

## Assessment of Accidental Condition in Rural Region Using Geo-Spatial Technique; A Case Study of Karchna Block, Prayagraj (India)

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**Key words:** Geo-spatial technique, road accident analysis, settlement pattern, infrastructure settlement

**Abstract:** The rapid growth of population and urbanization decreases non-renewable resource and urban settlement used renewable resource to control environment pollution. Road network analysis is based on new technology which is available in Geo-spatial technique. Urban planning is the most powerful concept of road networking analysis. Urban planning is basically working on urban management and infrastructure settlement, rural planning, etc. Transportation planning is the backbone of urban planning. The present study intends to monitor the road accident analysis at Karchna block, Prayagraj district in road networking management. Road networking management is part of urban planning, management which can be the primary base for development of urban settlement. Most of the scientist work on algorithm used for the shortest path Di-jicasta algorithm. It was considered shortest path analysis in the road network management analysis, it basically gives weight-age of time, shorter distance node point, connectivity of the node point etc. Road network analysis is based on settlement pattern, growth of population, width of road, distance of major road to minor road, etc. The role of Geo-spatial technique on road network and demarcation of accidental zone in urban settlement area with management.

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Page No.: 65-70

Volume: 15, Issue 4, 2020

ISSN: 1816-9155

Agricultural Journal

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### INTRODUCTION

The economic, social, cultural development of any place is depends upon its transportation facility for an ex-road network, rail network, air network. The batter connectivity in the road network its provide the saves time, less accidents, etc. the developing country accident cases are improving because of population explosion. sustainable development an increase in demand for

transport facility without depletion of resources<sup>[1]</sup>. Day by day the number of vehicles is rapidly increasing, road capacity has conflicts development visa-vi's traffic accidents<sup>[2]</sup>.

It is observed that most of accidents due to non-compliance of traffic rules. If a traffic rule follows by people to control road accidents. The result of road accidents due to road network condition, traffic facility, number of vehicles, people's awareness, government

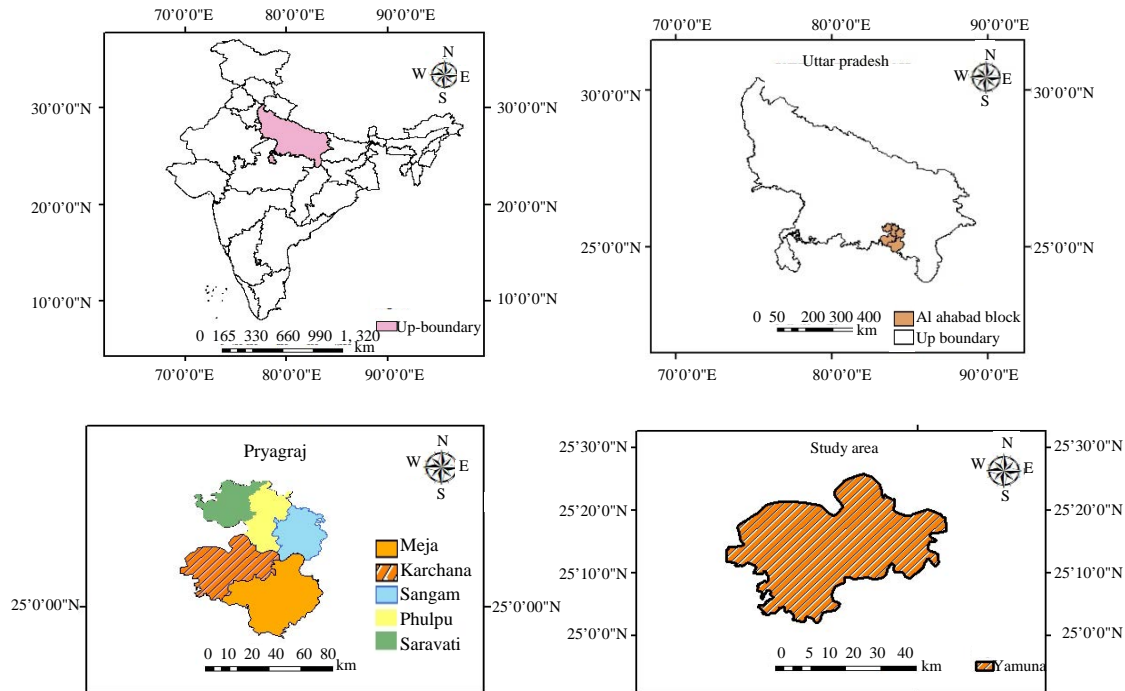


Fig. 1: Study area

policy, etc. a systematic and scientific approach based on the use of accurate and reliable accident data. The accident related information's are available at police stations in police records is incomplete, therefore would have been lack of information about the people who died in the road accident.

In addition, records including enforcement, maintenance, vehicle inspection, emergency medical services, science, technology and engineering to improve streets and highways.

Nowadays many agencies using GIS technology for analyzing accident zone. GIS is a Geographical Information system that supports the collection of data set, display and analysis of geospatial information. GIS technology generated demarcation of accidental zone using geospatial dataset. GIS technology uses to control road accident, management, planning, etc.<sup>[3]</sup>. The mapping provides accident area, location, distribution, etc.<sup>[4]</sup>. Settlement Patterns may cluster in linear or circular form or in other shapes<sup>[5]</sup>.

**Objective:** To study accidental case to find maximum and a minimum accidental zone of urban sprawl.

**Study area:** The area is located in Prayagraj District in the Indian state of Uttar Pradesh. It belongs to Prayagraj Division. The town is administrated by a village Panchayat system. Karchna lies the central part of Prayagraj district. It is located 21 km towards South from

district headquarters Prayagraj. It is a block head quarter. The town Karchana Tehsil is our study area which is one of Tehsil of Prayagraj have 81°30'0"E and 25°30'0"N coordinates.

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Karchna total area 1308.74 km<sup>2</sup>, total population is 3775 (census 2001) and number of houses are 546, Female Population is 50.8%. The village literacy rate is 62.0% and the Female Literacy rate is 26.3%. NH76 passes through this block which starts from the Madhya Pradesh border (Fig. 1).

This area surrounding the Meja and Bara tehsil, tehsil Karchana is near the Sangam of Ganga, Yamuna and Sarasvati river called Tiveni which is located near Naini.

#### Data used:

- Primary data; Field Data (Questionnaires), GPS- point, Line, Polygon
- Secondary data; Newspaper, Survey, road types
- Software used; ArcGIS 10.4, MS Excel, MS World, ENVI 5.2

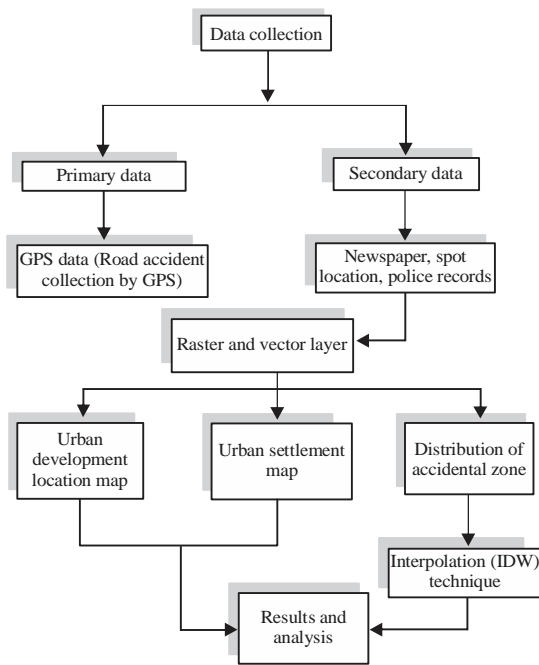


Fig. 2: Flowchart of methodology

## MATERIALS AND METHODS

First follow collection of dataset (primary Data and secondary data) which creates a database (Raster and Vector Layer). Settlement and road network data were extracted from the Google Earth and generated maps using ArcGIS 10.4 Software. All this information was registered onto a single layer and verified through the latest map and government information. Accidental Zone is created by Interpolation (IDW) technique with analysis and results. The demarcation of accidental zones methodology is shown in the Fig. 2.

**Data collection and management:** Data collection base on primary and secondary dataset. In this study, primary data generated through GPS and questionnaires. Other hand secondary data collection through policy records and government records, etc. statistical dataset using the analysis and processing of the maps through Arc GIS 10.4. The Accident database table involves attributes such as accident location, number of accident occurrence, etc. The accident locations on the map are identified as point, line, polygon features and road network are identified as line features in Arc GIS 10.4.

## RESULTS AND DISCUSSION

**Urban sprawl location:** Urban sprawl location can be classified in three categories:

- 7.1.1 Highly developed
- 7.1.2 Middle developed
- 7.1.3 Lower developed

**Highly developed:** Highly developed area must be seen in near old bridge NH-27 have a lot of settlement and densely populated. The hazardous locations are considered as a place where the road traffic accidents have an unusual high concentration of occurrence of settlement. Maximum number of accidents occur in Khan Chauraha, Naini railway station, Igatpuri by-pass road, Mahewa East, Mahewa West, Dandi road, Gangotri Nagar, Triveni Nagar, Udhyog Nagar, Shuats, Yamnotri Nagar, Naini jail these are the area have which have the highest number of accidents due of high flow of traffic.

**Middle developed:** In middle developed area must be seen in NH-76 have some settlement along the highway have less number of accidents like Cheonki railway station, Shankargarh, Kasiram Awas Yojna, ADA colony, Daudnagar, Arail, 220 kv sub station, Karma bus stop, Mukta Vihar these are the have less number of accidents.

**Lower developed:** In lower developed area which are far from highway have a low number of accidents like marakhpur, mohiud-din, Munder bazar, Semra, Lohagarh station, Kareha, Kazipue these are the rural area because settlement far from the highways (Fig. 3).

**Settlement map study:** Coastal region of Yamuna linear pattern settlement, increasing day by day because the coastal Yamuna region is the nearest distance from Prayagraj city.

Gangotri and Mahewa East and west have a linear cluster settlement pattern effected road network and to create an accidental zone of Karchna block.

The Naini settlement pattern is mostly linear and cluster but accidental zone is near the railway station between because of the undeveloped railway station as the same condition of Chonki railway station. Karchna railway station grows in a linear pattern (Fig. 4).

**Distribution of accidental zone:** This map was created by interpolation using IDW-Inverse distance weighted technique. This technique works on exact method that enforce the condition that the estimated value of a point is influenced more by near by known points than those by farther away (Fig. 5, Table 1).

**Accidental zone analysis:** Naini Railway Station, Mahewa East, Mahewa west Ambedkar Nagar, ADA

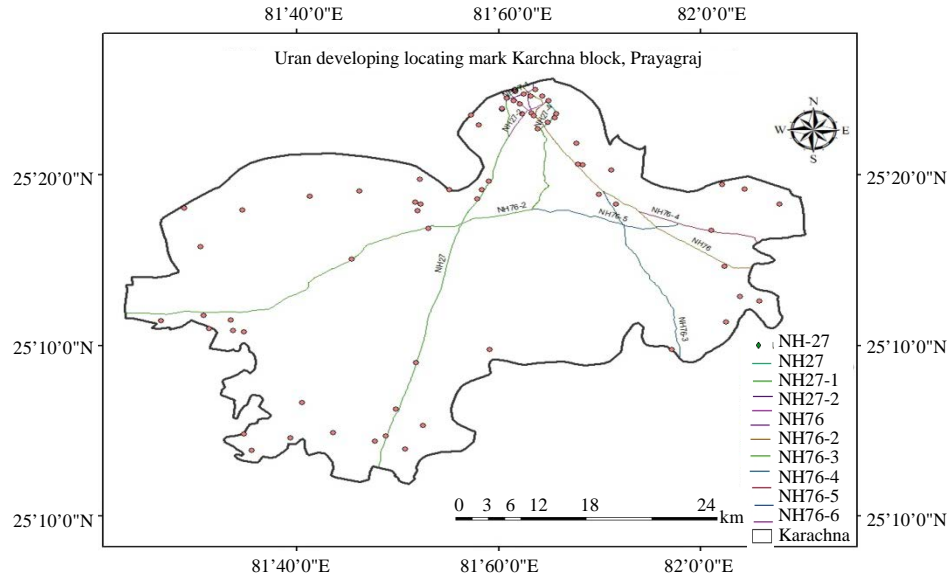


Fig. 3: Location map

Table 1: Accidented zone map in tabulated

Names	Latitude	Longitude	Accident per person
Naini railway station	25°23'36.54"N	81°51'37.69"E	7
Mahewa East	25°24'56.97"N	81°50'49.20"E	6
New Hostel	25°24'52.15"N	81°50'48.21"E	1
Mahewa West	25°24'42.51"N	81°51'14.07"E	4
Ambedkar Nagar	25°24'36.05"N	81°51'36.08"E	6
Mahewa Purab	25°25'0.24"N	81°51'48.31"E	3
Arail	25°24'20.62"N	81°52'27.62"E	4
ADA colony	25°23'33.57"N	81°52'52.07"E	5
Chak Mohiuddin	25°23'26.26"N	81°51'45.04"E	2
Dabhaon	25°23'33.11"N	81°51'8.88"E	2
Cheonki	25°23'3.41"N	81°52'25.09"E	3
Maruka Upahar	25°23'51.19"N	81°50'9.94"E	2
Cheonki railway station	25°22'40.16"N	81°51'56.89"E	5
Durga Pooja Mandir	25°23'19.39"N	81°52'46.63"E	3
KharKauni	25°24'36.02"N	81°52'8.87"E	3
Gangotri Nagar	25°24'19.58"N	81°50'44.34"E	2
Maduka Kachhar	25°24'29.18"N	81°50'24.63"E	5
Shiats	25°24'9.58"N	81°51'3.47"E	2
Marauka Uparhar	25°23'51.54"N	81°50'9.86"E	2
Deoria	25°19'7.09"N	81°47'32.48"E	2
Chitauri	25°18'14.96"N	81°46'8.86"E	5
Leauda	25°18'21.93"N	81°45'51.75"E	2
Dauna	25°17'52.90"N	81°45'59.17"E	3
Gambhirpur	25°15'3.09"N	81°42'42.05"E	1
Shankargarh railway station	25°10'51.07"N	81°36'50.91"E	2
Chundwa	25°10'50.53"N	81°36'47.44"E	4
Pagwar	25°10'47.18"N	81°37'21.71"E	2
Deora	25° 4'50.97"N	81°41'47.90"E	2
Katra	25° 4'20.88"N	81°43'51.02"E	3
Nariwari	25° 4'39.90"N	81°44'24.34"E	3
Ramapur	25° 6'37.70"N	81°40'14.36"E	2
Pahari Kalan	25° 4'47.53"N	81°37'21.83"E	2
Nauriha Uperhar	25° 3'50.31"N	81°37'46.45"E	2
Lonipar	25° 4'33.51"N	81°39'40.62"E	3
Deori Bargahi	25° 3'54.83"N	81°45'20.62"E	2
Phutara	25° 5'16.82"N	81°46'13.86"E	2
Surwal Sahini	25° 6'15.86"N	81°44'54.97"E	3
Shivaji Inter college	25° 8'57.42"N	81°45'53.01"E	2
Antari Samdariya	25° 9'45.40"N	81°49'33.17"E	2
Dharwara	25° 9'44.40"N	81°58'35.09"E	2
Raipura	25°12'35.56"N	82° 2'55.94"E	3

Table 1: Continue

Names	Latitude	Longitude	Accident per person
Saraha	25°12'51.41"N	82° 1'57.21"E	4
Kachari	25°14'36.86"N	82° 1'10.50"E	2
Dubey Mension	25°16'43.70"N	82° 0'32.90"E	2
Babura	25°18'15.27"N	82° 3'54.97"E	2
Rampur Uperhar	25°19'8.38"N	82° 2'11.93"E	3
Diha Kachar	25°19'26.01"N	82° 1'3.35"E	2
Karchna railway station	25°18'49.92"N	81°54'58.22"E	2
Hardua	25°18'15.10"N	81°55'49.03"E	1
Newada Samoger	25°20'15.50"N	81°55'5.10"E	2
Chak Noor	25°20'35.12"N	81°54'8.44"E	5
United College	25°20'36.71"N	81°53'56.73"E	5
Sadwa Kalan	25°21'51.02"N	81°53'51.19"E	1
Distance Education	25°22'54.59"N	81°49'1.41"E	0
Sayyadpur	25°23'19.31"N	81°47'39.79"E	6
Iradatganj	25°19'35.78"N	81°49'30.79"E	4
Iradatganj railway station	25°19'6.14"N	81°49'9.20"E	2
Ghurpur	25°18'35.10"N	81°48'56.06"E	2
Deoria	25°19'7.68"N	81°47'32.37"E	2
Kanjasa	25°19'43.78"N	81°46'5.08"E	3
Jasra railway station	25°16'51.49"N	81°46'30.95"E	2
Chilla Gauhani	25°19'2.85"N	81°43'6.66"E	2
Chatahara Ghureha	25°18'44.63"N	81°40'38.64"E	3
Sonaur	25°17'55.55"N	81°37'16.82"E	5
Pandua	25°18'2.14"N	81°34'23.93"E	3
Kachari	25°15'47.00"N	81°35'13.65"E	4
Lakhanpur	25°11'43.76"N	81°35'23.28"E	3
Shankargarh	25°11'26.98"N	81°36'42.26"E	2
Abhaipur	25°11'25.82"N	81°33'14.99"E	3
Hinauti Pandey	25°10'57.33"N	81°35'38.04"E	2

colony, Sayyad Nagar, Iradatganj, Karchari, Cheonki Railway station highly accidental zone area identifies by GIS technique in a research study. Sadwa Kalan, Gambhirpur, New Hostel, Hinauti Pandey and Surwal Sahini, Babua, Ramapur, Pahari Kalan Nauriha Uperhar middle and Lowest Accidental marked.

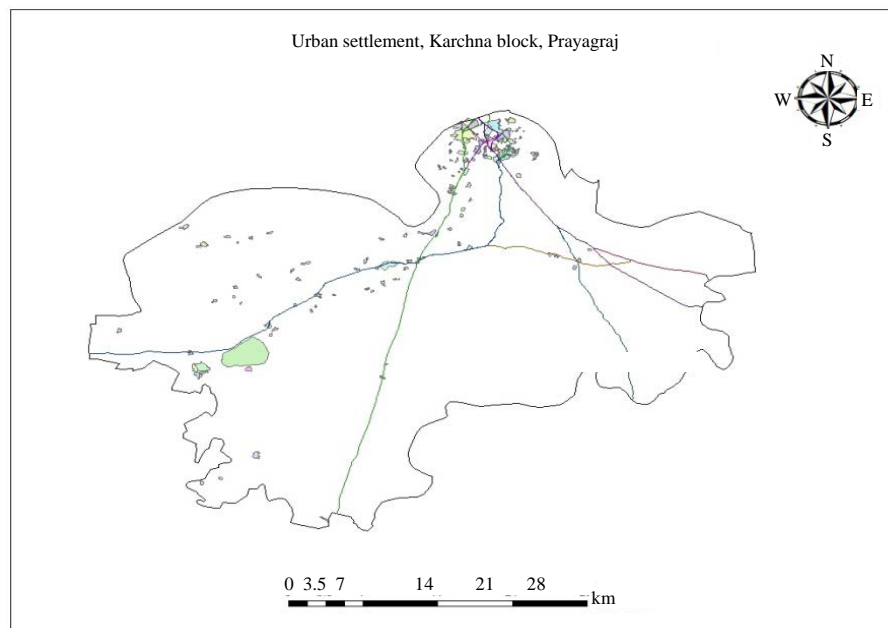


Fig. 4: Urban settlement and road network

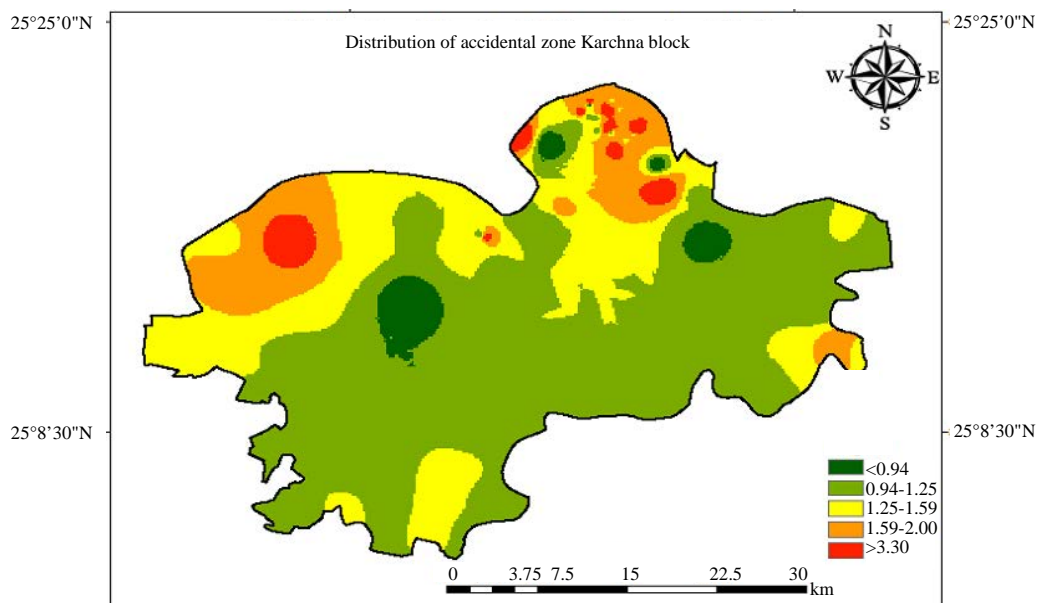


Fig. 5: Spatial distribution of accidental zone map

## CONCLUSION

This study assisted accident impact of rural area in Karchna block, Prayagraj, India. This comes to the conclusion that combined effect of road network, settlement and location, demarcation zone of accident in Karchna block. Geo-spatial

techniques is useful for accidental demarcation of regional, national, international level of research area.

## ACKNOWLEDGEMENTS

The parents and teachers would like to thank the SHUATS, Prayagraj (India) for providing the necessary

facilities. Acknowledgements are also due to the accidental data and police station in Prayagraj, Uttar Pradesh (India) for making available the datasets used for this study.

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