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

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

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Submitted by

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Executive Summary

Fire service is one of the most important emergency response services in the country, which comes under the 12th schedule of the constitution dealing with Municipal functions. At present, fire prevention and fire fighting services are organized by the concerned States and Union Territories (UTs), and Urban Local Bodies (ULBs). Directorate of National Disaster Response Force and Civil Defence (NDRF&CD, Fire Cell), Ministry of Home Affairs (MHA) 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 the remaining states, it is under the respective Home Department.

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

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

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

Role of Fire Services

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

responders' and wait until assistance from the flood department arrives. It is therefore, considered appropriate that the specialized facilities for such jobs is maintained and operated by the concerned department.

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

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

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

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

Phased Approach

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

Field Surveys for Fire Infrastructure Data

To collect and collate the information on Fire Infrastructure of these Pilot States/ UTs, RMSI team developed two detailed forms "Headquarter Data Collection Form" and individual "Fire Station Field-Survey Form". RMSI team field-surveyed all the Fire Stations in pilot States/UTs for collecting detailed fire Infrastructure information. The detailed information collected includes address of fire station, name of fire station in-charge, emergency contact numbers, communication between fire station control room, public and headquarter control room; fire station building including staff accommodation and barracks; fire fighting vehicles and specialized equipment; fire personnel, their duty pattern and pay-scales; water availability and water sources for fire vehicles, fire-risk in the jurisdiction of fire station and its geographical coordinates (latitude, longitude -by using a Global Positioning System, GPS) etc. All this information for each fire station has been digitally converted and is available through Fire Decision Support System (FDSS), which can generate a Fire Station report at the click of a button.

GIS based Fire Hazard and Risk Analysis

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

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

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

For estimating exposure and its vulnerability, detailed urban agglomerate classification maps generated from high-resolution satellite images have been used. With the help of remote sensing techniques applied on high-resolution satellite imageries, various types of urban agglomeration areas have been demarcated. These include urban, semi-urban, building blocks, and industrial and rural villages' built-up areas of different densities (high medium, low). For exposure vulnerability, 4 different layers such as population density, residential built-up areas, high-rise building block density, and industrial areas have been developed individually at the 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***

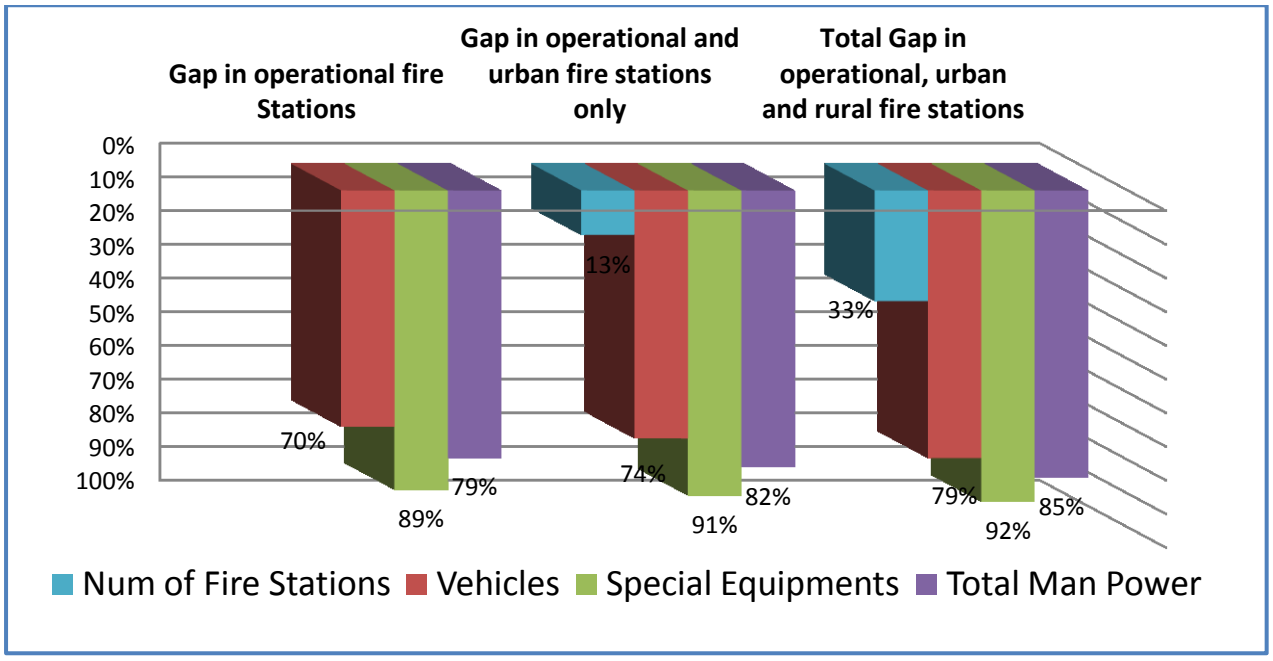
Summary of Findings for Tamil Nadu State

Presently, Tamil Nadu Fire & Rescue Services (TNFRS) has a total 303 operational fire stations and a full-fledged State Training School located in Chennai.

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 cantonments, nuclear/ thermal power plants etc. The remaining areas, not covered under ideal jurisdiction of operational fire stations, are also divided for ideal jurisdictions of new proposed fire stations. The requirements for fire fighting and rescue vehicles and specialized equipments are based on ideal served population, population density, and built-up areas within ideal jurisdiction boundary.

Fire Station Gap Analysis

As per detailed GIS based analysis, the state would require additional 46 Fire Stations in urban areas and 102 Fire Stations in rural areas. Hence this study finds an overall gap of 33% in terms of number of fire stations in Tamil Nadu State (for details, please refer to section 29.3.1).



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 29.3.2. This finds an overall gap of 79% in the firefighting and rescue vehicle and about 92% in specialized equipment for both operational and new Fire Stations in urban and rural areas.

Fire Personnel Gap Analysis

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

optimized the fire manpower requirement in comparison to what has been suggested in SFAC norms. The current duty patterns in Tamil Nadu state is double shift duty pattern (12 hours), in general, and RMSI team also estimated firefighting personnel requirement for double shift duty pattern (for details, please refer to section 29.3.3). Thus, in Tamil Nadu state, this study finds an overall gap of about 85% in fire personnel considering double shift duty pattern.

Fire Prevention Wing

The existing fire prevention wing in the state for inspection, awareness generation, and training for schools, colleges, hospitals, shopping malls, cinema halls, high-rise buildings, govt. offices, public buildings etc. need further strengthening, so that recurrence of the fire incidences similar to that at the Advance Medical Research Institute (AMRI), Kolkata, in terms of their magnitude and frequency can be reduced. Accordingly, to support DGP/Director, Tamil Nadu Fire and Rescue Services additional officers at the levels of Director (Technical), Joint-Director (Technical), Chief Fire Officers (CFO), Dy Chief Fire Officers (Dy-CFO), Division Officers (DO), and Assistant Divisional Officer (ADO) have been recommended (for details, please refer to section 29.2.2).

Fire Station, District and State Level Report Generation

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

Roadmap for Investment and Financial plan for next 10 years

The other tasks include the development of Investment and Financial Plan, Institutional Assessment & Capacity Building Plan along with a dynamic web-based Fire Decision Support System (FDSS). As detailed in section 29.5, the detailed investment and financial plan at district level includes estimation of capital cost for infrastructure, 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 29.5) for the next 10-years includes both capital and recurring expenditures. RMSI analysis estimates a total investment of **about Rs 24,527.96 Crores** spread over a period of 10 years for Tamil Nadu Fire & Rescue Services 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 Tamil Nadu State for both rural and urban areas has been detailed in section 29.6. Accordingly, separate priority ranking for both urban and rural areas are given in Tables 29.38 and 29.39, respectively.

Avenues for Fund Generation

TNFRS can generate new avenues for funds from the following:

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

Capacity Building and Training Facilities

The state has a fully functional State Training School in Chennai, however, there is scope for Capacity Building and Training among the fire personnel within the Tamil Nadu State. The Capacity Building and Training need assessment for various levels have been discussed in section 29.8. Additionally, RMSI team is making a separate report on capacity building and training infrastructure for all states/UTs in the country.

Limitations of the study

Limitations of study have been given in section 29.9.

Recommendations

The report concludes with the recommendations for the Tamil Nadu Fire & Rescue Services and is detailed in section 29.10. The present study made some recommendations to overcome some of the crucial issues such as lacks specialized equipments, strict implementation of State Fire Act & Fire Policy, and building bye-laws as per national building code (NBC- Part IV). In short, Tamil Nadu State Fire & Rescue Services can be revamped in next 10 years to desired level provided sufficient funds and trained resources are made available.

Report Structure

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

Part A: This part comprises of chapters 1-6, which are common for all the 35 States/UT Fire Service for which this study is being conducted.

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

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

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

For Part-B, this report consists of Chapter 29, which is for the Tamil Nadu state.

PART -A

1 Introduction

1.1 Background

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

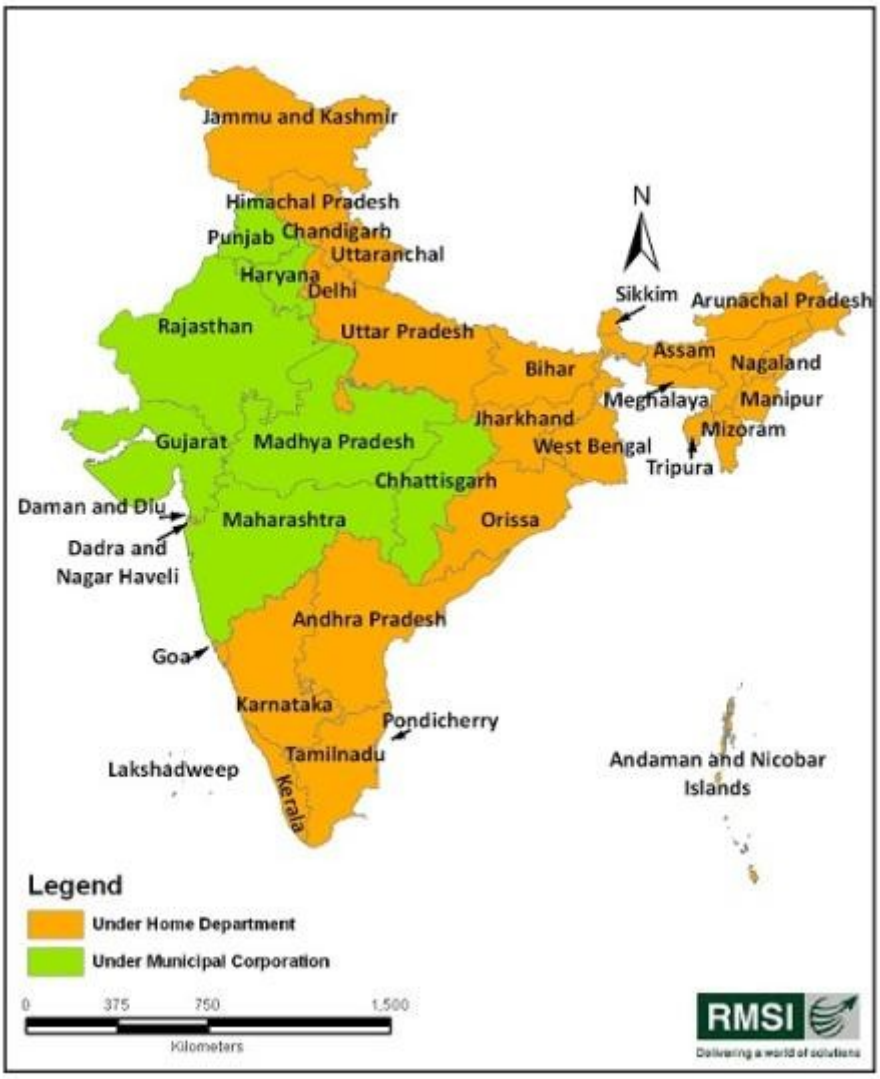


Figure 1-1: Distribution of fire services by various States/UTs by administrative organization

1.2 Role of Fire Services

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

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

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

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

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

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

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

overall deficiency in the country in number of fire stations is 97.54%, in fire fighting & rescue vehicles 80.04% and in fire personnel is 96.28%, respectively, which is quite alarming (NDMA Guideline, 2012, CR SFAC, 2011).

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

1.3 Objective of the study

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

1.4 Scope of the study

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

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

2 Technical Details on Methodology and Data Development

2.1 Understanding of the Scope of Work

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

1. Risk and Hazard Analysis
    - Identifications of gaps in the existing fire services
2. Investment and Financial Plan
3. Institutional Assessment and Capacity Building Plan
    - Including survey of NFSC Nagpur and regional fire training 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 for States/ UTs Fire and Emergency 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 will also be explored, and recommendations will be made for improvements to ensure good financing mechanisms for capital expenditure and operation and maintenance.

2.2 Study Area

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

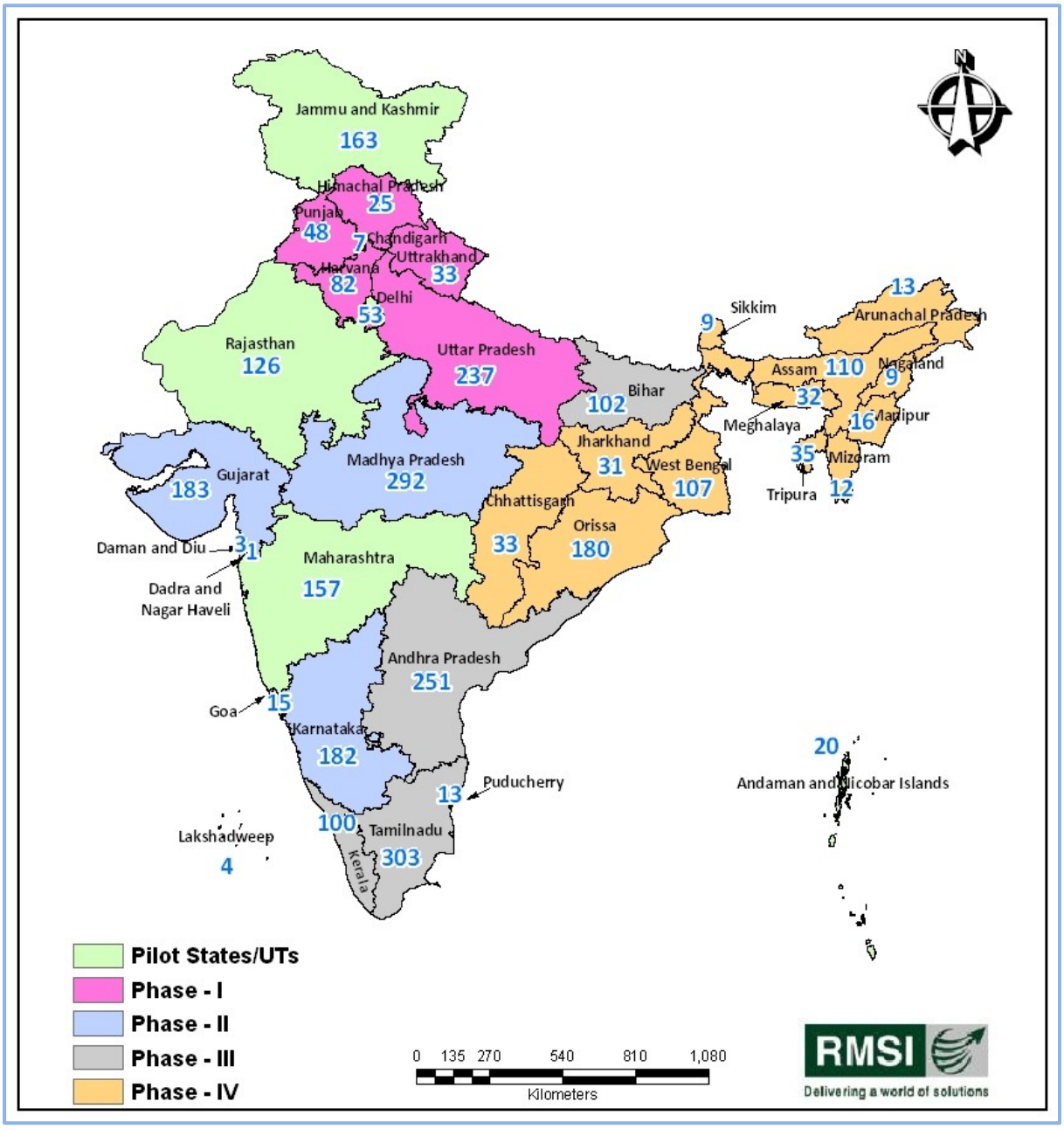


Figure 2-1 : State/UT wise distribution of fire service stations in India

2.3 Phased Approach

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

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

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

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

The number of fire stations shown in the Table 2-1 are tentative for states to be covered under all Phases. These are subjected to verification in detailed field-survey of the Fire Stations and will be updated as the project progresses.

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

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

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

3 GIS based Fire Hazard and Risk Analysis

Based on RMSI's vast experience of executing large projects at state and country levels, RMSI team is 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.

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

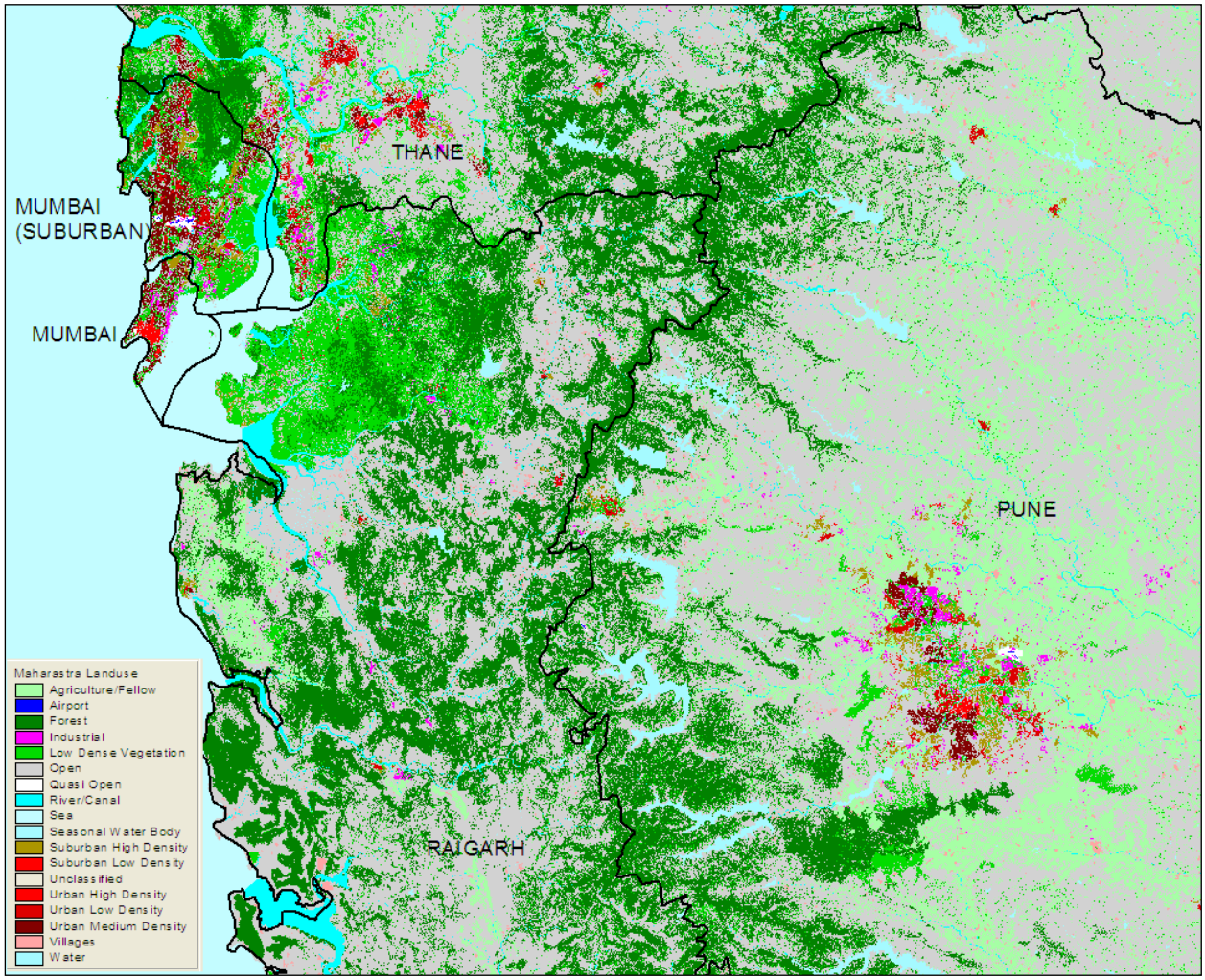


Figure 3-1 : An example of a Land use classification at 25m pixel. The example shows parts of Western Maharashtra (districts – Mumbai, Mumbai sub-urban, Thane, Pune, and Raigarh)

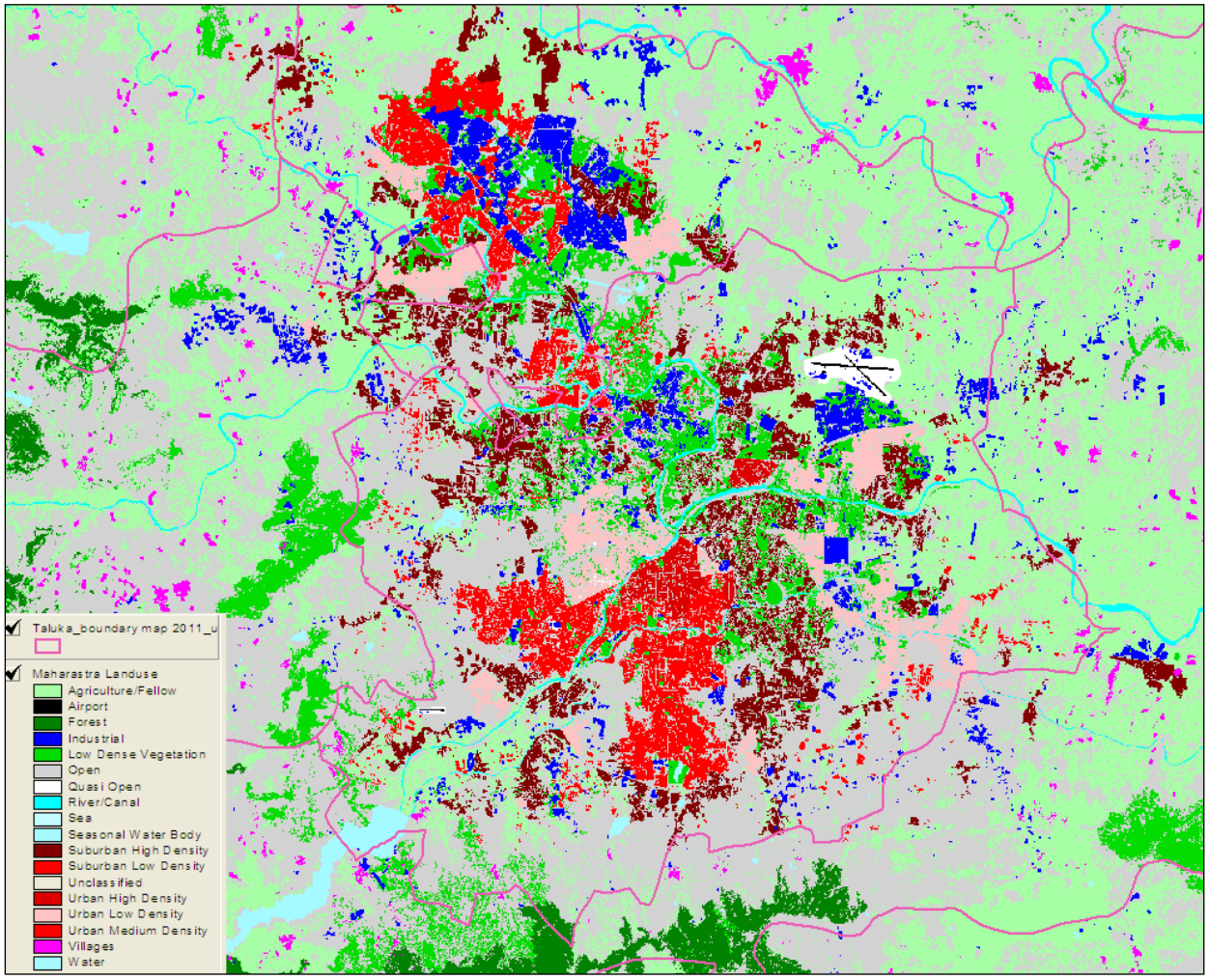


Figure 3-2 : Example of an enlarged view of classified. The example shows urban agglomeration classification in Pune city areas

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 based 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.

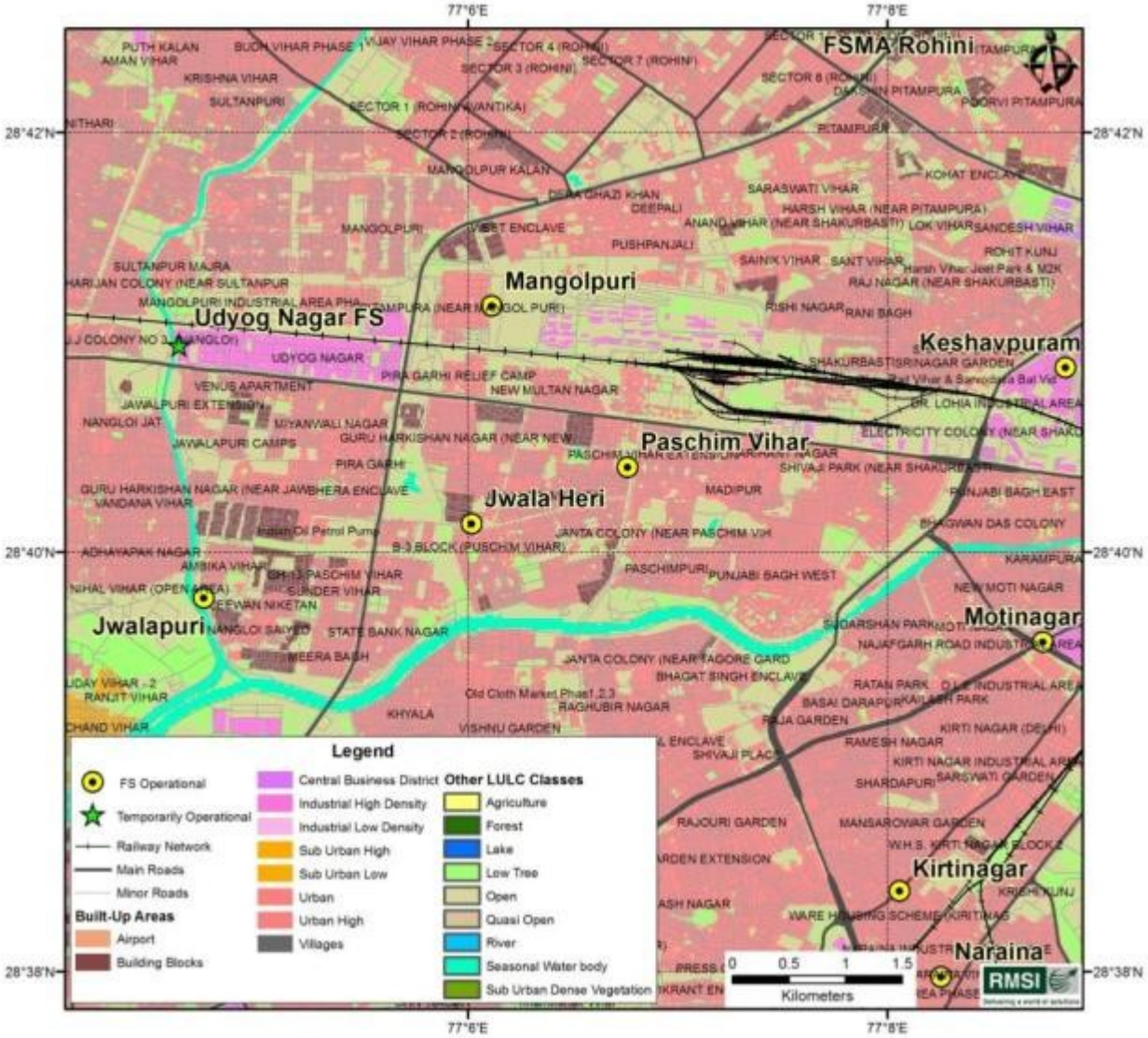


Figure 3-3 : An example of a detailed classified urban agglomerate area. The example shows parts of Delhi with overlay of GPS locations of fire stations

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.

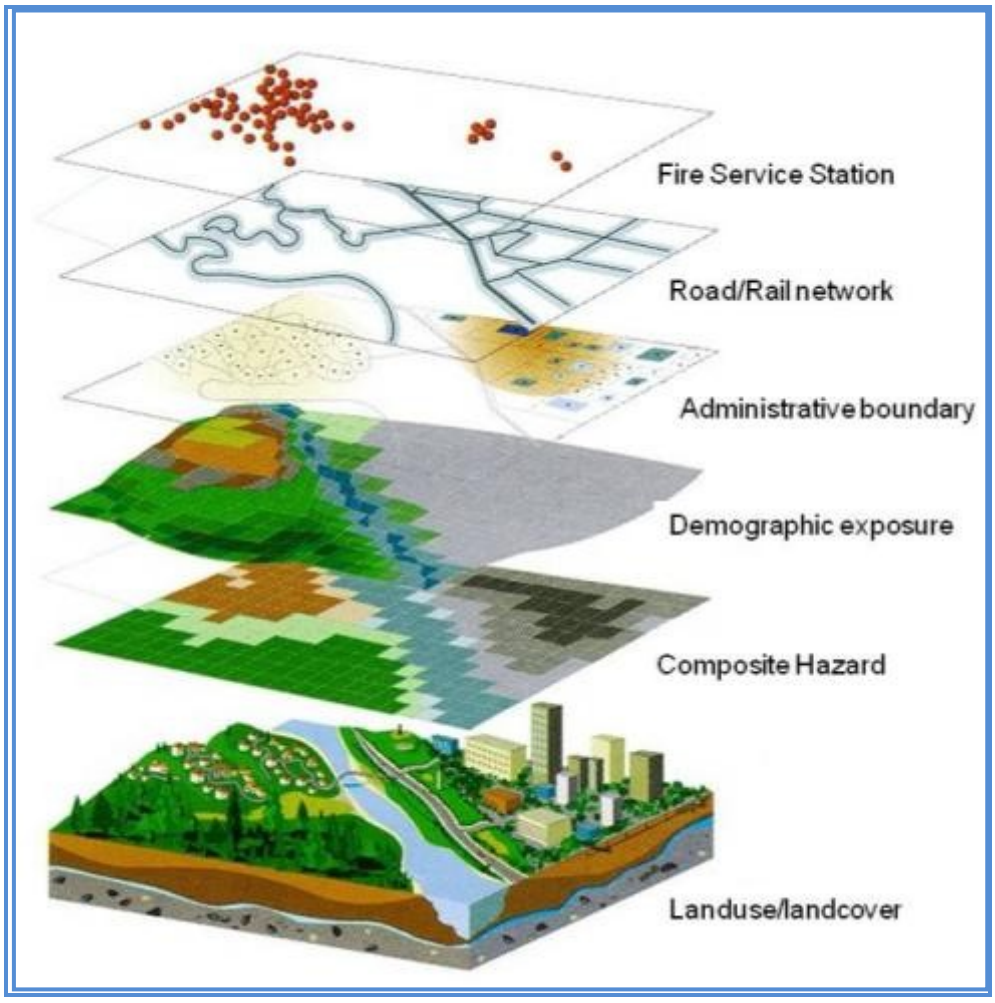


Figure 3-4 : Overlay analysis for Fire Risk Assessment

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.

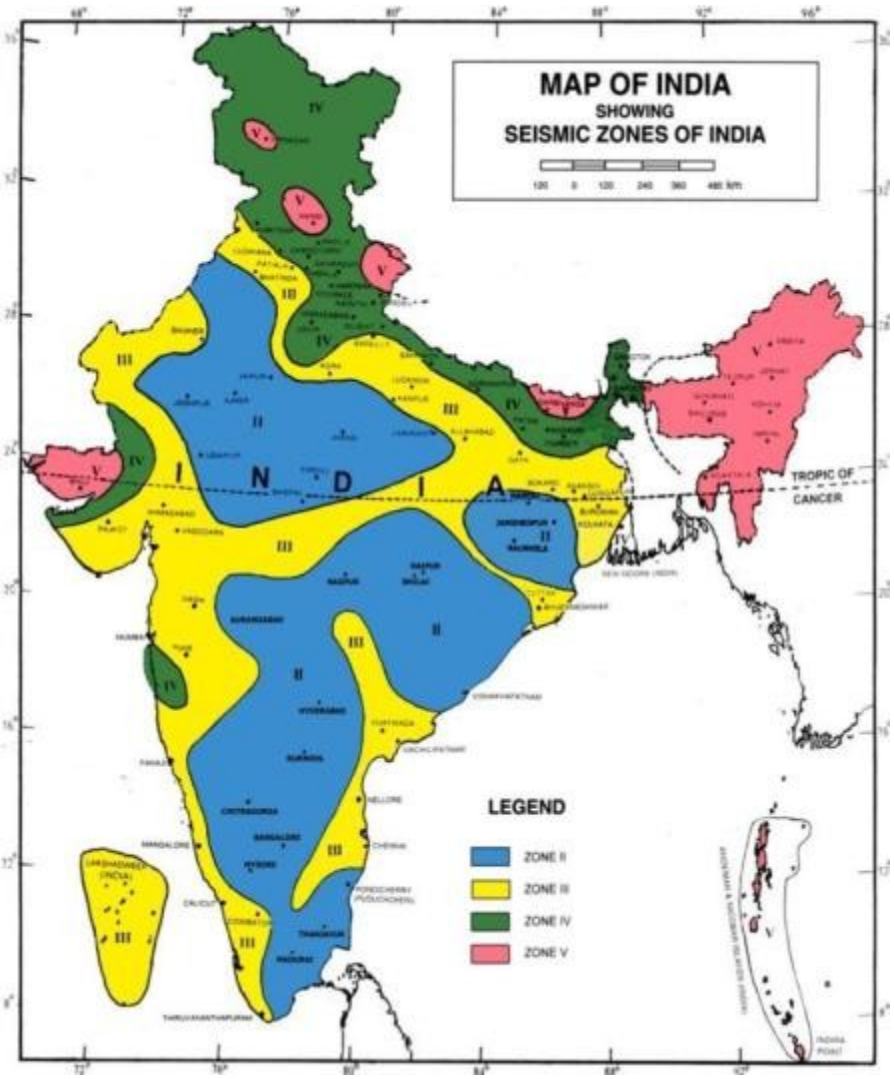


Figure 3-5 : Seismic zones of India

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%**

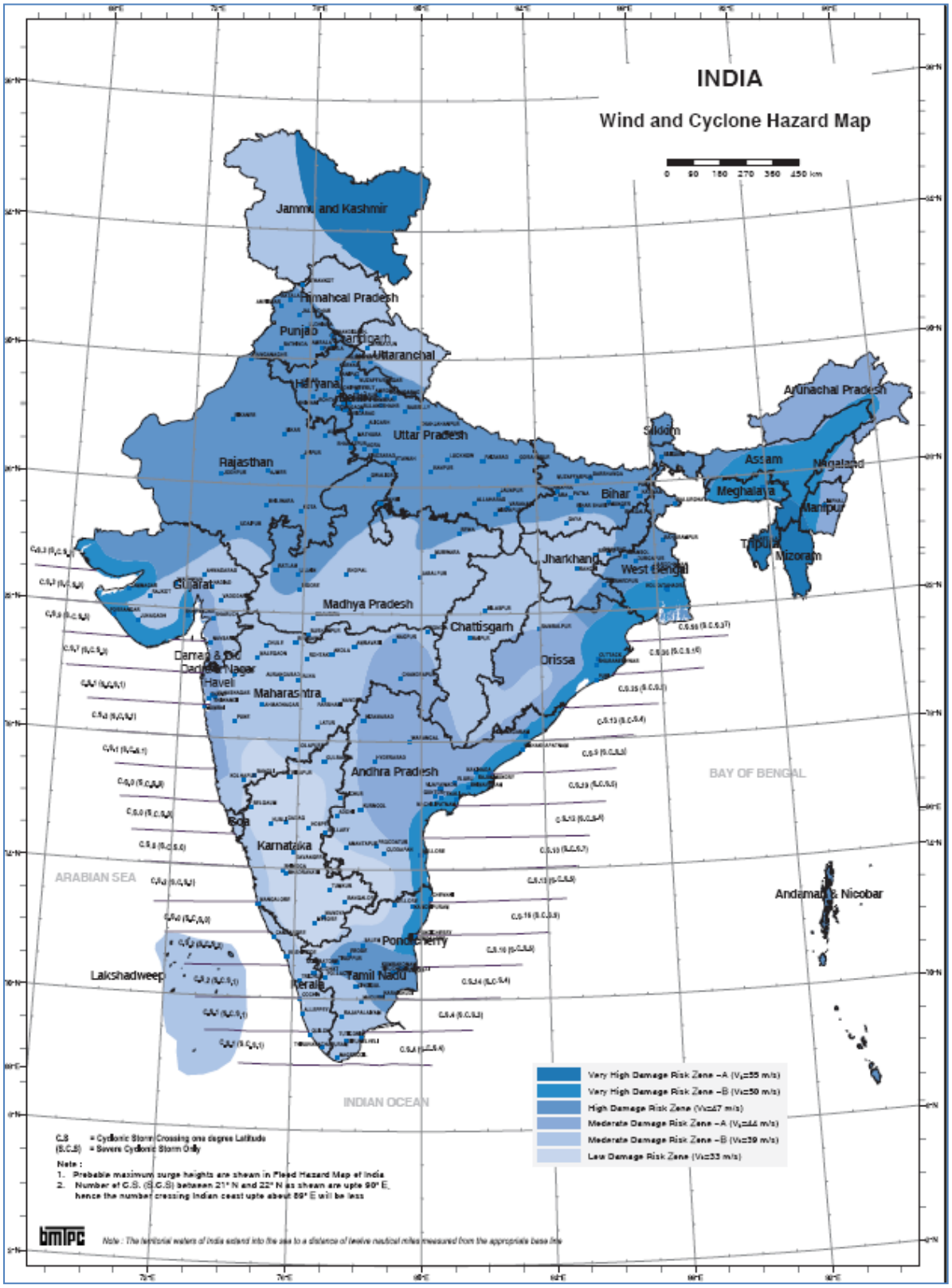


Figure 3-6 : Wind zone map of India (BMTPC, 2006)

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.

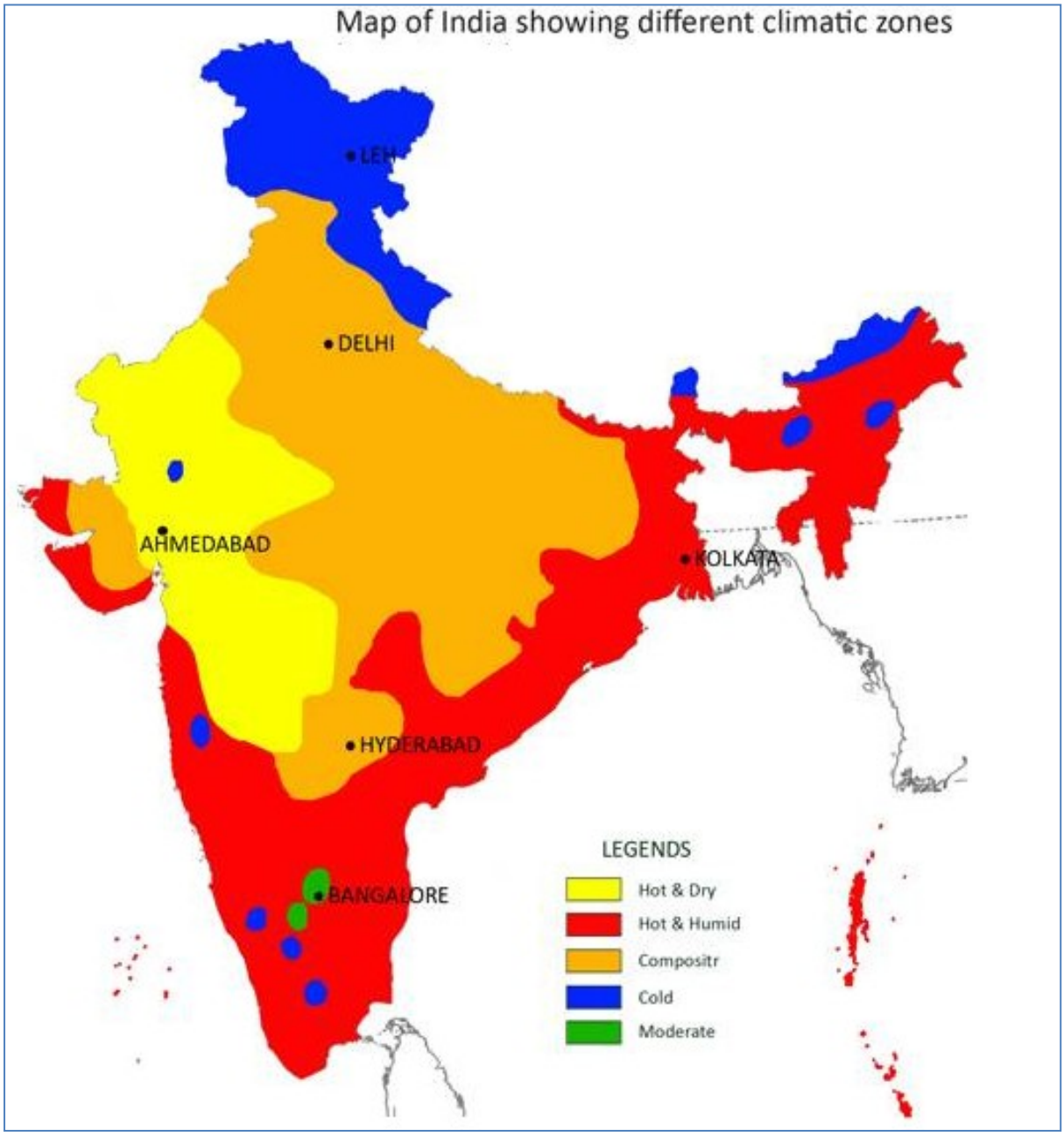


Figure 3-7 : Climatic Zones of India

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

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

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

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

3.5 Exposure Vulnerability Ranking

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

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

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

State	District	Geographical Area (sq km)	Population 2011	Population Density	Res Built-Up Area Sq Km	Industrial Area Sq Km	Res Built-Up Area (In %)
Andhra Pradesh							
	Adilabad	16,114	2,737,738	169.90	32.37	35.31	0.20%
	Anantapur	19,182	4,083,315	212.87	39.53	43.04	0.21%
	Chittoor	15,013	4,170,468	277.79	38.32	41.75	0.26%
	East Godavari	10,840	5,151,549	475.24	36.69	39.94	0.34%
	Guntur	11,400	4,889,230	428.87	39.62	43.24	0.35%
	Hyderabad	192	4,010,238	20,924.27	5.91	6.39	3.08%
	Karimnagar	11,845	3,811,738	321.80	33.68	36.92	0.28%
	Khammam	15,968	2,798,214	175.24	42.47	-	0.27%
	Krishna	8,754	4,529,009	517.39	48.16	-	0.55%
	Kurnool	17,701	4,046,601	228.61	26.74	-	0.15%
	Mahbubnagar	18,471	4,042,191	218.84	22.33	-	0.12%
	Medak	9,726	3,031,877	311.74	30.42	33.12	0.31%
	Nalgonda	14,233	3,483,648	244.76	38.44	-	0.27%
	Nizamabad	7,971	2,552,073	320.18	18.92	-	0.24%
	Prakasam	17,617	3,392,764	192.59	27.95	-	0.16%
	Rangareddy	7,510	5,296,396	705.24	112.25	122.53	1.49%
	Sri Potti Sriramulu Nellore	13,213	2,966,082	224.49	23.06	25.74	0.17%
	Srikakulam	5,867	2,699,471	460.14	8.66	9.53	0.15%
	Visakhapatnam	11,604	4,288,113	369.53	36.14	39.18	0.31%
	Vizianagaram	6,169	2,342,868	379.80	7.80	8.39	0.13%
	Warangal	12,911	3,522,644	272.85	290.54	7.00	2.25%
	West Godavari	7,727	3,934,782	509.24	237.97	10.43	3.08%
	Y.S.R.	15,356	2,884,524	187.85	40.15	43.84	0.26%
Bihar							
	Araria	2,826	2,806,200	993.12	150.62	0.33	5.33%

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

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

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

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

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

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

Population density	Ranking
>10,000	5
1,000 to 10,000	4
500 to 1,000	3
200 to 500	2
<200	1

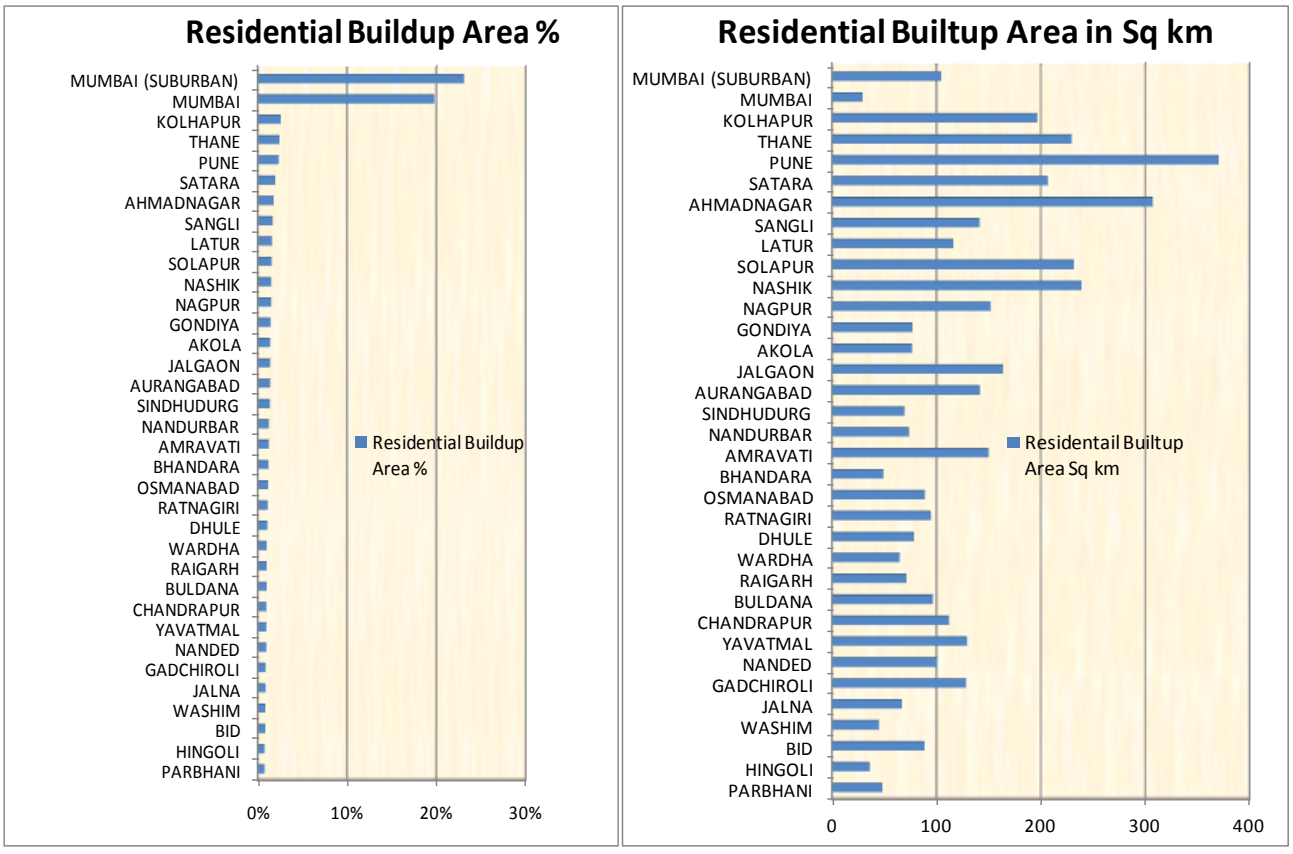
Built-up area %	Ranking
>35 %	5
14% to 35 %	4
2% to 14 %	3
1% to 2 %	2
<1 %	1

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.).

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



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

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

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

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

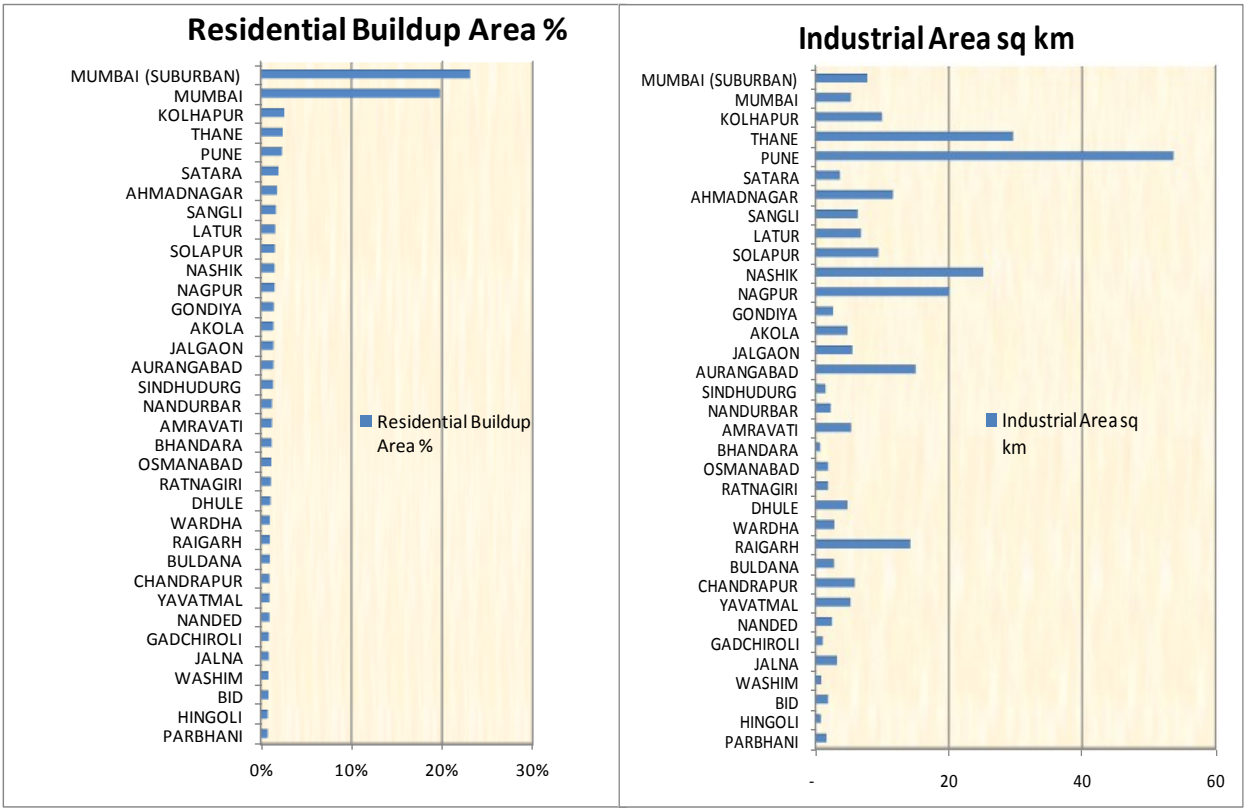


Figure 3-9 : Example of comparison of district level rankings for residential built-up areas and industrial areas (in sq km). The example shows a comparison for all 35 districts of Maharashtra state

Integrated Risk Analysis

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

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

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

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

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

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

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

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

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

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

State	District	Population Density Ranking	Res Built-up Area Sq km Ranking	Res Built-Up Area percentage Ranking	Industrial Area Sq km Ranking	Integrated Ranking	Overall District Risk Ranking
Andhra Pradesh							
	Adilabad	1	2	1	5	6	Medium
	Anantapur	2	2	1	5	6	Medium
	Chittoor	2	2	1	5	6	Medium
	East Godavari	2	2	1	5	7	Medium
	Guntur	2	2	1	5	6	Medium
	Hyderabad	5	1	3	4	8	High
	Karimnagar	2	2	1	5	7	Medium
	Khammam	1	2	1	1	3	Low
	Krishna	3	2	2	1	5	Low
	Kurnool	2	2	1	1	4	Low
	Mahbubnagar	2	2	1	1	4	Low
	Medak	2	2	1	5	7	Medium
	Nalgonda	2	2	1	1	4	Low
	Nizamabad	2	1	1	1	4	Low
	Prakasam	1	2	1	1	3	Low
	Rangareddy	3	4	2	5	9	Very High
	Sri Potti Sriramulu Nellore	2	2	1	5	7	Medium
	Srikakulam	2	1	1	4	5	Low
	Visakhapatnam	2	2	1	5	6	Medium
	Vizianagaram	2	1	1	4	5	Low
	Warangal	2	5	2	4	8	High
	West Godavari	3	5	3	5	9	Very High
	Y.S.R.	1	2	1	5	6	Medium
Bihar							
	Araria	3	4	3	1	8	High
	Arwal	4	1	3	1	7	Medium
	Aurangabad	3	4	3	1	7	Medium
	Banka	3	3	3	1	7	Medium
	Begusarai	4	3	3	3	9	Very High
	Bhagalpur	4	3	3	1	7	Medium
	Bhojpur	4	3	3	1	8	High
	Buxar	4	3	3	2	8	High
	Darbhanga	4	3	3	1	8	High
	Gaya	3	4	3	1	7	Medium
	Gopalganj	4	4	3	1	8	High
	Jamui	3	3	2	1	7	Medium

State	District	Population Density Ranking	Res Built-up Area Sq km Ranking	Res Built-Up Area percentage Ranking	Industrial Area Sq km Ranking	Integrated Ranking	Overall District Risk Ranking
	Jehanabad	4	3	3	1	8	High
	Kaimur (Bhabua)	2	2	2	2	6	Medium
	Katihar	4	4	3	1	8	High
	Khagaria	4	3	3	1	8	High
	Kishanganj	3	3	3	1	7	Medium
	Lakhisarai	3	2	3	1	7	Medium
	Madhepura	4	3	3	1	7	Medium
	Madhubani	4	4	3	1	8	High
	Munger	3	3	3	1	7	Medium
	Muzaffarpur	4	4	3	2	9	Very High
	Nalanda	4	3	3	1	8	High
	Nawada	3	3	3	1	7	Medium
	Pashchim Champaran	3	4	3	1	8	High
	Patna	4	4	3	4	10	Very High
	Purba Champaran	4	5	3	2	9	Very High
	Purnia	4	4	3	1	8	High
	Rohtas	3	4	3	3	9	Very High
	Saharsa	4	3	3	1	8	High
	Samastipur	4	4	3	1	8	High
	Saran	4	4	3	1	8	High
	Sheikhpura	3	1	3	1	6	Medium
	Sheohar	4	2	3	1	7	Medium
	Sitamarhi	4	4	3	1	8	High
	Siwan	4	4	3	1	8	High
	Supaul	3	3	3	1	7	Medium
	Vaishali	4	4	3	1	8	High
Kerala							
	Alappuzha	4	5	4	2	9	Very High
	Ernakulam	4	5	3	4	9	Very High
	Idukki	2	3	2	1	5	Low
	Kannur	3	5	3	1	7	Medium
	Kasaragod	3	4	3	2	7	Medium
	Kollam	4	5	3	2	8	High
	Kottayam	3	4	3	1	7	Medium
	Kozhikode	4	4	3	2	8	High
	Malappuram	4	5	3	1	8	High
	Palakkad	3	5	3	3	8	High
	Pathanamthitta	2	4	3	2	7	Medium

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

4 Field Surveys of Fire Stations for Data Collection

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

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

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

The information includes but is not limited to:

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

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

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

iv. Specialized firefighting equipment, their type, and quantity

v. Road access and connectivity to vulnerable areas

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

vii. Duty patterns

viii. Staff details at different levels

ix. Water availability etc.

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

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

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

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

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

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

4.2 Stakeholder Analysis

Apart from the quantitative data collection on the distribution of fire service infrastructure, stock of the existing equipments and their quality, the RMSI team also interacted with some of the key fire officials and senior members in DGCD, MHA and NDRF. The focus of such discussions was more on institutional aspects (issues in the service delivery and suggestions), capacity, and future requirements. As these interactions are mostly with senior personnel of fire department, the focus has been to derive a broader picture in terms of requirements, investment, and institutional capacity building. This information is being 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 are being highlighted along with RMSI's suggested solution.

In case required, as a last stage of the stakeholder analysis, RMSI will hold discussions with officials of the DG NDRF & CD to present the summary of observations for discussion as a close-door meeting by inviting only some of the identified senior personnel. By presenting this perception report collected from various States in a concise manner, RMSI expects a brain-storming session to get some concrete recommendation, which will be in line with various policy matters of the department.

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 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.

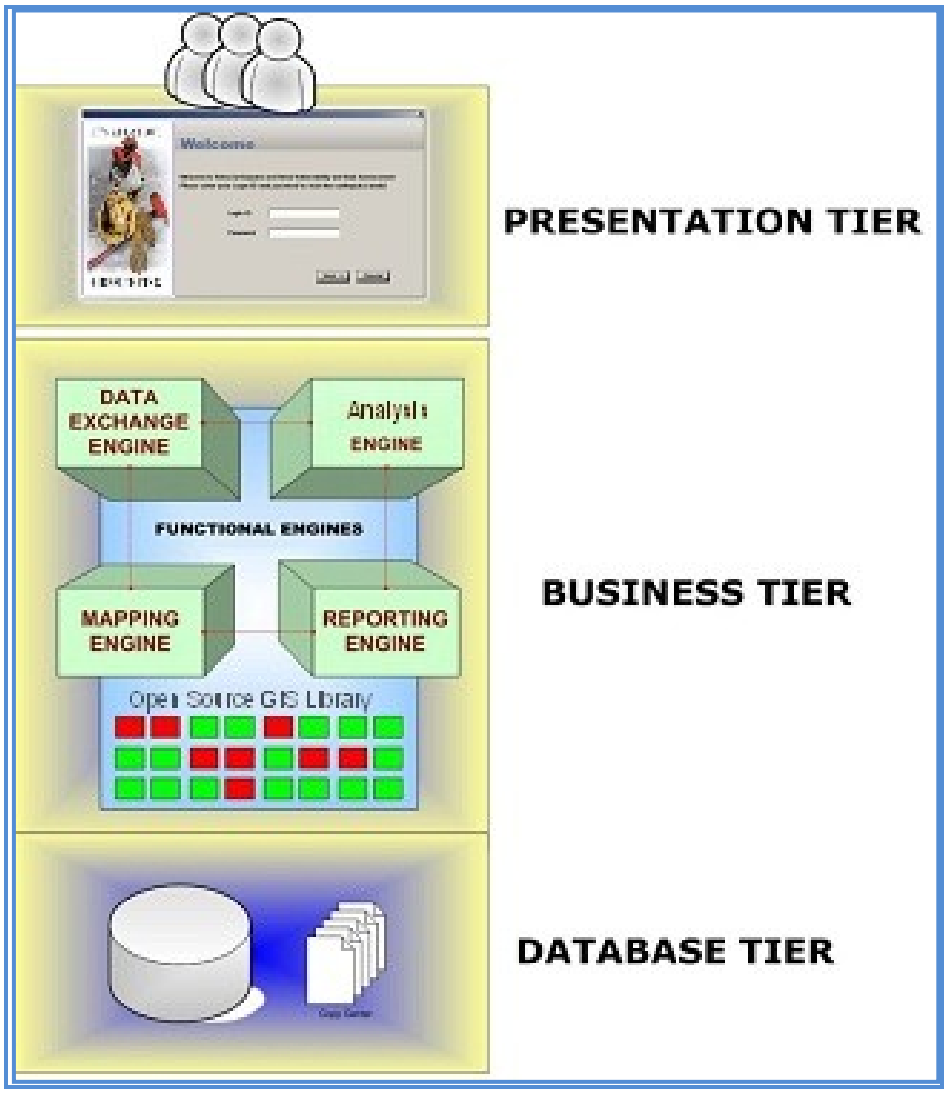


Figure 5-1 : Three-tier architecture

- **Presentation tier:** This 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 are being delivered by the FDSS platform.

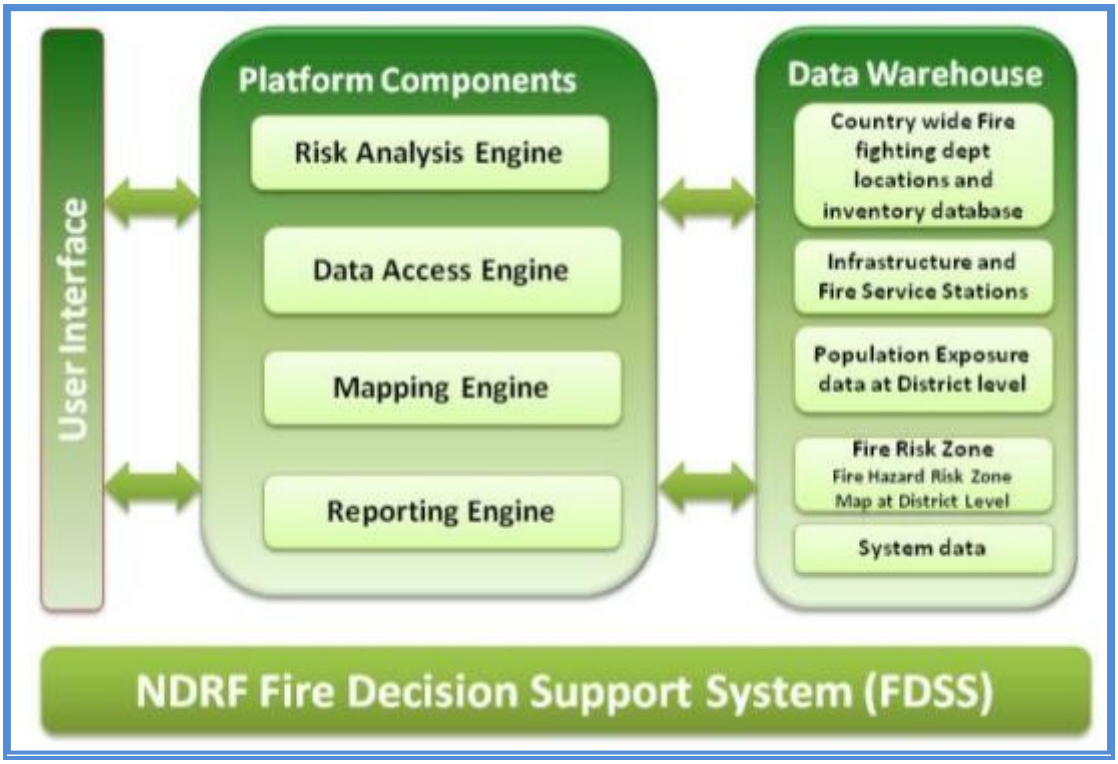


Figure 5-2 : High level design of FDSS

5.2.1 DATA WAREHOUSE

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

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

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

5.3 Platform Components

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

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

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

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

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

- Infrastructure Report
- Gap Analysis Report
- Status report for individual fire stations, district and state levels for and other reports required for decision making

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

- State
- District

This system provides the option for running gap analysis for firefighting and rescue vehicles, equipment, 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

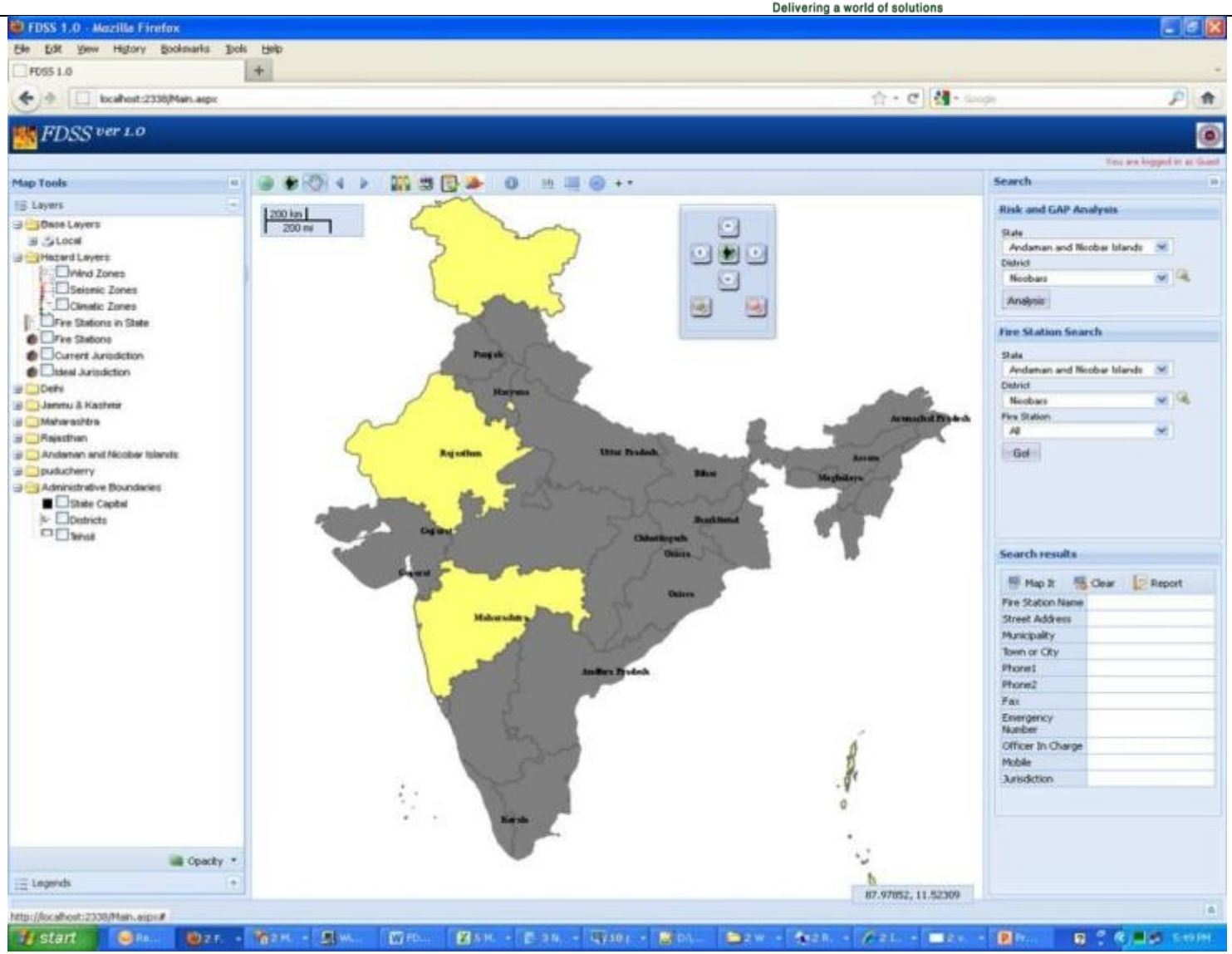


Figure 5-3 : User Interface for Base Analysis in FDSS. The example shows the states covered in the Pilot Phase of the study

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.

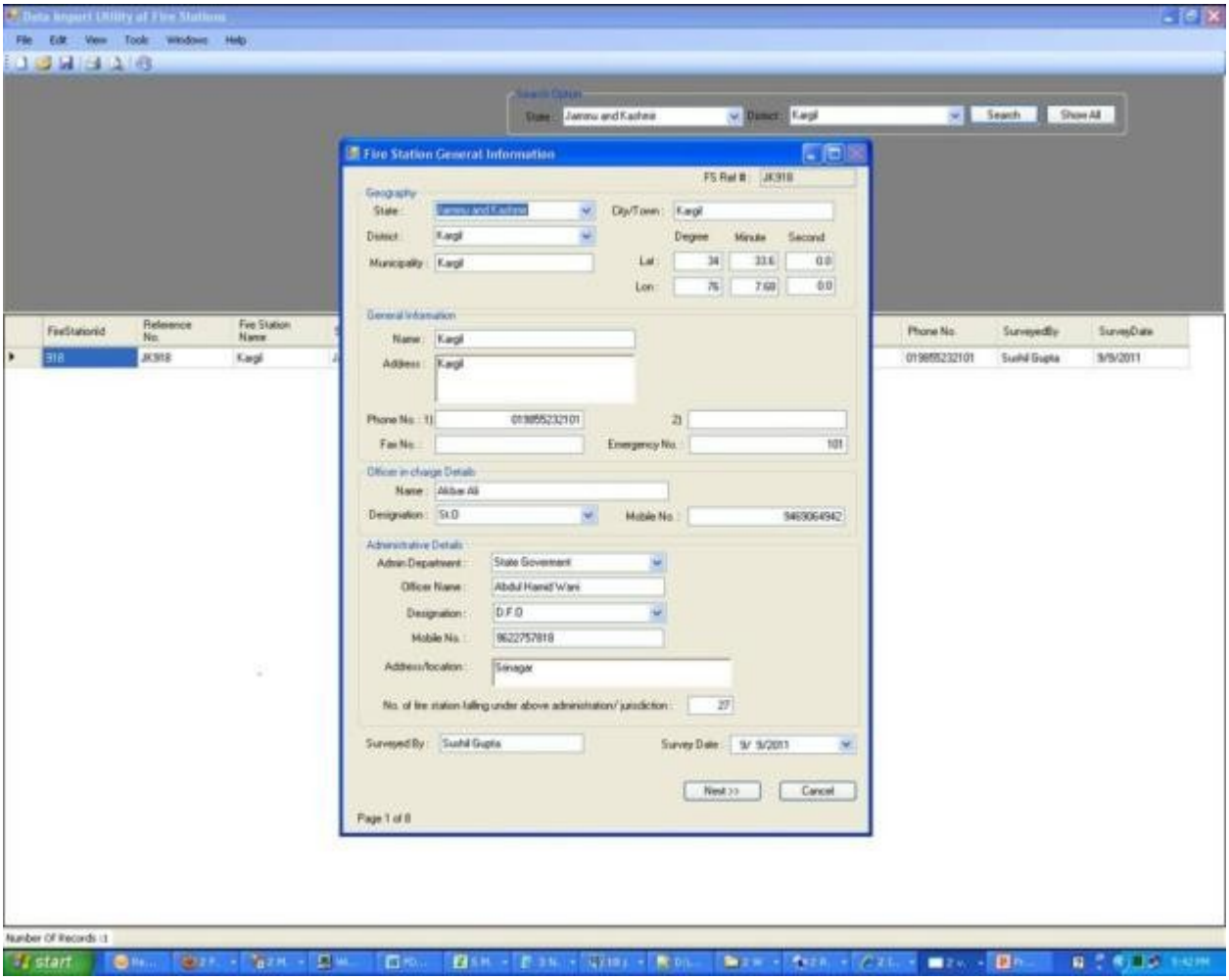


Figure 5-4 : System administration interface

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, equipments and fire tenders (Figure 5-4)
- Adds custom layers to the layer manager and performs visual overlays
- Views attributes information, queries and analyzes the spatial data layers
- Enables users to view thematic maps based on defined attribute values.

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

- View the fire risk analysis for any district
- 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.

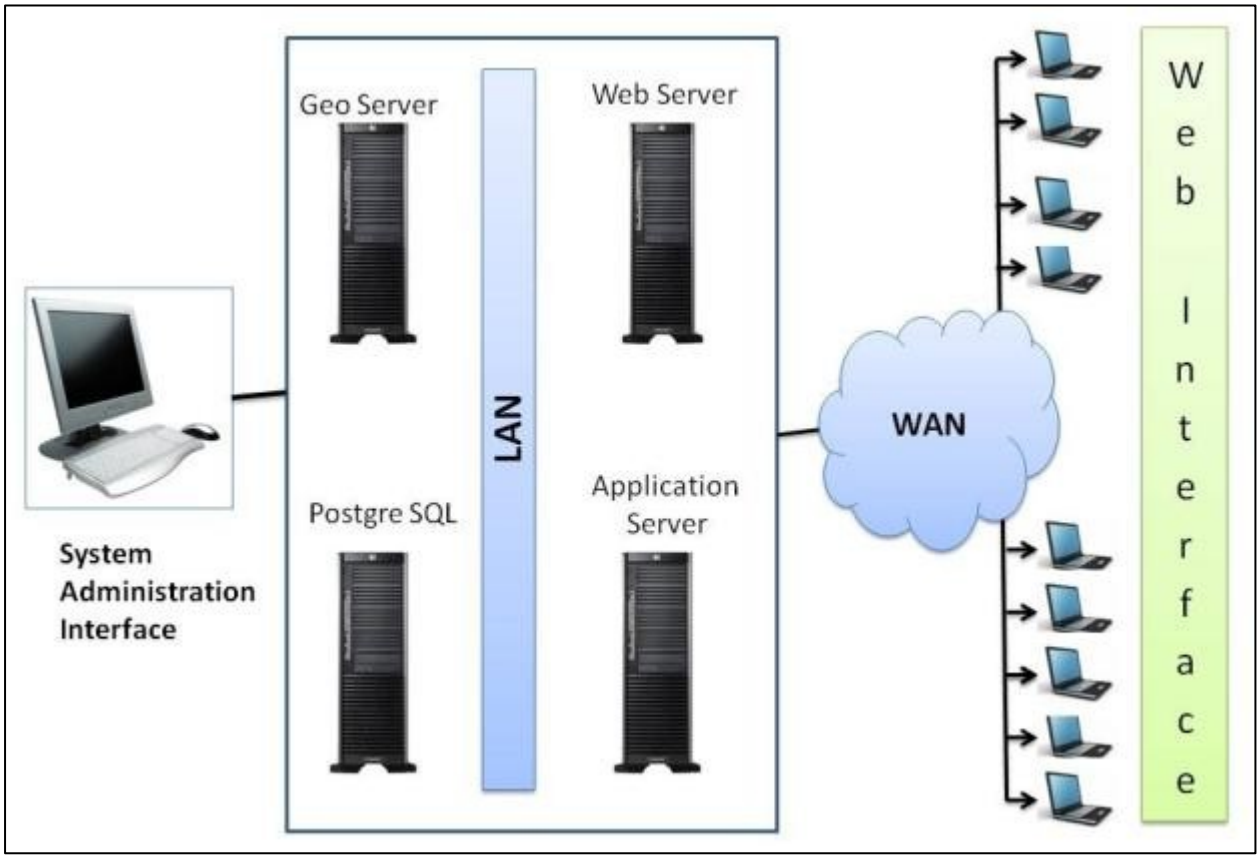


Figure 5-5 : FDSS - Systems Architecture

- 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 excellence in design	Not available publicly.

Advantages	Open Source Platform	Proprietary Software Platform
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 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 being conducted by using suitably modified SFAC Norms, population density, existing fire station distribution and other infrastructural information obtained as part of the field surveys. In addition, the risk information has been used to reflect certain aspects of risk that affect the infrastructure. The outcomes of this analysis are information and maps that show the infrastructure deficiency at district and state levels.

5.7.2 Equipment Gaps

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

5.7.3 Capacity Gaps

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

Similarly, district/state/ country level reports on up gradation and modernization requirements of existing fire stations including MIS, GIS, and communication systems will be generated by comparison of availability of existing resources and up gradation and modernization requirements through gap analysis.

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

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

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

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

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

5.9 Institutional Assessment and Capacity Building Plan

The National Fire Service College (NFSC), Nagpur and other state fire training centers 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 centers 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 being studied in detail and recommendations will be made for their implementation.

There are many ways of discovering funding avenues, such as introduction of Fire Tax, training programs to private sectors, tapping MP Local Area Development (MPLAD) funds etc. These issues are important since fire personnel need to be dedicated and motivated all times. For similar reasons, improvements in governance structure are imperative. Lack of fire-personnel is another challenge. For this, revamping training facilities in the country is another important aspect in any capacity building plan.

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

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

RMSI team has also prepared a detailed Roadmap for the Capacity Building Plan at country level for its implementation in next 10 years. For more detailed information, please refer to the National Level Training report as well as individual State/ UT report submitted by RMSI.

6 International and National Norms

6.1 Literature Survey

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

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

6.2 Response Time

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

6.2.1 GERMANY

The response from Germany (27.10.2011) is as follows:

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

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

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

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

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

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

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

6.2.2 JAPAN

Fire Service laws of Japan and its background:

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

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

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

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

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

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

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

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

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

6.2.3 USA

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

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

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

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

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

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

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

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

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

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

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

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

6.2.4 UK

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

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

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

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

6.2.5 INDIA

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

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

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

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

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

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

Table 6-1: Number of operational and additional fire stations and fire posts required in Delhi

Urban		Rural	
Operational fire stations	Additional fire stations	Operational fire 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.

HQ Ref #.....

A. Fire Headquarters General Information

Location Details

Fire Headquarters/Zone/District Office ---------- State ----------

Address ……..

……..

Office Phone numbers (with STD code):…… Fax ……Web site (if any)……

Name & Designation of the Head of Department: ……

Name & Designation of the nominated person by the dept. for providing data:

……

Mobile number …….. Email (s):……

Area under Jurisdiction

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

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

Area under Jurisdiction in each Zonal Office (provide jurisdiction map for each individual fire station)

Name of Zonal office …….

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

Name of Zonal office …….

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

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

Name of Zonal office ……

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

Please add additional sheets if required

C. Details of Proposed Fire Station

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

Please attach additional sheets if required

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

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

By State/ zonal Level

Zone Name ……..

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

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

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

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

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

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

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

Staff Welfare:

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

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

Measures to Improve Staff Efficiency

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

E. Training Details

Name of State Training Centre and address: ……

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

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

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

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

2007						
2006						

Please provide yearly break-up for the last 5 years

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

……
……
……
……
……
……

F. Inventory of Equipments

Division Wise Fire Vehicles

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

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

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

Additional Equipments

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

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

Any other not covered in above list

…….

……..

……..

Please provide separate list for each division/district

G. Communication between HQ and Zonal/district office

Details of Control rooms

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

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

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

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

Frequency of Fire Report Transmission:

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

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

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

H. Financial Details

Name of Zone

……

(If information provided zone wise)

Budget for year ……..

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

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

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

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

Name of Station …….

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

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

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

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

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

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

……
……
……

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

J. Public Awareness Programmes

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

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

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

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

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

Postal Address:

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

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

Annex-2: Fire Station Survey Form

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

SW FS Ref #.....

A. Fire Station General Information

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

Fire Station Name ……

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

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

Fax No: ……..

Emergency No: ……...

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

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

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

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

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

The fire station falls under the jurisdiction of (Division/Zone/Municipality) -……..

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

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

Number of total fire stations fall under above jurisdiction/ administration- ……

Surveyed by: **Date:**

(Signature of Witness from Fire Department)
Name & Designation

B. Fire Station Infrastructure Details

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

No permanent building

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

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

How many bay station should be in new fire station building

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

Provide building details

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

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

Mixed (kachha and pacca) (in case different parts of fire stations has different structrure types)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

C. Communication Systems

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

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

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

D. Water Supply Details for Fire Fighting Purpose

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

Water sources used by Fire Vehicles within Fire station

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

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

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

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

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

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

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

E. Human Resources

Permanent Staff Details- :

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

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

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

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

Mode to maintain Physical Fitness

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

F. Fire Risk Covered in the Area under Jurisdiction

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

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

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

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

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

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

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

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

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

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

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

Details of Vehicles- other than Fire Fighting/ Official Use

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

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

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

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

I. Other Dress Accessories

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

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

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

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

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

1)……
……
……..

2)……..……
……..……
……

3)
……
……

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

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

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

Details of any mutual-aid scheme / ……

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

Details of any mutual-aid scheme / ……

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

Details of any mutual-aid scheme / ……

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

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

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

Please send Fire call statistics to :

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

PART B

7 Delhi State

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8 Rajasthan State

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9 Maharashtra State

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10 Jammu and Kashmir State

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11Puducherry UT

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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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23 Karnataka 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

29.1 Introduction

Tamil Nadu state lies in the southernmost part of the Indian Peninsula and share its boundaries with the union territory of Puducherry, and the states of Karnataka, and Andhra Pradesh. In the north, it is bound by the Eastern Ghats while in the west, it is surrounded by the Nilgiri and Annamalai Hills. The state is also bounded by the Bay of Bengal in the east, the Gulf of Mannar, the Palk Strait in the south east, and by the Indian Ocean in the south.

Tamil Nadu state is entirely dependent on rains for recharging its water resources, monsoon failures lead to acute water scarcity and severe drought. The climate of the state ranges from dry sub-humid to semi-arid. The normal annual rainfall of the state is about 945 mm which is from the North East monsoon and from the South West monsoon.

As per Census 2011, Tamil Nadu is the seventh most populous state in India with a population of 721,38,958 (5.96% of India's population). It is the seventh most densely populated state in India with a population density of 555 persons per square kilometer. Out of total population of the state, 44% population live in urban areas, the highest among large states in India (Table29-2)

Tamil Nadu is the second largest contributor to India's GDP. It is the most industrialized state in India. Some of the industries includes textile, automobile, heavy industries, electronics and software, power, and leather industries. Tamil Nadu has seen major investments in the automobile industry over many decades manufacturing cars, railway coaches, battle-tanks, tractors, motorcycles, automobile spare parts and accessories, tyres and heavy vehicles. Major global automobile companies including BMW, Ford, Renault-Nissan, Caterpillar, Hyundai, Mitsubishi Motors and Michelin as well as local automobile majors like Ashok Leyland, Hindustan Motors, TVS Motors, Royal Enfield, MRF, Apollo Tyres, TAFE Tractors, Daimler Chrysler AG Company also invested for establishing new plant in Tamil Nadu. Apart from this, Textile mills and engineering industries are present around the city of Coimbatore. It is home to textile, automotive spare parts and motor pump manufacturing units. Cities of Tirupur and Erode are the country's largest exporters of knitwear. They are well known for textile manufacturing industries and exports to such extent that the districts of Coimbatore, Tirupur, Karur, Erode, Namakkal and Salem are known as “Textile Valley of India”. A few of public sector companies such as Bharat Heavy Electricals Limited, SAIL, and Chennai Petroleum Corporation Limited (CPCL) also have their plants in the State.

In fact, Tamil Nadu is one of the most fire hazard prone State in the country and reported a large numbers of fire incidents. The largest fireworks factories located in Sivakasi is one of the most vulnerable city in term of fire risk. A recent fire accident of 5 September 2012 caused at least 37 causalities and many injured. Keeping in view the high fire risk, the state Fire & Rescue Services requires to strengthen its Fire Prevention Wing with dedicated senior officials, trained manpower, and firefighting vehicles and specialized equipment. Due to huge industrialization and urban development, the state has a spread of 303 operational Fire Stations throughout the state.

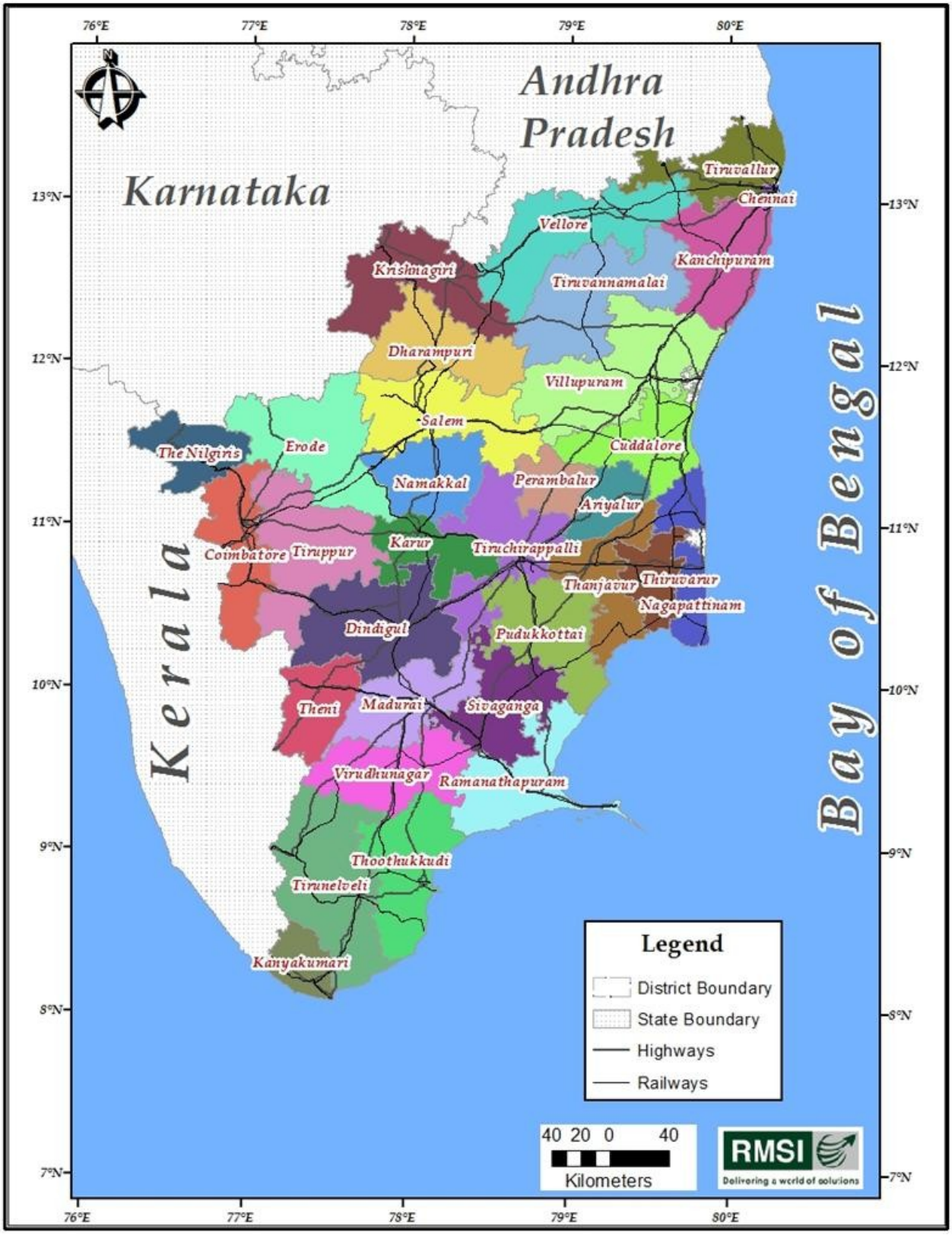

Figure 29-1: District map of Tamil Nadu

Table 29-1: Tamil Nadu Demography as per Census 2011

Tamil Nadu State	
Districts	32
Talukas	220
Panchayat Unions (Blocks)	385
Town Panchayats	559
Village Panchayats	12,618
Population	
Person	7,21,38,958
Males	3,61,58,871
Females	3,59,80,087
Sex Ratio (female per 1,000 male)	955

Table 29-2 provides the district wise details, i.e., number of operational fire stations, geographical, population as per Census 2011, and average estimated population served by each fire station is more than two Lakhs in Tamil Nadu.

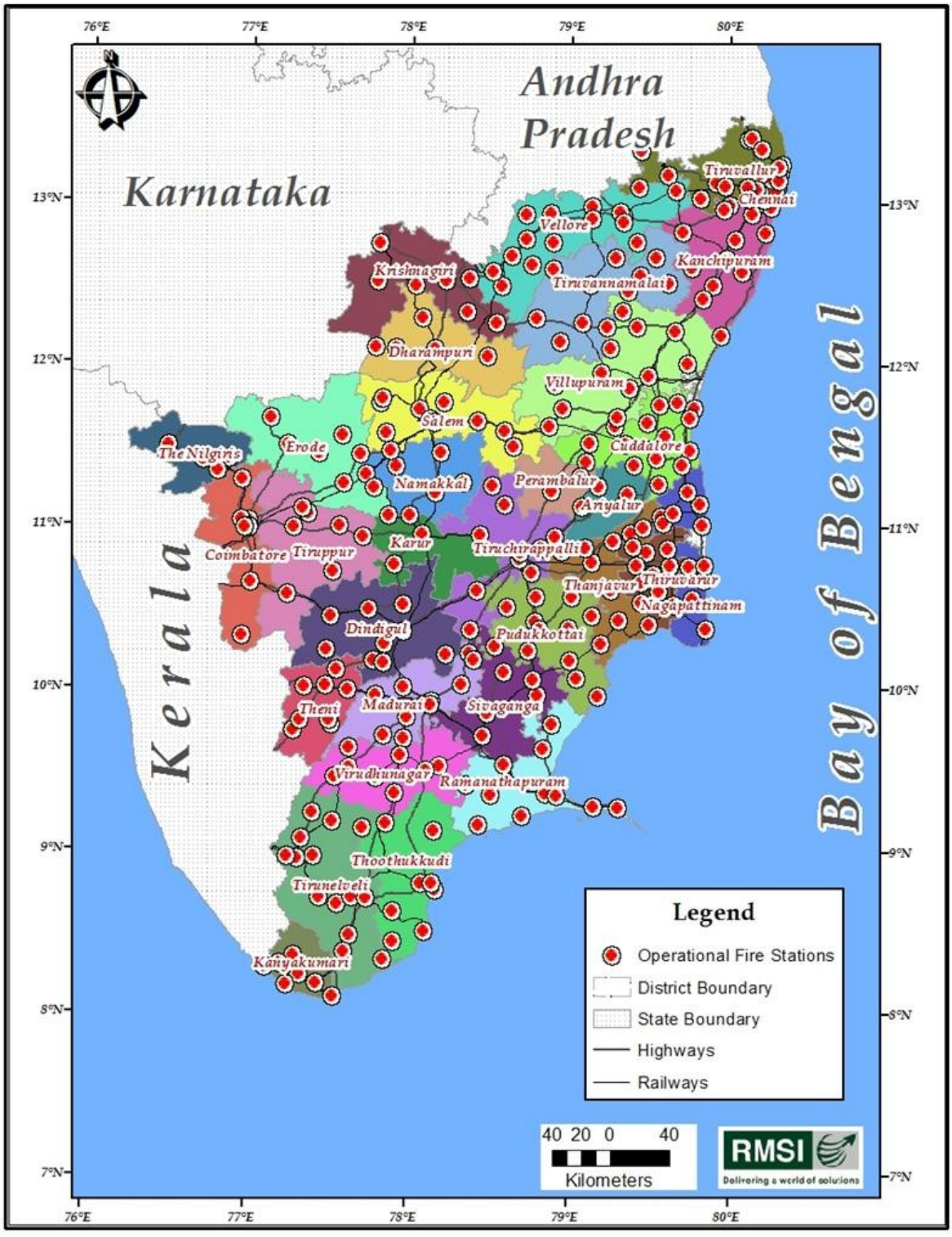

Figure 29-2: Location of operational fire stations in Tamil Nadu

Table 29-2: Summary of district level operational fire stations in Tamil Nadu

District	Area (sq km)	Total Population (Census 2011)	Population Density	No. of Fire Stations Operational	Average Population per Fire Station
Ariyalur	1,940	752,481	388	3	250,827
Chennai	167	4,681,087	28,030	23	203,526
Coimbatore	3,857	3,472,578	900	7	496,083
Cuddalore	3,718	2,600,880	700	15	173,392
Dharampuri	4,502	1,502,900	334	5	300,580
Dindigul	6,063	2,161,367	356	9	240,152
Erode	6,008	2,259,608	376	9	251,068
Kanchipuram	4,477	3,990,897	891	11	362,809
Kanyakumari	1,688	1,863,174	1,104	7	266,168
Karur	2,908	1,076,588	370	3	358,863
Krishnagiri	5,138	1,883,731	367	7	269,104
Madurai	3,717	3,041,038	818	10	304,104
Nagapattinam	2,567	1,614,069	629	11	146,734
Namakkal	3,425	1,721,179	503	4	430,295
Perambalur	1,747	564,511	323	2	282,256
Pudukkottai	4,670	1,618,725	347	12	134,894
Ramanathapuram	4,254	1,337,560	314	11	121,596
Salem	5,246	3,480,008	663	11	316,364
Sivaganga	4,102	1,341,250	327	6	223,542
Thanjavur	3,408	2,402,781	705	9	266,976
The Nilgiris	2,576	735,071	285	4	183,768
Theni	2,875	1,243,684	433	8	155,461
Thiruvarur	3,401	1,268,094	373	11	115,281
Thoothukkudi	2,117	1,738,376	821	9	193,153
Tiruchirappalli	4,636	2,713,858	585	10	271,386
Tirunelveli	4,499	3,072,880	683	13	236,375
Tiruppur	6,819	2,471,222	362	7	353,032
Tiruvallur	5,860	3,725,697	636	18	206,983
Tiruvannamalai	6,192	2,468,965	399	12	205,747
Vellore	6,077	3,928,106	646	16	245,507
Villupuram	7,290	3,463,284	475	12	288,607
Virudhunagar	4,253	1,943,309	457	8	242,914
Total	**130,058**	**72,138,958**	**555**	**303**	**238,082**

29.2 Field Surveys of Fire Stations for Data Collection

To have first-hand information on the distribution of the fire service stations across the country, infrastructure availability and their status, fire fighting manpower etc., RMSI project team has carried out detailed surveys of fire stations and collected data though individual

"Fire Station Survey Form" and Fire Headquarter Data Collection Form" as shown in Annexure 1 & 2. The collected information for each fire station is following categories:

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

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

29.3 Infrastructure Gap Analysis

29.3.1 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 29-3 shows district level summary of number of operational and new proposed fire stations with population covered within their ideal jurisdiction area.

Rural areas of Tamil Nadu state are similarly covered with new rural fire stations. 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 29-3. Figures 29-2 to 29-48 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 Tamil Nadu state are given in Tables 29-38 and 29-39.

Table 29-3: District level number of operational and new fire stations in the Tamil Nadu State

District	Num of operational Fire Stations	Ideally Served Population under operational fire stations	Num of new urban Fire Stations	Ideally Served Population under new urban fire stations	Num of new rural Fire Stations	Total Fire station
Ariyalur	3	281,470	0	0	3	6
Chennai	23	3,789,054	5	1,167,110	0	28
Coimbatore	7	1,340,479	4	739,774	4	15
Cuddalore	15	2,629,847	0	0	1	16
Dharampuri	5	1,079,475	0	0	3	8
Dindigul	9	1,074,482	1	140,972	6	16
Erode	9	1,625,961	1	105,911	5	15
Kanchipuram	11	1,678,397	6	1,547,237	3	20
Kanyakumari	7	860,484	1	235,155	4	12
Karur	3	534,948	0	0	6	9
Krishnagiri	7	1,453,168	1	131,013	1	9
Madurai	10	1,693,274	3	690,881	1	14
Nagapattinam	11	1,414,839	0	0	3	14
Namakkal	4	600,581	1	143,980	5	10
Perambalur	2	192,052	0	0	3	5
Pudukkottai	12	1,666,958	0	0	1	13
Ramanathapuram	11	1,183,388	0	0	4	15
Salem	11	2,034,201	3	431,552	3	17
Sivaganga	6	796,694	0	0	5	11
Thanjavur	9	1,505,123	1	213,753	2	12
The Nilgiris	4	458,691	0	0	3	7
Theni	8	1,073,304	0	0	1	9
Thiruvarur	11	1,351,866	0	0	1	12
Thoothukkudi	9	1,169,378	2	100,196	6	17
Tiruchirappalli	10	1,446,402	2	447,114	6	18
Tirunelveli	13	2,002,382	2	237,753	3	18
Tiruppur	7	1,076,195	2	275,629	6	15
Tiruvallur	18	2,205,256	7	1,087,388	2	27
Tiruvannamalai	12	2,234,387	0	0	2	14
Vellore	16	2,783,341	2	527,174	4	22
Villupuram	12	2,758,803	0	0	2	14
Virudhunagar	8	1,091,290	2	89,306	3	13
Grand Total	**303**	**47,086,170**	**46**	**8,311,898**	**102**	**451**

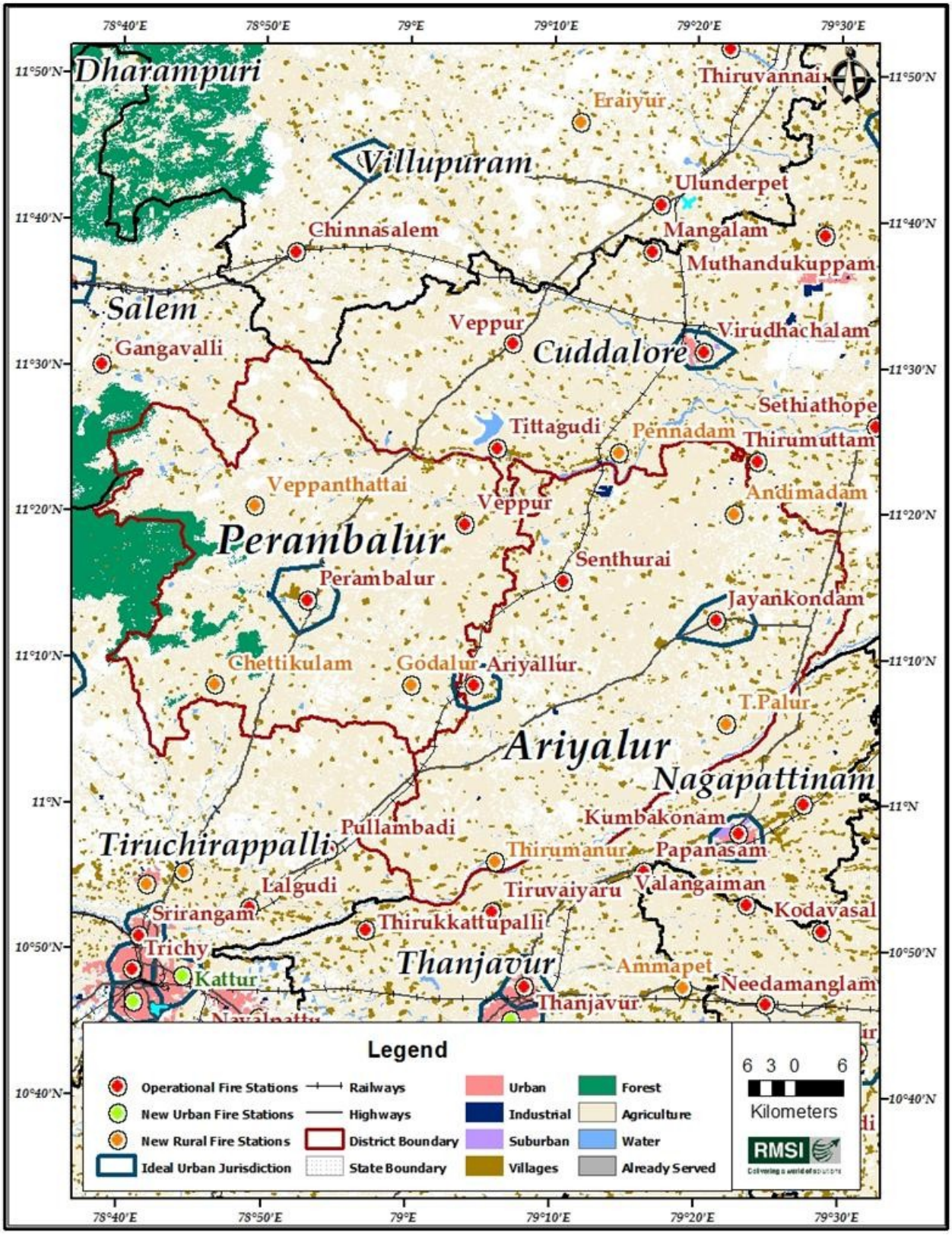

Figure 29-3: Fire stations gap analysis for Ariyalur and Perambalur areas

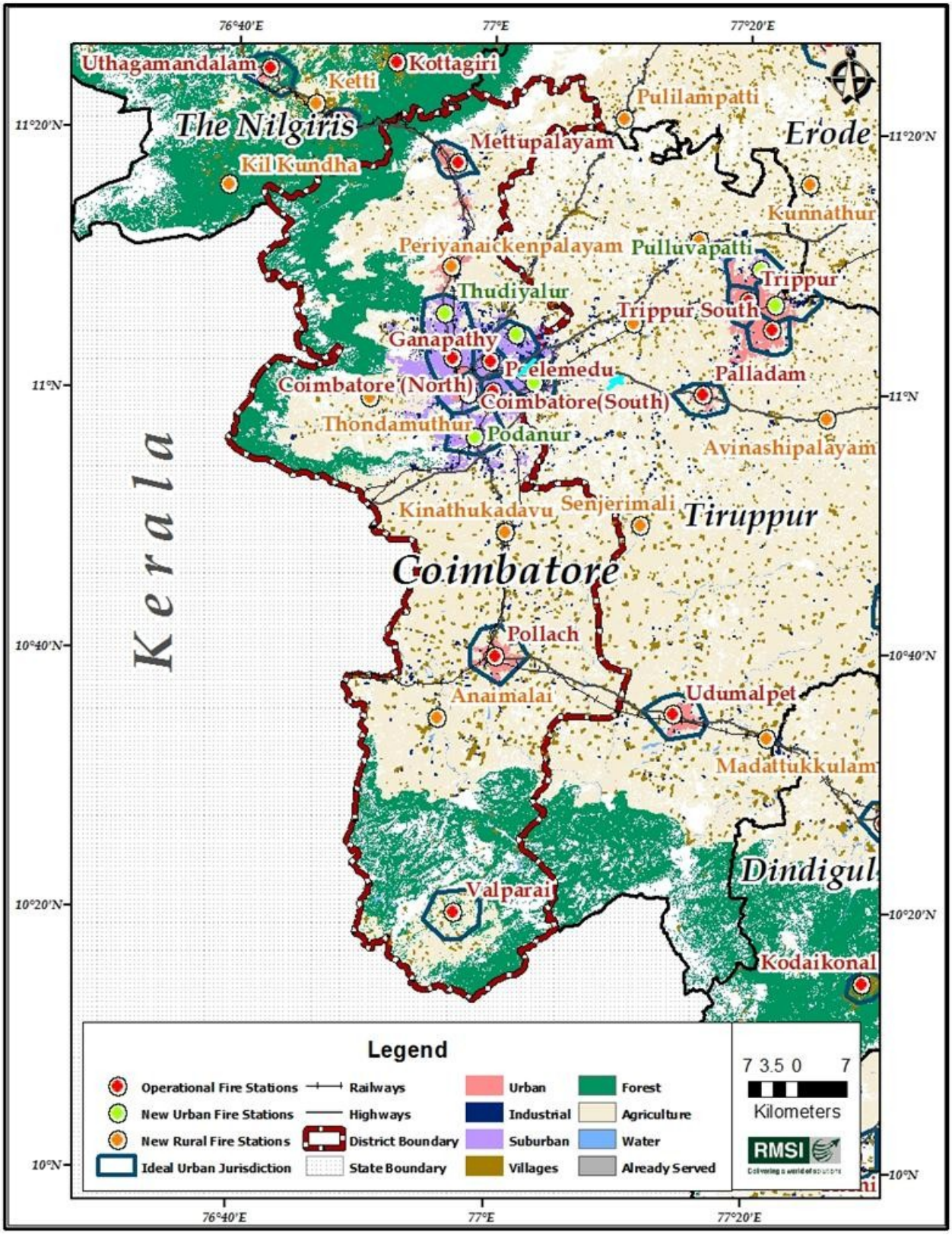

Figure 29-4: Fire stations gap analysis for Coimbatore rural areas

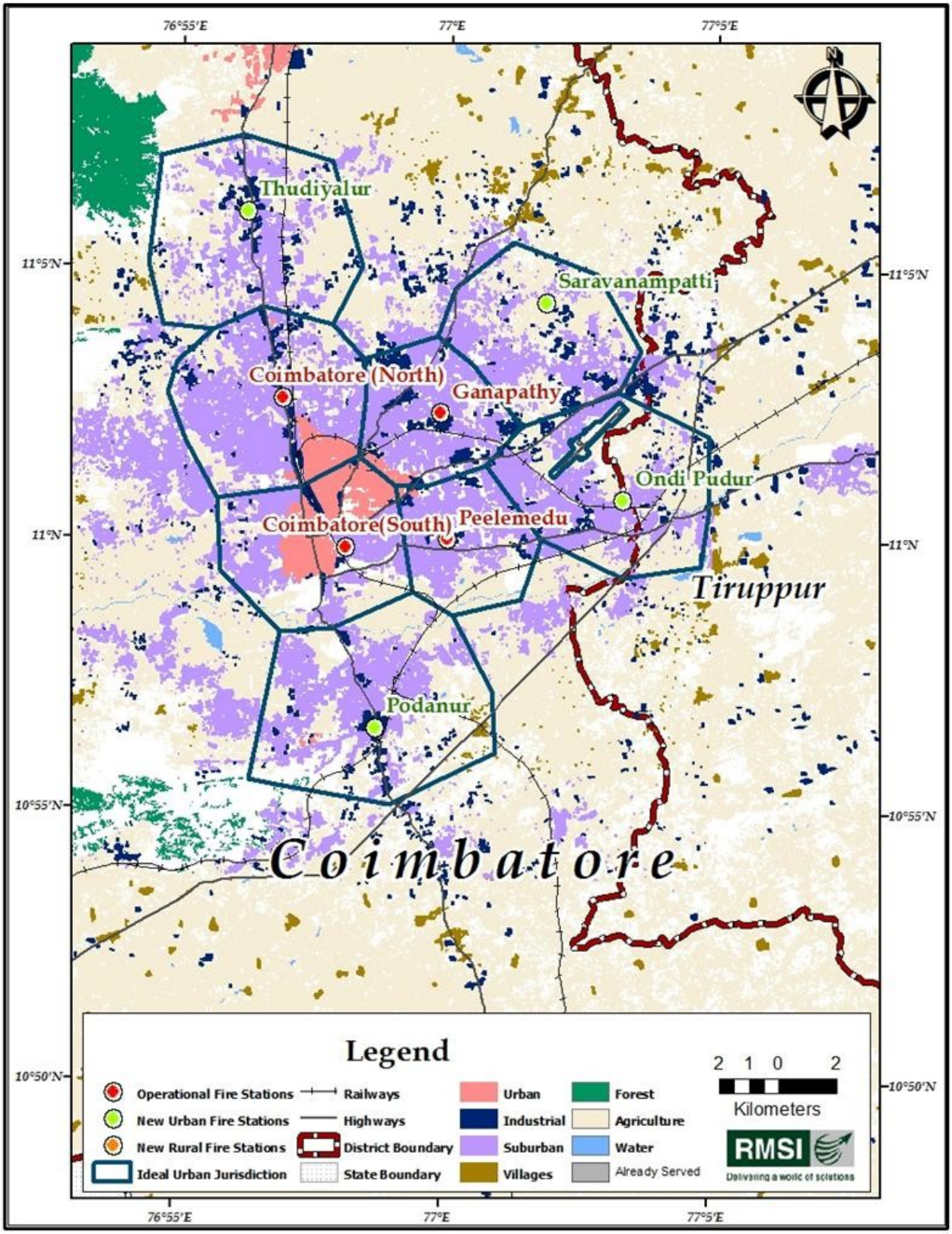

Figure 29-5: Fire stations gap analysis for Coimbatore urban areas

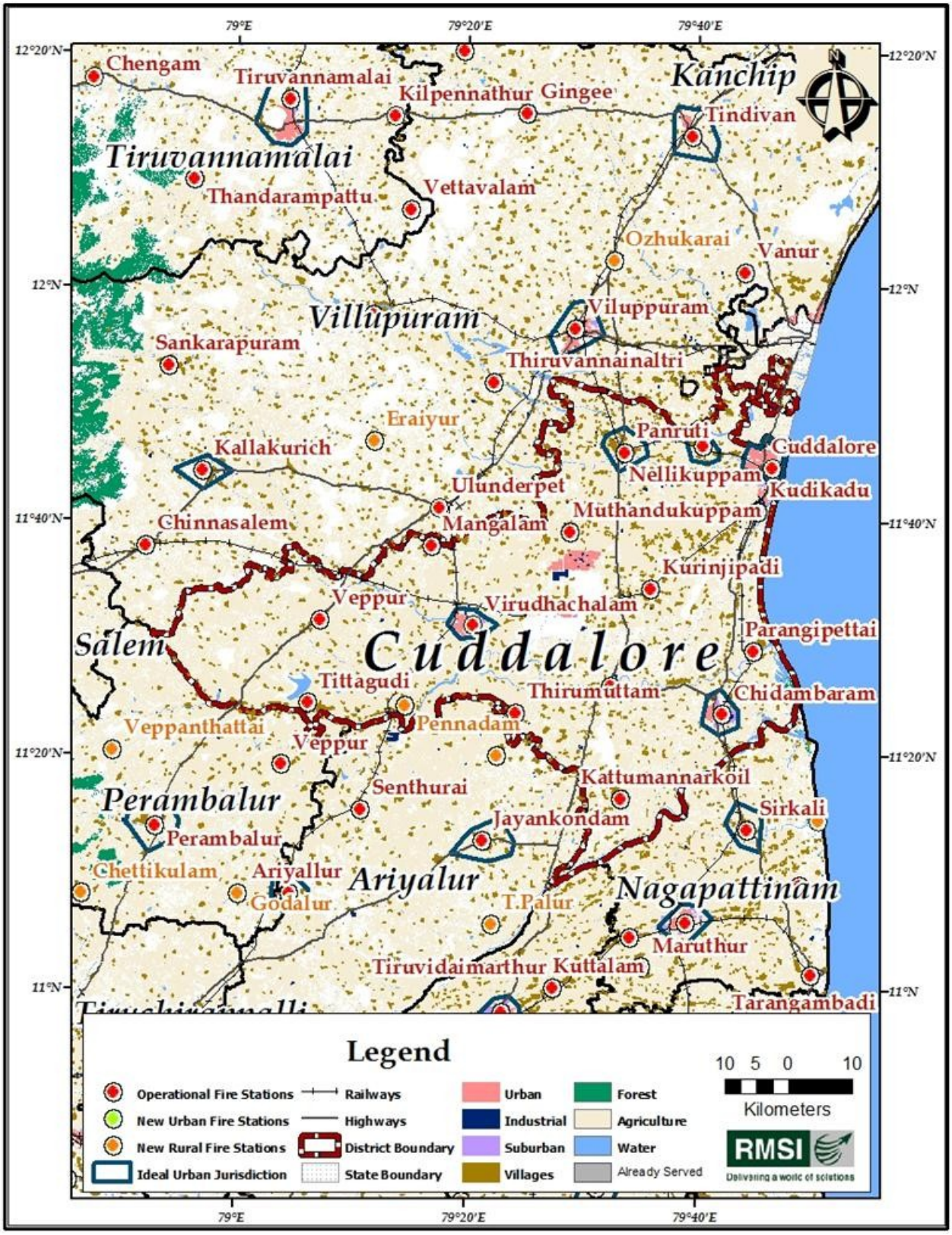

Figure 29-6: Fire stations gap analysis for Cuddalore rural area

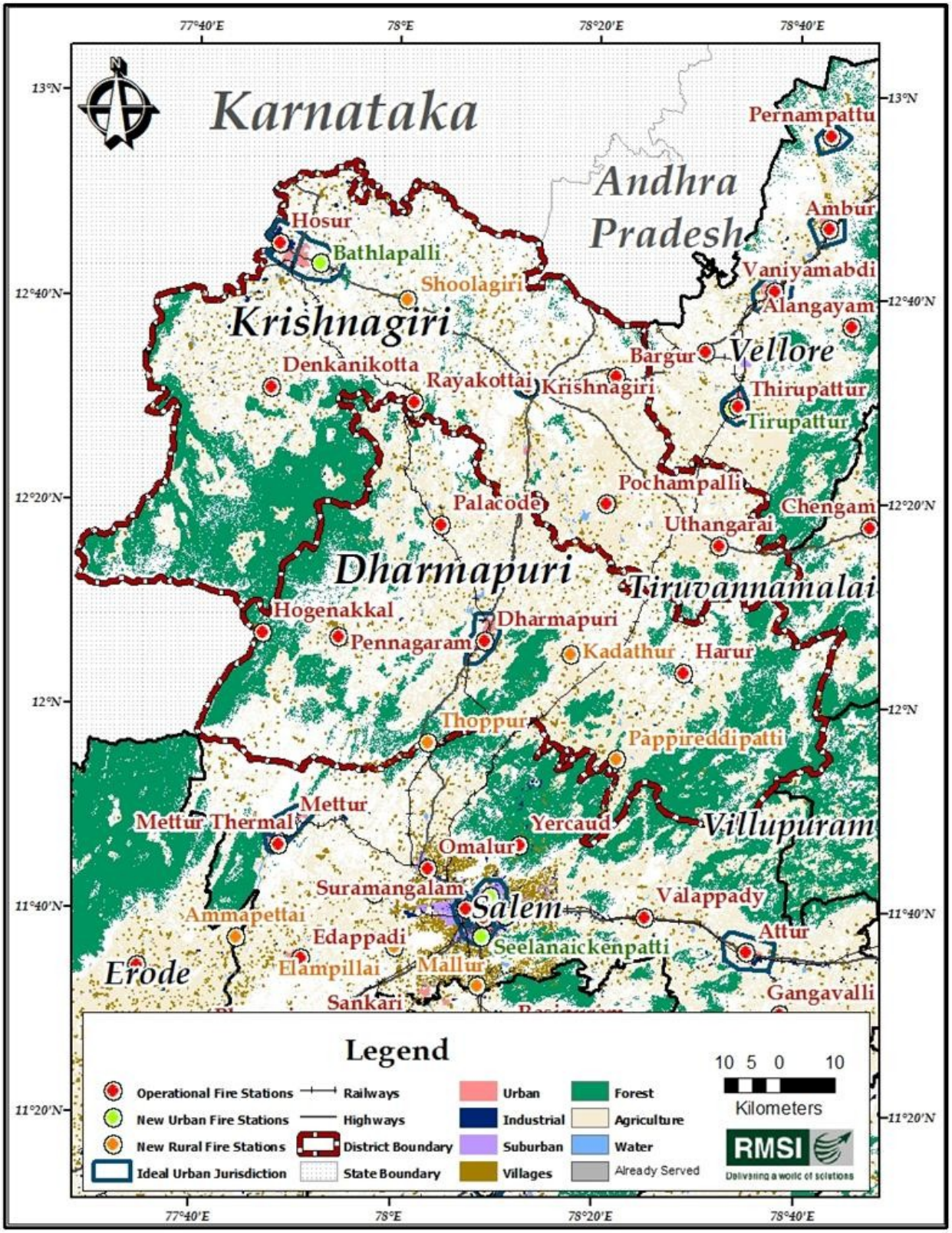

Figure 29-7: Fire stations gap analysis for Dharmapuri and Krishnagiri areas

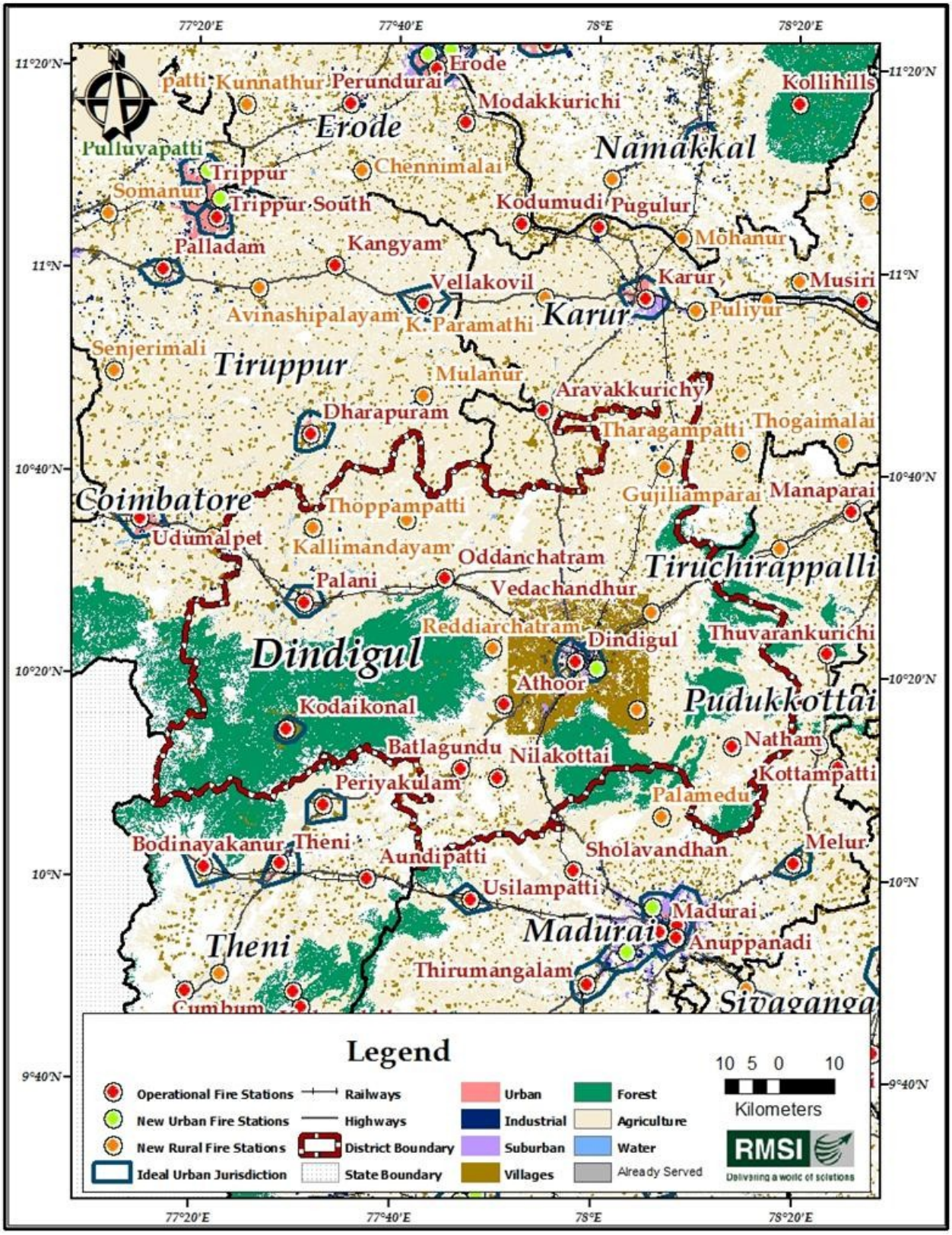

Figure 29-8: Fire stations gap analysis for Dindigul rural areas

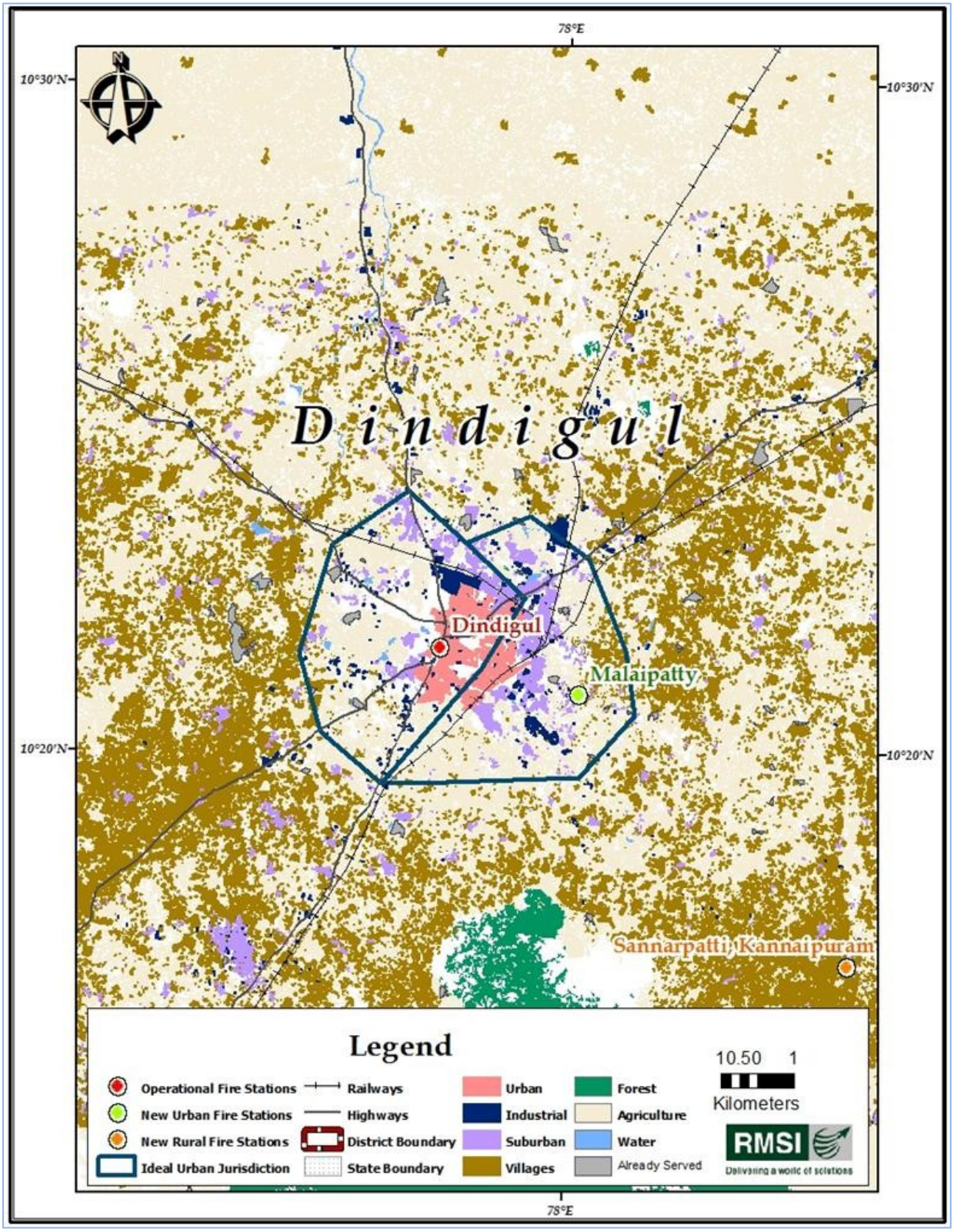

Figure 29-9: Fire stations gap analysis for Dindigul urban areas

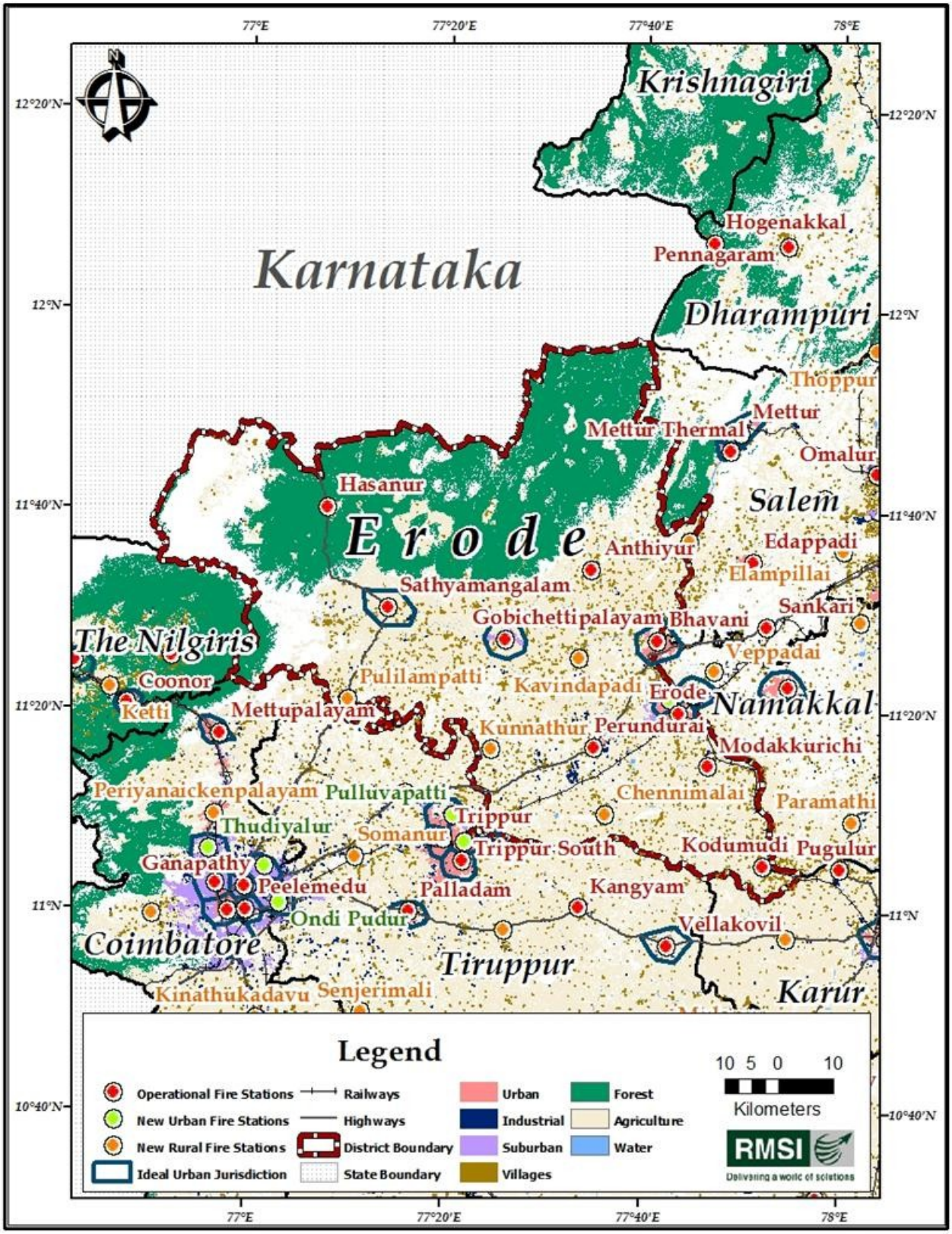

Figure 29-10: Fire stations gap analysis for Erode rural areas

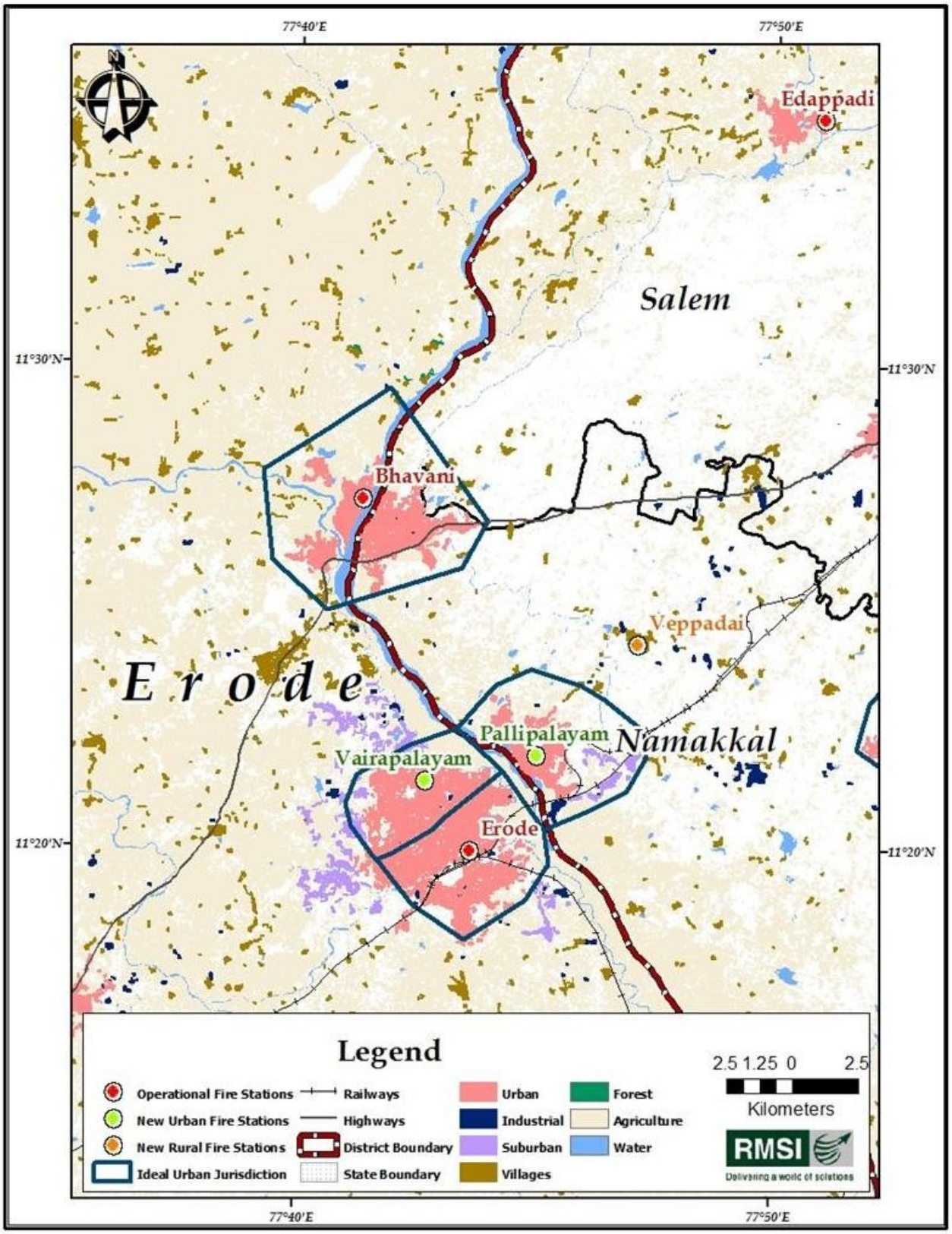

Figure 29-11: Fire stations gap analysis for Erode urban areas

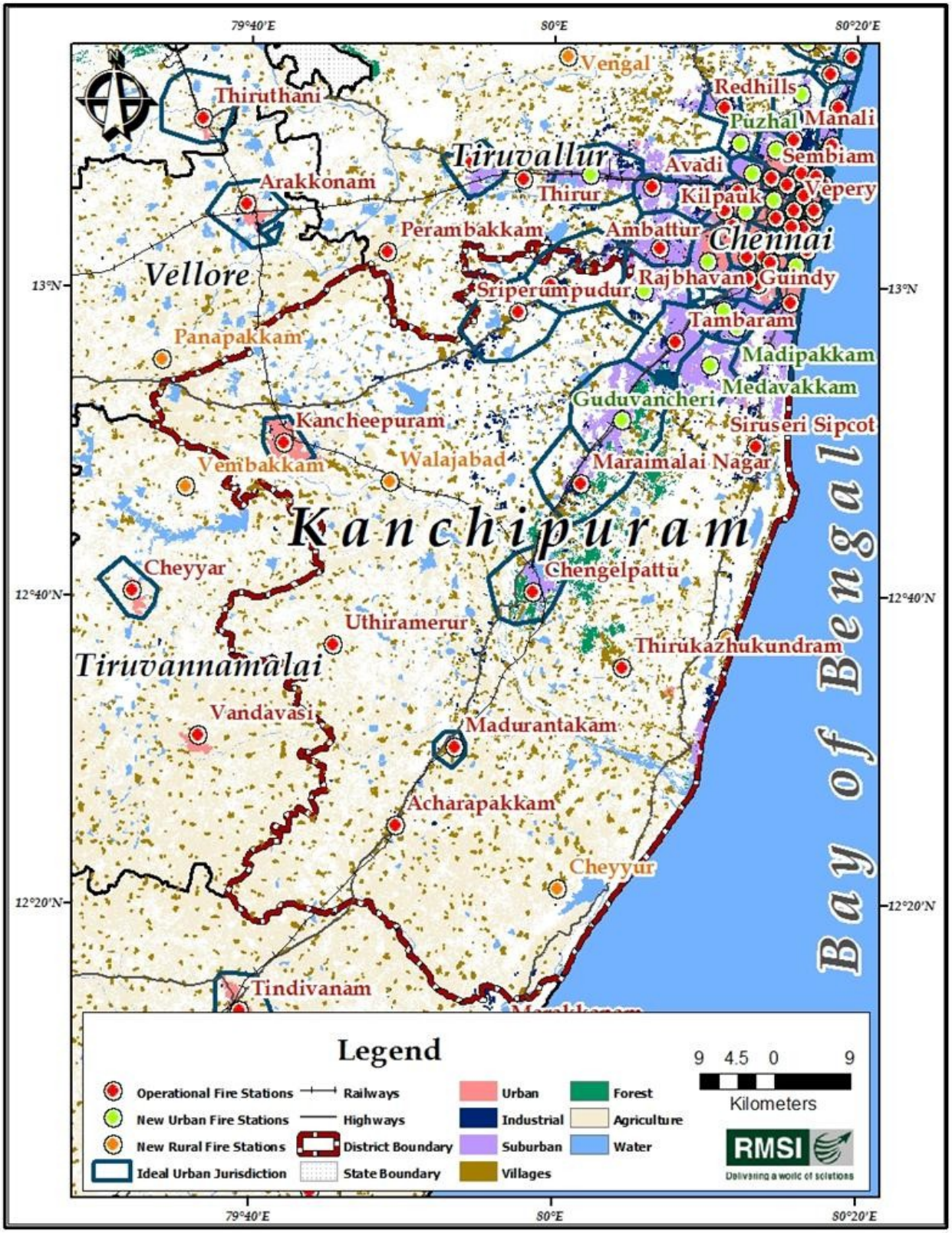

Figure 29-12: Fire stations gap analysis for Kanchipuram rural areas

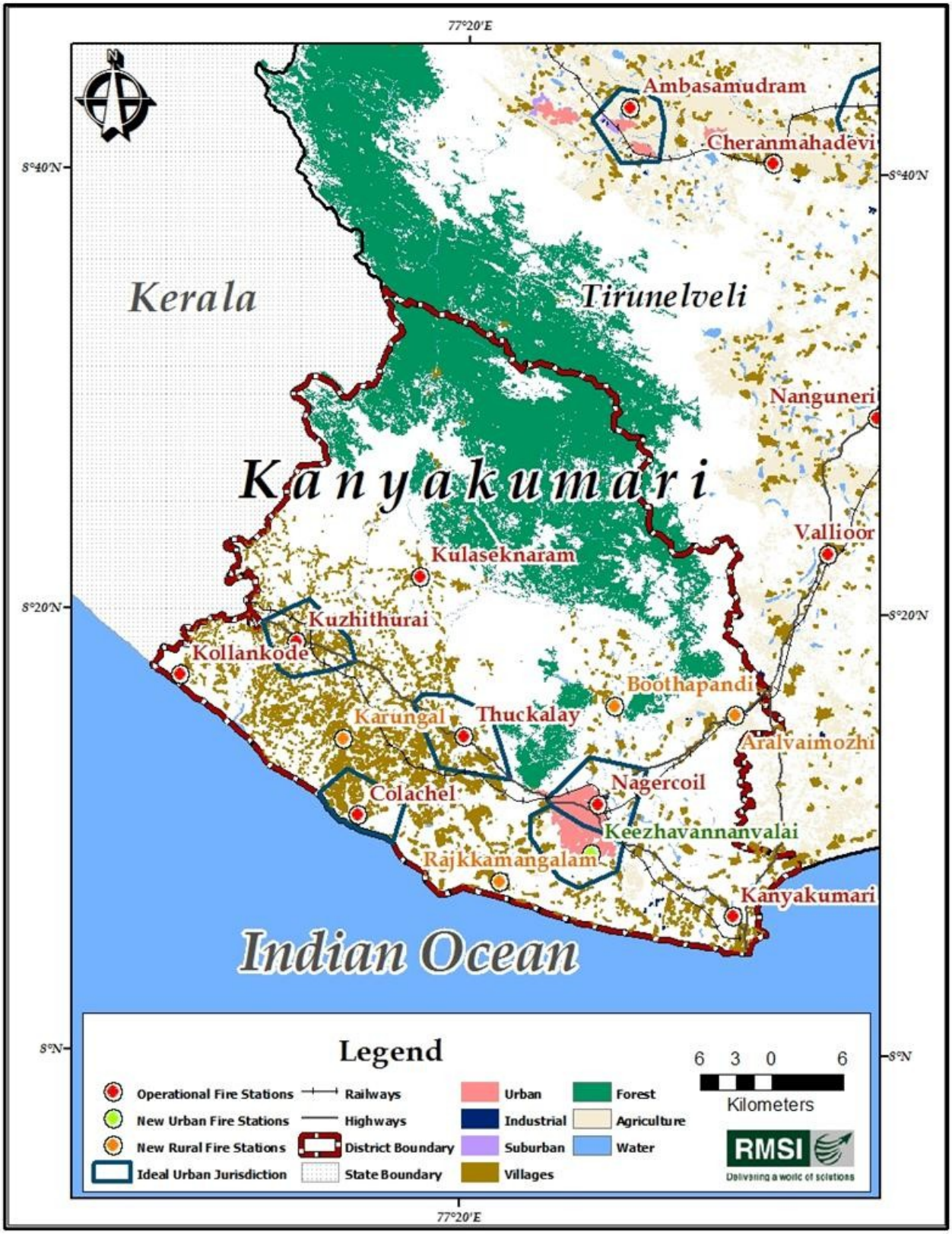

Figure 29-13: Fire stations gap analysis for Kanyakumari rural areas

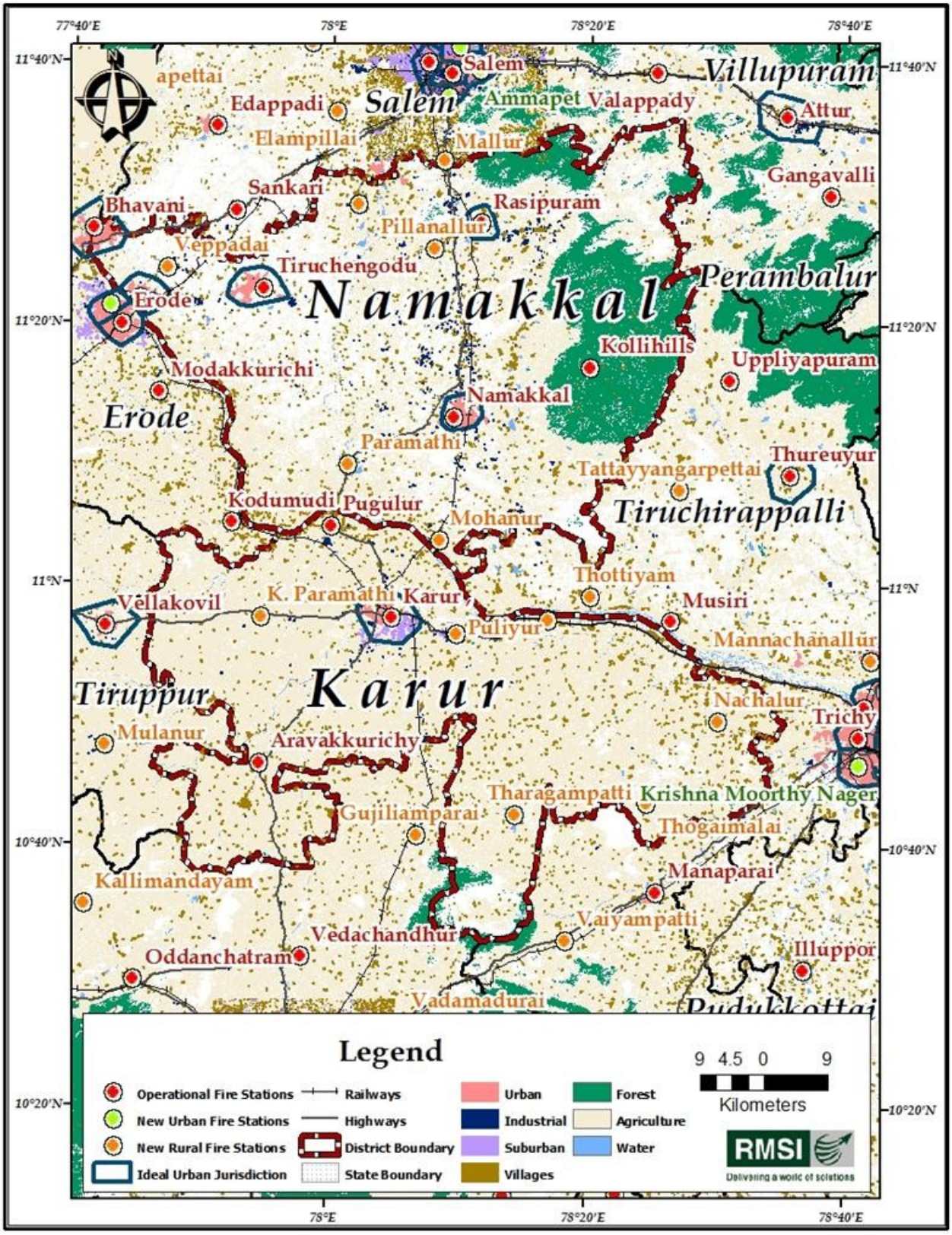

Figure 29-14: Fire stations gap analysis for Namakkal-Karur areas

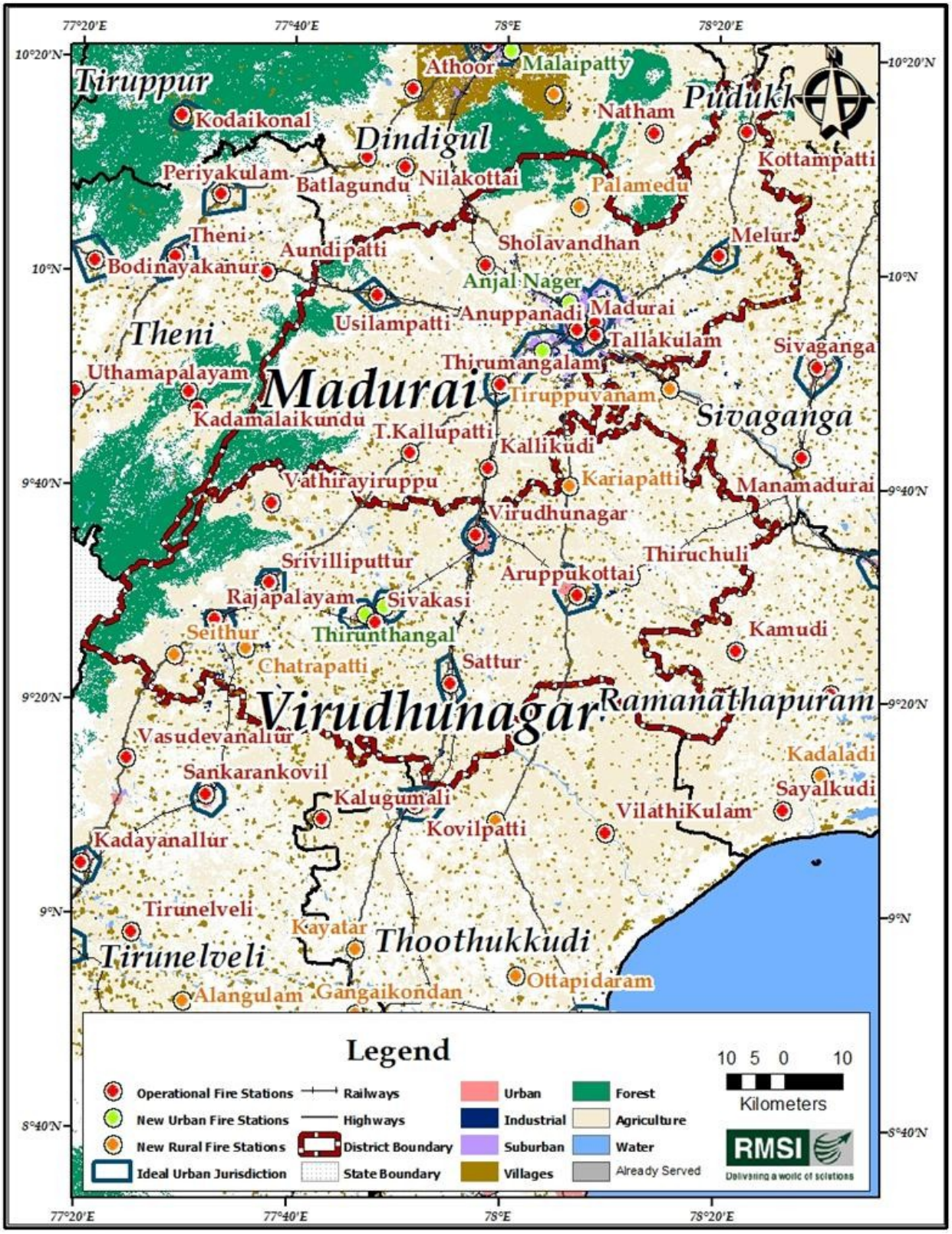

Figure 29-15: Fire stations gap analysis for Madurai-Virudhunagar rural areas

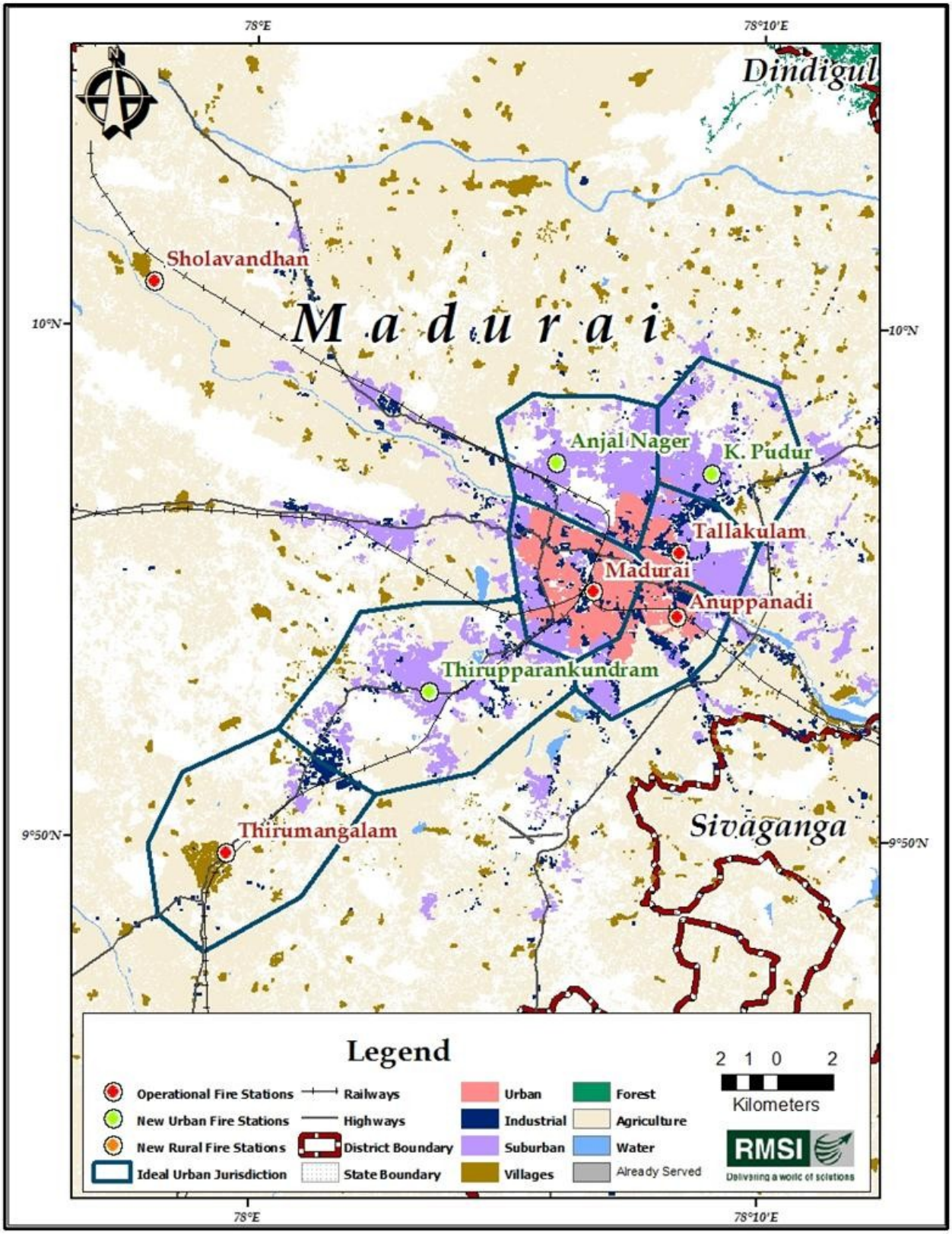

Figure 29-16: Fire stations gap analysis for Madurai urban areas

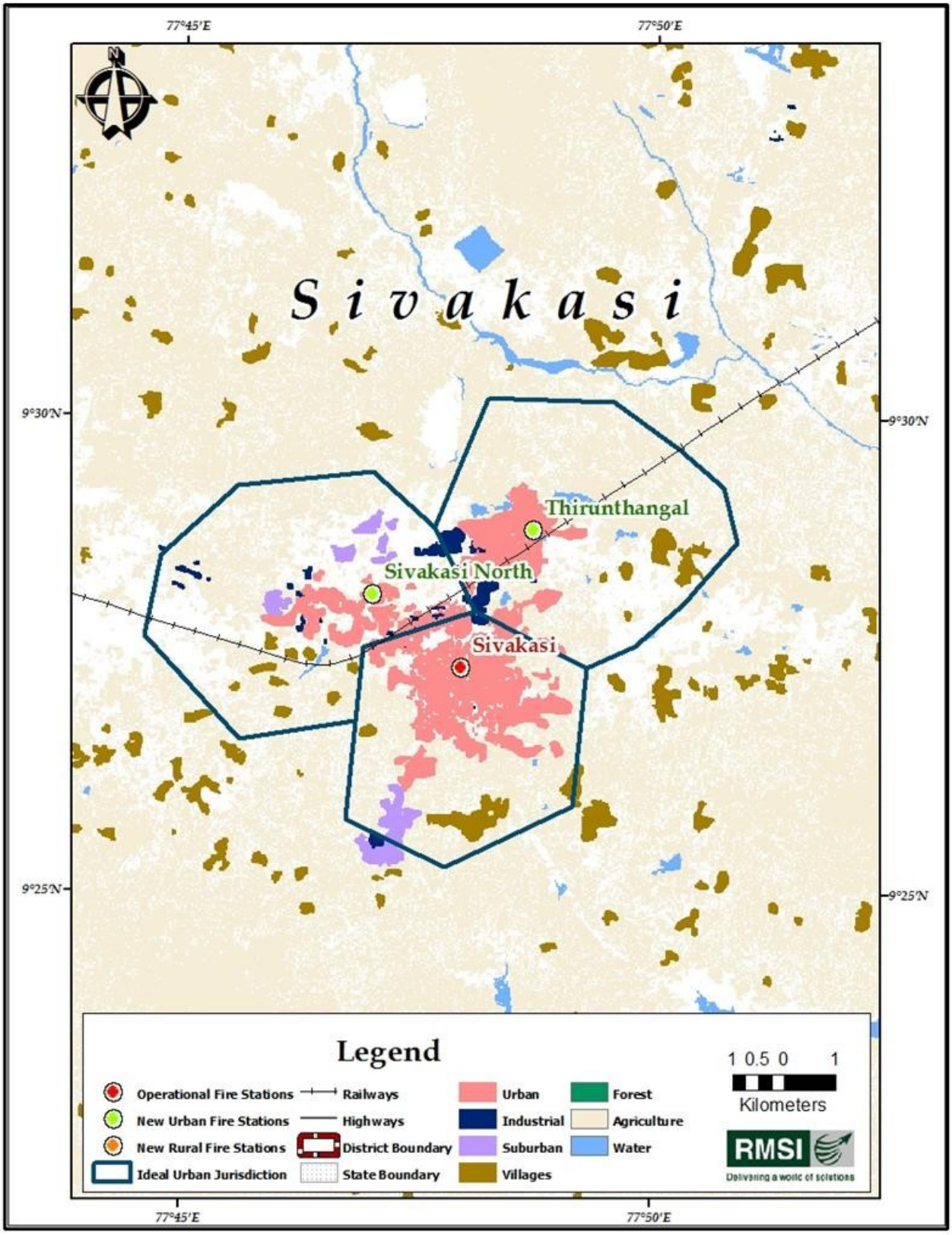

Figure 29-17: Fire stations gap analysis for Sivakasi urban areas

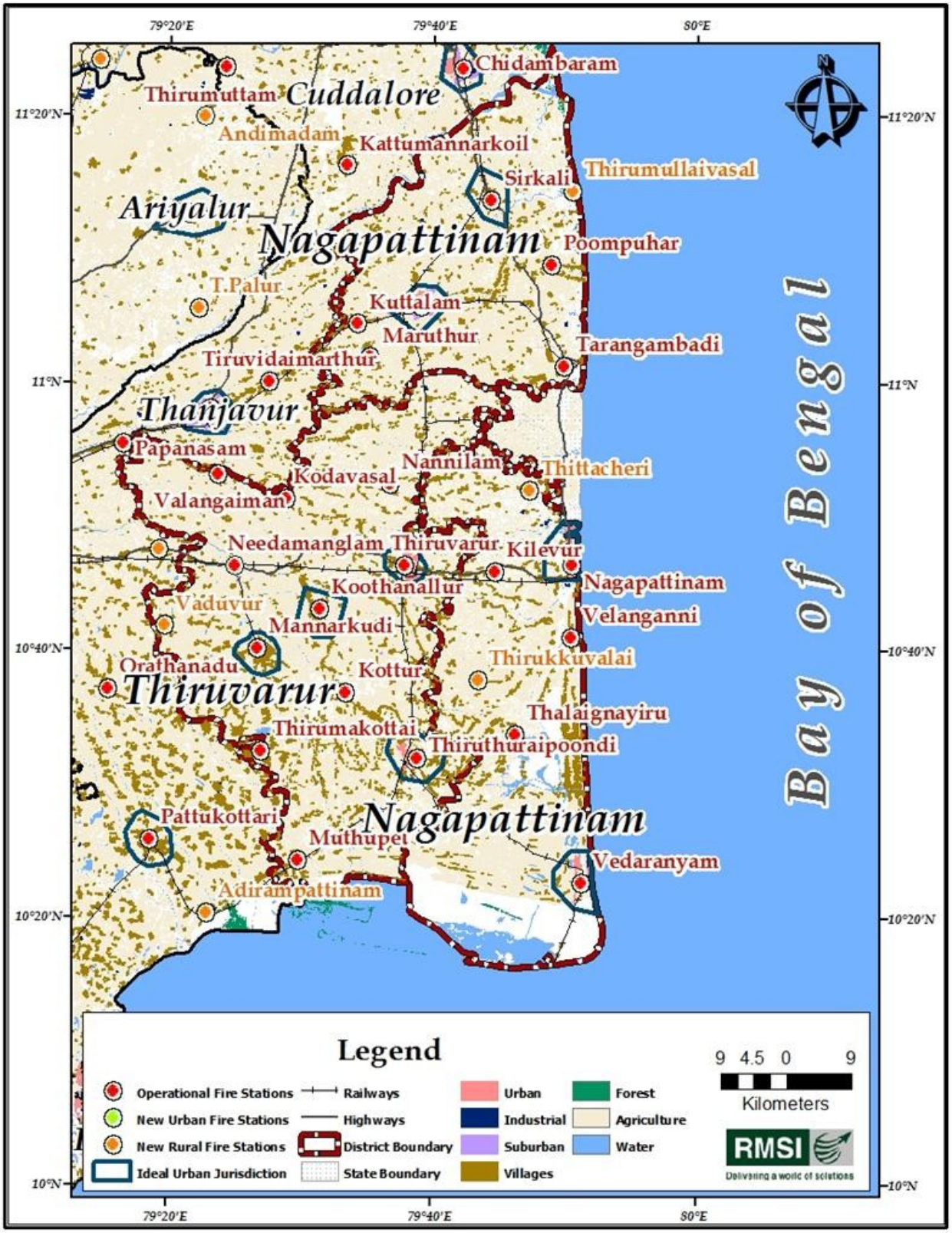

Figure 29-18: Fire stations gap analysis for Thiruvarur and Nagapattinam areas

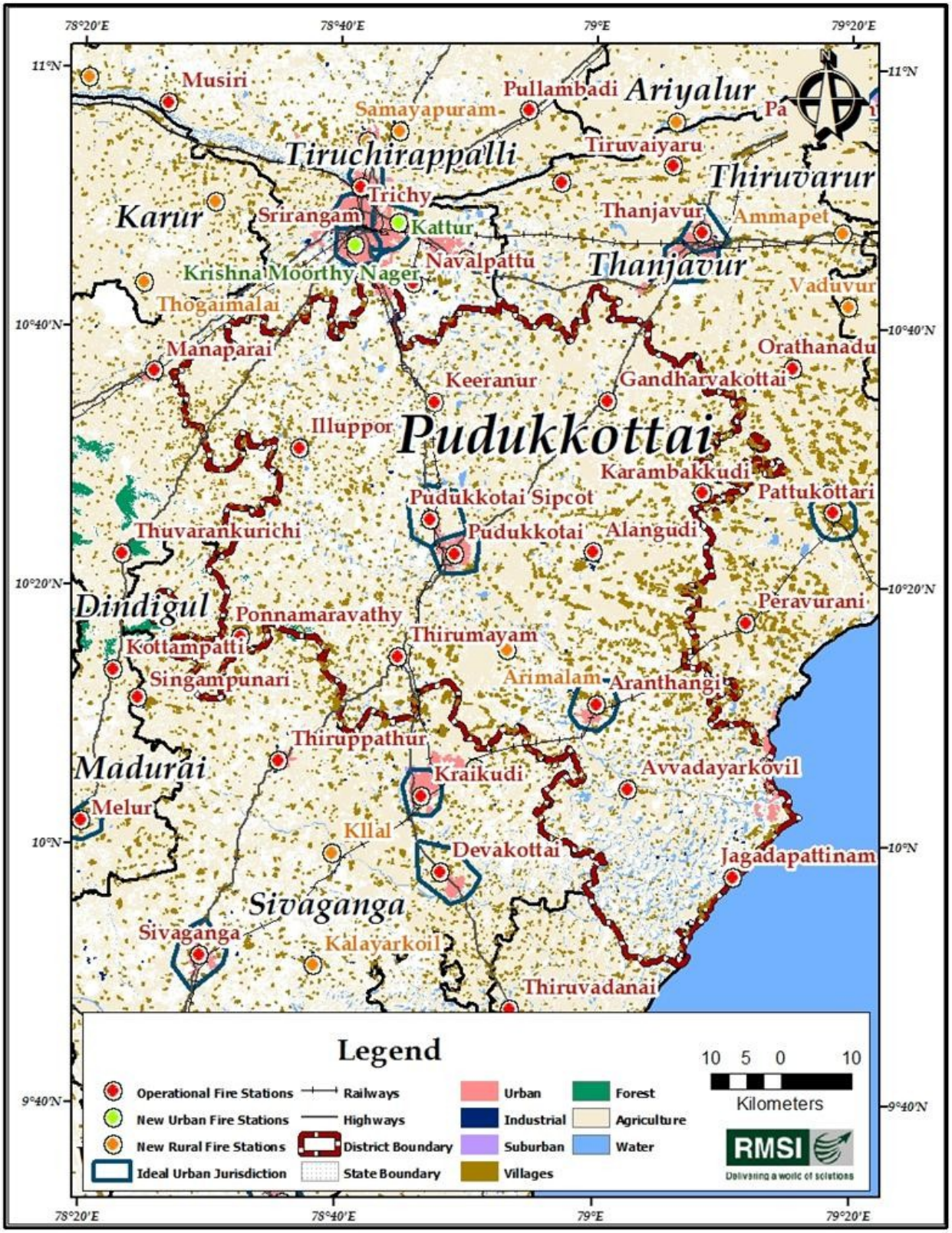

Figure 29-19: Fire stations gap analysis for Pudukkottai rural areas

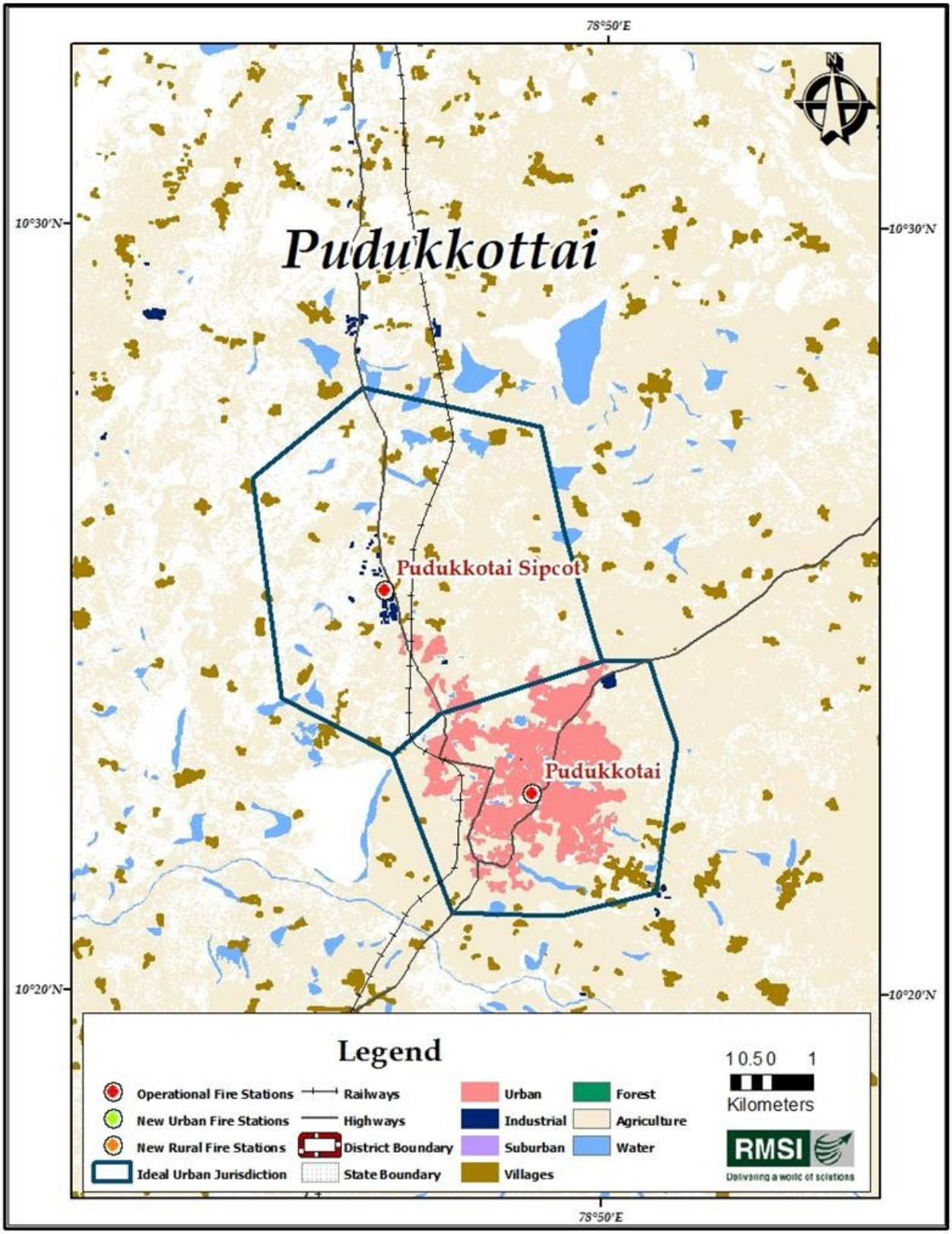

Figure 29-20: Fire stations gap analysis for Pudukkottai urban areas

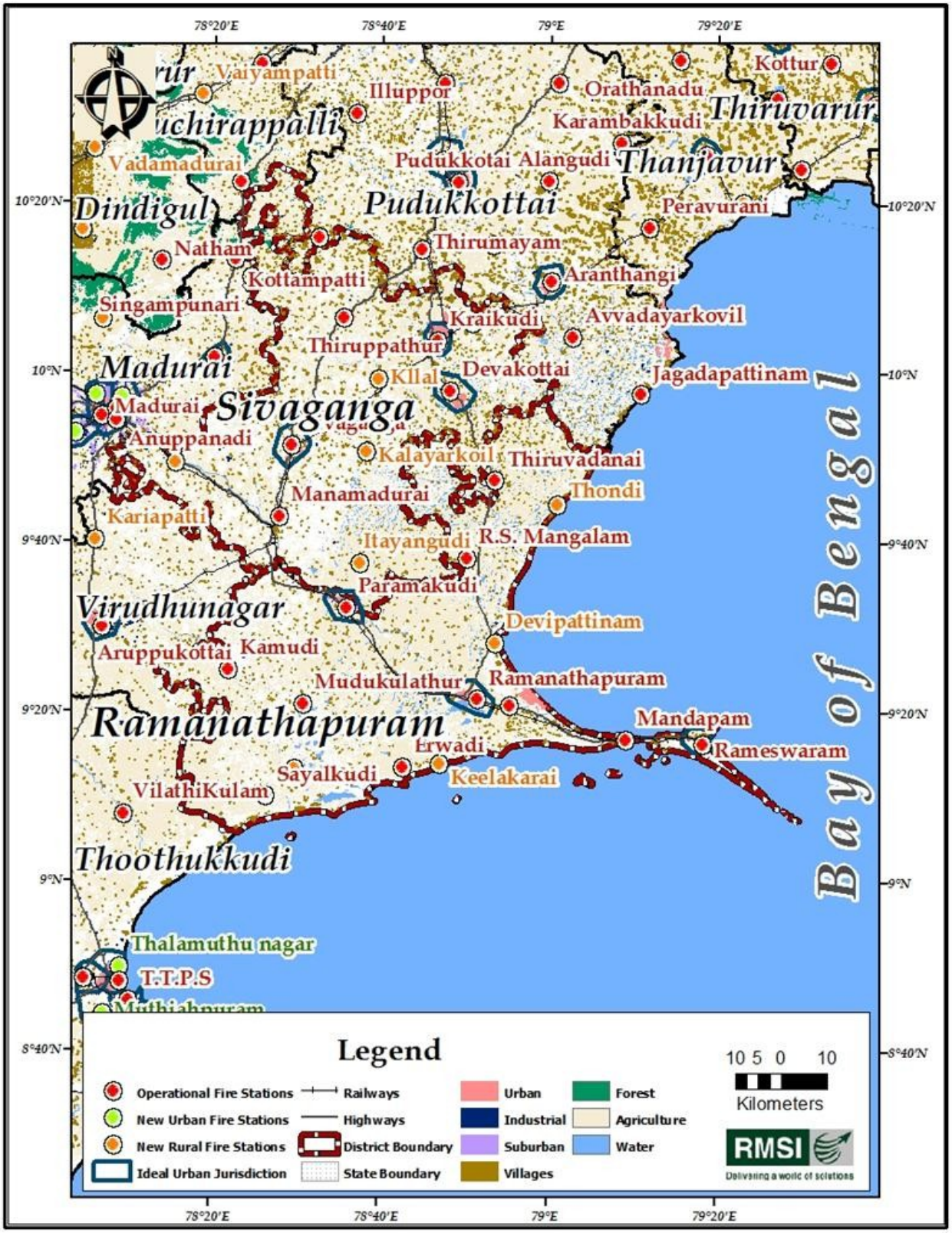

Figure 29-21: Fire stations gap analysis for Sivaganga ans Ramanathapuram areas

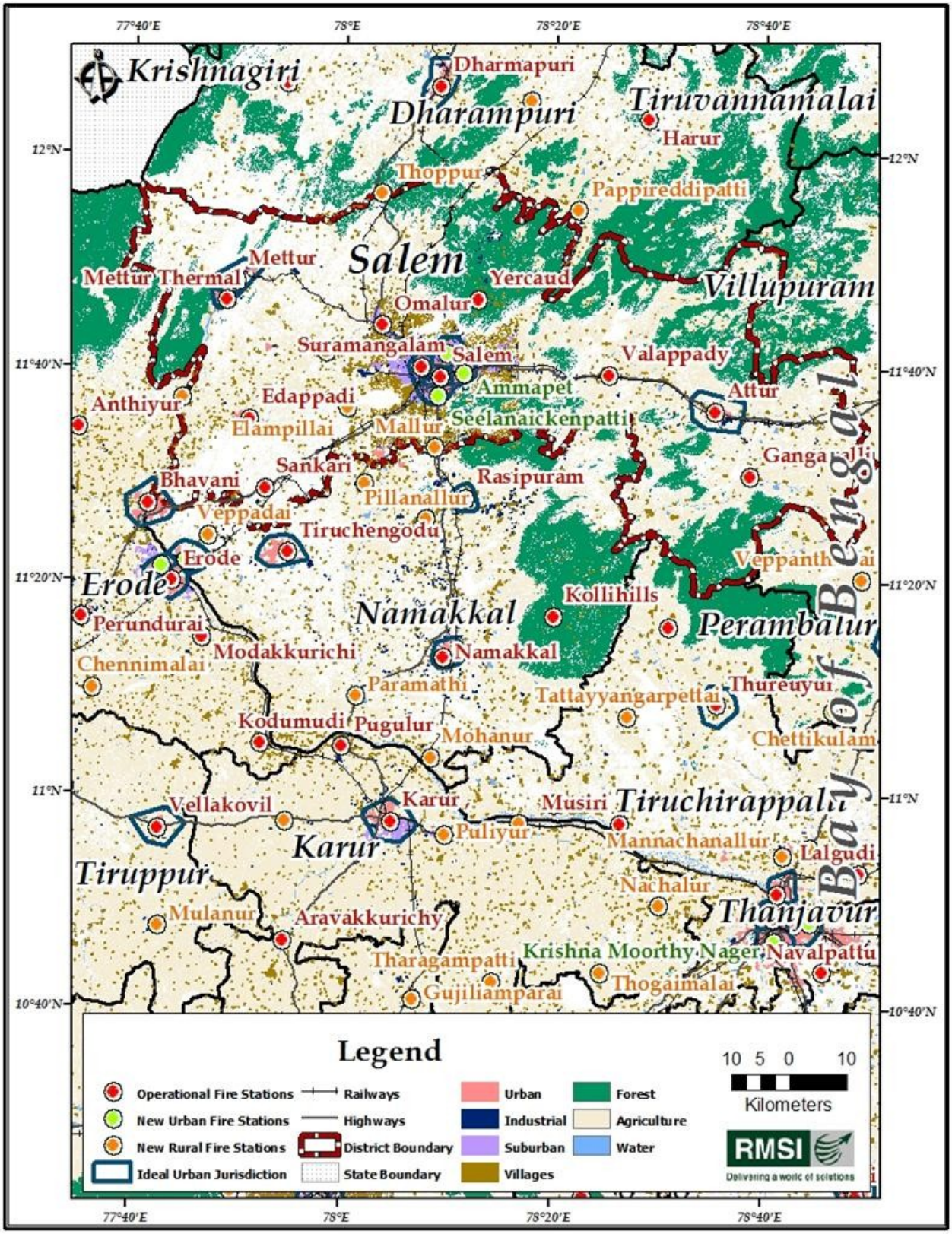

Figure 29-22: Fire stations gap analysis for Salem rural areas

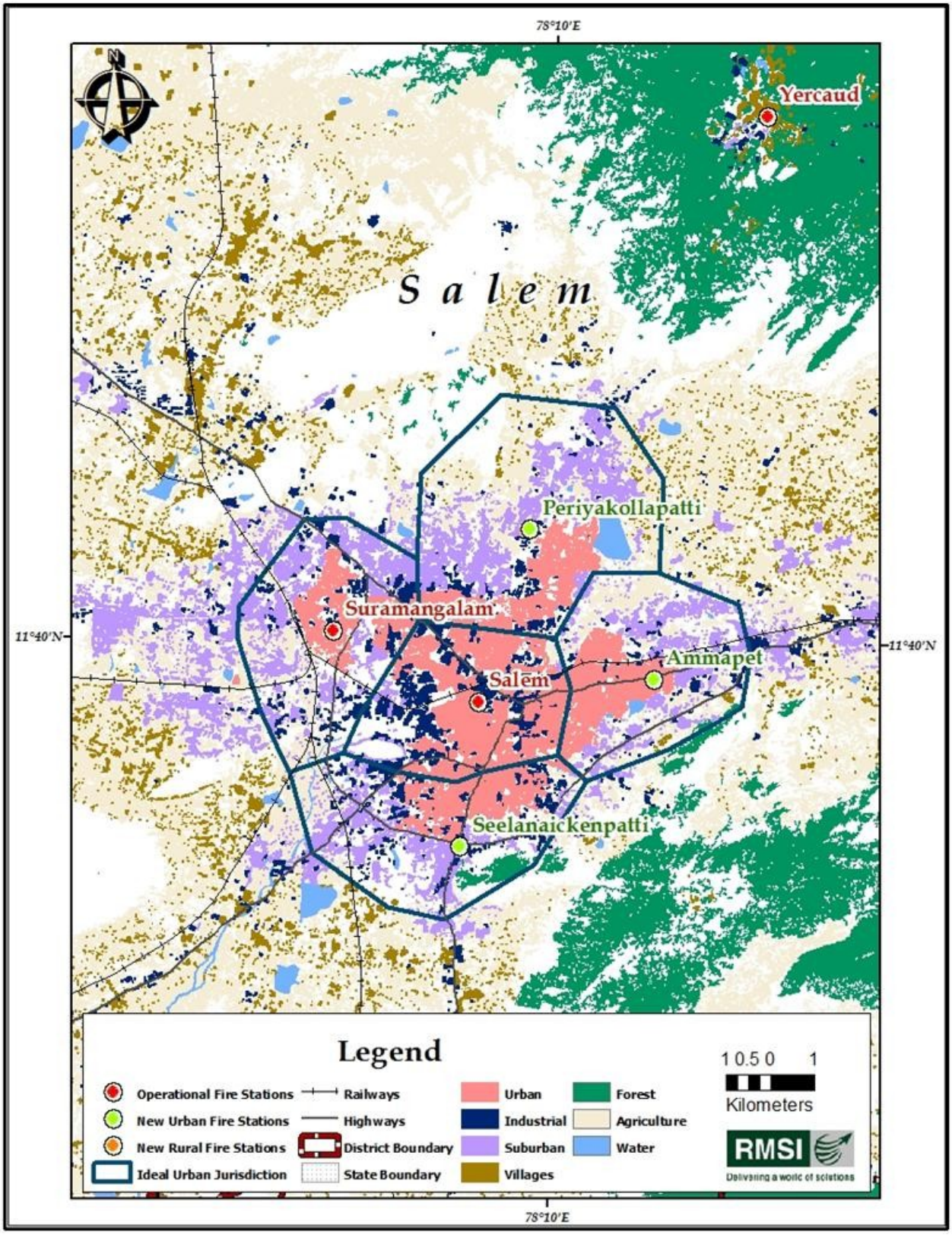

Figure 29-23: Fire stations gap analysis for Salem urban areas

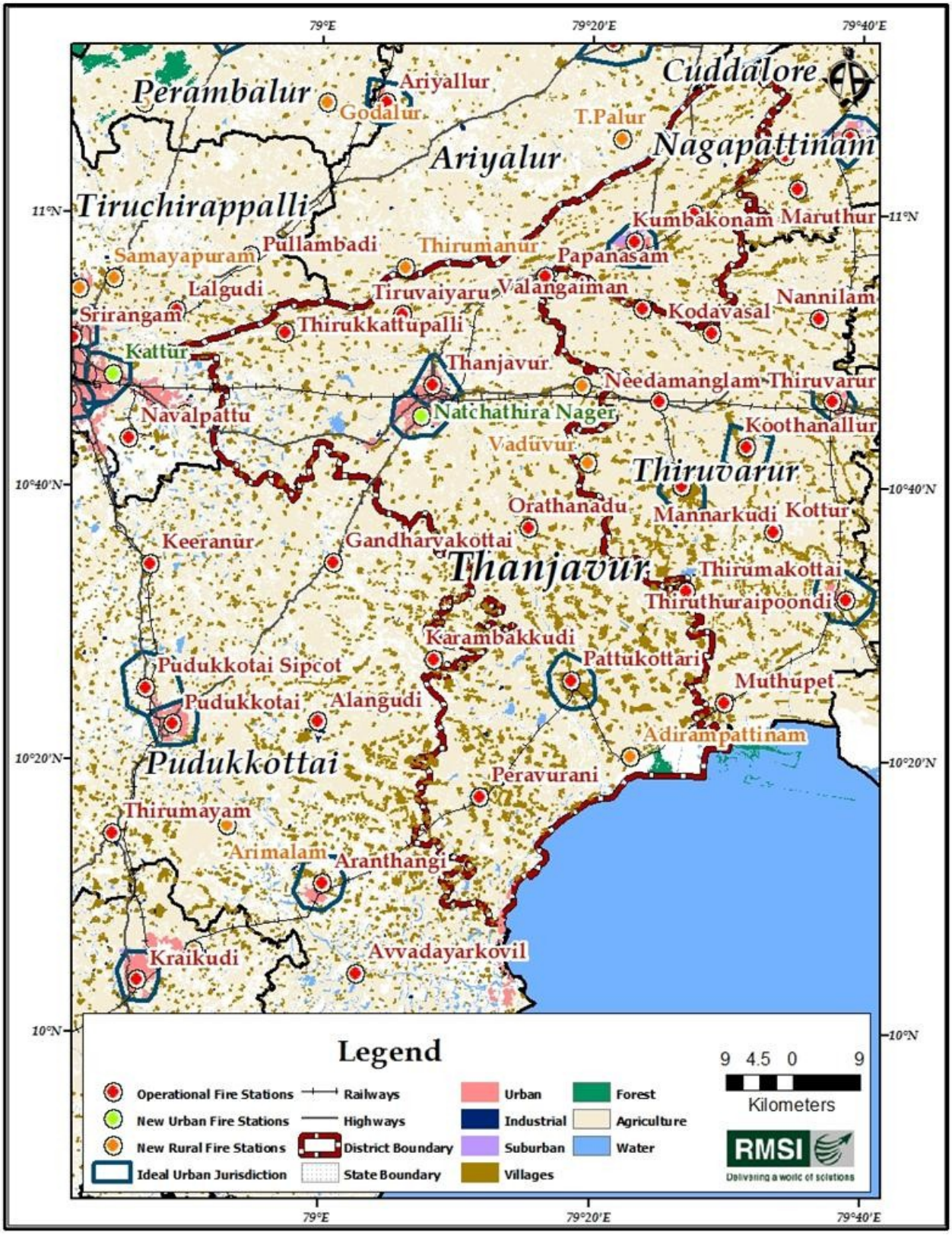

Figure 29-24: Fire stations gap analysis for Thanjavur rural areas

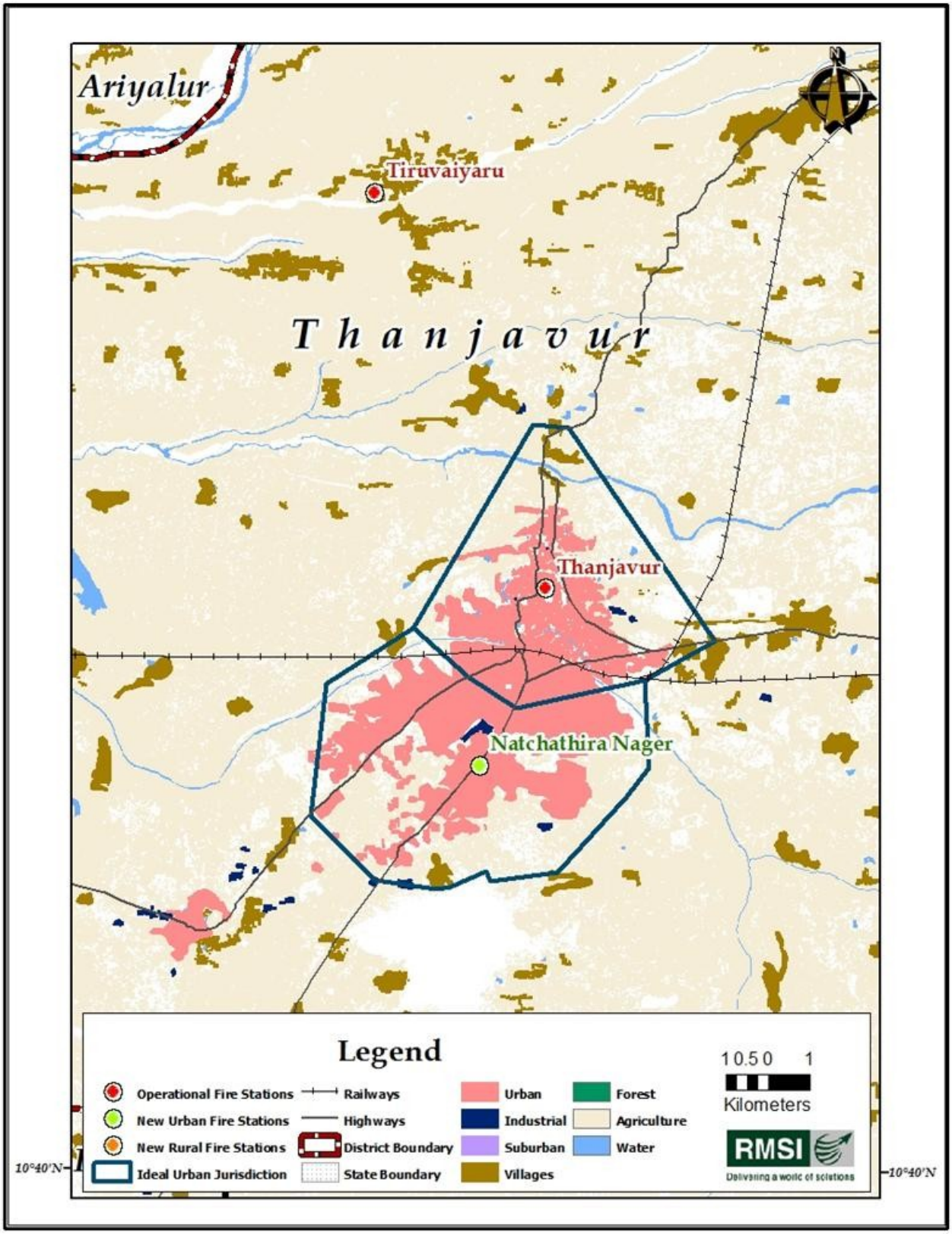

Figure 29-25: Fire stations gap analysis for Thanjavur urban areas

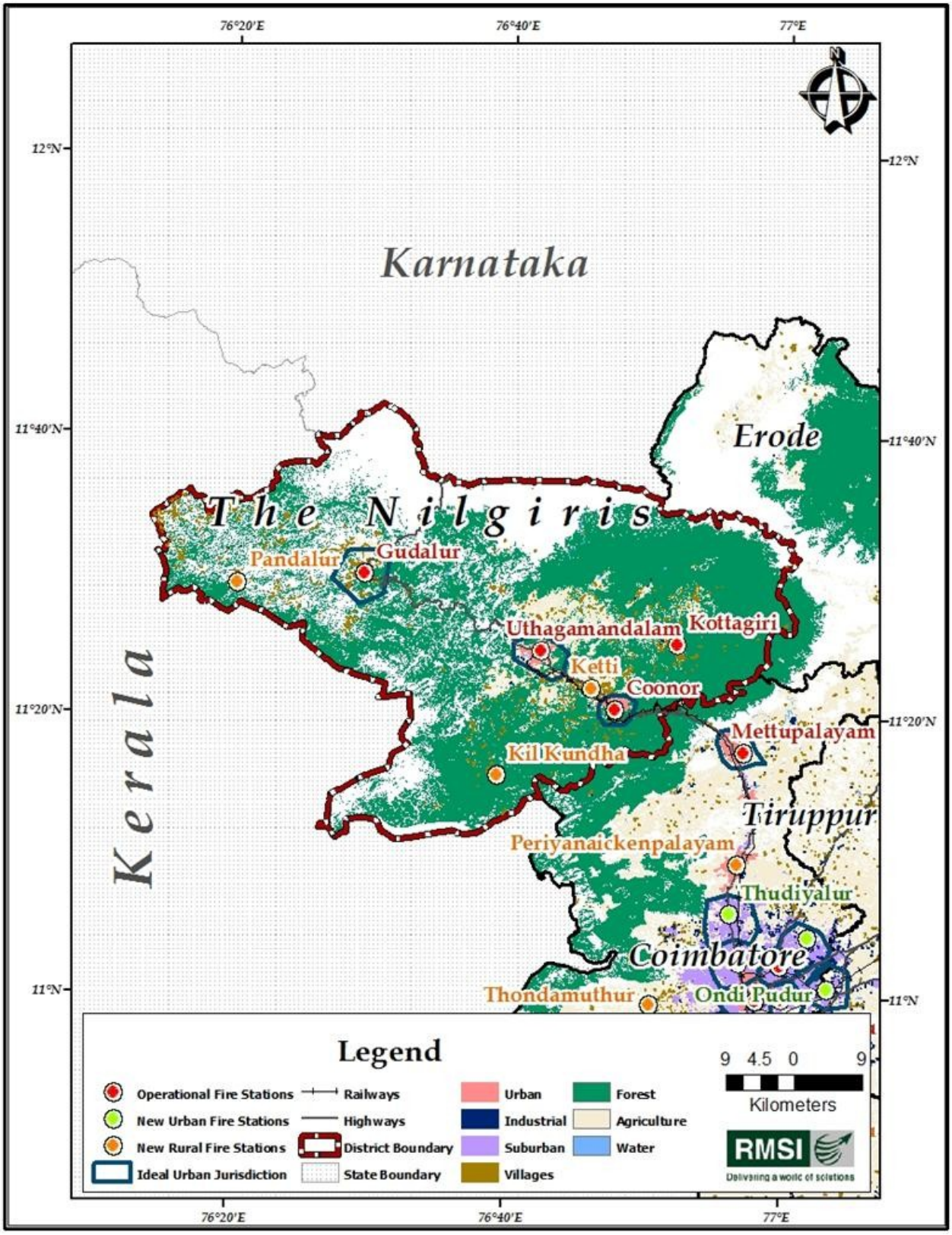

Figure 29-26: Fire stations gap analysis for The Nilgiris rural areas

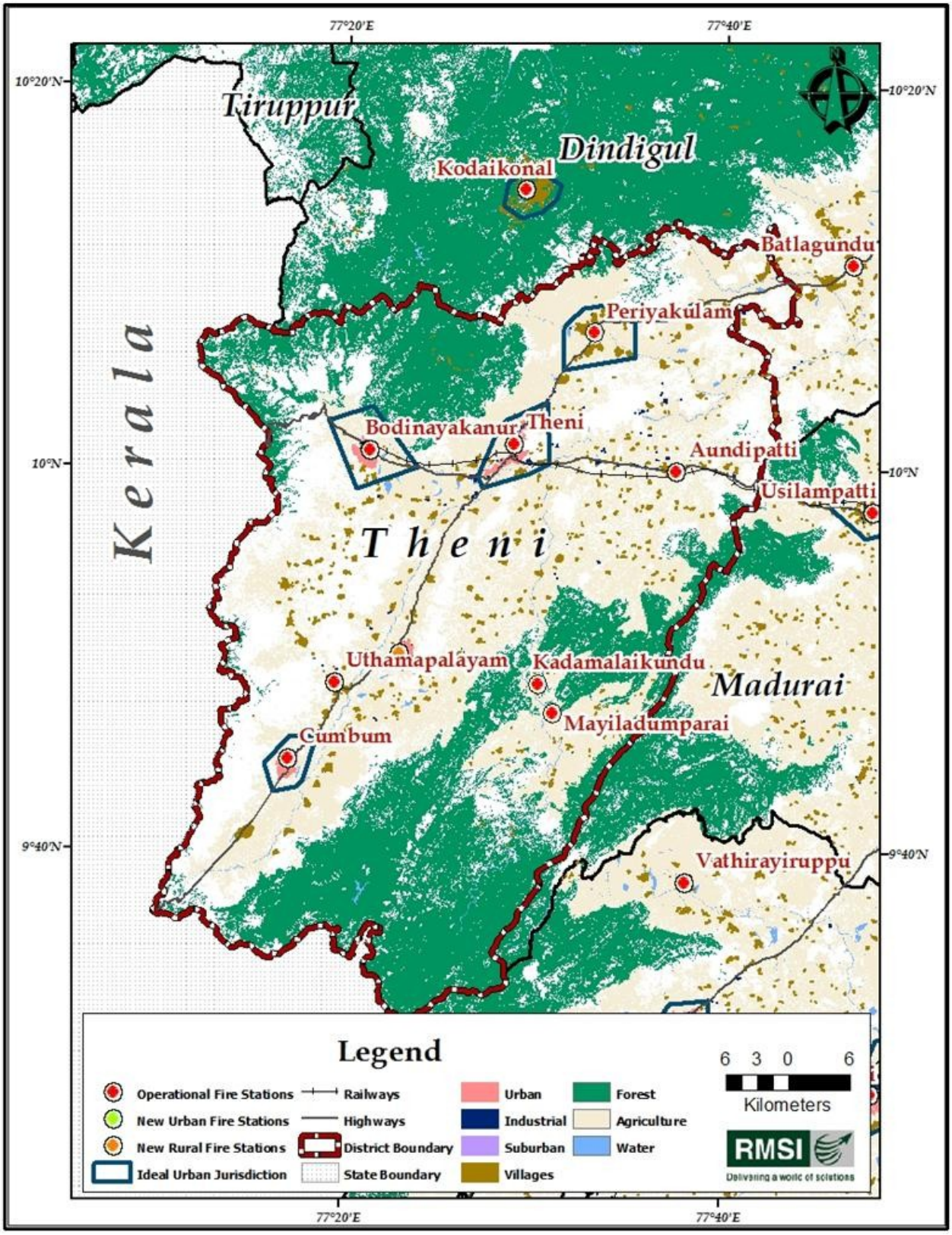

Figure 29-27: Fire stations gap analysis for Theni rural areas

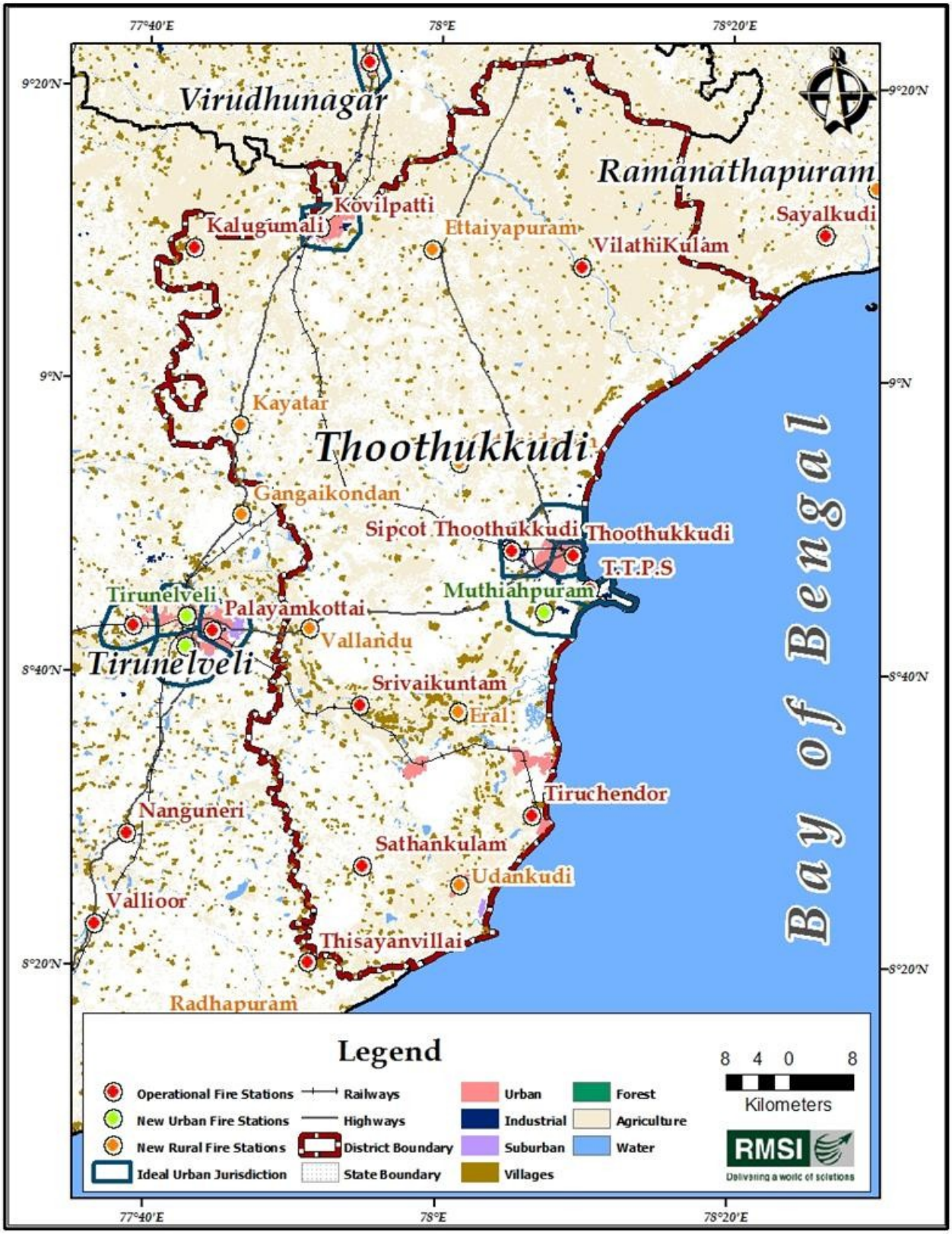

Figure 29-28: Fire stations gap analysis for Thoothukkudi rural areas

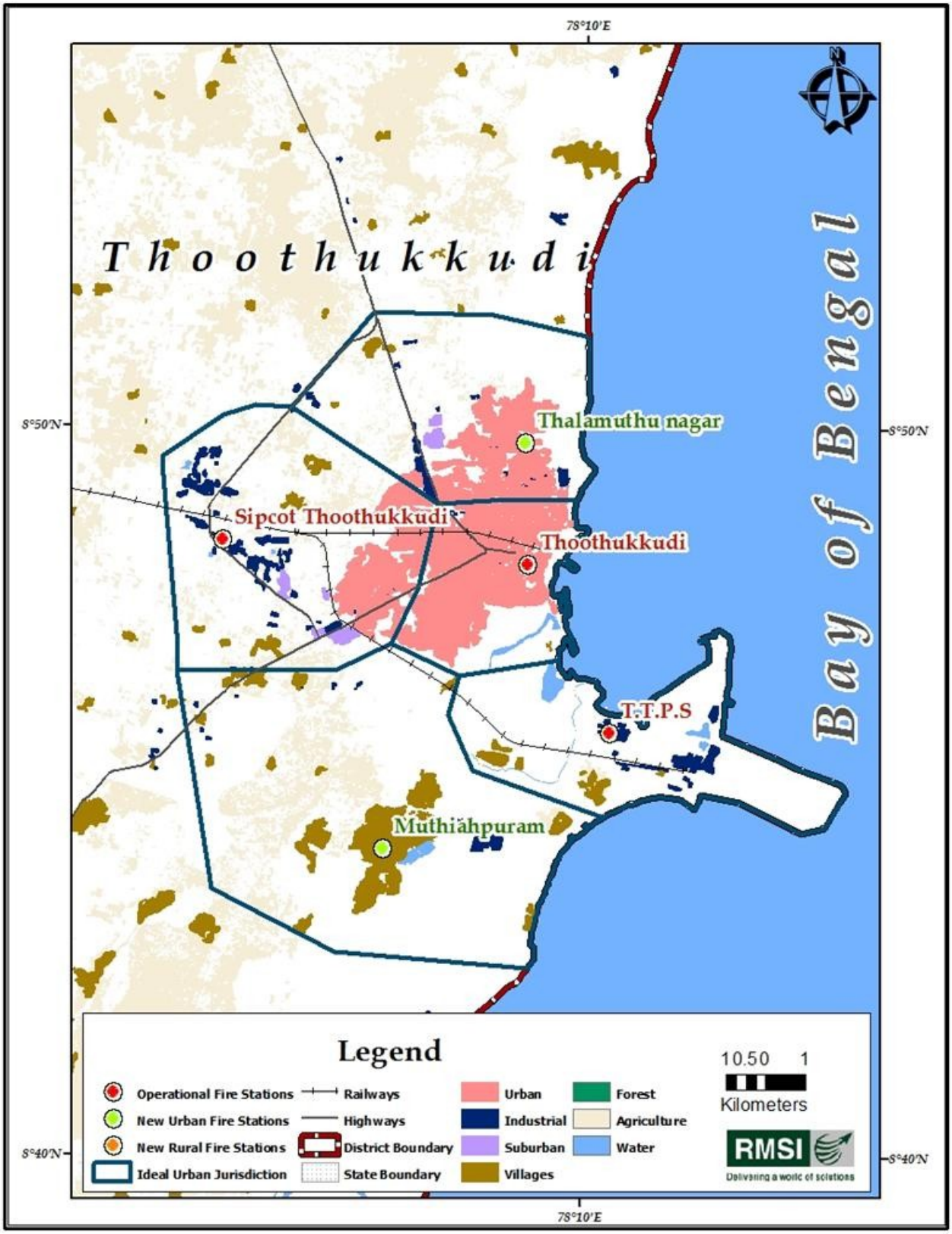

Figure 29-29: Fire stations gap analysis for Thoothukkudi Urban areas

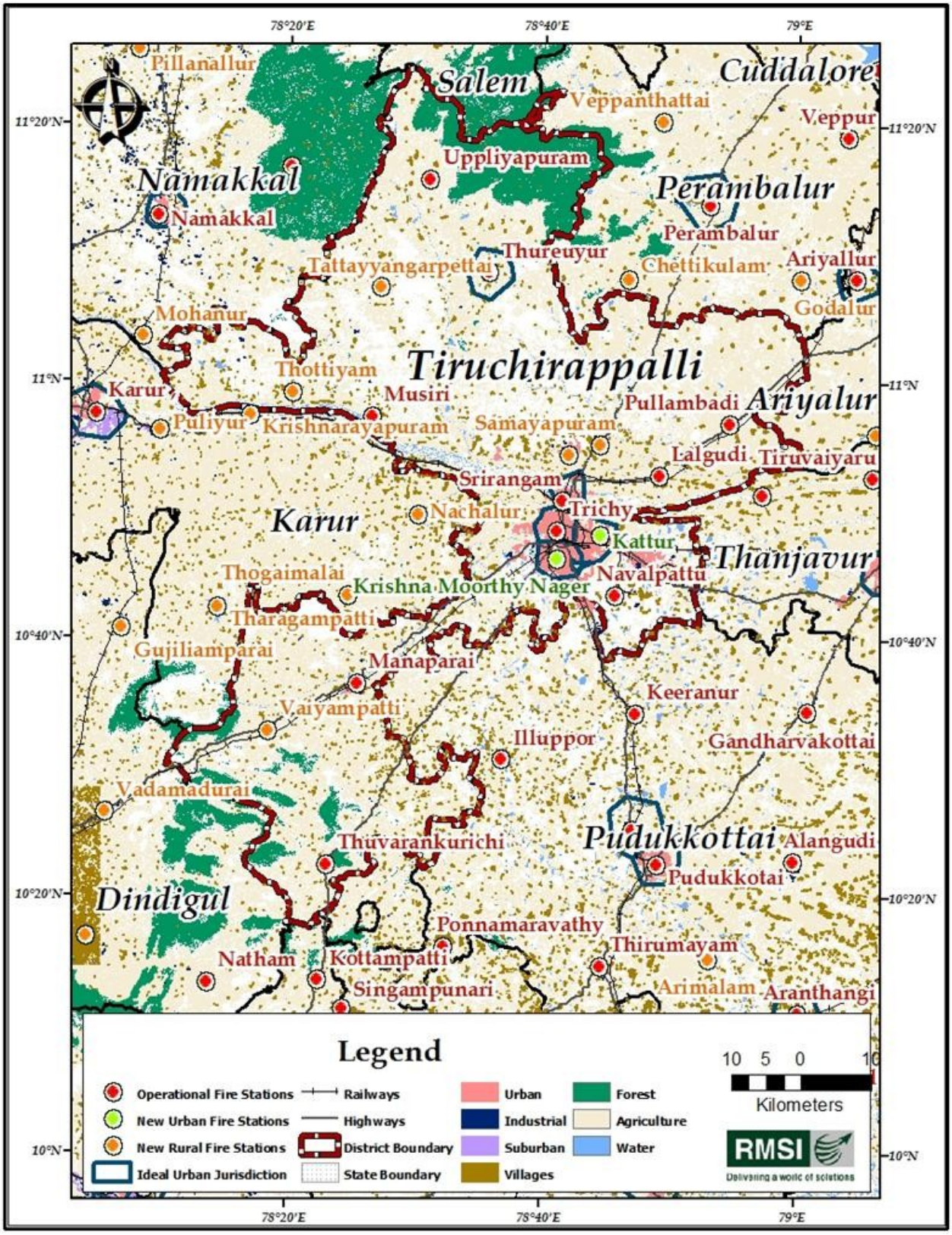

Figure 29-30: Fire stations gap analysis for Tiruchirappalli rural areas

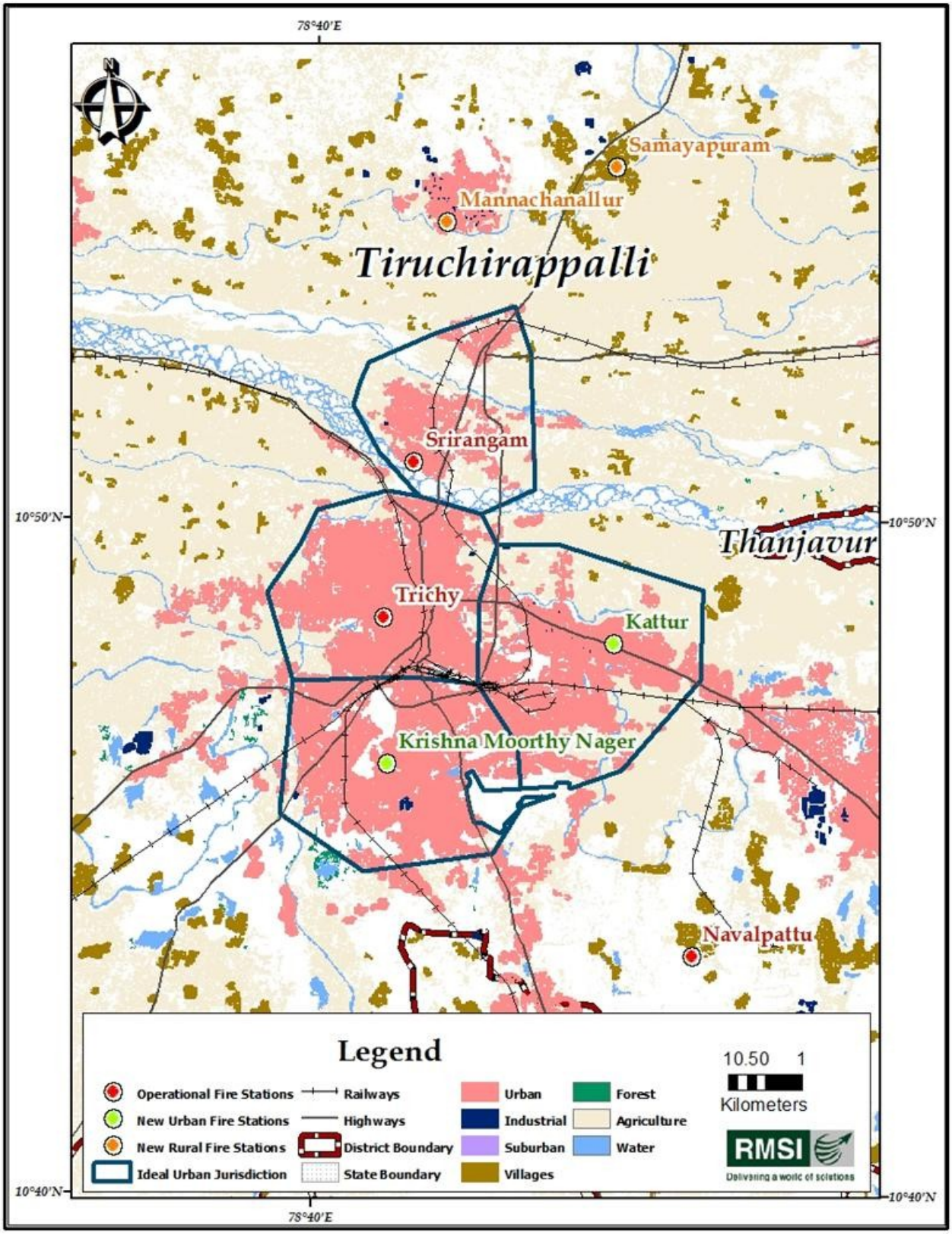

Figure 29-31: Fire stations gap analysis for Tiruchirapalli urban areas

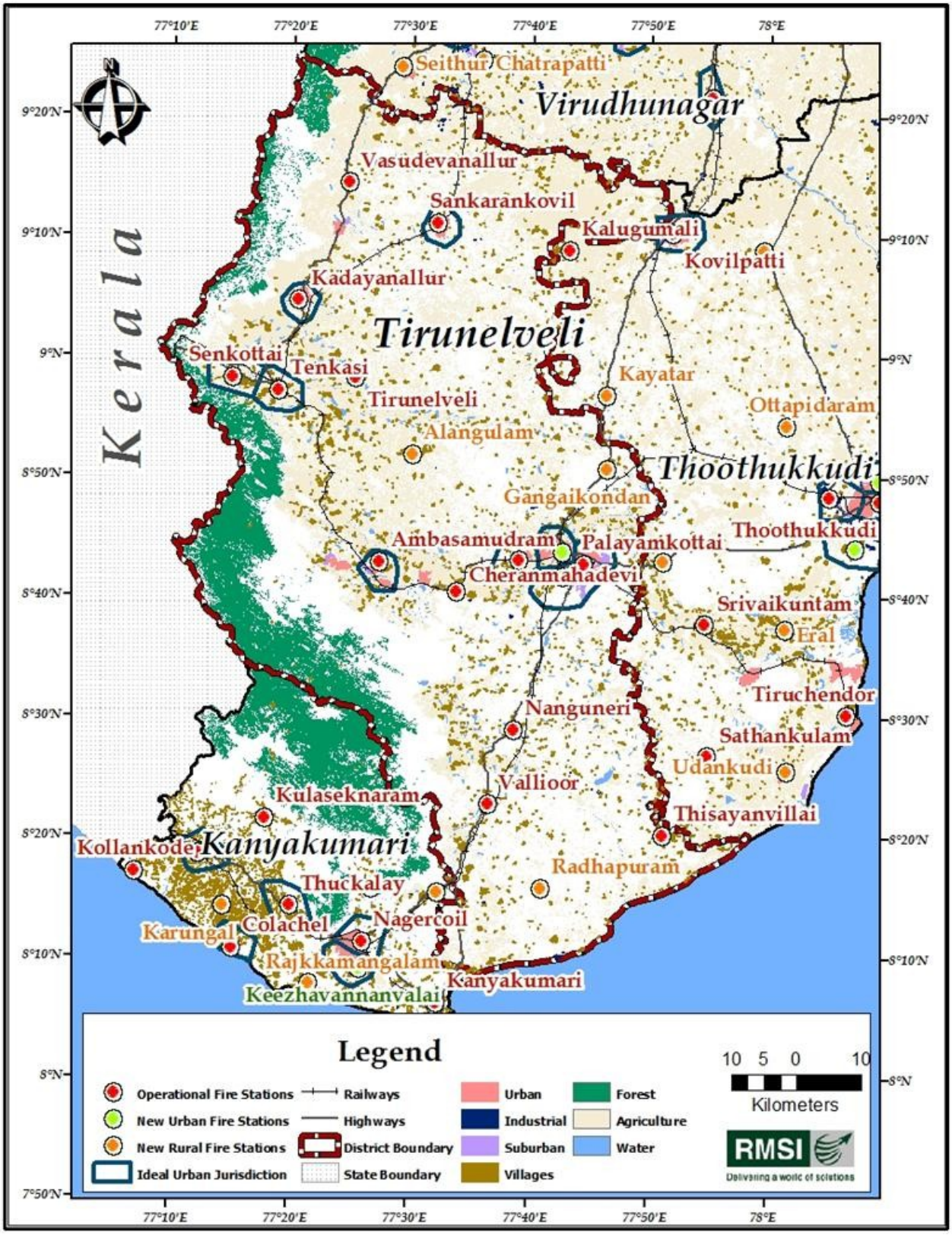

Figure 29-32: Fire stations gap analysis for Tirunelveli rural area

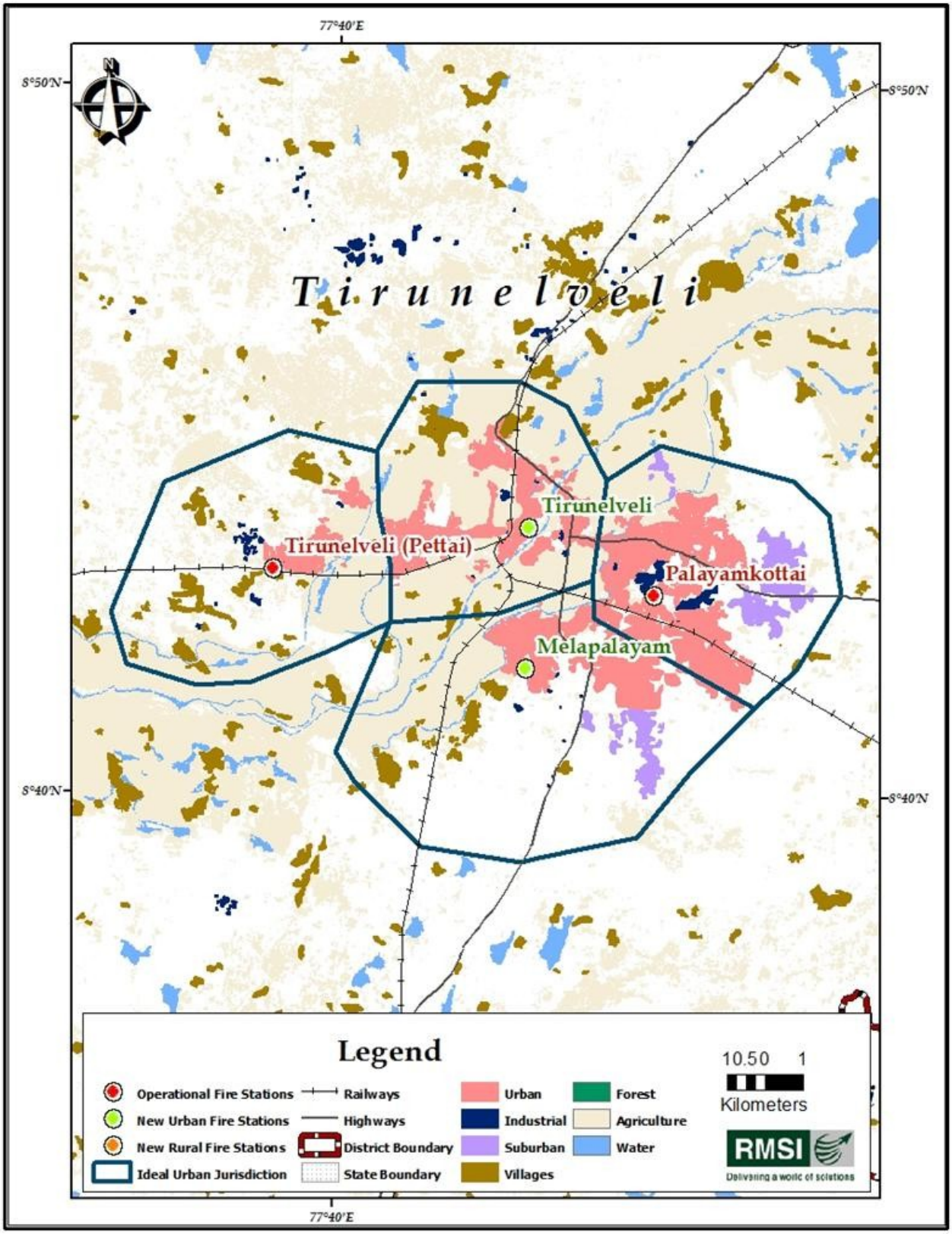

Figure 29-33: Fire stations gap analysis for Tirunelveli areas

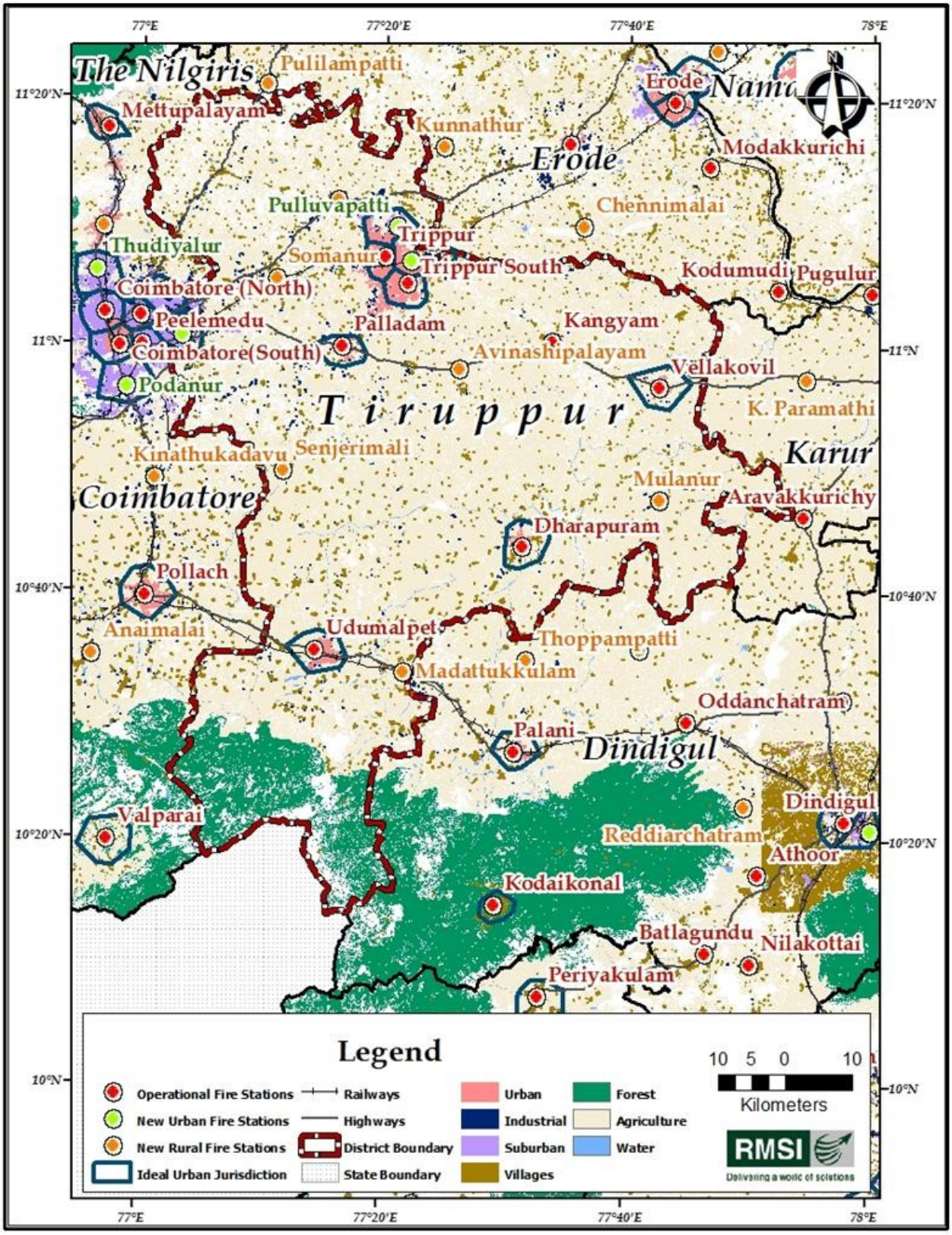

Figure 29-34: Fire stations gap analysis for Tiruppur rural areas

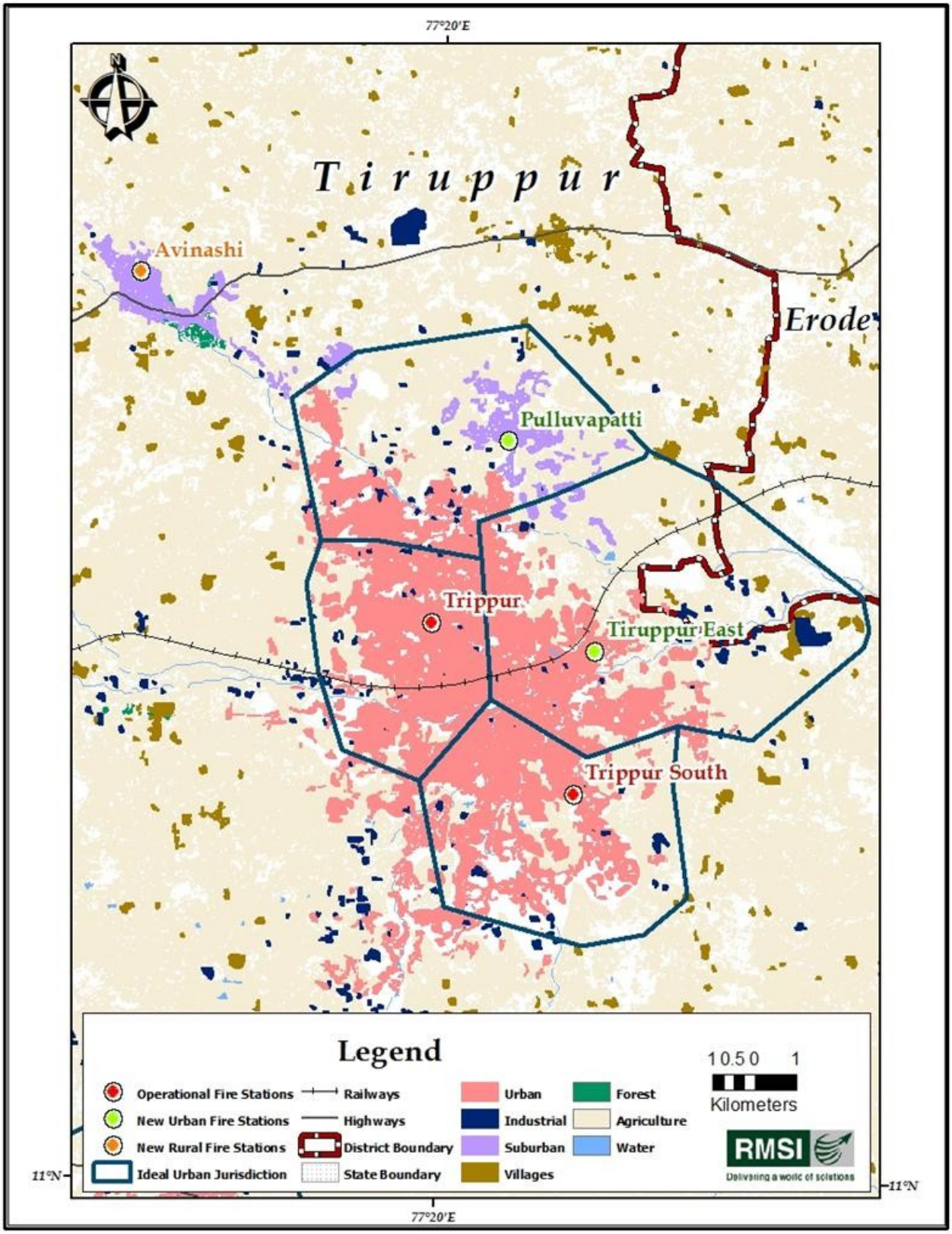

Figure 29-35: Fire stations gap analysis for Tiruppur urban areas

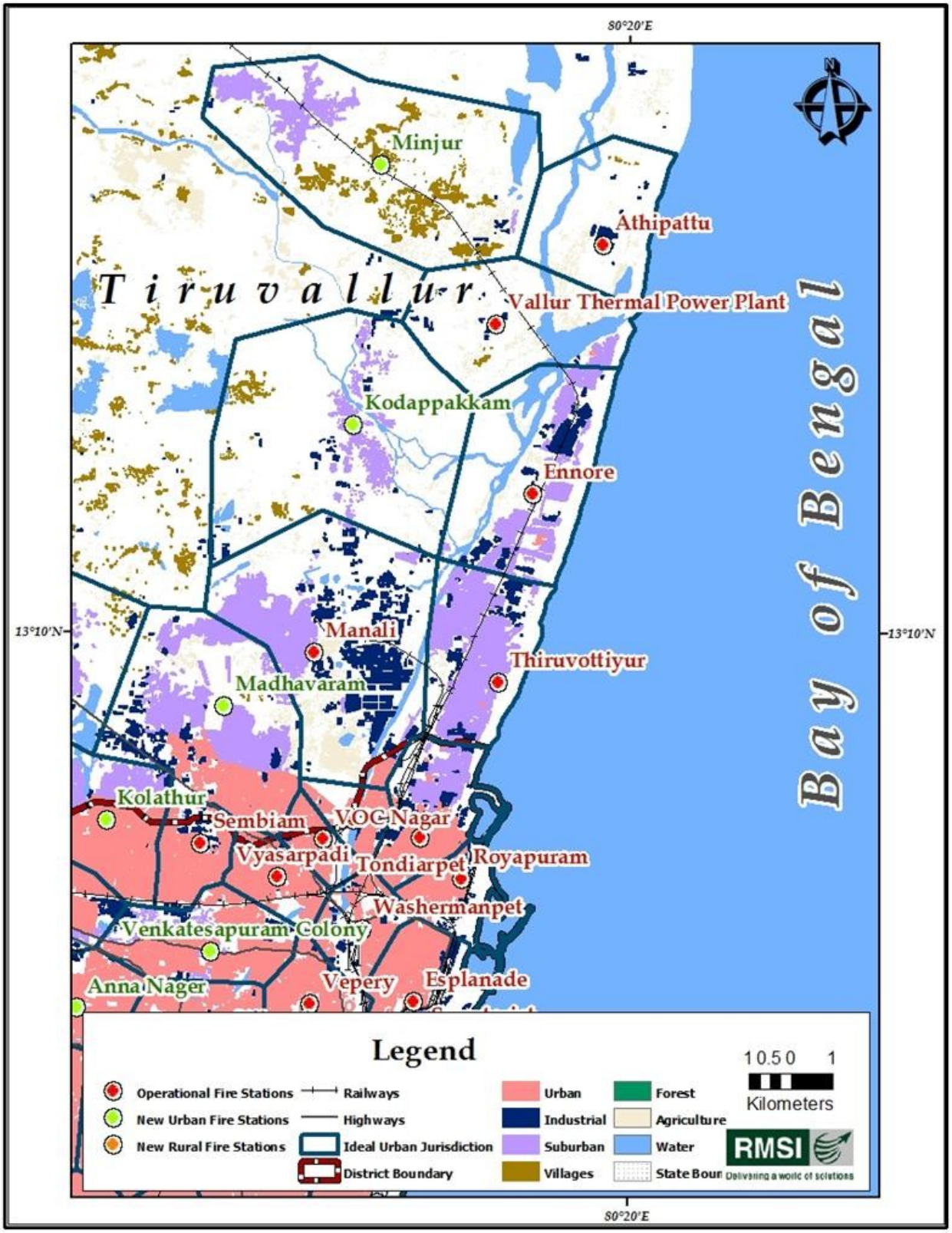

Figure 29-36: Fire stations gap analysis for Tiruvallur and nearby areas

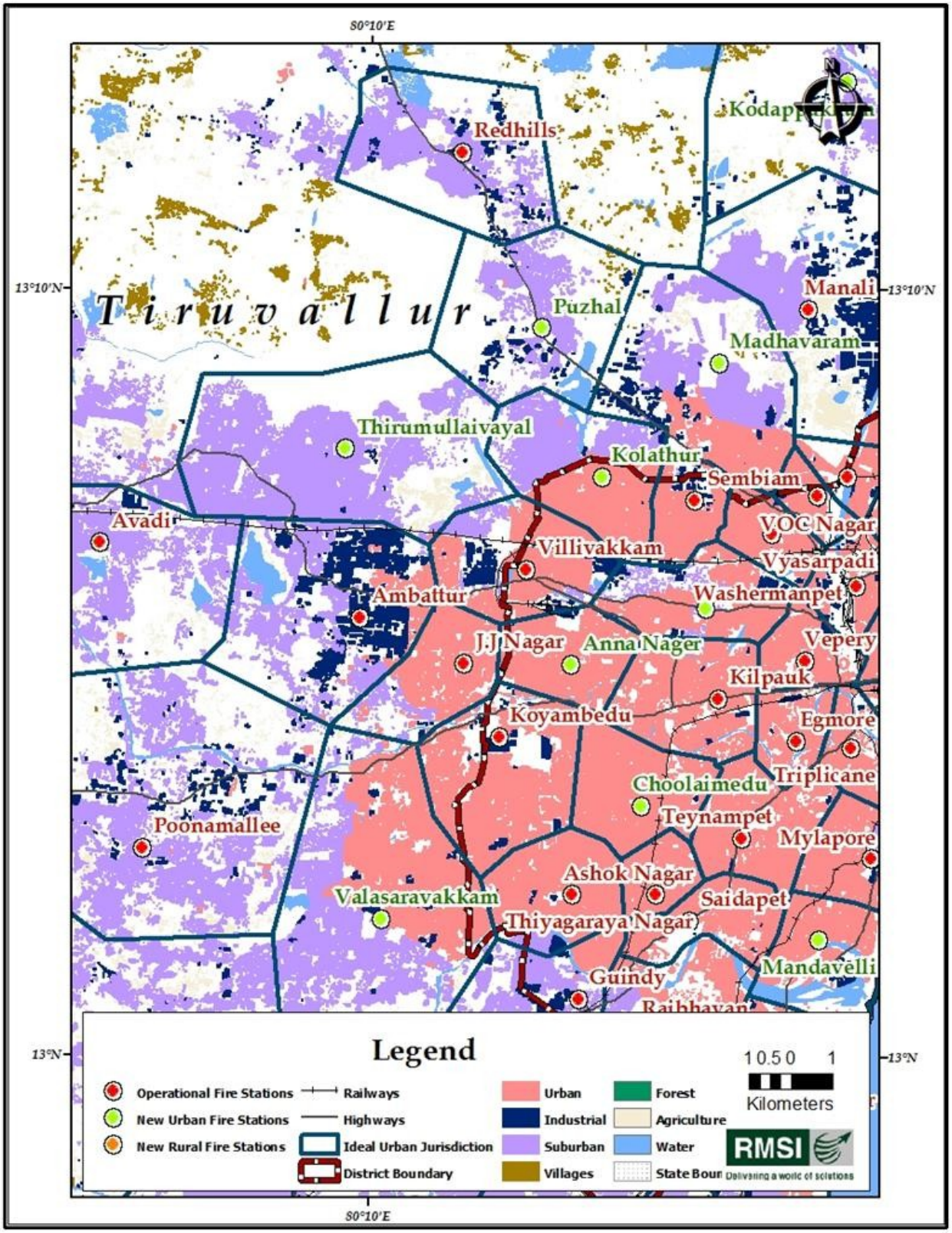

Figure 29-37: Fire stations gap analysis for Tiruvallur and surrounding areas

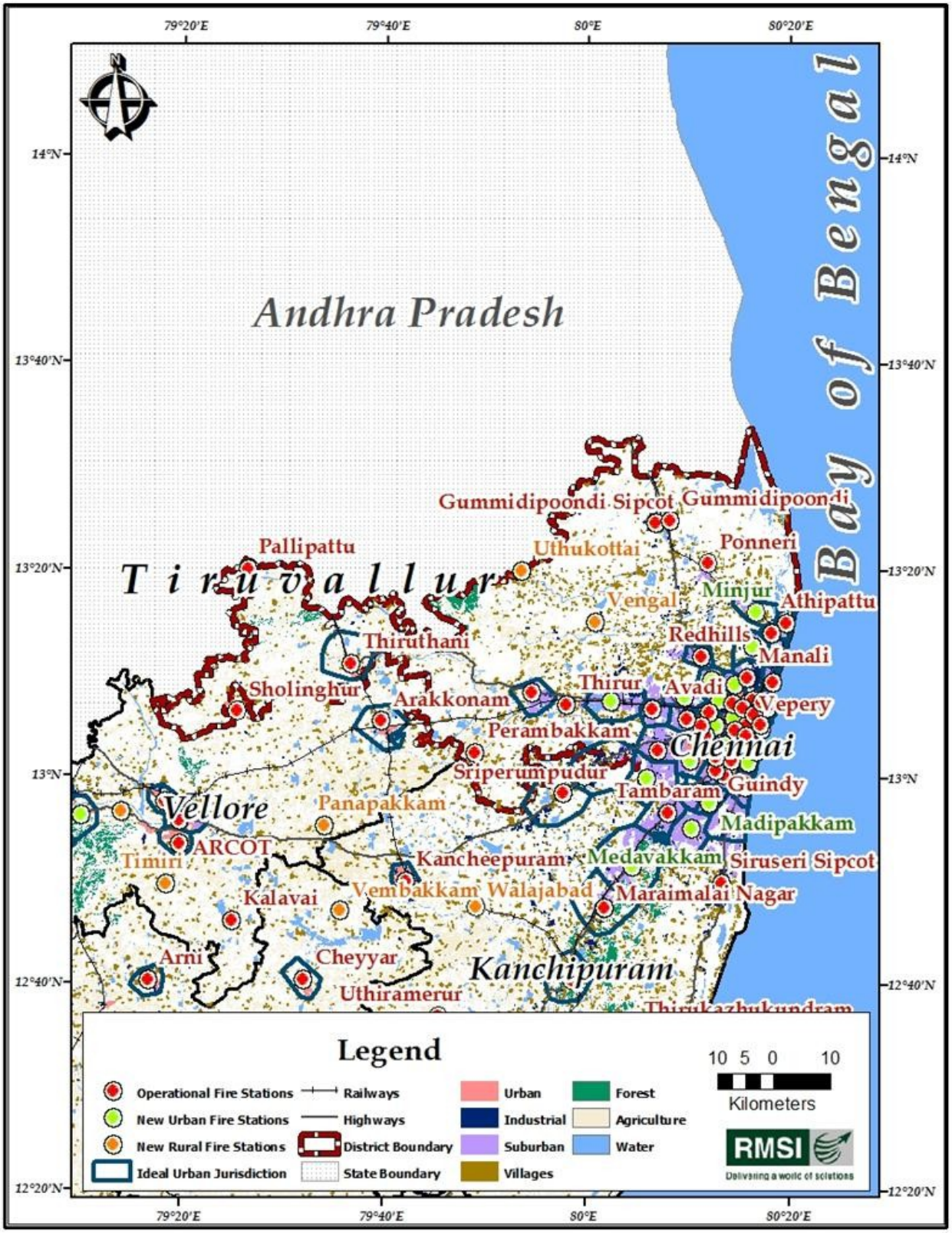

Figure 29-38: Fire stations gap analysis for Tiruvallur rural areas

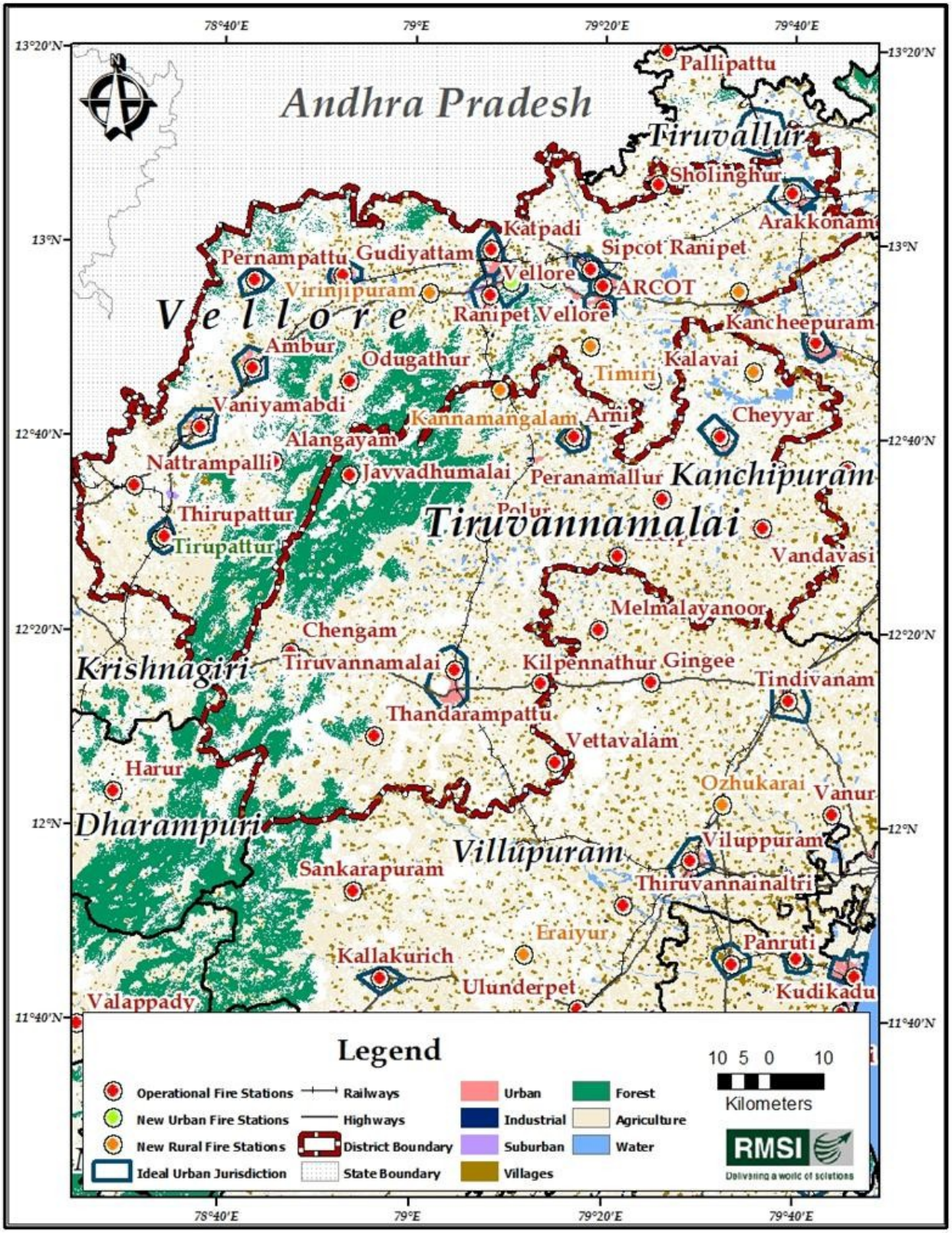

Figure 29-39: Fire stations gap analysis for Vellore and Tiruvannamalai areas

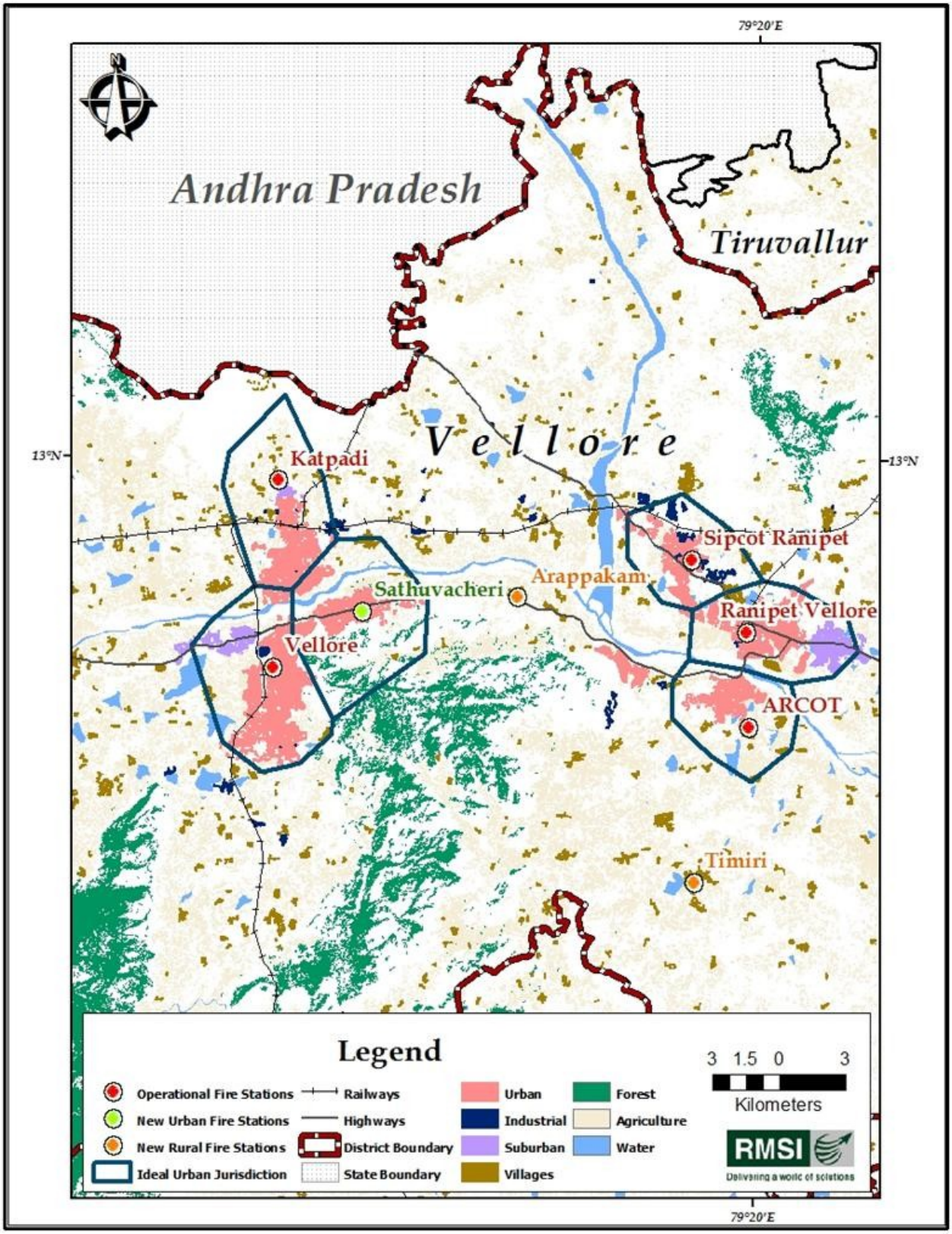

Figure 29-40: Fire stations gap analysis for Vellore areas

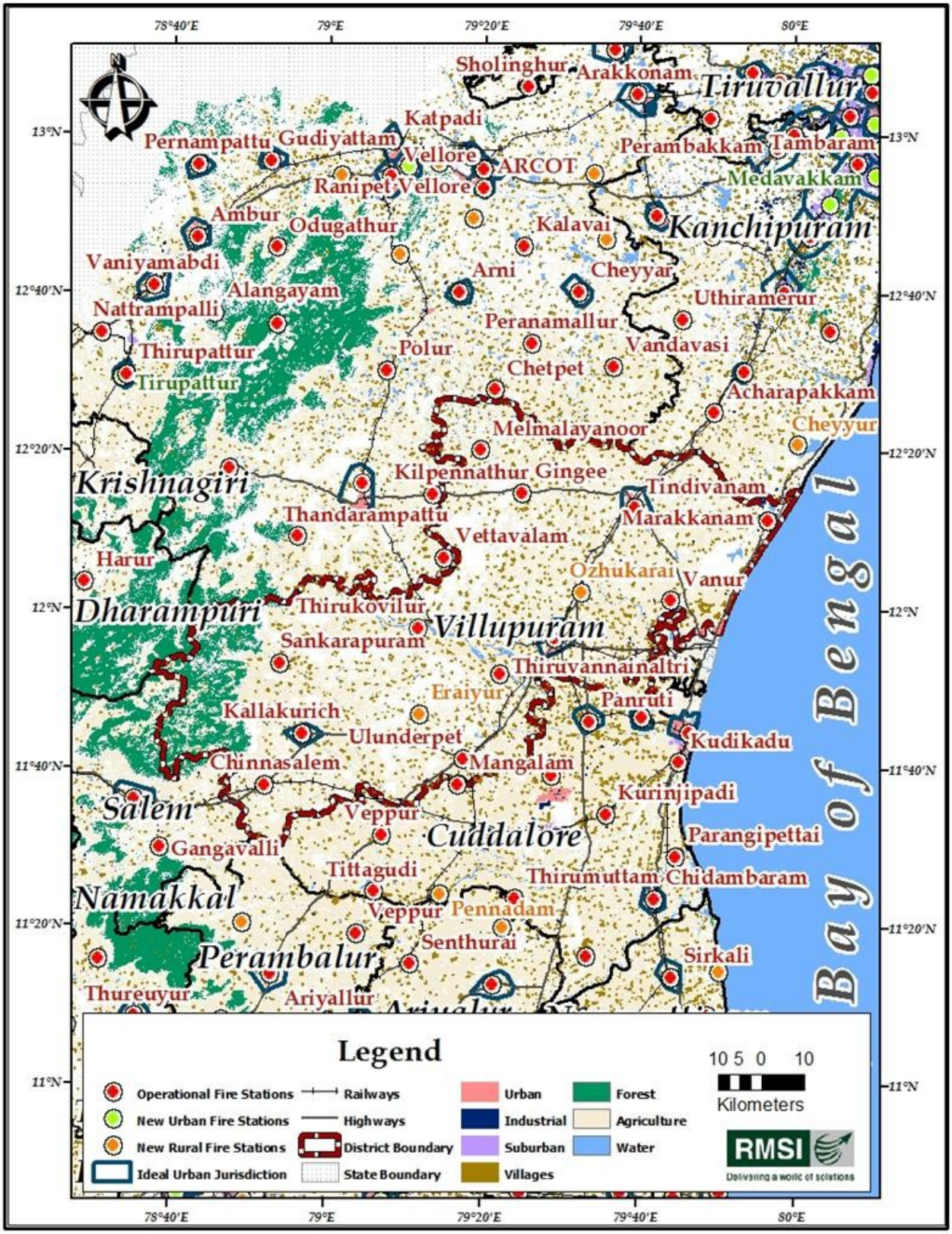

Figure 29-41: Fire stations gap analysis for Villupuram rural areas

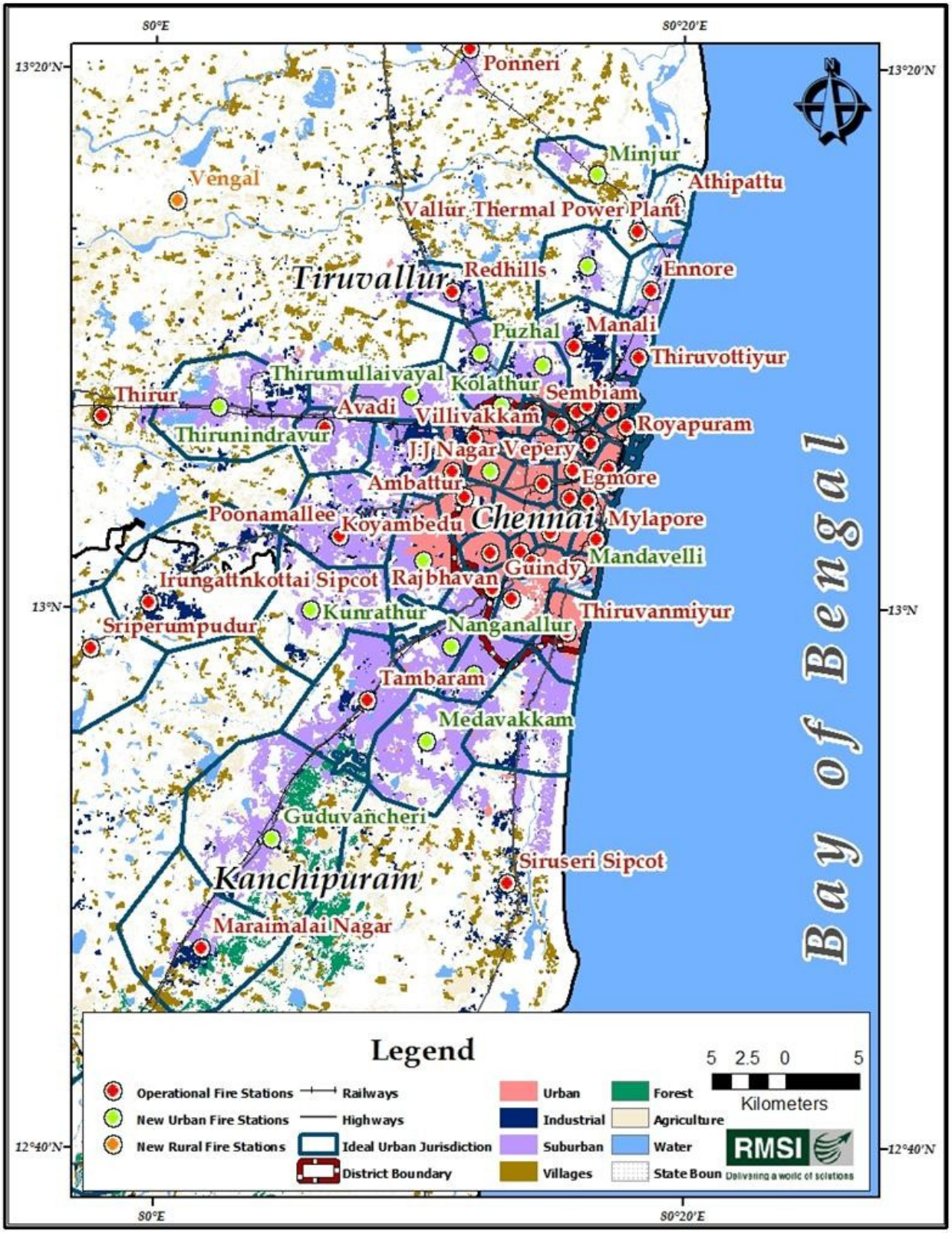

Figure 29-42: Fire stations gap analysis for Chennai and sorrouding areas

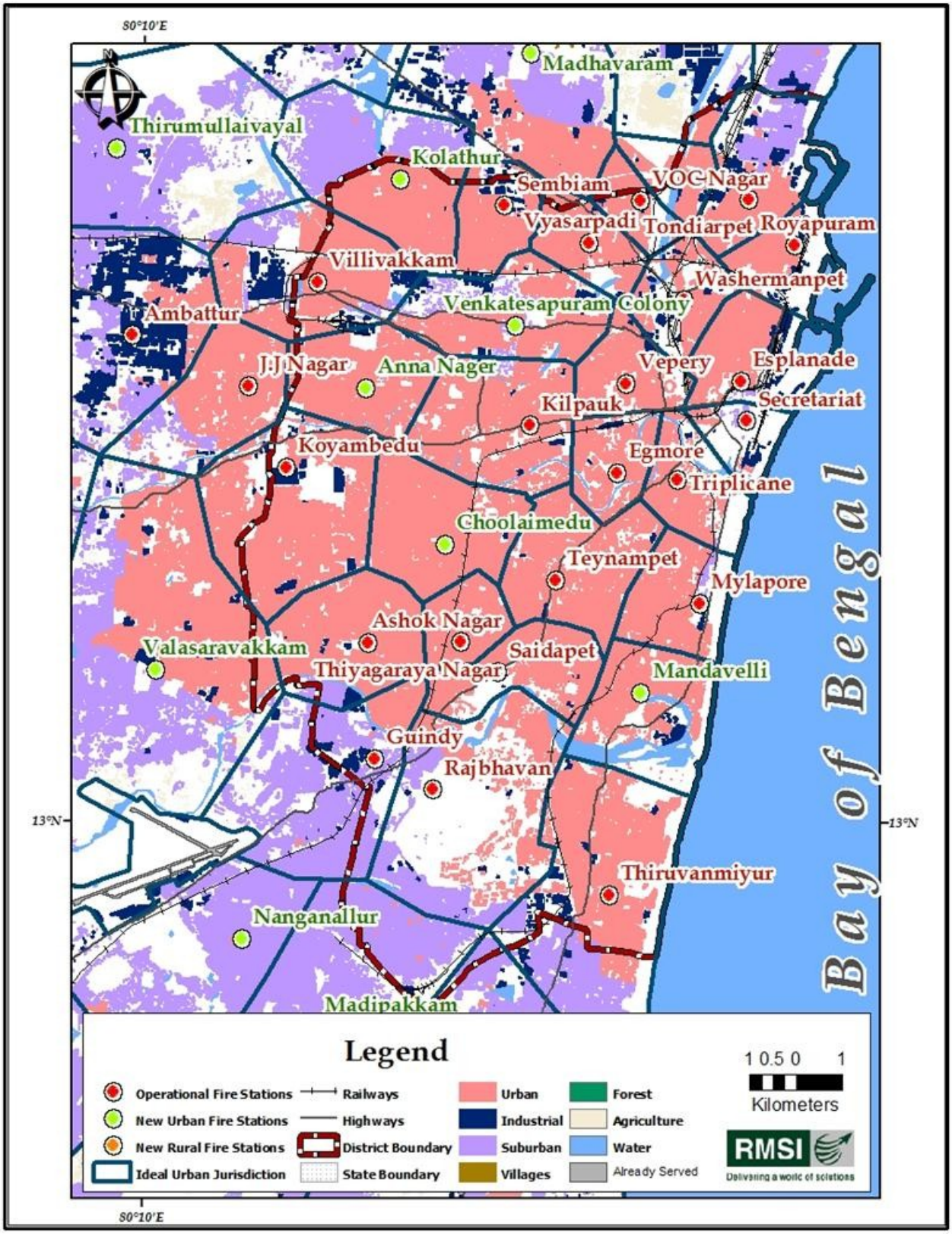

Figure 29-43: Fire stations gap analysis for Chennai urban areas

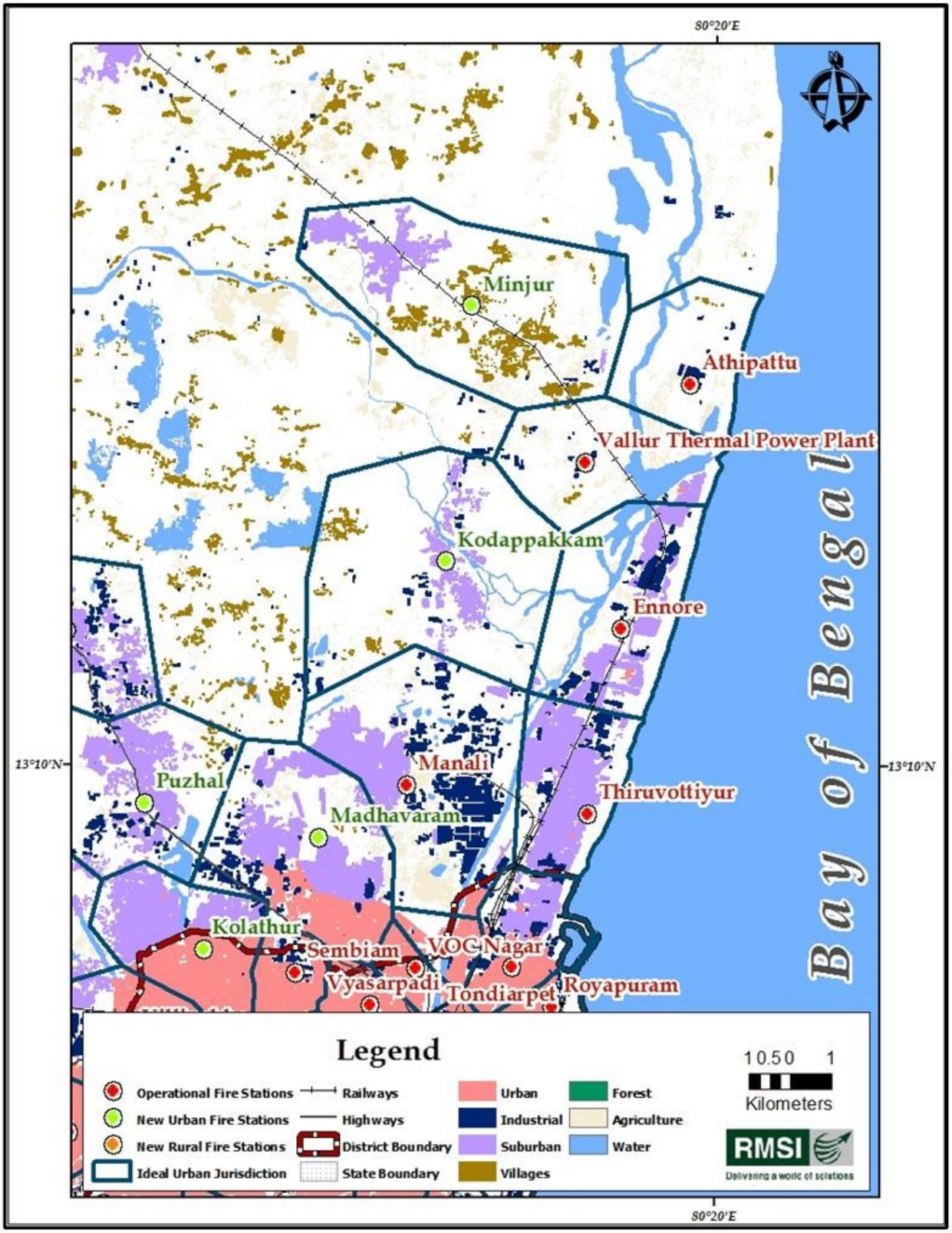

Figure 29-44: Fire stations gap analysis for Manali and Thiruvottiyur areas

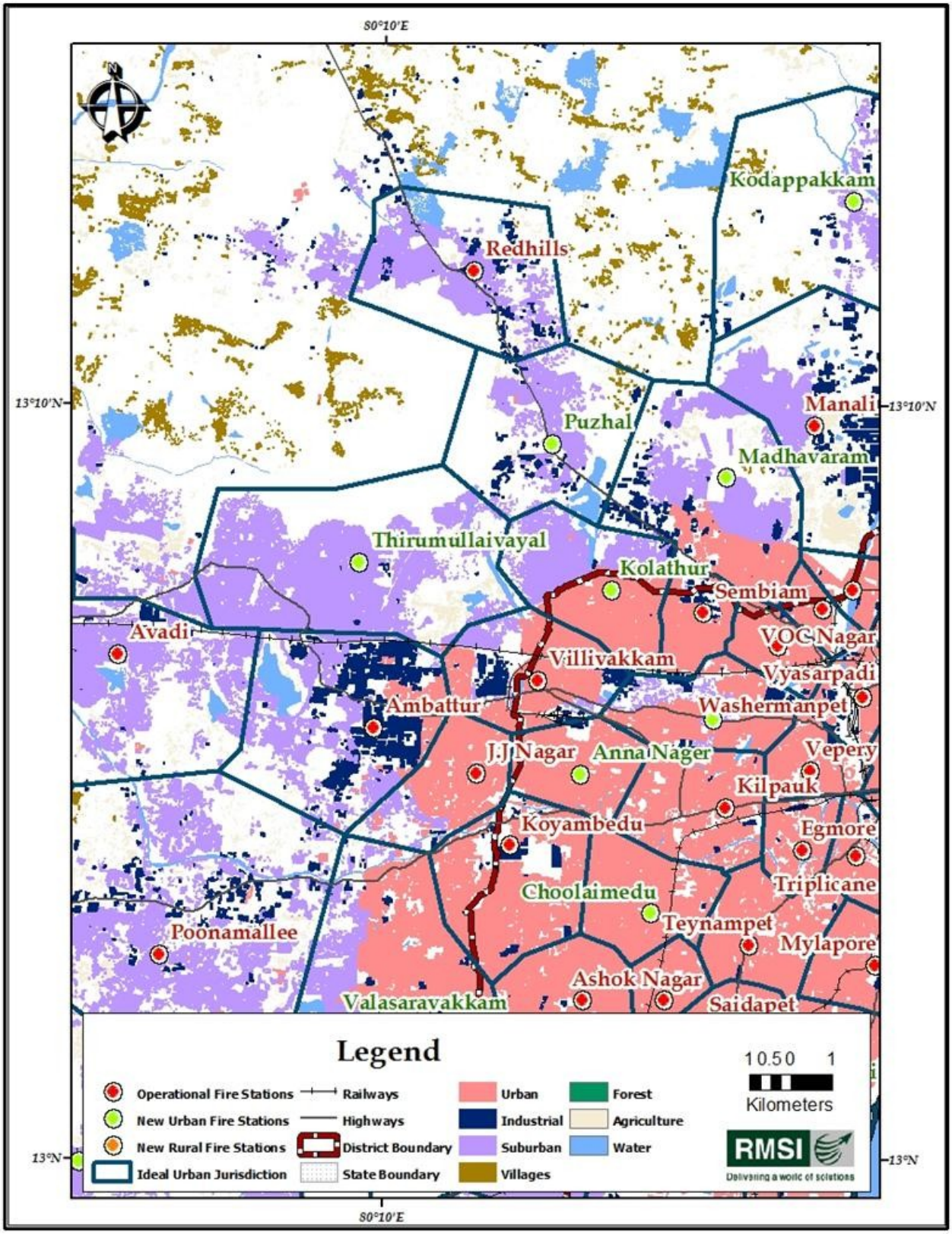

Figure 29-45: Fire stations gap analysis for Ambattur and Kilpaik areas

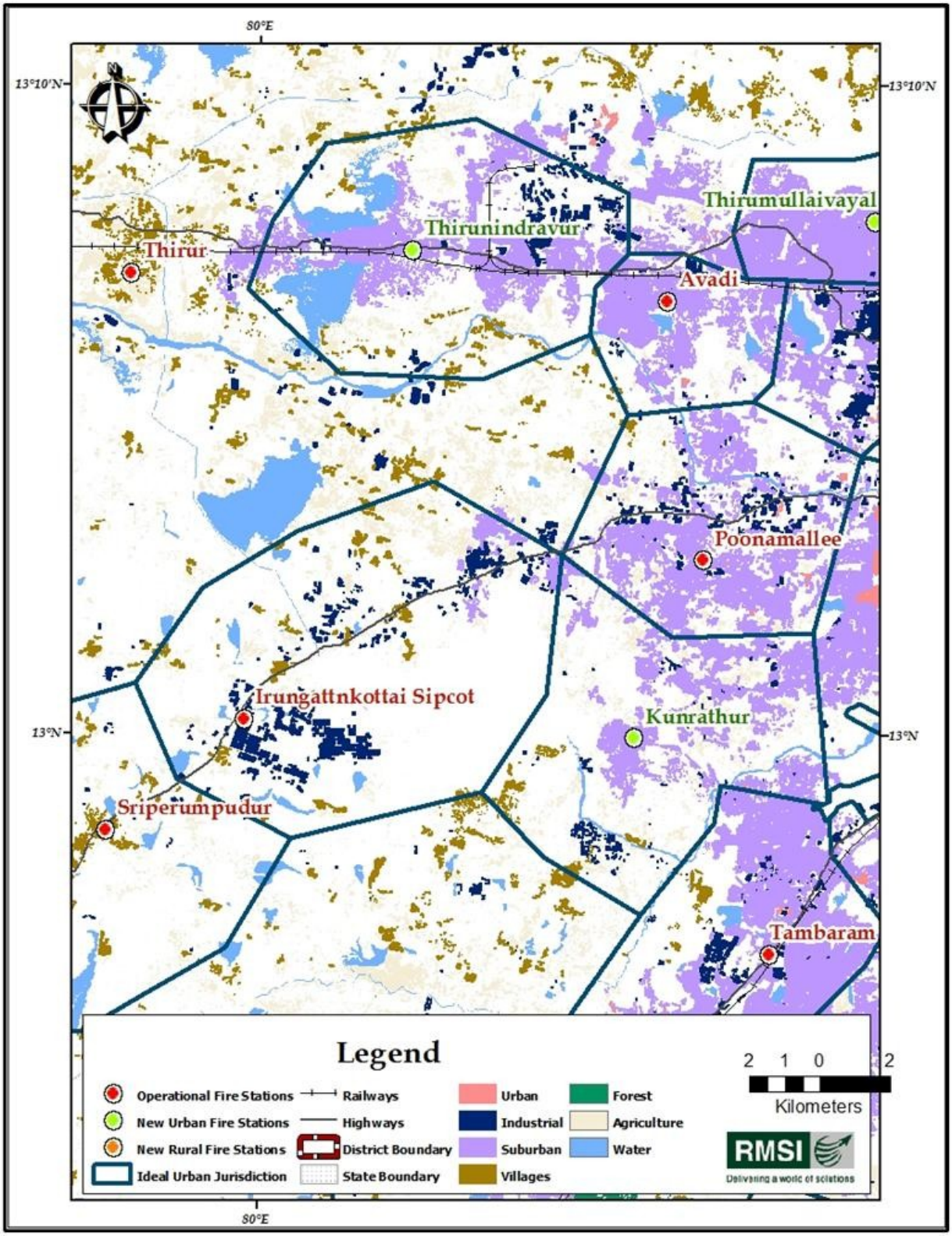

Figure 29-46: Fire stations gap analysis for Avadi and Sriperumpudur and nearby areas

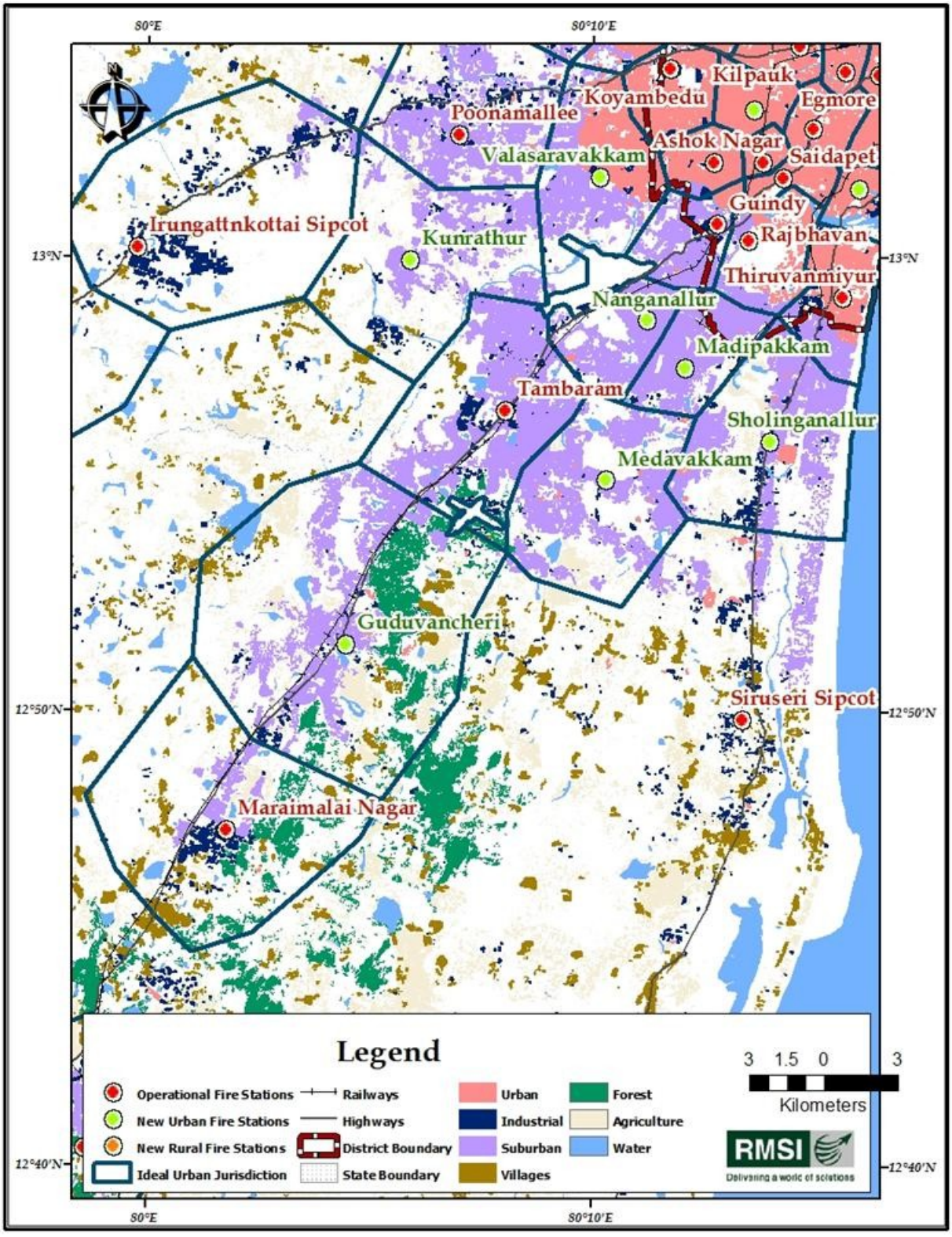

Figure 29-47: Fire stations gap analysis for Tambaram and Saidapet and nearby areas

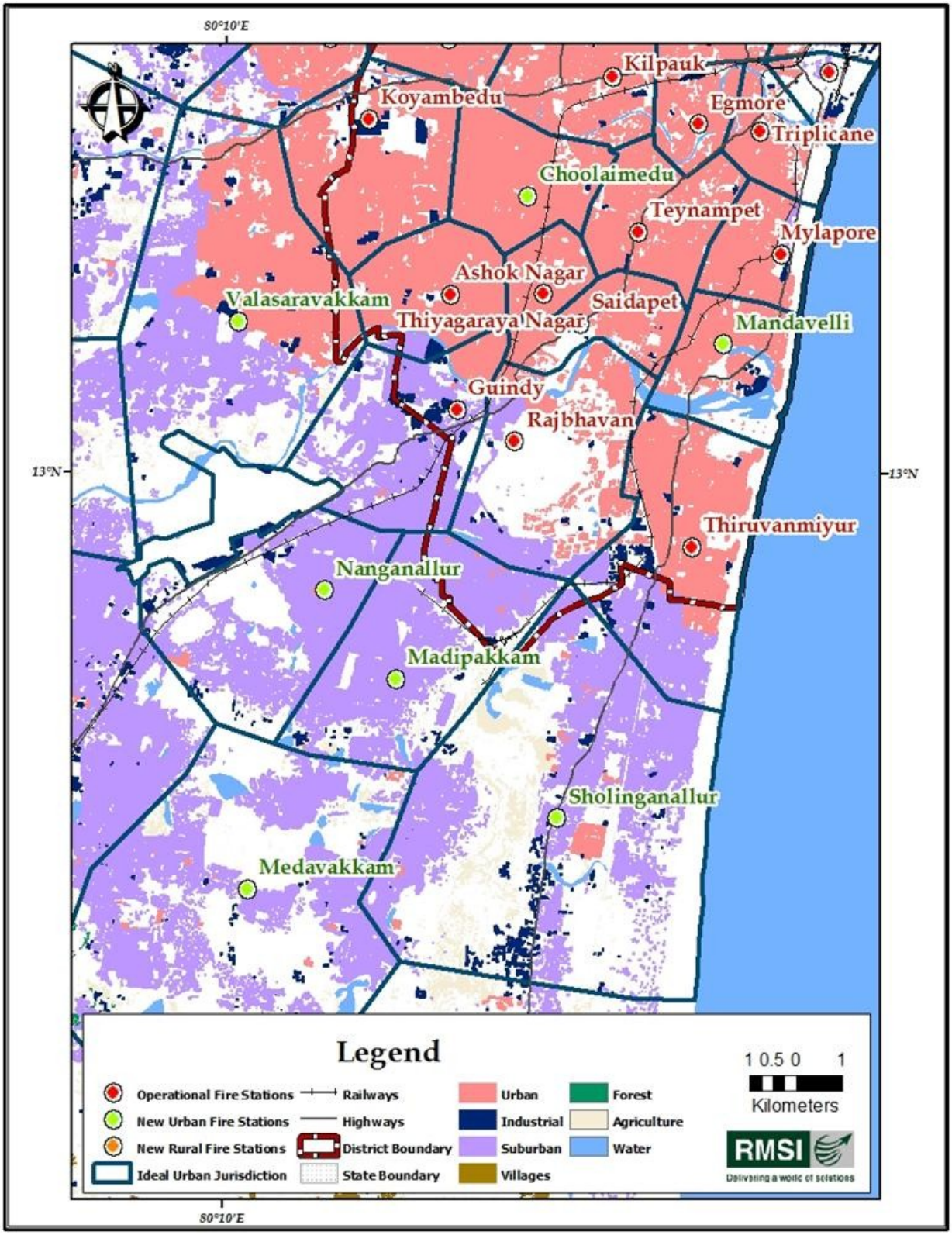

Figure 29-48: Fire stations gap analysis for Guindy and Tenyampet and nearby areas

29.3.2 FIRE FIGHTING AND RESCUE VEHICLES AND EQUIPMENT GAP

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

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

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

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

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

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

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

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

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

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

Specialized Equipment:

Specialized equipment for fire stations in urban areas shall be provided as per the following criteria:

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

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

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

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

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

Communication Equipment:

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

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

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

Detailed district level list of currently operational fire fighting vehicles available with Fire Service (As on July 2012), vehicle gap in operational Fire Stations for ideal Jurisdiction area, additional vehicle required for new urban and rural fire stations and total vehicle gap for existing and new Urban Fire stations are shown in Table 29-4 to 29-7. Similarly, gap analysis for specialized fire equipment is shown in Tables 29-8 to 29-15.

Table 29-4: List of operational fire fighting vehicles available with Tamil Nadu FRS (As on July, 2012)

District	Fire Stations	Ideally Served Population Estimates	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicles
Ariyalur	3	281,470	3	0	0	0	0	0	0	0	0	0	0	0	0	3
Chennai	23	3,789,054	35	14	1	4	5	0	0	0	0	0	0	3	0	62
Coimbatore	7	1,340,479	12	0	1	1	1	0	0	0	0	0	0	3	0	18
Cuddalore	15	2,629,847	19	0	0	1	0	0	0	0	0	0	0	1	0	21
Dharampuri	5	1,079,475	6	0	0	0	0	0	0	0	0	0	0	2	0	8
Dindigul	9	1,074,482	12	0	0	0	0	0	0	0	0	0	0	0	0	12
Erode	9	1,625,961	11	0	0	0	0	0	0	0	0	0	0	0	0	11
Kanchipuram	11	1,678,397	15	0	1	1	0	0	0	0	0	0	0	1	0	18
Kanyakumari	7	860,484	8	0	0	1	0	0	0	0	0	0	0	0	0	9
Karur	3	534,948	4	0	0	0	0	0	0	0	0	0	0	1	0	5
Krishnagiri	7	1,453,168	8	0	0	0	0	0	0	0	0	0	0	0	0	8
Madurai	10	1,693,274	13	0	1	1	0	0	0	0	0	0	0	1	1	17
Nagapattinam	11	1,414,839	13	0	0	1	0	0	0	0	0	0	0	2	0	16
Namakkal	4	600,581	6	0	0	0	0	0	0	0	0	0	0	1	0	7
Perambalur	2	192,052	2	0	0	0	0	0	0	0	0	0	0	1	0	3
Pudukkottai	12	1,666,958	15	0	0	0	0	0	0	0	0	0	0	1	0	16
Ramanathapuram	11	1,183,388	13	0	0	0	0	0	0	0	0	0	0	0	0	13
Salem	11	2,034,201	13	0	1	1	1	0	0	0	0	0	0	1	0	17
Sivaganga	6	796,694	7	0	0	0	0	0	0	0	0	0	0	0	0	7
Thanjavur	9	1,505,123	12	2	0	0	0	0	0	0	0	0	0	3	0	17

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	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicles
The Nilgiris	4	458,691	5	0	0	1	0	0	0	0	0	0	0	2	0	8
Theni	8	1,073,304	9	0	0	0	0	0	0	0	0	0	0	1	1	11
Thiruvarur	11	1,351,866	14	0	1	0	0	0	0	0	0	0	0	2	0	17
Thoothukkudi	9	1,169,378	11	0	1	0	0	0	0	0	0	0	0	2	0	14
Tiruchirappalli	10	1,446,402	13	0	0	1	0	0	0	0	0	0	0	1	0	15
Tirunelveli	13	2,002,382	15	0	0	0	0	0	0	0	0	0	0	0	0	15
Tiruppur	7	1,076,195	9	0	0	0	0	0	0	0	0	0	0	1	0	10
Tiruvallur	18	2,205,256	23	0	3	1	0	0	0	0	0	0	0	2	0	29
Tiruvannamalai	12	2,234,387	15	0	0	0	0	0	0	0	0	0	0	1	0	16
Vellore	16	2,783,341	19	0	0	1	0	0	0	0	0	0	0	4	0	24
Villupuram	12	2,758,803	16	1	0	1	0	0	0	0	0	0	0	2	0	20
Virudhunagar	8	1,091,290	13	0	0	1	0	0	0	0	0	0	0	3	0	17
Total	**303**	**47,086,170**	**389**	**17**	**10**	**17**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**42**	**2**	**484**

Table 29-5: 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	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicles
Ariyalur	3	281,470	0	1	2	1	0	1	1	0	1	1	0	0	0	8
Chennai	23	3,789,054	9	15	18	0	-1	1	4	0	21	21	0	0	2	90
Coimbatore	7	1,340,479	3	11	3	0	0	1	2	1	1	1	0	0	1	24
Cuddalore	15	2,629,847	5	16	14	0	0	1	2	1	10	10	0	1	1	60
Dharampuri	5	1,079,475	4	7	4	1	0	1	1	1	4	4	0	0	1	28
Dindigul	9	1,074,482	1	5	5	1	0	2	2	1	6	6	0	0	1	30
Erode	9	1,625,961	6	11	7	1	1	2	2	1	6	6	0	0	1	44
Kanchipuram	11	1,678,397	2	11	8	0	0	7	2	1	4	4	0	0	1	40
Kanyakumari	7	860,484	2	7	1	0	0	1	1	1	3	3	0	0	1	20
Karur	3	534,948	1	3	3	1	0	1	1	1	2	2	0	0	1	16
Krishnagiri	7	1,453,168	6	8	6	1	0	1	1	1	6	6	0	0	1	37
Madurai	10	1,693,274	6	11	6	0	1	4	1	1	6	6	0	0	0	42
Nagapattinam	11	1,414,839	3	9	3	0	0	1	1	1	7	7	0	0	1	33
Namakkal	4	600,581	1	4	3	1	0	1	1	1	1	1	0	0	1	15
Perambalur	2	192,052	0	0	1	1	0	1	1	1	1	1	0	0	1	8
Pudukkottai	12	1,666,958	3	5	10	1	0	1	1	1	9	9	0	0	1	41
Ramanathapuram	11	1,183,388	2	5	3	1	0	1	2	1	8	8	0	0	1	32
Salem	11	2,034,201	9	13	9	0	0	8	2	1	7	7	0	0	1	57
Sivaganga	6	796,694	1	3	6	1	0	1	1	1	3	3	0	0	1	21
Thanjavur	9	1,505,123	3	7	6	1	0	1	1	1	6	6	0	0	1	33

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	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicles
The Nilgiris	4	458,691	1	2	2	1	0	1	1	1	1	1	0	0	1	12
Theni	8	1,073,304	2	6	6	1	0	1	1	1	4	4	0	0	0	26
Thiruvarur	11	1,351,866	3	9	1	1	0	1	1	1	7	7	0	0	1	32
Thoothukkudi	9	1,169,378	3	5	2	1	1	1	2	1	6	6	0	0	1	29
Tiruchirappalli	10	1,446,402	4	7	5	0	1	1	2	1	8	8	0	0	1	38
Tirunelveli	13	2,002,382	7	11	9	1	1	1	3	1	7	7	0	0	1	49
Tiruppur	7	1,076,195	5	6	5	1	1	1	2	1	2	2	0	0	1	27
Tiruvallur	18	2,205,256	2	11	9	1	0	7	3	1	7	7	0	0	1	49
Tiruvannamalai	12	2,234,387	9	16	8	1	0	1	1	1	9	9	0	0	1	56
Vellore	16	2,783,341	10	14	10	0	1	2	3	1	7	7	0	0	1	56
Villupuram	12	2,758,803	11	20	9	1	0	1	1	1	9	9	0	0	1	63
Virudhunagar	8	1,091,290	-2	5	8	0	0	2	2	1	2	2	0	0	1	21
Total	**303**	**47,086,170**	**122**	**264**	**192**	**21**	**6**	**58**	**52**	**30**	**181**	**181**	**0**	**0**	**30**	**1,137**

Table 29-6: 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	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicles
Ariyalur	3	281,470	0	1	2	1	0	1	1	0	1	1	0	0	0	8
Chennai	28	4,956,164	20	26	23	0	-1	1	4	0	26	26	0	0	2	127
Coimbatore	11	2,080,253	11	17	7	0	0	1	2	1	1	1	0	0	1	42
Cuddalore	15	2,629,847	5	16	14	0	0	1	2	1	10	10	0	0	1	60
Dharampuri	5	1,079,475	4	7	4	1	0	1	1	1	4	4	0	0	1	28
Dindigul	10	1,215,454	2	6	6	1	0	2	2	1	6	6	0	0	1	33
Erode	10	1,731,872	7	12	8	1	1	2	2	1	6	6	0	0	1	47
Kanchipuram	17	3,225,634	17	25	14	0	0	7	2	1	6	6	0	0	1	79
Kanyakumari	8	1,095,639	5	9	2	0	0	1	1	1	3	3	0	0	1	26
Karur	3	534,948	1	3	3	1	0	1	1	1	2	2	0	0	1	16
Krishnagiri	8	1,584,181	7	9	7	1	0	1	1	1	6	6	0	0	1	40
Madurai	13	2,384,155	13	16	9	0	1	4	1	1	6	6	0	0	0	57
Nagapattinam	11	1,414,839	3	9	3	0	0	1	1	1	7	7	0	0	1	33
Namakkal	5	744,561	2	5	4	1	0	1	1	1	1	1	0	0	1	18
Perambalur	2	192,052	0	0	1	1	0	1	1	1	1	1	0	0	1	8
Pudukkottai	12	1,666,958	3	5	10	1	0	1	1	1	9	9	0	0	1	41
Ramanathapuram	11	1,183,388	2	5	3	1	0	1	2	1	8	8	0	0	1	32
Salem	14	2,465,753	13	16	12	0	0	8	3	1	7	7	0	0	1	68
Sivaganga	6	796,694	1	3	6	1	0	1	1	1	3	3	0	0	1	21
Thanjavur	10	1,718,876	5	9	7	1	0	1	1	1	6	6	0	0	1	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	QRT	Motor Cycle Mists	Fire Boats	Ambulances	Education Vans	Total Vehicles
The Nilgiris	4	458,691	1	2	2	1	0	1	1	1	1	1	0	0	1	12
Theni	8	1,073,304	2	6	6	1	0	1	1	1	4	4	0	0	0	26
Thiruvarur	11	1,351,866	3	9	1	1	0	1	1	1	7	7	0	0	1	32
Thoothukkudi	11	1,269,574	5	5	3	1	1	1	2	1	6	6	0	0	1	32
Tiruchirappalli	12	1,893,516	9	10	7	0	1	1	2	1	8	8	0	0	1	48
Tirunelveli	15	2,240,135	9	13	11	1	1	1	3	1	7	7	0	0	1	55
Tiruppur	9	1,351,824	8	8	7	1	1	2	2	1	2	2	0	0	1	35
Tiruvallur	25	3,292,644	15	19	14	1	0	8	3	1	7	7	0	0	1	76
Tiruvannamalai	12	2,234,387	9	16	8	1	0	1	1	1	9	9	0	0	1	56
Vellore	18	3,310,515	16	18	11	0	1	2	3	1	8	8	0	0	1	69
Villupuram	12	2,758,803	11	20	9	1	0	1	1	1	9	9	0	0	1	63
Virudhunagar	10	1,180,596	0	5	8	0	0	2	2	1	2	2	0	0	1	23
Total	**349**	**55,398,068**	**209**	**330**	**232**	**21**	**6**	**60**	**53**	**30**	**189**	**189**	**0**	**0**	**30**	**1,349**

Table 29-7: 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	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Total Vehicles
Ariyalur	3	326,991	4	1	0	0	0	0	3	3	11
Chennai	0	0	0	0	0	0	0	0	0	0	0
Coimbatore	4	1,409,592	13	10	4	0	0	0	4	4	35
Cuddalore	1	120,832	1	0	1	0	0	0	1	1	4
Dharampuri	3	503,727	5	1	3	0	0	0	3	3	15
Dindigul	6	985,919	10	4	4	0	0	0	6	6	30
Erode	5	922,022	9	4	4	0	0	0	5	5	27
Kanchipuram	3	544,091	6	2	2	0	0	0	3	3	16
Kanyakumari	4	851,724	9	6	0	0	0	0	4	4	23
Karur	6	676,087	7	2	2	0	0	0	6	6	23
Krishnagiri	1	374,715	4	3	1	0	0	0	1	1	10
Madurai	1	183,654	2	0	1	0	0	0	1	1	5
Nagapattinam	3	269,957	3	1	0	0	0	0	3	3	10
Namakkal	5	743,281	6	1	5	5	0	0	5	5	27
Perambalur	3	404,287	4	1	2	0	0	0	3	3	13
Pudukkottai	1	112,324	1	0	1	0	0	0	1	1	4
Ramanathapuram	4	207,048	4	0	0	0	0	0	4	4	12
Salem	3	707,139	6	6	3	1	0	0	3	3	22
Sivaganga	5	891,587	8	3	4	1	0	0	5	5	26
Thanjavur	2	286,360	3	0	2	0	0	0	2	2	9

District	Fire Stations	Ideally Served Population Estimates	Water Tenders	Water Bowsers	Foam Tenders	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Total Vehicles
The Nilgiris	3	288,000	4	0	1	0	0	0	3	3	11
Theni	1	247,260	2	2	1	0	0	0	1	1	7
Thiruvarur	1	124,531	1	0	1	0	0	0	1	1	4
Thoothukkudi	6	772,908	7	2	3	0	0	0	6	6	24
Tiruchirappalli	6	795,615	8	4	2	1	0	0	6	6	27
Tirunelveli	3	467,888	5	2	2	0	0	0	3	3	15
Tiruppur	6	999,130	9	4	6	4	0	0	6	6	35
Tiruvallur	2	366,751	3	2	2	1	0	0	2	2	12
Tiruvannamalai	2	360,144	4	1	2	0	0	0	2	2	11
Vellore	4	670,142	7	2	3	0	0	0	4	4	20
Villupuram	2	557,552	6	4	2	0	0	0	2	2	16
Virudhunagar	3	569,632	5	2	3	1	0	0	3	3	17
Total	**102**	**16,740,890**	**166**	**70**	**67**	**14**	**0**	**0**	**102**	**102**	**521**

Table 29-8: List of specialized equipment available with Tamil Nadu Fire & Rescue Services (As on July, 2012)

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters/ Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Ariyalur	3	281,470	0	0	5	0	4	0	1	0	0	0	0	0	2	1
Chennai	23	3,789,054	0	1	138	0	31	1	5	3	0	90	1	0	1	0
Coimbatore	7	1,340,479	0	0	25	0	17	0	2	12	0	4	0	1	1	1
Cuddalore	15	2,629,847	1	0	23	0	16	0	3	9	0	10	1	0	14	2
Dharampuri	5	1,079,475	0	0	12	0	5	0	0	1	0	0	0	0	3	0
Dindigul	9	1,074,482	1	0	17	0	13	0	0	1	0	1	0	0	3	0
Erode	9	1,625,961	0	0	11	0	8	0	0	2	0	3	0	0	3	0
Kanchipuram	11	1,678,397	0	0	42	0	12	0	5	4	0	19	0	0	5	1
Kanyakumari	7	860,484	1	0	12	0	8	0	2	3	0	3	0	0	1	0
Karur	3	534,948	0	0	12	0	4	0	1	0	0	1	0	0	2	0
Krishnagiri	7	1,453,168	0	0	13	0	9	0	0	1	0	1	0	0	6	0
Madurai	10	1,693,274	1	0	18	0	16	0	2	3	0	4	1	1	5	2
Nagapattinam	11	1,414,839	0	0	13	0	8	0	2	8	0	3	0	0	1	0
Namakkal	4	600,581	0	0	5	0	4	0	0	0	0	1	0	0	4	0
Perambalur	2	192,052	1	0	6	0	2	0	0	0	0	2	0	0	1	2
Pudukkottai	12	1,666,958	0	0	18	0	10	0	1	2	0	0	0	0	7	2
Ramanathapuram	11	1,183,388	2	0	23	3	8	0	0	3	0	5	0	0	2	0
Salem	11	2,034,201	1	0	26	0	15	1	7	2	0	10	1	0	6	2
Sivaganga	6	796,694	0	0	10	0	6	0	0	4	0	4	0	0	2	0
Thanjavur	9	1,505,123	0	0	14	0	6	0	0	1	0	2	0	0	4	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
The Nilgiris	4	458,691	1	0	20	0	7	0	3	17	0	6	0	0	2	0
Theni	8	1,073,304	0	0	16	0	7	0	0	1	0	3	0	0	8	0
Thiruvarur	11	1,351,866	0	0	10	0	11	0	0	3	0	3	0	0	3	0
Thoothukkudi	9	1,169,378	1	0	20	0	13	0	0	1	1	3	0	0	3	1
Tiruchirappalli	10	1,446,402	2	1	21	3	10	0	3	1	1	4	1	2	2	0
Tirunelveli	13	2,002,382	3	0	31	0	23	1	1	3	0	2	0	1	2	0
Tiruppur	7	1,076,195	0	1	13	0	10	0	0	0	0	2	0	0	5	0
Tiruvallur	18	2,205,256	0	0	65	0	9	0	4	5	0	35	0	0	4	0
Tiruvannamalai	12	2,234,387	0	0	12	0	11	0	0	0	0	2	0	0	7	0
Vellore	16	2,783,341	0	0	20	0	16	0	2	3	0	6	0	0	4	0
Villupuram	12	2,758,803	0	0	22	0	15	0	2	3	0	13	0	0	2	0
Virudhunagar	8	1,091,290	1	1	23	0	17	0	1	2	1	20	1	0	9	0
Total	**303**	**47,086,170**	**16**	**4**	**716**	**6**	**351**	**3**	**47**	**98**	**3**	**262**	**6**	**5**	**124**	**14**

Table 29-9: List of specialized equipment available with Tamil Nadu Fire & Rescue Service (As on July, 2012) (continued..)

District	Fire Stations	Ideally Served Population Estimates	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	Total
Ariyalur	3	281,470	0	1	0	0	0	0	0	0	0	14
Chennai	23	3,789,054	0	0	10	1	5	4	18	24	61	394
Coimbatore	7	1,340,479	0	1	2	2	0	2	0	2	0	72
Cuddalore	15	2,629,847	0	2	3	2	0	6	1	0	0	93
Dharampuri	5	1,079,475	0	0	1	0	0	1	0	0	0	23
Dindigul	9	1,074,482	0	1	2	1	0	1	0	0	0	41
Erode	9	1,625,961	0	1	0	0	2	0	1	0	0	31
Kanchipuram	11	1,678,397	0	1	3	4	0	0	6	9	25	136
Kanyakumari	7	860,484	0	1	1	1	0	2	0	0	0	35
Karur	3	534,948	0	1	1	0	0	0	0	0	0	22
Krishnagiri	7	1,453,168	0	1	1	0	0	1	0	0	0	33
Madurai	10	1,693,274	0	2	1	1	1	2	0	0	0	60
Nagapattinam	11	1,414,839	0	2	3	1	0	4	0	0	0	45
Namakkal	4	600,581	0	1	0	0	0	1	0	0	0	16
Perambalur	2	192,052	0	1	0	1	0	1	0	0	0	17
Pudukkottai	12	1,666,958	0	0	0	0	0	0	0	0	0	40
Ramanathapuram	11	1,183,388	0	1	1	0	0	1	0	0	0	49
Salem	11	2,034,201	0	3	1	1	0	3	0	0	0	79
Sivaganga	6	796,694	0	1	1	0	0	0	0	0	0	28
Thanjavur	9	1,505,123	0	1	1	0	0	2	0	0	0	31
The Nilgiris	4	458,691	0	2	0	0	5	0	0	2	0	65
Theni	8	1,073,304	0	1	1	0	0	1	0	0	0	38
Thiruvarur	11	1,351,866	0	0	0	0	0	1	0	0	0	31

District	Fire Stations	Ideally Served Population Estimates	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	Total
Thoothukkudi	9	1,169,378	0	1	1	0	0	1	0	0	0	46
Tiruchirappalli	10	1,446,402	0	3	1	4	0	3	0	0	0	62
Tirunelveli	13	2,002,382	0	1	1	3	0	2	0	0	0	74
Tiruppur	7	1,076,195	0	1	0	0	1	0	0	0	0	33
Tiruvallur	18	2,205,256	1	2	4	2	0	2	13	14	36	196
Tiruvannamalai	12	2,234,387	0	1	2	0	0	0	0	0	0	35
Vellore	16	2,783,341	0	1	3	0	0	0	1	0	0	56
Villupuram	12	2,758,803	0	1	2	6	0	2	1	1	0	70
Virudhunagar	8	1,091,290	0	1	2	3	0	2	0	0	0	84
Total	**303**	**47,086,170**	**1**	**37**	**49**	**33**	**14**	**45**	**41**	**52**	**122**	**2,049**

Table 29-10: 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
Ariyalur	3	281,470	1	5	26	4	5	1	1	4	4	9	6	1	5	0
Chennai	23	3,789,054	22	135	354	28	105	0	23	25	28	46	136	1	112	0
Coimbatore	7	1,340,479	6	37	121	8	22	1	6	-4	8	35	38	0	30	0
Cuddalore	15	2,629,847	3	18	260	18	62	1	3	9	18	68	18	1	50	0
Dharampuri	5	1,079,475	1	10	98	6	25	1	1	5	6	30	11	1	22	0
Dindigul	9	1,074,482	0	8	108	11	23	1	4	10	11	35	10	1	26	0
Erode	9	1,625,961	4	28	171	11	42	1	5	9	11	47	29	1	38	0
Kanchipuram	11	1,678,397	4	25	145	13	39	1	3	9	13	32	31	1	36	0
Kanyakumari	7	860,484	0	10	82	8	18	1	3	5	8	23	11	1	20	0
Karur	3	534,948	1	7	46	4	12	1	0	4	4	15	7	1	11	0
Krishnagiri	7	1,453,168	1	11	136	8	32	1	2	7	8	40	12	1	28	0
Madurai	10	1,693,274	3	28	174	12	37	1	5	9	12	49	29	0	38	0
Nagapattinam	11	1,414,839	2	13	138	13	35	1	3	5	13	40	14	1	34	0
Namakkal	4	600,581	2	14	65	5	15	1	4	5	5	18	14	1	11	0
Perambalur	2	192,052	0	1	11	2	4	1	1	2	2	4	2	1	3	0
Pudukkottai	12	1,666,958	1	8	162	14	41	1	3	12	14	51	10	1	35	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
Ramanathapuram	11	1,183,388	-1	11	107	10	30	1	4	10	13	33	12	1	29	0
Salem	11	2,034,201	4	22	207	13	48	0	-1	11	13	53	24	1	46	0
Sivaganga	6	796,694	2	10	79	7	18	1	4	3	7	20	11	1	18	0
Thanjavur	9	1,505,123	2	10	144	11	37	1	4	10	11	41	11	1	32	0
The Nilgiris	4	458,691	0	11	30	5	7	1	1	-12	5	8	12	1	9	0
Theni	8	1,073,304	1	14	104	10	25	1	5	9	10	29	16	1	19	0
Thiruvarur	11	1,351,866	1	11	141	13	32	1	5	10	13	40	12	1	32	0
Thoothukkudi	9	1,169,378	0	13	100	11	22	1	5	10	10	32	14	1	25	0
Tiruchirappalli	10	1,446,402	0	16	137	9	35	1	1	11	11	41	17	-1	35	0
Tirunelveli	13	2,002,382	-2	22	187	16	37	0	7	13	16	58	23	0	47	0
Tiruppur	7	1,076,195	4	29	112	8	23	1	7	8	8	31	31	1	22	0
Tiruvallur	18	2,205,256	4	35	182	22	60	1	10	17	22	34	40	1	51	0
Tiruvannamalai	12	2,234,387	2	13	240	14	57	1	4	14	14	66	14	1	50	0
Vellore	16	2,783,341	6	53	251	19	59	1	11	16	19	69	55	1	56	0
Villupuram	12	2,758,803	2	14	273	14	65	1	2	11	14	67	14	1	64	0
Virudhunagar	8	1,091,290	1	22	97	10	14	1	6	8	9	11	24	1	17	0
Total	**303**	**47,086,170**	**77**	**664**	**4,488**	**357**	**1,086**	**29**	**142**	**265**	**360**	**1,175**	**708**	**27**	**1,051**	**0**

Table 29-11: Specialized equipment gap in operational fire stations for ideal jurisdiction area (continued..)

District	Fire Stations	Ideally Served Population Estimates	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity Led Torches	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Ariyalur	3	281,470	3	2	1	10	4	12	13	4	121
Chennai	23	3,789,054	28	18	5	132	10	130	93	28	1,459
Coimbatore	7	1,340,479	7	6	4	38	8	44	47	8	470
Cuddalore	15	2,629,847	16	3	-1	78	17	84	85	18	829
Dharampuri	5	1,079,475	6	0	1	31	6	36	36	6	339
Dindigul	9	1,074,482	10	2	0	37	11	43	44	11	406
Erode	9	1,625,961	10	5	6	50	10	59	60	11	608
Kanchipuram	11	1,678,397	12	5	-3	58	7	55	40	13	539
Kanyakumari	7	860,484	7	4	0	26	8	31	31	8	305
Karur	3	534,948	3	0	1	17	4	22	22	4	186
Krishnagiri	7	1,453,168	7	1	1	42	8	47	47	8	448
Madurai	10	1,693,274	10	6	5	55	12	62	64	12	623
Nagapattinam	11	1,414,839	11	2	0	43	13	48	49	13	491
Namakkal	4	600,581	4	4	1	19	5	24	25	5	247
Perambalur	2	192,052	1	1	0	6	2	11	11	2	68
Pudukkottai	12	1,666,958	14	4	1	52	14	56	57	14	565
Ramanathapuram	11	1,183,388	12	3	1	38	13	44	44	13	428
Salem	11	2,034,201	10	5	5	72	13	79	80	13	718
Sivaganga	6	796,694	6	3	1	25	7	30	30	7	290
Thanjavur	9	1,505,123	10	3	1	44	11	49	49	11	493
The Nilgiris	4	458,691	3	4	1	9	5	18	21	5	144
Theni	8	1,073,304	9	4	1	34	10	38	38	10	388
Thiruvarur	11	1,351,866	13	5	1	43	13	48	49	13	498

District	Fire Stations	Ideally Served Population Estimates	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity Led Torches	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Thoothukkudi	9	1,169,378	10	4	1	35	11	42	43	11	401
Tiruchirappalli	10	1,446,402	9	3	2	46	12	53	53	12	503
Tirunelveli	13	2,002,382	15	7	3	60	16	68	69	16	678
Tiruppur	7	1,076,195	7	7	6	33	8	41	41	8	436
Tiruvallur	18	2,205,256	20	10	4	74	9	69	50	22	736
Tiruvannamalai	12	2,234,387	13	2	1	70	14	74	74	14	752
Vellore	16	2,783,341	18	10	6	74	18	83	84	19	928
Villupuram	12	2,758,803	13	2	-5	80	13	85	87	14	831
Virudhunagar	8	1,091,290	9	5	-2	34	10	40	40	10	367
Total	**303**	**47,086,170**	**326**	**140**	**49**	**1,465**	**322**	**1,625**	**1,576**	**363**	**16,295**

Table 29-12: Total gap in specialized equipments for operational and new urban fire stations

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws / Cutters / Hammers for Concrete	Electric Chain Saws / Cutters/ Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Ariyalur	3	281,470	1	5	26	4	5	1	1	4	4	9	6	1	5	0
Chennai	28	4,956,164	27	173	496	34	143	0	29	31	34	84	174	1	144	0
Coimbatore	11	2,080,253	7	59	207	13	44	1	11	1	13	57	60	0	48	0
Cuddalore	15	2,629,847	3	18	260	18	62	1	3	9	18	68	18	1	50	0
Dharampuri	5	1,079,475	1	10	98	6	25	1	1	5	6	30	11	1	22	0
Dindigul	10	1,215,454	0	12	122	12	27	1	5	11	12	39	14	1	29	0
Erode	10	1,731,872	4	32	185	12	46	1	6	10	12	51	33	1	41	0
Kanchipuram	17	3,225,634	10	69	318	20	83	1	10	16	20	76	75	1	73	0
Kanyakumari	8	1,095,639	1	17	111	9	25	1	4	6	9	30	18	1	26	0
Karur	3	534,948	1	7	46	4	12	1	0	4	4	15	7	1	11	0
Krishnagiri	8	1,584,181	1	15	150	9	36	1	3	8	9	44	16	1	31	0
Madurai	13	2,384,155	4	46	246	16	55	1	9	13	16	67	47	0	53	0
Nagapattinam	11	1,414,839	2	13	138	13	35	1	3	5	13	40	14	1	34	0
Namakkal	5	744,561	2	18	79	6	19	1	5	6	6	22	18	1	14	0
Perambalur	2	192,052	0	1	11	2	4	1	1	2	2	4	2	1	3	0
Pudukkottai	12	1,666,958	1	8	162	14	41	1	3	12	14	51	10	1	35	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
Ramanathapuram	11	1,183,388	-1	11	107	10	30	1	4	10	13	33	12	1	29	0
Salem	14	2,465,753	4	34	255	17	60	0	3	15	17	65	36	1	56	0
Sivaganga	6	796,694	2	10	79	7	18	1	4	3	7	20	11	1	18	0
Thanjavur	10	1,718,876	3	16	168	12	43	1	5	11	12	47	17	1	37	0
The Nilgiris	4	458,691	0	11	30	5	7	1	1	-12	5	8	12	1	9	0
Theni	8	1,073,304	1	14	104	10	25	1	5	9	10	29	16	1	19	0
Thiruvarur	11	1,351,866	1	11	141	13	32	1	5	10	13	40	12	1	32	0
Thoothukkudi	11	1,269,574	0	17	114	13	26	1	7	12	12	36	18	1	28	0
Tiruchirappalli	12	1,893,516	1	28	185	11	47	1	3	13	13	53	29	-1	45	0
Tirunelveli	15	2,240,135	-2	29	216	18	44	0	9	15	18	65	30	0	53	0
Tiruppur	9	1,351,824	5	37	146	10	31	1	9	10	10	39	41	1	29	0
Tiruvallur	25	3,292,644	6	66	307	30	93	1	18	25	30	67	72	1	77	0
Tiruvannamalai	12	2,234,387	2	13	240	14	57	1	4	14	14	66	14	1	50	0
Vellore	18	3,310,515	7	67	306	21	73	1	13	18	21	83	69	1	68	0
Villupuram	12	2,758,803	2	14	273	14	65	1	2	11	14	67	14	1	64	0
Virudhunagar	10	1,180,596	1	24	107	12	18	1	8	10	11	15	26	1	19	0
Total	**349**	**55,398,068**	**97**	**905**	**5,433**	**409**	**1,331**	**29**	**194**	**317**	**412**	**1420**	**952**	**27**	**1,252**	**0**

Table 29-13: Total gap in specialized equipments for operational and new urban fire stations (Continued….)

District	Fire Stations	Ideally Served Population Estimates	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity Led Torches	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Ariyalur	3	281,470	3	2	1	10	4	12	13	4	121
Chennai	28	4,956,164	34	24	5	170	16	168	131	34	1,952
Coimbatore	11	2,080,253	12	11	4	60	13	66	69	13	769
Cuddalore	15	2,629,847	16	3	-1	78	17	84	85	18	829
Dharampuri	5	1,079,475	6	0	1	31	6	36	36	6	339
Dindigul	10	1,215,454	11	3	0	41	12	47	48	12	459
Erode	10	1,731,872	11	6	6	54	11	63	64	12	661
Kanchipuram	17	3,225,634	19	12	-3	102	14	99	84	20	1,119
Kanyakumari	8	1,095,639	8	5	0	33	9	38	38	9	398
Karur	3	534,948	3	0	1	17	4	22	22	4	186
Krishnagiri	8	1,584,181	8	2	1	46	9	51	51	9	501
Madurai	13	2,384,155	14	10	5	73	16	80	82	16	869
Nagapattinam	11	1,414,839	11	2	0	43	13	48	49	13	491
Namakkal	5	744,561	5	5	1	23	6	28	29	6	300
Perambalur	2	192,052	1	1	0	6	2	11	11	2	68
Pudukkottai	12	1,666,958	14	4	1	52	14	56	57	14	565
Ramanathapuram	11	1,183,388	12	3	1	38	13	44	44	13	428
Salem	14	2,465,753	14	9	5	84	17	92	93	17	894
Sivaganga	6	796,694	6	3	1	25	7	30	30	7	290
Thanjavur	10	1,718,876	11	4	1	50	12	55	55	12	573
The Nilgiris	4	458,691	3	4	1	9	5	18	21	5	144
Theni	8	1,073,304	9	4	1	34	10	38	38	10	388

District	Fire Stations	Ideally Served Population Estimates	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity Led Torches	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Thiruvarur	11	1,351,866	13	5	1	43	13	48	49	13	498
Thoothukkudi	11	1,269,574	12	6	1	39	13	46	47	13	462
Tiruchirappalli	12	1,893,516	11	5	2	58	14	65	65	14	662
Tirunelveli	15	2,240,135	17	9	3	67	18	75	76	18	778
Tiruppur	9	1,351,824	9	9	6	43	10	51	51	10	558
Tiruvallur	25	3,292,644	28	18	4	106	17	101	84	30	1,180
Tiruvannamalai	12	2,234,387	13	2	1	70	14	74	74	14	752
Vellore	18	3,310,515	20	12	6	88	20	97	98	21	1,110
Villupuram	12	2,758,803	13	2	-5	80	13	85	87	14	831
Virudhunagar	10	1,180,596	11	7	-2	36	12	42	44	12	415
Total	**349**	**55,398,068**	**378**	**192**	**49**	**1,709**	**374**	**1,870**	**1,825**	**415**	**19,590**

Table 29-14: 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
Ariyalur	3	326,991	0	0	31	4	10	0	0	4	4	10	0	0	8	0
Chennai	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coimbatore	4	1,409,592	0	0	139	5	37	0	0	5	5	37	0	0	31	0
Cuddalore	1	120,832	0	0	12	1	4	0	0	1	1	4	0	0	3	0
Dharampuri	3	503,727	0	0	50	4	14	0	0	4	4	14	0	0	12	0
Dindigul	6	985,919	0	0	101	7	29	0	0	7	7	29	0	0	24	0
Erode	5	922,022	0	0	94	6	26	0	0	6	6	26	0	0	22	0
Kanchipuram	3	544,091	0	0	55	4	16	0	0	4	4	16	0	0	13	0
Kanyakumari	4	851,724	0	0	82	5	23	0	0	5	5	23	0	0	19	0
Karur	6	676,087	0	0	67	7	20	0	0	7	7	20	0	0	17	0
Krishnagiri	1	374,715	0	0	41	1	11	0	0	1	1	11	0	0	9	0
Madurai	1	183,654	0	0	17	1	5	0	0	1	1	5	0	0	4	0
Nagapattinam	3	269,957	0	0	26	4	8	0	0	4	4	8	0	0	7	0
Namakkal	5	743,281	0	0	70	6	20	0	0	6	6	20	0	0	17	0
Perambalur	3	404,287	0	0	41	4	12	0	0	4	4	12	0	0	10	0
Pudukkottai	1	112,324	0	0	12	1	4	0	0	1	1	4	0	0	3	0

District	Fire Stations	Ideally Served Population Estimates	Hydraulic Rescue Tools	Combi Tools	B.A. Sets	BA Compressors	First-Aid Boxes	Thermal Imaging Cameras	Electric Chain Saws /Cutters / Hammers for Concrete	Electric Chain Saws /Cutters / Hammers for Wood	Hydraulic / Manual Chain Saws / Cutters for Wood	Personal Protection Equipment	Hand Held Gas Detector Kits	Life Locator Equipment	Portable Pumps	Floating Pumps
Ramanathapuram	4	207,048	0	0	29	5	10	0	0	5	5	10	0	0	8	0
Salem	3	707,139	0	0	79	4	22	0	0	4	4	22	0	0	18	0
Sivaganga	5	891,587	0	0	84	6	24	0	0	6	6	24	0	0	20	0
Thanjavur	2	286,360	0	0	29	2	8	0	0	2	2	8	0	0	7	0
The Nilgiris	3	288,000	0	0	31	4	10	0	0	4	4	10	0	0	8	0
Theni	1	247,260	0	0	26	1	7	0	0	1	1	7	0	0	6	0
Thiruvarur	1	124,531	0	0	12	1	4	0	0	1	1	4	0	0	3	0
Thoothukkudi	6	772,908	0	0	72	7	22	0	0	7	7	22	0	0	18	0
Tiruchirappalli	6	795,615	0	0	82	7	24	0	0	7	7	24	0	0	20	0
Tirunelveli	3	467,888	0	0	50	4	14	0	0	4	4	14	0	0	12	0
Tiruppur	6	999,130	0	0	106	7	30	0	0	7	7	30	0	0	25	0
Tiruvallur	2	366,751	0	0	38	2	11	0	0	2	2	11	0	0	9	0
Tiruvannamalai	2	360,144	0	0	38	2	11	0	0	2	2	11	0	0	9	0
Vellore	4	670,142	0	0	67	5	19	0	0	5	5	19	0	0	16	0
Villupuram	2	557,552	0	0	62	2	17	0	0	2	2	17	0	0	14	0
Virudhunagar	3	569,632	0	0	55	4	16	0	0	4	4	16	0	0	13	0
Total	**102**	**16,740,890**	**0**	**0**	**1,698**	**123**	**488**	**0**	**0**	**123**	**123**	**488**	**0**	**0**	**405**	**0**

Table 29-15: Additional specialized equipment required for new rural fire stations (continued…)

District	Fire Stations	Ideally Served Population Estimates	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity Led Torches	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Ariyalur	3	326,991	4	0	0	10	4	10	10	4	113
Chennai	0	0	0	0	0	0	0	0	0	0	0
Coimbatore	4	1,409,592	5	0	0	37	5	37	37	5	385
Cuddalore	1	120,832	1	0	0	4	1	4	4	1	41
Dharampuri	3	503,727	4	0	0	14	4	14	14	4	156
Dindigul	6	985,919	7	0	0	29	7	29	29	7	312
Erode	5	922,022	6	0	0	26	6	26	26	6	282
Kanchipuram	3	544,091	4	0	0	16	4	16	16	4	172
Kanyakumari	4	851,724	5	0	0	23	5	23	23	5	246
Karur	6	676,087	7	0	0	20	7	20	20	7	226
Krishnagiri	1	374,715	1	0	0	11	1	11	11	1	111
Madurai	1	183,654	1	0	0	5	1	5	5	1	52
Nagapattinam	3	269,957	4	0	0	8	4	8	8	4	97
Namakkal	5	743,281	6	0	0	26	6	26	26	6	241
Perambalur	3	404,287	4	0	0	12	4	12	12	4	135
Pudukkottai	1	112,324	1	0	0	4	1	4	4	1	41
Ramanathapuram	4	207,048	5	0	0	10	5	10	10	5	117
Salem	3	707,139	4	0	0	23	4	23	23	4	234
Sivaganga	5	891,587	6	0	0	25	6	25	25	6	263
Thanjavur	2	286,360	2	0	0	8	2	8	8	2	88
The Nilgiris	3	288,000	4	0	0	10	4	10	10	4	113
Theni	1	247,260	1	0	0	7	1	7	7	1	73
Thiruvarur	1	124,531	1	0	0	4	1	4	4	1	41

District	Fire Stations	Ideally Served Population Estimates	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity Led Torches	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Thoothukkudi	6	772,908	7	0	0	22	7	22	22	7	242
Tiruchirappalli	6	795,615	7	0	0	25	7	25	25	7	267
Tirunelveli	3	467,888	4	0	0	14	4	14	14	4	156
Tiruppur	6	999,130	7	0	0	35	7	35	35	7	338
Tiruvallur	2	366,751	2	0	0	12	2	12	12	2	117
Tiruvannamalai	2	360,144	2	0	0	11	2	11	11	2	114
Vellore	4	670,142	5	0	0	19	5	19	19	5	208
Villupuram	2	557,552	2	0	0	17	2	17	17	2	173
Virudhunagar	3	569,632	4	0	0	17	4	17	17	4	175
Total	**102**	**16,740,890**	**123**	**0**	**0**	**504**	**123**	**504**	**504**	**123**	**5,329**

29.3.3 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 keeping in view the current 12 hour duty pattern in the Tamil Nadu state (Table 29.16).

Table 29-16: Manpower requirement for Station officer and lower staff for Tamil Nadu considering two shifts duty pattern

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

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

However, Delhi Administrative Reform Department (ARD), Govt. of India has studied the fire manpower requirement, and optimized it further for two-shift duty pattern (Table 29.17). From Tables 29.16 and 29.17, 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 29.17).

Table 29-17: 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 and rescue stations in Tamil Nadu state has been estimated, which comes to 31,269 (Table 29.19 to 29.21) against the present strength of 5,408 (Table 29.18)

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 dedicated 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 DGP/Director, Tamil Nadu Fire and Rescue Services additional officers at the levels of Director (Technical), Joint-Director (Technical), Chief Fire Officers (CFO), Dy Chief Fire Officers (Dy-CFO), Division Officers (DO), and Assistant Divisional Officer (ADO) have been proposed (including existing officials), which may be recruited in a phased manner approach:

- Director /Director General : 1
- Director (Technical) : 1
- Joint Director (Technical) : 2
- CFO : 8
- Dy. CFO : 16 (Two per CFO)
- DO : 56 (one per 8 fire stations)
- ADO :112 (one per 4 fire stations)

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

Accordingly, existing fire manpower and gap analysis for all the districts in Tamil Nadu state have been carried out and are shown Tables 29-19 to 29-21.

Table 29-18: List of manpower available for operational fire stations in Tamil Nadu Fire & Rescue Service (As on July, 2012)

District	Fire Stations	Level 10	Level 9	Level 8	Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0	Total Staff
Ariyalur	3	0	0	0	0	0	0	1	2	8	18	2	31
Chennai	23	1	2	0	0	3	8	15	8	64	459	16	576
Coimbatore	7	0	1	0	0	0	0	6	7	24	99	10	147
Cuddalore	15	0	0	0	0	1	1	2	15	47	179	17	262
Dharampuri	5	0	0	0	0	1	1	2	6	11	52	13	86
Dindigul	9	0	0	0	0	1	2	1	8	27	115	14	168
Erode	9	0	0	0	0	1	1	0	9	26	83	12	132
Kanchipuram	11	0	0	0	0	1	3	1	10	39	136	3	193
Kanyakumari	7	0	0	0	0	1	1	0	7	24	89	11	133
Karur	3	0	0	0	0	0	0	3	0	10	39	0	52
Krishnagiri	7	0	0	0	0	1	1	2	6	17	52	16	95
Madurai	10	0	1	0	0	1	2	3	10	24	161	17	219
Nagapattinam	11	0	0	0	0	1	1	3	9	30	92	17	153
Namakkal	4	0	0	0	0	1	1	0	4	11	40	6	63
Perambalur	2	0	0	0	0	1	1	1	2	5	19	5	34
Pudukkottai	12	0	0	0	0	2	1	0	9	34	112	5	163
Ramanathapuram	11	0	0	0	0	1	1	0	10	33	64	19	128
Salem	11	0	0	0	0	1	2	0	13	39	147	22	224
Sivaganga	6	0	0	0	0	1	1	0	6	17	59	10	94
Thanjavur	9	0	0	0	0	1	1	0	7	27	99	0	135
The Nilgiris	4	0	0	0	0	0	0	1	5	15	44	7	72
Theni	8	0	0	0	0	1	1	4	8	19	102	15	150
Thiruvarur	11	0	0	0	0	1	1	8	0	26	79	15	130
Thoothukkudi	9	0	0	0	0	1	1	10	6	34	141	13	206

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
Tiruchirappalli	10	0	1	0	0	1	3	2	6	35	143	0	191
Tirunelveli	13	0	0	0	0	1	3	0	13	37	187	30	271
Tiruppur	7	0	0	0	0	1	1	3	5	20	79	13	122
Tiruvallur	18	0	0	0	0	2	4	11	9	63	244	2	335
Tiruvannamalai	12	0	0	0	0	1	1	0	11	34	143	0	190
Vellore	16	0	1	0	0	1	2	7	8	93	135	4	251
Villupuram	12	0	0	0	0	1	1	4	12	32	144	25	219
Virudhunagar	8	0	0	0	0	1	2	6	7	21	128	18	183
Total	**303**	**1**	**6**	**0**	**0**	**32**	**49**	**96**	**238**	**946**	**3,683**	**357**	**5,408**

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

Table 29-19: 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
Ariyalur	3	0	0	0	0	1	2	4	10	10	116	1	144
Chennai	23	2	-1	2	0	0	-3	44	116	197	1285	7	1649
Coimbatore	7	0	0	2	0	1	2	14	36	75	575	-3	702
Cuddalore	15	0	0	0	0	0	1	30	55	100	832	-2	1016
Dharampuri	5	0	0	0	0	0	1	13	23	52	410	-8	491
Dindigul	9	0	0	0	0	0	-1	14	31	52	450	-5	541
Erode	9	0	0	0	0	1	2	22	41	83	688	-3	834
Kanchipuram	11	0	0	0	0	1	-1	25	47	85	701	8	866
Kanyakumari	7	0	0	0	0	0	2	12	20	23	259	-4	312
Karur	3	0	0	0	0	1	2	6	18	35	264	3	329
Krishnagiri	7	0	0	0	0	0	2	17	31	62	506	-9	609
Madurai	10	0	0	2	0	0	0	22	44	86	596	-7	743
Nagapattinam	11	0	0	0	0	1	3	13	35	57	516	-6	619
Namakkal	4	0	0	0	0	0	0	10	18	40	305	-2	371
Perambalur	2	0	0	0	0	1	3	4	7	11	99	-3	122
Pudukkottai	12	0	0	0	0	-1	1	21	37	52	524	7	641
Ramanathapuram	11	0	0	0	0	1	3	14	31	38	435	-8	514
Salem	11	0	1	2	0	0	0	34	54	110	847	-11	1037
Sivaganga	6	0	0	0	0	1	3	12	19	26	269	-4	326
Thanjavur	9	0	0	0	0	0	2	20	34	50	480	9	595
The Nilgiris	4	0	0	0	0	2	4	8	14	25	262	-3	312
Theni	8	0	0	0	0	0	1	11	27	49	382	-7	463

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
Thiruvarur	11	0	0	0	0	1	3	8	43	61	529	-4	641
Thoothukkudi	9	0	0	0	0	0	1	4	31	37	363	-4	432
Tiruchirappalli	10	1	0	2	0	0	0	18	39	52	474	10	596
Tirunelveli	13	0	1	2	0	0	-1	29	46	82	692	-17	834
Tiruppur	7	0	0	0	0	0	2	17	32	55	482	-6	582
Tiruvallur	18	0	0	0	0	-1	-1	21	68	77	738	16	918
Tiruvannamalai	12	0	0	0	0	1	3	27	51	103	761	12	958
Vellore	16	0	0	2	0	0	1	27	66	54	931	12	1093
Villupuram	12	0	1	2	0	1	3	31	60	125	911	-13	1121
Virudhunagar	8	0	0	0	0	0	-1	10	29	53	407	-10	488
Total	**303**	**3**	**2**	**16**	**0**	**12**	**39**	**562**	**1,213**	**2,017**	**17,089**	**-54**	**20,899**

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

Table 29-20: 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
Ariyalur	3	0	0	0	0	1	2	4	10	10	116	1	144
Chennai	28	2	-1	2	0	0	-2	58	146	257	1681	12	2155
Coimbatore	11	0	0	2	0	2	4	24	57	116	842	1	1048
Cuddalore	15	0	0	0	0	0	1	30	55	100	832	-2	1016
Dharampuri	5	0	0	0	0	0	1	13	23	52	410	-8	491
Dindigul	10	0	0	0	0	0	0	15	35	59	497	-4	602
Erode	10	0	0	0	0	1	3	23	45	90	735	-2	895
Kanchipuram	17	0	0	0	0	1	1	44	86	171	1273	14	1590
Kanyakumari	8	0	0	0	0	1	3	16	27	36	346	-3	426
Karur	3	0	0	0	0	1	2	6	18	35	264	3	329
Krishnagiri	8	0	0	0	0	1	3	18	35	69	553	-8	671
Madurai	13	0	0	2	0	1	2	31	61	120	817	-4	1030
Nagapattinam	11	0	0	0	0	1	3	13	35	57	516	-6	619
Namakkal	5	0	0	0	0	0	1	11	22	47	352	-1	432
Perambalur	2	0	0	0	0	1	3	4	7	11	99	-3	122
Pudukkottai	12	0	0	0	0	-1	1	21	37	52	524	7	641
Ramanathapuram	11	0	0	0	0	1	3	14	31	38	435	-8	514
Salem	14	0	1	2	0	1	2	39	67	136	1014	-8	1254
Sivaganga	6	0	0	0	0	1	3	12	19	26	269	-4	326
Thanjavur	10	0	0	0	0	1	3	22	40	61	553	10	690
The Nilgiris	4	0	0	0	0	2	4	8	14	25	262	-3	312
Theni	8	0	0	0	0	0	1	11	27	49	382	-7	463

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
Thiruvarur	11	0	0	0	0	1	3	8	43	61	529	-4	641
Thoothukkudi	11	0	0	0	0	1	3	5	36	42	410	-2	495
Tiruchirappalli	12	1	0	2	0	1	1	24	50	79	676	12	846
Tirunelveli	15	0	1	2	0	1	1	31	53	97	786	-15	957
Tiruppur	9	0	0	0	0	1	3	22	41	71	600	-4	734
Tiruvallur	25	0	0	0	0	0	0	35	101	144	1197	23	1500
Tiruvannamalai	12	0	0	0	0	1	3	27	51	103	761	12	958
Vellore	18	0	0	2	0	1	2	33	78	84	1152	14	1366
Villupuram	12	0	1	2	0	1	3	31	60	125	911	-13	1121
Virudhunagar	10	0	0	0	0	0	0	10	34	58	438	-8	532
Total	**349**	**3**	**2**	**16**	**0**	**24**	**63**	**663**	**1,444**	**2,481**	**20,232**	**-8**	**24,920**

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

Table 29-21: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
Ariyalur	3	0	0	0	0	0	0	1	9	12	78	3	103
Chennai	0	0	0	0	0	0	0	0	0	0	0	0	0
Coimbatore	4	0	0	0	0	0	0	16	29	66	447	4	562
Cuddalore	1	0	0	0	0	0	0	1	2	2	31	1	37
Dharampuri	3	0	0	0	0	0	0	5	11	19	138	3	176
Dindigul	6	0	0	0	0	0	0	10	23	39	270	6	348
Erode	5	0	0	0	0	0	0	10	21	37	254	5	327
Kanchipuram	3	0	0	0	0	0	0	5	13	23	150	3	194
Kanyakumari	4	0	0	0	0	0	0	7	19	41	275	4	346
Karur	6	0	0	0	0	0	0	4	18	24	167	6	219
Krishnagiri	1	0	0	0	0	0	0	5	8	25	171	1	210
Madurai	1	0	0	0	0	0	0	1	4	7	47	1	60
Nagapattinam	3	0	0	0	0	0	0	1	7	7	62	3	80
Namakkal	5	0	0	0	0	0	0	9	20	38	259	5	331
Perambalur	3	0	0	0	0	0	0	4	9	12	109	3	137
Pudukkottai	1	0	0	0	0	0	0	1	2	2	31	1	37
Ramanathapuram	4	0	0	0	0	0	0	0	10	10	62	4	86
Salem	3	0	0	0	0	0	0	9	18	36	233	3	299
Sivaganga	5	0	0	0	0	0	0	9	20	32	239	5	305
Thanjavur	2	0	0	0	0	0	0	2	6	10	78	2	98
The Nilgiris	3	0	0	0	0	0	0	1	9	12	78	3	103
Theni	1	0	0	0	0	0	0	2	6	11	73	1	93

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
Thiruvarur	1	0	0	0	0	0	0	1	2	2	31	1	37
Thoothukkudi	6	0	0	0	0	0	0	5	18	24	182	6	235
Tiruchirappalli	6	0	0	0	0	0	0	6	22	34	223	6	291
Tirunelveli	3	0	0	0	0	0	0	4	12	21	136	3	176
Tiruppur	6	0	0	0	0	0	0	12	27	51	346	6	442
Tiruvallur	2	0	0	0	0	0	0	5	9	16	118	2	150
Tiruvannamalai	2	0	0	0	0	0	0	4	8	17	107	2	138
Vellore	4	0	0	0	0	0	0	6	15	27	185	4	237
Villupuram	2	0	0	0	0	0	0	7	13	34	231	2	287
Virudhunagar	3	0	0	0	0	0	0	6	12	20	164	3	205
Total	**102**	**0**	**0**	**0**	**0**	**0**	**0**	**159**	**402**	**711**	**4,975**	**102**	**6,349**

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

29.3.4 Fire Station Building Infrastructure Gap

Depending upon the number of pumping units, no of bays in a fire station has been estimated. However, in order to consider future growth in population, a minimum two bay fire station has been proposed, even at a fire station having requirement of one pumping unit. Accordingly, gaps in operational fire stations, new urban and rural fire stations have been given in Tables 29-22.

Table 29-22: 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
Ariyalur	6	1	1	1	0	0	1	0	0
Chennai	28	1	-4	-1	4	4	1	6	3
Coimbatore	15	0	-2	1	0	3	3	1	3
Cuddalore	16	-4	-1	2	2	2	1	0	2
Dharampuri	8	-2	2	0	2	1	0	0	1
Dindigul	16	4	1	0	3	0	1	0	2
Erode	15	1	1	2	2	1	1	1	2
Kanchipuram	20	-2	-1	3	1	5	3	1	3
Kanyakumari	12	1	-1	2	0	2	2	0	1
Karur	9	2	1	2	0	1	0	0	1
Krishnagiri	9	-3	0	2	1	1	1	0	2
Madurai	14	-1	-2	0	2	3	2	1	1
Nagapattinam	14	1	1	0	1	0	0	0	2
Namakkal	10	0	-1	5	0	1	1	0	1
Perambalur	5	0	3	1	0	0	1	0	0
Pudukkottai	13	-3	3	1	3	0	0	0	1
Ramanathapuram	15	4	1	-1	0	0	1	0	1
Salem	17	-2	-5	3	1	6	3	0	2
Sivaganga	11	-1	2	0	2	1	0	2	0
Thanjavur	12	-2	4	0	1	1	1	1	1
The Nilgiris	7	2	1	1	0	0	0	0	1
Theni	9	-1	-1	2	0	1	1	0	1
Thiruvarur	12	-3	1	2	0	0	0	0	2
Thoothukkudi	17	2	3	1	0	2	0	0	1
Tiruchirappalli	18	3	1	-1	2	1	2	0	2
Tirunelveli	18	-3	2	3	2	1	1	0	2

District	Fire Stations	Bay1	Bay2	Bay3	Bay4	Bay5	Bay6	Bay7	Bay More Than 7
Tiruppur	15	1	3	1	1	0	4	0	1
Tiruvallur	27	-1	1	1	1	4	3	1	2
Tiruvannamalai	14	-3	-5	5	2	2	1	0	2
Vellore	22	-4	4	2	3	1	0	1	3
Villupuram	14	-2	-2	-3	3	4	2	0	3
Virudhunagar	13	2	0	3	0	1	0	1	1
Total	**451**	**-12**	**11**	**40**	**39**	**49**	**37**	**16**	**50**

29.4 Investment and Financial Analysis

29.4.1 Capital Cost

Building Infrastructure Cost:

Table 29-23 provides details of the fire station building infrastructure cost analysis in Tamil Nadu state. The ideal requirement of land for a fire station is 2 ½ acres, however, a 2 bay fire station may be constructed in one acre land. It may be noted that land cost will vary from time to time and place to place; hence it has not been added in cost estimates. The civil construction cost estimation involves cost of fire station building including stores, offices, residential quarters, static water tanks, which will vary in size depending upon the number of bays (garage) in a fire station. Accordingly, total cost estimates for one, two, three, five, and seven bay fire stations (based on the P.W. D. norms) is about 150 Lakhs, 300 Lakhs, 450 Lakhs, 700 Lakhs, 950 Lakhs. To start with, rural-fire stations/ fire posts may be stationed in government buildings like schools/ hospitals or a Panchayat-Ghar.

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. 1,694.5 Crores (Table 29-23)**.

Firefighting and Rescue Vehicles and Specialized Equipment Cost:

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

Table 29-23: 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
Ariyalur	6	150.0	300.0	450.0	0.0	0.0	825.0	0.0	0.0
Chennai	28	150.0	-1,200.0	-450.0	2,300.0	2,800.0	825.0	5,700.0	2,850.0
Coimbatore	15	0.0	-600.0	450.0	0.0	2,100.0	2,475.0	950.0	2,850.0
Cuddalore	16	-600.0	-300.0	900.0	1,150.0	1,400.0	825.0	0.0	1,900.0
Dharampuri	8	-300.0	600.0	0.0	1,150.0	700.0	0.0	0.0	950.0
Dindigul	16	600.0	300.0	0.0	1,725.0	0.0	825.0	0.0	1,900.0
Erode	15	150.0	300.0	900.0	1,150.0	700.0	825.0	950.0	1,900.0
Kanchipuram	20	-300.0	-300.0	1,350.0	575.0	3,500.0	2,475.0	950.0	2,850.0
Kanyakumari	12	150.0	-300.0	900.0	0.0	1,400.0	1,650.0	0.0	950.0
Karur	9	300.0	300.0	900.0	0.0	700.0	0.0	0.0	950.0
Krishnagiri	9	-450.0	0.0	900.0	575.0	700.0	825.0	0.0	1,900.0
Madurai	14	-150.0	-600.0	0.0	1,150.0	2,100.0	1,650.0	950.0	950.0
Nagapattinam	14	150.0	300.0	0.0	575.0	0.0	0.0	0.0	1,900.0
Namakkal	10	0.0	-300.0	2,250.0	0.0	700.0	825.0	0.0	950.0
Perambalur	5	0.0	900.0	450.0	0.0	0.0	825.0	0.0	0.0
Pudukkottai	13	-450.0	900.0	450.0	1,725.0	0.0	0.0	0.0	950.0
Ramanathapuram	15	600.0	300.0	-450.0	0.0	0.0	825.0	0.0	950.0
Salem	17	-300.0	-1,500.0	1,350.0	575.0	4,200.0	2,475.0	0.0	1,900.0
Sivaganga	11	-150.0	600.0	0.0	1,150.0	700.0	0.0	1,900.0	0.0
Thanjavur	12	-300.0	1,200.0	0.0	575.0	700.0	825.0	950.0	950.0
The Nilgiris	7	300.0	300.0	450.0	0.0	0.0	0.0	0.0	950.0

District	Fire Stations	Bay1	Bay2	Bay3	Bay4	Bay5	Bay6	Bay7	Bay More Than 7
Theni	9	-150.0	-300.0	900.0	0.0	700.0	825.0	0.0	950.0
Thiruvarur	12	-450.0	300.0	900.0	0.0	0.0	0.0	0.0	1,900.0
Thoothukkudi	17	300.0	900.0	450.0	0.0	1,400.0	0.0	0.0	950.0
Tiruchirappalli	18	450.0	300.0	-450.0	1,150.0	700.0	1,650.0	0.0	1,900.0
Tirunelveli	18	-450.0	600.0	1,350.0	1,150.0	700.0	825.0	0.0	1,900.0
Tiruppur	15	150.0	900.0	450.0	575.0	0.0	3,300.0	0.0	950.0
Tiruvallur	27	-150.0	300.0	450.0	575.0	2,800.0	2,475.0	950.0	1,900.0
Tiruvannamalai	14	-450.0	-1,500.0	2,250.0	1,150.0	1,400.0	825.0	0.0	1,900.0
Vellore	22	-600.0	1,200.0	900.0	1,725.0	700.0	0.0	950.0	2,850.0
Villupuram	14	-300.0	-600.0	-1,350.0	1,725.0	2,800.0	1,650.0	0.0	2,850.0
Virudhunagar	13	300.0	0.0	1,350.0	0.0	700.0	0.0	950.0	950.0
Total	**451**	**-1,800.0**	**3,300.0**	**18,000.0**	**22,425.0**	**34,300.0**	**30,525.0**	**15,200.0**	**47,500.0**

Table 29-24: Cost estimates (in Lakhs Rupees) for gap in fire fighting vehicles for operational and new urban fire stations

District	Fire Stations	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Education Vans	Total Vehicle Cost
Ariyalur	3	0.0	30.0	80.0	500.0	0.0	35.0	30.0	0.0	9.0	7.0	0.0	691.0
Chennai	28	700.0	780.0	920.0	0.0	-500.0	35.0	120.0	0.0	234.0	176.0	40.0	2,505.0
Coimbatore	11	385.0	510.0	280.0	0.0	0.0	35.0	60.0	30.0	9.0	7.0	20.0	1,336.0
Cuddalore	15	175.0	480.0	560.0	0.0	0.0	35.0	60.0	30.0	90.0	68.0	20.0	1,518.0
Dharampuri	5	140.0	210.0	160.0	500.0	0.0	35.0	30.0	30.0	36.0	27.0	20.0	1,188.0
Dindigul	10	70.0	180.0	240.0	500.0	0.0	70.0	60.0	30.0	54.0	41.0	20.0	1,265.0
Erode	10	245.0	360.0	320.0	500.0	500.0	70.0	60.0	30.0	54.0	41.0	20.0	2,200.0
Kanchipuram	17	595.0	750.0	560.0	0.0	0.0	245.0	60.0	30.0	54.0	41.0	20.0	2,355.0
Kanyakumari	8	175.0	270.0	80.0	0.0	0.0	35.0	30.0	30.0	27.0	20.0	20.0	687.0
Karur	3	35.0	90.0	120.0	500.0	0.0	35.0	30.0	30.0	18.0	14.0	20.0	892.0
Krishnagiri	8	245.0	270.0	280.0	500.0	0.0	35.0	30.0	30.0	54.0	41.0	20.0	1,505.0
Madurai	13	455.0	480.0	360.0	0.0	500.0	140.0	30.0	30.0	54.0	41.0	0.0	2,090.0
Nagapattinam	11	105.0	270.0	120.0	0.0	0.0	35.0	30.0	30.0	63.0	47.0	20.0	720.0
Namakkal	5	70.0	150.0	160.0	500.0	0.0	35.0	30.0	30.0	9.0	7.0	20.0	1,011.0
Perambalur	2	0.0	0.0	40.0	500.0	0.0	35.0	30.0	30.0	9.0	7.0	20.0	671.0
Pudukkottai	12	105.0	150.0	400.0	500.0	0.0	35.0	30.0	30.0	81.0	61.0	20.0	1,412.0
Ramanathapuram	11	70.0	150.0	120.0	500.0	0.0	35.0	60.0	30.0	72.0	54.0	20.0	1,111.0
Salem	14	455.0	480.0	480.0	0.0	0.0	280.0	90.0	30.0	63.0	47.0	20.0	1,945.0
Sivaganga	6	35.0	90.0	240.0	500.0	0.0	35.0	30.0	30.0	27.0	20.0	20.0	1,027.0
Thanjavur	10	175.0	270.0	280.0	500.0	0.0	35.0	30.0	30.0	54.0	41.0	20.0	1,435.0
The Nilgiris	4	35.0	60.0	80.0	500.0	0.0	35.0	30.0	30.0	9.0	7.0	20.0	806.0
Theni	8	70.0	180.0	240.0	500.0	0.0	35.0	30.0	30.0	36.0	27.0	0.0	1,148.0
Thiruvarur	11	105.0	270.0	40.0	500.0	0.0	35.0	30.0	30.0	63.0	47.0	20.0	1,140.0

District	Fire Stations	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Education Vans	Total Vehicle Cost
Thoothukkudi	11	175.0	150.0	120.0	500.0	500.0	35.0	60.0	30.0	54.0	41.0	20.0	1,685.0
Tiruchirappalli	12	315.0	300.0	280.0	0.0	500.0	35.0	60.0	30.0	72.0	54.0	20.0	1,666.0
Tirunelveli	15	315.0	390.0	440.0	500.0	500.0	35.0	90.0	30.0	63.0	47.0	20.0	2,430.0
Tiruppur	9	280.0	240.0	280.0	500.0	500.0	70.0	60.0	30.0	18.0	14.0	20.0	2,012.0
Tiruvallur	25	525.0	570.0	560.0	500.0	0.0	280.0	90.0	30.0	63.0	47.0	20.0	2,685.0
Tiruvannamalai	12	315.0	480.0	320.0	500.0	0.0	35.0	30.0	30.0	81.0	61.0	20.0	1,872.0
Vellore	18	560.0	540.0	440.0	0.0	500.0	70.0	90.0	30.0	72.0	54.0	20.0	2,376.0
Villupuram	12	385.0	600.0	360.0	500.0	0.0	35.0	30.0	30.0	81.0	61.0	20.0	2,102.0
Virudhunagar	10	0.0	150.0	320.0	0.0	0.0	70.0	60.0	30.0	18.0	14.0	20.0	682.0
Total	**349**	**7,315.0**	**9,900.0**	**9,280.0**	**10,500.0**	**3,000.0**	**2,100.0**	**1,590.0**	**900.0**	**1,701.0**	**1,275.7**	**600.0**	**48,161.7**

Table 29-25: Cost estimates (in Lakhs Rupees) for gap in fire vehicles for new rural fire stations

District	Fire Stations	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Fire Boats	Education Vans	Total Vehicle Cost
Ariyalur	3	140.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	27.0	20.0	0.0	0.0	217.0
Chennai	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
Coimbatore	4	455.0	300.0	160.0	0.0	0.0	0.0	0.0	0.0	36.0	27.0	0.0	0.0	978.0
Cuddalore	1	35.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	9.0	7.0	0.0	0.0	91.0
Dharampuri	3	175.0	30.0	120.0	0.0	0.0	0.0	0.0	0.0	27.0	20.0	0.0	0.0	372.0
Dindigul	6	350.0	120.0	160.0	0.0	0.0	0.0	0.0	0.0	54.0	41.0	0.0	0.0	725.0
Erode	5	315.0	120.0	160.0	0.0	0.0	0.0	0.0	0.0	45.0	34.0	0.0	0.0	674.0

District	Fire Stations	Water Tenders	Water Bowsers	Foam Tenders	Advanced Rescue Responders	Sky Lifts / TTL	DCP Tenders	Hose Tenders	BA Vans	QRT	Motor Cycle Mists	Fire Boats	Education Vans	Total Vehicle Cost
Kanchipuram	3	210.0	60.0	80.0	0.0	0.0	0.0	0.0	0.0	27.0	20.0	0.0	0.0	397.0
Kanyakumari	4	315.0	180.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	27.0	0.0	0.0	558.0
Karur	6	245.0	60.0	80.0	0.0	0.0	0.0	0.0	0.0	54.0	41.0	0.0	0.0	480.0
Krishnagiri	1	140.0	90.0	40.0	0.0	0.0	0.0	0.0	0.0	9.0	7.0	0.0	0.0	286.0
Madurai	1	70.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	9.0	7.0	0.0	0.0	126.0
Nagapattinam	3	105.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	27.0	20.0	0.0	0.0	182.0
Namakkal	5	210.0	30.0	200.0	0.0	0.0	175.0	0.0	0.0	45.0	34.0	0.0	0.0	694.0
Perambalur	3	140.0	30.0	80.0	0.0	0.0	0.0	0.0	0.0	27.0	20.0	0.0	0.0	297.0
Pudukkottai	1	35.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	9.0	7.0	0.0	0.0	91.0
Ramanathapuram	4	140.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	27.0	0.0	0.0	203.0
Salem	3	210.0	180.0	120.0	0.0	0.0	35.0	0.0	0.0	27.0	20.0	0.0	0.0	592.0
Sivaganga	5	280.0	90.0	160.0	0.0	0.0	35.0	0.0	0.0	45.0	34.0	0.0	0.0	644.0
Thanjavur	2	105.0	0.0	80.0	0.0	0.0	0.0	0.0	0.0	18.0	14.0	0.0	0.0	217.0
The Nilgiris	3	140.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	27.0	20.0	0.0	0.0	227.0
Theni	1	70.0	60.0	40.0	0.0	0.0	0.0	0.0	0.0	9.0	7.0	0.0	0.0	186.0
Thiruvarur	1	35.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	9.0	7.0	0.0	0.0	91.0
Thoothukkudi	6	245.0	60.0	120.0	0.0	0.0	0.0	0.0	0.0	54.0	41.0	0.0	0.0	520.0
Tiruchirappalli	6	280.0	120.0	80.0	0.0	0.0	35.0	0.0	0.0	54.0	41.0	0.0	0.0	610.0
Tirunelveli	3	175.0	60.0	80.0	0.0	0.0	0.0	0.0	0.0	27.0	20.0	0.0	0.0	362.0
Tiruppur	6	315.0	120.0	240.0	0.0	0.0	140.0	0.0	0.0	54.0	41.0	0.0	0.0	910.0
Tiruvallur	2	105.0	60.0	80.0	0.0	0.0	35.0	0.0	0.0	18.0	14.0	0.0	0.0	312.0
Tiruvannamalai	2	140.0	30.0	80.0	0.0	0.0	0.0	0.0	0.0	18.0	14.0	0.0	0.0	282.0
Vellore	4	245.0	60.0	120.0	0.0	0.0	0.0	0.0	0.0	36.0	27.0	0.0	0.0	488.0
Villupuram	2	210.0	120.0	80.0	0.0	0.0	0.0	0.0	0.0	18.0	14.0	0.0	0.0	442.0
Virudhunagar	3	175.0	60.0	120.0	0.0	0.0	35.0	0.0	0.0	27.0	20.0	0.0	0.0	437.0
Total	**102**	**5,810.0**	**2,100.0**	**2,680.0**	**0.0**	**0.0**	**490.0**	**0.0**	**0.0**	**918.0**	**688.5**	**0.0**	**0.0**	**12,686.5**

Table 29-26: 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
Ariyalur	3	15.0	12.5	10.4	6.0	0.5	10.0	0.8	2.0	1.2	22.5	1.8	6.5	10.0	0.0
Chennai	28	405.0	432.5	198.4	51.0	14.3	0.0	23.2	15.5	10.2	210.0	52.2	6.5	288.0	0.0
Coimbatore	11	105.0	147.5	82.8	19.5	4.4	10.0	8.8	0.5	3.9	142.5	18.0	0.0	96.0	0.0
Cuddalore	15	45.0	45.0	104.0	27.0	6.2	10.0	2.4	4.5	5.4	170.0	5.4	6.5	100.0	0.0
Dharampuri	5	15.0	25.0	39.2	9.0	2.5	10.0	0.8	2.5	1.8	75.0	3.3	6.5	44.0	0.0
Dindigul	10	0.0	30.0	48.8	18.0	2.7	10.0	4.0	5.5	3.6	97.5	4.2	6.5	58.0	0.0
Erode	10	60.0	80.0	74.0	18.0	4.6	10.0	4.8	5.0	3.6	127.5	9.9	6.5	82.0	0.0
Kanchipuram	17	150.0	172.5	127.2	30.0	8.3	10.0	8.0	8.0	6.0	190.0	22.5	6.5	146.0	0.0
Kanyakumari	8	15.0	42.5	44.4	13.5	2.5	10.0	3.2	3.0	2.7	75.0	5.4	6.5	52.0	0.0
Karur	3	15.0	17.5	18.4	6.0	1.2	10.0	0.0	2.0	1.2	37.5	2.1	6.5	22.0	0.0
Krishnagiri	8	15.0	37.5	60.0	13.5	3.6	10.0	2.4	4.0	2.7	110.0	4.8	6.5	62.0	0.0
Madurai	13	60.0	115.0	98.4	24.0	5.5	10.0	7.2	6.5	4.8	167.5	14.1	0.0	106.0	0.0
Nagapattinam	11	30.0	32.5	55.2	19.5	3.5	10.0	2.4	2.5	3.9	100.0	4.2	6.5	68.0	0.0
Namakkal	5	30.0	45.0	31.6	9.0	1.9	10.0	4.0	3.0	1.8	55.0	5.4	6.5	28.0	0.0
Perambalur	2	0.0	2.5	4.4	3.0	0.4	10.0	0.8	1.0	0.6	10.0	0.6	6.5	6.0	0.0
Pudukkottai	12	15.0	20.0	64.8	21.0	4.1	10.0	2.4	6.0	4.2	127.5	3.0	6.5	70.0	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
Ramanathapuram	11	-15.0	27.5	42.8	15.0	3.0	10.0	3.2	5.0	3.9	82.5	3.6	6.5	58.0	0.0
Salem	14	60.0	85.0	102.0	25.5	6.0	0.0	2.4	7.5	5.1	162.5	10.8	6.5	112.0	0.0
Sivaganga	6	30.0	25.0	31.6	10.5	1.8	10.0	3.2	1.5	2.1	50.0	3.3	6.5	36.0	0.0
Thanjavur	10	45.0	40.0	67.2	18.0	4.3	10.0	4.0	5.5	3.6	117.5	5.1	6.5	74.0	0.0
The Nilgiris	4	0.0	27.5	12.0	7.5	0.7	10.0	0.8	-6.0	1.5	20.0	3.6	6.5	18.0	0.0
Theni	8	15.0	35.0	41.6	15.0	2.5	10.0	4.0	4.5	3.0	72.5	4.8	6.5	38.0	0.0
Thiruvarur	11	15.0	27.5	56.4	19.5	3.2	10.0	4.0	5.0	3.9	100.0	3.6	6.5	64.0	0.0
Thoothukkudi	11	0.0	42.5	45.6	19.5	2.6	10.0	5.6	6.0	3.6	90.0	5.4	6.5	56.0	0.0
Tiruchirappalli	12	15.0	70.0	74.0	16.5	4.7	10.0	2.4	6.5	3.9	132.5	8.7	-6.5	90.0	0.0
Tirunelveli	15	-30.0	72.5	86.4	27.0	4.4	0.0	7.2	7.5	5.4	162.5	9.0	0.0	106.0	0.0
Tiruppur	9	75.0	92.5	58.4	15.0	3.1	10.0	7.2	5.0	3.0	97.5	12.3	6.5	58.0	0.0
Tiruvallur	25	90.0	165.0	122.8	45.0	9.3	10.0	14.4	12.5	9.0	167.5	21.6	6.5	154.0	0.0
Tiruvannamalai	12	30.0	32.5	96.0	21.0	5.7	10.0	3.2	7.0	4.2	165.0	4.2	6.5	100.0	0.0
Vellore	18	105.0	167.5	122.4	31.5	7.3	10.0	10.4	9.0	6.3	207.5	20.7	6.5	136.0	0.0
Villupuram	12	30.0	35.0	109.2	21.0	6.5	10.0	1.6	5.5	4.2	167.5	4.2	6.5	128.0	0.0
Virudhunagar	10	15.0	60.0	42.8	18.0	1.8	10.0	6.4	5.0	3.3	37.5	7.8	6.5	38.0	0.0
Total	**349**	**1455.0**	**2,262.5**	**2,173.2**	**613.5**	**133.1**	**290.0**	**155.2**	**158.5**	**123.6**	**3,550.0**	**285.6**	**175.5**	**2,504.0**	**0.0**

Table 29-27: Cost estimate (in Lakhs Rupees) for gap in fire fighting specialized equipment for operational and new urban fire stations (contd...)

District	Fire Stations	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity Led Torches	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Ariyalur	3	6.3	2.0	5.0	4.0	1.1	2.0	1.6	1.2	122.4
Chennai	28	71.4	24.0	25.0	68.0	4.3	28.6	15.7	10.2	1954.0
Coimbatore	11	25.2	11.0	20.0	24.0	3.5	11.2	8.3	3.9	746.0
Cuddalore	15	33.6	3.0	-5.0	31.2	4.6	14.3	10.2	5.4	628.7
Dharampuri	5	12.6	0.0	5.0	12.4	1.6	6.1	4.3	1.8	278.5
Dindigul	10	23.1	3.0	0.0	16.4	3.2	8.0	5.8	3.6	351.9
Erode	10	23.1	6.0	30.0	21.6	3.0	10.7	7.7	3.6	591.6
Kanchipuram	17	39.9	12.0	-15.0	40.8	3.8	16.8	10.1	6.0	999.4
Kanyakumari	8	16.8	5.0	0.0	13.2	2.4	6.5	4.6	2.7	326.9
Karur	3	6.3	0.0	5.0	6.8	1.1	3.7	2.6	1.2	166.2
Krishnagiri	8	16.8	2.0	5.0	18.4	2.4	8.7	6.1	2.7	394.1
Madurai	13	29.4	10.0	25.0	29.2	4.3	13.6	9.8	4.8	745.2
Nagapattinam	11	23.1	2.0	0.0	17.2	3.5	8.2	5.9	3.9	402.0
Namakkal	5	10.5	5.0	5.0	9.2	1.6	4.8	3.5	1.8	272.6
Perambalur	2	2.1	1.0	0.0	2.4	0.5	1.9	1.3	0.6	55.6
Pudukkottai	12	29.4	4.0	5.0	20.8	3.8	9.5	6.8	4.2	438.0
Ramanathapuram	11	25.2	3.0	5.0	15.2	3.5	7.5	5.3	3.9	314.6
Salem	14	29.4	9.0	25.0	33.6	4.6	15.6	11.2	5.1	718.8
Sivaganga	6	12.6	3.0	5.0	10.0	1.9	5.1	3.6	2.1	254.8
Thanjavur	10	23.1	4.0	5.0	20.0	3.2	9.4	6.6	3.6	475.6
The Nilgiris	4	6.3	4.0	5.0	3.6	1.4	3.1	2.5	1.5	129.4
Theni	8	18.9	4.0	5.0	13.6	2.7	6.5	4.6	3.0	310.6

District	Fire Stations	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity Led Torches	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Thiruvarur	11	27.3	5.0	5.0	17.2	3.5	8.2	5.9	3.9	396.6
Thoothukkudi	11	25.2	6.0	5.0	15.6	3.5	7.8	5.6	3.9	366.0
Tiruchirappalli	12	23.1	5.0	10.0	23.2	3.8	11.1	7.8	4.2	515.8
Tirunelveli	15	35.7	9.0	15.0	26.8	4.9	12.8	9.1	5.4	576.5
Tiruppur	9	18.9	9.0	30.0	17.2	2.7	8.7	6.1	3.0	539.1
Tiruvallur	25	58.8	18.0	20.0	42.4	4.6	17.2	10.1	9.0	1005.6
Tiruvannamalai	12	27.3	2.0	5.0	28.0	3.8	12.6	8.9	4.2	577.0
Vellore	18	42.0	12.0	30.0	35.2	5.4	16.5	11.8	6.3	999.3
Villupuram	12	27.3	2.0	-25.0	32.0	3.5	14.5	10.4	4.2	598.1
Virudhunagar	10	23.1	7.0	-10.0	14.4	3.2	7.1	5.3	3.6	305.9
Total	**349**	**793.8**	**192.0**	**245.0**	**683.6**	**101.0**	**317.9**	**219.0**	**124.5**	**16,556.5**

Table 29-28: 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
Ariyalur	3	0.0	0.0	12.4	6.0	1.0	0.0	0.0	2.0	1.2	25.0	0.0	0.0	16.0	0.0
Chennai	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
Coimbatore	4	0.0	0.0	55.6	7.5	3.7	0.0	0.0	2.5	1.5	92.5	0.0	0.0	62.0	0.0
Cuddalore	1	0.0	0.0	4.8	1.5	0.4	0.0	0.0	0.5	0.3	10.0	0.0	0.0	6.0	0.0
Dharampuri	3	0.0	0.0	20.0	6.0	1.4	0.0	0.0	2.0	1.2	35.0	0.0	0.0	24.0	0.0
Dindigul	6	0.0	0.0	40.4	10.5	2.9	0.0	0.0	3.5	2.1	72.5	0.0	0.0	48.0	0.0
Erode	5	0.0	0.0	37.6	9.0	2.6	0.0	0.0	3.0	1.8	65.0	0.0	0.0	44.0	0.0
Kanchipuram	3	0.0	0.0	22.0	6.0	1.6	0.0	0.0	2.0	1.2	40.0	0.0	0.0	26.0	0.0
Kanyakumari	4	0.0	0.0	32.8	7.5	2.3	0.0	0.0	2.5	1.5	57.5	0.0	0.0	38.0	0.0
Karur	6	0.0	0.0	26.8	10.5	2.0	0.0	0.0	3.5	2.1	50.0	0.0	0.0	34.0	0.0
Krishnagiri	1	0.0	0.0	16.4	1.5	1.1	0.0	0.0	0.5	0.3	27.5	0.0	0.0	18.0	0.0
Madurai	1	0.0	0.0	6.8	1.5	0.5	0.0	0.0	0.5	0.3	12.5	0.0	0.0	8.0	0.0
Nagapattinam	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	14.0	0.0
Namakkal	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	34.0	0.0
Perambalur	3	0.0	0.0	16.4	6.0	1.2	0.0	0.0	2.0	1.2	30.0	0.0	0.0	20.0	0.0
Pudukkottai	1	0.0	0.0	4.8	1.5	0.4	0.0	0.0	0.5	0.3	10.0	0.0	0.0	6.0	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
Ramanathapuram	4	0.0	0.0	11.6	7.5	1.0	0.0	0.0	2.5	1.5	25.0	0.0	0.0	16.0	0.0
Salem	3	0.0	0.0	31.6	6.0	2.2	0.0	0.0	2.0	1.2	55.0	0.0	0.0	36.0	0.0
Sivaganga	5	0.0	0.0	33.6	9.0	2.4	0.0	0.0	3.0	1.8	60.0	0.0	0.0	40.0	0.0
Thanjavur	2	0.0	0.0	11.6	3.0	0.8	0.0	0.0	1.0	0.6	20.0	0.0	0.0	14.0	0.0
The Nilgiris	3	0.0	0.0	12.4	6.0	1.0	0.0	0.0	2.0	1.2	25.0	0.0	0.0	16.0	0.0
Theni	1	0.0	0.0	10.4	1.5	0.7	0.0	0.0	0.5	0.3	17.5	0.0	0.0	12.0	0.0
Thiruvarur	1	0.0	0.0	4.8	1.5	0.4	0.0	0.0	0.5	0.3	10.0	0.0	0.0	6.0	0.0
Thoothukkudi	6	0.0	0.0	28.8	10.5	2.2	0.0	0.0	3.5	2.1	55.0	0.0	0.0	36.0	0.0
Tiruchirappalli	6	0.0	0.0	32.8	10.5	2.4	0.0	0.0	3.5	2.1	60.0	0.0	0.0	40.0	0.0
Tirunelveli	3	0.0	0.0	20.0	6.0	1.4	0.0	0.0	2.0	1.2	35.0	0.0	0.0	24.0	0.0
Tiruppur	6	0.0	0.0	42.4	10.5	3.0	0.0	0.0	3.5	2.1	75.0	0.0	0.0	50.0	0.0
Tiruvallur	2	0.0	0.0	15.2	3.0	1.1	0.0	0.0	1.0	0.6	27.5	0.0	0.0	18.0	0.0
Tiruvannamalai	2	0.0	0.0	15.2	3.0	1.1	0.0	0.0	1.0	0.6	27.5	0.0	0.0	18.0	0.0
Vellore	4	0.0	0.0	26.8	7.5	1.9	0.0	0.0	2.5	1.5	47.5	0.0	0.0	32.0	0.0
Villupuram	2	0.0	0.0	24.8	3.0	1.7	0.0	0.0	1.0	0.6	42.5	0.0	0.0	28.0	0.0
Virudhunagar	3	0.0	0.0	22.0	6.0	1.6	0.0	0.0	2.0	1.2	40.0	0.0	0.0	26.0	0.0
Total	**102**	**0.0**	**0.0**	**679.2**	**184.5**	**48.8**	**0.0**	**0.0**	**61.5**	**36.9**	**1220.0**	**0.0**	**0.0**	**810.0**	**0.0**

Table 29-29: Cost estimate (in Lakhs Rupees) for gap in specialized fire equipment for new rural fire stations (continued...)

District	Fire Stations	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity Led Torches	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Ariyalur	3	8.4	0.0	0.0	4.0	1.1	1.7	1.2	1.2	81.2
Chennai	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coimbatore	4	10.5	0.0	0.0	14.8	1.4	6.3	4.4	1.5	264.2
Cuddalore	1	2.1	0.0	0.0	1.6	0.3	0.7	0.5	0.3	28.9
Dharampuri	3	8.4	0.0	0.0	5.6	1.1	2.4	1.7	1.2	109.9
Dindigul	6	14.7	0.0	0.0	11.6	1.9	4.9	3.5	2.1	218.6
Erode	5	12.6	0.0	0.0	10.4	1.6	4.4	3.1	1.8	197.0
Kanchipuram	3	8.4	0.0	0.0	6.4	1.1	2.7	1.9	1.2	120.5
Kanyakumari	4	10.5	0.0	0.0	9.2	1.4	3.9	2.8	1.5	171.3
Karur	6	14.7	0.0	0.0	8.0	1.9	3.4	2.4	2.1	161.4
Krishnagiri	1	2.1	0.0	0.0	4.4	0.3	1.9	1.3	0.3	75.6
Madurai	1	2.1	0.0	0.0	2.0	0.3	0.9	0.6	0.3	36.2
Nagapattinam	3	8.4	0.0	0.0	3.2	1.1	1.4	1.0	1.2	70.6
Namakkal	5	12.6	0.0	0.0	10.4	1.6	4.4	3.1	1.8	161.8
Perambalur	3	8.4	0.0	0.0	4.8	1.1	2.0	1.4	1.2	95.8
Pudukkottai	1	2.1	0.0	0.0	1.6	0.3	0.7	0.5	0.3	28.9
Ramanathapuram	4	10.5	0.0	0.0	4.0	1.4	1.7	1.2	1.5	85.4
Salem	3	8.4	0.0	0.0	9.2	1.1	3.9	2.8	1.2	160.6
Sivaganga	5	12.6	0.0	0.0	10.0	1.6	4.3	3.0	1.8	183.1
Thanjavur	2	4.2	0.0	0.0	3.2	0.5	1.4	1.0	0.6	61.9
The Nilgiris	3	8.4	0.0	0.0	4.0	1.1	1.7	1.2	1.2	81.2
Theni	1	2.1	0.0	0.0	2.8	0.3	1.2	0.8	0.3	50.4
Thiruvarur	1	2.1	0.0	0.0	1.6	0.3	0.7	0.5	0.3	28.9

District	Fire Stations	Inflatable Lighting Towers	Smoke Exhausters / PPV	Pneumatic lifting bags	High Capacity Led Torches	Static Wireless Sets	Mobile Wireless Sets	Walky Talky	Mega Phones	Total
Thoothukkudi	6	14.7	0.0	0.0	8.8	1.9	3.7	2.6	2.1	172.0
Tiruchirappalli	6	14.7	0.0	0.0	10.0	1.9	4.3	3.0	2.1	187.2
Tirunelveli	3	8.4	0.0	0.0	5.6	1.1	2.4	1.7	1.2	109.9
Tiruppur	6	14.7	0.0	0.0	14.0	1.9	6.0	4.2	2.1	229.3
Tiruvallur	2	4.2	0.0	0.0	4.8	0.5	2.0	1.4	0.6	80.0
Tiruvannamalai	2	4.2	0.0	0.0	4.4	0.5	1.9	1.3	0.6	79.3
Vellore	4	10.5	0.0	0.0	7.6	1.4	3.2	2.3	1.5	146.2
Villupuram	2	4.2	0.0	0.0	6.8	0.5	2.9	2.0	0.6	118.7
Virudhunagar	3	8.4	0.0	0.0	6.8	1.1	2.9	2.0	1.2	121.2
Total	**102**	**258.3**	**0.0**	**0.0**	**201.6**	**33.2**	**85.7**	**60.5**	**36.9**	**3,717.1**

29.4.2 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 29-30 and Table 29-31. The total estimated annual manpower cost for existing and proposed staff will be about **Rs. 840.38 Crores** after filling gap in operational and new urban fire stations and about **Rs. 210.89 Crores** for new rural fire stations (Table 29-30 and Table 29-31).

Table 29-30: Annual cost estimates (in Lakhs Rupees) for manpower for Tamil Nadu 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
Ariyalur	3	0.0	0.0	0.0	0.0	6.4	11.4	20.2	43.0	33.1	375.8	0.8	490.8
Chennai	28	29.5	-13.8	17.2	0.0	0.0	-11.4	292.9	627.8	850.7	5,446.4	10.1	7,249.4
Coimbatore	11	0.0	0.0	17.2	0.0	12.8	22.9	121.2	245.1	384.0	2,728.1	0.8	3,532.1
Cuddalore	15	0.0	0.0	0.0	0.0	0.0	5.7	151.5	236.5	331.0	2,695.7	-1.7	3,418.7
Dharampuri	5	0.0	0.0	0.0	0.0	0.0	5.7	65.7	98.9	172.1	1,328.4	-6.7	1,664.1
Dindigul	10	0.0	0.0	0.0	0.0	0.0	0.0	75.8	150.5	195.3	1,610.3	-3.4	2,028.5
Erode	10	0.0	0.0	0.0	0.0	6.4	17.2	116.2	193.5	297.9	2,381.4	-1.7	3,010.8
Kanchipuram	17	0.0	0.0	0.0	0.0	6.4	5.7	222.2	369.8	566.0	4,124.5	11.8	5,306.4
Kanyakumari	8	0.0	0.0	0.0	0.0	6.4	17.2	80.8	116.1	119.2	1,121.0	-2.5	1,458.1
Karur	3	0.0	0.0	0.0	0.0	6.4	11.4	30.3	77.4	115.9	855.4	2.5	1,099.3
Krishnagiri	8	0.0	0.0	0.0	0.0	6.4	17.2	90.9	150.5	228.4	1,791.7	-6.7	2,278.4
Madurai	13	0.0	0.0	17.2	0.0	6.4	11.4	156.6	262.3	397.2	2,647.1	-3.4	3,494.8
Nagapattinam	11	0.0	0.0	0.0	0.0	6.4	17.2	65.7	150.5	188.7	1,671.8	-5.0	2,095.2
Namakkal	5	0.0	0.0	0.0	0.0	0.0	5.7	55.6	94.6	155.6	1,140.5	-0.8	1,451.1
Perambalur	2	0.0	0.0	0.0	0.0	6.4	17.2	20.2	30.1	36.4	320.8	-2.5	428.5
Pudukkottai	12	0.0	0.0	0.0	0.0	-6.4	5.7	106.1	159.1	172.1	1,697.8	5.9	2,140.2
Ramanathapuram	11	0.0	0.0	0.0	0.0	6.4	17.2	70.7	133.3	125.8	1,409.4	-6.7	1,756.0
Salem	14	0.0	13.8	17.2	0.0	6.4	11.4	197.0	288.1	450.2	3,285.4	-6.7	4,262.7
Sivaganga	6	0.0	0.0	0.0	0.0	6.4	17.2	60.6	81.7	86.1	871.6	-3.4	1,120.1
Thanjavur	10	0.0	0.0	0.0	0.0	6.4	17.2	111.1	172.0	201.9	1,791.7	8.4	2,308.7
The Nilgiris	4	0.0	0.0	0.0	0.0	12.8	22.9	40.4	60.2	82.8	848.9	-2.5	1,065.4
Theni	8	0.0	0.0	0.0	0.0	0.0	5.7	55.6	116.1	162.2	1,237.7	-5.9	1,571.4
Thiruvarur	11	0.0	0.0	0.0	0.0	6.4	17.2	40.4	184.9	201.9	1,714.0	-3.4	2,161.4
Thoothukkudi	11	0.0	0.0	0.0	0.0	6.4	17.2	25.3	154.8	139.0	1,328.4	-1.7	1,669.4
Tiruchirappalli	12	14.8	0.0	17.2	0.0	6.4	5.7	121.2	215.0	261.5	2,190.2	10.1	2,842.1

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
Tirunelveli	15	0.0	13.8	17.2	0.0	6.4	5.7	156.6	227.9	321.1	2,546.6	-12.6	3,282.7
Tiruppur	9	0.0	0.0	0.0	0.0	6.4	17.2	111.1	176.3	235.0	1,944.0	-3.4	2,486.6
Tiruvallur	25	0.0	0.0	0.0	0.0	0.0	0.0	176.8	434.3	476.6	3,878.3	19.3	4,985.3
Tiruvannamalai	12	0.0	0.0	0.0	0.0	6.4	17.2	136.4	219.3	340.9	2,465.6	10.1	3,195.9
Vellore	18	0.0	0.0	17.2	0.0	6.4	11.4	166.7	335.4	278.0	3,732.5	11.8	4,559.4
Villupuram	12	0.0	13.8	17.2	0.0	6.4	17.2	156.6	258.0	413.8	2,951.6	-10.9	3,823.6
Virudhunagar	10	0.0	0.0	0.0	0.0	0.0	0.0	50.5	146.2	192.0	1,419.1	-6.7	1,801.1
Total	**349**	**44.3**	**27.5**	**137.8**	**0.0**	**153.6**	**360.4**	**3,348.2**	**6,209.2**	**8,212.1**	**65,551.7**	**-6.7**	**84,037.9**

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

Table 29-31: Cost estimate (in Lakhs Rupees) manpower in Tamil Nadu 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
Ariyalur	3	0.0	0.0	0.0	0.0	0.0	0.0	5.1	38.7	39.7	252.7	2.5	338.7
Chennai	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
Coimbatore	4	0.0	0.0	0.0	0.0	0.0	0.0	80.8	124.7	218.5	1,448.3	3.4	1,875.6
Cuddalore	1	0.0	0.0	0.0	0.0	0.0	0.0	5.1	8.6	6.6	100.4	0.8	121.6
Dharampuri	3	0.0	0.0	0.0	0.0	0.0	0.0	25.3	47.3	62.9	447.1	2.5	585.1
Dindigul	6	0.0	0.0	0.0	0.0	0.0	0.0	50.5	98.9	129.1	874.8	5.0	1,158.3
Erode	5	0.0	0.0	0.0	0.0	0.0	0.0	50.5	90.3	122.5	823.0	4.2	1,090.4
Kanchipuram	3	0.0	0.0	0.0	0.0	0.0	0.0	25.3	55.9	76.1	486.0	2.5	645.8
Kanyakumari	4	0.0	0.0	0.0	0.0	0.0	0.0	35.4	81.7	135.7	891.0	3.4	1,147.1
Karur	6	0.0	0.0	0.0	0.0	0.0	0.0	20.2	77.4	79.4	541.1	5.0	723.2
Krishnagiri	1	0.0	0.0	0.0	0.0	0.0	0.0	25.3	34.4	82.8	554.0	0.8	697.3
Madurai	1	0.0	0.0	0.0	0.0	0.0	0.0	5.1	17.2	23.2	152.3	0.8	198.5
Nagapattinam	3	0.0	0.0	0.0	0.0	0.0	0.0	5.1	30.1	23.2	200.9	2.5	261.7
Namakkal	5	0.0	0.0	0.0	0.0	0.0	0.0	45.5	86.0	125.8	839.2	4.2	1,100.6
Perambalur	3	0.0	0.0	0.0	0.0	0.0	0.0	20.2	38.7	39.7	353.2	2.5	454.3
Pudukkottai	1	0.0	0.0	0.0	0.0	0.0	0.0	5.1	8.6	6.6	100.4	0.8	121.6
Ramanathapuram	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.0	33.1	200.9	3.4	280.3
Salem	3	0.0	0.0	0.0	0.0	0.0	0.0	45.5	77.4	119.2	754.9	2.5	999.5
Sivaganga	5	0.0	0.0	0.0	0.0	0.0	0.0	45.5	86.0	105.9	774.4	4.2	1,015.9
Thanjavur	2	0.0	0.0	0.0	0.0	0.0	0.0	10.1	25.8	33.1	252.7	1.7	323.4
The Nilgiris	3	0.0	0.0	0.0	0.0	0.0	0.0	5.1	38.7	39.7	252.7	2.5	338.7

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
Theni	1	0.0	0.0	0.0	0.0	0.0	0.0	10.1	25.8	36.4	236.5	0.8	309.7
Thiruvarur	1	0.0	0.0	0.0	0.0	0.0	0.0	5.1	8.6	6.6	100.4	0.8	121.6
Thoothukkudi	6	0.0	0.0	0.0	0.0	0.0	0.0	25.3	77.4	79.4	589.7	5.0	776.8
Tiruchirappalli	6	0.0	0.0	0.0	0.0	0.0	0.0	30.3	94.6	112.5	722.5	5.0	965.0
Tirunelveli	3	0.0	0.0	0.0	0.0	0.0	0.0	20.2	51.6	69.5	440.6	2.5	584.5
Tiruppur	6	0.0	0.0	0.0	0.0	0.0	0.0	60.6	116.1	168.8	1,121.0	5.0	1,471.6
Tiruvallur	2	0.0	0.0	0.0	0.0	0.0	0.0	25.3	38.7	53.0	382.3	1.7	500.9
Tiruvannamalai	2	0.0	0.0	0.0	0.0	0.0	0.0	20.2	34.4	56.3	346.7	1.7	459.2
Vellore	4	0.0	0.0	0.0	0.0	0.0	0.0	30.3	64.5	89.4	599.4	3.4	786.9
Villupuram	2	0.0	0.0	0.0	0.0	0.0	0.0	35.4	55.9	112.5	748.4	1.7	953.9
Virudhunagar	3	0.0	0.0	0.0	0.0	0.0	0.0	30.3	51.6	66.2	531.4	2.5	682.0
Total	**102**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**803.0**	**1728.6**	**2353.4**	**16,119.0**	**85.7**	**21,089.6**

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

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 29-32). The total estimated cost on vehicle maintenance & repairs, and PDL will be **Rs. 31.56 Crores** per year for filling the gap in operational and urban areas in Tamil Nadu. The annual specialized equipments, building maintenance, office expanses, and training expanses will be about **Rs. 15.01 Crores, 37.45 Crores, 63.94 Crores** and **Rs. 11.16 Crores**, respectively.

Table 29-32: 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
Ariyalur	3	19.10	14.32	10.61	31.50	37.23	6.50
Chennai	28	209.27	156.95	184.87	369.00	578.29	100.97
Coimbatore	11	67.82	50.86	64.74	137.50	252.93	44.16
Cuddalore	15	64.62	48.46	61.13	165.50	268.08	46.81
Dharampuri	5	34.03	25.52	23.70	56.50	121.46	21.21
Dindigul	10	40.43	30.32	31.85	88.50	161.25	28.15
Erode	10	62.03	46.52	49.15	110.00	215.88	37.69
Kanchipuram	17	82.31	61.73	89.05	226.50	374.87	65.45
Kanyakumari	8	35.21	26.41	30.25	83.00	118.28	20.65
Karur	3	25.00	18.75	14.54	37.00	80.25	14.01
Krishnagiri	8	42.83	32.12	33.87	91.00	161.57	28.21
Madurai	13	74.75	56.06	65.72	154.00	264.60	46.20
Nagapattinam	11	40.69	30.51	36.42	94.50	162.09	28.30
Namakkal	5	29.54	22.15	23.40	57.00	104.04	18.17
Perambalur	2	18.02	13.51	7.55	22.50	33.81	5.90
Pudukkottai	12	46.72	35.04	37.12	107.50	168.66	29.45
Ramanathapuram	11	37.58	28.19	30.81	80.50	135.05	23.58
Salem	14	82.81	62.10	66.31	188.50	312.50	54.56
Sivaganga	6	30.53	22.90	22.28	62.50	89.07	15.55
Thanjavur	10	46.67	35.00	40.67	107.00	173.95	30.37
The Nilgiris	4	36.02	27.01	15.17	37.00	81.27	14.19
Theni	8	35.83	26.87	27.99	74.50	128.78	22.48
Thiruvarur	11	40.57	30.42	33.73	92.00	161.82	28.25
Thoothukkudi	11	51.11	38.33	33.09	92.50	147.30	25.72
Tiruchirappalli	12	63.14	47.36	50.80	107.50	220.15	38.44
Tirunelveli	15	70.93	53.19	55.37	143.50	259.29	45.27
Tiruppur	9	56.08	42.06	45.22	90.50	180.71	31.55
Tiruvallur	25	99.13	74.34	93.93	261.00	385.31	67.28
Tiruvannamalai	12	57.76	43.32	48.48	145.00	241.36	42.14
Vellore	18	85.94	64.46	83.23	185.00	340.79	59.50
Villupuram	12	77.08	57.81	55.40	162.00	283.56	49.51
Virudhunagar	10	40.00	30.00	34.70	84.00	149.86	26.17
Total	**349**	**1,803.52**	**1,352.64**	**1,501.17**	**3,744.50**	**6,394.03**	**1,116.42**

Table 29-33: 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	625.75	269.85	22.08	917.68
Gap in Operational Fire Stations	979.50	413.11	136.43	1,529.03
New Urban Fire Stations	267.00	68.51	29.14	364.65
Total Gap in New Urban and Operational Fire Stations	1,246.50	481.62	165.56	1,893.68
New Rural Fire Stations	448.00	126.87	37.17	612.04
Total Gap in New Urban, New Rural and Operational Fire Stations	1,694.50	608.48	202.74	2,505.72

Table 29-34: 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	174.55	6.48	1.77	4.86	12.52	11.00	1.92	213.08
Gap in Operational Fire Stations	705.63	9.91	10.91	7.44	19.59	44.45	7.76	805.70
New Urban Fire Stations	134.75	1.64	2.33	1.23	5.34	8.49	1.48	155.27
Total Gap in New Urban and Operational Fire Stations	840.38	11.56	13.25	8.67	24.93	52.94	9.24	960.97
New Rural Fire Stations	210.90	3.04	2.97	2.28	8.96	13.29	2.32	243.76
Total Gap in New Urban ,New Rural and Operational Fire Stations	1,051.28	14.60	16.22	10.95	33.89	66.23	11.56	1,204.74

29.5 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 Tamil Nadu State (Table 29-35 and Table 29-36).

Table 29-35: State level 10 year investment plan for Tamil Nadu Fire & Rescue Service 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	249.30	274.77	27.23	527.36	33.22	5.80	22.31	1,140.00
Second Year	276.72	288.51	44.67	985.79	62.11	10.17	32.43	1,700.40
Third Year	153.58	21.53	49.46	1,137.90	71.69	11.00	33.84	1,479.00
Fourth Year	170.47	22.61	54.73	1,312.31	82.68	11.89	35.28	1,689.97
Fifth Year	189.23	11.87	59.82	1,490.99	93.93	12.67	36.19	1,894.70
Sixth Year	210.05	12.46	65.37	1,693.65	106.70	13.49	37.11	2,138.84
Seventh Year	233.15	13.09	71.43	1,923.49	121.18	14.37	38.05	2,414.74
Eighth Year	258.80	13.74	78.03	2,184.10	137.60	15.29	39.00	2,726.56
Ninth Year	0.00	14.43	85.24	2,479.55	156.21	16.28	39.97	2,791.68
Tenth Year	0.00	15.15	93.10	2,814.47	177.31	17.32	40.95	3,158.30
Total	**1,741.30**	**688.15**	**629.09**	**16,549.61**	**1,042.63**	**128.28**	**355.13**	**21,134.18**

Table 29-36: State level 10 year investment plan for Tamil Nadu Fire & Rescue Service 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	338.90	274.77	27.23	527.36	33.22	5.80	22.31	1,229.60
Second Year	376.18	288.51	44.67	985.79	62.11	10.17	32.43	1,799.85
Third Year	208.78	57.70	51.40	1,190.81	75.02	11.51	35.67	1,630.89
Forth Year	231.74	60.59	58.92	1,430.83	90.14	12.97	38.97	1,924.15
Fifth Year	257.24	31.81	65.47	1,656.91	104.39	14.08	40.85	2,170.74
Sixth Year	285.54	33.40	72.69	1,916.66	120.75	15.27	42.76	2,487.06
Seventh Year	316.94	35.07	80.65	2,214.88	139.54	16.54	44.71	2,848.32
Eighth Year	351.81	36.82	89.42	2,557.07	161.10	17.90	46.69	3,260.81
Ninth Year	0.00	38.66	99.07	2,949.51	185.82	19.36	48.70	3,341.12
Tenth Year	0.00	40.60	109.70	3,399.30	214.16	20.92	50.75	3,835.42
Total	**2,367.13**	**897.92**	**699.21**	**18,829.11**	**1,186.24**	**144.52**	**403.84**	**24,527.96**

29.6 Prioritization of new Fire Stations/Fire Posts

For prioritization of new fire stations/fire posts, the RMSI team has strictly followed risk categorization and estimated population density in the jurisdiction of new fire station/fire post as criteria. Accordingly, the priority for establishing new urban fire stations and rural fire stations/posts has been given in Tables 29-38 and 29-39, 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, Tamil Nadu Fire & Rescue Service may change the priority of a new fire station/fire post depending upon the local situation and requirements.

29.7 Avenues of Fund Generation

Tamil Nadu 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.

29.8 Capacity Building and Training Facilities

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

The Tamil Nadu state is running a fully-fledged State Training School, located near Tambaram in Chennai. The Centre is running regularly Basic courses, Refresher courses for department officers as well as special courses for employees of other government departments and private industries. The central government have selected this training centre as a Regional Training Centre for National Fire Service College, Nagpur (NFSC) and the Sub Officer Courses are regularly being conducted in the centre on behalf of NFSC, Nagpur.

Apart from this, The state is required to further strengthen and expand its Training Facilities. As a step toward this, The TN FRS, has also identified 12.84 Acres of land near Thiruporur to establish an Academy with state-of-the-art training facilities. The Academy is aimed to impart high quality basic as well as in-service training courses.

The roles of firefighter cannot be performed until and unless sufficient training is being imparted to the fire service personnel. The types of training and duration depend upon the type of entry to the fire service department or change of responsibility on promotion. Broadly, there are three entry levels in fire services in India; 1) Fireman level 2) Middle level (Sub Officer/ Asstt. Station Officer) and 3) Senior level. Immediately after joining the Fire Services, it is mandatory that every fire personnel needs to undergo professional training.

In 2011, 61 personnel of Tamil Nadu FRS have gone through the Sub-Office course at NFSC, Nagpur. Apart from this, The State Training Centre also imparted 3 months Fireman training to 77 personnel as well as leading Fireman training to 49 personnel. From 2006 to 2011, more than 2000 personnel of the Tamil Nadu FRS have been trained in different courses of various durations. Additionally, State has also sent its officials on International Training.

In order to further strengthen the Tamil Nadu FRS, the gap in training has been estimated for various levels of fire personnel. The fire station survey and gap analysis reveal that there is some gaps in training need for existing staff. The previous section (section 29.3.3.) details about gap in manpower for operational fire stations and need of additional fire personnel for new urban and new rural fire stations. As per the guidelines of SFAC, immediately after recruitment,

fire personnel should undertake professional trainings. Moreover, there should be refresher-training courses at an interval of 3 to 5 years for every fire personnel. The following sections detail about the estimation of training need at different levels (fireman, leading fireman, station officer, sub-officer etc.).

29.8.1 BASIC TRAINING FOR FIREMAN

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

Estimated number of fire personnel who require basic training for fireman in operational fire stations (after filling the gap of manpower), and additional new recruitment for new urban and new rural fire stations is shown in Table 29-37. Additional requirement of Refresher Training Course for fireman after every 3-5 years of service is also shown the Table 29-37. 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, Tamil Nadu Fire & Rescue Service would require to train 26,312 fire personnel in basic and 16,287 fire personnel in refresher training in next 10 years. Therefore, state training centre should have adequate capacity and infrastructure for meeting such training requirement.

Table 29-37: Estimated training requirements for fire personnel in Tamil Nadu Fire Services

Basic Training for Fireman		
	Number of Fire Personnel in Operational Fire Stations	18,194
	Number of Fire Personnel in New Urban Fire Stations	3,143
	Number of Fire Personnel in New Rural Fire Stations	4,975
	Total Number of Fire Personnel for Training	**26,312**
Refresher Training for Fireman		
	Total Number of Fire Personnel	**16,287**
Leading Fireman Training Course		
	Number of Fire Personnel in Operational Fire Stations	2,301
	Number of Fire Personnel in New Urban Fire Stations	464
	Number of Fire Personnel in New Rural Fire Stations	711
	Total Number of Fire Personnel for Training	3,476
Other specialized Training Course		
	Total Number of Fire Personnel for Training	**2,765**
Junior Officer Training Course		
	Number of Fire Personnel in Operational Fire Stations	1,875
	Number of Fire Personnel in New Urban Fire Stations	332
	Number of Fire Personnel in New Rural Fire Stations	561
	Total Number of Fire Personnel for Training	**2,768**
Divisional Officer Training Course		
	Number of Fire Personnel in Operational Fire Stations	95
	Number of Fire Personnel in New Urban Fire Stations	36
	Number of Fire Personnel in New Rural Fire Stations	0
	Total Number of Fire Personnel for Training	**131**
Fire Prevention Course		
	Total Number of Fire Personnel for Training	**192**

29.8.2 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 29-37.

29.8.3 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 29-38. In total, Tamil Nadu Fire & Rescue Service would need to train at least 2,765 firefighters for specialized courses in next 10 years.

29.8.4 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 29.37. After filling gap in operational fire stations, new urban and rural fire stations, Tamil Nadu Fire & Rescue Service would require to train 2,768 junior officers in next 10 years.

29.8.5 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 29-38. About 131 fire officers in Tamil Nadu Fire & Rescue Service who would require this training in next 10 years.

29.8.6 FIRE PREVENTION TRAINING COURSE

Beside Firefighting and rescue operations, creating awareness about fire prevention is also integral part of TN FRS. The State FRS has already set up separate Fire Prevention Wings at 12 different places in the State. These Wings are to create awareness and educate rural and urban population to learn fire prevention methods using different Aids.

Apart from this, the Fire Prevention Wings need to involve for inspection, awareness generation, and training for schools, colleges, hospitals, cinema halls, high-rise buildings, shopping malls govt. offices, public buildings etc. Though Fire & Rescue Services in the state are creating public awareness programs for schools, hospitals, Govt. offices, etc. however, it is not meeting the requirement to the desired level due to lack of dedicated trained manpower, resources, and funds. For that purpose sufficient manpower at senior officer levels have been recommended to have an dedicated "*Fire Prevention Wing*". The fire prevention wing should have trained officials for fire inspection, awareness and training, so that fire incidences similar to that of AMRI, Kolkata should not occur in the state. The state should have a dedicated "*Education Van*" in each district for the purpose. The van should be well equipped with short video films as produced by MHA, distribution of pamphlets on "DO"s and "DON'T"s generated by MHA, and live demonstration of how to use "portable extinguishers" and handle small fires. Accordingly, the state would require to train about 192 fire officials in fire prevention course

29.8.7 AWARENESS GENERATION PROGRAMS

Besides attending regular fire and other rescue calls, the state fire & rescue services should intensify their awareness generation programs, and it should conduct regular awareness programs throughout the year in schools, colleges, hospitals, shopping malls, cinema halls, industries, residential areas, NCC camps, nuclear and thermal power plants, Govt. offices etc..

29.9 Limitations of the Study

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

29.10 Recommendations for Tamil Nadu Fire & Rescue Services

1. At present, the state has Fire Service Act of 1985, which need thorough revision and updated to meet provisions of National Building Code (NBC, 2005). National Building Code (NBC) should be strictly adhered to in high-rise buildings, schools, colleges, shopping malls, cinema halls, hospitals, industrial units, institutions and public and private buildings.
2. Computerization of TN FRS was envisioned and accordingly several initiatives have been taken, for example, TN FRS has already a dedicated website (http://www.tnfrs.tn.nic.in/). The website provides DO's and DON'Ts on various issues such as Kitchen Fire Safety, leakage of LPG gas cylinders, fire in cinema halls. However, the TN FRS website can be further improved to issue online Fire Reports to public after say 72 hours of a Fire Incidence, and various other forms required for fire safety clearance.
3. The Tamil Nadu FRS lacks significant firefighting manpower and there are large number of vacancies at all levels in the state in operational fire stations, which need to be filled up at the earliest.
4. Instead of having firemen, driver, and operator separately, the state should recruit fireman-cum-driver-cum-operator. This will help in optimizing the huge manpower requirements. Since, these may not be readily available, the state should train the new recruit in a systematic manner, and encourage all existing staff, specially, fireman and leading fireman to obtain heavy vehicle driving license. The state may offer some incentive towards this, as this will help in optimization of resources.
5. Based on prioritization of fire stations, State Fire Services needs to add new fire stations at a faster pace, as there is a huge gap both in urban and rural areas.
6. Though, the State Fire and Rescue Services has a online vehicle tracking through GPS for and development of a fully computerized response system is another area for improvement.
7. Though fire services in the state are creating public awareness programs for schools, colleges, shopping malls, cinema halls, hospitals, Govt. offices, industries etc. however, it is not up to the desired level due to lack of dedicated trained manpower. For that purpose sufficient manpower at senior officer levels have been recommended to have an effective state "*Fire Prevention Wing*". The fire prevention wing should have trained officials for fire inspection, awareness and training, so that fire incidences similar to that of AMRI, Kolkata should not occur in the state. The state should have a dedicated "*Education Van*" in each district for the purpose. The van should be well equipped with short video films as produced by MHA, distribution of pamphlets on "DO"s and "DON'T"s generated by MHA, and live demonstration of how to use "portable extinguishers" and handle small fires.
8. Periodic, round the year fire drills and fire-inspection of schools, colleges, shopping malls, cinema halls, hospitals, public and private buildings, and major industrial centers should be carried out by the TN FRS through a dedicated staff required for the purpose.
9. For congested areas, and by-lanes where movement of Water Tender and Water Bowser is difficult, QRTs and motorcycle with mist sets should be used for the fastest response, supplemented by the Water Tenders and Water Bowsers by laying the large hose pipelines. Additionally, State Fire and Rescue Services should identify congested areas and request district administration to decongest such areas with the help of police. The congestion could be in terms of illegal extension of residential buildings, shops, unauthorized parking on roads. For unauthorized parking, state traffic department can also play an important role. Here role of fire prevention officials

is important as such, exercises are not one time exercise and should be carried out regularly.

10. The State Fire Services has required rules and these are being adhered in recruitment at different levels. There are some promotional of Fire personnel in the State. However, there is an urgent need to have merit-based promotion, so that deserving employees remain motivated and do not leave the organization at midst of their career.
11. The Fire & Rescue Services in the State should have audit by a central authority to ensure good finance mechanism for capital, and O&M expenditures.

Table 29-38: Details of operational and new proposed Urban Fire Stations with their ideal jurisdiction area, estimated ideal served population under their jurisdiction, and priority ranking for new fire stations

District	FS Ref No	Fire Station Name	Operational Type	Population Density	priority
ARIYALUR	TN2552	Ariyallur Fire & Rescue Station	Operational Urban	4,087	
ARIYALUR	TN2580	Jayankondam Fire & Rescue Station	Operational Urban	736	
CHENNAI	TN2103	VOC Nagar Fire & Rescue Station	Operational Urban	22,162	
CHENNAI	TN2105	Sembiam Fire & Rescue Station	Operational Urban	27,598	
CHENNAI	TN2108	Korukkupet Fire & Rescue Station	Operational Urban	23,287	
CHENNAI	TN2112	Vepery Fire & Rescue Station	Operational Urban	37,714	
CHENNAI	TN2114	Triplicane Fire & Rescue Station	Operational Urban	23,082	
CHENNAI	TN2115	Vyasarpadi Fire & Rescue Station	Operational Urban	31,000	
CHENNAI	TN2117	Villivakkam Fire & Rescue Station	Operational Urban	20,288	
CHENNAI	TN2118	Royapuram Fire & Rescue Station	Operational Urban	20,026	
CHENNAI	TN2123	Secretariat Fire & Rescue Station	Operational Urban	4,245	
CHENNAI	TN2126	Kilpauk Fire & Rescue Station	Operational Urban	30,169	
CHENNAI	TN2127	Washermanpet Fire & Rescue Station	Operational Urban	22,375	
CHENNAI	TN2129	Egmore Fire & Rescue Station	Operational Urban	25,543	
CHENNAI	TN2133	Tondiarpet Fire & Rescue Station	Operational Urban	32,246	
CHENNAI	TN2134	Koyambedu Fire & Rescue Station	Operational Urban	24,445	
CHENNAI	TN2135	Rajbhavan Fire & Rescue Station	Operational Urban	14,870	
CHENNAI	TN2138	Thiyagaraya Nagar Fire & Rescue station	Operational Urban	38,667	
CHENNAI	TN2141	Guindy Fire & Rescue Station	Operational Urban	18,974	
CHENNAI	TN2142	Saidapet Fire & Rescue Station	Operational Urban	30,635	
CHENNAI	TN2148	Teynampet Fire & Rescue Station	Operational Urban	31,224	
CHENNAI	TN2152	Mylapore Fire & Rescue Station	Operational Urban	32,802	
CHENNAI	TN2154	Thiruvanmiyur Fire & Rescue Station	Operational Urban	20,836	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	priority
CHENNAI	TN2155	Ashok Nagar Fire & Rescue Station	Operational Urban	36,046	
CHENNAI	TN2110	Esplanade Fire & Rescue Station	Operational Urban	28,094	
CHENNAI	TN_New_Ur_65	Choolaimedu	New Urban	39,884	1
CHENNAI	TN_New_Ur_66	Anna Nager	New Urban	30,895	2
CHENNAI	TN_New_Ur_67	Venkatesapuram Colony	New Urban	27,435	3
CHENNAI	TN_New_Ur_68	Kolathur	New Urban	27,310	4
CHENNAI	TN_New_Ur_70	Mandavelli	New Urban	18,864	6
COIMBATORE	TN2878	Mettupalayam Fire & Rescue Station	Operational Urban	7,863	
COIMBATORE	TN2915	Pollach Fire & Rescue Station	Operational Urban	2,933	
COIMBATORE	TN2916	Valparai Fire & Rescue Station	Operational Urban	256	
COIMBATORE	TN2843	Ganapathy Fire & Rescue Station	Operational Urban	11,182	
COIMBATORE	TN2848	Coimbatore (North) Fire & Rescue Station	Operational Urban	10,523	
COIMBATORE	TN2852	Peelemedu Fire & Rescue Station	Operational Urban	9,090	
COIMBATORE	TN2869	Coimbatore(South) Fire & Rescue Station	Operational Urban	10,252	
COIMBATORE	TN_New_Ur_92	Ondi Pudur	New Urban	6,603	13
COIMBATORE	TN_New_Ur_93	Saravanampatti	New Urban	5,424	15
COIMBATORE	TN_New_Ur_91	Podanur	New Urban	5,346	16
COIMBATORE	TN_New_Ur_94	Thudiyalur	New Urban	3,647	20
CUDDALORE	TN2671	Cuddalore Fire & Recsue Station	Operational Urban	3,586	
CUDDALORE	TN2685	Nellikuppam Fire & Rescue Station	Operational Urban	2,916	
CUDDALORE	TN2763	Panruti Fire & Rescue Station	Operational Urban	2,349	
CUDDALORE	TN2813	Chidambaram Fire & Rescue Station	Operational Urban	7,175	
CUDDALORE	TN2817	Virudhachalam Fire & Rescue Station	Operational Urban	6,176	
DHARAMPURI	TN2923	Dharmapuri Fire & Rescue Station	Operational Urban	9,102	
DINDIGUL	TN2950	Kodaikonal Fire & Rescue Station	Operational Urban	2,323	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	priority
DINDIGUL	TN3116	Palani Fire & Rescue Station	Operational Urban	3,283	
DINDIGUL	TN3117	Dindigul Fire & Rescue Station	Operational Urban	5,649	
DINDIGUL	TN_New_Ur_112	Malaipatty	New Urban	5,205	17
ERODE	TN2914	Sathyamangalam Fire & Rescue Station	Operational Urban	831	
ERODE	TN2917	Erode Fire & Rescue Station	Operational Urban	12,975	
ERODE	TN2929	Bhavani Fire & Rescue Station	Operational Urban	7,886	
ERODE	TN2939	Gobichettipalayam Fire & Rescie Station	Operational Urban	4,980	
ERODE	TN_New_Ur_88	Vairapalayam	New Urban	6,476	45
KANCHIPURAM	TN2143	Tambaram Fire & Rescue Station	Operational Urban	5,634	
KANCHIPURAM	TN2337	Irungattnkottai Sipcot Fire & Rescue Station	Operational Urban	807	
KANCHIPURAM	TN2340	Sriperumpudur Fire & Rescue Station	Operational Urban	536	
KANCHIPURAM	TN2346	Madurantakam Fire & Rescue Station	Operational Urban	1,379	
KANCHIPURAM	TN2352	Kancheepuram Fire & Rescue Station	Operational Urban	8,180	
KANCHIPURAM	TN2364	Chengelpattu Fire & Rescue Station	Operational Urban	2,006	
KANCHIPURAM	TN2366	Maraimalai Nagar Fire & Rescue Station	Operational Urban	1,145	
KANCHIPURAM	TN_New_Ur_147	Madipakkam	New Urban	24,669	5
KANCHIPURAM	TN_New_Ur_76	Nanganallur	New Urban	16,683	7
KANCHIPURAM	TN_New_Ur_77	Sholinganallur	New Urban	6,786	12
KANCHIPURAM	TN_New_Ur_78	Medavakkam	New Urban	4,330	18
KANCHIPURAM	TN_New_Ur_79	Kunrathur	New Urban	2,692	22
KANCHIPURAM	TN_New_Ur_81	Guduvancheri	New Urban	1,729	25
KANYAKUMARI	TN2814	Thuckalay Fire & Rescue Station	Operational Urban	2,939	
KANYAKUMARI	TN2818	Nagercoil Fire & Rescue Station	Operational Urban	950	
KANYAKUMARI	TN2824	Kuzhithurai Fire & Rescue Station	Operational Urban	3,090	
KANYAKUMARI	TN2827	Colachel Fire & Rescue Station	Operational Urban	2,906	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	priority
KANYAKUMARI	TN_New_Ur_122	Keezhavannanvalai	New Urban	7,118	44
KARUR	TN2683	Karur Fire & Rescue Station,	Operational Urban	4,865	
KRISHNAGIRI	TN2990	Krishnagiri Fire & Rescue Station	Operational Urban	17,325	
KRISHNAGIRI	TN3022	Hosur Fire & Rescue Station	Operational Urban	2,868	
KRISHNAGIRI	TN_New_Ur_85	Bathlapalli	New Urban	2,578	46
MADURAI	TN2546	Madurai Fire & Rescue Station	Operational Urban	18,546	
MADURAI	TN2554	Tallakulam Fire & Rescue Station	Operational Urban	16,346	
MADURAI	TN2559	Anuppanadi Fire & Rescue Station	Operational Urban	9,135	
MADURAI	TN2578	Thirumangalam Fire & Rescue Station	Operational Urban	1,349	
MADURAI	TN2600	Melur Fire & Rescue Station	Operational Urban	2,726	
MADURAI	TN2602	Usilampatti Fire & rescue Station	Operational Urban	2,744	
MADURAI	TN_New_Ur_113	Anjal Nager	New Urban	13,348	9
MADURAI	TN_New_Ur_57	K. Pudur	New Urban	7,906	11
MADURAI	TN_New_Ur_114	Thirupparankundram	New Urban	3,682	19
NAGAPATTINAM	TN2427	Vedaranyam Fire & Rescue Station	Operational Urban	2,846	
NAGAPATTINAM	TN2679	Mayiladuthurai Fire & Rescue Station	Operational Urban	5,518	
NAGAPATTINAM	TN2690	Nagapattinam Fire & Rescue Station	Operational Urban	3,352	
NAGAPATTINAM	TN2697	Sirkali Fire & Rescue Station	Operational Urban	576	
NAMAKKAL	TN2868	Tiruchengodu Fire & Rescue Station	Operational Urban	6,061	
NAMAKKAL	TN2870	Namakkal Fire & Rescue Station	Operational Urban	9,641	
NAMAKKAL	TN2872	Rasipuram Fire & Rescue Station	Operational Urban	2,300	
NAMAKKAL	TN_New_Ur_89	Pallipalayam	New Urban	5,398	33
NILGIRI	TN2911	Gudalur Fire & Rescue Station	Operational Urban	1,121	
NILGIRI	TN2912	Uthagamandalam Fire & Rescue Station	Operational Urban	7,924	
NILGIRI	TN2913	Coonor Fire & Rescue Station	Operational Urban	5,342	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	priority
PERAMBALUR	TN2544	Perambalur Fire & Rescue Station	Operational Urban	1,208	
PUDUKKOTTAI	TN2412	Aranthangi Fire & Rescue Station	Operational Urban	2,048	
PUDUKKOTTAI	TN2415	Pudukkotai Sipcot Fire & Rescue Station	Operational Urban	343	
PUDUKKOTTAI	TN2438	Pudukkotai Fire & Rescue Station	Operational Urban	3,662	
RAMANATHAPURAM	TN2762	Rameswaram Fire & Rescue Station	Operational Urban	1,253	
RAMANATHAPURAM	TN2777	Ramanathapuram Fire & Rescue Station	Operational Urban	3,887	
RAMANATHAPURAM	TN2793	Paramakudi Fire & Rescue Station	Operational Urban	2,945	
SALEM	TN2846	Attur Fire & Rescue Station	Operational Urban	3,254	
SALEM	TN2851	Mettur Thermal Fire & Rescue Station	Operational Urban	1,828	
SALEM	TN2856	Mettur Fire & Rescue Station	Operational Urban	5,258	
SALEM	TN2862	Suramangalam Fire & Rescue Station	Operational Urban	9,279	
SALEM	TN2863	Salem Fire & Rescue Station	Operational Urban	11,190	
SALEM	TN_New_Ur_12	Ammapet	New Urban	8,373	29
SALEM	TN_New_Ur_87	Seelanaickenpatti	New Urban	7,630	30
SALEM	TN_New_Ur_86	Periyakollapatti	New Urban	7,516	31
SIVAGANGA	TN2713	Devakottai Fire & Rescue Station	Operational Urban	1,769	
SIVAGANGA	TN2716	Kraikudi Fire & Rescue Station	Operational Urban	4,802	
SIVAGANGA	TN2732	Sivaganga Fire & Rescue Station	Operational Urban	1,349	
TENI	TN2632	Periyakulam Fire & Rescue Station	Operational Urban	2,212	
TENI	TN2637	Theni Fire & Rescue Station	Operational Urban	5,409	
TENI	TN2641	Bodinayakanur Fire & Rescue Station	Operational Urban	3,380	
TENI	TN2644	Cumbum Fire & Rescue Station	Operational Urban	5,400	
THANJAVUR	TN2395	Kumbakonam Fire & Rescue Station	Operational Urban	4,860	
THANJAVUR	TN2401	Pattukottari Fire & Rescue Station	Operational Urban	2,522	
THANJAVUR	TN2413	Thanjavur Fire & Rescue Station	Operational Urban	3,042	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	priority
THANJAVUR	TN_New_Ur_108	Natchathira Nager	New Urban	6,188	32
THIRUVARUR	TN2720	Thiruvarur Fire & Rescue Station	Operational Urban	6,156	
THIRUVARUR	TN2758	Koothanallur Fire & Rescue Station	Operational Urban	1,160	
THIRUVARUR	TN2773	Thiruthuraipoondi Fire & Rescue Station	Operational Urban	2,701	
THIRUVARUR	TN2779	Mannarkudi Fire & Rescue Station	Operational Urban	2,583	
TIRUCHIRAPPALLI	TN2449	Trichy Fire & Rescue Station	Operational Urban	13,644	
TIRUCHIRAPPALLI	TN2459	Srirangam Fire & Rescue Station	Operational Urban	8,186	
TIRUCHIRAPPALLI	TN2936	Thureuyur Fire & Rescue Station	Operational Urban	679	
TIRUCHIRAPPALLI	TN_New_Ur_101	Krishna Moorthy Nager	New Urban	12,869	28
TIRUCHIRAPPALLI	TN_New_Ur_102	Kattur	New Urban	2,819	36
TIRUNELVELI	TN2832	Tenkasi Fire & Rescue Station	Operational Urban	1,475	
TIRUNELVELI	TN2833	Sankarankovil Fire & Rescue Station	Operational Urban	3,267	
TIRUNELVELI	TN2834	Senkottai Fire & Rescue Station	Operational Urban	1,030	
TIRUNELVELI	TN2836	Tirunelveli (Pettai) Fire & Rescue Station	Operational Urban	1,888	
TIRUNELVELI	TN2837	Palayamkottai Fire & Rescue Station	Operational Urban	8,804	
TIRUNELVELI	TN2842	Ambasamudram Fire & Rescue Station	Operational Urban	3,108	
TIRUNELVELI	TN2853	Kadayanallur Fire & Rescue Station	Operational Urban	3,260	
TIRUNELVELI	TN_New_Ur_121	Tirunelveli	New Urban	4,158	34
TIRUNELVELI	TN_New_Ur_44	Melapalayam	New Urban	2,130	40
TIRUPPUR	TN2951	Trippur South Fire & Rescue Station	Operational Urban	8,122	
TIRUPPUR	TN2952	Trippur Fire & Rescue Station	Operational Urban	20,367	
TIRUPPUR	TN2954	Dharapuram Fire & Rescue Station	Operational Urban	2,681	
TIRUPPUR	TN2956	Palladam Fire & Rescue Station	Operational Urban	1,758	
TIRUPPUR	TN2959	Udumalpet Fire & Rescue Station	Operational Urban	4,367	
TIRUPPUR	TN2961	Vellakovil Fire & Rescue Station	Operational Urban	1,683	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	priority
TIRUPPUR	TN_New_Ur_148	Tiruppur East	New Urban	4,038	35
TIRUPPUR	TN_New_Ur_98	Pulluvapatti	New Urban	2,586	38
TIRUVALLUR	TN2121	J.J Nagar Fire & Rescue Station	Operational Urban	15,499	
TIRUVALLUR	TN2158	Athipattu Fire & Rescue Station	Operational Urban	197	
TIRUVALLUR	TN2159	Ennore Fire & Rescue Station	Operational Urban	2,599	
TIRUVALLUR	TN2161	Manali Fire & Rescue Station	Operational Urban	3,482	
TIRUVALLUR	TN2165	Redhills Fire & Rescue Station	Operational Urban	4,205	
TIRUVALLUR	TN2167	Thiruvottiyur Fire & Rescue Station	Operational Urban	13,758	
TIRUVALLUR	TN2168	Ambattur Fire & Rescue Station	Operational Urban	7,231	
TIRUVALLUR	TN2169	Avadi Fire & Rescue Station	Operational Urban	4,965	
TIRUVALLUR	TN2171	Poonamallee Fire & Rescue Station	Operational Urban	4,681	
TIRUVALLUR	TN2376	Thiruvallur Fire & Rescue Station	Operational Urban	6,789	
TIRUVALLUR	TN2388	Thiruthani Fire & Rescue Station	Operational Urban	1,669	
TIRUVALLUR	TN2408	Vallur Thermal Power Plant Fire & Rescue Station	Operational Urban	480	
TIRUVALLUR	TN_New_Ur_75	Valasaravakkam	New Urban	13,449	8
TIRUVALLUR	TN_New_Ur_69	Madhavaram	New Urban	11,608	10
TIRUVALLUR	TN_New_Ur_74	Thirumullaivayal	New Urban	6,128	14
TIRUVALLUR	TN_New_Ur_73	Puzhal	New Urban	2,886	21
TIRUVALLUR	TN_New_Ur_80	Thirunindravur	New Urban	2,551	23
TIRUVALLUR	TN_New_Ur_71	Minjur	New Urban	2,517	24
TIRUVALLUR	TN_New_Ur_72	Kodappakkam	New Urban	848	26
TIRUVANNAMALAI	TN2351	Arni Fire & Rescue Station	Operational Urban	6,623	
TIRUVANNAMALAI	TN2362	Cheyyar Fire & Rescue Station	Operational Urban	3,546	
TIRUVANNAMALAI	TN2373	Tiruvannamalai Fire & Rescue Station	Operational Urban	2,687	
TUTICORIN	TN2367	T.T.P.S Fire & Rescue Staion	Operational Urban	616	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	priority
TUTICORIN	TN2371	Sipcot Thoothukkudi Fire & Rescue Station	Operational Urban	786	
TUTICORIN	TN2386	Thoothukkudi Fire & Rescue Station	Operational Urban	17,087	
TUTICORIN	TN2389	Kovilpatti Fire & Rescue Staion	Operational Urban	3,529	
TUTICORIN	TN_New_Ur_123	Muthiahpuram	New Urban	1,577	42
TUTICORIN	TN_New_Ur_46	Thalamuthu nagar	New Urban	368	43
VELLORE	TN2282	Pernampattu Fire & Rescue Station	Operational Urban	3,186	
VELLORE	TN2287	Thirupattur Fire & Rescue Station	Operational Urban	55,223	
VELLORE	TN2297	Vaniyamabdi Fire & Rescue Station	Operational Urban	3,046	
VELLORE	TN2300	Gudiyattam Fire & Rescue Station	Operational Urban	6,034	
VELLORE	TN2305	Ambur Fire and Rescue Station	Operational Urban	3,492	
VELLORE	TN2307	Ranipet Vellore Fire & Rescue Station	Operational Urban	13,106	
VELLORE	TN2311	Katpadi Fire and Rescue Station	Operational Urban	5,205	
VELLORE	TN2314	Vellore Fire and Rescue Station	Operational Urban	6,912	
VELLORE	TN2317	Sipcot Ranipet Fire & Rescue Station	Operational Urban	5,705	
VELLORE	TN2319	ARCOT Fire and Rescue Station	Operational Urban	5,508	
VELLORE	TN2341	Arakkonam Fire & Rescue Station	Operational Urban	4,143	
VELLORE	TN_New_Ur_146	Tirupattur	New Urban	36,475	27
VELLORE	TN_New_Ur_84	Sathuvacheri	New Urban	2,675	37
VILLUPURAM	TN2456	Viluppuram Fire & Rescue Station	Operational Urban	6,071	
VILLUPURAM	TN2476	Kallakurich Fire & Rescue Station	Operational Urban	2,325	
VILLUPURAM	TN2523	Tindivanam Fire & Rescue Station	Operational Urban	3,312	
VIRUDHUNAGAR	TN2377	Sivakasi Fire & Rescue Station	Operational Urban	8,294	
VIRUDHUNAGAR	TN2385	Virudhunagar Fire & Rescue Station	Operational Urban	10,100	
VIRUDHUNAGAR	TN2387	Sattur Fire & Rescue Station	Operational Urban	3,682	
VIRUDHUNAGAR	TN2393	Srivilliputtur Fire & Rescue Station	Operational Urban	4,077	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	priority
VIRUDHUNAGAR	TN2616	Aruppukottai Fire & Rescue Station	Operational Urban	4,207	
VIRUDHUNAGAR	TN2620	Rajapalayam Fire & Rescue Station	Operational Urban	4,146	
VIRUDHUNAGAR	TN_New_Ur_118	Sivakasi North	New Urban	2,142	39
VIRUDHUNAGAR	TN_New_Ur_35	Thirunthangal	New Urban	2,016	41

Table 29-39: Details of operational and new proposed Rural Fire Stations with their ideal jurisdiction area, estimated ideal served population under their jurisdiction, and priority ranking for new fire stations

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking
ARIYALUR	TN2631	Senthurai Fire & Rescue Station	Operational Rural	311	
ARIYALUR	TN_New_Ru_10	T.Palur	New Rural	336	74
ARIYALUR	TN_New_Ru_104	Andimadam	New Rural	293	80
ARIYALUR	TN_New_Ru_11	Thirumanur	New Rural	269	82
COIMBATORE	TN_New_Ru_95	Periyanaickenpalayam	New Rural	700	2
COIMBATORE	TN_New_Ru_139	Kinathukadavu	New Rural	539	5
COIMBATORE	TN_New_Ru_96	Thondamuthur	New Rural	522	6
COIMBATORE	TN_New_Ru_97	Anaimalai	New Rural	208	13
CUDDALORE	TN2681	Kudikadu Fire & Rescue Station	Operational Rural	916	
CUDDALORE	TN2766	Tittagudi Fire & Rescue Station	Operational Rural	416	
CUDDALORE	TN2775	Kurinjipadi Fire & Rescue Station	Operational Rural	813	
CUDDALORE	TN2801	Parangipettai Fire & Rescue Station	Operational Rural	505	
CUDDALORE	TN2816	Kattumannarkoil Fire & Rescue Station	Operational Rural	376	
CUDDALORE	TN2819	Sethiathope Fire & Rescue Station	Operational Rural	435	
CUDDALORE	TN2822	Mangalam Fire & Rescue Station	Operational Rural	390	
CUDDALORE	TN2823	Veppur Fire & Rescue Station	Operational Rural	315	
CUDDALORE	TN2826	Thirumuttam Fire & Rescue Station	Operational Rural	458	
CUDDALORE	TN2828	Muthandukuppam Fire & Rescue Station	Operational Rural	786	
CUDDALORE	TN_New_Ru_138	Pennadam	New Rural	383	34
DHARAMPURI	TN2934	Harur Fire & Rescue Station	Operational Rural	222	
DHARAMPURI	TN2938	Palacode Fire & Rescue Station	Operational Rural	326	
DHARAMPURI	TN2942	Pennagaram Fire & Rescue Station	Operational Rural	222	
DHARAMPURI	TN2945	Hogenakkal Rescue Station	Operational Rural	110	
DHARAMPURI	TN_New_Ru_142	Kadathur	New Rural	333	94
DHARAMPURI	TN_New_Ru_18	Thoppur	New Rural	233	96
DHARAMPURI	TN_New_Ru_17	Pappireddipatti	New Rural	186	100
DINDIGUL	TN2919	Vedachandhur Fire station	Operational Rural	228	
DINDIGUL	TN2922	Natham Fire & Rescue Station	Operational Rural	96	
DINDIGUL	TN2931	Athoor Fire & Rescue Station	Operational Rural		

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking
				1,434	
DINDIGUL	TN2943	Batlagundu fire and Rescue station	Operational Rural	196	
DINDIGUL	TN3115	Nilakottai Fire & Rescue Station	Operational Rural	166	
DINDIGUL	TN3147	Oddanchatram Fire and Rescue Station	Operational Rural	139	
DINDIGUL	TN_New_Ru_27	Sannarpatti, Kannaipuram	New Rural	828	1
DINDIGUL	TN_New_Ru_26	Reddiarchatram	New Rural	578	4
DINDIGUL	TN_New_Ru_24	Vadamadurai	New Rural	478	7
DINDIGUL	TN_New_Ru_25	Thoppampatti	New Rural	167	14
DINDIGUL	TN_New_Ru_23	Gujiliamparai	New Rural	149	15
DINDIGUL	TN_New_Ru_28	Kallimandayam	New Rural	99	16
ERODE	TN2918	Modakkurichi Fire & Rescue Station	Operational Rural	377	
ERODE	TN2920	Kodumudi Fire & Rescue Station	Operational Rural	315	
ERODE	TN2921	Perundurai Fire & Rescue Station	Operational Rural	901	
ERODE	TN2932	Anthiyur Fire & Rescue Station	Operational Rural	109	
ERODE	TN2941	Hasanur Fire & Rescue Station	Operational Rural	31	
ERODE	TN_New_Ru_141	Kavindapadi	New Rural	451	65
ERODE	TN_New_Ru_30	Kunnathur	New Rural	354	72
ERODE	TN_New_Ru_22	Pulilampatti	New Rural	317	77
ERODE	TN_New_Ru_21	Chennimalai	New Rural	253	84
ERODE	TN_New_Ru_20	Ammapettai	New Rural	193	89
KANCHIPURAM	TN2354	Thirukazhukundram Fire & Rescue Station	Operational Rural	368	
KANCHIPURAM	TN2356	Uthiramerur Fire & Rescue Station	Operational Rural	257	
KANCHIPURAM	TN2360	Acharapakkam Fire & Rescue Station	Operational Rural	346	
KANCHIPURAM	TN2369	Siruseri Sipcot Fire & Rescue Station	Operational Rural	760	
KANCHIPURAM	TN_New_Ru_82	Mahablipuram	New Rural	425	8
KANCHIPURAM	TN_New_Ru_131	Walajabad	New Rural	407	9
KANCHIPURAM	TN_New_Ru_59	Cheyyur	New Rural	393	10
KANYAKUMARI	TN2811	Kulaseknaram Fire & Rescue Station	Operational Rural	220	
KANYAKUMARI	TN2815	Kanyakumari Fire & Rescue Station	Operational Rural	1,686	
KANYAKUMARI	TN2825	Kollankode Fire & Rescue Station	Operational Rural	1,422	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking
KANYAKUMARI	TN_New_Ru_52	Karungal	New Rural	2,940	57
KANYAKUMARI	TN_New_Ru_51	Rajkkamangalam	New Rural	1,925	58
KANYAKUMARI	TN_New_Ru_64	Aralvaimozhi	New Rural	453	64
KANYAKUMARI	TN_New_Ru_63	Boothapandi	New Rural	302	79
KARUR	TN2676	Pugulur Fire & Rescue Station	Operational Rural	704	
KARUR	TN2695	Aravakkurichy Fire & Rescue Station	Operational Rural	282	
KARUR	TN_New_Ru_124	Nachalur	New Rural	628	59
KARUR	TN_New_Ru_145	Puliyur	New Rural	333	75
KARUR	TN_New_Ru_62	Krishnarayapuram	New Rural	312	78
KARUR	TN_New_Ru_6	Tharagampatti	New Rural	260	83
KARUR	TN_New_Ru_7	Thogaimalai	New Rural	206	88
KARUR	TN_New_Ru_129	K. Paramathi	New Rural	102	93
KRISHNAGIRI	TN3001	Bargur Fire & Rescue Station	Operational Rural	293	
KRISHNAGIRI	TN3003	Pochampalli Fire & Rescue Station	Operational Rural	358	
KRISHNAGIRI	TN3005	Uthangarai Fire & Rescue Station	Operational Rural	249	
KRISHNAGIRI	TN3006	Denkanikotta Fire & Rescue Station	Operational Rural	270	
KRISHNAGIRI	TN3016	Rayakottai Fire & Rescue Station	Operational Rural	219	
KRISHNAGIRI	TN_New_Ru_19	Shoolagiri	New Rural	366	69
MADURAI	TN2596	Sholavandhan Fire & Rescue Station	Operational Rural	375	
MADURAI	TN2619	Kallikudi Fire & Rescue Station	Operational Rural	317	
MADURAI	TN2625	Kottampatti Fire & Rescue Station	Operational Rural	313	
MADURAI	TN2627	T.Kallupatti Fire & Rescue Station	Operational Rural	413	
MADURAI	TN_New_Ru_33	Palamedu	New Rural	350	11
NAGAPATTINAM	TN2411	Thalaignayiru Fire & Rescue Station	Operational Rural	602	
NAGAPATTINAM	TN2416	Kuttalam Fire & Rescue Station	Operational Rural	346	
NAGAPATTINAM	TN2420	Maruthur Fire & Rescue Station	Operational Rural	367	
NAGAPATTINAM	TN2422	Velanganni Fire & Rescue Station	Operational Rural	855	
NAGAPATTINAM	TN2430	Kilevur Fire & Rescue Station	Operational Rural	586	
NAGAPATTINAM	TN2684	Poompuhar Fire & Rescue Station	Operational Rural	486	
NAGAPATTINAM	TN2702	Tarangambadi Fire & Rescue Station	Operational Rural	416	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking
NAGAPATTINAM	TN_New_Ru_60	Thirukkuvalai	New Rural	564	61
NAGAPATTINAM	TN_New_Ru_106	Thittacheri	New Rural	537	62
NAGAPATTINAM	TN_New_Ru_105	Thirumullaivasal	New Rural	327	76
NAMAKKAL	TN2867	Kollihills Fire & Rescue Station	Operational Rural	169	
NAMAKKAL	TN_New_Ru_16	Mallasamudram	New Rural	520	25
NAMAKKAL	TN_New_Ru_126	Pillanallur	New Rural	455	27
NAMAKKAL	TN_New_Ru_14	Veppadai	New Rural	448	28
NAMAKKAL	TN_New_Ru_125	Mohanur	New Rural	312	38
NAMAKKAL	TN_New_Ru_15	Paramathi	New Rural	273	42
NILGIRI	TN2873	Kottagiri Rescue Station	Operational Rural	108	
NILGIRI	TN_New_Ru_90	Ketti	New Rural	219	98
NILGIRI	TN_New_Ru_53	Pandalur	New Rural	134	101
NILGIRI	TN_New_Ru_54	Kil Kundha	New Rural	63	102
PERAMBALUR	TN2551	Veppur Fire & Rescue Station	Operational Rural	406	
PERAMBALUR	TN_New_Ru_9	Godalur	New Rural	243	95
PERAMBALUR	TN_New_Ru_8	Veppanthattai	New Rural	229	97
PERAMBALUR	TN_New_Ru_103	Chettikulam	New Rural	205	99
PUDUKKOTTAI	TN2400	Alangudi Fire & Rescue Station	Operational Rural	433	
PUDUKKOTTAI	TN2406	Jagadapattinam Fire & Rescue station	Operational Rural	363	
PUDUKKOTTAI	TN2409	Avvadayarkovil Fire -& Rescue Station	Operational Rural	194	
PUDUKKOTTAI	TN2419	Keeranur Fire & Rescue Station	Operational Rural	241	
PUDUKKOTTAI	TN2421	Illuppor Fire & Rescue Station	Operational Rural	274	
PUDUKKOTTAI	TN2425	Ponnamaravathy Fire & Rescue Station	Operational Rural	325	
PUDUKKOTTAI	TN2429	Thirumayam Fire & Rescue Station	Operational Rural	430	
PUDUKKOTTAI	TN2437	Karambakkudi Fire & Rescue Station	Operational Rural	535	
PUDUKKOTTAI	TN2441	Gandharvakottai Fire & Rescue Station	Operational Rural	306	
PUDUKKOTTAI	TN_New_Ru_111	Arimalam	New Rural	298	41
RAMANATHAPURAM	TN2747	Kamudi Fire & Rescue Station	Operational Rural	141	
RAMANATHAPURAM	TN2752	Thiruvadanai Fire & Rescue Station	Operational Rural	232	
RAMANATHAPURAM	TN2756	R.S. Mangalam Fire & Rescue Station	Operational Rural	171	
RAMANATHAPURAM	TN2772	Mandapam Fire & Rescue Station	Operational Rural	264	
RAMANATHAPURAM	TN2786	Mudukulathur Fire & Rescue Station	Operational Rural	169	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking
RAMANATHAPURAM	TN2790	Valudhur Gas Turbine Fire & Rescue Station	Operational Rural	1,172	
RAMANATHAPURAM	TN2812	Sayalkudi Fire & Rescue Station	Operational Rural	185	
RAMANATHAPURAM	TN2821	Erwadi Fire & Rescue Station	Operational Rural	130	
RAMANATHAPURAM	TN_New_Ru_39	Thondi	New Rural	248	85
RAMANATHAPURAM	TN_New_Ru_117	Devipattinam	New Rural	207	87
RAMANATHAPURAM	TN_New_Ru_38	Keelakarai	New Rural	192	90
RAMANATHAPURAM	TN_New_Ru_37	Kadaladi	New Rural	141	92
SALEM	TN2849	Valappady Fire & Rescue Station	Operational Rural	211	
SALEM	TN2859	Omalur Fire & Rescue Station	Operational Rural	1,345	
SALEM	TN2861	Gangavalli Fire & Rescue Station	Operational Rural	274	
SALEM	TN2864	Yercaud Fire & Rescue Station	Operational Rural	512	
SALEM	TN2865	Sankari Fire & Rescue Station	Operational Rural	422	
SALEM	TN2866	Edappadi Fire & Rescue Station	Operational Rural	860	
SALEM	TN_New_Ru_128	Elampillai	New Rural	1,150	17
SALEM	TN_New_Ru_13	Tharamangalam	New Rural	608	22
SALEM	TN_New_Ru_127	Mallur	New Rural	585	23
SIVAGANGA	TN2709	Singampunari Fire & Rescue Station	Operational Rural	567	
SIVAGANGA	TN2721	Thiruppathur Fire & Rescue Station	Operational Rural	314	
SIVAGANGA	TN2740	Manamadurai Fire & Rescue Station	Operational Rural	160	
SIVAGANGA	TN_New_Ru_41	Puduvayal	New Rural	444	66
SIVAGANGA	TN_New_Ru_42	Tiruppuvanam	New Rural	375	67
SIVAGANGA	TN_New_Ru_115	Kllal	New Rural	287	81
SIVAGANGA	TN_New_Ru_116	Kalayarkoil	New Rural	245	86
SIVAGANGA	TN_New_Ru_40	Itayangudi	New Rural	160	91
TENI	TN2648	Aundipatti Fire & Rescue Station	Operational Rural	252	
TENI	TN2651	Mayiladumparai Fire & Rescue Station	Operational Rural	124	
TENI	TN2654	Kadamalaikundu Fire & Rescue Station	Operational Rural	272	
TENI	TN2656	Uthamapalayam Fire & Rescue Station	Operational Rural	262	
TENI	TN_New_Ru_34	Chinnamanur	New Rural	359	70

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking
THANJAVUR	TN2403	Tiruvidaimarthur Fire & Rescue Station	Operational Rural	384	
THANJAVUR	TN2410	Peravurani Fire & Rescue Station	Operational Rural	817	
THANJAVUR	TN2418	Orathanadu Fire & Rescue Station	Operational Rural	588	
THANJAVUR	TN2423	Thirukkattupalli Fire & Rescue Station	Operational Rural	449	
THANJAVUR	TN2424	Tiruvaiyaru Fire & Rescue Station	Operational Rural	410	
THANJAVUR	TN2428	Papanasam Fire & Rescue Station	Operational Rural	421	
THANJAVUR	TN_New_Ru_109	Adirampattinam	New Rural	677	20
THANJAVUR	TN_New_Ru_110	Ammapet	New Rural	460	26
THIRUVARUR	TN2738	Nannilam Fire & Rescue Station	Operational Rural	411	
THIRUVARUR	TN2744	Kodavasal Fire & Rescue Station	Operational Rural	328	
THIRUVARUR	TN2750	Valangaiman Fire & Rescue Station	Operational Rural	317	
THIRUVARUR	TN2753	Needamanglam Fire & Rescue Station	Operational Rural	286	
THIRUVARUR	TN2770	Thirumakottai Fire & Rescue Station	Operational Rural	1,020	
THIRUVARUR	TN2791	Kottur Fire & Rescue Station	Operational Rural	472	
THIRUVARUR	TN2802	Muthupet Fire & Rescue Station	Operational Rural	395	
THIRUVARUR	TN_New_Ru_107	Vaduvur	New Rural	594	60
TIRUCHIRAPPALLI	TN2480	Navalpattu Fire & Rescue Station,	Operational Rural	980	
TIRUCHIRAPPALLI	TN2498	Lalgudi Fire & Rescue Station	Operational Rural	536	
TIRUCHIRAPPALLI	TN2501	Pullambadi Fire & Rescue Station	Operational Rural	193	
TIRUCHIRAPPALLI	TN2504	Manaparai Fire & Rescue Station	Operational Rural	538	
TIRUCHIRAPPALLI	TN2506	Thuvarankurichi Fire & Rescue Station	Operational Rural	158	
TIRUCHIRAPPALLI	TN2508	Uppliyapuram Fire & Rescue Station	Operational Rural	111	
TIRUCHIRAPPALLI	TN2672	Musiri Fire & Rescue Station	Operational Rural	365	
TIRUCHIRAPPALLI	TN_New_Ru_4	Thuvakudi	New Rural	880	18
TIRUCHIRAPPALLI	TN_New_Ru_5	Mannachanallur	New Rural	804	19
TIRUCHIRAPPALLI	TN_New_Ru_2	Samayapuram	New Rural	367	35
TIRUCHIRAPPALLI	TN_New_Ru_58	Thottiyam	New Rural	347	37
TIRUCHIRAPPALLI	TN_New_Ru_144	Tattayyangarpettai	New Rural	217	47
TIRUCHIRAPPALLI	TN_New_Ru_3	Vaiyampatti	New Rural	131	56
TIRUNELVELI	TN2829	Vasudevanallur Fire & Rescue Station	Operational Rural	257	
TIRUNELVELI	TN2831	Tirunelveli Fire & Rescue Station	Operational Rural	375	
TIRUNELVELI	TN2835	Cheranmahadevi Fire & Rescue Station	Operational Rural	388	

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking
TIRUNELVELI	TN2838	Nanguneri Fire & Rescue Station	Operational Rural	393	
TIRUNELVELI	TN2839	Thisayanvillai Fire & Rescue Station	Operational Rural	298	
TIRUNELVELI	TN2845	Vallioor Fire & Rescue Station	Operational Rural	315	
TIRUNELVELI	TN_New_Ru_1	Gangaikondan	New Rural	403	32
TIRUNELVELI	TN_New_Ru_55	Alangulam	New Rural	309	40
TIRUNELVELI	TN_New_Ru_43	Radhapuram	New Rural	206	49
TIRUPPUR	TN2953	Kangyam Fire & Rescue Station	Operational Rural	115	
TIRUPPUR	TN_New_Ru_140	Somanur	New Rural	404	31
TIRUPPUR	TN_New_Ru_29	Avinashi	New Rural	395	33
TIRUPPUR	TN_New_Ru_100	Senjerimali	New Rural	209	48
TIRUPPUR	TN_New_Ru_99	Mulanur	New Rural	167	51
TIRUPPUR	TN_New_Ru_32	Madattukkulam	New Rural	158	52
TIRUPPUR	TN_New_Ru_31	Avinashipalayam	New Rural	155	53
TIRUVALLUR	TN2379	Thirur Fire & Rescue Station	Operational Rural	619	
TIRUVALLUR	TN2380	Perambakkam Fire & Rescue Station	Operational Rural	342	
TIRUVALLUR	TN2382	Gummidipoondi Sipcot Fire & Rescue Station	Operational Rural	465	
TIRUVALLUR	TN2384	Gummidipoondi Fire & Rescue Station	Operational Rural	363	
TIRUVALLUR	TN2394	Pallipattu Fire & Rescue Station	Operational Rural	218	
TIRUVALLUR	TN2402	Ponneri Fire & Rescue Station	Operational Rural	542	
TIRUVALLUR	TN_New_Ru_83	Vengal	New Rural	629	3
TIRUVALLUR	TN_New_Ru_61	Uthukottai	New Rural	334	12
TIRUVANNAMALAI	TN2350	Chetpet Fire & Rescue Station	Operational Rural	449	
TIRUVANNAMALAI	TN2353	Javvadhumalai Fire & Rescue Station	Operational Rural	42	
TIRUVANNAMALAI	TN2358	Kilpennathur Fire & Rescue Station	Operational Rural	328	
TIRUVANNAMALAI	TN2359	Vettavalam Fire & Rescue Station	Operational Rural	442	
TIRUVANNAMALAI	TN2361	Chengam Frie & Rescue Station	Operational Rural	187	
TIRUVANNAMALAI	TN2365	Vandavasi Fire & Rescue Station	Operational Rural	551	
TIRUVANNAMALAI	TN2368	Peranamallur Fire & Rescue Station	Operational Rural	349	
TIRUVANNAMALAI	TN2370	Polur Fire & Rescue Station	Operational Rural	338	
TIRUVANNAMALAI	TN2375	Thandarampattu Fire & Rescue Station	Operational Rural	285	
TIRUVANNAMALAI	TN_New_Ru_137	Vembakkam	New Rural	372	68

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking
TIRUVANNAMALAI	TN_New_Ru_135	Kannamangalam	New Rural	357	71
TUTICORIN	TN2363	VilathiKulam Fire & Rescue Station	Operational Rural	156	
TUTICORIN	TN2374	Srivaikuntam Fire & Rescue Station	Operational Rural	331	
TUTICORIN	TN2378	Tiruchendor Fire & Rescue Staion	Operational Rural	1,294	
TUTICORIN	TN2383	Sathankulam Fire & Resue Station	Operational Rural	246	
TUTICORIN	TN2392	Kalugumali Fire & Rescue Staion	Operational Rural	257	
TUTICORIN	TN_New_Ru_48	Eral	New Rural	650	21
TUTICORIN	TN_New_Ru_49	Udankudi	New Rural	563	24
TUTICORIN	TN_New_Ru_50	Vallandu	New Rural	273	43
TUTICORIN	TN_New_Ru_47	Kayatar	New Rural	186	50
TUTICORIN	TN_New_Ru_56	Ettaiyapuram	New Rural	139	54
TUTICORIN	TN_New_Ru_45	Ottapidaram	New Rural	136	55
VELLORE	TN2290	Alangayam Fire and Rescue Station	Operational Rural	110	
VELLORE	TN2293	Nattrampalli Fire & Rescue Station	Operational Rural	233	
VELLORE	TN2304	Odugathur Fire & Rescue Station	Operational Rural	126	
VELLORE	TN2320	Kalavai Fire and Rescue Station	Operational Rural	267	
VELLORE	TN2338	Sholinghur Fire & Rescue Station	Operational Rural	307	
VELLORE	TN_New_Ru_134	Arappakam	New Rural	423	30
VELLORE	TN_New_Ru_136	Timiri	New Rural	349	36
VELLORE	TN_New_Ru_132	Panapakkam	New Rural	310	39
VELLORE	TN_New_Ru_133	Virinjipuram	New Rural	269	44
VILLUPURAM	TN2439	Melmalayanoor Fire & Rescue Station	Operational Rural	325	
VILLUPURAM	TN2442	Ulunderpet Fire & Rescue Station	Operational Rural	701	
VILLUPURAM	TN2448	Gingee Fire & Rescue Station	Operational Rural	433	
VILLUPURAM	TN2462	Chinnasalem Fire & Rescue Station	Operational Rural	244	
VILLUPURAM	TN2499	Sankarapuram Fire & Rescue Station	Operational Rural	218	
VILLUPURAM	TN2503	Thirukovilur Fire & Rescue Station	Operational Rural	458	
VILLUPURAM	TN2505	Thiruvannainaltri Fire & Rescue Station	Operational Rural	461	
VILLUPURAM	TN2513	Marakkanam Fire & Rescue Station	Operational Rural	661	
VILLUPURAM	TN2517	Vanur Fire & Rescue Station	Operational Rural	578	
VILLUPURAM	TN_New_Ru_130	Ozhukarai	New Rural	506	63
VILLUPURAM	TN_New_Ru_143	Eraiyur	New Rural	353	73

District	FS Ref No	Fire Station Name	Operational Type	Population Density	Priority Ranking
VIRUDHUNAGAR	TN2381	Thiruchuli Fire & Rescue Station	Operational Rural	176	
VIRUDHUNAGAR	TN2391	Vathirayiruppu Fire and Rescue Station	Operational Rural	155	
VIRUDHUNAGAR	TN_New_Ru_119	Chatrapatti	New Rural	440	**29**
VIRUDHUNAGAR	TN_New_Ru_120	Seithur	New Rural	247	**45**
VIRUDHUNAGAR	TN_New_Ru_36	Kariapatti	New Rural	245	**46**

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