In the vector model, information about points, lines, and polygons is encoded and stored as a collection of x, y coordinates. The location of a point feature, such as a tube well, can be described by a single x, y coordinate. Linear features, such as roads and rivers, can be stored as a collection of point coordinates. Polygon features, such as forest and river basin, can be stored as a closed loop of coordinates. The vector model is extremely useful for describing discrete features, but less useful for describing continuously varying features such as soil type or accessibility costs for hospitals. The raster model has evolved to model such continuous features. A raster image comprises a collection of grid cells rather like a scanned map or picture. Both Fig. 3.1 C o o r d i r a t e s are used to d e f i n e f e a c t u r e b o u d a r i e s a t t r i b u t e s d e f i n e f e a t u r e p r o p e r t i e s

82 the vector and raster models for storing geographic data have unique advantages and disadvantages. Modern GIS is able to handle both models. 3.3.2 Generation of Vector layers: Many GIS database consists of sets of information called layers. Each layer represents a particular type of geographic data. For example, one layer may include information on communication network. Another layer may contain information about land use pattern, while another records drainage system. The GIS can combine these layers into one image, showing how the communication network, drainage system and land use pattern relate to one another. A GIS database can include hundreds of such layers. Thus with the help of registered image, one can create as many thematic layers as one desires. In digital cartography, different types of geographical information are represented in terms of line, point and area (polygon) symbols. Generally each layer contains a particular thematic information. Sometimes separate text layers are also generated. Before geographic data can be used in a GIS mode,

87% **MATCHING BLOCK 59/60** **W**

the data must be converted into a suitable digital format. The process of converting data from paper map into computer files is called

digitization or vectorization. To start with any project, at the very beginning the raster image (Figure 3.2) in the form of a hard copy map needs to be georeferenced with following commands in mapinfo: Annotations in terms of text matter including the title of the map, insertion of symbol like north line, incorporation of auto scale, inclusion of index, etc. are integral parts of a map. In the present exercise these information have either been included as separate text layers, or have been incorporated at the time of preparation of the layout. It may be mentioned here that there are two ways of visualising the end product of a digital map, either as softcopy which can be visualized on monitor or in terms of the hardcopy out put which may be obtained by printing through a printer or plotter. In case of hardcopy out put one is to prepare/assign the layout along with that appropriate page set up (portrait or landscape), out put scale etc. However, the process of georcterencing, digilization and preparation of layout has been discurred in detail in Unit 3.5. 3.3.3 Attachment of Attribute Data Geographic Information Systems are computer based systems that can deal with virtually any type of information about features that can be referenced by geographical Fig. 3.2

83 location. These systems are capable of handling both locational or spatial data and attribute or non-spatial data about such features. Spatial data refers to geographic areas or features which occupies a location, whereas non-spatial data has no specific location in space. It can however, have a geographic component and be linked to a geographic location. Tabular and attribute data are non-spatial but can be linked to location. Actually a G1S not only contains a "map" of the locations of say railway line, but also a database of descriptors about each railway line. These attributes might include information such as gauge width, electrified or not, single line or double line, jurisdiction of the route (i.e. it falls within which zone), date of construction, etc. The following table is the other examples of attributes that might be associated with a given point, line or area feature: Table 3.1: Attachment of attribute data Point feature Pond (depth, area, use) Line feature Railway line (gauge width, electrified or not, single line or double line, jurisdiction of the route) Area feature Forest (name, status, species) A map may contain spatial as well as non spatial or attribute data. In Geographical Information System, variety of attribute data may be attached to spatial data. For example in case of an agricultural plot, attribute information like owner of the plot, tax imposed there on, crops grown, whether the plot is irrigated or not, etc. may be attached in tabular form. For that purpose appropriate number of fields are to be opened and necessary data are to be attached there in. In Mapinfo software, the following steps are to be followed for attachment of attribute information for creation of data base. File New Table Create New Table Structure Field information → Block Type → Integer Create File name → Block Save Right click the mouse → Layer Control Make the Block layer editable (by checking 9) Select polyline from tool box Select appropriate line style, colour and width from style box Snap by pressing' S' from key board
84 Digitize Goghat II Block Right click block_bnd → Attribute Manager Right click Area → Table Definitions-Display Unit → Sq km → Apply → Ok Field → Add New → Name → Text + Population → Integer Attach Name and population data for each block from the follwing table. Table 3.2 : Hooghly District : Density of Population Block Shape ID Area (Sq km) Population Population (2001) Density (pop/sq km) Dhaniakhali 1 275.68 293,345 1064 Pandua 2 276.43 284,231 1028 Balagarh 3 202.15 214,784 1062 Chinsurah-Mogra 4 81.86 211,049 2578 Polba-Dadpur 5 285.69 239,493 838 Tarekeswar 6 119.93 162,371 1354 Haripal 7 184.42 235,494 1277 Singur 8 164.85 260,827 1582 Jangipara 9 164.23 201,001 1224 Chanditala-I 10 93.45 165,837 1775 Chanditala-II 11 70.34 213,485 3035 Seramur-Uttarpara 12 44.80 126,380 1821 Goghat-I 13 186.32 125,280 672 Goghat-II 14 190.03 143,359 754 Arambag 15 269.31 253,579 942 Khanakul-I 16 171.92 221,871 1291 Khanakur-II 17 121.83 160,888 1321 Pursurah 18 100.42 156,332 1557
85 Fig 3.6 (Raster Image)
86 3.3.4 Creation of Buffer Data analysis is an important process or task in GIS. In case of proximity analysis we use geometric distance to define the neighbour hood of one or more target locations. The most common and useful technique is buffer zone generation. The principle of buffer zone generation is simple. One selects one or more target locations, and then determine the area around them, with a certain distance. Buffer can be created along any line feature or around any point or polygon feature. In Mapinfo, to create buffer along a road the following instructions are to be folowed: Keep a particular table (e.g. Major Road/Rail) selectable/editable Object → Buffer Buffer object Value: 1 From column: id (select) Unit: kilometers Smoothness: 12 segment per circle One buffer of all objects (select) OK The buffer will appear on Major Road/Rail 3.4 Editing attribute tables using demographic and/ or Land use data 3.4.1 Introduction The data can be two major types (a) Spatial (i) Non-geographic (ii) Geographic b) Non-Spatial (It can be used in Data Management System) These data can be processed by editing the data table. Nature wise the data can be demographic or land use or dispaly other character. The editing method of copying and pasting records is valid for attribute tables of layers by using editor toolbar.
87 3.4.2 Procedure Let us know how to do the data attachment in the map info software. The steps are given below: (After digitization of block the data input or attachment can be done) a) Data field creation Table → Maintenance → Table structure → Add fields Name → male → type →[Integer] → Add field → Female → Type → [Integer] → OK (here male/ female are examples) b) Data Input: z Window → New browser window → Thematic map → OK → Input data (Male & Female) z Select info tool → Click on digitized block map → Put data (male & female by using keyboard) (The other demographic data like—Literate, illiterate, workers, non-workers and various land use data like—cultivation, forest, settlement, waterbody, waste land or other area data can also be put in the same procedure) z After attaching/ putting the data different thematic maps can be prepared in the map info software. GIS is a computer based system that can deal with virtually any type of information about features that can be referenced by geographical location. It is capable of handling both locational (spatial data) and attribute (non-spatial) data. z Spatial data refers to geographic areas of features which occupies a location. z Non-spatial data has no specific location in space.Tabular and attribute data are non-spatial but can be linked to location.

88 3.5 Preparation of Annotated maps ,,, 3.5.1 Introduction The preparation of annotated maps can be done after attaching or putting the data related to demography or land use and land cover. Spatial data or attribute data has to be incorporated in the digitized map and different sort of thematic maps can be prepared in the GIS software. All kind of data (demographic/ socio-economic/ land use or land cover data) can be used to prepare the thematic map. As the Map Info (12.5 version) is a GIS software, all the GIS related maps/ thematic maps can be prepared. (But using remote sensing data from the satellete images can not be prepared by using this version of Map Info software). After attaching the data, preparation of different thematic maps like Bar Graph, Pie Graph, Choropleth Map can be done by using the attached data. The preparation of these maps in the Map Info software is almost the same procedure to be followed. How to do in map info software : 3.5.2.1 About Mapinfo Software Mapinfo professional is a powerful Microsoft Windows-based mapping application. It allows GIS professional to easily visualize the relationships between data and geography. MapInfo Professional is an industry leader in usability and is part of a comprehensive integrated locational platform. 3.5.2.2 Tools/ Icons used for the operation under Mapinfo Standard Toolbar 1. Open dialog New Table (Ctrl + N) and allow to create new data. 2. Open dialog Open (Ctrl + O) and allow to load data. 3. Open dialog Open Workspace and allow to load workspace data. 4. Open Microsoft Bring Arial Satellite Imagery. 5. Open Microsoft Bring Hybrid Satellite Imagery. 6. Bring roads tool. 7. OSM roads tool.

89 8. Move map to tool. 9. Open dialog Save Table (Ctrl + S) and allow to save data. 10. Open dialog Save Workspace (Ctrl + K) and allow to save workspace data 11. Allow to close all open data. 12. Open dialog Save Window to File and allow to save window as raster file 13. Open dialog Print (Ctrl + P) and allow to print data. 14. Open dialog Print and allow to convert data to PDF. 15. Cut out the selected objects and put into the clipboard. 16. Paste the object from the clipboard to the current editable layers. 17. Copy the selected objects into the clipboard. 18. Undo the last editing action. 19. Open dialog New Browser Window (F2) and allow to view attribute data 20. Open dialog Map Window and allow to view map data. 21. Open dialog Create Graph and allow to create graph. 22. Open dialog New Layout Window and allow to create map layout. 23. Open dialog New Redistrict Window. Main Toolbar 1. Select vector object. 2. Vector object select by marquee selection. 3. Vector object select by radius selection. 4. Vector object select by polygon selection. 5. Vector object select by boundary selection. 6. Unselect all vector objects. 7. Vector object select by invert selection. 8. Graph selection. 9. Select zoom in tool. 10. Select zoom out tool. 11. Open dialog Change View and allow to specify the input zoom scale 12. Activates working window navigation mode. 13. Open dialog Info Tools, which allows preview and editing of vector attribute. 14. Hot links tool. 15. Labeling vector object. 16. Drag map windows tool. 17. Open dialog Layer Control and allow loading and creation of vector data.

90 18. Select distance measuring tool. 19. Show and hide legend window. 20. Show and hide statistics window. 21. Set target district tool. 22. Assign selected object tool. 23. Clip region on / off tool. 24. Set clip region tool. 25. Open dialog Create Adornment and allows to create a scale bar. 26. Display table list tool. 27. Add table to Mapinfo manager library tool. Drawing Toolbar 1. Adds the >>Symbol<< object to the vector layer being edited. 2. Adds the >>line<< object to the vector layer being edited. 3. Adds the >>Polyline<<object to the vector layer being edited. 4. Adds the >>Arc<< object to the vector layer being edited. 5. Adds the >>Polygon< object to the vector layer being edited. 6. Adds the >>EIlipse<< object to the vector layer being edited. 7. Adds the >>Rectangle<< object to the vector layer being edited. 8. Adds the >>Rounded Rectangle<< object to the vector layer being edited. 9. Adds the >>Text<< object to the vector layer being edited. 10. Adds the >>Frame<< object to active layout window. 11. Reshapes vector object being edited and selected. 12. Adds vertex to the vector object being edited and selected. 13. Open dialog Symbol Style and allows to change style, color & scale of symbol 14. Open dialog Line Style and allows to change style, color & width of line. 15. Open dialog Region Style and allows to change style of region. 16. Open dialog Text Style and allows to change style of text. 3.5.2.3 Supported Mapinfo File Format: Raster & Vector The native file format of Mapinfo is TAB. The Mapinfo TAB format is a popular geospatial vector data format for GIS software. The basis file components for a Mapinfo Professional data set relate to the two basic environment for working in Mapinfo; “Browser View” and “Mapper View”. The basic file set for viewing data and it’s graphic representation in vector form within Mapinfo Professional requires a minimum of five

91 files as below. z .TAB (The ASCII file that is the link- between all other files and nolds information about the type of data set file). z .DAT (The file that stores the attribute data. This is a dBase 111 DBF file) z .IND (Optional index file for tabular data. This is present if any columns are indexed). z .MAP (Stores the graphic and geographic information needed to display each vector feature on a map). z .ID (stores information linking graphic data to the database information. This contains a 4-byte integer index into the MAP file for each feature Supported File Format Map Info Professional 11.5 Supports the following file format for raster & vector. TAB: Maplnfo .TAB files (*.tab) WOR: Maplnfo workspace files (*.wor) MDB: Microsoft Access files (*.mdb) ACCDB: Microsoft Access 2007 files (*.accdb) DBF; dBASE DBF files (*.dbf) TXT: Delimited ASCII files (*.txt) WKS: Lotus 1-2-3 files (*.wkl, *.wks, *,.wk3, *.wk4) XLS: Microsoft Excel files (*.xls) XLSX: Microsoft Excel 2007 files (*.xisx) SHP: ESR1 Shapefiles (*.shp) Raster image files (*.bil, *.sid, *.gen, *.adf, *.img, *.ntf, *.ecw, *.url, *.tif, *.grc, *.bmp, *.gi *.tga, *.jpg, *.pcx, * jp2, *.j2k, *.png, *.psd, *.wmf, *.emf, *.map) Grid images (*.adf, *.flt, *.txt, *.asc, *.img, *.dem, *.dtO, *.dtl, *.dt2, *.mig, *.grd) CSV: Comma Delimited files (*.csv) DWG/DXF: AutoCAD MID/MIF: Maplnfo file formats DGN: Microstation Design files CATD.DDF: Spatial Data Transfer Standard (SDTS) FT: Vector Product Format (VPF) MB1: Maplnfo Professional Boundary Interchange format. An ASCII file for Maplnfo DOS boundary files. MMI: Maplnfo DOS MMI GML/XML: Geographic Markup Language 2.1 (*.gml, *.xml) MrSID: The MrSID raster handler allows you to open and display raster images compressed in the MrSID format.

92 3.5.2.4 Geo-rectification (Registering Raster Image) Image Registration/ Rectification: Projection: Indian Geodetic System/ Polyconic/ UTM-WGS 84 1. On the file menu, Click Open. 2. Open Window will appear. 3. Select Raster Image as File of type. 4. Browse to the desire location (MapInfo Training Data) 5. Select Hooghly.jpg and chose Open. 6. A question message will appear. 7. Click on Register button. 8. Image Registration dialog box will appear. 9. Click on Projection button to specify the projection system. 10. Chose Projection dialog box will appear. 11. Chose India-polyconic systems from Category drop down box. 12. From Category Members drop down box chose India (WGS 84). 13. Click OK button from chose Projection dialog box. 14. Click Add button and select a point on raster image, Edit Control Point dialog box will open. 15. Type X value in Map X and Y value in Map Y. 16. Click on OK button. Fig 3.3

93 17. Click Add button again and select another point and type the XY value 18. Repeat the process and try to take several points throughout the image 19. Use + and – button to Zoom In and Zoom Out. 20. Click Edit button to edit a point. 21. Click Remove button to remove a point. 22. Click Ok. 3.5.2.5 Starting Mapinfo [12.5 version] To start the work in mapinfo software for GIS work, one shall need a hardcopy analog base map that should be made compatible to the computer system. Such map must be scanned with the help of a scanner. This raster image is used as an input file to initiate the digital mapping job. It may be noted that appropriate number of registration marks in terms of latitudinal and longitudinal values should be inserted in the base map, so that the scanned image may be transformed into a registered image, thus matching with the real world coordinate system. Fig 3.4

94 The various GIS work in mapinfo software can be followed by the following steps:- (A) Registration To open a raster image in mapinfo software, we are to opt for register option. All the conrol pionts are registered with the help of available graticule values, followed by projecting the image with appropriate projection system. By moving the cursor, one can identity latitudinal and longitudinal value at any place. of the registered image. Fig 3.5

95 To register a map in Mapinfo software, the following instructions are to be followed: File → Open table → File name (Select a rester file; for example: map Hooghly Fig. 3.6) → File of type : Rarter image → Open → Register z Select (Add) Point 1 → label Pt 1 → Mapx : 88 degree Tab → Mapy: 22.75 degree → OK z Add → Point 2 → lable Pt 2 → Map X: 88.25 degree Tab → Map Y: 22.75 degree → Ok z Add → Point 3 → label Pt 3 → Map X: 88.50 degree Tab → Map Y : 22.50 degree → Ok z Add → Point 4 → table Pt 4 → Max X : 87.50 degree Tab → Map Y : 22.50 degree → Ok → Ok (It is desirable that the error in less than 5) Following the same prosedure, anybody can register any maps with proper coordinate value. Here, map of Hooghly was registered following the same procedure. [Raster and vector images (maps) of Hooghly are attached herewith] (Fig. 3.5) (B) Projection : Projection → Longitude / latidue (WGS 84) → Ok [Fig 3.6 and 3.7] (C) Digitization The digitization must be of three heads: (i) Line (ii) Point (iii) Area. i) Line : Railway Line : File → New table → Add to current Mapper (9) → Open new mapper off → creat → Name (type select) → Create → own folder → Same (give same name). z Map → Layer control z Layer (9) editable on → z Polyline → digitize railway line in map by single clicking of mouse → end with double click. [Save : File → save table → Rail → save] [Save in workspace : File → save workspace → own folder → Name (Question No.) → Save] [Delete: Wrong digitization is to be deleted by using select tool on clicking the mouse on the wrong line and → delete it] [Colour and style change: click on the digitized railway line ☒ → colour → style change → Ok. [Name Writing: control layer editable on → (A) text → write besides the line] [Length Selection : Double click on digitized railway line → Note the total length]

96 Road : z File → New table → Add to current mapper [9] → Open New mapper off ☒ → create → Name (type select) → create → own folder → give same name) → save then digitized → File → save table → save. (Fig. 3.8) River : z File → New table → Add to current mapper (9) Open New mapper off ☒ → creat → Name (type select) → create → own folder → give same name) → Save. z Then digitize → File → Save table → Save. (ii) Point : z File → New table → Add to current mapper [9] → Open New mapper off ☒ → create → Name (type select) → creat → own folder → give same name) → save z Select symbol (O) → editable on → click on map → file save table → save. (iii) Area: z File → New table → Add to current mapper [9] → Open New mapper off → create → Name → own folder → give same name) → save z Select Polygon to (☒) → editable on → click on point on map (block) → file → save table → save. [Snap tool : During block digitization press the 'S' button of the keyboard (then snap will be on) → It will help to digitize the common boundary] [Area measurement: Double click on the digitized block → Note the total area] (Fig 3.9) Thematic Map preparation : It has two part—(i) Data attachment/ input (ii) Thematic map preparation (i) Data attachment: z Table → Maintainance → Table structure → Add field → Name → [Male] → Type → [Integer] → Add field → Name → [Female] → Type → [Integer] → Ok. zData put → Window → New Browser window → Thematic map → Ok → data put (male & female). zTook info tool → click on digitized block → put data (male & female) ii) Thematic map preparation: a) Bar graph b) Pie graph c) Choropleth map. a) Bar Graph : z Map → create thematic wap → Bar chart → default of Next [male] select → field from tab [fimale] → Select → Add → Next → Ok.

97 Editing Bar Graph: Select the bar in the layer → control → click → style → change the colour → height → width → Ok. (Fig. 3.10) ii) Pie Graph : z Map → create thematic map → pie chart → default → Next → [male] → Add → [female] → Add → Next → Ok. z Editing Pie Graph → select the pie group in the layer control → click → style → change the colour → height → width → Ok (Fig. 3.11) Fig 3.7

98 Fig 3.8

99 Fig 3.9

100 Fig 3.10

101 Fig 3.11

102 Fig 3.12 (Fig 3.8)

103 Fig 3.13

104 Fig 3.14

105 iii) Choropleth Map : Choropleth map is prepared to represent the density of any demographic or socio- economic data in respect of area. Here you can prepare choropleth map to represent the population density. z Map → create thematic map → Ranges (type) → region ranges → Next → Table → Blolck → [Field] Expression → [Column] → population → [Operation] → Divide/ → Function → Area → Ok. Editing Choropleth Map Select the choropleth map → select the layer control → click → style → change the colour → Range change → Ok. (Fig. 3.12) * Buffer creation: i) Rail Buffer ii) Road Buffer iii) River Buffer iv) Point Buffer * Select table → buffer → select rail/ road/ river/ point → Next → Add to current mapper (9) → Open New Mapper off ☒→ Create → width → [100] → Unit → Meter/ Km → create → File name: Rail Buffer / Road buffer etc. (which one you want to prepare) → Save → one buffer of all objects/or one buffer for each object → Ok. z Editing buffer → Road buffer from layer ☒→ click → change the colour in foreground → Ok. (Fig. 3.14) Similarly Dot and sphere maps can also be prepared (Fig. 3.13) * Heading: Cursor location → editable on → [A] text → Select → Click on map where you want to write heading. z Editing :–Double click on the already written heading → change the colour → font size etc. → Ok. * North Line: → Select North Arrow [N] → click on map (where you want to draw the arrow) → Ok. * Scale : Map → create scale bar → Next → Unit [Cm] → [Km] → Finish. * Map does not display on screen (If the case arises, then follow the procedure):- Map → view entire layer → Haora Map → Map will display on screen. * Legend: Map → create legend → Finish → Minimize it beside the map display * Distance measurement: i) Straight line distance:- select line → Draw the straight line between two points → then double click on the drawn line → Note the total length → Ok. ii) Actual distance: select polyline → Draw the polyline connection along the road between two points then double click on the drawn line → Note the total length → Ok. * Latitude / Longitude determination:– * Open digitized map → Click on zoom (At the lower left corner) → Cursor location → Plot the mouse on particular point. → Note the longitude and latidue value.

106 [Items Taught] 1. Raster image 2. Vector image 3. Registration 4. Projection 5. Digitization—Point (Hospital/ School/ Temple) — Line (Rail/ Road/ River) — Polygon (Area/ Block) 6. Editing the digitized items 7. Heading 8. North Arrow 9. Scale 10. Distance Measurement 11. Length Measurement 12. Latitude/ Longitude determination. 13. Name writing 14. Save table 15. Buffer creation (Line/ Point) (Rail/ Road/ River) 16. Save 17. Save workshop (Question No.) 18. Use of snap tool 19. Use of info tool 20. Data attachment 21. Thematic Map Preparation —Bar Graph —Pie Graph —Choropleth Map. 22. Editing —Editing (style/ colour) —Thematic (Height/ Width/ Colour/ Size) 23. Creation of Legend 23. Deleting wrong digitization Major Questions of Map Info Software 1. Register the given map (Hooghly Map). 2. Digitize the railway line of the registered map. 3. Digitize the highway road of the registered map. 4. Digitize the river network of the registered map. 5. Make a rail buffer of 500 meters. 6. Digitize four/five/six/seven blocks of the registered map. 7. Attach the data in the digitized block of the given map. 8. Prepare suitable thematic map using the attached/ input data file. 9. Prepare a choropleth map to show the population density of the given map. 10. Prepare a pie chart bar graph to represent the given data.

107 3.6 Summary The basic concept of Geographic Information System is to record, store, and analyse information about the features that make up the earth's surface. To start with any GIS project, Georeferencing is necessary, so that the available raster format is converted into real world coordinate system. In the next step line, point and area features are to be digitized in line, point and polygon modes. Attribute data need to be attached to the data base for overlay analysis as well as query purposes. A neatly prepared thematic map with proper layout and annotation helps the viewer to visualize the available geographical information concerning a particular part of the world. Exercises 1. Distinguish between raster and vector data format with illustration. 2. Georeference the raster image of Hooghly District with Mapinfo software. 3. Prepare separate layers for road network, block head quarters and block boundries of Hooghly District using Mapinfo software. 4. Create a buffer along Damodar River (800 metre) flowing within Hooghly District. Selected Readings Burrough, P.A., Principles of Geographical Information Systems for Land Resources Assessment, Clarendon Press, Oxford, 1986 de By Rolf, A. ed. Principles of Geographic Information Systems, International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede, 2000 Heywood, Ian, et al., An Introduction to Geographical Information System, Second Indian Reprint, Pearson Education, Delhi, 2001 Kraak, Menno-Jan & Ormeling Ferjan, Cartography, Visualization of Geospatial Data, First Indian Reprint, Pearson Education, Delhi, 2004 Eillesand, T.M., et al., Remote Sensing and Image Interpretation, Fifth Edition, Wiley, New York, 2004 Pal, D.K., Proceedings on Remote Sensing & Geographic Information System ~ Principle & Applications, Vidyasagar University, Medinipur, 2004 Sarkar, Ashis, Practical Geography : Systemic Approach, Orient Longman Private Eimited, Kolkata, 2008 Sarkar, Asit Kumar, Study Material: M.A. Geography: Paper-IX, Part-II, Module-18, Geographical Information System and Remote Sensing, Directorate of Distance Education, Rabindra Bharati University, Kolkata, 2014

108 NOTE

Hit and source - focused comparison, Side by Side

Submitted text	As student entered the text in the submitted document.
Matching text	As the text appears in the source.

1/60	**SUBMITTED TEXT**	22 WORDS	**67%**	**MATCHING TEXT**	22 WORDS

All rights reserved. No Part of this Book may be reproduced in any form without permission in writing from Netaji Subhas Open University.

SA MGEOS-23 Remote Sensing_ALL Unit.pdf (D137281283)

2/60 **SUBMITTED TEXT** 36 WORDS **100%** **MATCHING TEXT** 36 WORDS

Remote sensing is the science and art of obtaining information about an object, area or phenomenon through the analysis of data acquired by a device that is not in contact with the object, area or phenomenon under investigation.

SA MGEOS-23 Remote Sensing_ALL Unit.pdf (D137281283)

3/60 **SUBMITTED TEXT** 12 WORDS **87%** **MATCHING TEXT** 12 WORDS

The advantage of this projection is that the distances, angles and areas

The advantage of this projection is that the distances, angles or areas

W https://ncert.nic.in/textbook/pdf/kegy306.pdf

4/60 **SUBMITTED TEXT** 10 WORDS **100%** **MATCHING TEXT** 10 WORDS

plane are independent of the elevation differences of the objects. (

plane are independent of the elevation differences of the objects.

W https://ncert.nic.in/textbook/pdf/kegy306.pdf

5/60 **SUBMITTED TEXT** 18 WORDS **72%** **MATCHING TEXT** 18 WORDS

of central projection, the projecting rays Aa, Bb, Cc pass through one point O, called the Projection Centre

of Central Projection. The projecting rays Aa, Bb and Cc pass through a common point O, which is called the perspective Centre.

W https://ncert.nic.in/textbook/pdf/kegy306.pdf

6/60 **SUBMITTED TEXT** 71 WORDS **45%** **MATCHING TEXT** 71 WORDS

it is necessary to understand what projection means in terms of geometry. In the example given below the triangle ABC and the line (LL 1) on which the projection is made are in the same plane. (a) Parallel Projection: In this projection, the projecting rays are parallel (Figure 1.7a). The triangle ABC is projected on the line LL 1 . The projection of the triangle is 'abc'. The projecting rays Aa, Bb, Cc, are all parallel

SA GIS 502.pdf (D125058113)

7/60	SUBMITTED TEXT	29 WORDS	57%	MATCHING TEXT	29 WORDS

the projecting rays are all perpendicular to the line LL 1 (Figure 1.7b). This is a special case of parallel projection. Map is an orthogonal projection of the ground

SA GIS 502.pdf (D125058113)

8/60	SUBMITTED TEXT	26 WORDS	70%	MATCHING TEXT	26 WORDS

Optical or photographic deficiencies, i.e. lens distortion and aberration, relief variation of the object photographed and tilt of the camera axis at the moment of exposure. (a) Lens distortion:

SA GIS 502.pdf (D125058113)

9/60	SUBMITTED TEXT	23 WORDS	100%	MATCHING TEXT	23 WORDS

distortion. All images are susceptible to geometric distortions caused by variations in platform stability including changes in their speed, altitude, and attitude (angular orientation

SA MGEOS-23 Remote Sensing_ALL Unit.pdf (D137281283)

10/60	SUBMITTED TEXT	9 WORDS	100%	MATCHING TEXT	9 WORDS

in a harmonic, sinusoidal fashion at the velocity of light.

SA GIS 502.pdf (D125058113)

11/60	SUBMITTED TEXT	37 WORDS	100%	MATCHING TEXT	37 WORDS

remote sensing is the science and art of obtaining information about an object, area or phenomenon through the analysis of data acquired by a device that is not in contact with the object, area or phenomenon under investigation.

SA MGEOS-23 Remote Sensing_ALL Unit.pdf (D137281283)

12/60 **SUBMITTED TEXT** 14 WORDS **75%** **MATCHING TEXT** 14 WORDS

Molecules and other tiny particles which are smaller in dimension than the wavelength of

SA MGEOS-23 Remote Sensing_ALL Unit.pdf (D137281283)

13/60 **SUBMITTED TEXT** 155 WORDS **93%** **MATCHING TEXT** 155 WORDS

of remote sensing platforms: ground based, air borne and space borne. Ground based — A wide variety of ground based platforms are used in remote sensing. Some of the more common ones are hand held devices, tripods, towers and cranes. Instruments that are ground-based are often used to measure the quantity and quality of light coming from the sun or for close range characterization of objects. For 40 example, to study properties of a single plant or a small patch of grass, it would make sense to use a ground based instrument. Laboratory instruments are used almost exclusively for research, sensor calibration, and quality control. Much of what is learned from laboratory work is used to understand how remote sensing can be better utilized to identify different materials. This contributes to the development of new sensors that improve on existing technologies. Field instruments are also largely used for research purposes. This type of remote sensing instrument is often hand-held or mounted on a tripod or other similar support.

SA GIS 502.pdf (D125058113)

14/60 **SUBMITTED TEXT** 39 WORDS **96%** **MATCHING TEXT** 39 WORDS

The platform on which a particular sensor is housed determines a number of attributes, which may dictate the use of particular sensors. These attributes include: distance the sensor is from the object of interest, periodicity of image acquisition, timing of image acquisition,

SA GIS 502.pdf (D125058113)

15/60 **SUBMITTED TEXT** 72 WORDS **100%** **MATCHING TEXT** 72 WORDS

Permanent ground platforms are typically used for monitoring atmospheric phenomenon although they are also used for long-term monitoring of terrestrial features. Towers and cranes are often used to support research projects where a reasonably stable, long-term platform is necessary. Towers can be built on site and can be tall enough to project through a forest canopy so that a range of measurements can be taken from the forest floor, through the canopy and from above the canopy.

SA GIS 502.pdf (D125058113)

16/60 **SUBMITTED TEXT** 74 WORDS **98%** **MATCHING TEXT** 74 WORDS

Airborne platforms were the sole non-ground-based platforms for early remote sensing work. The first aerial images were acquired with a camera carried aloft by a balloon in 1859. Balloons are rarely used today because they are not very stable and the course of flight is not always predictable, although small balloons carrying expendable probes are still used for some meteorological research. At present, airplanes are the most common airborne platform. Nearly the whole spectrum of civilian and military aircraft

SA GIS 502.pdf (D125058113)

17/60 **SUBMITTED TEXT** 60 WORDS **100%** **MATCHING TEXT** 60 WORDS

The most stable platform aloft is a satellite, which is space borne. The first remote sensing satellite was launched in 1960 for meteorology purposes. Now, over a hundred remote sensing satellites have been launched and more are being launched every year. The Space Shuttle is a unique spacecraft that functions as a remote sensing satellite and can be reused for a number of missions.

SA GIS 502.pdf (D125058113)

18/60 **SUBMITTED TEXT** 40 WORDS **100%** **MATCHING TEXT** 40 WORDS

used for remote sensing applications. When altitude and stability requirements for a sensor are not too demanding, simple, low-cost aircraft can be used as platforms. However, as requirements for greater instrument stability or higher altitudes become necessary, more sophisticated aircraft must be used.

SA GIS 502.pdf (D125058113)

19/60 **SUBMITTED TEXT** 35 WORDS **100%** **MATCHING TEXT** 35 WORDS

The payload for remote sensing satellites can include photographic systems, electro- optical sensors, microwave or lidar systems. For applications benefiting from simultaneous coverage by different sensors, more than one sensing system can be mounted on a single satellite.

SA GIS 502.pdf (D125058113)

20/60 **SUBMITTED TEXT** 52 WORDS **100%** **MATCHING TEXT** 52 WORDS

There are several broad categories of basic sensor system types such as passive vs. active, and imaging vs. non imaging. Passive vs. active refers to the illumination source of the system; imaging vs. Non imaging refers to the form of the data. A variety of different sensors fit in these categories, which are not mutually exclusive.

SA GIS 502.pdf (D125058113)

21/60 **SUBMITTED TEXT** 29 WORDS **100%** **MATCHING TEXT** 29 WORDS

Passive sensors measure light reflected or emitted naturally from surfaces and objects. Such instruments merely observe, and depend primarily on solar energy as the ultimate radiation source illuminating surfaces and objects.

SA GIS 502.pdf (D125058113)

22/60	SUBMITTED TEXT	31 WORDS	100%	MATCHING TEXT	31 WORDS

Active sensors (such as radar and lidar systems) first emit energy (supplied by their own energy source) and then measure the return of that energy after it has interacted with a surface.

SA GIS 502.pdf (D125058113)

23/60	SUBMITTED TEXT	44 WORDS	100%	MATCHING TEXT	44 WORDS

Use of data collected by passive sensors often requires accurate measurements of solar radiation reaching the surface at the time the observations were made. This information allows for the correction of "atmospheric effects" and results in data or images that are more representative of actual surface characteristics.

SA GIS 502.pdf (D125058113)

24/60	SUBMITTED TEXT	165 WORDS	98%	MATCHING TEXT	165 WORDS

Passive sensors are the most common sensor type for vegetation related remote sensing. This is not only because passive sensor systems are generally simpler in design (built only to receive energy) but also because portions of the solar spectrum provide very useful information for monitoring plant and canopy properties. A major limitation of passive systems is that in most cases they require sunlight in order for valid and useful data to be acquired. Consequently, deployment of or data acquisition by passive sensors is very dependent on lighting (time of day, time of year, latitude) and weather conditions, since cloud cover can interfere with the path of solar 43 radiation from the sun to the surface and then to the sensor. The signals detected by passive sensors can be greatly altered due to atmospheric effects, especially in the shorter wavelengths of the solar spectrum that are strongly scattered by the atmosphere. These effects can be minimized (but not eliminated) by collecting data only under very clear and dry atmospheric conditions. Sophisticated atmospheric correction routines now exist to remove

SA GIS 502.pdf (D125058113)

25/60 **SUBMITTED TEXT** 141 WORDS **99%** **MATCHING TEXT** 141 WORDS

Active systems supply their own illumination energy which can be controlled. Some advantages active systems have over passive sensors are they do not require solar illumination of surfaces or perfect weather conditions to collect useful data. Consequently they can be deployed at night or in conditions of haze, clouds, or light rain (depending on the wavelength of the system). Radar — Radar (radio detection and ranging) systems use microwaves (wavelengths ranging from 1 millimeter to 1 meter). Microwave pulses are transmitted at a target or surface, and the timing and intensity of the return signal is recorded. Transmission characteristics of radar depend on the wavelength and polarization of the energy pulse. Common wavelength bands used in pulse transmission are K-band (11-16.7 mm), X-band (24-37.5 mm), and L-band (150-300 mm). The use of letter codes to designate the wavelength range for various radar systems originated when radar was being developed during World War II.

SA GIS 502.pdf (D125058113)

26/60 **SUBMITTED TEXT** 52 WORDS **97%** **MATCHING TEXT** 52 WORDS

about the structure and composition of objects and surfaces can be detected with radar. Radar has been used in a number of fields, including geology, snow and ice studies, oceanography, agriculture, and vegetation studies. Radar has been especially useful in areas with nearly constant cloud cover. Lidar — Lidar (light detecting and ranging) systems use

SA GIS 502.pdf (D125058113)

27/60 **SUBMITTED TEXT** 216 WORDS **98%** **MATCHING TEXT** 216 WORDS

The simplest lidar systems measure the round trip travel time of a laser pulse, which is directly related to the distance between the sensor and the target. Basic distance measuring lidars are often referred to as rangefinders or as laser altimeters if deployed on an aircraft or spacecraft. These systems typically measure elevation, slope, and roughness of land, ice. or water surfaces. More advanced lidars measure the received intensity of the backscattered light as a function of travel time. The intensity of the signal provides information about the material that reflected the photons. Such backscatter lidar systems are often used for atmospheric monitoring applications concerned with the detection and characterization of various gases, aerosols and particulates. Lidar methods have recently been adapted to measure tree heights and the vertical distribution of canopy layers with great accuracy and precision. Lidar instruments have flown on the Space Shuttle, and Vegetation Canopy Lidar (VCL) and Ice, Cloud, and land Elevation Satellite (ICESat). 47 Lidar systems can also make fluorescence measurements. Fluorescence refers to the process where a material absorbs radiant energy at one wavelength and then emits it at a different wavelength without first converting the absorbed energy into thermal energy. The wavelengths at which absorption and emission occur are specific to particular molecules. Fluorescence data can identify and quantify the amount of plankton and pollutants in the marine environment. Leaf fluorescence can also help to identify plant species.

SA GIS 502.pdf (D125058113)

28/60 **SUBMITTED TEXT** 50 WORDS **97%** **MATCHING TEXT** 50 WORDS

Satellites can be classified by their orbital geometry and timing. Three orbits commonly used for remote sensing satellites are geostationary, equatorial and Sun synchronous. A geostationary satellite (Figure 1.23) has a period of rotation equal to that of Earth (24 hours) so the satellite always stays over the same location on Earth.

SA GIS 502.pdf (D125058113)

29/60 **SUBMITTED TEXT** 15 WORDS **100%** **MATCHING TEXT** 15 WORDS

Communications and weather satellites often use geostationary orbits with many of them located over the equator.

SA GIS 502.pdf (D125058113)

30/60 **SUBMITTED TEXT** 38 WORDS **92%** **MATCHING TEXT** 38 WORDS

In an equatorial orbit, such a satellite circles Earth at a low inclination (the angle between the orbital plane and the equatorial plane). The Space Shuttle uses an equatorial orbit with an inclination of 57 degrees. Fig.1.23 48 Sun synchronous satellites (

SA GIS 502.pdf (D125058113)

31/60 **SUBMITTED TEXT** 67 WORDS **100%** **MATCHING TEXT** 67 WORDS

have orbits with high inclination angles, passing nearly over the poles. Orbits are timed so that the satellite always passes over the equator at the same local sun time. In this way the satellites maintain the same relative position with the sun for all of its orbits. Many remote sensing satellites are Sun synchronous which ensures repeatable sun illumination conditions during specific seasons. Because a Sun synchronous orbit does not pass

SA GIS 502.pdf (D125058113)

32/60 **SUBMITTED TEXT** 53 WORDS **100%** **MATCHING TEXT** 53 WORDS

directly over the poles, it is not always possible to acquire data for the extreme polar regions. The frequency at which a satellite sensor can acquire data of the entire Earth depends on sensor and orbital characteristics. For most remote sensing satellites the total coverage frequency ranges from twice a day to once every 16 days.

SA GIS 502.pdf (D125058113)

33/60 **SUBMITTED TEXT** 16 WORDS **85%** **MATCHING TEXT** 16 WORDS

The swath of the satellite is 11.3 km at nadir and 13.8 km at 26° off-nadir.

SA 07180462.pdf (D102287107)

34/60 **SUBMITTED TEXT** 23 WORDS **100%** **MATCHING TEXT** 23 WORDS

both urban and rural mapping of natural resources and of natural disasters, tax mapping, agriculture and forestry analysis, mining, engineering, construction and change detection.

SA 07170409.pdf (D102312712)

35/60 **SUBMITTED TEXT** 23 WORDS **98%** **MATCHING TEXT** 23 WORDS

QuickBird's, global collection of panchromatic and multispectral imagery is designed to support applications ranging from map publishing to land asset management to insurance risk assessment.

QuickBird's global collection of panchromatic and multispectral imagery is designed to support applications ranging from map publishing to land and asset management to insurance risk assessment.

W https://remotesensingtechnique.blogspot.com/

36/60 **SUBMITTED TEXT** 20 WORDS **88%** **MATCHING TEXT** 20 WORDS

larger camera of CCD/TDI (Charge Coupled Device/Time Delay Integration), with standard panchromatic resolution of 0.70 metre at an altitude of 500 km.

larger camera of CCD/TDI type (Charge Coupled Device/Time Delay Integration), with standard panchromatic resolution of 0.70 m at an altitude of about 500 km,

W https://remotesensingtechnique.blogspot.com/

37/60 **SUBMITTED TEXT** 14 WORDS **82%** **MATCHING TEXT** 14 WORDS

Return Beam Vidicon (RBV), Multispectral Scanner (MSS), Thematic Mapper (TM), Enhanced Thematic Mapper (ETM),

SA rana-9.docx (D54864731)

38/60 **SUBMITTED TEXT** 30 WORDS **100%** **MATCHING TEXT** 30 WORDS

Another orbital characteristic is altitude. The Space Shuttle has a low orbital altitude of 300 km whereas other common remote sensing satellites typically maintain higher orbits ranging from 600 to 1000 km.

SA GIS 502.pdf (D125058113)

39/60 **SUBMITTED TEXT** 12 WORDS **100%** **MATCHING TEXT** 12 WORDS

It can yield relevant data for nearly all aspects of environmental study.

SA GMT_301_07180464.docx (D102243546)

40/60 **SUBMITTED TEXT** 43 WORDS **93%** **MATCHING TEXT** 43 WORDS

carries two state of the art panchromatic (PAN) cameras that take black and white stereoscopic pictures of the earth in the visible region of the electromagnetic spectrum. The swath covered by the high resolution PAN camera is 30 km and their spatial resolution is 2.5

carries two state-of-the-art Panchromatic (PAN) cameras that take black and white stereoscopic pictures of the earth in the visible region of the electromagnetic spectrum. The swath covered by high resolution PAN cameras is 30 km and their spatial resolution is 2.5

W https://remotesensingtechnique.blogspot.com/

41/60 **SUBMITTED TEXT** 43 WORDS **89%** **MATCHING TEXT** 43 WORDS

IKONOS images have also been produced by SIC for use in the media and motion picture industries, providing aerial views and satellite photos for many areas around the world. Its high resolution data makes an integral contribution to homeland security, coastal monitoring and facilitates 3D Terrain

SA 07170409.pdf (D102312712)

42/60 **SUBMITTED TEXT** 18 WORDS **83%** **MATCHING TEXT** 18 WORDS

the first generation satellites 1RS-1A and 1-B were designed, developed and launched successfully during 1988 and 1991 equipped with

SA Unit-1.doc (D109130277)

43/60 **SUBMITTED TEXT** 22 WORDS **83%** **MATCHING TEXT** 22 WORDS

in three bands, while in mono mode (Mono), the full swath of 70 km can be covered in any one single band,

SA rana-9.docx (D54864731)

44/60 **SUBMITTED TEXT** 24 WORDS **88%** **MATCHING TEXT** 24 WORDS

The data from Cartosat-1 is expected to provide enhanced inputs for large scale mapping applications and stimulate newer applications in the urban and rural development,

SA Unit-1.doc (D109130277)

45/60 **SUBMITTED TEXT** 16 WORDS **71%** **MATCHING TEXT** 16 WORDS

Subsequently the second generation remote sensing resource satellite IRS-IC and 1- D with improved spatial resolutions

SA Unit-1.doc (D109130277)

46/60 **SUBMITTED TEXT** 33 WORDS **95%** **MATCHING TEXT** 33 WORDS

The data from the satellite can be used for detailed mapping and other cartographic applications at cadastral level, urban and rural infrastructure development and management, as well as applications in Land Information System (LIS) and 9

SA Unit-1.doc (D109130277)

47/60 **SUBMITTED TEXT** 14 WORDS **100%** **MATCHING TEXT** 14 WORDS

is an advanced remote sensing satellite capable of providing scene specific spot imagery. The

SA Unit-1.doc (D109130277)

48/60 **SUBMITTED TEXT** 26 WORDS **100%** **MATCHING TEXT** 26 WORDS

in an image is dependent on the spatial resolution of the sensor and refers to the size of the smallest possible feature that can be detected.

SA rana-9.docx (D54864731)

49/60 **SUBMITTED TEXT** 12 WORDS **92%** **MATCHING TEXT** 12 WORDS

Images where only large features are visible are said to have low resolution,

Images where only large features are visible are said to have coarse or low resolution.

W https://remotesensingtechnique.blogspot.com/

50/60 **SUBMITTED TEXT** 17 WORDS **100%** **MATCHING TEXT** 17 WORDS

sensors ability to image (record) closely 62 spaced objects so that they are distinguishable as separate objects.

SA rana-9.docx (D54864731)

51/60 **SUBMITTED TEXT** 12 WORDS **92%** **MATCHING TEXT** 12 WORDS

Images where only large features are visible are said to have low resolution.

Images where only large features are visible are said to have coarse or low resolution.

W https://remotesensingtechnique.blogspot.com/

52/60 **SUBMITTED TEXT** 12 WORDS **95%** **MATCHING TEXT** 12 WORDS

is dependent on the Instantaneous Field of View (IFOV) of the sensor (

SA GIS 502.pdf (D125058113)

53/60	SUBMITTED TEXT	42 WORDS	62%	MATCHING TEXT	42 WORDS

the angular cone of the sensor (A), which determines the area on the surface of the earth as viewed from a given altitude (B). The size of the field recorded is determined by multiplying the IFOV by the distance from the ground to the sensor (

SA rana-9.docx (D54864731)

54/60	SUBMITTED TEXT	26 WORDS	100%	MATCHING TEXT	26 WORDS

Spectral Resolution: Spectral resolution describes the ability of a sensor to define fine wavelength intervals. The finer the spectral resolution, the narrower the wavelength ranges for a particular channel or band.

spectral resolution. Spectral resolution describes the ability of a sensor to define fine wavelength intervals. The finer the spectral resolution, the narrower the wavelength ranges for a particular channel or band.

W https://remotesensingtechnique.blogspot.com/

55/60 **SUBMITTED TEXT** 225 WORDS **100%** **MATCHING TEXT** 225 WORDS

Radiometric Resolution: While the arrangement of pixels describes the spatial structure of an image, the radiometric characteristics describe the actual information content in an image. Every time an image is acquired on film or by a sensor, its sensitivity to the magnitude of the electromagnetic energy determines the radiometric resolution. The radiometric resolution of an imaging system describes its ability to discriminate very slight differences in energy. The finer the radiometric resolution of a sensor, the more sensitive it is to detecting small differences in reflected or emitted energy. Imagery data are represented by positive digital numbers which vary from 0 to (one less than) a selected power of 2. This range corresponds to the number of bits used for coding numbers in binary format. Each bit records an exponent of power 2 (e.g. 1 bit=2 1 =2). The maximum number of brightness levels available depends on the number of bits used in representing the energy recorded. Thus, if a sensor used 8 bits to record the data, there would be 2 8 =256 digital values available, ranging from 0 to 255. However, if only 4 bits were used, then only 2 4 =16 values ranging from 0 to 15 would be available. Thus, the radiometric resolution would be much less. Image data are generally displayed in a range of grey tones, with black representing a digital number of 0 and white representing the maximum value (for example,

Radiometric Resolution While the arrangement of pixels describes the spatial structure of an image, the radiometric Characteristics describe the actual information content in an image. Every time an image is acquired on film or by a sensor, its sensitivity to the magnitude of the electromagnetic energy determines the radiometric resolution. The radiometric resolution of an imaging system describes its ability to discriminate very slight differences in energy The finer the radiometric resolution of a sensor, the more sensitive it is to detecting small differences in reflected or emitted energy. Imagery data are represented by positive digital numbers which vary from 0 to (one less than) a selected power of 2. This range corresponds to the number of bits used for coding numbers in binary format. Each bit records an exponent of power 2 (e.g. 1 bit=2 1=2). The maximum number of brightness levels available depends on the number of bits used in representing the energy recorded. Thus, if a sensor used 8 bits to record the data, there would be 28=256 digital values available, ranging from 0 to 255. However, if only 4 bits were used, then only 24=16 values ranging from 0 to 15 would be available. Thus, the radiometric resolution would be much less. Image data are generally displayed in a range of grey tones, with black representing a digital number of 0 and white representing the maximum value (for example, 255

W https://remotesensingtechnique.blogspot.com/

56/60 **SUBMITTED TEXT** 58 WORDS **100%** **MATCHING TEXT** 58 WORDS

revisit period, which refers to the length of time it takes for a satellite to complete one entire orbit cycle. The revisit period of a satellite sensor is usually several days. Therefore the absolute temporal resolution of a remote sensing system to image the exact same area at the same viewing angle a second time is equal to this period. 64

revisit period, which refers to the length of time it takes for a satellite to complete one entire orbit cycle. The revisit period of a satellite sensor is usually several days. Therefore the absolute temporal resolution of a remote sensing system to image the exact same area at the same viewing angle a second time is equal to this period.

W https://remotesensingtechnique.blogspot.com/

57/60	SUBMITTED TEXT	22 WORDS	100%	MATCHING TEXT	22 WORDS

The actual temporal resolution of a sensor depends on a variety of factors, including the satellite/sensor capabilities, the swath overlap, and latitude,

the actual temporal resolution of a sensor depends on a variety of factors, including the satellite/sensor capabilities, the swath overlap, and latitude.

W https://remotesensingtechnique.blogspot.com/

58/60	SUBMITTED TEXT	27 WORDS	100%	MATCHING TEXT	27 WORDS

high resolution images, small objects can be detected. Military sensors for example, are designed to view as much detail as possible, and therefore have very fine resolution. Commercial satellites provide imagery with

SA rana-9.docx (D54864731)

59/60	SUBMITTED TEXT	21 WORDS	87%	MATCHING TEXT	21 WORDS

the data must be converted into a suitable digital format. The process of converting data from paper map into computer files is called

the data must be converted into a suitable digital format. The process of converting data from paper maps or aerial photographs into computer files is called

W https://remotesensingtechnique.blogspot.com/

60/60	SUBMITTED TEXT	18 WORDS	90%	MATCHING TEXT	18 WORDS

varying from a few metres to several kilometers. Generally the finer the resolution, the less total ground area can be seen.

SA rana-9.docx (D54864731)

Ouriginal by Turnitin

Document Information

Analyzed document	PGGR-04_G-B.pdf (D165448858)
Submitted	4/29/2023 11:48:00 AM
Submitted by	Library NSOU
Submitter email	dylibrarian.plagchek@wbnsou.ac.in
Similarity	0%
Analysis address	dylibrarian.plagchek.wbnsou@analysis.urkund.com

Sources included in the report

Entire Document

PREFACE In the curricular structure introduced by this University for students of Post-Graduate degree programme, the opportunity to pursue Post-Graduate course in any subject introduced by this University is equally available to all learners.

Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely

in keeping with the objectives of open education which does not believe in artificial differentiation.

Keeping this in view, the study materials of the Post-Graduate level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis.

The accepted methodology of distance education has been followed in the preparation of these study materials. Co-operation in every form of experienced scholars is indispensable for a work of this kind.

We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing, and devising of

a

proper lay-out of the materials. Practically speaking, their role amounts to an involvement in 'invisible teaching'.

For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other.

The more a learner would seriously pursue these study materials, the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self-learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University. Needless to add, a great deal of these efforts is still experimental—in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned.

Professor (Dr.) Subha Sankar Sarkar Vice-Chancellor

Printed in accordance with the regulations

and financial assistance
of the Distance Education
Bureau of the University Grants Commission.
Second Reprint : June, 2017
POST GRADUATE : GEOGRAPHY [M. Sc] Paper : PGGR-04 Group : B Writer :
Prof. Ashis Sarkar

Mohan Kumar Chattopadhya Registrar
PGGR–04 Qunatitative Techniques Netaji Subhas Open University
Group B
Unit 1 ❑
Point Pattern Analysis 7–14 ● Mean Centre of Population ● Nearest Neighbour Analysis Unit 2 ❑ Line Pattern Analysis 15–25 ● Measures of Connectivity (alpha, beta and gamma index) ● Measures of accessibility from a point (de Tour Index) Unit 3 ❑ Areal Pattern Analysis 26–42 ❑ Measures of Specialisation ● Dominant and Distinctive Analysis ● Indices of Specialisation—Location Quotient ❑ Pattern of Regional Inequality ● Lorenz Curve and Gini's Coefficient ● Z-score values Unit 4 ❑ Hierarchy Analysis 43–50 ● Rank-size Distribution of Towns ● Dominant and Distinctive Analysis
7
8
9 PGGR (P-4 Gr-B)—2
10
12
13 PGGR (P-4 Gr-B)—4
14
16
v e =β v e =β
e 3(v - 2) γ =)2 (3 3 – = v γ
23 PGGR (P-4 Gr-B)—8
24
β
26
27 PGGR (
P-4 Gr-B)—10
28
30
31 PGGR (P-4 Gr-B)—12
32
33
34
36
37 PGGR (P-4 Gr-B)—14
38
40
41 PGGR (P-4 Gr-B)—16
42
45 PGGR (P-4 Gr-B)—18
46
48
49 PGGR (P-4 Gr-B)—20
50
51 PGGR (P-4 Gr-B)—21

52
50 0 50 100 km N
54
57 PGGR (P-4 Gr-B)—24
58
59 PGGR (P-4 Gr-B)—25
60
F - 26
63 PGGR (P-4 Gr-B)—27
64

Hit and source - focused comparison, Side by Side

Submitted text	As student entered the text in the submitted document.
Matching text	As the text appears in the source.

Ouriginal by Turnitin

Document Information

Analyzed document	PGGR-05_G-A-B.pdf (D165449296)
Submitted	2023-04-29 12:01:00
Submitted by	Library NSOU
Submitter email	dylibrarian.plagchek@wbnsou.ac.in
Similarity	0%
Analysis address	dylibrarian.plagchek.wbnsou@analysis.urkund.com

Sources included in the report

Entire Document

1 PREFACE In the curricular structure introduced by this University for students of Post-graduate degree programme, the opportunity to pursue Post-graduate course in subjects introduced by this University is equally available to all learners. Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely in keeping with the objectives of open education which does not believe in artificial differentiation. Keeping this in view, study materials of the Post-graduate level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis. The accepted methodology of distance education has been followed in the preparation of these study materials. Co-operation in every form of experienced scholars is indispensable for a work of this kind. We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing and devising of a proper lay-out of the materials. Practically speaking, their role amounts to an involvement in invisible teaching. For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other. The more a learner would seriously pursue these study materials, the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self- learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University. Needless to add, a great deal of these efforts is still experimental—in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation, the more they receive serious attention of all concerned. Professor (Dr.) Subha Sankar Sarkar Vice-Chancellor

2 Printed in accordance with the regulations and financial assistance of the Distance Education Bureau of the University Grants Commission. Second Reprint : June, 2016

3 POST-GRADUATE GEOGRAPHY [M. Sc] Paper : Groups PGGR : 05 : A & B Course Writing Dr. Asit Kumar Sarkar Notification All rights reserved. No Part of this study material may be reproduced in any form without permission in writing from Netaji Subhas Open University. Dr. Ashit Baran Aich Registrar (Actg.)

5 Group A Unit 1 ‰‰‰‰‰ Concept of Thematic Mapping 7-9 Unit 2 ‰‰‰‰‰ Land Use Map 10-15 Unit 3 ‰‰‰‰‰ Density Map (Choropleth Method) on Basin Drainage Morphology 16-17 Unit 4 ‰‰‰‰‰ Trend Surface Map (Isopleth Method) 18-19 Unit 5 ‰‰‰‰‰ Environmental Mapping (Hazard and Pollution) 20-26 Group B Unit 6 ‰‰‰‰‰ Map Interpretation and Field Techniques 29 Unit 7 ‰‰‰‰‰ Interpretation of Topographical Sheets 30-34 Unit 8 ‰‰‰‰‰ Interpretation of Aerial Photograph 35-41 Unit 9 ‰‰‰‰‰ Interpretation of Satellite Imagery 42-46 Unit 10 ‰‰‰‰‰ Preparation of Questionnaire Schedule 47-50 NETAJI SUBHAS OPEN UNIVERSITY PGGR-05 Preparation of Thematic Maps & Map Interpretation and Field Techniques

7 UNIT 1 ‰‰‰‰‰ CONCEPT OF THEMATIC MAPPING Structure 1.0 Concept of Thematic Mapping 1.1 Uses of Thematic Maps 1.2 Displaying Data 1.3 Methods of Thematic Mapping 1.3.1 Chorochromatic Maps 1.3.2 Choropleth Maps 1.3.3 Isopleth Maps 1.3.4 Dot Maps, Proportionate Symbols, Pic Graphs, Bar Graphs 1.0 Concept of Thematic Mapping A map may be defined as a two dimensional scale model of a part of the surface of the Earth. It is actually transformation of the three dimensional globe on two dimensional plane. Broadly speaking, there are two types of maps: topographical maps and thematic maps. A thematic map (also called a statistical or special purpose map) displays the spatial pattern of a theme or series of attributes. In contrast to topographical maps or reference maps which show many geographic features (e.g. settlement features, natural vegetation, communication network, administrative boundaries, etc.), thematic maps emphasize spatial variation of one or a small number of geographic distributions. These distributions may be physical phenomena such as climate or human characteristics such as population density and health issues. These types of maps are sometimes referred to as graphic essays that portray spatial variations and interrelationships of geographical distributions. Location, of course, is also important to provide a reference base of where selected phenomena are occurring. Thus, a thematic map is a map showing qualitative and / or quantitative information on specific features, concepts or subjects in relation to the necessary topographical details.

8 1.1 Uses of Thematic Maps Thematic maps serve three primary purposes. First, they provide specific information about particular locations. Second, they provide general information about spatial patterns. Third, they can be used to compare patterns on two or more maps. 1.2 Displaying Data In constructing any type of thematic map (or any map for that matter) it is understood that location is a key feature. After selecting the physical area to examine, the next step is collecting data sets. Data dealing with one subject is called univariate, which examines occurrences of a single type of event. The distribution of population, tuberculasis rates, and rainfall are all examples of univariate data. Bivariate mapping shows the distribution of two sets of data to explore possibilities of con-elations. For example, we can examine population density in relation to textile manufacturing. Other examples could be tuberculasis rates and population density, or rainfall and elevation. More than two sets of data leads to multivariate mapping. Taking three or more data sets and displaying the result on a map helps to determine possible con-elations between different phenomena. For instance, our bivariate example maps two data sets, rainfall and elevation. If we add another variable such as population density, our map becomes multivariate rather than bivariate. Map makers must be careful in designing thematic maps that display too much information or suggest phenomenon have a con-elation when in fact they do not. 1.3 Methods of Thematic Mapping Geographers use many methods to create thematic maps, but the following techniques are generally in use. 1.3.1 Chorochromatic Maps In this technology different colour tints are used to distinguish one feature from another. This type of maps are also known as colour patch maps. They are widely used to depict features like different categories of land utilization units, soil type, rock formation, etc. These maps basically represent qualitative information. Although

9 there is no universal colour code, but some conventional colour scheme is maintained. For example blue colour represents waterbody, green is used to depict vegetative cover, yellow indicated arable land, etc. 1.3.2 Choropleth Maps In case of choropleth maps, different colour tints or shadings are used to show area density or intensity patterns belonging to certain administrative unit or boundary. Thus they represent unit wise quantitative information. Density of population per sq. kilometre, percentage of land under cultivation, yield per acre of arable land, etc. are some of the common maps prepared by using choropleth technique. 1.3.3 Isopleth Maps Isopleth means a line on a map joining places with same value for certain element. This is the collective term for the various types of lines representing specific values that are drawn on a map. They are considered as quantitative areal maps where lines of equal values indicate the quantity. Familiar examples of isopleths are isobars, isohyets, isotherms, etc. 1.3.4 Dot Maps, Proportionate Symbols, Pie Graphs, Bar Graphs To portray statistical information in graphical forms, geographers use charts and diagrams inside or outside the body of the map. Population distribution, crop acreage, etc. may be visualized in a better way if they are represented in terms of dot maps. Two dimensional or even three dimensional population phenomena may be represented with the help of proportionate circles or spheres. Proportionate circles may further be used to construct pie diagrams showing information like different categories of land utilization or livelihood pattern. Various types of bar graphs may represent single or multiple information. All these types of graphs and charts are considered as integral part of maps depicting thematic information.

10 UNIT 2 ‰‰‰‰‰ LAND USE MAP (CHOROCHROMATIC METHOD) Structure 2.1 Introduction 2.2 Table showing land utilization 2.3 Interpretation 2.1 Introduction Various techniques may be adapted for preparation of land use maps, the most common technique being chorochromatic method. Actually land use classification means the classification of land according to the use to which it is put. In the UK, the First Land Utilization Survey, carried out in the 1930s by L.D. Stamp, identified six areas of land use - arable, health and rough pasture, orchards and nurseries, meadowland, forest and woodland, and urban areas. Land use maps may be prepared either for rural areas or urban areas. Very often plot wise data on land utilization are collected at grass root level in due course of field work. In case of land use map for rural areas, the base map is the cadastral map collected from the settlement office, whereas in case of urban areas the ward map may be collected from the municipality itself. It is advised that at the time of field survey abbreviations are marked on the field map for each plot, e.g. 'W' for water body, 'A' for arable land, 'V' for vegetative cover, 'RI' for road, 'RF for railway line, etc. Ultimately a colour scheme is to be developed for depicting information related to different types of land utilization for representation of the field data on the neatly drawn final map, which contains appropriate labels and also a legend. This type of land use maps are very important to understand the existing condition of the land use pattern. Based on such maps, future plans and programmes may be prepared for the area under investigation.

11 2.2 Table showing land utilization Table 1 : Plot wise land use pattern of Aminpur Mouza (part) Plot Land Utilization Plot Land Utilization No. No. 1 Partly settlement; partly 51 Vegetable growing land plantations, etc. 2 Settlement 52 Vegetable growing land 3 Settlement 53 Vegetable growing land 4 Bamboo grove, plantation, etc. 54 Vegetable growing land 5 Fallow land 55 Vegetable growing land 6 Bamboo grove, plantation, etc. 56 Vegetable growing land 7 Bamboo grove, plantation, etc. 57 Vegetable growing land 8 Bamboo grove, plantation, etc. 58 Partly Veg. land, Partly Sett. 9 Bamboo grove, plantation, etc. 59 Vegetable growing land 10 Vegetable growing land 60 Vegetable growing land 11 Bamboo grove, plantation, etc. 61 Water body 12 Vegetable growing land 62 Vegetable growing land 13 Vegetable growing land 63 Vegetable growing land 14 Vegetable growing land 64 Water body 15 Bamboo grove, plantation, etc. 65 Vegetable growing land 16 Water body 66 Play ground 17 Water body 67 Partly Fallow, Partly Temple 18 Fallow land 68 Water body 19 Bamboo grove, plantation, etc. 69 Water body 20 Bamboo grove, plantation, etc. 70 Vegetable growing land 21 Bamboo grove, plantation, etc .. 71 Vegetable growing land 22 Partly settlement; partly temple 72 Settlement (part), veg. land (part) 23 Settlement 73 Primary school 24 Water body 74 Bamboo grove, plantation, etc.

12 Plot Land Utilization Plot Land Utilization No. No. 25 Veg. growing land (part), 75 Water body Fallow(part) 26 Fallow land 76 Vegetable growing land 27 Vegetable growing land 77 Settlement 28 Vegetable growing land 78 Vegetable growing land 29 Vegetable growing land 79 Vegetable growing land 30 Vegetable growing land 80 Settlement 31 Bamboo grove, plantation, etc. 81 Settlement 32 Vegetable growing land 82 Settlement 33 Settlement 83 Settlement 34 Settlement 84 Settlement 35 Settlement 85 Settlement 36 Settlement 86 Settlement 37 Settlement 87 Settlement 38 Settlement 88 Vegetable growing land 39 Water body 89 Vegetable growing land 40 Vegetable growing land 90 Vegetable growing land 41 Fallow land 91 Vegetable growing land 42 Vegetable growing land 92 Vegetable growing land 43 Vegetable growing land 93 Vegetable growing land 44 Water body 217 Settlement (part) veg. land (part) 45 Settlement 377 Vegetable growing land 46 Settlement 373 Settlement 47 Settlement 378 Bamboo grove, plantation, etc. 48 Settlement 398 Vegetable growing land 49 Water body 403 Plantation, etc. 50 Vegetable growing land 448 Vegetable growing land

13 2.3 Interpretation Mouza : Aminpur J. L.No. : 71 Thana : Haripal Block : Haripal District : Hoogli A land use map for Aminpur Mouza has been prepared on the basis of plot wise data collected from the field. The total mouza is much bigger, and only a part of it has been mapped for our present exercise (Fig. 1). It is a typical rural area, where Fig. 1. Base Map : Aminpur Mousa (Part)

15 shuna land is comparatively upland in character. This is a typical vegetable growing land, where apart from different types of vegetable crops, potato, jute, etc. are also grown in plenty. The northern most part is predominately orchard and plantation area. This category of land is also found scattered in other parts within the mapped area. Bamboo groves are also found in these areas. High land areas are the homestead or bastu lands, where settlements have been developed. Almost at the center of the mapped area a big sized pond exists, which is used for domestic purposes by the villagers. It is paved all around. Otherwise small and shallow water bodies, known as doba are scattered at different places. A canal flows along the eastern part of the mouza, which irrigates agricultural lands. Other water bodies scattered at different parts are also used for irrigation purpose. Adjacent to the playground the famous than (temple) of Lord Panchanan exists, which attracts devotees even from far away places. Another Shih temple has been established nearby. Most of the lands of the mouza are well-utilized, excepting a few fallow land areas. The only metalled road runs along the western most part of the mouza. On the other hand, to the eastern part the un-metalled road runs partly parallel to the canal. Otherwith footpaths along the aal (parceling of land) and brick roads are the only means of communication system within the area under study (Fig. 2). To conclude, the area under investigation is agriculturally prosperous, where variety of crops are grown. Agriculturally it is surplus area, and after meeting domestic demand, the excess amount is sold away for outside requirement.

17 For this purpose, at the very beginning the particular topographical sheet(s) should be carefully examined for demarcating the particular basin under investigation (Fig. 3). The demarcated river basin is to be divided into equally spaces square grids, say 2 km. x 2 km. Then the drainage density for each grid is to be calculated with the formula : Drainage Density (Dd) = Length of Channels/area The drainage density data thus available is to be grouped in terms of suitable class intervals. Appropriate colour shades are to be assigned to each class for the purpose of visualization of gradation (Fig. 4). It is also possible to draw isoline with the help of grid wise data, and isopleth map would be the end product. DENSITY MAP OF RIVER BASIN Fig. 4. Drainage Density : Klwgadara Nata Basin

18 UNIT 4 ‰‰‰‰‰ TREND SURFACE MAP (ISOPLETH METHOD) Structure 4.1 Introduction 4.2 Morbidity Record of Pulmonary Tuberculosis in Govt. State Hospitals (2005) 4.1 Introduction Isopleth maps may be mono dimensional or multidimensional in character. By applying isopleth technique, it is possible to prepare trend surface maps with three dimensions. Trend surface analysis is usually done with the multivariate regression analysis but only one parameter can also be chosen according to importance. In such a case the subject concerned is taken as dependent variable (y) and parameters are taken as independent variable (x) [Fig. 5]. Regression equation ÖSy = na + bSx Sxy = aSx + bSx 2 y = a + bx Predicted y values are to be plotted on the geocentres of the districts or any unit division and then isolines are drawn to obtain the trend values. 4.2 Morbidity Record of Pulmonary Tuberculosis in Govt. State Hospitals (2005) Table 2 District Pop. Density/km 2 No. of Cases (x) (y) Darjeeling 510 7261 Jalpaiguri 547 3356 Koch Behar 732 2554 Dinajpur (U&D) 727 3470 Maldah 881 4338 Birbhum 663 5090 Barddhaman 985 7103

20 UNIT 5 ‰‰‰‰‰‰ ENVIRONMENTAL MAPPING (HAZARD AND POLLUTION) Structure 5.1 Definition 5.2 Example 5.3 Selected Readings 5.1 Definition A natural hazard is an unexpected or uncontrollable natural event of unusual magnitude that threatens the activities of people or people themselves. It may be mentioned here that the other type of calamity is natural disaster, which is also a natural hazard event that actually resulted in widespread destruction of property or caused injury and/or death. Hazards can be classified into several groups based on their occurrence. In recent contributions on disasters, such unexpected events include earthquakes, floods, hurricanes, droughts, tsunamis, etc. But thematic mapping in this direction needs an approach signifying distributional aspects in order to formulate the local, regional or natural strategies for hazard mitigation. 5.2 Example In our present context, only one type of hazard, i.e. flood has been taken into consideration. By defining a flood is a body of water, which rises to overflow land, which is not normally submerged. The following maps may be prepared to show flood condition : z Flood vulnerable zones (high, medium, low) z Flood frequency Zones (more than once a year) z Flood rise zones : flood with high (>2 m) water level, flood with moderate (1-2 m) water level, flood with low (max 1 m) water level.
25 Table: 3 Air Quality in 15 Stations of Kolkata (Yearly average) (µµµµgm/m 3) Station SMP SRPM so 2 o 2 Dunlop Bridge 244.76 121.52 12.59 67.81 Shyam Bazar 246.24 124.49 9.90 60.11 Beliaghata 207.66 98.91 8.63 50.16 Moulali 240.03 121.24 10.47 70.59 Salt Lake 195.36 91.69 5.88 49.65 Ultadanga 236.63 117.18 9.22 61.17 Minto Park 209.28 99.98 6.84 57.65 Gariahata 225.61 110.63 7.35 64.79 Mominpur 218.46 104.53 8.17 57.04 Hyde Road 220.27 107.05 8.50 58.81 Behala 220.22 107.77 8.29 61.63 Tollygunge 198.30 94.47 5.88 54.77 Baishnabghata 172.25 78.50 4.80 45.38 Picknic Garden 209.03 100.43 7.48 51.51 Topsia 239.70 119.72 12.93 62.36 Source : West Bengal Pollution Control Board 5.3 Selected Readings „ Basu, Ranjan & Bhaduri, Sukla (Eel.) (2007), Contemporary Issues and Techniques in Geography, Progressive Publishers, Kolkata. „ Central Pollution Control Board, & National Atlas and Thematic Mapping; Organisation, (2001), Environmental Atlas of India, Delhi, Kolkata „ Monkhouse,FJ. & Wilkinson, H.R(1971), Maps and Diagrams, Methuen & Co., London.
26 „ National Atlas and Thematic Mapping Organisation (1999), India : Natural Hazards, Second Edition, Kolkata. „ National Atlas and Thematic Mapping Organisation (2006), Environmental Status, Tripura, Kolkata. „ Robinson, A., et al. (1995), Elements of Cartography, Wiley, 6th Edition. „ Sarkar, Ashis (1997), Practical Geography : A Systematic Approach, Orient Longman, Kolkata. „ Stamp, L.D. (1948), The Land Use Map of Britain, It's Use and Misuse, Longman, Green & Co. Ltd, London.
27 GROUP-B
28
29 UNIT 6 ‰‰‰‰‰‰ MAP INTERPRETATION AND FIELD TECHNIQUE Maps are the best tools available to geographers for portraying the geographical information into graphical formats. It is said that maps should be self explanatory. But for practical purposes, it is observed that the map reader should acquire certain skill so that the map may be read at ease. Moreover, by interpreting the base map, variety of maps may be prepared. Nowadays with the advancement of various technologies, base maps are also considered as data. Initially traditional ground survey techniques were in use to prepare topographical sheets. Nowadays, remote sensing products in the form of aerial photograph and satellite imagery are used extensively for preparation and revision of topographical sheets. The main advantage of the toposheet is its annotation part. Moreover, with the help of conventional symbols it is easy to read the map. On the otherhand, the identification and recognition of objects from aerial photograph or satellite imagery depend upon the readers' knowledge about the characteristics of the photolimage recorded in terms of tone, texture, pattern, shape, size, shadow, situation, resolution and spectral sensitivity, etc. Different colour clues are also important to open the secrecy of colour images. Repetitive coverage, synoptic view and uniform data set are the main advantages of satellite images. But spatial resolution is the main constrain for such products. Moreover, neither aerial photograph nor satellite imagery contains any annotation.

30 UNIT 7 ‰‰‰‰‰ INTERPRETATION OF TOPOGRAPHICAL SHEET Structure 7.1 Definition 7.2 Model Interpretation 7.1 Definition A topographical map is a map that represents the form of Earth's surface. A topographical map contains information related to physical parameters like drainage, natural vegetation, topography, etc. along with man made features like communication network, settlement patter, etc. Geographical coordinates in terms of latitude and longitude, administrative boundaries, contour lines along with values, spot heights, etc. are also available in a topographical sheet. Amenities and facilities like hospital, places of work ship, rest house and bunglow, market place, etc. also find place in a topographical sheet. All these information are represented in terms of different colours, symbols and texts. Thus to interpret a topographical map one should thoroughly acquire the knowledge of map reading skill, which is available as marginal information in each and every map. One can identify the adjacent map with the help of map index. The legend helps the reader to understand different features within the map area. Thus proper interpretation of a topographical map would help the map reader to understand the grass root information of the topography under investigation. It is also possible to prepare series of maps and diagrams based on a particular toposheet to extract specific information. Thus apart from preparation of Broad Physiographic Divisions, other specific maps and charts like vegetation map, ruggedness index, dissection index, relative relief, transact chart (to show the relationship between different topographic features), long and cross profiles, etc, can also be prepared with the help of a topographical sheet.
31 7.2 Model Interpretation In the following paragraphs, a model interpretation of a particular topographical map is being presented. Introduction Reference No. 65J/9 Administrative Jurisdiction : Koraput District, Orissa Latitudinal extension : 18°45' N - 19°00' N Longitudinal extension : 82°30' E - 82°45' E Scale : 1 : 50,000 Contour interval 20 metres Year of Survey : 1980-81 Year of publication : 1983 Published by : Survey of India Relief This is a typical example of plateau topography. The general slope of the region is towards west. The highest altitude Auramali (1077 metre) is located at north central part of the region whereas the lowest altitude is 560 metres contour lines, which are observed at places towards extreme western part of the toposheet. A cross section drawn between places of altitudinal differences helps to identify break in slope, which separates two contrasting slope forms. Thus on the basis of break in slope at 600 m., the entire region may be divided into two broad physiographic divisions: dissected plateau region and erosional plain region (Fig. 1). Dissected Plateau Region : The aerial extension of dissected plateau region may be observed from the eastern to central and also to the south-western portion of this map. This dissected plateau region is characterized by flat topped hills, steep slope sided landforms, erosional hills, rounded hills which are covered up with dense vegetation. Some conical hills are to be found dissected along the high elevated plateau region. Erosional Plain : This region is washed out by rivers Telungary Nadi, Kolab River and Putra Nadi forming an erosional plain area. Due to concentration of
33 parallel to some extent ultimately join together to form Telungari Nadi. This combined drainage system serves the east central part of the region. Otherwise Kolab River and Putra Nadi act as main drainage system serving southern part and western part respectively. All these rivers are perennial in character, Most of these livers contain sand deposits, whereas rock deposits are also found in case of Putra Nadi. Numerous small rivers of different orders join these rivers. The course of Putra Nadi appears to be controlled by the structure of region, thus it flows along the southern margin then turns to the north, again takes a u-turn towards south and ultimately flows west ward. Numerous springs and water falls exist at different places within dissected plateau region. Artificial reservoirs have been constructed particularly in the plain region by damming small rivers. Otherwise Jagannatha Sagar, adjacent to Jaypur, the most important settlement in this area, is a lake with appreciable spatial extension. Natural Vegetation The dissected plateau region is characterized by plenty of natural vegetation. These areas are mostly reserved forest in character. They are either open, dense or fairly dense mixed jungle. At the periphery of the forest areas, dense or open scrub areas exist. At places, particularly to the south, extensive areas have been devoted for eucalyptus plantation. At suitable locations coffee plantations have also been experimented. Agriculture Agricultural activities are in practice in the western part of the region. Mostly rain fed cultivation exists. Occasionally tank and canal irrigation system facilitates the agricultural activity. Settlement The rugged terrain condition restricts development of settlement in the dissected plateau region. However, scattered huts do exist in isolation at places within this region, which are recognized as dispersed settlements. Koraput and Jaypur are the two big agglomerated urban settlements which have been developed to the eastern and western part respectively. Koraput is the district head quarters and possesses different amenities and facilities like police station, hospital, veterinary hospital, dispensary, market, post office, rest house, inspection bunglow, etc. The town is surrounded by hills and possesses strategic location. Orissa Military Police Colony and Railway Colony have been- established at the outskirt of the town. The town is

34 served by South Eastern Railway and several roads including NH 43. Jaypur, the other town located to the west, is equally important where amenity and facility like hospital, market, guest house, inspection bunglow, court, police station, post and telegraph office, etc. are available. The place can be reached by metalled road from all the directions. NH 43 also serves as a connecting road between Jaypur and Koraput. Clustered rural settlements have, been developed in different parts of the region, particularly in the erosional plain region. Communication Railway and road are the two important communication system within this region. The region is a show piece to exhibit the skill of railway engineering. The South Eastern railways's Kottavalas Kirandu branch railway enters tile region from north western part and negotiates tile central massif region with many loops and ultimately passing through Koraput, exits tile region in south eastern direction. This railway serves to transport huge quantity of minerals from mining areas to the factories. It also connects Koraput with other parts of tile country. National Highway 43 also serves the region extensively. Otherwise, particularly tile western part of the region, is served by various metalled and unmetalled roads. However, the dissected plateau region is devoid of communication system excepting foot path connecting isolated hutments. Conclusion A sharp contrast is noticed in between two regions, i.e. dissected plateau region and erosional plain region. The former is rich with forest resources and partly plantations, on the other hand tile later region is agriculturally rich and also overall development took place in this region.

35 UNIT 8 ‰‰‰‰‰ INTERPRETATION OF AERIAL PHOTOGRAPH Structure 8.1 Introduction 8.2 Procedure 8.3 Reference Data 8.4 Administrative Index 8.5 Scale 8.6 Landforms 8.7 Landuse 8.1 Introduction Photographs taken from an aircraft are commonly termed as aerial photographs (Fig. 2). To interpret an aerial photograph, the user should have enough skill regarding photo characteristics in terms of tone, texture, pattern, shape, size, shadow, situation, resolution and spectral sensitivity. However a model interpretation is presented here in below : The given aerial photographs bear numbers 518A 518A 518A , & 287 29 287 30 287 31 – – – The middle photograph, i.e. 518A 287 30– is to be interpreted. The interpretation of photographs can be seen as a process that can be divided into number of phases. For all purpose we can say that it is a three phase operation. Firstly, the examination of the photographs. Secondly, the identification of objects or features. Thirdly, the classification of objects identified.

36 8.2 Procedure 1) Placing photographs under the stereoscope with overlapping parts of the photographs next to each other. 2) Locating & marking of principal point on each of photograph. This is done by aligning opposite sets of fiducial marks with a straight edge & the intersecting point is considered as principal point. 3) Transferring of principal point from the adjacent overlapping photograph with the help of a minor stereoscope. By connecting the principal point & the transferred principal point the flight line may be obtained.

37 4) Placing the stereoscope over the stereo pair in such a way that the line joining the center of the stereoscopic lenses is parallel to the flight line. 5) Although the photographs should be seen three dimensionally now, a little adjustment in distance between the photographs may still be necessary. So the photographs may be moved side ways until the spacing between the corresponding images produce comfortable stereoscopic viewing. 8.3 Reference Data Survey of India topographical sheet number 73E/15 & 73113 with scale of 1 : 50,000 have been used as reference data. 8.4 Administrative Index From the topographic maps & the photo index it is known that the area under investigation covers parts of Puruliya district of West Bengal and Rachi District of Jharkhand. 8.5 Scale The scale of the photograph is 1 : 60,000 8.6 Landforms So far as the broad physiographic unit is concerned, the area covered by photograph belongs to Ranchi Plateau. Except the narrow strip of land along the both sides of river Suba marekha, the entire region is a plateau fringe. Based on image characteristics the following landforms can be identified in the photographic region (Fig. 3). (1) Hills, (2) Monadnocks, (3) Uplands, (4) Undulating Plains and (5) Gully. 1. Hills : The hilly areas are well marked in the north western part and also in the south, south eastern part. In the north west there is a dome shaped hill with appreciable height. In the southern and south eastern portion there are hilly areas characterized by appreciable length and height. It appears that

39 the monadnocks are residual parts of hard rocks which were intluenced by fluvial action. They are the remnants of peneplain formation. 3. Upland : The areas which are higher in elevation but the surface is not plain is upland. This landform is the result of fluvial erosion conducted by Salda Nadi and its tributaries. The area is almost covered by hard rocks. 4. Undulating Plain : Major part of the photograph is covered by undulating plains. This region is characterized by uneven plain topography which is rolling in nature. 5. Gully : Particularly in the north and central part of the map where the 1st order streams have been originated, such landforms may be identified. The topography has been well dissected due to erosion. Small streams follow the direction of slopes in straight fashion. 8.7 Land Use Information regarding different land use pattern have been extracted from the same photograph, i.e. 518A/287 : 30. The following land use features have been identified based on characteristics of image pattern (Fig. 6). 1. Settlement : Settlements are found scattered all over the all over the area. Most of them have been developed along the roads but they are not linear in pattern. Sometimes they have been formed at the junction of roads. The availability of water is also a predominating factor controlling the development of settlements. Most of the settlements are rural in character. Patjhalida, Masina, Khatjuri, Bengo, etc. are some of the important rural settlements. At the center of the photograph, the only compact urban settlement Jhalida can easily be identified. 2. Forest: The southern portion of the mapped area is characterized by dense forests. Extension of forest areas are also noticed in the north western part. Moreover, isolated hills or monadnocks located at the central or west central parts are covered with open mixed jungle. The vegetative cover can be recognized easily with the help of photographic tone, which is dark enough due to chlorophyll content denoting health vegetative cover.

41 4. Waste land : Waste lands are found either in rocky waste parts or along gully erosion areas. The former has been caused by deforestation whereas the later is the result of fluvial erosion. 5. Water bodies : There are numerous streams along with their tributaries traversing the photographic region. Sapahi Nadi. and Salda Nadi are the major livers, which flow almost parallel to each other. Both of them originate from the east and ultimately join Subarnarekha River further south (outside the photographic area). Scattered tanks are found in different parts of the area. It may be mentioned here that water bodies are recognized with the help of dark tonal expression of the photo image. 6. Communication systems : Communication network in the form of railway and road traverse the photographic region. They may be recognized by means of tonal variations along with geometric shape. South eastern railway passes along the central part of the photograph, parallel to the main highway.

42 UNIT 9 ‰ INTERPRETATION OF SATELLITE IMAGERY Structure 9.1 Introduction 9.2 Analysis 9.1 Introduction Three band satellite data are used to generate colour composites. The channel selection is restricted to three additive primary light beams i.e. blue, green and red. True colour representation for visual display of an image can be bade by using three band satellite data representing blue, green and red channels: In such a case blue band is projected in blue, green band is projected in green and red band is projected in red for preparation of the output image. But such true colour composites are having some constrains in terms of inadequate contrast, clarity problem, interpretability problem, etc. Hence images are generated in terms of false colour composite or FCC. Any combination of bands not representing the true colour of the objects in the output image is termed as FCC. They are generated with the purpose of better interpretation of the multi-band satellite data. In case of standard false colour composite, the combination of bands and the respective colour assignments are well defined. Hence they are known as standard FCC. The most commonly seen standard false colour images display the very near infrared as red, red as green and green as blue (Fig. 5). 9.2 Analysis However the satellite imagery under investigation is a typical geocoded linage which has been generated by matching with Survey of India toposheet No. 73M/7. It is a merged data of SPOT (PAN) and Landsat-5 TM where high degree of spatial resolution of SPOT (PAN) has been merged with Landsat TM's colour mode, thus different object's spatial detail can be visualized in false colours. Here it may be

44 The data was acquired on 8 November, 1991 whereas the image was generated by NRSA on 4 May, 1992. By applying different rules of image characteristics, various features within the area under investigation could be identified. Here it may be noted that SOI toposheet No. 73M / 7 has been used as reference data for extraction of information related to annotation, etc. Ultimately the Land Use / Land Cover Map has been prepared by interpreting the geo-coded hard copy output. Here land use refers to man made features like road, railway, arable land, settlement, etc., whereas land cover denotes natural features like forest cover, scrub areas, liver system, wet land, etc. (Fig. 6). Due to good amount of chlorophyll content, healthy vegetation absorbs energy strongly and appears as deep red in FCC. Bilaspur protected forest, situated at the north eastern comer of the image is a typical examples ill this regard. At places, forest areas have been degraded and they appear in terms of lighter tone. These are typical examples of fairly dense scrub areas. Water bodies appear either as deep blue / blackish or powder blue in colour depending upon depth/clearness of water. In case of deep / clear water, absorption of light is more, hence the apparent colour is blue/blackish blue. On the other hand in case of turbid/shallow water, the ret lection of light is more and the appearance of the object is powder blue. To the south-western comer, Damodar River can easily be identified. The channel of the river is characterized by braided nature with numerous bars and spits. The water is mostly sediment laden and the apparent colour is powder blue. Sand deposits within the course of the river reflect more light, hence they appear ill terms of light tone/white colour. Due to sediment deposit, even an island has been formed inside the liver, where crops are grown. However, in the present image, the DVC Left Bank Main Canal enters the region from the west and passes through the central part and curves towards the south. At the extreme western part of the image, Damodar Branch Canal originates from DVC Left Bank Main Canal and moves northward. Panagarh Branch Canal branches off from Damodar Branch Canal and runs in between the railway line and the Grand Trunk Road. Actually several linear features, viz. DVC Left Bank Main Canal, Eastern Railway Main Line and Grand Trunk Road run parallel to each other from north-west to south-east. The canal, if contains water, can be recognized with the help of dark blue colour, fine texture and also the typical geometric shape. Generally speaking, the tonal expressions of railway lines and road ways are darker and lighter respectively. Moreover, unlike road, railway takes typical curvature at the turning point and tries to avoid rural

46 settlements. On the other hand roads link up different settlements and can take any type of turning. Both sides of highways are generally associated with trees. All these factors provide clues to recognize different types of linear features. However, these are the general rules, and exceptions are there, depending upon the real world situation and also quality of the hard copy output. Good or moderately good agricultural lands are wide spread within the area under investigation, which appear as light pink colour with fine or medium texture. In case of poor agricultural land the appearance is in terms of whitish gray with coarse texture. Rural settlements are associated with water bodies and vegetation cover and they are represented in terms of dark blue with fine to medium texture. Sonal and Gopalpur are two examples of rural settlements, which are easily identifiable to the east-central and north-western parts of the image. On the other hand, in case of urban areas, due to Rayleigh scattering, blue or gray cast appear on the image. Panagarh, located at the center of the map is an example of urban settlement, although gray/blue casting is not that prominent for this urban area.

47 UNIT 10 ‰‰‰‰‰ PREPARATION OF QUESTIONNAIRE SCHEDULE Structure 10.1 Concept 10.2 Model 1 : Plot to plot land use and cropping pattern data 10.3 Model 2 : Socio-economic survey 10.4 Model 3 : Rural Market 10.5 Model 4 : Tourism 10.6 Selected Readings 10.1 Concept Data collection is an important job of the geographer in due course of field investigation. The data may be available from primary source or secondary source. III case of secondary source, the data is collected from existing literature, journals, reports, bulletin, etc. On the other hand primary data collection means collection of the information directly from the field by the investigator. It may be soil sample collection, study of the soil or geological profile, conducting ground survey to measure the cross or long profile across or along a valley, etc. But to study socio-economic parameter, elaborate questionnaire needs to be prepared. Actually the success of geographical investigation partly depends upon well prepared questionnaire schedule. The aims and objectives of the particular project determines the type of questionnaire to be prepared. Thus specific questionnaire is to be prepared for specific project. However, some model questionnaires have been annexed herein below. 10.2 Model 1: Plot to plot land use and cropping pattern data Name of the investigator Name of the village Crop season Plot No. Area of the Plot

48 Land use category Irrigated / un-irrigated Source and type of irrigation Energy used Crop grown Yield of crop Whether locally consumed or marketed else where 10.3 Model 2 : Socio-economic survey Name of the investigator Name of the village Name of the head of the family Religion / caste Mother tongue Own / rented house No. of domestic animal Details of family members (for each member) Age Sex Educational qualification Occupation School drop out, if any Monthly income Monthly expenditure on Food Clothing Rent / Maintenance of house Education Transpo rtation
49 Medical Repayment of loan Miscellaneous Deficit / excess income 10.4 Model 3 : Rural Market Name of the investigator Name of the market Day / days Wholesale or retail No. of vendors No. of customers Commodities sold Commodities brought from Customers coming from Mode of transport to bring commodities Mode of transport used by the customers Nearby other market with distance and day Total transaction of the market 10.5 Model 4 : Tourism Name of the investigator Name of the tourist spot Type of tourist spot (e.g. hill resort, sea resort, religious place, historical place, etc.) Total No.of Hotel, guest house, holiday home, etc. (For each of the hotel, etc.) Available room Room tariff No. of occupant
50 Peak season Lean season No. of employees Available infrastructure (e.g. transport, conducted tour facility, etc.) Annual income Total No. of shops serving tourist (for each shop) Type of item sold (e.g. souvenir, handicraft, etc.) No. of customer visited No. of employees Total income Tour operator (for each tour operator) No. and type (e.g. car, luxury bus, micro bus, etc.) of vehicle available No. of employee No. of customer Visiting points Tariff Income ** Schedules are to be prepared in tabular form 10.6 Selected Readings „ Howard J.A.(1970), Aerial Photo Ecology „ Lillesand, T.M., et el. (2004), Remote Sensing and Image Interpretation, Wiley, 5th Edition, New York.
51
52

Hit and source - focused comparison, Side by Side

Submitted text	As student entered the text in the submitted document.
Matching text	As the text appears in the source.

Ouriginal by Turnitin

Document Information

Analyzed document	PGGR-08_Gr-B-I.pdf (D165449297)
Submitted	2023-04-29 12:01:00
Submitted by	Library NSOU
Submitter email	dylibrarian.plagchek@wbnsou.ac.in
Similarity	0%
Analysis address	dylibrarian.plagchek.wbnsou@analysis.urkund.com

Sources included in the report

Entire Document

PREFACE In the curricular structure introduced by this University for students of Post- Graduate degree programme, the opportunity to pursue Post-Graduate course in any subject introduced by this University is equally available to all learners.

Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely
in keeping with the objectives of open education which does not believe in artificial differentiation.

Keeping this in view, the study materials of the Post-Graduate level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis.

The accepted methodology of distance education has been followed in the preparation of these study materials. Co-operation in every form of experienced scholars is indispensable for a work of this kind.

We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing, and devising of a proper lay-out of the materials. Practically speaking, their role amounts to an involvement in 'invisible teaching'.

For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other.

The more a learner would seriously pursue these study materials, the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self-learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University. Needless to add, a great deal of these efforts is still experimental—in fact, pioneering in certain areas.

Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned. Professor (Dr.) Manimala Das Vice-Chancellor

Printed in accordance with the regulations
and financial assistance of the Distance Education
Council, Government of India. First Reprint :

August, 2010
POST GRADUATE GEOGRAPHY [M. Sc.] PAPER : GROUP PGGR – 08 : B
Special
Paper – I Course Writing Dr. Ashis Kr. Pal
Notification

Professor (Dr.)
Kajal Dey Registrar (Acting)
PGGR : 08 Advanced Geomorphology NETAJI SUBHAS OPEN UNIVERSITY
Group – B
Special Paper – I Advanced Geomorphology Unit 1 ❑ Applied Geomorphology 7–45 Unit 2 ❑ Case Studies of Land-forms and Landuse 46–80 Unit 3 ❑ Management of Geomorphic Problems 81–113 Unit 4 ❑ Management of Geomorphic Hazards 114–159

Hit and source - focused comparison, Side by Side

Submitted text	As student entered the text in the submitted document.
Matching text	As the text appears in the source.

Ouriginal by Turnitin

Document Information

Analyzed document	PGGR-10_Gr-A.pdf (D165449298)
Submitted	4/29/2023 12:01:00 PM
Submitted by	Library NSOU
Submitter email	dylibrarian.plagchek@wbnsou.ac.in
Similarity	0%
Analysis address	dylibrarian.plagchek.wbnsou@analysis.urkund.com

Sources included in the report

Entire Document

PREFACE In the curricular structure introduced by this University for students of Post-Graduate degree programme, the opportunity to pursue Post-Graduate course in any subject introduced by this University is equally available to all learners. Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely in keeping with the objectives of open education which does not believe in artificial differentiation. Keeping this in view, the study materials of the Post-Graduate level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis. The accepted methodology of distance education has been followed in the preparation of these study materials. Co-operation in every form of experienced scholars is indispensable for a work of this kind. We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing, and devising of
a
proper lay-out of the materials. Practically speaking, their role amounts to an involvement in 'invisible teaching'. For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other. The more a learner would seriously pursue these study materials, the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self-learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University. Needless to add, a great deal of these efforts is still experimental—in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned.
Professor (Dr.) Subha Sankar Sarkar Vice-Chancellor
Printed in accordance with the regulations of the Distance Education
Bureau of the University Grants Commission.
Second Reprint :
December, 2017
POST GRADUATE : GEOGRAPHY [M. Sc] Paper :

PGGR 10
A (Practical) Course Writing Dr. Ashis Kumar Paul
Notification

Mohan Kumar Chattopadhya Registrar
PGGR–10
A Advanced Geomorphology (Practical) Netaji Subhas Open University
Unit 1 ❑ Analysis of Drainage Basin Morphometry and Channel Aspects from Topographical maps 8–30 ❑ Geomorphic Mapping 31–38 ❑ Velocity, Discharge and Sediment Load Analysis 39–58
7
8
9 PGGR(10A)—2
10
11
12
13
14
15
16
17 PGGR(10A)—3
18
19
20
21
22
23
24
25 PGGR(10A)—4
26
27
28
29 PGGR(10A)—5
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

47
48
49
50
51
52
53
54
55
56
57
58
NOTES .....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... 59

NOTES .....

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... 60

Hit and source - focused comparison, Side by Side

Submitted text	As student entered the text in the submitted document.
Matching text	As the text appears in the source.