

Methods of Delineation of Formal, Functional and Planning Regions

MA SEM I (Advanced Geography of India GEO 102)

Methods of Delineation of Region Methods of Delineation of Formal Region

1. Weighted index number methods

- i. Mono Variate Method
- ii. Fixed Index Method
- iii. Variable Index Method
- iv. Cluster Method

2. Factor analysis methods

Methods of Delineation of Planning Regions

- 1. Theissen Polygon Method
- 2. Distance Minimization Method
- 3. Discrimination Analysis Method
- 4. Graph Theory Method

Methods of Delineation of Functional Region

- 1. Flow Analysis
- 2. Gravitational Analysis Methods

Methods for Delineation of formal regions

Delineation of formal regions involves the grouping together of local units which have similar characteristics according to certain clearly defined criteria and which differ significantly from the units outside the region on the basis of certain chosen criteria.

The criteria can be unemployment rates, activity rate, migration trends, per capita income etc. The characteristics should differ significantly from units outside the region.

The delineation depends on the development objectives.

Variables for delineation of formal region (homogeneous):

Land use characteristics Demographic characteristics;

Transport infrastructure;

Social service and public utilities;

Socio-economic structures.

There are two techniques for delineation of formal regions are detailed below:

1. Weighted Index Number Methods

2. Factor Analysis Method

1. Weighted Index Number Methods:

In this method, some indices (parameters) are chosen and given weights, total weights for each part is separately calculated and areas with similar weights are carved out. This area is termed as 'region'. Example: For identifying employment & income level delineation the study area is divided into several localities varying according to unemployment rates and per capita income levels. The aim is to isolate the main problem region; i.e. the area of economic malaise. Weights are assigned to each criterion and when taken together and weighted, one of the region can be isolated. —If more than one feature is taken into consideration, the following methods are employed: Fixed Index Method; Variable Index Method; & Cluster Method. This method is considered as Weight age Index method outlined by Boudeville. —The aim is to isolate the main problem region; i.e. the area of economic malaise. Weights are assigned to each criterion and when taken together and weighted, one of the regions can be isolated.

- Fixed Index Method: Under the fixed index method, a common characteristic feature is chosen, i.e., per capita income, percentage of literacy, etc. In this method we should weight each variable and after that mean value is calculated.
- Variable Index Method: Under the variable index method, variable weights are attached to highlight different levels of activities in different regions. Similarly, you can use this method for employment & income level delineation. The study area is divided into several localities varying according to unemployment rates and per capita income levels.
- Cluster Method: The cluster method is employed to identify homogenous regions. The cluster are mapped with the help of mapping techniques whereas inter-related variables are mapped with the help of superimposed techniques. The composite ranking of areas is used when the variables are too many and have weak relations.
- Economists and geographers such as Ashok Mitra, Schwartzberg, M.J. Hagood and M.N. Pal popularised different methods to delineate regions. Whether it's not possible to compare between two features, Multivariate superimposition is done

2. The Factor Analysis method: In this method, each parameter is mapped out separately and then all the maps are kept one over the other. The common region that will be carved out after this exercise will form a region.

Smith used this method for delineating economic-health regions. Smith identified 14 industrial criteria on a local employment exchange area base and 14 socio-economic criteria on a local authority base. Many of these criteria are interdependent. The factor analysis method can be used to isolate these factors and to group areas on the basis of factor loadings. Smith identified

‘industrial change’ and industrial structure’ as major industrial factors, and ‘population change’ and ‘social structure’ as major socio-economic factors. These factors help in delineating economic health regions.

Example: To carve out South Eastern Mineral Region. The parameters considered were geology, minerals (coal, iron ore, bauxite, silica), availability of rail, soil, vegetation, climate, and population. Each line depicts an aspect and is called girdle. The area which satisfied 6 girdles was carved out and was called the SE resource region. Sometimes some parts of the delineated area have administrative conflicts at those moments, adjustment is done on the basis of smallest unit of delineation method.

Methods of delineation of functional region

There are two methods popular in Functional Region Delineation

1. Flow Analysis

2. Gravitational Analysis Method

1. Flow Analysis Method (based on actual observation)

- Flow analysis builds up functional regions on the basis of the direction and intensity of flows between the dominant centre and surrounding satellites. Each flow will show decreasing intensity as it becomes more distant from the main centre and increasing intensity as it approaches another centre. The boundary of the sphere of influence of the dominant centre will be where the flow intensity is at a minimum. When the flow significantly drops that means interaction/origin's influence drops. In terms of distance, in a particular direction, there is the influence of the node and there onwards it drops. This gives cut off points. Tentative delineation is done.

In the flow analysis, the processional regions are demarcated based on the direction and intensity of flow between the principal centre and the sub-cities around it. The flow decreases according to the distance from the principal centre and the effect increases as it approaches the other centre. Where the flow intensity around the principal centre is minimal, there is a limit to the circumference of the effect of that centre. This flow can be of any kind, economic, objective, social and political etc. Goods, passengers, roads and railways under economic influence; Purposeful flows include buying, exchanging, etc.; The social flow includes the flow of students or patients, the political flow includes the flow of government expenditure, the information system (telegram, newspapers etc.).

Functional territories are also demarcated on the basis of bus service, Graph theory is the transformed form of flow analysis approach. This is a very simple, systematic and systematic method of demarcation of functional territories.

Gravitational Analysis Method:

The basis of the origin of gravity analysis lies in Newton's theory. It is based on the possible value of human interaction.

- It is generally assumed that the interaction between two centres is in direct proportion to the mass of the centres and is inversely proportional to the distance between the centres.
- Simple Gravity Model Interaction, Between Two Centres Directly Proportional to the Mass of the Centres and Inversely Proportional to the Distance Between the Centres.
- Samuel Stauffer tested this theory in a study of the spatial, habitat dynamics of Cleveland Ohio towns in the United States. They concluded that the number of moving families up to a certain distance was inversely proportional to the opportunities received at that distance and the number of times they received to reside in the same value-neighbourhood of intermediate vacant houses.
- Newton used the following formula for the law of gravity.

$$F_{ij} = k * \frac{m_1 m_2}{d^2}$$

This model can be used to evaluate the geo-differential action as follows:

$F_{ij} = a * \frac{P_i P_j}{d^b}$ In which both P_i and P_j represent the population of the ij centre or an element of attraction, d is the distance between the two centres i and j above, a is an approximate standard constant and b is the distance. The value of b is assumed to be 2.0 in the fundamental gravity model.

- For example, if two cities A and B each have a population of 1000, are located at a distance of 10 kilometers, and the values of a and b are given as 1 and 2 respectively, then the entire interaction will be calculated as follows: $i_j = 1 * \frac{1000 * 1000}{10^2} = 10000$ unit

Methods of delineation of Planning region:

Planning is the significant basic basis for the demarcation of territories. Direct relations with the purpose of statement or identity, the type of territories and the deadlines. In this context, the important demarcation base can be placed in the following basis:

On the basis of Objectives:

The demarcation of planning territories is affected by the individual properties. The purpose of planning is different from the person to the person. By nature, no specified planning state is able to simultaneously reveal the objectives created by the overall possibilities and difficulties present in its border. For example, the demarcation of separate planning regions for special

purposes like- Agriculture Planning regions, Industrial Planning regions, urban Planning regions, Resource-planning Regions etc.

2. On the basis of Function: The type of territories formed varies according to the objective inspired elemental or functional characteristics. In the identification of the common sections of the country, mention is made of the specific, morphological, functional, naturalgeographical, nodal-rout regions. The basis of identification of all types of regions is basically inspired by symmetry, road confluence and administrative policy.

♣ In the context of planning, special importance can be taken of the morphological (elemental symmetry) and species-oriented regions. The elemental or functional region is identified on the basis of symmetry in the combined properties of a specific geographical element or group of elements. The demarcation of such a state proves to be relevant at a stage when elemental differences are important in regional matters at the regional level.

♣ The basis of the identification of a climatic region is based on the state of functional spatial configuration. Under this state, functional interrelationship and interdependence have special importance. For this reason, its strategic context can be considered relatively high.

There are many methods popularize for delimitation of planning region. They are broadly classified in two groups:

- I. **Qualitative Techniques:** In this method, specific regions are identified according to the general review of the development of particular geographical (physical, economic, socio-cultural) variables in the context of regional unit within the boundary of a large national territory. Planning regions can be identified on the basis of primacy or differentiation of diverse properties of agricultural, industrial, population, resources, In this context, the use of maps related to various elements is relevant. The material economic socio-cultural information available to any nation and the national boundary reflects the essential quality of equal diversity or elemental inequality, on the basis of which the boundaries of special planning regions can be determined. The method is simple and subjective in nature. Naturally, it lacks the mathematical basis and merits of arbitrariness and lack of faith in its utility. This method allows greater flexibility in the boundaries of the planned territories.

- II. **Quantitative Techniques:** It includes Index calculation based on mathematical and statistical techniques and the corresponding delimitation above the comparative map. The use of more sophisticated mathematical and statistical techniques has been popularise in quantitative methods. In this context, Peter Hagat has mentioned four methods of delimitation of planning region for the single functional regional element.
1. Thiessen Polygon Method
 2. Distance Minimization Method
 3. Discrimination Analysis Method
 4. Graph Theory Method

1.Thiessen Polygon Method:

The Thiessen polygon method was used by Bogue in 1949, to demarcate 67 metropolitan territories in the United States. The construction of polygons done in four steps –

- 1). The connecting lines are drawn from each adjacent centre to another nearest centre.
- 2). The midpoints of the lines draw from bisection lines connecting to the centres.
- 3). From the middle point, a vertical line is drawn on which the line is a ground of polygons. Similarly, lines are drawn from other midpoints.
- 4). Units located across the boundary lines are included within the boundary of that centre. In which more than half the area of that unit is located.

In fact, the demarcation of the planning regions by the Thiessen polygon method depends on two assumptions:

1. An area within the intersecting boundary lines of a polygon is closer to the centre bound within that polygon of some other centre.
2. A metropolis is dominant over all the area. In 1963, Kopek had described another method of constructing polygons in which the lines are drawn between the intersecting points intersecting the arcs by drawing the arcs of the same radius circles from the adjacent points These lines are the boundary lines of the points.

2. Distance Minimization Method:

In this method minimizing the distance by the cost of transportation for transporting an object from its various sources to several destinations or transporting it from the destination to the source has to be minimized. In 1963, Yeats conducted his

experiments on 2900 students attending 13 high schools in Wisconsin State Grand County. The optimum limit of school areas was determined in such a way so that- →

1) The total distance of the schools was minimized and →

2) Each school was filled to its full potential. This method was also used to solve rural school students and the school bus problem in the Somerset region of Britain. Garrison has also used this method to reduce the cost of distribution of petroleum products, even in terms of industrial location.

3. Discrimination Analysis Method:

The discriminate analysis method is a method of determining the boundaries of regions of geographical distribution. In this method, the two modes of distribution events Z and N have their four groups in the model. The more complex polynomial lines that divide the regions into the mean and n when the distribution is superimposed are calculated. Polynomial lines of simple first class appear to be simple lines, then increasing complexity. Sixth-grade polynomial lines are complex. Complex lines make the mean and n distributions a pure classification. Between these two are secondary solutions, whose second-tier polygon lines are sufficiently pure.

4. Graph Theory Method:

Graph theory was used in 1961 by Nistuen and Deci in demarcation of planning territories. By this method, the ability of territorial bonding is determined. This method is useful for territorial demarcation for meeting both administrative and industrial-trade requirements. Transport nets and regional structure are analyzed by this method. With this, their territorial hierarchy is determined after knowing the amount of their association with the towns in an area. The cities inside the graph are considered to be the end points. The order of the city is measured by the flow within it (by the number of telephone conversations). Hierarchical relationships between cities are determined by the most outgoing flow from cities in higher order.