

AN ASSESSMENT AND PLANNING OF FIRE SAFETY INFRASTRUCTURES IN SOUTH ZONE OF SURAT CITY

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Abstract - As the urbanization increase, the need for fire safety infrastructure is also increased. In India, many old cities were unplanned and that leads to the major problem in that city. Improper location of fire station causes major damage to the people life as well as their property, not only the location factor but also the width of road and traffic condition also matters. National Crime Records Bureau data shows that the major outbreak of fire is seen in the residential and commercial area. This study will focus on the analysis of the existing fire station available in the South Zone of Surat City. Comparing existing fire station with guideline, norms and standard so that we can identify the gap among fire station. Using the Geographic Information System (GIS) tool, the fire risk assessment map can be generated as per the available data and different parameters. This map will help to identify the fire risk zone. After analysis of the fire risk map, we can provide a relevant planning proposal of fire safety infrastructure. The provision of a fire station at a relevant location can reduce the response time and hence we can save the lives of people.

Key Words: Fire Safety Assessment, GIS, Fire Station Planning, Infrastructure Planning, Fire Hydrant, Surat City

1. INTRODUCTION

Fire Safety infrastructure is one of major infrastructure among the social infrastructure. As an Indian scenario most of the old cities were not well planned. This is because of the old cities were evolved cities not planned cities. The evolved cities were developed due to their own potential of economic activities. Evolved cities face many urban problems due to the lack of social and physical infrastructure. The social infrastructure plays major role in the city. It is one of the basic needs of the city. Fire safety infrastructure is one of the important for the safety of the city. It is considered as an emergency service.

This paper will focus on the improvement of fire safety infrastructure after analyzing existing condition of the fire safety infrastructure in South zone of Surat City. By the help of GIS tool; the location of existing fire station is determined. Using buffer analysis, the service area of the existing fire station is determined. The buffer analysis map is generated

using GIS tool. In this study, the URDPFI guideline reference is used to identify the gap among the fire station. By comparing the existing fire station with the guideline, we get the gap of fire station. After performing gap identification, we can provide planning proposal of fire station at suitable location.

The main aim of this study is to provide the fire safety infrastructure in South zone of Surat City. The location of all the existing fire stations in study area will be located using GIS tool. After that, the coverage area of that fire station is analyzed using the buffer analysis tool in GIS software. An uncovered area in buffer analysis shows the demand of fire safety infrastructure. The next step after the buffer analysis is to provide the suitable location of fire station as per the URDPFI guideline.

1.1 Evolution of fire services in India

The development of fire services in India was influenced by India's political and historical association with Britain. Regular fire services in India first came up in Bombay (Mumbai) & Calcutta (Kolkata). In 1855, the Bombay fire brigade was officially formed and formally placed under the police as a part-time function. In 1864, it was placed jointly with the government and Municipal Corporation.

Fire services in India come under the 12th schedule of the Constitution under the provisions of Article 243W of the Constitution. The performance and functions of fire station is in 12th schedule comes under the domain of municipalities. Fire prevention and firefighting services are organized by the concerned states, Union Territories (UTs) and ULBs. In 1956, The Government of India formed a Standing Fire Advisory Committee (SFAC) under the Ministry of Home Affairs (MHA).

1.2 Fire Incidents in India

The fire can be accrued either by the man mad or natural. In both the cases, it can be deadly damaging people life as well as their properties. The below table shows the number of fire incidences in different building to the respective year in India. This data were collected from the official website of National Crime Record Bureau.

In this study, the URDPFI guideline reference is used to identify the gap among the fire station. By comparing the existing fire station with the guideline, we get the gap of fire

station. After performing gap identification, we can provide planning proposal of fire station at suitable location.

1.3 Fire cases in Surat from the year 2001 to 2016

Sr. NO.	Place of Fire incident	Year 2016	Year 2017	Year 2018	Year 2019
1	Fire in School Buildings	21	6	7	23
2	Fire in Commercial Buildings	463	446	367	328
3	Fire in Residential/Dwelling Banglow	8359	7660	7241	6364
4	Fire in Government Buildings	48	13	24	60
5	Fire in the Mines	28	26	13	2
6	Fire in Factory Manufacturing Combustible Materials	253	76	51	27

Table -1: Fire incident cases in different buildings in India

(Source: National Crime Records Bureau, 2019)

Table-2: Death due to fire incident in India to the respective year

Sr. N O.	Place of Fire incident	Deat h in Year 201 6	Deat h in Year 201 7	Deat h in Year 201 8	Deat h in Year 201 9
1	Fire in School Buildings	19	3	7	28
2	Fire in Commercial Buildings	459	382	284	330
3	Fire in Residential/Dwe lling Banglow	847 8	761 4	720 8	632 9
4	Fire in Government Buildings	41	10	18	54
5	Fire in the Mines	28	26	14	2
6	Fire in Factory Manufacturing Combustible Materials	306	72	71	33

(Source: National Crime Records Bureau, 2019)

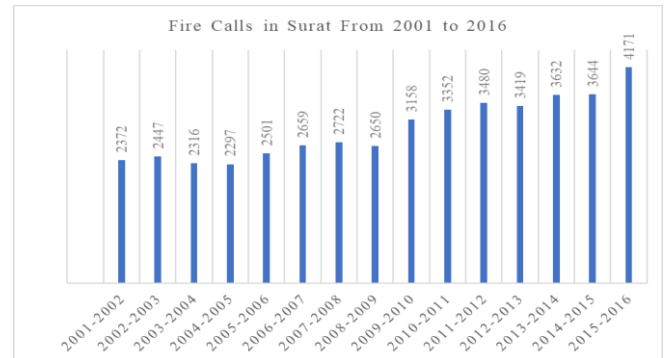
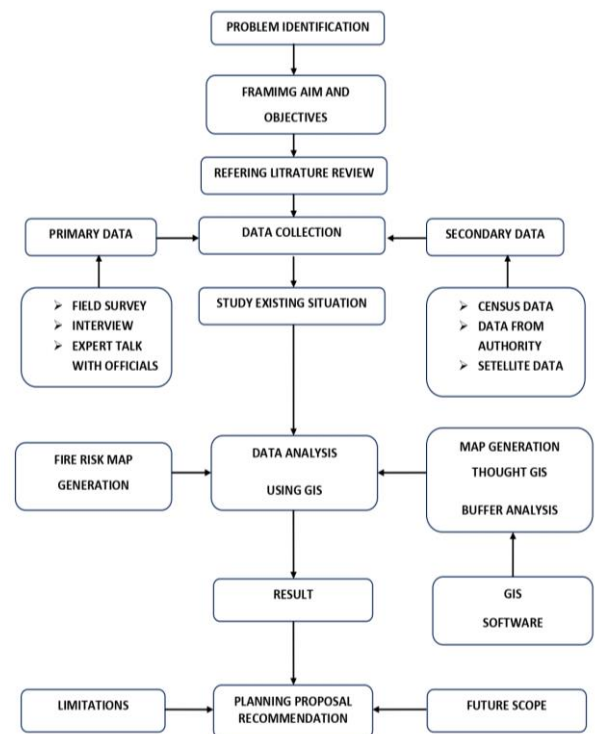


Chart-1 Fire calls in Surat from 2001-2016

2. Work Flow

Procedure of the research study is described in this chapter

2.1 Methodology



2.2 Aim

To perform assessment and analyses of fire safety infrastructure is South zone of Surat City and propose relevant planning proposal for the improvement of fire safety.

2.3 Objective

- To study existing situation of fire safety infrastructure in South zone of Surat city and identify the issues.
- To perform gap identification and buffer analysis of existing fire station in study area.
- To prepare relevant planning proposal for fire safety infrastructure of the study area using GIS tool.

3.4 Scope of Work

This study is limited for South Zone of Surat City. In this study an assessment of existing fire station is analyzed. As per the suitable condition and guideline the new fire station and fire hydrant are to be suggested at suitable location.

4. STUDY AREA PROFILE

Surat city is situated in Southern Region of Gujarat. It one of the faster growing city in India. It is settled near to the bank of Tapi river. It is the eighth largest city and ninth largest urban agglomeration in India.

Table-3: Study area profile

Area	326.515 sq.km.
Population	44,66,826 (Census 2011)
Density	13680 Persons/Sq.Km. (Census -2011)
Location	Latitude:21.112°N Longitude: 72.814°E

Surat city is headquarter of Surat district that situated in the centre of south of Gujarat. It is situated at latitude 21.112°N and longitude 72.814°E and covers the area of 326.515 Sq.km (Surat Municipal Corporation, 2016). Population density as per the Census-2011 is 13680 persons/Sq.km. It is the administrative capital of the Surat district. Surat has secured the second rank in cleanest city during 2020.

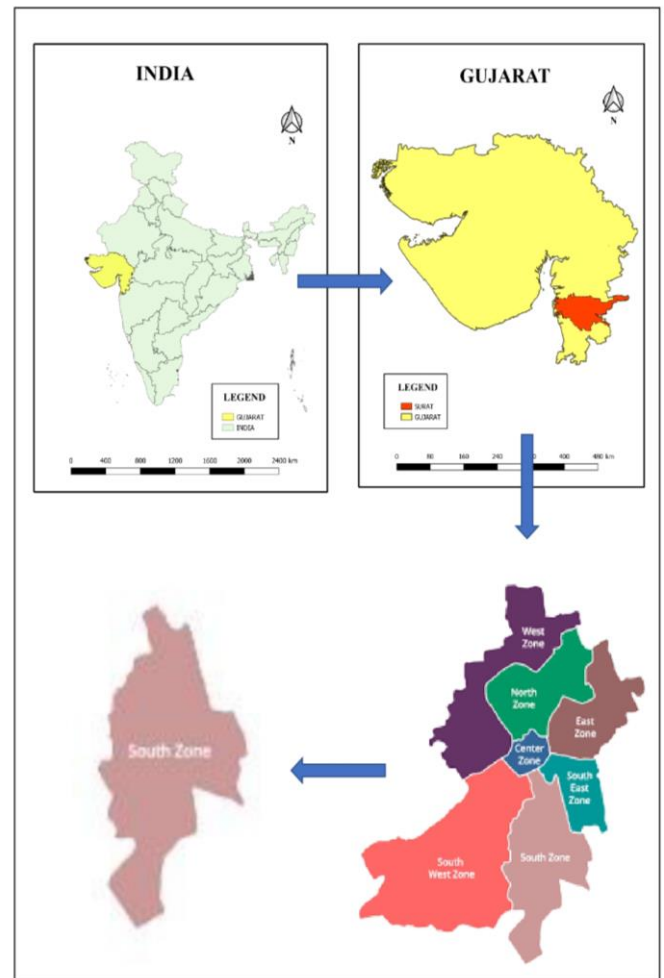


Chart-2: Location Map of South Zone, Surat City

The historical development of the city dates back to 300 BC. Surat was ruled successively by the kings from Sauvira in Mahabharata period (Urban Management Centre, 2009). In past, this was a famous port with ships of more than 84 countries anchored in its harbour at any time. Still today, Surat continues the equal tradition as people from all around the country group in for business and jobs.

Surat city is the 2nd largest city of Gujarat in terms of Area and Population. The area of the Surat city is 326.515 Sq.Km. and the population is around 44,66,826 as per the Census-2011. The density of the Surat city is 13680 Persons/Sq. Km. as per the Census -2011. Surat Municipal Corporation is the Urban Local Body (ULB). Surat Urban Development Authority (SUDA) is the urban development authority which prepare the Development Plant (D.P) and Town Planning (T.P) schemes.

5. DATA ANALYSIS

This chapter consists the data analysis of fire safety infrastructure in study area. The existing situation of the fire

safety is analyzed using the ArcGIS software. It is very helpful tool for the analysis of the fire station data.

5.1 Buffer Analysis

The GIS is very helpful software for the different types of analysis. In this study the buffer analysis tool of ArcGIS is used for the analysis. As per the URDPFI guideline the converge area of fire station should be 5-7 km. The converge area of 5-7 km radius fire station is prepared using ArcGIS Buffer Analysis tool. The map clearly indicates the lacking area of highlighted south zone.

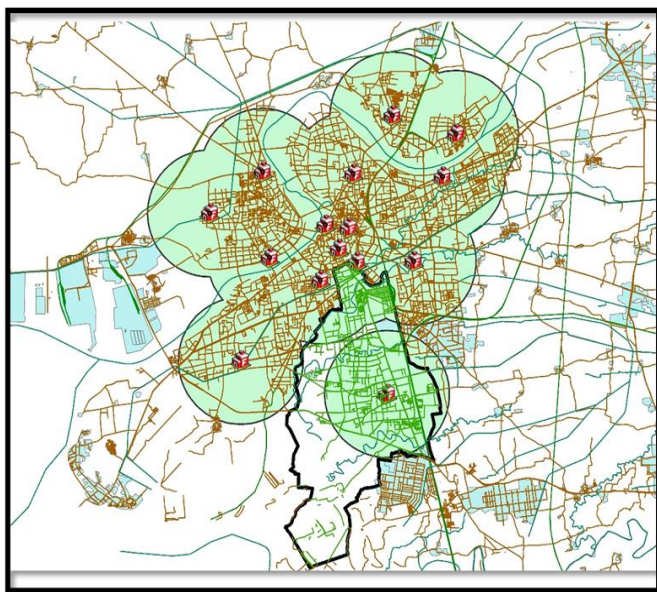


Chart-3 Buffer analysis of existing fire station

All the coordinate points of the fire station are obtained from the Google Earth Pro. This coordinate points are then used as the secondary data in ArcGIS software.

6. PLANNING PROPOSAL

In this chapter, planning proposal related to this study work is provided. As per the data analysis the planning proposal of new fire station is provided in T.P-33 near Sachin GIDC area. The planning proposal is prepared based on the different paraments and guidelines.

6.1 Provision of New Fire Station

The URDPFI guideline suggest that there should be one fire station withing the coverage area of the 5-7 km radius. The coverage area of all fire station in Surat is measured using buffer analysis tool in ArcGIS. The map generated through GIS is clearly indicates that there is lacking area in South zone. In order to fulfilment of URDPFI guideline, new fire station is

proposed in SUDA draft T.P-33 (Talangpore- UMBER) which covers the Sachin GIDC industrial area in South Zone.

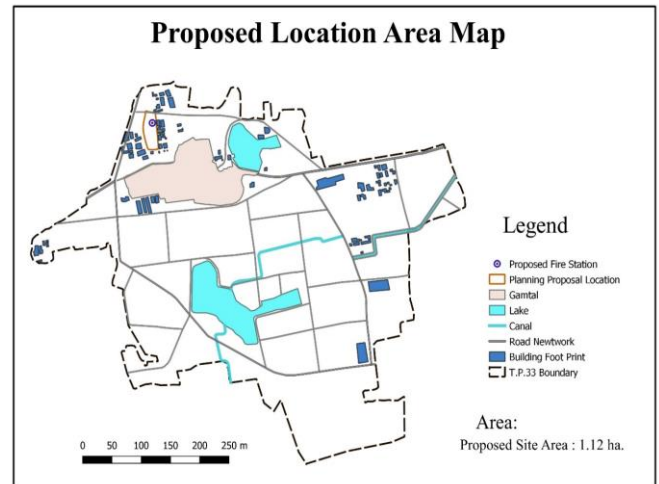


Chart-4: Proposed location area map

The Coverage area map of new fire station is also prepared which covers the lacking area of south zone. As per the URDPFI guideline at least 1 hecter area should be there for the provision of new fire station. The location of proposed site in T.P-33 having area of 1.13 hecter. The drawing of new fire station is prepared. Ground floor area is almost provided as parking space for the fire fighting vehicles area admin office.

6.2 Coverage Area of New Fire Station

The coverage area of new fire station is prepared using ArcGIS buffer tool. URDPFI guideline suggest the coverage area of fire station should be 5-7 km radius. Using coordinate points the buffer analysis is performed. This map is very helpful to check the coverage area of fire station. Then design makers can identify the need of fire station and provide the suitable location of fire station which can cover the lacking area.



Chart-4: Proposed new fire station coverage area

The new fire station is provided in draft T.P-33 (Talangpore-Umber). The proposed site having area of 1.12 hactor. It covers the industrial area of Sachin GIDC. Before planning proposal suggestion, the Sachin GIDC area which is complete out of the coverage area of nearby fire station.

7. CONCLUSIONS

- The URDPFI guideline suggest that there should be one fire station withing the coverage area of the 5-7 km radius.
- The coverage area of all fire station in Surat is measured using buffer analysis tool in ArcGIS. The map generated through GIS is clearly indicates that there is lacking area in South zone.
- In order to fulfilment of URDPFI guideline, new fire station is proposed in SUDA draft T.P-33 (Talangpore- Umber) which covers the Sachin GIDC industrial area in South Zone.

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