ROAD TRANSPORT NETWORK AND REGIONAL DEVELOPMENT IN HARYANA

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Transport is a function of various activities. It is considered as the major plank of infrastructure for growth and development. A road is a symbol of motion. Roads play a major role in the development of any region. A road network is usually established in an area with a view to facilitate economic and social interaction in space both at intra and inter-regional levels. It is considered as an integral part of the transport network of a nation. In a more general and wider context, road transport contributes towards mitigating social, economic, cultural and political imbalances between urban and rural areas and among different regions. The study of road transport and regional development is a primordial exercise in understanding the relationship between road transportation and different forms of regional development i.e. demographic, social, economic etc.

In the present study, an attempt has been made to examine the road transport network structure and regional development in Haryana. The study spreads over a time span of 40 years i.e. from 1971 to 2011. Finally, the relationship between levels of road transport development and regional development has been identified.

Objectives of the study

Major objectives of the present research work are to study the road transport structure, road accessibility, rank surface analysis and road connectivity in Haryana during 1971-2011 and to identify the relationship between levels of road transport development and regional development in the state.

Data and Methodology

The present study is based on secondary data. The census data for the year of 1971 and 2011 have been used in this study. Apart from the Census data, the data have been also collected from Ministry of Road Transport and Highways (MORTH), National Highway Authority of India (NHAI), District Statistical Abstracts, Public Works Department (Building and Roads) and various other government agencies.

The suitable standard techniques, methods, ratio measures, comparative bar diagrams, line graphs and pie diagrams etc. have been used to present the trends of road length and distribution of roads in Haryana. To study the physical accessibility patterns, areas lying within bands of a uniform width of 3.0 kms on either side of a national highway and

state highway have been treated as fairly accessible and that within 3.1-6.0 kms from a road as moderate accessible while areas beyond 6.0 kms from a transport artery have been defined as inaccessible. Accessibility is also measured by individual nodes by preparing the topological diagrams of road networks. The node selection is based on the development of road network in Haryana from 1971 to 2011. The analysis of accessibility is done with respect to minimum mileage matrix, nodality matrix (trans-shipment or break of bulk), weighted mileage matrix, weighted nodality matrix, gross accessibility matrix and composite accessibility matrix. The rank surface analysis is done by using the technique of 5, 10, 15.... for the year of 1971 and 15, 30, 45... for the year of 2011 which have shown the gradient of changing accessibility.

To examine the levels of road connectivity in Haryana, the nodes have been identified on the basis of following criteria: (i) settlements having minimum population of 10000 persons (ii) all district headquarters and tehsil headquarters, and (iii) settlements having three or more crossings on national highways, state highways and major district roads. The connectivity of the network is measured by four structural indices: cyclomatic number, alpha, beta and gamma. Aggregate Transport Scores (ATS) have been also computed by adding the values of three indices i.e. alpha, beta and gamma.

The levels of road transport development are identified by four indicators: index of road network, total road length per 100 km^2 area, total road length per lakh population and number of motor vehicles per km of total road length at district level. A composite index of road transport development has been prepared by adding the z-score values of above four indicators.

Eight indicators of regional development are considered in the present study to depict the levels of regional development in the study area. Further, z-scores of all the indicators have been calculated to find out the composite index of regional development in Haryana. To identify the relationship between road transport development and regional development, correlation and regression analysis have been applied.

Organization of the Material

First chapter of the study deals with introduction, transport geography and its significance, characteristics of road transport, review of literature, objectives of the study, sources of data, research methodology and organizational structure of the study.

Chapter two gives a closer insight about geographical background of the study area, which includes the information about nomenclature, location and extension, physical aspects, demographic characteristics, agriculture, economy, industries and road transport structure of the study area.

Third chapter describes the physical accessibility, topological networks and road accessibility pattern by individual nodes in Haryana from 1971-2011. The bands of uniform width on both sides of the roads are taken for analysis of the accessibility of roads as described in methodology. It is recorded that Haryana is highly accessible by roads. In 1971, 36 per cent of its total area lying within 3 kms from roads was considered as fairly accessible which increased up to 41 per cent in 2011. In 1971, 25 per cent area of the state was in between 3-6 kms taken as moderately accessible which increased up to 27 per cent in 2011. Similarly, 39 per cent area of the state was beyond 6 kms from the roads termed as inaccessible. Area in this category decreased to 32 per cent in 2011, recording a decline of 7

percentage points. Accessibility has been measured by individual nodes too. The node selection is based on the development of road network in Haryana from 1971 to 2011. The analysis of accessibility reveals that Jind is the most accessible node of Haryana as it has attained the 1st rank in both decades, while Mandi Dabwali and Kalka emerged least accessible nodes both in 1971 and 2011.

Chapter four is a detailed study of the rank surface analysis of accessibility by minimum mileage, nodality, weighted mileage, weighted nodality, gross accessibility, composite accessibility and composite bars. Rank surface is, in fact, a process of generalization, wherein the rank orders are grouped into categories of equal intervals, and rank lines are drawn for the value of last limit of each class.

In chapter five, levels of road connectivity have been identified. The topological diagrams of road network of Haryana for both the years i.e. 1971 and 2011 have been prepared with the help of 53 nodes and 114 edges in 1971 and 226 nodes and 359 edges in 2011. The analysis reveals that districts namely Yamunanagar, Sirsa, Bhiwani and Mahendergarh have witnessed the growth of many new nodes and edges during this period, therefore, these districts have been shifted towards the higher categories of road connectivity in 2011 than 1971. On the other hand, districts like Kurukshetra, Kaithal, Karnal and Palwal have been shifted from high to moderate level categories which indicates that ratio of growth between nodes and edges is not proportionate in these districts.

Chapter six is devoted to highlight the levels of road transport development as well as regional development and seeks a correlation between them in Haryana. Four districts namely, Faridabad, Kaithal, Ambala and Kurukshetra (mainly located in southern and

north-eastern parts of the state) by recording exceptionally very high composite index of road transport network development have been distinguished as areas of very high development of road transportation. Panchkula and Jhajjar districts located in the north-eastern and central parts of the state respectively have been included in the areas of high level of road transportation. By recording composite index ranging between -1.50 to 0.50, ten districts namely, Yamunanagar, Karnal, Sonipat, Panipat, Rohtak, Fatehabad, Sirsa, Hisar, Rewari and Gurgaon have emerged to be the areas of moderate level of road transport development. Four districts namely, Bhiwani, Mahendergarh, Mewat and Palwal recording the composite index between -3.50 to -1.50 are included in the areas having low level of development of road transport. Very low composite index recorded by Jind district (-5.87) has brought this district under the category of very low level of road transportation development. Similarly, three districts namely, Panchkula, Gurgaon and Faridabad (located in north-eastern and southern parts of the state) by recording exceptionally very high composite index (above 6.00) have been distinguished as areas of very high regional development. Such a high composite index recorded by these districts is due to very high percentage of urban population and high literacy rate. Sonipat, Jhajjar and Rewari districts located in the central and southern parts of the state respectively have been included in the areas of high level of regional development. By recording composite index ranging between -2.01 to 2.00, four districts namely Ambala, Yamunanagar, Panipat and Rohtak have emerged to be the areas of moderate level of regional development. Nine districts namely, Kurukshetra, Kaithal, Karnal, Jind, Sirsa, Hisar, Bhiwani, Mahendergarh and Palwal

(mainly comprising the northern, central, western and southern parts of the state) recording the composite index between -6.01 to -2.00 are included in the areas having low level of regional development. Very low composite indexes recorded by Mewat (-9.48) and Fatehabad districts (-6.03) have brought these districts under the category of very low level of regional development. The correlation results conclude that although road transport has emerged as an important element of infrastructure yet it does not have a major impact on the distributional patterns of development in Haryana. The last chapter is devoted to summary, conclusions and major findings of the study.