Course name: Quantitative Methods in Geography
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Advantages and limitations of quantitative methods in geography

Quantitative Revolution

- The application of statistical and mathematical techniques, theorems and proofs in understanding geographical systems is known as the 'quantitative revolution' in geography.
- Statistical methods were first introduced into geography in the early 1950s (Burton, 1963).
- Consisting mainly of descriptive statistics, there was also some attempt at hypotheses testing using, for example, chi-square. Bivariate Regression Analysis followed shortly but it was not until the 1960s that the General Linear Model was fully explored.
- It was I. Burton who published a research paper, 'The Quantitative Revolution and Theoretical Geography' in the Canadian Geographer (7: pp.151-62) in 1963.
- The statistical methods are employed in geography for the generating and testing hypotheses using empirical data, whereas the mathematical techniques and theorems are used for deriving models from a set of initial abstract assumptions.

Need of Quantification

- There has been confusion among the geographers and the public mind about the nature and social relevance of geography, especially after the Second World War.
- The status of geography as a university discipline was under discussion.
- It was also a topic of debate that what should be taught as geography at various stages of the educational processes.
- In 1948, James Conant, President of the Harvard University, had reportedly come to the conclusion that "geography is not a university subject".
- The Department of Geography of Harvard University was closed soon after and the discipline of geography was gradually eased out in many of the private universities of U.S.A.
- The continual threat of departmental closure or staff reduction also lead to frantic search in American universities for new ideas and research programmes.

- This resulted into the development of the ‘spatial sciences school’, also called ‘quantitative revolution’ in geography.
- The last three decades have been characterized by an almost continuous debate among human geographers concerning the philosophy, nature and methodology of geography.
- Moreover, the geographers of the post-Second World War suffered from a complex that they did not have standard theories, models and laws like that of other social and biological sciences.
- Consequently, their efforts and researches were not considered of much social relevance.
- In order to overcome these complexes and to put the subject on a sound theoretical footing, geographers started using quantitative techniques to interpret the organization of space, to generalize and to formulate their own theories and models about the man and environment relationship.

The main objectives of the quantitative revolution in geography were as under:

1. To change the descriptive character of the subject (geo + graphy) and to make it a scientific discipline;
2. To explain and interpret the spatial patterns of geographical phenomena in a rational, objective and cogent manner;
3. To use mathematical language instead of the language of literature, like 'After in the Koppen's classification of climate which stands for the 'tropical rainforests';
4. To make precise statements (generalizations) about locational order;
5. To test hypotheses and formulate models, theories and laws for estimations and predictions;
6. To identify the ideal locations for the various economic activities so that the profit may be maximized by the resource users; and
7. To provide geography a sound philosophical and theoretical base, and to make its methodology objective and scientific.

Advantages

- All the techniques are firmly based on empirical observations and are readily verifiable.
- They help in reducing a multitude of observations to a manageable number of factors.
- They allow the formulation of structured ideas and theories which can be tested under the assumed conditions.
- They help in deriving suitable models to understand the interaction of the evolved factors and their process within the models and with reference to observed facts.
- They help in identifying tendencies and desired trends, laws and theoretical concepts.

Limitations

- The theories and models developed on the basis of empirical data, do not take into account the normative questions like beliefs, emotions, attitudes, desires, hopes and fears and, therefore, cannot be taken as the tools explaining exact geographical realities.
- The man and environment relationship cannot be properly established by the mechanistic models designed with the help of quantitative techniques.
- More focused on 'locational analysis'. The main weakness of the locational analysis is that it promotes capitalism. In a capitalistic society, there is exploitation of human and environmental resources (land, water, forest and minerals) which makes the rich richer and the poor poorer.
- With the development of sophisticated machinery and automation, there is less scope of employment. Thus, it leads to unemployment and it is a system of wasteful production. The assumption that man is a 'rational person' who always tries to optimize his profit has also been criticized.
- Models developed with the help of quantitative techniques reduced people (decision-makers, workers) to passive agents. To a large extent such models may be seen as one of determinism.
- The estimations and predictions made with the help of sophisticated quantitative techniques proved erroneous many a time and there remains a danger of overgeneralization.

Thank you