PORTAL FOR REGULATION OF AIR POLLUTION IN NON-ATTAINMENT CITIES (PRANA)

A PROJECT REPORT

Submitted by

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to

The APJ Abdul Kalam Technological University

In partial fulfillment for the award of the degree of

MASTER OF COMPUTER APPLICATIONS

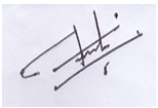
Thangal Kunju Musaliar College of Engineering
Kerala

DEPARTMENT OF COMPUTER APPLICATIONS

JULY 2022

DECLARATION

I undersigned hereby declare that the project report on **PRANA**, submitted for partial fulfillment of the requirements for the award of degree of Master of Computer Applications of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by me under supervision of Dr. Fousia M Shamsudeen. This submission represents my ideas in my own words and where ideas or words of others have been included,I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University..



Kollam

18-07-2022

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DEPT. OF COMPUTER APPLICATIONS TKM COLLEGE OF ENGINEERING

KOLLAM

2021 - 22

CERTIFICATE

This is to certify that the report entitled **PRANA** submitted by **AMAL BHAS P** (TKM20MCA-2004) to the APJ Abdul Kalam Technological University in partial fulfillment of the Masters degree in Computer Applications is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CIN No: U72200KA2013PTC072670

Date:19-07-2022

TO WHOM IT MAY CONCERN

This is to certify that Mr. Amal Bhas P from TKM College of Engineering, Kollam is pursuing the internship on **"PRANA"** project at **Knowledge Lens Pvt Ltd** starting from 2nd May 2022 to till 22nd July 2022. During the period of his training with us he is found punctual, hardworking, and inquisitive.

We wish him all the success in future endeavors.

Yours Truly,

For **Knowledge Lens Pvt Ltd**.

Jayashree S
HR Manager
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Acknowledgement

First and foremost I thank GOD almighty and my parents for the success of this project. I owe sincere gratitude and heart full thanks to everyone who shared their precious time and knowledge for the successful completion of my project.

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I owe my thanks to my friends and all others who have directly or indirectly helped me in the successful completion of this project.

AMAL BHAS P

ABSTRACT

Portal for Regulation of Air-pollution in Non-Attainment cities (PRANA), is a portal for monitoring of implementation of National Clean Air Programme (NCAP). It will assist in tracking the financial and physical status of the city's implementation of the air action plan and inform the public about the NCAP's air quality control initiatives. The entry will provide real-time information on pollution levels across the city, as well as past data on accomplishments made in decreasing air pollution from 2018 to the present. It will also provide information on the activities performed by 132 Indian cities to lower air pollution levels. The portal (prana.cpcb.gov.in) has a national dashboard that has interactive points on seven thematic areas of ambient air monitoring network, city air action plans, PM_{10} performance, graded response action plans, public grievance redressal portal and more. It is linked to the government's objective of preserving the environment and using public resources sustainably.

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Chapter 1

Introduction

For life to continue on Earth, three crucial elements—air, water, and land—need to be preserved. On 7^{th} September 2019, Bhupender Yadav, the Union Minister for Environment, Climate Change and Forests, introduced PRANA. The PRANA portal,which regulates air pollution in non-attainment cities, would allow for tracking the physical and financial status of city air action plan implementation.

The website (prana.cpcb.gov.in) contains a national dashboard with engaging points on seven thematic areas, including ambient air monitoring network, city air action plans, PM_{10} performance, graded response action plans, public grievance redressal portal and more. The government's goal of protecting, conserving, and using public goods and the environment sustainably is linked with this. The National Clean Air Program (NCAP) is a broad project to enhance air quality at the local, regional, and national levels in collaboration with numerous Ministries and States. In order to improve public participation and strengthen monitoring in 132 cities for effective Air Quality Management, a project was started in 2019. The national level aim is to lower the amount of Particulate Matter by 20 to 30% by 2024.

The Air Quality Index is a tool for properly communicating to the general public the state of the air quality. It simplifies complicated information about the air quality caused by different contaminants into a single number (index value), colour and nomenclature. 6 AQI classifications exist: Severe, Very Poor, Poor, Moderately Polluted, Satisfactory and Good. Based on ambient air pollutant concentration values and potential health effects, each of these groups is chosen. For 8 pollutants ($PM_{2.5}$, PM_{10}, NO_2, SO_2, CO, ozone, Pb and NH_3) for

which short-term (up to 24 hours) National Ambient Air Quality Standards are specified, health breakpoints and AQ sub-indices have been created. The AQI as a whole is determined by the worst sub-index.

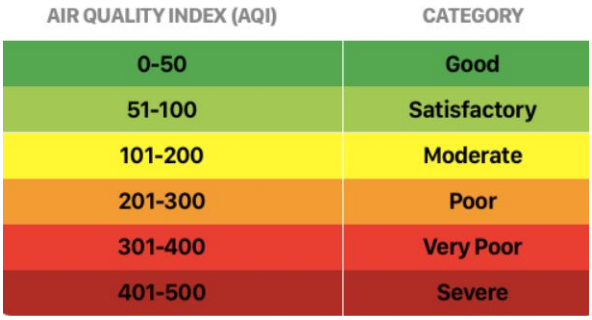

Figure 1.1: Air Quality Index

1.1 Objective

The following objectives are to be fulfilled:

- To make sure that strict mitigation measures are implemented for the control, prevention, and reduction of air pollution.
- To expand and develop a nationwide network for monitoring ambient air quality in order to create a comprehensive and reliable database.
- To increase public understanding of issues around air pollution and capacity-building strategies that include public outreach programmes and data dissemination for inclusive public engagement.

1.2 Company Profile

The set of Lenses offered by Knowledge Lens makes it easier and more automated to find undiscovered Big Data insights. Our goal is to transform dark data into actionable business insights. We are big data technology Geeks with a broad spectrum of big data projects ranging from big data engineering to data science and extensive industry expertise.

1.2.1 Products

- **iLens(Intelligent Lens)**

  iLens offers a centralised platform for the intelligent integration of several devices or sensors in major businesses, the manufacturing sector, the household, commercial properties, etc.

  In order to record time series data in real time, iLens offers a MQTT interface for smooth integration of various field sensor devices. ILens has the capacity to produce alerts and alarms depending on pre-configured rules.

- **Mlens**

  With MLens, managing disaster recovery for our big data and platforms is a one-step process. Features of MLens :

  1. Big Data Backup Migration
  2. Automated Disaster Recovery
  3. Data Encryption, compression Archival
  4. High Speed Batch Data Ingestion
  5. Monitoring Scheduling
  6. Secured Access controls

- **AiLens**

  Next Generation Ai platform that offers a collaborative workspace with experiment designer, modelling feature engineering work bench, AI/ML assets repository integrations for enterprise security and DevOps.

  AiLens is an intelligent assistant for Artificial Intelligence crafted with a unified graphical interface for building AI/ML pipelines and Data Engineering.AiLens includes a unified AI Orchestrator which triggers model execution runs on any runtimes like SparkML, Tensorflow, MxNet, H2O, PyTorch, AWS / Azure, Theano from a console. AiLens is quite flexible as the user experience will be the same.

  Irrespective of any new technological advancements because of the meta model-driven platform. Intuitive job submission and monitoring framework, secured integration with external entities and inbuilt encryption and rolebased access control support make our product stand out with a huge margin.

Key features are:

1. Any AI Stack, Any AI Algorithm, Anywhere
2. Unified AI Orchestrator
3. Simplified User Experience
4. Intelligent Assistant for AI
5. Integrated Data Preparation AI Modelling Environment
6. Seamless Enterprise Security Integration

- **GLens**

  For the monitoring and analytics of industrial emissions, real-time acquisition, ambient air monitoring and, effluent discharges; there is GLens. For all industrial environmental demands, GLens Server Platform, GLens Environ Data Logger and GLens DAS Software offer a complete solution. Any analyzer, sensor, or device can be connected to the platform using a plug-and-play model, and real-time data can be acquired.
  The key features of GLens are::

  1. Rest based open protocol for multi-client deployment.
  2. Real time alerts and alarms with SMS and Email integration.
  3. Remote calibration and configuration of analyzers.
  4. Plug and play complete protocol integration with any analyzer make and model. – Integrated and data quality codes as per ISO 7168.
  5. Integrated analytics and predictive models for effective pollution control.
  6. Live consolidated industry dashboards.

1.2.2 Services

- **Big Data Engineering Services**

  We offer complete architecture, design, development, testing, and deployment of big data protects.

- **Big Data Security Services**

  We are one of the specialised consulting firms offering Big Data Services.

- **Big Data Analytics Services**

  Using our pre-built analytical Lens, we provide hidden insights from a wide range of data sources.

- **Big Data Competency Development**

  Without specialised Big Data knowledge, we provide one of the top enterprise big data competency development programmes.

Chapter 2

Literature Survey

2.1 Air Quality Management System

Air pollution is a worldwide concern now. Rapid urbanisation has become a widespread phenomena, especially in developing countries. However, the environment suffers as a result. Organizations engaged in the project expose themselves and others to hazardous gases by focusing only on the short cuts to meet criteria. hence increasing everyone's vulnerability to several deadly diseases. Both prolonged exposure to contaminated air and brief inhalation of specific poison particles can result in significant illness.

Governmental organisations utilise the Air Quality Index (AQI) to inform the general public of the pollution levels. To establish the standards for air quality, numerous parameters are used in different nations. According to Table 1, there are six general classifications for the AQI: Severe, Very Poor, Poor, Moderately Polluted, Satisfactory and Good.The term "$PM_{2.5}$" (particulate matter 2.5) refers to particles in the air with a width of less than or equal to 2 microns. Particles in the $PM_{2.5}$ category pass through the respiratory system, enter at the lungs and settle in there. Because of the harmful effects of these small particles, a significant amount of research has been focused in this area. Long-term studies have shown that they may be linked to an increase in chronic bronchitis, a decline in lung function, and an increased risk of cardiovascular disease and lung cancer.

The socioeconomic consequences of general well-being due to declining air quality and a lack of physical activity in the environment that people have built were examined in a

study. chemical solvents and Gas fumes from factories, vehicle exhaust, and natural sources emit volatile organic compounds and nitrogen oxides, which are precursors to widespread pollution. They came to the conclusion that prolonged periods of intensive attention during the oppressively hot summer months result in respiratory problems and decreased worker productivity.

AQI CATEGORY	**AQI RANGE**	$PM_{2.5}$
Good	0-50	0-30
Satisfactory	51-100	31-60
Moderate	101-200	61-90
Poor	201-300	91-120
Very poor	301-400	121-250
Severe	401-500	250+

Table 1

A lack of a sufficient dispersion of air quality measuring stations has also been noted in most countries. It's most likely because setting up, running, and evaluating such stations is expensive. Deploying mobile nodes connected to a real-time database that can track the air pollution by updating the AQI at predefined intervals of time is a workable approach. Count the amount of pollutants in the area around the node's active zone to achieve this [1].

The system's main goal is to analyse and display air quality using real-time sensor data. The suggested method analyses six harmful air pollutants, the most significant of which are carbon monoxide (CO), ozone (O_3), sulphur dioxide (SO_2), particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2). The processed sensor data for dirty air is clustered using Fuzzy c-Means. The results show that, when compared to other algorithms in the literature, the Fuzzy c-Means approach offers higher results for the parameter correctness [2].

2.2 Problems in Air Quality Monitoring

An efficient technique to partially solve the problems of environmental pollution is to use multifactor analysis of the development of the level of pollution in conjunction with operational forecasts of the level of pollution. The fact that the governments of all advanced nations

spend, on average, between one and three percent of their budgets on environmental protection measures attests to the importance of research on monitoring the level of environmental pollution. The report gives a brief summary of existing mechanisms for keeping tabs on soil, water, and air pollution. It is demonstrated how crucial the technological aspect is to ensure monitoring. There are emerging trends in the use of cutting-edge technologies in the environmental monitoring sector. The structure of the information system for monitoring the state of the environment is proposed using the task of monitoring the environment. The system should have subsystems for gathering data on the state of the environment, for storing and retrieving data, for forecasting the status of the environment, and for user interaction [3].

The most significant element that directly affects the incidence of diseases and lowers quality of life in cities and urban areas is the air quality. Since the measurement and analysis of the qualities of the air are necessary for making prompt choices, real-time air quality monitoring is necessary. It is feasible to undertake a thorough level evaluation of the main pollutants and their sources with the use of multi-parameter air quality monitoring equipment. For reducing the concentrations of main pollutants in urban areas and for monitoring air quality, these monitoring devices are crucial parts of many smart city efforts. In this paper, provide a method for measuring important environmental factors efficiently at a reasonable cost that is based on a scalable sensor array with integrated amperometric and infrared gas sensors. The apparatus was tested around the city, and the results of the measurements were compared to those from the stations held by the neighbourhood environmental control organisation. The first findings indicate that this strategy may be utilised to replace costly professional-grade equipment at an affordable price [4].

The focus of this paper is Python, among other the IT industry's usage of programming paradigms that improve progression rate. Nevertheless, Python's inception dates back to the During the late 1980s and following its introduction in 1989, it has become a with the introduction of Big Data, a new multi-paradigm language platform. Python has a number of data structures and built-in libraries that putting data science and sentiment analysis code into practise. All of the programmers' awareness of these issues is the true goal. different python language facts. How Python interacts with many social and commercial communities and offers comprehensive and pleasing outcomes. When compared to other programming languages, Python stands out in a variety of contexts and applications [5].

A well-known JavaScript framework for building single-page web applications is Angular JS. It is built on the model-view-controller architecture. 95 experienced developers were polled by researchers regarding the performance issues with Angular JS applications. They identified the typical procedures developers used to prevent issues (such as the use third-party or unique components), the general causes of issues (such as inadequate application-architectures), and the technical causes of issues (for instance, unnecessary computation in the digest cycle, the internal calculation that automatically updates the view in response to changes found in the model) [6].

This research offers a model-driven development approach for creating AngularJS-based apps. Provide a UML profile for the framework together with a sequence of transformations that convert the model into a code template in order to create a model of an AngularJS web application. The developer may then finish the template to get a final, usable web application. A transformation tool is also provided to make the process of creating the code template simpler. According to an analysis of the transformation rate using a case study application, the automatically produced code accounts for 87 percent of the case study's whole code, which suggests that it might significantly save development time. [7].

The multi-model database system ArangoDB is native. Examples of data storage types that can only be retrieved using one query language include graphs, texts and key-value pairs (ArangoDB Query Language). For every data models, it uses the same core and query language. It provides the chance to maintain current products. Numerous data models are integrated in order to simplify the amount of data in a single query. In comparison to other databases, it has shown better scaling performance, more flexibility, a large amount of storage memory, fault tolerance and reduced cost. A online user interface is available [8].

A Python-based web framework is called Flask. Instead of having to start from scratch when creating a website, Flask offers a library and a collection of codes. The flask will be lighter and less dependent on numerous external libraries due to its simple features, which also make it less maintenance-intensive. For the most part, the flask offers 'Wekzeug', which is helpful for receiving requests (url) and answering.[9].

Chapter 3

Methodology

PRANA is a portal for tracking the National Clean Air Program's (NCAP)execution. The information of total 132 Non-Attainment Cities (NACs) being funded under NCAP (in 82 Cities) and Million Plus Challenge Fund under Fifteenth Finance Commission recommendation for Improvement of Air Quality (in 42 Urban Agglomerations/ Cities (50 Cities)), are provided in the portal.It provides tracking of physical and financial progress against the city action plan in improvement of air quality made in NACs and disseminates information to public. The multidisciplinary PRANA strategy involves numerous ministries, regional institutions including IITs and NITs, laboratories all over India, as well as global organisations. In this way, PRANA seeks to improve community outreach and capacity-building initiatives. The PRANA portal offers comprehensive information about NCAP, including details about the programme, its progress, city action plans, updates on its implementation from local, state, and federal agencies, support from international organisations,data on air quality trends, events, reference materials, testimonials and success stories, among other things.

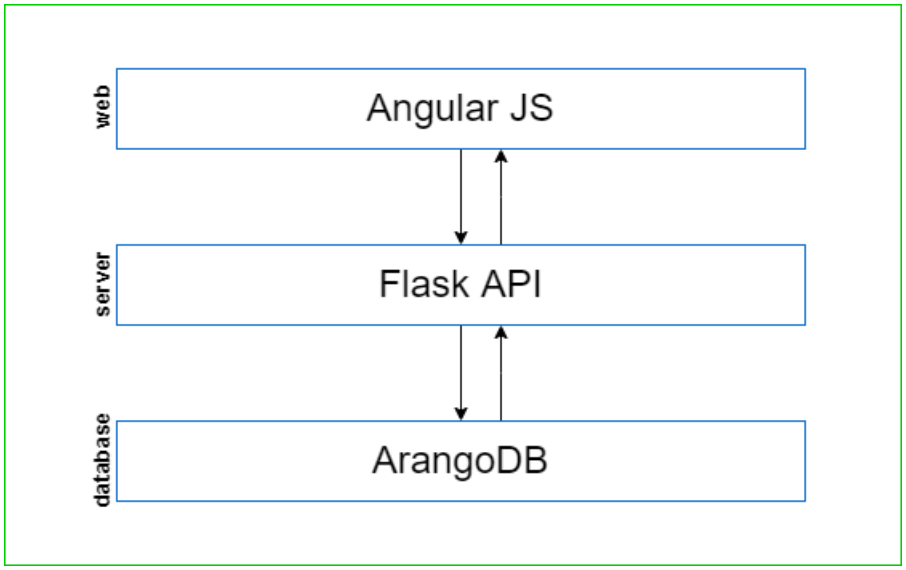

Figure 3.1: Login Page

A popular micro web framework for Python API development is Flask. It is a straightforward yet effective web framework with the capacity to scale up to complex projects, making it quick and simple to get started with. A configurable data format for documents and graphs is available in the open-source, multi-model ArangoDB NoSQL database.

3.1 Key Features of PRANA

- Information related to NCAP – programme
- National Dashboard
  - This includes interactive sections on seven thematic areas, including Ambient air monitoring network, PM_{10} performance, Public grievance redressal portal, City air action plans, Graded Response Action Plans, Source apportionment studies and Funds released for the 132 cities.
- City Dashboards
  - for all 132 cities, including color-coded information on the status of public grievance redressal; source apportionment studies, a graded response action plan, funds released under the 15th Finance Commission and NCAP, the 24-hour average value of PM_{10} concentration, meteorological data, city air action plans and an air quality index.

- realtime updates on Indian city air quality
- Dedicated pages for the sectoral Ministries
- Information of National Knowledge Network (NKN) & Institute of Reputes(IoRs).
- Information about activities of the International Organisations supporting for NCAP implementation.
- Various guidelines reports on Air Quality.
- Intranet for data entry, monitor the progress of city air action plan

3.2 Module Description

3.2.1 Intranet Data Entry System

The annual action plan for improving the air quality in each Non-Attainment city is uploaded, reviewed, and approved using an intranet portal. It also provides information on the physical and financial development of each action from the City level, State level, and Central level. The city nodal individuals are asked to enter information and data from this section in relation to the numerous action points. Separate login IDs are required for implementation committees (132), SPCB nodal officers (132), and state AQMCs in order to access Chief Secretaries (24), the intranet site (24), the MoEF and CC and the CPCB (1) .

Key Aspects of Intranet Portal

- The submission of an annual action plan, quarterly progress reports, and the use of funds for each action point in the city action plan are the key aspects.
- Acceptance of the action plans and quarterly progress reports delivered to CPCB.
- Track the NCAP and city air action plans' implementation status.
- System from portal to registered email as reminders for Action-plan/QPR submission.

3.2.2 Approval Management System

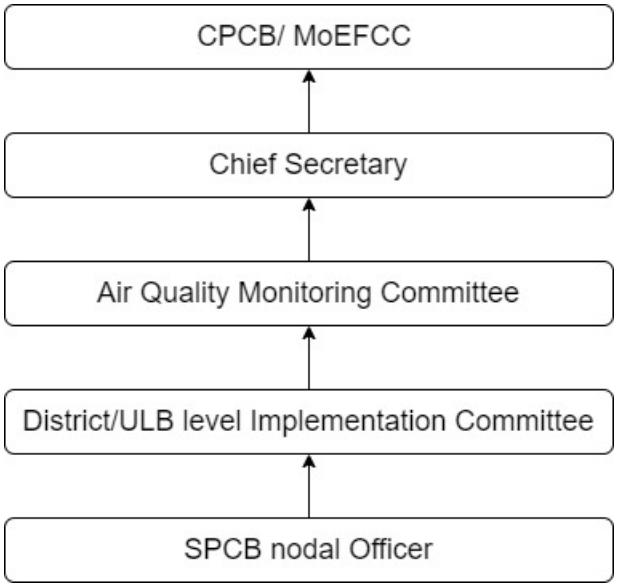

Figure 3.2: Hierarchy of Approval Management System

After gathering data from various departments, the SPCB nodal officer at the municipal level coordinates at various levels for the approval of the annual action plan and QPR. SPCB nodal officers gather data from the Air Quality Management Cell established at the ULB level and from other stakeholders in the DLC in order to fill up the information. The Ministry of Environment, Forests, and Climate Change is the legal home of the Central Pollution Control Board (CPCB) of India. By offering advice and technical support, it coordinates the work of the State Pollution Control Boards and arbitrates conflicts between them.

3.2.3 Messages

The ”Messages” module allows admin to send messages to users. It describes the type of the message (alert or information) and role of the user(City Nodal Officer, DLC, AQMC, Chief Secretary or SPCB). IT is mainly used by CPCB admin for sending message to a particular user or users.

3.2.4 Reporting Module

Reporting module is divided into two sub-modules, Mandatory Action Report and Progressive Report. Mandatory Action Reports are generated using Quarterly Progress Report. 15th of the first month of succeeding Quarter is the last date for submission of Quarterly Progress Report.

SPCB nodal officer at city level is responsible for filling up data after collating information from the various departments and coordinate at various levels for approval of the annual action plan and QPR.

3.3 System Specifications

The application development architecture recognized for this project is specified in this section on the basis of requirements.

3.3.1 Software Specification

- Programming Language : Python
- Framework: Flask Web Framework
- Designing tools : Angular
- Cloud service used : Amazon(AWS)
- Web server : Apache
- Web Browser : Any web browser
- Database : ArangoDB

3.3.2 Software Description

- **Python**

  A well-known high level, all-purpose programming language is Python. Because of the heavy emphasis on code readability in its design philosophy, programmers may express concepts using its syntax more efficiently than they might with languages like C++ or Java. The language offers constructs designed to support both small- and large-scale clear programmes. Python supports a variety of programming paradigms, including functional, imperative and object-oriented or procedural programming. It offers a huge and comprehensive standard library, intelligent memory management, a dynamic type system and more. Python interpreters are available for installation on many operating

systems, allowing Python code execution on a wide variety of systems. Using third-party tools like PyInstaller or Py2exe, Python code can be packaged into standalone executable programmes for some of the most widely used operating systems. This enables the distribution of Python-based software for use on those environments without necessitating the installation of a Python interpreter.

- **Angular**

  The Angular platform makes it simple to create web-based applications. Angular combines dependency injection, declarative templates, integrated best practises and end-to-end tooling to handle development difficulties. Developers can create desktop, web-based or mobile applications with the help of Angular.

  Features:

  - Components : Components assist in dividing applications into numerous modules. This aids in improved long-term maintenance of the application.
  - TypeScript :It is supported by Microsoft and is a superset of JavaScript.
  - Services :Various parts of an application's components can share a set of code called a service. So, for instance, if you had a data component that drew information from a database, you could have it as a shared service that was accessible by other apps.
  - Editor :For Angular development, a variety of editors are available, including Visual Studio code.

- **Flask Web Framework**

  Python was used to create the Flask web development framework. It is simple to use and learn. Because Flask lacks boilerplate code and dependencies, which might detract from an application's main purpose, it is "beginner-friendly". It is thought of as a little framework.

  Features:

  - In addition to a debugger, Flask offers a development server.
  - Jinja2 templates are used.
  - It is WSGI 1.0 compatible.
  - It offers integrated unit testing support.

- Flask has a variety of extensions that can be used to enhance its functionality.

Advantages:

1. **Scalable**

   Size matters a lot, and because Flask is a microframework, one can utilise it to rapidly expand a tech project like a web app. It's the perfect option if a person want to create an app that starts out modest but has the potential to expand quickly and in ways that haven't quite figured out. It can operate without interruption even as it scales up and higher because to its ease of usage and lack of dependencies.

2. **Flexible**

   One of Flask's main benefits and its fundamental feature. The Zen of Python states that simplicity is preferable to complexity since it is more easily rearranged and moved around.

   This not only makes it simple for our project to change direction, but it also ensures that the structure won't crumble in the event that a component is changed. Flask is more adaptable than Django itself due to its minimalist design and capacity for creating smaller web projects.

3. **Easy to negotiate**

   Like Django, being able to navigate with ease is essential for enabling web developers to focus solely on creating swiftly without becoming slowed down. Web developers can save time and effort using the microframework since it is fundamentally simple to understand, and it also gives them more control over their code and the possibilities.

4. **Lightweight**

   Additionally, Flask enables modular programming, which allows for the division of its functionality into a number of swappable modules. Each module serves as a standalone construction block that can carry out a specific functionality. Together, this indicates that each of the structure's individual components is adaptable, movable, and tested on its own.

- Arango DB

  A configurable data format for documents and graphs is available in the open-source, multi-model ArangoDB NoSQL database. It is intended to serve as a ”general purpose database,” providing all the functionality frequently required for contemporary web applications. It enables users to flexibly mix all data models in a single query and supports graph, document, and key-value data models.

  ArangoDB supports three data models:

  - Document database
  - Key-Value database
  - Graph database

  Features:

  1. Easy performance scaling

     With both vertical and horizontal scaling, the database enables us to quickly adjust to changing performance and storage needs. Additionally, it enables us to swiftly scale down our application to reduce hardware and operational costs while supporting the independent scalability of various data models.

  2. Decreased operational complexity

     One can utilise various storage techniques with multi-model databases that better match how our data is used by various parts of our application.

  3. Consolidation

     By significantly reducing the amount of parts that need to be maintained, ArangoDB makes our tech stack more simpler.

  4. VelocyPack (VPack)

     Data is stored in ArangoDB using binary JSON. It is compact, self-contained, uses little memory, and supports all of JSON in addition to dates, binary data, integers, and numbers with variable precision.

Chapter 4

RESULT AND DISCUSSION

The portal informs the public and tracks physical and monetary progress made in accordance with the city action plan to enhance air quality in NACs. In the site, you can find details about the 132 Non-Attainment Cities (NACs) that are receiving funding through NCAP (in 82 Cities) and the Million Plus Challenge Fund under the Fifteenth Finance Commission's proposal for Improving Air Quality (in 42 Urban Agglomerations/Cities (50 Cities)). ArangoDB's support for graphs and JSON documents makes it possible to project detailed realtime data on air quality in Indian cities. The national air quality index's graphic representation is also useful. Better performance and simple NoSQL integration are offered via the Flask API.

4.1 Testing methods

A strategy for ensuring that the system is error-free and conforms with the system's anticipated criteria is testing. Testing is used in this project to find requirements, design, or coding errors in the program.

4.1.1 Validation Testing

The process of determining whether the system satisfies client/user needs is known as validation testing. An essential sort of validation testing employed in this project is unit testing. Unit testing is used to look for flaws in the project section. One of the two potential circumstances exists following the validation test.

- There is agreement between the function or performance characteristics and the specifi-

cation. and are accepted.

- A deficiency list is made after a specification variation is discovered.

4.1.2 User Acceptance Testing

The success of the system is largely dependent on user acceptance. The system under consideration is put to the test for user approval by staying in regular communication with potential systems as they are being developed and making changes as needed. This is done in consideration of the menu-driven system, input screen design, and output screen design.

4.2 Output Screens and Results

1. Home page:

   When user hits the URL this page is loaded

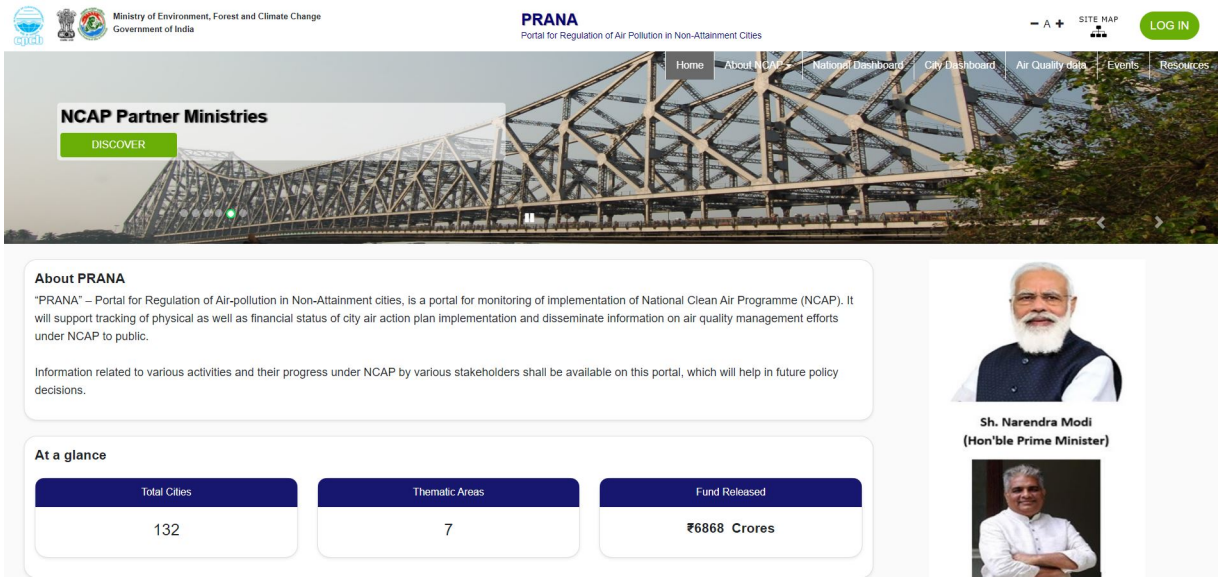

Figure 4.1: Home Page

2. Login page

   When user clicks the ”LOG IN” button this page is loaded

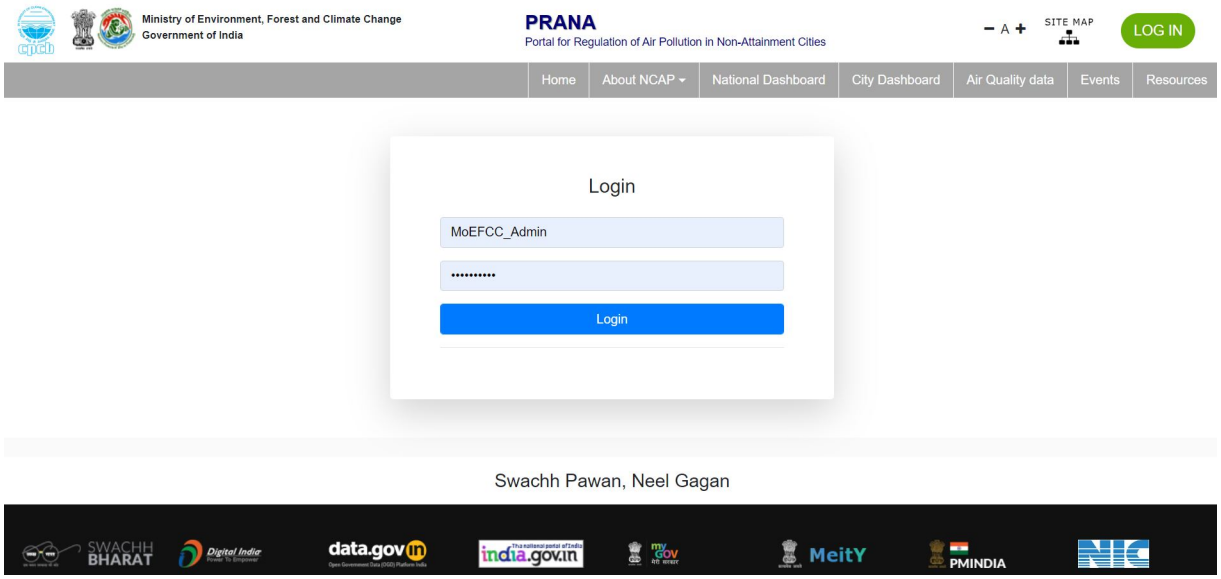

Figure 4.2: Login Page

3. Landing Page

   Landing page is different for admin,state and city

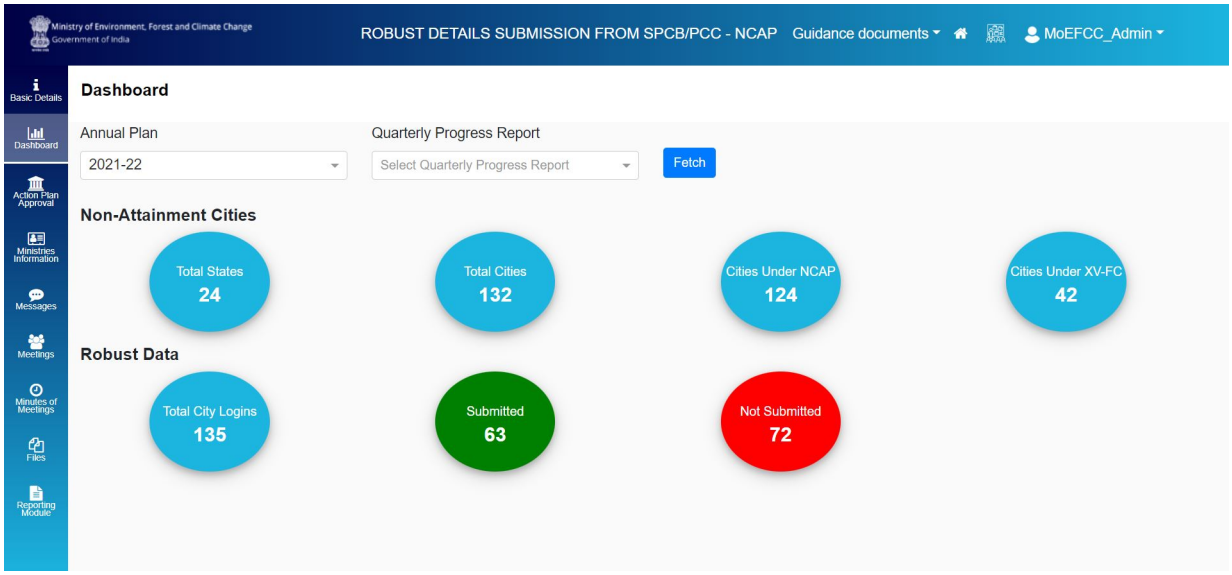

Figure 4.3: Landing Page(Admin)

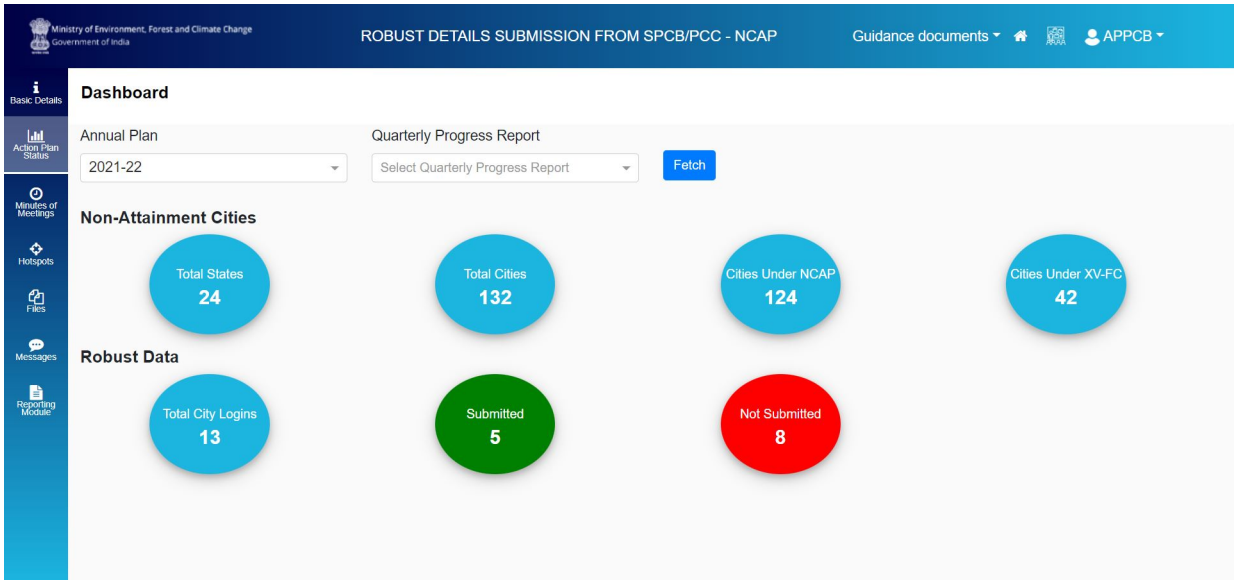

Figure 4.4: Landing Page(State)

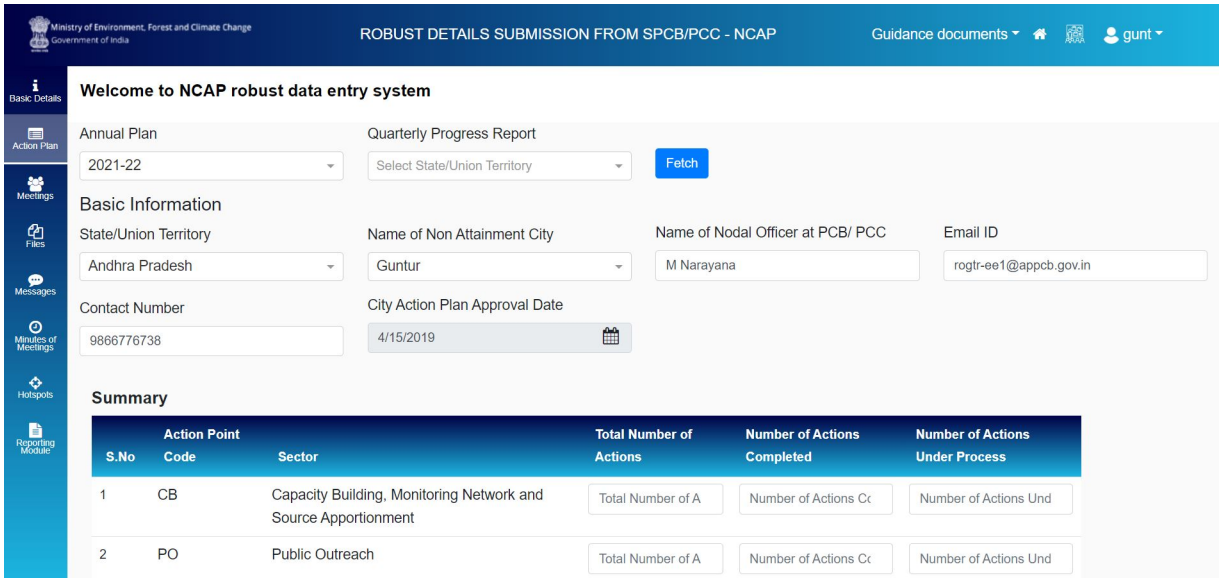

Figure 4.5: Landing Page(City)

4. Basic Details Page

   This basic details page is for adding the basic details of the officer.

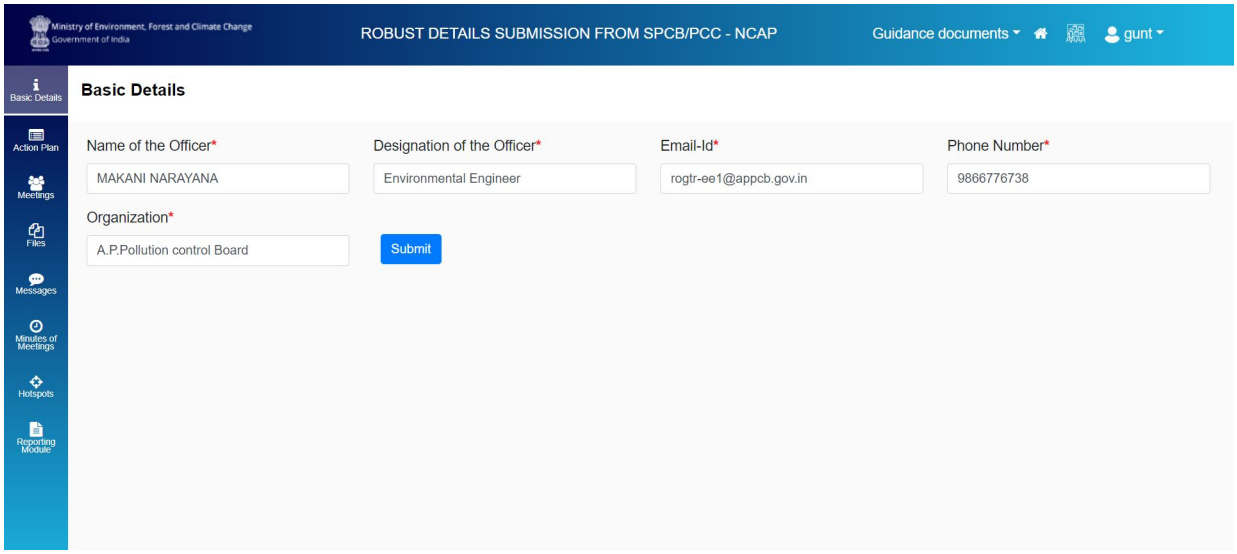

Figure 4.6: Basic Details

5. Meetings Page

- The thresholds page is where one can add, delete, and update the meeting details.
- Admin can see all the meeting details that were conductued by nodal officers at different cities.

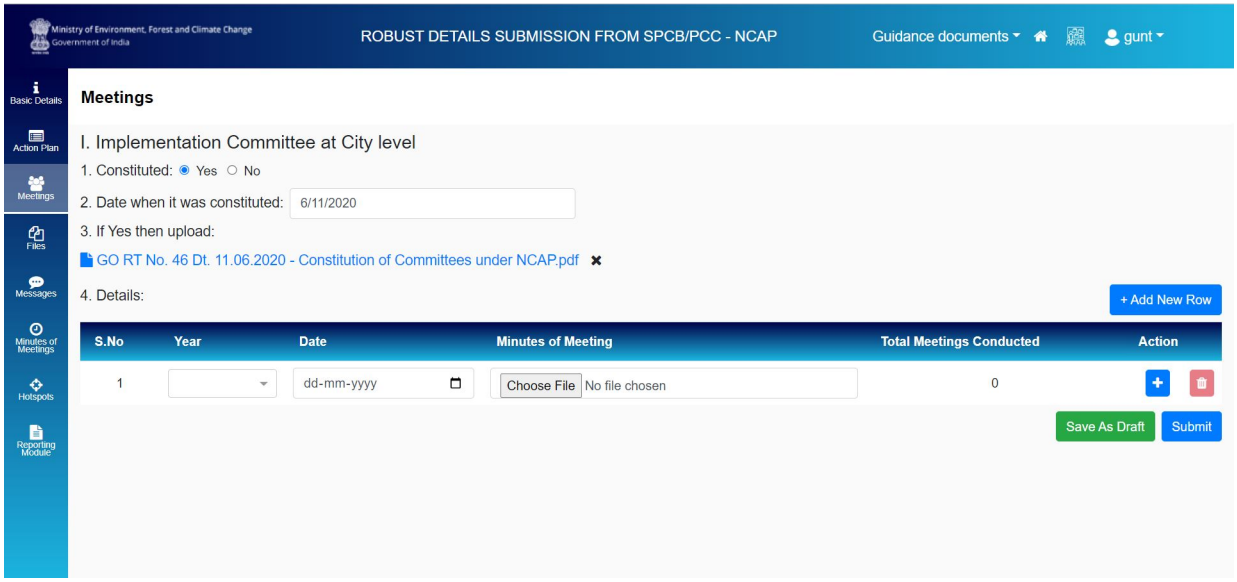

Figure 4.7: Meetings

6. Files Page

- The Files page is where one can add, delete, and update the MoU(Memorandum of Understanding) details.

- Admin can check the validity of MoU.

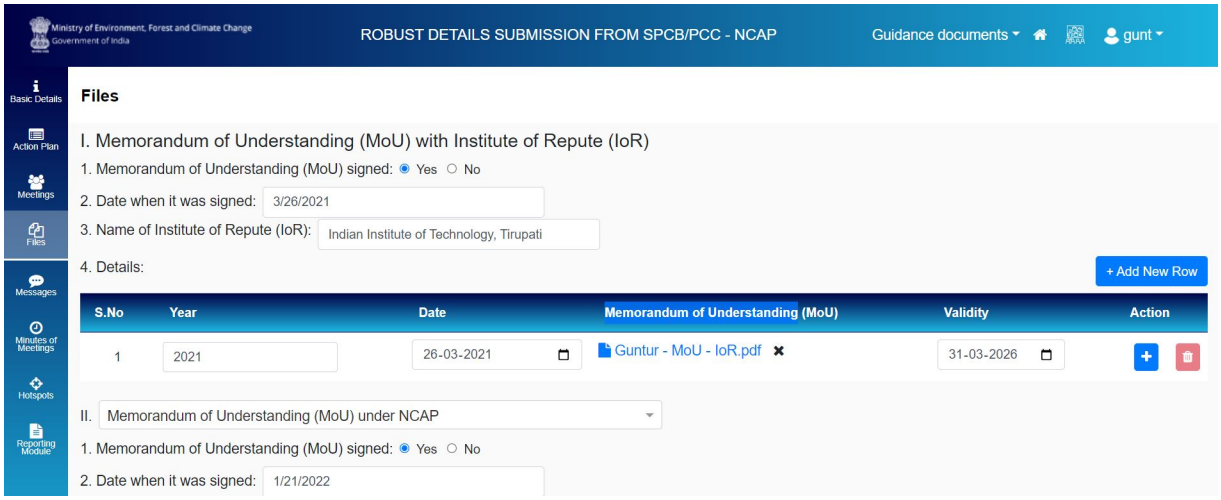

Figure 4.8: Files

7. Messages

   This page shows the messages sent by admin or other users.

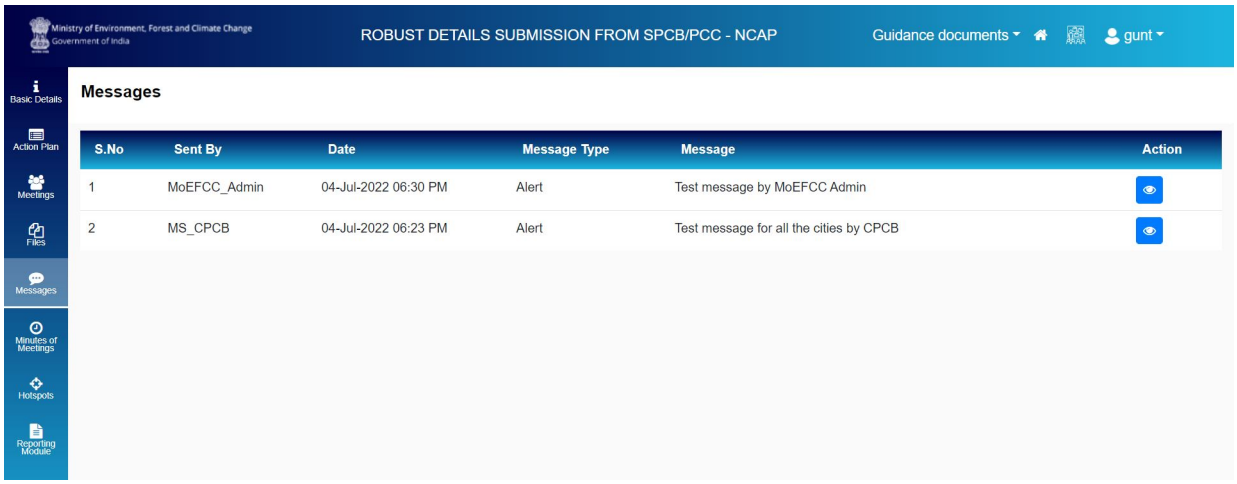

Figure 4.9: Messages

8. Hotspots

   The thresholds page is where one can add, delete, and update Hotspot.

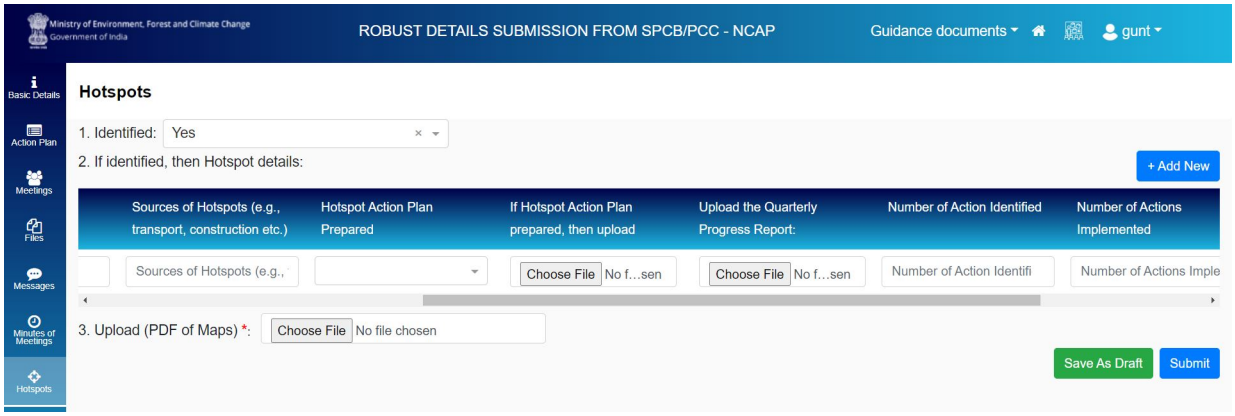

Figure 4.10: Hotspots

Chapter 5

CONCLUSION

The project's goal is to reduce the amount of work required of users to monitor and regulate pollution in accordance with applicable laws and regulations. The portal intends to give users access to up-to-date data on city-wise pollution levels. It is a centralised portal that also offers data on the ways in which particular cities are reducing their air pollution levels, as well as historical information on the air pollution mitigation milestones attained since 2018 up to the present. To improve the country's air quality, the central government has started a number of projects. In 2019, 86 cities had higher air quality than in 2018, and that number rose to 104 cities in 2020. The PRANA portal will provide all information pertaining to various stakeholder policies, programmes, schemes, and activities, as well as the advancements made toward raising air quality around the nation. This portal will serve as a venue for tracking and reviewing all initiatives taken to enhance air quality.

5.1 Future Enhancement

The multidisciplinary PRANA strategy involves numerous ministries, regional institutions including IITs and NITs, laboratories all over India, as well as global organisations. Through this study we can conclude that the PRANA portal is completely coping with what they are actually planning to implement. PRANA is aiming to reduce particular matter concentration by 20-30

REFERENCES

[1] C. Gautam, P. Pullan and V. Niranjan, *"Air Quality Management System"*, 2020 IEEE International Conference on Computing, Power and Communication Technologies (GUCON), 2020, pp. 436-439, DOI: 10.1109/GUCON48875.2020.9231233.

[2] R. Kingsy Grace, B. Monisha, Karthika Aishvarya and A. Kaarthik, *"Analysis and Visualization of Air Quality Using Real Time Pollutant Data"*, 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS), doi: 10.1109/ICACCS48705.2020.9074283

[3] Yuanfang He,Sergiy Paliy, Alexander Kuchansky and Yevhenia Shabala - *"Problems in Air Quality Monitoring"* - 2021 IEEE International Conference on Smart Information Systems and Technologies (SIST),DOI: 10.1109/SIST50301.2021.9465915

[4] Marin Marinov, Elitsa Gieva, Ivan Topalov and Georgi Nikolov, *"Air quality monitoring in urban environments"*, 2016 39th International Spring Seminar on Electronics Technology (ISSE), doi: 10.1109/ISSE.2016.7563237

[5] Supriya.P.Panda and Arun Kumar Department of CSE, MRIIRS, Faridabad- *"A Survey: How Python Pitches in IT-World"* -2019 International Conference on Machine Learning, Big Data, Cloud and Parallel Computing (Com-IT-Con).

[6] Miguel Ramos, Marco Tulio Valente and Ricardo Terra, *"AngularJS Performance: A Survey Study"*,IEEE Software (Volume: 35, Issue: 2, March/April 2018), doi: 10.1109/MS.2017.265100610

[7] Wutthichai Chansuwath and Twittie Senivongse, *"A model-driven development of web applications using AngularJS framework"*, 2016 IEEE/ACIS 15th International Conference on Computer and Information Science (ICIS), doi: 10.1109/ICIS.2016.7550838

[8] Anupam Das, Surendra Nath Bhagat, Anirban Mitra and Subrata Paul,*"Issues and Concepts of Graph Database and a Comparative Analysis on list of Graph Database tools"*, 2020 International Conference on Computer Communication and Informatics (ICCCI), doi: 10.1109/ICCCI48352.2020.9104202

[9] Indhi Farhandika Rochimansyah, M. Udin Harun Rasyid, Arif Basofi and Mohammad Robihul Mufid, *"Design an MVC Model using Python for Flask Framework Development"*, 2019 International Electronics Symposium (IES), doi: 10.1109/ELECSYM.2019.8901656

APPENDIX

Screenshots

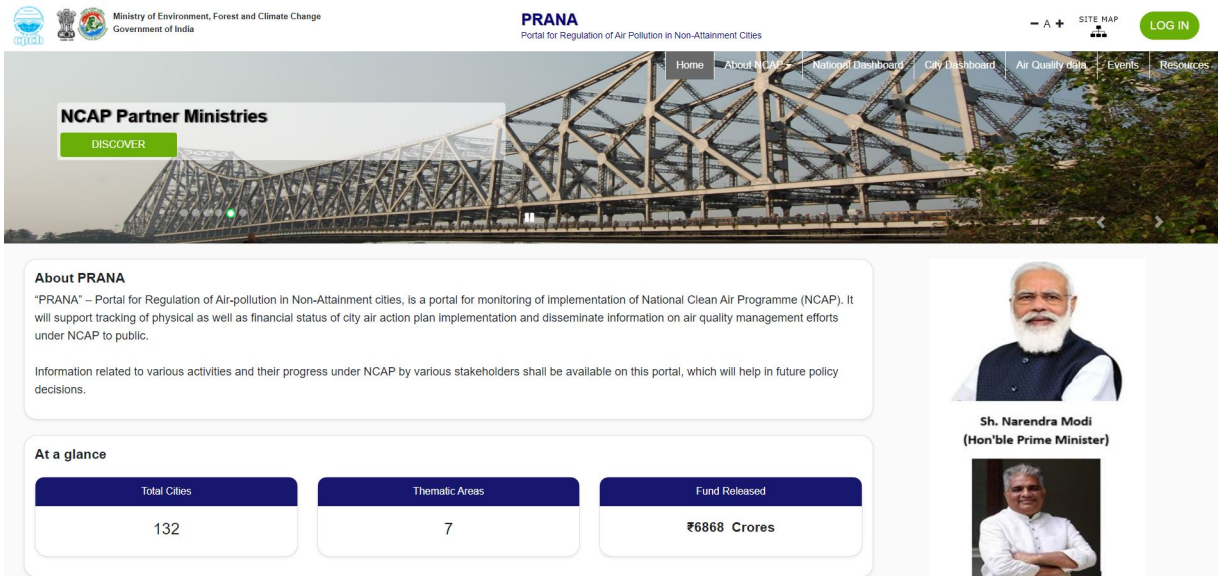

Figure A.1: Home Page

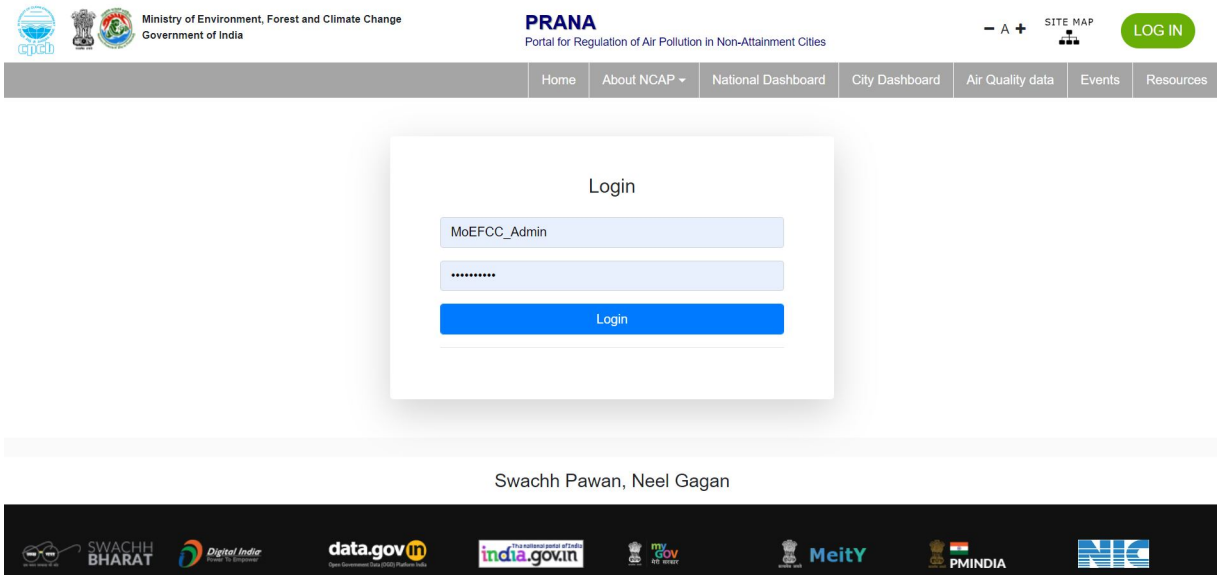

Figure A.2: Login Page

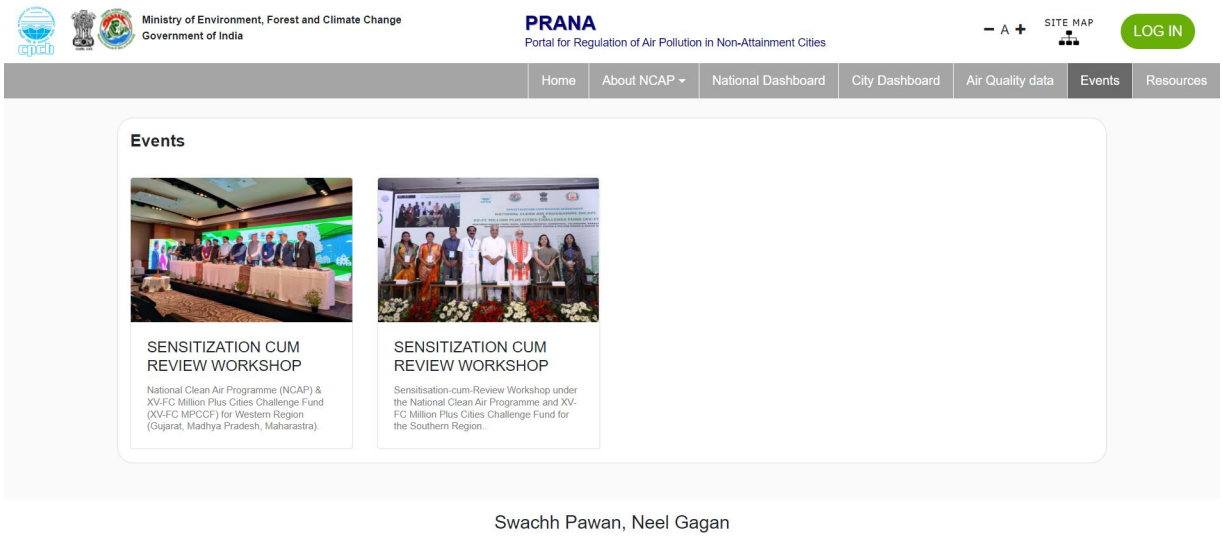

Figure A.3: Events

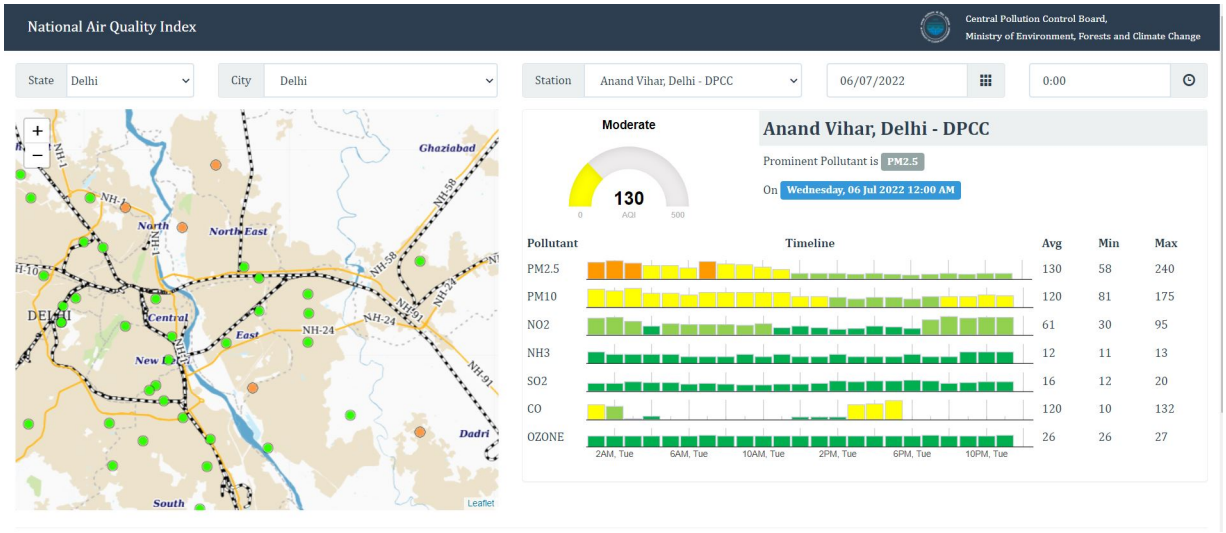

Figure A.4: National Air Quality Index

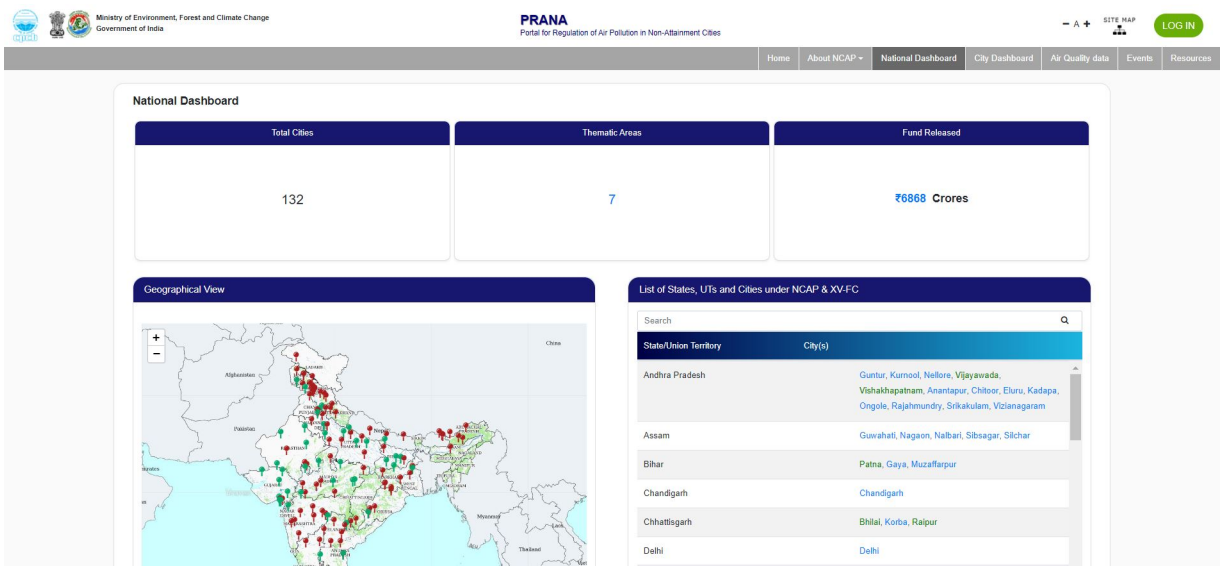

Figure A.5: National Dashboard(a)

Figure A.6: National Dashboard(b)

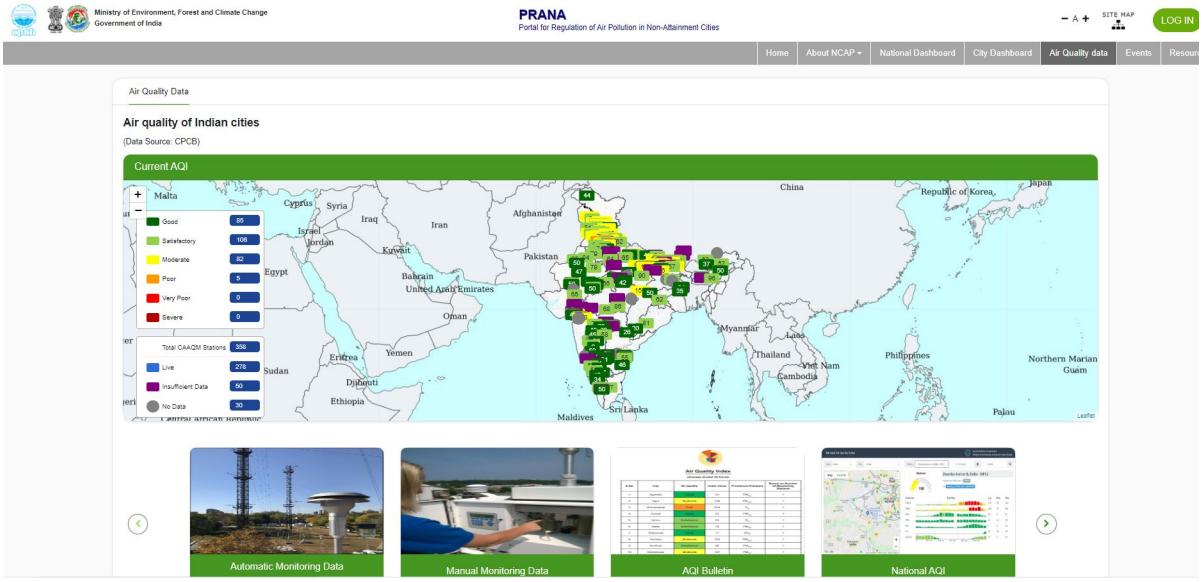

Figure A.7: Air Quality Data

Air Quality Index on Jul 05, 2022 @ 4 PM

(Average of past 24 hours)

S.No	City	Air Quality	Index Value	Prominent Pollutant	Based on Number of Monitoring Stations
1	Agartala	Good	33	PM_{10}	1
2	Agra	Good	45	PM_{10}, $PM_{2.5}$	4
3	Ahmedabad	Satisfactory	52	PM_{10}	6
4	Aizawl	Moderate	178	O_3	1
5	Ajmer	Satisfactory	100	PM_{10}	1
6	Alwar	Satisfactory	71	PM_{10}	1
7	Amaravati	Good	30	O_3	1
8	Ambala	Satisfactory	82	PM_{10}	1
9	Amritsar	Moderate	121	$PM_{2.5}$	1

Figure A.8: Air Quality Index

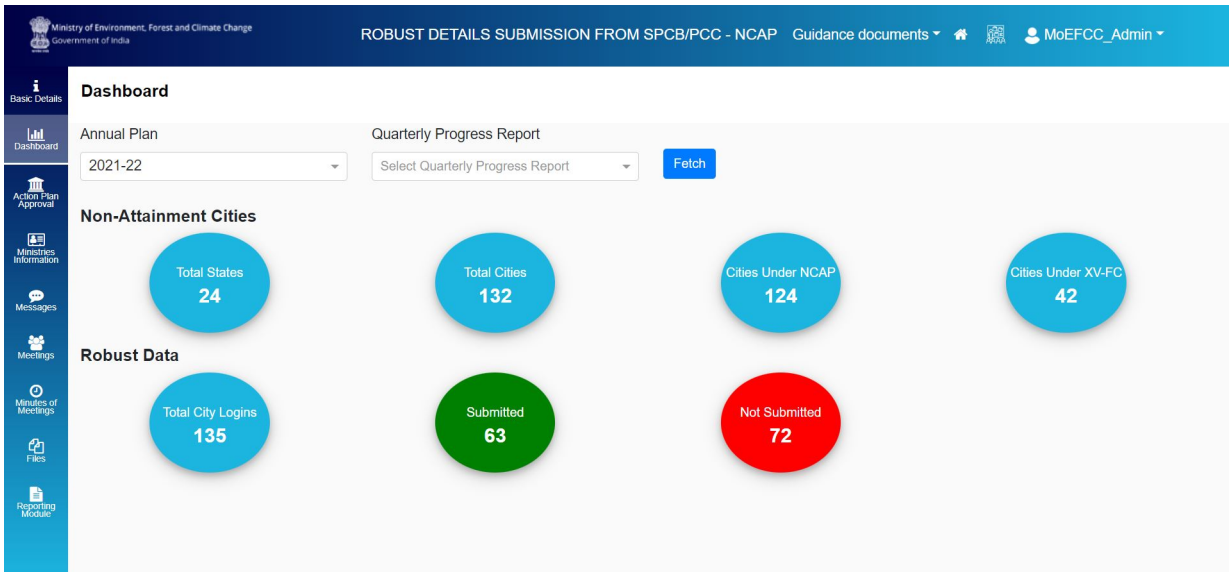

Figure A.9: Landing Page(Admin)

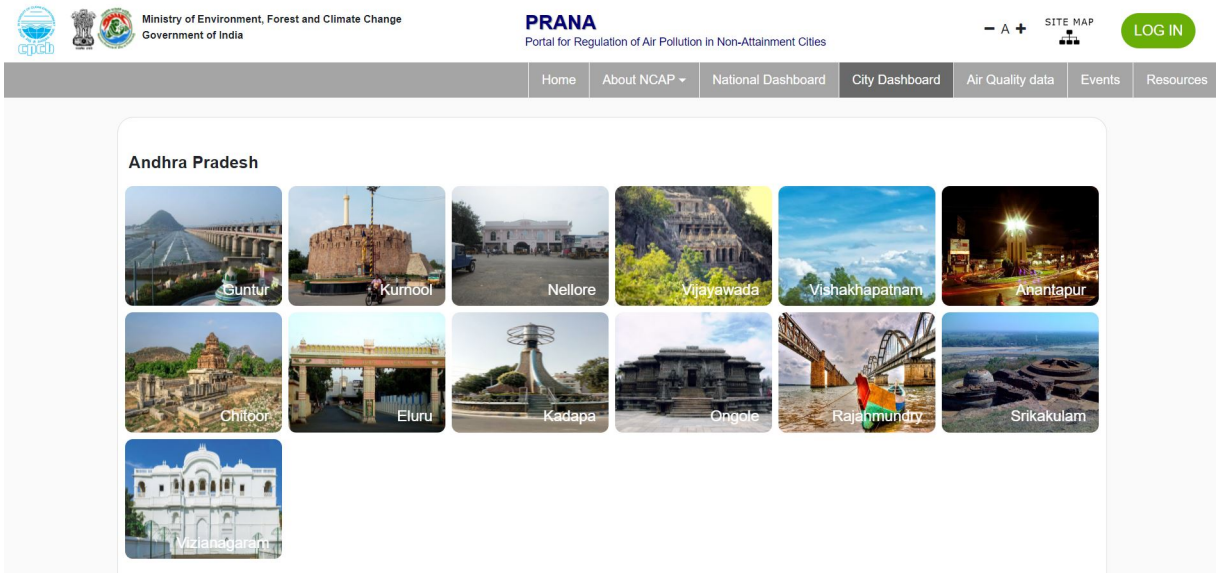

Figure A.10: City Dashboard

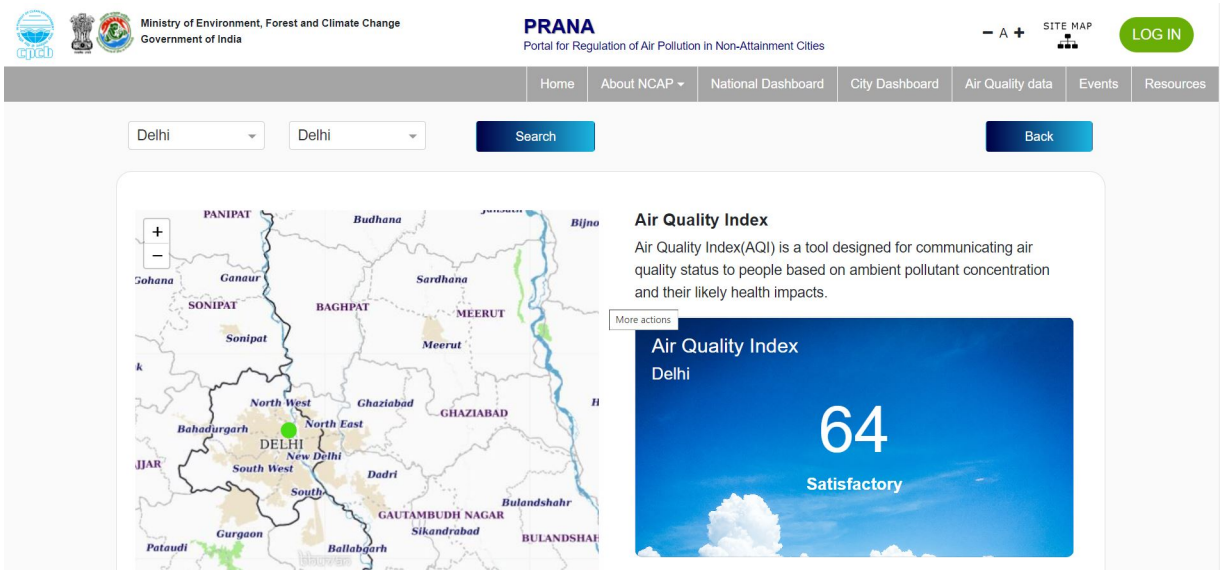

Figure A.11: Air Qulity index(Delhi)

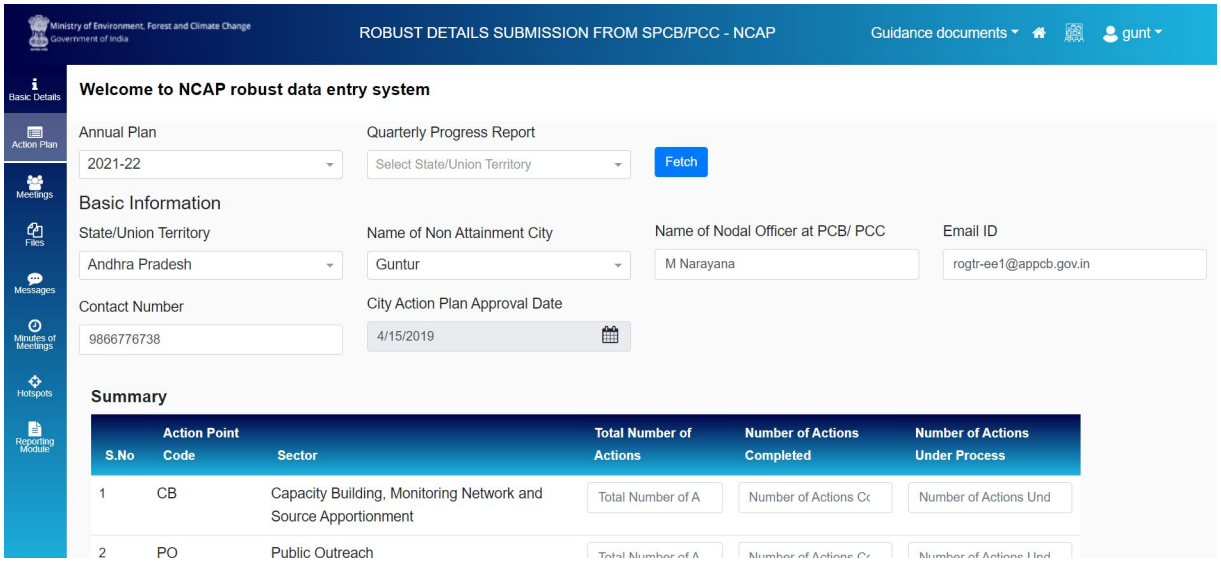

Figure A.12: Landing Page(City)

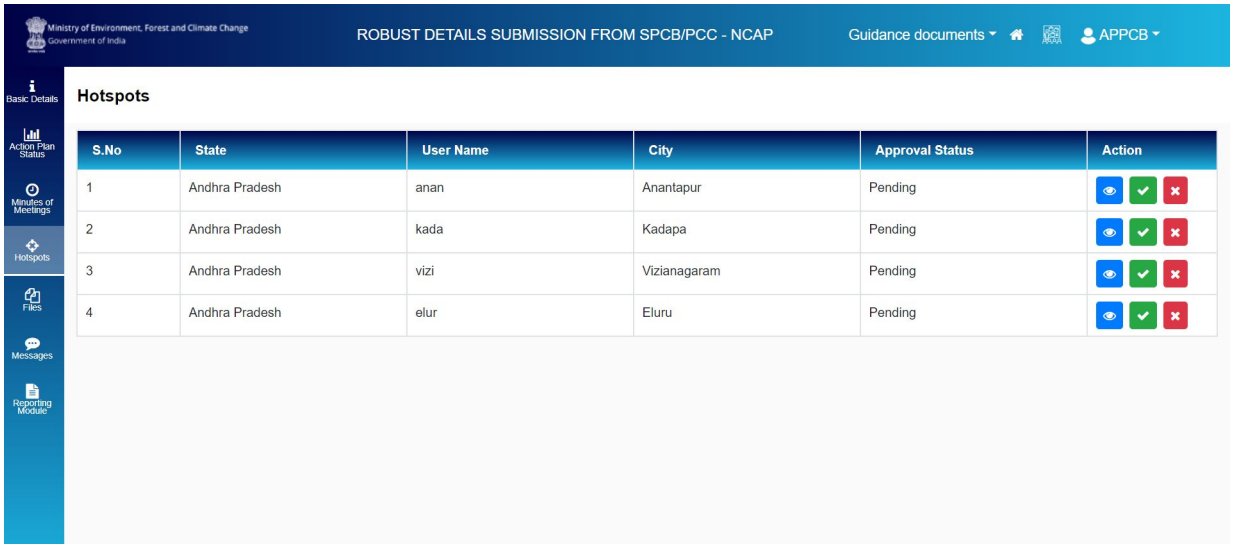

Figure A.13: Hotspots

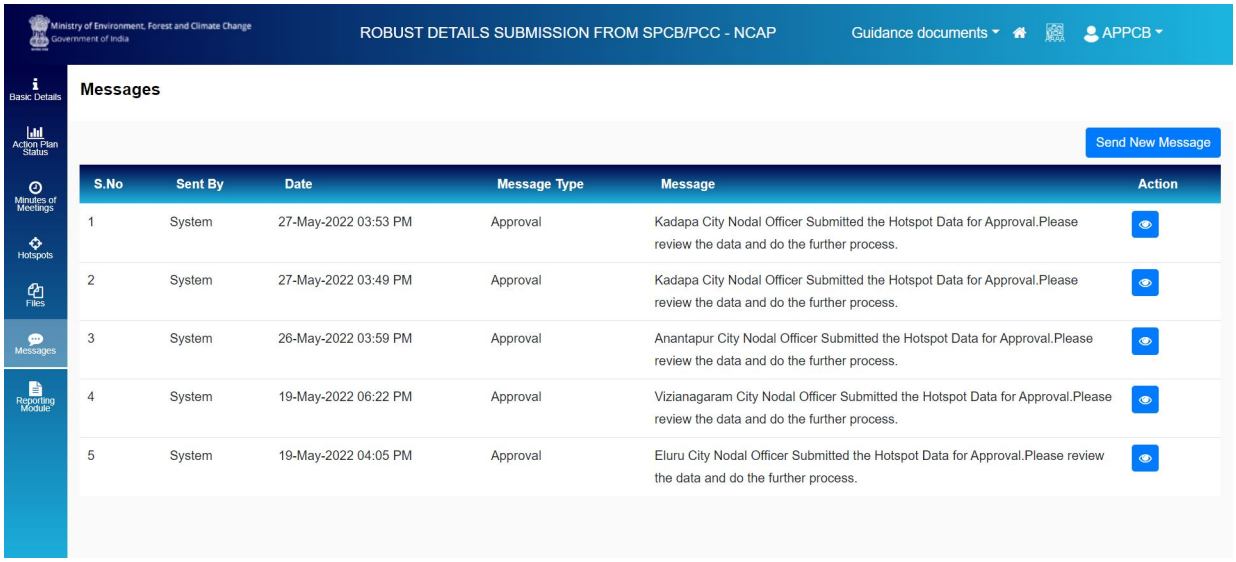

Figure A.14: Messages

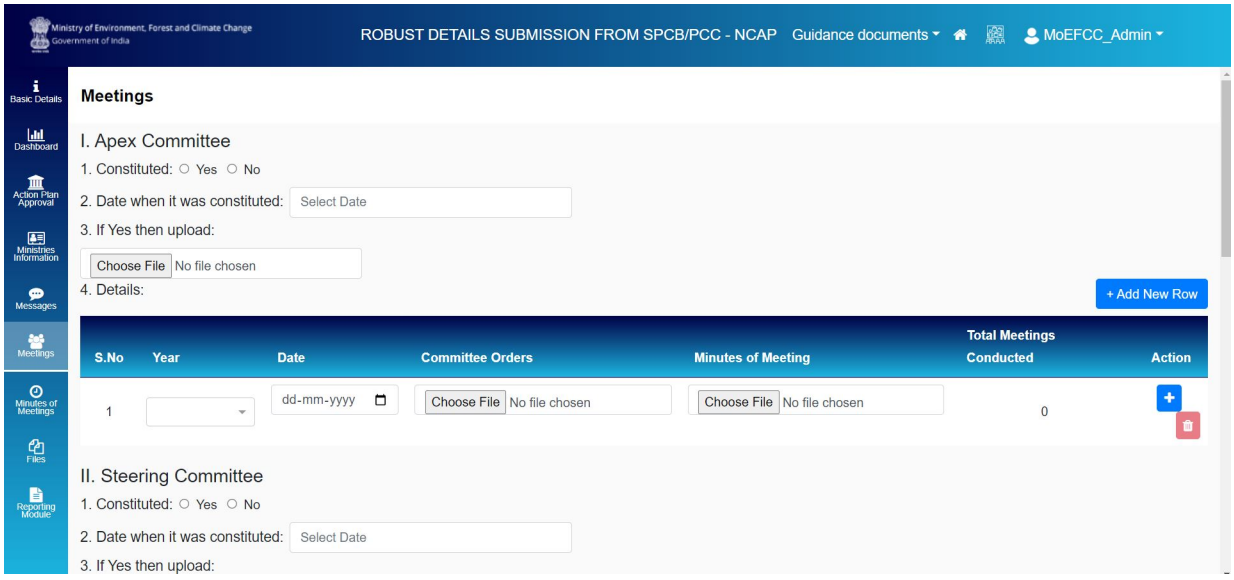

Figure A.15: Meetings

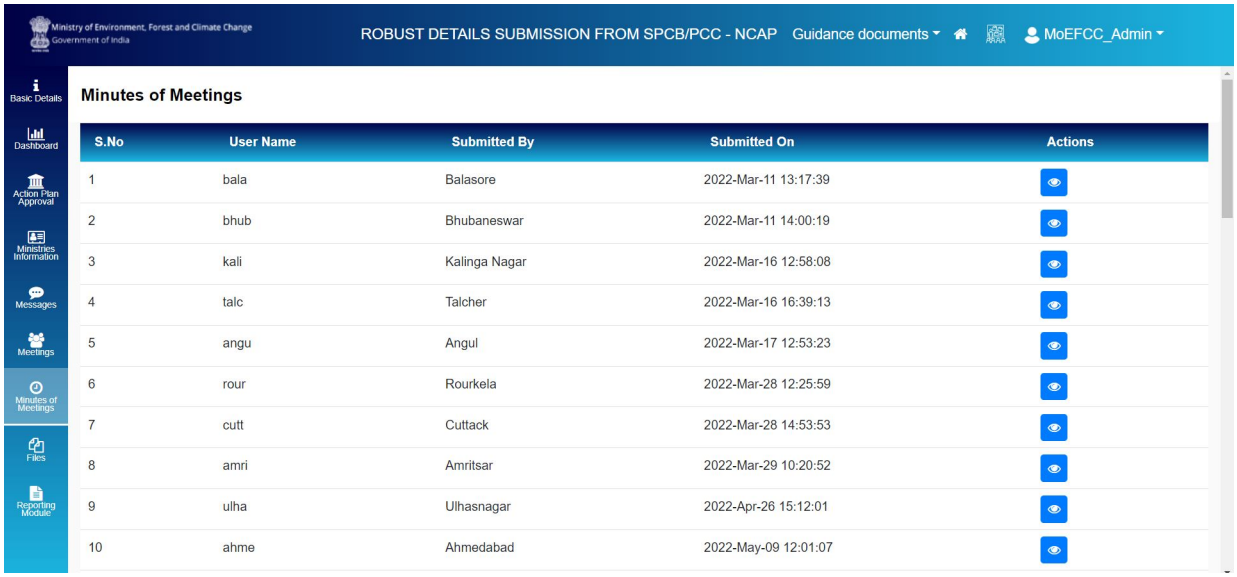

Figure A.16: Minutes of Meetings