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LOCATION

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30.1 Introduction

An individual's existence in time is determined, but an individual is largely free to select his/her location. This is influenced, though not dictated, by place of origin. The principles for a rational choice of location vary according to whether the location is viewed (as entrepreneurs) from the standpoint of the individual, or (as regional planners) from the standpoint of the whole (Losch, 1954).

This chapter provides an overview of the concept of location and its relationship with urban and regional planning education and practice. To achieve this aim, the chapter discusses the concept of location relative to its definitions, evolution and the key theories that are related to the

concept. It also examine the relationship of location to Urban and regional planning education and practice, and explains how the knowledge of Location can be used by the urban planner to address planning problems so as achieve efficient location of urban functions.

30.2 Meaning and Definition of Location

Location could refer to a point or extent in space – infinite, somewhere, forest, southwest, region, west, east, or school. The act of putting something in a certain place – positioning, orientation, planting, a determination of the place where something is or even a workplace – filming location or studio. In other words, it could be one's place and direction relative to one's surroundings: bearing, orientation, position, situation; a particular geographic area: locale, locality, place; the place where a person or thing is located: emplacement, locus, placement, position, site, situation or a particular portion of space chosen for something. The term location, in geography, is used to identify a point or an area on the Earth surface or elsewhere. Location, in physical planning, may be used to refer to a point in space, a site, a surveyed land, or a definite area with spatial attributes.

There are basically two types of location: the "relative location" and the "absolute location" (Gersmehl, 2008). A relative location is described as a shift from another site. An example is "30 km northeast of Lagos". An absolute location, on the other hand, is categorized using a definite blend of latitude and longitude in a Cartesian coordinate grid – for example, a spherical coordinate system or an ellipsoid-based system such as the World Geodetic System – or similar methods. For instance, the position of Old Oyo National Park in Oyo town, Oyo State, Nigeria can be expressed approximately in the geographical coordinate system as the location 8° 25' 00" N (latitude) and 3° 50' 00" E (longitude); the Kainji dam in Niger State as the location 9° 51' 45" N (latitude) and 4° 36' 48" E (longitude); and the Kainji Lake National Park in New Bussa, Niger

location rent will be the transportation costs. That is, when transportation costs are low, the location rent will be high, and vice versa. The location of intensive and extensive agriculture in relation to the market within the isolated state too is addressed by this theory. Von Thunen opined that Intensive agriculture will have a steep gradient and will be located closer to the market than the extensive agriculture.

In 1909, the location theory took another dimension when a German location economist, Alfred Weber, formulated a theory of industrial location. The industrial location theory by Weber is also called the location triangle. The industrial location theory seeks the best possible location for the production of a good based on the fixed locations of the market and two raw material sources which sequentially form a triangle. The least-cost production location is determined within the triangle by finding the total costs of transporting raw material from both sites to the production site and product from the production site to the market. The transport costs and the location of production are consequential to the weight of the raw materials and the final commodity. Weber claimed that commodities that lose mass or value during production can be transported with less cost from the production site to the market than from the raw material site to the production site. Weber was of the view that production site will be located near the raw material sources and that, where there is no great loss of value or mass during production, total transportation costs will be lower when located near the market.

Another major contribution to location theory was made by Walter Christaller in 1933 in his book entitled Central Places in Southern Germany. Christaller's theory offered geometric explanations as to how settlements and places are located in relation to one another and why settlements function as hamlets, villages, towns, or cities. Christaller argued that the determining factor in the location of any central place is the threshold, which comprises the small market area necessary for the goods and services to be economically viable. He opined that once a threshold has been established, the central place will seek to expand its

market area until the range, which is the maximum distance consumers will travel to purchase goods and services, is reached. In 1940, August Losch, a German economist, in his book The Spatial Organization of the Economy expanded on Walter Christaller's work. Losch began with a system of lowest-order in his central place, which was regularly distributed in a triangular-hexagonal pattern. His own idea was at variance with that of Christaller whose system of central places began with the highest-order (Encyclopaedia Britannica, 2016)

William Alonso also contributed to the location theory. In his Location and Land Use: Toward a General Theory of Land Rent published in 1964, William Alonso built upon the Von Thunen's theory to explain intra-urban variations in land use. According to William Alonso's theory, each land use type has its own rent gradient or bid rent curve. The curve in William Alonso's theory sets the maximum amount of rent any land use type will yield for a specific location.

Thunen, Weber, Alonso, Christaller and Losch are not the only contributors to location theory, but they are its foundation. These theories have been expanded upon and refined by geographers, economists, and regional scientists.

30.4 Key Elements and Related Theories

Location theory is the basis for examining how and why the arrangement of cities and markets has come to be and provides the rationale for siting decision-making and service allocation. The primary theoretical developments have focused on land use, industrial production, central places, and spatial competition. This theory supports various forms of locational analysis and highlights the significance of spatial proximity (Murray, 2009). Location theory has become an integral part of economic geography, regional science, and spatial economics. Location theory addresses questions of what activities are located where and why. Location theory rests—like microeconomic theory generally—on the assumption that agents act in their own self-interest. Firms thus choose

locations that maximize their profits and individuals choose locations that maximize their utility.

Theories of location deal with the organization of economic and human activity in geographical space and attempt to pinpoint different factors that influence location decisions and the location pattern that emerges under different sets of conditions. Location theories are innumerable, but, those central to the concern of planners and environmentalists are discussed below.

- Agricultural Land-use Theory
- Central Place Theory
- Spatial Interaction Theory
- Theory of Industrial Location
- Bid Rent Theory

30.4.1 Agricultural Land-use theory

The Von Thunen's theory of agricultural land-use assumes that farmers surrounding the market will produce crops which have the highest market value (highest rent) that will give them the maximum net profit (the location, land, or rent). The determining factor in the location rent will be the transportation costs. When transportation costs are low, the location rent will be high, and vice versa. This situation produces a rent gradient along which the location rent decreases with distance from the market, eventually reaching zero. The Thünen model also addresses the location of intensive versus extensive agriculture in relation to the same market. Intensive agriculture will possess a steep gradient and will locate closer to the market than extensive agriculture. Different crops will possess different rent gradients. Perishable crops (vegetables and dairy products) will possess steep gradients while less perishable crops (grains) will possess less steep gradients. Originally, Von Thünen model was only concerned with location. However, it is possible to derive the land rent from this model. The model is an excellent illustration of the balance between land cost and transportation costs. As one gets closer to a city,

this theory is that industry locates to minimize costs.

Several criticisms have been made of the postulates which Weber employs to construct his theory. By far the most important of these criticisms is that Weber assumed that firms are in a perfectly competitive situation. From this condition follows his treatment of the location decision as search for a least cost site, for demand and price are then given. However, it can be readily shown that the assumption of perfect competition is incompatible with the postulate of spatial framework for society. There cannot be perfect competition over space, for distance presents firms with monopoly advantages in proximate areas. In reality, then firms seek maximum profit location, not least cost locations. Further, not only must firms analyse the location of raw materials and cost of production, but they must also investigate the location of other firms. The location policies of all firms are interdependent because of the element of monopolistic competition conferred on markets by space. Demand varies with price, and with location chosen. The greatest total demand will be realized with a different location of the plant at each factory price. It is then meaningless to find the point of lowest cost. Weber also assumed that scale of production of the plant has no effect on costs and that the firm uses the same input mix at all locations. These assumptions have been criticized by Hoover. Several other problems in Weberian analysis have been examined by location theorists.

30.4.3 Central Place Theory

Another major contribution to location theory is Walter Christaller's formulation of the Central Place Theory, which offers geometric explanations as to how settlements and places are located in relation to one another and why settlements function as hamlets, villages, towns, or cities. This theory is concerned with the functional importance of places. A central place is a settlement that provides goods and services. It can be small (a village) or large (primate city). All settlements form a link in a hierarchy and the extent of the sphere of influence of any settlement will

depend upon the spacing size and functions of the surrounding central places. Christaller stated that the best shape for a sphere of influence is a hexagon. This shape means that consumers still have accessibility to the highest-order central place and its trading area from all parts of the hexagon. Christaller's key idea is that customers would go to the nearest higher-order central place to buy goods and services; that high-order central places act like a magnet for consumers.

Christaller's theory is often used by governments to plan the location of new towns (i.e. Milton Keynes) and high-order services, i.e. hospitals; it is used by transport authorities to plan transport routes (so that all areas have equal access, i.e. K4 model) and businesses can use the model to decide where to locate a new shop.

However, the theory has been criticized most especially for its basic assumptions. Few real-life regions fit Christaller's model (except the flat lands of the Dutch Polders and East Anglia in the UK). Large areas of flat land rarely exist. Mountains and hills, etc. distort transport routes (so the K4 theory would not work). Also, people do not always go to the nearest central place (they may choose a new edge of city superstore further away). So the K3 theory would not work. So also, people and wealth are not evenly distributed (if poorer people live in a certain area and their nearest high-order settlement is expensive, they would not visit it). Likewise, governments often control where new towns are located, not market forces (i.e. not necessarily where the demand for goods and services is highest).

30.4.4 Spatial Interaction Theory

Spatial interaction models are essentially based on Newton's gravity theory. After classical physics became established in the late 17th century, scientists and philosophers argued that the forces that occurred in the social world could be modelled in the same way as in the physical world. And as such, a number of early attempts were made towards that. Although spatial interaction models predict flows or movements, the key to enabling them to predict activities at different locations – origins and

destinations – is through the concept of potential. Literally, potential means potential energy, which is the summation of all forces around a location, and if flows add up to activity at a location, which they usually do, computing potential is a prediction of such activity. In this sense, it may not be the actual activity at the location, but the potential activity. There is an implicit assumption that this is, indeed, the case (Batty, 2007).

Spatial interaction is the representation and simulation of flows of activity between locations in geographical space. Location is usually represented as discrete points in space, which, in many applications, might approximate an area. The flows include physical flows of materials, such as freight; flows of people, such as traffic or migration; flows of ethereal activity, such as e-mails, telephone calls, and visits to web sites; as well as more abstract linkages that occur in space, such as patterns of marriage and friendship, which are the activities associated with social networks (Batty, 2007). Spatial interaction, according to Edward Ullman's theory, is controlled by three flow-determining factors: complementarity, transferability and intervening opportunity.

Complementarity implies that, for two places to interact, one place must have a supply of an item for which there is an effective demand. For example, product: oil - Interaction: US - Middle East. Differences of place are not enough to create interaction, for example, rain forest and greenland. Effective demand means desire for the item in question, handiness of good-purchasing power, and the availability and functionality of means to transport the product. Transferability refers to the mobility of a commodity. Spatial interaction occurs only when acceptable costs of an exchange are met. Costs include both *time* and *money*.

Transferability functions of three conditions are:

i. Characteristics and value of product
ii. The distance measured in time and money.
iii. The ability of the commodity to bear the *costs* of movement.

- Both physical and economic
- If the time and money costs are too great, interaction does not occur.
- Buyer seeks substitute or goes without product.

Intervening opportunity implies that closer opportunities will reduce the attractiveness of interaction with more distant – even slightly better alternatives. Distance has a retarding effect on human interactions because there are increasing penalties in time and cost associated with longer distances. The number of interactions reduces with increased distance. Even, information technology has had its toll on space-time compression and has impacted on daily living, cultural changes and migration patterns.

30.4.5 Bid Rent Theory

William Alonso (1964) built upon the Thünen model to account for intra-urban variations in land use. He attempted to apply accessibility requirements to the city centre for various types of land use (housing, commercial, and industry). According to his theory, each land use type has its own rent gradient or bid rent curve. The curve sets the maximum amount of rent any land use type will yield for a specific location. Households, commercial establishments, and industries compete for locations according to each individual's bid rent curve and his/her requirements for access to the city centre. All households will attempt to occupy as much land as possible while staying within their accessibility requirements. Since land is cheaper at the fringe of the city, households with less need for city-centre accessibility will locate near the fringe; these will usually be wealthy households. Poor households require greater accessibility to the city centre and, therefore, will locate near the centre, competing with commercial and industrial establishments. This will tend to create a segregated land use system, because households will not pay commercial and industrial land prices for central locations.

30.4.6 Economics of Location

German economist August Losch, in 1940, produced the first general theory of location, with demand as the major variable. Losch was the first to describe general spatial relations in a set of simple equations and to present "a full general equilibrium system describing in abstract the interrelationship of all locations". Briefly, what he tried to do was to show what pattern of location will, in a simplified situation, fulfil certain conditions that define a state of equilibrium. His basic philosophy is that there is order and reason behind the apparent chaos of the economic world. Losch rejected the least-cost perspective of Weber and his followers, as well as the alternative of seeking the location at which revenue is greatest. He pointed out that Weber's solution for the problem of location proves to be incorrect as soon as not only cost but also sales possibilities are considered. Losch's general theory is an attempt to show how, in given circumstances, all economic activities should be arranged in space. He assumed a broad homogeneous plain with an even distribution of raw materials and uniform transport rates in all directions.

The population, engaged in agriculture, is evenly distributed, and all individuals have identical tastes, technical knowledge and economic opportunities. The settlement pattern is one of evenly-distributed self-sufficient farmsteads. Losch pointed out the following five conditions which must be fulfilled by space economy to achieve equilibrium:

i. The location of every individual must be as advantageous as possible, in terms of profits for the producers and gains for the consumers.
ii. The production locations must be so numerous that the entire space is occupied (that is, there are no areas where the absence of a source of supply might attract a new firm).
iii. In activities open to everyone, there are no abnormal profits, for they will be competed away by the entry of new firms.
iv. The areas of supply, production, and sales must be as small a

possible, since only then can the number of enterprises that can survive reach its maximum.

v. At the boundaries of market areas, consumers are indifferent as to which of two neighbouring producing locations they get their supply from.

These conditions must be fulfilled if spatial order of the economy is to have, as Losch puts it, meaning and permanence. Although Losch criticized least-cost approach to location theory as being one sided, for neglecting demand, in order to overcome this weakness, he goes to the other extreme.

The most serious limitation of his theory is his failure to consider spatial cost variations, which were eliminated in his assumption of a uniform plain with evenly distributed materials and population. Neither natural resources nor demand are evenly distributed over space. Even if they were, to start with, interdependence would lead to unevenness in location of demand. The other problem of this theory is that it does not provide a theory of development, because it only tries to explain a pattern of centres and not how these patterns came into existence or how they will change.

Location theories have shared elements, but can still be differentiated from one another. It is difficult to compare the importance of these theories, though actual location analysis can be made by numerous techniques that have their foundations in the above-mentioned theories.

30.5 Relationship of Location to Urban and Regional Planning Education

As man's activities are carried out in space, it is imperative to ensure an orderly distribution and location of these activities. Physical planning, which is an aspect of planning that the urban planners are most concerned with, deals with spatial arrangement of urban and rural land uses. This arrangement of land use, according to Obateru (2005), involves the location of land use and allocation of land to them; but,

when this land uses are not properly located within an urban area, the planning of such an urban area would be termed chaotic. The knowledge of location theories will serve as a guide to the urban planners in creating orderly, economical, functionally efficient and aesthetically pleasing environments for living, working, recreation and circulation, as envisaged by Kebble (1969).

For urban planners to understand the morphology of any urban setting, origin, principles, application and limitations of location theories are required to know the workability of such theory in relation to his design. This would also give him (planner) an insight as to if his plan would be feasible or not. To achieve this, planning education on location needs to be incorporated into planning curricula in order to broaden the scope of planners on spatial arrangement and locations. Location education will go a long way in shaping and guiding the physical growth and arrangement of cities/towns in harmony with social and economic needs (Adams cited by Obateru, 2005).

30.5.1 Relationship of Location to Urban and Regional Planning Practice

Location plan is a common term often used in urban and regional practice. It is a plan showing the project proposal in its surrounding context. Location plan should be at an identified standard scale (typically 1:1250 or 1:2500 for larger sites) and should show the direction north. It shows sufficient roads and/or buildings on land adjoining the application site, shows the different land uses surrounding the project location, and shows application site boundaries and all land necessary to carry out the proposed development.

Location theories have been used by urban planners to solve varieties of urban problems, especially those problems arising from locating various activities within the urban area. Location problems, according to Oliver (1963), often receive publicity and cause urban planners more

trouble than any aspect of their work (planning work). Also, with spatial growth experienced in most urban centre, location and distribution of facilities therein are often lopsided. Adefila and Bulus (2014) opine that imbalances are most apparent among the commercial, industrial and urban centres and this will result to unequal access to productive resources, and basic infrastructures (Fakayode *et al.*, 2008). These issues prompted urban planners to establish an efficient pattern of locations for the goods and services that would serve the population of a city or a country (Oliver, 1963).

Location theories have been used by urban planners in different countries of the world to ameliorate the problems that arise from regional inequalities and the distribution of infrastructure and resources. Oliver (1963) avers that these theories are useful to the urban planner as a basis for making policy decisions on locations of urban activities. Nusantara (2012) sees location theories as a framework that would help urban planners to plan and sorts for projects needed to be developed at various places and at a specific time. Oliver (1963) asserts that location theories provide a framework within which the planner can organize geographic and economic information for a better understanding of urban space. Through the use of the locations theories (Central place), planners can borrow from other sources of information, such as sociological studies, population projections, market survey, and other location studies. This premise will provide the planner with specific point and vital information needed for efficient planning. This feat is often achieved when all the information gathered by the planner are unified (Oliver 1963).

The problems of imbalance in the level of development and economic opportunities between sub-districts can effectively be addressed when location theories are used (Nusantara, 2012). In order to facilitate this, hierarchies are created by planners. For example, order 1 may centre on transportation, located on the main overland to link the bigger cities. Order 2 – towns in the district framework – may be centred

on local activities; while order 3 and 4 may deal with equidistant towns and provision of lower-order services, respectively.

Location theories synthesize geographic and economic information into a coherent statement. With the use of these theories, inefficiencies in the present layout of the city can be determined and plans made to counterbalance any existing inefficiencies in the city. The planner can use the hierarchical pattern of centres as a basis for deciding where expressway interchanges should be located to combine local and through traffic needs (Oliver 1963). In urban renewal process, new towns, satellite towns, and areas subjected to intensive development, it is very important to determine where service centre should be located by the planner. The location theories (central place) are frequently used to predetermine the best locations for service centres to serve the new settlements/towns in relation with the existing centres.

Finally, the location theories help the urban planner to understand the behaviour of individuals as well as firms and government agencies with regard to location (Mabogunje, 1985). To the planner, location theories explain the relevance of input and output to industrial production. This is because most investment allocations are mindful of the sources of inputs, such as factors of production (land, labour and capital) and outputs in the form of services to be rendered, goods to be produced and markets for their final disposal to ensure proficient operation. When the input at one end of a process is compared with output of product at the other, submissions for tackling the problems of losses are made by the planner (Basorun, 2003). It is very imperative to note that, functional and pleasing environments achieved by physical planners hinges on location theories.

30.6 Conclusion

This study has effectively examined the application, limitations and relationship of location theories to urban and regional planning. This

study also explains how the knowledge of spatial relationship can be used by the urban planner to address planning problems so as to achieve efficient location of urban function. Location theories have great influence on planners because they have helped planners in major cities of the world to formulate sound development plans specifying the strengths and the weaknesses that are likely to occur in the plan. Consequently, planners can prepare a land use plan for commercial activities with an in-depth knowledge of location theories (Oliver, 1963). Day-to-day activities of urban planners are often guided by location theories, making these theories the core of any urban planning in the location of essential facilities.

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