

GEO 231
Introduction to Man-Environment Interaction

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GEO 231

Introduction to Man-Environment Interaction

By

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University of Ibadan



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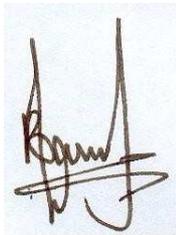
Vice-Chancellor's Message

I congratulate you on being part of the historic evolution of our Centre for External Studies into a Distance Learning Centre. The reinvigorated Centre, is building on a solid tradition of nearly twenty years of service to the Nigerian community in providing higher education to those who had hitherto been unable to benefit from it.

Distance Learning requires an environment in which learners themselves actively participate in constructing their own knowledge. They need to be able to access and interpret existing knowledge and in the process, become autonomous learners.

Consequently, our major goal is to provide full multi media mode of teaching/learning in which you will use not only print but also video, audio and electronic learning materials.

To this end, we have run two intensive workshops to produce a fresh batch of course materials in order to increase substantially the number of texts available to you. The authors made great efforts to include the latest information, knowledge and skills in the different disciplines and ensure that the materials are user-friendly. It is our hope that you will put them to the best use.



Professor Olufemi A. Bamiro, FNSE

Vice-Chancellor

Foreword

The University of Ibadan Distance Learning Programme has a vision of providing lifelong education for Nigerian citizens who for a variety of reasons have opted for the Distance Learning mode. In this way, it aims at democratizing education by ensuring access and equity.

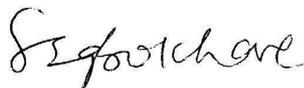
The U.I. experience in Distance Learning dates back to 1988 when the Centre for External Studies was established to cater mainly for upgrading the knowledge and skills of NCE teachers to a Bachelors degree in Education. Since then, it has gathered considerable experience in preparing and producing course materials for its programmes. The recent expansion of the programme to cover Agriculture and the need to review the existing materials have necessitated an accelerated process of course materials production. To this end, one major workshop was held in December 2006 which have resulted in a substantial increase in the number of course materials. The writing of the courses by a team of experts and rigorous peer review have ensured the maintenance of the University's high standards. The approach is not only to emphasize cognitive knowledge but also skills and humane values which are at the core of education, even in an ICT age.

The materials have had the input of experienced editors and illustrators who have ensured that they are accurate, current and learner friendly. They are specially written with distance learners in mind, since such people can often feel isolated from the community of learners. Adequate supplementary reading materials as well as other information sources are suggested in the course materials.

The Distance Learning Centre also envisages that regular students of tertiary institutions in Nigeria who are faced with a dearth of high quality textbooks will find these books very useful. We are therefore delighted to present these new titles to both our Distance Learning students and the University's regular students. We are confident that the books will be an invaluable resource to them.

We would like to thank all our authors, reviewers and production staff for the high quality of work.

Best wishes.



Professor Francis O. Egbokhare
Director

LECTURE ONE

Spatial Organization: Man-Environment Interaction

Introduction

The purpose of this lecture is to provide a general introduction to the entire course. It is meant to enable you see how the pattern of man's activities on the earth's surface can result from the relationships between man and his environment. What are these activities? They include virtually everything that man engages in. Examples are agricultural production, manufacturing, commercial activities, provision of services, such as education and health care, the movement or transportation of people, goods, services and information, the location of cities, towns and villages and so on. A number of these activities are covered by this course, and the way they are organized in space is a direct or indirect result of the relationship between man and his environment. At this point, it is important to clarify some of the concepts in the title of this lecture so that you can grasp better, its subject matter. The concepts are spatial organization, environment and interaction.

Pre-Test

What do you think is the nature of the relationship between man and the environment?

CONTENT

Spatial Organization

Spatial organization is the way man's activities are organized in space. More technically, it is the aggregate pattern of use of space by man. Let us

try to simplify this definition. We can do this by taking as an example, an areal unit, such as a clan or a local government area. In such an area, the towns and villages occupy specific locations, the farms occupy specific locations, roads, paths, market places, schools, dispensaries, maternity centres, hospitals, sources of water supply and so on, similarly occupy specific locations. When the locations of these diverse activities and phenomena are taken together, they constitute the way space is organized in the area in question. Hence, spatial organization is defined as the aggregate pattern of use of space.

Environment

The term environment refers to all the conditions and objects that surround man. All of these conditions and objects can be grouped into five categories which constitute the components of the environment. These components are as follows:

1. Climate
2. Terrain
3. Vegetation
4. Soils
5. Artifacts.

With regard to climate, such climatic conditions as temperature, humidity and precipitation are parts of man and environment. Mountains, and hills, plains, valleys, swamps, etc., are different types, of terrain and they also form parts of mans, environment. The same applies to vegetation and soils. Grasslands and forests, fertile soils and infertile soils all part and parcel of the environment.

Thus the environment of a community in a particular area can be characterized by high temperatures, swampy land, thick forests and fertile soils. However, man's environment is not limited to these natural components alone but also includes man-made components or objects. The man-made objects include cities, towns and villages, highways, airports, seaports, dams, and man-made lakes. All these are referred to as aircrafts and they are very much part of man's environment. Some of them are very large-scale and permanent features of the landscape and are therefore legitimately regarded as part of man's environment just as hills and rivers are:

Interaction

Interaction simply means the process whereby two or more objects act as one another. For instance, if we have two objects, say A and B, and A affects B, while B also affects A, then, we say that A and B are interacting. In other words, they are acting on or affecting one another. Interaction, therefore, refers to mutual action between two or more objects. With reference to the title of this course, man-environment interaction, therefore, refers to the mutual action between man and his environment. As will be shown in subsequent lectures, the environment affects man just as man also affects his environment. The relationship between man and his environment is essentially reciprocal.

The Geographical Significance of Man-Environment Interaction

Having defined the important concepts above, it is now necessary to discuss their geographical significance. We can start this discussion by posing a question: why is man-environment interaction important from the geographical point of view? The reason is simple. The landscape of any area is a result of the interrelations and interactions between man and the environment. For instance, if the rural or agricultural landscape in an area is covered by extensive cocoa plantations instead of palm plantations, then, two sets of factors must have operated to produce the landscape in question. On the one hand, we have human decision and technology, and on the other hand, we have favourable climatic, soil and other conditions which permit the growth of cocoa.

The area in question may also be suitable for the cultivation of oil palm trees but the decision to grow cocoa instead of oil palm trees is man's decision. But man's decision alone is not enough; man must also have the technology for cultivating cocoa. What this brief illustration boils down to is that the landscape in question is a product of the interactions between man on the one hand, and the environment on the other. As some authors put it, the natural and human phenomena in any area are closely interrelated, and interact with each other to produce distinct regional landscapes (Blunden, *et. al.*, 1978).

What is true of agricultural landscapes is also true of other landscapes, such as industrial landscapes, mining activities and the landscapes they create, human settlements (i.e. cities, towns and villages) and so on and so forth. For example, the spatial pattern of industries is a

product of both man's decision (which involves a lot of considerations and variables) and the location of raw materials which are part of the earth's natural endowment. The presence of industrial raw materials which are components of the environment is not enough to bring about manufacturing industries. Human decision and the existence of appropriate technologies are also important conditions for industries to come into being.

Human settlements are centres of population concentration, and richly endowed or good quality environments often support large population concentrations. However, excessive exploitation of the environment can reduce the value of the environment and lead to outmigration and low population densities. Over-cultivation or overgrazing are good examples of excessive exploitation and either of them can lead to reduced fertility and reduced agricultural output, out-migration and lower population densities. Some of the subsequent lectures in this course will examine the interactions between man and the environment in some detail, in particular, how the interactions influence the spatial pattern or spatial organization of man's activities. But a point that needs to be re-emphasized here is that man-environment interactions contribute to the variations from place to place in the character of the landscape, that is to say, in the spatial organization of man's activities on the earth's surface.

Summary

- a. Spatial organization is the way man's activities are organized in space.
- b. Environment refers to all the conditions and objects that surround man. It has five main components, four of which are natural and one, man-made.
- c. Interaction refers to mutual action between two or more objects. In the context of this course, man-environment interaction, therefore, refers to mutual action between man and the environment.
- d. Spatial organization is a product of the interaction between man and his environment. The landscape of any area is a result of the interactions and interrelationships between man and the environment. Herein lies the importance of man-environment interaction. Crop types, patterns of agricultural production, the location and patterns of settlements, industries and so on are all a result of these interrelationships and interactions.

Post-Test

1. Which of the following is true of the relationship between men and the environment?
 - a. The environment dominates man
 - b. Man dominates the environment
 - c. Both man and the environment affect each other.

References

Ablar. R. Adams. J. S. and Gould. P. (1971). *Spatial Organization: The Geographer's View of the World*, Prentice-Hall. London.

Blunden. J. Haggett. P. Hamnet. C. and Sarre, P. (1978). *Fundamentals of Human Geography: A reader*, Harper and Row Publishers. London. pp. vi-x.

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LECTURE TWO

Spatial Pattern and Process in Man-Environment System

Introduction

This lecture is concerned with spatial pattern and spatial process and the relationship between both of them in the context of the interactions between man and the environment. Spatial pattern and spatial process are very important concepts in geography and they come about as a result of the interaction between man and the environment. In interacting with the environment, man creates certain structures, such as roads, plantations, towns and cities, factories and so on. These structures can set in motion certain processes which in turn can affect the structures that brought them about. This lecture will attempt to shed some light on these interrelationships but for a start, it is important to define what we mean by spatial pattern and spatial process.

Pre-Test

Find out the dictionary meaning of the following words:

1. Pattern
2. Process
3. Spatial

CONTENT

Spatial Pattern

Spatial pattern and spatial structure are often used synonymously. But, it must be pointed out that in this context; structure does not have the same

meaning as when we refer to a road or building as a structure. A road or a building is only a component of spatial structure. In describing the spatial structure or the spatial pattern of a distribution, geographers use such terms as nucleated, dispersed, clustered, sparse, dense, concentrated, agglomerated, etc. It is clear from these terms that pattern or structure cannot refer to a single element, all by itself. It makes no sense to speak of a single building or a single factory as being clustered or dispersed. A building or factory is clustered or dispersed only in relation to other buildings or factories. If several buildings or factories are located close to one another, then, we say they are clustered. If they are located far apart from one another, then, we describe them as dispersed.

The spatial structure of a distribution, therefore, refers to the location of each element relative to all the other elements both individually and collectively. The definition of spatial structure by Abler, *et. al.* (1971) makes it very clear what the concept means. In their view; 'the spatial structure of a distribution is both the location of each element relative to each of the others, and the location of the each element relative to all the others taken together. Thus, when geographers describe the pattern of settlements in given areas as nucleated or dispersed, they are referring to the locational organization of the distribution of settlements. In other words, they are referring to the location of each settlement in relation to each and every other settlement in the area in question.

Spatial Process

Spatial process refers to all kinds of movement and flow that take place on the earth's surface. It must be pointed out that some movements and flows take place beneath the earth's surface and in the atmosphere. But, these do not concern us here. Even, on the earth's surface, movements and flows take place in both the physical world and the human world. Our concern in this lecture is with the latter, that is, movements and flows in the human world. However, movements and flows in the physical world are very useful in understanding the relationship between spatial structure and spatial process. Reference will, therefore, be made to movements in the physical world later.

Let us return once more to our attempt to define spatial process. We said earlier that spatial process refers to all kinds of movement and flow. The question then arises: what are the things that move? The answer is

that all sorts of things move. However, they can be categorized into three main groups. These are people, goods (and services) and information (including new ideas or techniques). For instance, migration is an important type of movement of people. There are, of course, other types of movement of people. They include journey to work, journey to hospital, journey to school, college or university, journey to recreation centres, and so on and so forth.

Commodity flows represent movement of goods. The movement of cattle, sheep, goats, grains, onions, etc. from the north to the south and of kolanuts, garri, plantains, palm-oil, etc. from the south to the north, is some examples of the movement of goods. The spread of a new breed of maize, a new method or technique of processing cassava or groundnuts, or even, a new fashion or dance is a result of the spread of information about these different things. Information therefore, travels from one place to another by different means. This logically leads to the medium or media of movement; how do the different movements take place? The movement of people and goods is by land (e.g. roads and railways), water or air (e.g. aeroplanes).

Finally, the movement or spread of information can be by telephone, radio, television, newspapers, magazines, pamphlets, books and so on. The spread of information is often referred to as diffusion and it is an important spatial process. Different types of movement and diffusion, therefore, constitute what geographers refer to as spatial process.

Spatial Process and Spatial Structure

Having attempted to explain what is meant by spatial process and spatial structure, it is now time to examine the relationship between them in the man-environment system. For a start, it is important to re-emphasize what was stated in the opening paragraph. In the said paragraph, the point was made that in interacting with the environment, man creates certain structures or, at least, some components or elements of spatial structure. For example, in an attempt to satisfy some human needs, man may build a factory to produce the needed goods and the factory may depend on raw materials extracted from the physical environment. If the factory in question is, say, an iron and steel plant, then, two elements of spatial structure are created, namely a factory and a mine where iron ore is extracted from the earth. These elements of spatial structure can

immediately set in motion, some spatial processes.

The most noticeable of these processes will be the migration of people to the mining town and factory town in search of employment. Other migrants move in to provide services, such as tailoring, motor vehicle, radio, TV and other repair and maintenance services, etc. As these migrants move in, the towns grow in population and thereby become large markets. This very fact may lead to the establishment of additional industries for, say, the production of consumer goods. Schools, hospitals and other facilities may spring up to provide services which in turn may attract movement of people from surrounding towns and villages that do not have schools and hospitals. The point then is that as the towns grow, the volume of movement into them increases, and as the volume of movement increases, it leads to the further growth of the town.

What this simple illustration shows is that there is a reciprocal relationship between spatial structure and spatial process. In other words, one is both a cause and an effect of the other. Spatial structure causes spatial process and similarly, spatial process causes spatial structure. The converse is also true, namely, that spatial structure is the effect of spatial process just as spatial process is the effect of spatial structure. When two things are at the same time the cause and the effect of each other, they are said to be circularly causal. Thus, spatial structure and spatial process are circularly causal. This point is summarized very aptly by Abler, *et. al.* (1971), when they observe that 'movements of every sort create spatial structures, and once established, such spatial arrangements influence subsequent movement'. They illustrated this relationship between structure and process with examples from the physical world. They noted that glaciation creates a variety of landforms (i.e. structures) and these structures or landforms in turn influence later water movements which in their turn affect landform, 'in a continuous process of mutual cause and effect'.

To return again to the human landscape, in exploiting the environment to satisfy his needs, man creates spatial structures (factories, farms, plantations, roads, railways, seaports, airports, towns and cities) and these structures set in motion, spatial processes (movements and flows of different types) which in their turn effect spatial structures in a continuous process of mutual cause and effect. If a road network is built to open an agricultural area, it could lead to greater productivity and increased volume of movement of agriculture products. This increased movement

may be too much for the road network to handle and consequently, the network becomes modified or expanded. The student should think of other examples of the circularly causal relationship between spatial structure and spatial process which is usually triggered by the interactions between man and the environment.

Summary

- a. Spatial pattern or spatial structure refers to the location organization of a distribution in space. It is the location of each element of spatial structure relative to all the other elements both individually and collectively. The spatial structure of a distribution can, thus, be described as nucleated, clustered, dispersed, etc.
- b. Spatial process refers to all types of movement and flow (including diffusion). The things that move include people, goods and services, and information (including new ideas, techniques, etc.). The media of movements range from roads, railways, airways, water, to telecommunications, print media and so on.
- c. Spatial structure and spatial process are linked to each other in a circularly causal manner. This means that each is both a cause and an effect of the other. Spatial structure can trigger spatial process which in turn affects spatial structures. For instance, the construction of a new federal capital in Abuja and a steel plant in Ajaokuta has already set in motion migration (a spatial process) into these towns and as the volume of migration increases, the towns will grow larger and larger. The growth of the towns will lead to further increases in migration into them, leading to the further growth in the towns, and the cause and effect relationship goes on and on.

Post-Test

1. Which of the following constitutes spatial pattern of settlements?
 - a. Individual houses
 - b. Individual settlements

- c. The location of each settlement in relation to each and every other settlement.
2. Which of the following constitute spatial process?
 - a. Migration
 - b. A musical concert
 - c. Journey to work
 - d. Movement of cattle from Kano to Lagos
 - e. Diffusion of information
 - f. A football match
 3. What is the relationship between spatial pattern and spatial process?
 - a. Spatial pattern causes spatial process
 - b. Spatial process causes spatial pattern
 - c. Spatial patterns and spatial process are the cause and effect of each other.

References

- Ablar, R., Adams J.s. and Gould, P. (1971) *ibid.* pp. 60-61,236-239.
- Morrill, R.L. (1970). *The Spatial Organization of society*, Duxbury Press, pp. 175-189.

LECTURE THREE

Distance and Man's Spatial Behaviour

Introduction

This lecture has three main objectives. First, it will attempt to explain what is meant by distance, especially in the geographical content. Secondly, it will also explain what is meant by spatial behaviour. Finally, it will show how distance affects spatial behaviour. Man's behaviour can be seen within the context of man-environment interaction. For instance, the decision by man to exploit a particular natural resource is not necessarily based on the mere existence of the resource in question. It is usually influenced by a number of factors, one of which is distance. Migration, journey to work, journey to school and other types of movement are all influenced by distance, among other factors. Before examining the influence of distance on spatial behaviour, we need to know what distance and spatial behaviour mean in the first place.

Pre-Test

What do you think the following concepts mean?

1. Distance
2. Spatial behaviour

CONTENT

Distance

It is important to emphasize from the outset that there are many types of distance. In other words, distance can be measured in different ways and each measure produces its own type of distance. The main types of distance include social distance and geographical distance. In this lecture,

our concern is with the latter. Distance, in the geographical context, is the spatial dimension of separation. It logically follows from this definition of geographical distance that social distance is the social dimension of separation between individuals. However, since social distance is not our concern here, we shall not pursue its discussion any further but it is important to know what it means. Turning now to geographical distance, we defined it as the spatial dimension of separation. Spatial is the adjective of space so that what geographical distance means in essence is how far apart or separate things or locations are in space. If two things are in the same location or place, then, the distance between them is zero. For instance, if you are a tailor and your residence is also your workplace, then, the distance between them is zero. On the other hand, Lagos and Ibadan are not located in the same place and so they are separated by some distance, about 134 kms to be precise. Thus, geographical distance separates locations from one another in space.

Geographical distance can be measured in different ways. It can be measured in kilometres, metres or other units of physical distance. Distance measured in this manner is referred to as physical distance. Distance can also be measured in terms of money (i.e. in Naira and Kobo) or in terms of time (i.e. in hours, minutes, etc.). Thus, instead of saying that Lagos is 134 kms away from Ibadan, we can say that it is two hours away from Ibadan or ₦300 away from Ibadan. When we measure distance in units of time or money, it means that we are measuring distance in terms of the cost involved in overcoming or covering distance.

Time and money are scarce resources and both are usually spent in moving from one place to another, that is to say, in overcoming or covering distance. It costs money and time to move from Ibadan to Lagos, about ₦300 and two hours respectively. Distance measured in terms of cost is referred to as economic distance. Distance is, therefore, the space that separates objects, places or location and movement from one place to another costs money and time. It is precisely because of this element of cost that distance affects man's spatial behaviour.

Spatial Behaviour

Morrill (1970) defines spatial behaviour as ' . . . the decisions individuals make about their use of and action in space.' Such decisions are, of course, manifested in the locational patterns of human activities as well as the

movements and flows observed on the earth's surface. Thus, the decision to own a shop, factory or farm and the actual setting up of the shop, factory or farm, and the decision to migrate and the actual movement are all aspects of spatial behaviour. When we speak of spatial behaviour, we are in actual fact concerned with patterns of location (including land-use) and interaction.

It is believed that there is some order underlying spatial behaviour and as a result, it can be explained in terms of some general principles. These principles include that of distance minimization and its corollary, the maximization of utility. For instance, the principle of distance minimization is evident in many instances. The greatest volume of movement is over short distances; related activities tend to agglomerate in space; and landuse intensity diminishes with increasing distance. All these are regarded as the result of the operation of the principle of distance minimization. Distance, thus, exerts an important influence on spatial behaviour.

Distance and Spatial Behaviour

Why does distance influence spatial behaviour in the manner just described? The answer to this question has already been given in the section on distance above: it is because of movement cost. It was stated earlier that the movement of people or goods between locations costs both money and time. Therefore, spatial behaviour is influenced by distance because of the need to reduce movement cost. Thus, when several factories that utilize the products of one another or which share common services agglomerate in the same locality, it is because they want to cut down on the cost of moving materials from one factory to another or the cost of maintenance or other services. A factory that is located far away from a service centre will pay more for the service in question than one that is located close to the service centre. As will be shown in a subsequent lecture., an industrialist wanting to locate a factory considers several factors but most of his considerations boil down to an attempt to minimize distance - it could be distance to raw materials and other inputs, distance to related industries or factories, distance to essential services, etc.

It is in the sphere of the movement of people and goods that the effect of distance is very striking. As indicated earlier, the most intensive

movements are over short distances. For instance, the number of people travelling daily from Ibadan to Lagos is much more than the number travelling from Ibadan to Kano, and the number of people who travel daily from Kano to Kaduna is much more than the number who travel daily from Kano to Maiduguri. Similarly, the number of patients from Oyo State who use the University College Hospital, Ibadan, far exceeds the number from, say, Anambra State. One can go on and on giving examples but the essential point to be noted is that in satisfying their needs, people tend to visit the nearest destinations where such needs can be satisfied. For this reason, the volume of movement (and this could be number of people or quantity of goods) usually diminishes with increasing distance. In other words, as distance increases, the volume of movement diminishes. This relationship between distance and movement is described as an inverse relationship. This means that as one variable (distance) increases, the other (volume of movement) decreases.

When these two variables are shown on a graph, they reveal a negative exponential relationship (Fig. 3.1). If the graph is examined closely, it will be observed that the volume of movement diminishes rapidly over shorter distances, and then more slowly over the longer distance.

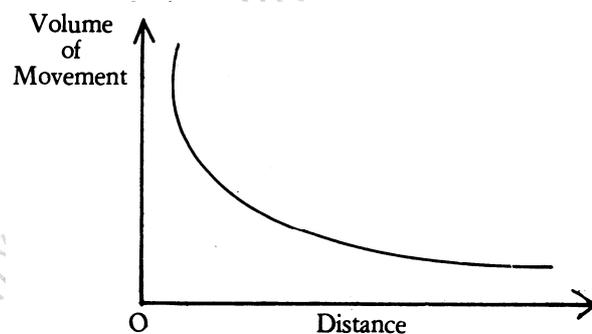


Figure 3.1: Relationship between Distance and Volume of Movement

This is what happens in real life. The volume of movement does not diminish in a regularly decreasing manner with increasing distance. Rather, it tends to diminish at a decreasing state. This effect of distance on movement is variously referred to as the friction of distance, distance decay effect or distance lapse-rate. These concepts imply that volume of movement is inversely related to distance. This relationship can be

represented by the following function: $M = aDb$

In the equation M = volume of movement, D = distance, while a and b are constants. Geographers are particularly interested in the value of the second constant (i.e. b). Low b values mean low friction of distance. In other words, the volume of movement diminishes rather slowly with increasing distance. On the other hand, high b values mean high friction of distance. In this case, the volume of movement diminishes rather rapidly with increasing distance. It is clear; therefore, that distance affects movements and flows just as it affects location decisions and location patterns. In other words, distance affects spatial behaviour.

Summary

- a. Distance is the spatial dimension of separation and it can be measured in physical units (metres, kilometres, etc.) or in terms of movement costs (transport cost, travel time, etc.). Movement from one place to another usually costs both money and time.
- b. Spatial behaviour refers to the decisions by individuals about their use of space and their action in space. The spatial outcomes of these decisions are the spatial patterns of human activities and different types of movement and flow. Some regularity or order underlies spatial behaviour and as such it can be explained in terms of some general principles such as distance minimization.
- c. Distance affects spatial behaviour because of the costs involved in movement. It costs both time and money to move between places. Spatial behaviour is therefore influenced by distance because of the desire among people to cut down on movement costs. Locational decisions and the movement of people, goods and information are affected by distance. Distance minimization is thus an important consideration in spatial behaviour. This principle underlies the order that is often observed in spatial patterns and spatial processes, that is to say, in locational patterns and movements and flows.

Post-Test

1. Which of the following refers to geographical distance?
 - a. Emotional or social bonds between individuals.
 - b. The social dimension of separation between individuals.
 - c. The spatial dimension of separation
2. Spatial behaviour is:
 - a. Friendliness
 - b. Movement and flows
 - c. The decision to set up a shop or factory
 - d. Honesty
 - e. The decision to migrate.
3. Which of the following is correct?
 - a. As distance increases, the volume of movement remains the same.
 - b. As distance increases the volume of movement also increases.
 - c. As distance increases the volume of movement diminishes.

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Ablar, R., Adams, J.S. and Gould, P. (1971), *ibid* pp. 72-77, 218-221, 230-231, 406-407.

Morrill, R.L. (1970), *ibid*, pp. 20-21, 113-115, 175-176.

LECTURE FOUR

Mental Maps and Spatial Organization

Introduction

In the first lecture, spatial organization was defined as the way human activities and man-made artifacts (farms, factories, human settlements, urban land-uses, etc.) are organized in space. Spatial organization refers to the aggregate pattern of these different activities and artifacts. But, what is responsible for the way space is organized? This is an important question that is not addressed in this lecture, although, some subsequent lectures will provide parts of the answer to the question. However, one point that needs to be emphasized in this lecture is as follows: In geography, it is believed that space is organized the way it is because of man's desire to use space efficiently. In practical terms, efficiency in the use of space translates to minimizing costs or maximizing profits or benefits in the location of human activities and the associated movements and flows. In other words, the criterion for spatial efficiency is either cost minimization or profit maximization.

Most theories in human geography incorporate one or both of these principles. A basic assumption of these theories is that human beings are economically rational in their actions. An economically rational person is one who is concerned with the best or the optimal in any given situation. For instance, an economically rational farmer will cultivate the particular crop and adopt the particular farming methods that will yield the highest net revenue. In a like manner, an economically rational industrialist will locate his factory at the point in space where the costs of procuring raw materials and other inputs as well as the cost of distributing the finished products are minimized. Such a location could maximize his profits. One can go on duplicating examples but the underlying principle of minimizing cost or maximizing profit runs through all of them.

At some point, it became clear that the assumption of economic rationality does not adequately characterize human behaviour. Not every person is an 'economic man;' that is to say, not everyone is economically rational. In other words, not every human being aims at the best result or outcome. Some aim at satisfactory results and these satisfactory results may not necessarily be the best ones. In short, some people are 'satisfiers' while others are 'optimizers.' People concerned with satisfactory outcomes are 'satisfiers' while those concerned with the best are 'optimizers.' Because everyone is not an 'optimizer,' theories and approaches based on the assumption of economic rationality were found to be inadequate for explaining the spatial organization of society. Alternative approaches were therefore developed in an attempt to explain better the pattern of spatial organization. One of these alternative approaches is the behavioural approach which is partly based on people's perception or mental images of the environment. The failure of traditional approaches to adequately explain locational patterns was therefore partly responsible for the development of an approach based on the mental images or mental maps which people have in their minds and how these affect spatial behaviour and spatial organization.

Pre-Test

1. What is the meaning of the following concepts?
 - a. Spatial efficiency
 - b. Satisfiers
 - c. Optimizers
 - d. Mental maps.

CONTENT

Mental Maps

Mental maps are the mental images of an environment held by an individual or group of individuals (Cox, 1972; Gould, 1973). They are products of the perception of the environment by individuals or groups. Perception itself can be defined as bits of knowledge acquired by individuals as a result of their contacts with the environment. These contacts are largely by means of what we see and what we hear of places; but both are important in shaping the images we have of places and

environments. Perceptions are however, subject to all the distortions that can be imposed by the human mind. Mental maps are therefore not necessarily accurate pictures of the actual environment. But, the important thing is that it is the perceived environment, not the actual environment, which influences spatial behaviour and spatial organization. People respond to the environment the way they see it, not necessarily the way the environment actually is. For instance, two individuals may see or perceive Lagos and the opportunities in it in very different ways. One may perceive it as an attractive place and would not mind living and working in Lagos. To the other, his mental image of Lagos may be very negative. Who would perceive Lagos as an unattractive place and would therefore not want to work and live in Lagos. These differences in perception could evoke migration of one but not the other individual. In this particular instance, the decision to migrate is a function, not of Lagos per se (i.e. the actual environment), but of the way the individuals concerned see or perceive Lagos (i.e. the perceived environment). The decision to locate a factory or shop or to grow a particular crop is all influenced by the perceived environment rather than the actual environment. It is the images of the environment which people have in their minds which influence spatial behaviour and spatial organization. These mental images hold the key to the understanding of the spatial organization of society.

Types of Perception

There are two main types of perception, namely, designative perception and appraise perception. Cox (1972) defines designative perceptions as ' . . . those perceptions that we have of the attributes of places and which are devoid of all evaluation of those attributes.' As the definition implies, this type of perception does not involve any evaluation or value judgments. The perception of such attributes as distance, temperature, precipitation, ethnic composition of towns, etcetera, and fall into this category. If you live in Ibadan and you say that Maiduguri is far away, then, you are involved in the designative perception of an attribute of that place. The attribute in question is distance. To say that Maiduguri is far away or distant does not involve the evaluation of the attribute of distance. But, if we go on to say that long distance is good or bad, then, we are evaluating the attribute of distance.

There are other examples of designative perception. For instance, if we say that Jos has a cool climate or that Port-Harcourt is very wet in the

rainy season, we are not evaluating these attributes of the two places, namely of the attributes of coolness and wetness. But, if we go on to evaluate these attributes in such terms as good, bad, nice, pleasant, interesting or whatever, then, we are no longer in the realm of designative perception. Thus, such statements as 'Maiduguri is far away,' 'Jos has a cool climate,' 'Ibadan is a Yoruba city,' 'Lagos is a coastal city' and so on, refer to designative perceptions of certain attributes of the places in question.

Appraisive perceptions, on the other hand, involve value judgments. They are the perceptions in which we appraise or evaluate places. For instance, if we say that Jos is beautiful or that Lagos is a horrible place, then, we are involved in the appraisive perception of these two places. In other words, we are evaluating the places in terms of the way we feel about them, given what we know of them. One important characteristic of appraisive perception is that it involves personal opinions and emotions. As a result of this, different people may perceive the same phenomenon very differently. Thus, while some individuals may perceive Lagos as an attractive place, others may perceive it as a very unattractive and terrible place.

In appraise perception, individuals or groups normally have information about different places. They then evaluate the available information in terms of their personal goals. Such goals could be migration (to a new place in search of a job), the location: of a factory or shop, etcetera. Before choosing a place to move to or locate a factory, individuals evaluate alternative places and rank them from the most preferred places to the least preferred. This ranking produces what is referred to as a space preference scale. This is a scale showing how individuals perceive alternative places. But, the important thing is that the spatial behaviour of individuals and their locational decisions are largely a function of the way they perceive alternative places and the environment in general. No one, for example, will be expected to migrate to or locate a factory in a place that is least preferred by him; that is to say, a place that is at the bottom of his space preference scale. In this way, the manner in which space is organized becomes the product of the perceived environment.

Summary

- a. The failure of traditional approaches based on the assumption of economic rationality to adequately explain the spatial organization of society led to the development of alternative approaches. One of these alternative approaches is the behavioural approach which is based on people's perception of the environment.
- b. Mental maps are the mental images of an environment held by an individual or group and they are products of the perception of the environment by the individuals or groups concerned.
- c. There are two types of perception. These are designative' perception and appraisive perception. The former does not involve any evaluation or value judgments while the latter involves evaluation and value judgments.
- d. Spatial organization is the outcome of locational decisions and such decisions are based on the perception of the environment by the decision maker. In other words, such decisions are based on the perceived environment, not the actual environment. Spatial organization is therefore the product of the mental maps or the mental images which people have of their environment.

Post-Test

1. Which of the following statements is correct?
 - a. Spatial efficiency refers to the situation in which the spatial arrangement of human activities is such that either minimizes costs or maximizes profits.
 - b. Spatial efficiency refers to the spatial behaviour of individuals.
2. Who is an optimizer?
 - a. Someone who is concerned with satisfactory or reasonably good results.
 - b. Someone who is concerned with the best outcome or result in any given situation.

3. What are mental maps?
 - a. Aerial photographs in a given environment.
 - b. The images of an environment which people carry about in their minds and which influence spatial behaviour.
4. What is the relationship between mental maps and spatial organization?

References

Cox, K.R. (1972). *Man, location and Behaviour: An introduction to Human Geography*. John Wiley, London, Chapter 6.

Haggett, P. (1972), *ibid*, pp. 218-224.

PROPERTY OF DISTANCE LEARNING CENTRE, UNIVERSITY OF PADAN

LECTURE FIVE

Man's Impact on the Environment

Introduction

As its title implies, this lecture is concerned with the human side of the man-environment system. The question it addresses is whether or not man has an impact on the natural or physical environment. You will recall that in the first lecture, the components of the physical environment were identified. The question then is, does man affect, or brings about change in, any of these components? The answer is yes and in this lecture, we shall attempt to show the different ways in which man affects the environment. However, it is important to first of all provide you with the background to the issue of the relationship between man and nature (i.e. between man and the physical environment).

Environmental change and man's role in bringing it about has been a long-standing theme in geography. One of the earliest concepts developed in an attempt to explain the nature of the relationship between man and the environment is the concept of environmental determinism. This concept regards the environment as the active agent in man environment interactions. It relegates man to the position of a passive, powerless organism under the complete control of powerful natural forces. In other words, the concept of environmental determinism does not regard man as an agent of environmental change. Rather, it attributes changes in the environment to the operation of powerful natural forces. Man was seen as being at the mercy of these forces which not only determined man's activities, but also influenced his personality and behaviour. This concept was rejected after a while since it became clear that man does intervene in the natural order and that he induces change in the environment. Other concepts were developed to incorporate the role of man in environmental change. They include the concept of possibilism which recognizes man as

an active agent of environmental change. The environment is seen as setting the broad limits within which man has some freedom of action. Possibilism does not in any way under-rate the importance of the environment but at the same time, it recognizes the importance of man in the man environment system.

One fact that emerges from the debate on environmental change is that there are two causes of change, namely, nature and man. In other words, human and natural factors are the primary causes of change in the environment. The role of man is no longer in doubt. The domestication of certain plants and animals is one of the most revolutionary interventions of man in the natural order. By favouring and reproducing certain plants and animals, man changed the balance of nature by forcing those species that were useless to him to give way to those that were useful. Cocoa trees are good examples in Nigeria. They were not part of the original vegetation. Man influenced the surface of the earth largely through the destruction or modification of vegetation. Fire played an important part in this regard for it was the tool with which man destroyed natural vegetations to replace them with favoured species or to hunt for game. The story of man's role in brining about changes in the natural environment therefore starts with the invention of fire-making and the domestication of plants and animals. The effects of man's impact on the changing landscape are evident everywhere.

Pre-Test

Do you think that man can in any way alter the environment and in what ways does he do it?

CONTENT

Examples of Man's Impact

Man's impacts on the environment can be grouped into two. These are the direct impacts and the indirect impacts. We shall discuss the direct impacts first. Direct impacts refer to those changes in which man alters the environment for specific purposes. Such purposes are usually beneficial to man and are designed to improve the productivity or habitability of a given environment. Direct impacts take different forms. Irrigation in an arid or semi-arid environment is a good example. Irrigation can lead to an improvement in the productivity of an area. In some arid or semi arid environments, it may be impossible to grow crops without irrigation. In

others, the growing season may be so short that only a limited range of crops can be grown. In such areas, irrigation could lengthen the growing season, thus enabling a wider variety of crops to be cultivated. I am sure it is now clear to you why irrigation is very important for agricultural production in northern Nigeria. Compared to the southern part of Nigeria, the wet season is relatively short in the north, especially in the far north. As a consequence of this, the growing season is also short. But irrigation has been used to alter the environment somewhat and the growing season in many parts of the north is now longer than would have been possible without irrigation.

Other forms of direct impact include construction of dams, drainage or reclamation of swamps, destruction of vegetation for cultivation or grazing, mining, construction of new towns or expansion of existing ones, etcetera. All of these cause some alterations in the environment. For instance, the construction of a dam could create an extensive man-made lake in a place where there was originally none. Kanji Lake is an example. Reclamation could transform swamps or water bodies into solid land surfaces. Some parts of Lagos such as Victoria Island were reclaimed in this manner. When vegetation is destroyed for cultivation or grazing, the original vegetation is often replaced by a somewhat different one. The construction of Abuja constitutes an important alteration of the environment in that part of the country. Generally speaking, the construction of cities affects many aspects of the environment. For example, it affects the climate of specific localities through the production of heat, the alteration of surface configuration, the lowering of wind speed because of obstruction by buildings, and so on.

Man therefore alters the physical environment in different ways. There are, however, three main consequences of man's direct impact on the environment. These are as follows:

1. Changes in the population of both domestic and wild animals.
2. Changes in plant population.
3. Changes in inorganic environments.

The first consequence is a result of the growth of human population. Selective exploitation by man has altered the balance in the population of domestic and wild animals. Over the years, there has been an expansion in the population of domesticated animals and a contraction or even extinction of wild animal populations. The second consequence also

relates to selective destruction and expansion but this time of plants rather than animals. This has altered the balance of plant populations. In Nigeria, for example, cocoa, palm trees, rubber trees, cotton and groundnuts have replaced the original vegetation cover in some areas. Finally, inorganic environments can be altered by changes in the boundaries between land and water resulting from land reclamation or the creation of man-made lakes. Changes in inorganic environments can also be caused by the depletion of mineral and underground water resources. Inorganic environments consist of non-living things.

In addition to man's direct impacts on the environment, there are also the indirect impacts. The indirect impacts are the unintended or accidental impacts. They include the pollution of land, water and the atmosphere by industrial, mining and other activities. I am sure that most of you are aware of the problem of oil spillage in the oil producing areas and the adverse effects of this problem on the environment. Other examples of indirect impact are soil erosion resulting from over-cultivation and over-grazing, as well as sedimentation and silting. I think it should be obvious at this stage that indirect impacts are, to a large extent, the negative by-products of man's activities.

Variations in Man's Impact

The intensity of man's impact is not uniform over the earth's surface. It varies from place to place, from country to country and from one part of the world to another. Population density, culture and technology are important determinants of the degree of environmental alteration by man. All things being equal, the following statements are correct:

1. Environmental change can be intensive in areas with high population densities.
2. Environmental change is usually minimal in areas with low population densities.
3. Developed countries, because of their level of cultural and technological development, have a higher capacity to alter their environments than underdeveloped countries.
4. In areas inhabited by primitive and technologically backward societies, fire is probably the most important instrument of environmental change. The intensity of man's impact on the environment thus varies from place to place depending on

population density and the level of cultural and technological development.

Summary

- a. Man is an important agent of environmental change. He is not a passive agent in the man-environment system as the environmental determinists would have us believe. Man and nature are the two main causes of environmental change.
- b. Man's impacts on the environment fall into two groups, namely, the direct impacts and the indirect or secondary impacts. Direct impacts are intentional and are often designed to improve the quality of the environment. Indirect impacts are often accidental and unintended. They are the negative by-products of some of man's activities.
- c. Man's impacts on the environment vary in intensity from place to place. Population density and the level of cultural and technological development are probably the most important determinants of the intensity of man's impact.

Post-Test

1. Which of the following concepts recognizes the capacity of man to alter the natural environment?
 - a. Environmental determinism.
 - b. Possibilism.
2. Which of the following factors can bring about significant environmental change due to human action?
 - a. Low population density
 - b. High level of cultural and technological development
 - c. Dense vegetation.
 - d. High population density.

Reference

Haggett, P. (1972), *ibid.*, Chapter 6.

LECTURE SIX

Location and Resources

Introduction

In this lecture, we shall examine the relationship between the location of natural resources and the location of human activities. In other words, we are interested in knowing how the location of man's activities is influenced by the location of natural resources. As in some of the previous lectures, we shall start our discussion with a definition, this time, of what the term resource means. After the definition, we shall examine an important characteristic of resources. Finally, we shall examine the influence of resources on location.

Pre-Test

1. What are natural resources?
2. Why do they influence the location of Population and human activities?

CONTENT

What is a Resource?

This is an important question but before providing an answer, I should point out that our concern here is with natural resources. Resources are the portion of the material components of the environment which, under specified technological, economic and social conditions, can be used to satisfy some human needs. This definition implies that something is a resource only if it is accessible and can in some way be used to satisfy human needs. Thus, except something is accessible in geographical, economic and technological terms, it is not regarded as a resource. This

means, for instance, that even if it is known that iron ore deposits exist in a place but the place is so remote on the earth's surface, or is so deep down in the earth that it cannot be reached, then, it cannot be used to satisfy any of the needs of the people in whose territory it occurs. For this reason, it cannot be regarded as a resource. Even where the technology exists to exploit the deposit in spite of its remoteness, the production or extraction cost may be higher than the market price of iron ore and it would therefore make no economic sense exploiting it. In some other cases where high cost of production resulting from remoteness or other factors is not a problem, the technology may not exist for exploiting very remote deposits. Whatever be the case, if a particular substance is not accessible and therefore cannot be used to satisfy human needs, then, it is not a resource.

A good example in this regard is the North Sea Crude Oil deposits. Although, these deposits were known to be in the North Sea, they were for many years not, listed as one of the resources of Britain because their remote location under the sea bed made their exploitation uneconomic. But, In the 1960s and 1970s as OPEC producers kept increasing the price of crude oil; it reached a level where it became economic to exploit the North Sea deposits. Crude oil thus became one of the natural resources of Britain. The point to note here is that although, globally, crude oil is an important, resource, it was not one of the natural resources of Britain until relatively recently when economic conditions changed and the North Sea deposits became viable. In our discussion so far, we have defined a resource in terms of access under existing economic and technological conditions. In the particular case cited, we were concerned with a substance (crude oil) which is a known resource but which in the case of Britain was not one of its natural resources until fairly recently when changes in economic conditions made its oil deposits accessible.

There is another interesting example of this nature. It is known that the core or Centre of the earth's crust consists of iron-nickel, but it is totally inaccessible under existing technology. Thus, although, iron ore is an important, resource, the particular deposit at the core of the earth cannot be regarded as a resource.

There is another important basis than accessibility for defining resources. This basis is implicit in the definition at the beginning of this section. You will recall that it was stated that for a substance to be a resource, it must be capable of satisfying some human need. Therefore, accessibility under existing economic and technological conditions is not

all that matters. Utility is equally important. To be a resource, a substance must be of use to man, or to put it another way, man must have found use for it. If man has not learned to use a particular substance, then, that substance cannot be a resource, no matter how accessible it is. The implication of this is that what is not a resource today could become one in the future. This is true of all the substances we regard as resources today. Many of them had existed for hundreds, thousands or millions of years before man learned or discovered how to use them. Only then did they become resources. We can expect, therefore, that some of the substances in our environment which are of no use to us today may well become important resources in the future.

It is important at this juncture to make a distinction between stock, resources and reserves. Stock refers to the entire or total material components of the environment. They could be gaseous, liquid or solid, animate or inanimate. There is no doubt that there is an abundance of total stock on the earth's surface, underground and in the atmosphere. But ' . . . the vast, proportion of the earth's total stock is of very little interest to man. Either it is wholly inaccessible under existing technology . . . or represents substances that - has not learned of use' (Hagget, 1972). Resources, on the other hand, are quite different from stock even though they are part of it. It should be clear from our discussion above that resources are that part of total stock which can be used by man under prevailing technological and socio-economic conditions. Resources are therefore a subset of total stock.

Finally, reserves are a subset of resources. They refer to that portion of resources that are available under prevailing technological and socio-economic conditions but which are presently not being utilized.

Classification of Resources

One way of classifying resources is in terms of whether or not they are renewable. This system of classification produces two classes or groups of resources and the two groups together represent an important characteristic of resources. The two groups in question are renewable resources and non-renewable resources. An important characteristic of resources is that while some are renewable, some others are non-renewable. As its name implies, a renewable resource is a resource that renews itself as man uses it. In other words, they do not get exhausted as a result of their exploitation or use by man. Examples of renewable

resources include soils, natural vegetation and water supplies. Except totally destroyed as a result of, erosion, soils can regenerate after they have been exhausted. The same is true of vegetation. Underground water resources can be replenished except the water-holding fissures (i.e. narrow openings in the crust) have been closed as a result of over-pumping. Other renewable resources such as tidal energy cannot be reduced in any way by man.

Non-renewable resources, on the other hand, exist in limited or fixed amounts. They can therefore be used up or exhausted as a result of continuous exploitation and use by man. Such resources form over hundreds of millions of years and so once they are used up, they are gone for good. Resources in this group include coal, petroleum, natural gas, zinc, iron ore, lead and tin ore. Because non-renewable resources can get exhausted, mankind is expressing some concern about how long they will last, given present consumption rates. Two important factors affecting the rate of exploitation of these resources are population growth and rising standards of living. Both factors have led to massive increases in resource extraction and use.

The concern about the lifespan of non-renewable resources has evoked two responses. One is optimistic and the other pessimistic. The optimistic response is the view of economists. They point to the relative price stability of natural resources over the years as an indication that there has been no scarcity. On this basis, they paint an optimistic picture for the future. However, it has been pointed out that price stability might be due to other factors than the abundance of resources. These other factors include greater economy and efficiency in the extraction and use of resources, and the use of both natural and synthetic substitutes as alternatives to some natural resources.

The pessimistic response is that of ecologists. They take a very long term view of the situation and are less optimistic than the economists. In their viewpoint, the extraction of other forms of resources depends on energy resources. Tractors in farms depend on petroleum products. Mining equipment and machinery depends on petroleum products either directly or indirectly. Electricity, which is important in resource extraction, is mainly produced from coal, natural gas or other fossil fuels. Given the present rate of consumption of these organic energy resources, it is estimated that about 80% of the resources will be used up in the next 100-400 years. If this happens, the availability of other resources will be

affected and the future might be bleak. However, scientists are beginning to develop inorganic energy like solar energy, water power, geothermal energy and nuclear energy as substitutes for fossil fuel. But apart from water power, the others are yet to be commercialized.

Location and Resources

From our discussion so far, one can conclude that resources must have a tendency to attract human populations or some form of human activity to locations or places where they occur. In other words, because of man's need for resources, he is not likely to live or locate his activities very far away from places where resources occur. For this reason, resources tend to attract the location of human activities, at least in some cases. Indeed, the spatial organization of society as reflected in the aggregate locational pattern of human activities can, to some extent, be regarded as a crude index of the spatial pattern of resource endowment. We are not likely to have large population concentrations in a desert because of its limited range of resources. On the other hand, humid areas with abundant water supply, fertile soils for agriculture, etc., usually have large concentrations of population and human activities. Even desert areas with rich mineral resources such as petroleum do not attract such concentrations. Libya and Saudi Arabia are examples in this regard. Because resources are not evenly distributed on the earth's surface, we find also that population and human activities are not evenly distributed.

Areas that are richly endowed with resources have more concentrations than areas that are poorly endowed. Although, this generalization is valid, it must be pointed out that the relationships between location and resources are a lot more complicated. For instance, technology or international trade can enable a country that is not very richly endowed to support large concentrations of population and human activities. But in spite of the exceptions, it is true to say that generally speaking, the location of resources influences the location of population and human activities. Nigeria, for example, is smaller than Sudan in terms of areal size but Nigeria is richer in natural resources than Sudan. Nigeria therefore has larger concentrations of population and economic activities than Sudan.

At a more local level, we find that the location of resources influences the location of settlements and resource processing or manufacturing.

These influences will be discussed in detail in subsequent lectures. But it is necessary to note here that the availability of fertile agricultural land and water supply sources are among the factors that determine the location of settlements. The availability and location of industrial raw materials also influences the location of manufacturing industries. For example, if a particular raw material is not only bulky but also loses some weight in the manufacturing process; the factory that uses it is usually located at the source of the raw material in question. Thus, both at the global, national and local levels, the influence of resources on location is very evident.

Summary

- a. A resource is a substance that is not only of use to man but is also accessible to him under prevailing technological and socio-economic conditions. Once man learns how to use a particular substance, it becomes a resource. It follows; therefore, that what is not a resource today could become one in the future, and that what is a resource today could cease to be one in the future.
- b. Resources fall into two main groups, namely: renewable and non-renewable resources. Renewable resources have the capacity to regenerate and therefore are not exhaustible. Non-renewable resources are fixed in amount, do not have the capacity to regenerate and are therefore exhaustible.
- c. Generally speaking, the location of resources tends to attract the location of population and human activities. In fact, the spatial patterns of population and human activities are a crude index of the spatial pattern of resource endowment.

Post-Test

1. Which of the following statements are correct?
 - a. Resources refer to all substances in the environment.
 - b. Resources are substances that are not only of use to man but are also accessible under prevailing technological and socio-economic conditions
 - c. Because of man's need for resources, the location of population and human activities is influenced by the location of resources.

Reference

Haggett, P. (1972), *ibid.*, Chapter 8.

PROPERTY OF DISTANCE LEARNING CENTRE, UNIVERSITY OF IBADAN

LECTURE SEVEN

Spatial Variations in Culture

Introduction

The primary concern of this lecture is to examine the role of culture in man-environment interactions. Such cultural elements as traditions, religious beliefs, fantasies and taboos affect a people's perception of their environment and their relationship to it. Culture is not one of the easiest words to define and different people tend to define it somewhat differently. But the different definitions have some common elements. The definition by De Blij (1974) is among the most comprehensive. In his words, 'culture . . . consists of people's beliefs (religious, political and so forth), institutions (legal, educational, governmental), and technology (equipment, skills). It is expressed in the way people communicate, in the way they perceive and exploit their resources, in their architecture and art, and in the way they organize that part of the earth that is theirs.' You will recall from some of our previous lectures that environmental perception and the exploitation of resources are important influences on and aspects of man-environment relationships. All the different elements of culture leave their spatial imprint on any area. When a given community inhabits an area, they transform it by building structures in it, by constructing roads and other lines of communication and by cultivating the land. In this way, the appearance of the area is affected. Culture therefore gives character to an area. In other words, culture influences the character of space and this is one reason why it is of interest to geographers.

Pre-Test

1. What is culture?
2. Why is it of interest to geographers?

CONTENT

The Geographical Significance of Culture

Culture is of interest to geographers for two main reasons. In the first place, cultures occupy specific parts of the earth's surface. They can therefore be expressed regionally. In other words, there is spatial variation in culture and spatial variation is the main focus of geography as an academic discipline. The spatial variation in culture is manifested in different ways. Patterns of agricultural production vary from place to place. So too do house types, the internal structure of cities, etc. In essence, culture affects the spatial organization of society, it affects the way a given society uses its territory, In the case of cities, for instance, it is possible for the character and internal structure of a city to reflect the influence of different cultures. The city of Ibadan is a good example in this regard. A number of zones exhibiting varying cultural characteristics can be identified in the city. The original core area is the largest of the zones and it is inhabited by the indigenous Yoruba population. It is characterized by densely packed compounds each of which is inhabited by an extended family unit. The compounds are made up of one or more buildings. The density of population is high in this zone which also contains a number of specialized ~ and night markets. Another zone lies to the north of the core area. It is called Sabo and is occupied by Hausa and other immigrants from northern Nigeria. A special feature of this zone is the kolanut-market. The final zone comprises the modern or newer areas of the city. It is associated with the colonial administration. The main features of this zone include a modern central business district (CBD), low-density housing of modern designs and low population density. With specific reference to Ibadan, Haggett (1972) notes that'. . . the spatial form of the city, its population density, and its economic organization are inseparable from the cultural diversity of its inhabitants.' What is true at the city level is also true at the regional and global levels. Because different cultures occupy different parts of the earth's surface, the character of space varies from place to place.

Another reason why culture is of interest to geographers is that it is a key factor in the interpretation of man-environment relations. You will recall that in our discussion of resources, the point was made that among other features, resources are substances which man has learned to use. The ability of any society to convert or use substances in the environment to satisfy human needs is partly a function of man's culture, particularly his

technology. You will also recall that in the lecture on man's impact on the environment, it was emphasized that technology is man's key instrument in this regard, and technology is an important component of culture. The search for and exploitation of resources and the processing of these resources in factories, the construction of dams and irrigation schemes as well as land reclamation are all aspects of man-environment interaction. These different activities of man affect the environment either directly or indirectly, positively or negatively.

However, the point to note here is that the intensity of these effects is partly a function of man's technology. For instance, primitive societies with a low level of technological development (in terms of equipments and skills) have a very limited capability for altering or modifying the environment. The reverse is the case for advanced societies. Thus, culture is an important mediator in man-environment relations and man's ability to adapt to or to modify his environment is largely a function of his culture.

Culture and Environmental Appraisal

It should be dear by now why geographers are interested in culture. One other fact that emerges from our discussion so far is that culture has implications for man's environmental appraisal. How does man appraise or evaluates his environment in terms of its potentials and limitations? This is largely a cultural matter; we shall illustrate this with some examples. The European colonization of Africa exposed the majority of Africans to European-culture and technology. Before the advent of European technology, Nigerian technology was very simple, characterized by simple wooden and iron implements as well as craft products. At that time, for instance, the environment of the Niger Delta was seen as having very limited potential. The only activities then possible were mainly fishing and what limited crop production was possible in a swampy environment. Little did the inhabitants of the area know that they were sitting on large reservoirs of crude oil and natural gas? It took the introduction of Western technology to the inhabitants of the area and indeed the people of Nigeria to appreciate the economic value of the swampy environment of the Niger Delta. The Niger Delta is thus a good example of the effect of culture on the appraisal of the environment. Some examples from the northern parts of Nigeria also illustrate this effect of culture very well.

The comparatively dry conditions in some parts of the north limit agricultural potential and possibilities in those areas. These areas are characterized by low rainfall, short rainy season and short growing seasons. These conditions, among others, constituted a serious constraint to agricultural production. For example, since the growing season is short, it means that in the absence of irrigation, farmers can have only one crop per year. It also means that dry season farming will virtually be absent except in a few favoured areas such as river valleys. But all these have changed with the advent of Western technology that made large-scale irrigation possible. Irrigation schemes have now made dry season cultivation possible in those parts of the north that are covered by the schemes. This, therefore, means that some farmers can have more than one crop a year. Examples thus abound of the implications of culture for man's environmental appraisal. Historical evidence shows that the grasslands of North America were seen by some groups as the 'Pastoral Garden of the West' and by others as the 'Great American Desert.' In this case, the same environment was appraised very differently by different groups. The same was true of the Great Plains in respect of which Haagett (1972) observed that 'each culture group saw in the Great Plains environment different possibilities linked to its current technology and cultural background.'

Acculturation

Our discussion in the preceding section raises two important issues, namely, the diffusion of culture and the process of acculturation. In essence, our discussion above relates to the diffusion of European or Western culture to Nigeria, and to other parts of the world for that matter. Diffusion is the process by which things spread from one place to another. The things that spread could be culture, new ideas, new crops, new tools, fashion, etc. When an alien culture spreads or diffuses to another place, (for instance, European culture in Nigeria), the process of acculturation may commence. Acculturation is the process by which an indigenous culture is changed or modified as a result of contacts or interactions with an alien culture. Our contacts with Europe and the Western world in general have caused important changes and modifications in Nigerian culture as well as reappraisals of the Nigerian environment. For example, our towns have been transformed with the introduction of European-style buildings. New languages, new religions and new forms of economic organization have been introduced. Thus, both the Nigerian economy and

Nigerian society show signs of Western cultural influence. This influence is reflected in our spatial organization (e.g. the internal structure of cities) and in our relationships with the environment. Western technology has been particularly important with regard to our relationship with the environment.

Summary

- a. Generally speaking, culture refers to a people's way of life. It includes their beliefs, institutions and technology. Among other things, it is expressed in the way people perceive and exploit their environment. Culture gives character to an area.
- b. Culture is of interest to geographers because cultures occupy specific parts of the earth's surface, can be expressed regionally and cause spatial variation in the character of space. In addition, culture is a key factor in the interpretation of man environment relations. It is an important determinant of man's impact on the environment. Man's ability to adapt to or to modify his environment is largely a function of his culture.
- c. Culture has important implications for man's appraisal of his environment. In terms of its resource potentials, the same environment can be appraised or evaluated very differently by different groups. Each group would see in the same environment different possibilities depending on the group's technology and culture.
- d. Cultures diffuse or spread from one place to another, and in the process, some acculturation takes place. Acculturation can lead to significant changes or modifications of indigenous cultures, and it has implications for environmental appraisal and the exploitation of resources.

Post-Test

1. Which of the following statements is false?
 - a. Culture varies in space and therefore causes variations in the character of the landscape.
 - b. Culture is an important determinant of man's impact on the

environment.

- c. Culture influences man's appraisal of his environment.
- d. Culture has no impact on landscape.

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Haggett, P. (1972), *ibid.*, chapter 9.

PROPERTY OF DISTANCE LEARNING CENTRE, UNIVERSITY OF IBADAN

LECTURE EIGHT

Population and Resources

Introduction

In this lecture, we shall examine the relationships between population and resources. We shall do this by using some concepts that describe these relationships. But for a start, we shall examine some of the factors affecting the size and growth of population.

The total population of any town, country or territory is a result of the operation of two factors. These are natural increase and migration. Natural increase or natural change is the difference between births and deaths while migration change represents the difference between immigration and emigration. Immigration is the movement of people into a place. On the other hand, emigration is the movement of people out of a place. Let us now examine how these two factors, natural increase and migration, can cause the growth or decline of population.

If at any given time and place, the birth rate is higher than the death rate, it means that there are more births than deaths. In such a situation, the total population will increase. If, on the other hand, the death rate is higher than the birth rate, it means that there are more deaths than births and the total population will decrease. A similar argument applies to migration. If at any given time and place, rate of immigration is more than emigration, it means that there are more immigrants than emigrants and as a result the total population will increase. On the other hand, if emigration is more than immigration, it means that there are more emigrants than immigrants. Consequently, population will decline.

It follows from the explanation we have just made that while births and immigration tend to lead to population increase, deaths and emigration tend to cause a decrease in population totals. However, migration is more

significant in smaller areas than in larger areas. In other words, the higher the scale or the larger the area, the less important migration becomes as a factor in population growth or decline. Thus, 'although, migration may be the most important component in small areas (for instance in a city block), it is less significant on national and higher levels. For the world total, migration change drops out of the calculations entirely because all the movements take place within the limits of the recording area' (Haggett, 1972). Migration is therefore totally unimportant on the global scale because all the movements (i.e. immigration and emigration) take place within the limits of the world. There is no movement out of it except when one dies! If that happens, then, we are in the realm of natural increase and not migration.

It should be clear by now that with the exception of relatively small areas, natural increase is a more important factor than migration. Indeed, it has been suggested that migration is a distorting influence. In other words, it is believed that the primary cause of population change is the difference between births and deaths and that migration only operates to distort or modify this basic cause of population change.

Pre-Test

1. Do you think that the resources available in a country can place a limit on its population size?
2. What happens if that limit is exceeded?
3. What other factors affect population growth?

CONTENT

Factors that Limit Population Growth

Population does not and cannot keep growing indefinitely. If it did, it might reach a point where human beings will barely have enough space to stand on. For instance, in most developing countries of the tropics, the population growth rates are 3% and above per annum. This growth rate means that their populations double every twenty years or so. The implications of this for food, space, shelter and other essential things are obvious. It should be fairly clear therefore that population cannot keep on growing without some form of check. Under natural conditions, population growth is checked by two factors. These are environmental or

natural limits and cultural constraints.

Environmental or natural limit is imposed by resources. The reasoning in this regard is that population cannot grow beyond that point where it cannot be sustained by available resources, especially food. The limit to growth is therefore set by available resources. Population growth could slow down as this limit is approached, eventually drop to zero. Alternatively, population may progressively overshoot or undershoot this limit as an equilibrium state is reached at which time; population is adjusted to available resources. When it overshoots, population may be reduced by food shortage, for instance. This is particularly true of the early period of man's history. There is some historical evidence of food shortages and consequent checks on population numbers. The 1877-1879 famine in East China took a toll of 9 million lives. This is the worst recorded famine in the world. In India, the famine of 1837 took a toll of 0.8 million lives while that of 1863 took 1.0 million lives. The worst famine in Europe was the Irish potato famine of 1845. About 0.75 million people died and about a million emigrated as a result of the Irish experience. Coming nearer home, the famines and deaths in Ethiopia and Sudan are very fresh in our memories.

If famines are due to environmental forces, such as rainfall failures, then, these forces can be regarded as affecting the carrying capacity of the area experiencing them. Very roughly speaking, carrying capacity is the saturation level or fixed point above which population cannot expand. Populations respond to famines and such environmentally induced problems in different ways, depending on the nature of the environmental change. Food could be stored for use during the problem season or period; local populations could migrate on a temporary basis to areas unaffected by the environmental change while waiting for conditions to improve in affected areas; the affected area may be totally abandoned by the local population; food and other essential items could be moved in from unaffected areas. What strategy is adopted depends on the nature and duration of the change in the environment. However, if the famine is world-wide, none of the strategies will work.

The cultural constraints on population growth vary from one society to another. But in all societies or cultures, these constraints tend to affect fertility or birth rate directly or indirectly. In every society, there are policies, laws, customs, traditions, life styles and so on which directly or indirectly affect fertility and the average number of children per family.

The age at which people are allowed to get married, the practice of polygamy or monogamy, urban life with its many diversions outside the home, education and urbanization which create a desire for smaller families, these are some of the cultural constraints on population growth. In some countries, there is outright legislation limiting family size. In others, incentives or disincentives are used to encourage large or small families. The most widely known cultural constraint on population growth is birth control by means of various contraceptive devices. All of these cultural practices affect population growth directly or indirectly.

Population/Resource Relationships

From the discussion in the preceding section, it is clear that population and resources are related in important ways. As we noted at the beginning of this lecture, there are some concepts that describe these relationships. We also noted during the course of the lecture that every environment or area has a carrying capacity which sets a limit that cannot be exceeded by population. Ultimately, therefore, resources place a limit on population growth. The concepts that describe the relationships between population and resources capture these basic notions. These concepts are overpopulation, under population and optimum population. Although, these three concepts are widely used, their definitions are rather vague and inexact. Overpopulation refers to a situation where the population in a given area is more than the number that can be sustained or supported by the resources in the area. You will recall that we touched upon this subject in our discussion of the limit to population growth in the preceding section. The symptoms of overpopulation include famine. Thus, rainfall failure could lead to a shortage of resources in relation to population thereby creating a situation of overpopulation. Other symptoms include high unemployment, malnutrition and declining standards of living.

Under population represents the opposite case. It refers to a situation where the population in an area is less than the number that can be supported by the resources in the area. In other words, there are too few people to fully utilize the available resources. A larger population can be supported by the same resources. Finally, optimum population represents a perfect balance between population and resources. It refers to a situation where the population is the exact number that can be supported by available resources, not more, not less. All three concepts must be used with a lot of care because they depend on many factors such as culture,

technology, etc. For example, a country that is overpopulated may become under populated or have an optimum population if technological improvements enable it convert the substances in its environment into resources. A country that is under populated may become overpopulated without any addition to its population. This can happen if the standard of living of its inhabitants rises and they start consuming more and more resources. In the same way, rising standard of living can convert a situation of optimum population to one of overpopulation. Adverse environmental change (e.g. rainfall failure) can cause a country that was not previously overpopulated to become so.

The concepts of overpopulation, under population and optimum population are therefore influenced by several variables. In addition to culture and technology mentioned above, others include standard of living, environmental change, and international trade. For this reason, the concepts are rather vague and changeable. What was overpopulation, under population or optimum population in the past may not be so now or in the future. Also, what is overpopulation, under population or optimum population in one place may not be so in another place. In other words, the concepts are not represented by fixed or exact numbers.

Summary

- a. The population of any place is determined by two factors, namely, natural increase and migration. Natural increase is the difference between births and deaths while migration change represents the difference between immigration and emigration. Births and immigration lead to population increase. On the other hand, deaths and emigration cause a decline in population totals. However, natural increase is the primary cause of population change.
- b. Population growth is hardly ever unchecked. Two main factors limit population growth. These are environmental or natural factors and cultural constraints. Environmental limits are imposed directly or indirectly by resources. Population cannot grow beyond the point where it cannot be sustained or supported by available resources. Cultural constraints consist of customs, traditions, policies, life styles, etc. which affect fertility and family size.
- c. The relationships between population and resources are manifested in three different ways, namely, overpopulation, under population and optimum population. These relationships are influenced by many factors as a result of which the concepts of overpopulation, under population and optimum population are vague, inexact and changeable. They cannot be represented by fixed or exact 'numbers. What is overpopulation; under population or optimum population at one time and place may not be so at another time and place.

Post-Test

1. Which of the following is correct?
 - a. Over-population refers to high population density.
 - b. Over-population refers to a situation where the population of a given place is more than the number which can be supported by the resources available at a given time.
2. Which of these factors can limit population growth?
 - a. Environmental limits

- b. Cultural constraints
- c. Mixed marriages.

Reference

Haggett, P. (1972), *ibid*, chapter 7.

PROPERTY OF DISTANCE LEARNING CENTRE, UNIVERSITY OF IBADAN

LECTURE NINE

Rural Settlements

Introduction

In this lecture, we shall be concerned with three main things. First, we shall try to explain what is meant by the term 'rural settlement'. In the process, an attempt will be made to highlight the difficulties involved in defining the term. After the definition we shall then examine the different types of rural settlement. Our main interest here will be the different criteria for classifying rural settlements. Finally, we shall examine the site, pattern and distribution of settlements. These are important concepts that relate settlements to their immediate physical environments or to each other.

Settlements are made up of groups of huts or houses occupied by varying numbers of people and they form distinctive features on the earth's surface. They range in size from small villages to very large cities. Rural settlements represent one type or category in this broad range or continuum of settlements. They occupy the lower end of the continuum. But what exactly are rural settlements? There is no clear-cut answer to this question. This is partly because several criteria can be used for defining rural settlements. Also, these criteria may vary from one country to another. The definitions are therefore neither precise nor unambiguous. However, the criteria most commonly used for defining rural settlements include the following: law, population size and land use or functions. In some countries, some settlements may be legally designated as urban and those that are not so designated are automatically rural settlements. In some cases the rural settlements may also be legally designated. Oftentimes, this designation is based on population size or population density.

Population size itself is often an explicitly used criterion. In this case, a lower population limit is set for what constitutes an urban centre and any settlement whose population is below this lower limit is a rural settlement. This minimum population size varies widely from one country to another. It varies from 200 in some Scandinavian countries through 10,000 in Greece to 20,000 in Nigeria. Thus, in Nigeria, settlements with less than 20,000 inhabitants are rural settlements. There is therefore no fixed lower limit for what is urban and so, different countries adopt different minimum population sizes. What is a rural settlement in Nigeria may be an urban settlement in Greece or Denmark.

Finally, function or land use is another criterion used for defining rural settlements. In this regard, rural settlements are those settlements in which agriculture (including forestry and grazing) is the dominant economic activity. It follows from this definition that all non agricultural settlements are not rural settlements, no matter how small their population sizes may be. The definition of rural settlements based on land use is too restrictive. This is particularly the case in developed countries where a settlement which is defined as rural in land use terms may in fact contain large numbers of people who have nothing to do with agriculture. Such people may be engaged in the service sector of the rural economy (e.g. shops, schools, etc.). They may also be retired people, or people who are only resident in rural settlements but work in nearby towns.

There are therefore, a number of problems involved in the precise definition of rural settlements. In spite of these definitional problems, rural settlements have some typical features which include the following (Volgyes, 1980): (a) they have the look or appearance of a countryside; (b) they are characterized by low population densities; (c) their economy is dominated by agricultural or primary activities; and (d) their inhabitants are noted for traditional or conservative attitudes and lifestyles. Generally speaking, therefore, rural settlements can be described as those settlements which are characterized by small or dispersed populations that are generally conservative in outlook, and which are predominantly agricultural in their economy. On the basis of this definition, it should be obvious that a vast majority of settlements in the world are rural. In fact, over half of the world's population lives in rural settlements. In Nigeria, between 70% and 80% of the population live in rural settlements. In Bendel State, the 1963 census showed that about 99.74% of all the settlements in the state were rural settlements (i.e. their populations were

each less than 20,000). Indeed about 96% of all the settlements in the state were small villages of under 4,000 inhabitants.

Pre-Test

1. Why are rural settlements different from urban settlements?
2. Why do settlement patterns differ from place to place?

CONTENT

Rural Settlement Types

There are several criteria for the classification of rural settlements. They include the following: (a) function, (b) morphology or physical layout, and (c) design. A functional classification of rural settlements is usually based on the dominant agricultural function performed by the settlement. On this basis, therefore, we can have the following types of rural settlements: fishing villages, farming villages, lumbering villages, plantation villages. A morphological classification is based on the physical layout or shape of the village. Based on this, we can have ribbon or linear villages, circular villages, rectangular villages and so on. Finally, a classification that is based on design relates to whether or not a village is planned. We thus have planned and unplanned villages.

Most villages developed gradually and naturally and so are unplanned. Their locations must have been carefully chosen, probably based on security considerations or the availability of water or arable land. But thereafter, the villages must have evolved on their own over long periods of time. However, this is not to suggest that there are no planned villages. On the contrary, planned villages do exist. Such villages are built as entire villages from scratch. Examples of planned villages include the Kibbutz in Israel and Ujamaa villages in Tanzania. I am sure that some of you are aware that in Nigeria some of the people displaced as a result of government acquisition of land for development and other purposes get resettled in planned villages. In the Kainji Lake area, some of those displaced as a result of the construction of the Kainji Dam were resettled in planned and well laid-out villages. As a matter of fact, in most developing countries such as Nigeria, planned rural settlements are often the product of government policy.

Function, morphology and design do not exhaust all the criteria for the classification of settlements. Indeed, a probably more important and

more common classification of settlement types is that based on settlement pattern. This classification gives rise to two commonly recognized settlement types, namely, dispersed and nucleated settlements. These will be discussed in the next section.

Site, Pattern and Distribution of Settlements

So far, we have defined rural settlements and examined settlement types. In this section, we shall move one step further by examining the locational characteristics of rural settlements. The three concepts of site, pattern and distribution relate to the locational characteristics of settlements and shall be discussed in turn here. Site is the relationship between a dwelling or group of dwellings and the immediate physical environment. In some cases, site may be peculiar to a single dwelling and in other cases, it may be peculiar to a whole village. A village or dwelling may be located on the top of a hill, at the foot of a hill, on a cliff overlooking the sea, on a rock outcrop, and so on. All of these refer to site characteristics; they refer to the immediate physical environment of the dwelling or village. Site does not refer to the relationship of one dwelling or village to another dwelling or village. It only refers to an individual dwelling or village in situ.

Settlement pattern is the concept that specifically refers to the relationship between dwellings. Pattern is the relationship between one dwelling and other dwellings, sometimes irrespective of site. The classification of rural settlements into dispersed or nucleated settlements is a classification based on pattern. 'Pattern . . . concerns the character of the settlements themselves - whether they are nucleated (as villages) or dispersed (as isolated dwellings)' (Whyne-Hammond, 1979). Thus, a nucleated settlement pattern is one in which the individual dwellings are close to one another; that is to say, one in which the individual dwellings are closely packed, forming compact villages. On the other hand, a dispersed settlement is one in which the individual dwellings are far apart from each other as a result of which there is no obvious or clearly defined division between the village and the countryside.

Settlement patterns are the result of complex social, economic, political, cultural, historical and other factors. As such, it is difficult to make general statements or rules about the cause or causes of settlement patterns. However, some attempts have been made in this direction. The agricultural system practised in an area is one of the factors that influence

settlement pattern. Nucleated patterns are associated with arable farming while dispersed patterns are associated with extensive farming practices such as shifting cultivation.

Topography also influences pattern. Dispersed patterns are associated with hilly or mountainous terrain while nucleated patterns are associated with flat or low terrain. Other factors that cause nucleated settlement patterns are insecurity, high population density and strong family, clannish or tribal ties. Conversely, the other factors that cause dispersed patterns are stability or security, low population density and weak family, clannish or tribal ties.

The last of the three concepts, namely distribution, is a descriptive one that indicates the parts of a territory that are settled and the parts that are not settled. In other words, it concerns how settlements are spread out in a given territory. Some parts of a territory may contain many settlements while some other parts may contain very few settlements or none at all. Thus, in describing the distribution of settlements in an area we can say that the distribution is sparse or dense. We can also say that settlements are clustered in some parts of the area or that they are randomly distributed all over the area. These are some of the terms used to describe the distribution of settlements.

As with settlement patterns, some generalizations can also be made with regard to the factors that influence the distribution of settlements. Generally speaking, adverse physical and climatic conditions are important limiting factors that determine the distribution of settlements, and vice versa. For instance, settlements tend to be numerous in areas with the following features: fertile soils, gentle relief, abundant water supply, and etcetera. On the other hand, where these features are absent or where farming is difficult because of natural disadvantages, settlements tend to be few. Clustered or random distributions are associated with areas of uneven topography, limited water supply and limited and patchy distribution of fertile soils. Finally, regular or even distributions are more common in areas of uniform and flat relief, uniform fertility and so on. Conversely, irregular distributions are common in areas where these features are not uniform, for example, in hilly areas.

I am sure that at this point, you should be able to distinguish between different types of rural settlements. If you live in a village or if you have seen one, you can tell whether or not it is fishing or lumbering or farming village or a hilltop village or a nucleated village or whether the

distribution of villages in the area is sparse or dense, clustered or random and so on. If you are not able to, then take a new look at the villages in your area in the light of our discussion in this lecture.

Summary

- a. Rural settlements are difficult to define in precise terms because the definition is usually based on one or more of several criteria. Furthermore, the criteria may vary from one country to another. Even where a single criterion such as population is used, the population size used may vary from one country to another. But in spite of these difficulties, rural settlements can be described as those settlements which are characterized by small or dispersed populations, primarily engaged in agriculture and related activities and whose inhabitants are largely conservative in outlook.
- b. There are different types of rural settlements. The classification of settlements can be based on several criteria, including the following: function, morphology or physical layout, design, site, pattern and distribution.
- c. Site, pattern and distribution relate to the locational characteristics of rural settlements. In particular it should be noted that ' . . . whereas distribution is normally the outcome of physical factors, pattern tends to result more from economic, historical and cultural factors' (Whyne-Hamond, 1979).
- d. Site refers to the location of a settlement in relation to its immediate physical environment while pattern refers to the relationship between dwellings. Finally, distribution refers to the way settlements are spread in an area, especially with regard to the parts of the area that are settled and the parts that are not.

Post-Test

1. Which of the following is a correct definition of rural settlements?
 - a. Rural settlements are noted for manufacturing and service activities.
 - b. Rural settlements have large populations.

- c. Rural settlements are noted for agriculture and related activities and are comparatively small in population size.
- 2. Settlement pattern is:
 - a. The immediate physical environment of a dwelling or village.
 - b. The relationship between one dwelling and other dwellings.

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PROPERTY OF DISTANCE LEARNING CENTRE, UNIVERSITY OF JORDAN

LECTURE TEN

Agricultural Land-use

Introduction

This lecture is concerned with an important economic activity, namely, agricultural production. Agriculture is a very important and strategic economic activity. It is the activity from which man derives his food. It is also a source of some vital industrial raw materials. In addition, it is an important source of employment. It is estimated that about two-thirds of the world's population are engaged in agriculture (Whyne-Hammond, 1979). In this lecture, we shall examine this activity in some detail. We shall do this by splitting our discussion into two main parts. In the first part we shall discuss some of the main features of agriculture. In the second part we shall focus on the theory of agricultural location. This theory is concerned with the explanation of the patterns of agricultural production. Although farming systems, farm sizes, the mixture of crops, etc. may appear chaotic on the landscape" there is some order underlying them. In other words, they are organized in keeping with some principles and this is what the theory of agricultural location attempts to illustrate. These will be examined later. For, now, we shall concern ourselves with the main features of agriculture.

Pre-Test

1. What are the different types of farming?
2. Why do crops grown by farmers differ from place to place?

CONTENT

Main Features of Agriculture

Agriculture is characterized by several features. These features relate to the types of crop or livestock produced, the types and quantities of input used, the disposition, size and shape of farm plots, and so on. These features are themselves the results of certain factors that influence or affect agriculture. These factors include relief, rock type, soils as well as cultural, social and economic variables. Agricultural landscapes are therefore the products of interactions between different factors.

The classification of types of farming could be a very difficult exercise because of the wide variations that exist. However, some four basic categories can be identified and these will be discussed in turn. First, we have the distinction between arable and pastoral farming. Arable farming includes all types of crop cultivation while pastoral farming is concerned with the grazing of animals. The products of arable and pastoral farming are food for human and animal consumption and raw materials for industry. Pastoral farming also produces animals that provide carriage. Donkeys are examples of these. Generally speaking, pastoral farming is found in areas that are not very suitable for arable farming. It is also found in areas that are far away from the village and urban markets. The reason for this is that pastoral farming is more tolerant of harsh or difficult environments than arable farming. In addition, the produce of pastoral farming is generally less perishable than the produce of arable farming and so can be transported over fairly long distances without going bad. Livestock production can therefore take place at distant locations. The only possible exception to this general rule is dairying although even in this case the development of refrigerated trucks now makes it possible to undertake dairy farming at distant locations.

The second distinction we shall consider is that between shifting and sedentary cultivation. Both arable and pastoral farming can be undertaken on a shifting or sedentary basis. Shifting cultivation or shifting agriculture involves the shifting of farms from one place to another which in turn may cause the shifting of settlements along with the farms.

In this system of cultivation, a farm plot is often cultivated for a number of years. When the soil gets exhausted the plot is abandoned and another plot brought under cultivation.

The length of time spent on a plot depends on the quality of the soil. Good, fertile soils can be cultivated for several years before they become exhausted while poor soils can be cultivated for shorter periods only. But the important point is that once the soil gets exhausted, the plot is abandoned and the farmer moves to another plot. The abandoned plot is usually re-cultivated at some future date when it must have regained its fertility. Abandonment thus has the effect of allowing the soil to regenerate or regain its lost fertility. When this is regained, it can be recultivated until it becomes exhausted. At this point it is again abandoned and the process of cultivation and abandonment goes on and on. Strictly speaking, shifting cultivation involves the movement of both the farms and the homes or settlements of the farmers. The system in which only the farms move but the homes or settlements of farmers are permanent is called rotational bush fallow.

Shifting agriculture is not limited to arable farming alone. It also applies to pastoral farming. In pastoral farming, shifting agriculture is called nomadism and the pastoral farmers who engage in it are called nomads. Nomads move from place to place with their livestock in search of pasture. The movement of nomads is usually more frequent than that of arable farmers involved in shifting cultivation. Nomads may need to move daily or seasonally in search of new grasslands. In Nigeria, for instance, cattle rearers in the north move towards river valleys or southwards during the dry season. Shifting agriculture, whether pastoral or arable is a primitive system and is commonly found in primitive or backward societies, especially those with low population densities where land is consequently available for the continual movement of people and farms or livestock.

Sedentary agriculture, on the other hand, is one in which such movement does not take place. Settlements are permanent and farm plots are cultivated continuously. This continuous cultivation has been made possible by agricultural progress. The development and use of crop rotation and fertilizers as well as the careful selection of seeds and other plants now make it possible to maintain soil fertility almost indefinitely. There is therefore no need to move farms around. In addition to agricultural progress, sedentary agriculture is also a result of rising population densities. Where population densities are high, much of the land is occupied and there is little room to move around.

The final distinction we shall consider here is that between intensive and extensive agriculture. Intensive farming is one which involves large amounts of input per unit area of land. The inputs include labour, farm machinery, fertilizer, money, etc. It is common in areas of high population density where land is scarce and costly. In such areas the only way to maximize production and profit is to produce intensively. There is no fallow in this system, only carefully planned rotation of crops and the use of fertilizers. Yield per unit area is usually very high in intensive farming; only highly profitable crops are grown in this manner. Less profitable crops are grown or cultivated extensively. Extensive farming is one that involves a lot of land but comparatively little inputs. It is common in areas where population densities are low and land is consequently abundant and cheap. It is also common in areas of limited technology where inputs are expensive. Because land is cheap, the way to maximize production is to use more land and few inputs which are costly. Crops cultivated under the extensive farming system do not often require much attention. Extensive agriculture is very common in developing countries.

It is clear from our discussion so far that a classification of farming into its different types reveals some of the important features of agriculture. However, it must be emphasized that the types discussed above and the features identified are not at all exhaustive. Agriculture is such a complex activity that farming types can be classified in many different ways. By the same token, agriculture has a multitude of features and characteristics. But we have highlighted some of the more important ones that relate directly to the theoretical discussion in the next section.

Agricultural Location Theory

The agricultural landscape could appear very chaotic and unorganized to a casual observer. The landscape may appear 'littered' with crops of different types and farms of different sizes. Some farmers may adopt the extensive farming system while others may adopt the intensive farming system. The net effect of all these is that the agricultural landscape may appear somewhat unorganized. But as was pointed out in the opening paragraph of this lecture, there is some order behind this apparent chaos. Crops, farm sizes and farming systems do not just vary anyhow. Rather, they vary in keeping with some basic principles. This is what the theory of agricultural location attempts to explain. In this lecture, we shall give only a general overview of the theory. It will be discussed 'in detail in later years during

this programme.

The theory was developed in 1826 by J. H. von Thunen in his book titled 'The Isolated State.' He was primarily concerned with finding out the laws or principles which govern the prices of agricultural products, and the laws by which variations in price are translated into patterns of agricultural land use. This broad objective of the theory can be posed as questions: What determines the prices of agricultural products? How do the variations in the price of these products influence the spatial patterns of agricultural production? These two questions encapsulate the primary concern of Von Thunen. He holds the view that the spatial distribution of crops and livestock as well as the distribution of farming systems (i.e. intensive or extensive farming) depends upon competitive bidding or land use between products and farming systems. In each case, land is assigned to the highest bidder. What this means is that if we have, for example, two crops or two farming systems or crop production and livestock production competing for a particular plot, the higher of the two bidders in each case will be assigned the plot. Let us imagine that the competition is between maize and yams. If it pays more to grow maize than yams, then the plot will be assigned to maize. In other words, maize will be cultivated on the plot in question, not yams. Yams may then be grown in another plot where it pays more to grow yams than maize and other crops. In this way, the competition between crops, between crop production and livestock production and between farming systems is resolved, giving rise to spatial patterns of agricultural land use.

One concept that is basic to Von Thunen's theory is the concept of economic rent. Economic rent is the surplus production which can be obtained from the use of a better plot or soil over and above the return or production which can be obtained by applying the same inputs (labour, fertilizers, etc.) on a poorer plot. To Von Thunen, better or poor is defined in terms of the location of the plot, not in terms of its fertility. Thus, a plot that is located close to the village is considered better than one that is located far away from the village because of the savings in transport cost that accrue to the former. Different locations vary in terms of their savings in transport costs with respect to the transportation of agricultural products and inputs. The farther away a farm is, the higher the transport cost it incurs and the lower the savings in transport costs that accrue to it. For this reason, economic rent decreases with increasing distance. This is illustrated in Fig. 10.1

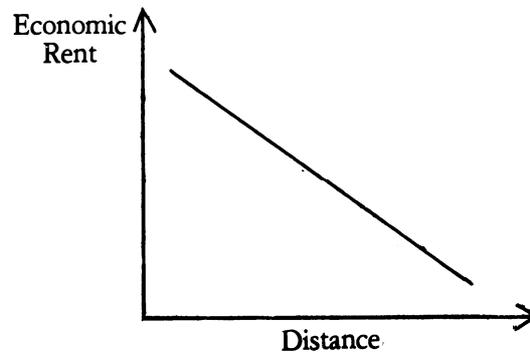


Figure 10.1: Economic Rent Curve

Economic rent is measured as net return per unit area. It is important to note that economic rent is measured in terms of returns per unit area, and not in terms of returns per unit weight. I am sure that it is fairly easy to understand one of the reasons why economic rent diminishes with increasing distance. This is because as distance increases, transport costs take up more and more of the total returns, thereby reducing net returns. This concept of economic rent underlies the competition between crops for the use of land and it provides the means whereby the competition is resolved to produce patterns of land use. This is because different crops have different economic rent curves. Some may have very steep curves and others may have gentle-sloping curves. But on any plot, the crop or farming system with the highest economic rent curve will be cultivated or adopted while the others will be displaced to other plots or locations where they have the highest curve. This is illustrated in Fig. 10.2

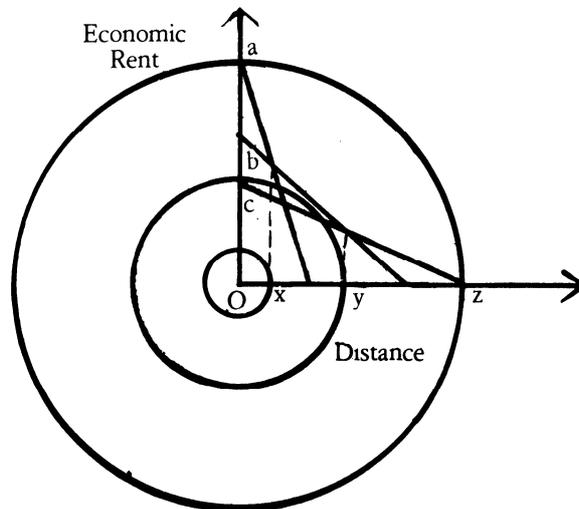


Figure 10.2: Economic Rent Curves and Zones of Agricultural Production

In Fig. 10.2, 0 represents the village, *a*, *b*, and *c* represent three different crops while *X*, *Y*, *Z* represent different distances from the village. It is clear from the figure that the three crops have different economic rent curves. Between 0 and *X*, crop *a* has the highest economic rent curve. In other words, of the three crops competing for plots in the zone around the village crop *a* is the highest bidder and so the plots in the zone are assigned to that crop. However, after *X*, crop *a* ceases to have the highest economic rent curve. Rather, crop *b* takes over, and between *X* and *Y* crop *b* has the highest economic rent curve. Accordingly the plots in that zone are assigned to crop *b*. In a like manner between *Y* and *Z* crop *c* has the highest curve and the plots in that zone are accordingly assigned to crop *c*. In this way, patterns of agricultural land use emerge around the village. The logic is fairly simple and can be illustrated with reference to Fig. 10.2. Using *OX* as a radius, one can describe a circle around the village that demarcates the zone devoted to crop *a*. Likewise using *OY* as radius one can demarcate the zone devoted to crop *b* while the zone devoted to crop *c* can be demarcated using *OZ* as radius. We thus have a concentric pattern of agricultural land use around the village. There is no doubt that in the real world the patterns are not concentric; nor are the zones perfect circles. Von Thunen's concentric pattern is the direct result of the assumptions on which he based his theory. Again these will be discussed in later years

during this programme when the theory will be examined in detail. But whether or not the patterns are concentric in the real world, one can use the concept of economic rent to understand how real world patterns of agricultural land use emerge.

Generally speaking, bulky and perishable crops have economic rent curves that decline very rapidly with distance (i.e. they have steep-sloping curves). For this reason they are cultivated close to the village. Such crops or products include vegetables and egg (poultry). They are represented by crop *a* in Fig. 10.2. Less bulky and less perishable crops are grown farther away from the village. Such crops include cereals and grain crops. They are represented by crops *b* and *c* in the figure.

The competition between farming systems can also be resolved by means of the concept of economic rent. Intensive farming systems have economic rent curves that are steeper than those for extensive farming systems. Thus, near the village the curve for the intensive system is higher than that of the extensive system. Accordingly, intensive farming is practiced near the village and extensive farming farther away. I am sure that at this stage you now know how the competition, between crops and livestock and between farming systems is resolved. The resolution gives rise to patterns of agricultural land use.

Summary

- a. The main types of agriculture are arable farming, pastoral farming, shifting cultivation, sedentary cultivation, intensive farming and extensive farming.
- b. Arable farming is concerned with the cultivation of crops while pastoral farming is concerned with livestock production. Under shifting cultivation both farmers and their farms move to new locations but in sedentary agriculture no such movements are involved. Farms and the dwellings of farmers are permanent. Finally, intensive agriculture involves a lot of inputs and little land while extensive farming involves few inputs but a lot of land.
- c. The theory of agricultural location is concerned with finding out the laws which govern the prices of agricultural products and the laws by which price variations are translated into patterns of agricultural land use.
- d. The concept of economic rent is basic to the theory of agricultural location. It provides the means whereby the competition between crops and farming systems is resolved to provide patterns of agricultural land use. On any given plots the crop or farming system that has the highest economic rent is cultivated while the others are displaced to plots where they have the highest economic rent.

Post-Test

1. Which of these statements is correct?
 - a. Arable farming is concerned with the production of animals.
 - b. Arable farming is concerned with crop cultivation.
2. Economic rent is:
 - a. The money farmers pay to land-lords.
 - b. The total revenue farmers obtain from their plots.
 - c. The surplus production obtained from a particular plot over and above the returns obtained from a poorer plot.

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LECTURE ELEVEN

Rural Market System

Introduction

In this lecture we shall be concerned with marketing activities in rural areas. What types of market do we have in rural areas and what brings them about? What is the theoretical basis of rural markets? These are the questions we shall attempt to answer in this lecture. A market place is a place where buyers and sellers gather at appointed times for the exchange of goods and services. Market places therefore link buyers and sellers for the exchange of commodities. They thus facilitate exchange in an economy. An efficient marketing system provides a means of determining the needs of consumers - the types of commodities they require, the times and places at which the commodities are required, the prices they are willing to pay, etc. The functions of the marketing system imply a considerable degree of coordination between buyers and sellers and also between different market places. The successful operation of the system depends on the existence of a network of market places. As we shall see later, the demands of the marketing process are partly responsible for the spatial patterns of market places.

Pre-Test

1. Indicate the correct statement:
 - a. Rural markets are periodic because of lack of storage facilities, poor transport facilities, and low population density.
 - b. Rural markets are periodic because markets stalls are few and costly to rent.

CONTENT

Types of Market

There are basically two types of market. These are daily markets and periodic markets. In daily markets, buyers and sellers meet on a daily basis at the same place. These markets are more common in urban centres than in rural areas. They are, therefore, not of interest to us in this lecture. On the other hand, periodic markets are those that hold at intervals of three, four, five or more days. In other words, the market holds once in three, four or five days as the case may be. Most rural markets are periodic, especially in developing countries. Periodic markets were also characteristic of medieval Europe. An important question that arises at this juncture is as follows: why are markets periodic? In other words, what causes the frequent repetition of marketing activities at different times and in different places? Three reasons have been suggested as possible causes of periodicity. These are as follows:

- a. Lack of storage facilities;
- b. Poor transport facilities; and
- c. Low population density.

Lack of storage facilities means that products, especially perishable products, have to be disposed of quickly, otherwise they would go bad. If a seller of such products happens to live in a small village in a rural area and he cannot sell all his goods in the village market, he would have to move from one village market to another on different days until all his goods are disposed of. If the seller does not move around in this manner, much of his goods may go bad because of the absence of storage facilities in his village for keeping the goods until the next market day. The lack of storage facilities therefore requires that perishable products be disposed of fairly quickly. One way of ensuring this in rural areas where some products may not all be sold in one market day is for the sellers to move from one village market to another on different days.

Poor transport facilities imply that people and products can neither be moved around very easily nor for long distances. In such a situation, if an area has only one central market place it cannot attract large numbers of people from far and wide on market days. This means, in turn, that some traders may not have enough customers as a result of which some of their products may be left unsold. Given the lack of storage facilities, such left-over products may go bad before the next market day, thereby imposing

severe losses on the traders. To avoid this, the traders have to move from one village market to another until all their goods are sold. Thus, because a large enough number of buyers cannot assemble at a single point or market place owing to poor transport facilities, sellers move their wares to different village markets on different days and in the process they tap a large enough total demand for their goods and services.

The third cause of the periodicity of rural markets is low population density. In comparison with urban centres, low population density is an important characteristic of rural areas. Where population density is low, the number of customers cannot be enough to support continuous trading or daily markets in any single place or village. If this is the case, markets cannot but be periodic, as traders move from one village to another on different days to tap the widely dispersed population or buyers who are not concentrated in anyone village in sufficiently large numbers. If traders do not move around in such a situation, then they will go out of business sooner or later as they cannot make enough sales by staying in one village.

Rural markets are therefore periodic for a combination of reasons three of which are lack of storage facilities, poor transport facilities and low population density. Periodicity itself can be viewed from two angles or perspectives, namely, from the perspective of the trader and from that of the buyer or consumer. On the part of the trader, periodicity is related to the mobility of individual 'firms' or enterprises. In rural areas, the trader and his wares (i.e. goods and services) constitute the firm or enterprise. The firms are mobile because the total demand in a single village or rural market is not enough to provide a profit level which enables the enterprise to survive. In other words, given the low level of demand in a single village, an enterprise cannot be profitable and therefore cannot survive by remaining in one place. By relocating himself in different places at different times, the trader can tap the demand in several villages and thereby attain the survival threshold. The survival threshold refers to the minimum demand a trader needs to remain in business. Periodicity in marketing has the advantage of concentrating the demand for his products at specific places on specific days.

From the viewpoint of the consumer, periodicity is a device for reducing the distance the consumer must travel to obtain the goods and services he requires. By rotating or moving marketing activity around, distance to essential goods and services is reduced for consumers some of whom may otherwise have to travel very long distances to a single central

market occupying a fixed location. In sparsely populated rural areas, if markets are periodic rather than daily then market centres can be distributed far more densely on the landscape so that the most disadvantaged villagers can manage a trip to and from the market in a reasonable period of time.

In peasant societies, subsistence needs are minimal owing to general poverty, emphasis is on frugality and consumption patterns that are traditional and conservative. Furthermore, these needs were largely met without recourse to marketing because the peasant household was virtually self-sufficient. In these circumstances, households have no need to market everyday. In any case, the number of households needed to support a daily market is very large, and, given the low population densities in rural areas, widely distributed in space. Daily markets would require trade areas so large that villagers at the boundary of the trade areas cannot make a trip to and from the markets in a single day, especially in the light of poor transport facilities for which rural areas are noted. The level of transport development is a crucial variable, no matter how one account for periodicity of rural markets. It is the friction of distance (a concept defined in lecture 3) which limits the trade area or catchment area of the village market. Catchment area is the area (comprising settlements and hamlets) from which buyers come to a particular market.

Theoretical Basis of Periodic Markets

In the preceding section we addressed the question of the types of markets found in rural areas and the causes of their existence. It needs to be emphasized that rural periodic markets are not restricted to the distribution of rural products. There is no doubt that they serve chiefly as collection, bulking and distribution points for surplus agricultural and cottage industrial products. But in addition they serve as important links between the rural agricultural sector and the urban commercial and industrial sector. It is through periodic markets that urban products find their way into rural areas. Likewise rural products find their way to urban centres through them because middlemen and other traders come to buy rural products in these markets for sale in the urban centres. Periodic markets are therefore important elements in an economy. Their functioning can be explained in terms of some general principles. This is what we shall attempt to do in this section.

The functioning of rural periodic markets can be explained in terms of some concepts borrowed from Central Place Theory. (This theory will be discussed briefly in the next lecture). Stine's (1962) theory of periodic markets draws heavily on this theory. The concepts in question are range and threshold. Stine defined these concepts within the context of periodic market systems, and then goes on to show why rural markets are periodic. Two types of range are recognized as follows:

- a. Maximum range, and
- b. Minimum range.

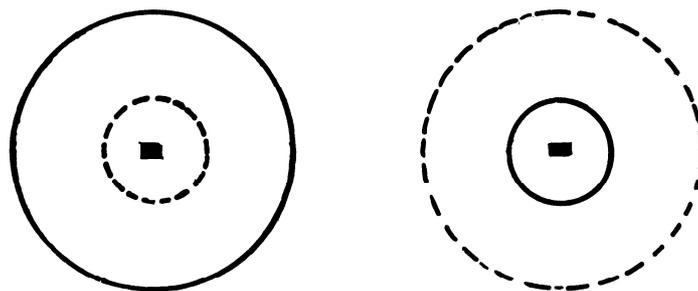
Maximum range represents the total market sellers can draw for their products. Total market as used here refers to the total number of customers or buyers. Since this total market is distributed over space, maximum range can be construed as the maximum distance beyond which buyers will not come to a particular market to purchase goods and services because of the travel costs involved. This maximum distance encloses the total market referred to above. The size of the maximum range is a function of the distance elasticity of demand on the one hand transport cost on the other. Indeed, the distance elasticity of demand is partly determined by transport cost. Distance elasticity of demand refers to the rate at which demand for goods in a market place decreases as distance increases. Demand in this case refers to the number of people who come to the market or the quantity of goods they buy or both. In general, the lower the transport cost, the lower the distance elasticity of demand, and the larger the maximum range. In other words, if transport cost is low, the rate of decline in demand with increasing distance is low and the maximum range or catchment area of the market is consequently very extensive; that is to say, people come from far and wide to the market. Conversely, the higher the transport cost, the higher the distance elasticity of demand and the smaller the maximum range.

Minimum range is quite different from maximum range. Minimum range refers to the minimum demand traders need for their businesses to survive or break even. Again, since the demand in question is represented by people spread over space, minimum range can be construed as the distance or radius enclosing the minimum demand needed to sustain an enterprise or group of enterprises. This minimum demand is referred to as the threshold. Thus, the minimum range encloses the threshold. The minimum range is a function of demand density on the one hand and the profit level of the firm on the other. Demand density is the volume or

amount of demand per unit area. If demand density is very high (i.e. if there is a lot of demand per unit area) then the minimum range will be small. On the other hand, if demand density is low, then minimum range will be very large or extensive. Demand density can be low as a result of low population density, low income level or both. Thus, even where population density is high, demand density can be low if income levels are low. Conversely, high income levels can cause demand density to be high in an area where population density is low.

We shall now address the important question of how the concepts of minimum range and maximum range explain the existence of period markets. The existence of such markets depends on the relationship between minimum range and maximum range. For our purposes here we should conceptualize (i.e. think of) maximum range and minimum range as boundary lines enclosing the total market and minimum demand (or threshold) respectively. The relationship between maximum range and minimum range can give rise to two situations as follows:

- a. Where the maximum range is greater than or equal to the minimum range, a market with a fixed location can survive. That is to say, a daily market can exist in such a situation. Fig. 11.1(a) illustrates this situation.
- b. Where the maximum range is less than the minimum range, a market with a fixed location cannot exist and firms (or traders) have to become mobile. In other words, markets have to be periodic in such a situation (see Fig. 11.1(b)). In Fig. 11.1(a), maximum range is greater than the minimum range.



KEY:

■ Village Market

---- Minimum Range

———— Maximum Range

Figure 11.1: Daily Markets and Periodic Markets

Where the situation in Fig. 11.1(b) exists, traders have to move from one village market to another on different days. This means that they trade in their own village market once in four days or once in five days depending on whether it is a three-, four- or five-day periodic market. If it is a four-day periodic market, for example, it means that after trading in their village market on a given day, the traders will trade successively in three other villages on subsequent days and then trade again in their own village on the fifth day, and so on (see Fig. 11.2).

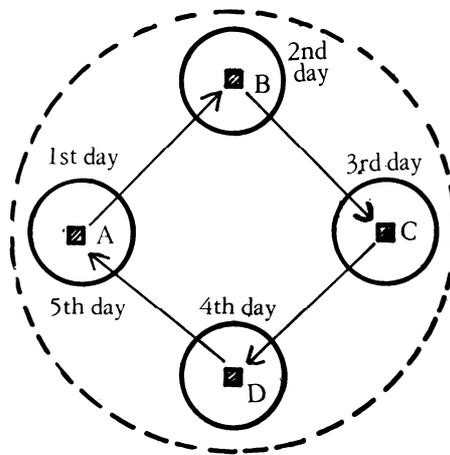


Figure 11.2: A Four-day Periodic Market System

Fig. 11.2 related to a four-day periodic market system. The market holds in each village every fourth day from the date of meeting. Thus the market holds in Village A on the first day, fifth day, ninth day and so on.

What happens to periodic markets as development takes place? Development can lead to the following: increased population density, increased income levels, improved transport facilities and so on. All of these, but especially the first two, lead to increased demand even where prices remain unchanged. In such a situation, maximum range begins to increase while minimum range begins to decrease. One consequence of development, therefore, is that markets began to meet more frequently, until meetings become daily (that is to say, until daily market came into existence). Thus, the frequency of meeting may increase from once in eight days to once in seven days, once in six days, once in five days and so

on until the meetings become daily meetings. At this point, the markets cease to be periodic markets.

Summary

- a. Periodic markets are markets that take place at intervals of three, four, five or more days, as the case may be. They come about as a result of lack of storage facilities, poor transport facilities and low population density. Such markets are more common in rural areas than in urban centres.
- b. By enabling traders to relocate to different places at different times, periodic markets ensure that traders can tap the demand in several villages, and thereby attain the survival threshold. For the consumer, periodicity is a device for reducing the distance he must travel to obtain the goods and services he requires.
- c. The existence and functioning of periodic markets can be explained in terms of the relationship between minimum range and maximum range. Where the maximum range is less than the minimum range, a daily market cannot survive and the firm has to become mobile.
- d. As development takes place, the frequency of meetings increases and ultimately periodic markets may become daily markets.

Post-Test

Why do you think markets do not hold daily in some places?

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LECTURE TWELVE

Urban Settlements

Introduction

You will recall that in our discussion of rural settlements earlier on the point was made that human settlements range in size from small villages to large cities. Large cities and some not so large ones constitute urban settlements, and in this lecture we shall attempt to shed some light on different aspects of urban settlements. Specifically we shall provide a definition of urban settlements and then go on to examine some of their features and characteristics. Other issues to be discussed include types of cities, the spatial distribution of cities, the catchment areas or spheres of influence of cities and the problems of urbanization. For a start, we shall attempt to define the term urban settlements.

Pre-Test

1. What do you think are the main features of urban settlements that make them very different from rural settlements?

CONTENT

What Are Urban Settlements?

Before going on to provide an answer to this question it is necessary to point out that in some parts of the world, particularly the developed or advanced countries, the distinction between urban and rural areas is no longer very clear-cut. It is argued that advanced countries are . . . completely urbanized in cultural terms even if not in physical terms. . . although all people do not necessarily live in an urban built environment, all are subject to the same cultural influences, irrespective of whether or

not they live in rural or urban areas' (Phillips and Williams, 1985). In these countries, rural settlements have come under the influence of urban settlements. Some of the characteristics usually associated with urban settlements are now common place in rural areas. In fact, the rural areas of some advanced countries are no longer wholly inhabited by populations that depend on agriculture and primary production. Increasingly large numbers of people reside in rural areas but work in urban centres. For these reasons, it is felt that the urban-rural dichotomy has become so blurred that it hardly exists anymore. These observations notwithstanding, there still are important differences between urban and rural settlements and so we shall proceed with the definition and discussion of urban settlements.

As with rural settlements, the definition of urban settlements is problematic, and for the same reasons too: several criteria are used, and the criteria usually vary from one country to another. Also like rural settlements, urban settlements are often defined on the basis of the following criteria: law, population size and function. In some countries, urban settlements are legally designated. In other words, a law is passed designating or declaring a settlement an urban settlement, sometimes irrespective of its population size or its functions. Very often, however, the designation is influenced by population size or a function of both.

Population size and function are the more commonly used criteria. These criteria were discussed at some length under rural settlements and so need no further elaboration here. It suffices therefore to emphasize that in Nigeria urban settlements are defined in population terms and that a settlement is urban if its population is 20,000 or above. Some countries such as Israel and Italy base their definition on function and regard as urban any settlement with a large proportion of its labour force in the non-agricultural sector. The definition of urban settlements therefore varies from place to place. But in spite of the variations, certain features are characteristic of urban settlements almost everywhere.

Characteristics of Urban Settlements

The characteristics of urban settlements can be categorized into three, namely, physical, economic and sociological. The physical characteristics relate to the physical appearance of urban settlements in terms of buildings, streets and other structures. In this regard, urban settlements are

noted for their closely packed buildings and streets. In some of them, high rise buildings now constitute an important landmark, especially in the business, commercial and administrative districts. In Nigeria, the Marina and Broad Street district of Lagos Island is noted for its high-rise buildings. In physical terms, urban settlements are dramatically different from rural settlements. In the latter, buildings are neither as closely packed nor as high as in the former. From the economic point of view, urban settlements are noted for secondary and tertiary activities. Secondary activities refer to manufacturing while tertiary activities refer to wholesaling, retailing and service provision. Thus, factories, warehouses, large department stores and supermarkets, banks, insurance companies, lawyers' offices, hotels, restaurants, night clubs, big hospitals, and so on are commonplace. Much of the labour force in urban settlements is engaged in secondary and tertiary activities and in this regard urban settlements differ significantly from rural settlements which are dominated by primary activities, especially agriculture.

The sociological characteristics refer to the human aspects of urban settlements. Urban settlements are noted not only for the large numbers and high density of people who reside in them but also for their cultural complexity. Different ethnic, and in some cases racial groups, coexist in urban settlements, thus endowing cities with a diversity of cultures. In fact, cities have been aptly described as the melting pot of cultures, that is to say, places where different cultures intermix. Other important features include occupational and geographical mobility caused respectively by people changing jobs and residences. Because city dwellers are always on the move social ties are neither as close nor as intimate as they are in rural settlements. For this and other reasons, cities are noted for social instability, unrest, violence and crime. Thus, in spite of the argument that rural settlements are urban in cultural terms, it is clear that urban settlements remain very distinctive in terms of their physical, economic and sociological characteristics. However, this is not to suggest that all urban settlements are exactly alike in every detail. There are different types of urban settlements. In some cases the differences are subtle; in other cases, they are not quite so.

The classification of cities can be based on different criteria. But employment structure or the value of a city's economic activities is probably the most commonly used criterion. Based on either of these, the class of a city is determined by the activity that accounts for a

disproportionate share of its labour force or its economy respectively. Thus, when an urban settlement is referred to as a service centre, it means that services constitute its most important economic activity, but not the only one. This fact is what is implied when cities are classified as industrial (or manufacturing) cities, resort cities, administrative cities, and commercial cities and so on. However, very large cities are often diversified in terms of their economy, while smaller cities and towns tend to be dominated by one activity or the other. For example, Lagos is a very large city, the largest in Nigeria. Although it is still the seat of the Federal Government, it would be wrong to classify Lagos as an administrative city. This is because other activities are also important. These include manufacturing, commerce, services, etc. These activities are equally important in Lagos, if not more important than its administrative functions.

On the other hand, some smaller cities such as Minna and Yola are dominated by one activity, in these cases, administration and so can rightly be classified as administrative cities. The classification of urban settlements is therefore not a very easy matter as some of them defy classification on the basis of economic criteria. However, there is a class of cities that emerges from a system of classification based more on history than on economics. This is the so-called pre-industrial cities. The industrial revolution was an important historical event in Europe and the rise of many cities, especially the industrial towns and cities, was associated with it. But some settlements had grown into major urban centres before this revolution. They were either important market centres or important centres of craft industries. Houses were closely packed and congested, and the cities were not properly laid out or planned. Since the industrial revolution some modern commercial and industrial development has been added on, often outside the old city which still retains much of its original features.

In Nigeria, pre-industrial cities are occasionally referred to as pre-colonial cities. These are cities that had become important urban centres before the colonial era. One often cited example is Ibadan. The juxtaposition of the old and the new is evident in the dual character of this ancient city. The closely packed, formless, unplanned old city with its traditional markets lies side by side with the more modern, relatively well laid out newer districts with a modern Central Business District (C.B.D.) characterized by high-rise buildings. Thus, like the pre-industrial cities of

Europe, the pre-colonial cities of Nigeria have had some modern commercial and industrial development appended to them, but mostly outside the old city. Most Yoruba cities in southwestern Nigeria belong to this category. Kano is another good example of a pre-colonial city. Most other cities in Nigeria developed to become urban settlements during and after the colonial era. Examples include Lagos, Enugu, Jos and Port Harcourt. Enugu and Jos developed initially as a result of mining activities, coal in the case of Enugu and tin in the case of Jos. The presence of minerals is therefore the most important reason for their location.

The Distribution of Cities

Why are cities located where they are? The examples of Jos and Enugu provide part of the answer to this question. We have just observed that both were located where they are because of the existence of important minerals. In other words, the existence of minerals is one of the many factors responsible for the location of urban settlements. But this does not mean that urban settlements are located wherever minerals exist. Urban settlements owe their locations to a variety of factors. In addition to mineral deposits, these factors include transportation and communication, trade, relief, climate, as well as historical and cultural factors. The origin of Kano, for example, is associated with the Trans-Saharan Trade for which it was an important southern terminus. Transportation and trade were therefore important in the location of Kano. Lagos and Port Harcourt were (and still are) important seaports and so here, too, transportation and trade were important in their location. Benin City is associated with the old Benin Empire and so the historical factor is important in its case. The reader should attempt to identify the factors behind the location of other cities known to him or her.

Because of the diversity of factors responsible for the location of urban settlements and because these factors are not uniformly distributed in space, urban settlements tend to be irregularly distributed over the earth's surface. In spite of this apparent irregularity, some geographers have attempted to find some order in the spacing or distribution of urban settlements. One of the best known of these attempts is that by Walter Christaller. He propounded the Central Place Theory which is designed to explain the size, number and distribution of urban settlements. The gist of the theory is that urban settlements serve as central places for a variety of

goods and services, and those different goods and services have catchment areas (i.e. market areas) of different sizes. One implication of this is that urban settlements (i.e. central places) vary in importance. Larger and more important urban centres (referred to as higher-order central places) have larger catchment areas than smaller and less important urban settlements (lower-order central places).

Catchment areas consist of the smaller towns and villages from which people come to a particular central place to purchase goods and services. Their size or extent depends on the range of the goods and services offered at the central place. You will recall that the concept of range was explained at some length while we were discussing rural market systems. Owing to the large size of the catchment areas of large urban settlements, one needs only a few such catchment areas to cover a given territory. On the other hand, it would take many more catchment areas of smaller urban settlements to cover the same territory thereby ensuring that people have access to the goods and services offered in urban centres. Fig. 12.1 illustrates this fairly well. In Fig. 12.1(a) only two relatively large catchment areas are needed to cover much of the area. But it requires as many as six smaller catchment

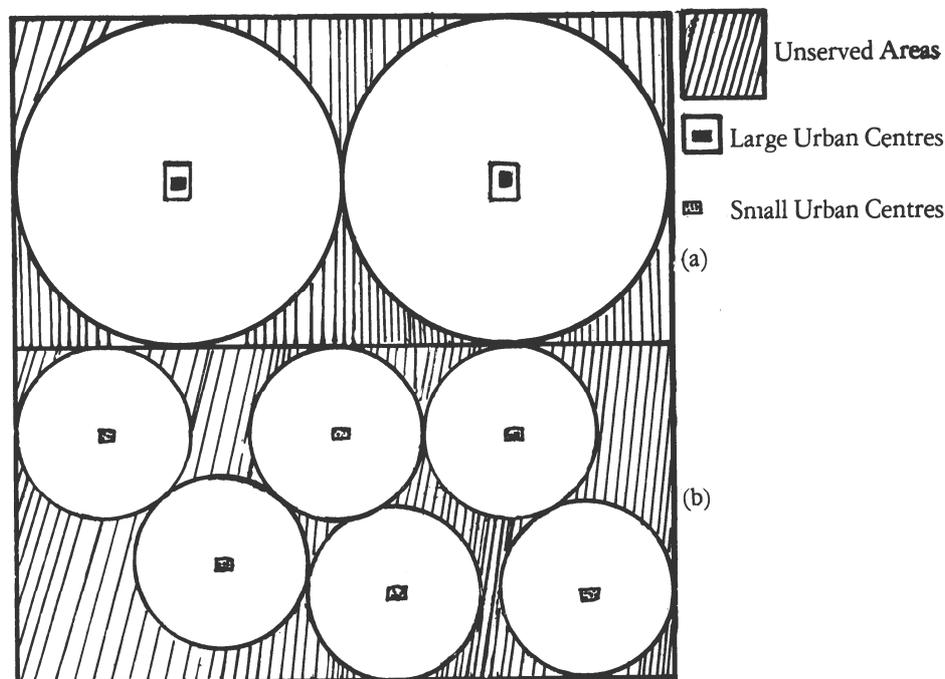


Figure 12.1: Catchment Areas of Urban Settlements

areas to cover much of an area exactly the same size as in Fig. 12.1(a) (see Fig. 12.1(b)). A number of important implications derive from Fig. 12.1. First, in many given areas, there are usually fewer large urban settlements than smaller urban settlements and other towns and villages. Secondly, and following from the above, large urban settlements are farther apart than small ones. These two implications are clearly obvious from Fig. 12.1. The third implication is that in any given area, there is usually a hierarchy of settlements, ranging from the largest settlements at the top to the smallest at the bottom. As one goes down the hierarchy from the top the number of settlements increases and both the catchment areas of settlements and the distances between the settlements get smaller. Thus, in terms of their distribution in space urban settlements are more dispersed than smaller towns and villages.

What we have presented above is only a scratch on the surface of Central Place Theory. All we have done is show how the theory sheds light on the distribution of urban settlements. One final point that needs to

be emphasized is that catchment areas are variously referred to in the literature as spheres of influence, urban fields, uplands, tributary areas and so on. All these terms mean the same thing. But one important thing they indicate is that urban settlements do not exist in isolation. Rather they have close relationships and interactions with surrounding areas. Urban fields consist of other towns and villages with which the urban centre has links. The city and its surrounding towns and villages are interdependent; therefore the links are mutual. The towns and villages in the urban field depend on the city for certain goods and services which are only available in the city while the city depends on the villages for agricultural products, especially food and agricultural raw materials. For a given city, it is possible to identify the towns and villages that depend on the city for goods and services and on which the city depends for agricultural products and on this basis draw or demarcate the urban field of the city in question.

Urbanization

One final subject to be discussed in this lecture is urbanization. Urbanization is the process whereby a rising proportion of the population of an area (e.g. a state, country, continent or indeed the world) resides in urban settlements. Urbanization is usually brought about by the growth in the number and size of urban settlements. It is important to emphasize that urbanization is not an increase in number of urban settlements if the increase is not accompanied by an increase in the proportion of the population residing in urban settlements. It is the increase in this proportion that shows that urbanization is taking place. Thus, urbanization can take place without an increase in the number of urban settlements if more and more people migrate to existing cities, thereby increasing the proportion of the total population residing in them. In most developed countries, about 70% of the populations reside in urban settlements. This is why developed countries are said to be highly urbanized. By contrast, between 20% and 30% of the population of developing countries live in urban settlements. Accordingly these countries are not highly urbanized. For example, most Nigerians (about 70%) live in rural areas, and as such Nigeria is not a highly urbanized country. It is believed that as development takes place, the proportion of the population living in urban settlements increases. In other words, urbanization is regarded as one of the indicators of development.

In spite of the benefits of urbanization such as material and economic progress, the development of new technologies and skills, and so on, it has some disadvantages as well. Chief among these are waste disposal problems, traffic congestion, environmental pollution, violence, crime, unemployment, the development of slums and shanty towns and shortage of housing and water supply. For instance, more people migrate into cities than there are jobs and houses. The results of this are unemployment and high rents resulting from housing shortage. Because of the shortage of housing, substandard houses spring up to house new migrants as well as the urban poor thereby leading to the emergence of slums and shanty towns. Industrial production and other activities pollute the environment. These problems are clearly evident in most urban settlements in Nigeria, especially the large cities such as Lagos, Ibadan, Aba, Onitsha, Kano, Kaduna, Warri and others.

Summary

- a. In spite of the fact that the urban-rural dichotomy is getting blurred in some countries, urban settlements remain distinctive in many respects. They are settlements that are relatively large in population size and whose economies are dominated by secondary and tertiary activities. The minimum population size varies from one country to another but in Nigeria any settlement whose population is 20,000 or more is an urban settlement.
- b. The principal characteristics of urban settlements can be categorized into three, namely, physical, economic and sociological. The physical characteristics refer to the physical appearance of cities, the economic characteristics to the major types of economic activity and the sociological to the human aspects of urban settlements.
- c. The location and distribution of cities are attributable to a variety of factors some of which are socio-economic, physical, cultural, and historical. Generally speaking, large cities tend to be farther apart than smaller cities and towns and they also tend to have larger urban fields than the latter.

Post-Test

What are urban settlements noted for?

1. Large population
2. Secondary and tertiary functions
3. Farming
4. Variety of ethnic and racial groups
5. Different cultures
6. Conservative outlook.

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LECTURE THIRTEEN

Industrial Activities

Introduction

In this lecture we shall be concerned with manufacturing industries. We shall examine different aspects of these industries such as their principal characteristics, the relationships or linkages between industries, the locational pattern of industries as well as the theory of industrial location, but before examining these different aspects, it is important to emphasize that the word industry has a much wider and more general connotation than just manufacturing. In actual fact, the word refers to all economic activities including wholesale and retail activities, agricultural and related activities, services of different types and so on, It is for this reason that people at times speak of the entertainment industry, the tourist industry, fishing industry, transport industry and, of course, the more familiar ones such as iron and steel industry, cement industry, electronics industry or textile industry, among others, Factories are therefore not the only components of industry, For example, department stores and supermarkets are components of the wholesale and retailing industry, while cinema houses, concert halls, theatres and night clubs are all components of the entertainment industry.

However, all of these industries fall into four main groups. The grouping is based both on the nature of the activities in each industry and the stage of these activities in the entire production process. This grouping has the advantage of enabling us appreciate the place of the manufacturing industry (which is our main concern in this lecture) in the production process. The four groups in question are as follows: primary industry, secondary industry, tertiary industry and quaternary industry.

Primary industry includes agriculture and related activities such as fishing and forestry as well as mining and quarrying. An important feature of this industry is that it involves the direct or indirect acquisition of resources from the earth's surface. The industry does not involve the physical change or transformation of the resources so acquired. In other words, primary industry involves no processing of materials whatsoever. For example, a farmer can produce maize while a miner can produce iron ore. Thus both maize and iron ore are products of primary industry. But if the maize is converted to corn flakes and the iron ore is converted into steel, then we are no longer in the realm of primary industry. Rather we would be concerned with processing or manufacturing, that is to say, with secondary industry.

Secondary industry involves processing and manufacturing. It is in this industry that the resources and materials obtained from primary industry referred to as raw materials are converted to other products. Some of these other products such as corn flakes are for final consumption while some such as iron and steel are used to produce other things such as beds, car bodies, tractors and so on.

Tertiary industry is concerned with the distribution of goods produced by primary industry and secondary industry. It therefore includes such activities as commercial transport, wholesales and retailing. Tertiary industry thus involves the distributions of goods from producers to consumers and the consumers could be individuals, firms, factories, farms, institutions etc.

Finally, quaternary industry is concerned with personal services of all types. The services in question include education, financial services (banking, insurance, etc.), health care services, administration and so on. Some of the services in quaternary industry require high levels of skill while others do not. For instance, a barber does not require much skill or expertise. The word industry thus has a much wider application than just to process and manufacture. It refers to virtually all types of economic activities. However, our main interest in this lecture is in manufacturing, that is to say secondary industry.

Pre-Test

1. What are the main features of manufacturing industries?
2. What factors influence their location?

CONTENT

Manufacturing Industries

This class of industries has some distinctive features. One of these was mentioned earlier on in our discussion, namely, that manufacturing industries convert raw materials into new products. The physical change of materials involved in this conversion process is an important feature of secondary industry. However, manufacturing also involves the assembly of components to make new products. For example, the car assembly plants in Nigeria assemble different components to produce cars. These components are themselves products of other factories. Thus, assembly and conversion are important features of manufacturing industries. One thing should be obvious at this point: factories produce either finished products or intermediate or semi-finished goods. For instance, beer, cornflakes, shoes, etc. are finished products ready for final consumption while car tyres, tubes, windscreens, head lamps, etc. are all intermediate products which are nevertheless products of some factories. They are used to produce cars which are finished products. Thus, the finished products of one factory may be the input of raw material of another factory. Generally speaking, the more processing, conversion or alteration a material is subjected to, the more valuable and therefore the more costly the final product will be.

Manufacturing industries are classified in different ways. One of the most common is that based on locational pull (i.e. the factors that determine the location of factories). Four such factors are recognized in the literature. These are raw materials, power, labour and market. On the basis of these factors, industries are classified into the following four groups:

- a. Raw material oriented industries,
- b. Power oriented industries,
- c. Labour oriented industries, and
- d. Market oriented industries.

Raw material oriented industries are those that use large quantities of raw materials, particularly bulky ones. For this reason, such industries are found at or near the sources of such raw materials. By so doing, the industries cut down the cost of procuring raw materials. Raw material orientation is very common among industries in which the cost of raw materials constitutes a significant proportion of total costs. Industries in this group include heavy engineering industries, and chemical industries.

There is a simple and straight forward principle behind the orientation of industries: industries tend to be oriented to the factor or factors that constitute(s) significant proportion of total costs. If it is raw material, the industry will be raw material oriented; if it is power, the industry will be power oriented; if it is labour, it will be labour oriented; and if it is market, it will be market oriented. In the past when coal was the main source of energy or power many industries were attracted to coal fields in a bid to cut down the cost of energy. This was the case in the United Kingdom, for example. But technological development has since made it possible to distribute energy more widely and cheaply through power lines (for electricity) and pipelines (for oil and gas). As a result of this development, the locational pull of energy has grown considerably weaker over the years. This is also true of labour. Industries that require a large labour force or a labour force with particular skills tend to locate in places or areas where such labour is available. But as with energy, the locational pull of labour is getting less and less due largely to the increasing mobility rate of labour. Labour can now migrate to industry rather than industry migrating to labour.

Where the cost of distributing finished products is very high, either because the products are perishable or they are fragile, the industries that produce such goods tend to be market oriented. The developments which are reducing the locational pull of energy and labour are tending to increase the importance of the market as a locational factor. This is one reason why industries are mostly found in large urban centres. Such centres contain large concentrations of consumers. It is thus possible to characterize industries as raw material oriented, power oriented, labour oriented or market oriented. The discussion of the orientation of industry is, in fact, a discussion of the relationship between industries and their major inputs. But there is also another important relationship, namely, the relationship between industries or factories.

Linkages and Agglomerations

Industries are related to one another as no one of them is self-sufficient. There are therefore functional linkages between industries. These linkages are in the form of either inputs or outputs. These links are alternatively called backward linkage or forward linkage respectively. For instance, a steel plant will have a backward linkage with an iron ore mine and a forward linkage with a car assembly plant. In other words, the steel plant gets its main input (iron ore) from the mine and supplies some of its output (flat sheets) to the car assembly plant. The reader should figure out the forward and backward linkages of any factory or industry well known to him or her. Linkages between major industries could be very complex indeed. Linkages thus differ in complexity.

Links can also differ in terms of the distances involved. This criterion gives rise to two types of linkage, namely local linkages and non-local linkages. Local linkages involve very short distances, often between factories in the same street, neighbourhood or locality; Non-local linkages involve considerable distances, usually between different cities, regions, countries or continents. For instance, the Peugeot assembly plant in Kaduna has some backward linkages with some factories in France. Links have the advantage of bringing about specialization and greater efficiency, Non-local links are much fewer in number than local links, and the latter often lead to the agglomeration of industries.

Industrial agglomeration refers to the concentration of several industries or factories in a given place or area. Such a concentration takes place because the area in question has the greatest locational advantage over other areas, including the advantage of proximity to related industries. Usually the industries in such agglomerations have strong functional linkages. The concentration of industries with strong functional linkages in industrial agglomerations brings about financial savings on the part of the industries concerned. Such savings are achieved because agglomerated industries can share common services such as water supply, electricity, security, transport facilities, research; and so on. Individual industries are thus saved the cost of providing these services for themselves. Such financial savings are referred to as external economies of scale.

Agglomerations also have the advantage of concentrating labour, managerial skill, capital, and customers in specific places, thereby making such places still more attractive to industries. This is one reason why

agglomerations tend to grow once they come into being. A new industry attracts related industries as well as social services which in turn make the area more attractive for more industries in a chain reaction referred to as the multiplier effect. The Lagos area is the most important industrial agglomeration in Nigeria, even though it is much smaller than the agglomerations in advanced countries. In fact, the size and complexity of agglomerations increase with economic development. The more developed countries have the largest agglomerations. It is important to emphasize that agglomerations also have negative aspects. For instance, they cause overcrowding, pollution, high cost of land, congestion, etc. These problems may reach a point where industries start moving away, a process referred to as deglomeration. But no matter how bad the situation is, some industries cannot move away because of industrial inertia. This refers to the situation where industries remain in a particular location even when it no longer has the locational advantages that made it attract industries in the first place. Such industries cannot move because of their fixed physical capital in the form of land, factory buildings and machinery. In such a situation the cost of moving may be far more than the financial savings that may be obtained at a new location. In other situations, the fear of losing the advantages of agglomerations makes some industries stay put.

Locational Pattern of Industries

Many factors are responsible for the locational pattern of industries. They include some aspects of the physical environment, as well as economic, social and political factors. However, these factors are very closely interrelated and in some cases the location of an industry may be a function of several of them. For this reason it is often difficult to make generalizations about the locational pattern of industries. In spite of this difficulty, the following statements are true to some extent:

- a. Environmental factors determine the regional pattern of industries.
- b. Economic factors (cost considerations) determine the specific location of individual industries.

With regard to the environment, it is obvious that an area that has a richer natural resource endowment will have more industries than an area that is poorly endowed. If we take West African as an example, this is probably one of the reasons why we have more industries in the forest region of West Africa than in the Sahel region. At the local level economic

considerations play an important part in directing industries to particular locations. The general principle here is that industries locate in places where costs are minimal. The costs in question include the cost of procuring raw materials and other inputs, the cost of labour, land and capital as well as the cost of distributing finished products to the market. Because different industries use different raw materials or different combinations of materials, labour, land, etcetera, the best location for one industry may not necessarily be the best for another industry. Thus the locational pattern that emerges may not be a very simple one.

Besides, for political, social or strategic reasons, industries may be located in places that are not the best locations in economic terms. For instance, a government may decide to locate an industry in a particular place in order to open up the area or create jobs there; a private industrialist may locate a factory in his village as part of community development effort; a government may locate an armament industry in a remote place for security reasons.

Barring the distortions introduced by these non-economic considerations, the choice in industrial location is a fairly simple one: industries are attracted to the location of the factor or factors that constitute important cost items in their production processes. You will recall that this point was made earlier on when we were discussing the orientation of industries. Thus the best or optimum location for an industry could be near raw materials, labour, market or energy sources. Some theories have been formulated in an attempt to explain patterns of industrial location. The main concern of the theories is to find the economically best location for each factory or industry. Such a location is called the optimal location. Optimal locations are those in which costs are minimal and profits maximal. But in reality it is rare to find the two conditions (i.e. minimum costs and maximum profits) in the same location.

One of the earliest theories of industrial location is that concerned with least-cost locations. The theory propounded by Alfred Weber belongs to this category. Weber's theory is based on transport costs, that is, the costs of assembling raw materials and of the distributing finished products. He held the view that highest profits can be obtained at least transport-cost locations. For this reason industries should be located in such places. One of the many weaknesses of Weber's theory is its undue emphasis on transport cost. For this and other reasons, Weber's theory

does not conform exactly to patterns of industrial location in the real world. This is a problem that Weber's theory shares with other theories of industrial location. Hardly do industries occupy optimal or least transport-cost locations.

Summary

- a. Industry is a general term that refers to virtually all economic activities. However, all industries or economic activities can be categorized into four groups. These are primary industry, secondary industry, tertiary industry and quaternary industry. Manufacturing activities constitute secondary industry.
- b. One of the common ways of classifying manufacturing industries is on the basis of locational pull. On this basis the following types of industry are recognized: raw material oriented industries, power oriented industries, labour oriented industries and market oriented industries. Generally speaking, industries tend to be oriented or attracted to the factor that constitutes an important proportion of total costs.
- c. Industries have functional linkages among themselves. Some of the links are local while others are non-local. Local linkages often lead to industrial agglomerations.
- d. The factors that influence the locational pattern of industries include some aspects of the physical environment as well as economic, social and political factors. But generally speaking, economic (or cost) considerations in many cases determine the location of individual industries.

Post-Test

1. Which of these two statements is correct?
 - a. Manufacturing involves the direct or indirect acquisition of resources from the earth's surface.
 - b. Manufacturing involves the transformation of resources to other products.
2. Which of these factors influences the location of individual industries?

- a. Environmental factors.
- b. Economic factors.

Reference

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PROPERTY OF DISTANCE LEARNING CENTRE, UNIVERSITY OF IBADAN

LECTURE FOURTEEN

Transportation Systems

Introduction

Transportation plays an important role in any economy. It enables people and goods to be moved to and from different places, both far and near. Without it, communities will live in isolation and different areas cannot specialize in the economic activities for which they are best suited. It is important in the spatial organization of society. In this lecture, we shall examine different aspects of transportation. These include the different modes of transport, some of the strengths and weaknesses of the different modes, the factors that influence the choice of one mode over another by people as well as the factors that influence movements and flows.

Pre-Test

1. What are the different modes of transport?
 - a. Road
 - b. Ship
 - c. Water
 - d. Air
 - e. Railway
 - f. Pipeline.

CONTENT

Modes of Transport and their Main Features

There are five main modes of transport. These are roads, railways, water transport, air transport and pipelines. Roads were the first mode to be

developed and used widely while air transport and pipelines are relatively more recent. Each mode has its distinctive features and specialized uses. Roads range from footpaths and dirt tracks to modern highways and express ways such as the Lagos-Ibadan expressway and the Port Harcourt-Enugu expressway. In developed countries, the roads are of much better quality than the roads in Nigeria. Roads have some important positive features. One of these is the flexibility of road transport service. This flexibility results from the fact that it is possible to have many roads linking many destinations. This is not the case with the other modes. In addition, roads make door-to-door transport services possible, can cope with a wide range of goods and road transport is faster and cheaper over short distances. On the negative side, running costs are relatively high because of the need to constantly maintain roads' and motor vehicles. Since only comparatively small quantities of goods can be carried by each vehicle, roads are not very useful if very large amounts of goods are to be transported.

With regard to railways, services are fast and reliable. This is largely because trains run on their own tracks and can therefore be properly timed to reduce the possibility of congestion and delay. This characteristic is truer of railways in developed countries than in Nigeria. The rail services in Nigeria cannot be said to be reliable. Railways are suitable for carrying goods that are heavy, bulky or in large quantities. In developed countries, railways are good for transporting passengers. In such countries (e.g. the United Kingdom) rail transport is fast, cheap, comfortable and safe. Finally, unlike motor vehicles which cause air pollution, trains cause very little air pollution. One of the disadvantages of rail transport is that since the location of rail lines is determined by relief, routes tend to be circuitous in areas of rough relief. This has the effect of slowing down rail movement. Secondly, rail lines may become obsolete with age and they are very expensive to replace. This is the case with rail lines in Nigeria. Thirdly, cargo must fit train and route dimensions. For this reason, trains cannot carry outsize or awkward loads. Roads are better in this respect.

Like roads, water is also an old mode of transport but it is not as flexible because its use is restricted to the places where rivers, canals, lakes; seas or oceans exist. However, oceans and seas are exceptions in this regard. Because of their extensive nature, services can be quite flexible. Water is the cheapest mode of transport, especially over long distances. This is one of its main features. One of the reasons for this

situation is the low running cost of water transport. In addition, since large ships can carry very large quantities of cargo, fuel costs are low per unit weight of cargo. Water transport is particularly suitable for heavy and bulky loads. There is little or no congestion in water transport except in places where rivers or canals are narrow. As with rail transport, water transport causes little or no pollution. But every once in a while oil spillage from tankers pollutes water bodies and adjoining coastal areas. The disadvantages of water transport include slow movement. It is therefore not suitable for the movement of goods which are either perishable or which need to be delivered urgently. Poor weather conditions can further impede movement. Water transport is unsuitable if cargo is to be moved over short distances. This is because transshipment is costly and time consuming.

Air transport is the mode that has witnessed the most remarkable development. Aircrafts have grown in size and in speed, and the volume of both passenger and cargo traffic has grown tremendously. Its main features include fast, efficient and comfortable services. This makes it particularly suitable for the movement of passengers, especially over long distances. In fact, air transport currently dominates long distance passenger movements. It is also suitable for the movement of perishable cargo which need to be delivered urgently as well as high quality and expensive cargoes. All of these cargoes are of high value and as such they can bear the high cost of air transport. One important feature or advantage of air transport is that it can reach very remote and inaccessible place that cannot be reached by road, rail or water. For instance, some of the inaccessible parts of the Niger Delta where oil exploration takes place are reached by helicopters and other light aircrafts owned or chartered by the oil companies operating in Nigeria. Also, routes and services are quite flexible. This is in spite of the restrictions of flight paths for political and traffic safety reasons. On the negative side, aircrafts, air fares and airports are very expensive; weather conditions can adversely affect the reliability of services; and aircrafts can cause noise and air pollution.

Pipelines are the final mode to be considered. Originally their use was limited to the movement of water. I am sure that you all know that in our urban centres and in some rural areas water is distributed by means of pipelines buried underground. These days, pipelines are used to move many things other than water; they include oil, natural gas, petrol, milk and chemicals. Most of you are no doubt aware that in Nigeria crude oil,

petrol and natural gas are moved by pipelines. Pipelines provide fast, safe and dependable service; they ensure continuous flow and can be very cheap for transporting things over long distances because of their low running costs. In addition, they cause no pollution. However, their services are very inflexible because their origins, destinations and routes are pre-set and fixed. Pipelines are very expensive to install and they can carry only a limited range of goods, mostly liquid ones. Because pipelines are underground, it is often difficult to locate and repair damaged sections.

It should be clear from our discussion so far that each mode of transport has its peculiar characteristics and specialized uses. But all the same, they all perform the same function, namely, that of providing movement. Thus, in spite of the differences between them, they all perform the same basic function. For this reason, the different modes are necessarily in competition with one another. This raises the question of modal choice.

Modal Choice

Modal choice refers to the choice made by customers whenever they are faced with the movement of goods or passengers. This issue of modal choice can be posed in the form of a question: for a given 'commodity, which mode or combination of modes should be used? For instance, if we have to move groundnuts from Kano to Lagos, should we move it by road or by rail or by a combination of road and rail (i.e. by road for some distance and by rail for the rest)? This is a question of modal choice. But the way it is posed raises the additional question of modal-split. Modal-split refers to the situation wherein more than one mode is used in a single movement. This situation is quite common.

A number of factors are important in choosing which mode or combination of modes to use in effecting a given movement. The factors include transport costs, the distances to be covered, speed, the peculiar requirements of the commodities to be moved, the nature of the commodities, the flexibility of routes and services, etc. From this list of factors, it is obvious that some knowledge of the characteristics of the different modes makes the issue of modal choice a fairly straightforward matter. Let us take an example. Suppose we want to move very heavy and very bulky cargo over thousands of kilometres, it is clear from our previous discussion that the most suitable mode to use is water transport.

In the same vein, if we want to move high quality, expensive cargo that is not bulky over a long distance, the most suitable mode is air transport. On the other hand, if we want to deliver goods from door to door, then road transport is the obvious choice.

There is, however, a general rule that governs decision-making in modal choice situations. That rule or principle is the extent to which the value of the goods to be transported covers transport costs. High-value goods can bear higher transport cost than low-value goods. It follows, therefore, that computers, for example, valued at, say, N1 million can be transported over a longer distance than an equivalent value of, say, cement without pushing the total costs beyond the selling price of computers. Transport increases the value or cost of a commodity. Therefore, there is usually a point beyond which transport costs push total costs above the selling price of the commodity. This point or distance varies from commodity to commodity depending on its value, its weight, bulk and so on. Because of the bulk, weight and comparatively low value of cement it is not economic to move them over very long distances. If one did, transport cost will so increase the cost of cement that no one could afford to buy them at the destination. With regard to modal choice, therefore, people always try to ensure that they use the mode whose cost will not push total costs beyond the selling price of the commodity.

Transport cost itself is a function of many factors. These include distance, terrain or topography, the type of mode and fuel used type of commodity, the degree of competition from other modes, as well as the profit margin of the transport owner. Transshipment also increases transport cost. Transshipment involves the transfer of cargo from one mode to another. In other words, movements that involve modal-split cost more than those that use only one mode. In general, transport costs are made up of three items. These are running costs (also called line-haul costs), overhead costs and transfer costs. The main components of running costs are fuel costs and wages. Overhead costs refer to the expenses associated with the building of equipment, terminal facilities, repair shops and offices. Finally transfer costs are costs arising from insurance cover for cargo. Overhead costs are high for water and air transport (because of the need for seaport and airport facilities) but low for road transport. Running costs are low for ocean transport but quite high for road transport. Rail transport occupies an intermediate position.

Cost considerations are not the only factors in modal choice. Non-cost factors are equally important. They include comfort, convenience, reliability and speed. For instance, if you need to get yourself or your goods to a destination quickly, then speed may be a more important consideration than cost. Non-cost factors have become particularly important in passenger transport. When transport costs are about the same, non-cost factors tend to be the primary consideration in modal choice. In such situations people become concerned with reliability, comfort, convenience and similar factors.

Movements and Flows

Although modes of transport differ in terms of characteristics and specialized uses, they all perform the function of providing movement. However, movements and flows have distinctive characteristics. For instance, they vary in content, volume and distance. But why do movements take place at all? One of the first geographers to systematically answer this question was Edward Ullman. He identified the three main factors that influence movements and flows. These are complementarity, intervening opportunity, and transferability. Complementarity is the degree to which two areas complement each other. For two places or areas to complement each other, there must be demand in one place and supply in another. Movement then takes place from the point of supply to the point of demand. In Nigeria, for example, kola-nut is produced in the south while there is demand for it in the north. For this reason there is movement of kola now from the south to the north. You can think of other examples. Without complementarity there can be no movement.

However, complementarity can only cause movement if there is no intervening opportunity. Intervening opportunity refers to alternative (but nearer) sources of supply. If, for instance, Kwara State and Benue State were important producers of kola nuts, then they would serve as alternative sources of supply and there would be no movements of kola nuts from the southern states which are farther away. Rather, movement would be from Kwara State and Benue State to the northern states. Thus, the absence of intervening opportunity is an important condition for interaction to take place between two places.

Even where the conditions of complementarity and absence of intervening opportunity are satisfied, movement will still not take place if the commodities are not transferable. Transferability is therefore also an important condition for movement to take place. Transferability refers to the possibility of moving a commodity. It is quite obvious and logical that if a commodity cannot be moved, movement cannot take place. If a commodity is fixed to a spot, then it cannot be moved. Also, if it is too costly to move it, then it will make no economic sense moving it and therefore it can be regarded as not being transferable. It is clear, therefore, that if any of the three conditions of complementarity, intervening opportunity and transferability is absent, movement cannot take place.

Summary

- a. There are five main modes of transport and these are roads, railways, water transport, air transport and pipelines. Each of these modes has its distinctive characteristics and specialized uses. But they all perform the same basic function, namely, the function of providing movement.
- b. The different modes are in competition with one another. The factors that influence choice of mode include transport costs, the distances to be covered, speed, the nature of the commodities to be moved, the flexibility of routes and services, etc. However, the extent to which the value of the goods to be moved covers the cost of transport determines the mode to be used in anyone situation.
- c. The factors that cause movement to take place are complementarity, intervening opportunity and transferability. If any of these conditions is not satisfied, movement cannot take place.

Post-Test

What factors influence modal choice?

References

- Hagget, P. (1972), *ibid*, chapter 14.
Whyne-Hamond, C. (1979), *ibid*. Chapter 10. 71

LECTURE FIFTEEN

Spatial Diffusion

Introduction

You will recall that in our lecture on man's impact on the environment we identified changes in plant population as one of the three main consequences of man's direct impact on the environment. In this connection, better or more valuable plants and crops replace those that are not very valuable to man, thus altering the appearance of the landscape. This implies that the crops in question spread over an entire area from their original locations. The point is that the alteration of the landscape does not happen overnight. It takes time to accomplish. The question then is how do the crops spread? This is the question that this lecture will attempt to answer. The spread of something over space is referred to as spatial diffusion. Thus, if a new crop or a new breed of an existing crop is introduced into an agricultural region and after some time the whole area is covered by the crop, we are in fact observing the spatial diffusion of the crop. It is important to emphasize at this juncture that it is not only crops that diffuse; it could be information or ideas, diseases, new tools, machines or equipment, new methods of doing things, and even fashion and dance steps. Diffusion therefore pertains to a whole range of things. In this lecture we shall specifically examine the different types of diffusion as well as the barriers to diffusion.

Pre-Test

1. If for instance, a new breed of maize is introduced in a farm in your local government area, how does it spread to the other farms in the area?
2. What do you think can prevent or stop the spread of the crop?

CONTENT

Types of Diffusion

In our lecture on spatial pattern and spatial process, diffusion was referred to as a spatial process. Thus, when we talk about spatial diffusion we are, in fact, concerned with an important spatial process. However, diffusion comes in different forms. Two main types of diffusion are recognized. These are expansion diffusion and relocation diffusion.

In expansion diffusion the information, new crop, new tool, etc. spreads through a population from one place to another. Certain things happen during the expansion diffusion process. First, the things being diffused (referred to as innovations) remain in the original centres or areas where they were first introduced or developed (referred to as the centres of innovation). Secondly, more and more people adopt the innovation in the innovation centres. Thirdly, the innovation spreads outwards from the innovation centres to other areas. All of these things happen between the time the innovation initially appeared (t_1) and subsequent time periods (t_2 , t_3 , etc). The net effects of the expansion diffusion process are as follows:

- a. new adopters are added to the population of adopters between two time periods (t_1 and t_2).
- b. the spatial pattern of the population of adopters is altered between the two time periods in question.

It is important to bear in mind that what is referred to as the spatial pattern of the population of adopters is, in fact, the spatial pattern of the innovation. Figs. 15.1 (a) & (b) illustrate the expansion diffusion process, (t_1 and t_2 refer to time 1 and time 2 respectively).

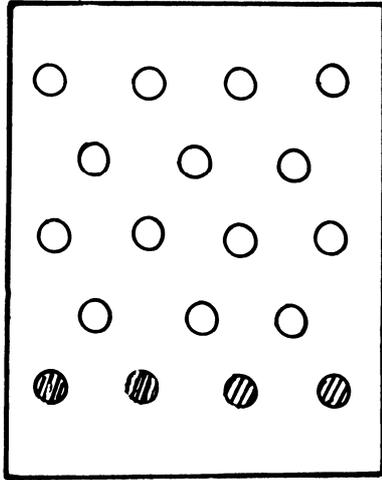


Fig. 15.1(a): t_1

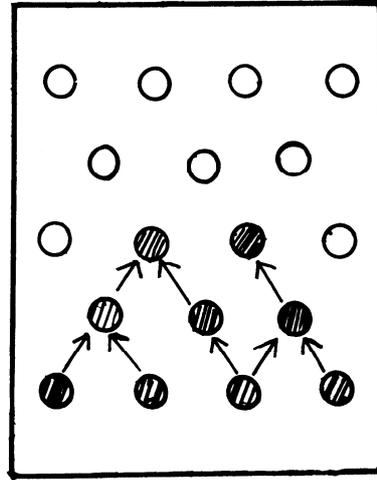


Fig. 15.1(b): t_2

Figure 15.1: Expansion Diffusion

Figs. 15.1 (a) & (b) relate to two time periods only (t_1 and t_2). We can imagine that the expansion diffusion process continues through other time periods until the innovation spreads over the entire territory; that is until everyone adopts the innovation.

In relocation diffusion the innovations vacate the old or original areas as they spread to new areas. The one important thing that happens during the relocation diffusion process is that the population changes its location between two time periods. In other words, the population or the innovation moves to new locations, abandoning the old ones. Figs. 15.2(a) & (b) illustrate the relocation diffusion process.

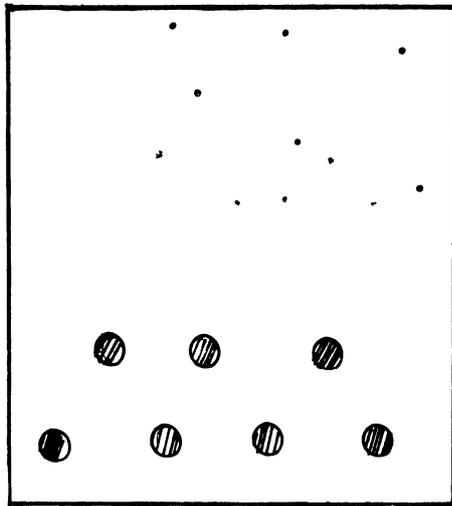


Fig. 15.2(a): t_1

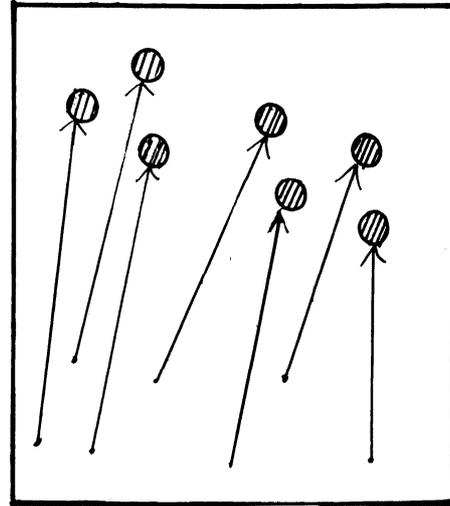


Fig. 15.2(b): t_2

Figure 15.2: Relocation Diffusion

Migration of different types represents good examples of relocation diffusion. When people migrate, they do not remain behind in their original place. Rather, they move to new locations, taking with them their innovations.

There are two sub-types of expansion diffusion. There are contagious diffusion and hierarchical diffusion (also called cascade diffusion). Contagious diffusion depends on direct contact between adopters and potential adopters of an innovation. It is therefore strongly influenced by distance. In other words, the probability of adoption decreases with distance. For instance, if a new high-yielding and pest-resistant breed of maize is adopted by a farmer in an area, those farmers who are nearby and who are therefore able to see the performance of the maize are more likely to adopt the new maize first than other farmers who are farther away. The same basic principle of proximity applies to the contagious diffusion of other types of innovation. Thus, in contagious diffusion the innovation tends to spread outwards (that is, in a centrifugal manner) from the innovation centre. A classical example of contagious diffusion is the spread of contagious diseases such as measles. Such diseases spread by means of direct person-to-person contact and people who are far away from an infected person are less likely to be infected than those who are nearby.

Hierarchical diffusion, on the other hand, does not depend on proximity or person to person contact. Rather, the innovations that diffuse hierarchically tend to be adopted by people and places that have certain characteristics. If the characteristics are not present in a place, then the innovation cannot spread to such a place. Let us take TV sets as an example. TV sets are expensive and so only those with high or fairly high income can own (or adopt) them. Also TV sets require electricity to function. This means that only people or places that have access to electricity can adopt TV sets. It is clear, therefore, that if TV sets are newly introduced into an area, they can spread only to the people and places that satisfy the conditions of high income and availability of electricity. The pattern of spread is, therefore, not necessarily influenced by proximity or nearness. TV sets will spread to only those places that satisfy the two conditions necessary for their adoption, whether or not the places are near the innovation centre. For example, a steward may live in the 'boy's quarter of his employer who owns a TV set. But he may not own one himself. The fact that he is near an owner or adopter of a TV set does not necessarily mean that he will own or adopt one, especially if his income is low. In a similar manner, the fact that there are TV sets in Ibadan does not mean that a small village without electricity located just outside Ibadan will have TV sets. But more distant towns such as Ife and Ilesha have TV sets. What we are saying in effect is that distance is not important in hierarchical diffusion. Some innovations do not spread to every or any kind of place. Instead they diffuse down the settlement hierarchy or the social hierarchy. In other words, the large towns and cities adopt them first before they diffuse to the smaller cities, towns and villages, depending on whether these other places satisfy the conditions for the adoption of the innovations. In this process, the innovations may bypass the intervening places which do not satisfy the conditions necessary for adoption, even if such intervening places are near a centre that has already adopted. In like manner, diffusion down the social hierarchy means that rich and important people adopt first before the less rich and the less important.

Barriers

Diffusion does not take place in vacuum. It occurs in specific areas or environments. The area may be homogeneous in terms of its characteristics (e.g. population, income, language, religion, physical

features, etc.) or it may be highly differentiated. Homogeneous areas are difficult if not impossible to come by. Most areas are therefore differentiated in one way or the other. Because of this, diffusion does not take place with equal ease in all directions. Innovations may diffuse speedily and with ease in some directions while in other directions they may diffuse slowly or encounter some resistance or barriers.

Barriers are therefore important in the diffusion process. There are basically three types of barriers. These are absorbing barriers, reflecting barriers and permeable barriers. To better understand the meaning and effect of barriers it is useful to think of diffusion as 'waves' moving across the landscape. These diffusion waves often encounter some obstacles on their paths. If the obstacle happens to be an absorbing barrier, the diffusion wave is completely absorbed and therefore cannot go beyond the barrier. In other words, the diffusion process stops once the barrier or obstacle is encountered. Thus, absorbing barriers are those that completely absorb diffusion waves so that the diffusion process is halted.

Reflecting barriers do not absorb the diffusion waves. When diffusion waves encounter a reflecting barrier they bounce off, back into the local area. This process is similar to the way a mirror reflects light. The mirror serves as the reflecting barrier in this case. Diffusion waves cannot pass through reflecting barriers. By reflecting the diffusion waves back into the local area, reflecting barriers have the effect of intensifying the diffusion process in the local area. Absorbing and reflecting barriers do not allow diffusion waves to pass through. But permeable barriers do. Permeable barriers are those that allow some (not all) of the diffusion waves to pass through. By so doing they slow down the diffusion process but cannot stop it.

In our discussion of barriers, we have considered them in a general or abstract manner. But they actually exist in different forms. However, all barriers can be classified into two, namely, physical barriers and cultural barriers. Physical barriers include such physical features as extensive forests, deserts, extensive swamps, extensive mountain ranges, wide rivers, oceans and seas as well as lakes. For instance, extensive mountain ranges can effectively isolate the communities on both sides of it, thus preventing information or innovation from one side spreading to the other. In this case such a mountain range will be an absorbing barrier. If the mountain range allows only some innovation to spread to the other side, then it is a permeable barrier. Alternatively, the mountain can reflect the

diffusion wave backwards; Forests, deserts, swamps, rivers, seas and oceans can behave in a similar manner.

The cultural barriers refer to some elements of man's culture that effectively interfere with or distort the diffusion process; they include language, religion, political ideology, etc. These are far more subtle than the physical barriers which are easily seen on the landscape. If information about an innovation is spread by word of mouth or in print, then language can slow down or stop the diffusion process. Thus language can act as an absorbing or a permeable barrier if information passed on in one language encounters an entirely different language. Religion can also obstruct the diffusion process. For example, the Catholic Church is against physical and chemical methods of birth control. For this reason, these birth control practices have diffused very slowly in predominantly Catholic countries and communities. Also for religious reasons, it is obvious that piggeries will diffuse only slowly, if at all, in predominantly moselm countries and communities.

Summary

- a. Spatial diffusion refers to the spread of innovations through time and over space. It is important in understanding how new ideas can bring about changes in the landscape or among human populations.
- b. There are two main types of diffusion, namely, expansion diffusion and relocation diffusion. In expansion diffusion, the innovation spreads outwards from the centre of the innovation, while in relocation diffusion, the innovation changes location, abandoning the original place.
- c. There are two subtypes of expansion diffusion. These are contagious diffusion and hierarchical diffusion. Distance is important in contagious diffusion as the probability of adoption of an innovation diminishes with increasing distance. Distance is not important in hierarchical diffusion because an innovation does not necessarily spread to nearby places. Rather, they diffuse to places that satisfy the conditions necessary for their adoption.
- d. The diffusion process encounters barriers. The three main types of barriers are absorbing barriers, reflecting barriers and

permeable barriers. All of these barriers are both physical and cultural in nature.

Post-Test

1. Which of the following statements is correct?
 - a. In expansion diffusion, the innovation spread outwards from the centre of the innovation without leaving the centre and the number of adopters increases over time.
 - b. In expansion diffusion, the innovations abandon their original place.
2. Which of the following is not a cultural barrier to diffusion?
 - a. Race
 - b. Religion
 - c. High mountain range
 - d. Language.

References

- Ablar, R., Adams, J.S. and Gould, P. (1971), *ibid*, chapter II.
Cox, K.R. (1972), *ibid.*, pp. 87-95.
Hagget, P. (1972), *ibid* chapter 15.