Directorate General NDRF & Civil Defence (Fire)
Ministry of Home Affairs
East Block 7, Level 7,
NEW DELHI, 110066,

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 (Arunachal Pradesh, Assam, Chhattisgarh, Jharkhand, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tripura, and West Bengal)

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Submitted by

RMSI
A-8, Sector 16
Noida 201301, INDIA
Tel: +91-120-251-1102, 2101
Fax: +91-120-251-1109, 0963
www.rmsi.com

Contact: **Sushil Gupta**
General Manager, Risk Modeling and Insurance
Email:Sushil.Gupta@rmsi.com

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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 equipment.

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 the initial 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 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 all the 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 and every 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***

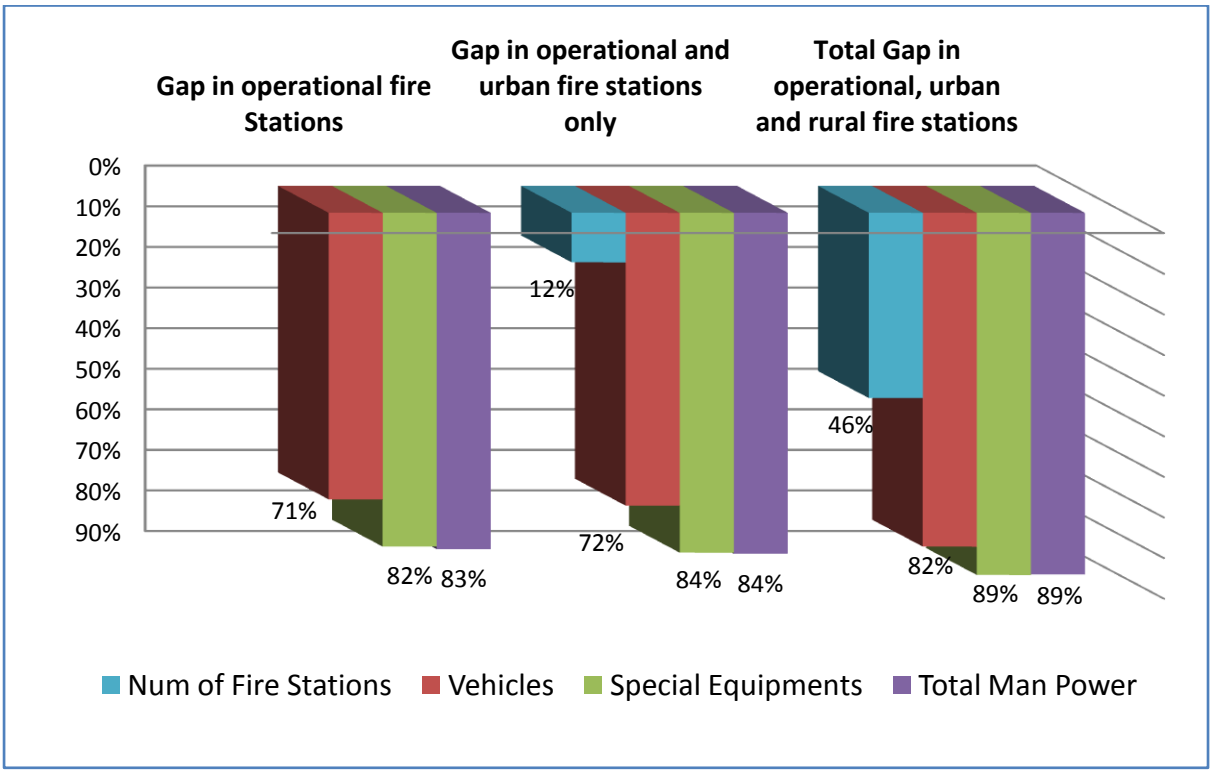
Summary of Findings for Orissa State

Presently, Orissa Fire Services (OFS) has 180 operational Fire Stations and one Orissa Fire Services Training Institute, Bhubaneswar.

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 ports, airports, military cantonment, 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 equipment 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 OFS would require additional 25 Fire stations in urban areas and 126 Fire stations in rural areas. Hence this study finds an overall gap of 46 % in terms of number of Fire Stations in Orissa State (for details, please refer to section 38.3.1).



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 38.3.2. This study finds an overall gap of 82% in the firefighting and rescue vehicles and about 89% 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 new 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 for firemen in Orissa State is 24 hours, and RMSI team estimated for manpower requirement for double shift duty pattern (for details, please refer to section 38.3.3). Thus, in Orissa State, this study finds an overall gap of 89% in fire personnel considering double shift duty pattern.

Fire Prevention Wing

In addition to fire fighting staff, though the State has established a "*Fire Prevention Wing*". However, there is a need for a dedicated *Fire Prevention Wing* for inspection, awareness generation, and training for schools, colleges, hospitals, shopping malls, cinema halls, high-rise buildings, industries, 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 ADG-cum-Director, Orissa Fire Services, additional officers at the levels of Director (Technical), Deputy Director (Technical), Chief Fire Officer (CFO), Dy Chief Fire Officer (Dy-CFO), Divisional Fire Officers (DFOs), and Assistant Divisional Fire Officers (ADFOs) have been recommended (for details, please refer to section 38.2.2).

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 Fire Decision Support System (FDSS). As detailed in section 38.5, 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 38.5) for the next 10-years includes both capital and recurring expenditures. RMSI analysis estimates a total Investment of **about Rs 15,235 Crores** (Table 38-36) spread over a period of 10 years for Orissa Fire Service 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 Orissa State for both rural and urban areas has been detailed in section 38.6. Accordingly, separate priority ranking for both urban and rural areas are given in Table 38.38 and Table 38.39, respectively.

Avenues for Fund Generation

Orissa Fire Service (OFS) 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 for scrutiny of building plans.

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 Orissa State. The detailed Capacity building and training need assessment for various levels has been discussed in section 38.8. Additionally, RMSI team has made a separate report of Capacity Building and Training Infrastructure for all States/UTs in the country.

Limitations of the Study

Limitations of study are given in section 38.9.

Recommendations

The report concludes with the recommendation for the Orissa State Fire Services and is detailed in section 38.10. In short, OFS 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 IV States/UTs is divided in two parts:

Part A: This part comprises of chapters 1-6, which are common for all the 35 States/UTs 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 30-41, which are specific to the State/UT being discussed.

- Chapter 30 provides detailed analysis for the Arunachal Pradesh State
- Chapter 31 provides detailed analysis for the Assam State
- Chapter 32 provides detailed analysis for the Chhattisgarh State
- Chapter 33 provides detailed analysis for the Jharkhand State
- Chapter 34 provides detailed analysis for the Manipur State
- Chapter 35 provides detailed analysis for the Meghalaya State
- Chapter 36 provides detailed analysis for the Mizoram State
- Chapter 37 provides detailed analysis for the Nagaland State
- Chapter 38 provides detailed analysis for the Orissa State
- Chapter 39 provides detailed analysis for the Sikkim State
- Chapter 40 provides detailed analysis for the Tripura State
- Chapter 41 provides detailed analysis for the West Bengal State

For Part-B, this report consists of Chapter 38, which is for Orissa 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).

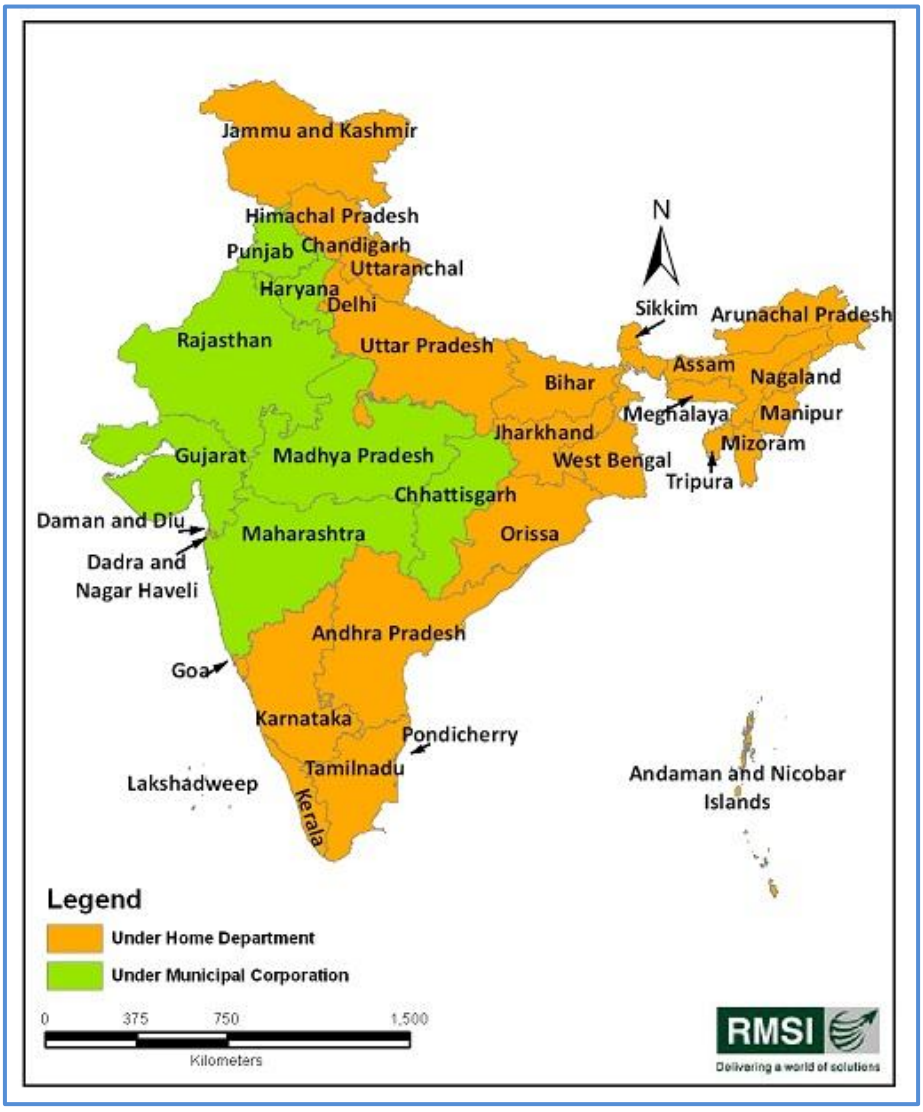


Figure 1-1: Distribution of fire services by various States/UTs by administrative organization

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 equipment 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 equipment. 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 Centers

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 has also made 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 are also be explored, and recommendations are 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.

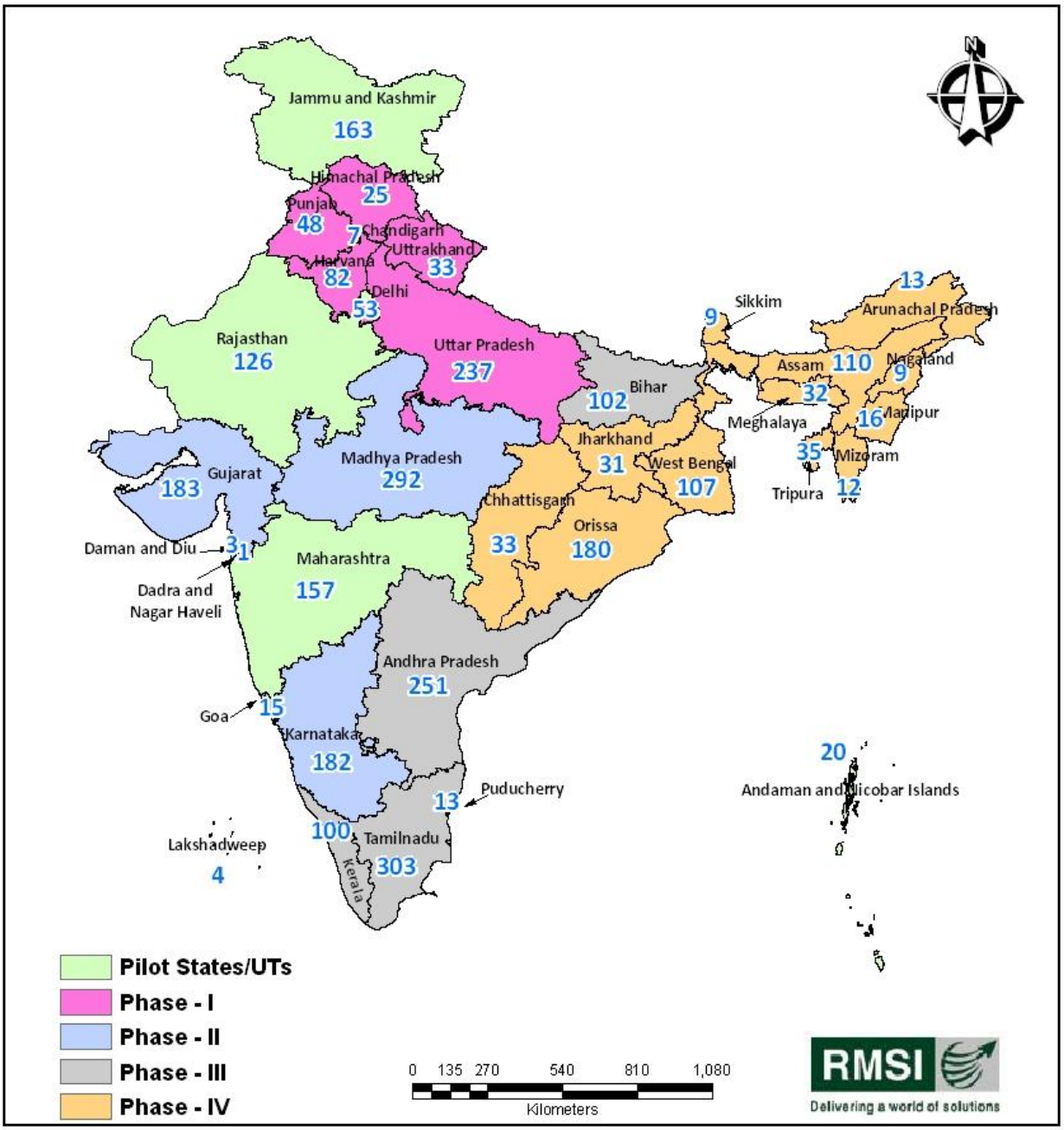


Figure 2-1 : State/UT wise distribution of fire service stations in India

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 other State/UTs are taken up in rest phases (Phase I to IV)**. 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 included 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 reports are 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 firefighting equipment 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/ Tehsils (Census, 2001), and number of Fire Stations (Table 2-1).

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

States/UTs	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	1	1	1

States/UTs	No of Districts (Census 2011)	No of Talukas/ Tehsils/ Mandals (Census 2001)	No of Fire Stations
Haveli			
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
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 has adopted 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

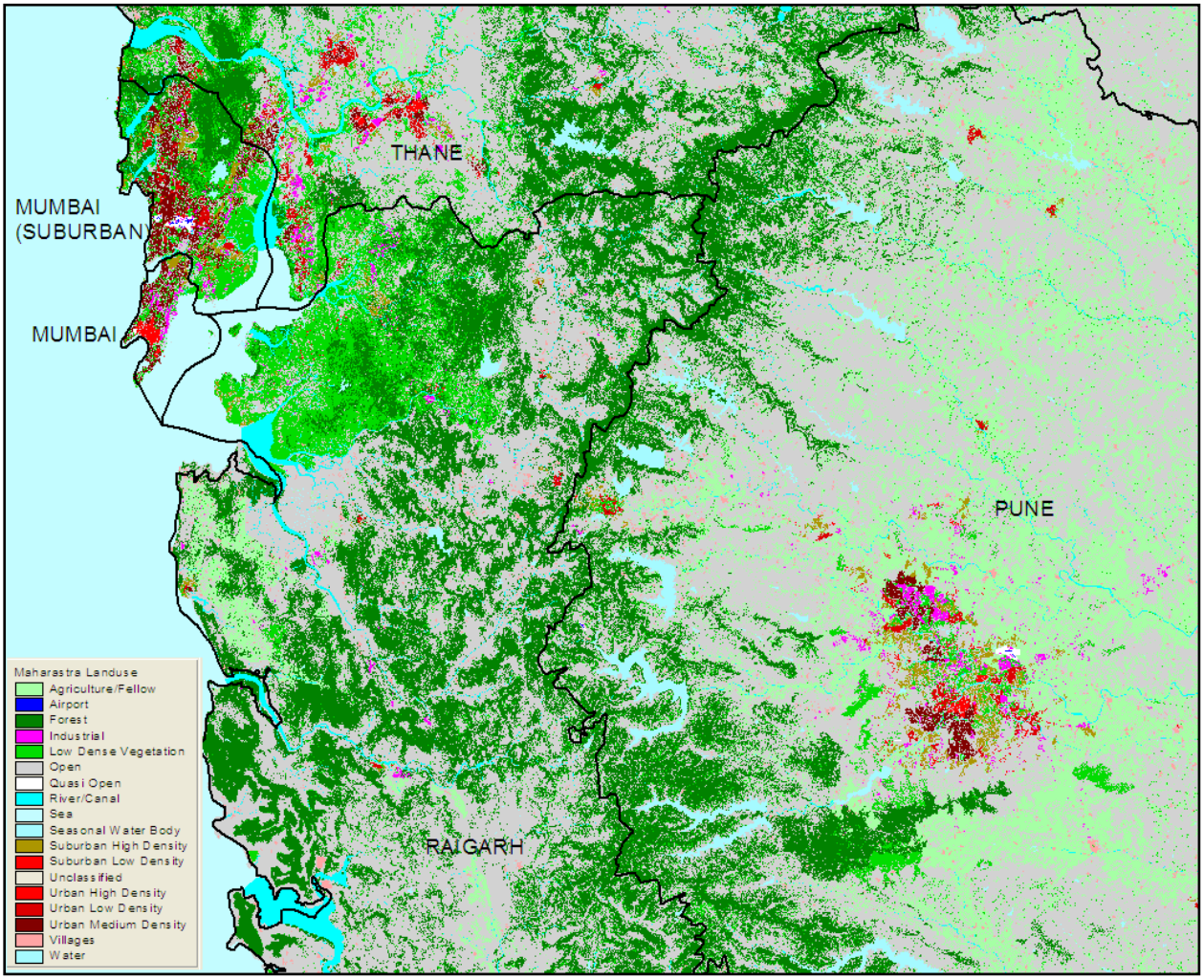


Figure 3-1 : An example of a Land use classification at 25m pixel. The example shows parts of Western Maharashtra (districts – Mumbai, Mumbai sub-urban, Thane, Pune, and Raigarh)

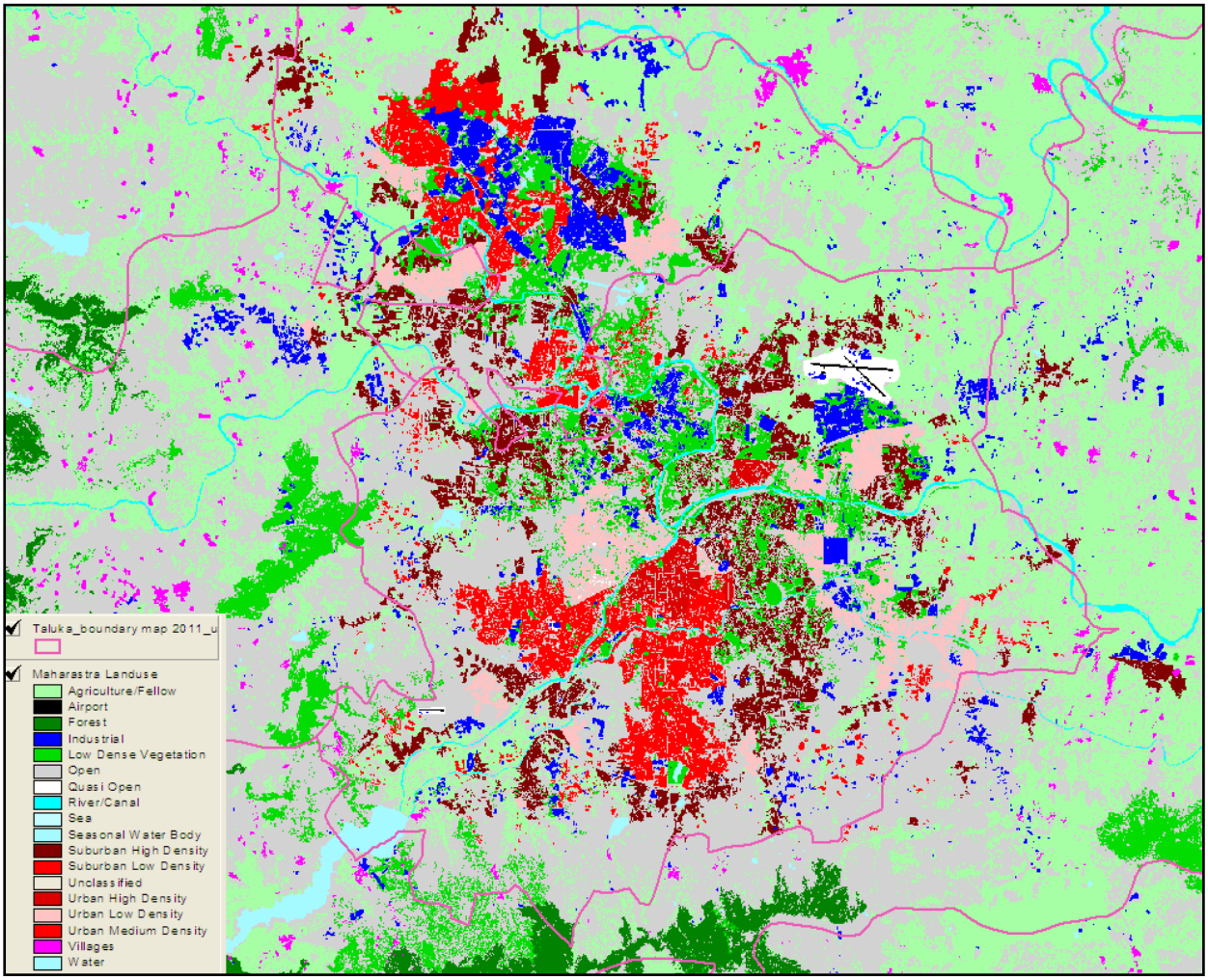


Figure 3-2 : Example of an enlarged view of classified. The example shows urban agglomeration classification in Pune city areas

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.

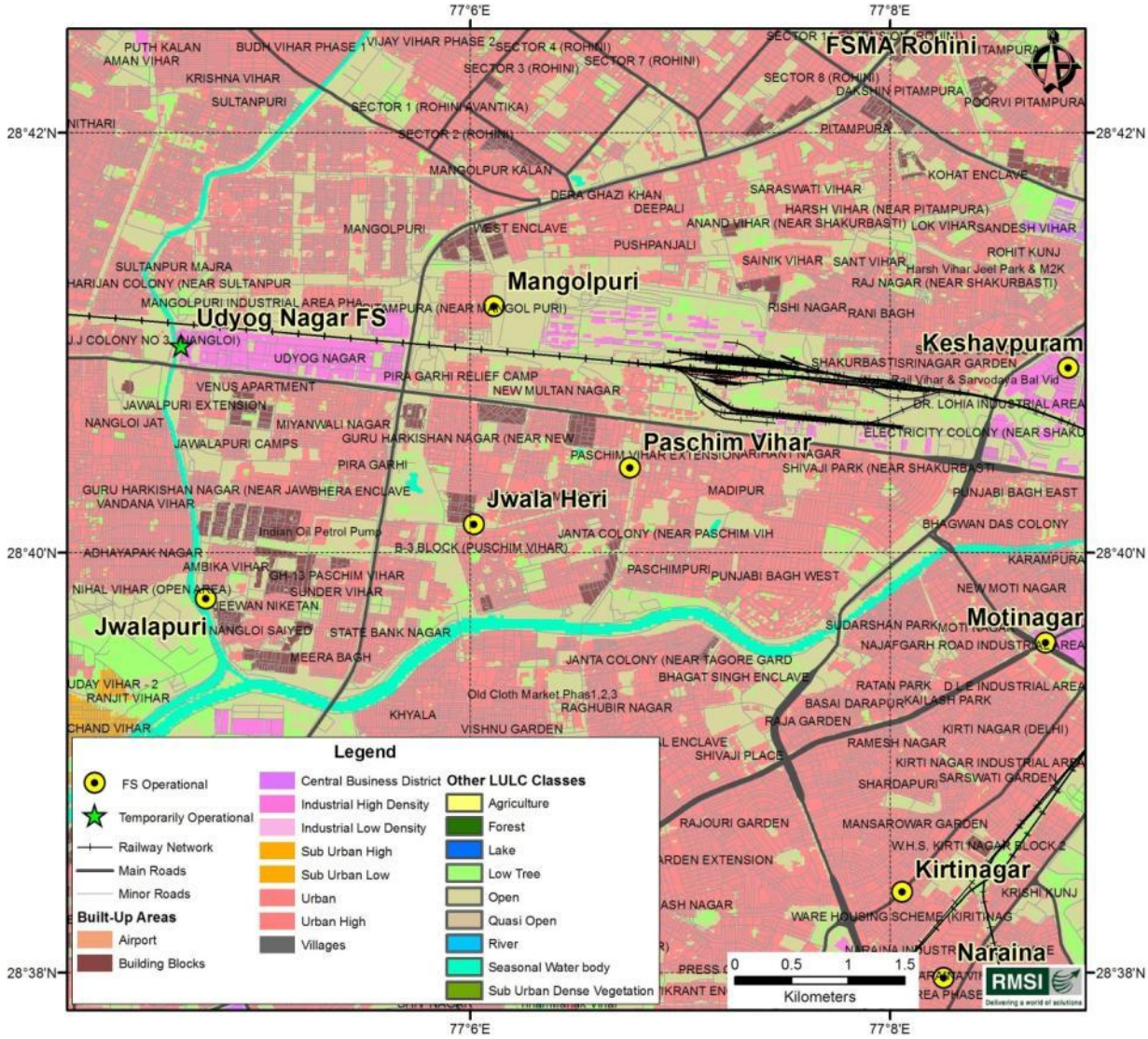


Figure 3-3 : An example of a detailed classified urban agglomerate area. The example shows parts of Delhi with overlay of GPS locations of Fire Stations

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 Use 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.

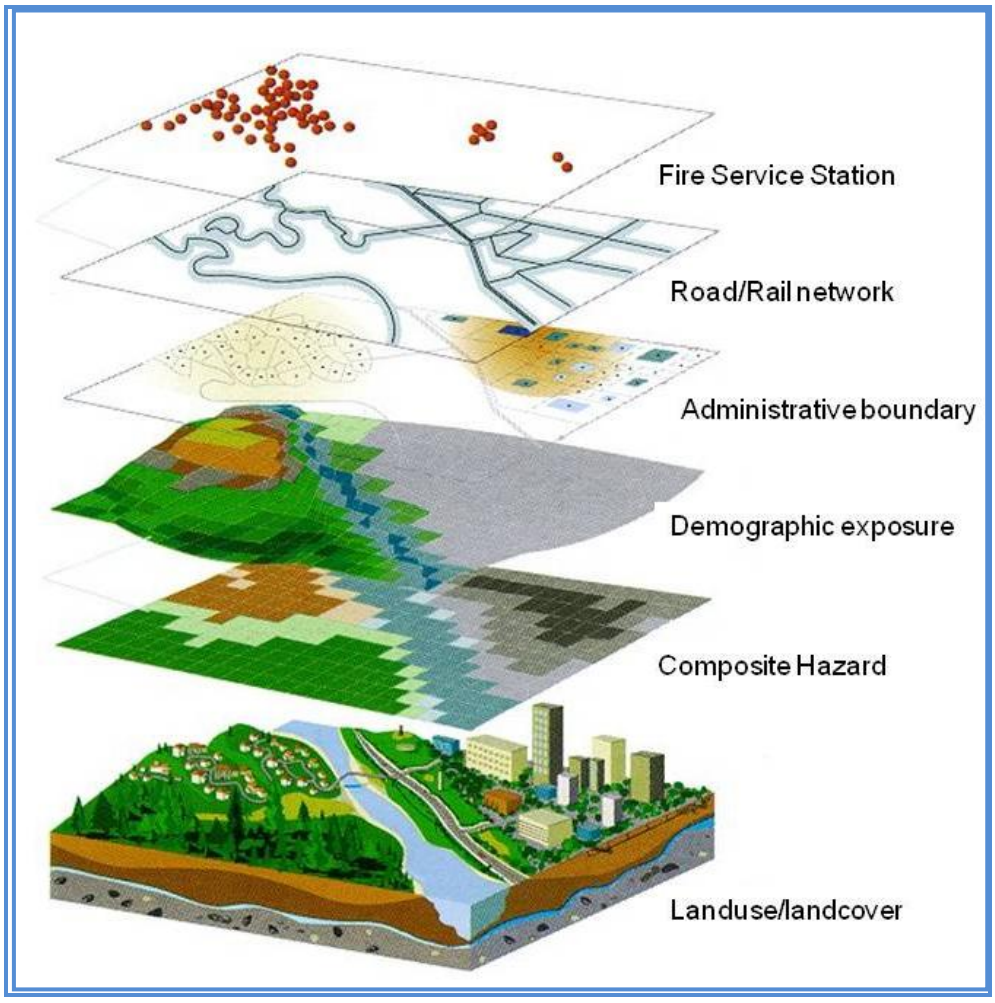


Figure 3-4 : Overlay analysis for Fire Risk Assessment

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.

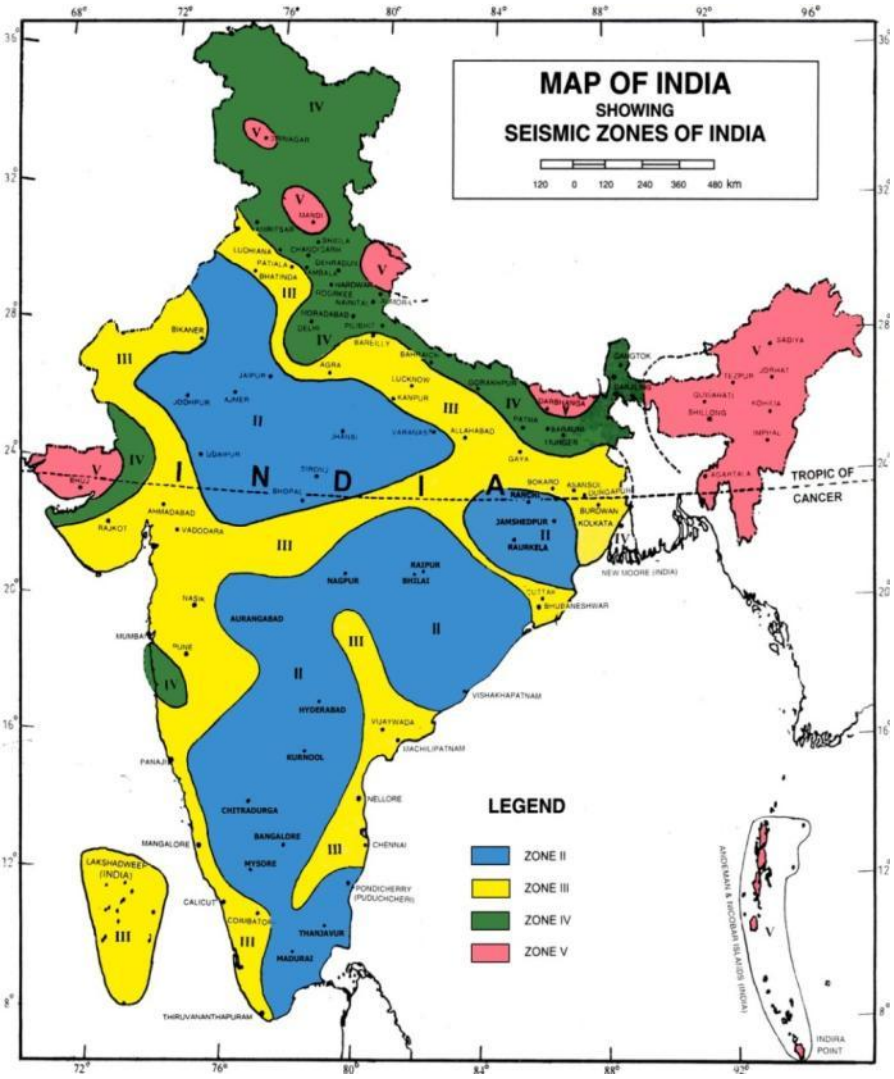


Figure 3-5 : Seismic zones of India

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%**

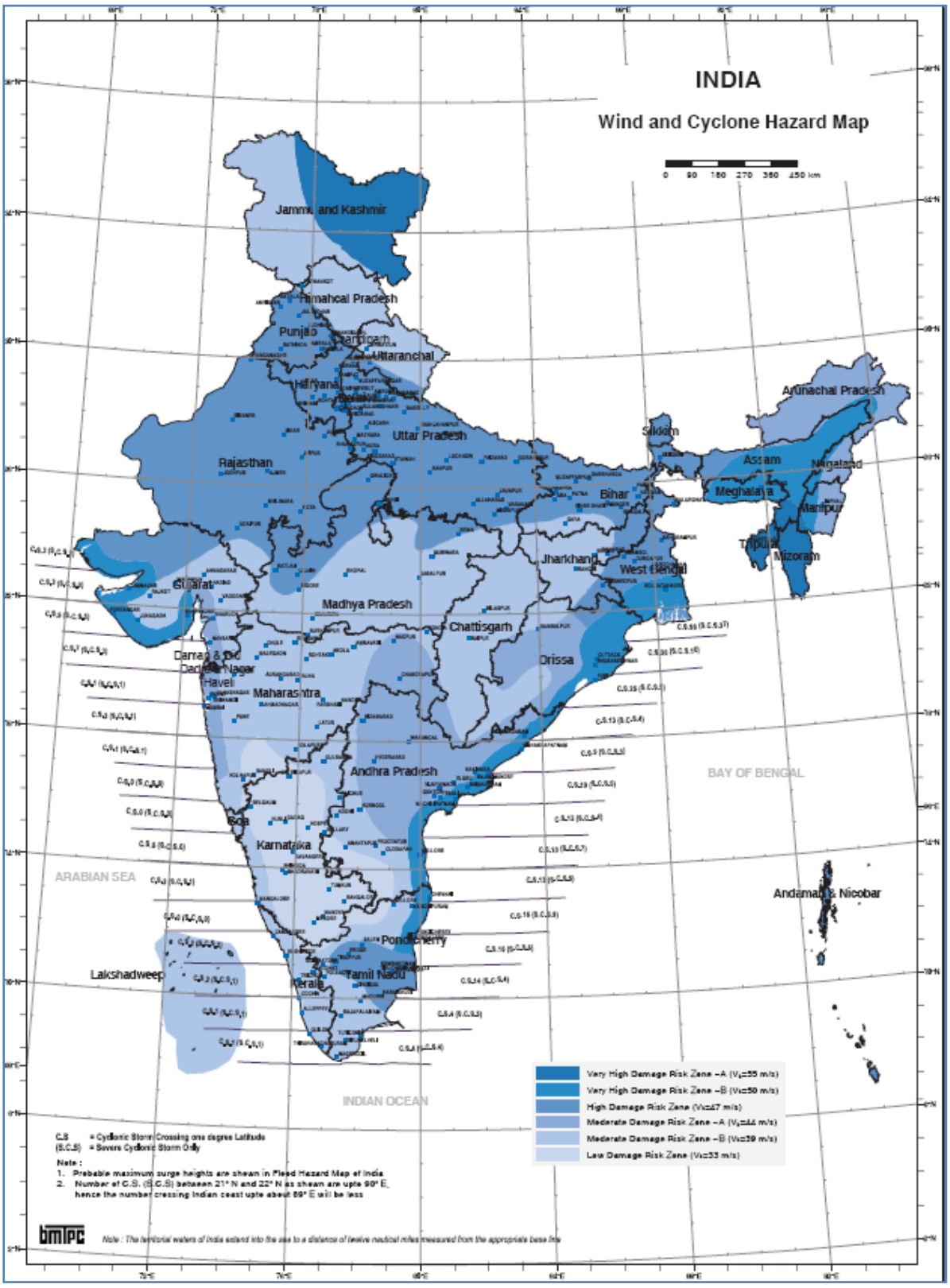


Figure 3-6 : Wind zone map of India (BMTPC, 2006)

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.

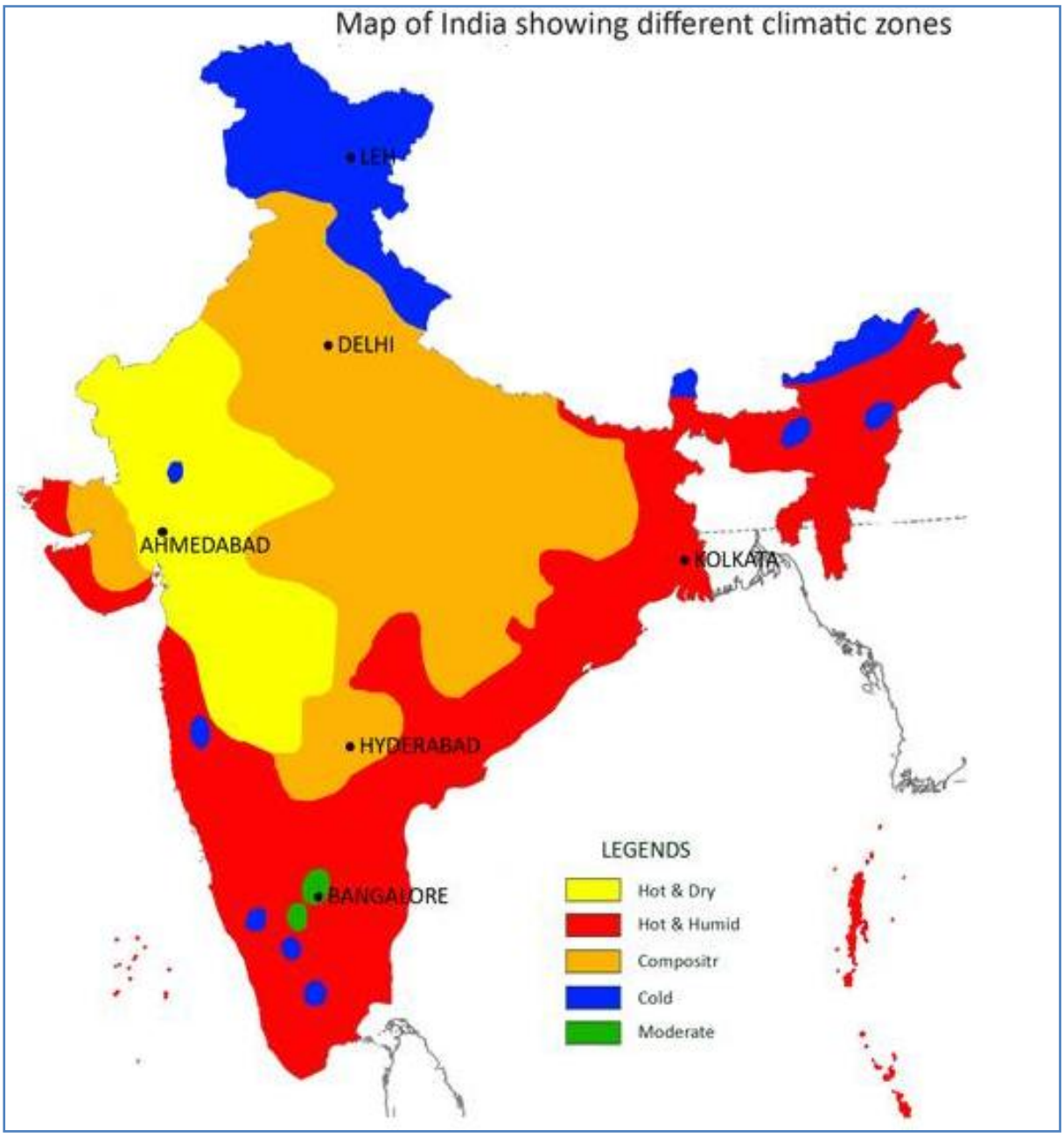


Figure 3-7 : Climatic Zones of India

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

Importance Factor			20%	20%	20%	40%	Integrated Hazard Zoning
State	**District**	**Geographical Area (Sq km)**	**Wind Zoning**	**Seismic Zoning**	**Climate Zoning**	**Hill Zoning**	
Arunachal Pradesh							
	Anjaw	6,808	2.0	4.0	1.0	1.0	1.8
	Changlang	5,536	2.1	4.0	1.0	1.0	1.8
	Dibang Valley	10,633	2.0	4.0	1.0	4.5	3.2
	East Kameng	6,806	2.0	4.0	1.0	4.5	3.2
	East Siang	3,989	2.4	4.0	1.0	1.5	2.1
	Kurung Kumey	7,240	2.0	4.0	1.0	5.0	3.4
	Lohit	4,689	2.7	4.0	1.0	1.0	1.9
	Lower Dibang Valley	4,036	2.4	4.0	1.0	1.0	1.9
	Lower Subansiri	2,965	2.0	4.0	1.0	1.0	1.8
	Papum Pare	3,956	2.1	4.0	1.0	1.0	1.8
	Tawang	2,446	2.0	4.0	1.0	5.0	3.4
	Tirap	2,345	2.1	4.0	1.0	1.0	1.8
	Upper Siang	7,572	2.0	4.0	1.0	5.0	3.4
	Upper Subansiri	6,984	2.0	4.0	1.0	5.0	3.4
	West Kameng	5,444	2.0	4.0	1.0	1.5	2.0
	West Siang	8,661	2.0	4.0	1.0	5.0	3.4
Assam							
	Baksa	2,604	3.3	4.0	1.0	1.0	2.1
	Barpeta	2,416	3.5	4.0	1.0	1.0	2.1
	Bongaigaon	1,152	3.1	4.0	1.0	1.0	2.0
	Cachar	4,100	3.9	4.0	1.0	1.0	2.2
	Chirang	2,047	3.0	4.0	1.0	1.0	2.0
	Darrang	1,700	3.5	4.0	1.0	5.0	3.7
	Dhemaji	2,728	3.3	4.0	1.0	1.0	2.1
	Dhubri	2,362	3.0	4.0	1.0	1.0	2.0
	Dibrugarh	3,725	3.5	4.0	1.0	1.0	2.1
	Dima Hasao	5,297	3.5	4.0	1.0	1.0	2.1
	Goalpara	2,101	3.4	4.0	1.0	1.0	2.1
	Golaghat	3,844	3.5	4.0	1.0	1.0	2.1
	Hailakandi	1,438	4.0	4.0	1.0	1.0	2.2
	Jorhat	3,104	3.5	4.0	1.0	4.5	3.5
	Kamrup Metro	1,063	3.5	4.0	1.0	5.0	3.7
	Kamrup Rural	3,317	3.5	4.0	1.0	4.5	3.5
	Karbi Anglong	11,279	3.5	4.0	1.0	1.0	2.1
	Karimganj	1,960	4.0	4.0	1.0	1.0	2.2
	Kokrajhar	3,310	3.0	4.0	1.0	1.0	2.0
	Lakhimpur	3,277	3.2	4.0	1.0	1.0	2.0

Importance Factor			20%	20%	20%	40%	Integrated Hazard Zoning
State	**District**	**Geographical Area (Sq km)**	**Wind Zoning**	**Seismic Zoning**	**Climate Zoning**	**Hill Zoning**	
	Morigaon	1,626	3.5	4.0	1.0	5.0	3.7
	Nagaon	4,362	3.5	4.0	1.0	1.0	2.1
	Nalbari	1,118	3.5	4.0	1.0	1.0	2.1
	Sivasagar	2,906	3.5	4.0	1.0	1.5	2.3
	Sonitpur	5,655	3.2	4.0	1.0	1.0	2.0
	Tinsukia	4,222	3.4	4.0	1.0	1.0	2.1
	Udalguri	2,163	3.3	4.0	1.0	1.5	2.3
Chhattisgarh							
	Bastar	10,589	1.5	1.0	1.8	2.0	1.7
	Bijapur (Ch)	9,131	1.9	1.4	1.2	1.5	1.5
	Bilaspur (Ch)	8,418	1.5	1.0	2.0	2.0	1.7
	Dakshin Bastar Dantewada	8,587	1.6	1.1	1.1	1.5	1.4
	Dhamtari	4,136	1.5	1.0	2.0	2.0	1.7
	Durg	8,619	1.5	1.0	2.0	2.0	1.7
	Janjgir - Champa	3,922	1.5	1.0	2.0	2.0	1.7
	Jashpur	5,967	1.5	1.0	1.7	2.0	1.6
	Kawardha	4,237	1.5	1.0	2.0	2.0	1.7
	Korba	6,695	1.5	1.2	2.0	2.0	1.7
	Koriya	6,696	1.5	2.0	2.0	2.0	1.9
	Mahasamund	4,829	1.6	1.0	2.0	2.0	1.7
	Narayanpur	3,929	1.5	1.0	2.0	2.0	1.7
	Raigarh (Ch)	7,175	1.5	1.4	2.0	2.0	1.8
	Raipur	12,577	1.5	1.0	2.0	2.0	1.7
	Rajnandgaon	8,138	1.5	1.0	2.0	2.0	1.7
	Surguja	15,993	1.5	1.8	2.0	2.0	1.9
	Uttar Bastar Kanker	7,259	1.5	1.0	2.0	2.0	1.7
Jharkhand							
	Bokaro	2,976	1.5	1.4	2.0	2.0	1.8
	Chatra	3,815	1.5	2.0	2.0	2.0	1.9
	Deogarh	2,571	2.5	2.0	1.8	2.0	2.1
	Dhanbad	2,110	2.1	2.0	2.0	2.0	2.0
	Dumka	3,911	3.0	2.0	1.0	1.0	1.6
	Garhwa	4,162	1.5	1.9	2.0	2.0	1.9
	Giridih	5,124	1.5	2.0	2.0	2.0	1.9
	Godda	2,349	3.0	2.7	1.0	1.0	1.7
	Gumla	5,482	1.5	1.0	1.5	2.0	1.6
	Hazaribagh	3,588	1.5	1.8	2.0	2.0	1.9
	Jamtara	1,881	2.9	2.0	1.5	1.5	1.9
	Khunti	2,548	1.5	1.0	1.8	2.0	1.7
	Kodarma	2,613	1.5	2.0	2.0	2.0	1.9

Importance Factor			20%	20%	20%	40%	Integrated Hazard Zoning
State	District	Geographical Area (Sq km)	Wind Zoning	Seismic Zoning	Climate Zoning	Hill Zoning	
	Latehar	4,386	1.5	1.3	2.0	2.0	1.8
	Lohardaga	1,537	1.5	1.0	2.0	2.0	1.7
	Pakur	1,888	3.0	2.0	1.0	1.0	1.6
	Palamu	4,484	1.5	2.0	2.0	2.0	1.9
	Paschimi Singhbhum	7,439	2.3	1.0	1.1	1.5	1.5
	Purbi Singhbhum	3,685	3.1	1.0	1.0	1.5	1.6
	Ramgarh	1,446	1.5	1.1	2.0	2.0	1.7
	Ranchi	5,299	1.5	1.0	2.0	2.0	1.7
	Sahibganj	2,282	3.0	2.7	1.0	1.0	1.7
	Saraikela - Kharswan	2,743	2.4	1.0	1.6	2.0	1.8
	Simdega	3,857	1.5	1.0	1.0	1.0	1.1
Manipur							
	Bishnupur	525	2.2	4.0	1.0	1.0	1.8
	Chandel	3,494	2.0	4.0	1.0	1.0	1.8
	Churachandpur	4,990	3.4	4.0	1.0	1.0	2.1
	Imphal East	795	2.7	4.0	1.0	1.0	1.9
	Imphal West	533	2.0	4.0	1.0	1.0	1.8
	Senapati	3,814	2.2	4.0	1.0	1.0	1.8
	Tamenglong	4,575	3.5	4.0	1.0	1.0	2.1
	Thoubal	782	2.0	4.0	1.0	1.0	1.8
	Ukhrul	4,900	2.0	4.0	1.0	1.0	1.8
Meghalaya							
	East Garo Hills	3,097	3.5	4.0	1.0	1.0	2.1
	East Khasi Hills	3,045	3.5	4.0	1.0	1.0	2.1
	Jaintia Hills	4,104	3.6	4.0	1.0	1.0	2.1
	Ri Bhoi	2,544	3.5	4.0	1.0	5.0	3.7
	South Garo Hills	1,951	3.5	4.0	1.0	1.0	2.1
	West Garo Hills	3,624	3.4	4.0	1.0	1.0	2.1
	West Khasi Hills	5,582	3.5	4.0	1.0	1.5	2.3
Mizoram							
	Aizawl	3,205	4.0	4.0	1.0	5.0	3.8
	Champhai	3,564	4.0	4.0	1.0	4.5	3.6
	Kolasib	1,659	4.0	4.0	1.0	4.5	3.6
	Lawngtlai	1,926	4.0	4.0	1.0	5.0	3.8
	Lunglei	4,509	4.0	4.0	1.0	5.0	3.8
	Mamit	2,844	4.0	4.0	1.0	4.5	3.6
	Saiha	2,042	4.0	4.0	1.0	5.0	3.8
	Serchhip	1,344	4.0	4.0	1.0	4.5	3.6
Nagaland							

Importance Factor			20%	20%	20%	40%	Integrated Hazard Zoning
State	District	Geographical Area (Sq km)	Wind Zoning	Seismic Zoning	Climate Zoning	Hill Zoning	
	Mon	2,386	2.3	4.0	1.0	4.5	3.3
	Dimapur	841	3.5	4.0	1.0	1.0	2.1
	Kiphire	1,205	2.0	4.0	1.0	1.0	1.8
	Kohima	1,678	2.3	4.0	1.0	1.0	1.9
	Longleng	564	2.3	4.0	1.0	5.0	3.5
	Mokokchung	1,761	2.8	4.0	1.0	5.0	3.6
	Peren	1,891	3.5	4.0	1.0	1.0	2.1
	Phek	2,256	2.0	4.0	1.0	1.0	1.8
	Tuensang	2,487	2.0	4.0	1.0	1.5	2.0
	Wokha	1,778	3.1	4.0	1.0	4.5	3.4
	Zunheboto	1,385	2.0	4.0	1.0	1.5	2.0
Orissa							
	Anugul	6,548	2.0	1.2	1.0	1.0	1.2
	Balangir	6,648	2.0	1.0	1.5	2.0	1.7
	Baleshwar	3,947	3.5	1.2	1.0	1.0	1.5
	Bargarh	5,951	1.9	1.0	1.8	2.0	1.7
	Baudh	3,173	2.0	1.0	1.0	1.0	1.2
	Bhadrak	2,611	3.5	1.5	1.0	1.0	1.6
	Cuttack	3,976	3.1	1.6	1.0	1.0	1.5
	Debagarh	3,016	2.0	1.5	1.0	1.0	1.3
	Dhenkanal	4,589	3.1	1.7	1.0	1.0	1.6
	Gajapati	4,218	2.4	1.0	1.0	1.0	1.3
	Ganjam	8,593	2.8	1.0	1.0	1.0	1.4
	Jagatsinghapur	1,793	3.5	2.0	1.0	1.0	1.7
	Jajapur	2,993	3.5	2.0	1.0	1.0	1.7
	Jharsuguda	2,120	1.5	1.3	2.0	2.0	1.8
	Kalahandi	8,039	1.8	1.0	1.4	1.5	1.4
	Kandhamal	8,195	1.7	1.0	1.0	1.0	1.1
	Kendrapara	2,656	3.5	2.0	1.0	1.0	1.7
	Kendujhar	8,566	3.1	1.1	1.0	1.0	1.4
	Khordha	2,976	3.4	1.3	1.0	1.0	1.5
	Koraput	8,496	1.5	1.0	1.0	1.0	1.1
	Malkangiri	5,826	1.5	1.0	1.0	1.0	1.1
	Mayurbhanj	10,757	3.3	1.0	1.0	1.0	1.5
	Nabarangapur	5,532	1.5	1.0	1.7	2.0	1.6
	Nayagarh	3,999	2.2	1.0	1.0	1.0	1.2
	Nuapada	3,911	2.0	1.0	2.0	2.0	1.8
	Puri	3,606	3.5	1.5	1.0	1.0	1.6
	Rayagada	7,485	1.6	1.0	1.0	1.0	1.1
	Sambalpur	6,794	1.8	1.2	1.1	1.5	1.4

Importance Factor			20%	20%	20%	40%	Integrated Hazard Zoning
State	District	Geographical Area (Sq km)	Wind Zoning	Seismic Zoning	Climate Zoning	Hill Zoning	
	Subarnapur	2,412	2.0	1.0	1.3	1.5	1.5
	Sundargarh	9,972	1.6	1.1	1.3	1.5	1.4
Sikkim							
	East Sikkim	998	3.0	3.0	1.0	5.0	3.4
	North Sikkim	4,450	3.0	3.0	1.0	5.0	3.4
	South Sikkim	767	3.0	3.0	1.0	4.5	3.2
	West Sikkim	1,254	3.0	3.0	1.0	3.0	2.6
Tripura							
	West Tripura	2,870	4.0	4.0	1.0	2.0	2.6
	South Tripura	2,996	4.0	4.0	1.0	2.0	2.6
	North Tripura	1,989	4.0	4.0	1.0	2.0	2.6
	Dhalai	2,170	4.0	4.0	1.0	2.5	2.8
West Bengal							
	Bankura	7,154	3.0	1.6	1.0	1.0	1.5
	Barddhaman	7,311	3.0	2.0	1.0	1.5	1.8
	Birbhum	4,733	3.0	2.0	1.0	1.0	1.6
	Dakshin Dinajpur	2,342	3.0	3.0	1.0	1.0	1.8
	Darjiling	3,255	3.0	3.0	1.0	1.0	1.8
	Haora	1,460	3.5	2.0	1.0	1.0	1.7
	Hugli	3,279	3.3	2.0	1.0	1.0	1.7
	Jalpaiguri	6,452	3.0	3.1	1.0	1.0	1.8
	Koch Bihar	3,563	3.0	3.1	1.0	1.0	1.8
	Kolkata	99	3.5	2.0	1.0	1.0	1.7
	Maldah	3,746	3.0	2.8	1.0	1.0	1.8
	Murshidabad	5,708	3.0	2.0	1.0	1.0	1.6
	Nadia	4,087	3.0	2.0	1.0	1.0	1.6
	North Twenty Four Parganas	4,234	3.5	2.0	1.0	1.0	1.7
	Paschim Medinipur	9,737	3.4	1.6	1.0	1.0	1.6
	Purba Medinipur	4,137	3.5	2.0	1.0	1.0	1.7
	Puruliya	6,457	2.6	1.1	1.8	2.0	1.9
	South Twenty Four Parganas	8,192	3.5	2.0	1.0	1.0	1.7
	Uttar Dinajpur	3,236	3.0	3.0	1.0	1.0	1.8

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 in percentage.

Table 3-4: District level geographical area, population, population density, residential built-up area, residential built-up area in percentage, and industrial area for all Phase IV States

State	District	Geographical Area (sq km)	Population 2011	Population Density	Residential Built-Up area (sq km)	Industrial Area (sq km)	Residential Built-Up area (in percentage)
Arunachal Pradesh							
	Anjaw	6,808	21,089	3.10	2.14	0.00	0.031%
	Changlang	5,536	147,951	26.73	15.28	0.00	0.276%
	Dibang Valley	10,633	7,948	0.75	4.22	0.00	0.040%
	East Kameng	6,806	78,413	11.52	5.84	0.00	0.086%
	East Siang	3,989	99,019	24.82	20.95	0.00	0.525%
	Kurung Kumey	7,240	89,717	12.39	1.85	0.00	0.026%
	Lohit	4,689	145,538	31.04	20.16	0.00	0.430%
	Lower Dibang Valley	4,036	53,986	13.38	12.36	0.00	0.306%
	Lower Subansiri	2,965	82,839	27.94	25.34	0.00	0.855%
	Papum Pare	3,956	176,385	44.58	11.81	0.13	0.299%
	Tawang	2,446	49,950	20.42	9.51	0.00	0.389%
	Tirap	2,345	111,997	47.76	16.66	0.00	0.710%
	Upper Siang	7,572	35,289	4.66	7.49	0.00	0.099%
	Upper Subansiri	6,984	83,205	11.91	15.36	0.00	0.220%
	West Kameng	5,444	87,013	15.98	8.50	0.00	0.156%
	West Siang	8,661	112,272	12.96	17.90	0.00	0.207%
Assam							
	Baksa	2,604	953,773	366.29	167.40	0.00	6.43%
	Barpeta	2,416	1,693,190	700.78	117.46	0.01	4.86%
	Bongaigaon	1,152	732,639	636.19	61.23	0.05	5.32%
	Cachar	4,100	1,736,319	423.45	107.37	0.39	2.62%
	Chirang	2,047	481,818	235.38	57.82	0.80	2.82%
	Darrang	1,700	908,090	534.17	145.14	0.00	8.54%
	Dhemaji	2,728	688,077	252.23	87.89	0.03	3.22%
	Dhubri	2,362	1,948,632	824.83	116.92	0.00	4.95%
	Dibrugarh	3,725	1,327,748	356.46	215.82	0.22	5.79%
	Dima Hasao	5,297	213,529	40.31	49.13	0.05	0.93%
	Goalpara	2,101	1,008,959	480.22	111.00	0.00	5.28%
	Golaghat	3,844	1,058,674	275.41	82.77	1.13	2.15%
	Hailakandi	1,438	659,260	458.56	77.96	0.10	5.42%
	Jorhat	3,104	1,091,295	351.55	154.74	1.12	4.99%

State	District	Geographical Area (sq km)	Population 2011	Population Density	Residential Built-Up area (sq km)	Industrial Area (sq km)	Residential Built-Up area (in percentage)
	Kamrup Metro	1,063	1,260,419	1185.19	122.22	7.69	11.50%
	Kamrup Rural	3,317	1,517,202	457.45	233.35	0.29	7.03%
	Karbi Anglong	11,279	965,280	85.58	69.80	0.18	0.62%
	Karimganj	1,960	1,217,002	621.02	91.14	0.00	4.65%
	Kokrajhar	3,310	886,999	267.95	110.47	0.02	3.34%
	Lakhimpur	3,277	1,040,644	317.59	248.02	0.23	7.57%
	Morigaon	1,626	957,853	589.05	88.59	0.00	5.45%
	Nagaon	4,362	2,826,006	647.84	160.65	0.28	3.68%
	Nalbari	1,118	769,919	688.81	157.56	0.02	14.09%
	Sivasagar	2,906	1,150,253	395.83	205.58	0.60	7.07%
	Sonitpur	5,655	1,925,975	340.59	300.24	0.51	5.31%
	Tinsukia	4,222	1,316,948	311.91	1.44	0.09	0.03%
	Udalguri	2,163	832,769	385.05	224.17	0.00	10.36%
Chhattisgarh							
	Bastar	10,589	1,411,644	133.31	120.66	0.35	1.14%
	Bijapur (Ch)	9,131	255,180	27.95	37.30	0.07	0.41%
	Bilaspur (Ch)	8,418	2,662,077	316.23	170.31	2.30	2.02%
	Dakshin Bastar Dantewada	8,587	532,791	62.04	43.19	0.72	0.50%
	Dhamtari	4,136	799,199	193.25	76.46	0.46	1.85%
	Durg	8,619	3,343,079	387.88	245.41	10.02	2.85%
	Janjgir - Champa	3,922	1,620,632	413.24	128.52	2.27	3.28%
	Jashpur	5,967	852,043	142.79	44.64	0.00	0.75%
	Kawardha	4,237	822,239	194.04	45.26	0.20	1.07%
	Korba	6,695	1,206,563	180.23	78.22	3.79	1.17%
	Koriya	6,696	659,039	98.42	23.72	0.16	0.35%
	Mahasamund	4,829	1,032,275	213.75	96.08	1.21	1.99%
	Narayanpur	3,929	140,206	35.69	10.64	0.01	0.27%
	Raigarh (Ch)	7,175	1,493,627	208.16	100.76	3.43	1.40%
	Raipur	12,577	4,062,160	322.98	272.52	15.97	2.17%
	Rajnandgaon	8,138	1,537,520	188.93	132.76	1.97	1.63%
	Surguja	15,993	2,361,329	147.65	110.93	0.36	0.69%
	Uttar Bastar Kanker	7,259	748,593	103.13	99.95	0.06	1.38%
Jharkhand							
	Bokaro	2,976	2,061,918	692.89	174.37	8.51	5.86%
	Chatra	3,815	1,042,304	273.23	60.62	0.33	1.59%
	Deogarh	2,571	1,491,879	580.23	96.83	0.51	3.77%
	Dhanbad	2,110	2,682,662	1271.17	178.53	5.25	8.46%
	Dumka	3,911	1,321,096	337.77	128.33	0.45	3.28%
	Garhwa	4,162	1,322,387	317.71	68.80	0.54	1.65%
	Giridih	5,124	2,445,203	477.23	165.43	1.01	3.23%

State	District	Geographical Area (sq km)	Population 2011	Population Density	Residential Built-Up area (sq km)	Industrial Area (sq km)	Residential Built-Up area (in percentage)
	Godda	2,349	1,311,382	558.20	45.97	0.35	1.96%
	Gumla	5,482	1,025,656	187.10	84.15	0.61	1.54%
	Hazaribagh	3,588	1,734,005	483.32	77.46	0.82	2.16%
	Jamtara	1,881	790,207	420.03	42.83	0.24	2.28%
	Khunti	2,548	530,299	208.15	31.77	0.74	1.25%
	Kodarma	2,613	717,169	274.50	67.54	0.83	2.58%
	Latehar	4,386	725,673	165.46	80.90	0.44	1.84%
	Lohardaga	1,537	461,738	300.39	44.85	0.28	2.92%
	Pakur	1,888	899,200	476.37	30.57	0.06	1.62%
	Palamu	4,484	1,936,319	431.84	101.22	0.68	2.26%
	Paschimi Singhbhum	7,439	1,501,619	201.85	129.04	1.98	1.73%
	Purbi Singhbhum	3,685	2,291,032	621.70	122.52	8.05	3.32%
	Ramgarh	1,446	949,159	656.36	58.73	3.07	4.06%
	Ranchi	5,299	2,912,022	549.55	166.91	11.30	3.15%
	Sahibganj	2,282	1,150,038	503.93	32.15	0.22	1.41%
	Saraikela - Kharswan	2,743	1,063,458	387.65	115.52	4.61	4.21%
	Simdega	3,857	599,813	155.50	27.60	0.02	0.72%
Manipur							
	Bishnupur	525	240,363	457.47	27.48	0.07	5.23%
	Chandel	3,494	144,028	41.23	5.93	0.16	0.17%
	Churachandpur	4,990	271,274	54.36	21.07	0.19	0.42%
	Imphal East	795	452,661	569.49	29.77	0.56	3.74%
	Imphal West	533	514,683	964.76	38.78	0.84	7.28%
	Senapati	3,814	354,972	93.07	12.85	0.04	0.34%
	Tamenglong	4,575	140,143	30.63	11.94	0.00	0.26%
	Thoubal	782	420,517	538.00	44.57	0.21	5.70%
	Ukhrul	4,900	183,115	37.37	6.46	0.00	0.13%
Meghalaya							
	East Garo Hills	3,097	317,618	102.55	29.22	0.01	0.94%
	East Khasi Hills	3,045	824,059	270.66	34.83	1.45	1.14%
	Jaintia Hills	4,104	392,852	95.72	22.31	0.20	0.54%
	Ri Bhoi	2,544	258,380	101.57	10.11	0.13	0.40%
	South Garo Hills	1,951	142,574	73.08	7.46	0.01	0.38%
	West Garo Hills	3,624	642,923	177.43	16.65	0.07	0.46%
	West Khasi Hills	5,582	385,601	69.08	39.58	0.06	0.71%
Mizoram							
	Aizawl	3,205	404,054	126.00	8.05	0.02	0.25%
	Champhai	3,564	125,370	35.00	2.86	0.00	0.08%
	Kolasib	1,659	83,054	50.00	1.81	0.00	0.11%
	Lawngtlai	1,926	117,444	61.00	1.76	0.00	0.09%

State	District	Geographical Area (sq km)	Population 2011	Population Density	Residential Built-Up area (sq km)	Industrial Area (sq km)	Residential Built-Up area (in percentage)
	Lunglei	4,509	154,094	34.00	3.49	0.00	0.08%
	Mamit	2,844	85,757	30.00	2.06	0.00	0.07%
	Saiha	2,042	56,366	28.00	1.40	0.00	0.07%
	Serchhip	1,344	64,875	48.00	1.46	0.00	0.11%
Nagaland							
	Mon	2,386	39,538	16.57	10.20	0.00	0.43%
	Dimapur	841	49,595	59.01	23.61	0.61	2.81%
	Kiphire	1,205	14,335	11.90	4.56	0.00	0.38%
	Kohima	1,678	36,157	21.54	15.70	0.02	0.94%
	Longleng	564	8,846	15.69	2.11	0.00	0.37%
	Mokokchung	1,761	20,046	11.38	15.35	0.03	0.87%
	Peren	1,891	15,221	8.05	5.24	0.00	0.28%
	Phek	2,256	27,538	12.21	7.70	0.00	0.34%
	Tuensang	2,487	34,931	14.05	9.39	0.02	0.38%
	Wokha	1,778	19,673	11.07	9.63	0.00	0.54%
	Zunheboto	1,385	20,101	14.52	10.37	0.00	0.75%
Orissa							
	Anugul	6,548	1,271,703	194.22	102.64	4.54	1.57%
	Balangir	6,648	1,648,574	247.97	67.70	1.14	1.02%
	Baleshwar	3,947	2,317,419	587.17	285.94	5.41	7.24%
	Bargarh	5,951	1,478,833	248.52	59.78	1.25	1.00%
	Baudh	3,173	439,917	138.64	26.54	0.25	0.84%
	Bhadrak	2,611	1,506,522	576.96	77.86	0.61	2.98%
	Cuttack	3,976	2,618,708	658.68	169.16	6.83	4.25%
	Debagarh	3,016	312,164	103.49	26.33	0.02	0.87%
	Dhenkanal	4,589	1,192,948	259.96	87.20	2.55	1.90%
	Gajapati	4,218	575,880	136.54	6.08	0.12	0.14%
	Ganjam	8,593	3,520,151	409.64	99.70	5.48	1.16%
	Jagatsinghapur	1,793	1,136,604	634.05	120.38	1.35	6.71%
	Jajapur	2,993	1,826,275	610.16	115.01	2.38	3.84%
	Jharsuguda	2,120	579,499	273.31	28.25	2.31	1.33%
	Kalahandi	8,039	1,573,054	195.67	55.77	1.55	0.69%
	Kandhamal	8,195	731,952	89.32	39.74	0.24	0.48%
	Kendrapara	2,656	1,439,891	542.17	72.39	0.05	2.73%
	Kendujhar	8,566	1,802,777	210.46	135.59	0.82	1.58%
	Khordha	2,976	2,246,341	754.84	126.99	6.76	4.27%
	Koraput	8,496	1,376,934	162.07	70.20	3.54	0.83%
	Malkangiri	5,826	612,727	105.17	29.24	0.15	0.50%
	Mayurbhanj	10,757	2,513,895	233.70	246.42	1.23	2.29%
	Nabarangapur	5,532	1,218,762	220.30	94.94	0.47	1.72%
	Nayagarh	3,999	962,215	240.59	41.88	0.06	1.05%

State	District	Geographical Area (sq km)	Population 2011	Population Density	Residential Built-Up area (sq km)	Industrial Area (sq km)	Residential Built-Up area (in percentage)
	Nuapada	3,911	606,490	155.09	19.43	0.87	0.50%
	Puri	3,606	1,697,983	470.83	69.14	0.84	1.92%
	Rayagada	7,485	961,959	128.52	24.63	0.95	0.33%
	Sambalpur	6,794	1,044,410	153.73	63.36	2.24	0.93%
	Subarnapur	2,412	652,107	270.35	26.04	0.12	1.08%
	Sundargarh	9,972	2,080,664	208.64	135.53	11.25	1.36%
Sikkim							
	East Sikkim	998	281,293	281.82	10.77	0.09	1.08%
	North Sikkim	4,450	43,354	9.74	2.68	0.00	0.06%
	South Sikkim	767	146,742	191.29	7.60	0.41	0.99%
	West Sikkim	1,254	136,299	108.69	7.16	0.00	0.57%
Tripura							
	West Tripura	2,870	1,724,619	601.00	25.74	0.06	0.90%
	South Tripura	2,996	875,144	292.00	14.91	0.00	0.50%
	North Tripura	1,989	693,281	349.00	10.33	0.00	0.52%
	Dhalai	2,170	377,988	174.00	6.37	0.00	0.29%
West Bengal							
	Bankura	7,154	6,882	0.96	233.19	4.68	3.26%
	Barddhaman	7,311	7,024	0.96	530.06	34.60	7.25%
	Birbhum	4,733	4,545	0.96	255.61	2.85	5.40%
	Dakshin Dinajpur	2,342	2,219	0.95	104.09	1.30	4.44%
	Darjiling	3,255	3,149	0.97	96.13	1.23	2.95%
	Haora	1,460	1,467	1.01	227.33	18.86	15.57%
	Hugli	3,279	3,149	0.96	313.56	10.51	9.56%
	Jalpaiguri	6,452	6,227	0.97	261.79	1.59	4.06%
	Koch Bihar	3,563	3,387	0.95	203.15	0.42	5.70%
	Kolkata	99	185	1.87	54.47	10.46	55.02%
	Maldah	3,746	3,733	1.00	220.59	0.81	5.89%
	Murshidabad	5,708	5,324	0.93	340.11	2.98	5.96%
	Nadia	4,087	3,927	0.96	291.01	2.96	7.12%
	North Twenty Four Parganas	4,234	4,094	0.97	504.34	10.47	11.91%
	Paschim Medinipur	9,737	9,345	0.96	639.05	7.53	6.56%
	Purba Medinipur	4,137	4,736	1.14	785.18	15.49	18.98%
	Puruliya	6,457	6,259	0.97	223.99	0.98	3.47%
	South Twenty Four Parganas	8,192	9,960	1.22	661.85	11.57	8.08%
	Uttar Dinajpur	3,236	3,140	0.97	148.91	0.79	4.60%

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

Built-up area %	Ranking
>35 %	5
14% to 35 %	4
2% to 14 %	3
1% to 2 %	2
<1 %	1

Residential Built-up area sq km	Ranking
>190	5
100 to 190	4
50 to 100	3
20 to 50	2
<20	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.). 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).

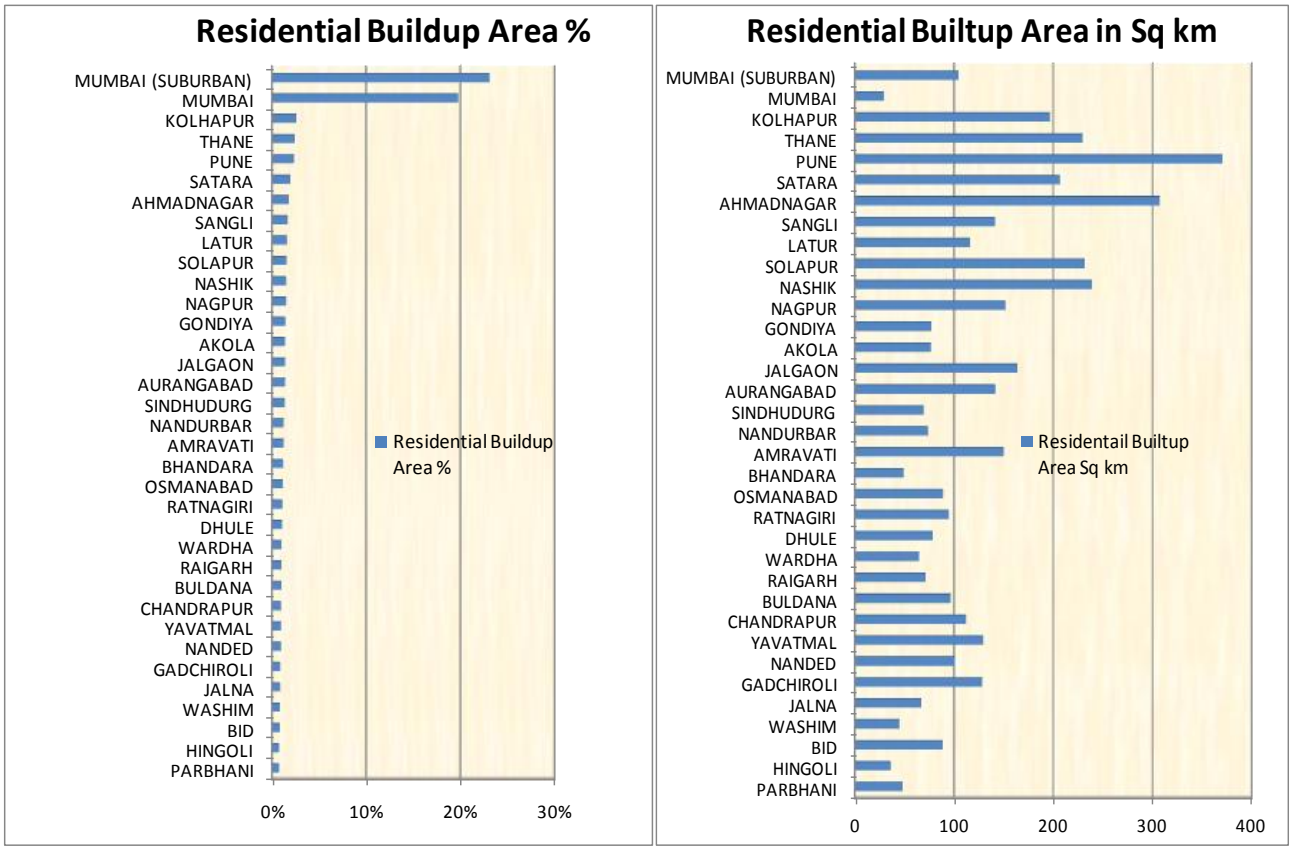


Figure 3-8 : Example of comparison of district level rankings for residential built-up area percentages and absolute areas (in sq km). The example shows a comparison for all 35 districts of Maharashtra State

An example of 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).

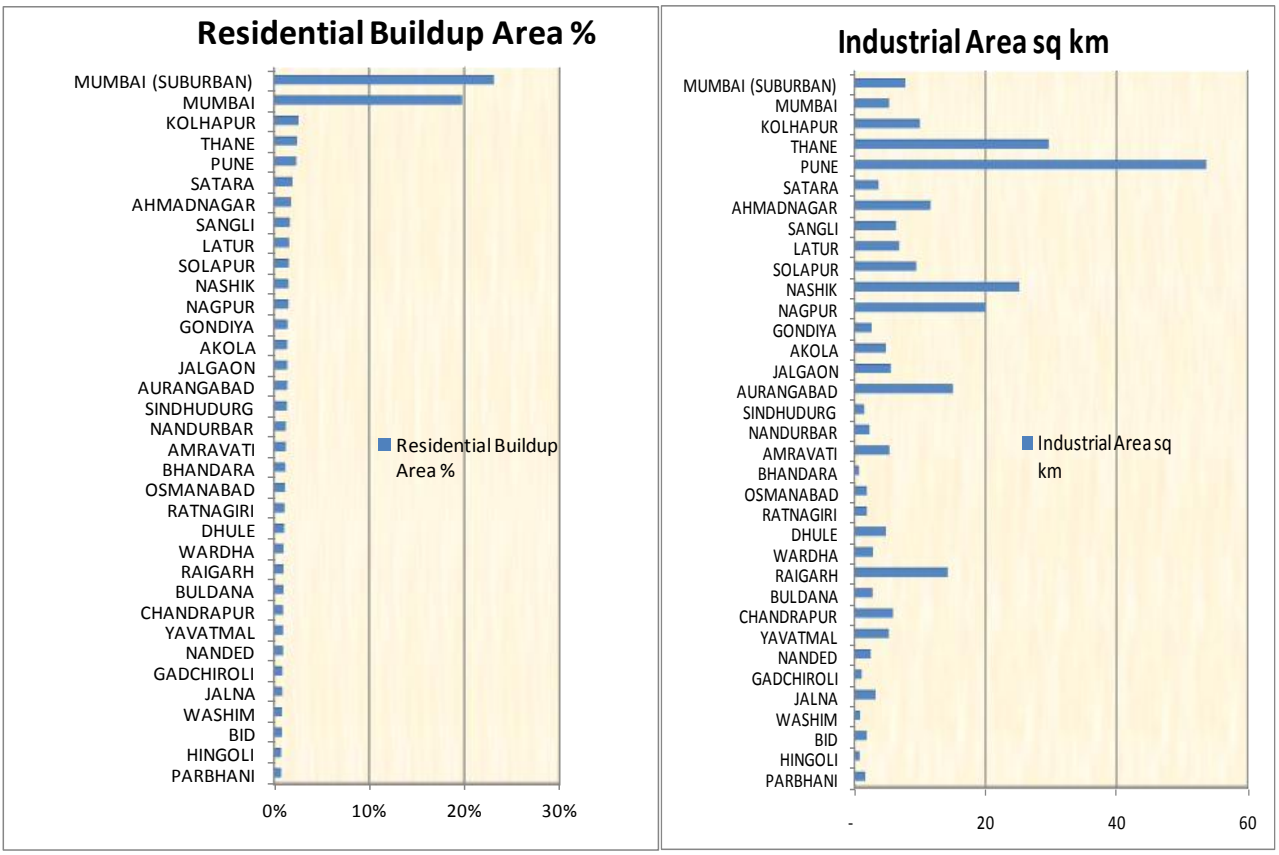


Figure 3-9 : Example of comparison of district level rankings for residential built-up areas and industrial areas (in sq km). The example shows a comparison for all 35 districts of Maharashtra State

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 all Phase IV States

State	District	Population Density Ranking	Res Built-up Area sq km Ranking	Res Built-up Area Percentage Ranking	Industrial Area Ranking	Integrated Ranking	Overall District Risk Ranking
Arunachal Pradesh							
	Anjaw	1	1	1	1	4	Low
	Changlang	1	1	1	1	4	Low
	Dibang Valley	1	1	1	1	5	Low
	East Kameng	1	1	1	1	5	Low
	East Siang	1	2	2	1	5	Low
	Kurung Kumey	1	1	1	1	5	Low
	Lohit	1	2	1	1	4	Low
	Lower Dibang Valley	1	1	1	1	4	Low
	Lower Subansiri	1	2	2	1	5	Low
	Papum Pare	1	1	1	1	4	Low
	Tawang	1	1	1	1	5	Low
	Tirap	1	1	2	1	4	Low
	Upper Siang	1	1	1	1	5	Low
	Upper Subansiri	1	1	1	1	5	Low
	West Kameng	1	1	1	1	4	Low
	West Siang	1	1	1	1	5	Low
Assam							
	Baksa	2	4	3	1	7	Medium
	Barpeta	3	4	3	1	8	High
	Bongaigaon	3	3	3	1	7	Medium
	Cachar	2	4	3	1	7	Medium
	Chirang	2	3	3	1	7	Medium
	Darrang	3	4	3	1	9	Very High
	Dhemaji	2	3	3	1	7	Medium
	Dhubri	3	4	3	1	8	High
	Dibrugarh	2	5	3	1	8	High
	Dima Hasao	1	2	2	1	5	Low
	Goalpara	2	4	3	1	7	Medium
	Golaghat	2	3	2	2	7	Medium
	Hailakandi	2	3	3	1	7	Medium
	Jorhat	2	4	3	2	9	Very High
	Kamrup Metro	4	4	3	4	11	Very High
	Kamrup Rural	2	5	3	1	9	Very High
	Karbi Anglong	1	3	2	1	6	Medium
	Karimganj	3	3	3	1	7	Medium

State	District	Population Density Ranking	Res Built-up Area sq km Ranking	Res Built-up Area Percentage Ranking	Industrial Area Ranking	Integrated Ranking	Overall District Risk Ranking
	Kokrajhar	2	4	3	1	7	Medium
	Lakhimpur	2	5	3	1	8	High
	Morigaon	3	3	3	1	9	Very High
	Nagaon	3	4	3	1	8	High
	Nalbari	3	4	4	1	8	High
	Sivasagar	2	5	3	1	8	High
	Sonitpur	2	5	3	1	8	High
	Tinsukia	2	1	1	1	5	Low
	Udalguri	2	5	3	1	8	High
Chhattisgarh							
	Bastar	1	4	2	1	6	Medium
	Bijapur (Ch)	1	2	1	1	4	Low
	Bilaspur (Ch)	2	4	3	3	8	High
	Dakshin Bastar Dantewada	1	2	2	1	4	Low
	Dhamtari	1	3	3	1	6	Medium
	Durg	2	5	3	5	9	VeryHigh
	Janjgir - Champa	2	4	3	3	8	High
	Jashpur	1	2	2	1	5	Low
	Kawardha	1	2	2	1	5	Low
	Korba	1	3	2	3	6	Medium
	Koriya	1	2	1	1	4	Low
	Mahasamund	2	3	3	3	7	Medium
	Narayanpur	1	1	1	1	4	Low
	Raigarh (Ch)	2	4	2	3	7	Medium
	Raipur	2	5	3	5	9	VeryHigh
	Rajnandgaon	1	4	3	3	7	Medium
	Surguja	1	4	2	1	6	Medium
	Uttar Bastar Kanker	1	4	2	1	6	Medium
Jharkhand							
	Bokaro	3	4	3	4	9	VeryHigh
	Chatra	2	3	3	1	6	Medium
	Deogarh	3	3	3	1	7	Medium
	Dhanbad	4	4	3	4	10	VeryHigh
	Dumka	2	4	3	1	7	Medium
	Garhwa	2	3	3	1	6	Medium
	Giridih	2	4	3	3	8	High
	Godda	3	2	3	1	6	Medium
	Gumla	1	3	3	1	6	Medium
	Hazaribagh	2	3	3	1	6	Medium

State	District	Population Density Ranking	Res Built-up Area sq km Ranking	Res Built-up Area Percentage Ranking	Industrial Area Ranking	Integrated Ranking	Overall District Risk Ranking
	Jamtara	2	2	3	1	6	Medium
	Khunti	2	2	2	1	5	Low
	Kodarma	2	3	3	1	6	Medium
	Latehar	1	3	3	1	6	Medium
	Lohardaga	2	2	3	1	6	Medium
	Pakur	2	2	3	1	6	Medium
	Palamu	2	4	3	1	7	Medium
	Paschimi Singhbhum	2	4	3	3	7	Medium
	Purbi Singhbhum	3	4	3	4	9	VeryHigh
	Ramgarh	3	3	3	3	8	High
	Ranchi	3	4	3	5	9	VeryHigh
	Sahibganj	3	2	2	1	6	Medium
	Saraikela-Kharswan	2	4	3	4	8	High
	Simdega	1	2	2	1	4	Low
Manipur							
	Bishnupur	2	2	3	1	6	Medium
	Chandel	1	1	1	1	4	Low
	Churachandpur	1	2	1	1	5	Low
	Imphal East	3	2	3	1	6	Medium
	Imphal West	3	2	3	1	6	Medium
	Senapati	1	1	1	1	4	Low
	Tamenglong	1	1	1	1	4	Low
	Thoubal	3	2	3	1	6	Medium
	Ukhrul	1	1	1	1	4	Low
Meghalaya							
	East Garo Hills	1	2	2	1	5	Low
	East Khasi Hills	2	2	2	3	7	Medium
	Jaintia Hills	1	2	2	1	5	Low
	Ri Bhoi	1	1	1	1	6	Medium
	South Garo Hills	1	1	1	1	4	Low
	West Garo Hills	1	1	1	1	4	Low
	West Khasi Hills	1	2	2	1	5	Low
Mizoram							
	Aizawl	1	1	1	1	6	Medium
	Champhai	1	1	1	1	6	Medium
	Kolasib	1	1	1	1	6	Medium
	Lawngtlai	1	1	1	1	6	Medium
	Lunglei	1	1	1	1	6	Medium

State	District	Population Density Ranking	Res Built-up Area sq km Ranking	Res Built-up Area Percentage Ranking	Industrial Area Ranking	Integrated Ranking	Overall District Risk Ranking
	Mamit	1	1	1	1	6	Medium
	Saiha	1	1	1	1	6	Medium
	Serchhip	1	1	1	1	6	Medium
Nagaland							
	Mon	1	1	1	1	5	Low
	Dimapur	1	2	3	1	6	Medium
	Kiphire	1	1	1	1	4	Low
	Kohima	1	1	2	1	4	Low
	Longleng	1	1	1	1	5	Low
	Mokokchung	1	1	2	1	6	Medium
	Peren	1	1	1	1	4	Low
	Phek	1	1	1	1	4	Low
	Tuensang	1	1	1	1	4	Low
	Wokha	1	1	2	1	6	Medium
	Zunheboto	1	1	2	1	5	Low
Orissa							
	Anugul	1	4	3	4	7	Medium
	Balangir	2	3	2	3	7	Medium
	Baleshwar	3	5	3	4	9	VeryHigh
	Bargarh	2	3	2	3	7	Medium
	Baudh	1	2	2	1	4	Low
	Bhadrak	3	3	3	1	7	Medium
	Cuttack	3	4	3	4	9	VeryHigh
	Debagarh	1	2	2	1	4	Low
	Dhenkanal	2	3	3	3	7	Medium
	Gajapati	1	1	1	1	3	Low
	Ganjam	2	4	2	4	7	Medium
	Jagatsinghapur	3	4	3	3	8	High
	Jajapur	3	4	3	3	8	High
	Jharsuguda	2	2	2	3	6	Medium
	Kalahandi	1	3	2	3	6	Medium
	Kandhamal	1	2	1	1	4	Low
	Kendrapara	3	3	3	1	7	Medium
	Kendujhar	2	4	3	1	6	Medium
	Khordha	3	4	3	4	9	VeryHigh
	Koraput	1	3	2	3	6	Medium
	Malkangiri	1	2	2	1	4	Low
	Mayurbhanj	2	5	3	3	8	High
	Nabarangapur	2	3	3	1	6	Medium
	Nayagarh	2	2	2	1	5	Low
	Nuapada	1	1	1	1	4	Low

State	District	Population Density Ranking	Res Built-up Area sq km Ranking	Res Built-up Area Percentage Ranking	Industrial Area Ranking	Integrated Ranking	Overall District Risk Ranking
	Puri	2	3	3	1	6	Medium
	Rayagada	1	2	1	1	4	Low
	Sambalpur	1	3	2	3	6	Medium
	Subarnapur	2	2	2	1	5	Low
	Sundargarh	2	4	2	5	8	High
Sikkim							
	East Sikkim	2	1	2	1	6	Medium
	North Sikkim	1	1	1	1	5	Low
	South Sikkim	1	1	2	1	6	Medium
	West Sikkim	1	1	2	1	5	Low
Tripura							
	West Tripura	3	2	1	1	6	Medium
	South Tripura	2	1	1	1	5	Low
	North Tripura	2	1	1	1	5	Low
	Dhalai	1	1	1	1	5	Low
West Bengal							
	Bankura	1	5	3	4	8	High
	Barddhaman	1	5	3	5	9	VeryHigh
	Birbhum	1	5	3	3	8	High
	Dakshin Dinajpur	1	4	3	3	7	Medium
	Darjiling	1	3	3	3	7	Medium
	Haora	1	5	4	5	9	VeryHigh
	Hugli	1	5	3	5	9	VeryHigh
	Jalpaiguri	1	5	3	3	8	High
	Koch Bihar	1	5	3	1	7	Medium
	Kolkata	1	3	5	5	9	VeryHigh
	Maldah	1	5	3	1	7	Medium
	Murshidabad	1	5	3	3	8	High
	Nadia	1	5	3	3	8	High
	North Twenty Four Parganas	1	5	3	5	9	VeryHigh
	Paschim Medinipur	1	5	3	4	8	High
	Purba Medinipur	1	5	4	5	9	VeryHigh
	Puruliya	1	5	3	1	7	Medium
	South Twenty Four Parganas	1	5	3	5	9	VeryHigh
	Uttar Dinajpur	1	4	3	1	6	Medium

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 equipment, 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 equipment, 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 equipment 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/bottlenecks in smooth operation were highlighted along with RMSI's suggested solution.

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.

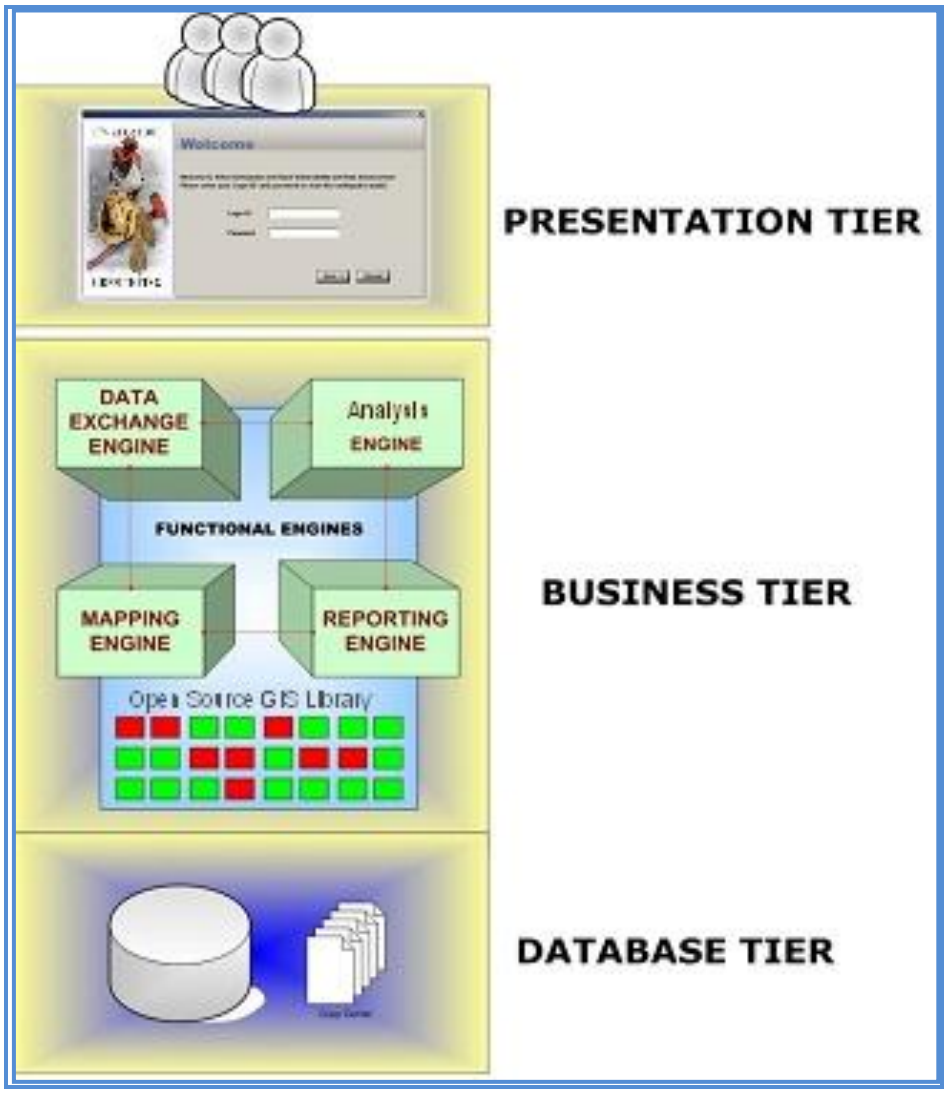


Figure 5-1 : Three-tier architecture

- **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.

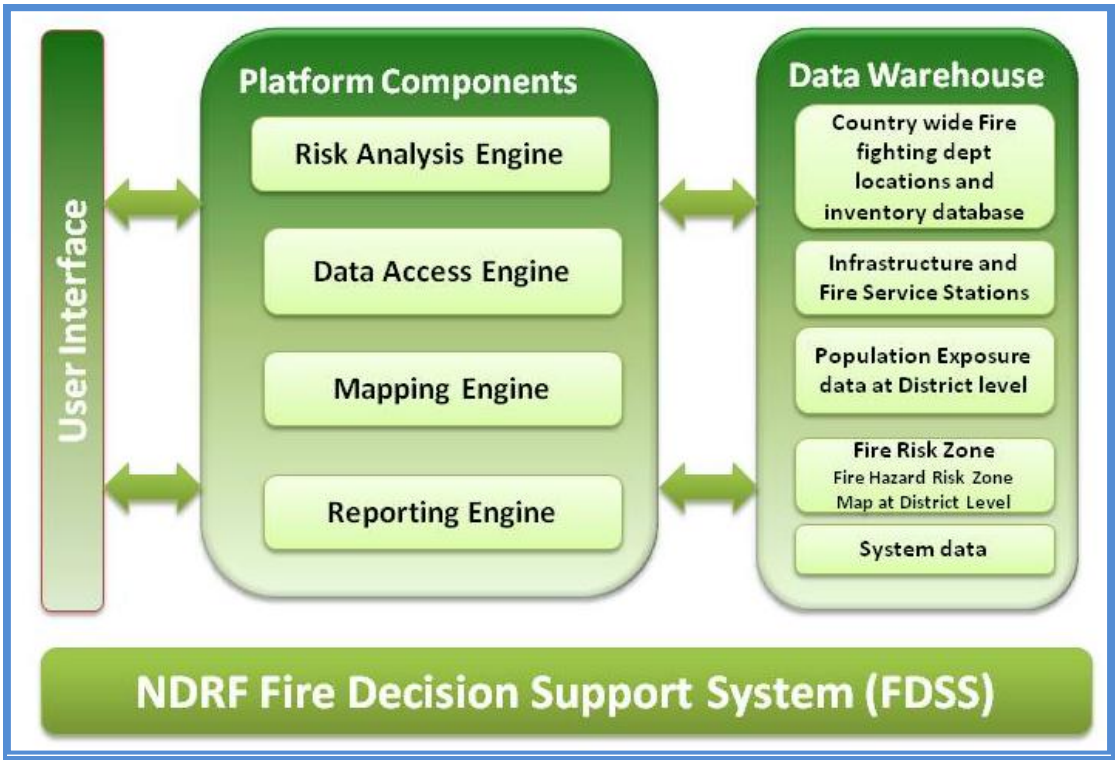


Figure 5-2 : High level design of FDSS

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/Pdf 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, fire fighting manpower, and 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

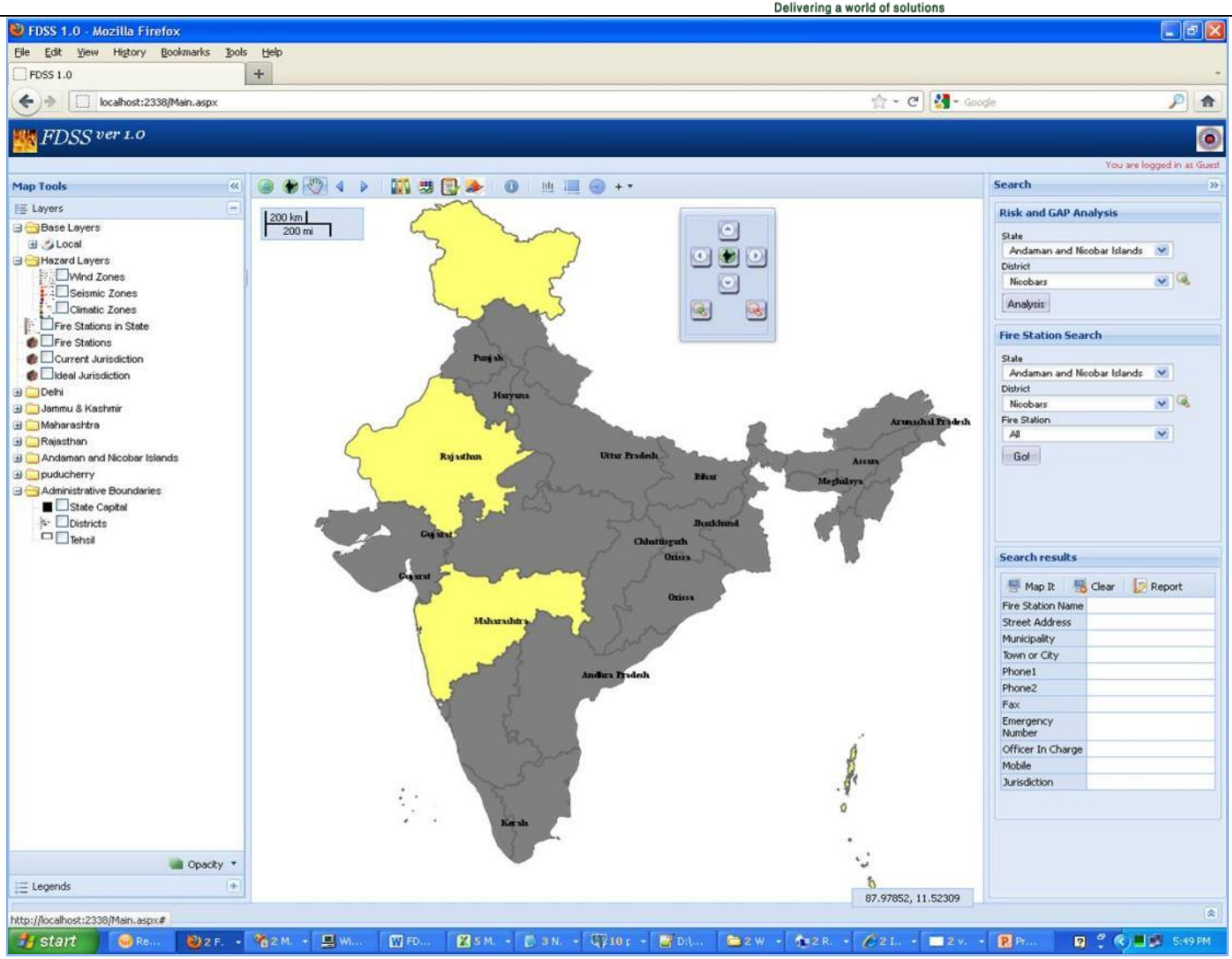


Figure 5-3 : User Interface for Base Analysis in FDSS. The example shows the States covered in the Pilot Phase of the study

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.

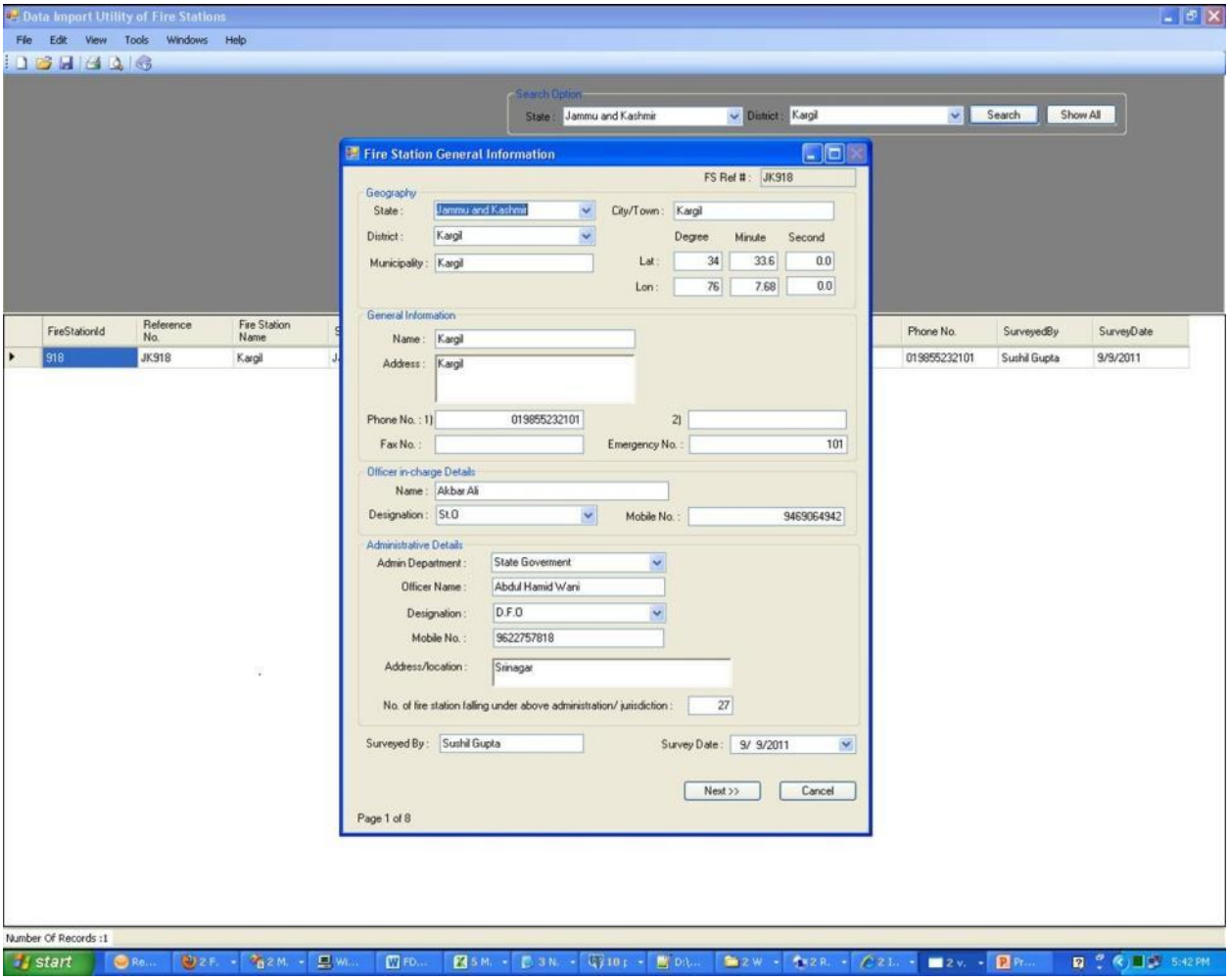


Figure 5-4 : System administration interface

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, equipment 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.

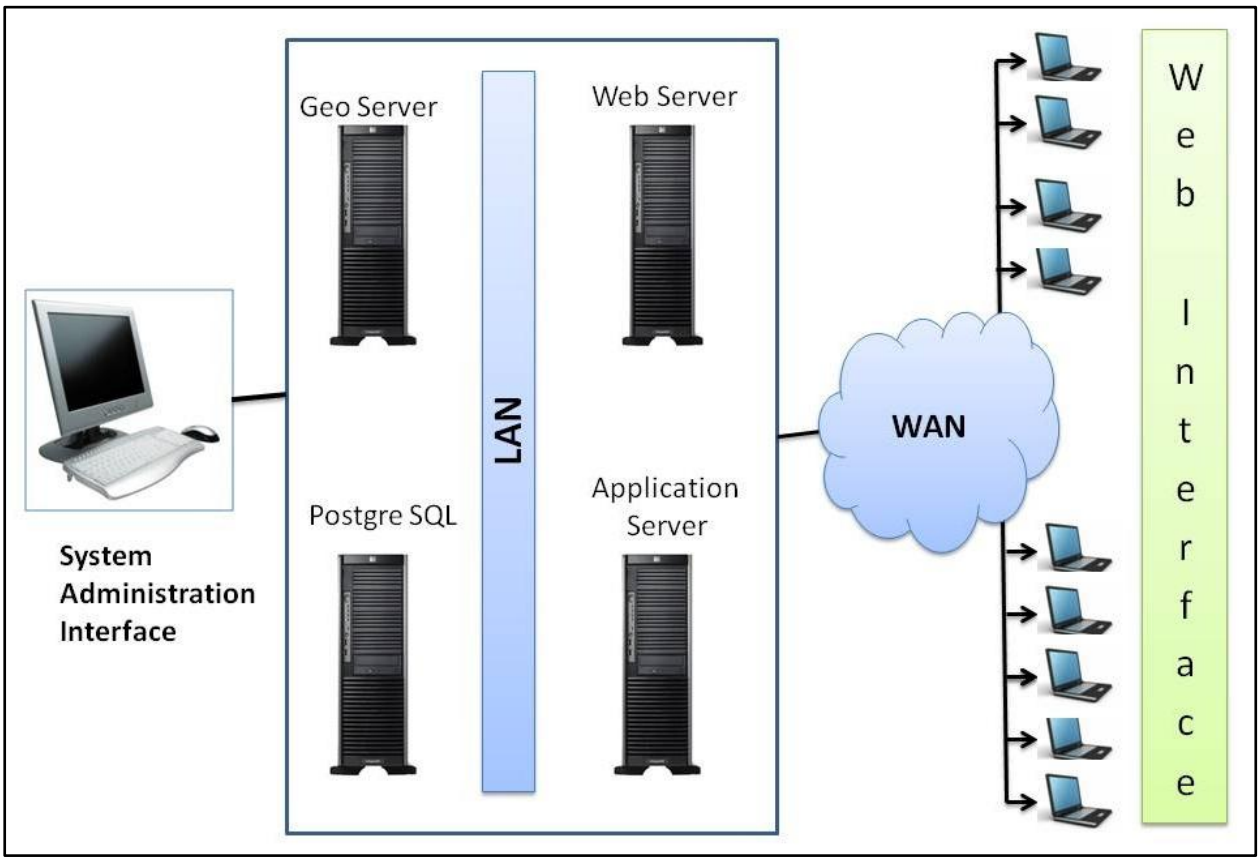


Figure 5-5 : FDSS - Systems Architecture

- 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 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 maps, 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 equipment 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 equipment 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 equipment, 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 are

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

The outcomes of the above analyses have 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 equipment), 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 are 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 technological enhancement. However, the tool has 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 high rise 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 are 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 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 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 equipment
All Fire prevention equipment 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 Station/ Fire Post	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, Tindal.*

Recruitment Rules for entry level in organization 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 Equipment

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 Equipment

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
2010-11																	
2009-10																	
2008-09																	
2007-06																	
2006-07																	

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				

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
2008-09				
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.

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-8, 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 temporarily operational from borrowed/ rented building of ……(Private, Municipality, 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 Kaccha masonry walls with Tin Roof Kaccha Tin shade Temp Porta- cabins
Kaccha wooden structure with tin Roof Others kaccha type specify ……

Mixed (kaccha and pacca) (in case different parts of Fire Stations has different structure types)

If whole station building is not a permanent (Pacca) building structure and need new partial 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/ Garage- 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				
6.	Fire Man (FM)				

S. no.	Designation	Total Number of Permanent Working Staff	Duty pattern/ Shifts (hrs)	Vacant, but sanctioned posts	Numbers of temporary/ contract persons (if any)
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, 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
	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 /	Minor/

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)
								GPS	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
	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

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)
	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	

Equipment	Number/ Quantity	Equipment	Number/ Quantity
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	
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																
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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 NCT of Delhi

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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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12 Andaman & 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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23Karnataka State

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24Madhya Pradesh State

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25Andhra Pradesh State

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26Bihar State

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27Kerala State

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28Lakshadweep UT

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29 Tamil Nadu State

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30Arunachal Pradesh State

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31Assam State

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32Chhattisgarh State

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33Jharkhand State

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34Manipur State

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35Meghalaya State

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36Mizoram State

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37Nagaland State

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38 Orissa State

38.1 Introduction

Orissa is located on the east coast of India. It used to be known as *Orissa*, but the name was officially changed in November 2011. The State covers an area of nearly 155,707 sq km (http://www.odisha.gov.in/portal/default.asp). Its exact geographical location is between 17° 49' N and 22° 34' N latitude, 81° 27' E, and 87° 29' E longitude. The State forms about 4.7% of India's landmass and has a 450 km long coastline. Orissa is surrounded by Bay of Bengal in the southeast, Jharkhand in the north, Andhra Pradesh in the south and Madhya Pradesh in the west.

The Chota Nagpur plateau occupies the western and northern portions of the State, while along the coast are fertile alluvial plains and the valleys of the Mahanadi, Brahmani, and Baitarani rivers, which empty into the Bay of Bengal. These alluvial plains are home to intensive rice cultivation. The highest mountain peak in the State is Deomali (1,672 m), which is situated in Koraput district in southern Orissa. It is also the tallest peak of the Eastern Ghats. It is part of the Chandragiri-Pottangi mountain system. Orissa enjoys a typical tropical climate, mainly because of its proximity to the sea. Here, summers are very hot and monsoons, very obliging. The average annual rainfall in the State is about 200 cm. Orissa experiences three main seasons, namely summer season, winter season and monsoons. Though the weather in the State remains pleasant throughout the year, the best time to explore its beauty is the winter season, which lasts from October to February.

Although much of Orissa's forest cover has been denuded lately, one of the greatest attractions of Orissa is its still vast expanses of unspoiled natural landscape that offer a protected yet natural habitat to the State’s incredible wildlife. There are many wildlife sanctuaries in Orissa. The Simlipal National Park Tiger Reserve is a huge expanse of lush green forest with waterfalls, inhabited by tigers, elephants, and other wildlife. The Bhitarkanika Wildlife Sanctuary has been protecting estuarine crocodiles since 1975.Chilka Lake, a brackish water coastal lake on the Bay of Bengal, south of the mouth of the Mahanadi River, is the largest coastal lake in India. It is protected by the Chilka Lake Bird Sanctuary, which harbors over 150 migratory and resident species of birds.

The economy of Orissa is a balanced mix of agricultural and industrial sectors. The Orissa economy has been boosted with the presence of modern infrastructural facilities. It was the first State in India to begin to privatize its electricity transmission and distribution businesses. The transportation system has been upgraded with well maintained road networks, an international airport at Bhubaneswar, major ports and rail network connecting all major cities of the country. The extensive telecom network in Orissa constitutes mostly of modern microwave systems and optical fibers. In the agricultural sector, the presence of fertile soils and favorable climate has aided Orissa to emerge as one of the leading agricultural States of the country. The State is also one of the major fish producing States.

The steel plants in Orissa are greatly responsible for the industrial boom that the State has witnessed in the recent past. The active presence of companies and organizations has resulted in the overall improvement of the industrial scenario of the State. The significance of small-scale industries like handloom and handicrafts cannot be overlooked as they contribute a considerable amount of revenue to the State's economy. Tourism in Orissa has grown considerably in recent years due to the various attractions of Orissa, ranging from wildlife reserves and beaches to temples and monuments and the arts and festivals.

Currently, Orissa Fire Service has 180 operational Fire Stations. In order to avoid accident like AMRI Kolkata, the State Fire Services needs to be strengthen by increasing number of Fire Stations as well as a fully dedicated trained “fire prevention wing” to create awareness and implementation of safety measurements. On an average, the 180 operational Fire Stations serve a population of more than two Lakhs per Fire Station in Orissa (Figure 38-2 and Table 38-2).

Figure 38-1: District map of Orissa

Table 38-1: Orissa Demography as per Census 2011

Orissa State			
No. of Districts	30		Percentage of Urban Population
No. of Sub-Districts	476		
No. of Towns	223		16.68
No of Villages	51,313		
Population			
	Total	**Rural**	**Urban**
Persons	41,947,358	34,951,234	6,996,124
Males	21,201,678	17,584,859	3,616,819
Females	20,745,680	17,366,375	3,379,305
Sex Ratio (females per 1,000 males)	978	988	934

Table 38-2 provides the district wise details, i.e., number of operational Fire Stations, geographical, population as per Census 2011, and on an average, each Fire Station in Orissa is serving more than two Lakhs population.

Figure 38-2: Location of operational Fire Stations in Orissa

Table 38-2: Summary of district level operational Fire Stations in Orissa

District name	Total Population (Census 2011)	Number of Fire Station operational	Average Population per Fire station
Anugul	1,271,703	7	181,672
Balangir	1,648,574	4	412,144
Baleshwar	2,317,419	10	231,742
Bargarh	1,478,833	4	369,708
Baudh	439,917	4	109,979
Bhadrak	1,506,522	7	215,217
Cuttack	2,618,708	13	201,439
Debagarh	312,164	2	156,082
Dhenkanal	1,192,948	10	119,295
Gajapati	575,880	4	143,970
Ganjam	3,520,151	14	251,439
Jagatsinghapur	1,136,604	4	284,151
Jajapur	1,826,275	7	260,896
Jharsuguda	579,499	3	193,166
Kalahandi	1,573,054	3	524,351
Kandhamal	731,952	4	182,988
Kendrapara	1,439,891	5	287,978
Kendujhar	1,802,777	9	200,309
Khordha	2,246,341	10	224,634
Koraput	1,376,934	4	344,234
Malkangiri	612,727	2	306,364
Mayurbhanj	2,513,895	10	251,390
Nabarangapur	1,218,762	4	304,691
Nayagarh	962,215	6	160,369
Nuapada	606,490	2	303,245
Puri	1,697,983	8	212,248
Rayagada	961,959	4	240,490
Sambalpur	1,044,410	6	174,068
Subarnapur	652,107	5	130,421
Sundargarh	2,080,664	5	416,133
Total	**41,947,358**	**180**	**233,041**

38.2 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 equipment 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.

38.3 Infrastructure Gap Analysis

38.3.1 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 38-3 shows district level summary of number of operational and new proposed Fire Stations with population covered within their ideal jurisdiction area.

Rural areas of Orissa 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 38-3. Figures 38-2 to 38-17 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 Orissa State are given in Table 38.38 and Table 38.39.

Table 38-3: District level number of operational and new Fire Stations in Orissa

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 Stations
Anugul	7	721,379	2	87,149	1	10
Balangir	4	245,928	1	19,991	9	14
Baleshwar	10	1,473,720	1	85,393	6	17
Bargarh	4	372,885	0	0	7	11
Baudh	4	575,736	0	0	0	4
Bhadrak	7	1,513,313	0	0	0	7
Cuttack	13	1,777,870	2	271,584	4	19
Debagarh	2	150,304	0	0	0	2
Dhenkanal	10	1,436,955	0	0	0	10
Gajapati	4	383,696	0	0	3	7
Ganjam	14	2,103,962	1	59,366	7	22
Jagatsinghapur	4	825,159	1	41,946	2	7
Jajapur	7	1,331,812	0	0	2	9
Jharsuguda	3	170,312	2	99,483	4	9
Kalahandi	3	333,578	1	26,164	8	12
Kandhamal	4	294,143	0	0	5	9
Kendrapara	5	811,067	0	0	2	7
Kendujhar	9	1,155,104	1	15,353	2	12
Khordha	10	1,478,098	3	367,816	1	14
Koraput	4	361,838	2	53,451	9	15
Malkangiri	2	138,585	0	0	6	8
Mayurbhanj	10	1,062,606	2	91,509	14	26
Nabarangapur	4	211,243	0	0	5	9
Nayagarh	6	780,358	0	0	0	6
Nuapada	2	98,763	0	0	3	5
Puri	8	1,175,948	0	0	5	13
Rayagada	4	455,491	0	0	5	9
Sambalpur	6	531,521	1	13,839	4	11
Subarnapur	5	563,446	0	0	1	6
Sundargarh	5	723,560	5	422,315	11	21
Total	**180**	**23,258,380**	**25**	**1,655,359**	**126**	**331**

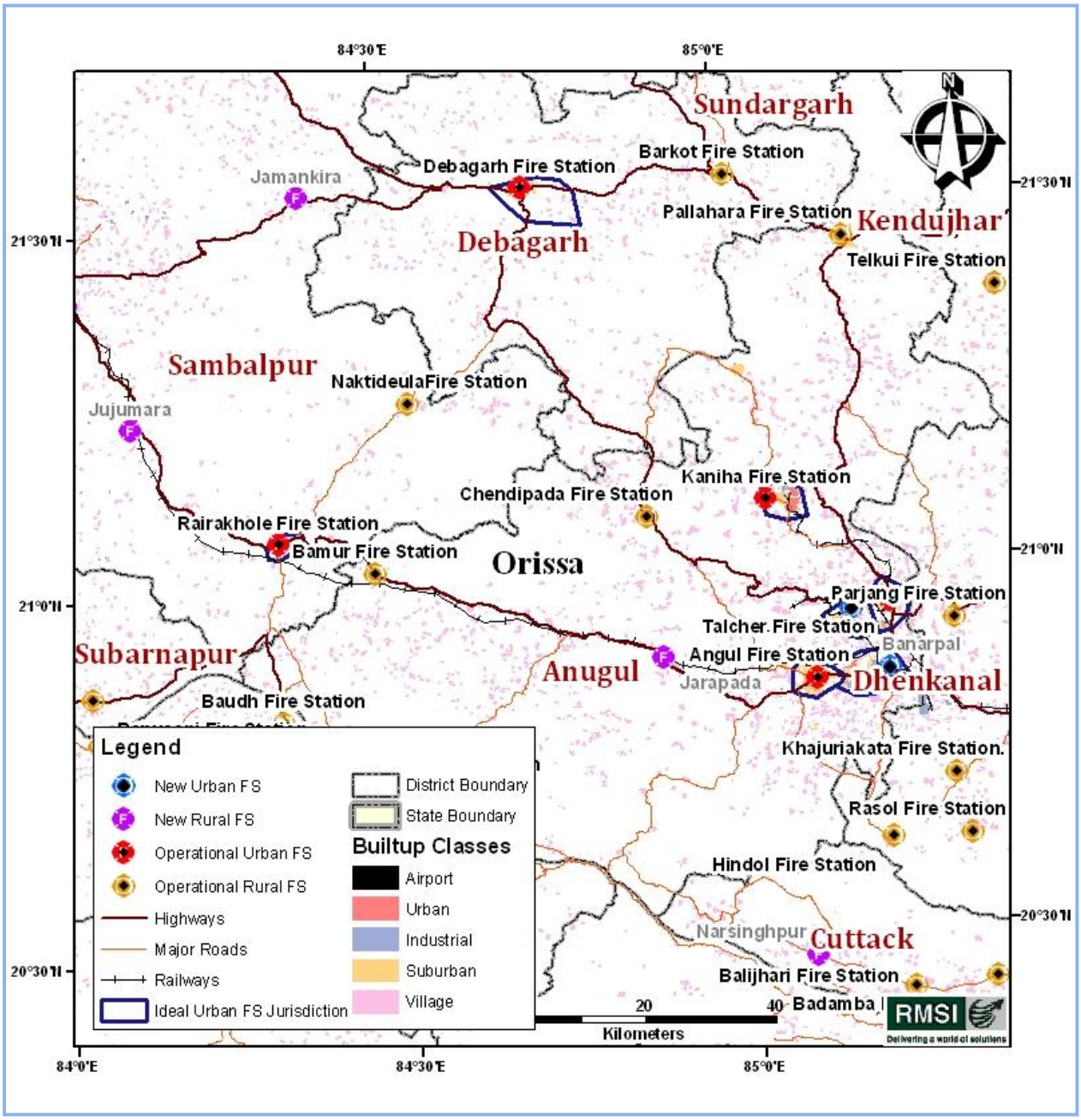

Figure 38-3: Fire stations gap analysis for Anugul rural area

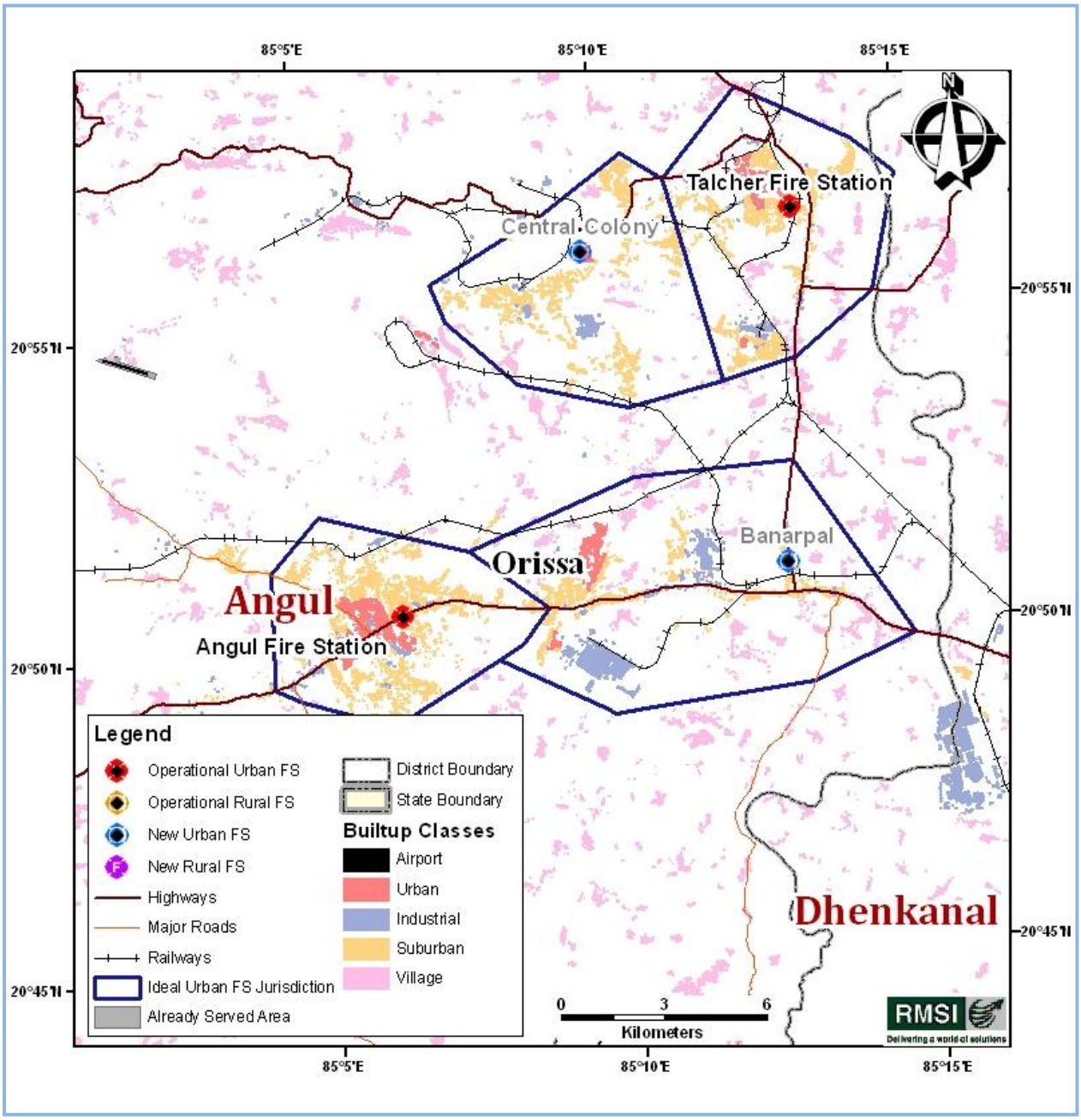

Figure 38-4: Fire stations gap analysis for Anugul urban area

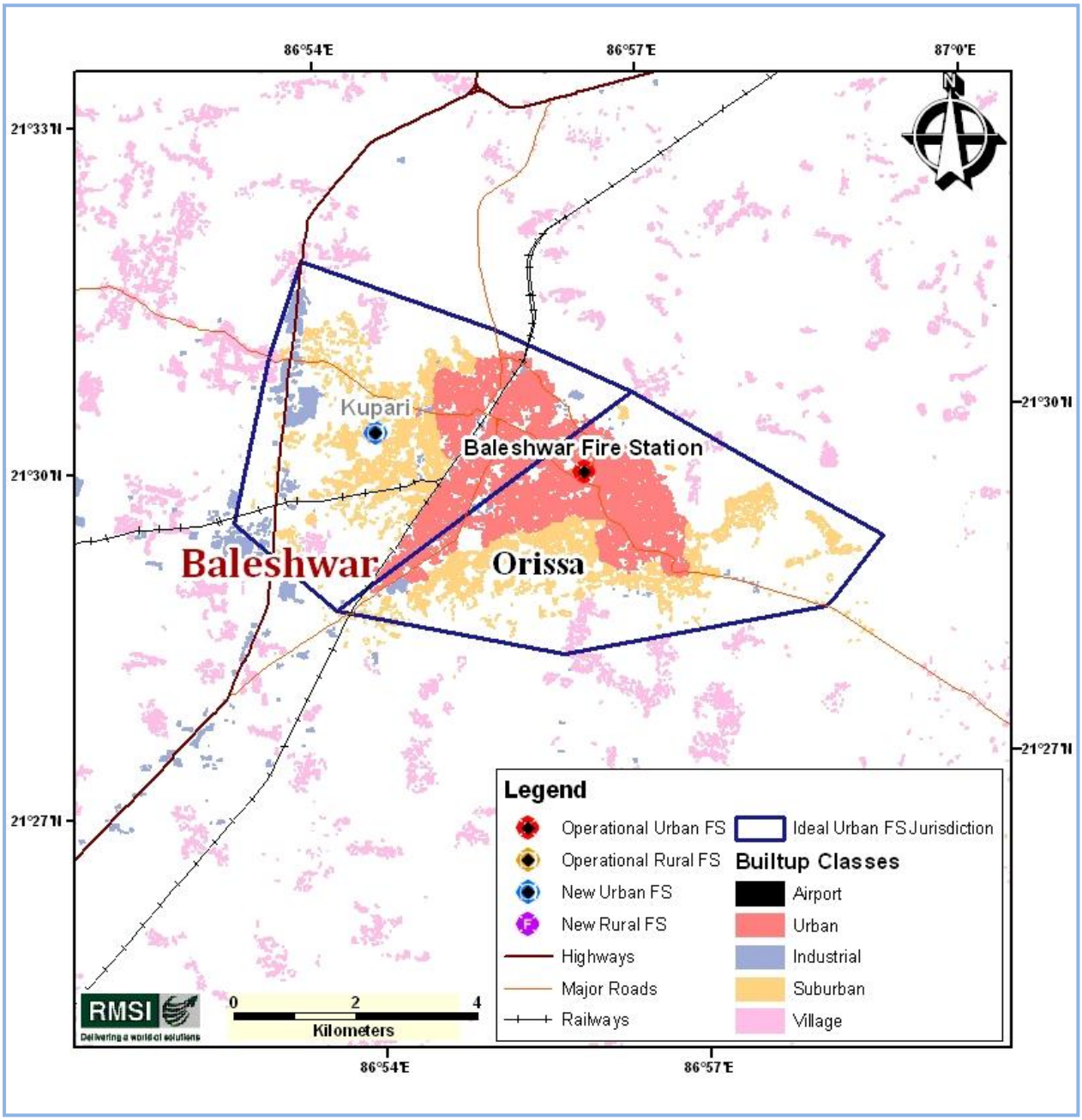

Figure 38-5: Fire stations gap analysis for Baleshwar urban areas

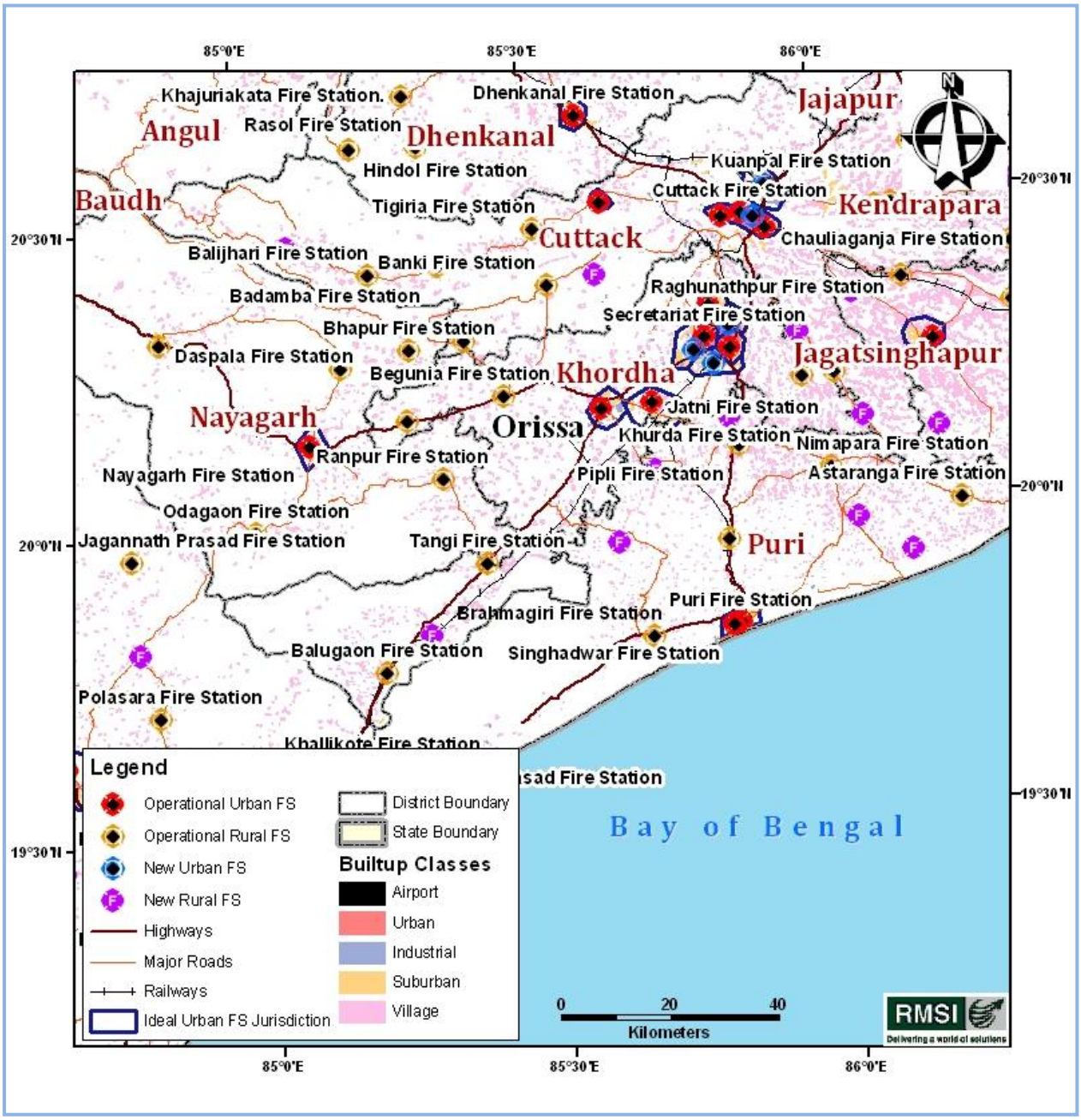

Figure 38-6: Fire stations gap analysis for Puri, Khordha areas

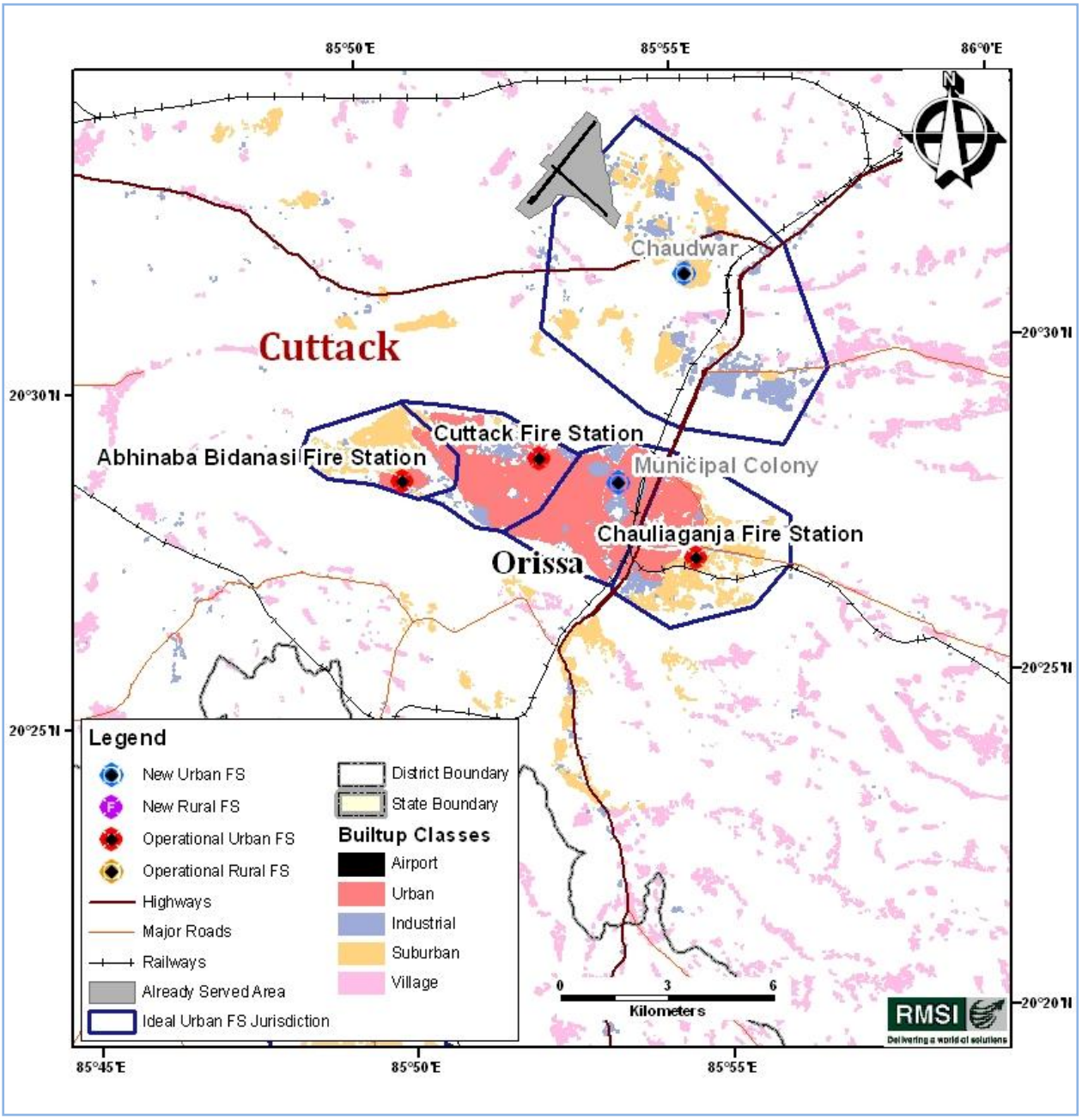

Figure 38-7: Fire stations gap analysis for Cuttuck urban areas

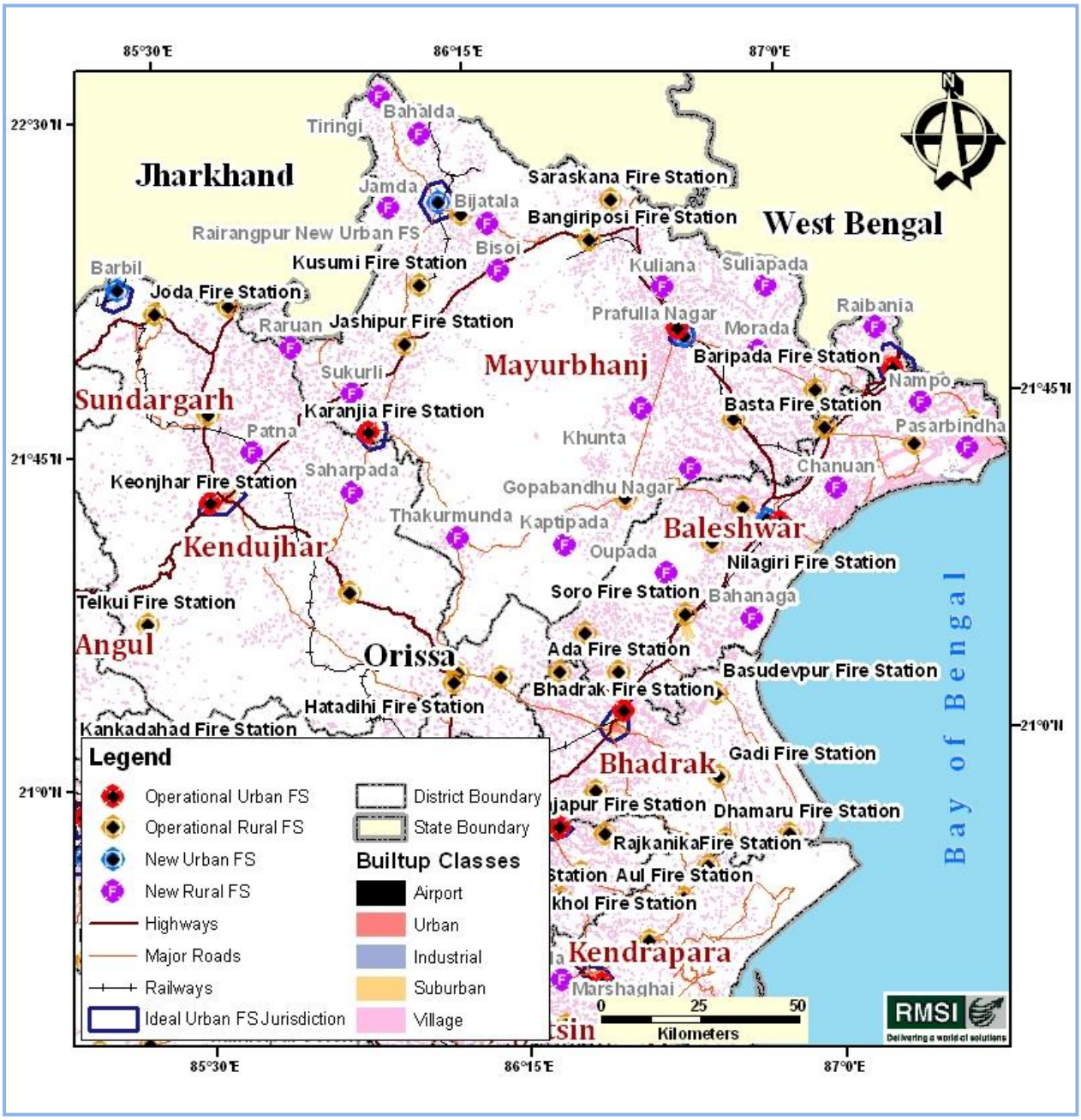

Figure 38-8: Fire stations gap analysis for East Orissa areas

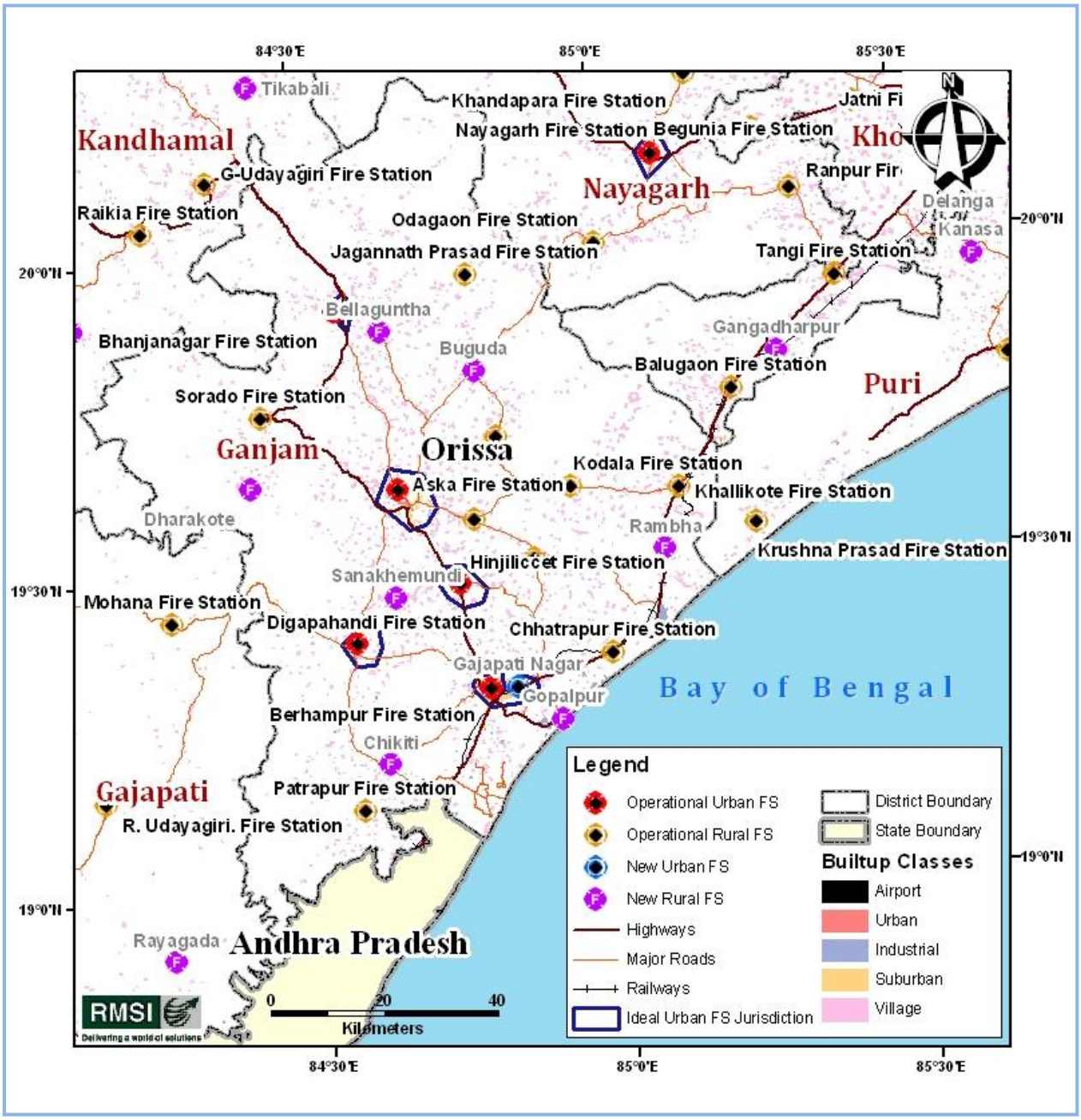

Figure 38-9: Fire stations gap analysis for Ganjam areas

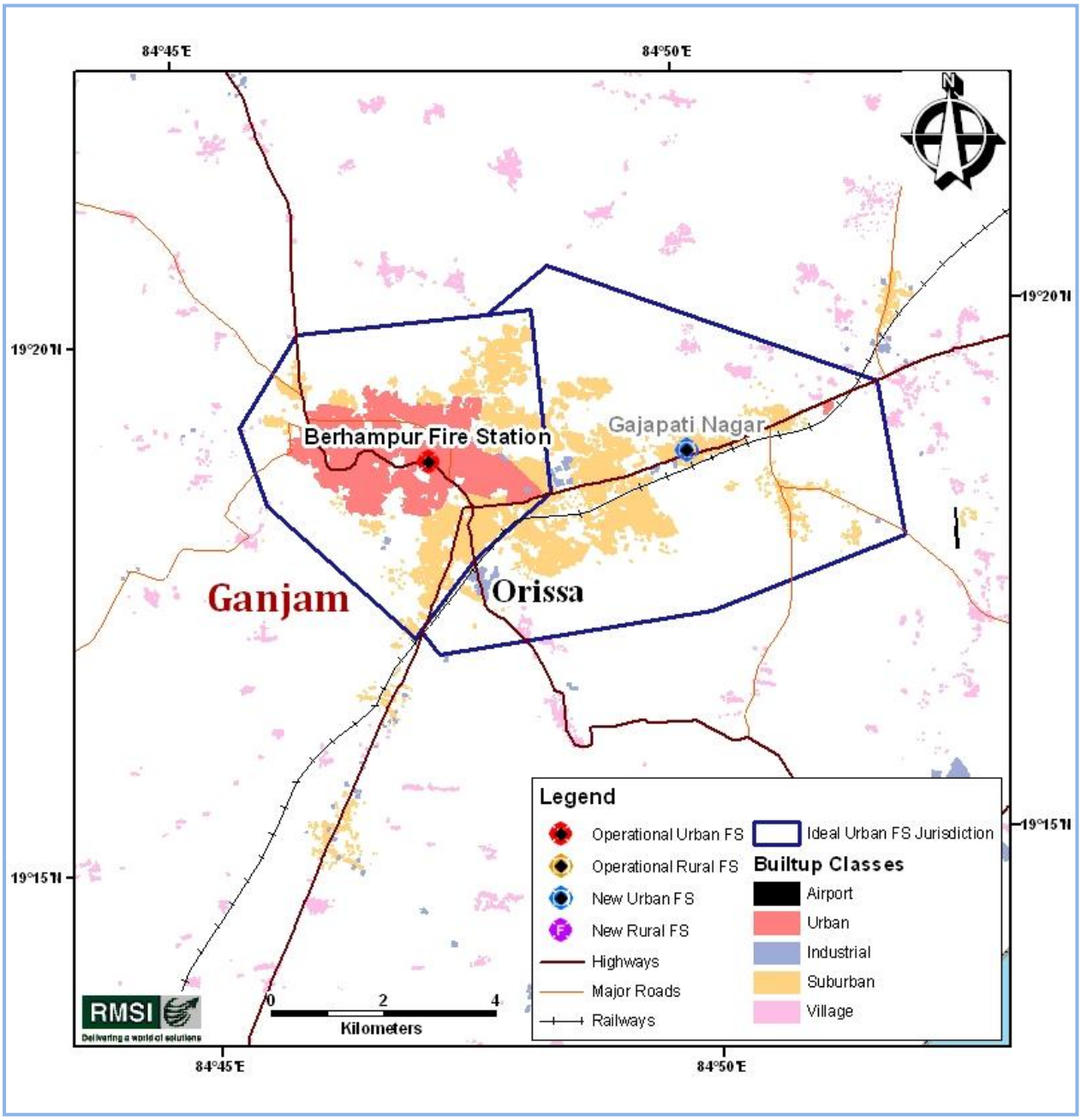

Figure 38-10: Fire stations gap analysis for Ganjam urban areas

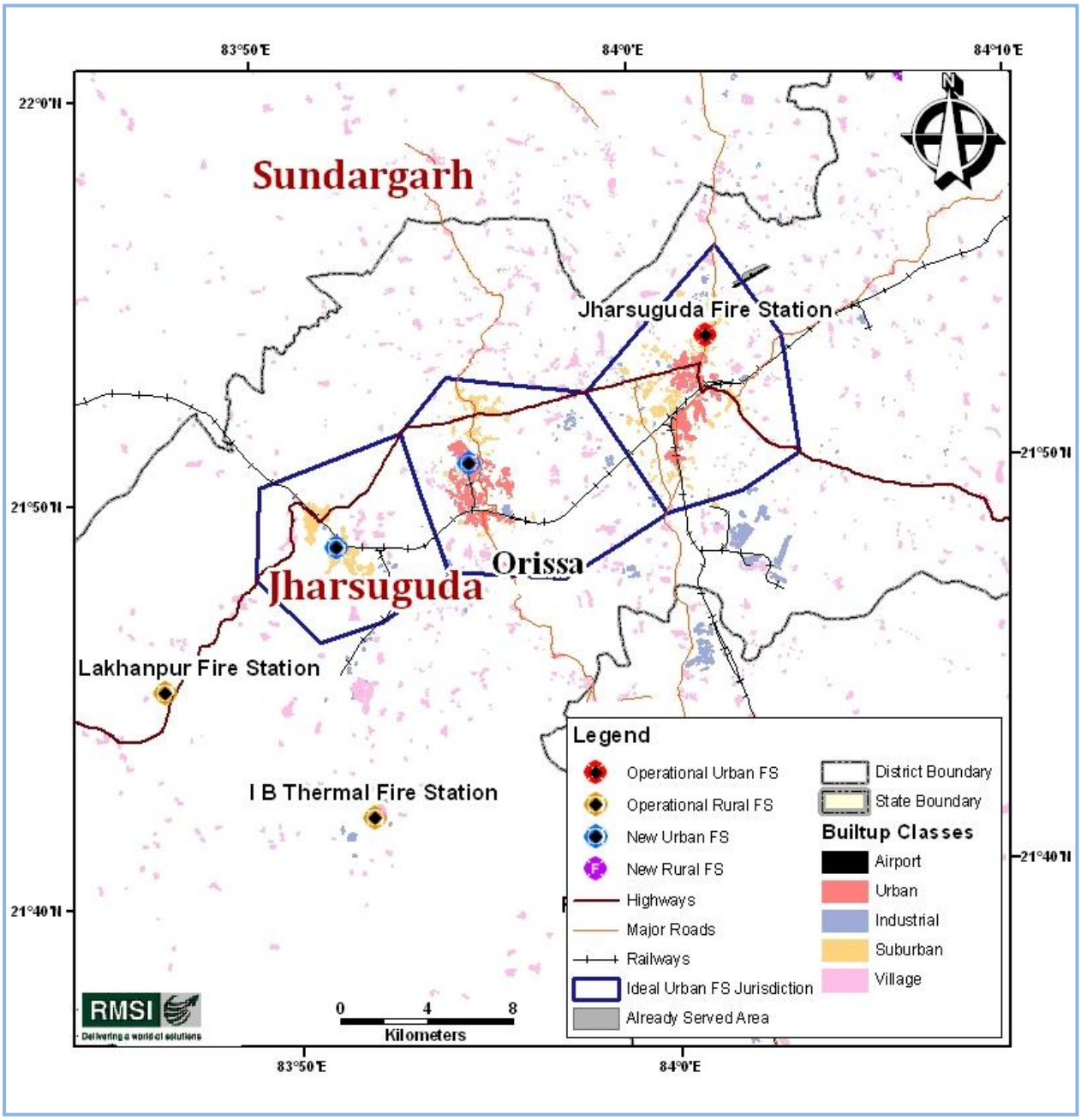

Figure 38-11: Fire stations gap analysis for Jharsugda areas

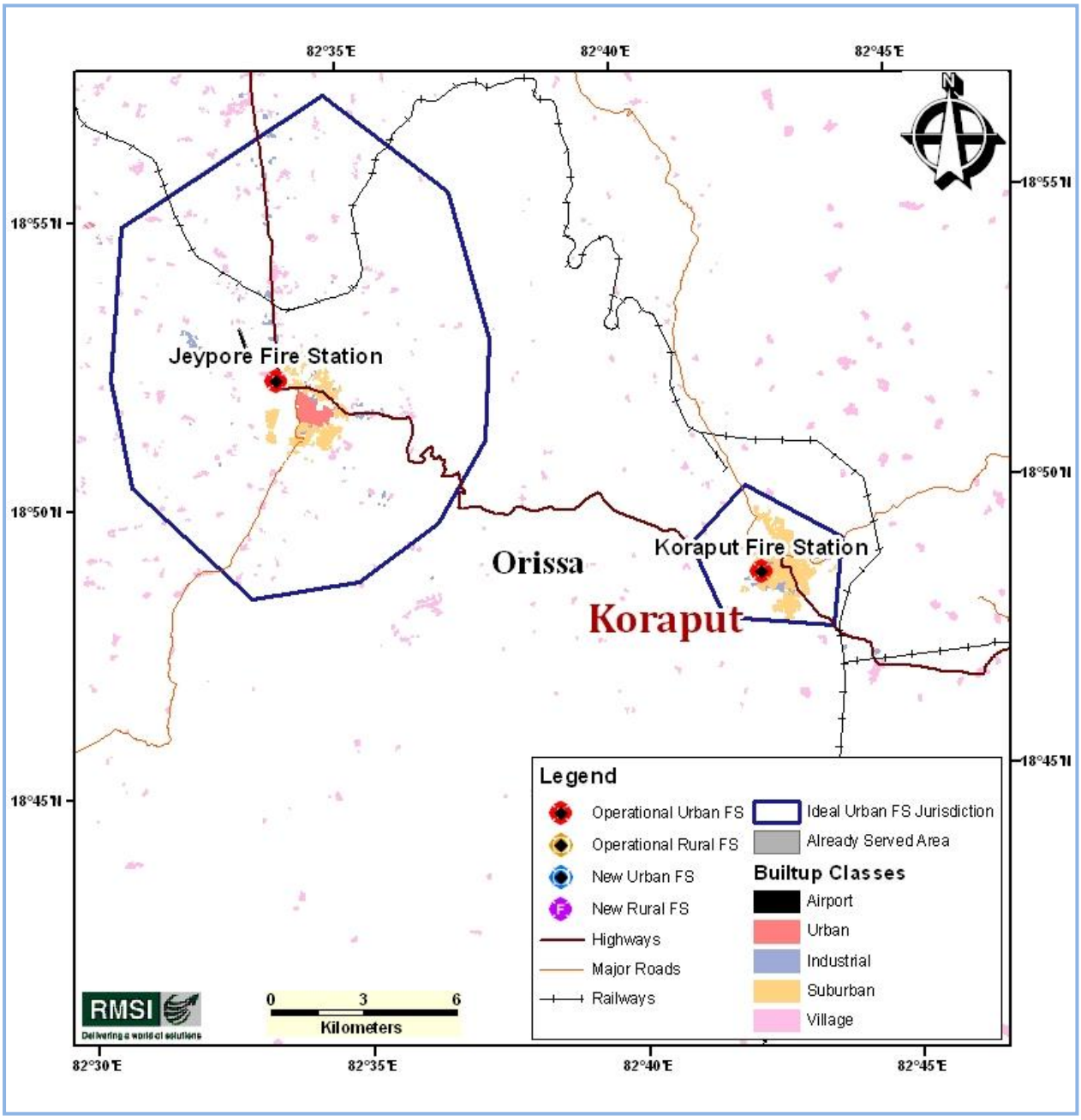

Figure 38-12: Fire stations gap analysis for Koraput urban areas

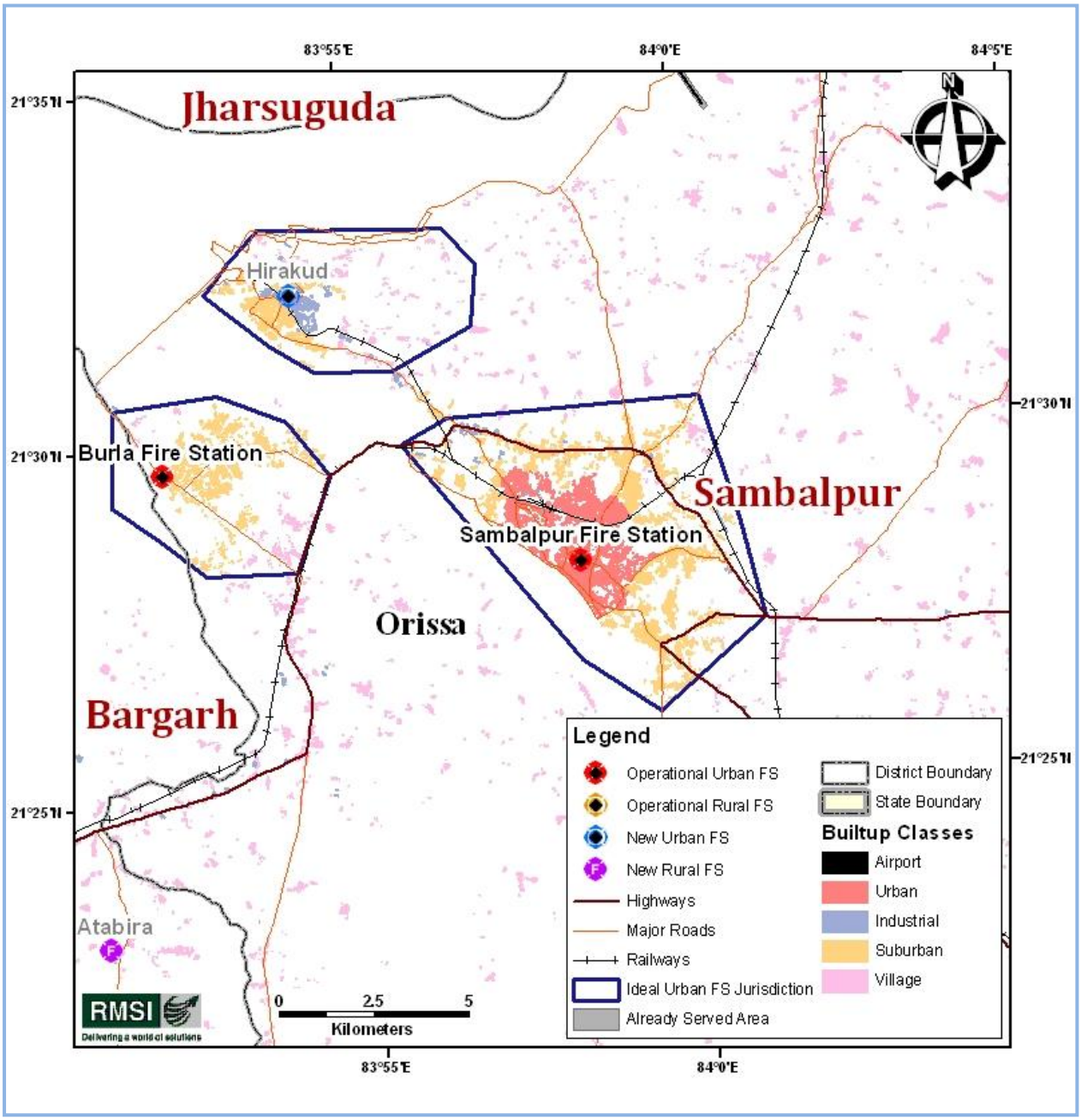

Figure 38-13: Fire stations gap analysis for Sambalpur urban areas

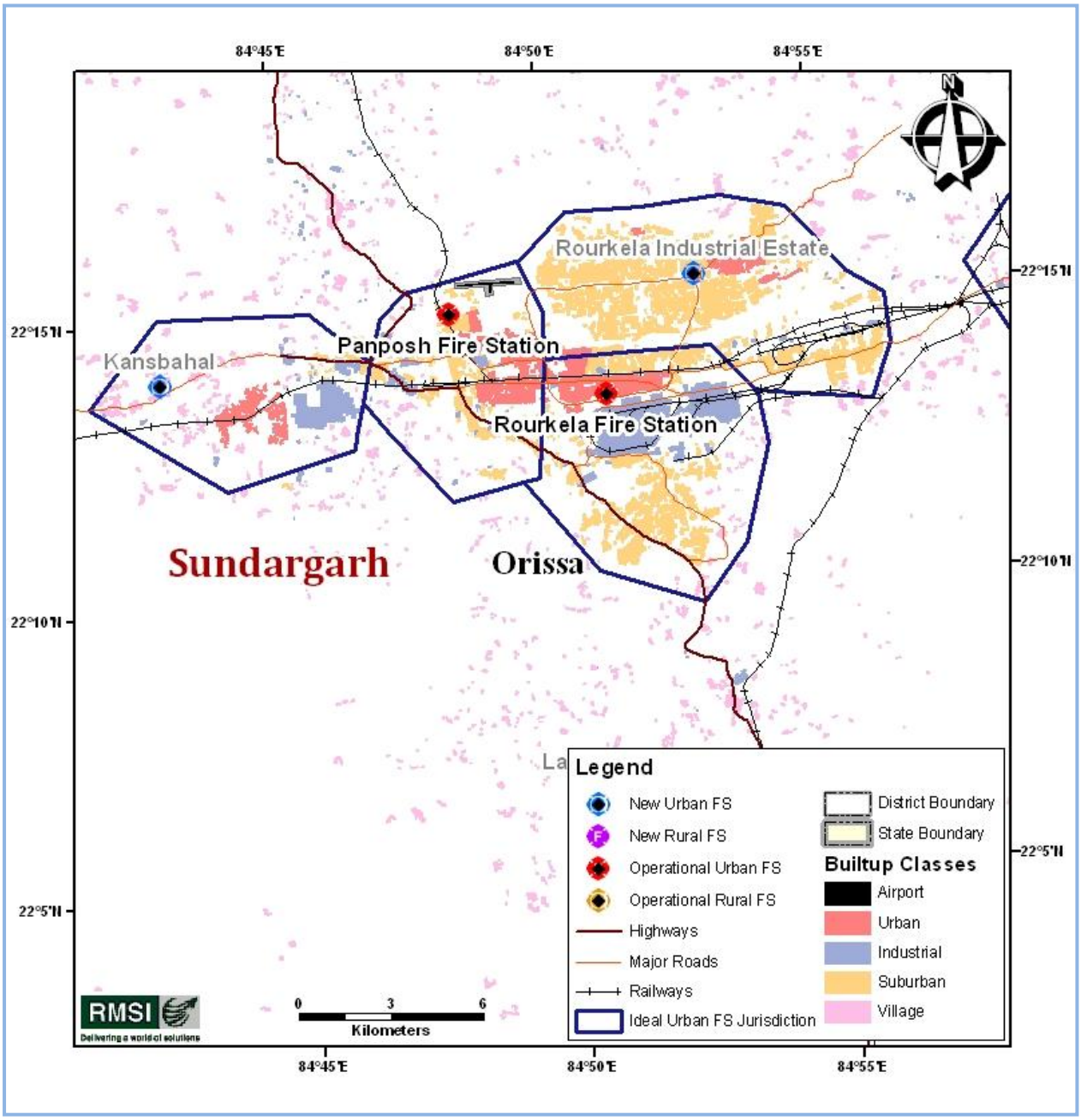

Figure 38-14: Fire stations gap analysis for Sundar garh urban areas

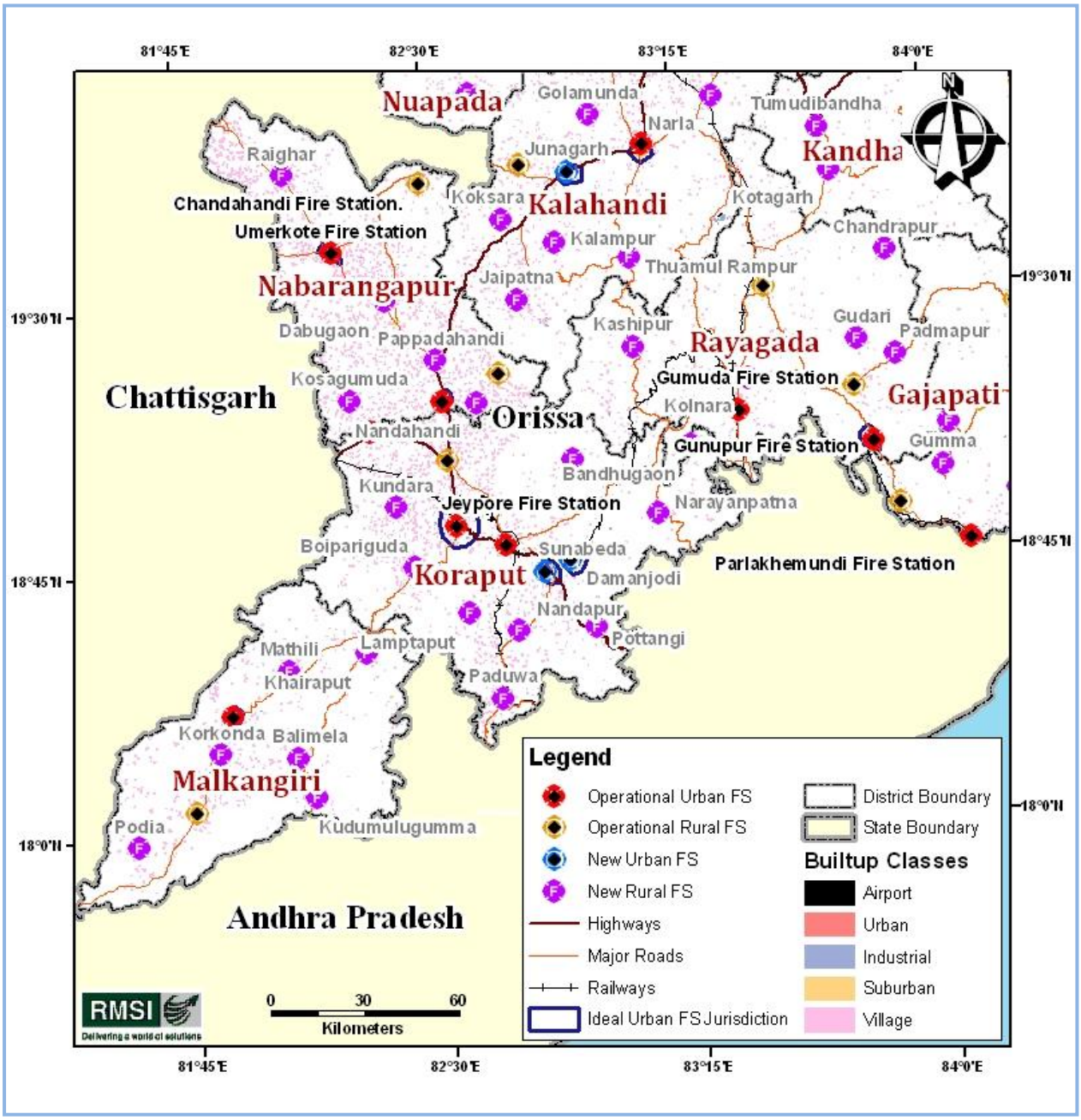

Figure 38-15: Fire stations gap analysis for South Orissa areas

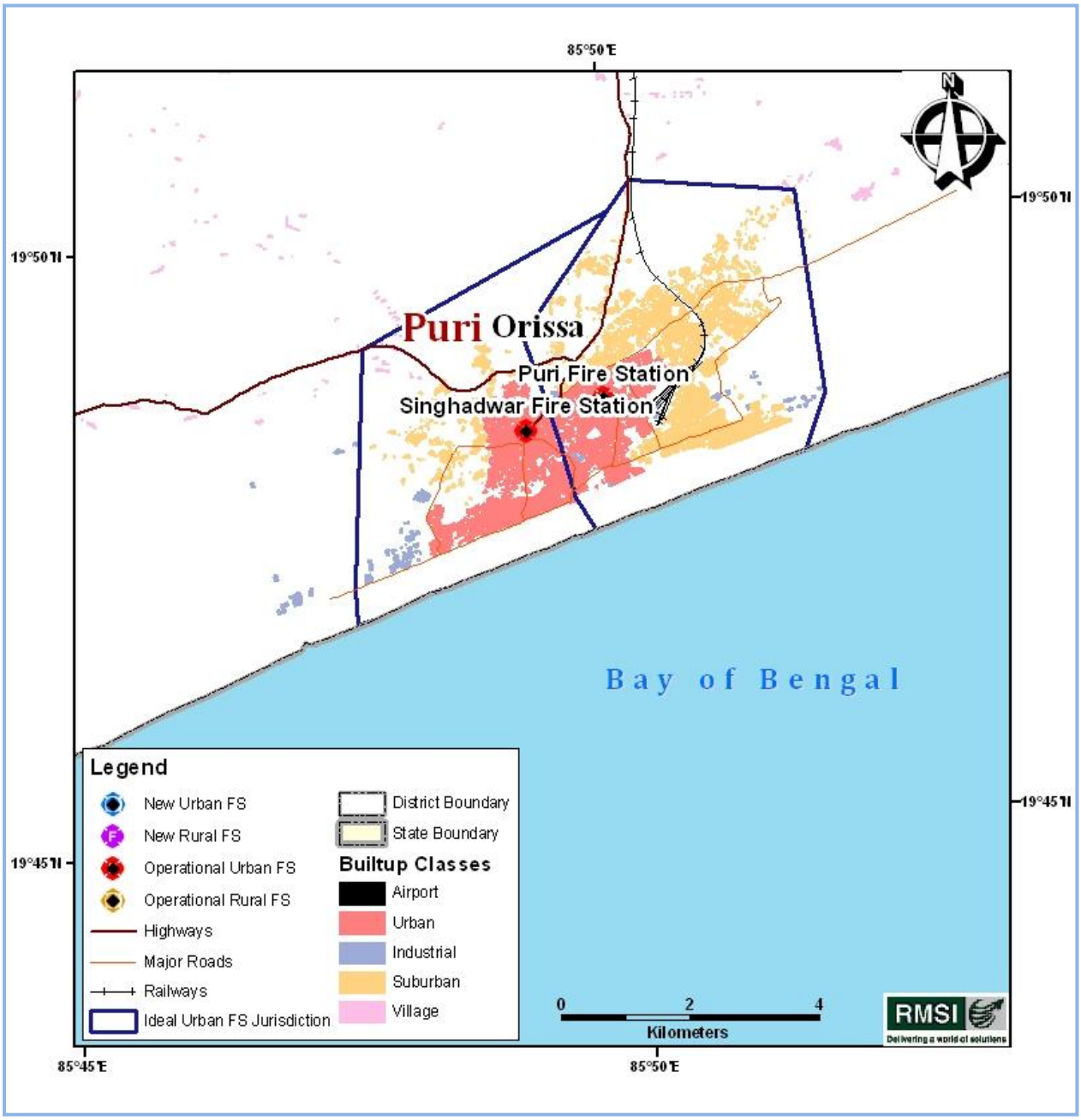

Figure 38-16: Fire stations gap analysis for Puri urban areas

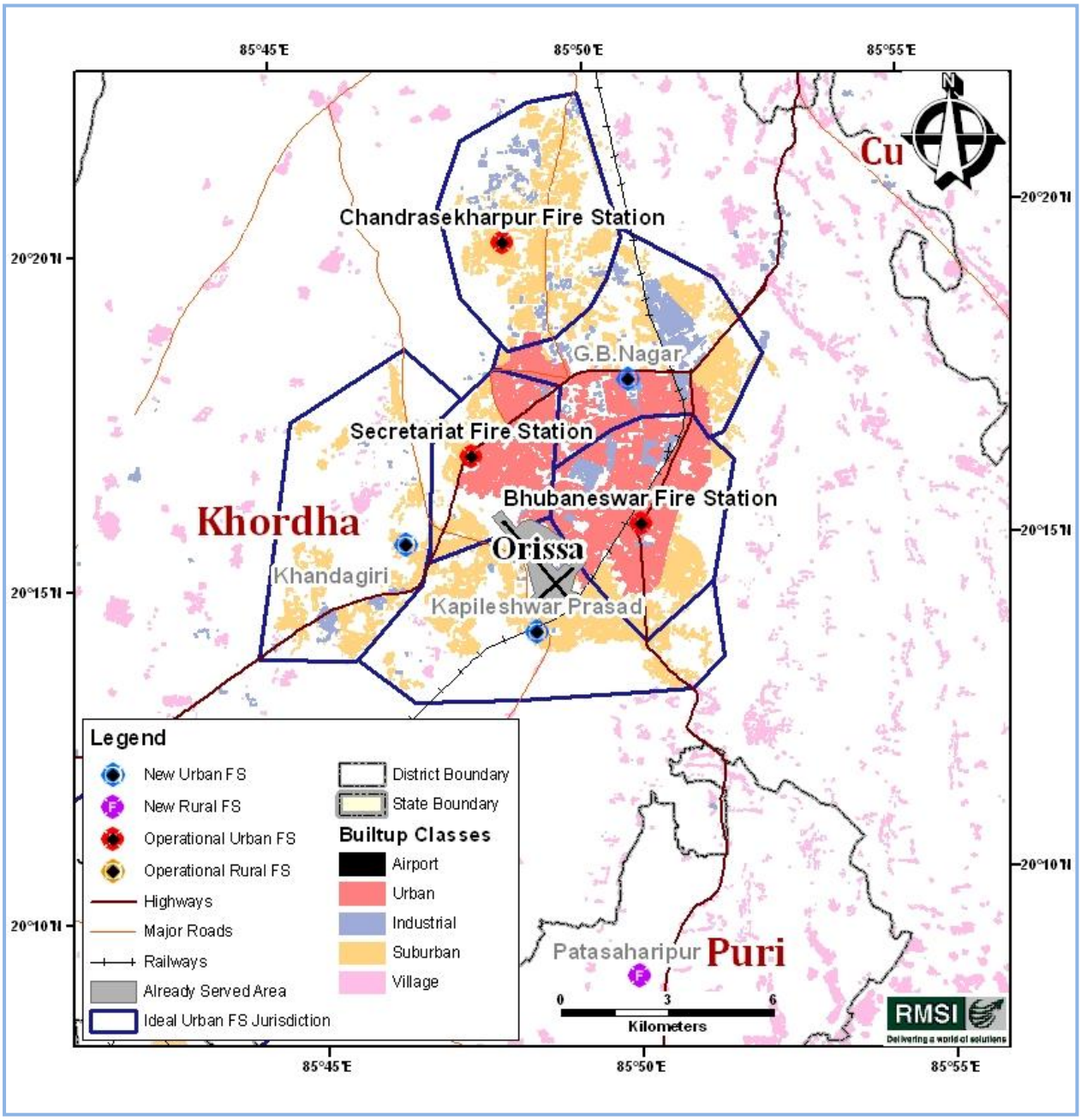

Figure 38-17: Fire stations gap analysis for Khordha urban areas

38.3.2 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, equipment 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 population density above 10,000 persons/sq km with 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 equipment 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 equipment, 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 or minimum one per district.
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 or minimum one per district
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 or minimum one per district
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 or minimum one per district
16. **Inflatable Lighting Tower:** One per Fire Station
17. **High Capacity LED Torch Light:** One piece per vehicle

Note: *Other smaller equipment 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 equipment 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 Aug- 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 38-4 to 38-7. Similarly, gap analysis for specialized fire equipment is shown in Tables 38-8 to 38-15.

Table 38-4: List of operational fire fighting vehicles available with Orissa Fire Services (As on August, 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 Vehicles
Anugul	7	2,193,944	11	1	0	1	0	0	0	0	0	0	1	0	1	0	15
Balangir	5	323,707	6	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Baleshwar	10	2,828,914	12	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Bargarh	4	345,104	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Baudh	4	520,980	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Bhadrak	7	1,180,145	10	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Cuttack	13	3,620,035	17	1	1	0	0	0	0	0	0	1	1	0	1	0	22
Debagarh	2	185,702	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Dhenkanal	10	840,110	12	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Gajapati	4	455,243	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Ganjam	14	2,548,311	19	0	0	0	0	0	0	0	0	1	0	0	0	0	20
Jagatsinghapur	4	582,134	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Jajapur	7	1,168,950	10	0	0	1	0	0	0	0	0	0	0	0	0	0	11
Jharsuguda	3	132,898	4	0	1	0	0	0	0	0	0	0	0	0	0	0	5
Kalahandi	3	645,315	4	0	0	0	1	0	0	0	0	0	0	0	0	0	5
Kandhamal	4	40,095	6	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Kendrapara	5	80,485	5	1	0	0	0	0	0	0	0	0	0	0	0	0	6
Kendujhar	9	759,934	12	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Khordha	10	1,872,239	20	1	0	0	2	0	0	0	0	1	0	0	1	0	25
Koraput	4	361,838	5	0	0	1	0	0	0	0	0	0	0	0	1	0	7
Malkangiri	2	138,585	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Mayurbhanj	10	394,166	13	0	0	0	0	0	0	0	0	0	0	0	0	0	13
Nabarangapur	4	74,599	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Nayagarh	6	44,447	10	0	0	0	0	0	0	0	0	0	0	0	0	0	10

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 Vehicles
Nuapada	2	98,763	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Puri	8	303,071	10	1	0	1	0	0	0	0	0	1	1	0	0	0	14
Rayagada	4	299,772	4	0	0	0	0	0	0	0	0	1	0	0	0	0	5
Sambalpur	6	512,727	7	1	0	0	0	0	0	0	0	1	1	0	2	0	12
Subarnapur	4	485,667	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Sundargarh	5	356,201	5	1	0	3	0	0	0	0	0	1	0	0	0	0	10
Total	**180**	**23,258,380**	**243**	**7**	**2**	**7**	**3**	**0**	**0**	**0**	**0**	**7**	**4**	**0**	**6**	**0**	**279**

Table 38-5: 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 Vehicles
Anugul	7	2,193,944	-1	2	2	1	0	1	1	1	0	4	3	0	0	1	15
Balangir	5	323,707	0	0	0	1	0	1	2	1	0	2	2	0	0	2	11
Baleshwar	10	2,828,914	7	5	3	1	1	1	1	1	0	9	9	0	0	1	39
Bargarh	4	345,104	-1	1	2	1	0	1	2	1	0	2	2	0	0	1	12
Baudh	4	520,980	2	3	1	1	0	1	1	1	0	4	4	0	0	1	19
Bhadrak	7	1,180,145	8	7	5	1	1	1	1	0	0	7	7	0	0	1	39
Cuttack	13	3,620,035	7	8	3	1	2	1	2	1	0	11	11	0	0	1	48
Debagarh	2	185,702	0	1	0	1	0	1	1	1	0	2	2	0	0	1	10
Dhenkanal	10	840,110	6	5	4	1	0	1	1	1	0	9	9	0	0	1	38
Gajapati	4	455,243	1	2	0	1	0	1	1	1	0	4	4	0	0	1	16
Ganjam	14	2,548,311	8	9	6	1	1	1	3	1	0	9	10	0	0	2	51

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 Vehicles
Jagatsinghapur	4	582,134	2	5	2	1	0	1	1	1	0	4	4	0	0	1	22
Jajapur	7	1,168,950	5	7	3	1	0	1	3	2	0	6	6	0	0	1	35
Jharsuguda	3	132,898	-1	0	0	1	0	1	1	1	0	3	3	0	0	1	10
Kalahandi	3	645,315	1	1	1	1	0	1	2	1	0	2	2	0	0	1	13
Kandhamal	4	40,095	-1	0	0	1	0	1	1	1	0	4	4	0	0	1	12
Kendrapara	5	80,485	4	3	1	1	0	1	1	1	0	5	5	0	0	1	23
Kendujhar	9	759,934	2	5	3	1	0	1	1	1	0	9	9	0	0	1	33
Khordha	10	1,872,239	0	5	5	2	1	2	2	1	0	6	7	0	0	1	32
Koraput	4	361,838	2	2	1	0	1	1	1	1	0	2	2	0	0	1	14
Malkangiri	2	138,585	-1	0	0	1	0	1	1	1	0	2	2	0	0	1	8
Mayurbhanj	10	394,166	2	3	2	1	1	1	2	1	0	9	9	0	0	1	32
Nabarangapur	4	74,599	0	0	0	1	0	1	1	1	0	3	3	0	0	1	11
Nayagarh	6	44,447	-1	3	1	1	0	1	1	1	0	6	6	0	0	1	20
Nuapada	2	98,763	0	0	0	1	0	1	1	1	0	1	1	0	0	1	7
Puri	8	303,071	6	5	3	0	1	1	2	1	0	6	6	0	0	1	32
Rayagada	4	299,772	2	2	2	1	0	1	1	1	0	2	3	0	0	1	16
Sambalpur	6	512,727	3	1	1	1	1	1	1	1	0	2	2	0	0	1	15
Subarnapur	4	485,667	0	2	0	1	0	1	1	1	0	4	4	0	0	1	15
Sundargarh	5	356,201	6	2	2	-1	1	1	1	1	0	3	4	0	0	1	21
Total	**180**	**23,258,380**	**68**	**89**	**53**	**27**	**11**	**31**	**41**	**30**	**0**	**142**	**145**	**0**	**0**	**32**	**669**

Table 38-6: 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
Anugul	9	808,528	1	2	2	1	0	2	2	1	0	4	3	0	0	1	19
Balangir	6	343,698	1	0	0	1	0	1	2	1	0	2	2	0	0	2	12
Baleshwar	11	1,559,113	8	5	4	1	1	2	2	1	0	9	9	0	0	2	44
Bargarh	4	372,885	-1	1	2	1	0	1	2	1	0	2	2	0	0	1	12
Baudh	4	575,736	2	3	1	1	0	1	1	1	0	4	4	0	0	1	19
Bhadrak	7	1,513,313	8	7	5	1	1	1	1	0	0	7	7	0	0	1	39
Cuttack	15	2,049,454	10	10	4	1	2	2	3	1	0	12	12	0	0	2	59
Debagarh	2	150,304	0	1	0	1	0	1	1	1	0	2	2	0	0	1	10
Dhenkanal	10	1,436,955	6	5	4	1	0	1	1	1	0	9	9	0	0	1	38
Gajapati	4	383,696	1	2	0	1	0	1	1	1	0	4	4	0	0	1	16
Ganjam	15	2,163,328	9	9	6	1	1	1	3	1	0	9	10	0	0	2	52
Jagatsinghapur	5	867,105	3	5	2	1	0	1	1	1	0	4	4	0	0	1	23
Jajapur	7	1,331,812	5	7	3	1	0	1	3	2	0	6	6	0	0	1	35
Jharsuguda	5	269,795	1	0	0	1	0	1	1	1	0	3	3	0	0	1	12
Kalahandi	4	359,742	2	1	1	1	0	1	2	1	0	2	2	0	0	1	14
Kandhamal	4	294,143	-1	0	0	1	0	1	1	1	0	4	4	0	0	1	12
Kendrapara	5	811,067	4	3	1	1	0	1	1	1	0	5	5	0	0	1	23
Kendujhar	10	1,170,457	3	5	3	1	0	1	1	1	0	9	9	0	0	1	34
Khordha	13	1,845,914	4	8	7	2	1	2	3	1	0	6	7	0	0	2	43
Koraput	6	415,289	4	2	1	0	1	1	1	1	0	2	2	0	0	1	16
Malkangiri	2	138,585	-1	0	0	1	0	1	1	1	0	2	2	0	0	1	8
Mayurbhanj	12	1,154,115	4	3	2	1	1	1	2	1	0	9	9	0	0	1	34
Nabarangapur	4	211,243	0	0	0	1	0	1	1	1	0	3	3	0	0	1	11
Nayagarh	6	780,358	-1	3	1	1	0	1	1	1	0	6	6	0	0	1	20

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
Nuapada	2	98,763	0	0	0	1	0	1	1	1	0	1	1	0	0	1	7
Puri	8	1,175,948	6	5	3	0	1	1	2	1	0	6	6	0	0	1	32
Rayagada	4	455,491	2	2	2	1	0	1	1	1	0	2	3	0	0	1	16
Sambalpur	7	545,360	4	1	1	1	1	1	1	1	0	2	2	0	0	1	16
Subarnapur	4	485,667	0	2	0	1	0	1	1	1	0	4	4	0	0	1	15
Sundargarh	10	1,145,875	13	4	3	-1	1	1	1	1	0	3	4	0	0	1	31
Total	**205**	**24,913,739**	**97**	**96**	**58**	**27**	**11**	**34**	**45**	**30**	**0**	**143**	**146**	**0**	**0**	**35**	**722**

Table 38-7: 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
Anugul	1	198,329	2	1	1	0	0	0	0	0	0	1	1	0	0	0	6
Balangir	9	1,380,919	11	6	6	0	0	0	0	0	0	9	9	0	0	0	41
Baleshwar	6	825,962	8	4	3	0	0	0	0	0	0	6	6	0	0	0	27
Bargarh	7	1,331,563	12	7	6	0	0	0	1	0	0	7	7	0	0	0	40
Baudh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bhadrak	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuttack	4	815,405	8	4	4	0	0	0	0	0	0	4	4	0	0	0	24
Debagarh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dhenkanal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gajapati	3	174,178	3	0	1	0	0	0	0	0	0	3	3	0	0	0	10
Ganjam	7	1,275,579	12	6	4	0	0	0	2	0	0	7	7	0	0	0	38

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
Jagatsinghapur	2	505,670	5	4	1	0	0	0	0	0	0	2	2	0	0	0	14
Jajapur	2	527,705	5	4	2	0	0	0	0	0	0	2	2	0	0	0	15
Jharsuguda	4	482,948	4	1	3	0	0	0	0	0	0	4	4	0	0	0	16
Kalahandi	8	1,214,806	13	7	3	0	0	0	0	0	0	8	8	0	0	0	39
Kandhamal	5	447,726	6	1	1	0	0	0	0	0	0	5	5	0	0	0	18
Kendrapara	2	494,994	5	4	1	0	0	0	0	0	0	2	2	0	0	0	14
Kendujhar	2	463,354	5	2	2	0	0	0	0	0	0	2	2	0	0	0	13
Khordha	1	65,434	1	0	0	0	0	0	0	0	0	1	1	0	0	0	3
Koraput	9	896,241	10	1	4	0	0	0	1	0	0	9	9	0	0	0	34
Malkangiri	6	482,592	6	1	0	0	0	0	0	0	0	6	6	0	0	0	19
Mayurbhanj	14	1,470,191	17	6	6	0	0	0	1	0	0	14	14	0	0	0	58
Nabarangapur	5	1,137,356	11	5	4	0	0	0	1	0	0	5	5	0	0	0	31
Nayagarh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nuapada	3	345,136	4	1	1	0	0	0	0	0	0	3	3	0	0	0	12
Puri	5	668,123	6	2	4	0	0	0	0	0	0	5	5	0	0	0	22
Rayagada	5	408,369	5	2	1	0	0	0	0	0	0	5	5	0	0	0	18
Sambalpur	4	388,933	4	1	1	0	0	0	0	0	0	4	4	0	0	0	14
Subarnapur	1	93,375	1	0	0	0	0	0	0	0	0	1	1	0	0	0	3
Sundargarh	11	938,732	11	0	4	0	0	0	1	0	0	11	11	0	0	0	38
Total	**126**	**17,033,620**	**175**	**70**	**63**	**0**	**0**	**0**	**7**	**0**	**0**	**126**	**126**	**0**	**0**	**0**	**567**

Table 38-8: List of specialized equipment available with Orissa Fire Services (As on August, 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
Anugul	7	721,379	1	1	11	1	4	0	0	2	3	2	0	0	2	0
Balangir	4	245,928	0	0	2	2	1	0	0	5	0	2	0	0	2	0
Baleshwar	10	1,473,720	1	2	6	1	11	0	0	14	0	3	0	0	3	0
Bargarh	4	372,885	0	1	4	0	3	0	3	0	0	3	0	0	1	0
Baudh	4	575,736	0	0	1	1	3	0	0	8	0	1	0	0	1	0
Bhadrak	7	1,513,313	2	1	3	1	6	0	0	9	0	2	0	0	5	0
Cuttack	13	1,777,870	0	2	8	1	15	0	2	23	1	2	0	0	4	1
Debagarh	2	150,304	0	0	3	0	0	0	0	3	0	2	0	0	1	0
Dhenkanal	10	1,436,955	0	1	3	0	10	0	0	9	1	0	0	0	2	2
Gajapati	4	383,696	0	0	3	0	5	0	0	3	0	1	0	0	1	0
Ganjam	14	2,103,962	2	2	14	1	9	0	1	17	0	8	0	0	4	0
Jagatsinghapur	4	825,159	3	1	5	1	4	0	0	8	0	2	1	0	2	1
Jajapur	7	1,331,812	2	1	5	1	7	0	0	13	0	0	0	0	2	0
Jharsuguda	3	170,312	0	1	7	0	2	0	0	3	0	4	0	0	2	0
Kalahandi	3	333,578	0	1	1	0	2	0	3	3	0	2	0	0	2	0
Kandhamal	4	294,143	0	0	4	0	4	0	2	6	0	2	0	0	2	0
Kendrapara	5	811,067	0	1	4	1	5	0	0	13	0	1	0	0	2	3
Kendujhar	9	1,155,104	0	0	1	0	11	0	0	7	0	1	0	0	0	0
Khordha	10	1,478,098	1	4	11	1	8	1	0	7	0	7	0	0	4	0
Koraput	4	361,838	1	1	5	0	3	0	0	7	0	4	0	0	7	0
Malkangiri	2	138,585	0	1	2	0	2	0	0	5	0	1	0	0	1	0
Mayurbhanj	10	1,062,606	0	1	4	0	10	0	0	11	0	3	0	0	2	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
Nabarangapur	4	211,243	0	0	2	0	4	0	0	4	0	0	0	0	3	0
Nayagarh	6	780,358	0	0	5	0	8	0	0	10	0	1	0	0	3	2
Nuapada	2	98,763	0	0	2	0	2	0	0	4	0	1	0	0	3	0
Puri	8	1,175,948	4	2	7	1	7	0	0	13	0	3	0	0	9	0
Rayagada	4	455,491	0	1	2	0	3	0	0	3	0	2	0	0	1	0
Sambalpur	6	531,521	3	1	7	1	5	0	0	2	0	3	0	0	2	0
Subarnapur	5	563,446	0	1	6	0	2	0	0	5	0	0	0	0	1	2
Sundargarh	5	723,560	0	0	9	1	6	0	0	8	0	4	0	0	0	0
Total	**180**	**23,258,380**	**20**	**27**	**147**	**15**	**162**	**1**	**11**	**225**	**5**	**67**	**1**	**0**	**74**	**11**

Table 38-9: List of specialized equipment available with Orissa Fire Services (As on August, 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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Anugul	7	721,379	0	0	14	0	0	19	3	1	0	0	0	64
Balangir	4	245,928	3	0	8	0	0	6	4	0	0	0	0	35
Baleshwar	10	1,473,720	0	0	24	0	1	13	12	0	0	0	0	91
Bargarh	4	372,885	0	0	6	0	0	9	0	1	0	2	0	33
Baudh	4	575,736	0	0	8	0	0	6	5	0	0	0	0	34
Bhadrak	7	1,513,313	0	0	26	0	0	9	13	0	0	0	0	77
Cuttack	13	1,777,870	0	0	29	0	0	28	23	1	0	0	0	140

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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Debagarh	2	150,304	0	0	4	0	0	5	1	0	0	0	0	19
Dhenkanal	10	1,436,955	0	0	19	0	0	16	6	0	0	2	0	71
Gajapati	4	383,696	0	4	8	0	0	5	2	0	0	0	0	32
Ganjam	14	2,103,962	0	0	32	0	0	23	18	0	0	0	0	131
Jagatsinghapur	4	825,159	0	0	14	0	0	5	8	0	0	0	0	55
Jajapur	7	1,331,812	0	0	16	0	0	11	6	0	0	0	0	64
Jharsuguda	3	170,312	0	0	4	0	0	8	1	1	0	0	0	33
Kalahandi	3	333,578	0	0	6	0	0	4	4	0	0	0	0	28
Kandhamal	4	294,143	0	0	8	0	0	8	2	0	0	0	0	38
Kendrapara	5	811,067	0	1	18	0	0	14	8	0	0	0	0	71
Kendujhar	9	1,155,104	0	0	16	0	1	15	3	0	0	0	0	55
Khordha	10	1,478,098	0	0	16	0	4	12	2	1	0	4	0	83
Koraput	4	361,838	0	0	8	0	0	10	1	0	0	0	0	47
Malkangiri	2	138,585	0	0	4	0	0	4	0	0	0	0	0	20
Mayurbhanj	10	1,062,606	0	0	16	0	0	19	9	0	0	0	0	75
Nabarangapur	4	211,243	0	0	8	0	0	8	4	0	0	2	0	35
Nayagarh	6	780,358	0	0	12	0	0	9	9	0	0	0	0	59
Nuapada	2	98,763	0	0	4	0	0	3	2	0	0	0	0	21
Puri	8	1,175,948	0	1	22	0	1	12	8	1	0	2	0	93
Rayagada	4	455,491	0	0	8	0	0	8	2	0	2	0	0	32
Sambalpur	6	531,521	0	0	17	0	0	15	2	2	0	9	0	69
Subarnapur	5	563,446	0	0	10	0	0	7	3	0	0	0	0	37
Sundargarh	5	723,560	0	0	10	0	0	11	4	0	0	0	0	53
Total	**180**	**23,258,380**	**3**	**6**	**395**	**0**	**7**	**322**	**165**	**8**	**2**	**21**	**0**	**1,695**

Table 38-10: 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
Anugul	7	721,379	0	6	71	7	21	1	5	6	5	23	8	1	0	3
Balangir	4	245,928	1	7	32	3	10	1	4	0	5	9	8	1	0	4
Baleshwar	10	1,473,720	0	3	145	11	33	1	2	-2	12	41	6	1	0	12
Bargarh	4	372,885	1	7	44	5	12	1	1	5	5	12	10	1	0	0
Baudh	4	575,736	0	0	57	4	14	0	0	-3	5	16	0	0	0	5
Bhadrak	7	1,513,313	-1	5	158	7	38	1	1	-1	8	42	7	1	0	13
Cuttack	13	1,777,870	4	16	198	15	45	2	3	-7	15	58	19	2	0	22
Debagarh	2	150,304	1	2	16	2	6	1	1	-1	2	4	4	1	0	1
Dhenkanal	10	1,436,955	1	4	148	12	34	1	2	3	11	44	6	1	0	4
Gajapati	4	383,696	1	5	40	5	8	1	1	2	5	12	6	1	0	2
Ganjam	14	2,103,962	2	16	212	16	55	1	5	0	17	56	18	1	0	18
Jagatsinghapur	4	825,159	-2	3	81	4	20	1	1	-3	5	22	4	1	0	7
Jajapur	7	1,331,812	-1	5	129	7	31	1	2	-5	8	38	7	1	0	6
Jharsuguda	3	170,312	1	1	19	4	6	1	1	1	4	4	4	1	0	1
Kalahandi	3	333,578	1	5	37	4	10	1	-1	1	4	10	7	1	0	4
Kandhamal	4	294,143	1	2	30	5	7	1	-1	-1	5	9	4	1	0	2
Kendrapara	5	811,067	1	3	75	5	18	1	1	-7	6	22	5	1	0	5
Kendujhar	9	1,155,104	1	4	126	11	26	1	1	4	11	36	5	1	0	3
Khordha	10	1,478,098	4	18	155	11	38	0	6	5	12	39	24	1	0	2
Koraput	4	361,838	1	5	48	5	12	1	4	-2	5	11	7	1	0	1

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
Malkangiri	2	138,585	1	1	17	2	4	1	1	-3	2	5	4	1	0	0
Mayurbhanj	10	1,062,606	1	3	114	12	26	1	2	1	12	33	5	1	0	9
Nabarangapur	4	211,243	1	4	24	5	5	1	2	1	5	9	5	1	0	4
Nayagarh	6	780,358	1	2	72	7	15	1	1	-3	7	22	4	1	0	7
Nuapada	2	98,763	1	4	10	2	2	1	2	-2	2	3	5	1	0	2
Puri	8	1,175,948	-2	5	130	9	31	1	2	-3	10	35	8	1	0	8
Rayagada	4	455,491	1	7	53	5	13	1	2	2	5	14	10	1	0	2
Sambalpur	6	531,521	-2	12	63	6	17	1	5	5	7	19	14	1	0	2
Subarnapur	5	563,446	1	5	47	6	14	1	2	1	6	16	7	1	0	1
Sundargarh	5	723,560	4	13	77	5	18	1	4	-2	6	20	14	1	0	4
Total	**180**	**23,258,380**	**24**	**173**	**2428**	**202**	**589**	**29**	**62**	**-8**	**212**	**684**	**235**	**30**	**0**	**154**

Table 38-11: 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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Anugul	7	721,379	0	6	-6	5	1	5	0	7	30	32	8	245
Balangir	4	245,928	0	8	-3	4	1	5	0	5	18	19	5	147
Baleshwar	10	1,473,720	0	24	-12	2	0	31	0	12	50	51	12	435

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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Bargarh	4	372,885	0	0	-1	4	1	5	0	4	20	19	5	161
Baudh	4	575,736	0	10	-3	0	0	12	0	5	23	23	5	173
Bhadrak	7	1,513,313	0	26	-18	1	1	37	0	8	50	50	8	442
Cuttack	13	1,777,870	0	46	-13	5	2	32	0	15	68	69	16	632
Debagarh	2	150,304	0	2	-2	1	1	2	0	2	12	12	2	72
Dhenkanal	10	1,436,955	0	12	-7	2	1	28	0	12	49	48	12	428
Gajapati	4	383,696	0	4	-3	1	1	9	0	5	19	19	5	149
Ganjam	14	2,103,962	0	36	-15	6	1	41	0	17	73	75	17	668
Jagatsinghapur	4	825,159	0	16	-9	1	1	20	0	5	30	30	5	243
Jajapur	7	1,331,812	0	12	-8	2	1	27	0	8	48	48	8	375
Jharsuguda	3	170,312	0	2	0	1	1	2	0	3	14	14	4	89
Kalahandi	3	333,578	0	8	-2	2	1	8	0	4	19	19	4	147
Kandhamal	4	294,143	0	4	-3	1	1	4	0	5	17	17	5	116
Kendrapara	5	811,067	0	15	-12	1	1	10	0	6	29	29	6	221
Kendujhar	9	1,155,104	0	6	-5	1	0	23	0	11	43	43	11	363
Khordha	10	1,478,098	0	4	-4	6	-3	36	0	11	59	56	12	492
Koraput	4	361,838	0	2	-3	4	1	6	0	5	22	22	5	163
Malkangiri	2	138,585	0	0	-2	1	1	3	0	2	12	12	2	67
Mayurbhanj	10	1,062,606	0	18	-4	2	1	17	0	12	43	44	12	365
Nabarangapur	4	211,243	0	8	-3	2	1	2	0	5	14	13	5	114
Nayagarh	6	780,358	0	18	-5	1	1	15	0	7	29	29	7	239
Nuapada	2	98,763	0	4	-2	2	1	2	0	2	10	10	2	64
Puri	8	1,175,948	0	15	-12	2	0	28	0	9	47	45	10	379
Rayagada	4	455,491	0	4	-3	2	1	9	0	5	20	22	5	181
Sambalpur	6	531,521	0	4	-10	5	1	5	0	5	26	19	7	212

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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Subarnapur	5	563,446	0	6	-4	2	1	10	0	6	22	22	6	179
Sundargarh	5	723,560	0	8	-4	4	1	14	0	6	32	32	6	264
Total	**180**	**23,258,380**	**0**	**328**	**-178**	**73**	**23**	**448**	**0**	**209**	**948**	**943**	**217**	**7,825**

Table 38-12: Total gap in specialized equipment 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
Anugul	9	808,528	2	8	81	9	25	1	7	8	7	27	12	1	0	3
Balangir	5	265,919	2	8	37	4	12	1	5	1	6	11	9	1	0	4
Baleshwar	11	1,559,113	1	5	155	12	35	1	3	-1	13	43	10	1	0	12
Bargarh	4	372,885	1	7	44	5	12	1	1	5	5	12	10	1	0	0
Baudh	4	575,736	0	0	57	4	14	0	0	-3	5	16	0	0	0	5
Bhadrak	7	1,513,313	-1	5	158	7	38	1	1	-1	8	42	7	1	0	13
Cuttack	15	2,049,454	6	24	229	17	54	3	5	-5	17	67	29	3	0	22
Debagarh	2	150,304	1	2	16	2	6	1	1	-1	2	4	4	1	0	1
Dhenkanal	10	1,436,955	1	4	148	12	34	1	2	3	11	44	6	1	0	4
Gajapati	4	383,696	1	5	40	5	8	1	1	2	5	12	6	1	0	2

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
Ganjam	15	2,163,328	3	17	217	17	57	1	6	1	18	58	19	1	0	18
Jagatsinghapur	5	867,105	-1	4	86	5	22	1	2	-2	6	24	5	1	0	7
Jajapur	7	1,331,812	-1	5	129	7	31	1	2	-5	8	38	7	1	0	6
Jharsuguda	5	269,795	3	3	29	6	10	1	3	3	6	8	6	1	0	1
Kalahandi	4	359,742	2	6	42	5	12	1	0	2	5	12	8	1	0	4
Kandhamal	4	294,143	1	2	30	5	7	1	-1	-1	5	9	4	1	0	2
Kendrapara	5	811,067	1	3	75	5	18	1	1	-7	6	22	5	1	0	5
Kendujhar	10	1,170,457	2	5	131	12	28	1	2	5	12	38	6	1	0	3
Khordha	13	1,845,914	8	29	198	15	50	1	10	9	16	51	35	2	0	2
Koraput	6	415,289	3	7	58	7	16	1	6	0	7	15	9	1	0	1
Malkangiri	2	138,585	1	1	17	2	4	1	1	-3	2	5	4	1	0	0
Mayurbhanj	12	1,154,115	3	5	124	14	30	1	4	3	14	37	7	1	0	9
Nabarangapur	4	211,243	1	4	24	5	5	1	2	1	5	9	5	1	0	4
Nayagarh	6	780,358	1	2	72	7	15	1	1	-3	7	22	4	1	0	7
Nuapada	2	98,763	1	4	10	2	2	1	2	-2	2	3	5	1	0	2
Puri	8	1,175,948	-2	5	130	9	31	1	2	-3	10	35	8	1	0	8
Rayagada	4	455,491	1	7	53	5	13	1	2	2	5	14	10	1	0	2
Sambalpur	7	545,360	-1	13	68	7	19	1	6	6	8	21	15	1	0	2
Subarnapur	5	563,446	1	5	47	6	14	1	2	1	6	16	7	1	0	1
Sundargarh	10	1,145,875	10	25	125	11	33	2	10	4	12	35	26	2	0	4
Total	**205**	**24,913,739**	**51**	**220**	**2630**	**229**	**655**	**32**	**89**	**19**	**239**	**750**	**288**	**33**	**0**	**154**

Table 38-13: Total gap in specialized equipment 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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Anugul	9	808,528	0	6	-4	7	1	9	0	9	35	38	10	302
Balangir	5	265,919	0	8	-2	5	1	6	0	6	19	21	6	171
Baleshwar	11	1,559,113	0	24	-11	3	0	35	0	13	56	57	13	480
Bargarh	4	372,885	0	0	-1	4	1	5	0	4	20	19	5	161
Baudh	4	575,736	0	10	-3	0	0	12	0	5	23	23	5	173
Bhadrak	7	1,513,313	0	26	-18	1	1	37	0	8	50	50	8	442
Cuttack	15	2,049,454	0	46	-11	7	3	42	0	17	80	81	18	754
Debagarh	2	150,304	0	2	-2	1	1	2	0	2	12	12	2	72
Dhenkanal	10	1,436,955	0	12	-7	2	1	28	0	12	49	48	12	428
Gajapati	4	383,696	0	4	-3	1	1	9	0	5	19	19	5	149
Ganjam	15	2,163,328	0	36	-14	7	1	42	0	18	74	77	18	692
Jagatsinghapur	5	867,105	0	16	-8	2	1	21	0	6	31	32	6	267
Jajapur	7	1,331,812	0	12	-8	2	1	27	0	8	48	48	8	375
Jharsuguda	5	269,795	0	2	2	3	1	4	0	5	16	18	6	137
Kalahandi	4	359,742	0	8	-1	3	1	9	0	5	20	21	5	171
Kandhamal	4	294,143	0	4	-3	1	1	4	0	5	17	17	5	116
Kendrapara	5	811,067	0	15	-12	1	1	10	0	6	29	29	6	221
Kendujhar	10	1,170,457	0	6	-4	2	0	24	0	12	44	45	12	387
Khordha	13	1,845,914	0	4	0	10	-2	47	0	15	72	70	16	658
Koraput	6	415,289	0	2	-1	6	1	8	0	7	24	26	7	211
Malkangiri	2	138,585	0	0	-2	1	1	3	0	2	12	12	2	67
Mayurbhanj	12	1,154,115	0	18	-2	4	1	19	0	14	45	48	14	413
Nabarangapur	4	211,243	0	8	-3	2	1	2	0	5	14	13	5	114
Nayagarh	6	780,358	0	18	-5	1	1	15	0	7	29	29	7	239

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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Nuapada	2	98,763	0	4	-2	2	1	2	0	2	10	10	2	64
Puri	8	1,175,948	0	15	-12	2	0	28	0	9	47	45	10	379
Rayagada	4	455,491	0	4	-3	2	1	9	0	5	20	22	5	181
Sambalpur	7	545,360	0	4	-9	6	1	6	0	6	27	21	8	236
Subarnapur	5	563,446	0	6	-4	2	1	10	0	6	22	22	6	179
Sundargarh	10	1,145,875	0	8	2	10	2	26	0	12	44	47	12	462
Total	**205**	**24,913,739**	**0**	**328**	**-151**	**100**	**26**	**501**	**0**	**236**	**1,008**	**1,020**	**244**	**8,701**

Table 38-14: 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
Anugul	1	198,329	0	0	22	1	6	0	0	1	1	6	0	0	0	0
Balangir	9	1,380,919	0	0	132	11	38	0	0	11	11	38	0	0	0	0
Baleshwar	6	825,962	0	0	86	7	25	0	0	7	7	25	0	0	0	0
Bargarh	7	1,331,563	0	0	137	8	38	0	0	8	8	38	0	0	0	0
Baudh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bhadrak	0	0	0	0	0	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
Cuttack	4	815,405	0	0	86	5	24	0	0	5	5	24	0	0	0	0
Debagarh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dhenkanal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gajapati	3	174,178	0	0	26	4	8	0	0	4	4	8	0	0	0	0
Ganjam	7	1,275,579	0	0	122	8	35	0	0	8	8	35	0	0	0	0
Jagatsinghapur	2	505,670	0	0	53	2	14	0	0	2	2	14	0	0	0	0
Jajapur	2	527,705	0	0	58	2	16	0	0	2	2	16	0	0	0	0
Jharsuguda	4	482,948	0	0	48	5	14	0	0	5	5	14	0	0	0	0
Kalahandi	8	1,214,806	0	0	130	10	37	0	0	10	10	37	0	0	0	0
Kandhamal	5	447,726	0	0	50	6	16	0	0	6	6	16	0	0	0	0
Kendrapara	2	494,994	0	0	53	2	14	0	0	2	2	14	0	0	0	0
Kendujhar	2	463,354	0	0	48	2	13	0	0	2	2	13	0	0	0	0
Khordha	1	65,434	0	0	7	1	2	0	0	1	1	2	0	0	0	0
Koraput	9	896,241	0	0	94	11	29	0	0	11	11	29	0	0	0	0
Malkangiri	6	482,592	0	0	48	7	16	0	0	7	7	16	0	0	0	0
Mayurbhanj	14	1,470,191	0	0	173	17	52	0	0	17	17	52	0	0	0	0
Nabarangapur	5	1,137,356	0	0	108	6	30	0	0	6	6	30	0	0	0	0
Nayagarh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nuapada	3	345,136	0	0	36	4	11	0	0	4	4	11	0	0	0	0
Puri	5	668,123	0	0	70	6	20	0	0	6	6	20	0	0	0	0
Rayagada	5	408,369	0	0	50	6	16	0	0	6	6	16	0	0	0	0
Sambalpur	4	388,933	0	0	38	5	12	0	0	5	5	12	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
Subarnapur	1	93,375	0	0	7	1	2	0	0	1	1	2	0	0	0	0
Sundargarh	11	938,732	0	0	98	13	31	0	0	13	13	31	0	0	0	0
Total	**126**	**17,033,620**	**0**	**0**	**1780**	**150**	**519**	**0**	**0**	**150**	**150**	**519**	**0**	**0**	**0**	**0**

Table 38-15: 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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Anugul	1	198,329	0	0	1	0	0	6	0	1	6	6	1	58
Balangir	9	1,380,919	0	0	11	0	0	38	0	11	38	38	11	388
Baleshwar	6	825,962	0	0	7	0	0	25	0	7	25	25	7	253
Bargarh	7	1,331,563	0	0	8	0	0	38	0	8	40	40	8	379
Baudh	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bhadrak	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuttack	4	815,405	0	0	5	0	0	24	0	5	24	24	5	236
Debagarh	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dhenkanal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gajapati	3	174,178	0	0	4	0	0	8	0	4	8	8	4	90
Ganjam	7	1,275,579	0	0	8	0	0	35	0	8	37	37	8	349

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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Jagatsinghapur	2	505,670	0	0	2	0	0	14	0	2	14	14	2	135
Jajapur	2	527,705	0	0	2	0	0	16	0	2	16	16	2	150
Jharsuguda	4	482,948	0	0	5	0	0	14	0	5	14	14	5	148
Kalahandi	8	1,214,806	0	0	10	0	0	37	0	10	37	37	10	375
Kandhamal	5	447,726	0	0	6	0	0	16	0	6	16	16	6	166
Kendrapara	2	494,994	0	0	2	0	0	14	0	2	14	14	2	135
Kendujhar	2	463,354	0	0	2	0	0	13	0	2	13	13	2	125
Khordha	1	65,434	0	0	1	0	0	2	0	1	2	2	1	23
Koraput	9	896,241	0	0	11	0	0	29	0	11	30	30	11	307
Malkangiri	6	482,592	0	0	7	0	0	16	0	7	16	16	7	170
Mayurbhanj	14	1,470,191	0	0	17	0	0	52	0	17	53	53	17	537
Nabarangapur	5	1,137,356	0	0	6	0	0	30	0	6	31	31	6	296
Nayagarh	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nuapada	3	345,136	0	0	4	0	0	11	0	4	11	11	4	115
Puri	5	668,123	0	0	6	0	0	20	0	6	20	20	6	206
Rayagada	5	408,369	0	0	6	0	0	16	0	6	16	16	6	166
Sambalpur	4	388,933	0	0	5	0	0	12	0	5	12	12	5	128
Subarnapur	1	93,375	0	0	1	0	0	2	0	1	2	2	1	23
Sundargarh	11	938,732	0	0	13	0	0	31	0	13	32	32	13	333
Total	**126**	**17,033,620**	**0**	**0**	**150**	**0**	**0**	**519**	**0**	**150**	**527**	**527**	**150**	**5,291**

38.3.3 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 (Table 38-16).

Table 38-16: Manpower requirement for Station officer and lower staff as per SFAC norm (2- shifts)

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. From Tables 38-16 and 38-17, 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 38-17).

Table 38-17: 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 Orissa State has been estimated, which comes to 21,170 (Table 38.19 to 38.21) against the present strength of 2,606 (Table 38-18).

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 ADG-cum-Director, Orissa Fire Services, additional officers at the levels of Director (Technical), Deputy Director (Technical), Chief Fire Officers (CFOs), Dy Chief Fire Officers (Dy-CFOs), Divisional Fire Officers (DFOs), and Assistant Divisional Fire Officer (ADFOs) have been suggested. 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
- Deputy Director (Technical) : 2
- Chief Fire Officer (CFO) : 4
- Deputy Chief Fire Officer (Dy.CFO) : 9
- Divisional Fire Officer (DFO)/DO : 41 (one per 8 Fire Stations)
- Assistant Divisional Fire Officer (ADFO) /ADO) : 82 (one per 4 Fire Stations)

It may be noted that for cleaning staff, we recommend hiring of Cleaners 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 Orissa State have been carried out and are shown Tables 38-19 to 38-21.

Table 38-18: List of manpower available for operational Fire Stations in Orissa Fire Services (As on August, 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
Anugul	7	0	0	0	0	0	0	6	4	35	79	0	124
Balangir	4	0	0	0	0	1	0	4	3	13	47	0	68
Baleshwar	10	0	0	0	0	0	1	4	7	32	83	0	127
Bargarh	4	0	0	0	0	0	0	4	2	12	47	0	65
Baudh	4	0	0	0	0	0	0	2	4	14	43	0	63
Bhadrak	7	0	0	0	0	0	1	3	5	20	55	0	84
Cuttack	13	0	1	0	0	2	2	9	6	46	135	2	203
Debagarh	2	0	0	0	0	0	0	3	1	6	18	0	28
Dhenkanal	10	0	0	0	0	0	1	5	6	30	92	0	134
Gajapati	4	0	0	0	0	0	1	4	2	13	36	0	56
Ganjam	14	0	0	0	0	0	0	14	6	51	123	0	194
Jagatsinghapur	4	0	0	0	0	0	1	3	3	19	36	0	62
Jajapur	7	0	0	0	0	0	2	4	3	21	51	9	90
Jharsuguda	3	0	0	0	0	0	1	4	0	10	32	0	47
Kalahandi	3	0	0	0	0	0	0	1	2	9	31	0	43
Kandhamal	4	0	0	0	0	0	1	1	3	14	43	0	62
Kendrapara	5	0	0	0	0	0	0	1	3	13	31	0	48
Kendujhar	9	0	0	0	0	0	1	6	4	30	84	0	125
Khordha	10	0	0	1	0	1	1	10	6	41	98	0	158
Koraput	4	0	0	0	0	0	0	3	3	14	47	0	67
Malkangiri	2	0	0	0	0	0	0	1	0	5	18	0	24
Mayurbhanj	10	0	0	0	0	0	0	6	6	29	91	0	132
Nabarangapur	4	0	0	0	0	0	1	1	3	11	43	0	59
Nayagarh	6	0	0	0	0	0	1	4	3	19	50	0	77
Nuapada	2	0	0	0	0	0	0	3	0	6	18	0	27
Puri	8	0	0	0	0	0	1	7	6	30	77	0	121

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
Rayagada	4	0	0	0	0	0	0	6	0	21	35	0	62
Sambalpur	6	0	0	0	0	1	1	5	2	21	66	0	96
Subarnapur	5	0	0	0	0	0	0	2	5	14	56	0	77
Sundargarh	5	0	0	0	0	1	0	5	2	18	57	0	83
Total	**180**	**0**	**1**	**1**	**0**	**6**	**17**	**131**	**100**	**617**	**1722**	**11**	**2606**

***Level 10**: Director General/Director/Deputy Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DO/DFO/Inspector/EO/Fire Supervisor; **Level 5**: ADO/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, Tindal.*

Table 38-19: 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
Anugul	7	0	0	0	0	1	3	4	27	25	256	7	323
Balangir	4	0	0	0	0	0	2	3	15	27	212	4	263
Baleshwar	10	0	0	1	0	2	2	15	42	79	515	10	666
Bargarh	4	0	0	0	0	2	4	3	18	36	247	4	314
Baudh	4	0	0	0	0	0	0	7	18	41	255	4	325
Bhadrak	7	0	0	0	0	1	2	17	43	100	602	7	772
Cuttack	13	1	0	1	0	-1	2	14	64	114	661	11	867
Debagarh	2	0	0	0	0	1	1	2	10	18	110	2	144
Dhenkanal	10	0	0	0	0	2	2	12	44	75	431	10	576
Gajapati	4	0	0	0	0	1	2	2	18	35	217	4	279
Ganjam	14	0	1	1	0	1	3	12	67	113	758	14	970
Jagatsinghapur	4	0	0	0	0	1	0	8	24	44	292	4	373

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
Jajapur	7	0	0	0	0	2	3	16	41	93	593	-2	746
Jharsuguda	3	0	0	0	0	1	0	1	15	20	117	3	157
Kalahandi	3	0	0	0	0	1	1	6	16	39	244	3	310
Kandhamal	4	0	0	0	0	1	0	4	15	23	127	4	174
Kendrapara	5	0	0	0	0	1	2	9	25	48	275	5	365
Kendujhar	9	0	0	0	0	1	0	6	39	65	370	9	490
Khordha	10	1	0	1	0	2	3	14	50	93	691	10	865
Koraput	4	1	1	1	0	2	3	6	18	30	200	4	266
Malkangiri	2	0	0	0	0	1	1	4	11	19	110	2	148
Mayurbhanj	10	0	0	0	0	1	3	6	40	67	358	10	485
Nabarangapur	4	0	0	0	0	1	0	3	14	22	106	4	150
Nayagarh	6	0	0	0	0	1	0	6	25	42	252	6	332
Nuapada	2	0	0	0	0	1	1	1	10	14	90	2	119
Puri	8	0	0	1	0	1	1	10	40	83	544	8	688
Rayagada	4	0	0	0	0	1	2	1	21	25	204	4	258
Sambalpur	6	0	1	1	0	0	2	5	26	38	305	6	384
Subarnapur	5	0	0	0	0	1	2	5	17	37	229	5	296
Sundargarh	5	0	0	1	0	1	4	7	29	57	383	5	487
Total	**180**	**3**	**3**	**8**	**0**	**31**	**51**	**209**	**842**	**1522**	**9754**	**169**	**12592**

***Level 10**: Director General/Director/Deputy Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DO/DFO/Inspector/EO/Fire Supervisor; **Level 5**: ADO/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, Tindal.*

Table 38-20: 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
Anugul	9	0	0	0	0	2	4	5	33	35	318	9	406
Balangir	5	0	0	0	0	1	3	3	17	29	228	5	286
Baleshwar	11	0	0	1	0	2	3	17	48	90	588	11	760
Bargarh	4	0	0	0	0	2	4	3	18	36	247	4	314
Baudh	4	0	0	0	0	0	0	7	18	41	255	4	325
Bhadrak	7	0	0	0	0	1	2	17	43	100	602	7	772
Cuttack	15	1	0	1	0	-1	2	19	75	135	798	13	1043
Debagarh	2	0	0	0	0	1	1	2	10	18	110	2	144
Dhenkanal	10	0	0	0	0	2	2	12	44	75	431	10	576
Gajapati	4	0	0	0	0	1	2	2	18	35	217	4	279
Ganjam	15	0	1	1	0	1	3	12	69	115	774	15	991
Jagatsinghapur	5	0	0	0	0	1	0	8	26	46	308	5	394
Jajapur	7	0	0	0	0	2	3	16	41	93	593	-2	746
Jharsuguda	5	0	0	0	0	1	1	1	20	25	148	5	201
Kalahandi	4	0	0	0	0	1	1	6	18	41	260	4	331
Kandhamal	4	0	0	0	0	1	0	4	15	23	127	4	174
Kendrapara	5	0	0	0	0	1	2	9	25	48	275	5	365
Kendujhar	10	0	0	0	0	1	0	6	41	67	386	10	511
Khordha	13	1	0	1	0	2	5	19	64	118	855	13	1078
Koraput	6	1	1	1	0	2	4	6	23	35	231	6	310
Malkangiri	2	0	0	0	0	1	1	4	11	19	110	2	148
Mayurbhanj	12	0	0	0	0	2	4	6	45	72	389	12	530
Nabarangapur	4	0	0	0	0	1	0	3	14	22	106	4	150
Nayagarh	6	0	0	0	0	1	0	6	25	42	252	6	332
Nuapada	2	0	0	0	0	1	1	1	10	14	90	2	119
Puri	8	0	0	1	0	1	1	10	40	83	544	8	688

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
Rayagada	4	0	0	0	0	1	2	1	21	25	204	4	258
Sambalpur	7	0	1	1	0	1	3	5	28	40	321	7	407
Subarnapur	5	0	0	0	0	1	2	5	17	37	229	5	296
Sundargarh	10	0	0	1	0	1	5	11	46	80	533	10	687
Total	**205**	**3**	**3**	**8**	**0**	**35**	**61**	**226**	**923**	**1639**	**10529**	**194**	**13621**

***Level 10**: Director General/Director/Deputy Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DO/DFO/Inspector/EO/Fire Supervisor; **Level 5**: ADO/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, Tindal.*

Table 38-21: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
Anugul	1	0	0	0	0	0	0	2	6	13	65	1	87
Balangir	9	0	0	0	0	0	1	11	40	87	399	9	547
Baleshwar	6	0	0	0	0	0	1	7	26	55	258	6	353
Bargarh	7	0	0	0	0	0	0	14	38	85	423	7	567
Baudh	0	0	0	0	0	0	0	0	0	0	0	0	0
Bhadrak	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuttack	4	0	0	0	0	0	0	9	23	53	260	4	349
Debagarh	0	0	0	0	0	0	0	0	0	0	0	0	0
Dhenkanal	0	0	0	0	0	0	0	0	0	0	0	0	0
Gajapati	3	0	0	0	0	0	0	1	10	19	77	3	110
Ganjam	7	0	0	0	0	0	0	12	37	86	453	7	595
Jagatsinghapur	2	0	0	0	0	0	0	6	13	30	157	2	208

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
Jajapur	2	0	0	0	0	0	0	6	14	32	170	2	224
Jharsuguda	4	0	0	0	0	0	1	4	15	31	145	4	200
Kalahandi	8	0	0	0	0	0	0	11	39	90	438	8	586
Kandhamal	5	0	0	0	0	0	0	2	19	37	150	5	213
Kendrapara	2	0	0	0	0	0	0	5	13	30	156	2	206
Kendujhar	2	0	0	0	0	0	0	5	12	29	144	2	192
Khordha	1	0	0	0	0	0	0	0	3	6	21	1	31
Koraput	9	0	0	0	0	0	0	6	35	70	292	9	412
Malkangiri	6	0	0	0	0	0	0	1	21	39	139	6	206
Mayurbhanj	14	0	0	0	0	0	0	12	59	123	529	14	737
Nabarangapur	5	0	0	0	0	0	0	11	29	66	338	5	449
Nayagarh	0	0	0	0	0	0	0	0	0	0	0	0	0
Nuapada	3	0	0	0	0	0	0	2	13	26	106	3	150
Puri	5	0	0	0	0	0	0	6	21	44	210	5	286
Rayagada	5	0	0	0	0	0	0	2	19	37	150	5	213
Sambalpur	4	0	0	0	0	0	0	2	14	26	114	4	160
Subarnapur	1	0	0	0	0	0	0	0	3	6	21	1	31
Sundargarh	11	0	0	0	0	0	0	5	40	76	305	11	437
Total	**126**	**0**	**0**	**0**	**0**	**0**	**3**	**142**	**562**	**1196**	**5520**	**126**	**7549**

***Level 10**: Director General/Director/Deputy Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DO/DFO/Inspector/EO/Fire Supervisor; **Level 5**: ADO/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, Tindal.*

38.3.4 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 Table 38-22.

Table 38-22: 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
Anugul	10	2	-1	0	1	1	0	1	0
Balangir	14	3	2	2	2	0	0	0	1
Baleshwar	17	0	0	2	1	1	2	0	1
Bargarh	11	2	1	1	2	1	0	1	1
Baudh	4	0	-1	-1	1	0	0	0	1
Bhadrak	7	0	-3	-1	1	0	1	1	2
Cuttack	19	0	-5	5	2	1	2	1	1
Debagarh	2	0	-1	0	0	0	1	0	0
Dhenkanal	10	0	-4	-1	3	0	1	1	0
Gajapati	7	3	1	0	0	0	0	0	1
Ganjam	22	3	-3	1	2	0	2	1	2
Jagatsinghapur	7	1	-3	0	1	1	2	1	0
Jajapur	9	0	-6	2	1	1	2	0	2
Jharsuguda	9	3	2	0	0	0	1	0	0
Kalahandi	12	5	-1	1	1	1	0	0	2
Kandhamal	9	3	1	0	0	0	1	0	0
Kendrapara	7	0	-2	-1	1	3	0	1	0
Kendujhar	12	1	-3	3	0	1	1	1	0
Khordha	14	2	-4	3	1	1	0	0	2
Koraput	15	7	1	0	1	0	2	0	0
Malkangiri	8	5	1	-1	0	0	1	0	0
Mayurbhanj	26	9	-1	2	4	1	0	1	0
Nabarangapur	9	1	1	1	0	0	2	1	0
Nayagarh	6	0	-1	0	1	0	1	0	0
Nuapada	5	2	-1	0	1	0	1	0	0
Puri	13	2	0	1	1	0	1	0	2
Rayagada	9	3	0	0	1	0	0	1	0
Sambalpur	11	3	2	-1	0	0	0	0	1
Subarnapur	6	2	0	-1	0	0	0	0	1
Sundargarh	21	11	1	2	0	0	1	0	1
Total	**331**	**73**	**-27**	**19**	**29**	**13**	**25**	**12**	**21**

38.4 Investment and Financial Analysis

38.4.1 Capital Cost

Building Infrastructure Cost:

Table 38-23 provides details of the Fire Station building infrastructure cost analysis in Orissa State. The ideal requirement of land for a Fire Station is 2 ½ acres, however, a 2 bay Fire Station may be constructed in a 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.

Table 38-23: 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	Total Bay Cost
Anugul	10	300.0	-300.0	0.0	575.0	700.0	0.0	950.0	0.0	2225.0
Balangir	14	450.0	600.0	900.0	1150.0	0.0	0.0	0.0	950.0	4050.0
Baleshwar	17	0.0	0.0	900.0	575.0	700.0	1650.0	0.0	950.0	4775.0
Bargarh	11	300.0	300.0	450.0	1150.0	700.0	0.0	950.0	950.0	4800.0
Baudh	4	0.0	-300.0	-450.0	575.0	0.0	0.0	0.0	950.0	775.0
Bhadrak	7	0.0	-900.0	-450.0	575.0	0.0	825.0	950.0	1900.0	2900.0
Cuttack	19	0.0	-1500.0	2250.0	1150.0	700.0	1650.0	950.0	950.0	6150.0
Debagarh	2	0.0	-300.0	0.0	0.0	0.0	825.0	0.0	0.0	525.0
Dhenkanal	10	0.0	-1200.0	-450.0	1725.0	0.0	825.0	950.0	0.0	1850.0
Gajapati	7	450.0	300.0	0.0	0.0	0.0	0.0	0.0	950.0	1700.0
Ganjam	22	450.0	-900.0	450.0	1150.0	0.0	1650.0	950.0	1900.0	5650.0
Jagatsinghapur	7	150.0	-900.0	0.0	575.0	700.0	1650.0	950.0	0.0	3125.0
Jajapur	9	0.0	-1800.0	900.0	575.0	700.0	1650.0	0.0	1900.0	3925.0
Jharsuguda	9	450.0	600.0	0.0	0.0	0.0	825.0	0.0	0.0	1875.0
Kalahandi	12	750.0	-300.0	450.0	575.0	700.0	0.0	0.0	1900.0	4075.0

District	Fire Stations	Bay1	Bay2	Bay3	Bay4	Bay5	Bay6	Bay7	Bay More Than 7	Total Bay Cost
Kandhamal	9	450.0	300.0	0.0	0.0	0.0	825.0	0.0	0.0	1575.0
Kendrapara	7	0.0	-600.0	-450.0	575.0	2100.0	0.0	950.0	0.0	2575.0
Kendujhar	12	150.0	-900.0	1350.0	0.0	700.0	825.0	950.0	0.0	3075.0
Khordha	14	300.0	-1200.0	1350.0	575.0	700.0	0.0	0.0	1900.0	3625.0
Koraput	15	1050.0	300.0	0.0	575.0	0.0	1650.0	0.0	0.0	3575.0
Malkangiri	8	750.0	300.0	-450.0	0.0	0.0	825.0	0.0	0.0	1425.0
Mayurbhanj	26	1350.0	-300.0	900.0	2300.0	700.0	0.0	950.0	0.0	5900.0
Nabarangapur	9	150.0	300.0	450.0	0.0	0.0	1650.0	950.0	0.0	3500.0
Nayagarh	6	0.0	-300.0	0.0	575.0	0.0	825.0	0.0	0.0	1100.0
Nuapada	5	300.0	-300.0	0.0	575.0	0.0	825.0	0.0	0.0	1400.0
Puri	13	300.0	0.0	450.0	575.0	0.0	825.0	0.0	1900.0	4050.0
Rayagada	9	450.0	0.0	0.0	575.0	0.0	0.0	950.0	0.0	1975.0
Sambalpur	11	450.0	600.0	-450.0	0.0	0.0	0.0	0.0	950.0	1550.0
Subarnapur	6	300.0	0.0	-450.0	0.0	0.0	0.0	0.0	950.0	800.0
Sundargarh	21	1650.0	300.0	900.0	0.0	0.0	825.0	0.0	950.0	4625.0
Total	**331**	**10950.0**	**-8100.0**	**8550.0**	**16675.0**	**9100.0**	**20625.0**	**11400.0**	**19950.0**	**89150.0**

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. 891.5 Crores** (Table 38-23).

Firefighting and Rescue Vehicles and Specialized Equipment Cost:

The costs of different fire fighting vehicles and specialized equipment 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 equipment for all the districts in Orissa State has been estimated (Tables 38-24 to 38-29).

Table 38-24: 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	Hazmat Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicle Cost
Anugul	9	35.0	60.0	80.0	500.0	0.0	70.0	60.0	30.0	0.0	36.0	20.3	0.0	0.0	20.0	911.3
Balangir	5	35.0	0.0	0.0	500.0	0.0	35.0	60.0	30.0	0.0	18.0	13.5	0.0	0.0	40.0	731.5
Baleshwar	11	280.0	150.0	160.0	500.0	500.0	70.0	60.0	30.0	0.0	81.0	60.8	0.0	0.0	40.0	1931.8
Bargarh	4	-35.0	30.0	80.0	500.0	0.0	35.0	60.0	30.0	0.0	18.0	13.5	0.0	0.0	20.0	751.5
Baudh	4	70.0	90.0	40.0	500.0	0.0	35.0	30.0	30.0	0.0	36.0	27.0	0.0	0.0	20.0	878.0
Bhadrak	7	280.0	210.0	200.0	500.0	500.0	35.0	30.0	0.0	0.0	63.0	47.3	0.0	0.0	20.0	1885.3
Cuttack	15	350.0	300.0	160.0	500.0	1000.0	70.0	90.0	30.0	0.0	108.0	81.0	0.0	0.0	40.0	2729.0
Debagarh	2	0.0	30.0	0.0	500.0	0.0	35.0	30.0	30.0	0.0	18.0	13.5	0.0	0.0	20.0	676.5
Dhenkanal	10	210.0	150.0	160.0	500.0	0.0	35.0	30.0	30.0	0.0	81.0	60.8	0.0	0.0	20.0	1276.8
Gajapati	4	35.0	60.0	0.0	500.0	0.0	35.0	30.0	30.0	0.0	36.0	27.0	0.0	0.0	20.0	773.0
Ganjam	15	315.0	270.0	240.0	500.0	500.0	35.0	90.0	30.0	0.0	81.0	67.5	0.0	0.0	40.0	2168.5
Jagatsinghapur	5	105.0	150.0	80.0	500.0	0.0	35.0	30.0	30.0	0.0	36.0	27.0	0.0	0.0	20.0	1013.0
Jajapur	7	175.0	210.0	120.0	500.0	0.0	35.0	90.0	60.0	0.0	54.0	40.5	0.0	0.0	20.0	1304.5
Jharsuguda	5	35.0	0.0	0.0	500.0	0.0	35.0	30.0	30.0	0.0	27.0	20.3	0.0	0.0	20.0	697.3
Kalahandi	4	70.0	30.0	40.0	500.0	0.0	35.0	60.0	30.0	0.0	18.0	13.5	0.0	0.0	20.0	816.5
Kandhamal	4	-35.0	0.0	0.0	500.0	0.0	35.0	30.0	30.0	0.0	36.0	27.0	0.0	0.0	20.0	643.0
Kendrapara	5	140.0	90.0	40.0	500.0	0.0	35.0	30.0	30.0	0.0	45.0	33.8	0.0	0.0	20.0	963.8
Kendujhar	10	105.0	150.0	120.0	500.0	0.0	35.0	30.0	30.0	0.0	81.0	60.8	0.0	0.0	20.0	1131.8
Khordha	13	140.0	240.0	280.0	1000.0	500.0	70.0	90.0	30.0	0.0	54.0	47.3	0.0	0.0	40.0	2491.3
Koraput	6	140.0	60.0	40.0	0.0	500.0	35.0	30.0	30.0	0.0	18.0	13.5	0.0	0.0	20.0	886.5
Malkangiri	2	-35.0	0.0	0.0	500.0	0.0	35.0	30.0	30.0	0.0	18.0	13.5	0.0	0.0	20.0	611.5
Mayurbhanj	12	140.0	90.0	80.0	500.0	500.0	35.0	60.0	30.0	0.0	81.0	60.8	0.0	0.0	20.0	1596.8
Nabarangapur	4	0.0	0.0	0.0	500.0	0.0	35.0	30.0	30.0	0.0	27.0	20.3	0.0	0.0	20.0	662.3
Nayagarh	6	-35.0	90.0	40.0	500.0	0.0	35.0	30.0	30.0	0.0	54.0	40.5	0.0	0.0	20.0	804.5

District	Fire Stations	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 Cost
Nuapada	2	0.0	0.0	0.0	500.0	0.0	35.0	30.0	30.0	0.0	9.0	6.8	0.0	0.0	20.0	630.8
Puri	8	210.0	150.0	120.0	0.0	500.0	35.0	60.0	30.0	0.0	54.0	40.5	0.0	0.0	20.0	1219.5
Rayagada	4	70.0	60.0	80.0	500.0	0.0	35.0	30.0	30.0	0.0	18.0	20.3	0.0	0.0	20.0	863.3
Sambalpur	7	140.0	30.0	40.0	500.0	500.0	35.0	30.0	30.0	0.0	18.0	13.5	0.0	0.0	20.0	1356.5
Subarnapur	5	0.0	60.0	0.0	500.0	0.0	35.0	30.0	30.0	0.0	36.0	27.0	0.0	0.0	20.0	738.0
Sundargarh	10	455.0	120.0	120.0	-500.0	500.0	35.0	30.0	30.0	0.0	27.0	27.0	0.0	0.0	20.0	864.0
Total	**205**	**3395.0**	**2880.0**	**2320.0**	**13500.0**	**5500.0**	**1190.0**	**1350.0**	**900.0**	**0.0**	**1287.0**	**985.5**	**0.0**	**0.0**	**700.0**	**34007.5**

Table 38-25: 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	Hazmat Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicle Cost
Anugul	1	70.0	30.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	6.8	0.0	0.0	0.0	155.8
Balangir	9	385.0	180.0	240.0	0.0	0.0	0.0	0.0	0.0	0.0	81.0	60.8	0.0	0.0	0.0	946.8
Baleshwar	6	280.0	120.0	120.0	0.0	0.0	0.0	0.0	0.0	0.0	54.0	40.5	0.0	0.0	0.0	614.5
Bargarh	7	420.0	210.0	240.0	0.0	0.0	0.0	30.0	0.0	0.0	63.0	47.3	0.0	0.0	0.0	1010.3
Baudh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bhadrak	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cuttack	4	280.0	120.0	160.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	27.0	0.0	0.0	0.0	623.0
Debagarh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dhenkanal	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

District	Fire Stations	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 Cost
Gajapati	3	105.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	27.0	20.3	0.0	0.0	0.0	192.3
Ganjam	7	420.0	180.0	160.0	0.0	0.0	0.0	60.0	0.0	0.0	63.0	47.3	0.0	0.0	0.0	930.3
Jagatsinghapur	2	175.0	120.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	13.5	0.0	0.0	0.0	366.5
Jajapur	2	175.0	120.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	13.5	0.0	0.0	0.0	406.5
Jharsuguda	4	140.0	30.0	120.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	27.0	0.0	0.0	0.0	353.0
Kalahandi	8	455.0	210.0	120.0	0.0	0.0	0.0	0.0	0.0	0.0	72.0	54.0	0.0	0.0	0.0	911.0
Kandhamal	5	210.0	30.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	33.8	0.0	0.0	0.0	358.8
Kendrapara	2	175.0	120.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	13.5	0.0	0.0	0.0	366.5
Kendujhar	2	175.0	60.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	13.5	0.0	0.0	0.0	346.5
Khordha	1	35.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	6.8	0.0	0.0	0.0	50.8
Koraput	9	350.0	30.0	160.0	0.0	0.0	0.0	30.0	0.0	0.0	81.0	60.8	0.0	0.0	0.0	711.8
Malkangiri	6	210.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.0	40.5	0.0	0.0	0.0	334.5
Mayurbhanj	14	595.0	180.0	240.0	0.0	0.0	0.0	30.0	0.0	0.0	126.0	94.5	0.0	0.0	0.0	1265.5
Nabarangapur	5	385.0	150.0	160.0	0.0	0.0	0.0	30.0	0.0	0.0	45.0	33.8	0.0	0.0	0.0	803.8
Nayagarh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nuapada	3	140.0	30.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	27.0	20.3	0.0	0.0	0.0	257.3
Puri	5	210.0	60.0	160.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	33.8	0.0	0.0	0.0	508.8
Rayagada	5	175.0	60.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	33.8	0.0	0.0	0.0	353.8
Sambalpur	4	140.0	30.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	27.0	0.0	0.0	0.0	273.0
Subarnapur	1	35.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	6.8	0.0	0.0	0.0	50.8
Sundargarh	11	385.0	0.0	160.0	0.0	0.0	0.0	30.0	0.0	0.0	99.0	74.3	0.0	0.0	0.0	748.3
Total	**126**	**6125.0**	**2100.0**	**2520.0**	**0.0**	**0.0**	**0.0**	**210.0**	**0.0**	**0.0**	**1134.0**	**850.5**	**0.0**	**0.0**	**0.0**	**12939.5**

Table 38-26: 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
Anugul	9	30.0	20.0	32.4	13.5	2.5	10.0	5.6	4.0	2.1	67.5	3.6	6.5	0.0	3.0
Balangir	5	30.0	20.0	14.8	6.0	1.2	10.0	4.0	0.5	1.8	27.5	2.7	6.5	0.0	4.0
Baleshwar	11	15.0	12.5	62.0	18.0	3.5	10.0	2.4	-0.5	3.9	107.5	3.0	6.5	0.0	12.0
Bargarh	4	15.0	17.5	17.6	7.5	1.2	10.0	0.8	2.5	1.5	30.0	3.0	6.5	0.0	0.0
Baudh	4	0.0	0.0	22.8	6.0	1.4	0.0	0.0	-1.5	1.5	40.0	0.0	0.0	0.0	5.0
Bhadrak	7	-15.0	12.5	63.2	10.5	3.8	10.0	0.8	-0.5	2.4	105.0	2.1	6.5	0.0	13.0
Cuttack	15	90.0	60.0	91.6	25.5	5.4	30.0	4.0	-2.5	5.1	167.5	8.7	19.5	0.0	22.0
Debagarh	2	15.0	5.0	6.4	3.0	0.6	10.0	0.8	-0.5	0.6	10.0	1.2	6.5	0.0	1.0
Dhenkanal	10	15.0	10.0	59.2	18.0	3.4	10.0	1.6	1.5	3.3	110.0	1.8	6.5	0.0	4.0
Gajapati	4	15.0	12.5	16.0	7.5	0.8	10.0	0.8	1.0	1.5	30.0	1.8	6.5	0.0	2.0
Ganjam	15	45.0	42.5	86.8	25.5	5.7	10.0	4.8	0.5	5.4	145.0	5.7	6.5	0.0	18.0
Jagatsinghapur	5	-15.0	10.0	34.4	7.5	2.2	10.0	1.6	-1.0	1.8	60.0	1.5	6.5	0.0	7.0
Jajapur	7	-15.0	12.5	51.6	10.5	3.1	10.0	1.6	-2.5	2.4	95.0	2.1	6.5	0.0	6.0
Jharsuguda	5	45.0	7.5	11.6	9.0	1.0	10.0	2.4	1.5	1.8	20.0	1.8	6.5	0.0	1.0
Kalahandi	4	30.0	15.0	16.8	7.5	1.2	10.0	0.0	1.0	1.5	30.0	2.4	6.5	0.0	4.0
Kandhamal	4	15.0	5.0	12.0	7.5	0.7	10.0	-0.8	-0.5	1.5	22.5	1.2	6.5	0.0	2.0
Kendrapara	5	15.0	7.5	30.0	7.5	1.8	10.0	0.8	-3.5	1.8	55.0	1.5	6.5	0.0	5.0
Kendujhar	10	30.0	12.5	52.4	18.0	2.8	10.0	1.6	2.5	3.6	95.0	1.8	6.5	0.0	3.0
Khordha	13	120.0	72.5	79.2	22.5	5.0	10.0	8.0	4.5	4.8	127.5	10.5	13.0	0.0	2.0
Koraput	6	45.0	17.5	23.2	10.5	1.6	10.0	4.8	0.0	2.1	37.5	2.7	6.5	0.0	1.0
Malkangiri	2	15.0	2.5	6.8	3.0	0.4	10.0	0.8	-1.5	0.6	12.5	1.2	6.5	0.0	0.0
Mayurbhanj	12	45.0	12.5	49.6	21.0	3.0	10.0	3.2	1.5	4.2	92.5	2.1	6.5	0.0	9.0

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
Nabarangapur	4	15.0	10.0	9.6	7.5	0.5	10.0	1.6	0.5	1.5	22.5	1.5	6.5	0.0	4.0
Nayagarh	6	15.0	5.0	28.8	10.5	1.5	10.0	0.8	-1.5	2.1	55.0	1.2	6.5	0.0	7.0
Nuapada	2	15.0	10.0	4.0	3.0	0.2	10.0	1.6	-1.0	0.6	7.5	1.5	6.5	0.0	2.0
Puri	8	-30.0	12.5	52.0	13.5	3.1	10.0	1.6	-1.5	3.0	87.5	2.4	6.5	0.0	8.0
Rayagada	4	15.0	17.5	21.2	7.5	1.3	10.0	1.6	1.0	1.5	35.0	3.0	6.5	0.0	2.0
Sambalpur	7	-15.0	32.5	27.2	10.5	1.9	10.0	4.8	3.0	2.4	52.5	4.5	6.5	0.0	2.0
Subarnapur	5	15.0	12.5	18.8	9.0	1.4	10.0	1.6	0.5	1.8	40.0	2.1	6.5	0.0	1.0
Sundargarh	10	150.0	62.5	50.0	16.5	3.3	20.0	8.0	2.0	3.6	87.5	7.8	13.0	0.0	4.0
Total	**205**	**765.0**	**550.0**	**1052.0**	**343.5**	**65.5**	**320.0**	**71.2**	**9.5**	**71.7**	**1875.0**	**86.4**	**214.5**	**0.0**	**154.0**

Table 38-27: 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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Anugul	9	0.0	12.0	-8.4	7.0	5.0	3.6	0.0	2.4	6.0	4.6	3.0	235.8
Balangir	5	0.0	16.0	-4.2	5.0	5.0	2.4	0.0	1.6	3.2	2.5	1.8	162.4
Baleshwar	11	0.0	48.0	-23.1	3.0	0.0	14.0	0.0	3.5	9.5	6.8	3.9	321.5
Bargarh	4	0.0	0.0	-2.1	4.0	5.0	2.0	0.0	1.1	3.4	2.3	1.5	130.3
Baudh	4	0.0	20.0	-6.3	0.0	0.0	4.8	0.0	1.4	3.9	2.8	1.5	103.2

District	Fire Stations	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Bhadrak	7	0.0	52.0	-37.8	1.0	5.0	14.8	0.0	2.2	8.5	6.0	2.4	268.4
Cuttack	15	0.0	92.0	-23.1	7.0	15.0	16.8	0.0	4.6	13.6	9.7	5.4	667.8
Debagarh	2	0.0	4.0	-4.2	1.0	5.0	0.8	0.0	0.5	2.0	1.4	0.6	70.8
Dhenkanal	10	0.0	24.0	-14.7	2.0	5.0	11.2	0.0	3.2	8.3	5.8	3.6	292.7
Gajapati	4	0.0	8.0	-6.3	1.0	5.0	3.6	0.0	1.4	3.2	2.3	1.5	125.1
Ganjam	15	0.0	72.0	-29.4	7.0	5.0	16.8	0.0	4.9	12.6	9.2	5.4	504.9
Jagatsinghapur	5	0.0	32.0	-16.8	2.0	5.0	8.4	0.0	1.6	5.3	3.8	1.8	169.6
Jajapur	7	0.0	24.0	-16.8	2.0	5.0	10.8	0.0	2.2	8.2	5.8	2.4	227.3
Jharsuguda	5	0.0	4.0	4.2	3.0	5.0	1.6	0.0	1.4	2.7	2.2	1.8	144.9
Kalahandi	4	0.0	16.0	-2.1	3.0	5.0	3.6	0.0	1.4	3.4	2.5	1.5	160.2
Kandhamal	4	0.0	8.0	-6.3	1.0	5.0	1.6	0.0	1.4	2.9	2.0	1.5	99.7
Kendrapara	5	0.0	30.0	-25.2	1.0	5.0	4.0	0.0	1.6	4.9	3.5	1.8	165.5
Kendujhar	10	0.0	12.0	-8.4	2.0	0.0	9.6	0.0	3.2	7.5	5.4	3.6	274.6
Khordha	13	0.0	8.0	0.0	10.0	-10.0	18.8	0.0	4.1	12.2	8.4	4.8	535.8
Koraput	6	0.0	4.0	-2.1	6.0	5.0	3.2	0.0	1.9	4.1	3.1	2.1	189.7
Malkangiri	2	0.0	0.0	-4.2	1.0	5.0	1.2	0.0	0.5	2.0	1.4	0.6	65.4
Mayurbhanj	12	0.0	36.0	-4.2	4.0	5.0	7.6	0.0	3.8	7.7	5.8	4.2	329.9
Nabarangapur	4	0.0	16.0	-6.3	2.0	5.0	0.8	0.0	1.4	2.4	1.6	1.5	115.0
Nayagarh	6	0.0	36.0	-10.5	1.0	5.0	6.0	0.0	1.9	4.9	3.5	2.1	191.8
Nuapada	2	0.0	8.0	-4.2	2.0	5.0	0.8	0.0	0.5	1.7	1.2	0.6	76.5
Puri	8	0.0	30.0	-25.2	2.0	0.0	11.2	0.0	2.4	8.0	5.4	3.0	205.4
Rayagada	4	0.0	8.0	-6.3	2.0	5.0	3.6	0.0	1.4	3.4	2.6	1.5	144.3
Sambalpur	7	0.0	8.0	-18.9	6.0	5.0	2.4	0.0	1.6	4.6	2.5	2.4	156.4
Subarnapur	5	0.0	12.0	-8.4	2.0	5.0	4.0	0.0	1.6	3.7	2.6	1.8	144.6
Sundargarh	10	0.0	16.0	4.2	10.0	10.0	10.4	0.0	3.2	7.5	5.6	3.6	498.8
Total	**205**	**0.0**	**656.0**	**-317.1**	**100.0**	**130.0**	**200.4**	**0.0**	**63.7**	**171.4**	**122.4**	**73.2**	**6778.3**

Table 38-28: 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
Anugul	1	0.0	0.0	8.8	1.5	0.6	0.0	0.0	0.5	0.3	15.0	0.0	0.0	0.0	0.0
Balangir	9	0.0	0.0	52.8	16.5	3.8	0.0	0.0	5.5	3.3	95.0	0.0	0.0	0.0	0.0
Baleshwar	6	0.0	0.0	34.4	10.5	2.5	0.0	0.0	3.5	2.1	62.5	0.0	0.0	0.0	0.0
Bargarh	7	0.0	0.0	54.8	12.0	3.8	0.0	0.0	4.0	2.4	95.0	0.0	0.0	0.0	0.0
Baudh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bhadrak	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cuttack	4	0.0	0.0	34.4	7.5	2.4	0.0	0.0	2.5	1.5	60.0	0.0	0.0	0.0	0.0
Debagarh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dhenkanal	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gajapati	3	0.0	0.0	10.4	6.0	0.8	0.0	0.0	2.0	1.2	20.0	0.0	0.0	0.0	0.0
Ganjam	7	0.0	0.0	48.8	12.0	3.5	0.0	0.0	4.0	2.4	87.5	0.0	0.0	0.0	0.0
Jagatsinghapur	2	0.0	0.0	21.2	3.0	1.4	0.0	0.0	1.0	0.6	35.0	0.0	0.0	0.0	0.0
Jajapur	2	0.0	0.0	23.2	3.0	1.6	0.0	0.0	1.0	0.6	40.0	0.0	0.0	0.0	0.0
Jharsuguda	4	0.0	0.0	19.2	7.5	1.4	0.0	0.0	2.5	1.5	35.0	0.0	0.0	0.0	0.0
Kalahandi	8	0.0	0.0	52.0	15.0	3.7	0.0	0.0	5.0	3.0	92.5	0.0	0.0	0.0	0.0
Kandhamal	5	0.0	0.0	20.0	9.0	1.6	0.0	0.0	3.0	1.8	40.0	0.0	0.0	0.0	0.0
Kendrapara	2	0.0	0.0	21.2	3.0	1.4	0.0	0.0	1.0	0.6	35.0	0.0	0.0	0.0	0.0
Kendujhar	2	0.0	0.0	19.2	3.0	1.3	0.0	0.0	1.0	0.6	32.5	0.0	0.0	0.0	0.0
Khordha	1	0.0	0.0	2.8	1.5	0.2	0.0	0.0	0.5	0.3	5.0	0.0	0.0	0.0	0.0
Koraput	9	0.0	0.0	37.6	16.5	2.9	0.0	0.0	5.5	3.3	72.5	0.0	0.0	0.0	0.0
Malkangiri	6	0.0	0.0	19.2	10.5	1.6	0.0	0.0	3.5	2.1	40.0	0.0	0.0	0.0	0.0
Mayurbhanj	14	0.0	0.0	69.2	25.5	5.2	0.0	0.0	8.5	5.1	130.0	0.0	0.0	0.0	0.0

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
Nabarangapur	5	0.0	0.0	43.2	9.0	3.0	0.0	0.0	3.0	1.8	75.0	0.0	0.0	0.0	0.0
Nayagarh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nuapada	3	0.0	0.0	14.4	6.0	1.1	0.0	0.0	2.0	1.2	27.5	0.0	0.0	0.0	0.0
Puri	5	0.0	0.0	28.0	9.0	2.0	0.0	0.0	3.0	1.8	50.0	0.0	0.0	0.0	0.0
Rayagada	5	0.0	0.0	20.0	9.0	1.6	0.0	0.0	3.0	1.8	40.0	0.0	0.0	0.0	0.0
Sambalpur	4	0.0	0.0	15.2	7.5	1.2	0.0	0.0	2.5	1.5	30.0	0.0	0.0	0.0	0.0
Subarnapur	1	0.0	0.0	2.8	1.5	0.2	0.0	0.0	0.5	0.3	5.0	0.0	0.0	0.0	0.0
Sundargarh	11	0.0	0.0	39.2	19.5	3.1	0.0	0.0	6.5	3.9	77.5	0.0	0.0	0.0	0.0
Total	**126**	**0.0**	**0.0**	**712.0**	**225.0**	**51.9**	**0.0**	**0.0**	**75.0**	**45.0**	**1297.5**	**0.0**	**0.0**	**0.0**	**0.0**

Table 38-29: 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 Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Anugul	1	0.0	0.0	2.1	0.0	0.0	2.4	0.0	0.3	1.0	0.7	0.3	33.5
Balangir	9	0.0	0.0	23.1	0.0	0.0	15.2	0.0	3.0	6.5	4.6	3.3	232.5
Baleshwar	6	0.0	0.0	14.7	0.0	0.0	10.0	0.0	1.9	4.3	3.0	2.1	151.4
Bargarh	7	0.0	0.0	16.8	0.0	0.0	15.2	0.0	2.2	6.8	4.8	2.4	220.2
Baudh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

District	Fire Stations	Diving Suits (Dry Type)	Diving Suits (Wet Type)	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity LED Torches	Rescue Boats	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Bhadrak	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cuttack	4	0.0	0.0	10.5	0.0	0.0	9.6	0.0	1.4	4.1	2.9	1.5	138.2
Debagarh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dhenkanal	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gajapati	3	0.0	0.0	8.4	0.0	0.0	3.2	0.0	1.1	1.4	1.0	1.2	56.6
Ganjam	7	0.0	0.0	16.8	0.0	0.0	14.0	0.0	2.2	6.3	4.4	2.4	204.3
Jagatsinghapur	2	0.0	0.0	4.2	0.0	0.0	5.6	0.0	0.5	2.4	1.7	0.6	77.2
Jajapur	2	0.0	0.0	4.2	0.0	0.0	6.4	0.0	0.5	2.7	1.9	0.6	85.8
Jharsuguda	4	0.0	0.0	10.5	0.0	0.0	5.6	0.0	1.4	2.4	1.7	1.5	90.1
Kalahandi	8	0.0	0.0	21.0	0.0	0.0	14.8	0.0	2.7	6.3	4.4	3.0	223.4
Kandhamal	5	0.0	0.0	12.6	0.0	0.0	6.4	0.0	1.6	2.7	1.9	1.8	102.5
Kendrapara	2	0.0	0.0	4.2	0.0	0.0	5.6	0.0	0.5	2.4	1.7	0.6	77.2
Kendujhar	2	0.0	0.0	4.2	0.0	0.0	5.2	0.0	0.5	2.2	1.6	0.6	71.9
Khordha	1	0.0	0.0	2.1	0.0	0.0	0.8	0.0	0.3	0.3	0.2	0.3	14.4
Koraput	9	0.0	0.0	23.1	0.0	0.0	11.6	0.0	3.0	5.1	3.6	3.3	188.0
Malkangiri	6	0.0	0.0	14.7	0.0	0.0	6.4	0.0	1.9	2.7	1.9	2.1	106.6
Mayurbhanj	14	0.0	0.0	35.7	0.0	0.0	20.8	0.0	4.6	9.0	6.4	5.1	325.1
Nabarangapur	5	0.0	0.0	12.6	0.0	0.0	12.0	0.0	1.6	5.3	3.7	1.8	172.0
Nayagarh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nuapada	3	0.0	0.0	8.4	0.0	0.0	4.4	0.0	1.1	1.9	1.3	1.2	70.5
Puri	5	0.0	0.0	12.6	0.0	0.0	8.0	0.0	1.6	3.4	2.4	1.8	123.6
Rayagada	5	0.0	0.0	12.6	0.0	0.0	6.4	0.0	1.6	2.7	1.9	1.8	102.5
Sambalpur	4	0.0	0.0	10.5	0.0	0.0	4.8	0.0	1.4	2.0	1.4	1.5	79.5
Subarnapur	1	0.0	0.0	2.1	0.0	0.0	0.8	0.0	0.3	0.3	0.2	0.3	14.4
Sundargarh	11	0.0	0.0	27.3	0.0	0.0	12.4	0.0	3.5	5.4	3.8	3.9	206.1
Total	**126**	**0.0**	**0.0**	**315.0**	**0.0**	**0.0**	**207.6**	**0.0**	**40.5**	**89.6**	**63.2**	**45.0**	**3167.3**

38.4.2 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 38-30 and Table 38-31. The total estimated annual manpower cost for existing and proposed staff will be **Rs. 455.39 Crores** (Table 38-30) after filling gap in operational and new urban Fire Stations and **Rs. 251.26 Crores only** (Table 38-31) for new rural Fire Stations.

Table 38-30: Annual cost estimates (in Lakhs Rupees) for manpower for Orissa 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
Anugul	9	0.0	0.0	0.0	0.0	12.8	22.9	25.3	141.9	115.9	1030.3	7.6	1356.6
Balangir	5	0.0	0.0	0.0	0.0	6.4	17.2	15.2	73.1	96.0	738.7	4.2	950.7
Baleshwar	11	0.0	0.0	8.6	0.0	12.8	17.2	85.9	206.4	297.9	1905.1	9.2	2543.1
Bargarh	4	0.0	0.0	0.0	0.0	12.8	22.9	15.2	77.4	119.2	800.3	3.4	1051.0
Baudh	4	0.0	0.0	0.0	0.0	0.0	0.0	35.4	77.4	135.7	826.2	3.4	1078.0
Bhadrak	7	0.0	0.0	0.0	0.0	6.4	11.4	85.9	184.9	331.0	1950.5	5.9	2576.0
Cuttack	15	14.8	0.0	8.6	0.0	-6.4	11.4	96.0	322.5	446.9	2585.5	10.9	3490.2
Debagarh	2	0.0	0.0	0.0	0.0	6.4	5.7	10.1	43.0	59.6	356.4	1.7	482.9
Dhenkanal	10	0.0	0.0	0.0	0.0	12.8	11.4	60.6	189.2	248.3	1396.4	8.4	1927.1
Gajapati	4	0.0	0.0	0.0	0.0	6.4	11.4	10.1	77.4	115.9	703.1	3.4	927.6
Ganjam	15	0.0	13.8	8.6	0.0	6.4	17.2	60.6	296.7	380.7	2507.8	12.6	3304.2
Jagatsinghapur	5	0.0	0.0	0.0	0.0	6.4	0.0	40.4	111.8	152.3	997.9	4.2	1313.0
Jajapur	7	0.0	0.0	0.0	0.0	12.8	17.2	80.8	176.3	307.8	1921.3	-1.7	2514.5
Jharsuguda	5	0.0	0.0	0.0	0.0	6.4	5.7	5.1	86.0	82.8	479.5	4.2	669.6
Kalahandi	4	0.0	0.0	0.0	0.0	6.4	5.7	30.3	77.4	135.7	842.4	3.4	1101.3
Kandhamal	4	0.0	0.0	0.0	0.0	6.4	0.0	20.2	64.5	76.1	411.5	3.4	582.1

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
Kendrapara	5	0.0	0.0	0.0	0.0	6.4	11.4	45.5	107.5	158.9	891.0	4.2	1224.9
Kendujhar	10	0.0	0.0	0.0	0.0	6.4	0.0	30.3	176.3	221.8	1250.6	8.4	1693.8
Khordha	13	14.8	0.0	8.6	0.0	12.8	28.6	96.0	275.2	390.6	2770.2	10.9	3607.6
Koraput	6	14.8	13.8	8.6	0.0	12.8	22.9	30.3	98.9	115.9	748.4	5.0	1071.3
Malkangiri	2	0.0	0.0	0.0	0.0	6.4	5.7	20.2	47.3	62.9	356.4	1.7	500.6
Mayurbhanj	12	0.0	0.0	0.0	0.0	12.8	22.9	30.3	193.5	238.3	1260.4	10.1	1768.2
Nabarangapur	4	0.0	0.0	0.0	0.0	6.4	0.0	15.2	60.2	72.8	343.4	3.4	501.4
Nayagarh	6	0.0	0.0	0.0	0.0	6.4	0.0	30.3	107.5	139.0	816.5	5.0	1104.7
Nuapada	2	0.0	0.0	0.0	0.0	6.4	5.7	5.1	43.0	46.3	291.6	1.7	399.8
Puri	8	0.0	0.0	8.6	0.0	6.4	5.7	50.5	172.0	274.7	1762.6	6.7	2287.2
Rayagada	4	0.0	0.0	0.0	0.0	6.4	11.4	5.1	90.3	82.8	661.0	3.4	860.3
Sambalpur	7	0.0	13.8	8.6	0.0	6.4	17.2	25.3	120.4	132.4	1040.0	5.9	1369.9
Subarnapur	5	0.0	0.0	0.0	0.0	6.4	11.4	25.3	73.1	122.5	742.0	4.2	984.8
Sundargarh	10	0.0	0.0	8.6	0.0	6.4	28.6	55.6	197.8	264.8	1726.9	8.4	2297.1
Total	**205**	**44.3**	**41.3**	**68.9**	**0.0**	**224.0**	**348.9**	**1141.3**	**3968.9**	**5425.1**	**34114.0**	**163.0**	**45539.5**

***Level 10**: Director General/Director/Deputy Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DO/DFO/Inspector/EO/Fire Supervisor; **Level 5**: ADO/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, Tindal.*

Table 38-31: Cost estimate (in Lakhs Rupees) manpower in Orissa 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
Anugul	1	0.0	0.0	0.0	0.0	0.0	0.0	10.1	25.8	43.0	210.6	0.8	290.4
Balangir	9	0.0	0.0	0.0	0.0	0.0	5.7	55.6	172.0	288.0	1292.8	7.6	1821.6
Baleshwar	6	0.0	0.0	0.0	0.0	0.0	5.7	35.4	111.8	182.1	835.9	5.0	1175.9
Bargarh	7	0.0	0.0	0.0	0.0	0.0	0.0	70.7	163.4	281.4	1370.5	5.9	1891.9
Baudh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bhadrak	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cuttack	4	0.0	0.0	0.0	0.0	0.0	0.0	45.5	98.9	175.4	842.4	3.4	1165.5
Debagarh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dhenkanal	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gajapati	3	0.0	0.0	0.0	0.0	0.0	0.0	5.1	43.0	62.9	249.5	2.5	362.9
Ganjam	7	0.0	0.0	0.0	0.0	0.0	0.0	60.6	159.1	284.7	1467.7	5.9	1978.0
Jagatsinghapur	2	0.0	0.0	0.0	0.0	0.0	0.0	30.3	55.9	99.3	508.7	1.7	695.9
Jajapur	2	0.0	0.0	0.0	0.0	0.0	0.0	30.3	60.2	105.9	550.8	1.7	748.9
Jharsuguda	4	0.0	0.0	0.0	0.0	0.0	5.7	20.2	64.5	102.6	469.8	3.4	666.2
Kalahandi	8	0.0	0.0	0.0	0.0	0.0	0.0	55.6	167.7	297.9	1419.1	6.7	1947.0
Kandhamal	5	0.0	0.0	0.0	0.0	0.0	0.0	10.1	81.7	122.5	486.0	4.2	704.5
Kendrapara	2	0.0	0.0	0.0	0.0	0.0	0.0	25.3	55.9	99.3	505.4	1.7	687.6
Kendujhar	2	0.0	0.0	0.0	0.0	0.0	0.0	25.3	51.6	96.0	466.6	1.7	641.1
Khordha	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9	19.9	68.0	0.8	101.6
Koraput	9	0.0	0.0	0.0	0.0	0.0	0.0	30.3	150.5	231.7	946.1	7.6	1366.1
Malkangiri	6	0.0	0.0	0.0	0.0	0.0	0.0	5.1	90.3	129.1	450.4	5.0	679.8
Mayurbhanj	14	0.0	0.0	0.0	0.0	0.0	0.0	60.6	253.7	407.1	1714.0	11.8	2447.2
Nabarangapur	5	0.0	0.0	0.0	0.0	0.0	0.0	55.6	124.7	218.5	1095.1	4.2	1498.0
Nayagarh	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nuapada	3	0.0	0.0	0.0	0.0	0.0	0.0	10.1	55.9	86.1	343.4	2.5	498.0
Puri	5	0.0	0.0	0.0	0.0	0.0	0.0	30.3	90.3	145.6	680.4	4.2	950.8

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
Rayagada	5	0.0	0.0	0.0	0.0	0.0	0.0	10.1	81.7	122.5	486.0	4.2	704.5
Sambalpur	4	0.0	0.0	0.0	0.0	0.0	0.0	10.1	60.2	86.1	369.4	3.4	529.1
Subarnapur	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9	19.9	68.0	0.8	101.6
Sundargarh	11	0.0	0.0	0.0	0.0	0.0	0.0	25.3	172.0	251.6	988.2	9.2	1446.3
Total	**126**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**17.2**	**717.1**	**2416.6**	**3958.8**	**17884.8**	**105.8**	**25100.3**

***Level 10**: Director General/Director/Deputy Director; **Level 9**: CFO/CO; **Level 8**: Deputy CFO; **Level 7**: Deputy Controller; **Level 6**: DO/DFO/Inspector/EO/Fire Supervisor; **Level 5**: ADO/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, 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 38-32). The total estimated cost on vehicle maintenance & repairs, and PDL will be **Rs. 20.14 Crores** per year for filling the gap in operational and urban areas in Orissa State. The annual specialized equipment, building maintenance, office expanses, and training expanses will be **Rs. 7.64 Crores, Rs. 20.36 Crores, Rs. 34.28 Crores** and **Rs. 5.98 Crores**, respectively.

Table 38-32: 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
Anugul	9	44.23	33.17	25.82	78.00	111.88	19.53
Balangir	5	22.60	16.95	18.32	43.00	74.69	13.04
Baleshwar	11	56.44	42.33	39.01	109.00	187.36	32.71
Bargarh	4	23.92	17.94	13.06	40.00	80.13	13.99
Baudh	4	24.43	18.32	12.65	42.50	81.33	14.20
Bhadrak	7	53.65	40.23	35.75	97.00	180.35	31.49
Cuttack	15	82.07	61.56	71.50	162.50	264.02	46.10
Debagarh	2	17.92	13.44	7.67	22.50	36.57	6.39
Dhenkanal	10	40.72	30.54	30.78	103.00	150.02	26.19
Gajapati	4	21.91	16.43	13.56	34.00	70.67	12.34
Ganjam	15	68.22	51.16	60.13	152.00	249.99	43.65
Jagatsinghapur	5	30.19	22.64	24.54	61.50	96.16	16.79
Jajapur	7	51.71	38.78	27.40	90.00	176.49	30.82
Jharsuguda	5	21.05	15.79	14.62	34.50	52.44	9.16
Kalahandi	4	34.96	26.22	16.83	40.00	78.45	13.70
Kandhamal	4	20.47	15.35	11.62	37.50	49.86	8.71
Kendrapara	5	28.05	21.04	21.84	56.50	87.34	15.25
Kendujhar	10	37.24	27.93	27.34	90.00	133.46	23.30
Khordha	13	101.77	76.32	54.05	139.50	261.95	45.74
Koraput	6	37.72	28.29	21.02	54.00	81.77	14.28
Malkangiri	2	18.04	13.53	6.87	22.50	36.57	6.39
Mayurbhanj	12	49.24	36.93	35.06	104.00	139.56	24.37
Nabarangapur	4	19.25	14.44	13.15	31.50	44.15	7.71
Nayagarh	6	27.71	20.78	22.71	55.00	86.21	15.05
Nuapada	2	16.82	12.61	8.61	25.50	31.07	5.42
Puri	8	50.77	38.07	32.47	87.00	170.28	29.73
Rayagada	4	24.29	18.22	14.94	45.50	67.63	11.81
Sambalpur	7	40.01	30.01	21.96	55.00	107.05	18.69
Subarnapur	5	23.59	17.69	15.60	40.00	78.38	13.69
Sundargarh	10	61.87	46.40	45.11	83.00	162.64	28.40
Total	**205**	**1,150.86**	**863.15**	**764.02**	**2,036.00**	**3,428.45**	**598.62**

Table 38-33: 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	579.00	139.45	27.72	746.17
Gap in Operational Fire Stations	365.75	322.82	57.00	745.56
New Urban Fire Stations	73.25	17.26	10.79	101.29
Total Gap in New Urban and Operational Fire Stations	439.00	340.08	67.78	846.86
New Rural Fire Stations	452.50	129.40	31.67	613.57
Total Gap in New Urban ,New Rural and Operational Fire Stations	891.50	469.47	99.46	1,460.43

Table 38-34: State level summary of Recurring Expenditure required for filling the gap (in Crores Rupees)

Recurring Expenditure								
Operational Type	Annual Staff Salary	Annual Vehicle Maintenance	Annual Maintenance Contract (Specialized Equipment)	Annual Petrol diesel and Lubricant Cost	Annual Building maintenance	Annual Office Expenses	Annual Training Expenses	Total Recurring Expenditure
Operational Fire Stations	88.80	3.35	2.22	2.51	11.58	5.59	0.98	115.03
Gap in Operational Fire Stations	421.03	7.75	4.56	5.81	7.32	26.53	4.63	477.62
New Urban Fire Stations	34.36	0.41	0.86	0.31	1.47	2.16	0.38	39.96
Total Gap in New Urban and Operational Fire Stations	455.40	8.16	5.42	6.12	8.78	28.69	5.01	517.58
New Rural Fire Stations	251.00	3.11	2.53	2.33	9.05	15.81	2.76	286.60
Total Gap in New Urban ,New Rural and Operational Fire Stations	706.40	11.27	7.96	8.45	17.83	44.50	7.77	804.18

38.5 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 Orissa State (Table 38-35 and Table 38-36).

Table 38-35: State level 10 year investment plan for Orissa 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	87.80	189.91	17.13	299.32	18.86	3.29	15.24	631.55
Second Year	97.46	199.40	28.29	571.02	35.97	5.89	19.08	957.11
Third Year	54.09	6.18	30.92	648.16	40.83	6.27	19.57	806.03
Fourth Year	60.04	6.49	33.79	735.60	46.34	6.67	20.07	909.00
Fifth Year	66.64	3.41	36.71	829.27	52.24	7.05	20.43	1,015.76
Sixth Year	73.98	3.58	39.88	934.84	58.89	7.45	20.78	1,139.41
Seventh Year	82.11	3.76	43.33	1,053.81	66.39	7.87	21.15	1,278.41
Eighth Year	91.15	3.95	47.07	1,187.86	74.84	8.32	21.52	1,434.68
Ninth Year	0.00	4.14	51.13	1,338.91	84.35	8.79	21.89	1,509.21
Tenth Year	0.00	4.35	55.53	1,509.11	95.07	9.29	22.27	1,695.62
Total	**613.26**	**425.17**	**383.79**	**9,107.90**	**573.80**	**70.87**	**202.00**	**11,376.78**

Table 38-36: State level 10 year investment plan for Orissa 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	178.30	189.91	17.13	299.32	18.86	3.29	15.24	722.05
Second Year	197.91	199.40	28.29	571.02	35.97	5.89	19.08	1,057.57
Third Year	109.84	41.70	32.78	711.13	44.80	6.87	21.42	968.55
Forth Year	121.92	43.78	37.81	876.65	55.23	7.95	23.80	1,167.14
Fifth Year	135.34	22.99	42.13	1,026.75	64.69	8.72	25.13	1,325.76
Sixth Year	150.23	24.14	46.91	1,200.25	75.62	9.56	26.49	1,533.19
Seventh Year	166.75	25.34	52.18	1,400.61	88.24	10.46	27.87	1,771.45

	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
Eighth Year	185.09	26.61	57.99	1,631.76	102.80	11.42	29.28	2,044.96
Ninth Year	0.00	27.94	64.40	1,898.23	119.59	12.46	30.71	2,153.33
Tenth Year	0.00	29.34	71.46	2,205.16	138.92	13.57	32.17	2,490.61
Total	**1,245.38**	**631.15**	**451.09**	**11,820.89**	**744.71**	**90.20**	**251.20**	**15,234.61**

38.6 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 Table 38-38 and Table 38-39, 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, Orissa Fire Services may change the priority of a new Fire Station depending upon the local situation and requirements.

38.7 Avenues of Fund Generation

Orissa 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.

38.8 Capacity Building and Training Facilities

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

Orissa Fire Services has a full-fledged State Fire Service Training Institute at Bhubaneswar, which is working as a Regional Fire Training Institute. This Training Centre is also conducting training for firefighters from neighboring States/UTs. Other than basic firefighting training, the institute is also providing training for Sub-Officers (SO) up to Divisional Officer (DO) level courses on behalf of NFSC, Nagpur. To improve the training curriculum and providing better facilities to trainees, the developmental plan taken up by the Orissa Fire Services is significant. In general, OFS firefighters as well as officers have sufficient opportunity towards training. However, given the number of vacant positions, the State lacks some trained manpower in firefighting as training is not a onetime activity. The detail of the training courses attended by fire personnel in OFS is provided in the below table-

Training Courses attended by fire personnel in Orissa Fire Services (OFS)

Sr No.	Name of the Training Courses	Duration (Months)	Maximum Capacity	Number of Personnel Trained Annually	Year
1	Station Officers Course	9	40	279	From 1972 to till date
2	Sub-Officers/ Asst. Station Officers Course	6	40	301	From 1972 to till date
3	Leading Fireman Course	6	270	659	From 1972 to till date
4	Driver Havildar Course	6	270	387	From 1978 to till date
5	Fireman Course	9	270	3,613	From 1971 to till date
6	External Sub-Officer Course of Training	6	40	151	From 2009 to till date

The roles of firefighter cannot be performed until and unless sufficient training is imparted to the fire service personnel. The types of training and duration depend upon the type of entry to the fire service department or the 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.

In order to further strengthen the OFS, the gap in training has been estimated for various levels of fire personnel. The Fire Station survey and gap analysis reveal that there is a gap in training need for existing staff. The previous section (section 38.3.3.) details about large gap in manpower in 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.).

38.8.1 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 equipment.

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 38-37. Additional requirement of Refresher Training Course for fireman after every 3-5 years of service is also shown the Table 38-37. 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, Orissa Fire Services would require to train 16,566 fire personnel in basic and 9,746 fire personnel in refresher training in next 10 years. Therefore, State training centre should have adequate capacity and infrastructure for meeting such training requirement.

38.8.2 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 38-37. In total, OFS would need to train at least 3,020 leading fireman in next 10 years.

38.8.3 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 38-37. In total, Orissa State would need to train at least 1,824 fire personnel for specialized courses in next 10 years.

Table 38-37: Estimated training requirements for fire personnel in Orissa Fire Services

Basic Training for Fireman		
	Number of Fire Personnel in Operational Fire Stations	10,271
	Number of Fire Personnel in New Urban Fire Stations	775
	Number of Fire Personnel in New Rural Fire Stations	5,520
	Total Number of Fire Personnel for Training	**16,566**
Refresher Training for Fireman		
	Total Number of Fire Personnel	**9,746**
Leading Fireman Training Course		
	Number of Fire Personnel in Operational Fire Stations	1,707
	Number of Fire Personnel in New Urban Fire Stations	117
	Number of Fire Personnel in New Rural Fire Stations	1,196
	Total Number of Fire Personnel for Training	**3,020**
Other specialized Training Course		
	Total Number of Fire Personnel for Training	**1,824**
Junior Officer Training Course		
	Number of Fire Personnel in Operational Fire Stations	1,120
	Number of Fire Personnel in New Urban Fire Stations	98
	Number of Fire Personnel in New Rural Fire Stations	704
	Total Number of Fire Personnel for Training	**1,922**
Divisional Officer Training Course		
	Number of Fire Personnel in Operational Fire Stations	101
	Number of Fire Personnel in New Urban Fire Stations	14
	Number of Fire Personnel in New Rural Fire Stations	3
	Total Number of Fire Personnel for Training	**118**
Fire Prevention Course		
	Total Number of Fire Personnel for Training	**135**

38.8.4 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 38-37. After filling gap in operational Fire Stations, new urban and rural Fire Stations, Orissa State would require to train 1,922 junior officers in next 10 years.

38.8.5 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 38-37. About 118 fire officers in OFS who would require this training in next 10 years.

38.8.6 AWARENESS GENERATION PROGRAMS

Besides attending regular fire and other rescue calls, the State fire services is also working on awareness generation programs, and conducting frequently regular awareness programs in schools, colleges, residential areas, cinema halls, shopping malls, hospitals, NCC camps, industries, Govt.& private offices etc. Currently, numbers of awareness programs conducted so far by OFS are not up to the satisfactory level and there is a need to enhance such activities. For large scale public awareness generation, each district is 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 produced by MHA, live- demonstrations of how to use “portable extinguishers” and how to handle small kitchen fires. The details of some of the awareness programs conducted by OFS in last one year are reported in following table:

List of awareness programs carried out by Orissa Fire Services

Sr No.	Name of Zonal/District Office	Total no. of programs in the year including Fire Safety	Total no. of persons attended	No of Programs Organized			No of Persons Attended			Brief Description of the Programmes
		(a +b + c)	(d + e + f)	Govt./ PSU	Pvt. Locations	Schools	Govt. / PSU	Pvt. Locations	Schools	
				(a)	(b)	(c)	(d)	(e)	(f)	
1	Northern Range Sambalpur	60	6580	10	15	35	1050	2530	3000	Talks regarding causes of fire, domestic fire, method of fire extinction

Sr No.	Name of Zonal/District Office	Total no. of programs in the year including Fire Safety	Total no. of persons attended	No of Programs Organized			No of Persons Attended			Brief Description of the Programmes
		(a +b + c)	(d + e + f)	Govt./ PSU	Pvt. Locations	Schools	Govt. / PSU	Pvt. Locations	Schools	
				(a)	(b)	(c)	(d)	(e)	(f)	
2	Central Range Cuttack	34	905	4	29	1	80	775	50	Mock Drill & Awareness program
3	Southern Range Berhampur	26	407	3	15	1	65	575	34	Mock Drill & Awareness program

38.9 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.

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 whatever information made available, 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.

38.10 Recommendations for Orissa Fire Services

1. The State has enacted Orissa Fire Service Act in 1993, which has been was further revised in 2012 as "Orissa Fire Prevention & Safety Rules 2012" and is pending with Orissa State government for its approval.2005. Since State falls in Seismic Zone III and II, there is a need for strict implementation of fire safety codes in building design and construction. National Building Code (NBC) should be strictly adhered to in high-rise buildings, schools, hospitals, shopping malls, cinema halls, industrial units, institutions and public and private buildings. Moreover, Keeping in mind the State vulnerability to earthquakes, even low-rise buildings need strict implementation of building code.
2. The Orissa State lacks firefighting manpower and there are vacancies at all levels in the State in operational Fire Stations, which need to be filled up at the earliest.
3. Instead of having fireman, 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 OFS 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 in rural areas.
5. To have a Computerization of Orissa Fire Services, training of fire personnel in use of computers is required, which is very important from the modernization 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 is creating public awareness programs for schools, colleges, hospitals, Govt. offices, high-rise buildings, etc., however, it is not up to the desired level due to lack of trained and dedicated 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, colleges, hospitals, shopping malls, cinema halls, multi-storied buildings, and major industrial centers should be taken care by the OFS.
9. The OFS should ensure that for operational duty, physically unfit firefighter should not be part of team, and he/she should be allowed to work in the areas, other than fire response.
10. 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, OFS 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.
11. OFS does have promotional avenues for their staff. However, there is a need to have merit-based promotion, so that deserving employees remain motivated and do not leave the organization at midst of their career.
12. The OFS should have audit by a central authority to ensure good finance mechanism for capital, and O&M expenditures.

Table 38-38: Details of operational and new proposed urban Fire Stations with their , population density, and priority ranking for new Fire Stations

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Urban FS
Anugul	New Urban_23	Central Colony	New Urban	947	16
Anugul	New Urban_24	Banarpal	New Urban	855	18
Anugul	OR3608	Talcher Fire Station	Urban	1098	
Anugul	OR3623	Kaniha Fire Station	Urban	1628	
Anugul	OR3624	Angul Fire Station	Urban	1415	
Anugul	OR3630	Athamallik Fire Station	Urban	631	
Balangir	New Urban_7	Kantabanji	New Urban	943	17
Balangir	OR3428	Titilagarh Fire Station	Urban	1546	
Balangir	OR3441	Balangir Fire Station	Urban	2256	
Balangir	OR3604	Patnagarh Fire Station	Urban	1422	
Baleshwar	New Urban_13	Kupari	New Urban	4474	3
Baleshwar	OR3527	Jaleshwar Fire Station	Urban	1087	
Baleshwar	OR3538	Baleshwar Fire Station	Urban	4791	
Bargarh	OR3606	Padampur Fire Station	Urban	5393	
Bargarh	OR3622	Barpali Fire Station	Urban	1581	
Bargarh	OR3659	Bargarh Fire Station	Urban	4445	
Bhadrak	OR3404	Bhadrak Fire Station	Urban	3675	
Cuttack	New Urban_18	Municipal Colony	New Urban	22357	1
Cuttack	New Urban_19	Chaudwar	New Urban	1200	6
Cuttack	OR3543	Chauliaganja Fire Station	Urban	10971	
Cuttack	OR3576	Athagarh Fire Station	Urban	1780	
Cuttack	OR3582	Abhinaba Bidanasi Fire Station	Urban	13866	
Cuttack	OR3648	Cuttack Fire Station	Urban	17969	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Urban FS
Debagarh	OR3617	Debagarh Fire Station	Urban	233	
Dhenkanal	OR3635	Kamakhya Nagar Fire Station	Urban	693	
Dhenkanal	OR3662	Dhenkanal Fire Station	Urban	1203	
Gajapati	OR3629	Parlakhemundi Fire Station	Urban	10677	
Ganjam	New Urban_17	Gajapati Nagar	New Urban	1797	15
Ganjam	OR3471	Berhampur Fire Station	Urban	14448	
Ganjam	OR3519	Aska Fire Station	Urban	1801	
Ganjam	OR3536	Hinjiliccet Fire Station	Urban	1597	
Ganjam	OR3565	Bhanjanagar Fire Station	Urban	2945	
Ganjam	OR3616	Digapahandi Fire Station	Urban	632	
Jagatsinghapur	New Urban_20	Paradip	New Urban	592	12
Jagatsinghapur	OR3462	Jagatsinghapur Fire Station	Urban	2581	
Jajapur	OR3547	Jajapur Fire Station	Urban	2032	
Jajapur	OR3778	Jajapur Road Fire Station	Urban	4747	
Jharsuguda	New Urban_2	Brajarajnagar	New Urban	733	21
Jharsuguda	New Urban_1	Belpahar	New Urban	730	22
Jharsuguda	OR3633	Jharsuguda Fire Station	Urban	822	
Kalahandi	New Urban_8	Junagarh	New Urban	814	19
Kalahandi	OR3539	Kesinga Fire Station	Urban	1419	
Kalahandi	OR3541	Bhawanipatna Fire Station	Urban	3224	
Kandhamal	OR3542	Phulbani Fire Station	Urban	1360	
Kendrapara	OR3588	Kendrapara Fire Station	Urban	2414	
Kendujhar	New Urban_11	Barbil	New Urban	423	25
Kendujhar	OR3469	Keonjhar Fire Station	Urban	897	
Khordha	New Urban_14	G.B.Nagar	New Urban	7997	2

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Urban FS
Khordha	New Urban_16	Kapileshwar Prasad	New Urban	3968	4
Khordha	New Urban_15	Khandagiri	New Urban	1716	5
Khordha	OR3431	Chandrasekharpur Fire Station	Urban	4518	
Khordha	OR3433	Bhubaneswar Fire Station	Urban	10906	
Khordha	OR3557	Jatni Fire Station	Urban	1610	
Khordha	OR3575	Khurda Fire Station	Urban	1781	
Khordha	OR3634	Secretariat Fire Station	Urban	10408	
Koraput	New Urban_9	Sunabeda	New Urban	779	20
Koraput	New Urban_10	Damanjodi	New Urban	498	24
Koraput	OR3590	Koraput Fire Station	Urban	1910	
Koraput	OR3654	Kotpad Fire Station	Urban	1190	
Koraput	OR3656	Jeypore Fire Station	Urban	200	
Malkangiri	OR3592	Malkangiri Fire Station	Urban	1594	
Mayurbhanj	New Urban_25	Prafulla Nagar	New Urban	3612	8
Mayurbhanj	New Urban_12	Rairangpur New Urban FS	New Urban	570	13
Mayurbhanj	OR3447	Karanjia Fire Station	Urban	602	
Mayurbhanj	OR3550	Baripada Fire Station	Urban	4025	
Nabarangapur	OR3601	Umerkote Fire Station	Urban	1739	
Nabarangapur	OR3645	Nabarangapur Fire Station	Urban	2060	
Nayagarh	OR3468	Nayagarh Fire Station	Urban	1579	
Nuapada	OR3594	Khariar Fire Station	Urban	2586	
Nuapada	OR3595	Khariar Road Fire Station	Urban	2192	
Puri	OR3545	Puri Fire Station	Urban	7291	
Puri	OR3644	Singhadwar Fire Station	Urban	7261	
Rayagada	OR3607	Rayagada Fire Station	Urban	18305	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Urban FS
Rayagada	OR3609	Gunupur Fire Station	Urban	1051	
Sambalpur	New Urban_21	Hirakud	New Urban	668	23
Sambalpur	OR3611	Rairakhole Fire Station	Urban	1099	
Sambalpur	OR3636	Sambalpur Fire Station	Urban	5918	
Sambalpur	OR3640	Burala Fire Station	Urban	779	
Sambalpur	OR3657	Kuchinda Fire Station	Urban	1899	
Subarnapur	OR3413	Sonepur Fire Station	Urban	1891	
Sundargarh	New Urban_5	Rourkela Industrial EState	New Urban	5017	7
Sundargarh	New Urban_4	Kansbahal	New Urban	1573	9
Sundargarh	New Urban_3	Rajgangpur	New Urban	1135	10
Sundargarh	New Urban_6	Biramitrapur	New Urban	898	11
Sundargarh	New Urban_22	Bisra	New Urban	536	14
Sundargarh	OR3598	Rourkela Fire Station	Urban	4991	
Sundargarh	OR3599	Panposh Fire Station	Urban	2304	
Sundargarh	OR3650	Sundargarh Fire Station	Urban	2386	

Table 38-39: Details of operational and new proposed rural Fire Stations with their population density and priority ranking for new Fire Stations

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Anugul	New Rural_129	Jarapada	New Rural	173	81
Anugul	OR3619	Chendipada Fire Station	Rural	213	
Anugul	OR3632	Pallahara Fire Station	Rural	141	
Anugul	OR3655	Bamur Fire Station	Rural	113	

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Balangir	New Rural_26	Loisingha	New Rural	305	55
Balangir	New Rural_28	Deogaon	New Rural	288	59
Balangir	New Rural_29	Saintala	New Rural	238	65
Balangir	New Rural_38	Bangomunda	New Rural	233	67
Balangir	New Rural_34	Muribahal	New Rural	226	74
Balangir	New Rural_107	Puintala	New Rural	207	77
Balangir	New Rural_31	Belpara	New Rural	196	79
Balangir	New Rural_33	Khaprakhol	New Rural	159	86
Balangir	New Rural_35	Taraikela	New Rural	129	93
Balangir	OR3422	Tarava Fire Station	Rural	188	
Balangir	OR3574	Gudvella Fire Station	Rural	128	
Baleshwar	New Rural_128	Pasarbindha	New Rural	2084	1
Baleshwar	New Rural_85	Nampo	New Rural	641	3
Baleshwar	New Rural_84	Raibania	New Rural	475	5
Baleshwar	New Rural_83	Chanuan	New Rural	443	6
Baleshwar	New Rural_122	Bahanaga	New Rural	383	7
Baleshwar	New Rural_123	Oupada	New Rural	49	11
Baleshwar	OR3435	Khaira Fire Station	Rural	301	
Baleshwar	OR3566	Basta Fire Station	Rural	729	
Baleshwar	OR3570	Baliapal Fire station.	Rural	918	
Baleshwar	OR3572	Nilagiri Fire Station	Rural	434	
Baleshwar	OR3583	Remuna Fire station	Rural	374	
Baleshwar	OR3586	Ada Fire Station	Rural	378	
Baleshwar	OR3669	Soro Fire Station	Rural	573	
Baleshwar	OR3534	Bhogarai Fire Station	Rural	1419	

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Bargarh	New Rural_19	Bheden	New Rural	309	54
Bargarh	New Rural_23	Atabira	New Rural	292	58
Bargarh	New Rural_20	Bijepur	New Rural	258	61
Bargarh	New Rural_32	Jharbandh	New Rural	229	70
Bargarh	New Rural_25	Gaisilet	New Rural	197	78
Bargarh	New Rural_18	Bhatli	New Rural	163	84
Bargarh	New Rural_17	Ambabhona	New Rural	124	94
Bargarh	OR3605	Paikmal Fire Station	Rural	194	
Baudh	OR3407	Charichhak Fire Station	Rural	126	
Baudh	OR3429	Baudh Fire Station	Rural	187	
Baudh	OR3544	Banusani Fire Station	Rural	148	
Baudh	OR3559	Kantamal Fire Station	Rural	72	
Bhadrak	OR3398	Dhamaru Fire Station	Rural	98	
Bhadrak	OR3406	Gadi Fire Station	Rural	350	
Bhadrak	OR3424	Dhamnagar Fire Station	Rural	492	
Bhadrak	OR3529	Aagarpada Fire Station	Rural	1000	
Bhadrak	OR3548	Basudevpur Fire Station	Rural	817	
Bhadrak	OR3578	Chandabali Fire Station	Rural	314	
Cuttack	New Rural_112	Niali	New Rural	1315	2
Cuttack	New Rural_119	Balianta	New Rural	623	4
Cuttack	New Rural_124	Dompada	New Rural	282	8
Cuttack	New Rural_110	Narsinghpur	New Rural	169	9
Cuttack	OR3551	Balijhari Fire Station	Rural	284	
Cuttack	OR3554	Salipur Fire Station	Rural	757	
Cuttack	OR3555	NischintakoiliFire Station	Rural	1103	

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Cuttack	OR3562	Tigiria Fire Station	Rural	293	
Cuttack	OR3564	Badamba Fire Station	Rural	213	
Cuttack	OR3584	Kuanpal Fire Station	Rural	935	
Cuttack	OR3585	Adaspur Fire Station	Rural	1284	
Cuttack	OR3587	Kalapathar Fire Station	Rural	406	
Cuttack	OR3646	Banki Fire Station	Rural	267	
Debagarh	OR3631	Barkot Fire Station	Rural	103	
Dhenkanal	OR3412	Bhuban Fire Station	Rural	464	
Dhenkanal	OR3612	Khajuriakata Fire Station.	Rural	325	
Dhenkanal	OR3618	Rasol Fire Station	Rural	195	
Dhenkanal	OR3621	Hindola Road Fire Station	Rural	312	
Dhenkanal	OR3637	Gondia Fire Station	Rural	289	
Dhenkanal	OR3649	Parjang Fire Station	Rural	200	
Dhenkanal	OR3660	Kankadahad Fire Station	Rural	105	
Dhenkanal	OR3670	Hindol Fire Station	Rural	175	
Gajapati	New Rural_92	Rayagada	New Rural	124	111
Gajapati	New Rural_90	Gumma	New Rural	113	114
Gajapati	New Rural_91	Nuagada	New Rural	43	122
Gajapati	OR3614	Mohana Fire Station	Rural	82	
Gajapati	OR3628	Kashinagar Fire Station	Rural	197	
Gajapati	OR3653	R. Udayagiri. Fire Station	Rural	92	
Ganjam	New Rural_97	Bellaguntha	New Rural	525	45
Ganjam	New Rural_103	Sanakhemundi	New Rural	467	47
Ganjam	New Rural_98	Buguda	New Rural	379	48
Ganjam	New Rural_95	Gopalpur	New Rural	358	51

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Ganjam	New Rural_96	Rambha	New Rural	356	52
Ganjam	New Rural_94	Chikiti	New Rural	192	80
Ganjam	New Rural_104	Dharakote	New Rural	130	92
Ganjam	OR3533	Khallikote Fire Station	Rural	605	
Ganjam	OR3535	Purusottampur Fire Station	Rural	564	
Ganjam	OR3561	Jagannath Prasad Fire Station	Rural	263	
Ganjam	OR3567	Sorado Fire Station	Rural	124	
Ganjam	OR3569	Kabisuryanagar Fire Station	Rural	940	
Ganjam	OR3573	Kodala Fire Station	Rural	423	
Ganjam	OR3579	Chhatrapur Fire Station	Rural	792	
Ganjam	OR3581	Polasara Fire Station	Rural	610	
Ganjam	OR3625	Patrapur Fire Station	Rural	123	
Jagatsinghapur	New Rural_117	Biridi	New Rural	919	12
Jagatsinghapur	New Rural_111	Naugaon	New Rural	690	13
Jagatsinghapur	OR3451	Kujanga Fire Station	Rural	234	
Jagatsinghapur	OR3453	Tirtol Fire Station	Rural	712	
Jagatsinghapur	OR3528	Raghunathpur Fire Station	Rural	1054	
Jajapur	New Rural_121	Dharmasala	New Rural	627	15
Jajapur	New Rural_120	Danagadi	New Rural	581	16
Jajapur	OR3464	DasarathpurFire Station	Rural	430	
Jajapur	OR3467	Sukinda Fire Station	Rural	335	
Jajapur	OR3472	Binijharpur Fire Station	Rural	590	
Jajapur	OR3520	Chandikhol Fire Station	Rural	629	
Jajapur	OR3642	Bari Fire Station	Rural	909	
Jharsuguda	New Rural_7	Kolabira	New Rural	293	57

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Jharsuguda	New Rural_6	Kirmira	New Rural	242	63
Jharsuguda	New Rural_8	Laikera	New Rural	224	75
Jharsuguda	New Rural_16	Jharupalli	New Rural	132	91
Jharsuguda	OR3593	I B Thermal Fire Station	Rural	120	
Jharsuguda	OR3597	Lakhanpur Fire Station	Rural	107	
Kalahandi	New Rural_108	Karlamunda	New Rural	366	50
Kalahandi	New Rural_40	Narla	New Rural	245	62
Kalahandi	New Rural_39	Golamunda	New Rural	215	76
Kalahandi	New Rural_45	Jaipatna	New Rural	167	82
Kalahandi	New Rural_44	Kalampur	New Rural	146	87
Kalahandi	New Rural_42	Koksara	New Rural	134	89
Kalahandi	New Rural_109	Madanpur Rampur	New Rural	59	101
Kalahandi	New Rural_43	Thuamul Rampur	New Rural	57	103
Kalahandi	OR3603	Dhramgarh Fire Station	Rural	326	
Kandhamal	New Rural_105	Phiringia	New Rural	141	107
Kandhamal	New Rural_106	Tikabali	New Rural	136	109
Kandhamal	New Rural_100	Daringbadi	New Rural	46	120
Kandhamal	New Rural_101	Kotagarh	New Rural	46	121
Kandhamal	New Rural_102	Tumudibandha	New Rural	27	126
Kandhamal	OR3546	Raikia Fire Station	Rural	106	
Kandhamal	OR3560	Balliguda Fire Station	Rural	64	
Kandhamal	OR3580	G-Udayagiri Fire Station	Rural	180	
Kendrapara	New Rural_127	Chakroda	New Rural	1637	41
Kendrapara	New Rural_118	Marshaghai	New Rural	803	43
Kendrapara	OR3452	Aul Fire Station	Rural	332	

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Kendrapara	OR3461	Pattamundai Fire Station	Rural	437	
Kendrapara	OR3463	Korua Fire Staion	Rural	1681	
Kendrapara	OR3470	RajkanikaFire Station	Rural	294	
Kendujhar	New Rural_69	Patna	New Rural	375	49
Kendujhar	New Rural_70	Saharpada	New Rural	227	73
Kendujhar	OR3442	Ghatagaon Fire Station	Rural	145	
Kendujhar	OR3530	Jhumpura Fire Station	Rural	325	
Kendujhar	OR3531	Anandapur Fire Station	Rural	189	
Kendujhar	OR3532	Champua Fire Station	Rural	463	
Kendujhar	OR3540	Joda Fire Station	Rural	130	
Kendujhar	OR3556	Ghasipura Fire Station	Rural	342	
Kendujhar	OR3568	Hatadihi Fire Station	Rural	239	
Kendujhar	OR3638	Telkui Fire Station	Rural	102	
Khordha	New Rural_125	Gangadharpur	New Rural	118	10
Khordha	OR3420	Balipatna FIre Station	Rural	1118	
Khordha	OR3425	Bolagarh Fire Station	Rural	416	
Khordha	OR3427	Begunia Fire Station	Rural	606	
Khordha	OR3434	Tangi Fire Station	Rural	325	
Khordha	OR3563	Balugaon Fire Station	Rural	227	
Koraput	New Rural_52	Kundara	New Rural	233	68
Koraput	New Rural_63	Nandapur	New Rural	228	71
Koraput	New Rural_55	Paduwa	New Rural	165	83
Koraput	New Rural_49	Boipariguda	New Rural	142	88
Koraput	New Rural_61	Lamptaput	New Rural	116	95
Koraput	New Rural_51	Dasamantapur	New Rural	94	96

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Koraput	New Rural_87	Bandhugaon	New Rural	69	98
Koraput	New Rural_64	Narayanpatna	New Rural	59	100
Koraput	New Rural_62	Pottangi	New Rural	58	102
Koraput	OR3639	Borigumma Fire Station	Rural	342	
Malkangiri	New Rural_56	Korkonda	New Rural	170	106
Malkangiri	New Rural_58	Podia	New Rural	128	110
Malkangiri	New Rural_54	Balimela	New Rural	93	115
Malkangiri	New Rural_59	Mathili	New Rural	81	116
Malkangiri	New Rural_60	Khairaput	New Rural	61	118
Malkangiri	New Rural_57	Kudumulugumma	New Rural	30	124
Malkangiri	OR3591	Kalimela Fire Station	Rural	133	
Mayurbhanj	New Rural_78	Gopabandhu Nagar	New Rural	687	14
Mayurbhanj	New Rural_68	Raruan	New Rural	552	17
Mayurbhanj	New Rural_76	Morada	New Rural	484	18
Mayurbhanj	New Rural_74	Suliapada	New Rural	354	19
Mayurbhanj	New Rural_67	Sukurli	New Rural	298	20
Mayurbhanj	New Rural_82	Khunta	New Rural	205	24
Mayurbhanj	New Rural_65	Tiringi	New Rural	192	25
Mayurbhanj	New Rural_75	Kuliana	New Rural	189	26
Mayurbhanj	New Rural_66	Bahalda	New Rural	167	27
Mayurbhanj	New Rural_72	Jamda	New Rural	164	28
Mayurbhanj	New Rural_71	Bijatala	New Rural	126	31
Mayurbhanj	New Rural_73	Bisoi	New Rural	63	37
Mayurbhanj	New Rural_79	Kaptipada	New Rural	55	38
Mayurbhanj	New Rural_77	Thakurmunda	New Rural	52	39

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Mayurbhanj	OR3446	Rasgovindpur Fire Station	Rural	712	
Mayurbhanj	OR3448	Jashipur Fire Station	Rural	104	
Mayurbhanj	OR3449	Kusumi Fire Station	Rural	148	
Mayurbhanj	OR3473	Betanati Fire Station	Rural	665	
Mayurbhanj	OR3474	Saraskana Fire Station	Rural	260	
Mayurbhanj	OR3475	Bangiriposi Fire Station	Rural	161	
Mayurbhanj	OR3526	Udala Fire Station	Rural	375	
Mayurbhanj	OR3552	Rairangpur Fire Station	Rural	211	
Nabarangapur	New Rural_50	Nandahandi	New Rural	338	53
Nabarangapur	New Rural_46	Pappadahandi	New Rural	241	64
Nabarangapur	New Rural_48	Dabugaon	New Rural	235	66
Nabarangapur	New Rural_47	Raighar	New Rural	232	69
Nabarangapur	New Rural_53	Kosagumuda	New Rural	227	72
Nabarangapur	OR3626	Chandahandi Fire Station.	Rural	59	
Nabarangapur	OR3652	Tentulikhundi FIre Station	Rural	162	
Nayagarh	OR3466	Ranpur Fire Station	Rural	338	
Nayagarh	OR3549	Daspala Fire Station	Rural	135	
Nayagarh	OR3558	Khandapara Fire Station	Rural	281	
Nayagarh	OR3571	Bhapur Fire Station	Rural	596	
Nayagarh	OR3577	Odagaon Fire Station	Rural	185	
Nuapada	New Rural_36	Komana	New Rural	137	108
Nuapada	New Rural_37	Sinapali	New Rural	122	112
Nuapada	New Rural_30	Boden	New Rural	61	117
Puri	New Rural_126	Patasaharipur	New Rural	855	42
Puri	New Rural_114	Delanga	New Rural	569	44

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Puri	New Rural_116	Gop	New Rural	518	46
Puri	New Rural_115	Kakatpur	New Rural	298	56
Puri	New Rural_113	Kanasa	New Rural	269	60
Puri	OR3443	Nimapara Fire Station	Rural	1951	
Puri	OR3445	Satybadi Fire Station	Rural	116	
Puri	OR3450	Krushna Prasad Fire Station	Rural	147	
Puri	OR3589	Astaranga Fire Station	Rural	362	
Puri	OR3627	Brahmagiri Fire Station	Rural	103	
Puri	OR3423	Pipli Fire Station	Rural	1791	
Rayagada	New Rural_88	Kolnara	New Rural	174	105
Rayagada	New Rural_41	Kashipur	New Rural	119	113
Rayagada	New Rural_89	Gudari	New Rural	57	119
Rayagada	New Rural_93	Padmapur	New Rural	39	123
Rayagada	New Rural_99	Chandrapur	New Rural	28	125
Rayagada	OR3613	Gumuda Fire Station	Rural	74	
Rayagada	OR3615	Bissam Cuttack Fire Station	Rural	111	
Sambalpur	New Rural_21	Maneswar	New Rural	160	85
Sambalpur	New Rural_9	Bamra	New Rural	133	90
Sambalpur	New Rural_24	Jamankira	New Rural	81	97
Sambalpur	New Rural_22	Jujumara	New Rural	61	99
Sambalpur	OR3596	Rengali Fire Station	Rural	119	
Sambalpur	OR3602	NaktideulaFire Station	Rural	89	
Subarnapur	New Rural_27	Binika	New Rural	244	104
Subarnapur	OR3402	Ullanda Fire Station	Rural	208	
Subarnapur	OR3403	Birmaharaipur Fire Station	Rural	333	

District	FSRefNo	Fire Station Name	Operational Type	Population Density	Priority Ranking of New Rural FS
Subarnapur	OR3647	Rampur Fire Station	Rural	347	
Sundargarh	New Rural_10	Kuanramunda	New Rural	244	21
Sundargarh	New Rural_5	Bargaon	New Rural	225	22
Sundargarh	New Rural_11	Nuagaon	New Rural	220	23
Sundargarh	New Rural_2	Subdega	New Rural	145	29
Sundargarh	New Rural_3	Tangarpali	New Rural	136	30
Sundargarh	New Rural_4	Balisankara	New Rural	113	32
Sundargarh	New Rural_12	Lathikata	New Rural	86	33
Sundargarh	New Rural_14	Lahunipada	New Rural	83	34
Sundargarh	New Rural_15	Gurundia	New Rural	82	35
Sundargarh	New Rural_1	Hemagiri	New Rural	77	36
Sundargarh	New Rural_13	Koira	New Rural	44	40
Sundargarh	OR3600	Banei Fire Station	Rural	238	
Sundargarh	OR3651	Kutra Fire Station	Rural	220	

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