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Transport Network Analysis of Rohtak City through Geospatial Technology

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Abstract:

Developed and efficient transportation network in urban areas is just like blood flowing through veins in body. It is a basic infrastructural requirement to meet the need of the increasing population and growing economy. The study was taken up to provide road and railway network information to city dwellers which help them to choose appropriate route for increasing the transport network system efficiency. The analysis was done using high resolution CARTOSAT-I Panchromatic data, collateral maps of MC and top sheets of area. The Arc GIS software was used to complete the process geo-referencing, digitization of transport network layers, building topology and final transport network map was generated. The study reveals that city is having dense network of roads and facing the problems of traffic congestion, parking and inefficient transport network.

1. Introduction

A mode of transport is a solution that makes use of a particular type of vehicle, infrastructure and operation. The transportation of a person or of cargo may involve one mode or several modes, with the latter case being called intermodal or multimodal transport. Transport systems are among the various factors affecting the quality of life and safety in a city. The urban transport situation in large cities in India is becoming poorer and more complicated. Commuters in these cities are faced with acute road congestion, rising air pollution, and a high level of accident risk. These problems cannot be solved without a concise and sound urban transport strategy. The main objective of such a strategy should be to provide and promote sustainable high-quality links for people by improving the efficiency and effectiveness of the city transport systems. Policy should be designed in such a way as to reduce the need to travel by personalized modes and boost the public transport system. At the same time, demand-side as well as supply-side management measures should effectively be used. Present study found that Rohtak city is situated at convergence point of all type of inland transport network. The study area has two means of transport i.e. railways and roads. The Present analysis of the road and railway transport network analysis was carried out because the city is the convergence point of all type of inland transport network of Railways and State & National Highway. Further, the city being in close proximity to national capital, it is facing number transport problem of heavy traffic, narrow roads, poor quality of roads etc. The main concerns of these types of studies are the observation of development of the road transport network which creates level of connectivity and accessibility between settlements. Mishra et al (1992)[1] conducted a study, "Transport in Amethi taluka of Utter Pradesh". They analyzed the transport network which indicates spatial disparities and imbalances in their distribution pattern and connectivity. Fazel (2006)[2] conducted a study on the topic "Land Transformation in Relation to Distance in Developing Economy." This study was based on remote sensing data and processing using the GIS Technique. R. Nijagunappa et al (2007)[3] evaluated the study on road network analysis of Dehradun city using high resolution satellite data and GIS. Ritesh et al (2013)[4] also studied on road network analysis using Geo-informatics Technique.

2. Study Area

Rohtak city is the administrative headquarters of the Rohtak division, district and tehsil. This city is one of the oldest district of Haryana is located in the Southeastern part of the state (Fig-1). It is located between $28^{\circ}51'47''$ N to $28^{\circ}54'57''$ N latitude and $76^{\circ}32'31''$ E to $76^{\circ}38'32''$ E longitude. It is situated at 77 km far from Delhi in north-west direction, and 235 km from Chandigarh. This city is situated in the middle of the district area which is spread over an area of 101 km². It has a total area of 1745 km² and a population of 10, 61, 204 out of which 4, 46,164 persons are living in urban area (2011 Census). The district has 35.06 percent urban population with a density of 539 persons per sq km. The average elevation of the city is about 220 meters above mean sea level. There is gentle slope of about 19 cm. per kilometers from north-east to south-west. The north-eastern part has a number of wide quelled, low lands with select channels slopping from North-North East to South-South West. The hydrologic gradient of ground water is very gentle. (Report on Geographical Condition and Scope of Ground Water Development in district, Rohtak)

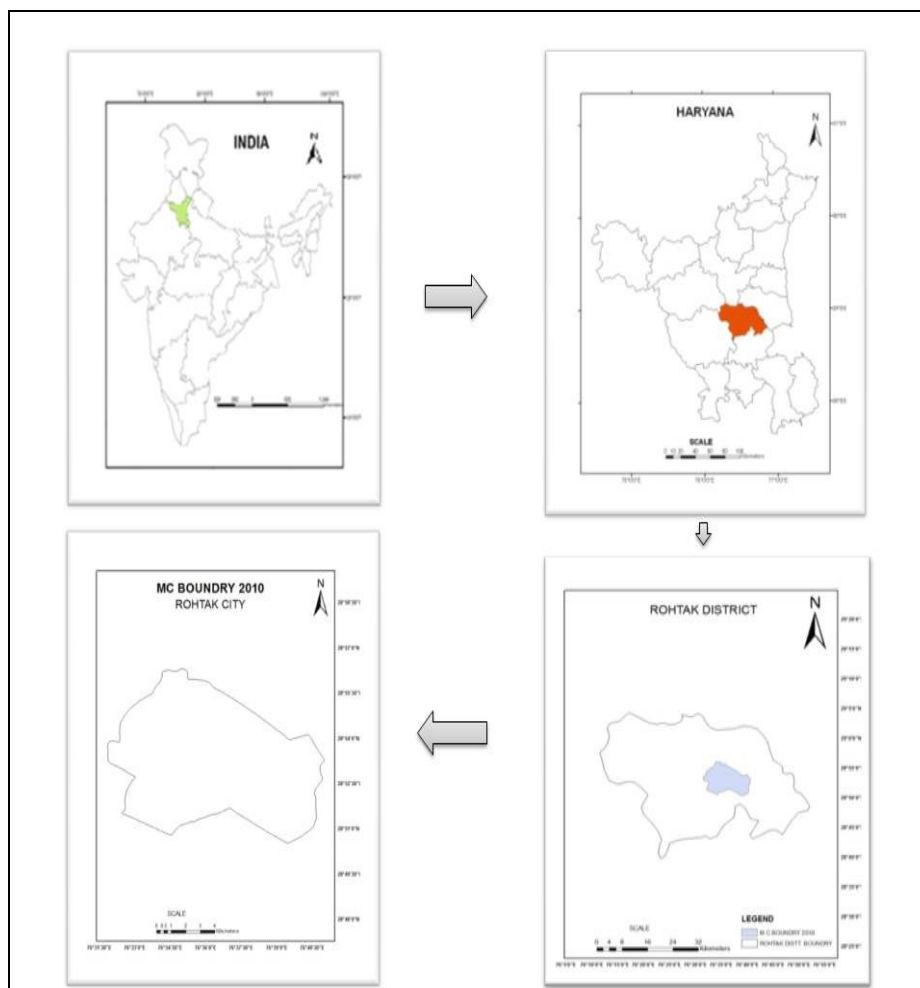


Figure 1: Location Map of Study Area

2.1. Objectives

1. To prepare road and railway transport network map of study area
2. To assess the transport network problems and suggest better connectivity in the city.

3. Materials and Methodology

3.1. Data Source

In this study, the cartosat-1 panchromatic 2010 satellite data along with topographical sheet no--- were used as primary source of data. The secondary data of city municipal boundary map, other road maps and pervious transport network related literature were sourced from M.C Rohtak and public works department (2010).

3.2. Methodology

Methodology is the central part of the any research work which helps in scientific descriptive and explanation of reality (Fig-2). Steps adopted in methodology are as under:

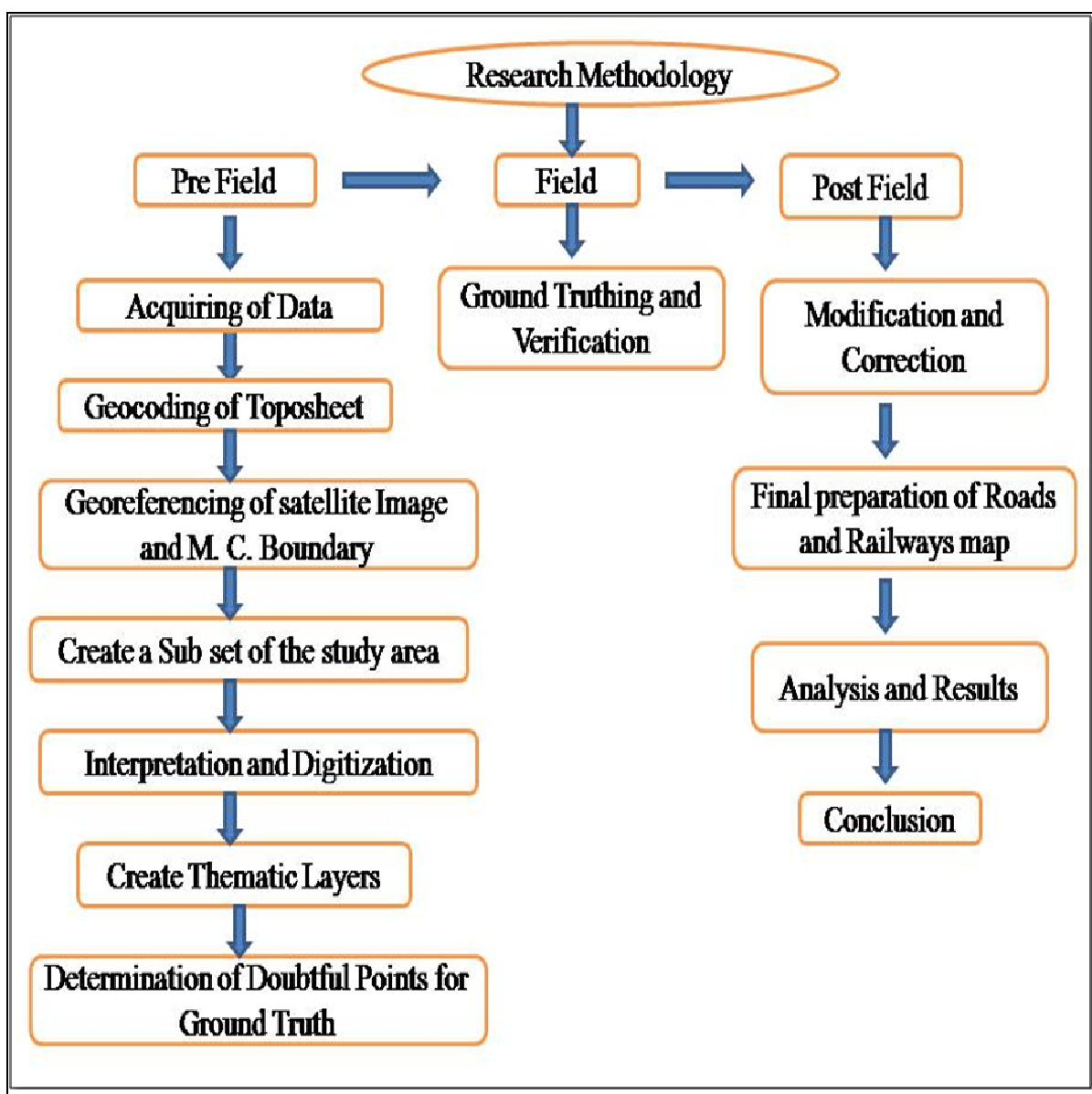


Figure 2: Showing Methodology Chart

4. Results and Analysis of Transport Network of Rohtak City

4.1. Analysis

Transport network plays a vital role in the growth of urban center and economic development of a region (Kaushik and Kumar, 2013)[5]. It is also found that there is a positive relationship between urbanization and good transport network. The study area has National Highway, State Highway and Local Roads on the road pattern model of National Highway Authority of India (NHAI) and Indian road Congress

4.2. National Highways

The study area is passed through by three National Highways namely NH. No. 10, NH no. and NH. No 71A (Table 1). Total length of all National Highways in Rohtak City is 39 kilometer out of which 15 kilometer length of National Highway No.10, 9 kilometer of National Highway No. 71 and 5 kilometer of National Highway no. 71A. The longest Highway no. 10 passes the through city and as a bypass with 10 kilometer length. The Highway No.71A radiated from city centre towards Sonipat city and Highway No.71 goes out ward in northwest and south east direction.

4.3. State Highways

There are two State Highways in the study area which passes through center of the city. These are S.H nos 16 and 18. S.H. 16 no. originates from old bus stand Rohtak and ends at Bhiwani city. Total length of this State Highway is 62.28 kilometers. Another State

Highway namely S.H. 18 starts from Rohtak and goes to Delhi border via Kharkhoda with length of 41.1 kilometer. The length of State Highways in Rohtak city is only 13 km (Table 1 & Fig-4). The distance of S.H. 16 is only 2 km length in the city where as S.H. length of SH 18 is 11 kilometer length.

4.4. Local Roads

The network of local roads provides mobility within and between local areas and provides vital links to the national roads network (Fig-3,4).. The roads are the backbone of the city transport network. There are two main characteristics of local roads (i) is low speed limits and (ii) is low volumes of heavy traffic. Traffic of local road is connected to roads of higher level of road network. Alike National Highway and State Highway, local roads have its own importance. These roads serve an important the total length of local roads in Rohtak city is 277 kilometers. It accounts nearly 80 percent of the city’s road network. These roads have less width but provide short distance from one place to another.

4.5. Rail Transport

Rail transport has its own importance. Presently, Rohtak city has only one type of railway network i.e. broad gauge railway line. This city is connected by railways to New Delhi, Panipat, Bhiwani, Jind and Rewari towns. A new railway track is also being laid down between Rohtak to Hissar via Meham and Hansi .The Railway track in Rohtak City is 18 kilometer long and out of which 9 Kilometer distance of Delhi to Jind track, 2 kilometer length of Rohtak to Bhiwani track and 7 killometer distance of Rohtak to Panipat track.

S.No.	Transport Network	Length (kms)	Length (%)
1	National Highways	39	11.2
2	State Highways	13	3.8
3	Local Road	277	79.8
4	Railway Line	18	5.2
5	Total Length	347	100

Table 1: Length of Transport Network of Rohtak City
Source: Based on Personal calculation

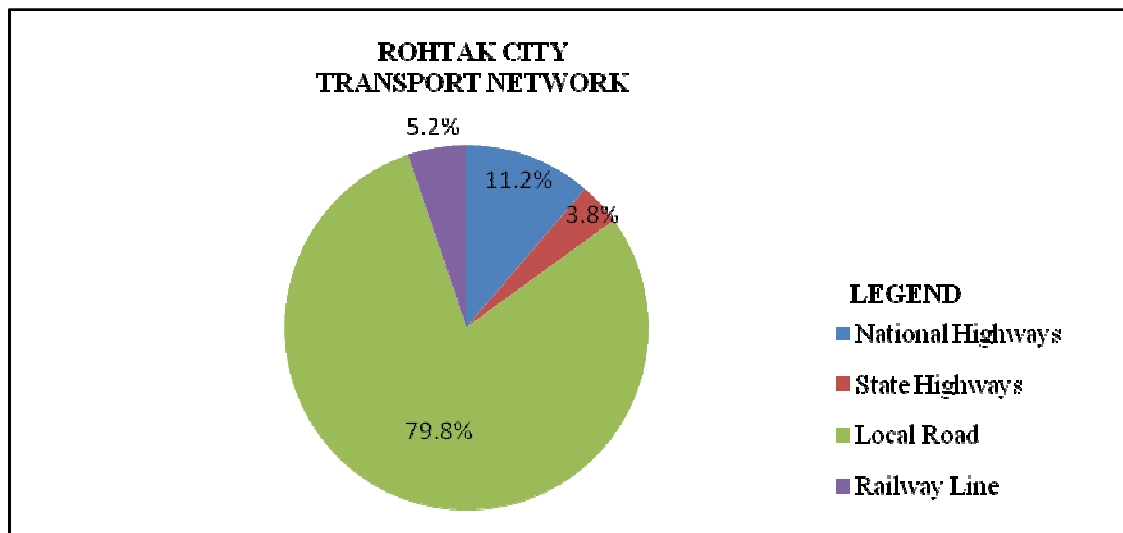


Figure 3: Percentage Distribution of Transport Network

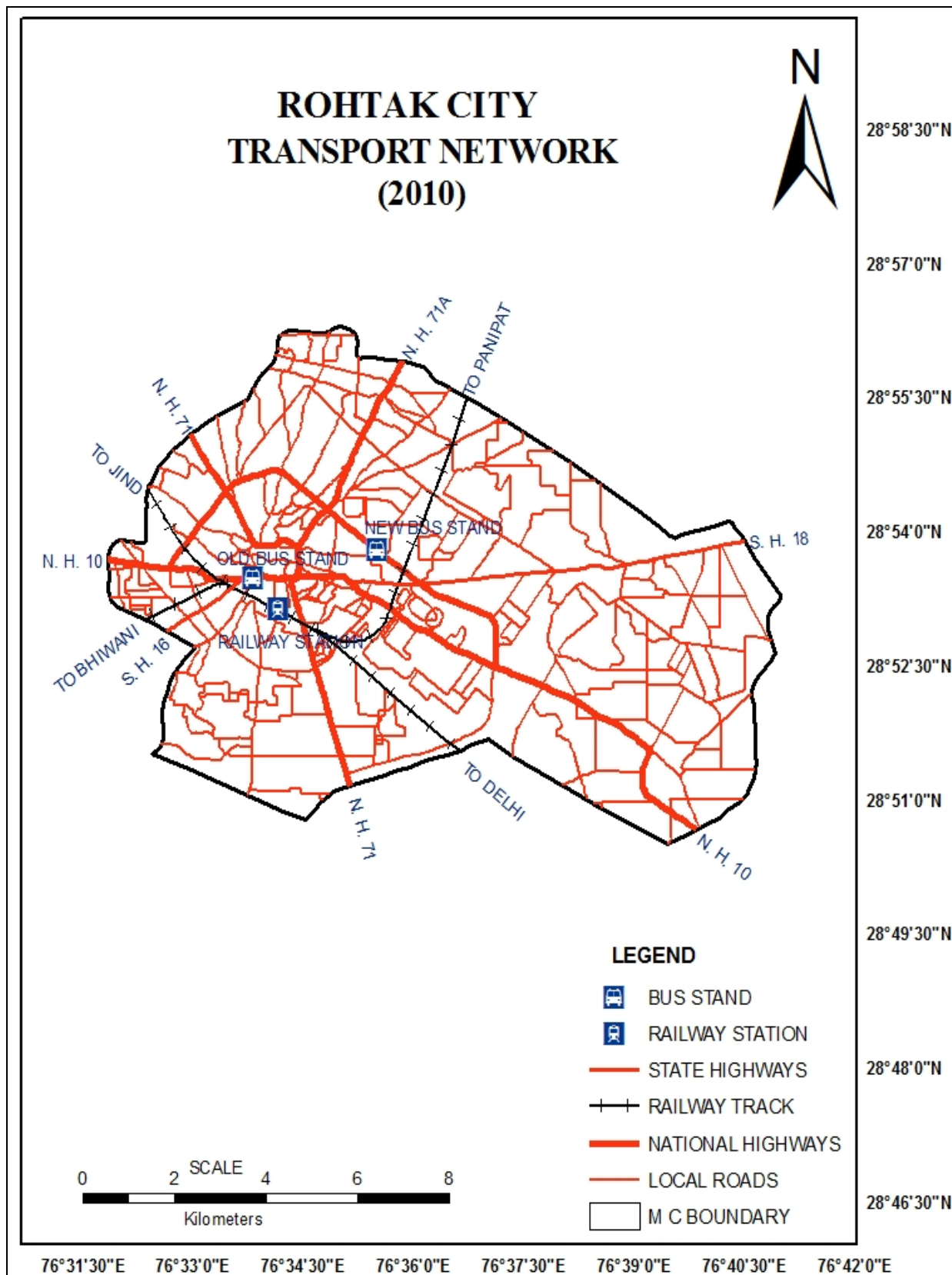


Figure 4

4. Conclusion

This study has proved that the remote sensing and GIS technology is efficient tool for the generation transport network spatial data base and to solve the problems transport routes connectivity to various places in city and intercity. With the help of network analysis tool of GIS, the best route or the shortest route can suggested. Because of this city growth and being situated in national Capital Region and very near to Delhi has led to heavy pressure on transport network. So there is acute need to develop an efficient transport network to ease out the pressure of population on national capital.

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