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Fire Hazard and Risk Analysis in the Country for Revamping the Fire Services in the Country

Final Report – State Wise Risk Assessment, Infrastructure and Institutional Assessment of Phase IV States (Andhra Pradesh, Bihar, Kerala, Lakshadweep, Tamil Nadu)

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Submitted by

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Executive Summary

Fire service is one of the most important emergency response services in the country, which comes under the 12th schedule of the constitution dealing with Municipal functions. At present, fire prevention and fire fighting services are organized by the concerned States and Union Territories (UTs), and Urban Local Bodies (ULBs). Directorate of National Disaster Response Force and Civil Defence (NDRF&CD, Fire Cell), Ministry of Home Affairs (MHA) render technical advice to the States, UTs, and central ministries on fire protection, prevention, and legislation. Fire services in Maharashtra, Haryana, Gujarat, Chhattisgarh, Madhya Pradesh (excluding Indore), and Punjab are under the respective Municipal Corporations. In the remaining States, it is under the respective Home Department.

The growth of fire-services in the country has been on an ad-hoc basis, without much scientific analysis of existing risks in different parts of the country. Varying risk scenarios need different types of equipment. The risk varies with geographical location such as hilly-area, coastal-area, desert–area, and with residential (high-rise, medium, and low rise-buildings), industrial, commercial area or a combination of these. Moreover, lack of knowledge management for future planning and institutional capacity and funds are also seen as one of the major challenges in addressing improvements in fire and emergency services in the country. As per a recent analysis by the Standing Fire and Advisory Council (SFAC), the overall deficiency in the country in terms of number of Fire Stations is 97.54%, in terms of fire fighting and rescue vehicles is 80.04% and in terms of fire personnel is 96.28%, respectively, which is quite alarming (NDMA Guideline, 2012, CR SFAC, 2011). In consideration of this and the increasing fire risks from various hazards, the Directorate of NDRF&CD, Fire Cell, MHA planned a study called "**Fire Hazard and Risk Analysis in the Country for Revamping the Fire Services in the Country**", to identify existing gaps in terms of availability and requirement of Fire Stations, capacity-building, trained man-power and fire-fighting, rescue, and other specialized equipments.

The **broad objectives** of the study are:

- To carry out GIS thematic map based Fire Hazard and Risk analysis though overlaying hazards and quantified risk, and classify the districts as base units into appropriate risk categories such as very high, high, medium, or low.
- To prepare a detailed Investment and Financing Plan for next 10 years for up-gradation, expansion and modernization of Fire Services, based on existing situation analysis and risk based actual requirements.
- To develop an open-source GIS based software called as a Fire Decision Support System (FDSS) containing administrative boundaries, quantified risk GIS layers and with capability of estimation of financial implications for desired capacity development.
- To prepare an Institutional Assessment and Capacity Building Plan, based on field-data collection, enquiry, spatial analysis and understanding of the availability and gaps in the fire service infrastructure.

Role of Fire Services

The primary role of fire services has been to attend to fire incidents. Besides firefighting, fire department also attends to other emergencies such as building collapse, road traffic accidents, human and animal rescue etc., and other special service calls. Some fire services also attend medical emergencies for transportation of casualties through ambulances maintained by them. Similarly, some States, like Delhi, have separate flood department with rescue boats and trained divers. The Fire Services maintain skeletal facilities to act as *'first responders'* and wait until assistance from the flood department arrives. It is therefore,

considered appropriate that the specialized facilities for such jobs is maintained and operated by the concerned department.

As indicated in the National Disaster Management Authority (NDMA) guidelines, Fire Service is one of the Emergency Support Functions (ESF). Based on DM Act 2005, various States have also formulated State Disaster Management Authorities (SDMA's) and District Disaster Management Authorities (DDMA's) both of which consider Fire Service as an ESF. It is, therefore, evident that the role of Fire Services has become multi-dimensional that includes not only attending fire incident calls but also various other emergencies. Accordingly, fire services in the jurisdiction of the respective Fire Station are required to be prepared with suitable types of equipment to deal with various emergencies.

The role of fire services also includes effective fire prevention, creating awareness on fire safety, and enforcing the inbuilt fire protection arrangements for various types of occupancies in line with National Building Code (NBC) part – IV. However, majority of the States/Municipal Fire Services are unable to enforce the fire safety provisions due to a lack of appropriate directives from the authorities controlling the function of fire services. Some of the Fire Services do not adhere to NBC and have created their own fire-safety building bye-laws, e.g., Mumbai Fire Brigade. It may be noted that in-built fire safety arrangements and escape facilities are much more important than having a fire service within the premises without the above facilities. It is, therefore, necessary to enforce the fire-safety provisions through appropriate directives to all the States/UTs by the Ministry of Home Affairs (MHA) directly or through DG, NDRF & CD office.

In addition to the regular fire services, various other organizations/ industries, such as Ports, Airports, Defence, Power, Oil and Gas, Steel, Heavy Engineering, Fertilizers, Chemicals etc. have their own fire service set-ups (including their own captive resources), in order to provide fire protection to their facilities and some of them at times provide support to local fire services on request. All of them have their rules and regulations concerning fire safety. For example, Oil India Safety Directorate (OISD) norms for Oil and Gas Industries, International Civil Aviation Organization (ICAO) norms for Airports, Tariff Advisory Committee (TAC) regulations- now discontinued, for industries etc. and Electricity Rules for power sector.

Safety of highly hazardous processing and storage industries requires 100 percent round the clock built-in and functional fire protection arrangements with trained fire fighters as well as onsite and off-site disaster management plans. Fire services are not expected to create the infrastructure to independently tackle such emergencies within the industry, as it may be not be possible to do so. However, they are expected to support any on-site and off-site fire fighting to protect surrounding populations and handle such incidents during transportation through the civil areas. Moreover, local fire services should have mutual-aid schemes with all the industries in their jurisdiction and must be aware of the various arrangements available with them in order to provide efficient support, in case of an emergency.

Phased Approach

In order to conduct this study for India, a vast country covering all the States and Union Territories (UTs), it was decided to conduct this study in a phased manner. In initial pilot phase, the pilot study comprises of 6 States and UTs (Jammu & Kashmir, Rajasthan, Maharashtra, Delhi, Andaman & Nicobar Island, and Puducherry), and in subsequent phases (Phase I to Phase IV), rest of the States/UTs have been taken up as detailed in section 2.2.

Field Surveys for Fire Infrastructure Data

To collect and collate the information on Fire Infrastructure of these Pilot States/ UTs, RMSI team developed two detailed forms "Headquarter Data Collection Form" and individual "Fire Station Field-Survey Form". RMSI team field-surveyed all the Fire Stations in pilot

States/UTs for collecting detailed fire Infrastructure information. The detailed information collected includes address of Fire Station, name of Fire Station in-charge, emergency contact numbers, communication between Fire Station control room, public and headquarter control room; Fire Station building including staff accommodation and barracks; fire fighting vehicles and specialized equipment; fire personnel, their duty pattern and pay-scales; water availability and water sources for fire vehicles, fire-risk in the jurisdiction of Fire Station and its geographical coordinates (latitude, longitude -by using a Global Positioning System, GPS) etc. All this information for each Fire Station has been digitally converted and is available through Fire Decision Support System (FDSS), which can generate a Fire Station report at the click of a button.

GIS based Fire Hazard and Risk Analysis

In general, fire risk is defined as the combination of hazard potential, exposure, and vulnerability:

Risk = F (**H**azard potential x **E**xposure x **V**ulnerability)

The occurrence of fire incidents that constitute a threat for the population and exposed infrastructure of a certain region is associated with economic and human losses, always as a function of the exposure conditions and the vulnerability of the exposed assets in that particular region. Different natural hazards such as seismic (earthquake), climatic, and wind are considered in risk analysis. Additionally hill zone are also considered in risk analysis due to increased fire risk from wooden houses and heating provisions in cold areas.

For estimating exposure and its vulnerability, detailed urban agglomerate classification maps generated from high-resolution satellite images have been used. With the help of remote sensing techniques applied on high-resolution satellite imageries, various types of urban agglomeration areas have been demarcated. These include urban, semi-urban, building blocks, and industrial and rural villages' built-up areas of different densities (high medium, low). For exposure vulnerability, 4 different layers such as population density, residential built-up areas, high-rise building block density, and industrial areas have been developed individually at district level. For assessing fire risk, both absolute built-up areas in sq km as well as built-up areas percent (ratio of built-up areas to the total area) are considered as important parameters. It is obvious that industrial areas in districts have much lower percentages than residential built-up areas. However, presence of industrial areas in a district has a significant influence in assessing fire risk. Hence, industrial areas in absolute terms (sq km) have been considered in risk ranking.

In order to assess the impact of each exposure vulnerability type, a vulnerability score/ ranking has been assigned to each layer at their base unit. The vulnerability score represents the level of vulnerability (very high to negligible) of a specific type of exposure in response to the occurrences of small and medium fire incidents. The natural break in value distribution has been considered for defining the ranking class.

After developing ranking of individual units of hazard and exposure vulnerability, GIS layers have been overlaid on top of each other and a spatial analysis has been performed for integration in GIS environment. For combining hazard and risk, Weighted Factor Analysis (WFA) in GIS environment has been performed. Weighted ranking scores have been used in the integration analysis and quantified risk distribution for each district. Values of weighted factor depend upon the importance of a particular hazard/ vulnerability class in risk analysis. For integration of hazards, equal weights have been assigned to wind, seismic and climatic hazards, while double weights have been given to hill zoning. This is because, in hilly terrain, wooden houses and heating provisions in buildings increase the chances of fire-incidences, and thus have been given higher weightage.

After obtaining integrated individual weighted score for hazard and exposure vulnerability, fire risk categories have been obtained in quantitative terms by further integration of hazard

and exposure vulnerability. It is obvious that in the occurrence of the number of fire incidents in a given district, exposure vulnerability has more importance than the prevailing hazard. Hence, in quantified integration, double weights have been assigned to exposure vulnerability. The quantified numeric values of district risk scores are again grouped into four descriptive categories of district level risk ranking (very high, high, medium, and low).

As per project scope of work, countrywide district level fire hazard and risk analysis has been carried out. However, it is obvious that the fire risk is not uniformly distributed throughout the districts in both urban and rural areas. Considering the above fact, RMSI has performed GIS based risk analysis, based on distribution of population agglomeration by defining built-up areas into different risk categories, such as high-density urban, low-density urban, sub-urban, and village. Moreover, distinct demarcated industrial areas have also been considered in the analysis.

Review of International and National Norms

To estimate the gaps from the existing position in terms of number of Fire Stations and their appropriate location, the RMSI team followed scientific and innovative GIS based response time network analysis approach involving various norms and regulations. Various international and national norms on response time have been reviewed. Response time is defined as "*en route time (in minutes) taken by the fire fighting vehicle from the Fire Station to the fire emergency scene.*" Different counties follow different norms on response time such as:

Germany: response time in urban areas varies from 8 to 15 minutes

Japan: response time varies from 5 to 10 minutes, depending upon the location of the building

USA: response time varies from (3-4) to 8 minutes

United Kingdom: response time varies from 5 to 8 minutes

India: SFAC norms recommended response time for first fire tender is 3, 5, and 7 minutes respectively depending on risk category A, B, and C in urban area and 20 minutes in rural area. The norms also defined one Fire Station in an area of 10 sq km in urban area; and 50 sq km in rural area.

To investigate the practicability of SFAC norms, RMSI team carried out a number of simulations using GIS based network analysis. With these simulations, RMSI demonstrated that two SFAC norms (response time and area-based) are not in synchronization with each other, and recommended revised response time based norms for positioning a Fire Station, as response area will vary from place to place depending upon the road network.

- ***Depending upon the risk category, the recommended response time for first fire tender is 5 to 7 minutes in urban areas and 20 minutes in rural areas***

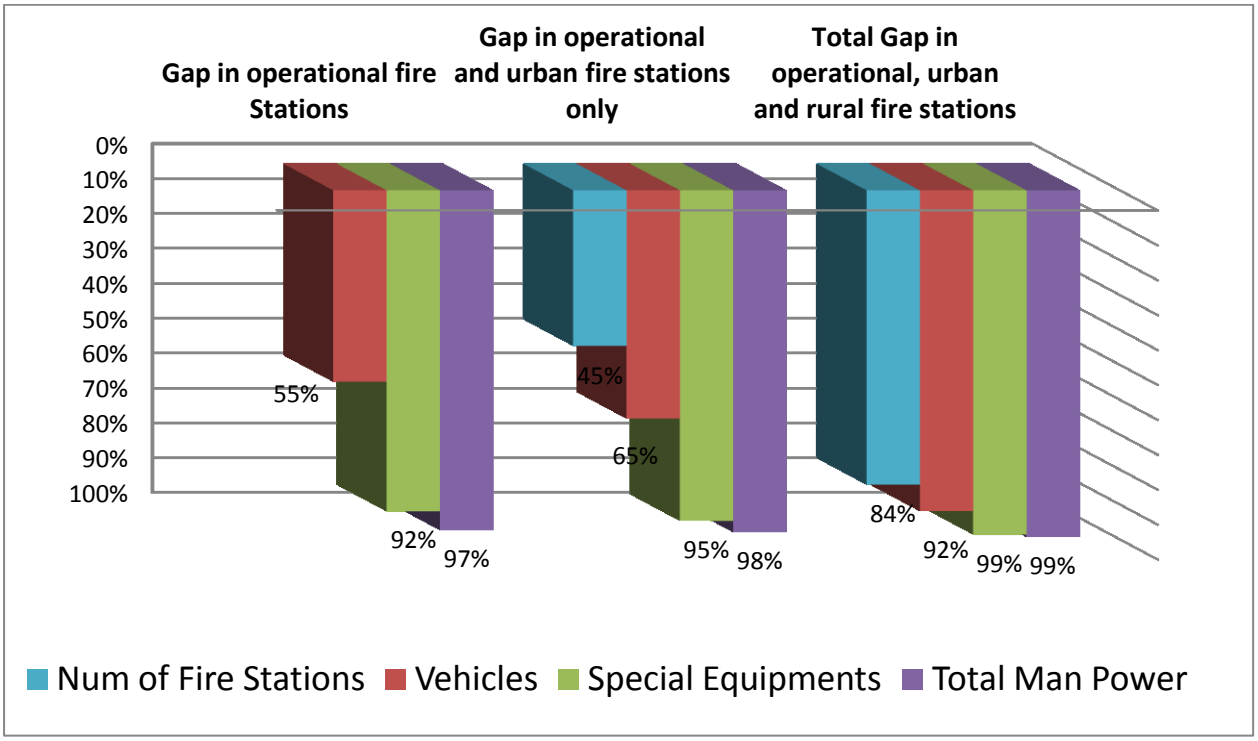
Summary of Findings for Bihar State

Presently, Bihar State Fire Services has 102 operational Fire Stations, both in urban and rural areas and one upcoming Fire Training Centre.

Based on detailed demarcated built-up areas and GIS based network analysis (response time analysis), ideal jurisdiction boundaries have been demarcated for all operational Fire Stations excluding areas served by other agencies, such as port, airports, military cantonments, thermal power plants etc. The remaining areas, not covered under ideal jurisdiction of operational Fire Stations, are also divided for ideal jurisdictions of new proposed Fire Stations. The requirements for fire fighting and rescue vehicles and specialized equipments are based on ideal served population, population density, and built-up areas within ideal jurisdiction boundary.

Fire Station Gap Analysis

As per detailed GIS based analysis, the State would require additional 82 Fire stations in urban areas and 466 stations in rural areas. Hence this study finds a overall gap of 84% in terms of number of Fire Stations in Bihar State (for details, please refer to section 26.3.1).



Firefighting and Rescue Vehicles and Specialized Equipment Gap Analysis

For estimating the gap in fire fighting and rescue vehicles and specialized equipment in operational as well proposed Fire Stations both in urban and rural areas, the RMSI team modified the SFAC norms with expert opinions. These modifications also helped in optimization of resources and are detailed in section 26.3.2. This finds an overall gap of 92% in the firefighting and rescue vehicle and about 99% in specialized equipment for both operational and new Fire Stations in urban and rural areas.

Fire Personnel Gap Analysis

For estimating the gap in fire personnel in operational as well as proposed Fire Stations both in urban and rural areas, the RMSI team used Administrative Reform Department (ARD, Delhi) norms based on duty pattern (double-shift) prevalent in Delhi as ARD has already optimized the fire manpower requirement in comparison to what has been suggested in

SFAC norms. The current duty pattern in Bihar State is 24 hours, in general, and RMSI team estimated for manpower requirement for double shift duty pattern (for details, please refer to section 26.3.3). Thus, in Bihar State, this study finds an overall gap of about 99% in fire personnel considering double shift duty pattern.

Fire Prevention Wing

In addition to fire fighting staff, there is an urgent need for fire prevention wing for inspection, awareness generation, and training for schools, hospitals, high-rise buildings, govt. offices, public buildings etc. need further strengthening, so that recurrence of the fire incidences similar to that at the Advance Medical Research Institute (AMRI), Kolkata, in terms of their magnitude and frequency can be reduced. Accordingly, to support DG-cum-Commandant General and IG-cum-Add. Commandant General, Home Guard & Fire Services, Bihar, additional officers at the levels of Director (Technical), Joint-Director (Technical), Chief Fire Officers (CFO), Dy Chief Fire Officers (Dy-CFO), Division Officers (DO), and Assistant Divisional Officer (ADO) have been recommended (for details, please refer to section 26.2.2).

Fire Station, District and State Level Report Generation

The detailed report of Operational Fire Stations, district and State levels for fire infrastructure and gap analysis is also available through the Fire Decision Support System (FDSS), which can generate reports for each Operational Fire Station, district, and State level at the click of a button.

Roadmap for Investment and Financial Plan for Next 10 Years

The other tasks include the development of Investment and Financial Plan, Institutional Assessment & Capacity Building Plan along with a dynamic web-based Fire Decision Support System (FDSS). As detailed in section 26.5, the detailed investment and financial plan at district level includes estimation of capital cost for infrastructure cost, fire fighting and rescue vehicles, and specialized fire and communication equipment. The recurring expenditure cost includes fire personnel cost depending upon pay-scales at various levels; staff uniform cost, and personal protective equipment (PPE); annual vehicle and specialized equipment maintenance cost, petrol, diesel, and lubricant (PDL); building maintenance; office and training expenses etc. The detailed roadmap and investment plan (section 26.5) for the next 10-years includes both capital and recurring expenditures. RMSI analysis estimates a total investment of about **Rs 27,510 Crores** spread over a period of 10 years for Bihar State including inflationary factors and after filling the gaps for both operational and proposed urban and rural Fire Stations.

Prioritization of New Fire Stations

The prioritization of new Fire Stations in Bihar for both rural and urban areas has been detailed in section 26.6. Accordingly, separate priority ranking for both urban and rural areas are given in Tables 26.38 and 26.39, respectively.

Avenues for Fund Generation

DFS can generate new avenues for funds from the following:

- Introduction of Fire Tax (1% of existing property tax)
- Training programs at different levels and durations to private sector employees on chargeable basis
- Capitation fee can be charged for scrutiny of building plans
- Sale of condemned fire appliances, equipments, uniform articles and general store items.

Capacity Building and Training Facilities

The study finds that there is a substantial gap for Capacity Building and Training among the fire personnel within the Bihar State. The detailed Capacity building and training need assessment for various levels have been discussed in section 26.8. Additionally, RMSI team is making a separate report on Capacity Building and Training Infrastructure for all States/UTs in the country.

Limitations of the Study

Limitations of study have been given in section 26.9.

Recommendations

The report concludes with the recommendations for the Bihar State Fire Services and is detailed in section 26.10. The present study made some recommendations to overcome some of the crucial issues such as lacks firefighting manpower, strict implementation of State Fire Act & Fire Policy, and building bye-laws as per national building code (NBC- Part IV). In short, Bihar State Fire services can be revamped in next 10 years to desired level provided sufficient funds and trained resources are made available.

Report Structure

This report for the Phase III States/UTs is divided in two parts:

Part A: This part comprises of chapters 1-6, which are common for all the 35 State's/UT's Fire Services for which this study is conducted.

- Chapter 1 provides brief details of project background, role of fire services, objective and scope of study
- Chapter 2 outlines the methodology adopted and data development
- Chapter 3 provides details on GIS based fire hazard and risk analysis
- Chapter 4 provides a brief overview of field-survey of individual Fire Station and headquarter data collection and approach for stakeholder analysis
- Chapter 5 briefly explains the Development of Fire Decision Support System (FDSS)
- Chapter 6 examines international and national norms

Part B: This part comprises of Chapters 25-29, which are specific to the State/UT being discussed.

- Chapter 25 provides detailed analysis for the Andhra Pradesh State
- Chapter 26 provides detailed analysis for the Bihar State
- Chapter 27 provides detailed analysis for the Kerala State
- Chapter 28 provides detailed analysis for the Lakshadweep UT
- Chapter 29 provides detailed analysis for the Tamil Nadu State

For Part-B, this report consists of Chapter 26, which is for the Bihar State.

PART - A

1 Introduction

1.1 Background

Fire service is one of the most important emergency response services. In India, Fire services come under the 12th Schedule of the constitution dealing with Municipal functions. At present, fire prevention and fire fighting services are organized by the concerned States and Union Territories (UTs), and Urban Local Bodies (ULBs). Ministry of Home Affairs (MHA) renders technical advice to the States, UTs, and central ministries on fire protection, prevention, and legislation. Fire services in Maharashtra, Haryana, Gujarat, Chhattisgarh, Madhya Pradesh excluding Indore, and Punjab are under the respective Municipal Corporations. In remaining States, it is under the Home Department (Figure 1-1).

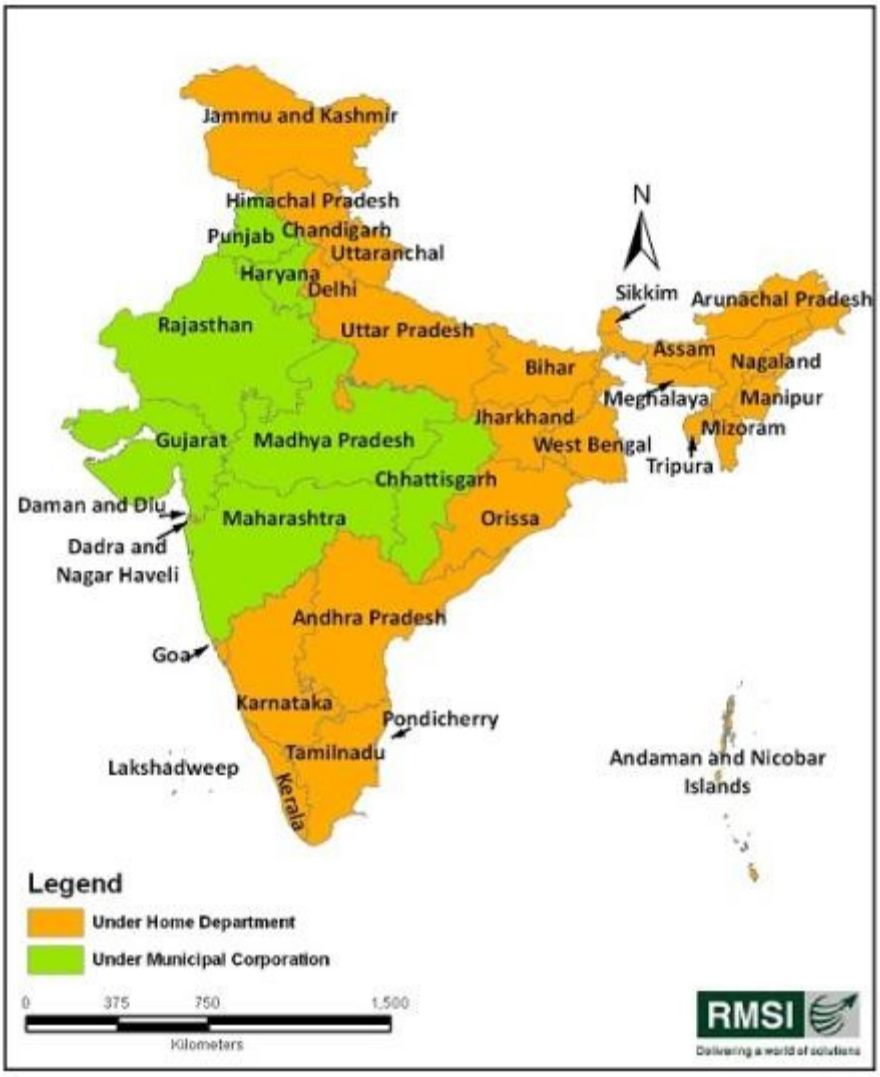


Figure 1-1: Distribution of fire services by various States/UTs by administrative organization

1.2 Role of Fire Services

As far as the role of fire services is concerned, the primary job of fire services has been to attend to fire incidents. However, they also attend to other emergencies like rescue from building collapse, road traffic accidents, human and animal rescue etc., and other special service calls. Some fire services also attend medical emergencies for transportation of

casualties through ambulances maintained by them. Similarly, some States have separate flood department with rescue boats and trained divers, like Delhi. The Fire Services maintain skeleton facility to act as 'first responder' and wait until assistance from flood department is reached. It is therefore, considered appropriate that the specialized facilities for such job is maintained and operated by the concerned department.

As indicated in the National Disaster Management Authority (NDMA) guidelines, Fire Services is one of the Emergency Support Functions (ESF). Based on DM Act 2005, various States have also formulated State Disaster Management Authorities (SDMA's) and District Disaster Management Authorities (DDMA's) both of which consider Fire Service as an ESF. It is therefore evident that the role of Fire Service is multi-dimensional that includes attending various emergencies. Accordingly, fire services are required to be prepared with suitable types of equipment to deal with various emergencies arising in the jurisdiction of the respective Fire Station.

The role of fire services also includes effective fire prevention, creating awareness on fire safety, and enforcing the inbuilt fire protection arrangements for various types of occupancies in line with National Building Code (NBC) part – IV. However, some of the States/Municipal Fire Services are unable to enforce the fire safety provisions due to a lack of appropriate directives from the authorities controlling the function of fire services. Some of the Fire Services do not adhere to NBC and have created their own fire-safety building bye-laws, e.g., Mumbai Fire Brigade. It may be noted that in-built fire safety arrangements and escape facilities are much more important than having a fire service within the premises without the above facilities. It is, therefore, necessary to enforce the fire-safety provisions through appropriate directives to all the States/UTs by the Ministry of Home Affairs (MHA) directly or through DG, NDRF & CD office.

In addition to the regular fire services, various other organizations/ industries, such as Ports, Airports, Defence, Power, Oil and Gas, Steel, Heavy Engineering, Fertilizers, Chemicals etc. have their own fire service set-ups (including their own captive resources), in order to provide fire protection to their facilities and some of them at times provide support to local fire services on request. All of them have their rules and regulations concerning fire safety. For example, Oil India Safety Directorate (OISD) norms for Oil and Gas Industries, International Civil Aviation Organization (ICAO) norms for Airports, Tariff Advisory Committee (TAC) regulations- now discontinued, for industries etc. and Electricity Rules for power sector.

Safety of highly hazardous processing and storage industries requires 100 percent round the clock built-in and functional fire protection arrangements with trained fire fighter as well as onsite and off-site disaster management plans. Fire services are not expected to create the infrastructure to independently tackle such emergencies within the industry, as it may be not be possible to do so. However, they are expected to support any on-site and off-site fire fighting to protect surrounding populations and handle such incidents during transportation through the civil areas. Moreover, local fire services should have mutual-aid schemes with all the industries in their jurisdiction and must be aware of the various arrangements available with them in order to provide efficient support, in case of an emergency.

The growth of fire-services in the country has been on an ad-hoc basis, without much scientific analysis of existing risks in different parts of the country. Varying risk scenarios need different types of equipments depending upon the risk and geographical location such as hilly-area, coastal-area, desert–area, and residential (high-rise, medium, and low rise-buildings), industrial, commercial area or a combination of these. Moreover, lack of knowledge management for future planning and institutional capacity and funds are also seen as major challenges in addressing improvements in fire and emergency services in the country. As per a recent analysis by the Standing Fire and Advisory Council (SFAC), the overall deficiency in the country in number of Fire Stations is 97.54%, in fire fighting &

rescue vehicles 80.04% and in fire personnel is 96.28%, respectively, which is quite alarming (NDMA Guideline, 2012, CR SFAC, 2011).

In consideration of this and the increasing risks from various hazards, such as Fire Following an Earthquake (FFEQ), and the rapid pace of urbanization and industrialization in the country, the Directorate of National Disaster Response Force and Civil Defence (NDRF&CD, Fire Cell), MHA felt the need for a comprehensive study to identify existing gaps in terms of availability and requirement of Fire Stations, capacity-building, in terms of trained man-power and fire-fighting, rescue, and other specialized equipments. This comprehensive study **aims at preparing a perspective plan for the next 10 years for revamping the fire services in the country**.

1.3 Objective of the study

The broader objective of this study is to prepare a Capital Investment and Institutional Strengthening plan for accelerated development of fire services in the country.

1.4 Scope of the study

The study area for this assignment is the entire country under the Directorate of NDRF & Civil Defence (Fire). The scope of the assignment will include, inter alia, the following activities:

1. **Fire Hazard & Risk Analysis:** Carry out a GIS (Open Source) based fire hazard and risk analysis and identify the gaps in fire services in terms of fire fighting vehicles, specialized equipment, and trained fire personnel.
2. **Investment and Financing Plan:** Assess the status, availability and distribution of the fire service infrastructure under the Directorate of NDRF & Civil Defence (Fire Cell) by conducting field investigations and interviews. It is expected to conduct an investigation to assess the gaps and needs for future planning and up-gradation/ modernization of the fire service infrastructure in the country in a quantified approach. As part of the Investment and Financing Plan, it is also expected to estimate the Capital and O&M Investment plan for the next 10 years and the investment priorities.
3. **Institutional Assessment and Capacity Building Plan:** Based on field-data collection, enquiry, spatial analysis and understanding on the availability and gaps in the fire service infrastructure, and prepare an institutional assessment and capacity-building plan for the department. Institutional Assessment and Capacity Building Plan will include but will not be limited to understanding the policies, regulations, strategies and programs of the department; existing legal and institutional mechanisms, issues and constraints of effective management; and training needs and capacity of the department's resources. Based on a comprehensive understanding of the mentioned variables, it is expected to prepare a consolidated national report and key recommendations for the Directorate of NDRF & CD (Fire Cell). It is also expected to explore the possibility of funding sources and provide recommendations for improvements to ensure appropriate financing mechanisms for capital expenditure, and for operation and maintenance.

2 Technical Details on Methodology and Data Development

2.1 Understanding of the Scope of Work

The primary objective of this comprehensive study on "Fire Hazard and Risk Analysis in the Country" is to prepare a capital investment and institutional strengthening plan for accelerated Development of Fire Services in the country. To achieve this objective of the study, the Directorate of NDRF & CD has defined the broad scope of the work as:

1. Risk and Hazard Analysis
    - Identifications of gaps in the existing fire services
2. Investment and Financial Plan
3. Institutional Assessment and Capacity Building Plan
    - Including survey of NFSC Nagpur and Regional Fire Training Centres

As part of the Risk and Hazard Analysis, it is expected to carry out a GIS based hazard, risk analysis at base unit (district) level, and identify the gaps in the existing fire services. Risk assessment of forest fire is not included under the present scope of work. The infrastructures of forest department, privately owned fire safety infrastructure, infrastructures in restricted areas like military cantonments and airbases, and ammunition depots; nuclear facilities such as nuclear power plants, nuclear research reactors, heavy water plants; and mines, ports, airports, and oil exploration and oil refineries are excluded from the study. While assessing the infrastructure for the Investment and Financing Plan, RMSI has focused specifically on the States/ UTs Fire Services . ***However, it may please be noted that RMSI team is also making efforts to get details of areas served by other agencies as well, so that requirement of establishing Fire Stations in these areas does not become part of the Gap analyses.***

As part of the 'Investment and Financing Plan', it is expected to assess the status, availability and distribution of the fire service infrastructure under the jurisdiction of Director General (NDRF & Civil Defence) through conducting field investigations and interviews. It is also expected to conduct an investigation to assess the gaps and needs for future planning, up gradation/ modernization of the fire service infrastructure in the country through a quantified approach. As part of the Investment and Financing Plan, it is also expected to estimate the Capital and O&M Investment plan for the next 10 years and the investment priorities. Based on the field data collection, enquiry, spatial analysis and understanding on the availability and gaps in the fire service infrastructure, it is expected to prepare an institutional assessment and capacity-building plan for the department. Institutional Assessment and Capacity Building Plan will include but not limited be to understanding the polices, regulations, strategies and programs of the department; existing legal and institutional mechanisms, issues and constrains of effective management; training needs and capacity of the department's resources. Based on a comprehensive understanding of the mentioned variables, it is expected to prepare a consolidated National Report and key recommendations for the Director General (NDRF & Civil Defence) for all the Fire Stations under jurisdiction of the Directorate of NDRF & CD. Moreover, the possibility of funding sources will also be explored, and recommendations will be made for improvements to ensure good financing mechanisms for capital expenditure and operation and maintenance.

2.2 Study Area

The study area for this assignment is the entire fire service area of the country under the Directorate of NDRF & Civil Defence (Fire Cell). RMSI has carried out physical survey of all the Fire Stations under the Directorate of NDRF & CD (Fire Cell) (Figure 2-1) across the country.

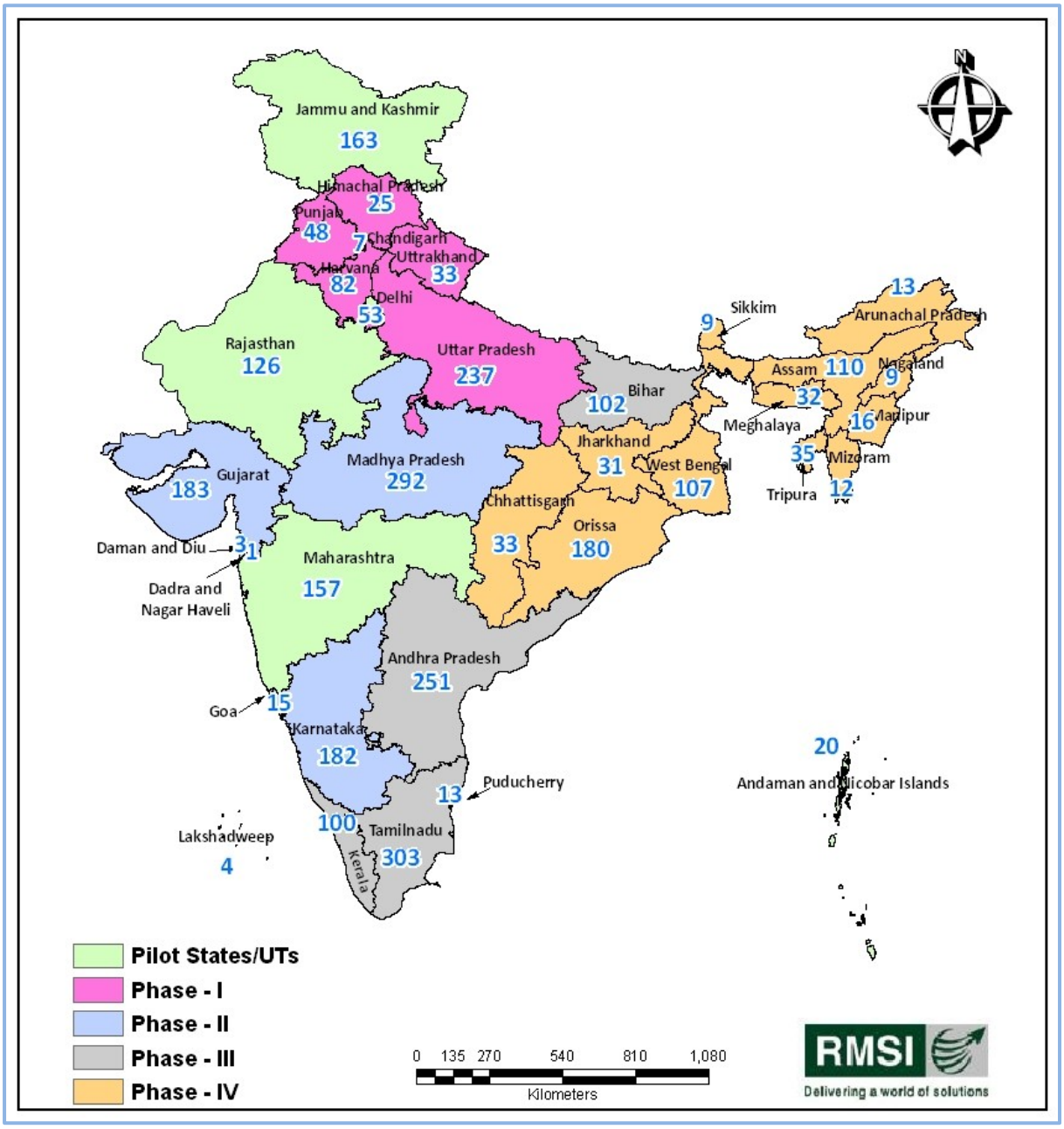


Figure 2-1 : State/UT wise distribution of fire service stations in India

2.3 Phased Approach

As India is a vast country and in order to conduct this study for all the States and Union Territories (UTs), it was decided to conduct this study in a phased manner (Table 2-1).

The initial phase pilot study comprises of six States and UTs - **Jammu & Kashmir, Rajasthan, Puducherry, Maharashtra, Andaman & Nicobar Island, and Delhi** and in

subsequent phases (Phases I to Phase IV), the other States/UTs have taken up as detailed in section 2.2.The Fire- Infrastructure of all States/ UTs has been Field–Surveyed by RMSI team and fire hazard and risk analyses have been carried out. The other tasks include development of Investment and financing plan, Institutional Assessment & Capacity Building Plan along with a prototype Fire Decision Support System (FDSS). The outcomes of pilot study were submitted to the Expert Group of the project for their review and approval and detailed discussions were held with senior Fire Officials, MHA and respective State/UT representatives. The approved report are being used as a template for conducting the study for the remaining States/ UTs in the phased manner indicated in Table 2-1.

It may be noted that there could be region specific modifications and variations in the requirements of different kinds and types of fire fighting equipments depending upon the risk category of the district (base unit) of Fire Station, its geographical location such as coastal-area, hilly-area and desert–area. Phase wise list of States/UTs also includes corresponding number of districts (Census, 2011), number of Talukas/ Mandals (Census, 2001), and number of Fire Stations (Table 2-1).

Table 2-1: Phase wise distribution of various States/UTs in the Country

States	No of Districts (Census 2011)	No of Talukas/ Tehsils/ Mandals (Census 2001)	No of Fire Stations
Pilot Phase			
NCT of Delhi	9	27	53
Maharashtra	35	355	157
Puducherry	4	15	13
Andaman & Nicobar Islands	3	7	20
Rajasthan	33	241	126
Jammu & Kashmir	22	59	163
Phase I			
Chandigarh	1	1	7
Haryana	21	67	82
Punjab	20	72	48
Himachal Pradesh	12	109	25
Uttarakhand	13	49	33
Uttar Pradesh	71	300	237
Phase II			
Madhya Pradesh	50	259	292
Gujarat	26	227	183
Daman & Diu	2	2	3
Dadra & Nagar Haveli	1	1	1
Karnataka	30	175	182
Goa	2	11	15
Phase III			
Kerala	14	63	100
Lakshadweep	1	4	4
Tamil Nadu	32	202	303
Andhra Pradesh	23	1110	251
Bihar	38	533	102
Phase IV			
West Bengal	19	343	107
Assam	27	145	110
Manipur	9	38	16
Meghalaya	7	32	32
Mizoram	8	25	12
Sikkim	4	9	9
Tripura	4	38	35
Nagaland	11	93	9
Arunachal Pradesh	16	149	13

States	No of Districts (Census 2011)	No of Talukas/ Tehsils/ Mandals (Census 2001)	No of Fire Stations
Orissa	30	398	180
Chhattisgarh	18	97	33
Jharkhand	24	210	31
Total	**640**	**5,466**	**2,987**

3 GIS based Fire Hazard and Risk Analysis

Based on RMSI's vast experience of executing large projects at State and country levels, RMSI team has adopted the following approach (detailed below) to carry out this assignment. This approach has also been presented and discussed in a series of meetings with the officials of the Directorate of NDRF & CD, MHA, Government of India.

The risk of fire in urban areas has increased over the years and the rising cost of fire losses would seem to indicate that they are increasing at a greater rate than the measures devised to control them. Cities are growing in size and complexity day by day; therefore, they need to be managed more efficiently.

Geographic Information System (GIS) is an important and efficient tool that can be used by local administrations to minimize natural disasters (Recep Nisanci, 2010). Although there are many formal definitions of GIS, for practical purposes GIS can be defined as a computer-based system to aid in the collection, maintenance, storage, analysis, output and distribution of spatial data information (Bolstad, 2005). Thus, GIS technologies have been used in fire analysis related to the optimum location of Fire Stations. For example, Habibi et al. (2008), has made spatial analysis of urban Fire Stations in Tehran, using an analytical hierarchy process and GIS. Yang et al. (2004) also carried out studies concerning the selection of Fire Station locations using GIS.

Unlike a flat paper map, a GIS-generated map can represent many layers of different information. This representation provides a unique way of thinking about geographic space. By linking map databases, GIS enables users to visualize, manipulate, analyze and display spatial data. GIS technology based approach is cost-effective and provides accurate solutions in an expanding range of applications. RMSI team is adopting following approach for fire risk analysis of Indian States.

3.1 GIS Data Compilations

GIS Map based fire hazard and risk analysis is one of the main tasks of this assignment. In order to undertake hazard and risk analysis, various GIS layers and other associated thematic maps have been created for each of the pilot States/UTs that form the basis for risk ranking of base units (districts). The following is a list of selected GIS layers as base administrative layers and other dependant layers that have been used in GIS based fire risk analyses.

1. State administrative boundary layers
2. District administrative boundary layers
3. Rail network
4. Major (highways) and main road networks
5. Minor roads/ street road networks
6. Locations of cities, and major towns with their names
7. State level Land use land cover maps
8. Demarcation of residential, commercial and industrial built-up areas
9. Census population data (2011)
10. Geographical locations (latitude, longitude) of operational Fire Stations
11. Other collateral data such as information from city development plans (if available), and demarcation of fire-station jurisdictional areas.

These data layers and their attribute data have been expanded according to needs analyses. The needs analyses include query information for the data needed for generating risk maps and effective fire fighting planning.

After taking into account all requirements and data types, RMSI team has generated various GIS data layers for further GIS spatial analyses. District boundaries were considered as the base unit for analysis in assessing fire services infrastructure gaps, risk quantifications, and risk classifications.

GIS maps for administrative boundary layers such as State, and district are based on published Census 2011 data. **Currently, Census 2011 has published only district level demographic data.** In comparison to previous census (Census 2001), several new districts have been created. These new districts have been considered in the analysis.

Classified land use and land cover data is the backbone in fire hazard and risk analysis. Latest vintage satellite images have been used to capture the various features such as road networks, forest areas and habitat/settlement areas (Figure 3-1). The various land use land cover classes were extracted from latest vintage satellite images at 25m resolution for the selected States and UTs, and at higher resolution for major cities. The extraction is based on a semi-automated classification approach to distinguish the classes based on their reflectance values in the source satellite imagery. Data quality and data validation checks have been carried out for each stage of data generation.

For LULC classification, remote sensing satellite images were geo-referenced and classified to generate different LULC layers such as vegetation, built-up area, water bodies, and streets, based on their spectral reflectance i.e. DN (Digital Number) values. In this process, through a semi-automated process, these DN values of satellite images are classified into respective LULC classes to generate the clutter data. These clutter data layers are further subdivided into their respective sub-classes and merged together to give preliminary clutter data. The output clutter goes through standard validation processes and quality checks to produce high quality final clutters. Table 3-1 shows a list of classified LULC data at 25-meter resolution. Figure 3-1 displays delineated LULC classes for different parts of western Maharashtra (districts– Mumbai, Mumbai sub-urban, Thane, Pune and Raigarh). Figure 3-2 shows an enlarged view of classified urban agglomerate of Pune city areas.

Table 3-1: Cluster class morphology in land use maps

ID	Class Name	Description
0	**Unclassified**	Edge of the database
1	**Urban High Density**	Areas within urban perimeters, Inner city, very little/negligible vegetation. Closely packed buildings indicative of high density with only major streets and roads being visible. Absence of large open spaces.
2	**Urban Medium Density**	Medium density of buildings, vegetations are less but higher than the dense urban, major pedestrian zones being partially visible and streets and roads visible. Comparatively more open spaces exist within this region
3	**Urban Low Density**	Low density of buildings, vegetations / open area are higher than the medium urban, major pedestrian zones being partially visible and streets and roads visible. Comparatively more open spaces than medium density exist within this region
4	**Suburban High Density**	Suburban areas surrounding big cities (Outer parts of the city) with loosely packed built up and little vegetation.
5	**Suburban Low Density**	Sparse Suburban areas in outskirt of big cities (Outer parts of the city) with loosely packed built up and little vegetation.
6	**Building Blocks**	Systematic groups of buildings, parallel or not, that may be separated by large open spaces.

ID	Class Name	Description
7	**Villages**	Unsystematic small pockets /clusters of buildings, within large agriculture / open spaces
8	**Industrial**	**Industrial:** Factories, Warehouse, Garages, Shipyards, Mostly situated outside the main cities.
9	**Commercial Areas**	**Commercial:** Central Mall, Office Complexes with large building footprints, Central Business districts, Commercial buildings within the city (like petrol pumps, gas filling stations etc.) etc. will be classified as commercial areas
10	**Forest**	All kinds of dense forest in rural areas, over hills/ mountains, Natural Parks with high tree density.
11	**Low Dense Vegetation**	Low density of trees, low vegetation, bushes, scrubs with low tree density.
12	**Agriculture/Fellow**	All kinds of agriculture/fellow cultivated areas, croplands, farmlands etc.
13	**Water**	Inland permanent water bodies. This class will consist of lakes & dams.
14	**Open**	No buildings, no vegetation e.g. desert, beach, and open lands mostly barren.
15	**Quasi Open**	Areas with some obstruction like scattered trees or bushes with some mixed built-up, open, agricultural fallow lands etc
16	**Airport**	Airstrip and terminal buildings
17	**River/Canal**	Linear water features like streams and rivers.
18	**Seasonal Water Body**	Seasonal water body
19	**Sea**	Sea

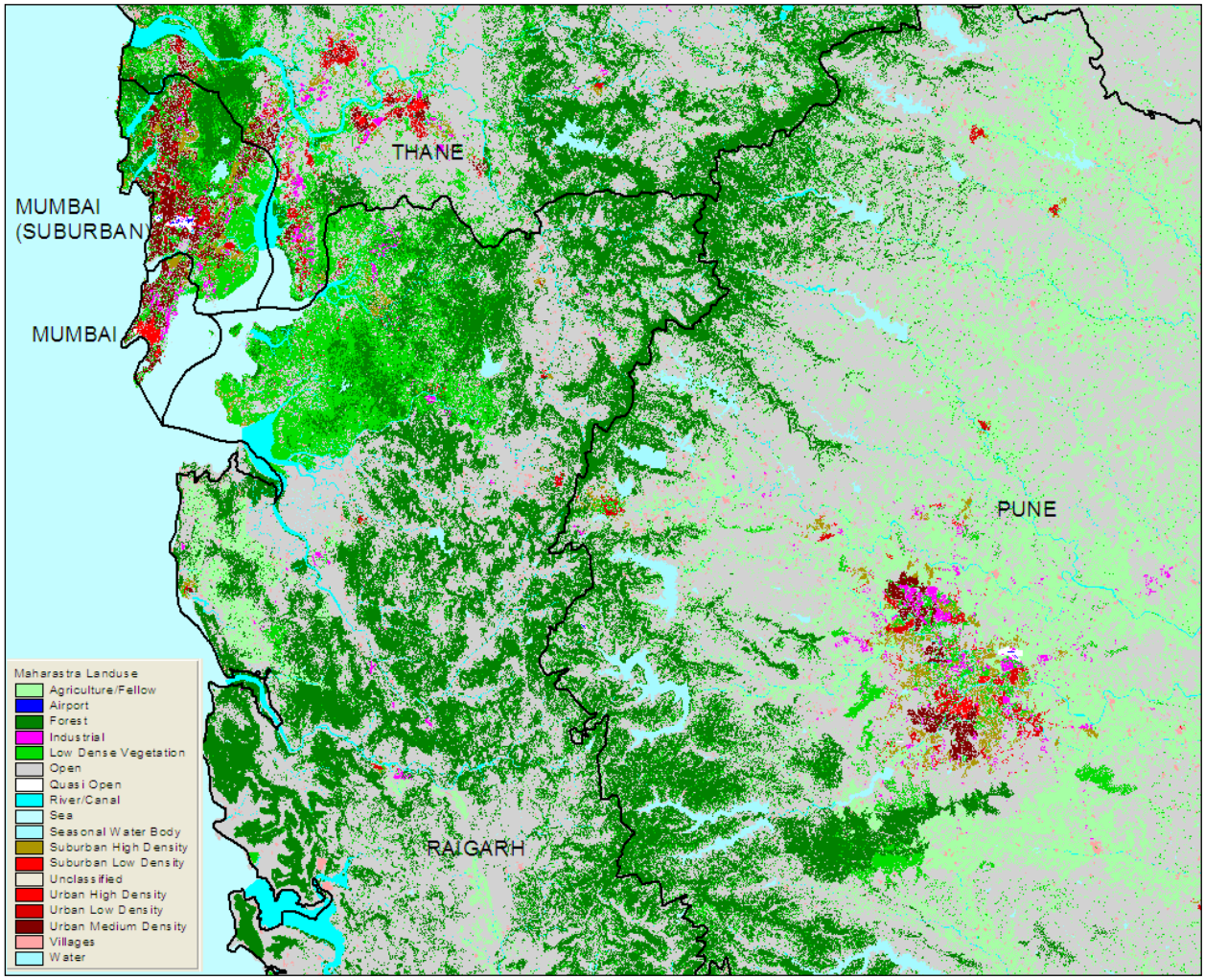


Figure 3-1 : An example of a Land use classification at 25m pixel. The example shows parts of Western Maharashtra (districts – Mumbai, Mumbai sub-urban, Thane, Pune, and Raigarh)

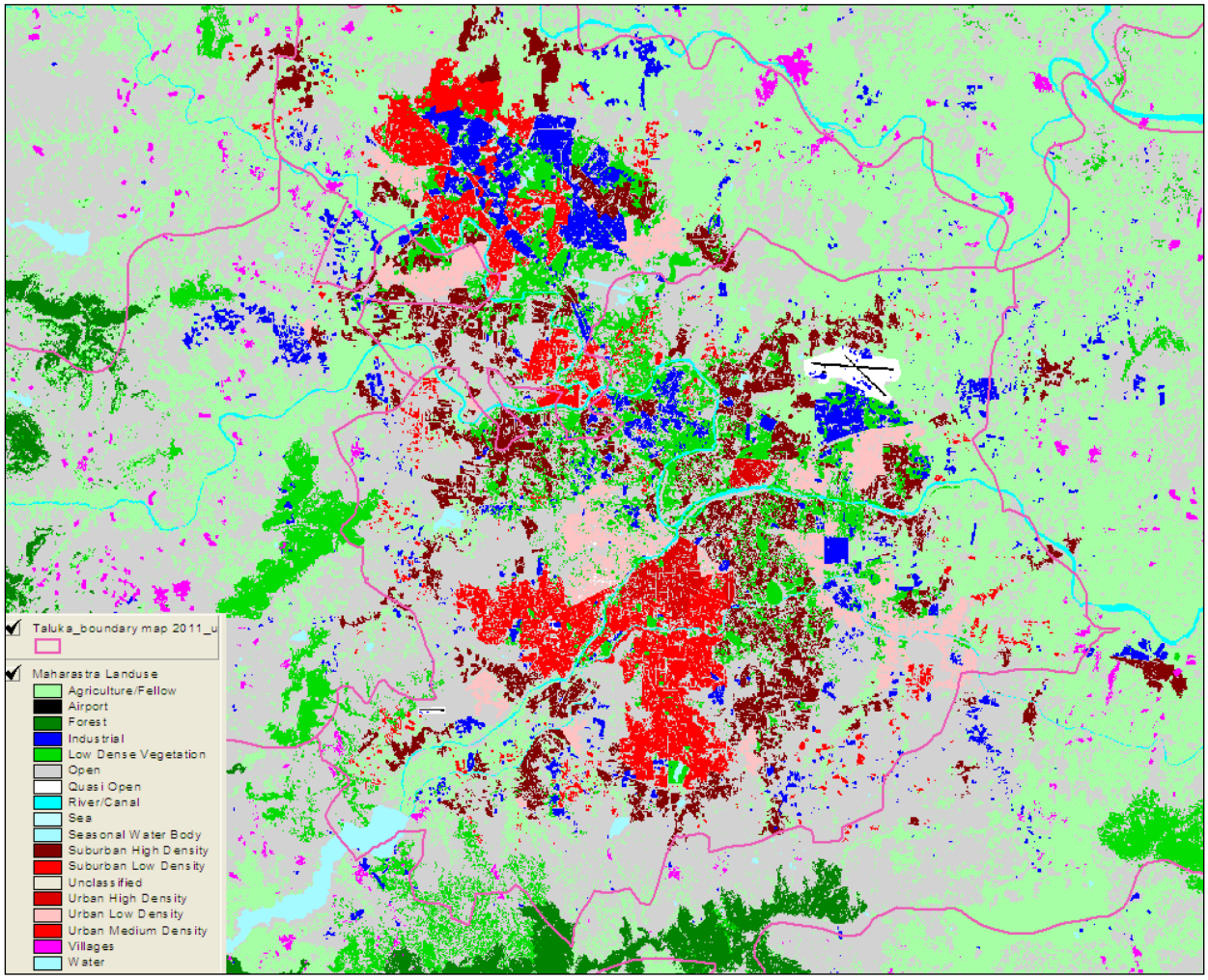


Figure 3-2 : Example of an enlarged view of classified. The example shows urban agglomeration classification in Pune city areas

For major city areas, classifications that are even more detailed have been created with a high-resolution data layer as shown in Figure 3-3. For major cities / towns, besides the other classified units, such as highways and main roads, minor roads/streets and localities, have been captured. After the field survey of individual Fire Stations, GPS locations of all Fire Stations have been displayed for gap analysis.

3.2 GIS - Overlay Analysis

The basic way to create or identify spatial relationships among various GIS layers is through the process of spatial overlay. Overlay is a GIS operation in which layers with a common, registered map base are joined on the basis of their occupation of space. (Keith C. Clarke, 1997). Spatial overlay is accomplished by joining and viewing together separate data sets that share all or part of the same area. The result of this combination is a new data set that identifies the spatial relationships.

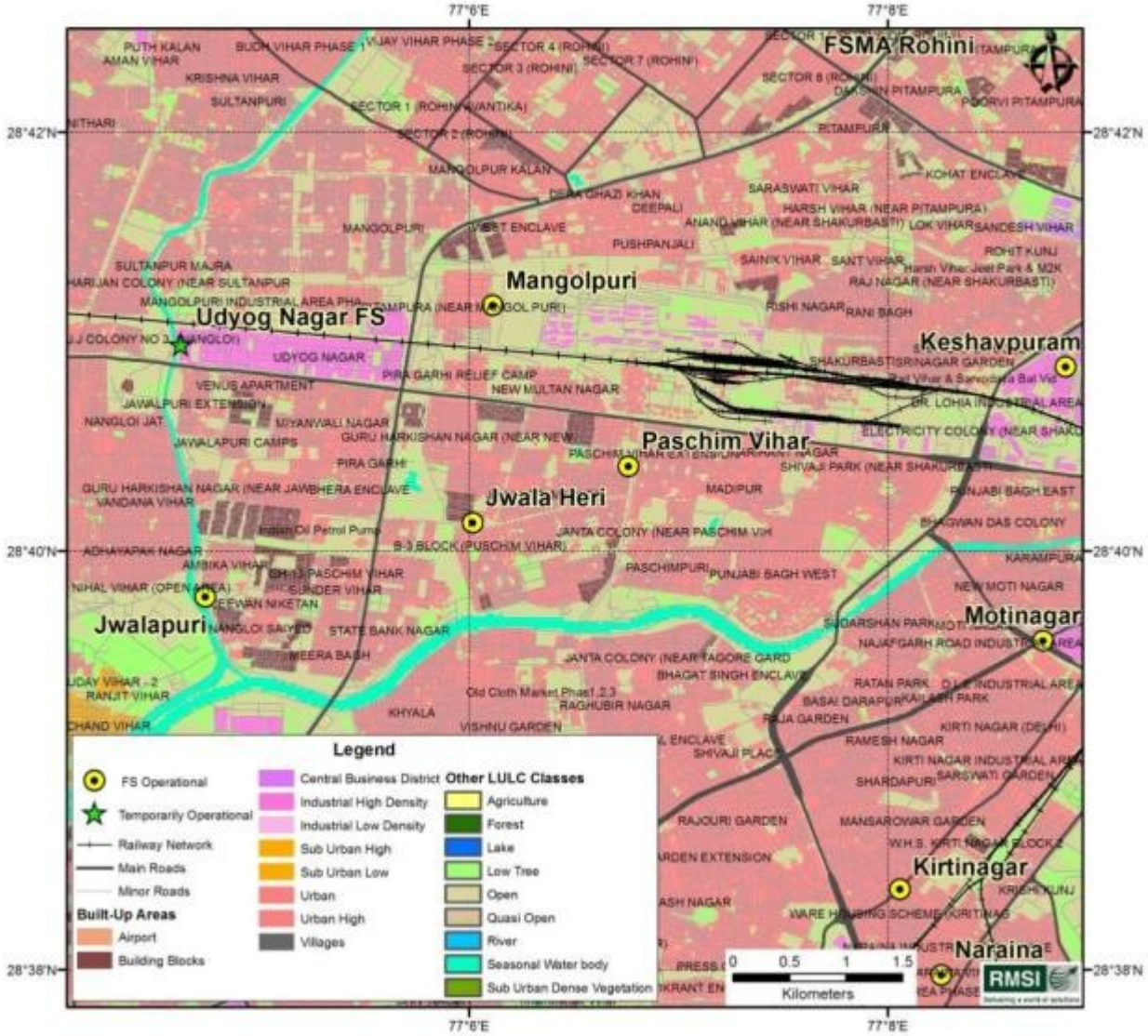


Figure 3-3 : An example of a detailed classified urban agglomerate area. The example shows parts of Delhi with overlay of GPS locations of Fire Stations

Overlay analysis is a common, widely used method of analyzing and evaluating geospatial data. Overlay analysis utilizes map layers in GIS to discover relationships across the layers. Overlay analysis is used to investigate geographic patterns and to determine locations that meet specific criteria. Spatial overlay is illustrated and highlighted in Figure 3-4. Various data layers, such as Land se Land Cover (LULC), composite hazard, demographic exposure, road network, administrative boundary and Fire Station locations have been used through overlay analysis by combining diverse data sets for hazard analysis and Fire Station gap analysis.

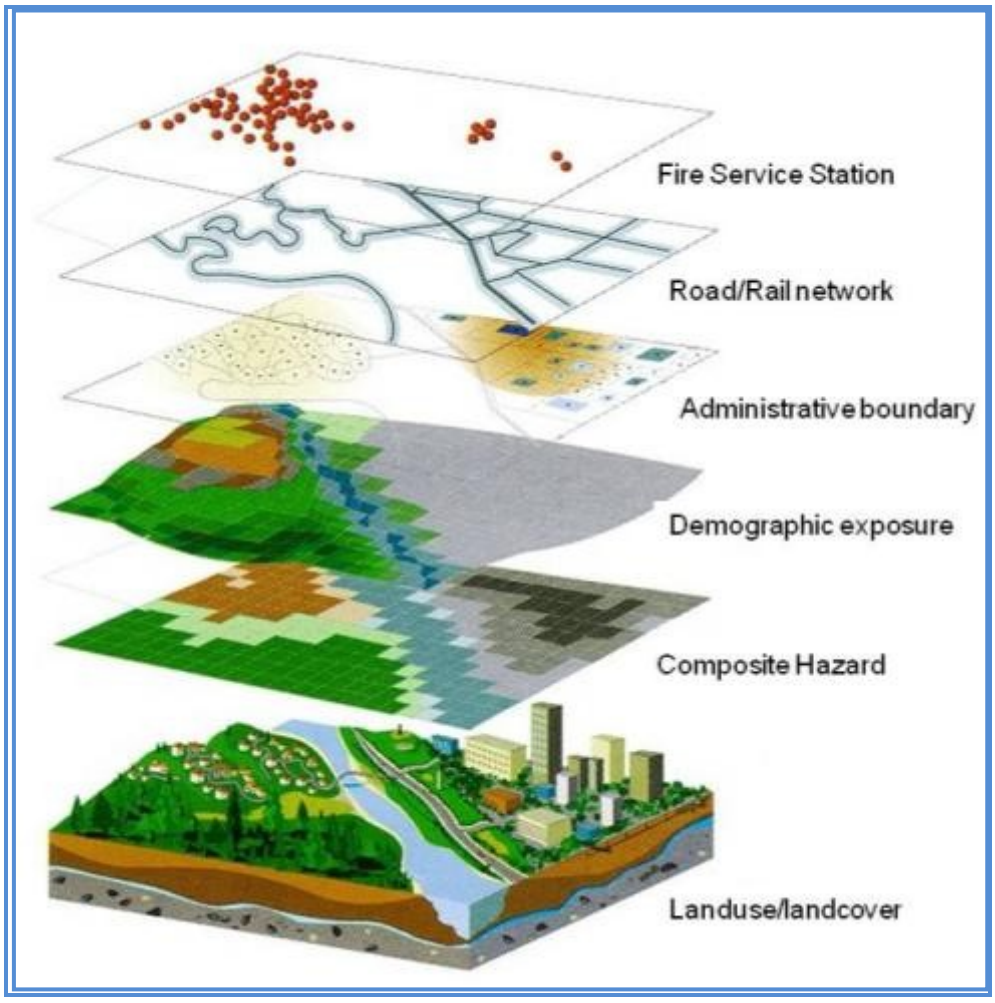


Figure 3-4 : Overlay analysis for Fire Risk Assessment

3.3 Fire Hazard and Risk Analysis

The first-turnout of fire vehicles normally originates from the Fire Station under whose jurisdiction the fire-call has been received. Sometimes, calls go to a centralized control room, from where they are directed to the concerned Fire Station. To provide an effective response, Fire Station infrastructure in the form of fire fighting and rescue vehicles, specialized equipment and manpower should also take into consideration of fire risks in addition to road conditions and population distribution. Thus, hazard and risk analysis of the base unit (district) should be on a scientific basis.

In general, fire risk is defined as the combination of hazard potential, exposure, and vulnerability:

Risk = F (**H**azard potential x **E**xposure x **V**ulnerability)

The occurrence of fire incidents that constitute a threat for the population and the exposed infrastructure of a certain region is associated with economic and human losses, always as a function of the exposure conditions and the vulnerability of the exposed assets in that particular region. In the present scope, fire risk can be defined as associated with the number of small and medium fire incidents and their locations.

3.4 Hazard Ranking

Earthquake (Seismic zones)

Besides loss of life, property damage, building collapses, and loss of basic amenities such as bridge and road damage, earthquakes can also induce small to large fires. Hence, earthquake zoning is an important parameter for fire risk analysis.

Based on occurrence of earthquakes of different intensities, the Seismic Zoning Map of India (IS 1893, 2001; BMTPC, 2006; NBC 2005) divides the country into 4 seismic zones as shown in Figure 3-5. Seismic Zone V is the highest risk zone where earthquakes having intensity of IX+ on Modified Mercalli Intensity (MMI) scale can take place. Earthquakes of intensities between VIII to IX can be experienced in seismic Zone IV, whereas earthquakes can occur between VI and VIII intensity in seismic Zone III.

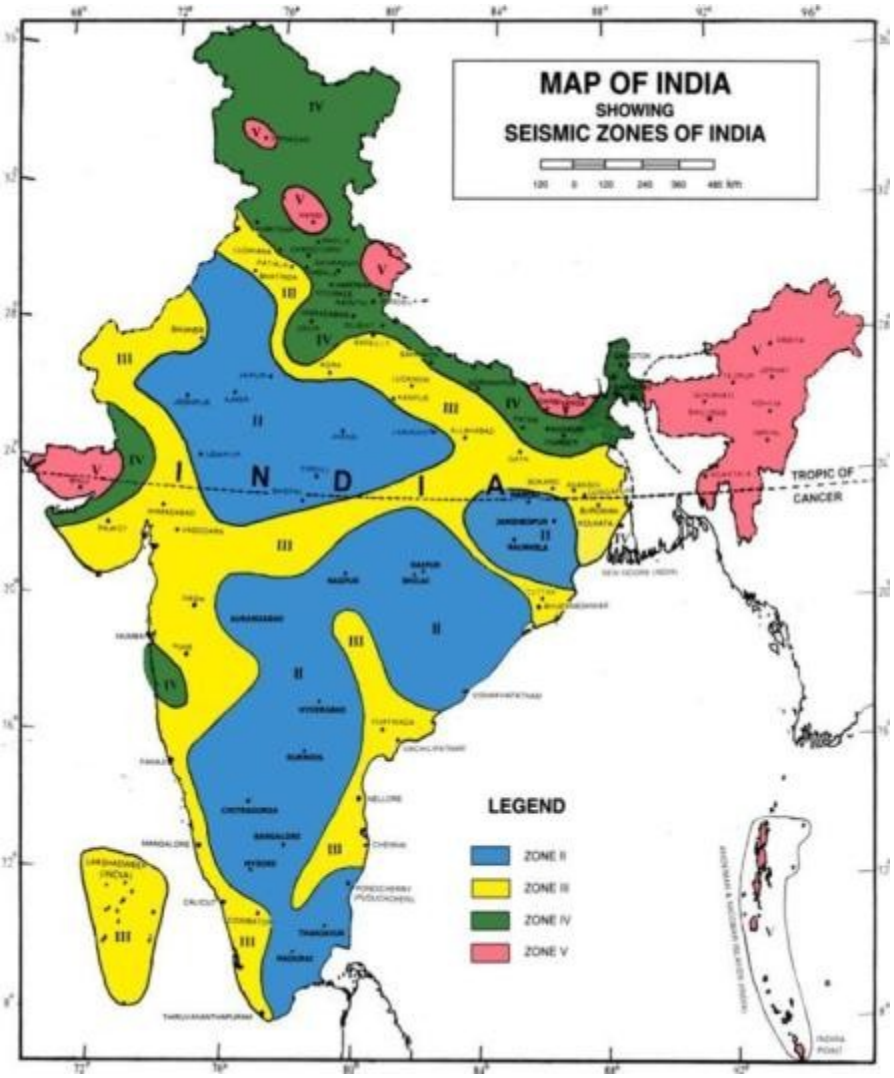


Figure 3-5 : Seismic zones of India

With GIS overlay analysis, district areas falling within each seismic zone have been computed. In order to compare seismic risk among various districts, district level ranking of seismic zones has been assigned, based on the scheme shown in Table 3-2. District level seismic ranking for pilot States/UTs is shown in Table 3-3.

Wind Zones

Prevailing wind speed is one of the important parameters in assessing fire risk in the area. Wind speed has a noticeable influence on fire spread. The wind zone map illustrates the areas vulnerable to high wind speeds (Figure 3-6). There are six basic wind speeds considered for zoning, namely:

- 55m/s (198 km/hr) Very High Damage Risk Zone-A
- 50m/s (180 km/hr) Very High Damage Risk Zone-B
- 47m/s (169.2 km/hr) High Damage Risk Zone
- 44m/s (158.4 km/hr) Moderate Damage Risk Zone-A
- 39m/s (140.4 km/hr) Moderate Damage Risk Zone-B
- 33m/s (118.8 km/hr) Low Damage Risk Zone

The coastal areas are subjected to severe windstorms and cyclonic storms. A full-grown cyclone is 150 to 1,000 km across and 10 to 15 km high. Macro-level wind speed zones of India have been formulated and published in IS 875 (Part-3) – 1987. It is known that in certain events, the wind gusts could appreciably exceed the given basic wind speeds. For assessing vulnerability and fire risk to buildings, above macro-level zonings have been considered. Based on wind speed, risk ranking has been assigned to each wind zone following the schema described in Table 3-2. District wise estimated wind risk from GIS overlay analysis is shown in Table 3-3.

Table 3-2: Risk ranking schema for earthquake, wind and climatic zones

Wind Zone	Ranking
Very High Damage Risk Zone - A (Vb=55m/s)	4
Very High Damage Risk Zone - B (Vb=50m/s)	3.5
High Damage Risk Zone (Vb=47m/s)	3
Moderate Damage Risk Zone - A (Vb=44m/s)	2
Moderate Damage Risk Zone - B (Vb=39m/s)	1.5
Low Damage Risk Zone (Vb=33m/s)	1
Importance Factors/ Weightage	**20%**

Seismic Zone	Ranking
ZONE V	4
ZONE IV	3
ZONE III	2
ZONE II	1
20%	

Climatic Zones	Ranking
Hot and Dry	3
Composite, Temperate	2
Warm and Humid	1
Cold Climate	1
20%	

Hill Zoning	Ranking
Cold Climate	5
Other Climates	1
Importance Factors/ Weightage	**40%**

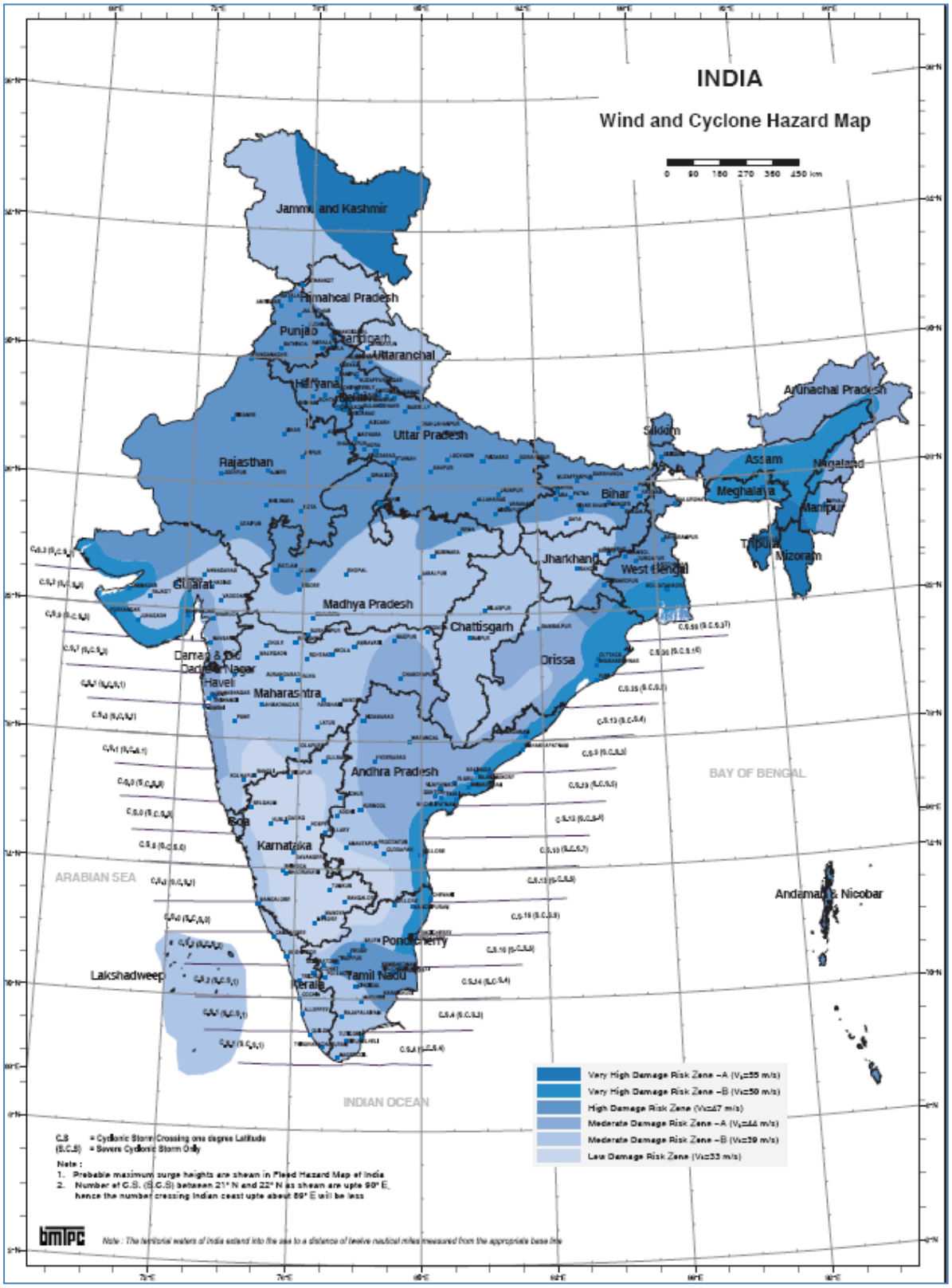


Figure 3-6 : Wind zone map of India (BMTPC, 2006)

Climatic Zones

Regions having similar characteristic features of climate are grouped under one climatic zone. According to a recent code of the Bureau of Indian Standards, the country has been divided into the following five major climatic zones:

- Hot & Dry (mean monthly temperature >30 and relative humidity <55%);
- Warm & Humid (mean monthly temperature >25-30 and relative humidity >55-75%);
- Temperate (mean monthly temperature 25-30 and relative humidity <75%);
- Cold (mean monthly temperature <25 and relative humidity – can be any values);
- Composite (This applies when six months or more do not fall within any of the other categories meaning sharing characteristics of two or more of the above categories in a year).

Map of climatic zones is shown in Figure 3-7. The hot and dry zone lies in the western and the central parts of India; Jaisalmer, Jodhpur and Sholapur are some of the towns that experience this type of climate. In this zone, solar radiation and movement of hot winds are higher. The warm and humid zone covers the coastal parts of the country, such as Mumbai, Chennai and Kolkata. Pune and Bangalore are examples of non-coastal cities that fall the under moderate climatic zone. Generally, the Himalayan region experiences cold type of climate. The composite zone covers the northern Indo-Gangetic plains, such as New Delhi, Kanpur, and Allahabad.

With GIS overlay analysis, district overlap areas falling within each climatic zone have been computed. In order to compare impact of being a district in a climatic zone, district level ranking has been assigned based on the scheme shown in Table 3-2. District level climatic zone ranking for pilot States/ UT is shown in Table 3-3.

Hilly Areas and Building Class Zones

Extreme cold climate, rugged topography and use of flammable material in building construction (such as wood) and the use of heating provisions in houses during cold weather is an important factor for causing fire incidents in that region. To capture such elements in fire risk hazard, Hilly Areas and Building Class Zones have been created. This class is directly linked to the cold climate zone. All hilly districts, (such as all districts of Jammu & Kashmir in the Pilot study) fall under this category. In such districts, a ranking of five has been assigned. Importance of this zone in terms of occurrence of number of fire incidents is quite high. Hence, while integrating, a double weightage of 40% has been assigned to this layer.

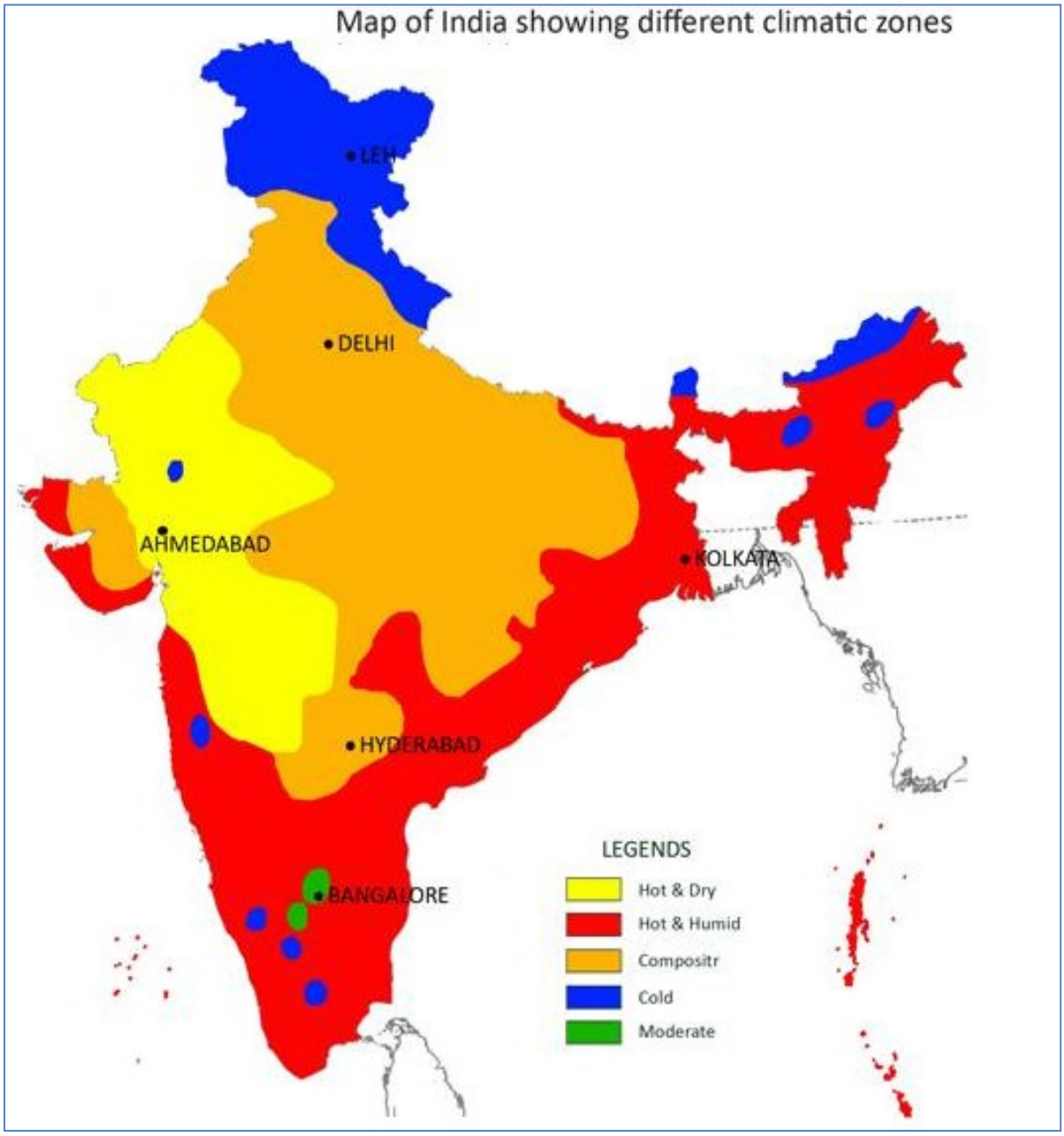


Figure 3-7 : Climatic Zones of India

Table 3-3: District level ranking for individual (earthquake, wind and climatic) hazard and integrated hazards

Importance Factor			20%	20%	20%	40%	
State	State/District	Total Area	Wind Zoning	Seismic Zoning	Climate Zoning	Hill Zoning	Integrated Hazard Zoning
Andhra Pradesh							
	Adilabad	16,114	2.0	1.4	1.3	1.5	1.5
	Anantapur	19,182	1.1	1.0	1.1	1.0	1.0
	Chittoor	15,013	1.4	1.5	1.0	1.0	1.2
	East Godavari	10,840	2.9	1.8	1.0	1.0	1.5
	Guntur	11,400	2.3	1.4	1.0	1.0	1.3
	Hyderabad	192	2.0	1.0	2.0	2.0	1.8
	Karimnagar	11,845	2.0	1.2	1.9	2.0	1.8
	Khammam	15,968	2.0	1.9	1.0	1.0	1.4
	Krishna	8,754	2.6	2.0	1.0	1.0	1.5
	Kurnool	17,701	1.6	1.0	1.0	1.0	1.1
	Mahbubnagar	18,471	1.8	1.0	1.7	2.0	1.7
	Medak	9,726	1.9	1.0	2.0	2.0	1.8
	Nalgonda	14,233	2.0	1.0	1.4	1.5	1.5
	Nizamabad	7,971	1.9	1.0	2.0	2.0	1.8
	Prakasam	17,617	2.5	1.2	1.0	1.0	1.3
	Rangareddy	7,510	1.8	1.0	2.0	2.0	1.8
	Sri Potti Sriramulu Nellore	13,213	2.9	1.8	1.0	1.0	1.5
	Srikakulam	5,867	3.3	1.0	1.0	1.0	1.5
	Visakhapatnam	11,604	2.6	1.0	1.0	1.0	1.3
	Vizianagaram	6,169	2.6	1.0	1.0	1.0	1.3
	Warangal	12,911	2.0	1.3	1.6	2.0	1.8
	West Godavari	7,727	2.4	2.0	1.0	1.0	1.5
	Y.S.R.	15,356	1.4	1.1	1.0	1.0	1.1
Bihar							
	Araria	2,826	3.0	4.0	1.0	1.0	2.0
	Arwal	521	3.0	2.0	2.0	2.0	2.2
	Aurangabad	3,314	1.9	2.0	2.0	2.0	2.0
	Banka	3,055	2.8	2.8	1.4	1.5	2.0
	Begusarai	1,946	3.0	3.0	2.0	2.0	2.4
	Bhagalpur	2,578	3.0	3.0	1.0	1.0	1.8
	Bhojpur	2,431	3.0	2.0	2.0	2.0	2.2
	Buxar	1,668	3.0	2.0	2.0	2.0	2.2
	Darbhanga	2,524	3.0	3.5	1.8	2.0	2.5
	Gaya	4,985	1.5	2.0	2.0	2.0	1.9
	Gopalganj	2,044	3.0	3.0	2.0	2.0	2.4
	Jamui	3,121	1.6	2.4	2.0	2.0	2.0
	Jehanabad	1,060	2.8	2.0	2.0	2.0	2.2

Importance Factor			20%	20%	20%	40%	
State	State/District	Total Area	Wind Zoning	Seismic Zoning	Climate Zoning	Hill Zoning	Integrated Hazard Zoning
	Kaimur (Bhabua)	3,372	2.6	2.0	2.0	2.0	2.1
	Katihar	3,070	3.0	3.0	1.0	1.0	1.8
	Khagaria	1,504	3.0	3.0	1.4	1.5	2.1
	Kishanganj	2,012	3.0	3.4	1.0	1.0	1.9
	Lakhisarai	1,225	2.7	3.0	2.0	2.0	2.3
	Madhepura	1,816	3.0	3.6	1.0	1.0	1.9
	Madhubani	3,525	3.0	4.0	1.0	1.0	2.0
	Munger	1,421	3.0	3.0	2.0	2.0	2.4
	Muzaffarpur	3,191	3.0	3.0	1.9	2.0	2.4
	Nalanda	2,378	2.8	2.7	2.0	2.0	2.3
	Nawada	2,504	1.5	2.1	2.0	2.0	1.9
	Pashchim Champaran	5,245	3.0	3.0	1.7	2.0	2.3
	Patna	3,191	3.0	2.6	2.0	2.0	2.3
	Purba Champaran	3,982	3.0	3.0	1.4	1.5	2.1
	Purnia	3,245	3.0	3.3	1.0	1.0	1.9
	Rohtas	3,850	2.5	2.0	2.0	2.0	2.1
	Saharsa	1,677	3.0	3.3	1.4	1.5	2.1
	Samastipur	2,701	3.0	3.0	2.0	2.0	2.4
	Saran	2,686	3.0	2.8	2.0	2.0	2.4
	Sheikhpura	668	2.5	3.0	2.0	2.0	2.3
	Sheohar	444	3.0	3.0	1.0	1.0	1.8
	Sitamarhi	2,199	3.0	3.4	1.0	1.0	1.9
	Siwan	2,223	3.0	2.6	2.0	2.0	2.3
	Supaul	2,437	3.0	4.0	1.0	1.0	2.0
	Vaishali	2,030	3.0	3.0	2.0	2.0	2.4
Kerala							
	Alappuzha	1,423	1.5	2.0	1.0	1.0	1.3
	Ernakulam	3,067	1.5	2.0	1.0	1.0	1.3
	Idukki	4,377	1.5	2.0	1.0	1.0	1.3
	Kannur	2,979	1.5	2.0	1.0	1.0	1.3
	Kasaragod	1,998	1.5	2.0	1.0	1.0	1.3
	Kollam	2,495	1.5	2.0	1.0	1.0	1.3
	Kottayam	2,216	1.5	2.0	1.0	1.0	1.3
	Kozhikode	2,353	1.5	2.0	1.0	1.0	1.3
	Malappuram	3,579	1.4	2.0	1.0	1.0	1.3
	Palakkad	4,503	1.5	2.0	1.0	1.0	1.3
	Pathanamthitta	2,662	1.5	2.0	1.0	1.0	1.3
	Thiruvananthapuram	2,180	1.5	2.0	1.0	1.0	1.3
	Thrissur	3,053	1.5	2.0	1.0	1.0	1.3
	Wayanad	2,149	1.2	2.0	1.0	1.0	1.2

Importance Factor			20%	20%	20%	40%	
State	State/District	Total Area	Wind Zoning	Seismic Zoning	Climate Zoning	Hill Zoning	Integrated Hazard Zoning
Tamil Nadu							
	Ariyalur	1,940	3.0	1.0	1.0	1.0	1.4
	Chennai	167	3.5	2.0	1.0	1.0	1.7
	Coimbatore	3,857	1.5	2.0	1.0	1.0	1.3
	Cuddalore	3,718	3.3	1.0	1.0	1.0	1.5
	Dharmapuri	4,502	1.4	1.5	1.0	1.0	1.2
	Dindigul	6,063	1.8	1.1	1.0	3.0	2.0
	Erode	6,008	2.2	1.2	1.0	1.0	1.3
	Kancheepuram	4,477	3.3	1.4	1.0	1.0	1.5
	Kanniyakumari	1,688	1.5	2.0	1.0	1.0	1.3
	Karur	2,908	3.0	1.0	1.0	1.0	1.4
	Krishnagiri	5,138	1.1	1.2	1.0	1.0	1.0
	Madurai	3,717	1.6	1.0	1.0	1.0	1.1
	Nagapattinam	2,567	3.0	1.0	1.0	1.0	1.4
	Namakkal	3,425	3.0	1.1	1.0	1.0	1.4
	Perambalur	1,747	3.0	1.0	1.0	1.0	1.4
	Pudukkottai	4,670	3.0	1.0	1.0	1.0	1.4
	Ramanathapuram	4,254	1.8	1.0	1.0	1.0	1.2
	Salem	5,246	2.6	1.3	1.0	1.0	1.4
	Sivaganga	4,102	2.4	1.0	1.0	1.0	1.3
	Thanjavur	3,408	3.0	1.0	1.0	1.0	1.4
	The Nilgiris	2,576	1.2	2.0	1.0	1.0	1.2
	Theni	2,875	1.5	1.2	1.0	1.0	1.1
	Thiruvallur	3,401	3.0	2.0	1.0	1.0	1.6
	Thiruvarur	2,117	3.0	1.0	1.0	1.0	1.4
	Thoothukkudi	4,636	1.5	1.0	1.0	1.0	1.1
	Tiruchirappalli	4,499	3.0	1.0	1.0	1.0	1.4
	Tirunelveli	6,819	1.5	1.4	1.0	1.0	1.2
	Tiruppur	5,860	2.4	1.7	1.0	1.0	1.4
	Tiruvannamalai	6,192	1.6	1.6	1.0	1.0	1.3
	Vellore	6,077	1.2	2.0	1.0	1.0	1.2
	Viluppuram	7,290	2.4	1.0	1.0	1.0	1.3
	Virudhunagar	4,253	1.5	1.0	1.0	1.0	1.1

3.5 Exposure Vulnerability Ranking

For estimating exposure and its vulnerability, detailed urban agglomerate classification maps generated from high-resolution satellite images have been used. With the help of remote sensing techniques applied on high-resolution satellite imageries, 10 types of urban agglomeration areas have been delineated (Figures 3-1 and 3-2). For major city areas, even more detailed urban agglomerate classification has been created with high-resolution data

layers as shown in Figure 3-3. These include urban, semi-urban, building blocks, industrial and rural villages' built-up areas. District level census 2011 population has been distributed to each population agglomeration cluster. For exposure vulnerability, 4 different layers viz. population density, residential built-up areas, high-rise building block density, and industrial areas have been developed individually at district level. Table 3-4 shows district level geographical area, population, population density, residential built-up area, industrial area, and residential built-up area.

Table 3-4: District level geographical area, population, population density, residential built-up area, residential built-up area, and industrial area

State	District	Geographl. Area (sq km)	Population 2011	Population Density	Res Built-Up Area Sq Km	Industrial Area Sq Km	Res Built-Up Area (In %)
Andhra Pradesh							
	Adilabad	16,114	2,737,738	169.90	32.37	35.31	0.20%
	Anantapur	19,182	4,083,315	212.87	39.53	43.04	0.21%
	Chittoor	15,013	4,170,468	277.79	38.32	41.75	0.26%
	East Godavari	10,840	5,151,549	475.24	36.69	39.94	0.34%
	Guntur	11,400	4,889,230	428.87	39.62	43.24	0.35%
	Hyderabad	192	4,010,238	20,924.27	5.91	6.39	3.08%
	Karimnagar	11,845	3,811,738	321.80	33.68	36.92	0.28%
	Khammam	15,968	2,798,214	175.24	42.47	-	0.27%
	Krishna	8,754	4,529,009	517.39	48.16	-	0.55%
	Kurnool	17,701	4,046,601	228.61	26.74	-	0.15%
	Mahbubnagar	18,471	4,042,191	218.84	22.33	-	0.12%
	Medak	9,726	3,031,877	311.74	30.42	33.12	0.31%
	Nalgonda	14,233	3,483,648	244.76	38.44	-	0.27%
	Nizamabad	7,971	2,552,073	320.18	18.92	-	0.24%
	Prakasam	17,617	3,392,764	192.59	27.95	-	0.16%
	Rangareddy	7,510	5,296,396	705.24	112.25	122.53	1.49%
	Sri Potti Sriramulu Nellore	13,213	2,966,082	224.49	23.06	25.74	0.17%
	Srikakulam	5,867	2,699,471	460.14	8.66	9.53	0.15%
	Visakhapatnam	11,604	4,288,113	369.53	36.14	39.18	0.31%
	Vizianagaram	6,169	2,342,868	379.80	7.80	8.39	0.13%
	Warangal	12,911	3,522,644	272.85	290.54	7.00	2.25%
	West Godavari	7,727	3,934,782	509.24	237.97	10.43	3.08%
	Y.S.R.	15,356	2,884,524	187.85	40.15	43.84	0.26%
Bihar							

State	District	Geographl. Area (sq km)	Population 2011	Population Density	Res Built-Up Area Sq Km	Industrial Area Sq Km	Res Built-Up Area (In %)
	Araria	2,826	2,806,200	993.12	150.62	0.33	5.33%
	Arwal	521	699,563	1,343.16	16.61	0.01	3.19%
	Aurangabad	3,314	2,511,243	757.82	99.78	0.71	3.01%
	Banka	3,055	2,029,339	664.20	98.31	0.05	3.22%
	Begusarai	1,946	2,954,367	1,518.27	83.39	2.47	4.29%
	Bhagalpur	2,578	3,032,226	1,176.36	90.88	0.78	3.53%
	Bhojpur	2,431	2,720,155	1,118.83	89.13	0.50	3.67%
	Buxar	1,668	1,707,643	1,023.52	66.60	1.01	3.99%
	Darbhanga	2,524	3,921,971	1,554.09	98.57	0.80	3.91%
	Gaya	4,985	4,379,383	878.45	182.63	0.97	3.66%
	Gopalganj	2,044	2,558,037	1,251.62	123.98	0.30	6.07%
	Jamui	3,121	1,756,078	562.75	71.65	0.11	2.30%
	Jehanabad	1,060	1,124,176	1,060.89	49.26	0.40	4.65%
	Kaimur (Bhabua)	3,372	1,626,900	482.45	47.13	1.84	1.40%
	Katihar	3,070	3,068,149	999.55	112.79	0.31	3.67%
	Khagaria	1,504	1,657,599	1,102.23	55.26	0.01	3.67%
	Kishanganj	2,012	1,690,948	840.42	92.64	0.18	4.60%
	Lakhisarai	1,225	1,000,717	816.97	41.60	0.04	3.40%
	Madhepura	1,816	1,994,618	1,098.19	70.36	0.03	3.87%
	Madhubani	3,525	4,476,044	1,269.72	165.12	0.04	4.68%
	Munger	1,421	1,359,054	956.59	54.86	0.48	3.86%
	Muzaffarpur	3,191	4,778,610	1,497.46	181.37	1.87	5.68%
	Nalanda	2,378	2,872,523	1,207.92	90.99	0.72	3.83%
	Nawada	2,504	2,216,653	885.20	74.18	0.23	2.96%
	Pashchim Champaran	5,245	3,922,780	747.95	167.90	0.82	3.20%
	Patna	3,191	5,772,804	1,809.32	172.29	5.53	5.40%
	Purba Champaran	3,982	5,082,868	1,276.34	266.98	1.20	6.70%
	Purnia	3,245	3,273,127	1,008.76	153.10	0.10	4.72%
	Rohtas	3,850	2,962,593	769.45	118.87	2.16	3.09%
	Saharsa	1,677	1,897,102	1,130.94	54.84	0.09	3.27%
	Samastipur	2,701	4,254,782	1,575.26	169.97	0.12	6.29%
	Saran	2,686	3,943,098	1,467.96	123.02	0.71	4.58%
	Sheikhpura	668	634,927	950.84	17.44	0.13	2.61%
	Sheohar	444	656,916	1,480.71	41.70	0.15	9.40%

State	District	Geographl. Area (sq km)	Population 2011	Population Density	Res Built-Up Area Sq Km	Industrial Area Sq Km	Res Built-Up Area (In %)
	Sitamarhi	2,199	3,419,622	1,555.04	119.43	0.32	5.43%
	Siwan	2,223	3,318,176	1,492.72	158.36	0.37	7.12%
	Supaul	2,437	2,228,397	914.30	96.49	0.09	3.96%
	Vaishali	2,030	3,495,249	1,722.04	107.86	0.70	5.31%
Kerala							
	Alappuzha	1,423	2,121,943	1,491.08	230.06	1.32	16.17%
	Ernakulam	3,067	3,279,860	1,069.39	273.50	6.12	8.92%
	Idukki	4,377	1,107,453	253.02	87.65	0.07	2.00%
	Kannur	2,979	2,525,637	847.77	243.68	0.91	8.18%
	Kasaragod	1,998	1,302,600	651.93	149.47	1.25	7.48%
	Kollam	2,495	2,629,703	1,053.91	275.24	1.46	11.03%
	Kottayam	2,216	1,979,384	893.34	173.51	0.85	7.83%
	Kozhikode	2,353	3,089,543	1,312.77	157.94	1.74	6.71%
	Malappuram	3,579	4,110,956	1,148.75	350.83	1.00	9.80%
	Palakkad	4,503	2,810,892	624.20	341.73	2.73	7.59%
	Pathanamthitta	2,662	1,195,537	449.12	138.76	1.23	5.21%
	Thiruvananthapuram	2,180	3,307,284	1,516.92	145.57	5.66	6.68%
	Thrissur	3,053	3,110,327	1,018.83	325.72	1.89	10.67%
	Wayanad	2,149	816,558	379.93	57.74	0.26	2.69%
Tamil Nadu							
	Ariyalur	1,940	752,481	387.95	33.64	2.45	1.73%
	Chennai	167	4,681,087	28,025.00	93.72	4.42	56.11%
	Coimbatore	3,857	3,472,578	900.43	182.35	24.37	4.73%
	Cuddalore	3,718	2,600,880	699.48	127.64	7.53	3.43%
	Dharmapuri	4,502	1,502,900	333.82	39.76	1.70	0.88%
	Dindigul	6,063	2,161,367	356.49	196.03	8.42	3.23%
	Erode	6,008	2,259,608	376.09	117.41	9.08	1.95%
	Kancheepuram	4,477	3,990,897	891.48	212.63	21.76	4.75%
	Kanniyakumari	1,688	1,863,174	1,103.51	113.12	0.42	6.70%
	Karur	2,908	1,076,588	370.21	71.98	4.25	2.48%
	Krishnagiri	5,138	1,883,731	366.63	61.78	12.23	1.20%
	Madurai	3,717	3,041,038	818.19	109.33	10.79	2.94%
	Nagapattinam	2,567	1,614,069	628.81	112.68	0.95	4.39%
	Namakkal	3,425	1,721,179	502.53	79.26	15.24	2.31%

State	District	Geographl. Area (sq km)	Population 2011	Population Density	Res Built-Up Area Sq Km	Industrial Area Sq Km	Res Built-Up Area (In %)
	Perambalur	1,747	564,511	323.12	24.31	0.28	1.39%
	Pudukkottai	4,670	1,618,725	346.64	232.27	3.49	4.97%
	Ramanathapuram	4,254	1,337,560	314.46	103.34	0.83	2.43%
	Salem	5,246	3,480,008	663.39	113.90	18.23	2.17%
	Sivaganga	4,102	1,341,250	327.01	148.98	3.13	3.63%
	Thanjavur	3,408	2,402,781	704.98	245.74	1.73	7.21%
	The Nilgiris	2,576	735,071	285.39	34.30	0.67	1.33%
	Theni	2,875	1,243,684	432.62	57.12	2.75	1.99%
	Thiruvallur	3,401	3,725,697	1,095.45	168.85	23.10	4.96%
	Thiruvarur	2,117	1,268,094	599.07	125.81	0.47	5.94%
	Thoothukkudi	4,636	1,738,376	375.01	155.27	5.17	3.35%
	Tiruchirappalli	4,499	2,713,858	603.16	180.73	3.53	4.02%
	Tirunelveli	6,819	3,072,880	450.61	227.48	3.45	3.34%
	Tiruppur	5,860	2,471,222	421.74	174.60	21.28	2.98%
	Tiruvannamalai	6,192	2,468,965	398.73	105.21	1.54	1.70%
	Vellore	6,077	3,928,106	646.38	142.30	5.80	2.34%
	Viluppuram	7,290	3,463,284	475.11	183.51	3.35	2.52%
	Virudhunagar	4,253	1,943,309	456.89	123.38	9.68	2.90%

In order to assess the impact of each exposure vulnerability type, a vulnerability score/ ranking has been assigned to each layer at its base unit. The vulnerability score represents the level of vulnerability (very high to negligible) of a specific type of exposure in response to the occurrences of small and medium fire incidents. Base unit for vulnerability ranking is the district boundary. The natural break in value distribution has been considered for defining the ranking class.

Based on Census 2011 population, district-level population densities have been computed and grouped into five ranges based on the schema shown in Table 3-5. A ranking of 5 has been assigned to highly dense districts, having populations greater than 10,000 per sq km, and 1 to sparsely populated districts having less than 200 people per sq km area.

Table 3-5: Grouping schema for ranking of exposure and vulnerability layers

Population density	Ranking
>10,000	5
1,000 to 10,000	4
500 to 1,000	3
200 to 500	2
<200	1
Residential Built-up area sq km	**Ranking**
>190	5
100 to 190	4
50 to 100	3
20 to 50	2
<20	1

Built-up area %	Ranking
>35 %	5
14% to 35 %	4
2% to 14 %	3
1% to 2 %	2
<1 %	1
Industrial area sq km	**Ranking**
>10	5
5 to 10	4
2 to 5	3
1 to 2	2
< 1	1

As described earlier, various types of residential built-up areas have been delineated using high-resolution images. For assessing fire risk, both absolute built-up areas in sq km as well as built-up areas percent (ratio of built-up areas to the total area) are important parameters. Figure 3-8 illustrates an example of district level ranking of residential built-up area percent and corresponding residential built up area in absolute terms (i.e. area in sq.km.).

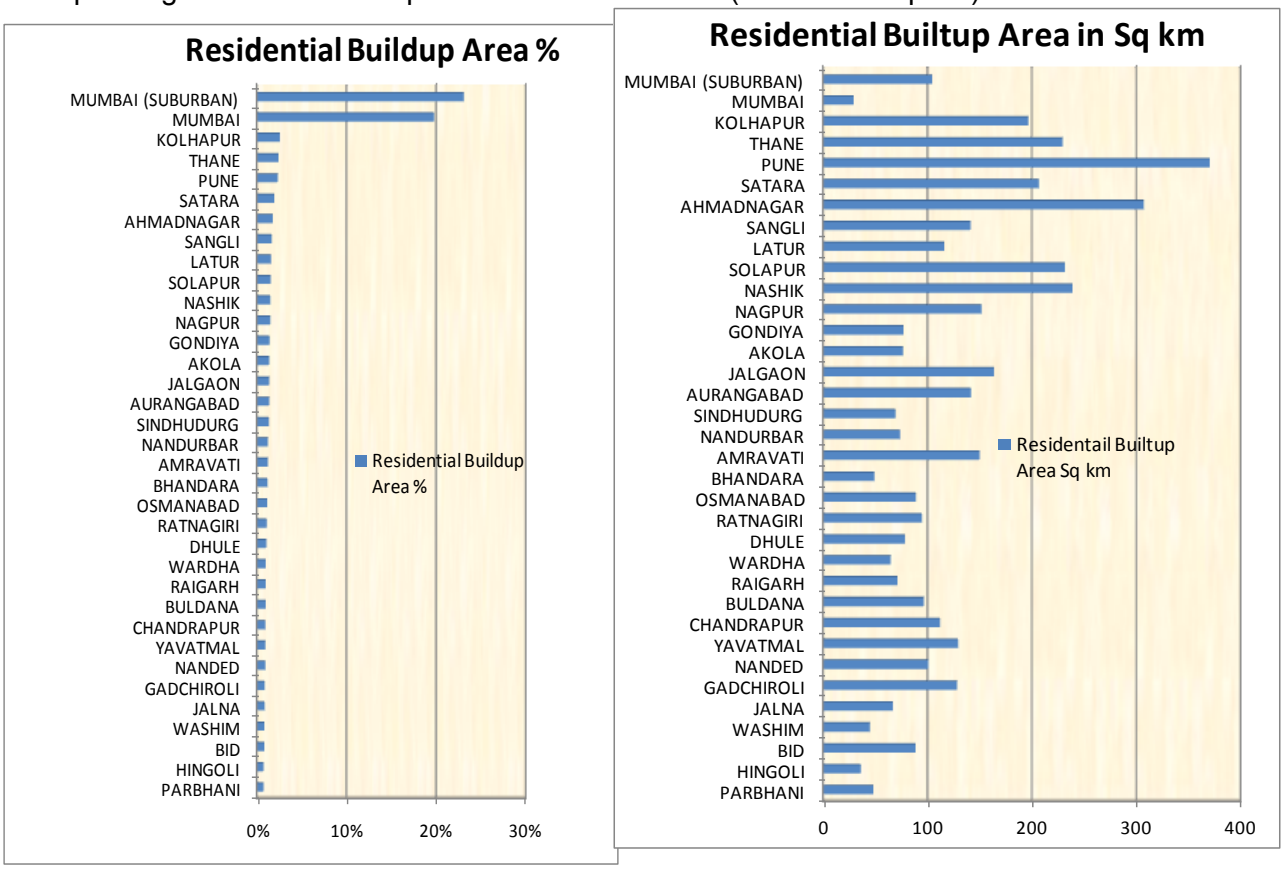


Figure 3-8 : Example of comparison of district level rankings for residential built-up area percentages and absolute areas (in sq km). The example shows a comparison for all 35 districts of Maharashtra State

An example of this is shown in Figure 3-8 for Maharashtra. It can be seen that Pune district has the highest residential built-up area, while in terms of residential built-up area in percentage, Pune district comes at fifth rank (Figure 3-8).

District level values of residential built-up area in percent and in absolute terms (i.e. area in sq km.) have been grouped separately into five classes and assigned a ranking score of 1- 5 based on the schema shown in Table 3-5. Districts having > 35% residential built-up have been assigned 5th ranking, while districts having <1 % built-up area as whole have been assigned a rank of 1. Similarly, 5 ranking has been assigned to district wise residential built-up areas in sq km based on schema shown in Table 3-5. This schema has been prepared based on natural breaks of value distribution considering all 106 districts of the pilot study area. Because of its appropriateness, the schema has been used for ranking all the districts in the remaining 29 States/UTs also.

It is obvious that industrial areas in districts have much lower percentages than residential built-up areas. However, presence of industrial areas in a district has a significant influence in assessing fire risk. Hence, industrial areas in absolute terms (sq km) have been considered in risk ranking. In a similar fashion, district wise industrial areas have been grouped into five classes and vulnerability ranking has been assigned based on the schema described in Table 3-5. Districts having more than 10 sq km industrial plot area are ranked at 5, while districts having industrial area of less than 1 sq km are ranked at 1 (Table 3-5).

An example of district level total residential built-up areas in sq km and industrial areas for all 35 districts of Maharashtra have been plotted for direct comparison in Figure 3-9. Industrial as well residential built-up area is the highest in Pune district. In contrast, Ahmadnagar, has second ranking in terms of residential built-up area, but in terms of industrial area, Thane district holds second ranking (Figure 3-9).

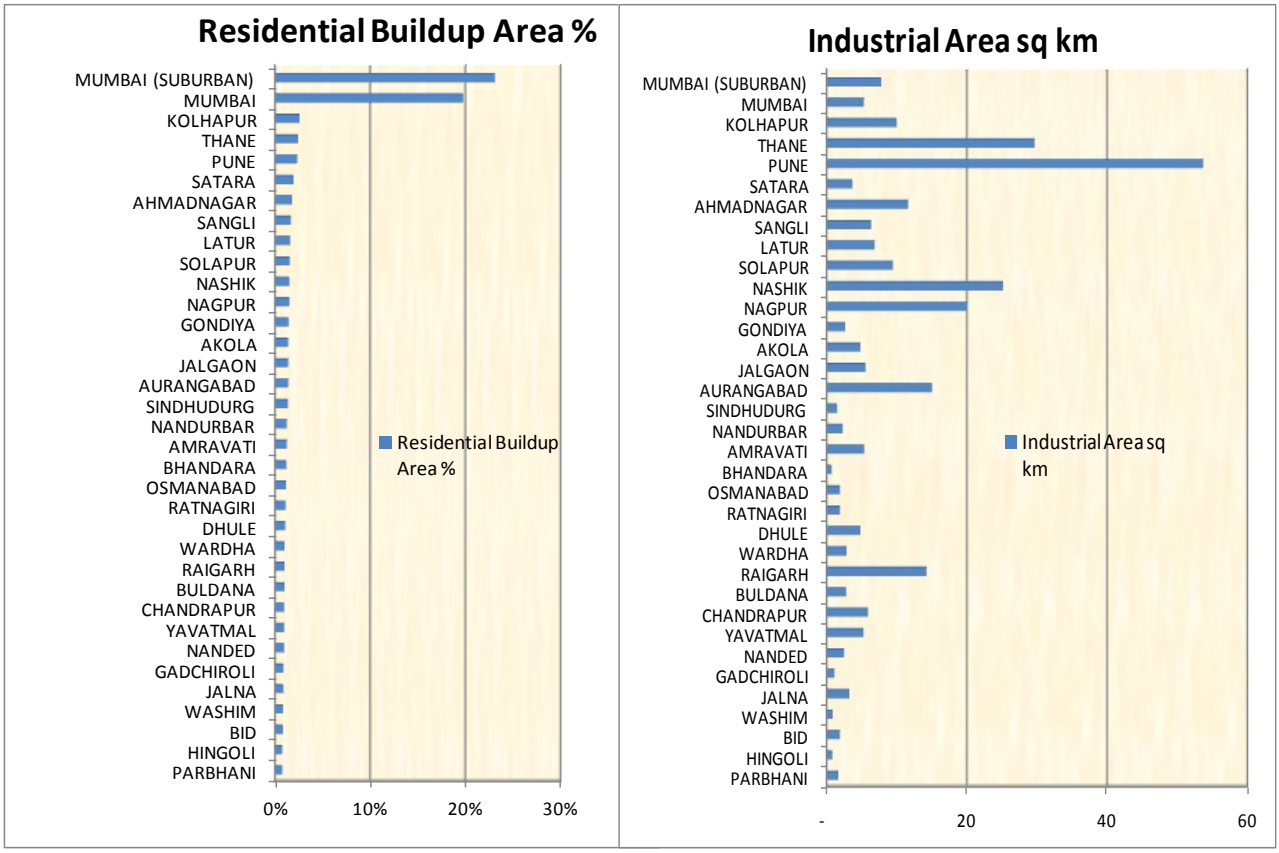


Figure 3-9 : Example of comparison of district level rankings for residential built-up areas and industrial areas (in sq km). The example shows a comparison for all 35 districts of Maharashtra State

Integrated Risk Analysis

After developing ranking of individual units in terms of hazard and exposure vulnerability, GIS layers have been overlaid on top of each other and a spatial analysis has been performed for integration in GIS environment. For combining hazard and risk, Weighted Factor Analysis (WFA) in GIS environment has been performed. Weighted ranking scores have been used in the integration analysis and quantified risk distribution for all districts. Values of weighted factor depend upon the importance of a particular hazard/ vulnerability class in risk analysis. For example, temperate zone hazard value of a district has a much lower weight than the population density of a district.

For integration of hazards, equal weights have been assigned to wind, seismic, and climatic hazards, while double weights have been given to hill zoning (Table 3-5). This is because, in hilly terrain, wooden houses, and heating provisions in buildings increase the chances of fire-incidences, and thus have been given higher weightage.

Four layers of exposure/ vulnerability, such as population density, residential built-up area percentage, residential built-up area in sq km and Industrial area in sq km seem to have equal importance in the occurrence of the number of fire incidents in a district. Hence, equal weights have been assigned in integration of these layers (Table 3-6).

After obtaining integrated individual weighted score for hazard and exposure vulnerability, fire risk categories have been obtained in quantitative terms by further integration of hazard and exposure vulnerability. It is obvious that in the occurrence of the number of fire incidents in a given district, exposure vulnerability has more importance than the prevailing hazard. Hence, in quantified integration, double weights have been assigned to exposure vulnerability (Table 3-6).

Table 3-6: Weightage assigned in risk scoring schema for integration of hazard and exposure vulnerability into fire risk categories

Hazard		Weightage	
H1	Wind Zoning	W1	0.2
H2	Seismic Zoning	W2	0.2
H3	Climate zoning	W3	0.2
H4	Hill zoning	W4	0.4
Integrated Hazard		H1*W1+H2*W2+H3*W3+H4*W4	

Exposure/ Vulnerability Class		Weightage	
EV1	Population Density	W1	0.25
EV2	Residential built-up area %	W2	0.25
EV3	Residential built-up area in sq km	W3	0.25
EV4	Industrial area in sq km	W4	0.25
Integrated Exposure Vulnerability		EV1*W1+EV2*W2+EV3*W3+EV4*W4	

Fire Risk score = Integrated Hazard x 2 (Integrated Exposure Vulnerability)

The quantified numeric values of district risk scores are again grouped into four descriptive categories of district level risk ranking (very high, high, medium, and low) as depicted in Table 3-7.

Table 3-7: District risk rankings for four States of Phase III

State	District	Population Density Ranking	Res Built-up Area Sq km Ranking	Res Built-Up Area percentage Ranking	Industrial Area Sq km Ranking	Integrated Ranking	Overall District Risk Ranking
Andhra Pradesh							
	Adilabad	1	2	1	5	6	Medium
	Anantapur	2	2	1	5	6	Medium
	Chittoor	2	2	1	5	6	Medium
	East Godavari	2	2	1	5	7	Medium
	Guntur	2	2	1	5	6	Medium
	Hyderabad	5	1	3	4	8	High
	Karimnagar	2	2	1	5	7	Medium
	Khammam	1	2	1	1	3	Low
	Krishna	3	2	2	1	5	Low

State	District	Population Density Ranking	Res Built-up Area Sq km Ranking	Res Built-Up Area percentage Ranking	Industrial Area Sq km Ranking	Integrated Ranking	Overall District Risk Ranking
	Kurnool	2	2	1	1	4	Low
	Mahbubnagar	2	2	1	1	4	Low
	Medak	2	2	1	5	7	Medium
	Nalgonda	2	2	1	1	4	Low
	Nizamabad	2	1	1	1	4	Low
	Prakasam	1	2	1	1	3	Low
	Rangareddy	3	4	2	5	9	Very High
	Sri Potti Sriramulu Nellore	2	2	1	5	7	Medium
	Srikakulam	2	1	1	4	5	Low
	Visakhapatnam	2	2	1	5	6	Medium
	Vizianagaram	2	1	1	4	5	Low
	Warangal	2	5	2	4	8	High
	West Godavari	3	5	3	5	9	Very High
	Y.S.R.	1	2	1	5	6	Medium
Bihar							
	Araria	3	4	3	1	8	High
	Arwal	4	1	3	1	7	Medium
	Aurangabad	3	4	3	1	7	Medium
	Banka	3	3	3	1	7	Medium
	Begusarai	4	3	3	3	9	Very High
	Bhagalpur	4	3	3	1	7	Medium
	Bhojpur	4	3	3	1	8	High
	Buxar	4	3	3	2	8	High
	Darbhanga	4	3	3	1	8	High
	Gaya	3	4	3	1	7	Medium
	Gopalganj	4	4	3	1	8	High
	Jamui	3	3	2	1	7	Medium
	Jehanabad	4	3	3	1	8	High
	Kaimur (Bhabua)	2	2	2	2	6	Medium
	Katihar	4	4	3	1	8	High
	Khagaria	4	3	3	1	8	High
	Kishanganj	3	3	3	1	7	Medium
	Lakhisarai	3	2	3	1	7	Medium
	Madhepura	4	3	3	1	7	Medium
	Madhubani	4	4	3	1	8	High

State	District	Population Density Ranking	Res Built-up Area Sq km Ranking	Res Built-Up Area percentage Ranking	Industrial Area Sq km Ranking	Integrated Ranking	Overall District Risk Ranking
	Munger	3	3	3	1	7	Medium
	Muzaffarpur	4	4	3	2	9	Very High
	Nalanda	4	3	3	1	8	High
	Nawada	3	3	3	1	7	Medium
	Pashchim Champaran	3	4	3	1	8	High
	Patna	4	4	3	4	10	Very High
	Purba Champaran	4	5	3	2	9	Very High
	Purnia	4	4	3	1	8	High
	Rohtas	3	4	3	3	9	Very High
	Saharsa	4	3	3	1	8	High
	Samastipur	4	4	3	1	8	High
	Saran	4	4	3	1	8	High
	Sheikhpura	3	1	3	1	6	Medium
	Sheohar	4	2	3	1	7	Medium
	Sitamarhi	4	4	3	1	8	High
	Siwan	4	4	3	1	8	High
	Supaul	3	3	3	1	7	Medium
	Vaishali	4	4	3	1	8	High
Kerala							
	Alappuzha	4	5	4	2	9	Very High
	Ernakulam	4	5	3	4	9	Very High
	Idukki	2	3	2	1	5	Low
	Kannur	3	5	3	1	7	Medium
	Kasaragod	3	4	3	2	7	Medium
	Kollam	4	5	3	2	8	High
	Kottayam	3	4	3	1	7	Medium
	Kozhikode	4	4	3	2	8	High
	Malappuram	4	5	3	1	8	High
	Palakkad	3	5	3	3	8	High
	Pathanamthitta	2	4	3	2	7	Medium
	Thiruvananthapuram	4	4	3	4	9	Very High
	Thrissur	4	5	3	2	8	High
	Wayanad	2	3	3	1	6	Medium
Tamil Nadu							
	Ariyalur	2	2	2	3	6	Medium

State	District	Population Density Ranking	Res Built-up Area Sq km Ranking	Res Built-Up Area percentage Ranking	Industrial Area Sq km Ranking	Integrated Ranking	Overall District Risk Ranking
	Chennai	5	3	5	4	10	Very High
	Coimbatore	3	4	3	5	9	Very High
	Cuddalore	3	4	3	4	8	High
	Dharmapuri	2	2	2	2	5	Low
	Dindigul	2	5	3	4	9	Very High
	Erode	2	4	2	4	7	Medium
	Kancheepuram	3	5	3	5	10	Very High
	Kanniyakumari	4	4	3	1	7	Medium
	Karur	2	3	2	4	7	Medium
	Krishnagiri	2	3	2	5	7	Medium
	Madurai	3	4	3	5	9	Very High
	Nagapattinam	3	4	3	1	7	Medium
	Namakkal	3	3	2	5	8	High
	Perambalur	2	2	2	1	5	Low
	Pudukkottai	2	5	3	3	8	High
	Ramanathapuram	2	4	2	1	6	Medium
	Salem	3	4	2	5	8	High
	Sivaganga	2	4	3	3	7	Medium
	Thanjavur	3	5	3	2	8	High
	The Nilgiris	2	2	2	1	5	Low
	Theni	2	3	2	3	6	Medium
	Thiruvallur	4	4	3	5	10	Very High
	Thiruvarur	3	4	3	1	7	Medium
	Thoothukkudi	2	4	3	4	8	High
	Tiruchirappalli	3	4	3	3	8	High
	Tirunelveli	2	5	3	3	8	High
	Tiruppur	2	4	3	5	8	High
	Tiruvannamalai	2	4	2	2	6	Medium
	Vellore	3	4	2	4	8	High
	Viluppuram	2	4	3	3	7	Medium
	Virudhunagar	2	4	3	4	8	High

4 Field Surveys of Fire Stations for Data Collection

At present, there is a lack of a comprehensive centralized database on the distribution of fire service infrastructure, and the stock of existing fire fighting vehicles, manpower and specialized equipments, their types, and their quantities. Most of the information is either disaggregated or not updated. This information is required for undertaking the gap analysis, future planning, and improvement of institutional capacity, financial planning, and creating a roadmap for the next 10 years for revamping the fire services in the country. To have first-hand information on the distribution of the fire service stations across the country, trained human resources, infrastructure availability and their status, RMSI project team has carried out surveys of Fire Stations and collected data from Headquarters of all the States under the jurisdiction of DG, NDRF & CD (Fire) in the country. In addition to the survey of Fire Stations, the team has also collected the location (latitude, longitude) of Fire Stations using GPS. The geographical coordinate information is used for plotting all the Fire Station locations on the map to perform GIS based spatial analysis. This is required for the analysis of distribution of Fire Stations and gap analysis on fire-infrastructure, based on risk-category, response time, and population.

4.1 Field-Survey of individual Fire Station and collection of Headquarter Data

RMSI project team has designed a comprehensive “Fire Headquarter Data Collection Form” (*Annexure-1*) and individual “Fire Station Survey Form” (*Annexure-2*) to collect all the required information for each State/UT in the country.

The information includes but is not limited to:

i. Location (latitude, longitude) and location description of the Fire Station

ii. Name of fire-station in-charge and his contact details

iii. Fire Vehicles type, numbers, their model, year of manufacture/induction at the Fire Station, and general condition of fire vehicles

iv. Specialized firefighting equipment, their type, and quantity

v. Road access and connectivity to vulnerable areas

vi. Infrastructure facilities (accommodation) of fire-personnel and their distance from Fire Stations

vii. Duty patterns

viii. Staff details at different levels

ix. Water availability etc.

The Fire Headquarter Data Collection Form and individual Fire Station Survey Form have been designed in such a way as to extract most of the common information including communication, human resources, specialized equipments, fire-statistics etc. applicable for the entire State, in a quantitative way, which might help the analysis at a later stage. In addition to infrastructure information, RMSI also attempted to collect information/indicators related to vulnerability and risk through indirect questions like:

i. Year wise information on the number of events each unit had attended during the last 5 years and losses caused by fire events both in terms of assets and life.

ii. Few questions on the general perception of the fire officer and in charge of the unit on various types of risks in the Fire Station jurisdiction.

Analysis on the information of events over time and the loss can provide an understanding of the vulnerability and risk as well as the susceptibility trend over the year. The fire officer would be the key person who faces actual needs on the ground as well as in using the infrastructure for the service.

During the field survey in the pilot study, the RMSI team members have interacted with Fire Station In-charges to gather the required information. In addition to discussions with the Fire Station in charge, other key department officials have been contacted to know their perception about the fire risks and the difficulties that fire department is facing. The project team is ensuring that the Headquarter Data Collection Forms and Individual Fire Station Survey Forms are comprehensive and contain all information required for this assignment.

The field data collected by the survey team have undergone through quality checks and the project team has created a database with all collected information. The database has been designed in such a way that the data can be used for spatial and non-spatial analysis. All the Fire Stations have a unique code as identifier.

4.2 Stakeholder Analysis

Apart from the quantitative data collection on the distribution of fire service infrastructure, stock of the existing equipments and their quality, the RMSI team also interacted with some of the key fire officials and senior members in DGCD, MHA and NDRF. The focus of such discussions was more on institutional aspects (issues in the service delivery and suggestions), capacity, and future requirements. As these interactions are mostly with senior personnel of fire department, the focus has been to derive a broader picture in terms of requirements, investment, and institutional capacity building. This information has been compiled and summarized under various heads, for instance, requirement, investment, institutional capacity building, etc. RMSI key experts have been analyzing the diverse opinion of various fire officials and are providing their recommendations.

Any significant issue that was observed during this process, in terms of issues in the process of the delivery.

Finally, RMSI team held discussions with officials of the DG NDRF & CD and members of project review to present the summary of observations for discussions in several meetings.

5 Development of Fire Decision Support System (FDSS)

This chapter discusses the modeling software solution named FDSS (Fire Decision Support System), developed by RMSI as part of the deliverables. FDSS is a dynamic web-based application aimed at supporting decision makers take optimal decisions on complex tasks, such as resource prepositioning, gap analysis, prioritization, and resource optimization along with the day-to-day tasks. The most important aspect of FDSS is that it enables the apex fire management authority to provide the entire country's fire agencies information on a single platform.

5.1 Salient Features

Following is a brief description of the FDSS platform. The platform is built on a framework that is State of the art and is the most suitable solution for users' needs.

The salient features of the FDSS platform include:

- Web based application built using .NET Framework 3.5 utilizing the GIS capabilities of an open source GIS Platform.
- Multi-tier system architecture that follows the Object Oriented Programming model with the following objectives:
    - Loose coupling between the various tiers – presentation, business and data
    - Ease of development and deployment
- Ability to navigate, query and render the spatial data
- Exposure view, query and update capabilities that will help the user to keep the information in the system up-to-date
- Ability to view and query the outputs in a tabular format
- A powerful reporting engine that enables a set of pre-formatted reports that provide various views of the outputs from the model
- A thematic map generator that uses the underlying GIS platform to depict the outputs from the model as pre-designed thematic maps.

5.2 High Level Design

FDSS has a multi-tier architecture to allow for modularity and scalability. The architecture follows the Object Oriented Programming model. The various tiers of the system are as shown in Figure 5-1.

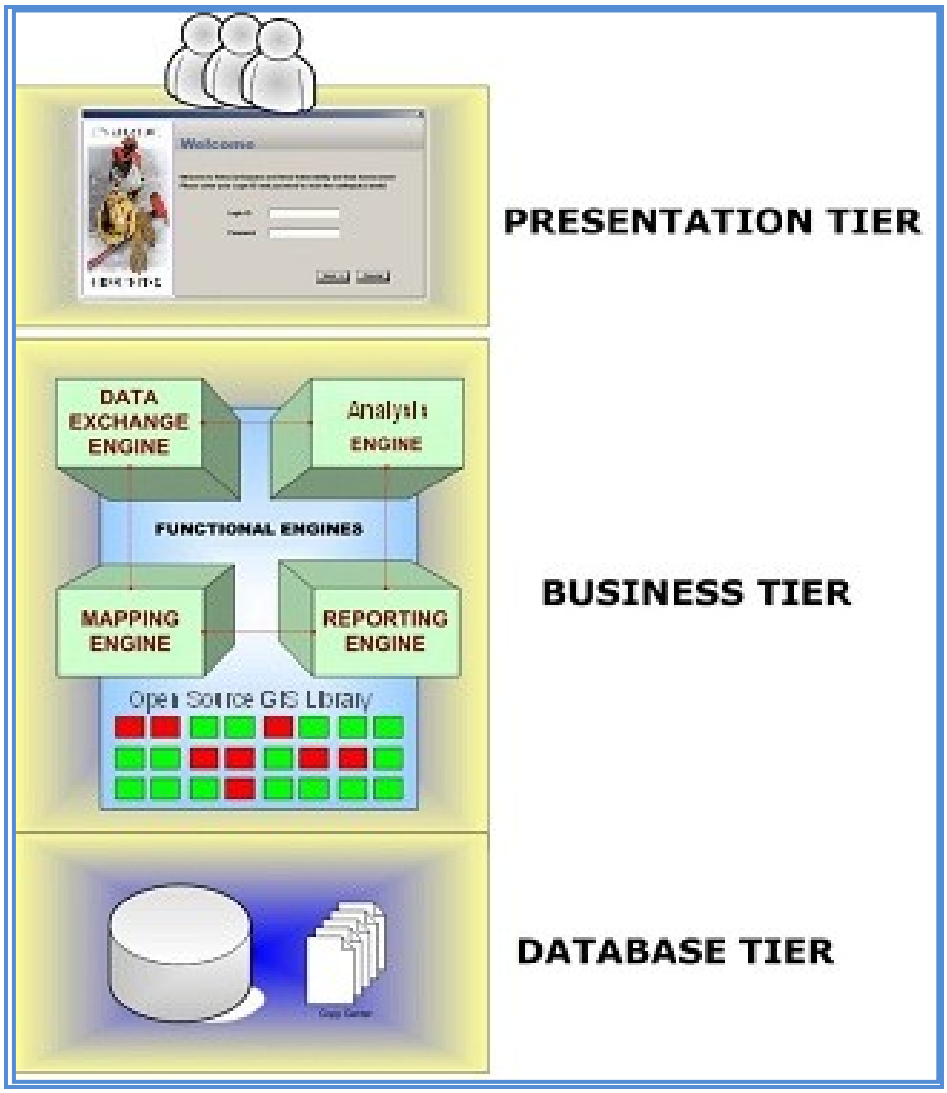


Figure 5-1 : Three-tier architecture

- **Presentation tier:** This user interface is responsible for gathering inputs from the user and passing on the same to the business layer for processing. The presentation layer ensures that the communications passing through are in the appropriate form for the recipient business objects in the business tier. In FDSS, the user interface constitutes this tier.
- **Business tier:** consists of the system business rules and computing logic as a set of business objects. This tier also interfaces with the data tier. The Mapping engine, Data Access engine, Reporting engine, and Analysis engine constitute this tier.
- **Database tier:** consists of the environment that allows persistence of user information – both lookup and computed data. Physical implementation of this layer can be files on the system or databases. In FDSS, relational database constitutes this tier and houses both spatial and non-spatial data.

Figure 5-2 shows the high-level design for the FDSS platform. The whole architecture is modular. The major modules are user Data Warehouse, Platform Components, and User Interface. The model components are stand-alone and are not dependent on the platform

components. Both perform their respective tasks working with the same data on the backend and are guided by the same user interface on the front end. The following sections discuss the various modules in detail and showcase how all the requirements has been delivered by the FDSS platform.

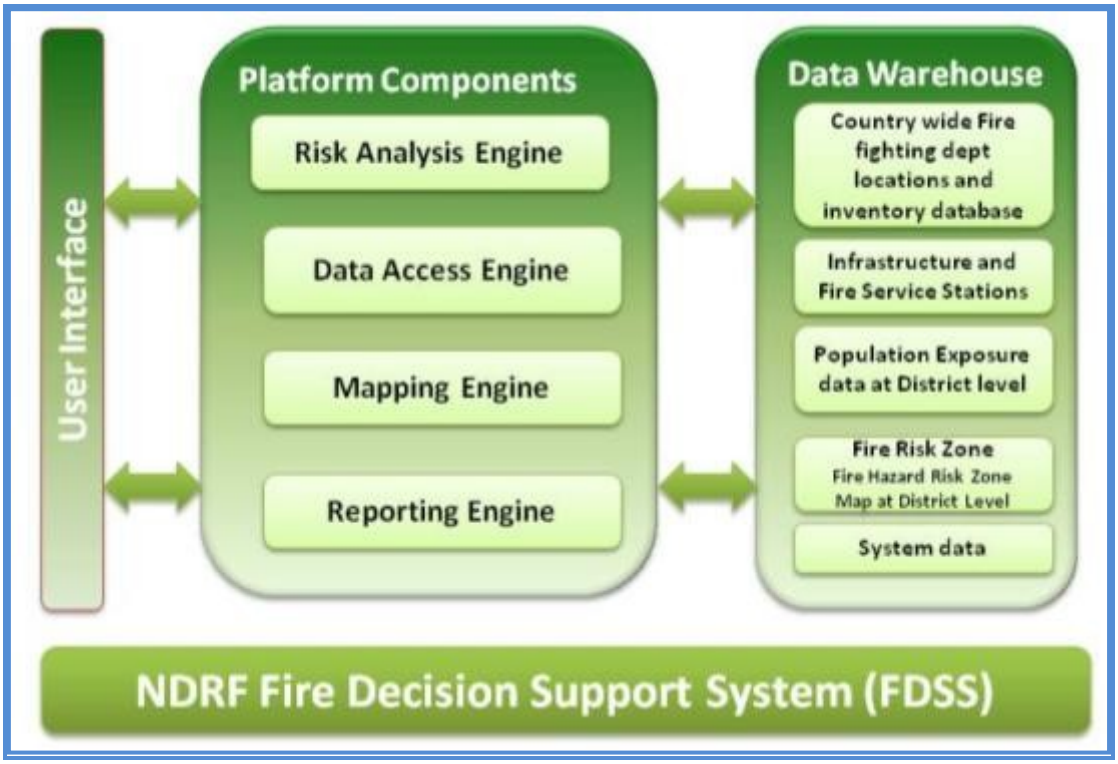


Figure 5-2 : High level design of FDSS

5.2.1 DATA WAREHOUSE

Data warehouse represents the Database tier. It stores all the input data to the model, system data, and the output results. The data can be categorized as spatial and non-spatial. All the spatial data resides either in the form of ESRI shape files and grids or Postgres based PostGIS database. Post GIS/ Postgres is an open source geo-spatial relational database system. All the non-spatial data is stored as tables in the Postgres database.

Spatial Data Layers: The spatial data layers stored in the data warehouse are:

- Fire station locations and inventory data at Fire Station level
- Land Use Land Cover classes by their use or occupancy
- Fire Risk Zone Map at district level
- Population density map at district level
- Road and Rail Network

5.3 Platform Components

Platform components represent the Application Tier. These components focus on the application logic for all data access, mapping and reporting. These are generic components

that operate directly on the data warehouse and present the data in different views to the user.

Data Access Engine: Data Access Engine provides access to all non-spatial data that are stored in the Data Warehouse. This includes data viewing and editing capabilities. This allows for bulk building inventory updates and extraction of results so the outcome of the analysis can be reused for other applications.

Mapping Engine: Mapping engine provides all mapping capabilities to the application. The major component in mapping engine is the Map Viewer that loads the spatial data and displays the map and provides all basic map navigation functions like Zoom, Pan, Identify tool and calculate distance. This engine also provides spatial querying capabilities like buffer query and point in polygon query. In addition to this, the mapping engine also provides capabilities for defining symbology for various map layers including themes based on a range of values and unique values. All the layers are loaded with a predefined symbology. The mapping engine provides the ability to view the hazard, damage and loss on maps using predefined themes based on a range of values.

Reporting Engine: Reporting engine generates all the reports. FDSS provides a set of preformatted predefined reports that can be printed or exported into Excel format. This provides the ability to format the data into tables, generate summations, and create graphs. The following reports are generated at district and State levels by the reporting engine:

- Infrastructure Report
- Gap Analysis Report
- Status report for individual Fire Stations, district and State levels for and other reports required for decision making

The FDSS provides functionality to run GAP Analysis at two levels:

- State
- District

This system provides the option for running gap analysis for firefighting and rescue vehicles, specialized equipment, firefighting manpower, building infrastructure. User can also opt to get output based on all the analysis parameters available.

User Interface: User Interface (Figure 5-3) comprises of the Presentation tier. This is the part of the FDSS platform that the user interacts with. User Interface for FDSS can be categorized into two types:

1) System Administration Interface
2) Application Interface

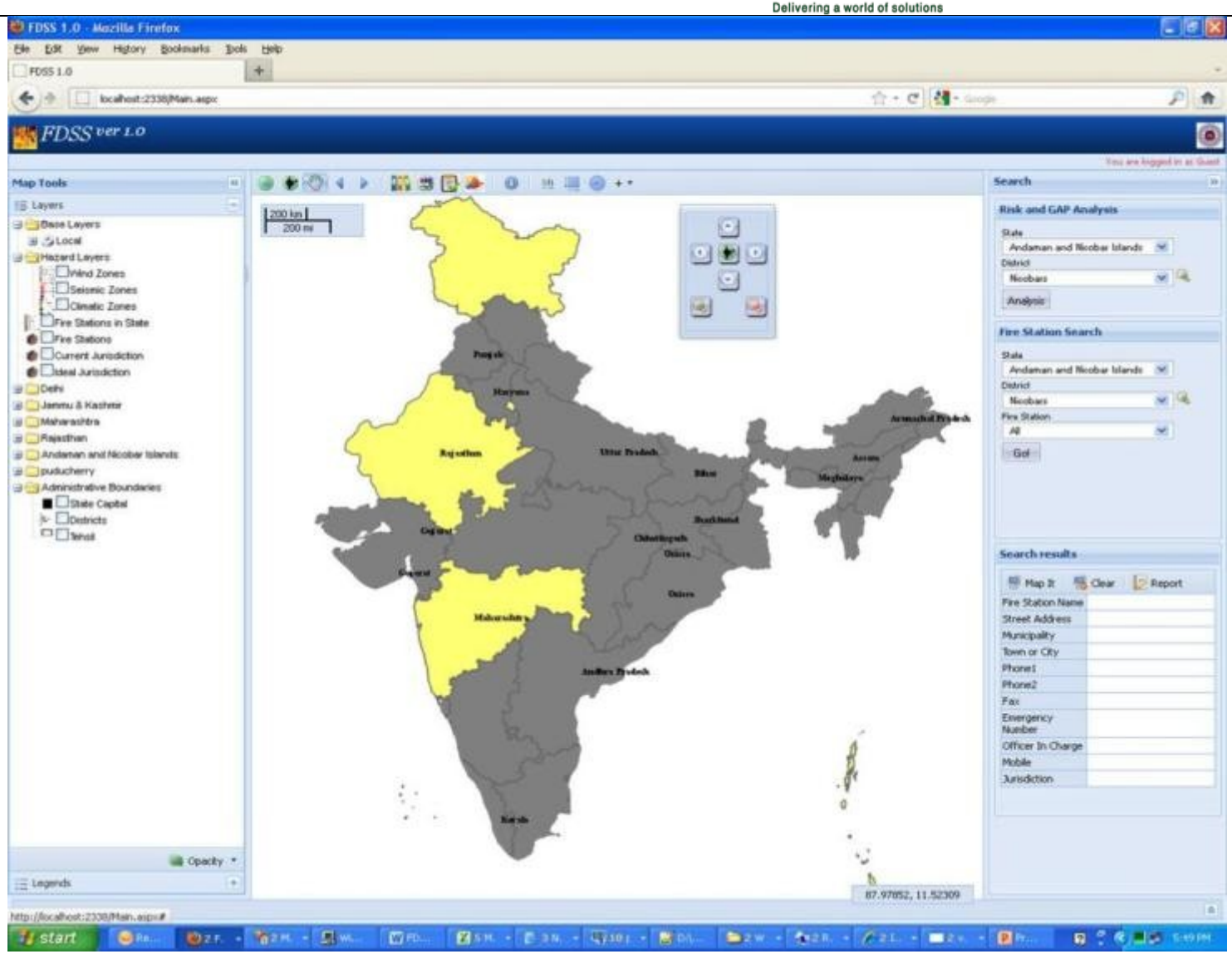


Figure 5-3 : User Interface for Base Analysis in FDSS. The example shows the States covered in the Pilot Phase of the study

5.4 System Administration Interface

This is an individual stand alone component run at the server only. This desktop interface allows the administrator to manage users and update exposure, thereby providing security for other users and preventing unauthorized updation of the building exposure data. All the data updation and maintenance is done through the system administration interface. Figure 5-4 shows the system administration interface of the application.

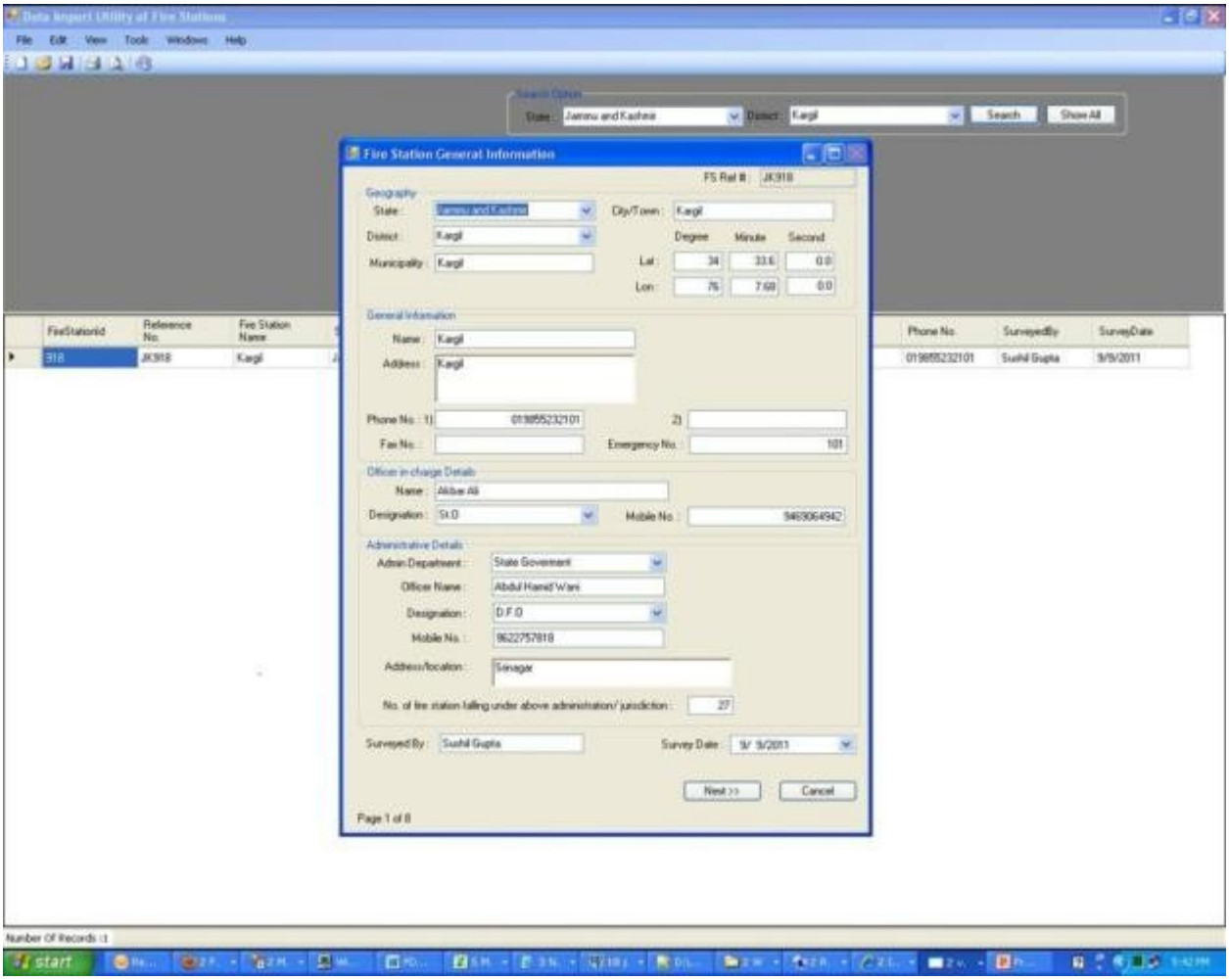


Figure 5-4 : System administration interface

5.5 Application Interface

Data Management: Exposure management provides the ability to view and query the underlying default demographic and Fire Station inventory datasets.

Map Management: The Map management interface provides support for viewing the information on a map by utilizing the Mapping Engine component from the Application Logic tier. It offers the following functionalities:

- Displays the following layers by default as the application is loaded:
    - Location of Fire Stations
    - Administrative boundary maps
    - Land use land cover map
    - Road / Rail network
    - Fire Risk Zone map

- Basic GIS tools like zoom, pan, zoom to selection, zoom to entire layer, location attribute information etc.
- Creates following maps based on analysis results:
    - Gap Analysis Map – showing gaps in existing resource, equipments and fire tenders (Figure 5-4)
- Adds custom layers to the layer manager and performs visual overlays
- Views attributes information, queries and analyzes the spatial data layers
- Enables users to view thematic maps based on defined attribute values.

Analysis Management: The analysis management interface provides the ability to execute the analysis. It allows the user the following options:

- View the fire risk analysis for any district or State
- Gap analysis at State and district levels

Results Management: This entails generating displays of results in pre-defined formats based on user selection. Following are the various types of result views that will be available in FDSS.

- Reports providing predefined content in predefined format. This utilizes the Reporting Engine Component to display various reports. Following is a list of various reports:
    - Fire Station Profile report
    - Gap Analysis report

5.5.1 TECHNOLOGY

The physical servers also represent the logical needs elaboration servers and the physical clients also represent the logical clients.

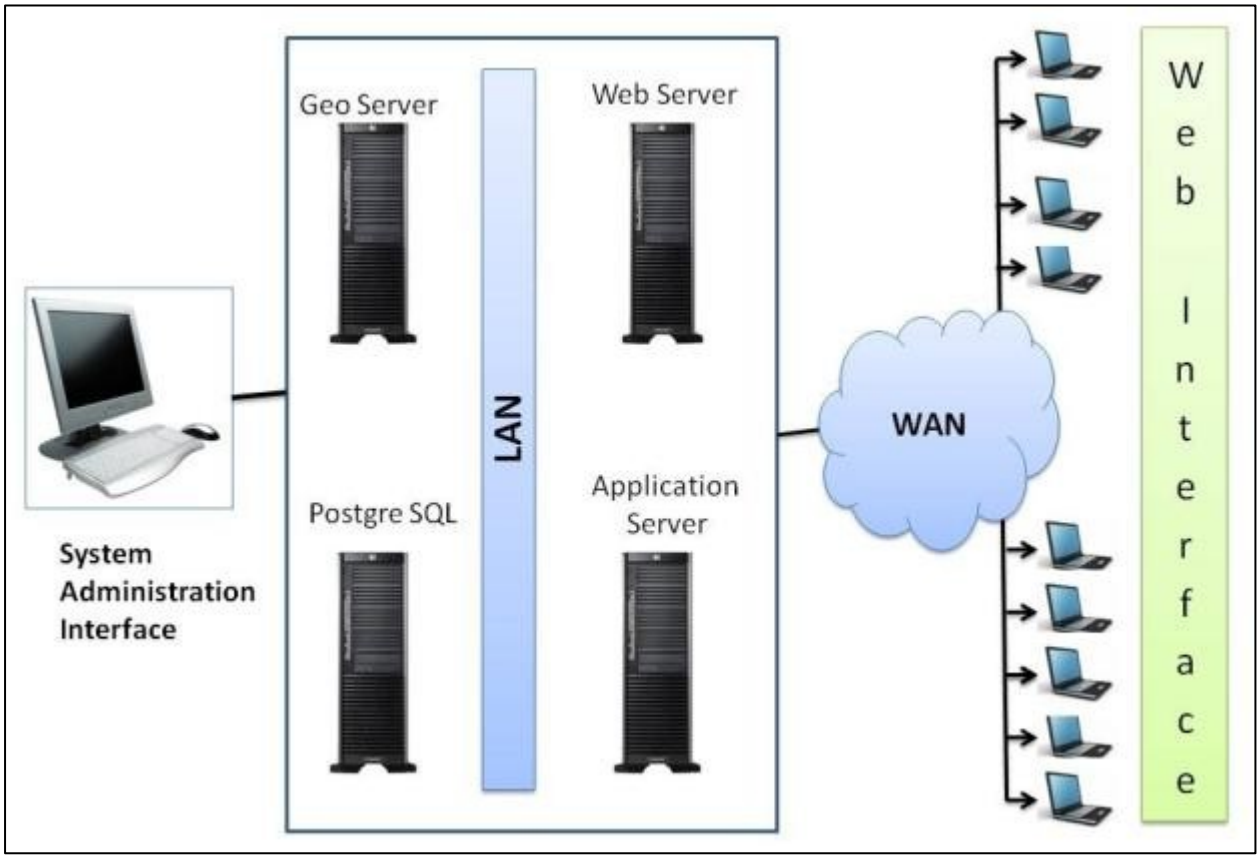


Figure 5-5 : FDSS - Systems Architecture

- The Frontend is web based, and registered users can view all kinds of maps and reports.
- Middleware: It is the Web server that hosts the web site and coordinates between the client and the backend servers for publishing maps and reports. Application Server serves as the main point of contact for the web server for all functionalities other than serving maps and GIS analyses. The application server is hosted in IIS 5.1 or higher and requires Dot net Framework 3.5.
- The backend consists of the following two components:

- Geo server and Geo web cache: This server handles map publishing and all the GIS functionalities. For all GIS analyses, it relies on the Post GIS database server. Geo server and Geo web cache are published in Apache Tomcat Server.
- Post GreSQL Database Server: This serves all the GIS and attributes data to both the application and map servers. In addition, it also takes care of all GIS analyses required for any functionality.

The technological framework for FDSS utilizes the following platforms:

Hardware Configuration

- Rack Server 2U having Intel Xeon (Quad Core) E5410 or higher processor support for dual multi core processor
- 16 GB DDR2-533 FB DIMM or higher ECC memory
- SVGA Video Controller with 16 MB RAM
- SAS Raid Controller having 128 MB buffer memory with battery backup and supporting RAID 0,1 and 5 Dual Gigabit Server Ethernet controller with teaming, load balancing and auto fail over feature
- 5X146GB SAS HS HDDD, IDE DVD ROM Drive with (N) hot swap Redunt Hot SEAP power supply

Software Configuration

- Operating System: Windows Server 2008
- Web Server: IIS 7.0
- Framework: .net Framework (3.5)

Supported Browser

- Internet Explorer 6.0 or higher
- Mozilla Firefox 3.0 or Higher

5.6 Advantages of Open Source Platform

The application software is built on open source GIS platform. The open source GIS platform has several advantages (Table 5-1) of production and development allowing users and developers not only to see the source code of software but also modify it and easily implement it in web applications.

Table 5-1: Advantages of Open Source Platform

Advantages	Open Source Platform	Proprietary Software Platform
Control and Audit 	Gives power to control software code and hence modification can be carried out to suit the requirements	Forces users to adhere to standards and flexibility provided in the software only. Modifications are based solely on vendor discretion
Low ownership Cost 	No license fees are required thereby reducing annual license fees cost to zero, zero cost of scale as open source doesn't require additional licenses as the installation grows	License fees are required
Quality and Excellence	It's available publicly. A large no. of reviewers analyze the code making it more secure, increasing the quality and	Not available publicly.

Advantages	Open Source Platform	Proprietary Software Platform
	excellence in design	
Flexibility & customization 	There is scope to customize the software toward end users' needs	Limited scope of customization

5.7 Identification of Gaps in Infrastructure, Up-gradation and Modernization Requirement

Gap identification is carried out in FDSS using the information captured as part of the field surveys and stakeholder interviews, distribution of Fire Stations and risk analysis. The gaps in infrastructure can be in terms of number of Fire Stations in both served and un-served areas, availability of fire vehicles, fire-personnel and building infrastructure in the existing operational Fire Stations. Through the input of field survey work, risk categorization, and infrastructure requirement norms, gap analysis is performed in FDSS at the district and State level.

Gaps will primarily address the three areas:

5.7.1 Infrastructure Gaps

This covers served/ un-served areas, unsuitable locations of Fire Stations, etc. This gap analysis is conducted by using suitably modified SFAC Norms, population density , existing Fire Station distribution and other infrastructural information obtained as part of the field surveys. In addition, the risk information has been used to reflect certain aspects of risk that affect the infrastructure. The outcomes of this analysis are information and maps that show the infrastructure deficiency at district and State levels.

5.7.2 Equipment Gaps

The objective of this analysis is to identify gaps in equipments existing at various Fire Stations against the population they serve, the hazards that the jurisdiction they serve is exposed to, trained map-power available, average response time to a fire call, etc. This will result in the identification of new types of equipments required, phasing out of old equipment and their replacement, and equipment effectiveness analysis.

5.7.3 Capacity Gaps

This would cover the shortage of fire fighting personnel and additional training requirements for existing teams, etc. This analysis is conducted using infrastructure analysis information, equipment analysis information, population density, SFAC norms and risk information as the primary datasets, and average response time. The primary outcomes would include the gap in capacity in terms of number of additional fire fighting personnel required, and the additional requirement of trainings on equipments, tools, technologies and emergency management approaches.

Similarly, district/State/ country level reports on up gradation and modernization requirements of existing Fire Stations including MIS, GIS, and communication systems will

be generated by comparison of availability of existing resources and up gradation and modernization requirements through gap analysis.

The outcomes of the above analyses has been integrated to the Fire Decision Support System (FDSS), so similar analyses at a later stage may also be performed by changing the underlying datasets as things change on the ground.

5.8 Preparation of detail cost estimates with Capital and O&M Investment Plan

Once gaps in terms of number of Fire Stations, fire-personnel, infrastructure (building, vehicles and equipments), up gradation and modernization requirements of existing Fire Stations including MIS, GIS, and communication systems are finalized, the investment and financial analysis is performed in FDSS. This involves reviewing the outcomes of the gap analysis, prioritizing them by district and estimating the cost of investment.

The investment costs is estimated separately for infrastructure development and improvements, capacity building, and equipment procurement and modernization. This is where the extensive experience of RMSI team in fire department operations, equipment procurement, and training needs assessment and planning has been applied. For more detailed information regarding the specification of firefighting and rescue vehicles and equipment, please refer to the Vehicle and Equipment Specification report submitted by RMSI.

The outcomes of this process are a detailed investment plan that shows year-by-year investments prioritized by district, gaps and associated benefits. The financial plan addresses investment for next 10-years in a year-by-year phased manner approach. The financial tool has been integrated to the FDSS, which helps in generating various reports related to detailed cost estimates with Capital and O&M Investment Plan for next 10 years, and to prioritize investments. This is based on the current cost estimate and technology. However, the tool have flexibility to change/modify the cost of various infrastructural elements and re-regenerate reports for prioritization of the investment plan.

5.9 Institutional Assessment and Capacity Building Plan

The National Fire Service College (NFSC), Nagpur and other State Fire Training Centres across the country are key institutions involved in improving the level of fire personnel knowledge and their overall capabilities to face the challenges of fire-fighting. The RMSI team surveyed NFSC Nagpur and Pilot State/UTs Fire Training Centres across the country and studied their programs to delineate their role and relationship for improvement in training facilities for fire personnel in the country.

Human resource bottlenecks at various levels of training fire officials (such as refresher's training, breathing training in smoke, industrial training, specialized training to handle highrise building fires, etc.) to different cadre of officials, issue of language in training; physical fitness; duty patterns (8 hours and 12 hours versus 24 hours); availability of accommodation in fire-stations; pay-scale structures, and promotion progression etc. are studied in detail and recommendations were made for their implementation.

There are many ways of discovering funding avenues, such as introduction of Fire Tax, training programs to private sectors, tapping MP Local Area Development (MPLAD) funds etc. These issues are important since fire personnel need to be dedicated and motivated all times. For similar reasons, improvements in governance structure are imperative. Lack of

fire-personnel is another challenge. For this, revamping training facilities in the country is another important aspect in any capacity building plan.

Computerization of fire and emergency services and strict audit by a central authority can be one mechanism to ensure a good finance mechanism for capital expenditures and operation and maintenance. Training of fire personnel in the use of computers is another aspect, which is very important from the implementation perspective.

It may be noted that RMSI team is aware of past studies on the subject such as the Recommendations by the SFAC and has kept these studies in mind while making recommendations for the Capacity Building Plan.

RMSI team has also prepared a detailed Roadmap for the Capacity Building Plan at country level for its implementation in next 10 years.

6 International and National Norms

6.1 Literature Survey

Under this task, standards and practices that are being followed in various developed countries for fire safety norms, such as in USA -NFPA (1211, 1710, 1720), Japan, UK, and Germany, are being studied and compared.

As per literature survey and personnel communications with fire officials in different countries, international norms regarding response time *(defined as **en route time taken by the fire fighting vehicle from the Fire Station to fire emergency scene, and turnout time is not included in it**)* differs from country to country.

6.2 Response Time

The practices regarding response time of fire tenders/ambulances in different countries are as follows:

6.2.1 GERMANY

The response from Germany (27.10.2011) is as follows:

*"1. **Concerning the response time in Berlin**. On the basis of an agreement between CFO and the Ministry of Interior the options are:*

*Calls in Risk Areas class A (higher risks) - 15 fire-fighters must arrive in **max.15 minutes** at 90% of all calls and*

Calls in Risk Areas class B (lower risks) - 15 fire-fighters must arrive in max.15 minutes at 50% of all calls.

*The standard turn out time of a fire truck is **60 seconds for professionals**, as **for volunteers** the turn out time should not be higher **4 minutes**, otherwise the Control Centre will automatically send a professional fire truck.*

*Ambulance cars must be at the scene within **8 minutes** in 75% of all calls."*

2. Temperature problem - heating devices in the garage (close the doors) and additional a electrical wire is going to the motor section of the vehicle for saving working temperature of the trucks."

From the above, it may be inferred that in Germany, areas have been divided only into two Risk Categories (higher, lower) and **response time** in urban areas varies from **8 - 15 minutes**. As far as turnout time is concerned, it varies from 1 to 4 minutes.

6.2.2 JAPAN

Fire Service laws of Japan and its background:

1. The Japanese system of laws and regulations regarding fire service law (Hierarchy structure)
   A .Law: Fire Service Act
   B. Cabinet order: Order for Enforcement of the Fire Service Act
   ・Specify the type of building fire protection
   ・Technical standards for installation and maintenance of fire prevention equipment
C Ministerial ordinance: Rule for Enforcement of the Fire Service Act
   ・Details of technical standards for installation and maintenance of fire prevention equipment"
D. Municipal ordinances: Fire prevention ordinance"

2. Requirements for Fire prevention equipments
All Fire prevention equipments are necessary to have national certification in Japan (regulation not standard).

3. Background of Japanese fire service
・Fire service in Japan consists of **one unit per municipality**.
・Under the laws, fire prevention regulations are enacted by each of the municipalities.
・Fire prevention regulations are slightly different for each individual municipality.

- **Japanese Regulation, the response time has not been determined.**

According to the Fire Service Law Enforcement Order (**not regulation**), the fire panel shall be installed where there are always people in Japan.

In large buildings, the fire panel has been installed in Guard Room. Security people are always monitoring the fire panel.
At the same time the alarm is sounded, Fire tenders will rush to the site for extinguishing the fire.
Time to reach the site, which varies depending on the building, assumed at **5 to 10 minutes. (not determined by law).**

2. Since, there are several Islands in Japan, is there any different Regulations for Islands?
Almost the same.

As you know, Japan is made up of three islands and many small islands. There has prefectures, among which are divided into municipalities regardless of islands."

From the above, it may be inferred that in Japan, each municipality has at least one Fire Station and response time varies from 5 to 10 minutes, depending upon the location of building.

6.2.3 USA

"There are three National Fire Protection Association (NFPA) standards that contain time requirements that influence the delivery of fire and emergency medical services. These are:

1. **NFPA 1221**, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems;
2. **NFPA 1710**, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments; and
3. **NFPA 1720**, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments.

NFPA 1710 contains time objectives that shall be established by career fire departments as follows:

- **Turnout time:** One minute (60 seconds) for turnout time
- **Fire response time:** Four minutes (240 seconds) or less for the arrival of the first arriving engine company at a fire suppression incident and/or eight minutes (480 seconds) or less for the deployment of a full first alarm assignment at a fire suppression incident
- **First responder or higher emergency medical response time:** Four minutes (240 seconds) or less for the arrival of a unit with first responder or higher-level capability at an emergency medical incident
- **Advanced life support response time:** Eight minutes (480 seconds) or less for the arrival of an advanced life support unit at an emergency medical incident, where the service is provided by the fire department

The standard States that the fire department shall establish a performance objective of not less than 90 percent for the achievement of each response time objective. NFPA 1710 does contain a time objective for dispatch time by requiring that "All communications facilities, equipment, staffing, and operating procedures shall comply with NFPA 1221." For the purposes of NFPA 1710, the following definitions apply:

- **Dispatch time:** The point of receipt of the emergency alarm at the public safety answering point to the point where sufficient information is known to the dispatcher and applicable units are notified of the emergency
- **Turnout time:** The time that begins when units acknowledge notification of the emergency to the beginning point of response time
- **Response time:** The time that begins when units are en route to the emergency incident and ends when units arrive at the scene

NFPA 1720 contains a time objective for dispatch time by requiring that "All communications facilities, equipment, staffing, and operating procedures shall comply with NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems." NFPA 1720 contains no time requirements for turnout and response times.

NFPA 1221 requires that 95 percent of alarms shall be answered within 15 seconds, 99 percent of alarms shall be answered in 40 seconds, and the dispatch of the emergency

response agency shall be completed within 60 seconds 95 percent of the time. The time lines for dispatching are taken from NFPA 1221:

- After the receipt of a call for assistance, the fire department will respond with the first unit to that location within three minutes.
- After receipt of a call for assistance, the fire department will respond with a unit to that location, within four minutes, to 90 percent of area served.

After receipt of a call for a medical emergency, the fire department will respond with an engine company to that location within four minutes and an ambulance within six minutes."

From the above, it may be inferred that in USA, response time varies from **(3 - 4 minutes) to 8 minutes.**

6.2.4 UK

The London Fire Brigade (LFB) is run by the London Fire and Emergency Planning Authority as part of a group of organizations operating under the 'umbrella' of the Greater London Authority. It is the third largest firefighting organization in the world, with **111 Fire Stations** (plus 1 River Thames-based station) from which it operates across the 1,587 sq km of Greater London, with its resident population of some 7.4 million. This increases by a further 500,000 each day during working hours.

In the year 2005/06 the London Fire Brigade answered some 268,000 emergency calls and attended nearly 156,000 incidents. On an average, the first fire engine arrived at an incident **within 8 minutes on 92 per cent of occasions**, meeting the Brigade's target, and **within 5 minutes on nearly 65 per cent of occasions**. When required, a second fire engine was on scene within ten minutes on 93 per cent of occasions, exceeding the target. (Hooper, Nov-Dec, 2006; http://www.cadcorp.com/pdf/PA-firebrigade_ukv4i5.pdf).

Another recent review of "Fire and Rescue Service response times" (Fire Research Series 1/2009) concludes that response times have increased due to traffic conditions, which was similar to the finding of the London Fire and Emergency Planning Authority thematic report, which concluded that it now ***takes 50 seconds longer for a 1st appliance to arrive on average and one minute longer for a second appliance.***

From the above, it may be inferred that in UK, response time varies from **5 to 8 minutes.**

6.2.5 INDIA

"Standing Fire and Advisory Council (SFAC) reviewed the norms in various countries, and as given in the RFP, has laid down norms for the Fire and Emergency Services throughout the country based on:-

- *Response time, fire risk, and population*
- *Depending on risk category A, B, and C the recommended response time for first fire tender is 3, 5, and 7 minutes, respectively*
- *One Fire Station per 10 sq. km in urban areas and one Fire Station per 50 sq. km in rural areas*
- *One Rescue Tender per 3 – 10 lakhs population*
- In rural areas, the recommended response time is 20 minutes

From the above, it can be inferred that SFAC norms are based on the idealized conditions of the western world and would be too demanding, thus requiring some modifications.

To see the practicability of SFAC norms, RMSI did several simulations through *network analysis* taking different average vehicle speeds for Delhi State. These different speed simulations were presented on Nov. 02, 2011 to DFS officials and on Nov 03, 2011 to Fire Advisor and Deputy Fire Advisor at DG, NDRF, MHA. After discussions with both DFS and MHA officials, the average fire vehicle speeds on main roads has been taken as 40 km/hr and minor roads as 20 km/ hr. While, for congested areas, such as Sadar Bazar, Delhi, the average fire vehicle speed on main roads has been taken as 20 km/hr and for minor roads as 10 km/hr, respectively. RMSI choose Delhi, because it has a high density of Fire Stations in comparison to the rest of the States/UTs.

Taking SFAC norms as a guideline, RMSI analyzed the requirements of Fire Stations in Delhi, keeping a response time of 3 minutes for very high-risk category, 5 minutes for high category and taking response time in rural area as 20 minutes. *It may be noted that areas served by other agencies, such as the Airport and Military Cantonment have been excluded from the gap analysis, so that there is no duplicity of Fire Stations in those areas. Additionally, areas covered by forests, rivers, sparsely inhabited (small pockets of a few houses, say in a river channel) etc. have also not been considered in the gap analysis.* To make a distinction, the Fire Stations in rural areas are designated as **Fire Stations/Fire Posts**.

Thus, taking the vehicle speeds discussed earlier, and response time as per SFAC norms, Delhi requires additional **120** Fire Stations in urban areas and **10** rural Fire Stations/Posts in rural areas (Table 6-1).

Table 6-1: Number of operational and additional Fire Stations and Fire Posts required in Delhi

Urban		Rural	
Operational Fire Stations	Additional Fire Stations	Operational Fire Stations/ Fire Posts	Additional Fire Stations/ Fire Posts
51	**120**	**1**	**10**

As per SFAC norms, one Fire Station is required per 10 sq. km in urban areas and per 50 sq. km in rural areas. This seems to be based on average area per station over a large area/State.

From the above analysis, the average area per Fire Station in urban areas in Delhi comes to 4.7 sq km, while in rural area; it comes to 62.5 sq km. This analysis also shows that the average Fire Station coverage area in urban areas is too low when compared to the norms specified by SFAC, which is 10 sq km in urban area. Moreover, population covered in such a small area of less than 5 sq km is sometimes very low to justify opening of a new Fire Station, thus contradicting the area based norm of SFAC. Moreover, additional required number of Fire Stations will be too high and it may not be possible to set-up so many Fire Stations in Delhi, where land availability in urban areas is scarce.

Thus, keeping in view the above analyses, RMSI reanalyzed the requirements of Fire Stations in Delhi, by modifying the response time of 5 - 7 minutes for various risk categories and keeping the response time in rural area as 20 minutes. Accordingly, the proposed requirement of additional number of Fire Stations in urban and rural areas is shown in Table 6-2. In terms of average area and population served by the revised response time, the average area served comes to 8.38 sq km (close to 10 sq km) in urban areas serving an average population of 1, 61,289.

Table 6-2: Revised number of operational and additional Fire Stations and Fire Posts required in Delhi

Urban		Rural		Total
Operational Fire Stations	Additional Fire Stations	Operational Fire Station/ Fire Post	Additional Fire Stations/ Fire Posts	
51	**46**	**1**	**9**	**107**

As discussed in section 6.2.4, Greater London Authority operates 112 Fire Stations in an area of 1,587 sq km of Greater London, which is equivalent to on an average one Fire Station per 14.2 sq km. A comparison of the proposed 107 Fire Stations serving an area of 1483 sq km Delhi shows that in Delhi there will be one Fire Station on an average area of 13.9 sq km, which is almost equal to the average area per Fire Station in Greater London.

Thus, keeping in view the above analyses, RMSI recommend to modify the SFAC norms *(response time and area based)* to *response time based* norms for positioning a Fire Station, as response area will vary from place to place depending upon the road network:

Depending upon the risk category, the recommended response time for first fire tender is 5 - 7 minutes in urban areas and 20 minutes in rural areas.

Annex-1: Fire Headquarter Data Collection Form

This questionnaire is prepared in consultation with Directorate General NDRF & CD for collecting basic information all fire infrastructure in the country as part of the project "Fire-Risk and Hazard analysis in the Country" with an objective to Prepare Capital Investment and Institutional Strengthening Plan for Accelerated Development of Fire Services in the Country. All information collection through this questionnaire will be kept confidential and will only be used for the preparation of the report and other deliverables of the project. Directorate General NDRF/ CD has entrusted RMSI Private Limited to carry out this assignment and State Officials are requested to provide required authentic information which is very important for preparation of this report and future development plans of the department.

A. Fire Headquarters General Information

HQ Ref #.....

Location Details

Fire Headquarters/Zone/District Office ---------- State ----------
Address ……..
……..
Office Phone numbers (with STD code):…… Fax ……Web site (if any)……
Name & Designation of the Head of Department: ……
Name & Designation of the nominated person by the dept. for providing data:
……
Mobile number …….. Email (s):……

Area under Jurisdiction

Zonal Office (name and street address)	Num of districts covered	Census 2011 Population (to be filled by RMSI)	Num of Fire stations (Operational)	Num of Fire stations (under Construction)	Num of Fire stations proposed for future expansion

Surveyed by: **Date:** (Signature of the official provided the information)

Area under Jurisdiction in each Zonal Office (provide jurisdiction map for each individual Fire Station)

Name of Zonal office …….

S.N.	Name of Fire stations	Name of district	Under direct Jurisdiction control of [1]	Population (to be filled by RMSI)	Num of Fire stations (Operational)	Num of Fire stations (under Construction)	Num of Fire stations proposed for future expansion	Any additional Information

Name of Zonal office …….

S.N.	Name of Fire stations	Name of district	Under direct Jurisdiction control of [1]	Population (to be filled by RMSI)	Num of Fire stations (Operational)	Num of Fire stations (under Construction)	Num of Fire stations proposed for future expansion	Any additional Information

[1] State Government Fire Department Police Department Municipal Corporation Others specify

Name of Zonal office ……

S.N.	Name of Fire stations	Name of district	Under direct Jurisdiction control of [1]	Population (to be filled by RMSI)	Num of Fire stations (Operational)	Num of Fire stations (under Construction)	Num of Fire stations proposed for future expansion	Any additional Information

Please add additional sheets if required

C. Details of Proposed Fire Station

S.N.	Name of the Site for Proposed Fire Station	District	Status of Work in Progress, (e.g. approval awaited, plan cleared, land acquired/ allocated, % of construction completed)	Remarks

Please attach additional sheets if required

D. Human Resources and Staff Welfare (Please attach additional sheets for each zonal, divisional, and sub-div. Fire Stations)

Organization Structure and Human resources (Operational Staff including higher level officers)

By State/ zonal Level

Zone Name ……..

Level	Designation	Pay-scale	Duty Pattern	Number of sanctioned posts	Total Number of Filled posts	Total No of Vacant posts	Remark, if any
11	Director General / Asst. Director General						
10	Director / Deputy Director						
9	Divisional Officer (D.O.)/ Fire Prevention Officer						
8	Station Officer (St. O)						
7	Sub Officer (S.O)						
6	Fire Engine Operator cum Driver (FEOD)/ Leading Fire Operator (LFO)						
5	Fire Operator (FO)						
4	Cleaner/ Sweeper						
3	Other Officers (Chief Mobilizing Officer/						

	Mobilizing Officer/ Asst. Mobilizing Officer)						
2	Other Officers (Mechanical Superintendent/ Foreman)						
1	Other Staffs (Mechanic/ Mechanic-Helper)						
Any Other							

Please attach additional sheets if required for each Fire zonal region/ division human resources *(broad categories of designations are mentioned below for reference)*

Level 10*: Director General/ Director;* ***Level 9****: CFO/ CO;* ***Level 8****: Deputy CFO/Joint Director;* ***Level 7****: AD/Deputy Controller/Deputy Director/DO;* ***Level 6****: ADO/ Inspector/EO/Fire Supervisor;* ***Level 5****: DFO/ADFO/AFO/Fire In-charge;* ***Level 4****: St.O/Sub Inspector/Station In-charge/ASt O./AEO;* ***Level 3****: S O/Assistant Sub Inspector/ASO/Sub-Fire Officer/;* ***Level 2*** *: LFM/ Mechanic Driver/Head Constable/Store Superintendant;* ***Level 1*** *: FM/ FM Driver/Radio Technician/ SGFM/ Driver/ Police Constable/ Wireless Technician/ Radio Technician/ Asst FM/ Sanitary Inspector, FO/FO Driver/Driver Operator/Driver/Ambulance Driver/ Clerk;* ***Level 0:*** *Cleaner, Fire Coolie, Supporting Staff, Attendant, Labourer, Peon, Security Guard, Cleaner, Tindal.*

Recruitment Rules for entry level in oragnization chart (Please provide copy of State recruitment rules in detail)

Level	Designations	Essential qualification as per recruitment rule	Preferential	Training / Experience	Departmental Reservation policy if any
8					
7					
6					

5					
4					
3	FEOD				
2	Leading Fire Operator				
1	Fire Operator				
Any Other					

Staff Welfare:

Please list the Staff welfare measures being followed in the State:

Ration money: Rs…….
Sports facilities: ……
TV for common room: …….
Cash rewards and recognition: Rs…….
Incentives, through benevolent fund: Rs…….. ……
Insurance: Rs…….....
Other schemes etc……

Measures to Improve Staff Efficiency

S. no	Type of Drill	Frequency *(Daily/Weekly, Bi-Monthly, Quarterly)*	Remarks
1.	**Squad Drill**	Daily	
2.	**Pump/ Hose Drill - Dry**	Weekly	
3.	**Pump/ Hose Drill - Wet**	Bimonthly	
4.	**Ladder/ Rescue Drill**	Monthly	
5.	**Rope Rescue Drill**	others	
6.			
7.			

E. Training Details

Name of State Training Centre and address: ……

Number of Faculty/Trainers with Designation: ……
……
……

S. N.	Name of Training Courses	Duration (months)	Maximum capacity	Number of personnel Trained annually	Year
1					
2					
3					
4					

Training obtained by fire-staff annually (sub-officer course and above)

Year	Type of Training Obtained/ name of training course	Within State Training Centre	At NFSC, Nagpur	Other State Training Centre (mention City, State)	Foreign country	Total Number of personnel Trained
2011						
2010						
2009						
2008						

2007						
2006						

Please provide yearly break-up for the last 5 years

Training Centre Infrastructure for basic training and sub-officer course: Provide details of facilities at the training centre, short comings etc.

……
……
……
……
……
……

F. Inventory of Equipments

Division Wise Fire Vehicles

Fire Station Name ----------

Division/ Station Name	Number of Deployment of fire fighting units											
	water tender	Water Browser	Foam Tender	Dry Chemical Powder Tender	Emergency Tender/Rescue Tender/ Rescue Responder	Motor Pump	Motor Cycle	BA Van	Hose Tender	Aerial Ladder Platform	Hazmat Van	Others

Please provide separate list for working, non-working and under procurement

Additional Equipments

Fire Station / District/ Division Name ----------

Division/ Station Name	Gas Cutters	Bolt Cutters	B.A. Sets with B.A. Comp	Circular Saw with Diamond Blade(Electric)	Electric Hammer	Chain Saw-Concrete	Chain Saw-Wood	Pneumatic Lifting bags	Hydraulic Spreader and Cutters/ Cobmi-tool	Rescue Boats

Any other not covered in above list

…….

……..

……..

Please provide separate list for each division/district

G. Communication between HQ and Zonal/district office

Details of Control rooms

Centralized Control Room for the entire State: Yes / No, if yes please provide location and street address:

S.No	Name of Control Room for the Division/district	Size in terms of number of Emergency Fire Telephone (EFT) lines	Command and Control		Remark
			Manual	Computerized	
1					
2					
3					
4					

State Communication centre is connected with Zonal/District office through: Internet/Intranet/Wireless/Telephone lines

State Communication centre is connected with individual Fire Station through: Internet/Intranet/Wireless/Telephone lines

Frequency of Fire Report Transmission:

From Individual Fire Station to District/Zonal Hq: Instantaneous, daily, weekly, bi-weekly/monthly
From Individual Fire Station to State Hq: Instantaneous, daily, weekly, bi-weekly/monthly
From Individual District/Zonal Hq to District/Zone Hq: Instantaneous, daily, weekly, bi-weekly/monthly

Does State have a communication policy?*, if yes, please provide a copy of the report:*

Does State have any approved plans to improve communication?, if yes, please provide a copy of the plan:

H. Financial Details

Name of Zone

……

(If information provided zone wise)

Budget for year ……..

Plan			Non-Plan		
Capital (Rs)	**Revenue (Rs)**		**Capital (Rs)**	**Revenue (Rs)**	
	Equipment			Equipment	
	Maintenance			Maintenance	
	POL			POL	

Please repeat if information is available for each zone/ State more than one year

I. Fire and other Incidences Summary (last 5 years)

Please provide information for each Fire Station, and District/division and Headquarter Level summary

Name of Station …….

Number of Fire and other Incidence (P= Public and FS= Fire Service)

Year	Total Calls (A+B+C+D)	Total Fire Incidence (A)	Occupancy wise break up of fire incidence				Total Rescue incidence (B)	Break up of Rescue incidence				Special service calls (C)	False/ malicious calls (D)	Total injured		Num of Deaths	
			Residential	Industrial	Institutional/ commercial	Others		Road Accidents	Building collapse	Animal	Others			P	FS	P	FS
2010-																	
2009-																	
2008-																	
2007-																	
2006-																	

Severity of fire incidences at each Fire Station, and District/division and Headquarter Level summary

Year	Total no of Small Fire Incidence	Total no of Medium Fire Incidence	Total no of Serious Fire Incidence	Brief description of Major Fire Incidence
2010-11				
2009-10				
2008-09				

Year	Total no of Small Fire Incidence	Total no of Medium Fire Incidence	Total no of Serious Fire Incidence	Brief description of Major Fire Incidence
2007-06				
2006-07				

(Attach additional sheets for each region/ and addition year)
Please provide definition of fire types

……
……
……

Severity of events: Small fire – estimated loss of Rs. 10 lakh, Medium – Rs. 10 to 50 lakh, Serious - >Rs. 50 lakh, any fire where there is human death to be consider as Serious fire. (As per the compendium, even there is causalities, it is considered as serious, but the causality severity not mentioned

J. Public Awareness Programmes

Public Awareness Programmes organized in last One Year
Name of Zonal/district Office …….

Total no. of programs in the year including Fire Safety Week (a +b + c)	Total no. of persons attended (d + e + f)	No of Programs Organized			No of Persons attended			Brief description of the programmes
		Govt./ PSU (a)	Pvt. Locations (b)	Schools (c)	Govt./ PSU (d)	Pvt. Locations (e)	Schools (f)	

K. Suggestions/views of the department for improvement of fire and emergency service in the State

1.
2.
3.
4.
5.
6.
7.
8.

L. Contact person Details for Communication at RMSI (On behalf of DGCD, Fire Project Cell):

Postal Address:

Mr Sushil Gupta
General Manager,
Risk Modeling and Insurance,
A-7, RMSI, Sector-16, NOIDA
PIN 201301 (U.P.) INDIA

Mobile- +91 9818798715
Phone (Office): +91 0120 2511102/ 2512101 ext 2612
(Office): +91 120 4040512 (direct)
Fax (Office): +91 0120 2511109/ 2510963
email<Sushil.Gupta@rmsi.com>
<sushilgupta74@yahoo.com>
www.rmsi.com

Annex-2: Fire Station Survey Form

This questionnaire is prepared in consultation with Directorate General NDRF & CD for collecting basic information all fire infrastructure in the country as part of the project "Fire-Risk and Hazard analysis in the Country" with an objective to Prepare Capital Investment and Institutional Strengthening Plan for Accelerated Development of Fire and Emergency Services in the Country. All information collection through this questionnaire will be kept confidential and will only be used for the preparation of the report and other deliverables of the project. Directorate General NDRF has entrusted RMSI Private Limited to carry out this assignment and State Officials and Official in-charge of Fire Station are requested to provide required authentic information which is very important for preparation of this report and future development plans of the department.

SW FS Ref #.....

A. Fire Station General Information

State	District	City/ Town	Block / Tehsil	Municipality	Latitude , Longitude (to be filled by RMSI)(DDM format)		ID

Fire Station Name ……

Address of the Fire Station (with landmark) …….

Station Phone number(s) with STD code: 1) …….. 2)……. 3)……

Fax No: ……..

Emergency No: ……...

Fire Station Type based on served area: Urban ☐ ***Rural*** ☐

Name of officer in-charge …… Designation ……..

Mobile number *(officer in-charge)* : ……..

Fire station is under the administration of (put tick mark in the box)

State Government ☐ Municipal Corporation ☐ Police Department ☐ Others specify…….

The Fire Station falls under the jurisdiction of (Division/Zone/Municipality) -…….

Name of Administrative District/Divisional/Zonal Fire Officer- ……..……Mobile……..

Address/location of District/Divisional/Zonal HQ- ……

Number of total Fire Stations fall under above jurisdiction/ administration- ……

Surveyed by: **Date:**

(Signature of Witness from Fire Department)
Name & Designation

B. Fire Station Infrastructure Details

Does Fire station has its own building: Yes in good condition, Yes, but condition is not good & need new building.

No permanent building

If Fire Station is temporarly operational from borrowed/ rented building of ……(Private, Muncipallity, Police, any other ……)

Please mentioned the status : Land acquired -…Yes/ No… and building under construction -……Yes/ No….

How many bay station should be in new Fire Station building

If permanent building - Fire station belongs to State Fire Department / State Government / Municipal Corporation / Police fire Service/ any other

Provide building details

Number of Floors	Number of Rooms	Approx Plot Area (SQM)	Approx Built-up Area (SQM)

Whole Fire Station Building Structure Type : Pacca - Reinforced concrete (RCC) frame structure Pacca -Masonry with RCC Roof Pacca Masonry walls with flexible Roof Kachha masonry walls with Tin Roof Kaccha Tin shade Temp Porta- cabins Kaccha wooden structure with tin Roof Others kaccha type specify ……

Mixed (kachha and pacca) (in case different parts of Fire Stations has different structrure types)

If whole station building is not a permanent (Pacca) building structure and need new partiall building, please specify the details of partial components that needs to be build

Vehicle bays (with num of bays) Fire station office building Barracks Staff quarters

Age of building structure/ year of construction- …….. (write year in the blank space and tick in the box below)

Less than 5yrs 5-10 yrs 10-20yrs More than 20 yrs

Number of Bays/Garages for the Fire Vehicles - , How many fire vehicle parked within Bay/ Garage

Structure of Bay/ Garrage- Pacca- RCC/Masonry Kaccha Tin Shade Open any other kaccha ……..

Availability of Staff Quarters - Yes No , If Yes, mention numbers……

Availability of Barracks - Yes ☐ No ☐ , If Yes, mention numbers and total capacity…… ,……

Availability of T.V. in Barracks - Yes ☐ No ☐ Any other entertainment indoor/ outdoor……

Provision of Mess/ Canteen facilities in Fire Station- Yes ☐ No ☐

Availability of Watch room /Control Room- Yes ☐ No ☐ If yes, is it computerized - Yes ☐ No ☐

Is Watch room /Control room online/ internet connected with zonal/ headquarter Yes ☐ No ☐

Availability of drill/ parade ground - Yes ☐ No ☐ Availability of hose drying/ drill tower - Yes ☐ No ☐

Power Supply in the Fire Station Watch Room/ Control Room -

Electricity: Uninterrupted 24 Hrs ☐ Interrupted supply ☐ Availability of standby generator ☐ Inverter for control room ☐

Does the Fire Station maintain ambulance unit ? Yes ☐ No ☐

C. Communication Systems

1. Between Public and Fire control room/ watch room
   i. Landline Telephone: Yes ☐ No ☐ , If 'Yes', mention number of land line phone in operation…….
   ii. Emergency phone number- 101 or,……..Connection Type : Direct ☐ Indirect ☐ Not Available ☐
2. Hotline between Important agencies and Fire control room
   Oil industries/ storage ☐ Airport ☐ PCR ☐ Banks ☐ District Magistrate Office ☐
   Others specify…….
3. Automatic Fire Alarm between High Rise Buildings and Fire Station: Yes ☐ No ☐ If yes, num. of buildings …….
   If with any other agency, specify: ……

Availability of GPS on Fire Engines and other vehicles - Yes ☐ No ☐ , If Yes, mention number of vehicles: ……..

4. Between Fire Station Control Room and Fire Vehicles
   Static Wireless Set in watch room Yes ☐ No ☐ If 'Yes', mention number of operational phones …….
   Number of Mobile wireless sets: ☐ Number of Walky-Talky: ☐ Number of Satellite Phones: ☐
5. Type of Frequency used- HF ☐ VHF ☐ UHF ☐

D. Water Supply Details for Fire Fighting Purpose

Whether 24 hours water available in fire vehicles? Yes ☐ No ☐

Water sources used by Fire Vehicles within Fire station

Direct supply… ☐ .. b) Overhead tank ☐ c) Pumping from underground tank … ☐

d) Pumping by Tube well ☐ .. e) any other ……

Any storage of water within Fire Station for fire vehicles- Yes ☐ No ☐

Water sources regularly used by Fire Vehicles outside Fire station (also mention distance in km from Fire Station)

City over-head tank with coupling arrangements ☐ River ☐ Stream ☐ Well ☐ Pond ☐ Lake ☐

Other location / static fire hydrant available in the vicinity - Yes ☐ No ☐ , If 'Yes', provide number and distance (km) ……,……..……

Overall, is there any scarcity of water for fire vehicles- Yes ☐ No ☐

E. Human Resources

Permanent Staff Details- :

S. no.	Designation	Total Number of Permanent Working Staff	Duty pattern/ Shifts (hrs)	Vacant, but sanctioned posts	Numbers of temporary/ contract persons (if any)
1.	Senior Fire Officers		24 hrs		
2.	Station Officer (St.O)/(FSO)				
3.	Sub Officer (S.O)/FSSO				
4.	Leading Fire Men (LFM)				
5.	Driver				

S. no.	Designation	Total Number of Permanent Working Staff	Duty pattern/ Shifts (hrs)	Vacant, but sanctioned posts	Numbers of temporary/ contract persons (if any)
6.	Fire Man (FM)				
7.	Sweeper				
8.	Cook				
9.	Any other				
10.	Any other				

Total Permanent Staff in the Fire Station [ ] Details of Temporary staff/ Contract persons (if any)……

***Level 10**: Director General/ Director; **Level 9**: CFO/ CO; **Level 8**: Deputy CFO/Joint Director; **Level 7**: AD/Deputy Controller/Deputy Director/DO; **Level 6**: ADO/ Inspector/EO/Fire Supervisor; **Level 5**: DFO/ADFO/AFO/Fire In-charge; **Level 4**: St.O/Sub Inspector/Station In-charge/ASt O./AEO; **Level 3**: S O/Assistant Sub Inspector/ASO/Sub-Fire Officer/; **Level 2** : LFM/ Mechanic Driver/Head Constable/Store Superintendant; **Level 1** : FM/ FM Driver/Radio Technician/ SGFM/ Driver/ Police Constable/ Wireless Technician/ Radio Technician/ Asst FM/ Sanitary Inspector, FO/FO Driver/Driver Operator/Driver/Ambulance Driver/ Clerk; **Level 0:** Cleaner, Fire Coolie, Supporting Staff, Attendant, Labourer, Peon, Security Guard, Cleaner, Tindal.*

Mode to maintain Physical Fitness

S. no	Type of Drill	Yes/No	S. no	Type of Drill	Yes/No
8.	P.T./ Parade	Daily/……	4.	Vehicle maintenance	Weekly/Monthly/Quarterly/……
9.	Fire Drill	Daily/Weekly……	5.	Any other	……
10.	Games	Daily/ ……			

F. Fire Risk Covered in the Area under Jurisdiction

Jurisdiction of Fire Station (in approx sq km) ……*(collect current* jurisdiction *map from the Fire Station)*

Fire Risk	If Yes, Brief description of its Name, Type, Risks involved	Dist. From FS (km)	No. of Units
Old city Area/ congested areas			
Jhuggi -Jhopdi (Thatched House Clusters)			
Industrial Area (also mention whether small/medium/large scale)			
Industrial Area (any other)			
High-Rise Buildings (>15m height)			
Major Scrap yards (Iron/Wood etc)			
Oil Mills/Storage/Processing Units			
Refineries			
Underground Gas pipe lines			
LPG Bottling Plant			
Water –Treatment Plant (chlorine cylinders)			
Bulk Fuel Storage Area/ Petrol Pump			
Major Hazardous (MAH) units			

Fire Risk	If Yes, Brief description of its Name, Type, Risks involved	Dist. From FS (km)	No. of Units
Explosive manufacturing/stores			
Port/ dockyard area			
Railway Station			
Airport Area			
Wild Forest-Area			
Vicinity to Coast			
Army Ammunition Storage			
Cross-Border Shelling			
Any other			
Any other			

Availability of water for Fire Fighting in High-Rise Building as per National Building Code (NBC) - All ☐ Few ☐ No ☐

Applicability of NBC/ local laws in District/ State for fire safety of High-Rise building - All ☐ Few ☐ No ☐

Applicability of NBC/ local laws for fire safety in industrial and other buildings- All ☐ Few ☐ No ☐

G. Status of Fire Fighting Vehicles (attach separate sheet if number of vehicle are more than space provided below)

(Total number of Fire Fighting Vehicles at station ……..…)

Sl No	Fire Vehicle Type	Fire Dept. Vehicle Number	Vehicle Registration Number	Make	Year of Fabrication (age)	Size/ water capacity (ltr)	Pumping capacity/ size (LPM)	Comm. System mounted on vehicle	If not in running condition (off road)
	Water Tender (WT) 1							Wireless / GPS	Minor/ Major/Condemned
	Water Tender (WT) 2							Wireless / GPS	Minor/ Major/Condemned
	Water Tender (WT) 3							Wireless / GPS	Minor/ Major/Condemned
	Water Bowser (WB) 1							Wireless / GPS	Minor/ Major/Condemned
	Water Bowser (WB) 2							Wireless / GPS	Minor/ Major/Condemned
	Foam Tender (FT)							Wireless / GPS	Minor/ Major/Condemned
	DCP Tender					kg		Wireless / GPS	Minor/ Major/Condemned
	Multi-purpose Tender							Wireless / GPS	Minor/ Major/Condemned
	Hose Tender (HT)							Wireless / GPS	Minor/ Major/Condemned

Sl No	Fire Vehicle Type	Fire Dept. Vehicle Number	Vehicle Registration Number	Make	Year of Fabrication (age)	Size/ water capacity (ltr)	Pumping capacity/ size (LPM)	Comm. System mounted on vehicle	If not in running condition (off road)
	Rescue / emergency tender/ responder							Wireless / GPS	Minor/ Major/Condemned
	Advanced Rescue Tender (with inst. to handle hazardous materials)							Wireless / GPS	Minor/ Major/Condemned
	Aerial Ladder Platform (ALP)							Wireless / GPS	Minor/ Major/Condemned
	Turn Table Ladder (TTL)							Wireless / GPS	Minor/ Major/Condemned
	Hazmat Van							Wireless / GPS	Minor/ Major/Condemned
	B.A. Van							Wireless / GPS	Minor/ Major/Condemned
	Quick Response Tender (QRT)							Wireless / GPS	Minor/ Major/Condemned
	Motor Cycle Mist 1							Wireless / GPS	Minor/ Major/Condemned
	Motor Cycle Mist 2							Wireless / GPS	Minor/ Major/Condemned
	Rescue Boat							Wireless / GPS	Minor/ Major/Condemned

Sl No	Fire Vehicle Type	Fire Dept. Vehicle Number	Vehicle Registration Number	Make	Year of Fabrication (age)	Size/ water capacity (ltr)	Pumping capacity/ size (LPM)	Comm. System mounted on vehicle	If not in running condition (off road)
	Fire Boat							Wireless / GPS	Minor/ Major/Condemned
	High Pressure Light Van							Wireless / GPS	Minor/ Major/Condemned
	Any Other							Wireless / GPS	Minor/ Major/Condemned

Details of Vehicles- other than Fire Fighting/ Official Use

Sl No	Fire Vehicle Type	Vehicle Registration Number	Make	If allotted to individual	Comm. System mounted on vehicle	If not in running condition (off road)
	Ambulance				Wireless / GPS	Minor/ Major/Condemned
	Motor cycle (office use)				Wireless / GPS	Minor/ Major/Condemned
	Motor cycle (office use)				Wireless / GPS	Minor/ Major/Condemned
	Jeep/ Gypsy (office use)				Wireless / GPS	Minor/ Major/Condemned
	Jeep/ Gypsy (office use)				Wireless / GPS	Minor/ Major/Condemned
	Bus/ Mini Bus				Wireless / GPS	Minor/ Major/Condemned
	Other Transport Vehicle				Wireless / GPS	Minor/ Major/Condemned
	Any other				Wireless / GPS	Minor/ Major/Condemned

H. Specialized Equipment provided (mention total quantity for all equipment including vehicle and storage)

Equipment	Number/ Quantity	Equipment	Number/ Quantity
Self rescue units ropes/slugs (ft)		Ladders (extension + hook)	
Foam compound (ltr.)		Hand controlled nozzle/ branches	
Foam making branches (tool)		Fog/ Mist Branch	
Breathing Apparatus (B.A.) Sets		B.A. Compressor	
Personal Protection Suits (multi-layer suits etc)		Combi Tool	
Personal Protection Equipment (PPE) (protection suit with BA sets etc)		Jumping cushion / sheets	
Chemical Suit		Dry Chemical Powder (DCP) Extinguisher	
Lock cutter		First-Aid Box	
Hydraulic Rescue Tool (spreader, cutter, rams)		Portable Pump	
Electric powered hammer/ floor breaker		Submersible Pumps	
Electric chain saw for wood		Pneumatic Lifting Bag (capacity -Ton)	
Electric powered concrete cutter saw		Thermal Imaging Camera	
Electric chain saw for concrete		Life Locator Equipment	
Petrol Powered Concrete Cutter Saw		Chemical Leakage/Gas Detection Kit	
Petrol Chain Saw for Concrete		Radio-active Leakage Detection Kit	
Petrol Chain Saw for Wood		Curtain Spray Nozzle	

Equipment	Number/ Quantity	Equipment	Number/ Quantity
Hydraulic Chain Saw for Wood		Escape Chutes (length m)	
Long Branch		Search Light	
Short Branch		Generator Set	
Diffuser		Robots if any	
Lifebuoy		Fire-Curtain	
Life Jacket		Floating Pump	
Diving Suit (Wet / Dry)		Smoke Exhauster/ PPV	
Fire Beater		Any Other…	
Inflatable Lighting Tower		Any Other…	

I. Other Dress Accessories

Normal Dangri	Individual issue / Group use	
Helmets (steel/leather/fiber)	Individual issue / Group use	
Gum Boots	Individual issue / Group use	
Fire retardant Dangri	Individual issue / Group use	
Any Other		

Any other incentives for staff such as ration money, insurance etc

Ration money – Yes ☐ No ☐ Amount (Rs) ……..

Insurance - Yes ☐ No ☐ Amount (Rs) ……..

J. Suggestions/views of fire-official for improvement of fire and emergency service at the station

1)……
……
……..

2)……..……
……..……
……

3)
……
……

K. Other Fire Station (nearby) not belonging to Fire Service Department

Airport / Defence Installations / Power Plant (all type) / Oil Refineries / Private Agency / Other Industries etc.

a) Name/Agency-…… cooperation with the above Fire Station …….
(in large fire only/ all small & big fires/ no cooperation)

Details of any mutual-aid scheme / ……

b) Name/Agency-…… cooperation with the above Fire Station …….
(in large fire only/ all small & big fires/ no cooperation)

Details of any mutual-aid scheme / ……

c) Name/Agency-…… cooperation with the above Fire Station …….
(in large fire only/ all small & big fires/ no cooperation)

Details of any mutual-aid scheme / ……

L. Fire Calls and other Incidence Statistics (last 3-5 years) Name of Fire Station ……

Monthly number of fire calls and other special service calls (use additional sheet to pen down the Fire Statistics for last 5 years)

Month-Year	Total Calls (A+B+C+D)	Total Fire Incidence calls (A)	Occupancy wise break up of fire incidence (if any)				Total Rescue incidence (B)	Break up of Rescue incidence (if any)				Special service calls (C)	False/ malicious calls (D)	Total injured		Total Death
			Residential	Industrial	Institutional/ commercial	Others		Road Accidents	Building collapse	Animal	Others			Minor	Major	
12-Jul																
12-Jun																
12-May																
12-Apr																
12-Mar																
12-Feb																
12-Jan																
11-Dec																
11-Nov																
11-Oct																
11-Sep																
11-Aug																
11-Jul																
11-Jun																
11-May																
11-Apr																
11-Mar																
11-Feb																
11-Jan																
10-Dec																
10-Nov																
10-Oct																

10-Sep																
10-Aug																
10-Jul																
10-Jun																
10-May																
10-Apr																
10-Mar																
10-Feb																
10-Jan																
9-Dec																
9-Nov																
9-Oct																
9-Sep																
9-Aug																
9-Jul																
9-Jun																
9-May																
9-Apr																
9-Mar																
9-Feb																
9-Jan																
8-Dec																
8-Nov																
8-Oct																
8-Sep																
8-Aug																

Please send Fire call statistics to :

Mr. Sushil Gupta (General Manager), Risk Modeling & Insurance,
A-7, RMSI, Sector 16, Noida 201301, Fax: 0120 2511109
Mobile: 08826100332, phone: 0120 4040512(direct)
Sushil.Gupta@rmsi.com

PART B

7 Delhi State

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8 Rajasthan State

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9 Maharashtra State

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10 Jammu and Kashmir State

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11Puducherry UT

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12Andaman & Nicobar Islands UT

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13Chandigarh UT

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14Haryana State

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15Himachal Pradesh State

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16Punjab State

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17Uttarakhand State

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18Uttar Pradesh State

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19Dadra and Nagar Haveli UT

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20Daman and Diu UT

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21Goa State

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22 Gujarat State

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23 Karnataka State

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24Madhya Pradesh State

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25Andhra Pradesh State

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26Bihar

26.1Introduction

Bihar is a State in northern part of India. It is the 12th largest State in terms of geographical size at 38,202 sq mi (98,940 km^2) and 3rd largest by population. It is located between latitudes 24^0 20' 10" to 27^0 31' 15" and longitudes 82^0 19' 50" to 88^0 17' 40" and shares international boundaries with Nepal in the north. It shares border with Uttar Pradesh in northwest and with Jharkhand State in the south. It is entirely land-locked State, though Kolkata sea port is not at a far away distance. Its average elevation from sea level is 173 feet. The State covers an area of 94,212 sq. km. of which only 1,095 sq. km belong to urban areas. The State has substantially larger rural area which approximately 97% of total area. Apart from this, Bihar has notified forest area of 6,764 sq. km., which is 6.8% of its geographical area.

The Bihar plain is divided into two parts by the river Ganges which flows through the middle from west to east. Other Ganges tributaries are the Son River, Budhi Gandak, Chandan, Orhani and Falgu. Though the Himalayas begin at the foothills, a short distance inside Nepal and to the north of Bihar, the mountains influence Bihar in terms of landforms, climate, hydrology and culture. Most of the area of Bihar lies in plain except Central part of Bihar which have some small hills

Bihar lies in the tropical to sub tropical region. Rainfall here is the most significant factor in determining the nature of vegetation. Bihar has a monsoon climate with an average annual rainfall of 1,200 mm. It is mildly cold in the winter, with the lowest temperatures being in the range from 2–10 °C (36–50 °F). Winter months are December and January. It is hot in the summer, with average highs around 35–40 °C (95–104 F). April to mid June is the hottest months. The topography of Bihar is such that it has a very fertile alluvial plain starting from in foothills of Himalaya in north to a few miles south of river Ganges. Bihar is also one of enriched source of minerals for the India comprising of primarily Steatite, Pyrites, Quartzite and Limestone.

The State is divided into 9 divisions, which comprises of 38 districts. The State capital is Patna, which also most populated district in the Bihar. Gaya is one of the districts in Bihar popularly known for religious tourism around the world. As per Census 2011, Bihar has a population of 103,804,637 and it is one of most populous States in India. The most populated city is Patna and least populous is Sheikhpura. The State has literacy rate is 63.82% which among the States having low literacy rate. Table 26-2 provides the district wise operational Fire Stations, estimated population served by each Fire Station.


China
Nepal
India
C h i n a
Sikkim
N e p a l
Uttarpradesh
Pashchim Champaran
Purba Champaran
Sitamarhi
Gopalganj
Sheohar
Madhubani
Supaul
Kishanganj
Araria
Siwan
Muzaffarpur
Darbhanga
Samastipur
Saharsa
Madhepura
Purnia
Saran
Vaishali
B i h a r
Katihar
Buxar
Bhojpur
Patna
Begusarai
Khagaria
Bhagalpur
Kaimur (Bhabua)
Arwal
Jehanabad
Nalanda
Lakhisarai
Munger
Sheikhpura
Rohtas
Aurangabad
Gaya
Nawada
Jamui
Banka
Jharkhand
Bengal
Chattisgarh
Orriss
Legend
District Boundary
State Boundary
Country Boundary
Railways
Highways
50 25 0 50
Kilometers
RMSI
Delivering a world of solutions
84°E
85°E
86°E
87°E
88°E
29°N
28°N
27°N
26°N
25°N
24°N
23°N

Figure 26-1: District map of Bihar

Table 26-1: Bihar Demography as per Census 2011

Bihar State	
Divisions	9
Districts	38
Sub-Divisions	101
CD Blocks	534
Number of Towns	199
Panchayats	8,471
Population	
Person	10,38,04,637
Males	5,41,85,347
Females	4,96,19,290
Sex Ratio (female per 1,000 male)	916

Table 26-2 provides the district wise details, i.e., number of operational Fire Stations, geographical, population as per Census 2011, and average estimated population served by each Fire Station in Bihar. On an average, each Fire Station in Bihar State is serving more than 10 Lakhs population.

Figure 26-2: Location of operational Fire Stations in Bihar

Table 26-2: Summary of district level operational Fire Stations in Bihar

District	Area (Sq km)	Total Population (Census 2011)	No. of Fire Stations Operational	Average Population per Fire Station
Araria	2,798	2,806,200	2	1,403,100
Arwal	520	699,563	1	699,563
Aurangabad	3,310	2,511,243	2	1,255,622
Banka	3,029	2,029,339	1	2,029,339
Begusarai	1,933	2,954,367	6	492,395
Bhagalpur	2,554	3,032,226	3	1,010,742
Bhojpur	2,427	2,720,155	3	906,718
Buxar	1,668	1,707,643	2	853,822
Darbhanga	2,508	3,921,971	3	1,307,324
Gaya	4,971	4,379,383	5	875,877
Gopalganj	2,042	2,558,037	2	1,279,019
Jamui	3,099	1,756,078	1	1,756,078
Jehanabad	1,056	1,124,176	1	1,124,176
Kaimur (Bhabua)	3,376	1,626,900	1	1,626,900
Katihar	3,036	3,068,149	3	1,022,716
Khagaria	1,492	1,657,599	2	828,800
Kishanganj	1,989	1,690,948	1	1,690,948
Lakhisarai	1,217	1,000,717	1	1,000,717
Madhepura	1,801	1,994,618	2	997,309
Madhubani	3,502	4,476,044	4	1,119,011
Munger	1,410	1,359,054	3	453,018
Muzaffarpur	3,179	4,778,610	2	2,389,305
Nalanda	2,368	2,872,523	3	957,508
Nawada	2,492	2,216,653	2	1,108,327
Pashchim Champaran	5,239	3,922,780	3	1,307,593
Patna	3,179	5,772,804	10	577,280
Purba Champaran	3,972	5,082,868	6	847,145
Purnia	3,212	3,273,127	4	818,282
Rohtas	3,850	2,962,593	3	987,531
Saharsa	1,665	1,897,102	2	948,551
Samastipur	2,686	4,254,782	4	1,063,696
Saran	2,679	3,943,098	3	1,314,366
Sheikhpura	664	634,927	1	634,927
Sheohar	442	656,916	1	656,916
Sitamarhi	2,189	3,419,622	2	1,709,811
Siwan	2,220	3,318,176	2	1,659,088

District	Area (Sq km)	Total Population (Census 2011)	No. of Fire Stations Operational	Average Population per Fire Station
Supaul	2,417	2,228,397	2	1,114,199
Vaishali	2,021	3,495,249	3	1,165,083
Total	**94,212**	**103,804,637**	**102**	**1,017,693**

26.2 Field Surveys of Fire Stations for Data Collection

To have first-hand information on the distribution of the fire service stations across the country, infrastructure availability and their status, fire fighting manpower etc., RMSI project team has carried out detailed surveys of Fire Stations and collected data though individual "Fire Station Survey Form" and Fire Headquarter Data Collection Form" as shown in Annexure 1 & 2. The collected information for each Fire Station is following categories:

1. Fire station general information
2. Fire station infrastructure details
3. Communication systems
4. Water supply details for firefighting purpose
5. Human resources
6. Fire risk covered in the area under jurisdiction
7. Status of fire fighting vehicles
8. Specialized equipments provided (Specify whether kept in vehicle or in stores)
9. Other accessories
10. Fire calls and other fire incidence statistics (last 3-5 years)

Besides the collection of field survey data, RMSI team has also collected the location coordinates (latitude, longitude) of Fire Stations using Geo Positioning System (GPS). The geographical coordinate information is used for plotting all the Fire Station locations in the map to perform GIS based spatial analyses. This is also used in the analysis of distribution of new proposed Fire Stations and gap analysis on fire-infrastructure, based on risk-category, response time, and population criteria.

26.3 Infrastructure Gap Analysis

26.3.1 Fire Station Location Gap Analysis

As discussed in section 6.2.5, response time of 5-7 minutes in urban area and 20 minutes in rural area has been considered. With network analysis, ideal jurisdiction areas have been delineated for all operating Fire Stations. In delineation of ideal jurisdiction areas, built-up areas such as various types of residential areas and industrial areas with estimated population has also been considered. After delineation of ideal jurisdiction area, un-served gaps in urban agglomeration have been identified. These un-served gaps are shown to be filled by new proposed urban Fire Stations. Table 26-3 shows district level summary of number of operational and new proposed Fire Stations with population covered within their ideal jurisdiction area.

Rural areas of Bihar State are similarly covered with new rural Fire Stations. It may be noted that rural populations are very sparsely distributed in the State. Hence, locations of rural Fire

Stations are demarcated to the nearest relatively bigger village having population of more than 5,000 -10,000 or major roads intersection. District level numbers of new rural Fire Stations are given in Table 26-3. Figures 26-2 to 26-57 depict representative detailed maps showing delineated ideal jurisdiction areas for operational and new proposed urban Fire Stations and location of new rural Fire Station in the State.

Detailed list of delineated operational, new urban and rural Fire Stations/Fire Post in Bihar State are given in Tables 26-38 and 26-39.

Table 26-3: District level number of operational and new Fire Stations in the Bihar State

District	Num of operational Fire Stations	Ideally Served Population under operational Fire Stations	Num of new urban Fire Stations	Ideally Served Population under new urban Fire Stations	Num of new rural Fire Stations	Total Fire station
Araria	2	87,054	0	0	12	14
Arwal	1	266,469	0	0	1	2
Aurangabad	2	305,468	4	183,533	13	19
Banka	1	24,687	0	0	16	17
Begusarai	6	1,086,483	4	428,979	5	15
Bhagalpur	3	509,852	6	515,393	12	21
Bhojpur	3	222,556	3	148,219	12	18
Buxar	2	116,792	2	97,323	9	13
Darbhanga	3	322,948	1	124,801	14	18
Gaya	5	568,007	2	161,688	19	26
Gopalganj	2	172,018	2	119,910	13	17
Jamui	1	52,315	1	55,655	8	10
Jehanabad	1	119,018	1	41,451	4	6
Kaimur (Bhabua)	1	37,382	2	93,605	9	12
Katihar	3	275,830	2	199,079	14	19
Khagaria	2	199,365	0	0	8	10
Kishanganj	1	115,070	0	0	9	10
Lakhisarai	1	108,158	1	55,694	2	4
Madhepura	2	128,923	1	73,189	8	11
Madhubani	4	381,207	1	27,300	19	24
Munger	3	479,564	1	122,894	5	9
Muzaffarpur	2	127,056	8	330,838	29	39
Nalanda	3	408,370	2	83,725	16	21
Nawada	2	157,220	1	28,753	11	14
Pashchim Champaran	3	241,066	3	192,747	17	23
Patna	10	2,125,525	10	1,140,579	16	36
Purba Champaran	6	524,977	2	242,505	29	37
Purnia	4	518,505	3	376,769	18	25
Rohtas	3	436,331	6	288,373	11	20
Saharsa	2	207,055	0	0	7	9
Samastipur	4	787,546	2	211,263	14	20
Saran	3	177,253	5	247,776	19	27
Sheikhpura	1	82,251	1	32,635	2	4
Sheohar	1	91,430	0	0	4	5

District	Num of operational Fire Stations	Ideally Served Population under operational Fire Stations	Num of new urban Fire Stations	Ideally Served Population under new urban Fire Stations	Num of new rural Fire Stations	Total Fire station
Sitamarhi	2	141,357	3	169,003	16	21
Siwan	2	247,311	0	0	17	19
Supaul	2	74,053	0	0	12	14
Vaishali	3	214,509	2	147,053	16	21
Total	**102**	**12,140,981**	**82**	**5,940,732**	**466**	**650**

Figure 26-3: Fire stations gap analysis for Arariya rural area

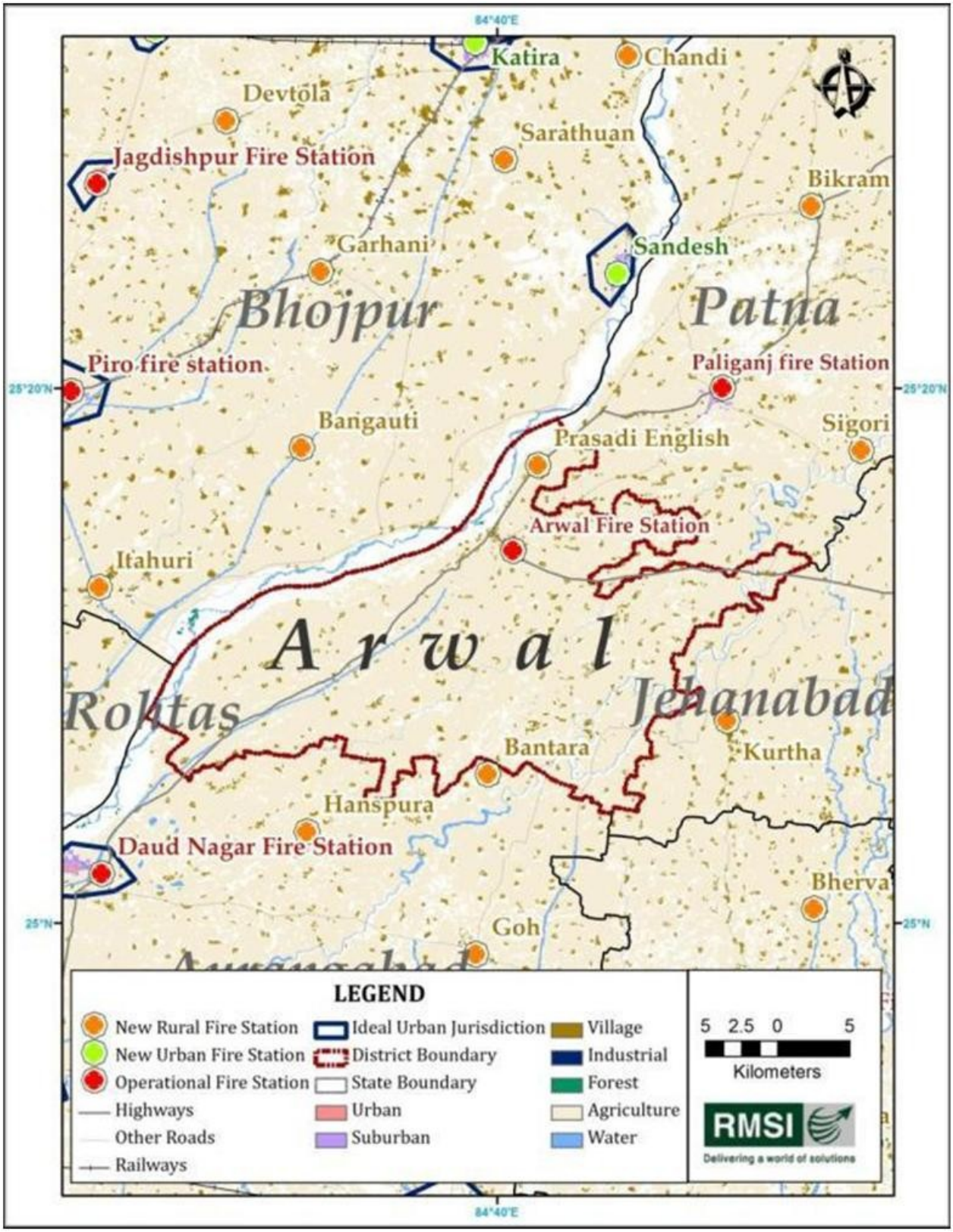

Figure 26-4: Fire stations gap analysis for Arwal rural areas

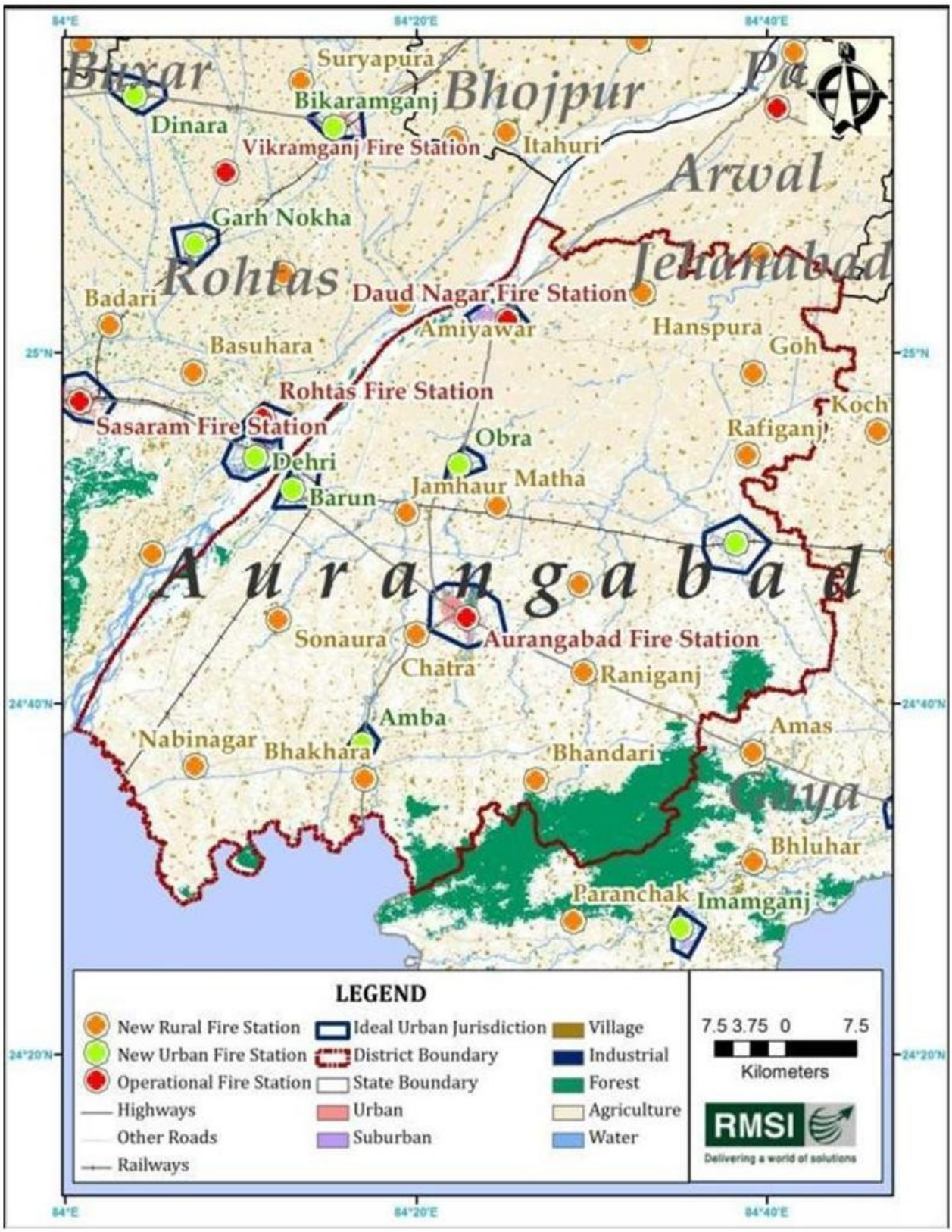

Figure 26-5: Fire stations gap analysis for Aurangabad rural area

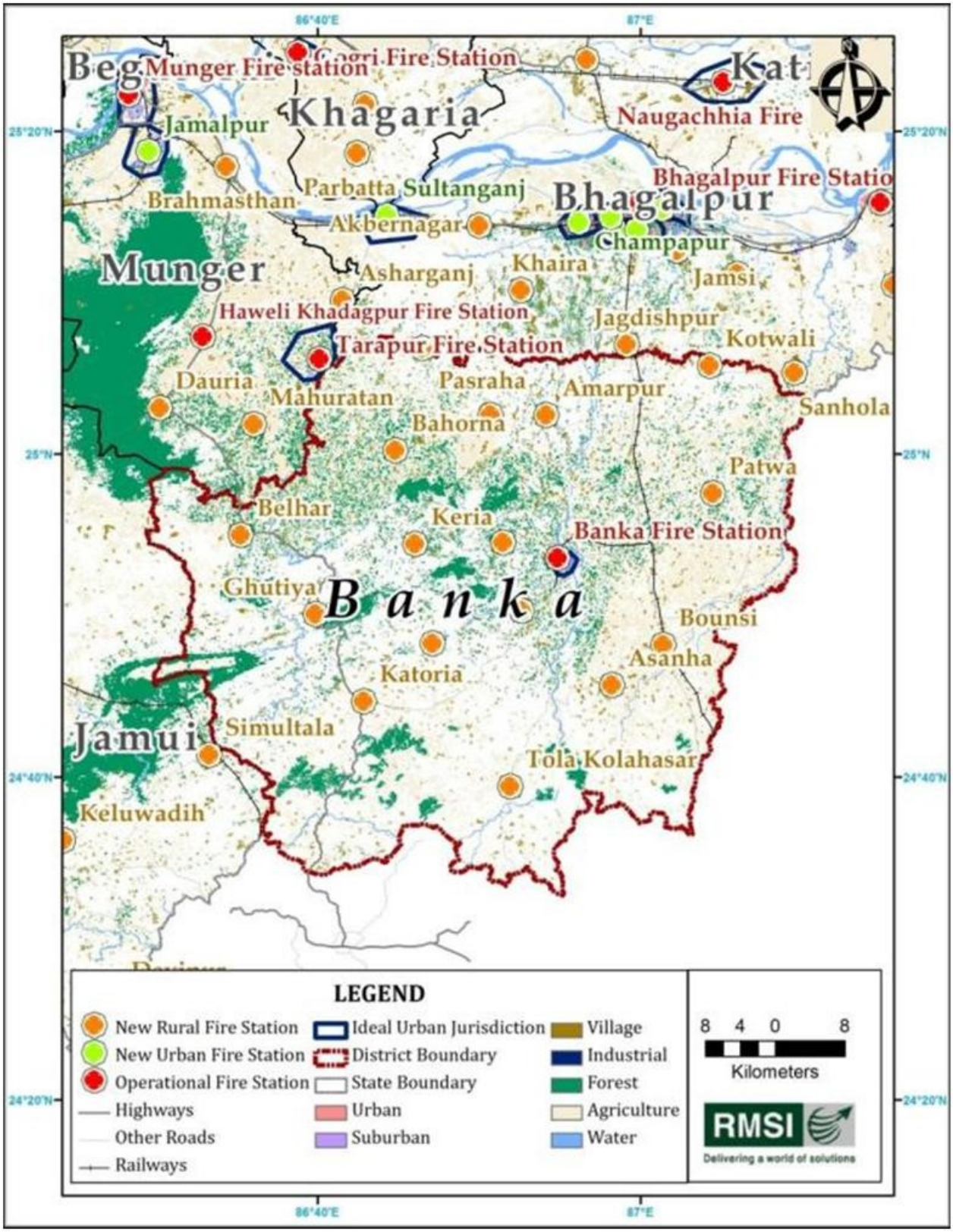

Figure 26-6: Fire stations gap analysis for Banka rural area

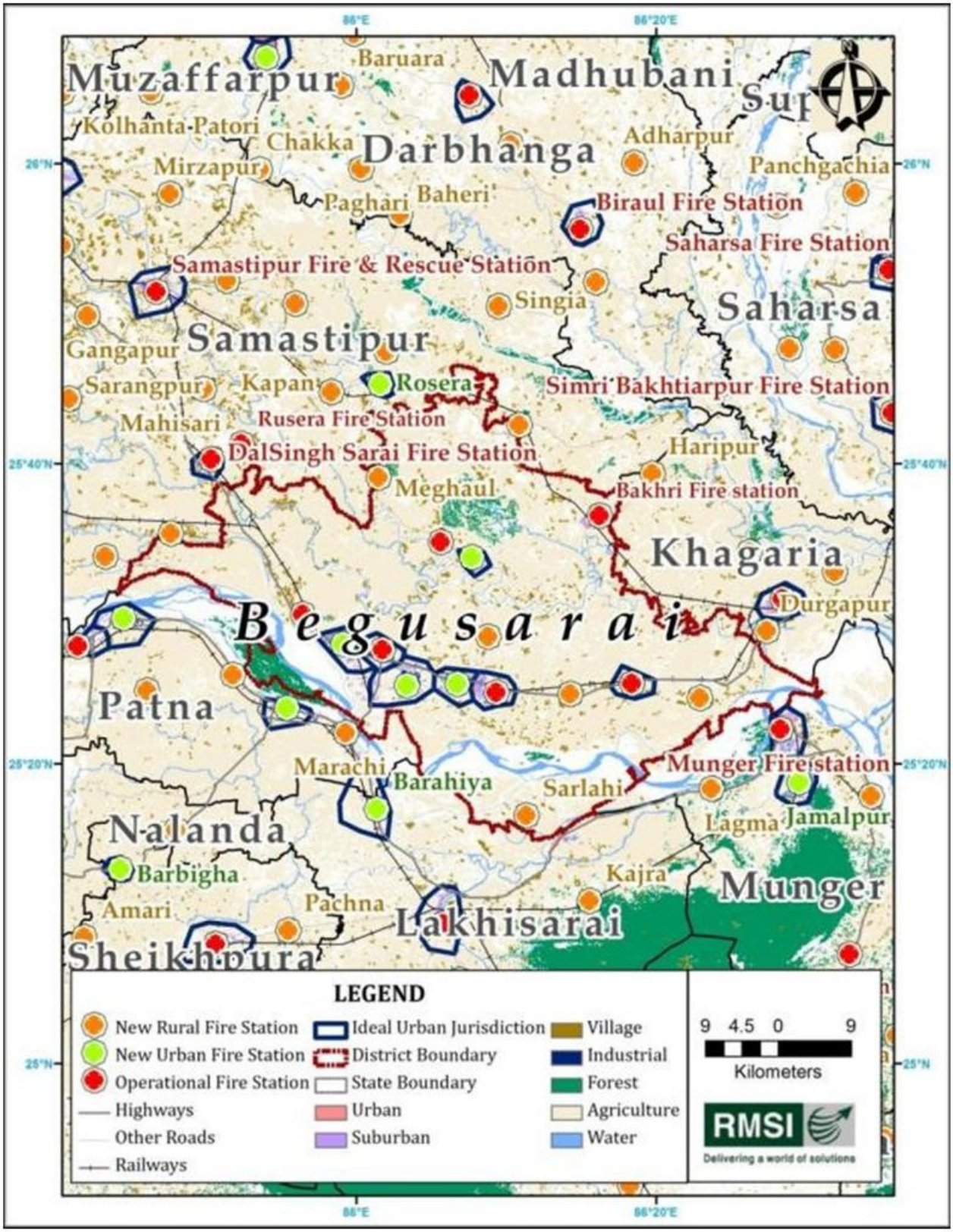

Figure 26-7: Fire stations gap analysis for Begusarai rural area

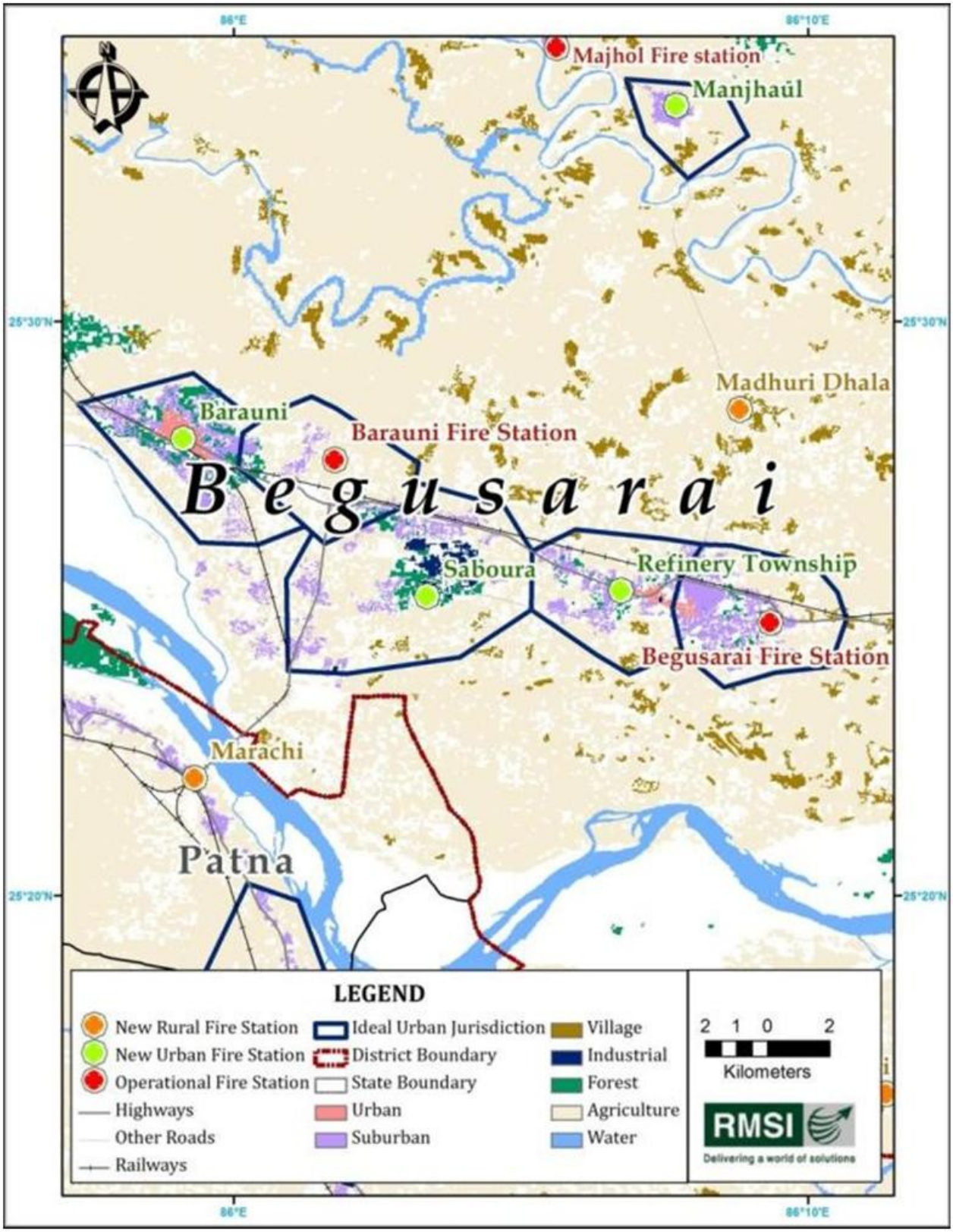

Figure 26-8: Fire stations gap analysis for Begusarai urban area

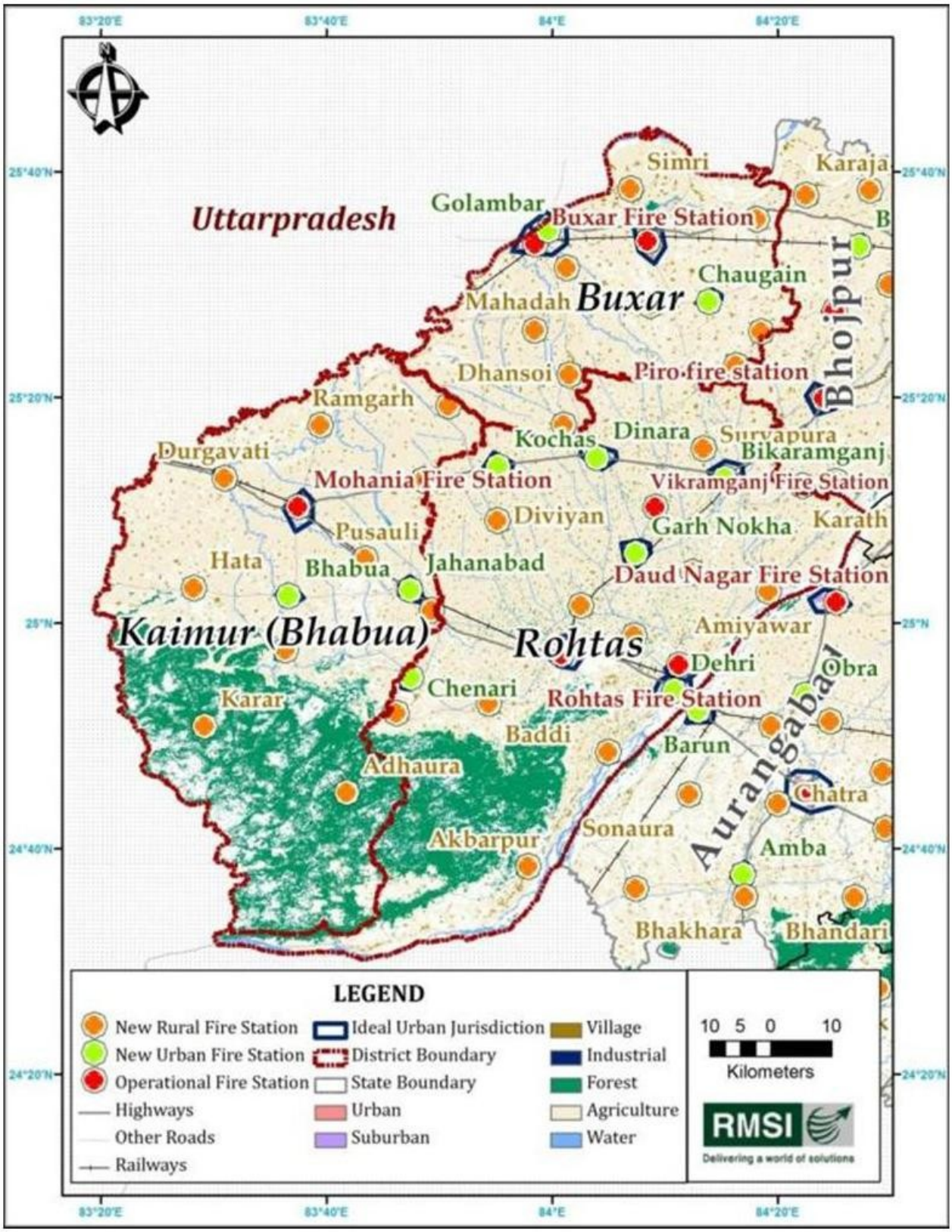

Figure 26-9: Fire stations gap analysis for Bhabhua Buxar Rohta rural area

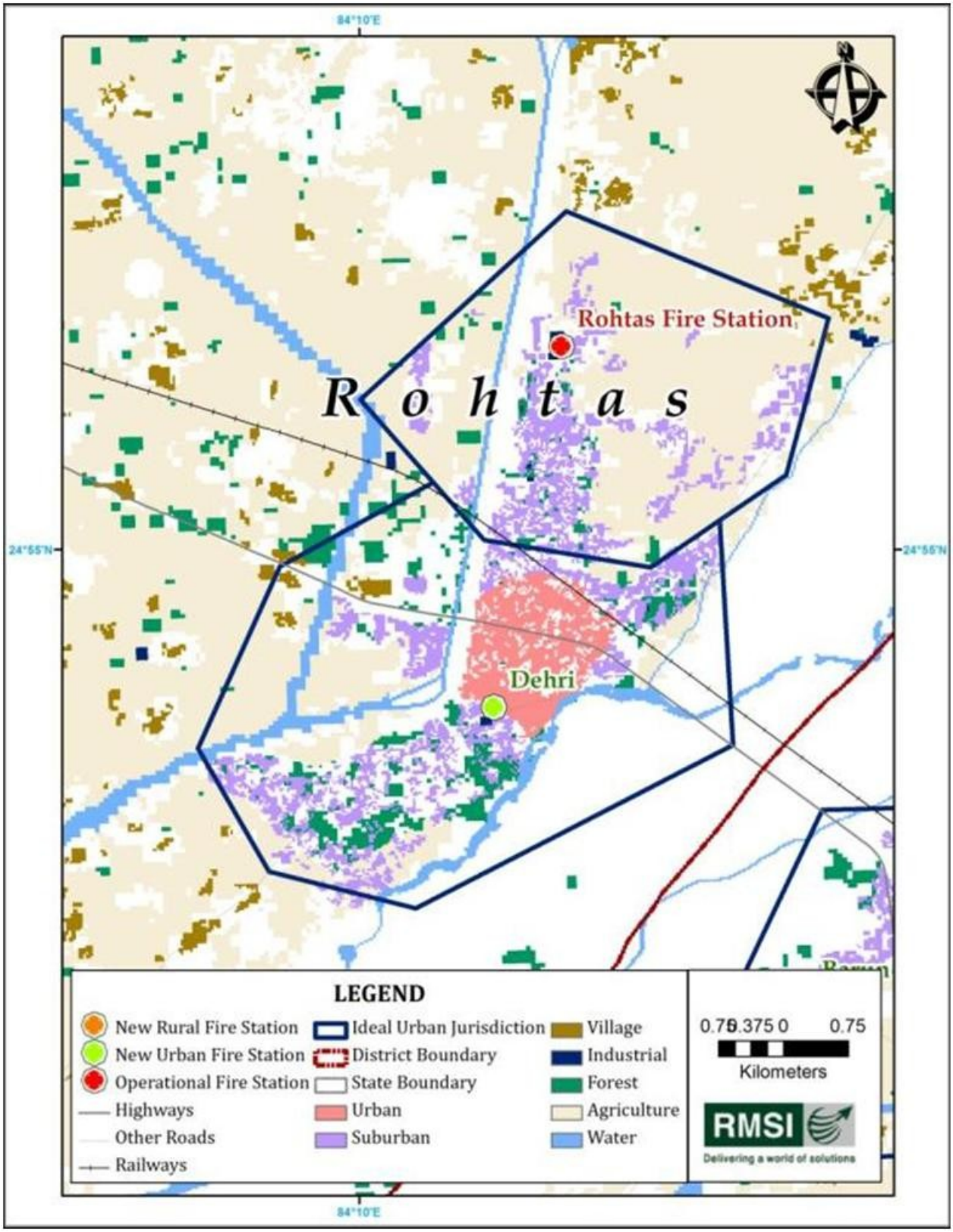

Figure 26-10: Fire stations gap analysis for Rohta urban area

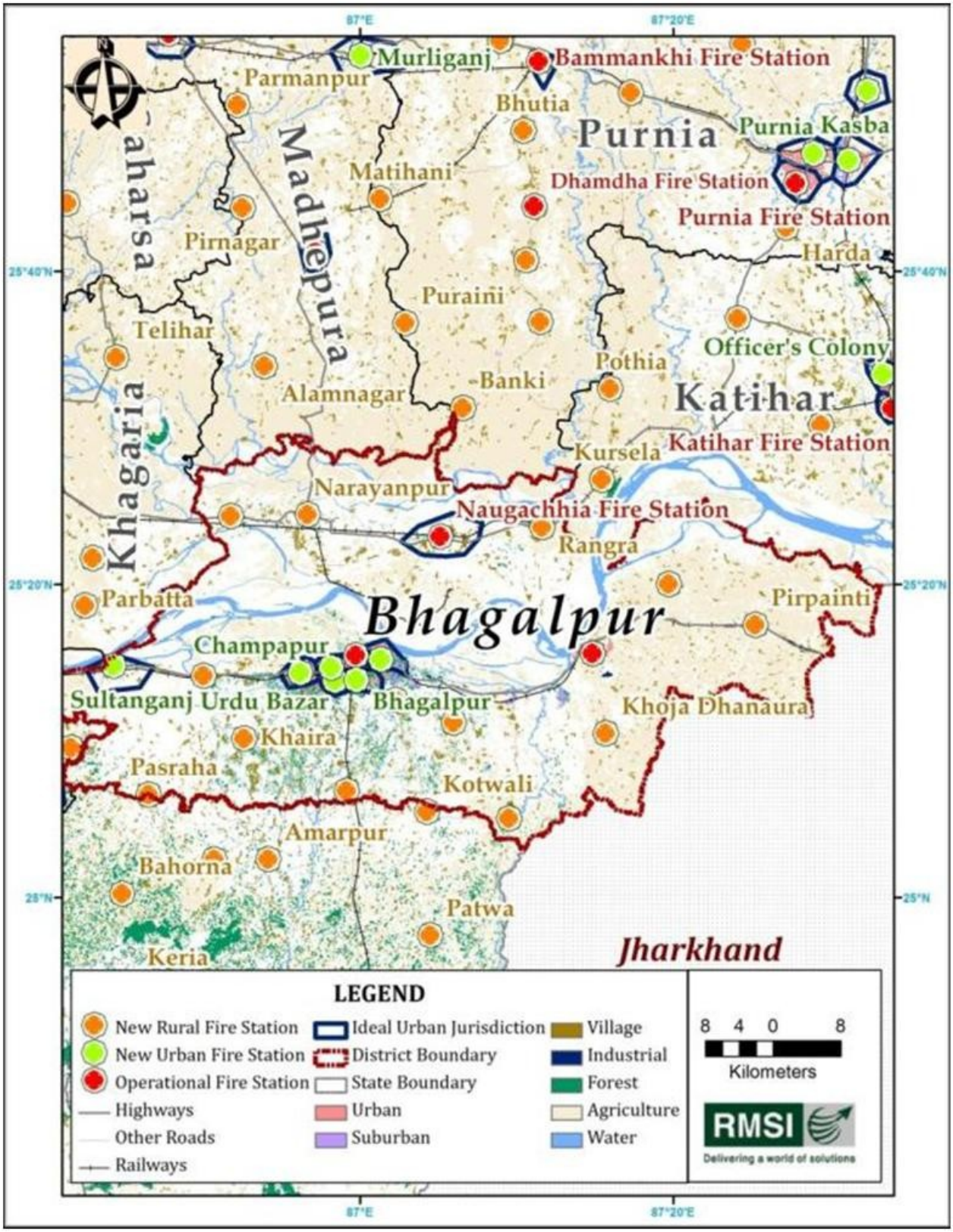

Figure 26-11: Fire stations gap analysis for Bhagalpur rural area

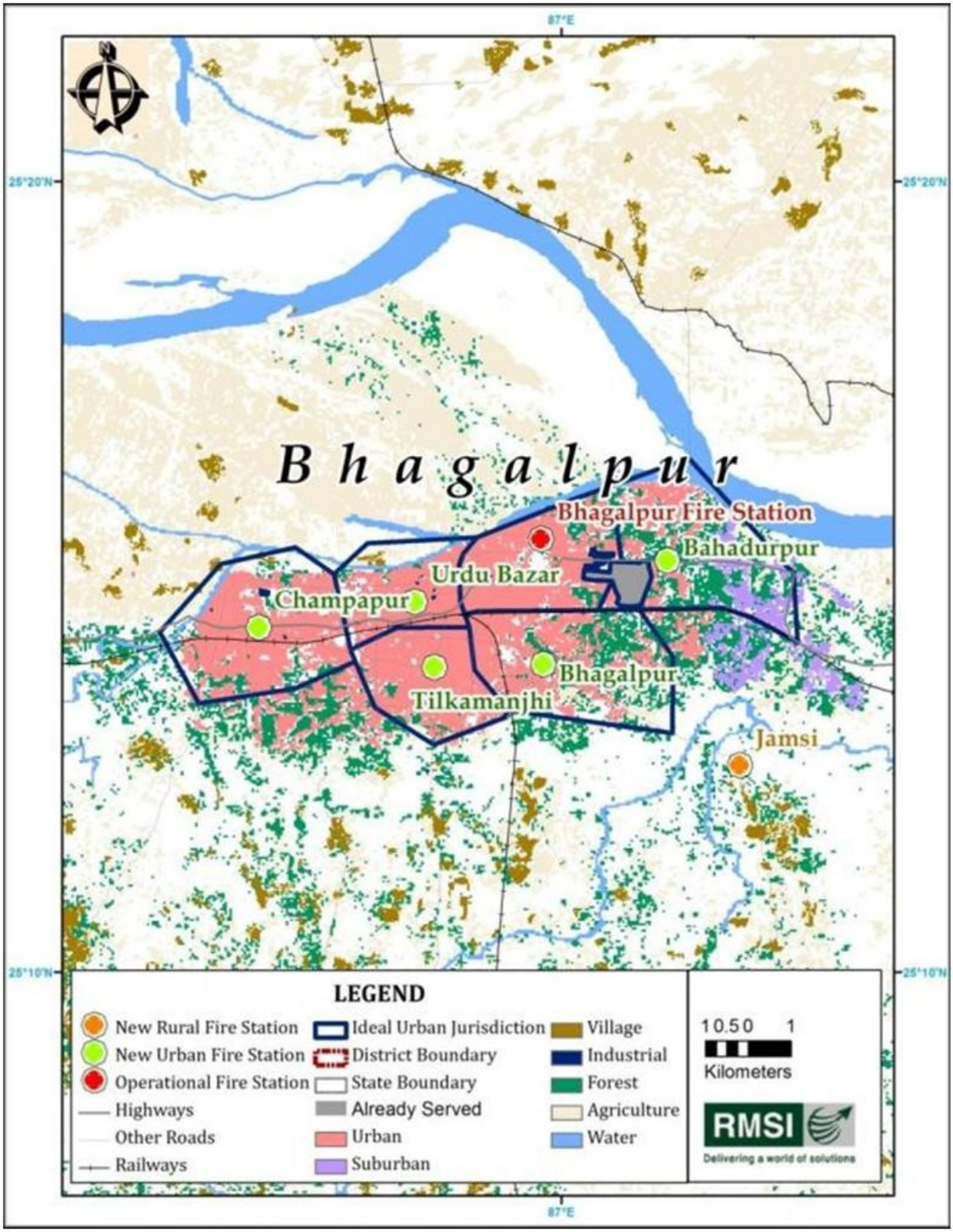

Figure 26-12: Fire stations gap analysis for Bhagalpur urban area

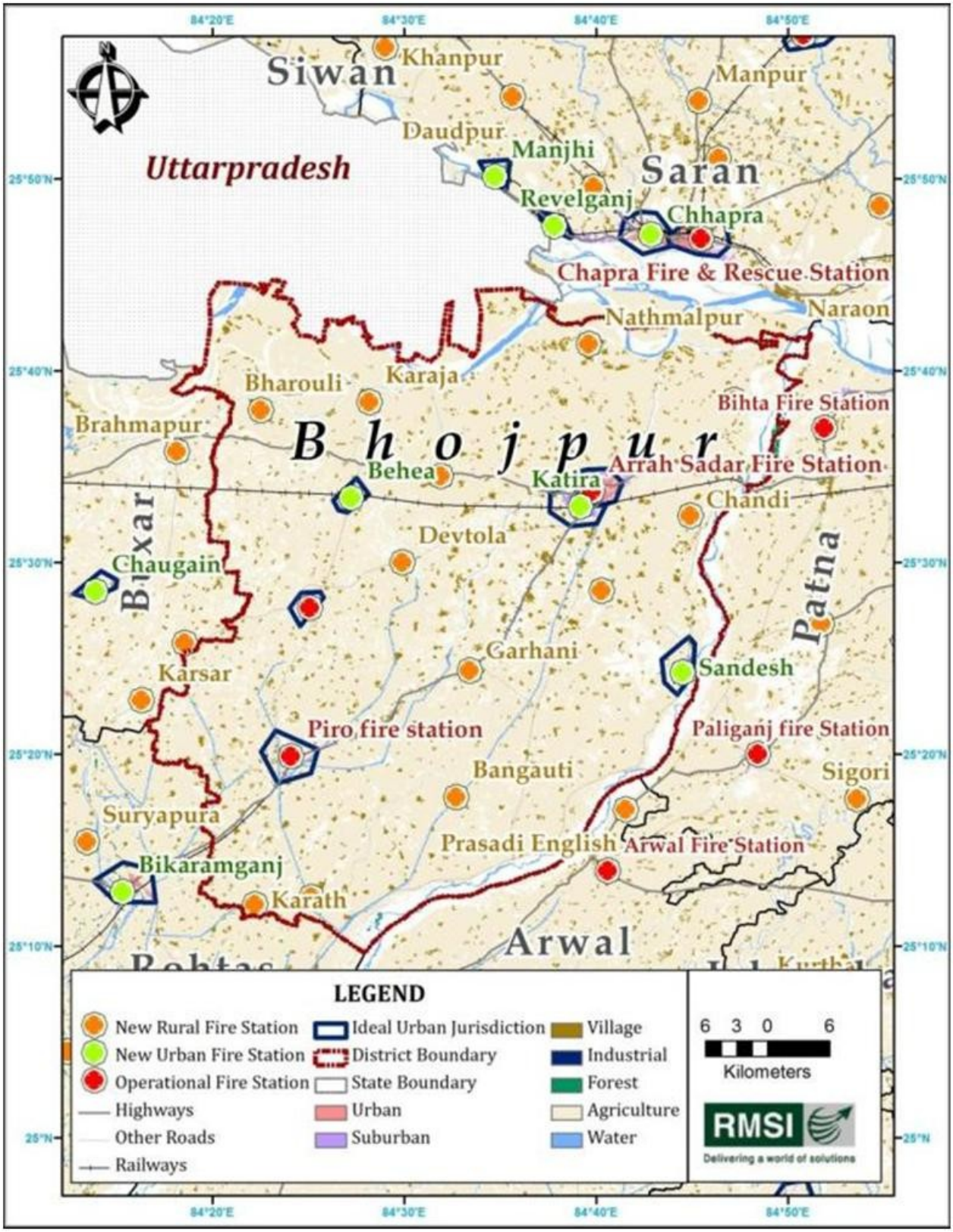

Figure 26-13: Fire stations gap analysis for Bhojpur rural areas

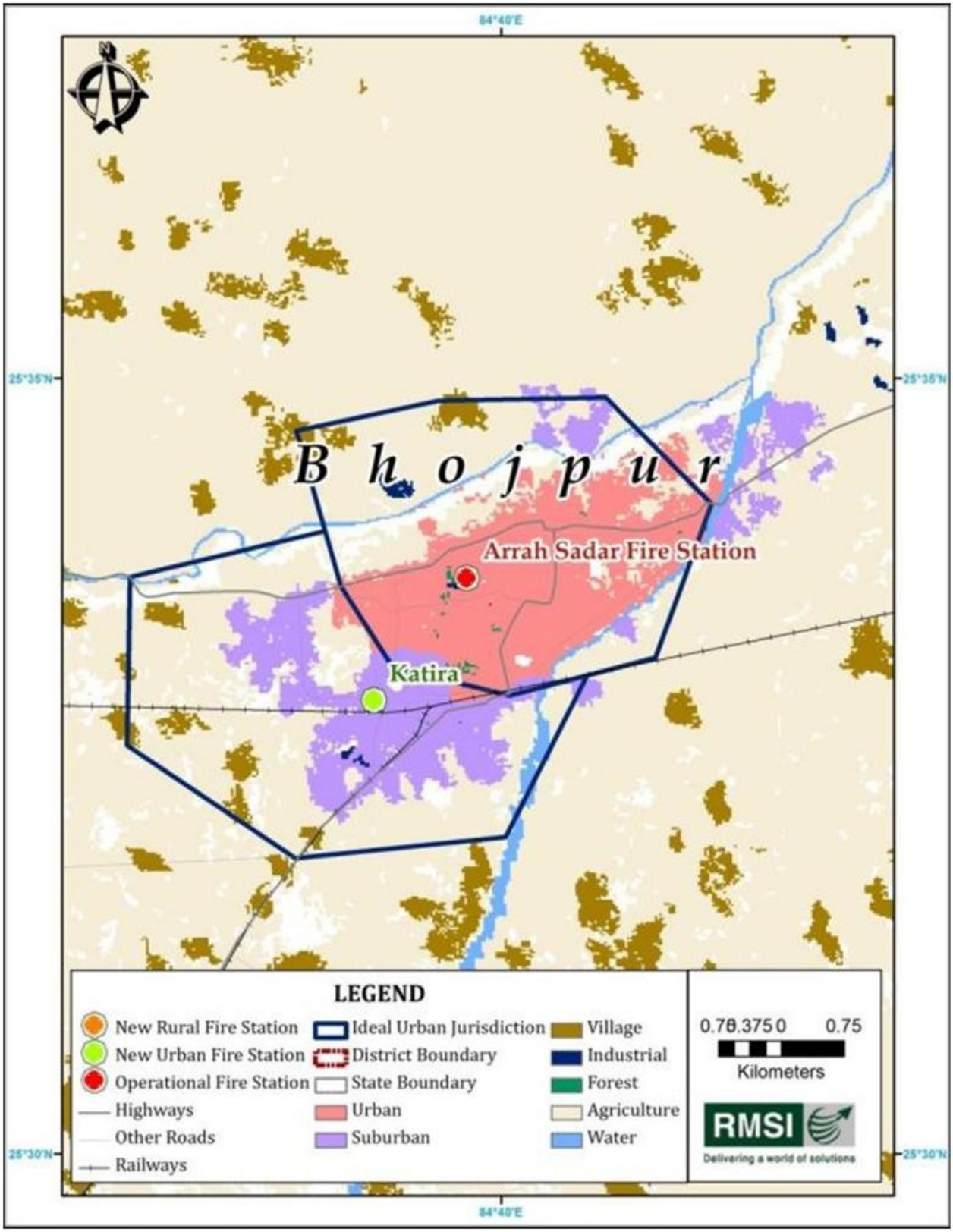

Figure 26-14: Fire stations gap analysis for Bhojpur urban areas

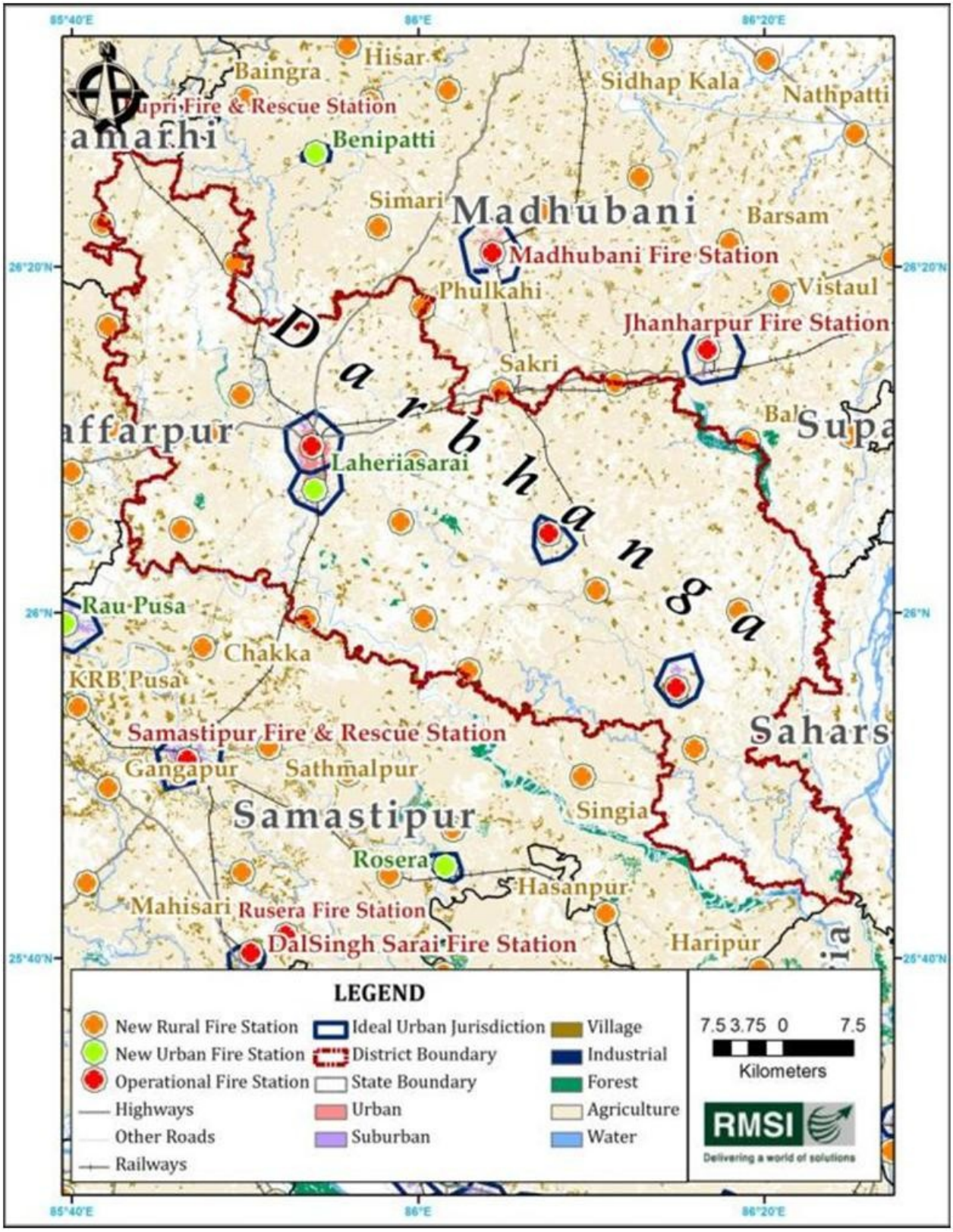

Figure 26-15: Fire stations gap analysis for Dharbhanga rural areas

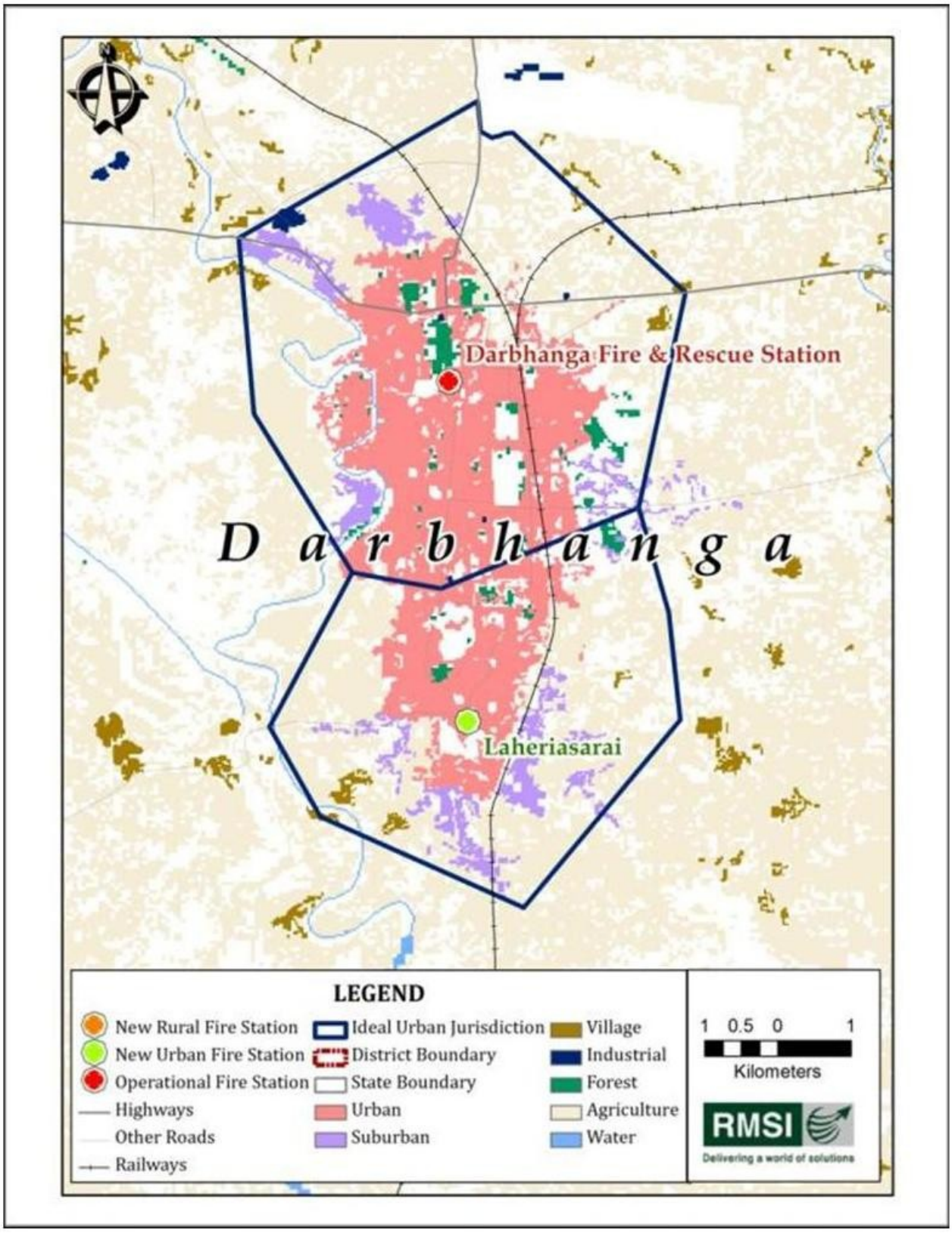

Figure 26-16: Fire stations gap analysis for Dharbhanga urban areas

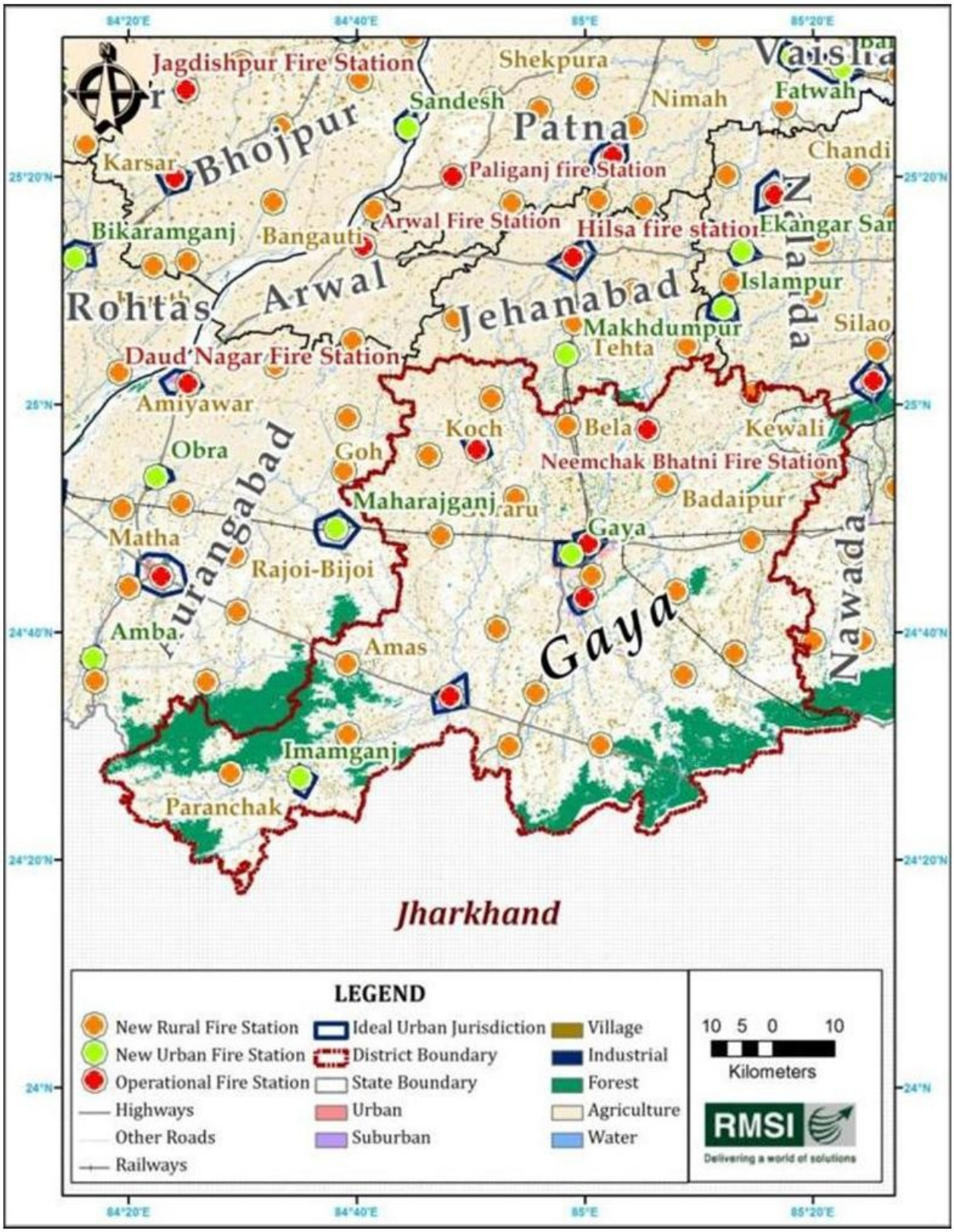

Figure 26-17: Fire stations gap analysis for Gaya rural areas

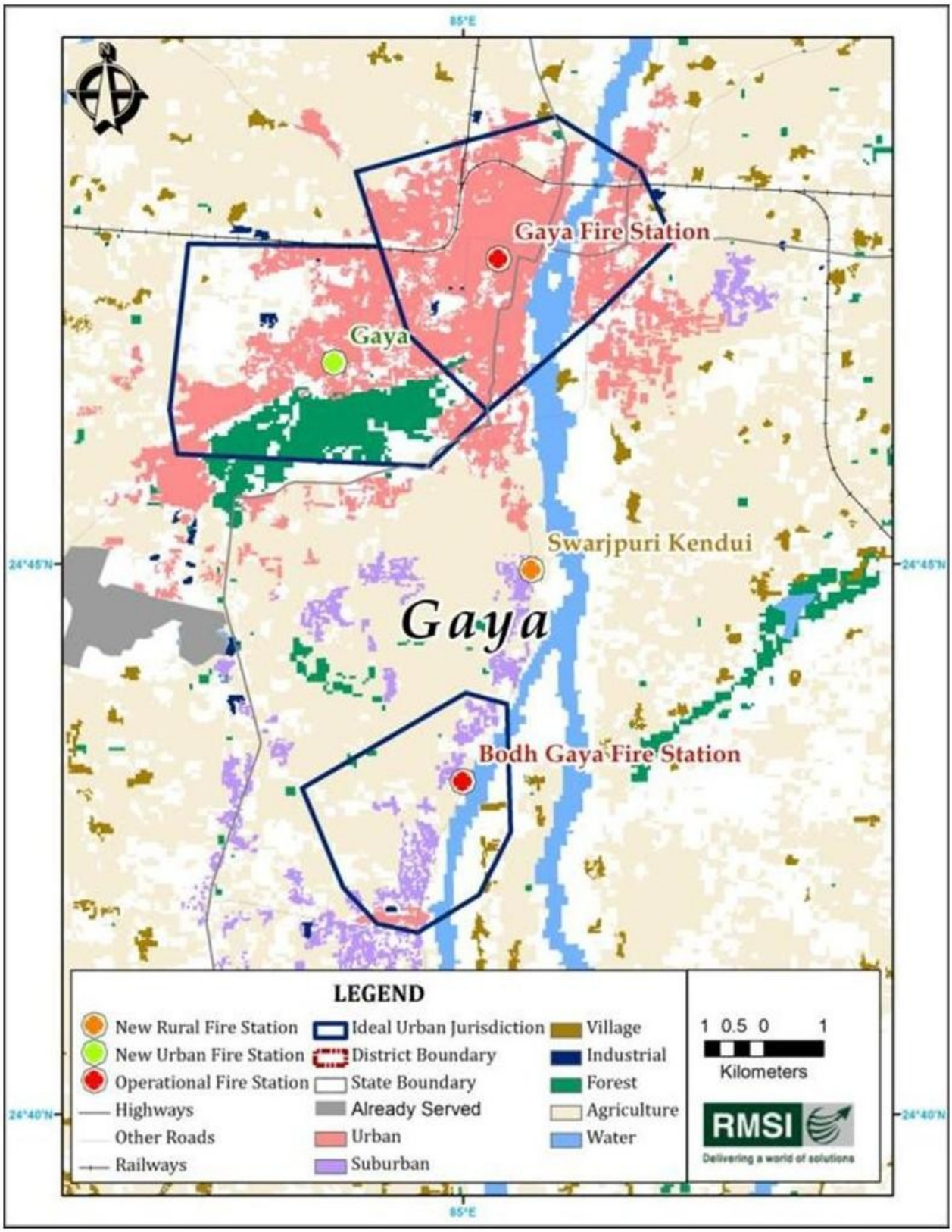

Figure 26-18: Fire stations gap analysis for Gaya urban areas

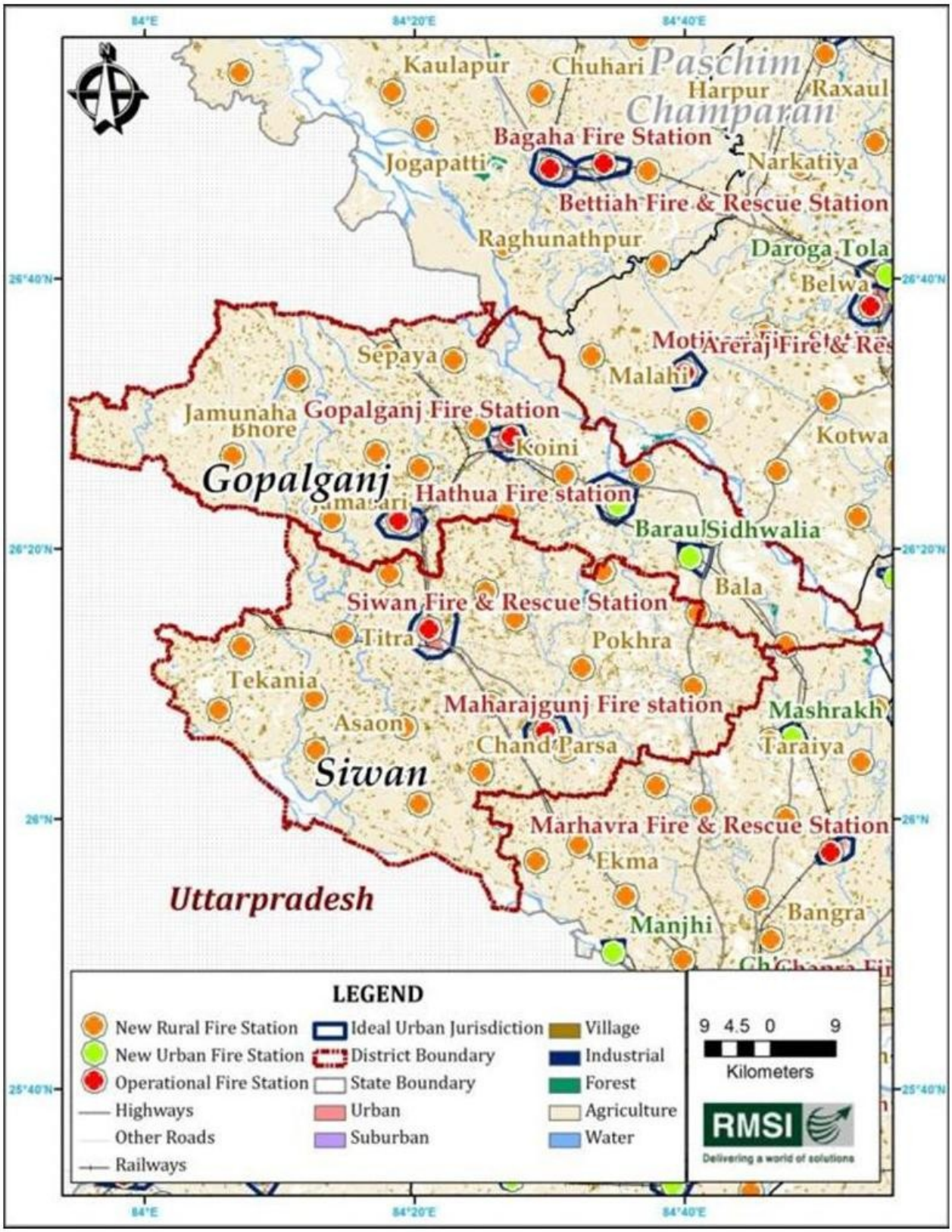

Figure 26-19: Fire stations gap analysis for Gopalganj Siwan rural areas

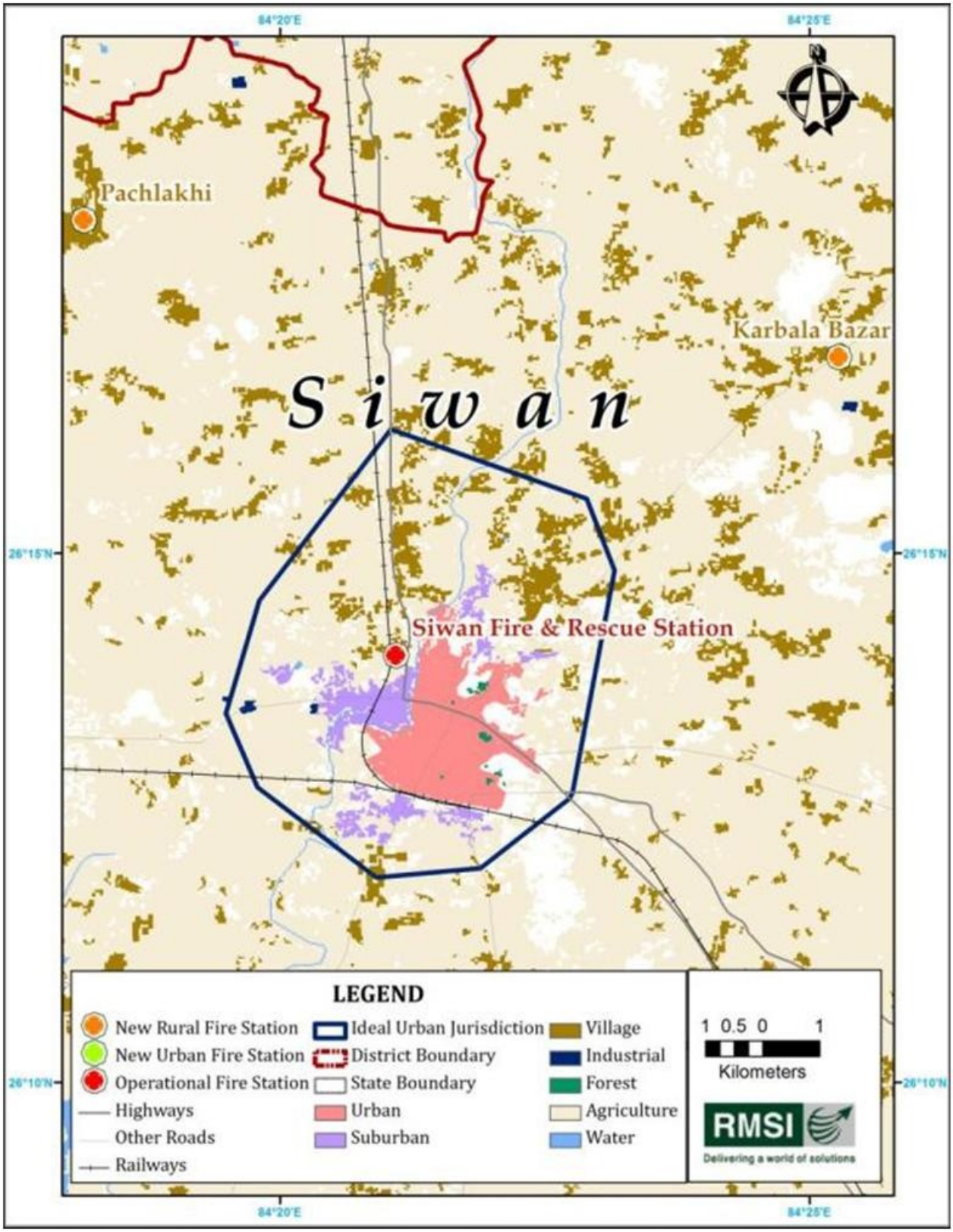

Figure 26-20: Fire stations gap analysis for Siwan urban areas

Figure 26-21: Fire stations gap analysis for Jehanabad rural areas

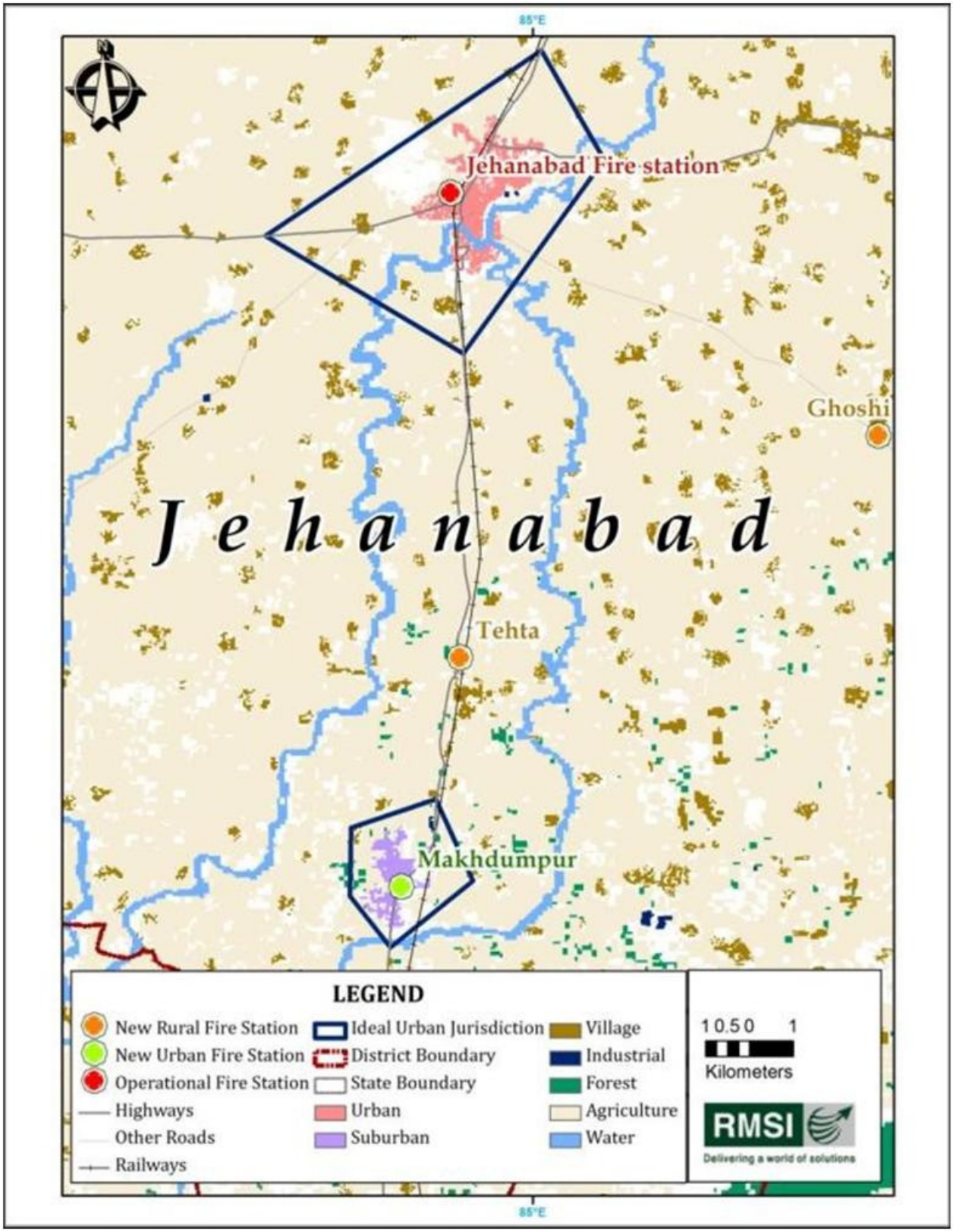

Figure 26-22: Fire stations gap analysis for Jehanabad Urban areas

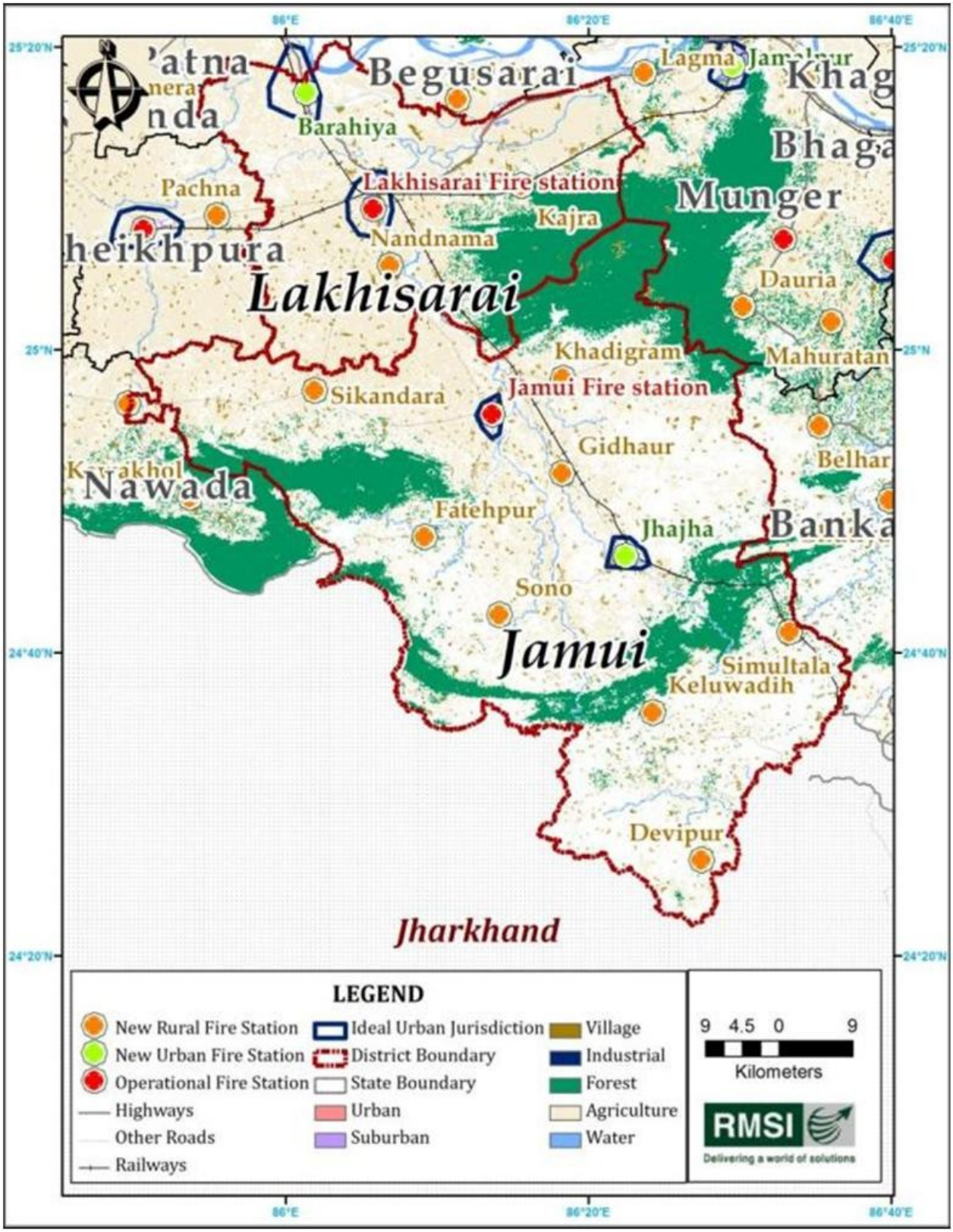

Figure 26-23: Fire stations gap analysis for Jamui-Lakhisarai areas

Figure 26-24: Fire stations gap analysis for Katihar-Purania rural areas

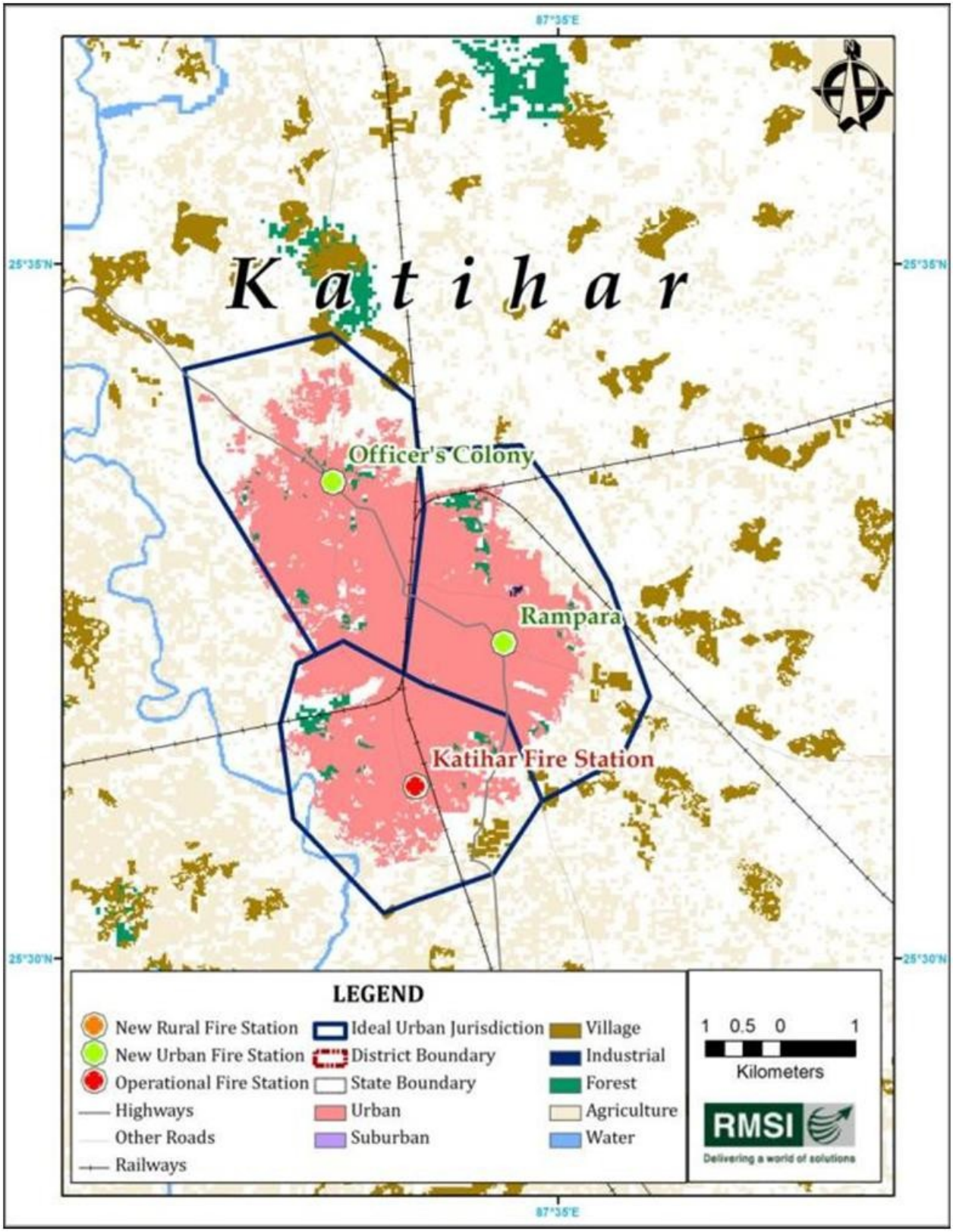

Figure 26-25: Fire stations gap analysis for Katihar urban areas

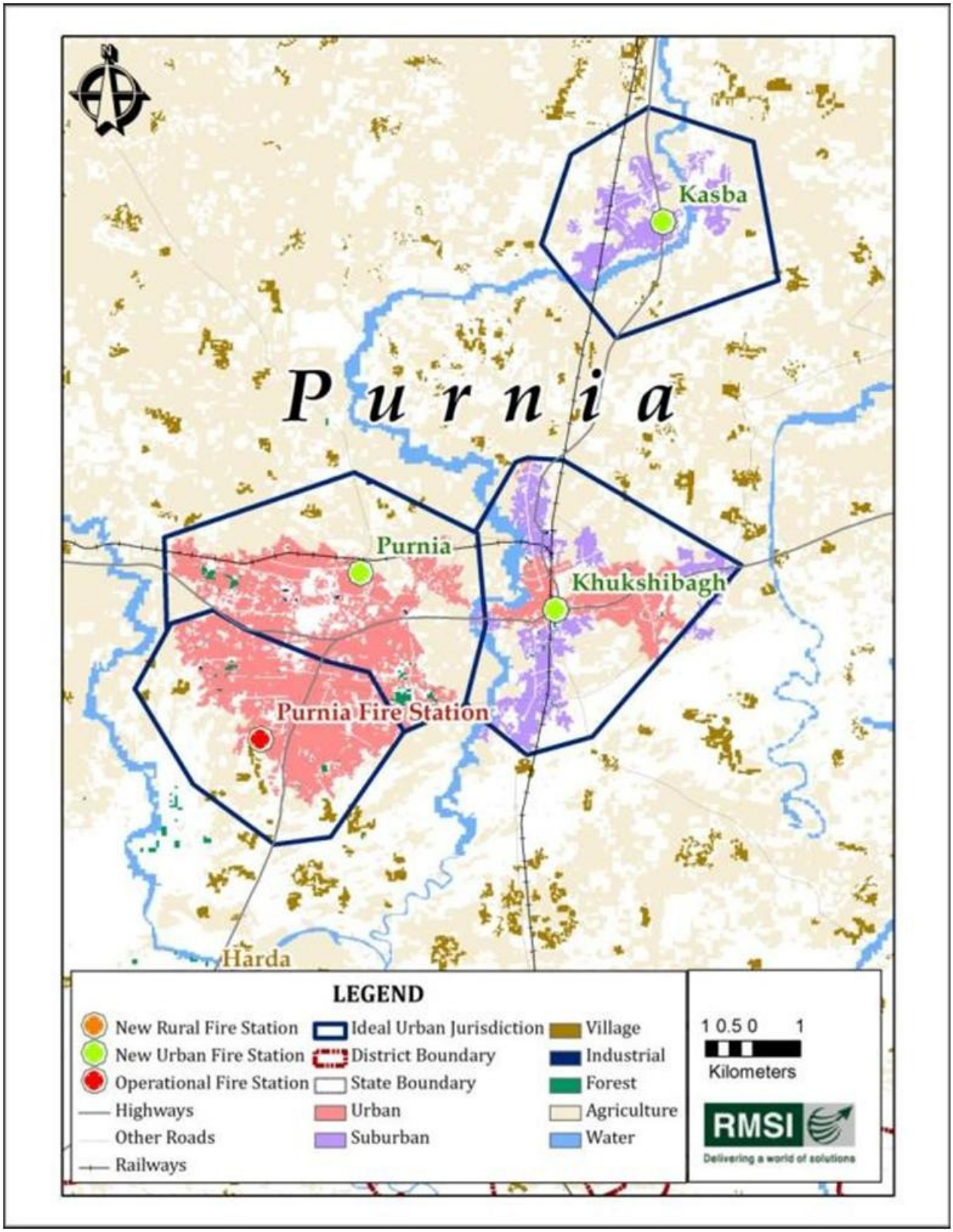

Figure 26-26: Fire stations gap analysis for Purnia urban areas

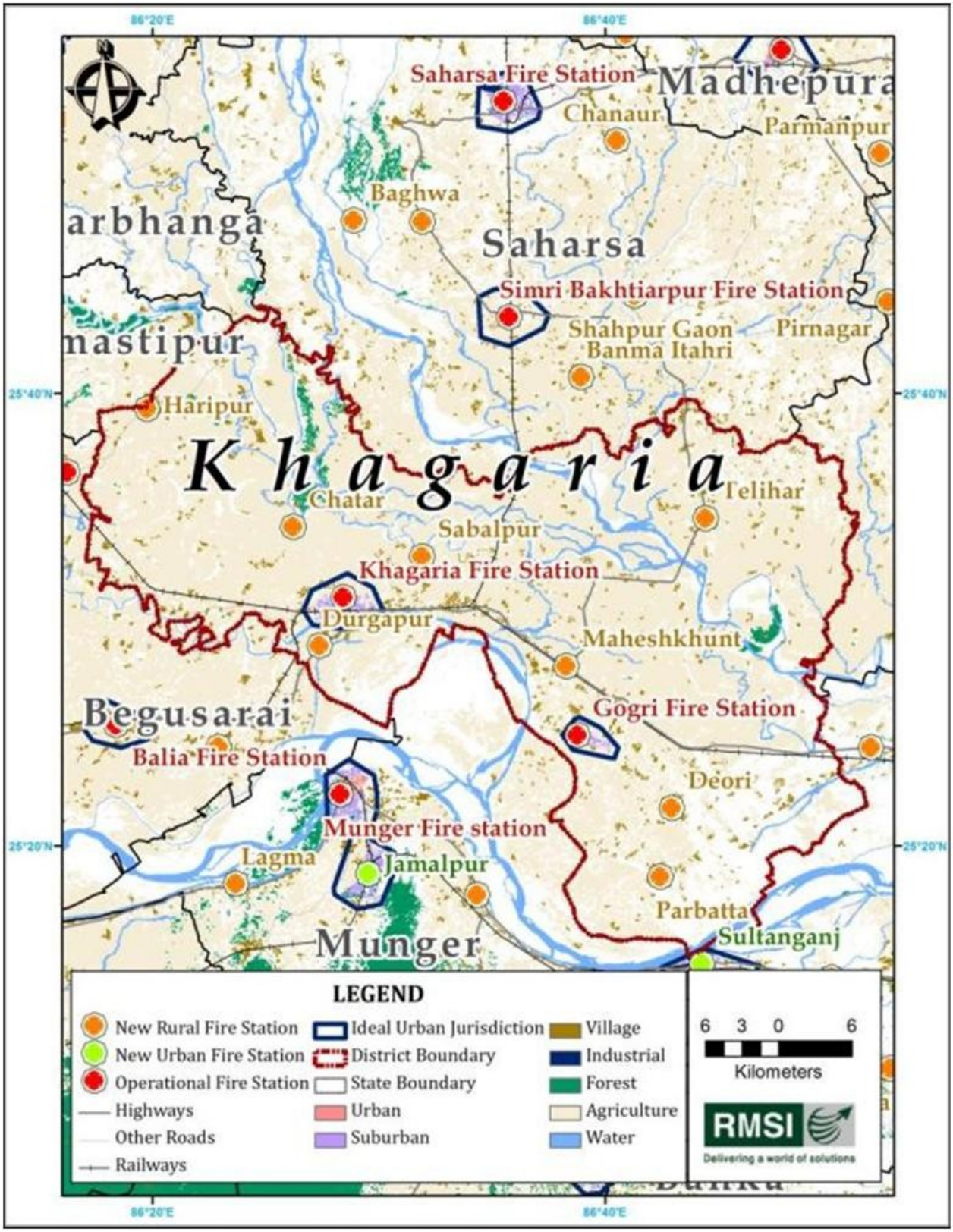

Figure 26-27: Fire stations gap analysis for Khagaria rural areas

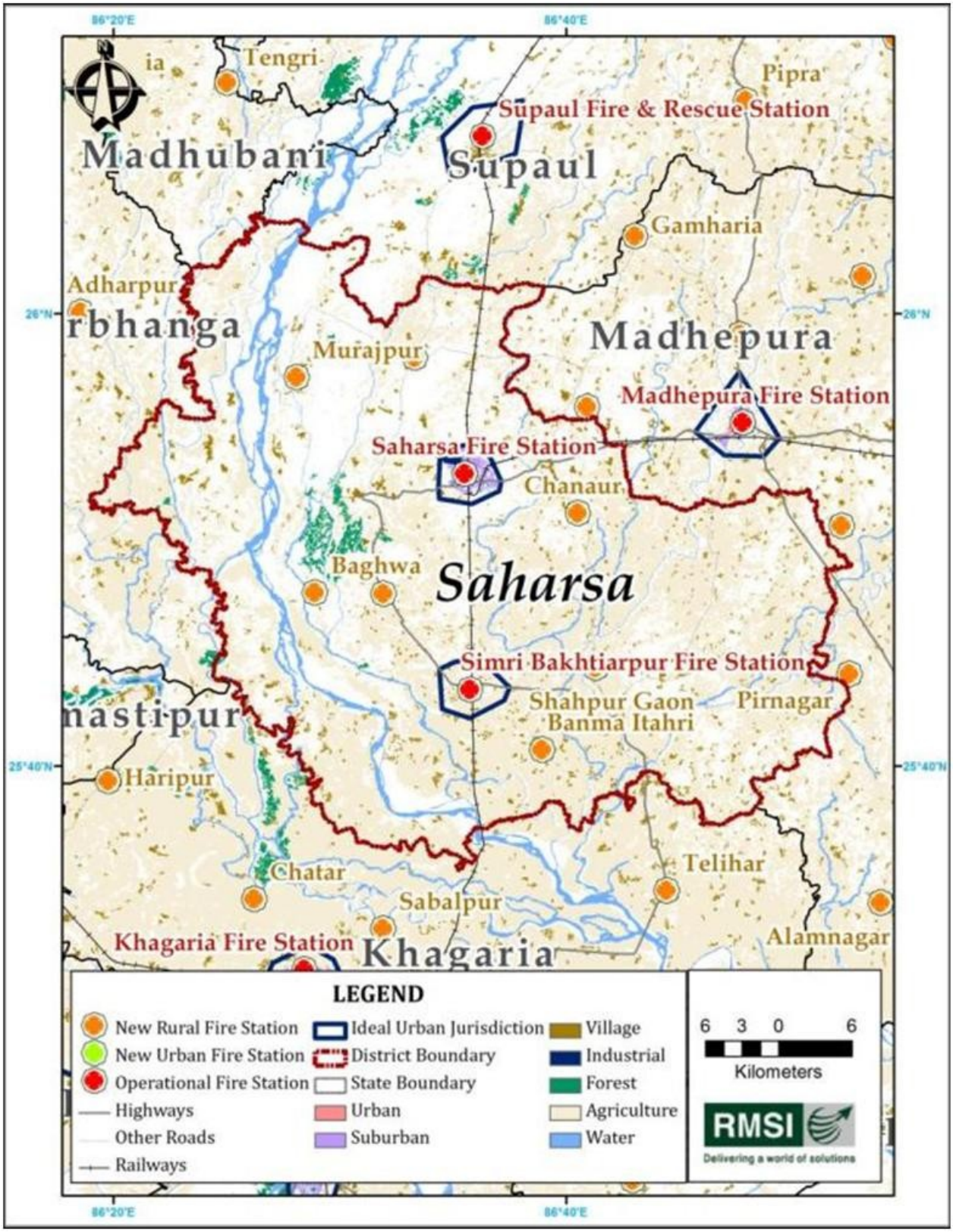

Figure 26-28: Fire stations gap analysis for Saharasa rural areas

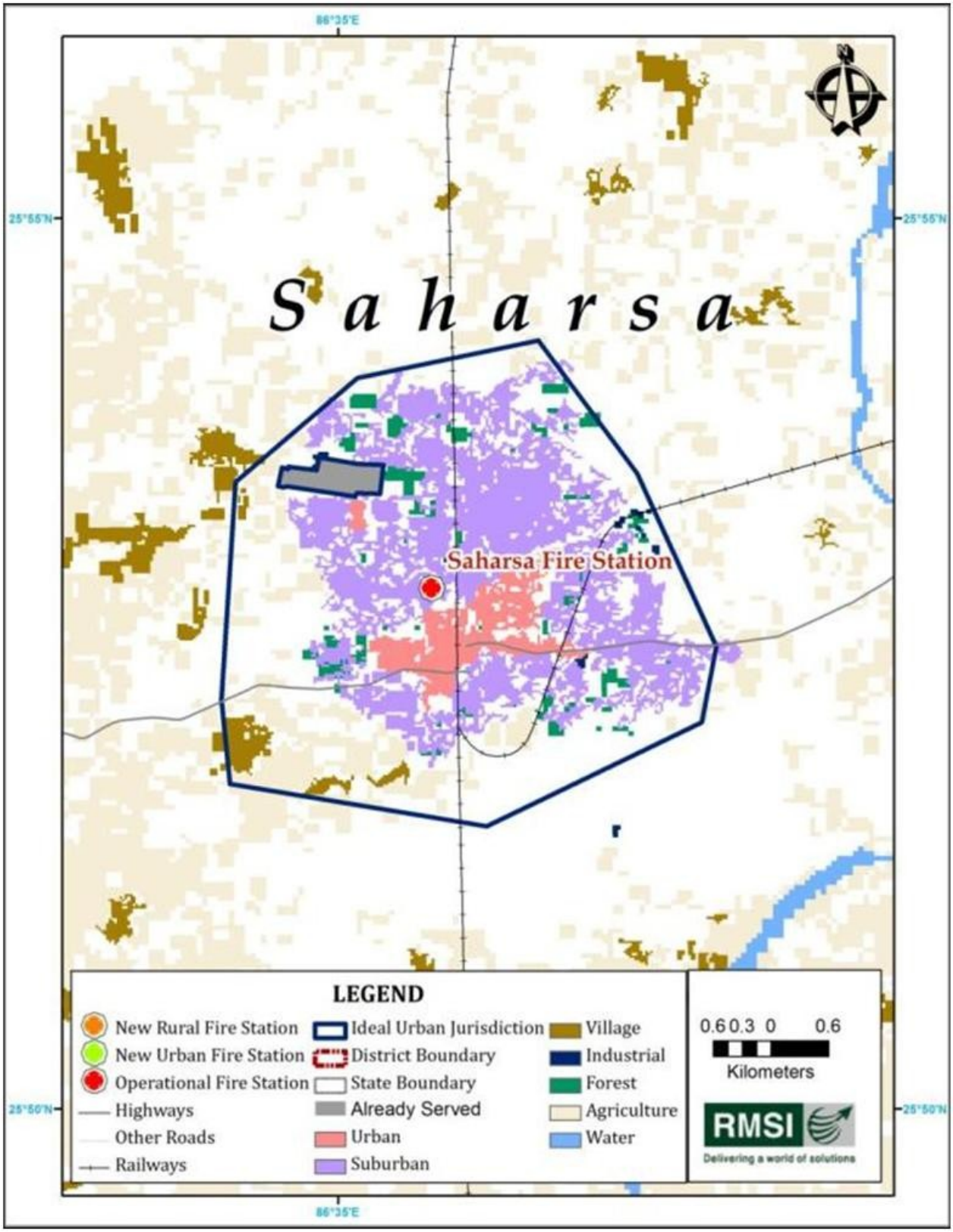

Figure 26-29: Fire stations gap analysis for Saharasa Urban areas

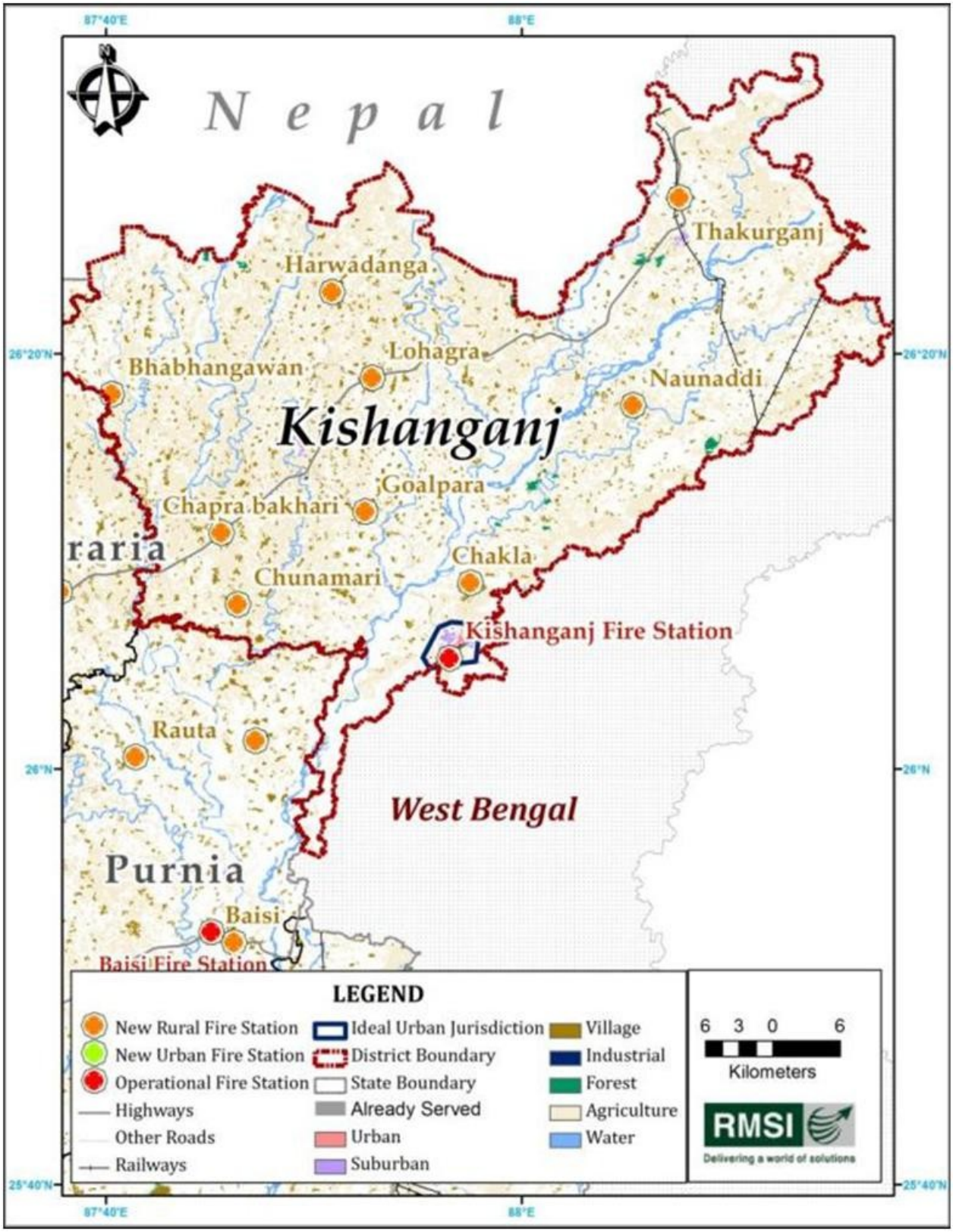

Figure 26-30: Fire stations gap analysis for Kishanganj rural area

Figure 26-31: Fire stations gap analysis for Kishanganj urban area

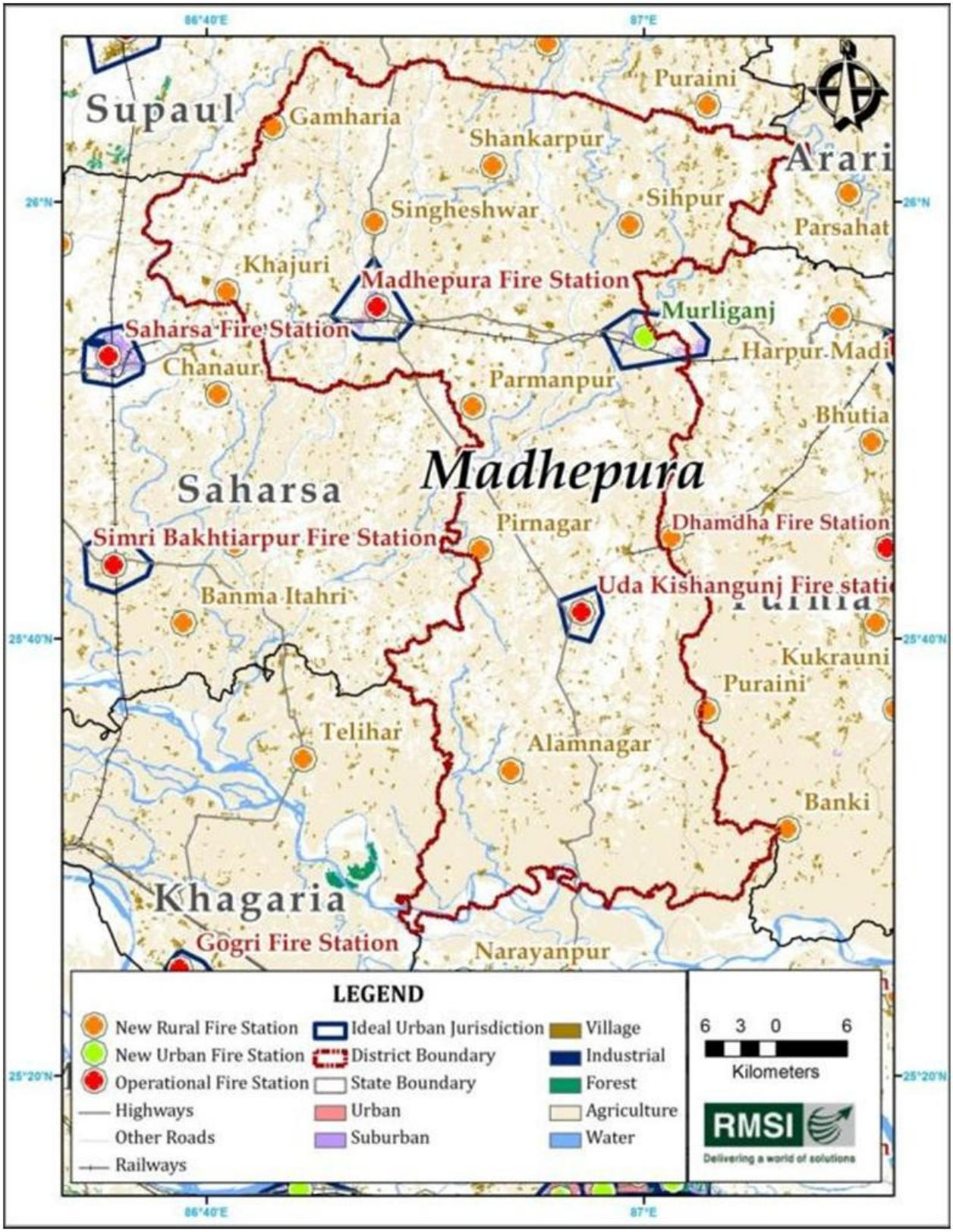

Figure 26-32: Fire stations gap analysis for Madhepura rural area

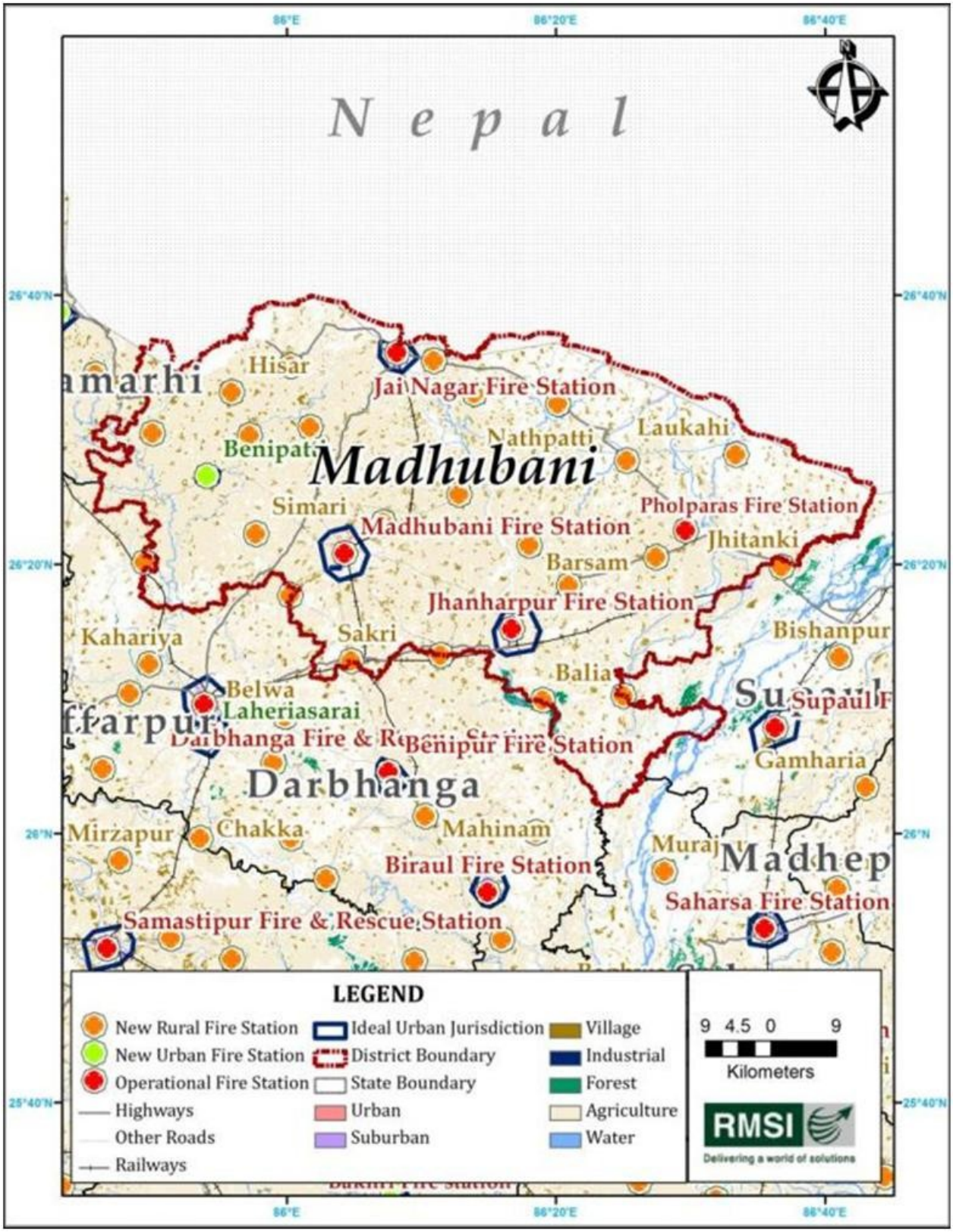

Figure 26-33: Fire stations gap analysis for Madhubani rural areas

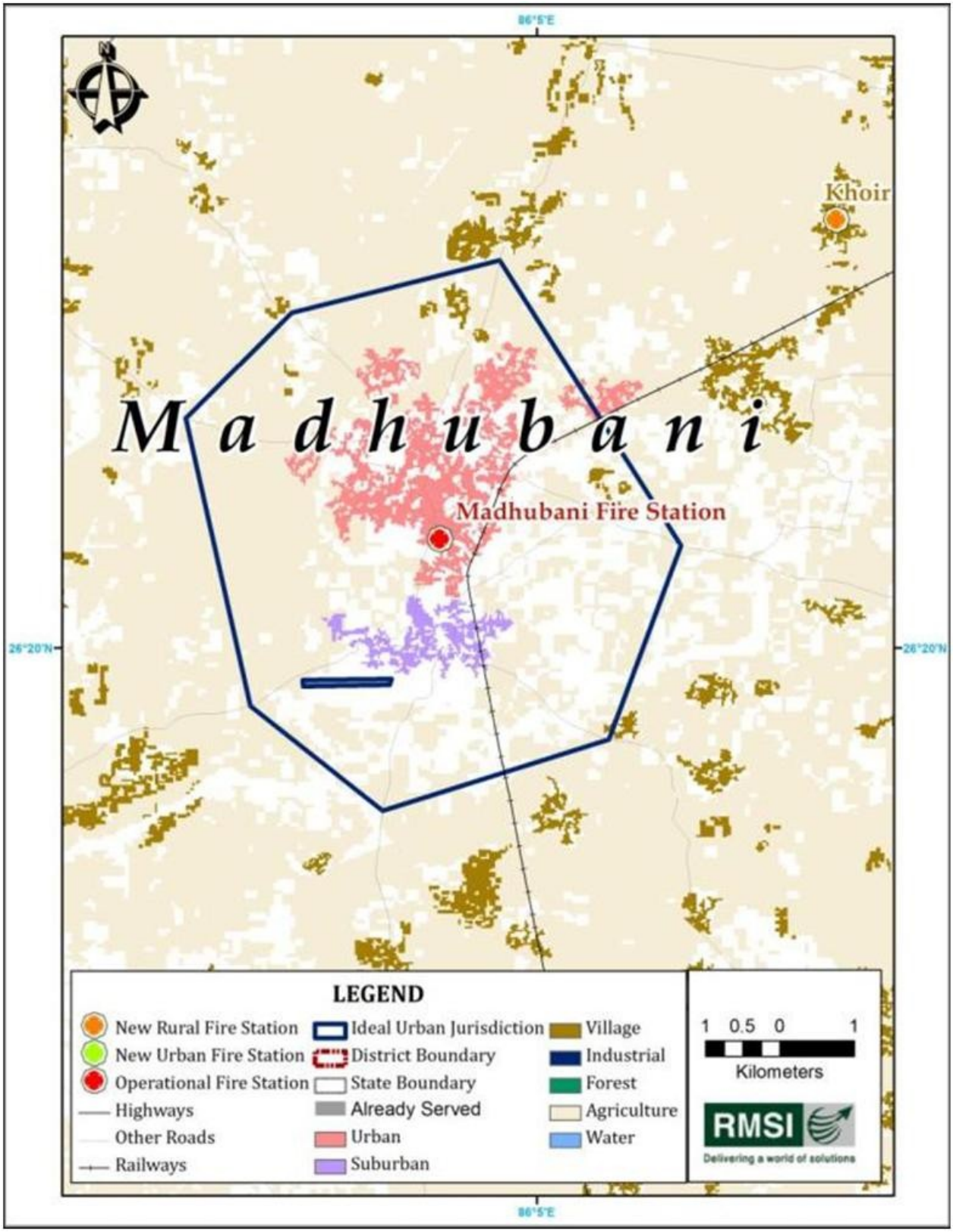

Figure 26-34: Fire stations gap analysis for Madhubani urban areas

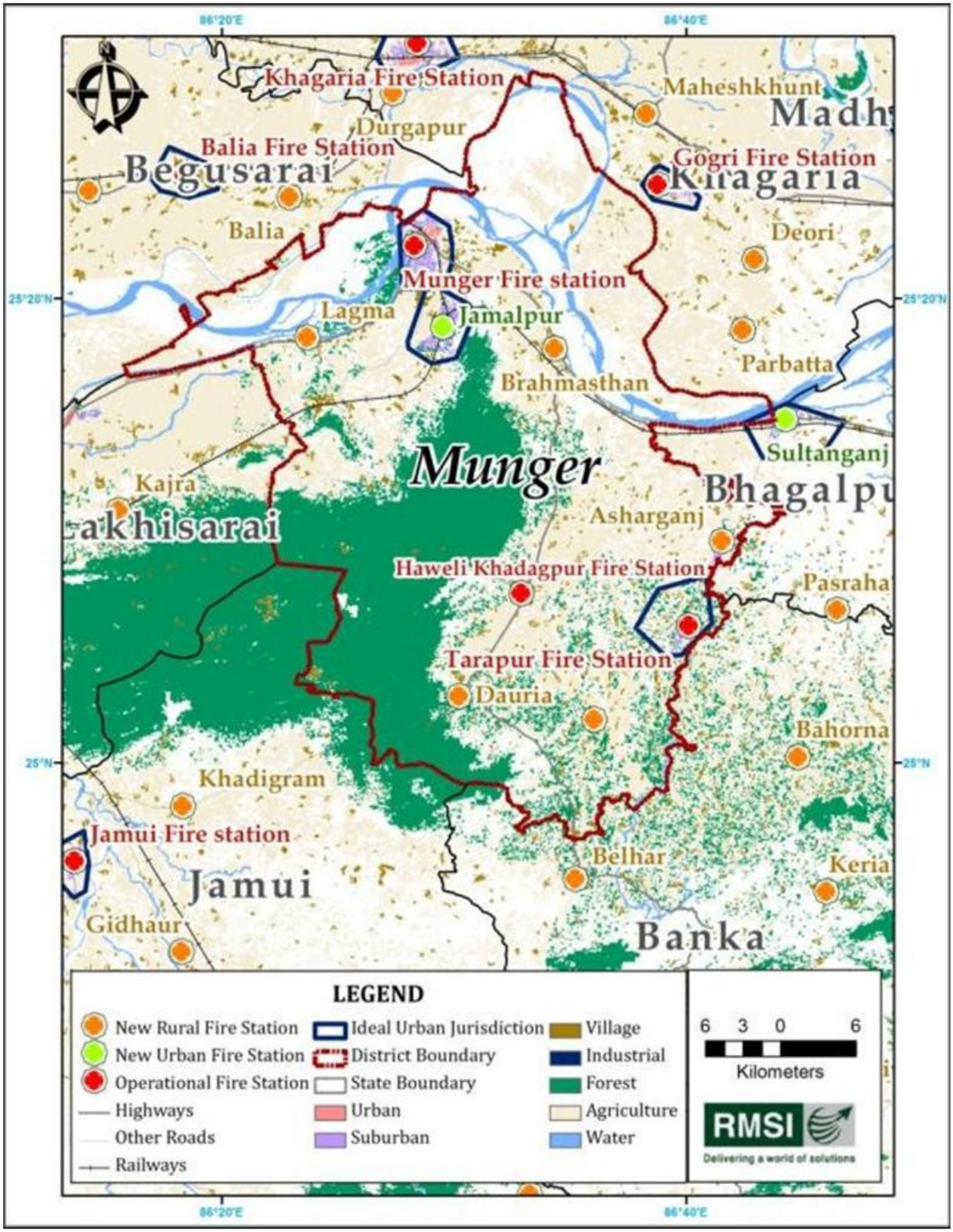

Figure 26-35: Fire stations gap analysis for Munger rural areas

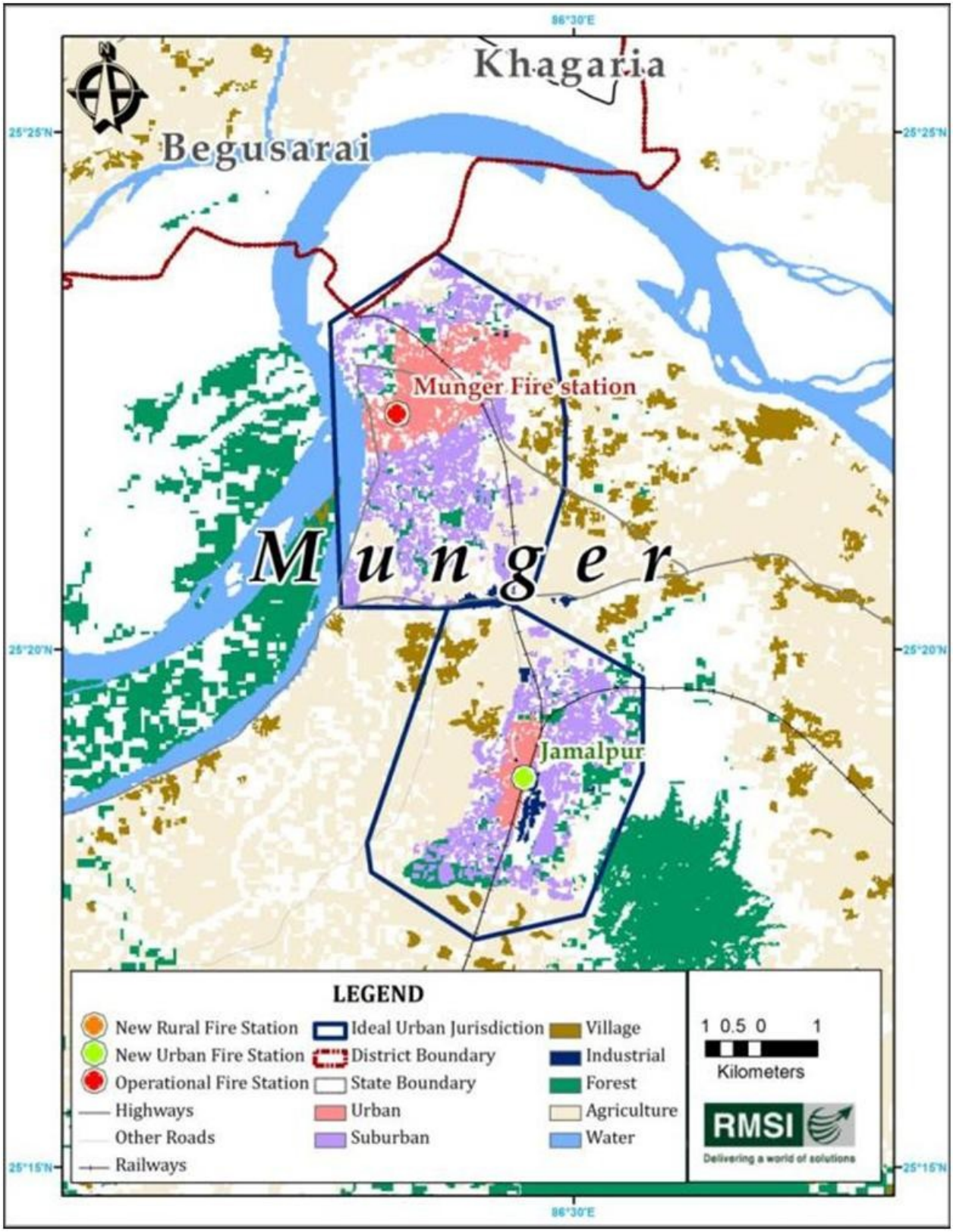

Figure 26-36: Fire stations gap analysis for Munger urban areas

Figure 26-37: Fire stations gap analysis for Muzaffarpur rural areas

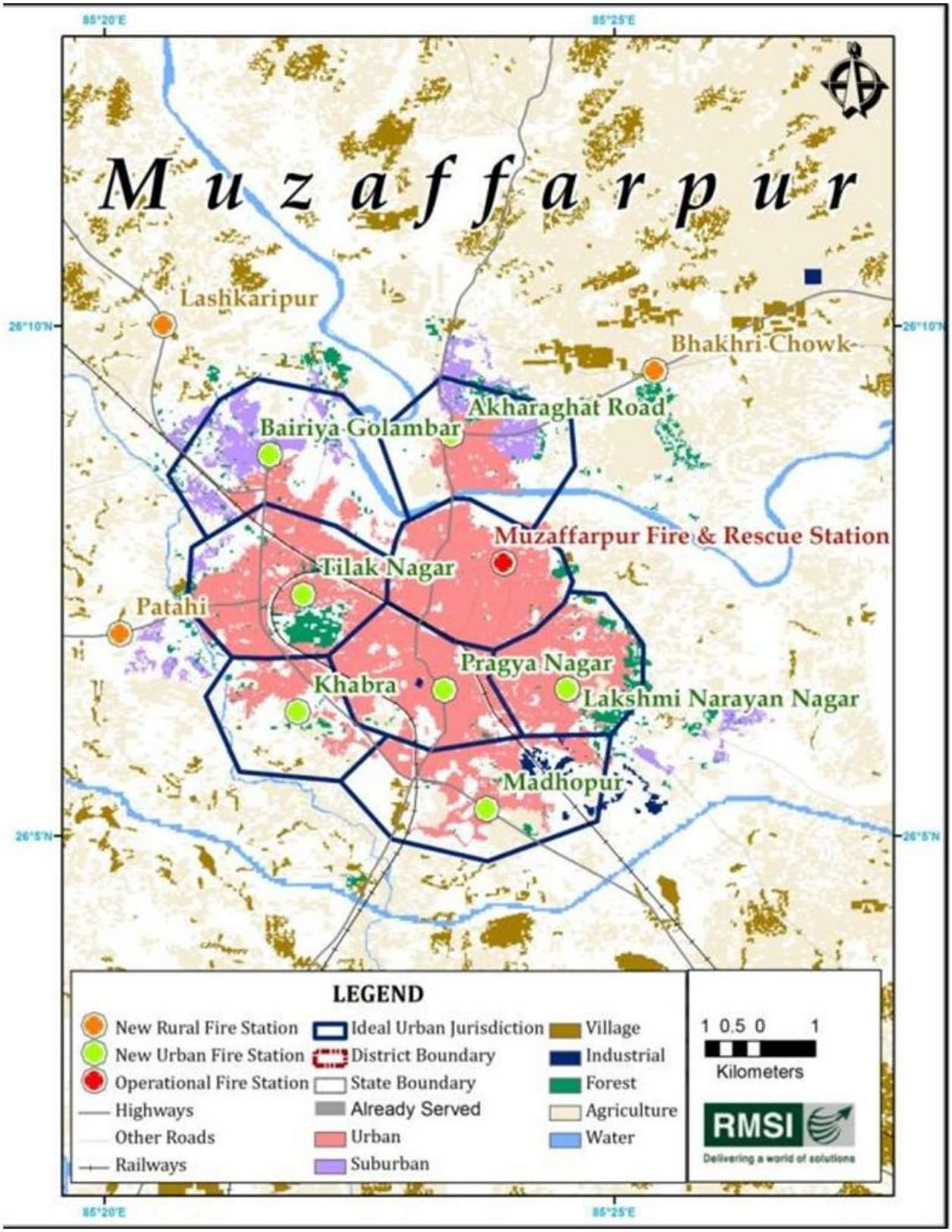

Figure 26-38: Fire stations gap analysis for Muzaffarpur urban areas

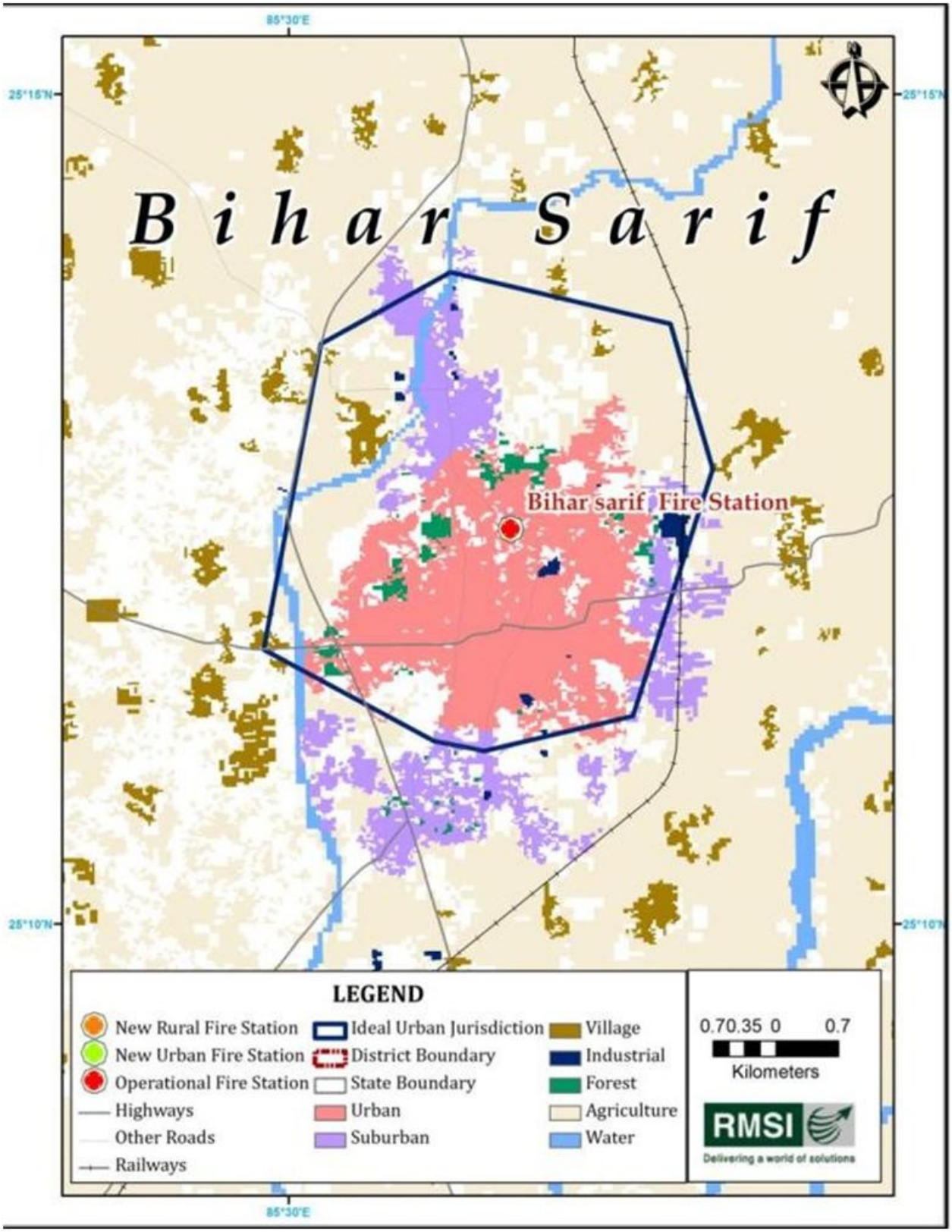

Figure 26-39: Fire stations gap analysis for Bihar-Sharif urban areas

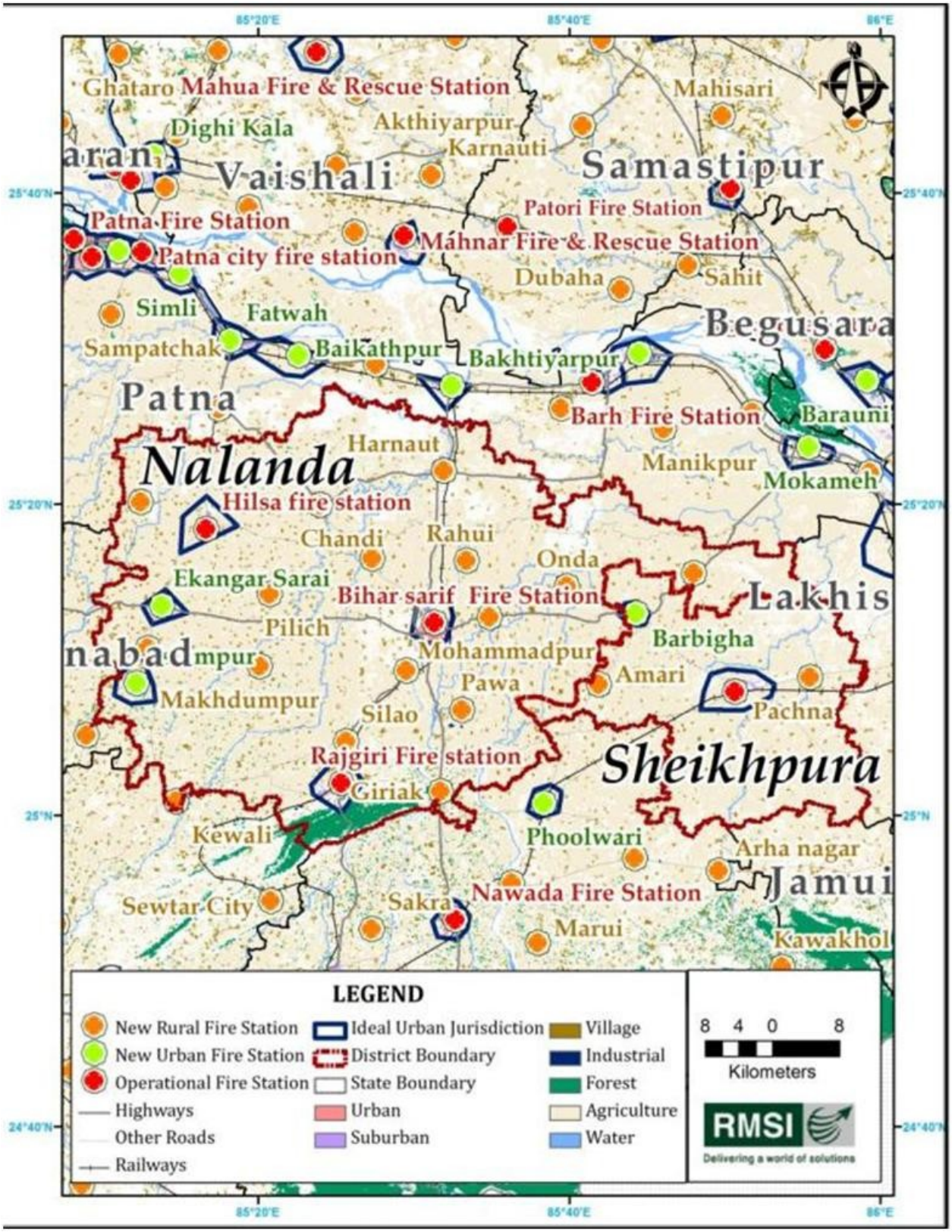

Figure 26-40: Fire stations gap analysis for Nalanda-Sheikhpura rural areas

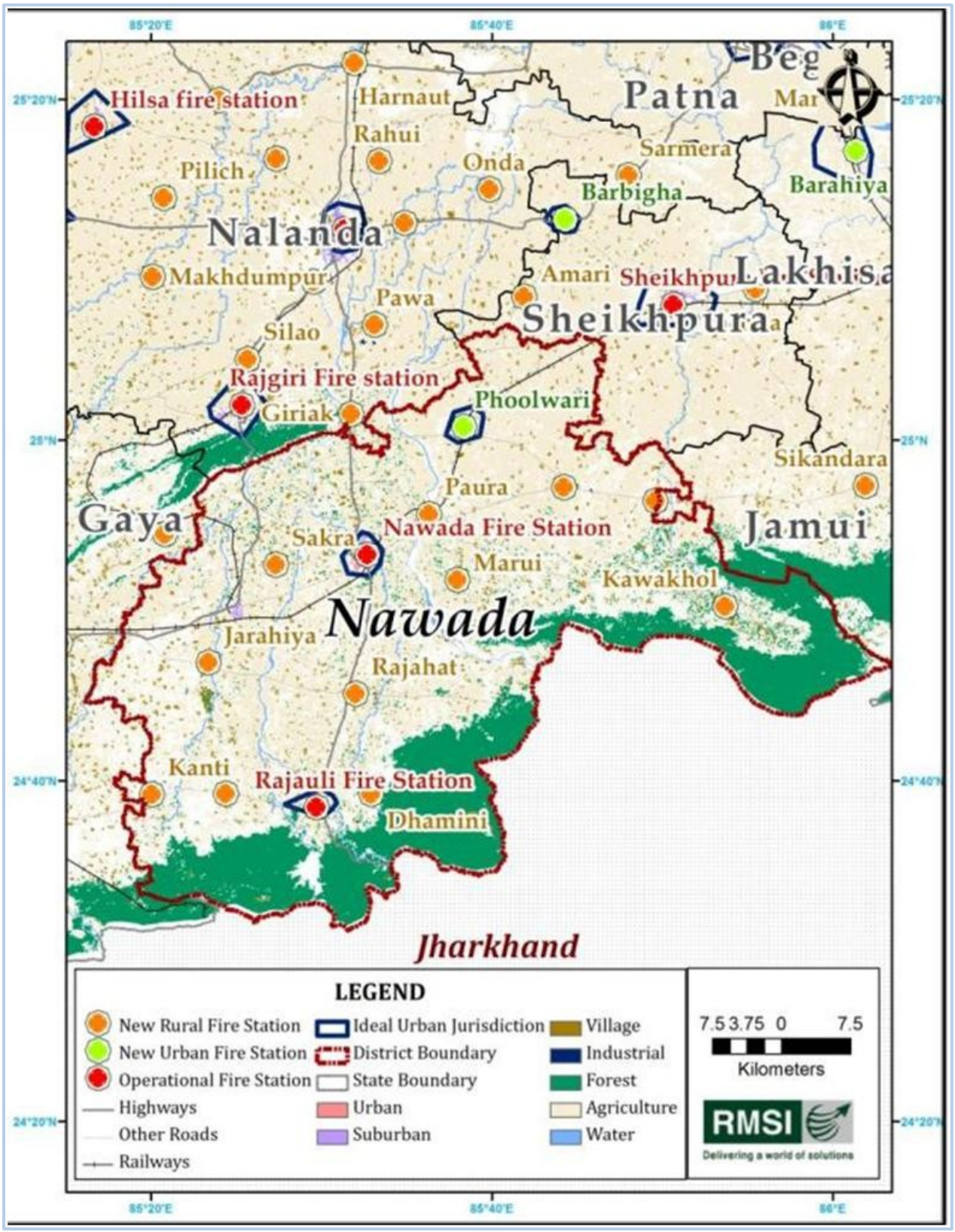

Figure 26-41: Fire stations gap analysis for Nawada rural areas

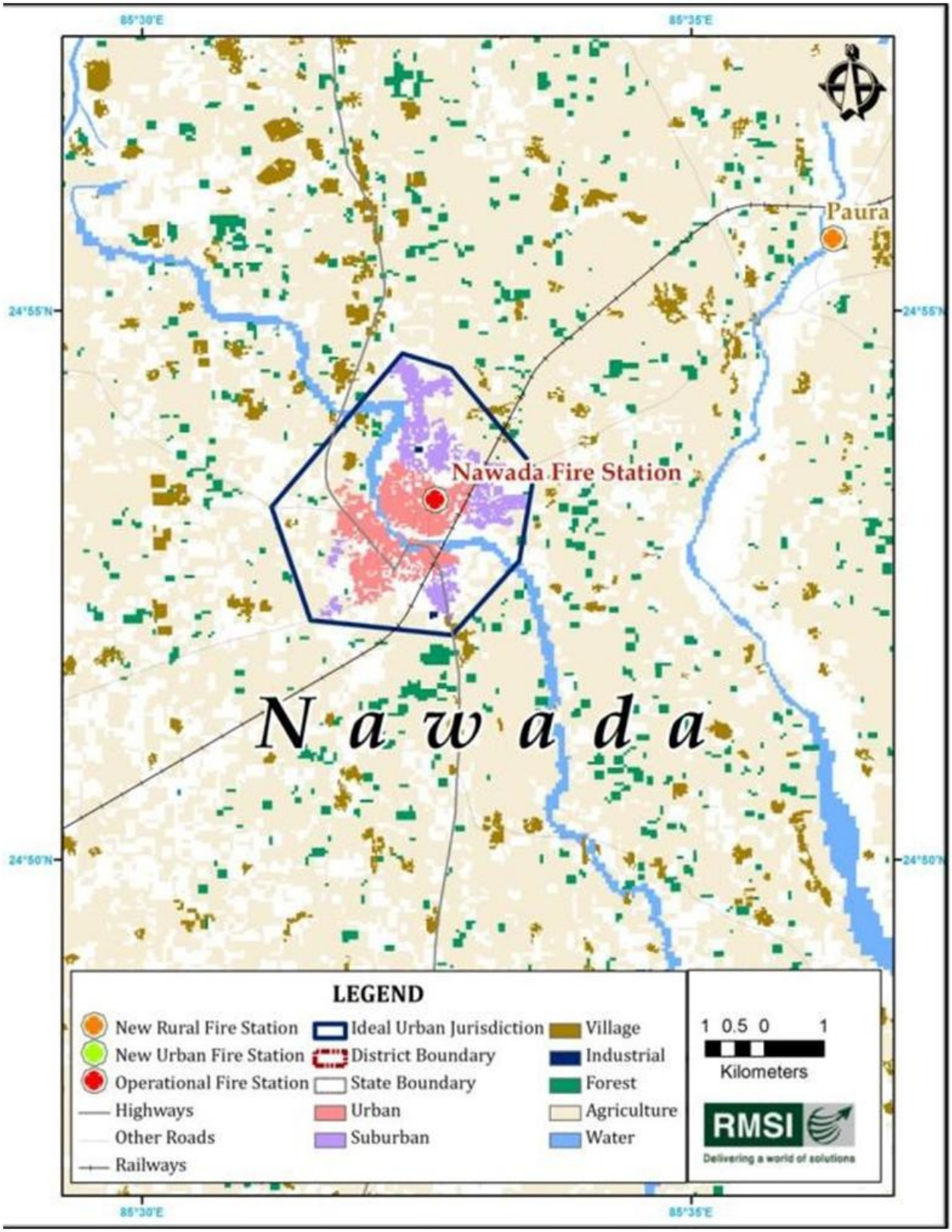

Figure 26-42: Fire stations gap analysis for Nawada urban areas

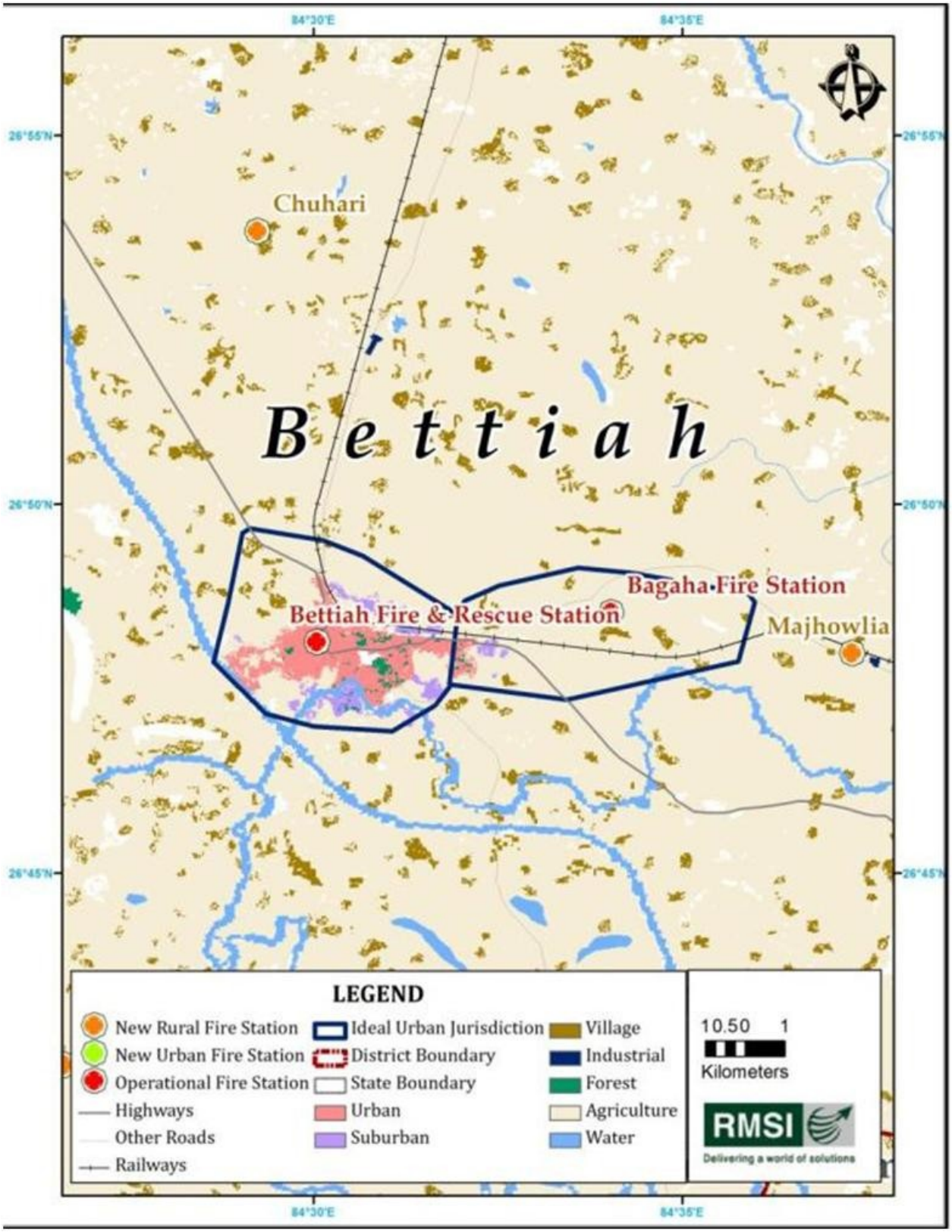

Figure 26-43: Fire stations gap analysis for Bettiah urban areas

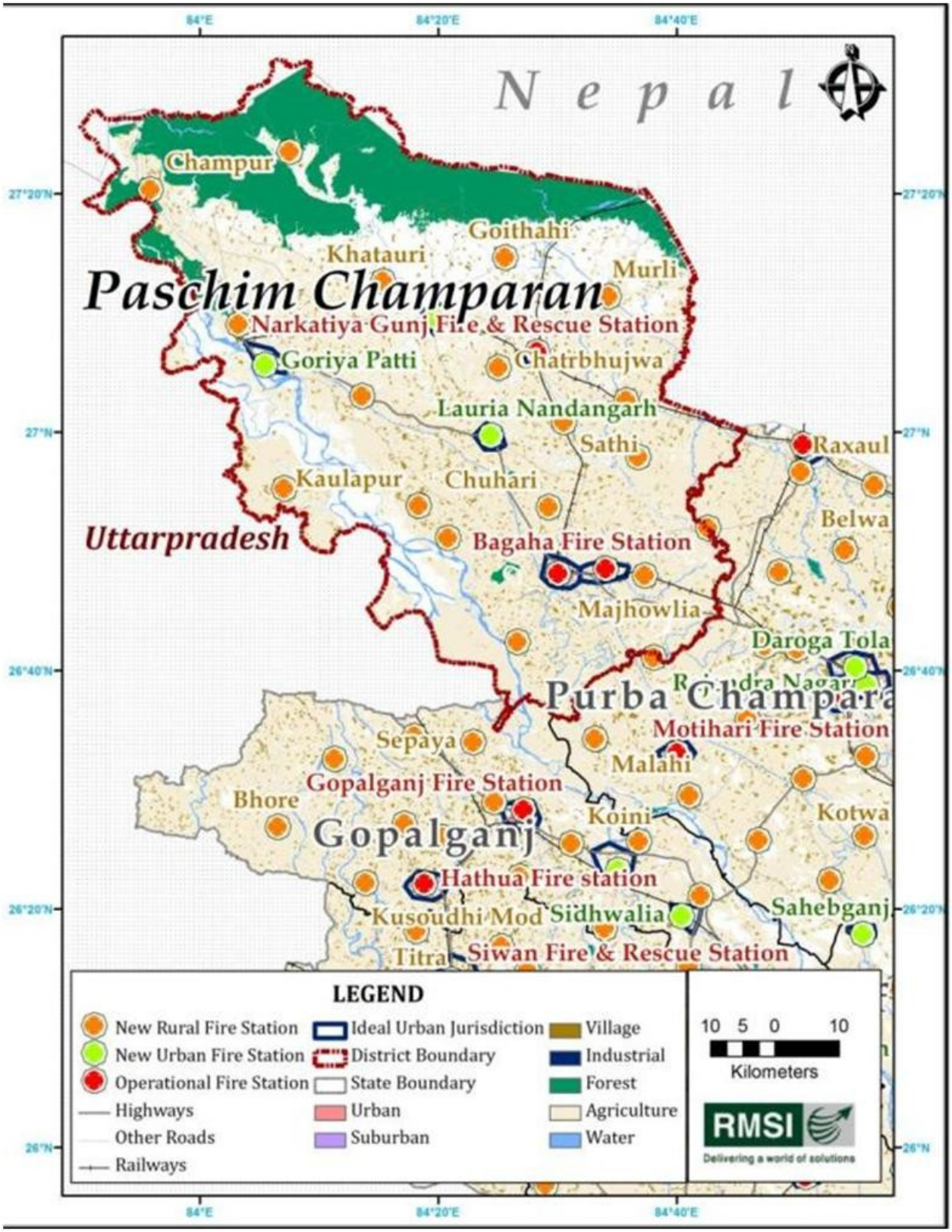

Figure 26-44: Fire stations gap analysis for Paschim Champaran areas

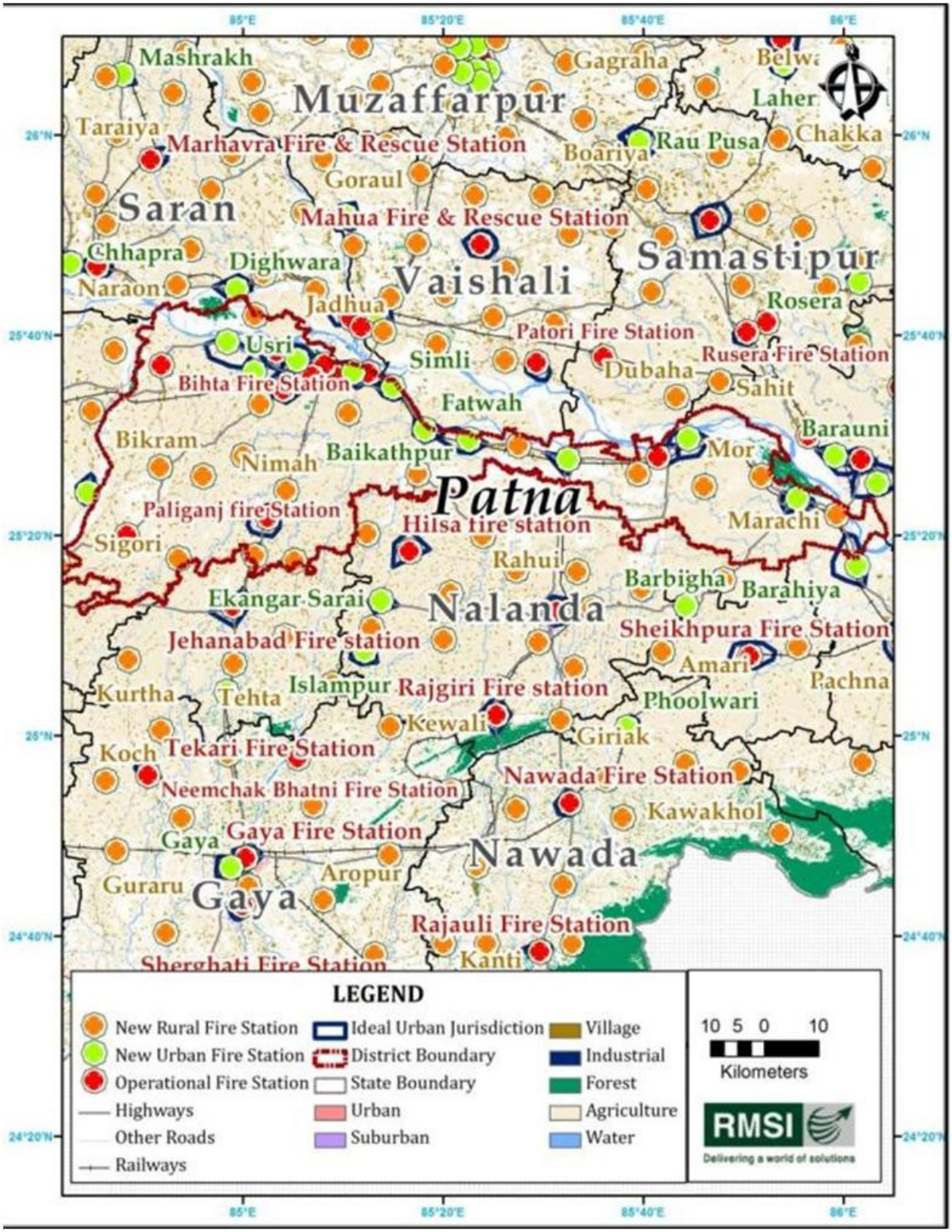

Figure 26-45: Fire stations gap analysis for Patna rural areas

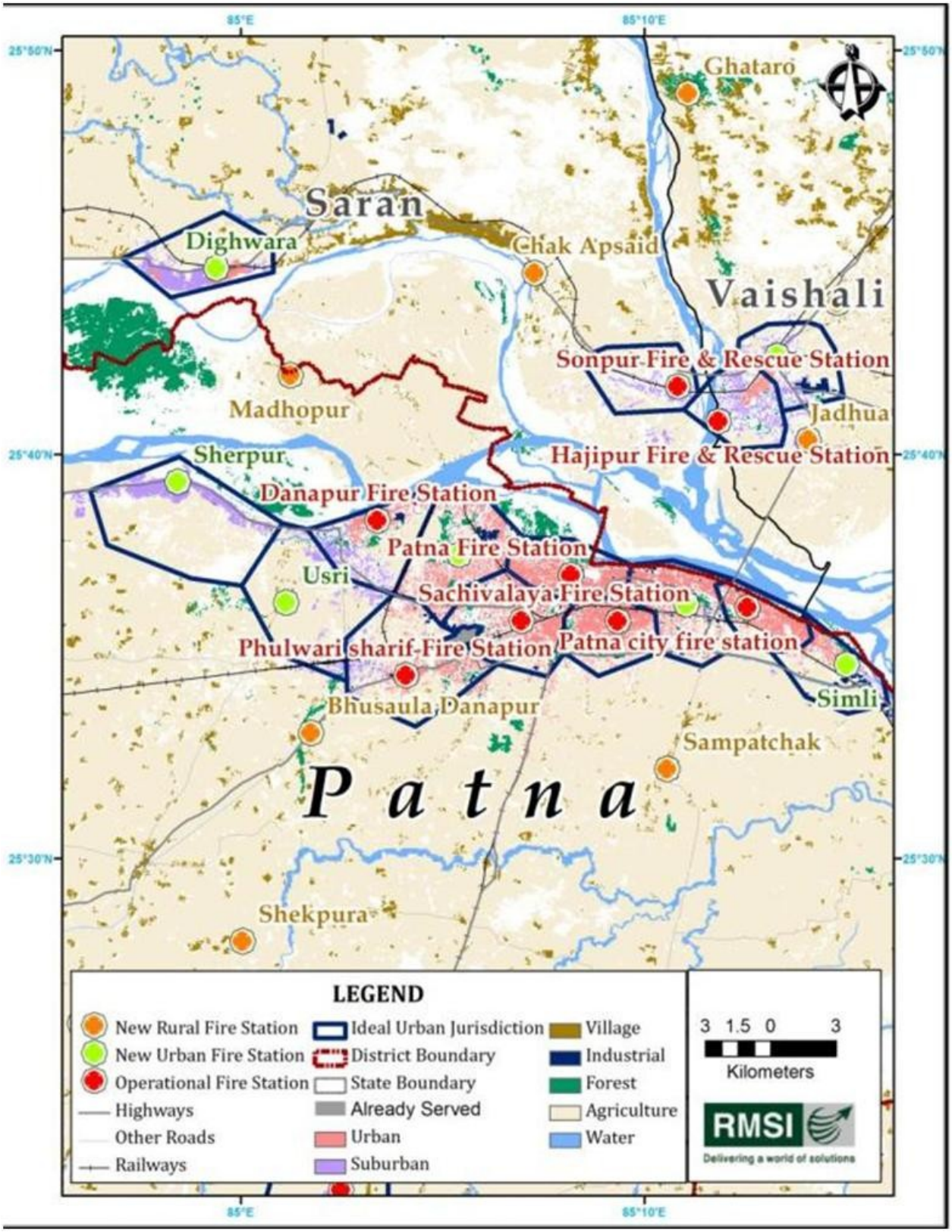

Figure 26-46: Fire stations gap analysis for Patna urban areas

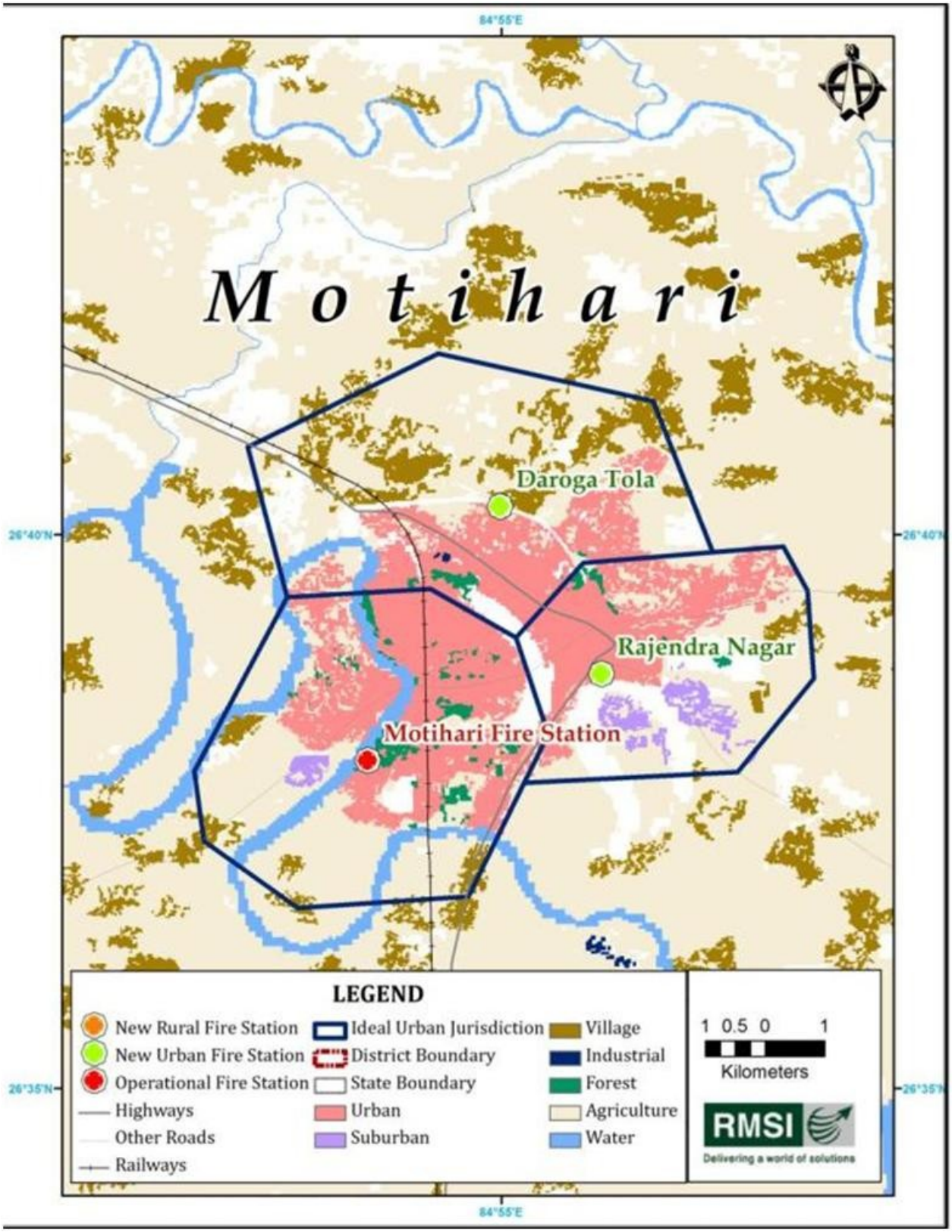

Figure 26-47: Fire stations gap analysis for Motihari urban areas

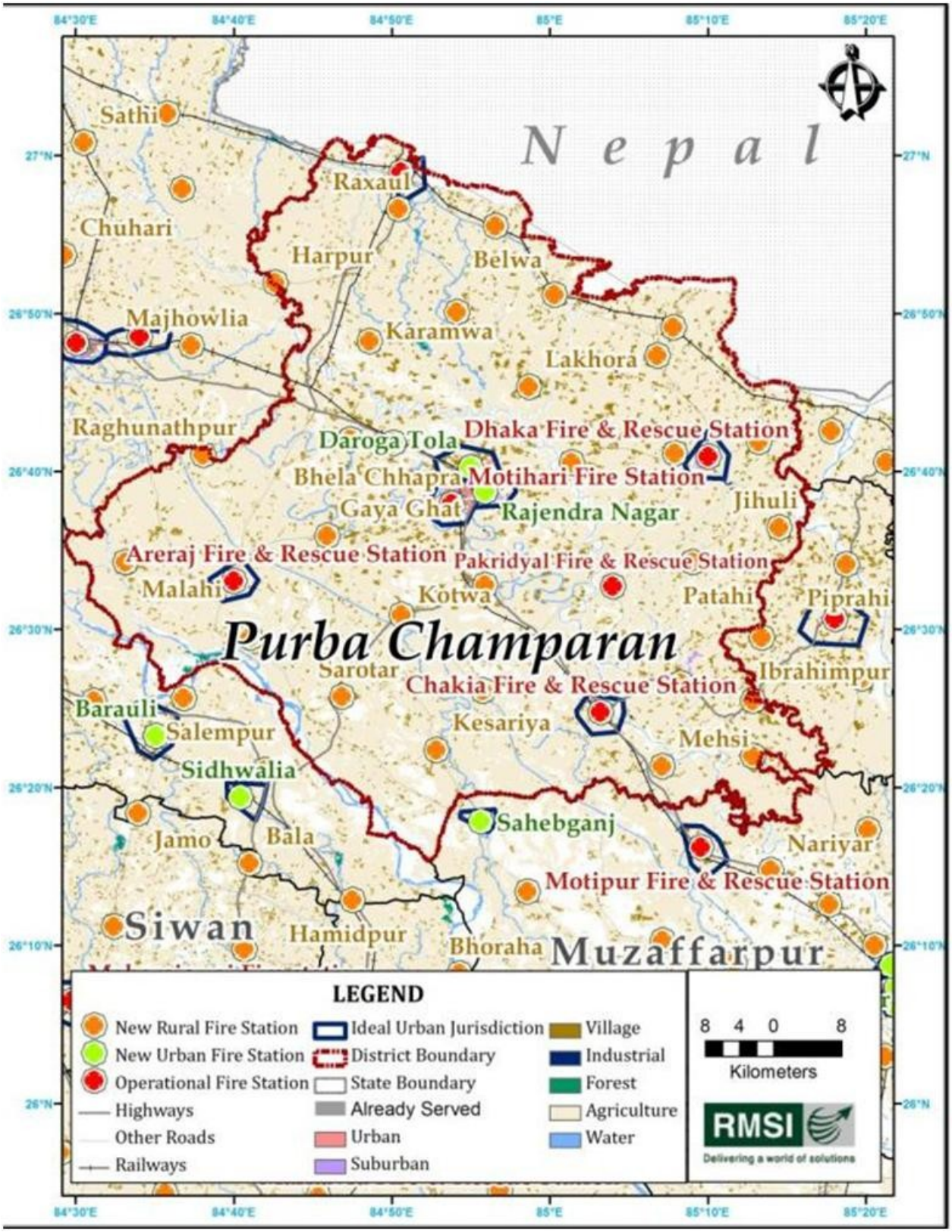

Figure 26-48: Fire stations gap analysis for Purba Champaran rural areas

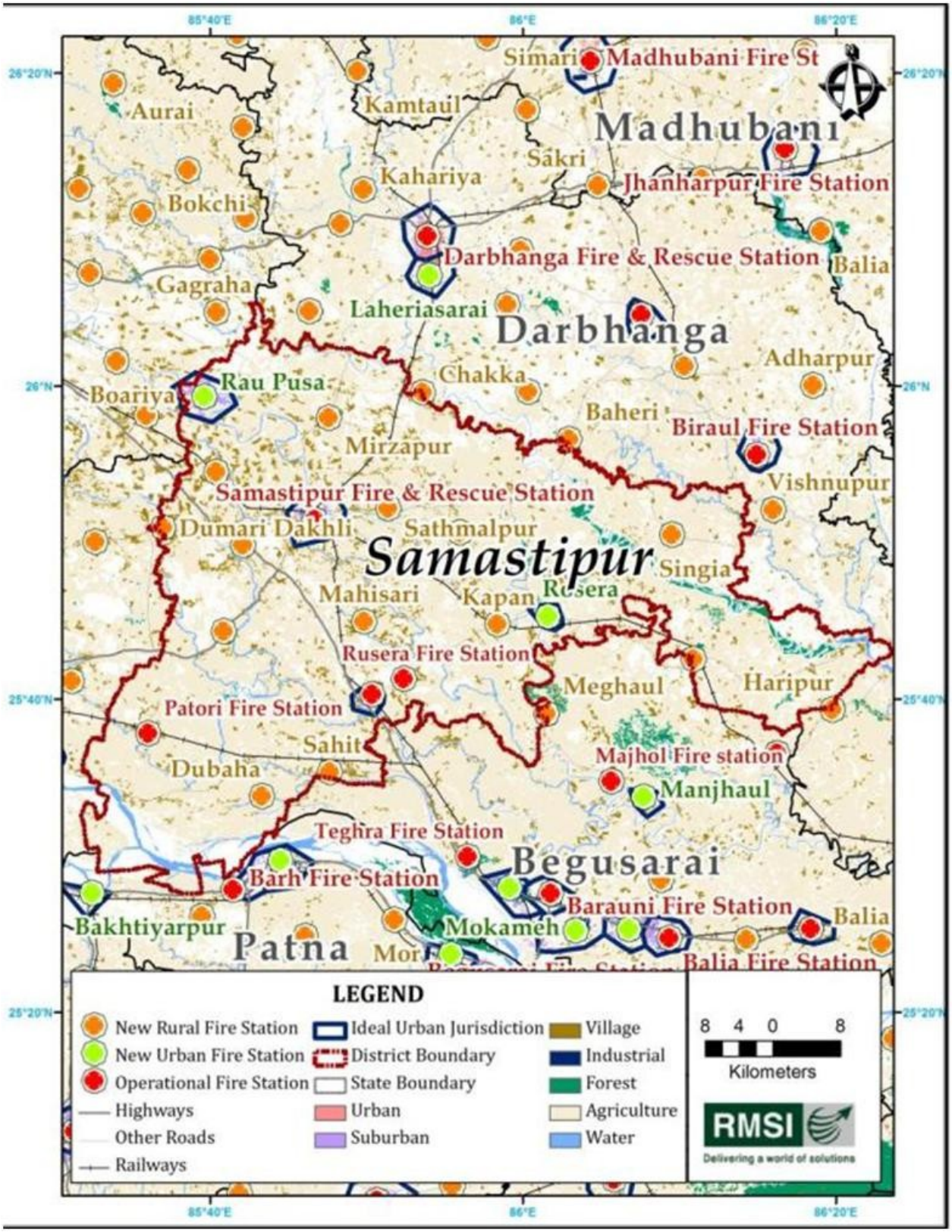

Figure 26-49: Fire stations gap analysis for Samastipur rural areas

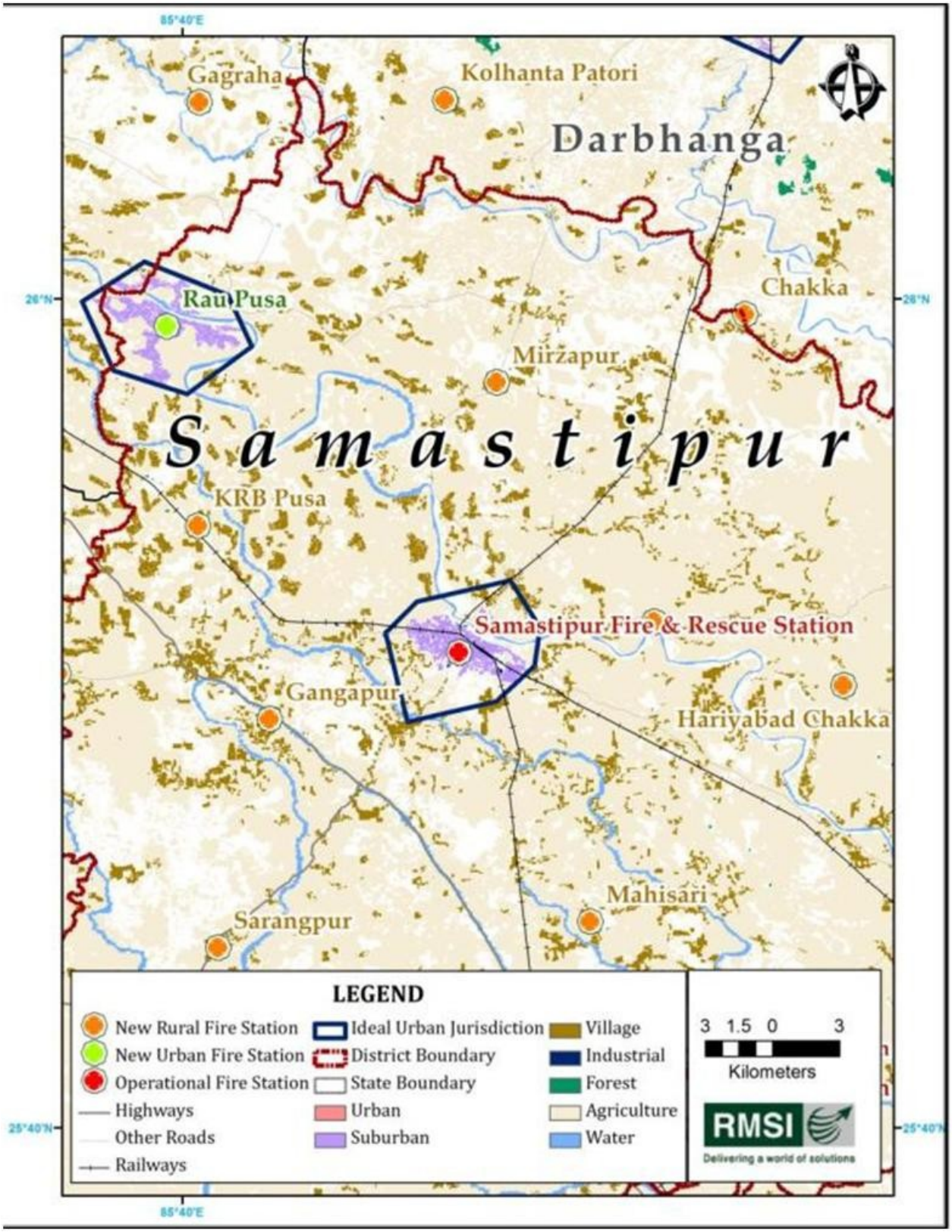

Figure 26-50: Fire stations gap analysis for Samastipur urban areas

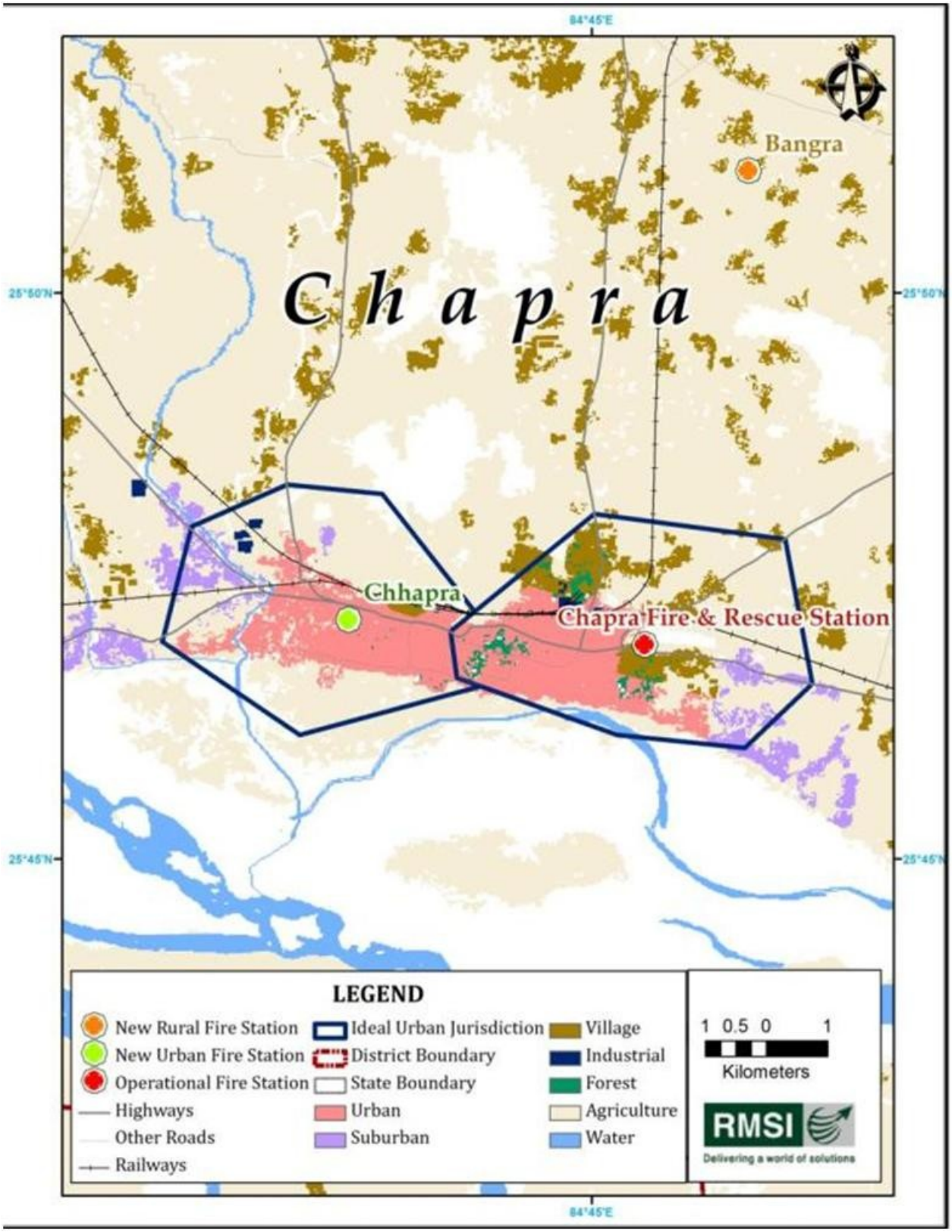

Figure 26-51: Fire stations gap analysis for Chapra urban areas

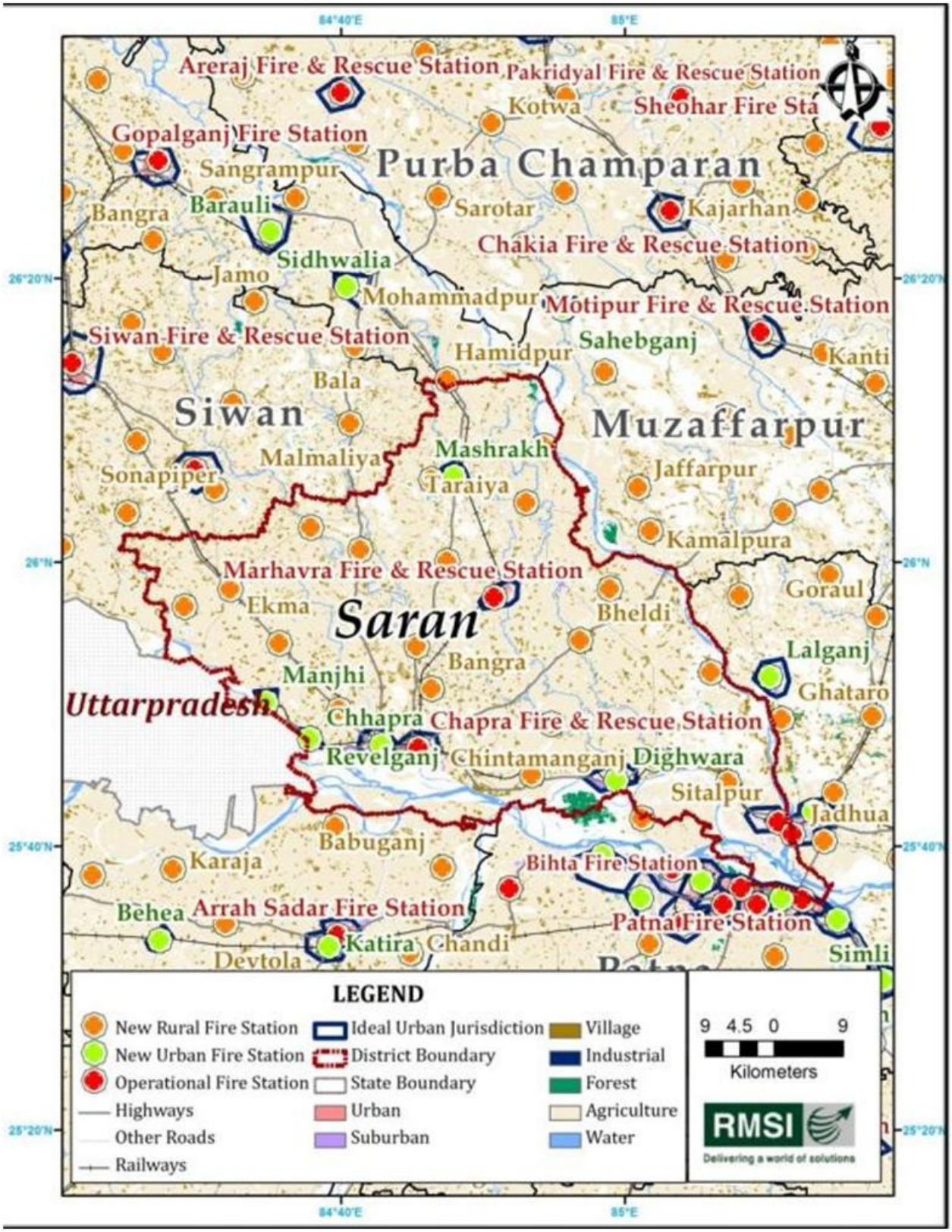

Figure 26-52: Fire stations gap analysis for Saran rural areas

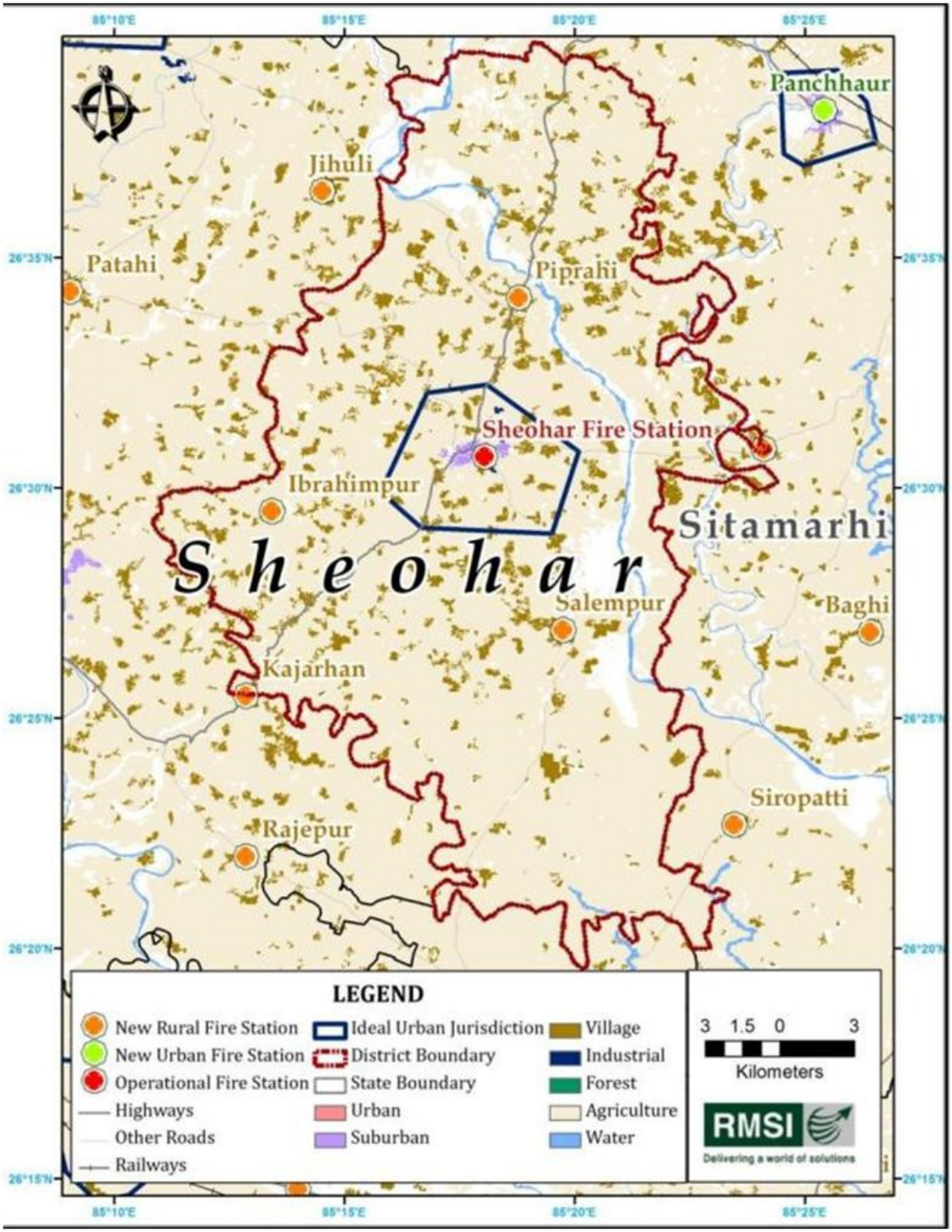

Figure 26-53: Fire stations gap analysis for Sheohar rural areas

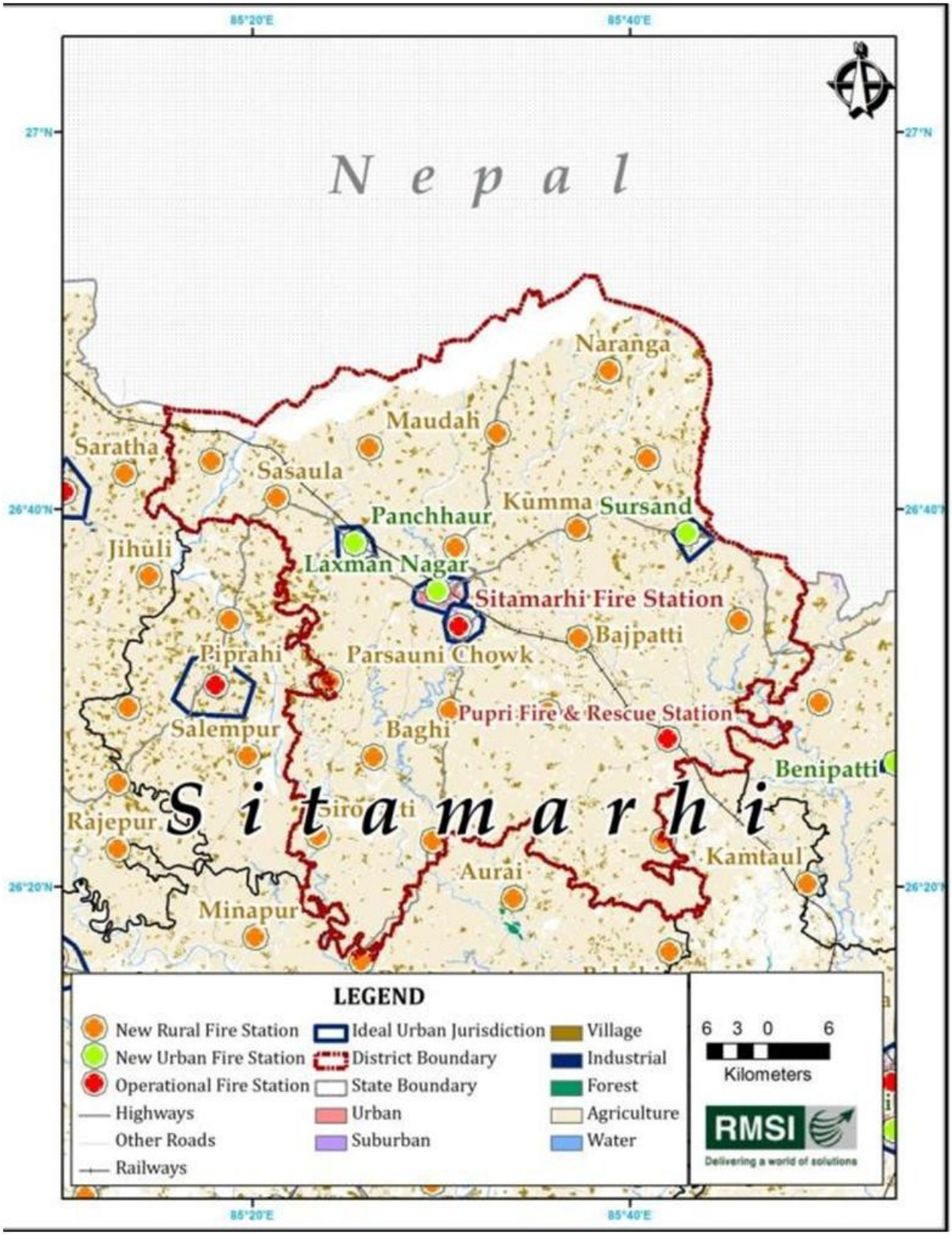

Figure 26-54: Fire stations gap analysis for Sitamarhi rural areas

Figure 26-55: Fire stations gap analysis for Supaul rural areas

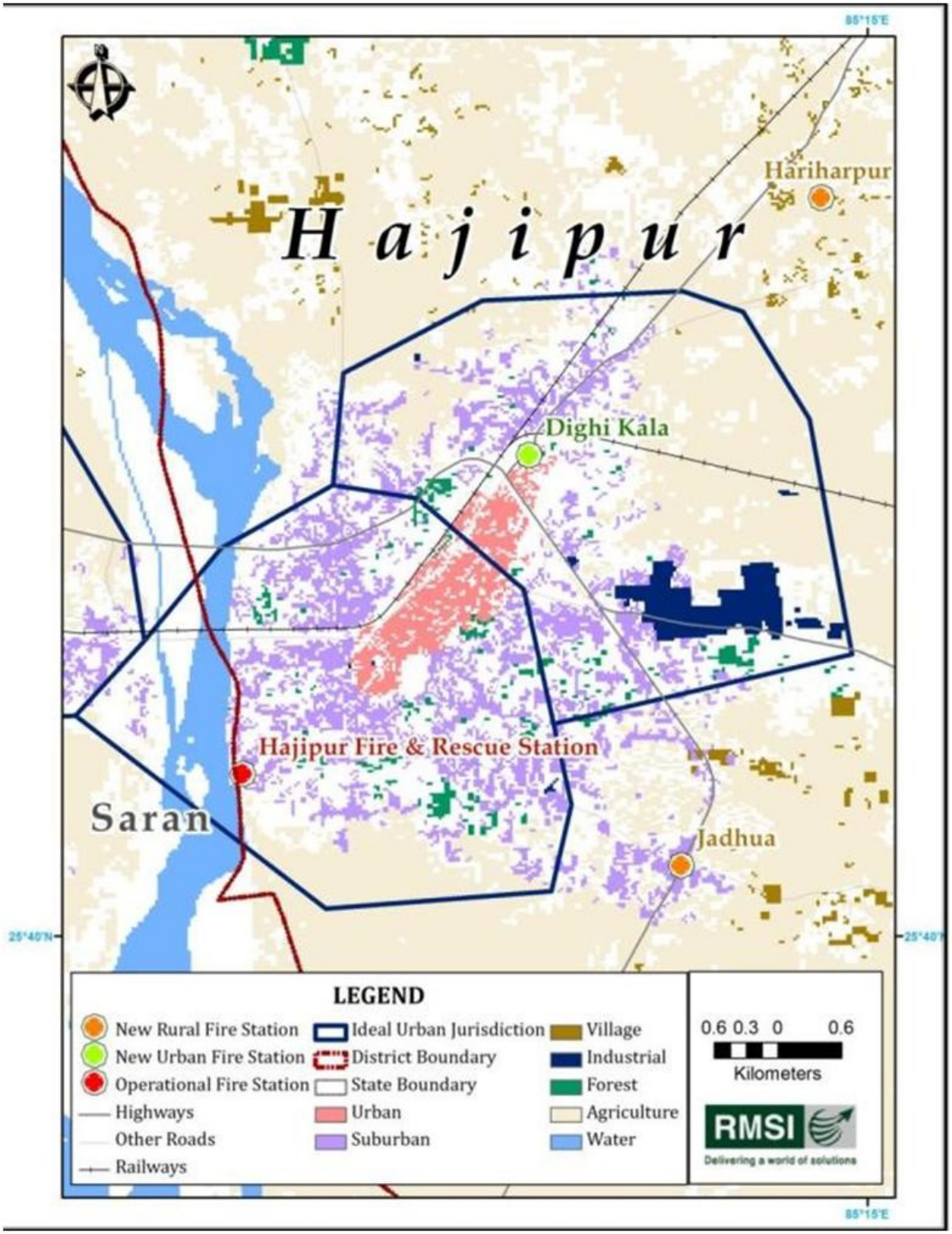

Figure 26-56: Fire stations gap analysis for Hajipur urban areas

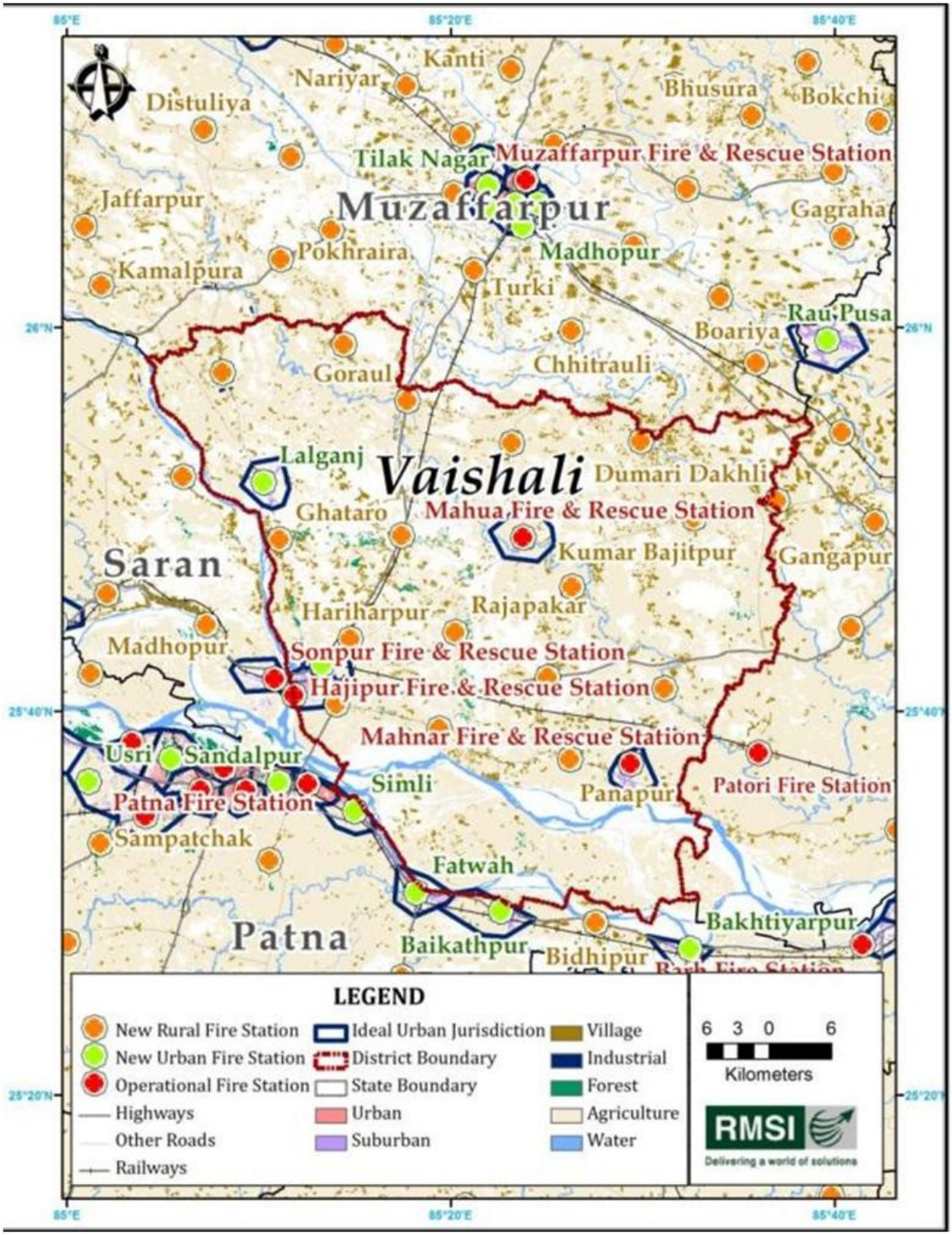

Figure 26-57: Fire stations gap analysis for Vaishali rural areas

26.3.2 FIRE FIGHTING AND RESCUE VEHICLES AND EQUIPMENT GAP

For firefighting and rescue vehicles and specialized equipment gap analysis at the operational Fire Stations and the additional Fire Stations in urban and rural areas, the following criteria have been followed, which have been basically taken from SFAC norms and minor changes have been made with expert opinion, for optimization of resources.

1. **Pumping Unit:** For counting of existing pumping units at various Fire Stations, equipments such as Fire Tender, Water Bowser, Water Mist Mini Fire Tender, Foam Tender, Crash Fire Tender, Fire Engine, Jumbo Tanker, and Multi-purpose Tender have been counted as one pumping unit. The SFAC criteria with some modifications have been proposed for estimating the requirement of pumping units. Accordingly, one pumping unit per 50,000 populations (subject to minimum one) up to 3 Lakhs population has been considered. For population of more than 3 Lakhs, one additional pumping unit per Lakhs of population has been considered. For example, if the population is 3,50,000 or more but less than 4,50,000, there should be 7 pumping units. At Fire Stations, where pumping unit requirements are coming to 2 or more units, half the units will be Water Tender and half the units will be Water Bowser, for example, for 2 pumping unit requirement, one will be Water Tender and one Water Bowser, however, for 3 pumping unit requirement, 2 will be Water Tender and 1 will be Water Bowser. *However, in hilly States, the criteria have been further relaxed.*

   Note: *we have considered pumping unit as a complete unit with water carrying capacity pumping unit, however, trailer fire pump with towing vehicle or a jeep fire engine, QRT with mist unit, or motor cycle with mist set have not been considered as a pumping unit. QRT with mist unit or motor cycle with mist set has been considered as a unit to cut response time in congested areas in urban areas.*

2. **Foam Tender:** For those Fire Stations, in whose jurisdiction small industrial area also lie, one Water Tender should be replaced with Foam Tender.
3. **DCP Tender:** Minimum one per district or one for 8-10 Fire Stations. Fire stations, having a large industrial plot area (in their ideal jurisdiction) of above 1.0 - 3.0 sq km, should have additionally one DCP tender. For industrial areas more than 3.0 - 6.0 sq km, there should be 2 DCP Tenders and so on.
4. **Advanced Rescue Tender:** One per district (minimum) up to 10 Lakhs population, and one additional unit for every 10 Lakhs urban population.
5. **Hydraulic Platform/ALP/TTL:** One per district depending upon the presence of high-rise buildings (height more than 15 m). Additional unit is to be provided for districts having a large number of such building blocks, i.e., Central Business Districts. It may be noted that Hydraulic Platform/ALP/TTL is not a replacement for in-built systems in high-rise buildings. Moreover, equipment is heavy and maneuvering on roads becomes difficult, where there are overhead electrical lines.
6. **HAZMAT Van:** Hazmat van is used rarely and is a very costly equipment requiring highly trained manpower. Hence, to optimize on resources and manpower, HAZMAT van is not recommended for future procurement in the State. However, for that purpose, an Advanced Rescue Responder is proposed (at Sr. No 4), which will have equipment to handle hazardous material release.
7. **Crash Fire Tender:** Crash Fire Tender is not recommended for the State Fire and Emergency Service. Instead, for Fire Stations in the funnel area on either side of the airport, one WT should be replaced with Foam Tender depending upon the State policy.

8. **BA Van, Light Van and Control Van:** One each per district. However, to optimize on resources and manpower, we are proposing a BA Van- cum-Light Van – cum-Control Van.
9. **Hose Tender:** One per district (minimum) or one for 8-10 Fire Stations.
10. **Trailer Pump:** Though Trailer Pumps are prescribed in SFAC norms, it is not recommended for future use, as this needs an additional towing vehicle. In place of this, procurement of Portable Pumps are recommended, which will be part of a Fire Tender (Specialized Equipment at Sl. No. 12)**.**
11. **QRT:** One each at Fire Stations serving a population density (total population in the FS jurisdiction/area of jurisdiction, in sq km) above 30,000 persons/sq km in metro and big cities, above 15,000 persons/sq km in other cities, or in congested areas based on field-survey.

    Note: The criteria of population density has been relaxed for hilly State from 15,000 person/sq km (in plains) to 5,000 person/sq km in the Fire Station jurisdiction
12. **Motorcycle with 2-water mist sets:** One each at Fire Stations serving higher population density or in congested areas with each QRT.
13. **Fire Boat:** One each at selected Fire Stations, in whose jurisdiction some inhabitated areas exist near water bodies, such as lake, major river, sea, where fire fighting can be better performed, through watercourse.
14. **Ambulance:** It is seen that Ambulance services are also with some of the State fire services and in few other States this is looked after by the Ministry of Health department of the States e.g., Rajasthan State has a modern fleet of Ambulances (108), well equipped with GPS, medical equipments and staff under National Rural Health Mission (Rajasthan), CATS (Centralized Accident Trauma Service, Ministry of Health) in case of Delhi State.

    It is observed during visit to the Fire Stations by the RMSI team that wherever the Ambulance are available with fire services, they neither have the Paramedic staff, nor adequate life support/normal equipments, and cannot be considered as an efficient system. It is therefore felt that either ambulance service should be run by Health Department through various hospitals / health centers or provide fully trained staff to fire services with properly equipped Ambulances. Accordingly, cost of the ambulance is not included in the gap analysis of the present study. However, the ambulance cost may be added, in case, it is decided in a particular State that Ambulance service should be part of fire services.
15. **Educational Van**: One per district and one additional unit for every 30 Lakhs district population.

At rural Fire Station/ Fire Post, if the estimated pumping unit is two, then one water tender with a QRT on pickup truck having 500 - 600 liters of water mist capacity along with a motor cycle with two water mist backpacks will be provided. This will help in quick response, as majority of rural villages inside roads are small in width and congested. This will also help in optimization of resources. For rural Fire Stations/ Fire Posts where less than 10,000 persons are residing within its jurisdiction, QRT and motor cycle with two water mist backpacks has only been recommended.

It may be noted that if a fire is responded to immediately, it may not flare-up into large fire; hence, QRT and Motorcycle are being considered as a quick responder and not as full-fledged fire units. In case of large fires, nearby Fire Station(s) will provide support with Water Tenders and Water Bowsers.

For reserve requirement, RMSI estimated reserve requirement of 20% at district level, and these will be distributed to individual Fire Stations by the concerned fire officials. This will help in optimizing the additional requirements of minimum one reserve at each Fire Station.

Specialized Equipment:

Specialized equipment for Fire Stations in urban areas shall be provided as per the following criteria:

1. **Hydraulic Rescue Tool:** One for each Fire Station depending upon the seismic Zone IV and V, or Fire Station having urban population more than 1.5 Lakhs in its ideal jurisdiction including Hydraulic Cutter, Hydraulic Spreader, Hydraulic Pump, Power Wedge, and Hydraulic Rescue Ram depending upon the seismic Zone IV and V.
2. **Combi-Tool:** One Combi-Tool set shall be provided with each fire-fighting vehicle.
3. **B.A. Set with BA Compressor:** Four B. A. Sets per fire fighting vehicle with minimum one compressor per Fire Station
4. **First Aid Box:** One for each fire fighting vehicle (minimum two at each Fire Station) with regular replacement of expired medicines
5. **Thermal Imaging Camera:** One for each Fire Station depending upon the seismic Zone IV and V, or Fire Station having urban population more than 1.5 Lakhs in its ideal jurisdiction
6. **Personal Protection Equipment (PPE):** One Set for each pumping unit or a minimum of two for each Fire Station
7. **Hydraulic Chain Saw/Cutter for Wood:** One for each Fire Station
8. **Electric/Petrol Chain Saw/Cutter for Wood:** One for each Fire Station
9. **Electric/Petrol Chain Saw/Cutter for Concrete:** One for each Fire Station
10. **Hand Held Gas Detector:** One piece per Vehicle
11. **Victim Location Device (Acoustic**): One for each Fire Station depending upon the seismic Zone IV and V, or Fire Station having urban population more than 1.5 Lakhs in its ideal jurisdiction
12. **Portable Pump:** One for each fire fighting unit
13. **Floating Pump**: One for each Fire Boat
14. **Smoke Exhauster/PPV:** One per Fire Stations located in urban areas (minimum one per district)
15. **Pneumatic Lifting Bags:** One for each Fire Station depending upon the seismic Zone IV and V, or Fire Station having urban population more than 1.5 Lakhs in its ideal jurisdiction
16. **Diving Suit (Dry Type):** Two for each Fire Boat depending upon the Fire Stations located in extreme climatic condition where wet type of diving suit cannot be used
17. **Diving Suit (Wet Type):** Two for each Fire Boat for Fire Stations located in normal climatic condition
18. **Inflatable Lighting Tower:** One per Fire Station
19. **High Capacity LED Torch Light:** One piece per vehicle

Note: *Other smaller equipments such as ropes, Fireman Axe, Small Hammer, different Branches/Nozzles, Foam Compound has not been mentioned separately, as these are standard items for any Fire Station/post.*

For rural Fire Station/Fire Post, following specialized equipment has been recommended:

1. **B.A. Set with BA Compressor:** Two B. A. set per fire fighting vehicle with one compressor per Fire Station/post
2. **Personal Protection Equipment (PPE):** One set per fire fighting vehicle
3. **Electric/Petrol Chain Saw/Cutter for Wood:** One per Fire Station/post
4. **Hydraulic Chain Saw/Cutter for Wood:** One per Fire Station/post
5. **Portable Pump:** One for each fire fighting unit
6. **Inflatable Lighting Tower:** One per Fire Station
7. **High Capacity LED Torch Light:** One piece per fire fighting vehicle
8. **First Aid Box:** One per fire fighting vehicle

For reserve requirement, RMSI estimated reserve requirement of 20% at district level, and these will be distributed to individual Fire Stations by the concerned fire officials. . *The replacement of condemned / major repair (off road) vehicles as well as instruments from operating Fire Stations can be accounted as reserve and these will be distributed to individual Fire Stations by the concerned fire officials.* This will help in optimizing the additional requirements of minimum one reserve at each Fire Station.

Communication Equipment:

For better coordination between Fire Station and fire fighting staff, communication plays an important role. Hence, there is a need that each fire vehicle and Fire Station is equipped with a communication device. Accordingly, following communication equipments for urban Fire Station are recommended:

1. **Static Wireless Set (VHF):** One set at each Fire Station
2. **Mobile Wireless Set (VHF):** One per vehicle
3. **Walky-Talky:** One per vehicle
4. **Megaphone:** One set per Fire Station/Post

Additionally, at each rural Fire Post, each QRT should be equipped with 1 mobile wireless set and 1 walky-talky.

Detailed district level list of currently operational fire fighting vehicles available with Fire Service (As on July 2012), vehicle gap in operational Fire Stations for ideal Jurisdiction area, additional vehicle required for new urban and rural Fire Stations and total vehicle gap for existing and new Urban Fire stations are shown in Table 26-4 to 26-7. Similarly, gap analysis for specialized fire equipment is shown in Tables 26-8 to 26-15.

Table 26-4: List of operational fire fighting vehicles available with Bihar Fire Services (As on July, 2012)

District	Fire Stations	Ideally Served Population Estimates	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	Hazmat Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicle
Araria	2	87,054	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Arwal	1	266,469	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Aurangabad	2	305,468	6	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Banka	1	24,687	4	0	0	0	0	0	0	0	0	1	0	0	0	0	5
Begusarai	6	1,086,483	15	1	2	0	0	0	0	0	0	0	0	0	0	0	18
Bhagalpur	3	509,852	9	1	1	0	0	1	0	0	0	1	0	0	0	0	13
Bhojpur	3	222,556	8	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Buxar	2	116,792	4	1	0	0	0	0	0	0	0	0	0	0	0	0	5
Darbhanga	3	322,948	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Gaya	5	568,007	9	1	1	1	0	0	0	0	0	1	0	0	0	0	13
Gopalganj	2	172,018	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Jamui	1	52,315	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Jehanabad	1	119,018	3	0	1	0	0	0	0	0	0	0	0	0	0	0	4
Kaimur (Bhabua)	1	37,382	3	1	0	0	0	0	0	0	0	0	0	0	0	0	4
Katihar	3	275,830	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Khagaria	2	199,365	4	0	0	0	0	0	0	0	0	1	0	0	0	0	5
Kishanganj	1	115,070	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Lakhisarai	1	108,158	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Madhepura	2	128,923	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Madhubani	4	381,207	8	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Munger	3	479,564	6	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Muzaffarpur	2	127,056	5	1	1	1	0	0	0	0	0	1	0	0	0	0	9
Nalanda	3	408,370	7	0	0	0	0	0	0	0	0	1	0	0	0	0	8
Nawada	2	157,220	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Pashchim	3	241,066	8	0	0	0	0	0	0	0	0	0	0	0	0	0	8

District	Fire Stations	Ideally Served Population Estimates	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	Hazmat Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicle
Champaran																	
Patna	10	2,125,525	19	4	3	2	2	0	0	0	0	2	0	0	1	0	33
Purba Champaran	6	524,977	11	0	0	0	0	0	0	0	0	0	0	0	0	0	11
Purnia	4	518,505	8	0	0	0	0	0	0	0	0	1	0	0	0	0	9
Rohtas	3	436,331	9	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Saharsa	2	207,055	3	0	0	0	0	0	0	0	0	1	0	0	0	0	4
Samastipur	4	787,546	8	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Saran	3	177,253	6	0	0	0	0	0	0	0	0	1	0	0	0	0	7
Sheikhpura	1	82,251	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Sheohar	1	91,430	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Sitamarhi	2	141,357	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Siwan	2	247,311	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Supaul	2	74,053	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Vaishali	3	214,509	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Total	**102**	**12,140,981**	**230**	**10**	**9**	**4**	**2**	**1**	**0**	**0**	**0**	**11**	**0**	**0**	**1**	**0**	**268**

Table 26-5: Vehicle gap in operational Fire Stations for their ideal jurisdiction area

District	Fire Stations	Ideally Served Population Estimates	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	Hazmat Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicle
Araria	2	87,054	-2	0	1	1	0	1	2	1	0	0	0	0	0	1	5
Arwal	1	266,469	0	2	1	1	0	1	1	1	0	1	1	0	0	1	10
Aurangabad	2	305,468	1	0	1	1	0	2	2	1	0	0	0	0	0	1	9
Banka	1	24,687	-2	0	0	1	0	1	1	1	0	0	0	0	0	1	3
Begusarai	6	1,086,483	1	3	2	1	1	1	2	1	0	4	4	0	0	1	21
Bhagalpur	3	509,852	-1	0	1	1	1	1	2	1	0	1	2	0	0	1	10
Bhojpur	3	222,556	-4	1	1	1	1	1	2	1	0	1	1	0	0	1	7
Buxar	2	116,792	-1	0	0	1	0	1	1	1	0	0	0	0	0	1	4
Darbhanga	3	322,948	0	1	1	1	1	2	2	1	0	0	0	0	0	1	10
Gaya	5	568,007	0	2	2	0	1	2	2	1	0	1	2	0	0	1	14
Gopalganj	2	172,018	-1	0	0	1	0	1	1	1	0	0	0	0	0	1	4
Jamui	1	52,315	-1	0	0	1	0	1	1	1	0	0	0	0	0	1	4
Jehanabad	1	119,018	-1	0	0	1	0	1	1	1	0	0	0	0	0	1	4
Kaimur (Bhabua)	1	37,382	-1	-1	0	0	0	0	0	0	0	0	0	0	0	0	-2
Katihar	3	275,830	-1	1	0	1	1	1	1	1	0	1	1	0	0	1	8
Khagaria	2	199,365	-1	1	0	1	0	1	1	1	0	0	0	0	0	1	5
Kishanganj	1	115,070	0	0	0	1	0	1	1	1	0	0	0	0	0	1	5
Lakhisarai	1	108,158	0	0	0	1	0	1	1	1	0	0	0	0	0	1	5
Madhepura	2	128,923	-1	0	0	1	0	1	1	1	0	0	0	0	0	1	4
Madhubani	4	381,207	-1	1	0	1	0	1	1	1	0	1	1	0	0	1	7
Munger	3	479,564	0	3	1	1	1	1	1	1	0	2	2	0	0	1	14
Muzaffarpur	2	127,056	-2	-1	1	0	1	1	1	1	0	0	1	0	0	1	4
Nalanda	3	408,370	0	2	1	1	1	1	2	1	0	0	1	0	0	1	11
Nawada	2	157,220	-1	0	1	1	0	1	1	1	0	0	0	0	0	1	5

District	Fire Stations	Ideally Served Population Estimates	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	Hazmat Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicle
Pashchim Champaran	3	241,066	-1	0	0	1	0	1	1	1	0	1	1	0	0	1	6
Patna	10	2,125,525	6	10	6	1	0	3	4	1	0	6	8	0	0	1	46
Purba Champaran	6	524,977	-2	1	2	1	0	2	2	1	0	1	1	0	0	1	10
Purnia	4	518,505	-2	4	1	1	1	2	2	1	0	2	3	0	0	1	16
Rohtas	3	436,331	-2	2	2	1	0	1	1	1	0	1	1	0	0	1	9
Saharsa	2	207,055	0	1	1	1	0	1	1	1	0	-1	0	0	0	1	6
Samastipur	4	787,546	3	5	1	1	0	1	2	1	0	2	2	0	0	1	19
Saran	3	177,253	-2	0	1	1	1	1	1	1	0	-1	0	0	0	1	4
Sheikhpura	1	82,251	-1	0	0	1	0	1	1	1	0	0	0	0	0	1	4
Sheohar	1	91,430	0	0	0	1	0	1	1	1	0	0	0	0	0	1	5
Sitamarhi	2	141,357	-1	1	0	1	0	1	2	1	0	1	1	0	0	1	8
Siwan	2	247,311	-1	2	1	1	0	1	2	1	0	0	0	0	0	1	8
Supaul	2	74,053	0	0	0	1	0	1	1	1	0	0	0	0	0	1	5
Vaishali	3	214,509	0	0	0	1	1	2	2	1	0	0	0	0	0	1	8
Total	**102**	**12,140,981**	**-22**	**41**	**29**	**35**	**12**	**45**	**54**	**37**	**0**	**24**	**33**	**0**	**0**	**37**	**325**

Table 26-6: Total gap in operational and new urban Fire Stations under their ideal jurisdiction areas

District	Fire Stations	Ideally Served Population Estimates	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	Hazmat Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicle
Araria	2	87,054	-2	0	1	1	0	1	2	1	0	0	0	0	0	1	5
Arwal	1	266,469	0	2	1	1	0	1	1	1	0	1	1	0	0	1	10
Aurangabad	6	489,001	5	0	2	1	0	2	2	1	0	0	0	0	0	1	14
Banka	1	24,687	-2	0	0	1	0	1	1	1	0	0	0	0	0	1	3
Begusarai	10	1,515,462	6	6	4	1	1	1	2	1	0	4	4	0	0	1	31
Bhagalpur	9	1,025,245	5	3	4	1	1	1	2	1	0	4	5	0	0	1	28
Bhojpur	6	370,775	-1	1	2	1	1	1	2	1	0	1	1	0	0	1	11
Buxar	4	214,115	1	0	1	1	0	1	1	1	0	0	0	0	0	1	7
Darbhanga	4	447,749	1	2	2	1	1	2	2	1	0	0	0	0	0	1	13
Gaya	7	729,695	2	3	3	0	1	2	3	1	0	1	2	0	0	1	19
Gopalganj	4	291,928	1	1	0	1	0	1	1	1	0	0	0	0	0	1	7
Jamui	2	107,970	0	0	0	1	0	1	1	1	0	0	0	0	0	1	5
Jehanabad	2	160,469	0	0	0	1	0	1	1	1	0	0	0	0	0	1	5
Kaimur (Bhabua)	3	130,987	1	-1	0	1	0	1	1	1	0	0	0	0	0	1	5
Katihar	5	474,909	1	2	2	1	1	1	2	1	0	2	2	0	0	1	16
Khagaria	2	199,365	-1	1	0	1	0	1	1	1	0	0	0	0	0	1	5
Kishanganj	1	115,070	0	0	0	1	0	1	1	1	0	0	0	0	0	1	5
Lakhisarai	2	163,852	1	0	0	1	0	1	1	1	0	0	0	0	0	1	6
Madhepura	3	202,112	0	1	0	1	0	1	1	1	0	0	0	0	0	1	6
Madhubani	5	408,507	0	1	0	1	0	1	2	1	0	1	1	0	0	1	9
Munger	4	602,458	1	4	2	1	1	1	1	1	0	2	2	0	0	1	17
Muzaffarpur	10	457,894	6	-1	2	0	1	2	4	1	0	1	2	0	0	1	19
Nalanda	5	492,095	2	2	1	1	1	1	2	1	0	0	1	0	0	1	13
Nawada	3	185,973	0	0	1	1	0	1	1	1	0	0	0	0	0	1	6

District	Fire Stations	Ideally Served Population Estimates	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	Hazmat Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicle
Pashchim Champaran	6	433,813	2	0	2	1	0	1	3	1	0	1	1	0	0	1	13
Patna	20	3,266,104	20	16	12	1	0	3	4	1	0	8	10	0	0	1	76
Purba Champaran	8	767,482	1	3	3	1	0	2	3	1	0	1	1	0	0	1	17
Purnia	7	895,274	2	7	3	1	1	2	3	1	0	2	3	0	0	1	26
Rohtas	9	724,704	4	3	3	1	0	1	2	1	0	1	1	0	0	1	18
Saharsa	2	207,055	0	1	1	1	0	1	1	1	0	-1	0	0	0	1	6
Samastipur	6	998,809	6	7	1	1	0	1	2	1	0	2	2	0	0	1	24
Saran	8	425,029	4	1	2	1	1	1	3	1	0	-1	0	0	0	1	14
Sheikhpura	2	114,886	0	0	0	1	0	1	1	1	0	0	0	0	0	1	5
Sheohar	1	91,430	0	0	0	1	0	1	1	1	0	0	0	0	0	1	5
Sitamarhi	5	310,360	2	1	1	1	0	1	2	1	0	1	1	0	0	1	12
Siwan	2	247,311	-1	2	1	1	0	1	2	1	0	0	0	0	0	1	8
Supaul	2	74,053	0	0	0	1	0	1	1	1	0	0	0	0	0	1	5
Vaishali	5	361,562	3	1	0	1	1	2	2	1	0	0	0	0	0	1	12
Total	**184**	**18,081,713**	**70**	**69**	**57**	**36**	**12**	**47**	**68**	**38**	**0**	**31**	**40**	**0**	**0**	**38**	**506**

Table 26-7: Additional vehicle required for new rural Fire Stations under their ideal jurisdiction areas

District	Fire Stations	Ideally Served Population Estimates	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	Hazmat Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicle
Araria	12	2,466,928	24	20	3	0	0	0	0	0	0	12	12	0	0	0	71
Arwal	1	129,844	1	1	0	0	0	0	0	0	0	1	1	0	0	0	4
Aurangabad	13	2,057,465	18	13	5	0	0	0	0	0	0	13	13	0	0	0	62
Banka	16	2,054,864	19	12	2	0	0	0	0	0	0	16	16	0	0	0	65
Begusarai	5	1,156,936	11	10	2	0	0	0	0	0	0	5	5	0	0	0	33
Bhagalpur	12	1,901,960	18	11	5	0	0	0	0	0	0	12	12	0	0	0	58
Bhojpur	12	2,324,607	20	13	11	0	0	0	0	0	0	12	12	0	0	0	68
Buxar	9	1,653,037	15	9	7	0	0	0	0	0	0	9	9	0	0	0	49
Darbhanga	14	3,344,018	35	25	6	0	0	0	0	0	0	14	14	0	0	0	94
Gaya	19	3,697,490	35	26	9	0	0	0	0	0	0	19	19	0	0	0	108
Gopalganj	13	2,242,164	21	14	7	0	0	0	1	0	0	13	13	0	0	0	69
Jamui	8	1,660,912	17	13	2	0	0	0	0	0	0	8	8	0	0	0	48
Jehanabad	4	864,937	8	6	3	0	0	0	0	0	0	4	4	0	0	0	25
Kaimur (Bhabua)	9	1,658,588	14	10	8	0	0	0	0	0	0	9	9	0	0	0	50
Katihar	14	2,369,592	24	17	3	0	0	0	0	0	0	14	14	0	0	0	72
Khagaria	8	1,528,634	15	11	1	0	0	0	0	0	0	8	8	0	0	0	43
Kishanganj	9	1,711,247	17	12	3	0	0	0	0	0	0	9	9	0	0	0	50
Lakhisarai	2	520,138	6	4	1	0	0	0	0	0	0	2	2	0	0	0	15
Madhepura	8	1,588,535	17	13	1	0	0	0	0	0	0	8	8	0	0	0	47
Madhubani	19	4,180,726	43	34	2	0	0	0	1	0	0	19	19	0	0	0	118
Munger	5	935,291	11	6	1	0	0	0	0	0	0	5	5	0	0	0	28
Muzaffarpur	29	4,143,527	41	23	7	0	0	0	0	0	0	29	29	0	0	0	129
Nalanda	16	2,739,381	26	15	9	0	0	0	0	0	0	16	16	0	0	0	82
Nawada	11	1,930,332	19	13	4	0	0	0	0	0	0	11	11	0	0	0	58
Pashchim Champaran	17	3,355,157	32	26	7	0	0	0	0	0	0	17	17	0	0	0	99

District	Fire Stations	Ideally Served Population Estimates	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	Hazmat Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicle
Patna	16	2,764,094	26	17	7	0	0	0	0	0	0	16	16	0	0	0	82
Purba Champaran	29	4,549,081	43	30	8	0	0	0	1	0	0	29	29	0	0	0	140
Purnia	18	2,890,244	29	19	5	0	0	0	0	0	0	18	18	0	0	0	89
Rohtas	11	2,113,524	19	13	8	0	0	0	0	0	0	11	11	0	0	0	62
Saharsa	7	1,685,164	18	13	2	0	0	0	0	0	0	7	7	0	0	0	47
Samastipur	14	3,351,009	34	27	1	0	0	0	0	0	0	14	14	0	0	0	90
Saran	19	3,365,269	33	20	9	0	0	0	0	0	0	19	19	0	0	0	100
Sheikhpura	2	503,238	5	5	0	0	0	0	0	0	0	2	2	0	0	0	14
Sheohar	4	766,183	8	6	0	0	0	0	0	0	0	4	4	0	0	0	22
Sitamarhi	16	2,882,737	30	20	3	0	0	0	0	0	0	16	16	0	0	0	85
Siwan	17	3,144,123	31	22	6	0	0	0	0	0	0	17	17	0	0	0	93
Supaul	12	2,340,194	25	16	4	0	0	0	0	0	0	12	12	0	0	0	69
Vaishali	16	3,151,746	31	22	5	0	0	0	1	0	0	16	16	0	0	0	91
Total	**466**	**85,722,916**	**839**	**587**	**167**	**0**	**0**	**0**	**4**	**0**	**0**	**466**	**466**	**0**	**0**	**0**	**2,529**

Table 26-8: List of specialized equipment available with Bihar Fire Services department (As on July, 2012)

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters/ Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Araria	2	87,054	0	1	1	0	0	0	0	1	0	0	0	0	0	0
Arwal	1	266,469	0	2	0	0	0	0	0	2	0	0	0	0	0	0
Aurangabad	2	305,468	0	0	1	0	0	0	1	0	0	0	0	0	1	0
Banka	1	24,687	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Begusarai	6	1,086,483	0	0	2	0	8	0	5	0	0	0	0	0	1	0
Bhagalpur	3	509,852	0	1	5	0	3	1	0	0	0	2	0	0	1	0
Bhojpur	3	222,556	0	0	1	0	3	0	1	0	0	0	0	0	1	0
Buxar	2	116,792	0	0	1	0	0	0	1	0	0	1	0	0	0	0
Darbhanga	3	322,948	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gaya	5	568,007	0	1	3	0	0	0	3	1	0	1	0	0	1	0
Gopalganj	2	172,018	0	0	2	0	0	0	0	1	0	0	0	0	1	0
Jamui	1	52,315	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jehanabad	1	119,018	0	0	1	0	2	0	0	0	0	0	0	0	1	0
Kaimur (Bhabua)	1	37,382	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Katihar	3	275,830	0	1	4	0	0	0	0	2	0	0	0	0	0	0
Khagaria	2	199,365	0	0	0	0	1	0	2	0	0	0	0	0	1	0
Kishanganj	1	115,070	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Lakhisarai	1	108,158	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Madhepura	2	128,923	0	0	2	0	0	0	0	0	0	0	0	0	0	0

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters/ Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Madhubani	4	381,207	0	1	3	0	0	0	0	3	0	0	0	0	1	0
Munger	3	479,564	0	0	2	0	0	0	0	1	0	0	0	0	4	0
Muzaffarpur	2	127,056	0	1	6	1	0	1	1	0	0	4	1	0	1	0
Nalanda	3	408,370	0	1	3	0	1	0	0	0	0	0	0	0	1	0
Nawada	2	157,220	0	1	1	0	3	1	1	0	0	0	0	0	1	0
Pashchim Champaran	3	241,066	0	0	3	0	1	0	0	0	0	1	0	0	1	0
Patna	10	2,125,525	0	5	17	0	9	0	0	1	0	6	0	0	8	0
Purba Champaran	6	524,977	0	0	2	0	0	0	1	1	0	2	0	0	1	0
Purnia	4	518,505	0	2	3	0	1	0	0	0	0	0	0	0	0	0
Rohtas	3	436,331	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Saharsa	2	207,055	0	1	1	0	1	0	1	0	0	1	0	0	1	0
Samastipur	4	787,546	0	0	2	0	0	0	2	1	0	0	0	0	0	0
Saran	3	177,253	1	1	2	0	1	0	0	1	0	2	0	0	1	0
Sheikhpura	1	82,251	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Sheohar	1	91,430	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sitamarhi	2	141,357	0	0	2	0	0	0	0	1	0	0	0	0	0	0
Siwan	2	247,311	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Supaul	2	74,053	0	0	3	0	1	0	1	0	0	0	0	0	0	0
Vaishali	3	214,509	2	1	2	0	2	0	3	0	0	0	0	0	1	0
Total	**102**	**12,140,981**	**3**	**20**	**81**	**1**	**37**	**3**	**23**	**17**	**0**	**20**	**1**	**0**	**30**	**0**

Table 26-9: List of specialized equipment available with Bihar Fire Services department (As on July, 2012) (continued..)

District	Fire Stations	Ideally Served Population Estimates	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Araria	2	87,054	0	0	1	0	0	5	0	0	0	0	0	9
Arwal	1	266,469	0	0	1	0	0	3	0	0	0	0	0	8
Aurangabad	2	305,468	0	0	1	0	0	4	0	0	0	0	0	8
Banka	1	24,687	0	0	1	0	0	3	0	0	0	0	0	4
Begusarai	6	1,086,483	0	0	1	0	0	19	0	0	2	0	0	38
Bhagalpur	3	509,852	0	0	1	0	0	11	0	1	0	0	0	26
Bhojpur	3	222,556	0	0	1	0	0	6	0	0	0	0	0	13
Buxar	2	116,792	0	0	0	0	0	3	0	0	0	0	0	6
Darbhanga	3	322,948	0	0	1	0	0	5	0	0	0	0	0	6
Gaya	5	568,007	0	0	1	1	0	12	0	0	0	0	0	24
Gopalganj	2	172,018	0	0	1	0	0	4	0	0	0	0	0	9
Jamui	1	52,315	0	0	1	0	0	3	0	0	0	0	0	4
Jehanabad	1	119,018	0	0	1	0	0	4	0	1	0	0	0	10
Kaimur (Bhabua)	1	37,382	0	0	2	0	0	2	0	0	0	0	0	5
Katihar	3	275,830	0	0	1	0	0	7	0	0	0	0	0	15
Khagaria	2	199,365	0	0	1	0	0	4	0	0	0	0	0	9
Kishanganj	1	115,070	0	0	0	0	0	2	0	0	0	0	0	3
Lakhisarai	1	108,158	0	0	1	0	0	2	0	0	1	0	0	4
Madhepura	2	128,923	0	0	0	0	0	1	0	0	0	0	0	3
Madhubani	4	381,207	0	0	1	0	0	4	0	0	0	0	0	13
Munger	3	479,564	0	0	1	0	0	5	0	0	0	0	0	13

District	Fire Stations	Ideally Served Population Estimates	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Muzaffarpur	2	127,056	0	0	1	1	0	5	0	1	2	0	0	26
Nalanda	3	408,370	0	0	1	0	0	3	0	0	0	0	0	10
Nawada	2	157,220	0	0	1	0	0	2	0	1	3	0	0	15
Pashchim Champaran	3	241,066	0	0	2	0	0	7	0	0	0	0	0	15
Patna	10	2,125,525	0	0	2	2	0	20	0	4	6	16	0	96
Purba Champaran	6	524,977	0	0	0	0	0	8	0	0	0	0	0	15
Purnia	4	518,505	0	0	1	0	1	7	0	0	0	0	0	15
Rohtas	3	436,331	0	0	2	0	0	9	0	0	0	0	0	13
Saharsa	2	207,055	0	0	1	0	0	3	0	0	0	0	0	10
Samastipur	4	787,546	0	0	1	0	0	7	0	0	0	0	0	13
Saran	3	177,253	0	0	1	0	0	5	0	0	0	0	0	15
Sheikhpura	1	82,251	0	0	1	0	0	1	0	0	0	0	0	4
Sheohar	1	91,430	0	0	1	0	0	0	0	0	0	0	0	1
Sitamarhi	2	141,357	0	0	0	0	0	4	0	0	0	0	0	7
Siwan	2	247,311	0	0	1	0	0	2	0	0	0	0	0	5
Supaul	2	74,053	0	0	1	0	0	2	0	0	0	0	0	8
Vaishali	3	214,509	0	0	0	0	0	4	0	0	0	0	0	15
Total	**102**	**12,140,981**	**0**	**0**	**36**	**4**	**1**	**198**	**0**	**8**	**14**	**16**	**0**	**513**

Table 26-10: Specialized equipment gap in operational Fire Stations for ideal jurisdiction area

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters/ Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Araria	2	87,054	2	4	18	2	5	2	2	1	2	5	6	2	4	0
Arwal	1	266,469	1	6	31	1	8	1	1	-1	1	8	10	1	7	0
Aurangabad	2	305,468	1	10	37	2	10	1	1	2	2	10	12	1	7	0
Banka	1	24,687	1	4	12	1	4	1	1	1	1	4	5	1	3	0
Begusarai	6	1,086,483	4	12	123	7	26	4	-1	7	7	34	13	4	27	0
Bhagalpur	3	509,852	2	9	53	4	13	1	2	4	4	14	11	2	12	0
Bhojpur	3	222,556	1	8	30	4	7	1	3	4	4	10	10	1	6	0
Buxar	2	116,792	1	5	18	2	6	1	1	2	2	5	6	1	4	0
Darbhanga	3	322,948	4	11	43	4	11	4	4	4	4	11	13	4	9	0
Gaya	5	568,007	1	13	69	6	21	1	2	5	6	20	16	1	15	0
Gopalganj	2	172,018	2	5	17	2	6	2	2	1	2	6	6	2	3	0
Jamui	1	52,315	1	2	10	1	2	1	1	1	1	2	4	1	2	0
Jehanabad	1	119,018	1	4	13	1	2	1	1	1	1	4	5	1	2	0
Kaimur (Bhabua)	1	37,382	0	2	10	1	2	0	1	0	1	2	2	0	2	0
Katihar	3	275,830	2	4	32	4	10	2	2	2	4	10	6	2	8	0
Khagaria	2	199,365	2	6	22	2	6	2	0	2	2	7	7	2	4	0
Kishanganj	1	115,070	1	4	13	1	4	1	1	1	1	4	5	1	3	0
Lakhisarai	1	108,158	1	4	14	1	4	1	1	1	1	4	5	1	3	0
Madhepura	2	128,923	2	4	12	2	4	2	2	2	2	4	5	2	3	0

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters/ Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Madhubani	4	381,207	4	5	38	5	12	4	4	2	5	12	7	4	8	0
Munger	3	479,564	2	11	51	4	15	2	2	3	4	15	12	2	8	0
Muzaffarpur	2	127,056	2	6	20	1	7	1	1	2	2	3	7	2	5	0
Nalanda	3	408,370	2	12	47	4	12	2	4	4	4	13	14	2	10	0
Nawada	2	157,220	1	4	18	2	3	0	1	2	2	6	6	1	3	0
Pashchim Champaran	3	241,066	4	10	33	4	9	4	4	4	4	9	11	4	7	0
Patna	10	2,125,525	8	44	228	12	58	8	10	11	12	61	52	8	47	0
Purba Champaran	6	524,977	6	10	58	7	17	6	5	6	7	15	12	6	12	0
Purnia	4	518,505	2	8	57	5	17	2	2	5	5	18	11	2	14	0
Rohtas	3	436,331	1	8	54	4	14	1	2	4	4	14	10	1	11	0
Saharsa	2	207,055	2	5	23	2	6	2	1	2	2	6	7	2	4	0
Samastipur	4	787,546	2	10	84	5	23	2	0	4	5	23	11	2	19	0
Saran	3	177,253	3	5	22	4	7	4	4	3	4	6	7	4	4	0
Sheikhpura	1	82,251	1	2	8	1	2	1	1	1	1	2	4	1	2	0
Sheohar	1	91,430	1	2	10	1	2	1	1	1	1	2	4	1	2	0
Sitamarhi	2	141,357	1	2	20	2	6	1	1	1	2	6	4	1	5	0
Siwan	2	247,311	2	7	27	2	8	2	2	2	2	8	8	2	6	0
Supaul	2	74,053	2	4	11	2	3	2	1	2	2	4	5	2	3	0
Vaishali	3	214,509	2	7	32	4	6	4	1	4	4	8	11	4	6	0
Total	**102**	**12,140,981**	**78**	**279**	**1418**	**119**	**378**	**78**	**74**	**103**	**120**	**395**	**350**	**81**	**300**	**0**

Table 26-11: Specialized equipment gap in operational Fire Stations for ideal jurisdiction area (continued..)

District	Fire Stations	Ideally Served Population Estimates	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Araria	2	87,054	0	0	1	2	2	1	0	2	12	12	2	89
Arwal	1	266,469	0	0	0	1	1	7	0	1	14	14	1	114
Aurangabad	2	305,468	0	0	1	2	1	8	0	2	18	18	2	148
Banka	1	24,687	0	0	0	1	1	2	0	1	10	10	1	65
Begusarai	6	1,086,483	0	0	6	4	4	16	0	7	40	42	7	393
Bhagalpur	3	509,852	0	0	3	2	2	7	0	3	25	25	4	202
Bhojpur	3	222,556	0	0	3	4	1	4	0	4	17	18	4	144
Buxar	2	116,792	0	0	2	2	1	3	0	2	11	12	2	89
Darbhanga	3	322,948	0	0	3	4	4	8	0	4	20	20	4	193
Gaya	5	568,007	0	0	5	4	1	10	0	6	29	30	6	267
Gopalganj	2	172,018	0	0	1	2	2	2	0	2	11	12	2	90
Jamui	1	52,315	0	0	0	1	1	1	0	1	8	8	1	50
Jehanabad	1	119,018	0	0	0	1	1	1	0	0	10	10	1	61
Kaimur (Bhabua)	1	37,382	0	0	-1	1	0	0	0	1	2	2	1	29
Katihar	3	275,830	0	0	3	2	2	4	0	4	17	17	4	141
Khagaria	2	199,365	0	0	1	2	2	3	0	2	12	13	2	101
Kishanganj	1	115,070	0	0	1	1	1	3	0	1	10	10	1	68
Lakhisarai	1	108,158	0	0	0	1	1	3	0	1	9	10	1	67
Madhepura	2	128,923	0	0	2	2	2	4	0	2	10	10	2	80
Madhubani	4	381,207	0	0	4	4	4	8	0	5	17	18	5	175
Munger	3	479,564	0	0	3	2	2	11	0	4	22	22	4	201
Muzaffarpur	2	127,056	0	0	1	1	2	3	0	1	12	14	2	95

District	Fire Stations	Ideally Served Population Estimates	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Nalanda	3	408,370	0	0	3	4	2	11	0	4	22	22	4	202
Nawada	2	157,220	0	0	1	2	1	4	0	1	8	12	2	80
Pashchim Champaran	3	241,066	0	0	2	4	4	4	0	4	16	16	4	161
Patna	10	2,125,525	0	0	10	8	8	50	0	8	77	68	12	800
Purba Champaran	6	524,977	0	0	7	6	6	10	0	7	24	26	7	260
Purnia	4	518,505	0	0	4	2	1	12	0	5	26	27	5	230
Rohtas	3	436,331	0	0	2	2	1	7	0	4	20	20	4	188
Saharsa	2	207,055	0	0	1	2	2	4	0	2	12	13	2	102
Samastipur	4	787,546	0	0	4	2	2	17	0	5	30	30	5	285
Saran	3	177,253	0	0	3	4	4	2	0	4	13	15	4	126
Sheikhpura	1	82,251	0	0	0	1	1	3	0	1	8	8	1	50
Sheohar	1	91,430	0	0	0	1	1	4	0	1	8	8	1	53
Sitamarhi	2	141,357	0	0	2	1	1	3	0	2	13	13	2	89
Siwan	2	247,311	0	0	1	2	2	6	0	2	14	14	2	121
Supaul	2	74,053	0	0	1	2	2	3	0	2	10	10	2	75
Vaishali	3	214,509	0	0	4	4	4	7	0	4	18	18	4	156
Total	**102**	**12,140,981**	**0**	**0**	**84**	**93**	**80**	**256**	**0**	**112**	**655**	**667**	**120**	**5,840**

Table 26-12: Total gap in specialized equipments for operational and new urban Fire Stations

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters/ Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Araria	2	87,054	2	4	18	2	5	2	2	1	2	5	6	2	4	0
Arwal	1	266,469	1	6	31	1	8	1	1	-1	1	8	10	1	7	0
Aurangabad	6	489,001	1	16	61	7	18	1	6	7	7	18	18	1	7	0
Banka	1	24,687	1	4	12	1	4	1	1	1	1	4	5	1	3	0
Begusarai	10	1,515,462	9	24	171	12	39	9	4	12	12	47	25	9	36	0
Bhagalpur	9	1,025,245	9	27	118	11	33	8	9	11	11	34	29	9	21	0
Bhojpur	6	370,775	1	13	49	8	13	1	7	8	8	16	15	1	6	0
Buxar	4	214,115	1	9	32	4	10	1	3	4	4	9	10	1	4	0
Darbhanga	4	447,749	5	15	57	5	15	5	5	5	5	15	17	5	12	0
Gaya	7	729,695	1	18	88	8	27	1	4	7	8	26	21	1	18	0
Gopalganj	4	291,928	4	9	31	4	10	4	4	3	4	10	10	4	3	0
Jamui	2	107,970	1	3	15	2	4	1	2	2	2	4	5	1	2	0
Jehanabad	2	160,469	1	5	18	2	4	1	2	2	2	6	6	1	2	0
Kaimur (Bhabua)	3	130,987	1	4	20	3	6	1	3	2	3	6	6	1	2	0
Katihar	5	474,909	4	11	58	6	17	4	4	4	6	17	13	4	12	0
Khagaria	2	199,365	2	6	22	2	6	2	0	2	2	7	7	2	4	0
Kishanganj	1	115,070	1	4	13	1	4	1	1	1	1	4	5	1	3	0
Lakhisarai	2	163,852	2	5	19	2	6	2	2	2	2	6	6	2	3	0
Madhepura	3	202,112	3	6	22	3	6	3	3	3	3	6	7	3	3	0
Madhubani	5	408,507	5	6	43	6	14	5	5	3	6	14	8	5	8	0

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters/ Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Munger	4	602,458	3	15	65	5	19	3	3	4	5	19	16	3	11	0
Muzaffarpur	10	457,894	12	18	66	11	24	11	11	12	12	20	20	12	6	0
Nalanda	5	492,095	2	14	57	6	16	2	6	6	6	17	16	2	10	0
Nawada	3	185,973	2	5	23	3	5	1	2	3	3	8	7	2	3	0
Pashchim Champaran	6	433,813	8	16	57	8	16	8	8	8	8	16	17	8	7	0
Patna	20	3,266,104	20	78	358	24	95	20	22	23	24	98	86	20	52	0
Purba Champaran	8	767,482	8	17	87	9	24	8	7	8	9	22	19	8	12	0
Purnia	7	895,274	6	19	100	9	28	6	6	9	9	29	22	6	17	0
Rohtas	9	724,704	1	18	92	11	28	1	9	11	11	28	20	1	14	0
Saharsa	2	207,055	2	5	23	2	6	2	1	2	2	6	7	2	4	0
Samastipur	6	998,809	4	16	108	7	30	4	2	6	7	30	17	4	19	0
Saran	8	425,029	5	15	60	10	19	6	10	9	10	18	17	6	7	0
Sheikhpura	2	114,886	2	3	13	2	4	2	2	2	2	4	5	2	2	0
Sheohar	1	91,430	1	2	10	1	2	1	1	1	1	2	4	1	2	0
Sitamarhi	5	310,360	5	7	39	6	12	5	5	5	6	12	9	5	5	0
Siwan	2	247,311	2	7	27	2	8	2	2	2	2	8	8	2	6	0
Supaul	2	74,053	2	4	11	2	3	2	1	2	2	4	5	2	3	0
Vaishali	5	361,562	4	12	51	6	12	6	3	6	6	14	16	6	9	0
Total	**184**	**18,081,713**	**144**	**466**	**2145**	**214**	**600**	**144**	**169**	**198**	**215**	**617**	**540**	**147**	**349**	**0**

Table 26-13: Total gap in specialized equipments for operational and new urban Fire Stations (Continued….)

District	Fire Stations	Ideally Served Population Estimates	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Araria	2	87,054	0	0	1	2	2	1	0	2	12	12	2	89
Arwal	1	266,469	0	0	0	1	1	7	0	1	14	14	1	114
Aurangabad	6	489,001	0	0	6	7	1	14	0	7	24	26	7	260
Banka	1	24,687	0	0	0	1	1	2	0	1	10	10	1	65
Begusarai	10	1,515,462	0	0	11	9	9	28	0	12	52	55	12	597
Bhagalpur	9	1,025,245	0	0	10	9	9	25	0	10	43	45	11	492
Bhojpur	6	370,775	0	0	7	8	1	9	0	8	22	24	8	233
Buxar	4	214,115	0	0	4	4	1	7	0	4	15	16	4	147
Darbhanga	4	447,749	0	0	4	5	5	12	0	5	24	24	5	250
Gaya	7	729,695	0	0	7	6	1	15	0	8	35	37	8	345
Gopalganj	4	291,928	0	0	3	4	4	6	0	4	15	16	4	156
Jamui	2	107,970	0	0	1	2	1	2	0	2	9	10	2	73
Jehanabad	2	160,469	0	0	1	2	1	2	0	1	11	12	2	84
Kaimur (Bhabua)	3	130,987	0	0	1	3	1	4	0	3	10	11	3	94
Katihar	5	474,909	0	0	5	4	4	11	0	6	25	25	6	246
Khagaria	2	199,365	0	0	1	2	2	3	0	2	12	13	2	101
Kishanganj	1	115,070	0	0	1	1	1	3	0	1	10	10	1	68
Lakhisarai	2	163,852	0	0	1	2	2	4	0	2	10	12	2	94
Madhepura	3	202,112	0	0	3	3	3	6	0	3	12	12	3	116
Madhubani	5	408,507	0	0	5	5	5	9	0	6	19	20	6	203
Munger	4	602,458	0	0	4	3	3	15	0	5	26	26	5	258
Muzaffarpur	10	457,894	0	0	11	11	12	16	0	11	29	34	12	371

District	Fire Stations	Ideally Served Population Estimates	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Nalanda	5	492,095	0	0	5	6	2	13	0	6	24	26	6	248
Nawada	3	185,973	0	0	2	3	2	5	0	2	9	14	3	107
Pashchim Champaran	6	433,813	0	0	6	8	8	10	0	8	24	24	8	281
Patna	20	3,266,104	0	0	22	20	20	84	0	20	111	105	24	1,326
Purba Champaran	8	767,482	0	0	9	8	8	17	0	9	32	34	9	364
Purnia	7	895,274	0	0	8	6	5	23	0	9	38	39	9	403
Rohtas	9	724,704	0	0	9	9	1	17	0	11	31	34	11	368
Saharsa	2	207,055	0	0	1	2	2	4	0	2	12	13	2	102
Samastipur	6	998,809	0	0	6	4	4	23	0	7	36	37	7	378
Saran	8	425,029	0	0	9	10	6	12	0	10	25	29	10	303
Sheikhpura	2	114,886	0	0	1	2	2	4	0	2	9	10	2	77
Sheohar	1	91,430	0	0	0	1	1	4	0	1	8	8	1	53
Sitamarhi	5	310,360	0	0	6	5	5	8	0	6	18	19	6	194
Siwan	2	247,311	0	0	1	2	2	6	0	2	14	14	2	121
Supaul	2	74,053	0	0	1	2	2	3	0	2	10	10	2	75
Vaishali	5	361,562	0	0	6	6	6	12	0	6	23	24	6	240
Total	**184**	**18,081,713**	**0**	**0**	**179**	**188**	**146**	**446**	**0**	**207**	**863**	**904**	**215**	**9,096**

Table 26-14: Additional specialized equipment required for new rural Fire Stations

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws /Cutters / Hammers for Concrete	Electric Chain Saws /Cutters / Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Araria	12	2,466,928	0	0	254	14	71	0	0	14	14	71	0	0	59	0
Arwal	1	129,844	0	0	12	1	4	0	0	1	1	4	0	0	3	0
Aurangabad	13	2,057,465	0	0	204	16	59	0	0	16	16	59	0	0	49	0
Banka	16	2,054,864	0	0	197	19	59	0	0	19	19	59	0	0	49	0
Begusarai	5	1,156,936	0	0	122	6	34	0	0	6	6	34	0	0	28	0
Bhagalpur	12	1,901,960	0	0	192	14	55	0	0	14	14	55	0	0	46	0
Bhojpur	12	2,324,607	0	0	240	14	67	0	0	14	14	67	0	0	56	0
Buxar	9	1,653,037	0	0	170	11	48	0	0	11	11	48	0	0	40	0
Darbhanga	14	3,344,018	0	0	350	17	96	0	0	17	17	96	0	0	80	0
Gaya	19	3,697,490	0	0	382	23	107	0	0	23	23	107	0	0	89	0
Gopalganj	13	2,242,164	0	0	233	16	66	0	0	16	16	66	0	0	55	0
Jamui	8	1,660,912	0	0	173	10	48	0	0	10	10	48	0	0	40	0
Jehanabad	4	864,937	0	0	91	5	25	0	0	5	5	25	0	0	21	0
Kaimur (Bhabua)	9	1,658,588	0	0	175	11	49	0	0	11	11	49	0	0	41	0
Katihar	14	2,369,592	0	0	245	17	70	0	0	17	17	70	0	0	58	0
Khagaria	8	1,528,634	0	0	149	10	42	0	0	10	10	42	0	0	35	0
Kishanganj	9	1,711,247	0	0	175	11	49	0	0	11	11	49	0	0	41	0
Lakhisarai	2	520,138	0	0	58	2	16	0	0	2	2	16	0	0	13	0
Madhepura	8	1,588,535	0	0	168	10	47	0	0	10	10	47	0	0	39	0

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws /Cutters / Hammers for Concrete	Electric Chain Saws /Cutters / Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Madhubani	19	4,180,726	0	0	425	23	118	0	0	23	23	118	0	0	98	0
Munger	5	935,291	0	0	98	6	28	0	0	6	6	28	0	0	23	0
Muzaffarpur	29	4,143,527	0	0	410	35	120	0	0	35	35	120	0	0	100	0
Nalanda	16	2,739,381	0	0	278	19	79	0	0	19	19	79	0	0	66	0
Nawada	11	1,930,332	0	0	199	13	56	0	0	13	13	56	0	0	47	0
Pashchim Champaran	17	3,355,157	0	0	353	20	98	0	0	20	20	98	0	0	82	0
Patna	16	2,764,094	0	0	278	19	79	0	0	19	19	79	0	0	66	0
Purba Champaran	29	4,549,081	0	0	458	35	132	0	0	35	35	132	0	0	110	0
Purnia	18	2,890,244	0	0	298	22	85	0	0	22	22	85	0	0	71	0
Rohtas	11	2,113,524	0	0	218	13	61	0	0	13	13	61	0	0	51	0
Saharsa	7	1,685,164	0	0	175	8	48	0	0	8	8	48	0	0	40	0
Samastipur	14	3,351,009	0	0	331	17	91	0	0	17	17	91	0	0	76	0
Saran	19	3,365,269	0	0	343	23	97	0	0	23	23	97	0	0	81	0
Sheikhpura	2	503,238	0	0	53	2	14	0	0	2	2	14	0	0	12	0
Sheohar	4	766,183	0	0	77	5	22	0	0	5	5	22	0	0	18	0
Sitamarhi	16	2,882,737	0	0	293	19	83	0	0	19	19	83	0	0	69	0
Siwan	17	3,144,123	0	0	324	20	91	0	0	20	20	91	0	0	76	0
Supaul	12	2,340,194	0	0	245	14	68	0	0	14	14	68	0	0	57	0
Vaishali	16	3,151,746	0	0	317	19	89	0	0	19	19	89	0	0	74	0
Total	**466**	**85,722,916**	**0**	**0**	**8763**	**559**	**2471**	**0**	**0**	**559**	**559**	**2471**	**0**	**0**	**2059**	**0**

Table 26-15: Additional specialized equipment required for new rural Fire Stations (continued…)

District	Fire Stations	Ideally Served Population Estimates	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Araria	12	2,466,928	0	0	14	0	0	71	0	14	71	71	14	752
Arwal	1	129,844	0	0	1	0	0	4	0	1	4	4	1	41
Aurangabad	13	2,057,465	0	0	16	0	0	59	0	16	59	59	16	644
Banka	16	2,054,864	0	0	19	0	0	59	0	19	59	59	19	655
Begusarai	5	1,156,936	0	0	6	0	0	34	0	6	34	34	6	356
Bhagalpur	12	1,901,960	0	0	14	0	0	55	0	14	55	55	14	597
Bhojpur	12	2,324,607	0	0	14	0	0	67	0	14	67	67	14	715
Buxar	9	1,653,037	0	0	11	0	0	48	0	11	48	48	11	516
Darbhanga	14	3,344,018	0	0	17	0	0	96	0	17	96	96	17	1,012
Gaya	19	3,697,490	0	0	23	0	0	107	0	23	107	107	23	1,144
Gopalganj	13	2,242,164	0	0	16	0	0	66	0	16	67	67	16	716
Jamui	8	1,660,912	0	0	10	0	0	48	0	10	48	48	10	513
Jehanabad	4	864,937	0	0	5	0	0	25	0	5	25	25	5	267
Kaimur (Bhabua)	9	1,658,588	0	0	11	0	0	49	0	11	49	49	11	527
Katihar	14	2,369,592	0	0	17	0	0	70	0	17	70	70	17	755
Khagaria	8	1,528,634	0	0	10	0	0	42	0	10	42	42	10	454
Kishanganj	9	1,711,247	0	0	11	0	0	49	0	11	49	49	11	527
Lakhisarai	2	520,138	0	0	2	0	0	16	0	2	16	16	2	163
Madhepura	8	1,588,535	0	0	10	0	0	47	0	10	47	47	10	502
Madhubani	19	4,180,726	0	0	23	0	0	118	0	23	119	119	23	1,253
Munger	5	935,291	0	0	6	0	0	28	0	6	28	28	6	297
Muzaffarpur	29	4,143,527	0	0	35	0	0	120	0	35	120	120	35	1,320

District	Fire Stations	Ideally Served Population Estimates	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Nalanda	16	2,739,381	0	0	19	0	0	79	0	19	79	79	19	853
Nawada	11	1,930,332	0	0	13	0	0	56	0	13	56	56	13	604
Pashchim Champaran	17	3,355,157	0	0	20	0	0	98	0	20	98	98	20	1,045
Patna	16	2,764,094	0	0	19	0	0	79	0	19	79	79	19	853
Purba Champaran	29	4,549,081	0	0	35	0	0	132	0	35	133	133	35	1,440
Purnia	18	2,890,244	0	0	22	0	0	85	0	22	85	85	22	926
Rohtas	11	2,113,524	0	0	13	0	0	61	0	13	61	61	13	652
Saharsa	7	1,685,164	0	0	8	0	0	48	0	8	48	48	8	503
Samastipur	14	3,351,009	0	0	17	0	0	91	0	17	91	91	17	964
Saran	19	3,365,269	0	0	23	0	0	97	0	23	97	97	23	1,047
Sheikhpura	2	503,238	0	0	2	0	0	14	0	2	14	14	2	147
Sheohar	4	766,183	0	0	5	0	0	22	0	5	22	22	5	235
Sitamarhi	16	2,882,737	0	0	19	0	0	83	0	19	83	83	19	891
Siwan	17	3,144,123	0	0	20	0	0	91	0	20	91	91	20	975
Supaul	12	2,340,194	0	0	14	0	0	68	0	14	68	68	14	726
Vaishali	16	3,151,746	0	0	19	0	0	89	0	19	90	90	19	952
Total	**466**	**85,722,916**	**0**	**0**	**559**	**0**	**0**	**2471**	**0**	**559**	**2475**	**2475**	**559**	**26,539**

26.3.3 Fire Manpower Gap

SFAC guidelines have suggested manpower, including reserve for duty off, training, leave for Station Officer, Sub-Officer (75%) and Leading Firemen and lower staff (25%). This has been further estimated for two shifts for Leading Firemen and lower staff, while the current duty pattern for them is practically 24 hours (Table 26.16).

Table 26-16: Manpower requirement for Station Officer and lower staff for Bihar considering two shifts duty pattern

Sr No	Size of Station (Pumping Unit)	Station Officer	Sub-Officer*	Leading Firemen (L.F.)	Additional LFM	Total LFM	Drivers/ Operators	Fire men	Additional FM per FS (FAD,HID, DISP,WRO)	Total Fire men	Total
1	One	0	1.75	2.5	1.25	3.75	5	15	10	25	35.50
2	Two	1.75	1.75	5	1.25	6.25	7.5	30	10	40	57.25
3	Three	1.75	3.5	7.5	1.25	8.75	10	45	10	55	79.00
4	Four	3.5	3.5	10	1.25	11.25	15	60	10	70	103.25
5	Five	3.5	5.25	12.5	1.25	13.75	17.5	75	10	85	125.00
6	Six	3.5	7	15	1.25	16.25	22.5	90	10	100	149.25
7	Seven	5.25	7	17.5	1.25	18.75	25	105	10	115	171.00

**: Where extent of fire risk may justify Sub-Officers may be replaced with Station Officers*

However, Delhi Administrative Reform Department (ARD), Govt. of India has studied the fire manpower requirement, and optimized it further for two-shift duty pattern (Table 26.17). From Tables 26.16 and 26.17, it is quite clear that The Administrative Reform Department (ARD, Delhi), has already optimized the fire manpower requirement in comparison of what has been suggested in SFAC norms. It may be noted that total number of staff is coming in decimal places, as calculations are on pumping units including reserve staff, which has been rounded of in the fire manpower gap analysis at district and State levels (Table 26.17).

Table 26-17: Manpower requirement for Station officer and lower staffs as per ARD, Delhi (2-shifts)

Sr No	Fire Station (Pumping Unit)	Station Officer	Sub-Officer	LFM	Firemen-cum-Driver-cum Operator	Total Staff
1	One	0.00	2.50	2.50	15.63	20.60
2	Two	1.25	2.50	2.50	31.25	37.50
3	Three	1.25	3.75	7.50	46.88	59.40
4	Four	2.50	4.69	9.38	60.00	76.60
5	Five	2.50	5.63	11.25	73.13	92.50
6	Six	3.75	6.56	13.13	87.19	110.60
7	Seven	3.75	7.50	15.00	101.25	127.50

Thus for optimization on resources, following manpower criteria have been suggested for manpower gap analysis. Accordingly, total firefighting manpower gap in both urban and rural Fire Stations in Bihar State has been estimated, which comes to 45,712 (Table 26.19 to 26.21) against the present strength of 318 Table 26.18)

In addition to fire fighting staffs, there is an urgent need of senior level fire officers for making a well coordinated State level hierarchy and fire prevention wing for inspection, awareness generation and training, so that recurrence of the fire incidences, such as Advance Medical Research Institute (AMRI), Kolkata, in terms of their magnitude and frequency can be reduced. Accordingly, to support DG-cum-Commandant General and IG-cum-Add. Commandant General, Home Guard & Fire Services, Bihar, additional officers at the levels of Director (Technical), Joint-Director (Technical), Chief Fire Officers (CFO), Dy Chief Fire Officers (Dy-CFO), Division Officers (DO), and Assistant Divisional Officer (ADO) have been recommended. To meet the ideal requirement of officials, following numbers of total officials have been proposed (including existing officials), which may be recruited in a phased manner approach:

- Director (Technical) : 1
- Joint Director : 2
- CFO : 4 (One per division)
- Dy. CFO : 8 (Two per CFO)
- DFO : 69 (one per 8 Fire Stations)
- ADFO : 138 (one per 4 Fire Stations)

It may be noted that we recommend hiring of Cleaners/Sweepers on contract basis. For computation in financial analysis, we have assumed a fixed salary of Rs 7,000/pm, and without any reserve over that.

Accordingly, existing fire manpower and gap analysis for all the districts in Bihar State have been carried out and are shown Tables 26-19 to 26-21.

Table 26-18: List of manpower available for operational Fire Stations in Bihar Fire Services (As on July, 2012)

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Araria	2	0	0	0	0	0	0	1	0	1	2	0	4
Arwal	1	0	0	0	0	0	0	0	0	3	2	0	5
Aurangabad	2	0	0	0	0	0	0	0	0	6	2	0	8
Banka	1	0	0	0	0	0	0	0	0	1	3	0	4
Begusarai	6	0	0	0	0	0	0	0	0	6	4	0	10
Bhagalpur	3	0	0	0	0	0	0	0	0	4	6	0	10
Bhojpur	3	0	0	0	0	0	0	0	0	3	7	0	10
Buxar	2	0	0	0	0	0	0	0	0	1	3	0	4
Darbhanga	3	0	0	0	0	0	0	0	1	4	5	0	10
Gaya	5	0	0	0	0	0	0	0	1	4	7	0	12
Gopalganj	2	0	0	0	0	0	0	0	0	4	2	0	6
Jamui	1	0	0	0	0	0	0	0	1	2	2	0	5
Jehanabad	1	0	0	0	0	0	0	0	0	1	4	0	5
Kaimur (Bhabua)	1	0	0	0	0	0	0	0	0	1	3	0	4
Katihar	3	0	0	0	0	0	0	0	0	4	2	0	6
Khagaria	2	0	0	0	0	0	0	0	0	4	5	0	9
Kishanganj	1	0	0	0	0	0	0	0	0	0	4	0	4
Lakhisarai	1	0	0	0	0	0	0	0	0	4	0	0	4
Madhepura	2	0	0	0	0	0	0	0	0	2	3	0	5
Madhubani	4	0	0	0	0	0	0	0	0	3	4	0	7
Munger	3	0	0	0	0	0	0	0	0	5	2	0	7
Muzaffarpur	2	0	0	0	0	0	1	1	0	0	9	0	11
Nalanda	3	0	0	0	0	0	0	0	1	5	2	0	8
Nawada	2	0	0	0	0	0	0	0	0	6	4	0	10
Pashchim Champaran	3	0	0	0	0	0	0	0	0	1	4	0	5
Patna	10	0	1	0	0	1	0	4	0	16	38	0	60
Purba Champaran	6	0	0	0	0	0	0	0	0	4	7	0	11

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Purnia	4	0	0	0	0	0	0	0	0	4	3	0	7
Rohtas	3	0	0	0	0	0	0	0	0	5	10	0	15
Saharsa	2	0	0	0	0	0	0	0	0	4	2	0	6
Samastipur	4	0	0	0	0	0	0	0	0	2	5	0	7
Saran	3	0	0	0	0	0	0	0	0	5	3	0	8
Sheikhpura	1	0	0	0	0	0	0	0	0	1	4	0	5
Sheohar	1	0	0	0	0	0	0	1	0	1	1	0	3
Sitamarhi	2	0	0	0	0	0	0	0	0	1	4	0	5
Siwan	2	0	0	0	0	0	0	0	0	3	3	0	6
Supaul	2	0	0	0	0	0	0	1	0	2	2	0	5
Vaishali	3	0	0	0	0	0	0	0	0	2	5	0	7
Total	**102**	**0**	**1**	**0**	**0**	**1**	**1**	**8**	**4**	**125**	**178**	**0**	**318**

***Level 10**: Director General/Director/Joint Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DFO/DO/EO/Fire Supervisor; **Level 5**: ADFO/ADO/AFO/Fire In-charge; **Level 4**: St.O/Sub Inspector/Station In-charge/ASt O./AEO; **Level 3**: S O/Assistant Sub Inspector/ASO/Sub-Fire Officer/; **Level 2** : LFM/ Mechanic Driver/Head Constable/Store Superintendant; **Level 1** : FM/ FM Driver/Radio Technician/ SGFM/ Driver/ Police Constable/ Wireless Technician/ Radio Technician/ Asst FM/ Sanitary Inspector, FO/FO Driver/Driver Operator/Driver/Ambulance Driver/ Clerk; **Level 0:** Cleaner, Fire Coolie, Supporting Staff, Attendant, Labourer, Peon, Security Guard, Tindal.*

Table 26-19: Manpower gap in operational Fire Stations for ideal jurisdiction area

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Araria	2	0	0	0	0	2	3	4	11	21	146	2	189
Arwal	1	0	0	0	0	1	1	6	11	29	226	1	275
Aurangabad	2	0	0	0	0	2	3	9	16	35	280	2	347
Banka	1	0	0	0	0	1	1	4	7	14	98	1	126
Begusarai	6	0	0	0	0	2	5	16	35	73	518	6	655
Bhagalpur	3	0	1	1	0	2	3	11	21	47	337	3	426
Bhojpur	3	0	0	0	0	1	2	8	15	32	249	3	310
Buxar	2	0	0	0	0	2	3	5	11	26	184	2	233
Darbhanga	3	1	1	1	0	2	3	10	18	40	314	3	393
Gaya	5	0	0	1	0	2	4	12	25	50	397	5	496
Gopalganj	2	0	0	0	0	2	2	5	11	23	185	2	230
Jamui	1	0	0	0	0	1	1	4	6	13	99	1	125
Jehanabad	1	0	0	0	0	1	1	5	8	24	167	1	207
Kaimur (Bhabua)	1	0	0	0	0	1	1	1	2	1	28	1	35
Katihar	3	0	0	0	0	2	4	7	15	31	247	3	309
Khagaria	2	0	0	0	0	2	2	5	11	23	182	2	227
Kishanganj	1	0	0	0	0	1	2	5	8	25	167	1	209
Lakhisarai	1	0	0	0	0	1	2	5	8	21	171	1	209
Madhepura	2	0	0	0	0	2	2	4	10	15	114	2	149
Madhubani	4	0	0	0	0	2	3	6	16	24	191	4	246
Munger	3	0	0	1	0	2	4	9	18	37	311	3	385
Muzaffarpur	2	0	1	1	0	2	2	5	12	30	212	2	267
Nalanda	3	0	0	0	0	2	2	10	18	40	323	3	398
Nawada	2	0	0	0	0	2	3	5	11	21	183	2	227
Pashchim Champaran	3	0	0	0	0	2	2	6	14	31	233	3	291
Patna	10	2	0	1	0	2	4	30	67	123	922	10	1,161
Purba Champaran	6	0	0	0	0	2	3	10	24	37	277	6	359

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Purnia	4	0	0	1	0	2	4	11	22	45	351	4	440
Rohtas	3	0	0	0	0	2	3	10	18	39	281	3	356
Saharsa	2	0	0	0	0	2	2	5	12	26	204	2	253
Samastipur	4	0	0	0	0	2	3	13	25	55	400	4	502
Saran	3	0	0	0	0	2	2	5	14	27	218	3	271
Sheikhpura	1	0	0	0	0	1	1	4	7	14	97	1	125
Sheohar	1	0	0	0	0	1	1	3	7	14	100	1	127
Sitamarhi	2	0	0	0	0	2	3	5	11	21	144	2	188
Siwan	2	0	0	0	0	2	2	8	13	29	237	2	293
Supaul	2	0	0	0	0	2	2	3	10	15	115	2	149
Vaishali	3	0	0	1	0	2	3	9	17	37	276	3	348
Total	**102**	**3**	**3**	**8**	**0**	**66**	**94**	**283**	**585**	**1,208**	**9,184**	**102**	**11,536**

***Level 10**: Director General/Director/Joint Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DFO/DO/EO/Fire Supervisor; **Level 5**: ADFO/ADO/AFO/Fire In-charge; **Level 4**: St.O/Sub Inspector/Station In-charge/ASt O./AEO; **Level 3**: S O/Assistant Sub Inspector/ASO/Sub-Fire Officer/; **Level 2** : LFM/ Mechanic Driver/Head Constable/Store Superintendant; **Level 1** : FM/ FM Driver/Radio Technician/ SGFM/ Driver/ Police Constable/ Wireless Technician/ Radio Technician/ Asst FM/ Sanitary Inspector, FO/FO Driver/Driver Operator/Driver/Ambulance Driver/ Clerk; **Level 0:** Cleaner, Fire Coolie, Supporting Staff, Attendant, Labourer, Peon, Security Guard, Tindal.*

Table 26-20: Total staff gap for operational and new urban Fire Stations

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Araria	2	0	0	0	0	2	3	4	11	21	146	2	189
Arwal	1	0	0	0	0	1	1	6	11	29	226	1	275
Aurangabad	6	0	0	0	0	2	5	10	26	45	358	6	452
Banka	1	0	0	0	0	1	1	4	7	14	98	1	126
Begusarai	10	0	0	0	0	2	6	20	49	98	674	10	859
Bhagalpur	9	0	1	1	0	2	6	16	38	72	524	9	669
Bhojpur	6	0	0	0	0	1	4	9	22	39	311	6	392
Buxar	4	0	0	0	0	2	4	6	16	31	231	4	294
Darbhanga	4	1	1	1	0	2	4	11	22	47	361	4	454
Gaya	7	0	0	1	0	2	5	14	32	62	473	7	596
Gopalganj	4	0	0	0	0	2	3	6	16	28	232	4	291
Jamui	2	0	0	0	0	1	2	4	8	15	115	2	147
Jehanabad	2	0	0	0	0	1	2	5	10	26	183	2	229
Kaimur (Bhabua)	3	0	0	0	0	2	3	5	11	17	131	3	172
Katihar	5	0	0	0	0	2	5	9	22	46	341	5	430
Khagaria	2	0	0	0	0	2	2	5	11	23	182	2	227
Kishanganj	1	0	0	0	0	1	2	5	8	25	167	1	209
Lakhisarai	2	0	0	0	0	1	3	5	10	23	187	2	231
Madhepura	3	0	0	0	0	2	3	5	12	17	145	3	187
Madhubani	5	0	0	0	0	2	4	7	18	26	222	5	284
Munger	4	0	0	1	0	2	5	10	22	44	358	4	446
Muzaffarpur	10	0	1	1	0	2	5	10	33	55	415	10	532
Nalanda	5	0	0	0	0	2	3	10	23	45	354	5	442
Nawada	3	0	0	0	0	2	4	5	13	23	199	3	249
Pashchim Champaran	6	0	0	0	0	2	3	10	23	43	342	6	429
Patna	20	2	0	1	0	2	7	42	102	176	1,314	20	1,666
Purba Champaran	8	0	0	0	0	2	4	14	32	54	384	8	498

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Purnia	7	0	0	1	0	2	5	16	34	69	505	7	639
Rohtas	9	0	0	0	0	2	5	12	34	59	422	9	543
Saharsa	2	0	0	0	0	2	2	5	12	26	204	2	253
Samastipur	6	0	0	0	0	2	5	15	32	67	476	6	603
Saran	8	0	0	0	0	2	4	9	29	49	374	8	475
Sheikhpura	2	0	0	0	0	1	2	4	9	16	113	2	147
Sheohar	1	0	0	0	0	1	1	3	7	14	100	1	127
Sitamarhi	5	0	0	0	0	2	5	6	18	28	206	5	270
Siwan	2	0	0	0	0	2	2	8	13	29	237	2	293
Supaul	2	0	0	0	0	2	2	3	10	15	115	2	149
Vaishali	5	0	0	1	0	2	5	10	23	47	338	5	431
Total	**184**	**3**	**3**	**8**	**0**	**67**	**137**	**348**	**829**	**1,563**	**11,763**	**184**	**14,905**

***Level 10**: Director General/Director/Joint Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DFO/DO/EO/Fire Supervisor; **Level 5**: ADFO/ADO/AFO/Fire In-charge; **Level 4**: St.O/Sub Inspector/Station In-charge/ASt O./AEO; **Level 3**: S O/Assistant Sub Inspector/ASO/Sub-Fire Officer/; **Level 2** : LFM/ Mechanic Driver/Head Constable/Store Superintendant; **Level 1** : FM/ FM Driver/Radio Technician/ SGFM/ Driver/ Police Constable/ Wireless Technician/ Radio Technician/ Asst FM/ Sanitary Inspector, FO/FO Driver/Driver Operator/Driver/Ambulance Driver/ Clerk; **Level 0:** Cleaner, Fire Coolie, Supporting Staff, Attendant, Labourer, Peon, Security Guard, Tindal.*

Table 26-21:Additional staff required for new rural Fire Stations

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Araria	12	0	0	0	0	0	0	25	55	107	706	12	905
Arwal	1	0	0	0	0	0	0	1	2	2	31	1	37
Aurangabad	13	0	0	0	0	0	0	19	45	75	552	13	704
Banka	16	0	0	0	0	0	0	16	47	64	511	16	654
Begusarai	5	0	0	0	0	0	0	14	26	52	340	5	437
Bhagalpur	12	0	0	0	0	0	0	17	42	69	519	12	659
Bhojpur	12	0	0	0	0	0	0	24	52	99	663	12	850
Buxar	9	0	0	0	0	0	0	17	37	66	467	9	596
Darbhanga	14	0	0	0	0	0	0	37	75	150	977	14	1,253
Gaya	19	0	0	0	0	0	0	39	82	157	1,055	19	1,352
Gopalganj	13	0	0	0	0	0	0	22	53	99	650	13	837
Jamui	8	0	0	0	0	0	0	19	37	69	476	8	609
Jehanabad	4	0	0	0	0	0	0	10	20	39	253	4	326
Kaimur (Bhabua)	9	0	0	0	0	0	0	16	38	69	478	9	610
Katihar	14	0	0	0	0	0	0	25	54	95	668	14	856
Khagaria	8	0	0	0	0	0	0	15	34	60	404	8	521
Kishanganj	9	0	0	0	0	0	0	16	38	71	482	9	616
Lakhisarai	2	0	0	0	0	0	0	6	12	24	160	2	204
Madhepura	8	0	0	0	0	0	0	17	36	70	466	8	597
Madhubani	19	0	0	0	0	0	0	45	92	182	1,194	19	1,532
Munger	5	0	0	0	0	0	0	9	22	42	269	5	347
Muzaffarpur	29	0	0	0	0	0	0	35	95	151	1,093	29	1,403
Nalanda	16	0	0	0	0	0	0	27	62	106	755	16	966
Nawada	11	0	0	0	0	0	0	19	44	77	542	11	693
Pashchim Champaran	17	0	0	0	0	0	0	35	77	146	973	17	1,248
Patna	16	0	0	0	0	0	0	26	61	107	760	16	970
Purba Champaran	29	0	0	0	0	0	0	41	102	170	1,252	29	1,594

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Purnia	18	0	0	0	0	0	0	27	66	115	809	18	1,035
Rohtas	11	0	0	0	0	0	0	21	48	94	602	11	776
Saharsa	7	0	0	0	0	0	0	19	37	75	488	7	626
Samastipur	14	0	0	0	0	0	0	35	72	137	914	14	1,172
Saran	19	0	0	0	0	0	0	35	75	132	936	19	1,197
Sheikhpura	2	0	0	0	0	0	0	6	11	22	147	2	188
Sheohar	4	0	0	0	0	0	0	7	17	31	211	4	270
Sitamarhi	16	0	0	0	0	0	0	27	64	116	802	16	1,025
Siwan	17	0	0	0	0	0	0	32	71	135	893	17	1,148
Supaul	12	0	0	0	0	0	0	21	54	106	676	12	869
Vaishali	16	0	0	0	0	0	0	30	72	131	876	16	1,125
Total	**466**	**0**	**0**	**0**	**0**	**0**	**0**	**852**	**1,927**	**3,512**	**24,050**	**466**	**30,807**

***Level 10**: Director General/Director/Joint Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DFO/DO/EO/Fire Supervisor; **Level 5**: ADFO/ADO/AFO/Fire In-charge; **Level 4**: St.O/Sub Inspector/Station In-charge/ASt O./AEO; **Level 3**: S O/Assistant Sub Inspector/ASO/Sub-Fire Officer/; **Level 2** : LFM/ Mechanic Driver/Head Constable/Store Superintendant; **Level 1** : FM/ FM Driver/Radio Technician/ SGFM/ Driver/ Police Constable/ Wireless Technician/ Radio Technician/ Asst FM/ Sanitary Inspector, FO/FO Driver/Driver Operator/Driver/Ambulance Driver/ Clerk; **Level 0:** Cleaner, Fire Coolie, Supporting Staff, Attendant, Labourer, Peon, Security Guard, Tindal..*

26.3.4 Fire Station Building Infrastructure Gap

Depending upon the number of pumping units, no of bays in a Fire Station has been estimated. However, in order to consider future growth in population, a minimum two bay Fire Station has been proposed, even at a Fire Station having requirement of one pumping unit. Accordingly, gaps in operational Fire Stations, new urban and rural Fire Stations have been given in Tables 26-22.

Table 26-22: Fire station building required for gap in operational, new urban and new rural Fire Stations (no. of bays)

District	Fire Stations	Bay1	Bay2	Bay3	Bay4	Bay5	Bay6	Bay7	Bay More Than 7
Araria	14	0	1	6	2	2	2	1	0
Arwal	2	0	0	0	0	0	0	0	1
Aurangabad	19	4	6	4	2	2	0	0	1
Banka	17	5	7	2	2	0	0	1	0
Begusarai	15	1	-1	5	3	4	1	0	1
Bhagalpur	21	3	7	6	1	2	1	0	1
Bhojpur	18	3	4	4	3	2	1	0	1
Buxar	13	2	4	1	3	2	0	0	1
Darbhanga	18	0	1	5	3	2	6	0	1
Gaya	26	2	5	4	9	3	1	0	1
Gopalganj	17	4	2	4	4	1	1	0	1
Jamui	10	1	2	0	3	2	1	1	0
Jehanabad	6	1	0	0	3	1	0	0	1
Kaimur (Bhabua)	12	2	3	2	0	3	2	0	0
Katihar	19	1	5	6	5	0	1	0	1
Khagaria	10	3	1	1	2	0	2	0	1
Kishanganj	10	0	2	3	1	3	0	0	1
Lakhisarai	4	1	0	0	0	1	1	0	1
Madhepura	11	1	2	3	2	0	2	1	0
Madhubani	24	1	3	6	6	3	4	1	0
Munger	9	2	1	2	1	2	0	0	1
Muzaffarpur	39	11	13	8	4	0	1	0	1
Nalanda	21	4	6	3	4	2	1	0	1
Nawada	14	3	3	2	2	3	0	0	1
Pashchim Champaran	23	2	5	5	4	4	2	0	1
Patna	36	6	9	4	1	3	2	6	1
Purba Champaran	37	5	12	10	4	4	1	1	0
Purnia	25	3	6	8	5	1	1	0	1
Rohtas	20	5	1	4	7	2	0	0	1
Saharsa	9	1	0	1	2	2	2	0	1
Samastipur	20	3	2	1	4	3	4	2	1

District	Fire Stations	Bay1	Bay2	Bay3	Bay4	Bay5	Bay6	Bay7	Bay More Than 7
Saran	27	5	7	4	7	3	0	0	1
Sheikhpura	4	1	-1	0	1	0	1	1	0
Sheohar	5	0	1	1	1	1	0	1	0
Sitamarhi	21	3	5	6	2	3	1	1	0
Siwan	19	1	3	5	7	1	1	0	1
Supaul	14	2	0	5	1	5	0	1	0
Vaishali	21	4	3	2	4	6	0	1	1
Total	**650**	**96**	**130**	**133**	**115**	**78**	**43**	**19**	**27**

26.4 Investment and Financial Analysis

26.4.1 Capital Cost

Building Infrastructure Cost:

Table 26-23 provides details of the Fire Station building infrastructure cost analysis in Bihar State. The ideal requirement of land for a Fire Station is 2 ½ acres, however, a 2 bay Fire Station may be constructed in one acre land. It may be noted that land cost will vary from time to time and place to place; hence it has not been added in cost estimates. The civil construction cost estimation involves cost of Fire Station building including stores, offices, residential quarters, static water tanks, which will vary in size depending upon the number of bays (garage) in a Fire Station. Accordingly, total cost estimates for one, two, three, five, and seven bay Fire Stations (based on the P.W. D. norms) is about 150 Lakhs, 300 Lakhs, 450 Lakhs, 700 Lakhs, 950 Lakhs. To start with, rural-Fire Stations/ Fire Posts may be stationed in government buildings like schools/ hospitals or a Panchayat-Ghar.

Table 26-23: Cost (in Lakhs Rupees) of Fire Station building (no. of bays) required for gap in operational, new urban and new rural Fire Stations

District	Fire Stations	Bay1	Bay2	Bay3	Bay4	Bay5	Bay6	Bay7	Bay More Than 7
Araria	14	0.00	300.00	2700.00	1150.00	1400.00	1650.00	950.00	0.00
Arwal	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	950.00
Aurangabad	19	600.00	1800.00	1800.00	1150.00	1400.00	0.00	0.00	950.00
Banka	17	750.00	2100.00	900.00	1150.00	0.00	0.00	950.00	0.00
Begusarai	15	150.00	-300.00	2250.00	1725.00	2800.00	825.00	0.00	950.00
Bhagalpur	21	450.00	2100.00	2700.00	575.00	1400.00	825.00	0.00	950.00
Bhojpur	18	450.00	1200.00	1800.00	1725.00	1400.00	825.00	0.00	950.00
Buxar	13	300.00	1200.00	450.00	1725.00	1400.00	0.00	0.00	950.00
Darbhanga	18	0.00	300.00	2250.00	1725.00	1400.00	4950.00	0.00	950.00
Gaya	26	300.00	1500.00	1800.00	5175.00	2100.00	825.00	0.00	950.00
Gopalganj	17	600.00	600.00	1800.00	2300.00	700.00	825.00	0.00	950.00
Jamui	10	150.00	600.00	0.00	1725.00	1400.00	825.00	950.00	0.00
Jehanabad	6	150.00	0.00	0.00	1725.00	700.00	0.00	0.00	950.00
Kaimur (Bhabua)	12	300.00	900.00	900.00	0.00	2100.00	1650.00	0.00	0.00
Katihar	19	150.00	1500.00	2700.00	2875.00	0.00	825.00	0.00	950.00
Khagaria	10	450.00	300.00	450.00	1150.00	0.00	1650.00	0.00	950.00
Kishanganj	10	0.00	600.00	1350.00	575.00	2100.00	0.00	0.00	950.00
Lakhisarai	4	150.00	0.00	0.00	0.00	700.00	825.00	0.00	950.00
Madhepura	11	150.00	600.00	1350.00	1150.00	0.00	1650.00	950.00	0.00
Madhubani	24	150.00	900.00	2700.00	3450.00	2100.00	3300.00	950.00	0.00
Munger	9	300.00	300.00	900.00	575.00	1400.00	0.00	0.00	950.00
Muzaffarpur	39	1650.00	3900.00	3600.00	2300.00	0.00	825.00	0.00	950.00
Nalanda	21	600.00	1800.00	1350.00	2300.00	1400.00	825.00	0.00	950.00
Nawada	14	450.00	900.00	900.00	1150.00	2100.00	0.00	0.00	950.00
Pashchim Champaran	23	300.00	1500.00	2250.00	2300.00	2800.00	1650.00	0.00	950.00

District	Fire Stations	Bay1	Bay2	Bay3	Bay4	Bay5	Bay6	Bay7	Bay More Than 7
Patna	36	900.00	2700.00	1800.00	575.00	2100.00	1650.00	5700.00	950.00
Purba Champaran	37	750.00	3600.00	4500.00	2300.00	2800.00	825.00	950.00	0.00
Purnia	25	450.00	1800.00	3600.00	2875.00	700.00	825.00	0.00	950.00
Rohtas	20	750.00	300.00	1800.00	4025.00	1400.00	0.00	0.00	950.00
Saharsa	9	150.00	0.00	450.00	1150.00	1400.00	1650.00	0.00	950.00
Samastipur	20	450.00	600.00	450.00	2300.00	2100.00	3300.00	1900.00	950.00
Saran	27	750.00	2100.00	1800.00	4025.00	2100.00	0.00	0.00	950.00
Sheikhpura	4	150.00	-300.00	0.00	575.00	0.00	825.00	950.00	0.00
Sheohar	5	0.00	300.00	450.00	575.00	700.00	0.00	950.00	0.00
Sitamarhi	21	450.00	1500.00	2700.00	1150.00	2100.00	825.00	950.00	0.00
Siwan	19	150.00	900.00	2250.00	4025.00	700.00	825.00	0.00	950.00
Supaul	14	300.00	0.00	2250.00	575.00	3500.00	0.00	950.00	0.00
Vaishali	21	600.00	900.00	900.00	2300.00	4200.00	0.00	950.00	950.00
Total	**650**	**14400.00**	**39000.00**	**59850.00**	**66125.00**	**54600.00**	**35475.00**	**18050.00**	**25650.00**

Thus, total estimated capital cost for the Fire Stations building development for gap in operational and all the proposed and new urban and rural Fire Stations is **Rs. 3,131.5 Crores**.

Firefighting and Rescue Vehicles and Specialized Equipment Cost:

The costs of different fire fighting vehicles and specialized equipments including communication sets (static and mobile VHF sets) have been taken as approximate rates quoted by fire equipment suppliers. Accordingly, capital cost for fire fighting vehicles and equipments for all the districts in Bihar has been estimated (Tables 26-24 to 26-29).

Table 26-24: Cost estimates (in Lakhs Rupees) for gap in fire fighting vehicles for operational and new urban Fire Stations

District	Fire Stations	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Education Vans	Total Vehicle Cost
Araria	2	-70.00	0.00	40.00	500.00	0.00	35.00	60.00	30.00	0.00	0.00	20.00	615.00
Arwal	1	0.00	60.00	40.00	500.00	0.00	35.00	30.00	30.00	9.00	6.75	20.00	730.75
Aurangabad	6	175.00	0.00	80.00	500.00	0.00	70.00	60.00	30.00	0.00	0.00	20.00	935.00
Banka	1	-70.00	0.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	545.00
Begusarai	10	210.00	180.00	160.00	500.00	500.00	35.00	60.00	30.00	36.00	27.00	20.00	1,758.00
Bhagalpur	9	175.00	90.00	160.00	500.00	500.00	35.00	60.00	30.00	36.00	33.75	20.00	1,639.75
Bhojpur	6	-35.00	30.00	80.00	500.00	500.00	35.00	60.00	30.00	9.00	6.75	20.00	1,235.75
Buxar	4	35.00	0.00	40.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	690.00
Darbhanga	4	35.00	60.00	80.00	500.00	500.00	70.00	60.00	30.00	0.00	0.00	20.00	1,355.00
Gaya	7	70.00	90.00	120.00	0.00	500.00	70.00	90.00	30.00	9.00	13.50	20.00	1,012.50
Gopalganj	4	35.00	30.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	680.00
Jamui	2	0.00	0.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	615.00
Jehanabad	2	0.00	0.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	615.00
Kaimur (Bhabua)	3	35.00	-30.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	620.00
Katihar	5	35.00	60.00	80.00	500.00	500.00	35.00	60.00	30.00	18.00	13.50	20.00	1,351.50
Khagaria	2	-35.00	30.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	610.00
Kishanganj	1	0.00	0.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	615.00
Lakhisarai	2	35.00	0.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	650.00
Madhepura	3	0.00	30.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	645.00
Madhubani	5	0.00	30.00	0.00	500.00	0.00	35.00	60.00	30.00	9.00	6.75	20.00	690.75
Munger	4	35.00	120.00	80.00	500.00	500.00	35.00	30.00	30.00	18.00	13.50	20.00	1,381.50
Muzaffarpur	10	210.00	-30.00	80.00	0.00	500.00	70.00	120.00	30.00	9.00	13.50	20.00	1,022.50
Nalanda	5	70.00	60.00	40.00	500.00	500.00	35.00	60.00	30.00	0.00	6.75	20.00	1,321.75
Nawada	3	0.00	0.00	40.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	655.00
Pashchim Champaran	6	70.00	0.00	80.00	500.00	0.00	35.00	90.00	30.00	9.00	6.75	20.00	840.75

District	Fire Stations	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Education Vans	Total Vehicle Cost
Patna	20	700.00	480.00	480.00	500.00	0.00	105.00	120.00	30.00	72.00	67.50	20.00	2,574.50
Purba Champaran	8	35.00	90.00	120.00	500.00	0.00	70.00	90.00	30.00	9.00	6.75	20.00	970.75
Purnia	7	70.00	210.00	120.00	500.00	500.00	70.00	90.00	30.00	18.00	20.25	20.00	1,648.25
Rohtas	9	140.00	90.00	120.00	500.00	0.00	35.00	60.00	30.00	9.00	6.75	20.00	1,010.75
Saharsa	2	0.00	30.00	40.00	500.00	0.00	35.00	30.00	30.00	-9.00	0.00	20.00	676.00
Samastipur	6	210.00	210.00	40.00	500.00	0.00	35.00	60.00	30.00	18.00	13.50	20.00	1,136.50
Saran	8	140.00	30.00	80.00	500.00	500.00	35.00	90.00	30.00	-9.00	0.00	20.00	1,416.00
Sheikhpura	2	0.00	0.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	615.00
Sheohar	1	0.00	0.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	615.00
Sitamarhi	5	70.00	30.00	40.00	500.00	0.00	35.00	60.00	30.00	9.00	6.75	20.00	800.75
Siwan	2	-35.00	60.00	40.00	500.00	0.00	35.00	60.00	30.00	0.00	0.00	20.00	710.00
Supaul	2	0.00	0.00	0.00	500.00	0.00	35.00	30.00	30.00	0.00	0.00	20.00	615.00
Vaishali	5	105.00	30.00	0.00	500.00	500.00	70.00	60.00	30.00	0.00	0.00	20.00	1,315.00
Total	**184**	**2,450.00**	**2,070.00**	**2,280.00**	**18,000.00**	**6,000.00**	**1,645.00**	**2,040.00**	**1,140.00**	**279.00**	**270.00**	**760.00**	**36,934.00**

Table 26-25: Cost estimates (in Lakhs Rupees) for gap in fire vehicles for new rural Fire Stations

District	Fire Stations	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Education Vans	Total Vehicle cost
Araria	12	840.00	600.00	120.00	0.00	0.00	0.00	0.00	0.00	108.00	81.00	0.00	1,749.00
Arwal	1	35.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	6.75	0.00	80.75
Aurangabad	13	630.00	390.00	200.00	0.00	0.00	0.00	0.00	0.00	117.00	87.75	0.00	1,424.75
Banka	16	665.00	360.00	80.00	0.00	0.00	0.00	0.00	0.00	144.00	108.00	0.00	1,357.00
Begusarai	5	385.00	300.00	80.00	0.00	0.00	0.00	0.00	0.00	45.00	33.75	0.00	843.75
Bhagalpur	12	630.00	330.00	200.00	0.00	0.00	0.00	0.00	0.00	108.00	81.00	0.00	1,349.00
Bhojpur	12	700.00	390.00	440.00	0.00	0.00	0.00	0.00	0.00	108.00	81.00	0.00	1,719.00
Buxar	9	525.00	270.00	280.00	0.00	0.00	0.00	0.00	0.00	81.00	60.75	0.00	1,216.75
Darbhanga	14	1,225.00	750.00	240.00	0.00	0.00	0.00	0.00	0.00	126.00	94.50	0.00	2,435.50
Gaya	19	1,225.00	780.00	360.00	0.00	0.00	0.00	0.00	0.00	171.00	128.25	0.00	2,664.25
Gopalganj	13	735.00	420.00	280.00	0.00	0.00	0.00	30.00	0.00	117.00	87.75	0.00	1,669.75
Jamui	8	595.00	390.00	80.00	0.00	0.00	0.00	0.00	0.00	72.00	54.00	0.00	1,191.00
Jehanabad	4	280.00	180.00	120.00	0.00	0.00	0.00	0.00	0.00	36.00	27.00	0.00	643.00
Kaimur (Bhabua)	9	490.00	300.00	320.00	0.00	0.00	0.00	0.00	0.00	81.00	60.75	0.00	1,251.75
Katihar	14	840.00	510.00	120.00	0.00	0.00	0.00	0.00	0.00	126.00	94.50	0.00	1,690.50
Khagaria	8	525.00	330.00	40.00	0.00	0.00	0.00	0.00	0.00	72.00	54.00	0.00	1,021.00
Kishanganj	9	595.00	360.00	120.00	0.00	0.00	0.00	0.00	0.00	81.00	60.75	0.00	1,216.75
Lakhisarai	2	210.00	120.00	40.00	0.00	0.00	0.00	0.00	0.00	18.00	13.50	0.00	401.50
Madhepura	8	595.00	390.00	40.00	0.00	0.00	0.00	0.00	0.00	72.00	54.00	0.00	1,151.00
Madhubani	19	1,505.00	1,020.00	80.00	0.00	0.00	0.00	30.00	0.00	171.00	128.25	0.00	2,934.25
Munger	5	385.00	180.00	40.00	0.00	0.00	0.00	0.00	0.00	45.00	33.75	0.00	683.75
Muzaffarpur	29	1,435.00	690.00	280.00	0.00	0.00	0.00	0.00	0.00	261.00	195.75	0.00	2,861.75
Nalanda	16	910.00	450.00	360.00	0.00	0.00	0.00	0.00	0.00	144.00	108.00	0.00	1,972.00
Nawada	11	665.00	390.00	160.00	0.00	0.00	0.00	0.00	0.00	99.00	74.25	0.00	1,388.25
Pashchim Champaran	17	1,120.00	780.00	280.00	0.00	0.00	0.00	0.00	0.00	153.00	114.75	0.00	2,447.75
Patna	16	910.00	510.00	280.00	0.00	0.00	0.00	0.00	0.00	144.00	108.00	0.00	1,952.00

District	Fire Stations	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Education Vans	Total Vehicle cost
Purba Champaran	29	1,505.00	900.00	320.00	0.00	0.00	0.00	30.00	0.00	261.00	195.75	0.00	3,211.75
Purnia	18	1,015.00	570.00	200.00	0.00	0.00	0.00	0.00	0.00	162.00	121.50	0.00	2,068.50
Rohtas	11	665.00	390.00	320.00	0.00	0.00	0.00	0.00	0.00	99.00	74.25	0.00	1,548.25
Saharsa	7	630.00	390.00	80.00	0.00	0.00	0.00	0.00	0.00	63.00	47.25	0.00	1,210.25
Samastipur	14	1,190.00	810.00	40.00	0.00	0.00	0.00	0.00	0.00	126.00	94.50	0.00	2,260.50
Saran	19	1,155.00	600.00	360.00	0.00	0.00	0.00	0.00	0.00	171.00	128.25	0.00	2,414.25
Sheikhpura	2	175.00	150.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	13.50	0.00	356.50
Sheohar	4	280.00	180.00	0.00	0.00	0.00	0.00	0.00	0.00	36.00	27.00	0.00	523.00
Sitamarhi	16	1,050.00	600.00	120.00	0.00	0.00	0.00	0.00	0.00	144.00	108.00	0.00	2,022.00
Siwan	17	1,085.00	660.00	240.00	0.00	0.00	0.00	0.00	0.00	153.00	114.75	0.00	2,252.75
Supaul	12	875.00	480.00	160.00	0.00	0.00	0.00	0.00	0.00	108.00	81.00	0.00	1,704.00
Vaishali	16	1,085.00	660.00	200.00	0.00	0.00	0.00	30.00	0.00	144.00	108.00	0.00	2,227.00
Total	**466**	**29,365.00**	**17,610.00**	**6,680.00**	**0.00**	**0.00**	**0.00**	**120.00**	**0.00**	**4,194.00**	**3,145.50**	**0.00**	**61,114.50**

Table 26-26: Cost estimate (in Lakhs Rupees) for gap in fire fighting specialized equipment for operational and new urban Fire Stations

District	Fire Stations	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters / Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Araria	2	30.00	10.00	7.20	3.00	0.50	20.00	1.60	0.50	0.60	12.50	1.80	13.00	8.00	0.00
Arwal	1	15.00	15.00	12.40	1.50	0.80	10.00	0.80	-0.50	0.30	20.00	3.00	6.50	14.00	0.00
Aurangabad	6	15.00	40.00	24.40	10.50	1.80	10.00	4.80	3.50	2.10	45.00	5.40	6.50	14.00	0.00
Banka	1	15.00	10.00	4.80	1.50	0.40	10.00	0.80	0.50	0.30	10.00	1.50	6.50	6.00	0.00
Begusarai	10	135.00	60.00	68.40	18.00	3.90	90.00	3.20	6.00	3.60	117.50	7.50	58.50	72.00	0.00
Bhagalpur	9	135.00	67.50	47.20	16.50	3.30	80.00	7.20	5.50	3.30	85.00	8.70	58.50	42.00	0.00
Bhojpur	6	15.00	32.50	19.60	12.00	1.30	10.00	5.60	4.00	2.40	40.00	4.50	6.50	12.00	0.00
Buxar	4	15.00	22.50	12.80	6.00	1.00	10.00	2.40	2.00	1.20	22.50	3.00	6.50	8.00	0.00
Darbhanga	4	75.00	37.50	22.80	7.50	1.50	50.00	4.00	2.50	1.50	37.50	5.10	32.50	24.00	0.00
Gaya	7	15.00	45.00	35.20	12.00	2.70	10.00	3.20	3.50	2.40	65.00	6.30	6.50	36.00	0.00
Gopalganj	4	60.00	22.50	12.40	6.00	1.00	40.00	3.20	1.50	1.20	25.00	3.00	26.00	6.00	0.00
Jamui	2	15.00	7.50	6.00	3.00	0.40	10.00	1.60	1.00	0.60	10.00	1.50	6.50	4.00	0.00
Jehanabad	2	15.00	12.50	7.20	3.00	0.40	10.00	1.60	1.00	0.60	15.00	1.80	6.50	4.00	0.00
Kaimur (Bhabua)	3	15.00	10.00	8.00	4.50	0.60	10.00	2.40	1.00	0.90	15.00	1.80	6.50	4.00	0.00
Katihar	5	60.00	27.50	23.20	9.00	1.70	40.00	3.20	2.00	1.80	42.50	3.90	26.00	24.00	0.00
Khagaria	2	30.00	15.00	8.80	3.00	0.60	20.00	0.00	1.00	0.60	17.50	2.10	13.00	8.00	0.00
Kishanganj	1	15.00	10.00	5.20	1.50	0.40	10.00	0.80	0.50	0.30	10.00	1.50	6.50	6.00	0.00
Lakhisarai	2	30.00	12.50	7.60	3.00	0.60	20.00	1.60	1.00	0.60	15.00	1.80	13.00	6.00	0.00
Madhepura	3	45.00	15.00	8.80	4.50	0.60	30.00	2.40	1.50	0.90	15.00	2.10	19.50	6.00	0.00
Madhubani	5	75.00	15.00	17.20	9.00	1.40	50.00	4.00	1.50	1.80	35.00	2.40	32.50	16.00	0.00

District	Fire Stations	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters / Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Munger	4	45.00	37.50	26.00	7.50	1.90	30.00	2.40	2.00	1.50	47.50	4.80	19.50	22.00	0.00
Muzaffarpur	10	180.00	45.00	26.40	16.50	2.40	110.00	8.80	6.00	3.60	50.00	6.00	78.00	12.00	0.00
Nalanda	5	30.00	35.00	22.80	9.00	1.60	20.00	4.80	3.00	1.80	42.50	4.80	13.00	20.00	0.00
Nawada	3	30.00	12.50	9.20	4.50	0.50	10.00	1.60	1.50	0.90	20.00	2.10	13.00	6.00	0.00
Pashchim Champaran	6	120.00	40.00	22.80	12.00	1.60	80.00	6.40	4.00	2.40	40.00	5.10	52.00	14.00	0.00
Patna	20	300.00	195.00	143.20	36.00	9.50	200.00	17.60	11.50	7.20	245.00	25.80	130.00	104.00	0.00
Purba Champaran	8	120.00	42.50	34.80	13.50	2.40	80.00	5.60	4.00	2.70	55.00	5.70	52.00	24.00	0.00
Purnia	7	90.00	47.50	40.00	13.50	2.80	60.00	4.80	4.50	2.70	72.50	6.60	39.00	34.00	0.00
Rohtas	9	15.00	45.00	36.80	16.50	2.80	10.00	7.20	5.50	3.30	70.00	6.00	6.50	28.00	0.00
Saharsa	2	30.00	12.50	9.20	3.00	0.60	20.00	0.80	1.00	0.60	15.00	2.10	13.00	8.00	0.00
Samastipur	6	60.00	40.00	43.20	10.50	3.00	40.00	1.60	3.00	2.10	75.00	5.10	26.00	38.00	0.00
Saran	8	75.00	37.50	24.00	15.00	1.90	60.00	8.00	4.50	3.00	45.00	5.10	39.00	14.00	0.00
Sheikhpura	2	30.00	7.50	5.20	3.00	0.40	20.00	1.60	1.00	0.60	10.00	1.50	13.00	4.00	0.00
Sheohar	1	15.00	5.00	4.00	1.50	0.20	10.00	0.80	0.50	0.30	5.00	1.20	6.50	4.00	0.00
Sitamarhi	5	75.00	17.50	15.60	9.00	1.20	50.00	4.00	2.50	1.80	30.00	2.70	32.50	10.00	0.00
Siwan	2	30.00	17.50	10.80	3.00	0.80	20.00	1.60	1.00	0.60	20.00	2.40	13.00	12.00	0.00
Supaul	2	30.00	10.00	4.40	3.00	0.30	20.00	0.80	1.00	0.60	10.00	1.50	13.00	6.00	0.00
Vaishali	5	60.00	30.00	20.40	9.00	1.20	60.00	2.40	3.00	1.80	35.00	4.80	39.00	18.00	0.00
Total	**184**	**2,160.00**	**1,165.00**	**858.00**	**321.00**	**60.00**	**1,440.00**	**135.20**	**99.00**	**64.50**	**1,542.50**	**162.00**	**955.50**	**698.00**	**0.00**

Table 26-27: Cost estimate (in Lakhs Rupees) for gap in fire fighting specialized equipment for operational and new urban Fire Stations (contd...)

District	Fire Stations	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Araria	2	0.00	0.00	2.10	2.00	10.00	0.40	0.00	0.54	2.04	1.44	0.60	127.82
Arwal	1	0.00	0.00	0.00	1.00	5.00	2.80	0.00	0.27	2.38	1.68	0.30	112.23
Aurangabad	6	0.00	0.00	12.60	7.00	5.00	5.60	0.00	1.89	4.08	3.12	2.10	224.39
Banka	1	0.00	0.00	0.00	1.00	5.00	0.80	0.00	0.27	1.70	1.20	0.30	77.57
Begusarai	10	0.00	0.00	23.10	9.00	45.00	11.20	0.00	3.24	8.84	6.60	3.60	754.18
Bhagalpur	9	0.00	0.00	21.00	9.00	45.00	10.00	0.00	2.70	7.31	5.40	3.30	663.41
Bhojpur	6	0.00	0.00	14.70	8.00	5.00	3.60	0.00	2.16	3.74	2.88	2.40	207.88
Buxar	4	0.00	0.00	8.40	4.00	5.00	2.80	0.00	1.08	2.55	1.92	1.20	139.85
Darbhanga	4	0.00	0.00	8.40	5.00	25.00	4.80	0.00	1.35	4.08	2.88	1.50	354.41
Gaya	7	0.00	0.00	14.70	6.00	5.00	6.00	0.00	2.16	5.95	4.44	2.40	289.45
Gopalganj	4	0.00	0.00	6.30	4.00	20.00	2.40	0.00	1.08	2.55	1.92	1.20	247.25
Jamui	2	0.00	0.00	2.10	2.00	5.00	0.80	0.00	0.54	1.53	1.20	0.60	80.87
Jehanabad	2	0.00	0.00	2.10	2.00	5.00	0.80	0.00	0.27	1.87	1.44	0.60	92.68
Kaimur (Bhabua)	3	0.00	0.00	2.10	3.00	5.00	1.60	0.00	0.81	1.70	1.32	0.90	96.13
Katihar	5	0.00	0.00	10.50	4.00	20.00	4.40	0.00	1.62	4.25	3.00	1.80	314.37
Khagaria	2	0.00	0.00	2.10	2.00	10.00	1.20	0.00	0.54	2.04	1.56	0.60	139.64
Kishanganj	1	0.00	0.00	2.10	1.00	5.00	1.20	0.00	0.27	1.70	1.20	0.30	80.47
Lakhisarai	2	0.00	0.00	2.10	2.00	10.00	1.60	0.00	0.54	1.70	1.44	0.60	132.68
Madhepura	3	0.00	0.00	6.30	3.00	15.00	2.40	0.00	0.81	2.04	1.44	0.90	183.19
Madhubani	5	0.00	0.00	10.50	5.00	25.00	3.60	0.00	1.62	3.23	2.40	1.80	313.95
Munger	4	0.00	0.00	8.40	3.00	15.00	6.00	0.00	1.35	4.42	3.12	1.50	290.39
Muzaffarpur	10	0.00	0.00	23.10	11.00	60.00	6.40	0.00	2.97	4.93	4.08	3.60	660.78
Nalanda	5	0.00	0.00	10.50	6.00	10.00	5.20	0.00	1.62	4.08	3.12	1.80	250.62

District	Fire Stations	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Nawada	3	0.00	0.00	4.20	3.00	10.00	2.00	0.00	0.54	1.53	1.68	0.90	135.65
Pashchim Champaran	6	0.00	0.00	12.60	8.00	40.00	4.00	0.00	2.16	4.08	2.88	2.40	476.42
Patna	20	0.00	0.00	46.20	20.00	100.00	33.60	0.00	5.40	18.87	12.60	7.20	1,668.67
Purba Champaran	8	0.00	0.00	18.90	8.00	40.00	6.80	0.00	2.43	5.44	4.08	2.70	530.55
Purnia	7	0.00	0.00	16.80	6.00	25.00	9.20	0.00	2.43	6.46	4.68	2.70	491.17
Rohtas	9	0.00	0.00	18.90	9.00	5.00	6.80	0.00	2.97	5.27	4.08	3.30	307.92
Saharsa	2	0.00	0.00	2.10	2.00	10.00	1.60	0.00	0.54	2.04	1.56	0.60	136.24
Samastipur	6	0.00	0.00	12.60	4.00	20.00	9.20	0.00	1.89	6.12	4.44	2.10	407.85
Saran	8	0.00	0.00	18.90	10.00	30.00	4.80	0.00	2.70	4.25	3.48	3.00	409.13
Sheikhpura	2	0.00	0.00	2.10	2.00	10.00	1.60	0.00	0.54	1.53	1.20	0.60	117.37
Sheohar	1	0.00	0.00	0.00	1.00	5.00	1.60	0.00	0.27	1.36	0.96	0.30	64.49
Sitamarhi	5	0.00	0.00	12.60	5.00	25.00	3.20	0.00	1.62	3.06	2.28	1.80	306.36
Siwan	2	0.00	0.00	2.10	2.00	10.00	2.40	0.00	0.54	2.38	1.68	0.60	154.40
Supaul	2	0.00	0.00	2.10	2.00	10.00	1.20	0.00	0.54	1.70	1.20	0.60	119.94
Vaishali	5	0.00	0.00	12.60	6.00	30.00	4.80	0.00	1.62	3.91	2.88	1.80	348.21
Total	**184**	**0.00**	**0.00**	**375.90**	**188.00**	**730.00**	**178.40**	**0.00**	**55.89**	**146.71**	**108.48**	**64.50**	**11,508.58**

Table 26-28: Cost estimate (in Lakhs Rupees) for gap in specialized fire equipment for new rural Fire Stations

District	Fire Stations	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters / Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Araria	12	0.00	0.00	101.60	21.00	7.10	0.00	0.00	7.00	4.20	177.50	0.00	0.00	118.00	0.00
Arwal	1	0.00	0.00	4.80	1.50	0.40	0.00	0.00	0.50	0.30	10.00	0.00	0.00	6.00	0.00
Aurangabad	13	0.00	0.00	81.60	24.00	5.90	0.00	0.00	8.00	4.80	147.50	0.00	0.00	98.00	0.00
Banka	16	0.00	0.00	78.80	28.50	5.90	0.00	0.00	9.50	5.70	147.50	0.00	0.00	98.00	0.00
Begusarai	5	0.00	0.00	48.80	9.00	3.40	0.00	0.00	3.00	1.80	85.00	0.00	0.00	56.00	0.00
Bhagalpur	12	0.00	0.00	76.80	21.00	5.50	0.00	0.00	7.00	4.20	137.50	0.00	0.00	92.00	0.00
Bhojpur	12	0.00	0.00	96.00	21.00	6.70	0.00	0.00	7.00	4.20	167.50	0.00	0.00	112.00	0.00
Buxar	9	0.00	0.00	68.00	16.50	4.80	0.00	0.00	5.50	3.30	120.00	0.00	0.00	80.00	0.00
Darbhanga	14	0.00	0.00	140.00	25.50	9.60	0.00	0.00	8.50	5.10	240.00	0.00	0.00	160.00	0.00
Gaya	19	0.00	0.00	152.80	34.50	10.70	0.00	0.00	11.50	6.90	267.50	0.00	0.00	178.00	0.00
Gopalganj	13	0.00	0.00	93.20	24.00	6.60	0.00	0.00	8.00	4.80	165.00	0.00	0.00	110.00	0.00
Jamui	8	0.00	0.00	69.20	15.00	4.80	0.00	0.00	5.00	3.00	120.00	0.00	0.00	80.00	0.00
Jehanabad	4	0.00	0.00	36.40	7.50	2.50	0.00	0.00	2.50	1.50	62.50	0.00	0.00	42.00	0.00
Kaimur (Bhabua)	9	0.00	0.00	70.00	16.50	4.90	0.00	0.00	5.50	3.30	122.50	0.00	0.00	82.00	0.00
Katihar	14	0.00	0.00	98.00	25.50	7.00	0.00	0.00	8.50	5.10	175.00	0.00	0.00	116.00	0.00
Khagaria	8	0.00	0.00	59.60	15.00	4.20	0.00	0.00	5.00	3.00	105.00	0.00	0.00	70.00	0.00
Kishanganj	9	0.00	0.00	70.00	16.50	4.90	0.00	0.00	5.50	3.30	122.50	0.00	0.00	82.00	0.00
Lakhisarai	2	0.00	0.00	23.20	3.00	1.60	0.00	0.00	1.00	0.60	40.00	0.00	0.00	26.00	0.00
Madhepura	8	0.00	0.00	67.20	15.00	4.70	0.00	0.00	5.00	3.00	117.50	0.00	0.00	78.00	0.00
Madhubani	19	0.00	0.00	170.00	34.50	11.80	0.00	0.00	11.50	6.90	295.00	0.00	0.00	196.00	0.00
Munger	5	0.00	0.00	39.20	9.00	2.80	0.00	0.00	3.00	1.80	70.00	0.00	0.00	46.00	0.00

District	Fire Stations	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters / Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Muzaffarpur	29	0.00	0.00	164.00	52.50	12.00	0.00	0.00	17.50	10.50	300.00	0.00	0.00	200.00	0.00
Nalanda	16	0.00	0.00	111.20	28.50	7.90	0.00	0.00	9.50	5.70	197.50	0.00	0.00	132.00	0.00
Nawada	11	0.00	0.00	79.60	19.50	5.60	0.00	0.00	6.50	3.90	140.00	0.00	0.00	94.00	0.00
Pashchim Champaran	17	0.00	0.00	141.20	30.00	9.80	0.00	0.00	10.00	6.00	245.00	0.00	0.00	164.00	0.00
Patna	16	0.00	0.00	111.20	28.50	7.90	0.00	0.00	9.50	5.70	197.50	0.00	0.00	132.00	0.00
Purba Champaran	29	0.00	0.00	183.20	52.50	13.20	0.00	0.00	17.50	10.50	330.00	0.00	0.00	220.00	0.00
Purnia	18	0.00	0.00	119.20	33.00	8.50	0.00	0.00	11.00	6.60	212.50	0.00	0.00	142.00	0.00
Rohtas	11	0.00	0.00	87.20	19.50	6.10	0.00	0.00	6.50	3.90	152.50	0.00	0.00	102.00	0.00
Saharsa	7	0.00	0.00	70.00	12.00	4.80	0.00	0.00	4.00	2.40	120.00	0.00	0.00	80.00	0.00
Samastipur	14	0.00	0.00	132.40	25.50	9.10	0.00	0.00	8.50	5.10	227.50	0.00	0.00	152.00	0.00
Saran	19	0.00	0.00	137.20	34.50	9.70	0.00	0.00	11.50	6.90	242.50	0.00	0.00	162.00	0.00
Sheikhpura	2	0.00	0.00	21.20	3.00	1.40	0.00	0.00	1.00	0.60	35.00	0.00	0.00	24.00	0.00
Sheohar	4	0.00	0.00	30.80	7.50	2.20	0.00	0.00	2.50	1.50	55.00	0.00	0.00	36.00	0.00
Sitamarhi	16	0.00	0.00	117.20	28.50	8.30	0.00	0.00	9.50	5.70	207.50	0.00	0.00	138.00	0.00
Siwan	17	0.00	0.00	129.60	30.00	9.10	0.00	0.00	10.00	6.00	227.50	0.00	0.00	152.00	0.00
Supaul	12	0.00	0.00	98.00	21.00	6.80	0.00	0.00	7.00	4.20	170.00	0.00	0.00	114.00	0.00
Vaishali	16	0.00	0.00	126.80	28.50	8.90	0.00	0.00	9.50	5.70	222.50	0.00	0.00	148.00	0.00
Total	**466**	**0.00**	**0.00**	**3,505.20**	**838.50**	**247.10**	**0.00**	**0.00**	**279.50**	**167.70**	**6,177.50**	**0.00**	**0.00**	**4,118.00**	**0.00**

Table 26-29: Cost estimate (in Lakhs Rupees) for gap in specialized fire equipment for new rural Fire Stations (continued…)

District	Fire Stations	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Araria	12	0.00	0.00	29.40	0.00	0.00	28.40	0.00	3.78	12.07	8.52	4.20	522.77
Arwal	1	0.00	0.00	2.10	0.00	0.00	1.60	0.00	0.27	0.68	0.48	0.30	28.93
Aurangabad	13	0.00	0.00	33.60	0.00	0.00	23.60	0.00	4.32	10.03	7.08	4.80	453.23
Banka	16	0.00	0.00	39.90	0.00	0.00	23.60	0.00	5.13	10.03	7.08	5.70	465.34
Begusarai	5	0.00	0.00	12.60	0.00	0.00	13.60	0.00	1.62	5.78	4.08	1.80	246.48
Bhagalpur	12	0.00	0.00	29.40	0.00	0.00	22.00	0.00	3.78	9.35	6.60	4.20	419.33
Bhojpur	12	0.00	0.00	29.40	0.00	0.00	26.80	0.00	3.78	11.39	8.04	4.20	498.01
Buxar	9	0.00	0.00	23.10	0.00	0.00	19.20	0.00	2.97	8.16	5.76	3.30	360.59
Darbhanga	14	0.00	0.00	35.70	0.00	0.00	38.40	0.00	4.59	16.32	11.52	5.10	700.33
Gaya	19	0.00	0.00	48.30	0.00	0.00	42.80	0.00	6.21	18.19	12.84	6.90	797.14
Gopalganj	13	0.00	0.00	33.60	0.00	0.00	26.40	0.00	4.32	11.39	8.04	4.80	500.15
Jamui	8	0.00	0.00	21.00	0.00	0.00	19.20	0.00	2.70	8.16	5.76	3.00	356.82
Jehanabad	4	0.00	0.00	10.50	0.00	0.00	10.00	0.00	1.35	4.25	3.00	1.50	185.50
Kaimur (Bhabua)	9	0.00	0.00	23.10	0.00	0.00	19.60	0.00	2.97	8.33	5.88	3.30	367.88
Katihar	14	0.00	0.00	35.70	0.00	0.00	28.00	0.00	4.59	11.90	8.40	5.10	528.79
Khagaria	8	0.00	0.00	21.00	0.00	0.00	16.80	0.00	2.70	7.14	5.04	3.00	317.48
Kishanganj	9	0.00	0.00	23.10	0.00	0.00	19.60	0.00	2.97	8.33	5.88	3.30	367.88
Lakhisarai	2	0.00	0.00	4.20	0.00	0.00	6.40	0.00	0.54	2.72	1.92	0.60	111.78
Madhepura	8	0.00	0.00	21.00	0.00	0.00	18.80	0.00	2.70	7.99	5.64	3.00	349.53
Madhubani	19	0.00	0.00	48.30	0.00	0.00	47.20	0.00	6.21	20.23	14.28	6.90	868.82
Munger	5	0.00	0.00	12.60	0.00	0.00	11.20	0.00	1.62	4.76	3.36	1.80	207.14
Muzaffarpur	29	0.00	0.00	73.50	0.00	0.00	48.00	0.00	9.45	20.40	14.40	10.50	932.75

District	Fire Stations	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torch	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Nalanda	16	0.00	0.00	39.90	0.00	0.00	31.60	0.00	5.13	13.43	9.48	5.70	597.54
Nawada	11	0.00	0.00	27.30	0.00	0.00	22.40	0.00	3.51	9.52	6.72	3.90	422.45
Pashchim Champaran	17	0.00	0.00	42.00	0.00	0.00	39.20	0.00	5.40	16.66	11.76	6.00	727.02
Patna	16	0.00	0.00	39.90	0.00	0.00	31.60	0.00	5.13	13.43	9.48	5.70	597.54
Purba Champaran	29	0.00	0.00	73.50	0.00	0.00	52.80	0.00	9.45	22.61	15.96	10.50	1,011.72
Purnia	18	0.00	0.00	46.20	0.00	0.00	34.00	0.00	5.94	14.45	10.20	6.60	650.19
Rohtas	11	0.00	0.00	27.30	0.00	0.00	24.40	0.00	3.51	10.37	7.32	3.90	454.50
Saharsa	7	0.00	0.00	16.80	0.00	0.00	19.20	0.00	2.16	8.16	5.76	2.40	347.68
Samastipur	14	0.00	0.00	35.70	0.00	0.00	36.40	0.00	4.59	15.47	10.92	5.10	668.28
Saran	19	0.00	0.00	48.30	0.00	0.00	38.80	0.00	6.21	16.49	11.64	6.90	732.64
Sheikhpura	2	0.00	0.00	4.20	0.00	0.00	5.60	0.00	0.54	2.38	1.68	0.60	101.20
Sheohar	4	0.00	0.00	10.50	0.00	0.00	8.80	0.00	1.35	3.74	2.64	1.50	164.03
Sitamarhi	16	0.00	0.00	39.90	0.00	0.00	33.20	0.00	5.13	14.11	9.96	5.70	622.70
Siwan	17	0.00	0.00	42.00	0.00	0.00	36.40	0.00	5.40	15.47	10.92	6.00	680.39
Supaul	12	0.00	0.00	29.40	0.00	0.00	27.20	0.00	3.78	11.56	8.16	4.20	505.30
Vaishali	16	0.00	0.00	39.90	0.00	0.00	35.60	0.00	5.13	15.30	10.80	5.70	662.33
Total	**466**	**0.00**	**0.00**	**1,173.90**	**0.00**	**0.00**	**988.40**	**0.00**	**150.93**	**420.75**	**297.00**	**167.70**	**18,532.18**

26.4.2 Recurring Cost

Manpower Cost

The manpower cost estimation per year has been carried out by considering pay-scale structure for different level of employees. Accordingly, cost estimates for manpower requirement at various levels by district is shown in Table 26-30 and Table 26-31. The total estimated annual manpower cost for existing and proposed staff will be about **Rs. 501.29 Crores** after filling gap in operational and new urban Fire Stations and about **Rs. 1,025.26 Crores** for new rural Fire Stations.

Table 26-30: Annual cost estimates (in Lakhs Rupees) for manpower for Bihar after filling up the gap in operational and new urban Fire Stations

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Araria	2	0.00	0.00	0.00	0.00	12.80	17.16	20.20	47.30	69.51	473.04	1.68	641.69
Arwal	1	0.00	0.00	0.00	0.00	6.40	5.72	30.30	47.30	95.99	732.24	0.84	918.79
Aurangabad	6	0.00	0.00	0.00	0.00	12.80	28.60	50.50	111.80	148.95	1,159.92	5.04	1,517.61
Banka	1	0.00	0.00	0.00	0.00	6.40	5.72	20.20	30.10	46.34	317.52	0.84	427.12
Begusarai	10	0.00	0.00	0.00	0.00	12.80	34.32	101.00	210.70	324.38	2,183.76	8.40	2,875.36
Bhagalpur	9	0.00	13.75	8.61	0.00	12.80	34.32	80.80	163.40	238.32	1,697.76	7.56	2,257.32
Bhojpur	6	0.00	0.00	0.00	0.00	6.40	22.88	45.45	94.60	129.09	1,007.64	5.04	1,311.10
Buxar	4	0.00	0.00	0.00	0.00	12.80	22.88	30.30	68.80	102.61	748.44	3.36	989.19
Darbhanga	4	14.76	13.75	8.61	0.00	12.80	22.88	55.55	94.60	155.57	1,169.64	3.36	1,551.52
Gaya	7	0.00	0.00	8.61	0.00	12.80	28.60	70.70	137.60	205.22	1,532.52	5.88	2,001.93
Gopalganj	4	0.00	0.00	0.00	0.00	12.80	17.16	30.30	68.80	92.68	751.68	3.36	976.78
Jamui	2	0.00	0.00	0.00	0.00	6.40	11.44	20.20	34.40	49.65	372.60	1.68	496.37
Jehanabad	2	0.00	0.00	0.00	0.00	6.40	11.44	25.25	43.00	86.06	592.92	1.68	766.75
Kaimur (Bhabua)	3	0.00	0.00	0.00	0.00	12.80	17.16	25.25	47.30	56.27	424.44	2.52	585.74
Katihar	5	0.00	0.00	0.00	0.00	12.80	28.60	45.45	94.60	152.26	1,104.84	4.20	1,442.75
Khagaria	2	0.00	0.00	0.00	0.00	12.80	11.44	25.25	47.30	76.13	589.68	1.68	764.28
Kishanganj	1	0.00	0.00	0.00	0.00	6.40	11.44	25.25	34.40	82.75	541.08	0.84	702.16
Lakhisarai	2	0.00	0.00	0.00	0.00	6.40	17.16	25.25	43.00	76.13	605.88	1.68	775.50
Madhepura	3	0.00	0.00	0.00	0.00	12.80	17.16	25.25	51.60	56.27	469.80	2.52	635.40
Madhubani	5	0.00	0.00	0.00	0.00	12.80	22.88	35.35	77.40	86.06	719.28	4.20	957.97
Munger	4	0.00	0.00	8.61	0.00	12.80	28.60	50.50	94.60	145.64	1,159.92	3.36	1,504.03
Muzaffarpur	10	0.00	13.75	8.61	0.00	12.80	28.60	50.50	141.90	182.05	1,344.60	8.40	1,791.21
Nalanda	5	0.00	0.00	0.00	0.00	12.80	17.16	50.50	98.90	148.95	1,146.96	4.20	1,479.47
Nawada	3	0.00	0.00	0.00	0.00	12.80	22.88	25.25	55.90	76.13	644.76	2.52	840.24

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Pashchim Champaran	6	0.00	0.00	0.00	0.00	12.80	17.16	50.50	98.90	142.33	1,108.08	5.04	1,434.81
Patna	20	29.52	0.00	8.61	0.00	12.80	40.04	212.10	438.60	582.56	4,257.36	16.80	5,598.39
Purba Champaran	8	0.00	0.00	0.00	0.00	12.80	22.88	70.70	137.60	178.74	1,244.16	6.72	1,673.60
Purnia	7	0.00	0.00	8.61	0.00	12.80	28.60	80.80	146.20	228.39	1,636.20	5.88	2,147.48
Rohtas	9	0.00	0.00	0.00	0.00	12.80	28.60	60.60	146.20	195.29	1,367.28	7.56	1,818.33
Saharsa	2	0.00	0.00	0.00	0.00	12.80	11.44	25.25	51.60	86.06	660.96	1.68	849.79
Samastipur	6	0.00	0.00	0.00	0.00	12.80	28.60	75.75	137.60	221.77	1,542.24	5.04	2,023.80
Saran	8	0.00	0.00	0.00	0.00	12.80	22.88	45.45	124.70	162.19	1,211.76	6.72	1,586.50
Sheikhpura	2	0.00	0.00	0.00	0.00	6.40	11.44	20.20	38.70	52.96	366.12	1.68	497.50
Sheohar	1	0.00	0.00	0.00	0.00	6.40	5.72	15.15	30.10	46.34	324.00	0.84	428.55
Sitamarhi	5	0.00	0.00	0.00	0.00	12.80	28.60	30.30	77.40	92.68	667.44	4.20	913.42
Siwan	2	0.00	0.00	0.00	0.00	12.80	11.44	40.40	55.90	95.99	767.88	1.68	986.09
Supaul	2	0.00	0.00	0.00	0.00	12.80	11.44	15.15	43.00	49.65	372.60	1.68	506.32
Vaishali	5	0.00	0.00	8.61	0.00	12.80	28.60	50.50	98.90	155.57	1,095.12	4.20	1,454.30
Total	**184**	**44.28**	**41.25**	**68.88**	**0.00**	**428.80**	**783.64**	**1,757.40**	**3,564.70**	**5,173.53**	**38,112.12**	**154.56**	**50,129.16**

***Level 10**: Director General/Director/Joint Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DFO/DO/EO/Fire Supervisor; **Level 5**: ADFO/ADO/AFO/Fire In-charge; **Level 4**: St.O/Sub Inspector/Station In-charge/ASt O./AEO; **Level 3**: S O/Assistant Sub Inspector/ASO/Sub-Fire Officer/; **Level 2** : LFM/ Mechanic Driver/Head Constable/Store Superintendant; **Level 1** : FM/ FM Driver/Radio Technician/ SGFM/ Driver/ Police Constable/ Wireless Technician/ Radio Technician/ Asst FM/ Sanitary Inspector, FO/FO Driver/Driver Operator/Driver/Ambulance Driver/ Clerk; **Level 0:** Cleaner, Fire Coolie, Supporting Staff, Attendant, Labourer, Peon, Security Guard, Tindal.*

Table 26-31: Cost estimate (in Lakhs Rupees) manpower in Bihar for new rural Fire Stations

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Araria	12	0.00	0.00	0.00	0.00	0.00	0.00	126.25	236.50	354.17	2,287.44	10.08	3,014.44
Arwal	1	0.00	0.00	0.00	0.00	0.00	0.00	5.05	8.60	6.62	100.44	0.84	121.55
Aurangabad	13	0.00	0.00	0.00	0.00	0.00	0.00	95.95	193.50	248.25	1,788.48	10.92	2,337.10
Banka	16	0.00	0.00	0.00	0.00	0.00	0.00	80.80	202.10	211.84	1,655.64	13.44	2,163.82
Begusarai	5	0.00	0.00	0.00	0.00	0.00	0.00	70.70	111.80	172.12	1,101.60	4.20	1,460.42
Bhagalpur	12	0.00	0.00	0.00	0.00	0.00	0.00	85.85	180.60	228.39	1,681.56	10.08	2,186.48
Bhojpur	12	0.00	0.00	0.00	0.00	0.00	0.00	121.20	223.60	327.69	2,148.12	10.08	2,830.69
Buxar	9	0.00	0.00	0.00	0.00	0.00	0.00	85.85	159.10	218.46	1,513.08	7.56	1,984.05
Darbhanga	14	0.00	0.00	0.00	0.00	0.00	0.00	186.85	322.50	496.50	3,165.48	11.76	4,183.09
Gaya	19	0.00	0.00	0.00	0.00	0.00	0.00	196.95	352.60	519.67	3,418.20	15.96	4,503.38
Gopalganj	13	0.00	0.00	0.00	0.00	0.00	0.00	111.10	227.90	327.69	2,106.00	10.92	2,783.61
Jamui	8	0.00	0.00	0.00	0.00	0.00	0.00	95.95	159.10	228.39	1,542.24	6.72	2,032.40
Jehanabad	4	0.00	0.00	0.00	0.00	0.00	0.00	50.50	86.00	129.09	819.72	3.36	1,088.67
Kaimur (Bhabua)	9	0.00	0.00	0.00	0.00	0.00	0.00	80.80	163.40	228.39	1,548.72	7.56	2,028.87
Katihar	14	0.00	0.00	0.00	0.00	0.00	0.00	126.25	232.20	314.45	2,164.32	11.76	2,848.98
Khagaria	8	0.00	0.00	0.00	0.00	0.00	0.00	75.75	146.20	198.60	1,308.96	6.72	1,736.23
Kishanganj	9	0.00	0.00	0.00	0.00	0.00	0.00	80.80	163.40	235.01	1,561.68	7.56	2,048.45
Lakhisarai	2	0.00	0.00	0.00	0.00	0.00	0.00	30.30	51.60	79.44	518.40	1.68	681.42
Madhepura	8	0.00	0.00	0.00	0.00	0.00	0.00	85.85	154.80	231.70	1,509.84	6.72	1,988.91
Madhubani	19	0.00	0.00	0.00	0.00	0.00	0.00	227.25	395.60	602.42	3,868.56	15.96	5,109.79
Munger	5	0.00	0.00	0.00	0.00	0.00	0.00	45.45	94.60	139.02	871.56	4.20	1,154.83
Muzaffarpur	29	0.00	0.00	0.00	0.00	0.00	0.00	176.75	408.50	499.81	3,541.32	24.36	4,650.74
Nalanda	16	0.00	0.00	0.00	0.00	0.00	0.00	136.35	266.60	350.86	2,446.20	13.44	3,213.45
Nawada	11	0.00	0.00	0.00	0.00	0.00	0.00	95.95	189.20	254.87	1,756.08	9.24	2,305.34
Pashchim Champaran	17	0.00	0.00	0.00	0.00	0.00	0.00	176.75	331.10	483.26	3,152.52	14.28	4,157.91
Patna	16	0.00	0.00	0.00	0.00	0.00	0.00	131.30	262.30	354.17	2,462.40	13.44	3,223.61
Purba Champaran	29	0.00	0.00	0.00	0.00	0.00	0.00	207.05	438.60	562.70	4,056.48	24.36	5,289.19
Purnia	18	0.00	0.00	0.00	0.00	0.00	0.00	136.35	283.80	380.65	2,621.16	15.12	3,437.08

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Rohtas	11	0.00	0.00	0.00	0.00	0.00	0.00	106.05	206.40	311.14	1,950.48	9.24	2,583.31
Saharsa	7	0.00	0.00	0.00	0.00	0.00	0.00	95.95	159.10	248.25	1,581.12	5.88	2,090.30
Samastipur	14	0.00	0.00	0.00	0.00	0.00	0.00	176.75	309.60	453.47	2,961.36	11.76	3,912.94
Saran	19	0.00	0.00	0.00	0.00	0.00	0.00	176.75	322.50	436.92	3,032.64	15.96	3,984.77
Sheikhpura	2	0.00	0.00	0.00	0.00	0.00	0.00	30.30	47.30	72.82	476.28	1.68	628.38
Sheohar	4	0.00	0.00	0.00	0.00	0.00	0.00	35.35	73.10	102.61	683.64	3.36	898.06
Sitamarhi	16	0.00	0.00	0.00	0.00	0.00	0.00	136.35	275.20	383.96	2,598.48	13.44	3,407.43
Siwan	17	0.00	0.00	0.00	0.00	0.00	0.00	161.60	305.30	446.85	2,893.32	14.28	3,821.35
Supaul	12	0.00	0.00	0.00	0.00	0.00	0.00	106.05	232.20	350.86	2,190.24	10.08	2,889.43
Vaishali	16	0.00	0.00	0.00	0.00	0.00	0.00	151.50	309.60	433.61	2,838.24	13.44	3,746.39
Total	**466**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4,302.60**	**8,286.10**	**11,624.72**	**77,922.00**	**391.44**	**102,526.86**

***Level 10**: Director General/Director/Joint Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DFO/DO/EO/Fire Supervisor; **Level 5**: ADFO/ADO/AFO/Fire In-charge; **Level 4**: St.O/Sub Inspector/Station In-charge/ASt O./AEO; **Level 3**: S O/Assistant Sub Inspector/ASO/Sub-Fire Officer/; **Level 2** : LFM/ Mechanic Driver/Head Constable/Store Superintendant; **Level 1** : FM/ FM Driver/Radio Technician/ SGFM/ Driver/ Police Constable/ Wireless Technician/ Radio Technician/ Asst FM/ Sanitary Inspector, FO/FO Driver/Driver Operator/Driver/Ambulance Driver/ Clerk; **Level 0:** Cleaner, Fire Coolie, Supporting Staff, Attendant, Labourer, Peon, Security Guard,Tindal.*

Annual Vehicle Maintenance & Repairs, and PDL Cost

For Gap analysis, vehicle maintenance, repairs and Petrol, Diesel & Lubricant (PDL) costs have been estimated based on average current expenditure to total vehicles cost (Table 26-32). The total estimated cost on vehicle maintenance & repairs, and PDL will be about **Rs. 20.49 Crores** per year for filling the gap in operational and urban areas in Bihar. The annual specialized equipments, building maintenance, office expanses, and training expanses will be about **Rs. 9.58 Crores, 17.43 Crores, 32.25 Crores** and **Rs. 5.63 Crores**, respectively.

Table 26-32: Annual recurring cost estimates (in Lakhs Rupees) for petrol, diesel, and lubricants after filling the gap in operational and new urban Fire Stations

District	Num of Fire Stations	Annual Vehicle Maintenance	Annual PDL Cost	Annual Equipment Maintenance	Annual Building Maintenance	Office Expenses	Training Expenses
Araria	2	18.96	14.22	10.83	28.00	41.36	7.22
Arwal	1	20.06	15.04	9.72	19.00	58.92	10.29
Aurangabad	6	27.48	20.61	18.50	48.00	97.27	16.98
Banka	1	16.66	12.49	6.47	19.00	27.73	4.84
Begusarai	10	57.43	43.07	61.75	109.00	183.22	31.99
Bhagalpur	9	49.65	37.24	55.36	80.50	144.27	25.19
Bhojpur	6	36.38	27.28	17.27	40.00	84.65	14.78
Buxar	4	20.64	15.48	11.58	31.00	63.14	11.02
Darbhanga	4	38.40	28.80	28.68	45.50	99.87	17.44
Gaya	7	45.76	34.32	24.68	60.00	128.66	22.46
Gopalganj	4	20.52	15.39	20.34	31.00	62.78	10.96
Jamui	2	17.28	12.96	6.73	22.00	32.37	5.65
Jehanabad	2	18.24	13.68	7.94	22.00	49.33	8.61
Kaimur (Bhabua)	3	18.12	13.59	8.13	25.50	37.72	6.59
Katihar	5	38.32	28.74	25.95	52.00	92.14	16.09
Khagaria	2	18.22	13.66	11.76	22.00	50.00	8.73
Kishanganj	1	17.28	12.96	6.53	19.00	45.05	7.87
Lakhisarai	2	18.12	13.59	10.86	22.00	49.69	8.68
Madhepura	3	18.84	14.13	14.75	28.00	41.06	7.17
Madhubani	5	23.30	17.47	25.99	43.00	61.79	10.79
Munger	4	38.20	28.65	24.30	37.00	96.20	16.80
Muzaffarpur	10	42.64	31.98	55.68	64.00	115.36	20.14
Nalanda	5	37.82	28.36	20.78	40.00	94.93	16.57
Nawada	3	19.08	14.31	12.43	25.00	55.00	9.60
Pashchim Champaran	6	26.90	20.17	39.14	49.00	91.42	15.96
Patna	20	132.18	99.14	139.09	228.00	366.33	63.96
Purba Champaran	8	32.54	24.40	43.43	74.50	107.70	18.80
Purnia	7	46.49	34.87	40.59	69.00	136.74	23.87
Rohtas	9	31.82	23.86	25.45	69.00	117.64	20.54
Saharsa	2	18.96	14.22	11.83	22.00	54.78	9.56
Samastipur	6	34.00	25.50	33.25	67.50	128.94	22.51
Saran	8	39.24	29.43	35.13	55.00	101.60	17.74
Sheikhpura	2	17.28	12.96	9.65	22.00	32.37	5.65

District	Num of Fire Stations	Annual Vehicle Maintenance	Annual PDL Cost	Annual Equipment Maintenance	Annual Building Maintenance	Office Expenses	Training Expenses
Sheohar	1	16.44	12.33	5.33	19.00	27.73	4.84
Sitamarhi	5	22.58	16.93	24.74	40.00	58.57	10.23
Siwan	2	20.40	15.30	12.65	25.00	63.36	11.06
Supaul	2	17.28	12.96	10.00	22.00	33.04	5.77
Vaishali	5	37.44	28.08	31.02	48.50	93.06	16.25
Total	**184**	**1,170.91**	**878.18**	**958.29**	**1,743.00**	**3,225.80**	**563.23**

Table 26-33: State level summary of Capital Expenditure required for filling the gap (in Crores Rupees)

Capital Expenditure				
Operational Type	**Fire Station Building Infrastructure**	**Vehicle Cost**	**Equipment Cost**	**Total Capital Cost**
Operational Fire Stations	41.00	118.54	4.70	164.24
Gap in Operational Fire Stations	583.50	306.04	68.26	957.80
New Urban Fire Stations	247.00	63.30	46.82	357.13
Total Gap in New Urban and Operational Fire Stations	830.50	369.34	115.09	1,314.93
New Rural Fire Stations	2,301.00	611.15	185.32	3,097.47
Total Gap in New Urban ,New Rural and Operational Fire Stations	3,131.50	980.49	300.41	4,412.39

Table 26-34: State level summary of Recurring Expenditure required for filling the gap (in Crores Rupees)

Recurring Expenditure								
Operational Type	**Annual Staff Salary**	**Annual Vehicle Maintenance**	**Maintenance Contract (Specialized**	**Annual Petrol diesel and Lubricant Cost**	**Annual Building Maintenance**	**Annual Office Expenses**	**Annual Training Expenses**	**Total Recurring Expenditure**
Operational Fire Stations	10.74	2.84	0.38	2.13	0.82	0.68	0.12	17.71
Gap in Operational Fire Stations	388.99	7.34	5.46	5.51	11.67	24.51	4.28	447.76
New Urban Fire Stations	112.30	1.52	3.75	1.14	4.94	7.07	1.24	131.95
Total Gap in New Urban and Operational Fire Stations	501.29	8.86	9.21	6.65	16.61	31.58	5.51	579.72
New Rural Fire Stations	1,025.27	14.67	14.83	11.00	46.02	64.59	11.28	1,187.65
Total Gap in New Urban ,New Rural and Operational Fire Stations	1,526.56	23.53	24.03	17.65	62.63	96.17	16.79	1,767.37

26.5 Detailed Financial Investment Plan

All the above detailed capital and recurring expenses have been taken into consideration, while finalizing the detailed investment plan for next 10 years for Bihar State (Table 26-35 and Table 26-36).

Table 26-35: State level 10 year investment plan for Bihar Fire Services for filling gap in operational and new urban Fire Stations (in Crores Rupees)

	Capital Expenditure		Recurring Expenditure					
Year	Building Infrastructure	Vehicle and Equipment	Annual Vehicle Maintenance & PDL AMC	Annual Staff Salary	Annual Office Expenses	Annual Training Office Expenses	Annual Bldg. maintenance	Total
First Year	166.10	187.15	14.51	205.24	12.93	2.26	6.66	594.84
Second Year	184.37	196.51	25.56	447.70	28.21	4.62	12.62	899.58
Third Year	102.33	24.28	29.10	529.60	33.36	5.12	13.75	737.54
Fourth Year	113.58	25.50	33.04	624.71	39.36	5.66	14.90	856.75
Fifth Year	126.08	13.39	36.56	717.34	45.19	6.10	15.57	960.22
Sixth Year	139.95	14.06	40.42	823.21	51.86	6.56	16.24	1,092.30
Seventh Year	155.34	14.76	44.67	944.16	59.48	7.05	16.93	1,242.40
Eighth Year	172.43	15.50	49.35	1,082.29	68.18	7.58	17.63	1,412.95
Ninth Year	0.00	16.27	54.48	1,239.97	78.12	8.14	18.34	1,415.32
Tenth Year	0.00	17.08	60.12	1,419.91	89.45	8.74	19.06	1,614.36
Total	**1,160.17**	**524.49**	**387.82**	**8,034.13**	**506.15**	**61.82**	**151.69**	**10,826.27**

Table 26-36: State level 10 year investment plan for Bihar Fire Services for filling gap in operational, new urban and new rural Fire Stations (in Crores Rupees)

	Capital Expenditure		Recurring Expenditure					
Year	Building Infrastructure	Vehicle and Equipment	Annual Vehicle Maintenance & PDL AMC	Annual Staff Salary	Annual Office Expenses	Annual Training Office Expenses	Annual Bldg. maintenance	Total
First Year	626.30	187.15	14.51	205.24	12.93	2.26	6.66	1,055.04
Second Year	695.19	196.51	25.56	447.70	28.21	4.62	12.62	1,410.40
Third Year	385.83	199.90	38.55	786.82	49.57	7.61	23.14	1,491.42
Forth Year	428.26	209.89	53.45	1,200.88	75.66	10.88	33.87	2,012.89
Fifth Year	475.39	110.20	64.10	1,523.98	96.01	12.95	39.51	2,322.14

	Capital Expenditure		Recurring Expenditure					
Year	Building Infrastructure	Vehicle and Equipment	Annual Vehicle Maintenance & PDL AMC	Annual Staff Salary	Annual Office Expenses	Annual Training Office Expenses	Annual Bldg. maintenance	Total
Sixth Year	527.69	115.71	76.12	1,907.33	120.16	15.19	45.26	2,807.47
Seventh Year	585.72	121.49	89.66	2,360.74	148.73	17.63	51.12	3,375.09
Eighth Year	650.16	127.57	104.87	2,895.51	182.42	20.27	57.10	4,037.89
Ninth Year	0.00	133.95	121.94	3,524.63	222.05	23.14	63.19	4,088.89
Tenth Year	0.00	140.64	141.06	4,263.04	268.57	26.23	69.39	4,908.95
Total	**4,374.55**	**1,543.01**	**729.82**	**19,115.86**	**1,204.30**	**140.78**	**401.86**	**27,510.18**

26.6 Prioritization of new Fire Stations/Fire Posts

For prioritization of new Fire Stations/Fire Posts, the RMSI team has strictly followed risk categorization and estimated population density in the jurisdiction of new Fire Station/Fire Post as criteria. Accordingly, the priority for establishing new urban Fire Stations and rural Fire Stations/posts has been given in Tables 26-38 and 26-39, respectively.

However, It may be noted that actual implementation of priority depends upon a number of factors such as land availability, land possession, tackling any encroachment on available land, getting construction clearances from various authorities for implementation of construction work. Hence, Bihar State Fire Services may change the priority of a new Fire Station/Fire Post depending upon the local situation and requirements.

26.7 Avenues of Fund Generation

Bihar State can generate new avenues for funds from the followings:

- Introduction of Fire Tax (1% of existing property tax)
- Introduction of Fire Cess, which can be collected for auditing and inspecting various occupancies for adoption of Fire Safety Measures besides training public manpower for use of first aid firefighting equipment
- Training programs at different levels and duration to private sector employee on chargeable basis
- Capitation fees can be charged for scrutiny of building plans
- Clearance of building plans from fire safety point of view
- Sale of condemned fire appliances, equipment, uniform articles and general store items
- Fee on deployment of members of Fire Service along-with necessary equipment and appliances beyond the jurisdiction of the State Fire Services
- Standby charges on deployment of members of Fire Service along-with equipment and appliances in the area for stand by for a specific duration can be charged except

the visits of Government authorities, or in public interest, if demanded by the district administration

- Training Charges from the external trainees sponsored by private industries for short and long duration courses.

26.8 Capacity Building and Training Facilities

The State has framed Recruitment Rules (RR) for each level, and these are being adhered to for filling the vacant position.

In Bihar State, a full-fledged training centre is coming up for leading fireman and lower staff. A few senior level officials got training at NFSC Nagpur, however, State lacks significant trained manpower. The advanced courses like improvised Sub Officer's Course is imparted at New Delhi, Kolkata, Chennai, Hyderabad, Karnataka while as Station Officers/ Instructor's Course and Divisional Courses are imparted at National Fire Service College (NFSC), Nagpur. In general, Bihar State lacks trained manpower in firefighting.

The roles of firefighter cannot be performed until and unless sufficient training is being imparted to the fire service personnel. The types of training and duration depend upon the type of entry to the fire service department or change of responsibility on promotion. Broadly, there are two entry levels in fire services in India; 1) Fireman level and 2) Middle level (Sub Officer/ Asstt. Station Officer). Immediately after joining the Fire Services, it is mandatory that every fire personnel needs to undergo professional training.

A few senior level officials of Bihar Fire Services have been trained at NFSC Nagpur and few officials have been trained for short duration basic training courses at other States Fire Training Institutes.

In order to further strengthen the Bihar State fire services, the gap in training has been estimated for various levels of fire personnel. The Fire Station survey and gap analysis reveal that there is significant gap in training need for existing staff. The previous section (section 26.3.3.) details about huge gap in manpower for operational Fire Stations and need of additional fire personnel for new urban and new rural Fire Stations. As per the guidelines of SFAC, immediately after recruitment, fire personnel should undertake professional trainings. Moreover, there should be refresher-training courses at an interval of 3 to 5 years for every fire personnel. The following sections detail about the estimation of training need at different levels (fireman, leading fireman, station officer, sub-officer etc.).

26.8.1 Basic Training for Fireman

The basic training course should provide practical experience of fire fighting to meet the challenge in fire fighting operations. Fire personnel should also be trained for operation and maintenance of fire fighting vehicles and equipments.

Estimated number of fire personnel who require basic training for fireman in operational Fire Stations (after filling the gap of manpower), and additional new recruitment for new urban and new rural Fire Stations is shown in Table 26-37. Additional requirement of Refresher Training Course for fireman after every 3-5 years of service is also shown the Table 26-37. Some of the special training for handling specialized equipment such as Breathing Apparatus, Global-positioning System etc should also be part of the Refresher course. As a whole, Bihar Fire Service would require to train 35,866 fire personnel in basic and 18,084 fire personnel in refresher training in next 10 years. Therefore, State training centre should have adequate capacity and infrastructure for meeting such training requirement.

Table 26-37: Estimated training requirements for fire personnel in Bihar Fire Services

Basic Training for Fireman		
	Number of Fire Personnel in Operational Fire Stations	9237
	Number of Fire Personnel in New Urban Fire Stations	2579
	Number of Fire Personnel in New Rural Fire Stations	24050
	Total Number of Fire Personnel for Training	**35866**
Refresher Training for Fireman		
	Total Number of Fire Personnel	**18084**
Leading Fireman Training Course		
	Number of Fire Personnel in Operational Fire Stations	1246
	Number of Fire Personnel in New Urban Fire Stations	355
	Number of Fire Personnel in New Rural Fire Stations	3512
	Total Number of Fire Personnel for Training	**5113**
Other specialized Training Course		
	Total Number of Fire Personnel for Training	**1601**
Junior Officer Training Course		
	Number of Fire Personnel in Operational Fire Stations	872
	Number of Fire Personnel in New Urban Fire Stations	309
	Number of Fire Personnel in New Rural Fire Stations	2779
	Total Number of Fire Personnel for Training	**3960**
Divisional Officer Training Course		
	Number of Fire Personnel in Operational Fire Stations	172
	Number of Fire Personnel in New Urban Fire Stations	44
	Number of Fire Personnel in New Rural Fire Stations	0
	Total Number of Fire Personnel for Training	**216**
Fire Prevention Course		
	Total Number of Fire Personnel for Training	**218**

26.8.2 Training Course for Leading Fireman

While promotion from fireman to leading fireman category, fire personnel should undertake training course designed for leading fireman. This training will provide both theoretical and practical training required for effective deployment of fire vehicles and fire equipment as well.

Estimated number of fire personnel who require training for leading fireman in operational Fire Stations (after filling the gap of manpower), and additional new recruitment for new urban and new rural Fire Stations is shown in Table 26-37.

26.8.3 OTHER SPECIALIZED TRAINING COURSES

Besides regular normal training course for leading fireman, every leading fireman should also undergo at least one special training for multi-tasking performance in due course of time. In many cases, the fire services need to face new challenges and play an important role in other emergencies. Therefore, fire personnel must be well trained to perform in all possible situations. Some of the other specialized trainings courses are mentioned below:

- Breathing Apparatus
- Collapsed structure – Search & Rescue
- Advanced Search & Rescue
- Flood Rescue
- Chemical Disaster
- Flood / Cyclone Disaster Response
- Earthquake Disaster Response
- Emergency Response to Rail Accidents
- Hazardous Material Emergency

The syllabi for above courses are already provided in SFAC guidelines. Number of leading fireman need to attend specialized course is also shown in Table 26-38. In total, Bihar State fire services would need to train at least 1,601 leading fireman for specialized courses in next 10 years.

26.8.4 JUNIOR OFFICER TRAINING COURSE

While promotion from leading fireman to sub-officer/ station officer fire personnel should undertake a Junior Officer training course. This course should provide an understanding of Fire Station administration, fire safety management and leadership as to be able to command a Fire Station and command a fire crew in case of an emergency. Upon successful completion of the training, fire officers should be able to identify components of an effective fire service organization and planning requirement. The officials will be responsible for implementation of fire safety and prevention programs at their assigned Fire Station.

Estimated number of fire officers who need to participate in Junior Officer training course in operational Fire Stations (after filling the gap of manpower), and additional new recruitment for new urban and new rural Fire Stations is shown in Table 26.37. After filling gap in operational Fire Stations, new urban and rural Fire Stations, Bihar State fire services would require to train 3,960 junior officers in next 10 years.

26.8.5 DIVISIONAL FIRE OFFICER TRAINING COURSE

On promotion to divisional officer, every fire officer should undertake a Divisional Fire Officer (DFO) training course. This course should provide with theory, principles and practices in terms of Fire Station management, facilities, fire inspection as well as effective guidelines to command fire crew and control at an incident site. This course should be designed to promote them for their roles as senior fire officers. Upon successful completion of training, officers should be able to identify components of an effective fire service organization, and implementation of fire prevention and fire safety programs at their assigned area of jurisdiction.

Estimated number of fire officers who require Divisional Officer training course in operational and new Fire Stations (after filling the gap of manpower) is shown in Table 26-38. About 218 fire officers in Bihar State fire services who would require this training in next 10 years.

26.8.6 FIRE PREVENTION TRAINING COURSE

In addition to fire fighting staff, there is an urgent need for fire prevention wing for inspection, awareness generation, and training for schools, hospitals, high-rise buildings, shopping malls govt. offices, public buildings etc. Though fire services in the State are creating public awareness programs for schools, hospitals, Govt. offices, etc. however, it is not up to the desired level due to significant lack of trained manpower. For that purpose sufficient manpower at senior officer levels have been recommended to have an effective State "*Fire Prevention Wing*". The fire prevention wing should have trained officials for fire inspection, awareness and training, so that fire incidences similar to that of AMRI, Kolkata should not occur in the State. The State should have a dedicated "*Education Van*" in each district for the purpose. The van should be well equipped with short video films as produced by MHA, distribution of pamphlets on "DO"s and "DON'T"s generated by MHA, and live demonstration of how to use "portable extinguishers" and handle small fires. Accordingly, the State would require to train about 218 fire officials in fire prevention course

26.8.7 AWARENESS GENERATION PROGRAMS

Besides attending regular fire and other rescue calls, the State fire services should also work on awareness generation programs, and it should conduct regular awareness programs in schools, residential areas, NCC camps, oil and gas plants, Govt. offices etc.. Currently, numbers of awareness programs conducted so far by Bihar State fire services are not up to the satisfactory level and there is urgent need to enhance such activities. For large scale public awareness generation, each district is being recommended with an Education Van equipped with short video films as produced by MHA, distribution of pamphlets on "DO"s and "DON'T"s to prevent fire event generated by MHA, live- demonstrations of how to use "portable extinguishers" and how to handle small kitchen fires.

26.9 Limitations of the Study

1. In fire hazard and risk analysis, fire-load of specific industry has not been taken into consideration. However, weightage has been given to the size of industrial area in the fire hazard and risk analysis of the base unit (district level). An attempt has been made even in the present assignment to go further down at lower levels. Providing special weightage of type of industry will require building level survey including estimation of fire-load for each industry, which is out of scope of present assignment.
2. Currently, Census 2011 has published only district level demographic data (the Tehsil/ Block level data is still unavailable), which has been used for further estimation and analysis purpose.
3. Floating population in cities has not been considered for distribution over the land use (built-up area); this may be attempted in future detailed studies.
4. Non-availability of a uniform level of fire statistics of all the fire events in the past 5 years.
5. Designation, rank structure and administrative control are very heterogeneous from State to State, which in the present State creates ambiguity while brining in at National level. For example, Director Position pay scale in one State may not be equal to that of Chief Fire Officer in another State. For the purpose of present assignment, we have divided the rank/designation structure into 11 levels (level 0 to level 10). For this, a system needs to be put in place through having a uniform administrative structure at national level to State level. This may require development and implementation of National Fire Act, which MHA is trying to develop in near future.
6. The fire fighting infrastructure of forest department, privately owned companies/ organizations, military cantonment and airbases, nuclear power plants, nuclear research reactors, heavy water plants, mines, ports, airports, oil exploration and oil refineries are out of scope of present study. However, RMSI has tried to get information about the fire-fighting infrastructure for these, and included all available information, as there are limitations due to security concerns. This is more so, as result of this study may be made available in public domain with their spatial location. Studying fire infrastructure in above areas will require special MOU's with MHA and controlling agencies, and may be attempted in future studies to have a complete coverage of the country.

26.10 Recommendations for Bihar State Fire Services

1. At present, the State has Bihar Fire Act of 1948, which need thorough revision and updation to meet provisions of National Building Code (NBC, 2005). Since different parts of the State fall in Seismic Zone V (15.2%), Zone IV(63.7%) and Zone III (21.1%) , there is an urgent need/modification of existing Bihar Fire Act and strict implementation of fire code in building design and construction. National Building Code (NBC) should be strictly adhered to in high-rise buildings, schools, colleges, shopping malls, cinema halls, hospitals, industrial units, institutions and public and private buildings. As majority of structures are low rise, however, keeping in mind the State vulnerability to earthquakes, even low-rise buildings need strict implementation of building code.
2. The Bihar State lacks significant firefighting manpower and there are large number of vacancies at all levels in the State in operational Fire Stations, which need to be filled up at the earliest.
3. Instead of having firemen, driver, and operator separately, the State should recruit fireman-cum-driver-cum-operator. This will help in optimizing the huge manpower requirements. Since, these may not be readily available, the State should train the new recruit in a systematic manner, and encourage all existing staff, specially, fireman and leading fireman to obtain heavy vehicle driving license. The State may offer some incentive towards this, as this will help in optimization of resources.
4. Based on prioritization of Fire Stations, State Fire Services needs to add new Fire Stations at a faster pace, as there is a huge gap both in urban and rural areas.
5. To have a Computerization of Bihar State Fire Services, training of fire personnel in use of computers is required, which is very important from the modernization of point of view.
6. Online Vehicle tracking through GPS and development of a fully computerized response system is another area for improvement.
7. Though fire services in the State are creating public awareness programs for schools, colleges, shopping malls, cinema halls , hospitals, Govt. offices, etc. however, it is not up to the desired level due to lack of trained manpower. For that purpose sufficient manpower at senior officer levels have been recommended to have an effective State "*Fire Prevention Wing*". The fire prevention wing should have trained officials for fire inspection, awareness and training, so that fire incidences similar to that of AMRI, Kolkata should not occur in the State. The State should have a dedicated "*Education Van*" in each district for the purpose. The van should be well equipped with short video films as produced by MHA, distribution of pamphlets on "DO"s and "DON'T"s generated by MHA, and live demonstration of how to use "portable extinguishers" and handle small fires.
8. Periodic fire drills and fire-inspection of schools, hospitals, shopping complexes, multi-storied buildings, and major industrial centers should be taken care by the State fire services.
9. For congested areas, and by-lanes where movement of Water Tender and Water Bowser is difficult, QRTs and motorcycle with mist sets should be used for the fastest response, supplemented by the Water Tenders and Water Bowsers by laying the large hose pipelines. Additionally, State Fire Service should identify congested areas and request district administration to decongest such areas with the help of police. The congestion could be in terms of illegal extension of residential buildings, shops, unauthorized parking on roads. For unauthorized parking, State traffic department can also play an important role. Here role of fire prevention officials is important as such, exercises are not one time exercise and should be carried out regularly.

10. Though, State fire service does have some promotional avenues for their staff. However, there is an urgent need to have merit-based promotion, so that deserving employees remain motivated and do not leave the organization at midst of their career.
11. The Fire Services in the State should have audit by a central authority to ensure good finance mechanism for capital, and O&M expenditures.

Table 26-38: Details of operational and new proposed urban Fire Stations with their ideal jurisdiction area, estimated ideal served population under their jurisdiction, and priority ranking for new Fire Stations

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Araria	BR3209	Araria Fire Station	Operational Urban	3073	
Araria	BR3215	Forbesganj Fire Station	Operational Urban	2290	
Aurangabad	BR3263	Daud Nagar Fire Station	Operational Urban	6626	
Aurangabad	BR3264	Aurangabad Fire Station	Operational Urban	5331	
Aurangabad	BR_New Urban FS_38	Amba	New Urban FS	6131	69
Aurangabad	BR_New Urban FS_35	Barun	New Urban FS	3463	77
Aurangabad	BR_New Urban FS_36	Obra	New Urban FS	3451	78
Aurangabad	BR_New Urban FS_39	Maharajganj	New Urban FS	2792	80
Banka	BR3184	Banka Fire Station	Operational Urban	4900	
Begusarai	BR_New Urban FS_12	Refinery Township	New Urban FS	8991	6
Begusarai	BR3217	Begusarai Fire Station	Operational Urban	10654	
Begusarai	BR3210	Balia Fire Station	Operational Urban	7194	
Begusarai	BR3214	Barauni Fire Station	Operational Urban	2716	
Begusarai	BR_New Urban FS_55	Manjhaul	New Urban FS	7085	10
Begusarai	BR_New Urban FS_73	Barauni	New Urban FS	6326	12
Begusarai	BR_New Urban FS_72	Saboura	New Urban FS	3749	20
Bhagalpur	BR3187	Bhagalpur Fire Station	Operational Urban	23792	
Bhagalpur	BR3188	Naugachhia Fire Station	Operational Urban	4202	
Bhagalpur	BR_New Urban FS_1	Tilkamanjhi	New Urban FS	20374	63
Bhagalpur	BR_New Urban FS_64	Urdu Bazar	New Urban FS	18024	64
Bhagalpur	BR_New Urban FS_65	Champapur	New Urban FS	10730	65
Bhagalpur	BR_New Urban FS_63	Bhagalpur	New Urban FS	5294	70
Bhagalpur	BR_New Urban FS_62	Bahadurpur	New Urban FS	4939	72
Bhagalpur	BR_New Urban FS_58	Sultanganj	New Urban FS	4013	75

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Bhojpur	BR3231	Arrah Sadar Fire Station	Operational Urban	13704	
Bhojpur	BR3222	Jagdishpur Fire Station	Operational Urban	3195	
Bhojpur	BR3224	Piro fire station	Operational Urban	2747	
Bhojpur	BR_New Urban FS_3	Katira	New Urban FS	7612	37
Bhojpur	BR_New Urban FS_28	Behea	New Urban FS	5109	48
Bhojpur	BR_New Urban FS_40	Sandesh	New Urban FS	3184	56
Buxar	BR3234	Buxar Fire Station	Operational Urban	4430	
Buxar	BR3236	Dumraon Fire Station	Operational Urban	2872	
Buxar	BR_New Urban FS_29	Chaugain	New Urban FS	4677	50
Buxar	BR_New Urban FS_76	Golambar	New Urban FS	3089	57
Darbhanga	BR3153	Darbhanga Fire & Rescue Station	Operational Urban	7879	
Darbhanga	BR3196	Biraul Fire Station	Operational Urban	5225	
Darbhanga	BR3199	Benipur Fire Station	Operational Urban	2855	
Darbhanga	BR_New Urban FS_75	Laheriasarai	New Urban FS	7165	40
Gaya	BR3229	Gaya Fire Station	Operational Urban	21281	
Gaya	BR3226	Tekari Fire Station	Operational Urban	3932	
Gaya	BR3228	Sherghati Fire Station	Operational Urban	2580	
Gaya	BR3230	Bodh Gaya Fire Station	Operational Urban	1055	
Gaya	BR_New Urban FS_4	Gaya	New Urban FS	8818	66
Gaya	BR_New Urban FS_37	Imamganj	New Urban FS	3934	76
Gopalganj	BR3130	Gopalganj Fire Station	Operational Urban	6133	
Gopalganj	BR3097	Hathua Fire station	Operational Urban	2986	
Gopalganj	BR_New Urban FS_25	Sidhwalia	New Urban FS	3262	55
Gopalganj	BR_New Urban FS_24	Barauli	New Urban FS	3064	58
Jamui	BR3170	Jamui Fire station	Operational Urban	5362	
Jamui	BR_New Urban FS_78	Jhajha	New Urban FS	4185	74
Jehanabad	BR3157	Jehanabad Fire station	Operational Urban	5252	

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Jehanabad	BR_New Urban FS_79	Makhdumpur	New Urban FS	7581	38
Kaimur (Bhabua)	BR3239	Mohania Fire Station	Operational Urban	2046	
Kaimur (Bhabua)	BR_New Urban FS_17	Bhabua	New Urban FS	6311	68
Kaimur (Bhabua)	BR_New Urban FS_32	Jahanabad	New Urban FS	4697	73
Katihar	BR3197	Katihar Fire Station	Operational Urban	4560	
Katihar	BR3194	Barsoi Fire Station	Operational Urban	4377	
Katihar	BR_New Urban FS_15	Rampara	New Urban FS	14273	31
Katihar	BR_New Urban FS_74	Officer's Colony	New Urban FS	8501	33
Khagaria	BR3205	Khagaria Fire Station	Operational Urban	8180	
Khagaria	BR3202	Gogri Fire Station	Operational Urban	6350	
Kishanganj	BR3190	Kishanganj Fire Station	Operational Urban	8403	
Lakhisarai	BR3164	Lakhisarai Fire station	Operational Urban	3409	
Lakhisarai	BR_New Urban FS_54	Barahiya	New Urban FS	1539	82
Madhepura	BR3088	Madhepura Fire Station	Operational Urban	4260	
Madhepura	BR3103	Uda Kishangunj Fire station	Operational Urban	2815	
Madhepura	BR_New Urban FS_60	Murliganj	New Urban FS	2720	81
Madhubani	BR3204	Madhubani Fire Station	Operational Urban	3280	
Madhubani	BR3206	Jhanharpur Fire Station	Operational Urban	3268	
Madhubani	BR3180	Jai Nagar Fire Station	Operational Urban	2685	
Madhubani	BR_New Urban FS_50	Benipatti	New Urban FS	7299	39
Munger	BR3177	Munger Fire station	Operational Urban	14366	
Munger	BR3181	Tarapur Fire Station	Operational Urban	2580	
Munger	BR_New Urban FS_59	Jamalpur	New Urban FS	6363	67
Muzaffarpur	BR_New Urban FS_21	Pragya Nagar	New Urban FS	10488	3
Muzaffarpur	BR_New Urban FS_11	Tilak Nagar	New Urban FS	9543	4
Muzaffarpur	BR_New Urban FS_20	Lakshmi Narayan Nagar	New Urban FS	8903	7

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Muzaffarpur	BR_New Urban FS_68	Akharaghat Road	New Urban FS	7128	9
Muzaffarpur	BR_New Urban FS_47	Sahebganj	New Urban FS	6315	13
Muzaffarpur	BR_New Urban FS_69	Bairiya Golambar	New Urban FS	5254	14
Muzaffarpur	BR_New Urban FS_70	Madhopur	New Urban FS	3685	21
Muzaffarpur	BR_New Urban FS_71	Khabra	New Urban FS	3329	25
Muzaffarpur	BR3155	Muzaffarpur Fire & Rescue Station	Operational Urban	16503	
Muzaffarpur	BR3158	Motipur Fire & Rescue Station	Operational Urban	1739	
Nalanda	BR3240	Bihar sarif Fire Station	Operational Urban	14813	
Nalanda	BR3235	Rajgiri Fire station	Operational Urban	3388	
Nalanda	BR3238	Hilsa fire station	Operational Urban	2989	
Nalanda	BR_New Urban FS_81	Ekangar Sarai	New Urban FS	3503	53
Nalanda	BR_New Urban FS_82	Islampur	New Urban FS	2850	59
Nawada	BR3269	Nawada Fire Station	Operational Urban	9978	
Nawada	BR3268	Rajauli Fire Station	Operational Urban	3291	
Nawada	BR_New Urban FS_57	Phoolwari	New Urban FS	2851	79
Pashchim Champaran	BR_New Urban FS_23	Ramnagar	New Urban FS	7859	35
Pashchim Champaran	BR_New Urban FS_7	Goriya Patti	New Urban FS	6185	43
Pashchim Champaran	BR3089	Narkatiya Gunj Fire & Rescue Station	Operational Urban	11272	
Pashchim Champaran	BR3086	Bettiah Fire & Rescue Station	Operational Urban	7503	
Pashchim Champaran	BR3223	Bagaha Fire Station	Operational Urban	1286	
Pashchim Champaran	BR_New Urban FS_22	Lauria Nandangarh	New Urban FS	2477	60
Patna	BR_New Urban FS_2	Rajiv Nagar	New Urban FS	17687	1
Patna	BR_New Urban FS_13	Sandalpur	New Urban FS	17687	2
Patna	BR_New Urban FS_46	Simli	New Urban FS	9122	5

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Patna	BR_New Urban FS_44	Fatwah	New Urban FS	4935	16
Patna	BR_New Urban FS_52	Bakhtiyarpur	New Urban FS	4225	17
Patna	BR_New Urban FS_53	Mokameh	New Urban FS	3884	19
Patna	BR_New Urban FS_41	Sherpur	New Urban FS	3682	22
Patna	BR_New Urban FS_8	Usri	New Urban FS	3608	23
Patna	BR_New Urban FS_45	Baikathpur	New Urban FS	2949	26
Patna	BR_New Urban FS_19	Dhiwar (Barh, Near NTPC)	New Urban FS	2462	27
Patna	BR3253	Kankarbagh Fire Station.	Operational Urban	24110	
Patna	BR3262	Patna Fire Station	Operational Urban	22511	
Patna	BR3318	Patna city fire station	Operational Urban	20148	
Patna	BR3278	Sachivalaya Fire Station	Operational Urban	18490	
Patna	BR3275	Danapur Fire Station	Operational Urban	13069	
Patna	BR3258	Phulwari sharif Fire Station	Operational Urban	10008	
Patna	BR3273	Barh Fire Station	Operational Urban	6304	
Patna	BR3242	Masaurhi Fire Station	Operational Urban	4033	
Purba Champaran	BR_New Urban FS_67	Daroga Tola	New Urban FS	8146	8
Purba Champaran	BR_New Urban FS_9	Rajendra Nagar	New Urban FS	4980	15
Purba Champaran	BR3095	Raxaul Fire & Rescue Station	Operational Urban	7833	
Purba Champaran	BR3200	Motihari Fire Station	Operational Urban	4739	
Purba Champaran	BR3159	Dhaka Fire & Rescue Station	Operational Urban	4051	
Purba Champaran	BR3162	Chakia Fire & Rescue Station	Operational Urban	1492	
Purba Champaran	BR3092	Areraj Fire & Rescue Station	Operational Urban	1451	
Purnia	BR_New Urban FS_66	Khukshibagh	New Urban FS	9261	32
Purnia	BR_New Urban FS_6	Purnia	New Urban FS	5498	45

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Purnia	BR_New Urban FS_61	Kasba	New Urban FS	5327	47
Purnia	BR3175	Purnia Fire Station	Operational Urban	14770	
Purnia	BR3173	Bammankhi Fire Station	Operational Urban	4092	
Rohtas	BR_New Urban FS_16	Dehri	New Urban FS	7082	11
Rohtas	BR_New Urban FS_18	Bikaramganj	New Urban FS	4079	18
Rohtas	BR_New Urban FS_33	Chenari	New Urban FS	3395	24
Rohtas	BR_New Urban FS_31	Kochas	New Urban FS	2295	28
Rohtas	BR_New Urban FS_30	Dinara	New Urban FS	1752	29
Rohtas	BR_New Urban FS_34	Garh Nokha	New Urban FS	1734	30
Rohtas	BR3237	Sasaram Fire Station	Operational Urban	7545	
Rohtas	BR3259	Rohtas Fire Station	Operational Urban	5466	
Saharsa	BR3195	Saharsa Fire Station	Operational Urban	9945	
Saharsa	BR3163	Simri Bakhtiarpur Fire Station	Operational Urban	2048	
Samastipur	BR_New Urban FS_51	Rau Pusa	New Urban FS	6978	42
Samastipur	BR_New Urban FS_14	Rosera	New Urban FS	4814	49
Samastipur	BR3168	Samastipur Fire & Rescue Station	Operational Urban	8354	
Samastipur	BR3171	DalSingh Sarai Fire Station	Operational Urban	8344	
Saran	BR_New Urban FS_42	Dighwara	New Urban FS	8214	34
Saran	BR_New Urban FS_5	Chhapra	New Urban FS	5629	44
Saran	BR_New Urban FS_26	Mashrakh	New Urban FS	3700	52
Saran	BR_New Urban FS_27	Manjhi	New Urban FS	2337	61
Saran	BR_New Urban FS_80	Revelganj	New Urban FS	1853	62
Saran	BR3150	Chapra Fire & Rescue Station	Operational Urban	8911	
Saran	BR3152	Marhavra Fire & Rescue Station	Operational Urban	2423	
Saran	BR3149	Sonpur Fire & Rescue Station	Operational Urban	1729	
Sheikhpura	BR_New Urban FS_56	Barbigha	New Urban FS	5088	71

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Sheikhpura	BR3161	Sheikhpura Fire Station	Operational Urban	2776	
Sheohar	BR3221	Sheohar Fire Station	Operational Urban	3000	
Sitamarhi	BR_New Urban FS_10	Laxman Nagar	New Urban FS	7155	41
Sitamarhi	BR_New Urban FS_49	Sursand	New Urban FS	5380	46
Sitamarhi	BR_New Urban FS_48	Panchhaur	New Urban FS	4177	51
Sitamarhi	BR3084	Sitamarhi Fire Station	Operational Urban	2960	
Siwan	BR3091	Siwan Fire & Rescue Station	Operational Urban	5879	
Siwan	BR3100	Maharajgunj Fire station	Operational Urban	2300	
Supaul	BR3165	Supaul Fire & Rescue Station	Operational Urban	2364	
Supaul	BR3167	Birpur Fire & Rescue Station	Operational Urban	2276	
Vaishali	BR_New Urban FS_43	Lalganj	New Urban FS	7631	36
Vaishali	BR_New Urban FS_77	Dighi Kala	New Urban FS	3413	54
Vaishali	BR3148	Hajipur Fire & Rescue Station	Operational Urban	9132	
Vaishali	BR3146	Mahnar Fire & Rescue Station	Operational Urban	5372	
Vaishali	BR3145	Mahua Fire & Rescue Station	Operational Urban	2127	

Table 26-39: Details of operational and new proposed rural Fire Stations with their ideal jurisdiction area, estimated ideal served population under their jurisdiction, and priority ranking for new Fire Stations

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Araria	BR_New Rural FS_255	Sikhti	New Rural FS	1245	185
Araria	BR_New Rural FS_366	Palasi	New Rural FS	1217	191
Araria	BR_New Rural FS_355	Palasi	New Rural FS	1204	193
Araria	BR_New Rural FS_342	Mahthawa	New Rural FS	1132	208
Araria	BR_New Rural FS_257	Jokihat	New Rural FS	1088	225
Araria	BR_New Rural FS_311	Lahtora	New Rural FS	1083	226
Araria	BR_New Rural FS_360	Parsahat	New Rural FS	1039	237
Araria	BR_New Rural FS_325	Bathnaha	New Rural FS	955	254
Araria	BR_New Rural FS_457	Araria	New Rural FS	918	259
Araria	BR_New Rural FS_253	Manikpur	New Rural FS	895	262
Araria	BR_New Rural FS_352	Dak	New Rural FS	764	299
Araria	BR_New Rural FS_309	Raniganj	New Rural FS	763	300
Arwal	BR3282	Arwal Fire Station	Operational Rural	1656	
Arwal	BR_New Rural FS_428	Prasadi English	New Rural FS	1063	361
Aurangabad	BR_New Rural FS_97	Chatra	New Rural FS	1080	360
Aurangabad	BR_New Rural FS_114	Bantara	New Rural FS	956	375
Aurangabad	BR_New Rural FS_101	Bhakhara	New Rural FS	850	390
Aurangabad	BR_New Rural FS_98	Raniganj	New Rural FS	749	410
Aurangabad	BR_New Rural FS_104	Hanspura	New Rural FS	735	413
Aurangabad	BR_New Rural FS_109	Goh	New Rural FS	690	420
Aurangabad	BR_New Rural FS_96	Jamhaur	New Rural FS	678	424
Aurangabad	BR_New Rural FS_108	Rafiganj	New Rural FS	635	430
Aurangabad	BR_New Rural FS_99	Rajoi-Bijoi	New Rural FS	595	435
Aurangabad	BR_New Rural FS_100	Matha	New Rural FS	560	437

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Aurangabad	BR_New Rural FS_102	Nabinagar	New Rural FS	515	448
Aurangabad	BR_New Rural FS_228	Bhandari	New Rural FS	498	451
Aurangabad	BR_New Rural FS_103	Sonaura	New Rural FS	383	459
Banka	BR_New Rural FS_333	Bishunpur Kothia	New Rural FS	1177	352
Banka	BR_New Rural FS_265	Amarpur	New Rural FS	1137	355
Banka	BR_New Rural FS_332	Pasraha	New Rural FS	850	389
Banka	BR_New Rural FS_329	Belauni	New Rural FS	847	392
Banka	BR_New Rural FS_336	Kotwali	New Rural FS	841	394
Banka	BR_New Rural FS_317	Patwa	New Rural FS	771	407
Banka	BR_New Rural FS_328	Kakwara	New Rural FS	758	409
Banka	BR_New Rural FS_298	Bahorna	New Rural FS	745	411
Banka	BR_New Rural FS_266	Bounsi	New Rural FS	718	416
Banka	BR_New Rural FS_326	Asanha	New Rural FS	686	421
Banka	BR_New Rural FS_268	Belhar	New Rural FS	684	422
Banka	BR_New Rural FS_303	Keria	New Rural FS	547	441
Banka	BR_New Rural FS_327	Barbasni	New Rural FS	541	442
Banka	BR_New Rural FS_296	Ghutiya	New Rural FS	525	446
Banka	BR_New Rural FS_267	Katoria	New Rural FS	506	450
Banka	BR_New Rural FS_302	Tola Kolahasar	New Rural FS	344	462
Begusarai	BR_New Rural FS_291	Balia	New Rural FS	1369	32
Begusarai	BR_New Rural FS_293	Madhuri Dhala	New Rural FS	1206	39
Begusarai	BR_New Rural FS_3	Meghaul	New Rural FS	1137	44
Begusarai	BR3211	Teghra Fire Station	Operational Rural	1808	
Begusarai	BR3208	Bakhri Fire station	Operational Rural	1323	
Begusarai	BR3212	Majhol Fire station	Operational Rural	1296	
Begusarai	BR_New Rural FS_417	Sarlahi	New Rural FS	957	55

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Begusarai	BR_New Rural FS_248	Panshala Village	New Rural FS	907	62
Bhagalpur	BR3183	Kahalgaon Fire Station	Operational Rural	1274	
Bhagalpur	BR_New Rural FS_304	Khaira	New Rural FS	1431	344
Bhagalpur	BR_New Rural FS_334	Baijnathpur	New Rural FS	1082	359
Bhagalpur	BR_New Rural FS_301	Sanhola	New Rural FS	1052	363
Bhagalpur	BR_New Rural FS_300	Jagdishpur	New Rural FS	980	371
Bhagalpur	BR_New Rural FS_264	Narayanpur	New Rural FS	938	377
Bhagalpur	BR_New Rural FS_305	Pirpainti	New Rural FS	930	378
Bhagalpur	BR_New Rural FS_337	Khoja Dhanaura	New Rural FS	845	393
Bhagalpur	BR_New Rural FS_477	Akbernagar	New Rural FS	781	406
Bhagalpur	BR_New Rural FS_339	Rangra	New Rural FS	758	408
Bhagalpur	BR_New Rural FS_423	Narayanpur	New Rural FS	638	429
Bhagalpur	BR_New Rural FS_338	Krishnadaspur	New Rural FS	607	433
Bhagalpur	BR_New Rural FS_335	Jamsi	New Rural FS	321	463
Bhojpur	BR_New Rural FS_422	Karath	New Rural FS	1151	202
Bhojpur	BR_New Rural FS_34	Chandi	New Rural FS	1136	206
Bhojpur	BR_New Rural FS_37	Garhani	New Rural FS	1118	212
Bhojpur	BR_New Rural FS_33	Navanagar	New Rural FS	1117	215
Bhojpur	BR_New Rural FS_459	Sarathuan	New Rural FS	991	244
Bhojpur	BR_New Rural FS_42	Itahuri	New Rural FS	914	260
Bhojpur	BR_New Rural FS_371	Devtola	New Rural FS	878	265
Bhojpur	BR_New Rural FS_429	Bharouli	New Rural FS	873	268
Bhojpur	BR_New Rural FS_476	Karaja	New Rural FS	866	269
Bhojpur	BR_New Rural FS_115	Bangauti	New Rural FS	825	278
Bhojpur	BR_New Rural FS_415	Babuganj	New Rural FS	752	303
Bhojpur	BR_New Rural FS_32	Nathmalpur	New Rural FS	749	304

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Buxar	BR_New Rural FS_416	Simri	New Rural FS	1350	162
Buxar	BR_New Rural FS_40	Dhansoi	New Rural FS	1163	199
Buxar	BR_New Rural FS_418	Karsar	New Rural FS	1094	221
Buxar	BR_New Rural FS_41	Mahadah	New Rural FS	1058	231
Buxar	BR_New Rural FS_39	Sailkala	New Rural FS	1019	242
Buxar	BR_New Rural FS_441	Jamuawan	New Rural FS	779	295
Buxar	BR_New Rural FS_227	Mathila	New Rural FS	758	301
Buxar	BR_New Rural FS_442	Sunjaypur	New Rural FS	744	306
Buxar	BR_New Rural FS_38	Brahmapur	New Rural FS	701	312
Darbhanga	BR_New Rural FS_238	Phulkahi	New Rural FS	2045	106
Darbhanga	BR_New Rural FS_392	Chakka	New Rural FS	2004	110
Darbhanga	BR_New Rural FS_405	Baruara	New Rural FS	1720	126
Darbhanga	BR_New Rural FS_403	Kharrakh	New Rural FS	1662	131
Darbhanga	BR_New Rural FS_236	Manihas Kansi	New Rural FS	1662	132
Darbhanga	BR_New Rural FS_362	Belwa	New Rural FS	1434	153
Darbhanga	BR_New Rural FS_237	Kolhanta Patori	New Rural FS	1404	156
Darbhanga	BR_New Rural FS_462	Kahariya	New Rural FS	1352	160
Darbhanga	BR_New Rural FS_398	Adharpur	New Rural FS	1243	186
Darbhanga	BR_New Rural FS_414	Paghari	New Rural FS	1135	207
Darbhanga	BR_New Rural FS_283	Mahinam	New Rural FS	1092	222
Darbhanga	BR_New Rural FS_182	Kamtaul	New Rural FS	1078	228
Darbhanga	BR_New Rural FS_247	Baheri	New Rural FS	937	256
Darbhanga	BR_New Rural FS_463	Vishnupur	New Rural FS	817	283
Gaya	BR3227	Neemchak Bhatni Fire Station	Operational Rural	887	
Gaya	BR_New Rural FS_222	Bajaura	New Rural FS	1227	348
Gaya	BR_New Rural FS_217	Fatehpur	New Rural FS	1203	350

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Gaya	BR_New Rural FS_216	Wazirganj	New Rural FS	1008	366
Gaya	BR_New Rural FS_479	Amarut	New Rural FS	979	372
Gaya	BR_New Rural FS_106	Bhluhar	New Rural FS	963	374
Gaya	BR_New Rural FS_113	Bherva	New Rural FS	951	376
Gaya	BR_New Rural FS_240	Sewtar City	New Rural FS	917	381
Gaya	BR_New Rural FS_218	Aropur	New Rural FS	837	395
Gaya	BR_New Rural FS_221	Swarjpuri Kendui	New Rural FS	805	401
Gaya	BR_New Rural FS_112	Bela	New Rural FS	800	402
Gaya	BR_New Rural FS_224	Karyadpur	New Rural FS	795	403
Gaya	BR_New Rural FS_107	Guraru	New Rural FS	789	404
Gaya	BR_New Rural FS_110	Koch	New Rural FS	735	412
Gaya	BR_New Rural FS_225	Amas	New Rural FS	720	415
Gaya	BR_New Rural FS_219	Cherki	New Rural FS	676	425
Gaya	BR_New Rural FS_235	Badaipur	New Rural FS	667	426
Gaya	BR_New Rural FS_220	Dharamshala	New Rural FS	550	440
Gaya	BR_New Rural FS_223	Barachatti	New Rural FS	532	445
Gaya	BR_New Rural FS_105	Paranchak	New Rural FS	431	456
Gopalganj	BR_New Rural FS_54	Jamasari	New Rural FS	1972	112
Gopalganj	BR_New Rural FS_80	Basdilla Bazar	New Rural FS	1927	113
Gopalganj	BR_New Rural FS_472	Uchkagaon	New Rural FS	1809	120
Gopalganj	BR_New Rural FS_78	Bangra	New Rural FS	1697	128
Gopalganj	BR_New Rural FS_79	Belthari	New Rural FS	1664	130
Gopalganj	BR_New Rural FS_56	Koini	New Rural FS	1262	183
Gopalganj	BR_New Rural FS_90	Kusoudhi Mod	New Rural FS	1165	198
Gopalganj	BR_New Rural FS_53	Jamunaha	New Rural FS	1160	201
Gopalganj	BR_New Rural FS_55	Sepaya	New Rural FS	1122	210

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Gopalganj	BR_New Rural FS_71	Hamidpur	New Rural FS	861	272
Gopalganj	BR_New Rural FS_52	Bhore	New Rural FS	716	309
Gopalganj	BR_New Rural FS_81	Salempur	New Rural FS	669	316
Gopalganj	BR_New Rural FS_28	Mohammadpur	New Rural FS	495	330
Jamui	BR_New Rural FS_270	Keluwadih	New Rural FS	703	418
Jamui	BR_New Rural FS_273	Sikandara	New Rural FS	695	419
Jamui	BR_New Rural FS_297	Gidhaur	New Rural FS	661	427
Jamui	BR_New Rural FS_448	Devipur	New Rural FS	517	447
Jamui	BR_New Rural FS_269	Simultala	New Rural FS	491	452
Jamui	BR_New Rural FS_272	Khadigram	New Rural FS	490	453
Jamui	BR_New Rural FS_271	Sono	New Rural FS	490	454
Jamui	BR_New Rural FS_274	Fatehpur	New Rural FS	397	457
Jehanabad	BR_New Rural FS_203	Ghoshi	New Rural FS	1334	165
Jehanabad	BR_New Rural FS_204	Hulasganj	New Rural FS	1150	203
Jehanabad	BR_New Rural FS_111	Kurtha	New Rural FS	878	266
Jehanabad	BR_New Rural FS_205	Tehta	New Rural FS	811	287
Kaimur (Bhabua)	BR_New Rural FS_44	Ramgarh	New Rural FS	847	391
Kaimur (Bhabua)	BR_New Rural FS_45	Mukhrav	New Rural FS	820	398
Kaimur (Bhabua)	BR_New Rural FS_50	Durgavati	New Rural FS	786	405
Kaimur (Bhabua)	BR_New Rural FS_48	Kudrar	New Rural FS	609	432
Kaimur (Bhabua)	BR_New Rural FS_233	Hata	New Rural FS	597	434
Kaimur (Bhabua)	BR_New Rural FS_93	Pusauli	New Rural FS	551	439
Kaimur (Bhabua)	BR_New Rural FS_49	Bhagwanpur	New Rural FS	384	458
Kaimur (Bhabua)	BR_New Rural FS_231	Adhaura	New Rural FS	124	465
Kaimur (Bhabua)	BR_New Rural FS_232	Karar	New Rural FS	38	466
Katihar	BR_New Rural FS_306	Pindhal	New Rural FS	1799	121

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Katihar	BR_New Rural FS_435	Sonaili	New Rural FS	1559	140
Katihar	BR_New Rural FS_451	Barsoi	New Rural FS	1515	146
Katihar	BR3191	Manihari Fire Station	Operational Rural	641	
Katihar	BR_New Rural FS_349	Kamraili	New Rural FS	1346	163
Katihar	BR_New Rural FS_260	Shitalpur	New Rural FS	1293	175
Katihar	BR_New Rural FS_468	Azamnagar	New Rural FS	1069	229
Katihar	BR_New Rural FS_357	Bansbhitha	New Rural FS	980	246
Katihar	BR_New Rural FS_316	Chaumukha	New Rural FS	894	263
Katihar	BR_New Rural FS_358	Ahmadabad	New Rural FS	860	273
Katihar	BR_New Rural FS_481	Basatpur	New Rural FS	843	275
Katihar	BR_New Rural FS_359	Pothia	New Rural FS	766	298
Katihar	BR_New Rural FS_261	Katihar	New Rural FS	638	320
Katihar	BR_New Rural FS_348	Sakraili	New Rural FS	547	326
Katihar	BR_New Rural FS_263	Kursela	New Rural FS	345	334
Khagaria	BR_New Rural FS_249	Maheshkhunt	New Rural FS	1103	218
Khagaria	BR_New Rural FS_401	Deori	New Rural FS	1060	230
Khagaria	BR_New Rural FS_419	Haripur	New Rural FS	1052	235
Khagaria	BR_New Rural FS_290	Chatar	New Rural FS	961	253
Khagaria	BR_New Rural FS_320	Telihar	New Rural FS	927	258
Khagaria	BR_New Rural FS_443	Sabalpur	New Rural FS	793	293
Khagaria	BR_New Rural FS_444	Durgapur	New Rural FS	727	308
Khagaria	BR_New Rural FS_480	Parbatta	New Rural FS	675	315
Kishanganj	BR_New Rural FS_312	Goalpara	New Rural FS	1578	341
Kishanganj	BR_New Rural FS_473	Chunamari	New Rural FS	1331	345
Kishanganj	BR_New Rural FS_356	Chapra bakhari	New Rural FS	1193	351
Kishanganj	BR_New Rural FS_256	Lohagra	New Rural FS	1092	358

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Kishanganj	BR_New Rural FS_313	Bhabhangawan	New Rural FS	862	387
Kishanganj	BR_New Rural FS_424	Harwadanga	New Rural FS	716	417
Kishanganj	BR_New Rural FS_314	Naunaddi	New Rural FS	586	436
Kishanganj	BR_New Rural FS_465	Chakla	New Rural FS	536	443
Kishanganj	BR_New Rural FS_258	Thakurganj	New Rural FS	509	449
Lakhisarai	BR_New Rural FS_279	Kajra	New Rural FS	908	382
Lakhisarai	BR_New Rural FS_295	Nandnama	New Rural FS	869	385
Madhepura	BR_New Rural FS_285	Khajuri	New Rural FS	1495	343
Madhepura	BR_New Rural FS_350	Sihpur	New Rural FS	1205	349
Madhepura	BR_New Rural FS_345	Singheshwar	New Rural FS	1111	357
Madhepura	BR_New Rural FS_2	Shankarpur	New Rural FS	1000	367
Madhepura	BR_New Rural FS_319	Parmanpur	New Rural FS	994	368
Madhepura	BR_New Rural FS_453	Pirnagar	New Rural FS	830	396
Madhepura	BR_New Rural FS_368	Alamnagar	New Rural FS	819	399
Madhepura	BR_New Rural FS_252	Gamharia	New Rural FS	815	400
Madhubani	BR_New Rural FS_245	Sakri	New Rural FS	1791	122
Madhubani	BR_New Rural FS_243	Chhatrapati	New Rural FS	1748	125
Madhubani	BR_New Rural FS_244	Khoir	New Rural FS	1556	142
Madhubani	BR_New Rural FS_433	Sidhap Kala	New Rural FS	1498	148
Madhubani	BR_New Rural FS_242	Champa	New Rural FS	1480	149
Madhubani	BR_New Rural FS_395	Nathpatti	New Rural FS	1454	151
Madhubani	BR_New Rural FS_430	Hisar	New Rural FS	1371	158
Madhubani	BR_New Rural FS_404	Bhatsimmari	New Rural FS	1354	159
Madhubani	BR_New Rural FS_183	Baingra	New Rural FS	1326	167
Madhubani	BR_New Rural FS_281	Vistaul	New Rural FS	1305	171
Madhubani	BR_New Rural FS_4	Kesuli	New Rural FS	1304	172

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Madhubani	BR_New Rural FS_246	Balia	New Rural FS	1286	176
Madhubani	BR_New Rural FS_484	Brahmpur	New Rural FS	1281	178
Madhubani	BR_New Rural FS_282	Parwa	New Rural FS	1280	179
Madhubani	BR3203	Pholparas Fire Station	Operational Rural	1328	
Madhubani	BR_New Rural FS_426	Barsam	New Rural FS	1102	219
Madhubani	BR_New Rural FS_361	Laukahi	New Rural FS	1023	240
Madhubani	BR_New Rural FS_455	Basopatti	New Rural FS	954	255
Madhubani	BR_New Rural FS_420	Simari	New Rural FS	822	279
Madhubani	BR_New Rural FS_396	Tengri	New Rural FS	655	318
Munger	BR3179	Haweli Khadagpur Fire Station	Operational Rural	560	
Munger	BR_New Rural FS_331	Mahuratan	New Rural FS	1037	364
Munger	BR_New Rural FS_277	Brahmasthan	New Rural FS	918	380
Munger	BR_New Rural FS_299	Asharganj	New Rural FS	868	386
Munger	BR_New Rural FS_292	Lagma	New Rural FS	656	428
Munger	BR_New Rural FS_330	Dauria	New Rural FS	279	464
Muzaffarpur	BR_New Rural FS_176	Itha Rasulnagar	New Rural FS	3494	1
Muzaffarpur	BR_New Rural FS_449	Bhusura	New Rural FS	3095	2
Muzaffarpur	BR_New Rural FS_178	Makrandpur	New Rural FS	2288	4
Muzaffarpur	BR_New Rural FS_180	Lakhanpur	New Rural FS	2233	5
Muzaffarpur	BR_New Rural FS_394	Boariya	New Rural FS	2218	6
Muzaffarpur	BR_New Rural FS_425	Bokchi	New Rural FS	2067	7
Muzaffarpur	BR_New Rural FS_438	Shiodaha	New Rural FS	1990	8
Muzaffarpur	BR_New Rural FS_148	Devgan Ghat	New Rural FS	1925	10
Muzaffarpur	BR_New Rural FS_154	Pokhraira	New Rural FS	1908	12
Muzaffarpur	BR_New Rural FS_437	Gagraha	New Rural FS	1803	14

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Muzaffarpur	BR_New Rural FS_177	Gopalpur	New Rural FS	1721	16
Muzaffarpur	BR_New Rural FS_128	Jaffarpur	New Rural FS	1699	18
Muzaffarpur	BR_New Rural FS_170	Dwarkanagar	New Rural FS	1619	21
Muzaffarpur	BR_New Rural FS_452	Kamalpura	New Rural FS	1513	25
Muzaffarpur	BR_New Rural FS_149	Kanti	New Rural FS	1389	30
Muzaffarpur	BR_New Rural FS_169	Chhitrauli	New Rural FS	1353	33
Muzaffarpur	BR_New Rural FS_171	Ali Neora	New Rural FS	1329	35
Muzaffarpur	BR_New Rural FS_152	Turki	New Rural FS	1286	36
Muzaffarpur	BR_New Rural FS_147	Bhakhri Chowk	New Rural FS	1214	38
Muzaffarpur	BR_New Rural FS_151	Patahi	New Rural FS	1197	40
Muzaffarpur	BR_New Rural FS_150	Nariyar	New Rural FS	1057	48
Muzaffarpur	BR_New Rural FS_146	Rampurhari	New Rural FS	990	50
Muzaffarpur	BR_New Rural FS_181	Aurai	New Rural FS	980	53
Muzaffarpur	BR_New Rural FS_173	Karjan Dih	New Rural FS	972	54
Muzaffarpur	BR_New Rural FS_172	Lashkaripur	New Rural FS	937	58
Muzaffarpur	BR_New Rural FS_130	Barkagaon	New Rural FS	917	61
Muzaffarpur	BR_New Rural FS_145	Minapur	New Rural FS	903	63
Muzaffarpur	BR_New Rural FS_129	Distuliya	New Rural FS	742	72
Muzaffarpur	BR_New Rural FS_30	Dhania Hazaratpur	New Rural FS	532	85
Nalanda	BR_New Rural FS_196	Chiksaura	New Rural FS	1462	150
Nalanda	BR_New Rural FS_197	Pilich	New Rural FS	1411	155
Nalanda	BR_New Rural FS_201	Ratanpura	New Rural FS	1346	164
Nalanda	BR_New Rural FS_191	Chandi	New Rural FS	1315	169
Nalanda	BR_New Rural FS_199	Deepnagar	New Rural FS	1203	194
Nalanda	BR_New Rural FS_482	Makhdumpur	New Rural FS	1177	197
Nalanda	BR_New Rural FS_198	Silao	New Rural FS	1118	213

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Nalanda	BR_New Rural FS_206	Giriak	New Rural FS	1058	232
Nalanda	BR_New Rural FS_192	Noorsarai	New Rural FS	1030	239
Nalanda	BR_New Rural FS_200	Kewali	New Rural FS	981	245
Nalanda	BR_New Rural FS_193	Rahui	New Rural FS	819	282
Nalanda	BR_New Rural FS_208	Pawa	New Rural FS	806	288
Nalanda	BR_New Rural FS_189	Harnaut	New Rural FS	801	291
Nalanda	BR_New Rural FS_210	Onda	New Rural FS	788	294
Nalanda	BR_New Rural FS_194	Mohammadpur	New Rural FS	711	310
Nalanda	BR_New Rural FS_209	Sarmera	New Rural FS	688	313
Nawada	BR_New Rural FS_213	Jarahiya	New Rural FS	1514	342
Nawada	BR_New Rural FS_211	Paura	New Rural FS	1167	353
Nawada	BR_New Rural FS_460	Marui	New Rural FS	1053	362
Nawada	BR_New Rural FS_446	Sakra	New Rural FS	1032	365
Nawada	BR_New Rural FS_294	Arha nagar	New Rural FS	905	383
Nawada	BR_New Rural FS_215	Kanti	New Rural FS	852	388
Nawada	BR_New Rural FS_212	Pakri Barwan	New Rural FS	824	397
Nawada	BR_New Rural FS_214	Rajahat	New Rural FS	729	414
Nawada	BR_New Rural FS_467	Sirdala	New Rural FS	626	431
Nawada	BR_New Rural FS_445	Dhamini	New Rural FS	347	460
Nawada	BR_New Rural FS_275	Kawakhol	New Rural FS	347	461
Pashchim Champaran	BR_New Rural FS_88	Sathi	New Rural FS	1230	189
Pashchim Champaran	BR_New Rural FS_14	Sagrauwa	New Rural FS	1220	190
Pashchim Champaran	BR_New Rural FS_13	Chuhari	New Rural FS	1080	227
Pashchim Champaran	BR_New Rural FS_11	Chatrbhujwa	New Rural FS	1022	241
Pashchim Champaran	BR_New Rural FS_12	Kaulapur	New Rural FS	972	250
Pashchim Champaran	BR_New Rural FS_87	Majhowlia	New Rural FS	864	271

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Pashchim Champaran	BR_New Rural FS_7	Lagunaha Chautarwa	New Rural FS	802	289
Pashchim Champaran	BR_New Rural FS_454	Jogapatti	New Rural FS	753	302
Pashchim Champaran	BR_New Rural FS_16	Phatuchhapar	New Rural FS	747	305
Pashchim Champaran	BR_New Rural FS_241	Baishakawa	New Rural FS	727	307
Pashchim Champaran	BR_New Rural FS_10	Murli	New Rural FS	669	317
Pashchim Champaran	BR_New Rural FS_8	Khatauri	New Rural FS	623	322
Pashchim Champaran	BR_New Rural FS_6	Bagaha	New Rural FS	584	324
Pashchim Champaran	BR_New Rural FS_9	Goithahi	New Rural FS	525	327
Pashchim Champaran	BR_New Rural FS_5	Champur	New Rural FS	505	329
Pashchim Champaran	BR_New Rural FS_89	Khalwapatti	New Rural FS	434	332
Pashchim Champaran	BR_New Rural FS_51	Naurangia	New Rural FS	103	335
Patna	BR_New Rural FS_35	Bikram	New Rural FS	1572	22
Patna	BR_New Rural FS_406	Piplawan	New Rural FS	1461	26
Patna	BR_New Rural FS_202	Nataul	New Rural FS	1405	29
Patna	BR_New Rural FS_36	Bhusaula Danapur	New Rural FS	1346	34
Patna	BR_New Rural FS_434	Nadaul	New Rural FS	1190	41
Patna	BR_New Rural FS_466	Shekpura	New Rural FS	1132	45
Patna	BR_New Rural FS_409	Sigori	New Rural FS	1048	49
Patna	BR_New Rural FS_478	Karjan Suryapura	New Rural FS	989	51
Patna	BR_New Rural FS_469	Madhopur	New Rural FS	927	59
Patna	BR_New Rural FS_195	Daniawan	New Rural FS	888	65
Patna	BR_New Rural FS_229	Sampatchak	New Rural FS	883	66
Patna	BR_New Rural FS_190	Bidhipur	New Rural FS	848	67
Patna	BR_New Rural FS_475	Nimah	New Rural FS	720	75
Patna	BR_New Rural FS_431	Mor	New Rural FS	674	78
Patna	BR_New Rural FS_188	Manikpur	New Rural FS	674	79

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Patna	BR_New Rural FS_278	Marachi	New Rural FS	412	89
Patna	BR3274	Bihta Fire Station	Operational Rural	1746	
Patna	BR3252	Paliganj fire Station	Operational Rural	1388	
Purba Champaran	BR_New Rural FS_421	Belwa	New Rural FS	2371	3
Purba Champaran	BR_New Rural FS_117	Lakhora	New Rural FS	1941	9
Purba Champaran	BR_New Rural FS_123	Madhuban	New Rural FS	1913	11
Purba Champaran	BR_New Rural FS_126	Kajarhan	New Rural FS	1814	13
Purba Champaran	BR_New Rural FS_118	Bhatinia	New Rural FS	1740	15
Purba Champaran	BR_New Rural FS_83	Lalbegiya	New Rural FS	1719	17
Purba Champaran	BR_New Rural FS_18	Bhela Chhapra	New Rural FS	1678	19
Purba Champaran	BR_New Rural FS_120	Saratha	New Rural FS	1630	20
Purba Champaran	BR_New Rural FS_119	Dhaka	New Rural FS	1541	23
Purba Champaran	BR_New Rural FS_116	Chauradano	New Rural FS	1535	24
Purba Champaran	BR_New Rural FS_20	Pipra Kothi	New Rural FS	1449	27
Purba Champaran	BR_New Rural FS_483	Ghorasahan	New Rural FS	1430	28
Purba Champaran	BR_New Rural FS_65	Gaya Ghat	New Rural FS	1377	31
Purba Champaran	BR_New Rural FS_121	Jihuli	New Rural FS	1272	37
Purba Champaran	BR_New Rural FS_86	Karamwa	New Rural FS	1156	42
Purba Champaran	BR_New Rural FS_66	Kotwa	New Rural FS	1140	43
Purba Champaran	BR_New Rural FS_85	Belwa	New Rural FS	1107	46
Purba Champaran	BR_New Rural FS_19	Narkatiya	New Rural FS	981	52
Purba Champaran	BR_New Rural FS_122	Patahi	New Rural FS	955	56
Purba Champaran	BR_New Rural FS_131	Rajepur	New Rural FS	953	57
Purba Champaran	BR_New Rural FS_82	Sarotar	New Rural FS	893	64
Purba Champaran	BR_New Rural FS_127	Mehsi	New Rural FS	776	71
Purba Champaran	BR_New Rural FS_84	Raxaul	New Rural FS	738	73

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Purba Champaran	BR_New Rural FS_64	Malahi	New Rural FS	702	76
Purba Champaran	BR_New Rural FS_17	Raghunathpur	New Rural FS	595	81
Purba Champaran	BR_New Rural FS_29	Kesariya	New Rural FS	586	82
Purba Champaran	BR_New Rural FS_1	Sangrampur	New Rural FS	561	83
Purba Champaran	BR_New Rural FS_15	Harpur	New Rural FS	539	84
Purba Champaran	BR_New Rural FS_67	Kalyanpur	New Rural FS	505	86
Purba Champaran	BR3160	Pakridyal Fire & Rescue Station	Operational Rural	1255	
Purnia	BR_New Rural FS_432	Suhiya	New Rural FS	1200	195
Purnia	BR_New Rural FS_354	Milki	New Rural FS	1030	238
Purnia	BR_New Rural FS_318	Matihani	New Rural FS	992	243
Purnia	BR_New Rural FS_310	Rauta	New Rural FS	976	248
Purnia	BR_New Rural FS_347	Mathia	New Rural FS	975	249
Purnia	BR_New Rural FS_262	Mahenderpur	New Rural FS	961	252
Purnia	BR_New Rural FS_456	Harda	New Rural FS	934	257
Purnia	BR_New Rural FS_346	Bhutia	New Rural FS	890	264
Purnia	BR_New Rural FS_341	Harpur Madi	New Rural FS	864	270
Purnia	BR_New Rural FS_367	Baisi	New Rural FS	850	274
Purnia	BR_New Rural FS_321	Puraini	New Rural FS	838	276
Purnia	BR_New Rural FS_315	Phulpur	New Rural FS	838	277
Purnia	BR_New Rural FS_259	Mankol	New Rural FS	821	281
Purnia	BR_New Rural FS_340	Kukrauni	New Rural FS	801	290
Purnia	BR_New Rural FS_307	Sondip Milik	New Rural FS	775	296
Purnia	BR_New Rural FS_353	Balua Kachhari	New Rural FS	646	319
Purnia	BR_New Rural FS_363	Banki	New Rural FS	563	325
Purnia	BR_New Rural FS_308	Sarsi Istamrar	New Rural FS	489	331
Purnia	BR3176	Baisi Fire Station	Operational Rural	1121	

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Purnia	BR3174	Dhamdha Fire Station	Operational Rural	779	
Rohtas	BR_New Rural FS_410	Suryapura	New Rural FS	1085	47
Rohtas	BR_New Rural FS_413	Rajpur	New Rural FS	923	60
Rohtas	BR_New Rural FS_43	Amiyawar	New Rural FS	818	68
Rohtas	BR_New Rural FS_436	Basuhara	New Rural FS	805	69
Rohtas	BR_New Rural FS_47	Badari	New Rural FS	797	70
Rohtas	BR_New Rural FS_226	Parsathua	New Rural FS	731	74
Rohtas	BR_New Rural FS_95	Tilauthu	New Rural FS	688	77
Rohtas	BR_New Rural FS_46	Diviyan	New Rural FS	612	80
Rohtas	BR_New Rural FS_230	Akbarpur	New Rural FS	461	87
Rohtas	BR_New Rural FS_94	Baddi	New Rural FS	420	88
Rohtas	BR_New Rural FS_234	Malahipur	New Rural FS	325	90
Rohtas	BR3218	Vikramganj Fire Station	Operational Rural	777	
Saharsa	BR_New Rural FS_407	Banma Itahri	New Rural FS	1631	134
Saharsa	BR_New Rural FS_427	Chanaur	New Rural FS	1264	182
Saharsa	BR_New Rural FS_289	Balwahat	New Rural FS	1143	205
Saharsa	BR_New Rural FS_411	Murajpur	New Rural FS	1055	234
Saharsa	BR_New Rural FS_402	Baghwa	New Rural FS	811	286
Saharsa	BR_New Rural FS_250	Shahpur Gaon	New Rural FS	799	292
Saharsa	BR_New Rural FS_284	Panchgachia	New Rural FS	709	311
Samastipur	BR_New Rural FS_391	Gangapur	New Rural FS	4162	91
Samastipur	BR_New Rural FS_390	KRB Pusa	New Rural FS	3902	92
Samastipur	BR_New Rural FS_175	Dumari Dakhli	New Rural FS	2827	95
Samastipur	BR_New Rural FS_179	Mirzapur	New Rural FS	2600	96
Samastipur	BR_New Rural FS_397	Mahisari	New Rural FS	2513	97

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Samastipur	BR_New Rural FS_393	Sathmalpur	New Rural FS	2093	105
Samastipur	BR_New Rural FS_439	Hariyabad Chakka	New Rural FS	1498	147
Samastipur	BR_New Rural FS_187	Sahit	New Rural FS	1320	168
Samastipur	BR_New Rural FS_286	Kapan	New Rural FS	1191	196
Samastipur	BR_New Rural FS_287	Hasanpur	New Rural FS	976	247
Samastipur	BR_New Rural FS_186	Sarangpur	New Rural FS	971	251
Samastipur	BR_New Rural FS_288	Singia	New Rural FS	821	280
Samastipur	BR_New Rural FS_471	Dubaha	New Rural FS	677	314
Samastipur	BR_New Rural FS_440	Maharour	New Rural FS	636	321
Samastipur	BR3166	Rusera Fire Station	Operational Rural	1679	
Samastipur	BR3172	Patori Fire Station	Operational Rural	740	
Saran	BR_New Rural FS_157	Sitalpur	New Rural FS	2251	100
Saran	BR_New Rural FS_408	Tara Amnaur	New Rural FS	2135	102
Saran	BR_New Rural FS_25	Ekma	New Rural FS	2006	109
Saran	BR_New Rural FS_450	Dadibadi	New Rural FS	1983	111
Saran	BR_New Rural FS_156	Parsadi Parsauna	New Rural FS	1828	118
Saran	BR_New Rural FS_61	Banpura bazar	New Rural FS	1823	119
Saran	BR_New Rural FS_26	Manpur	New Rural FS	1631	133
Saran	BR_New Rural FS_155	Bheldi	New Rural FS	1615	136
Saran	BR_New Rural FS_69	Pachkhanda	New Rural FS	1557	141
Saran	BR_New Rural FS_68	Bhakura Bhitthi	New Rural FS	1434	152
Saran	BR_New Rural FS_91	Daudpur	New Rural FS	1351	161
Saran	BR_New Rural FS_31	Chintamanganj	New Rural FS	1210	192
Saran	BR_New Rural FS_474	Khanpur	New Rural FS	1131	209
Saran	BR_New Rural FS_470	Bangra	New Rural FS	1095	220
Saran	BR_New Rural FS_464	Naraon	New Rural FS	1056	233

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Saran	BR_New Rural FS_27	Taraiya	New Rural FS	1044	236
Saran	BR_New Rural FS_70	Bhoraha	New Rural FS	909	261
Saran	BR_New Rural FS_162	Chak Apsaid	New Rural FS	767	297
Saran	BR_New Rural FS_92	Tekniwas	New Rural FS	589	323
Sheikhpura	BR_New Rural FS_207	Amari	New Rural FS	994	369
Sheikhpura	BR_New Rural FS_276	Pachna	New Rural FS	553	438
Sheohar	BR_New Rural FS_133	Piprahi	New Rural FS	2417	336
Sheohar	BR_New Rural FS_132	Parsauni Chowk	New Rural FS	1670	339
Sheohar	BR_New Rural FS_125	Ibrahimpur	New Rural FS	1660	340
Sheohar	BR_New Rural FS_124	Salempur	New Rural FS	1292	346
Sitamarhi	BR_New Rural FS_400	Parihar	New Rural FS	2501	98
Sitamarhi	BR_New Rural FS_139	Kumma	New Rural FS	1883	116
Sitamarhi	BR_New Rural FS_135	Bhatauliya	New Rural FS	1760	123
Sitamarhi	BR_New Rural FS_140	Bajpatti	New Rural FS	1749	124
Sitamarhi	BR_New Rural FS_412	Naranga	New Rural FS	1668	129
Sitamarhi	BR_New Rural FS_134	Sasaula	New Rural FS	1602	137
Sitamarhi	BR_New Rural FS_136	Ramnagara	New Rural FS	1528	145
Sitamarhi	BR_New Rural FS_144	Baghi	New Rural FS	1398	157
Sitamarhi	BR_New Rural FS_137	Bhuthi	New Rural FS	1309	170
Sitamarhi	BR_New Rural FS_447	Parigawan	New Rural FS	1298	173
Sitamarhi	BR_New Rural FS_141	Ratwara	New Rural FS	1298	174
Sitamarhi	BR_New Rural FS_142	Premnagar	New Rural FS	1238	187
Sitamarhi	BR_New Rural FS_138	Maudah	New Rural FS	1122	211
Sitamarhi	BR_New Rural FS_239	Kharke Basant	New Rural FS	1117	214
Sitamarhi	BR_New Rural FS_143	Raksia	New Rural FS	1088	224
Sitamarhi	BR_New Rural FS_185	Siropatti	New Rural FS	815	285

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Sitamarhi	BR3085	Pupri Fire & Rescue Station	Operational Rural	792	
Siwan	BR_New Rural FS_461	Pipra Narayan	New Rural FS	2180	101
Siwan	BR_New Rural FS_63	Karbala Bazar	New Rural FS	2125	103
Siwan	BR_New Rural FS_74	Chand Parsa	New Rural FS	2121	104
Siwan	BR_New Rural FS_75	Mahapur	New Rural FS	2012	108
Siwan	BR_New Rural FS_21	Pachlakhi	New Rural FS	1830	117
Siwan	BR_New Rural FS_57	Chanuar	New Rural FS	1621	135
Siwan	BR_New Rural FS_24	Sonapiper	New Rural FS	1588	138
Siwan	BR_New Rural FS_59	Tekania	New Rural FS	1534	144
Siwan	BR_New Rural FS_60	Titra	New Rural FS	1329	166
Siwan	BR_New Rural FS_72	Pokhra	New Rural FS	1283	177
Siwan	BR_New Rural FS_58	Shakara	New Rural FS	1279	180
Siwan	BR_New Rural FS_23	Malmaliya	New Rural FS	1266	181
Siwan	BR_New Rural FS_22	Jamo	New Rural FS	1232	188
Siwan	BR_New Rural FS_62	Bala	New Rural FS	1160	200
Siwan	BR_New Rural FS_77	Panchavinda	New Rural FS	1111	216
Siwan	BR_New Rural FS_73	Rukundipur	New Rural FS	877	267
Siwan	BR_New Rural FS_76	Asaon	New Rural FS	816	284
Supaul	BR_New Rural FS_254	Puraini	New Rural FS	1805	337
Supaul	BR_New Rural FS_251	Raghopur	New Rural FS	1695	338
Supaul	BR_New Rural FS_351	Lachhminia	New Rural FS	1232	347
Supaul	BR_New Rural FS_364	Laharnia	New Rural FS	1160	354
Supaul	BR_New Rural FS_324	Balbhadrapur	New Rural FS	1117	356
Supaul	BR_New Rural FS_343	Bahorwa	New Rural FS	987	370
Supaul	BR_New Rural FS_344	Chhatapur	New Rural FS	972	373
Supaul	BR_New Rural FS_323	Jiwachipur	New Rural FS	925	379

District	FSRefNo	Name	Operational Type	Population Density	Priority Ranking of New FS
Supaul	BR_New Rural FS_322	Pipra	New Rural FS	897	384
Supaul	BR_New Rural FS_365	Jhitanki	New Rural FS	681	423
Supaul	BR_New Rural FS_280	Bishanpur	New Rural FS	533	444
Supaul	BR_New Rural FS_458	Pipra Khurd	New Rural FS	477	455
Vaishali	BR_New Rural FS_167	Mohammadpur Suki	New Rural FS	3311	93
Vaishali	BR_New Rural FS_165	Gazipur Chowk	New Rural FS	2840	94
Vaishali	BR_New Rural FS_399	Kumar Bajitpur	New Rural FS	2311	99
Vaishali	BR_New Rural FS_158	Imadpur Chowk	New Rural FS	2037	107
Vaishali	BR_New Rural FS_166	Akthiyarpur	New Rural FS	1905	114
Vaishali	BR_New Rural FS_159	Ghataro	New Rural FS	1889	115
Vaishali	BR_New Rural FS_153	Goraul	New Rural FS	1719	127
Vaishali	BR_New Rural FS_174	Manpura	New Rural FS	1577	139
Vaishali	BR_New Rural FS_370	Karnauti	New Rural FS	1534	143
Vaishali	BR_New Rural FS_164	Biddupur	New Rural FS	1420	154
Vaishali	BR_New Rural FS_369	Panapur	New Rural FS	1257	184
Vaishali	BR_New Rural FS_184	Dharampur	New Rural FS	1146	204
Vaishali	BR_New Rural FS_168	Mansurpur Halaiya	New Rural FS	1104	217
Vaishali	BR_New Rural FS_160	Rajapakar	New Rural FS	1091	223
Vaishali	BR_New Rural FS_161	Hariharpur	New Rural FS	513	328
Vaishali	BR_New Rural FS_163	Jadhua	New Rural FS	412	333

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