

VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF TECHNOLOGY

**(An Autonomous Institute Affiliated to University of Mumbai
Department of Computer Engineering)**

Department of Computer Engineering



Project Report on

PlanItUrban: Shaping Future

Together for Better City

Submitted in partial fulfillment of the requirements of Third Year
(Semester–VI), Bachelor of Engineering Degree in Computer Engineering at
the University of Mumbai Academic Year 2024-25

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(AY 2024-25)**

VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF TECHNOLOGY

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CERTIFICATE

This is to certify that _____ of Third Year Computer Engineering studying under the University of Mumbai has satisfactorily presented the project on “**PlanItUrban: Shaping future together for better City**” as a part of the coursework of Mini Project 2B for Semester-VI under the guidance of **Prof. Indu Dokare** in the year 2024-25.

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Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea / data / fact / source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Computer Engineering Department

COURSE OUTCOMES FOR T.E MINI PROJECT 2B

Learners will be to:-

CO No.	COURSE OUTCOME
CO1	Identify problems based on societal /research needs.
CO2	Apply Knowledge and skill to solve societal problems in a group.
CO3	Develop interpersonal skills to work as a member of a group or leader.
CO4	Draw the proper inferences from available results through theoretical/ experimental/simulations.
CO5	Analyze the impact of solutions in societal and environmental context for sustainable development.
CO6	Use standard norms of engineering practices
CO7	Excel in written and oral communication.
CO8	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
CO9	Demonstrate project management principles during project work.

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ABSTRACT

Urban governance in India is often hindered by fragmented departmental structures, inefficient resource management, and poor interdepartmental coordination. These challenges frequently lead to project delays, resource misallocation, and overlapping responsibilities among departments such as Water Supply, Public Works, and Sanitation, all of which undermine the efficient execution of urban projects. The lack of communication and cooperation between these departments results in infrastructural inefficiencies that hamper development efforts across Indian cities.

To address these issues, PlanItUrban is proposed as an innovative digital platform designed to streamline governance processes by enhancing interdepartmental collaboration. The platform's key objectives are to improve coordination through real-time data sharing, optimize resource management by leveraging AI-driven decision-making, foster transparency in project execution and enable proactive conflict resolution through data analytics. By integrating these tools, PlanItUrban aims to eliminate the inefficiencies that commonly arise in fragmented governance structures, ensuring that projects are completed on time and within budget.

Additionally, PlanItUrban aligns with global smart city trends by fostering transparency, accountability, and informed decision-making in urban planning. Drawing from successful case studies in cities like Kansas City and Dhaka, the platform incorporates strategies to mitigate delays and inefficiencies while enabling scalability and adaptability across various urban environments. With its potential for expansion, PlanItUrban stands as a promising model for sustainable urban governance in India, capable of transforming the way cities operate and manage their resources.

1. INTRODUCTION

1.1 Introduction

The PlanItUrban project aims to create a digital platform that enhances interdepartmental collaboration and streamlines urban governance in Indian cities. Traditionally, urban governance in India faces challenges due to fragmented departmental structures and inefficient resource management, leading to project delays and ineffective coordination among critical urban departments like Water Supply, Public Works, and Sanitation [3]. PlanItUrban addresses these issues by facilitating seamless coordination, enabling departments to communicate in real-time, assign tasks efficiently, and track the progress of ongoing infrastructure projects. This real-time data-sharing mechanism can mitigate common issues, such as project overlap and delays, by ensuring departments remain informed and aligned with project timelines [2].

The platform provides distinct user roles—Administrators, Departments, and Officers—each responsible for different levels of project management, task assignment, and resource allocation. This role-based structure ensures accountability while minimizing the bureaucratic bottlenecks that often hinder interdepartmental coordination. Additionally, the platform enables easy documentation of progress, allowing departments to maintain up-to-date records, which reduces the risk of miscommunication and enhances project transparency [1].

Research on e-governance and digital platforms highlights the role of such tools in improving transparency, accountability, and efficiency in urban governance [5]. For instance, studies on urban planning in India have demonstrated that digital platforms can help address challenges in governance by fostering citizen engagement and improving the coordination of government projects [14]. Similarly, platforms in cities like Kansas City and Dhaka have shown how digital technology can enhance transparency and reduce project delays by providing a centralized communication system for departments and stakeholders [14].

Furthermore, PlanItUrban incorporates AI-driven decision-making tools, allowing departments to detect potential conflicts, optimize resource management, and make proactive decisions to prevent project disruptions [8]. AI-based planning and real-time data analytics ensure that the platform can predict issues like overlapping timelines or resource shortages, enabling departments to adjust plans before significant delays occur. The growing global emphasis on smart city development supports the implementation of AI-driven platforms like PlanItUrban, which align with current trends in urban planning [10].

1.2 Motivation

Urban governance is crucial for enhancing public services and infrastructure, which directly contribute to economic growth and stability. In India, fragmented departmental structures often lead to inefficiencies, project delays, and resource wastage. PlanItUrban is designed to address these challenges by creating a digital platform that streamlines interdepartmental collaboration. By enabling real-time data sharing and communication across departments like Water Supply and Public Works, the platform aims to reduce delays, optimize resource management, and improve overall project execution [1].

Integrating operations research (OR) into urban planning can further enhance the effectiveness and social impact of platforms like PlanItUrban. While OR has traditionally focused on urban issues such as transportation and housing, its application in urban governance has been limited compared to public policy [6]. By adopting a more inclusive OR approach that prioritizes community engagement and methodological pluralism, PlanItUrban can address the complex, multi-stakeholder nature of urban environments. This perspective not only recognizes the diverse voices of community members but also aims to develop equitable solutions to urban challenges by incorporating qualitative methods alongside technological innovations [5].

Additionally, efficient governance plays a key role in promoting sustainability and preserving cultural heritage. By streamlining project management and reducing resource wastage, PlanItUrban supports sustainable urban development, ensuring that modern infrastructure projects align with environmental and cultural conservation goals [9]. The platform's scalability makes it a valuable model for future expansions, benefiting current and future generations by fostering transparency and efficient governance [7].

1.3 Problem Definition

The rapid urbanization of Indian cities has led to increased demand for efficient infrastructure and public services. However, the existing governance framework often suffers from fragmentation, with multiple departments operating in isolation. This lack of coordination results in overlapping responsibilities, project delays, and mismanagement of resources. For instance, a newly constructed road can be disrupted by the later installation of utility lines, highlighting the inefficiencies inherent in a fragmented governance system that ultimately affects the quality of urban services provided to residents [4].

Research on urban planning in Dhaka, Bangladesh, further emphasizes the importance of

coordinated governance structures for effective urban management. Despite the theoretical advantages of decentralization, the lack of alignment among various planning bodies—such as the Dhaka City Corporation and the Capital Development Authority—has led to inefficiencies and poor urban management [14]. Overlapping roles and responsibilities among these organizations hinder effective planning and service delivery, resulting in fragmented efforts that do not align with the city's development goals [6][7].

In response to these challenges, there is a pressing need for a centralized digital platform to facilitate interdepartmental cooperation. The proposed platform, PlanItUrban, aims to enhance communication and resource sharing while establishing clear roles and responsibilities among departments. The objectives of PlanItUrban include improving urban governance, streamlining project execution, and ultimately ensuring that urban projects are completed efficiently and effectively to meet the growing needs of residents.

1.4 Existing Systems

Currently, most urban infrastructure projects are managed through fragmented systems or manual processes. Various government departments operate in silos, each using their own isolated methods for project planning, approvals, and communication. Below are some observations from existing systems:

1. Manual and Paper-Based Processes

- Officer registration, project approvals, and resource allocation often rely on physical paperwork.
- Lack of digitalization leads to significant delays and human errors.

2. Department-Specific Tools

- Some departments use basic tools like spreadsheets or localized software.
- These tools do not support integration with other departments, resulting in poor visibility and coordination.

3. No Conflict Detection Mechanism

- Overlapping infrastructure work (e.g., road construction and utility installation) often goes unnoticed until conflicts arise on ground.
- Existing systems do not include GIS-based or AI-based detection to prevent such issues.

4. Ineffective Communication Channels Interdepartmental coordination is largely dependent on phone calls, emails, or in-person meetings.

- No centralized platform exists to manage task updates or meeting schedules in real time.

5. Limited or No Real-Time Tracking

- Projects are rarely monitored in real time, making it difficult for officials to track progress or bottlenecks.
- Delays or overruns are often identified too late to take corrective actions.

1.5 Lacunas of the Existing System

- **Fragmented Communication:** Siloed operations among various departments and agencies significantly hinder effective data sharing, leading to operational inefficiencies and misaligned objectives. The lack of streamlined communication channels often results in duplicated efforts, delays in decision-making, and reduced transparency. Without integrated platforms for interdepartmental collaboration, valuable insights and critical information are lost or delayed, ultimately impairing project outcomes and coordination. Addressing this challenge requires the implementation of unified communication frameworks and interoperable data systems that facilitate real-time information exchange and collective decision-making.
- **Project Interference and Delays:** Concurrent infrastructure projects undertaken by different agencies frequently lead to conflicts that cause unnecessary delays and increased costs. A common example is when newly constructed roads are damaged shortly afterward by utility installations, such as water pipelines or fiber optic cables, due to a lack of preemptive collaboration and project synchronization. These disruptions highlight the pressing need for integrated planning processes that ensure all stakeholders are aligned before execution begins. Establishing centralized project databases and collaborative planning tools can significantly reduce interference, improve timelines, and preserve infrastructure integrity.
- **Underutilized Resources:** Public sector agencies often face challenges in efficiently utilizing shared resources such as machinery, manpower, and technical expertise. The absence of mechanisms for inter-agency resource pooling leads to duplication, idle equipment, and increased operational costs. Despite possessing complementary capabilities, departments frequently operate in isolation, which prevents the optimal use of available assets. Developing resource-sharing protocols, centralized asset inventories, and cross-training programs can help maximize resource utilization, lower project expenses, and enhance overall efficiency across government projects.

1.6 Relevance of the Project

The relevance of the "PlanItUrban: Shaping Future Together for Better City" project lies in its ability to streamline interdepartmental coordination in urban governance—a critical issue that leads to resource underutilization, project delays, and inefficient infrastructure development in Indian cities. As urban areas rapidly expand, especially in countries like India, effective coordination among multiple authorities becomes essential for sustainable development.

This project is highly relevant because:

- **Improved Interdepartmental Coordination:** PlanItUrban creates a centralized digital platform where departments and officers can collaborate seamlessly, minimizing the risk of miscommunication and conflicting project timelines. This helps prevent scenarios like freshly constructed roads being damaged by subsequent utility work.
- **Efficient Resource Utilization:** By providing visibility into the availability of machinery and technical expertise across departments, the system promotes better resource sharing. This significantly reduces operational costs and increases productivity.
- **Real-Time Project Oversight:** With features like dashboards, notifications for overlapping tasks, and integrated meeting scheduling, PlanItUrban ensures proactive conflict detection and resolution, enhancing the efficiency of project execution.
- **Addressing Gaps in Existing Systems:** Current urban governance mechanisms are plagued by fragmented communication and lack of transparency. PlanItUrban overcomes these barriers through robust modules for user management, project tracking, and communication, ultimately aiming to reduce delays and optimize outcomes in urban infrastructure development.

2. Literature Survey

A. Overview

This literature survey investigates prior innovations and academic research concerning interdepartmental urban project coordination, digital governance frameworks, and intelligent infrastructure planning. Existing municipal systems are often hindered by fragmented communication, delayed approvals, and inefficient tracking mechanisms. These gaps contribute to overlapping projects and resource mismanagement. The PlanItUrban system is designed to resolve these challenges by drawing upon digital integration, AI assistance, and geospatial awareness—offering a unified solution for efficient urban project execution.

B. Related Works

PlanItUrban draws inspiration and technical direction from multiple pioneering efforts in smart city governance, geospatial coordination, and AI-driven urban planning:

- **"An IoT-Based Smart City Framework for Efficient Urban Governance"**

This paper details how sensor-based data and IoT systems can unify city services and offer real-time monitoring across departments. Inspired by this, PlanItUrban includes real-time project updates and department-wise notifications for improved transparency and decision-making.

- **"Integrated Platform for Urban Project Management using Geospatial Technology"**

This study presents a GIS-backed coordination system to track infrastructure development and avoid overlaps. PlanItUrban mirrors this by integrating Google Maps to visually manage project sites and identify conflict zones.

- **"A Digital Platform for Resource Allocation and Inter-Agency Communication"**

Highlighting resource sharing and smoother communication, this work serves as a blueprint for PlanItUrban's Resource Management and Meeting Scheduling features. These reduce redundancy and project delays due to miscommunication.

- **"Enhancing Urban Infrastructure Through E-Governance Portals"**

This paper emphasizes the impact of digital tools on transparency and departmental coordination. Similarly, PlanItUrban supports structured approval workflows, officer authentication, and dashboard-driven monitoring to streamline governance operations.

2.1 Research Paper referred

1. “Digital Infrastructure for Smart Cities” – M. Singh & R. Gupta

- **Abstract:**

This study examines integrated digital platforms in cities like Pune and Surat. It proves how real-time systems minimize project delays and streamline resource use.

- **Inference:**

Interdepartmental platforms significantly enhance execution and minimize operational conflicts.

2. “GIS-Based Urban Planning System” by T. Ramesh and K. Patel

- **Abstract:**

Presents a spatially aware project management system. It overlays infrastructure tasks to identify and resolve clashes before execution.

- **Inference:**

GIS tools enhance visual planning and prevent overlapping tasks, such as roadworks and utility setups.

3. “E-Governance Frameworks for Municipal Coordination” by A. Bose et al.

- **Abstract:**

Focuses on centralized digital systems for project tracking and meeting management. Results indicate improved accountability and faster task completion.

- **Inference:**

E-governance systems ensure transparency and improve departmental collaboration.

4. “Smart Collaboration: Resolving Urban Infrastructure Conflicts using AI” by P. Iyer and V. Menon

- **Abstract:**

Introduces AI-based conflict detection in infrastructure projects by analyzing interdepartmental data for early warnings.

- **Inference:**

AI integration can prevent redundant work by identifying potential project clashes in early planning stages.

2.2 Patent Search

Several patents in the domain of urban planning, digital governance, and infrastructure management were reviewed to understand the existing solutions and innovations. Key takeaways include:

- US10354129B2 – Smart City Infrastructure Coordination Platform
Describes a digital system for coordinating utility projects using GPS data and cross-departmental scheduling.
☐ Relevance: Supports the concept of PlanItUrban’s project overlap detection and GIS integration.
- US10572834B1 – Real-Time Municipal Project Tracker
Focuses on real-time task assignment and progress tracking for civic departments.
☐ Relevance: Closely aligns with PlanItUrban’s officer task tracking and dashboard modules.
- IN201921012345 – E-Governance Workflow System for Urban Bodies
Proposes an approval and communication system for municipal bodies with centralized document control.
☐ Relevance: Mirrors the secure approval workflows and commissioner review features in PlanItUrban.

2.3 Inference Drawn

From the literature and patent survey, the following key insights have been derived:

- Fragmented governance leads to costly delays, redundant tasks, and unplanned overlaps.
- GIS and AI can significantly reduce project conflicts and enhance decision-making.
- E-Governance systems with structured workflows improve transparency and accountability.
- Real-time updates and centralized dashboards are crucial for efficient urban planning.

2.4 Comparison with existing systems

Feature	Traditional Systems	PlanItUrban
Communication	Siloed, departmental	Unified, interdepartmental notifications
Project Approval	Manual, slow	Automated digital workflows
Project Overlap Detection	Lacking or ad hoc	AI-based conflict detection + GIS mapping
Task Assignment & Tracking	Manual updates	Officer dashboard with real-time task progress
Resource & Meeting Management	No centralized scheduling	Resource allocation + meeting scheduling module
Visualization	Not commonly used	Google Maps-based spatial visualization
Citizen Engagement	External e-governance platforms only	Internal dashboards and secure access for officials

3. Requirement gathering for proposed system

3.1 Introduction to Requirement Gathering

The *PlanItUrban* project, aimed at resolving inefficiencies in urban project coordination across government departments, began with recognizing the fragmented nature of interdepartmental planning in Indian cities. Requirement gathering focused on clearly defining the need for a unified digital solution that supports centralized communication, optimized resource sharing, conflict detection, and real-time collaboration. The project aimed to reduce project delays, overlapping efforts, and resource wastage by enabling seamless coordination among departments such as water, electricity, roads, and telecom.

3.2 Functional Requirements

The core functions of the system include enabling urban departments to register their projects, view ongoing and upcoming works by others, and identify possible overlaps or conflicts in real-time. The system must integrate user authentication, project data entry, and a shared dashboard for visualization. A key component is the conflict detection mechanism that identifies overlapping projects based on geography and timelines, prompting departments to collaborate.

Additionally, the system allows departments to share available resources and request help when required, reducing redundancy and improving equipment utilization. A built-in meeting scheduler facilitates coordination between stakeholders for resolving overlaps. Notifications and alerts are automatically triggered to ensure timely awareness and decision-making. The system ultimately aims to increase transparency, improve resource efficiency, and minimize infrastructural disruptions.

3.3 Non Functional Requirements

The system must demonstrate high **reliability**, ensuring 24/7 availability for government use. **Usability** is critical, requiring an intuitive interface for users with varying degrees of digital proficiency. **Scalability** is also essential, allowing the system to accommodate multiple cities, departments, and growing project volumes. Security is paramount, with role-based access control and secure login mechanisms to protect sensitive infrastructure data.

In addition, **performance** requirements include fast response times for conflict detection and meeting scheduling. Lastly, the solution must be **cost-effective** to ensure feasibility for widespread

adoption by municipal bodies with limited technical infrastructure.

Hardware, Software, Technology and Tools Utilized

Hardware Requirements

- **Processor:** Intel Core i5 (or equivalent) or higher. This ensures sufficient processing power for running the prediction models and handling data.
- **Memory (RAM):** 8 GB or more. Adequate memory is needed for efficient data processing and model execution.
- **Storage:** 256 GB SSD or higher. Solid-state drives (SSDs) provide faster data access compared to traditional hard drives.
- **Network:** Stable internet connection. A reliable network connection is crucial for real-time data collection and communication.

Software Requirements

- **Operating System:** Windows 10/11 or Linux (Ubuntu). These operating systems are commonly used for software development and data analysis.
- **Programming Language:** Python 3.x. Python is a popular choice for data science and machine learning due to its extensive libraries and ease of use.
- **Framework:** Flask – used to develop web APIs and host core application functionalities.
- **Database:** MySQL – employed to store project, user, and resource data securely.

Constraints

1. **Limited Stakeholder Access:** Involving all departments across different regions posed logistical and technical difficulties, potentially leading to incomplete requirement analysis.
2. **Data Inconsistency:** Variability in data formats and project reporting structures across departments hindered seamless integration.
3. **Technological Resistance:** Adoption may be slow due to reluctance in shifting away from manual coordination methods and existing legacy tools.
4. **Conflicting Departmental Priorities:** Different departments have varying objectives and

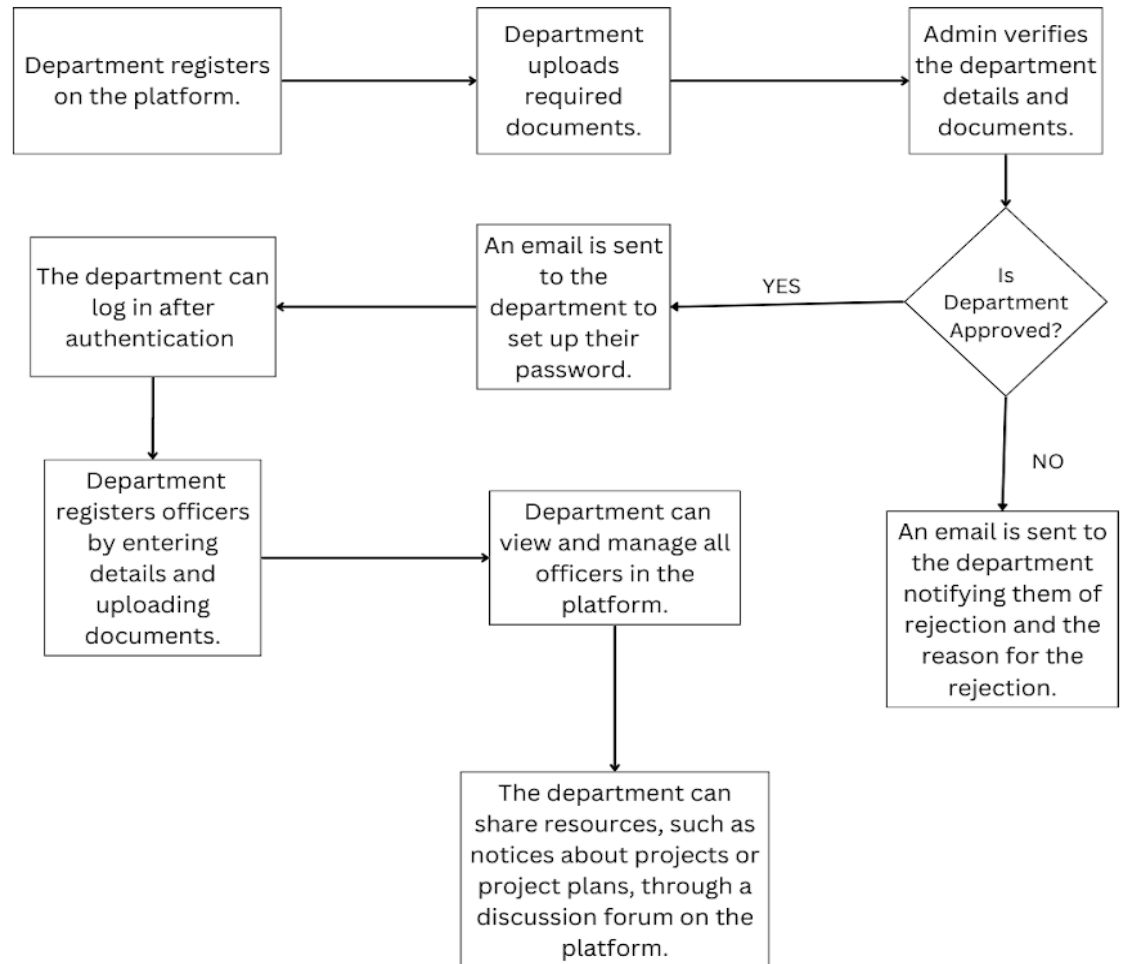
may resist collaboration, posing challenges in standardizing processes.

5. **Infrastructure Limitations:** Some departments lack the necessary digital infrastructure to fully utilize the platform initially.

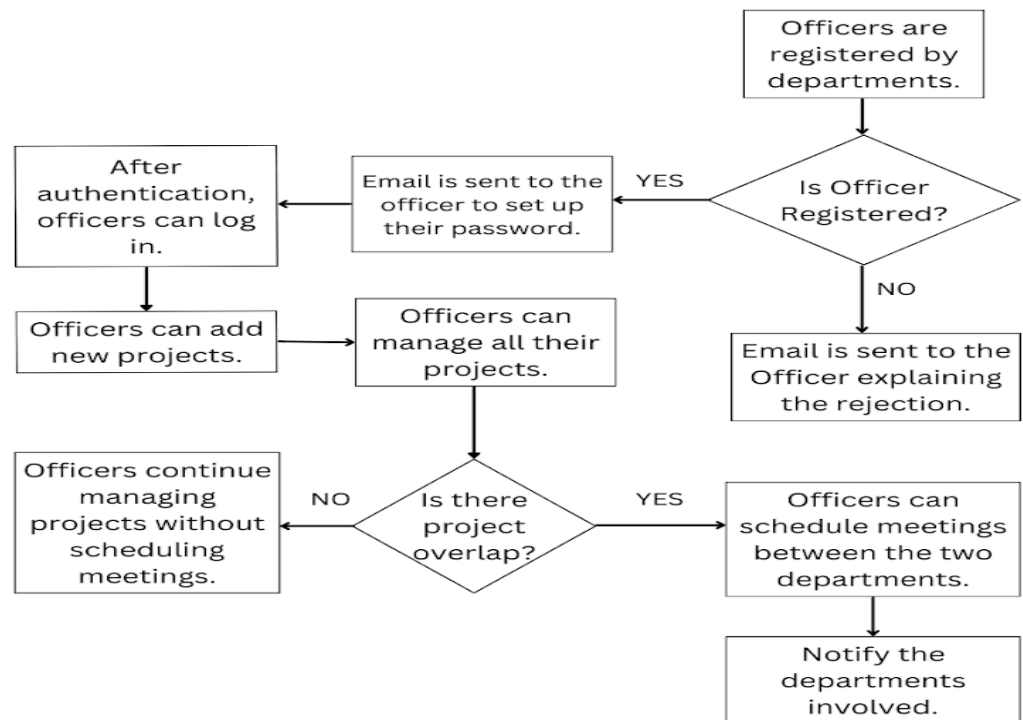
4. Proposed Design

Block Diagram

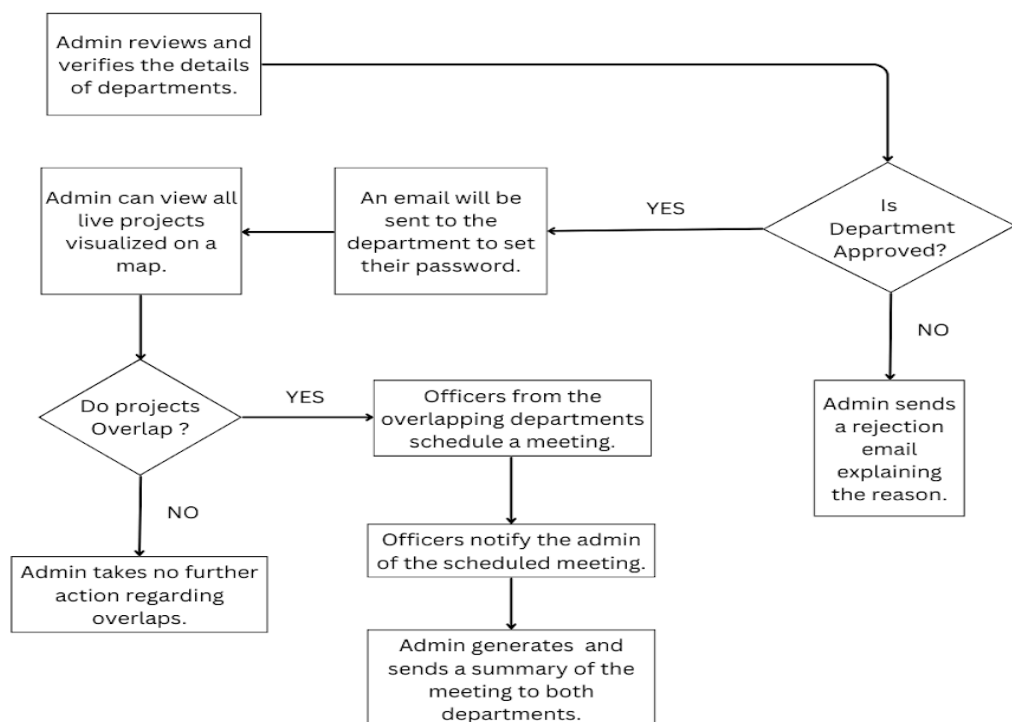
1. Departments



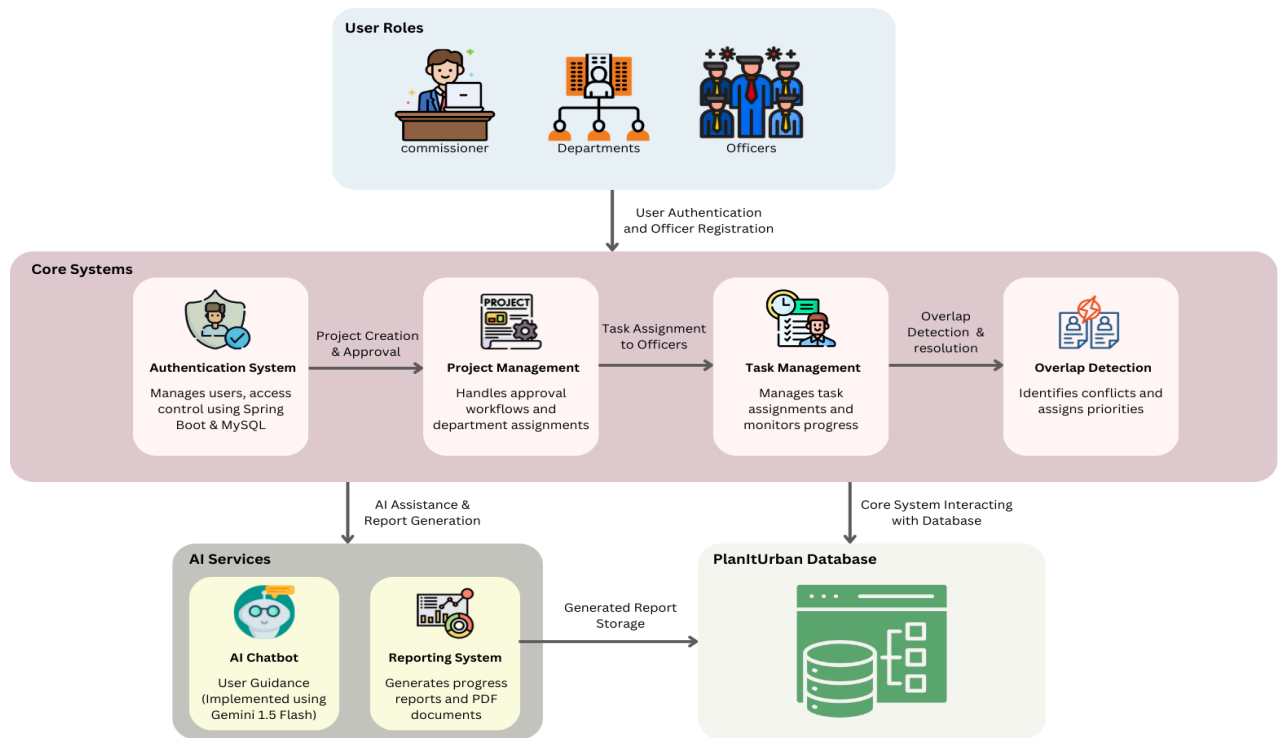
2. Officer



3. Admin



Modular Diagram



5. Implementation of the Proposed System

Methodology Employed

Overview

PlanItUrban is a digital solution designed to streamline interdepartmental coordination for urban infrastructure projects. It incorporates modern technologies such as Angular (frontend), Spring Boot (backend), and MySQL/MSSQL (database) to automate approvals, detect project overlaps, and enhance task management. The methodology is structured around five core systems that work together to ensure seamless planning and execution of civic projects.

Data Collection

The *PlanItUrban* system collects and manages structured data related to:

- **Departmental Profiles:** Information such as department name, type, contact info, and registration documents.
- **Officer Profiles:** Includes officer credentials, designation, department association, and login information.
- **Project Details:** Data such as project name, description, coordinates, start/end dates, and budget allocation are stored for tracking and management.

This information is stored securely in a relational database and made accessible through role-based authentication.

Model Architecture

User Management

Admins verify and onboard departments. Once approved, departments can register their officers, who receive secure email-based credentials to log in. This ensures authenticated access and proper role assignment across the platform.

Project Management Module

Officers can create new projects by entering all relevant details such as project name, description, location, budget, and timelines. All active projects are displayed on a shared dashboard with

Google Maps integration. The system automatically checks for time and location-based overlaps to prevent conflicts.

Notification & Communication Module

The platform sends real-time alerts for key events like project status updates, detected overlaps, or resource availability changes. These notifications keep stakeholders informed and enable timely decisions and conflict prevention.

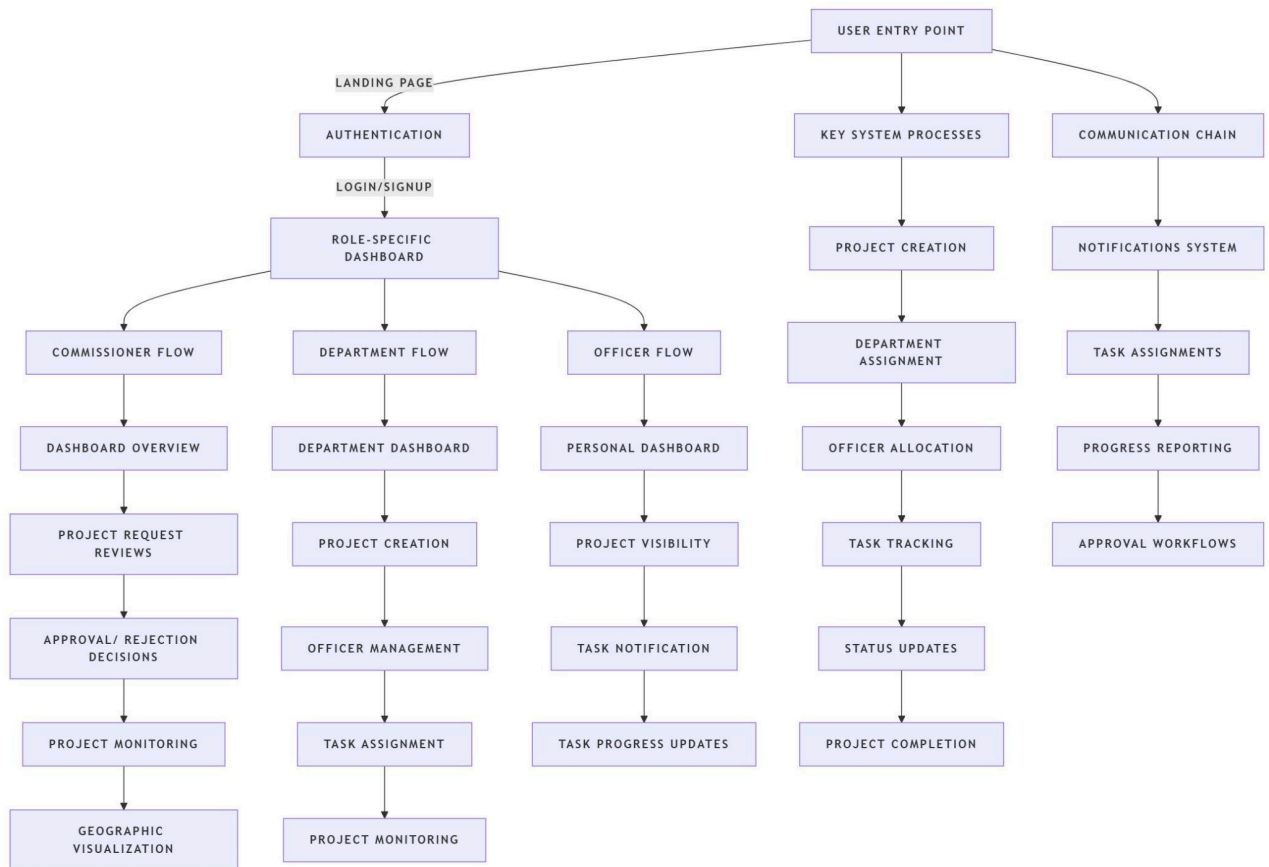
Evaluation Metrics

To evaluate the effectiveness of the PlanItUrban system, the following metrics are considered:

- **User Onboarding Rate:** Tracks how quickly departments and officers adopt the platform.
- **Project Overlap Detection Accuracy:** Measures how reliably the system flags potential conflicts based on project location and duration.
- **Resource Sharing Efficiency:** Evaluates the percentage of listed resources being utilized across departments.
- **Conflict Resolution Time:** Monitors the average time taken to resolve overlapping project issues after detection.
- **User Feedback:** Surveys and feedback forms are used to assess usability and satisfaction.

5.2 Algorithms and flowcharts

FLOWCHART:



ALGORITHM

Step 1: Start

Step 2: User enters the system (UserEntryPoint)

Step 3: Perform user authentication (Authentication)

Step 4: Determine the UserRole

If UserRole = Commissioner:

Step 5: Access CommissionerFlow

Step 6: Show DashboardOverview

Step 7: Access ProjectRequestReviews

Step 8: Perform ApprovalRejection

Step 9: Begin ProjectMonitoring

Step 10: Show GeographicVisualization

Step 11: Access KeySystemProcesses

Step 12: Perform ProjectCreation

Step 13: Execute DepartmentAssignment

Step 14: Execute OfficerAllocation

Step 15: Start TaskTracking

Step 16: Provide StatusUpdates

Step 17: Mark ProjectCompletion

Step 18: Follow CommunicationChain

Step 19: Use NotificationSystem

Step 20: Manage TaskAssignments

Step 21: Generate ProgressReporting

Step 22: Execute ApprovalWorkflows

Step 23: End

If UserRole = Department:

Step 5: Access DepartmentFlow

Step 6: View DepartmentDashboard

Step 7: Perform ProjectCreation

Step 8: Handle OfficerManagement

Step 9: Assign tasks via TaskAssignment

Step 10: Begin ProjectMonitoring

Step 11: End

If UserRole = Officer:

Step 5: Access OfficerFlow

Step 6: View PersonalDashboard

Step 7: Check ProjectVisibility

Step 8: Receive TaskNotification

Step 9: Send TaskProgressUpdates

Step 10: End

6. Testing of the Proposed System

Introduction to testing

Testing was a critical phase in ensuring the **PlanItUrban** platform functions reliably under different scenarios and user loads. As the platform supports interdepartmental communication and real-time resource management, testing ensured accuracy, stability, and robustness of all modules including user management, project coordination, and alert mechanisms.

Types of tests Considered

To validate the performance and reliability of the system, the following types of testing were conducted:

- **Unit Testing:** Verified individual modules like user registration, project creation, and meeting scheduling to ensure independent correctness.
- **Integration Testing:** Checked seamless data flow between components such as project creation, calendar scheduling, and email notifications.
- **System Testing:** End-to-end testing of the full application including user login, resource management, and conflict resolution notifications.
- **Performance Testing:** Measured system load times, email dispatch speed, and responsiveness under concurrent access by multiple departments.
- **GUI Testing:** Validated form validations, calendar UI responsiveness, and data display consistency across various screens.

6.3 Various test case scenarios considered

The following test cases were defined and evaluated:

Test Case ID	Scenario	Expected Output	Status
TC_01	Department registration with valid data	Department successfully added and notified	Passed
TC_02	Officer signs up and creates a new project	Project appears under dashboard with accurate details	Passed

TC_03	Overlapping project creation by two departments	Conflict notification is triggered	Passed
TC_04	Admin attempts to approve a document with missing data	System shows validation error and prevents action	Passed
TC_05	High concurrent project view access	Dashboard loads within acceptable response time	Passed
TC_06	Google Map fails to fetch project coordinates	System gracefully handles failure and logs error	Passed
TC_07	Invalid email credentials used for officer alert	System shows alert failed message and logs details	Passed

6.4. Inference drawn from the test cases

- All major modules performed as expected under both normal and stress test conditions.
- The **project creation and registration modules** were consistently responsive and intuitive.
- Conflict alerts and meeting scheduling operated in real-time, aiding prompt communication.
- Failures such as incorrect data or external API issues were gracefully handled without system crashes.
- The **UI remained responsive**, even under multiple concurrent users.

Chapter 7: Results and Discussion

7.1. Screenshots of User Interface (GUI)

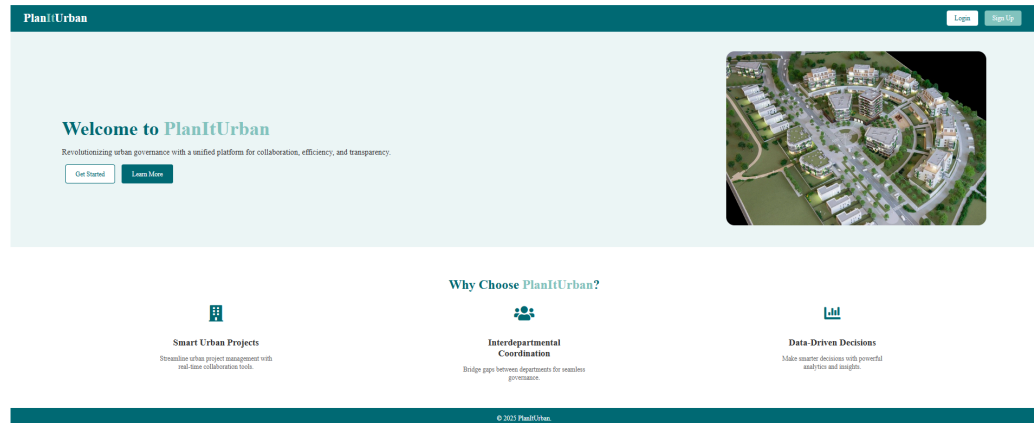


Figure 1. Home Page

A teal-themed landing page for "PlanItUrban" platform with a welcome message highlighting urban governance with unified platforms. Features include a hero image of an aerial view of urban development, along with three value propositions: Smart Urban Projects, Interdepartmental Coordination, and Data-Driven Decisions.

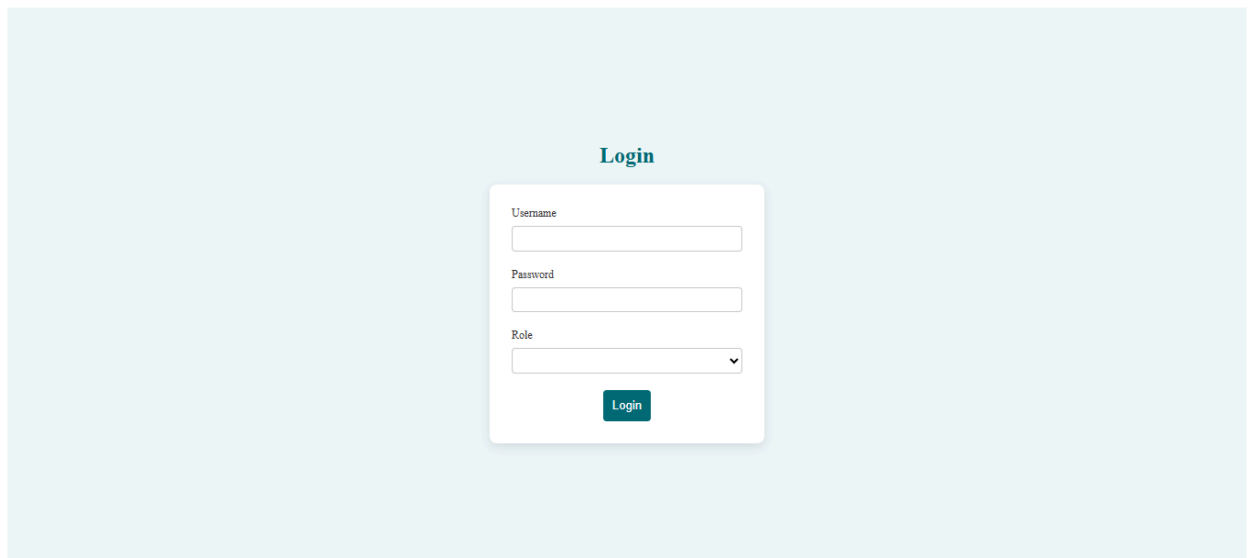
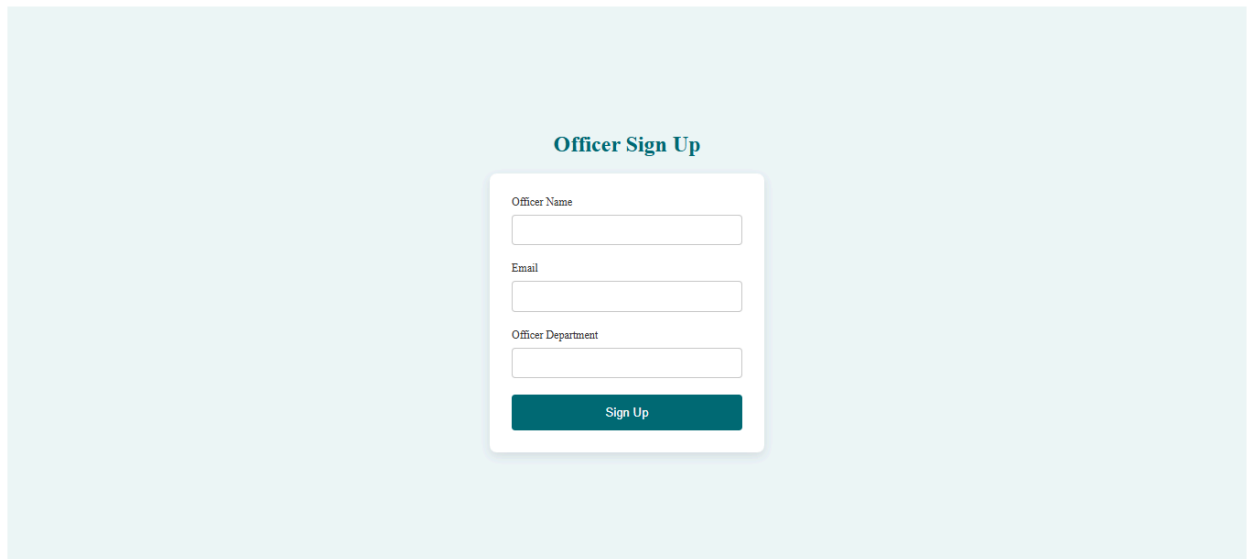


Figure 2. Login Page

A minimalist login interface with a light blue background featuring input fields for username and password, a dropdown role selector, and a teal login button. The clean design focuses on user authentication with minimal distractions.

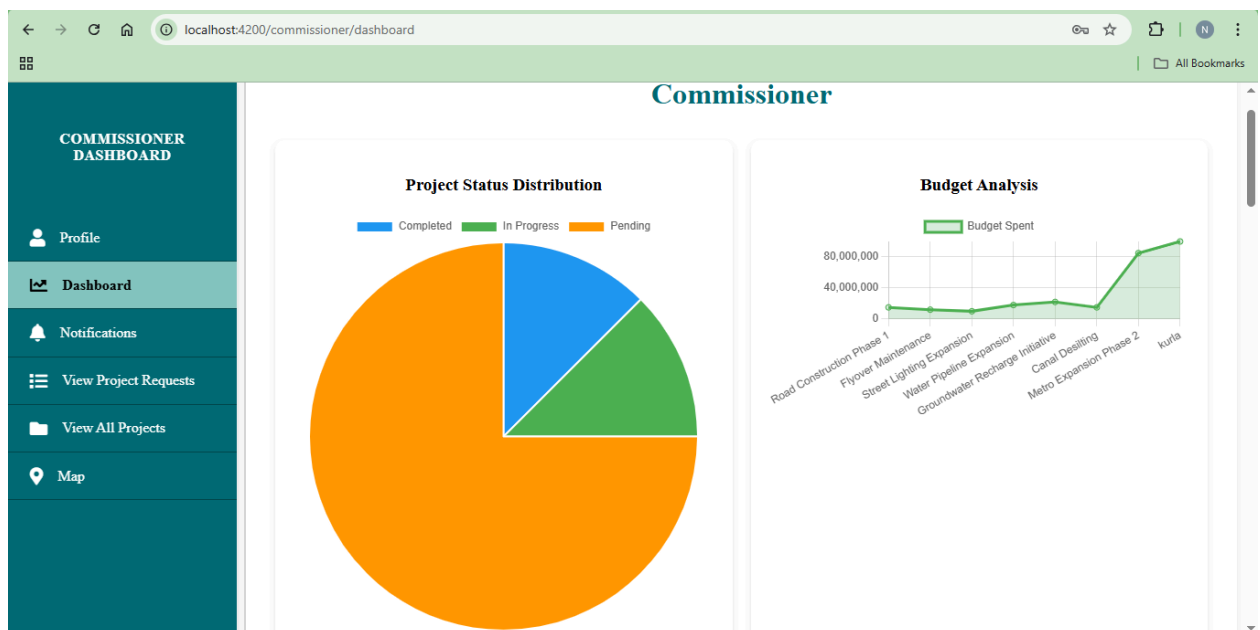


The image shows a web form titled "Officer Sign Up" centered on a light blue background. The form is a white card with a thin border. It contains three input fields: "Officer Name", "Email", and "Officer Department". Below these fields is a teal button labeled "Sign Up".

Figure 3. Signup Page

A signup form specifically for officers with a light blue background. Contains fields for Officer Name, Email, and Officer Department, along with a teal "Sign Up" button at the bottom. The interface maintains the platform's clean, minimalist aesthetic.

A. Commissioner:



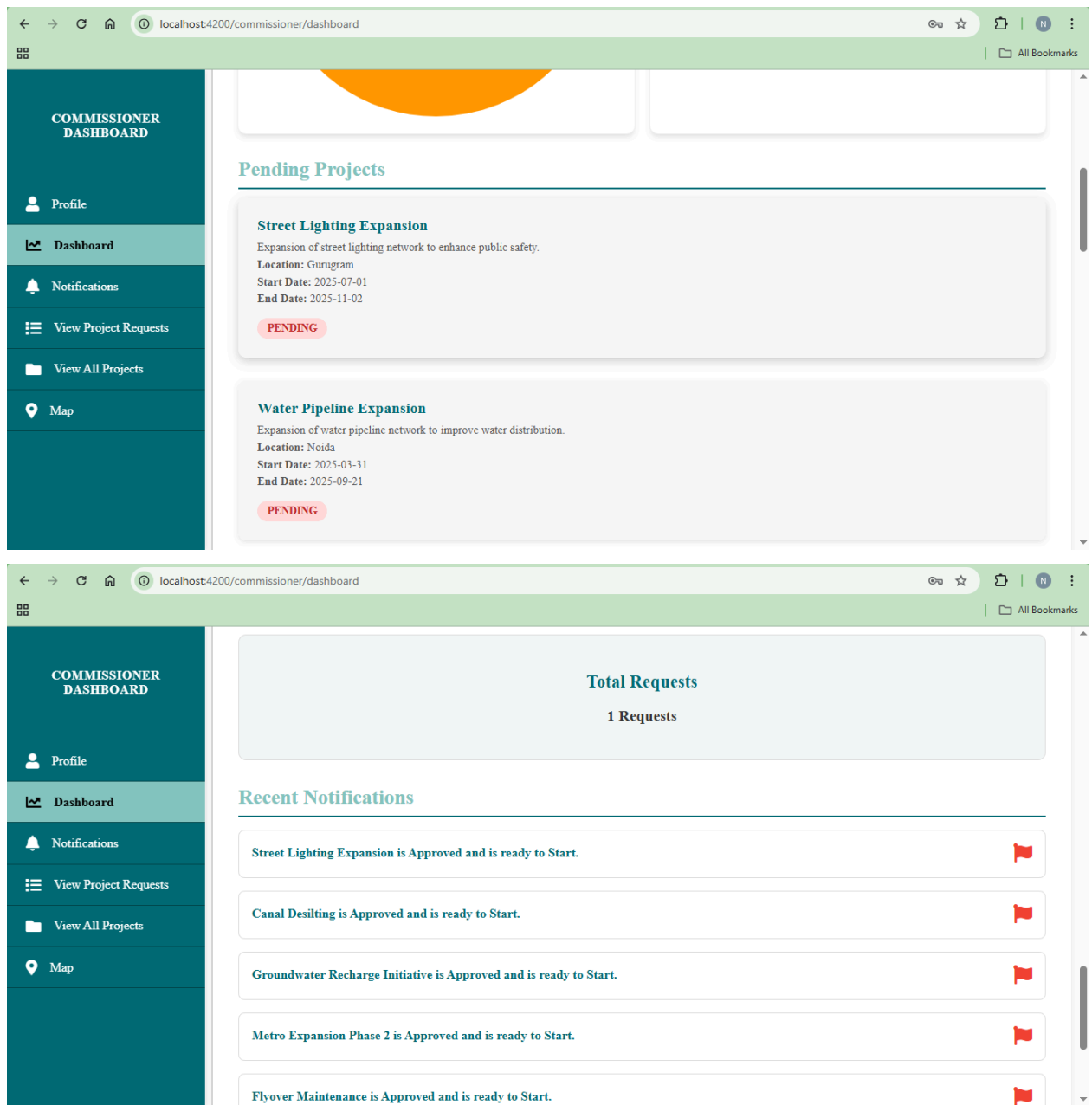


Figure 1. Dashboard Page

The Commissioner Dashboard showing a project status distribution pie chart with color-coded segments for Completed, In Progress, and Pending projects. Also displays a budget analysis line graph on the right. The left sidebar contains navigation options in the platform's teal color scheme.

A continuation of the Commissioner Dashboard showing a list of pending projects, each with details including project name, purpose, location, start/end dates, and status. Two specific projects are shown: Street Lighting Expansion and Water Pipeline Expansion, both marked as "PENDING".

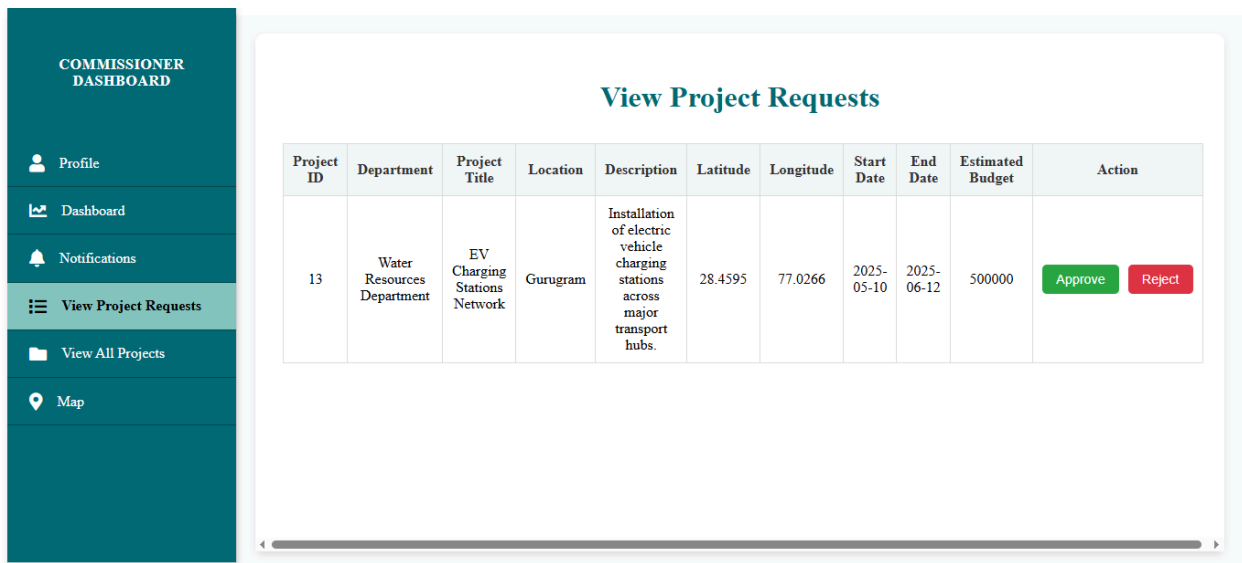


Figure 2. View Project Requests Page

A continuation of the Commissioner Dashboard showing a list of pending projects, each with details including project name, purpose, location, start/end dates, and status. Two specific projects are shown: Street Lighting Expansion and Water Pipeline Expansion, both marked as "PENDING".

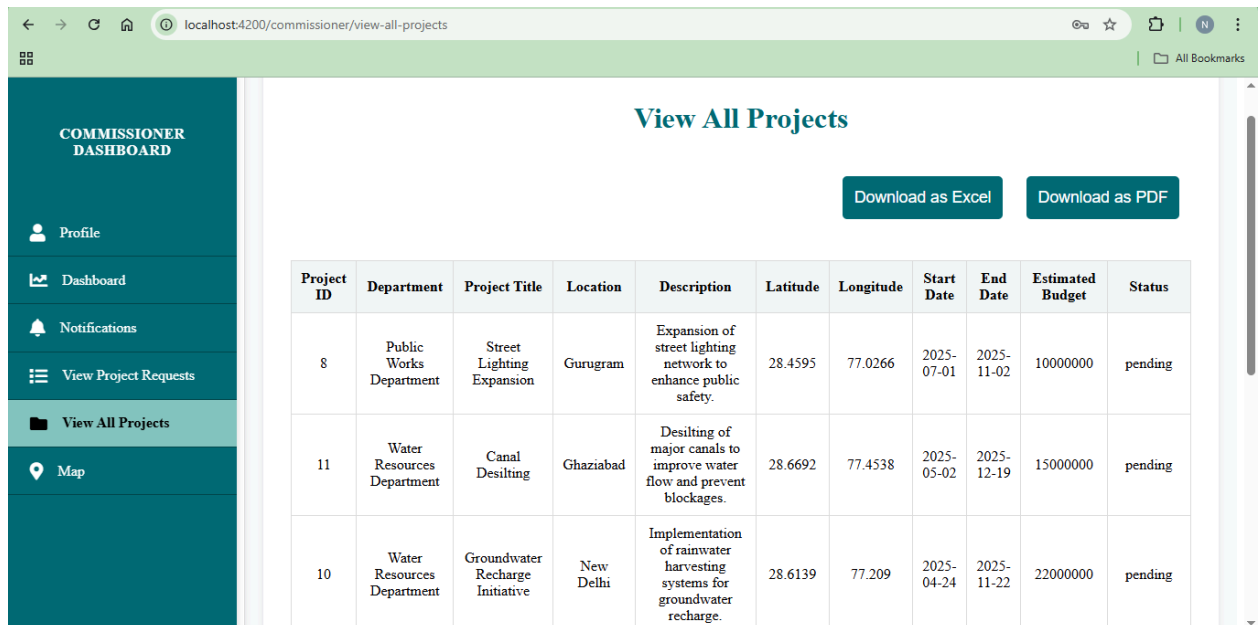


Figure 3. View All Projects Page

A tabular view of project requests with detailed information columns including Project ID, Department, Project Title, Location, Description, Latitude, Longitude, Dates, Budget, and Status. The interface includes approve/reject options for pending requests.

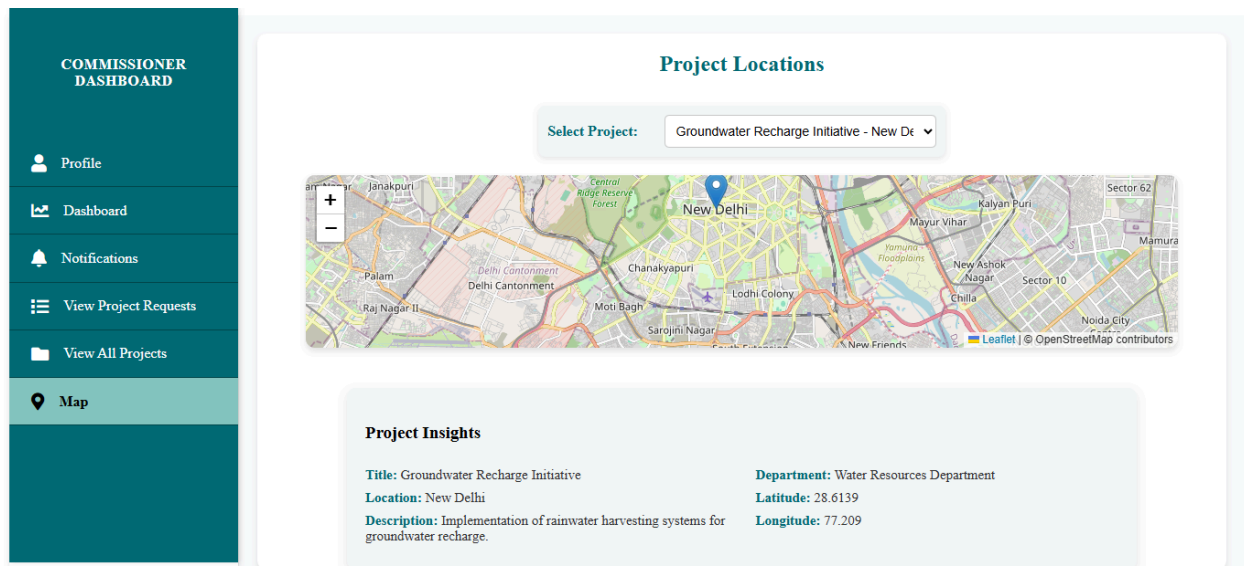
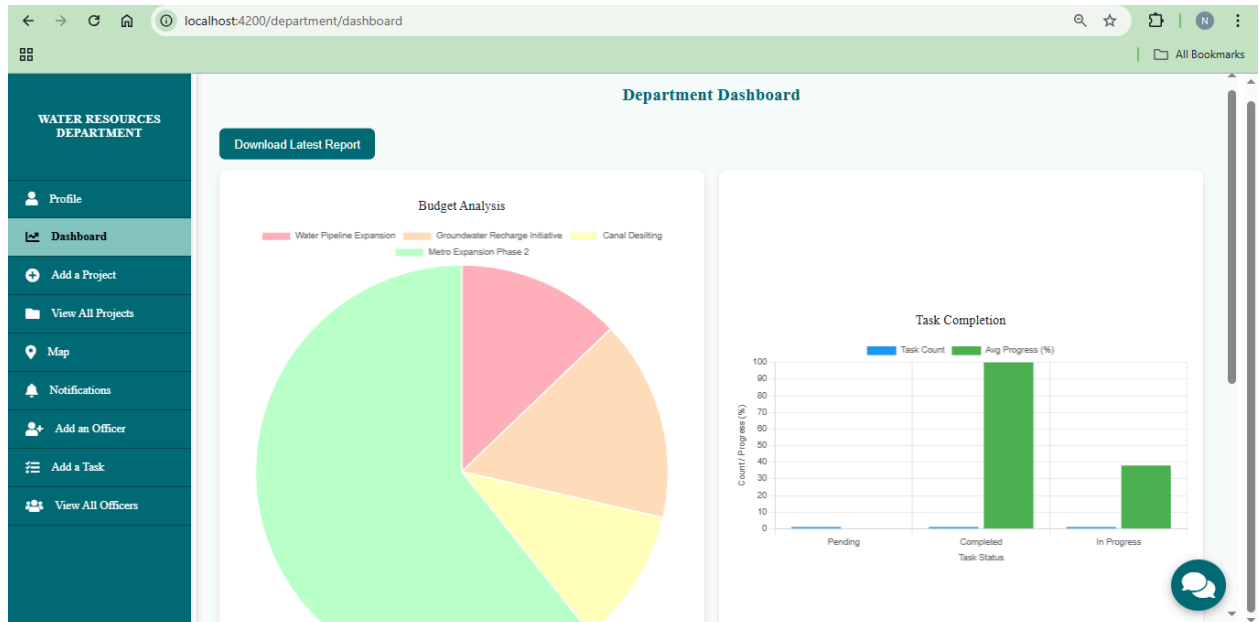


Figure 4. Map Page

A geographical visualization of projects showing a map interface with the currently selected project "Groundwater Recharge Initiative" in New Delhi. Project insights are displayed below the map, showing details like department, location coordinates, and project description.

B.Department:



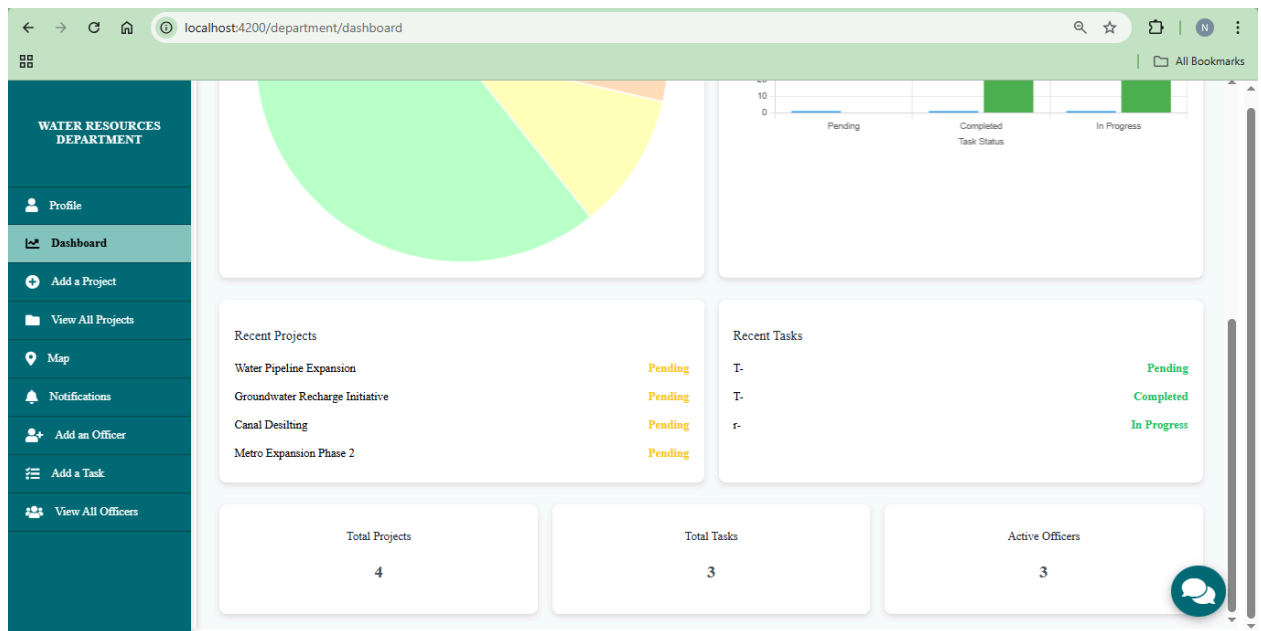
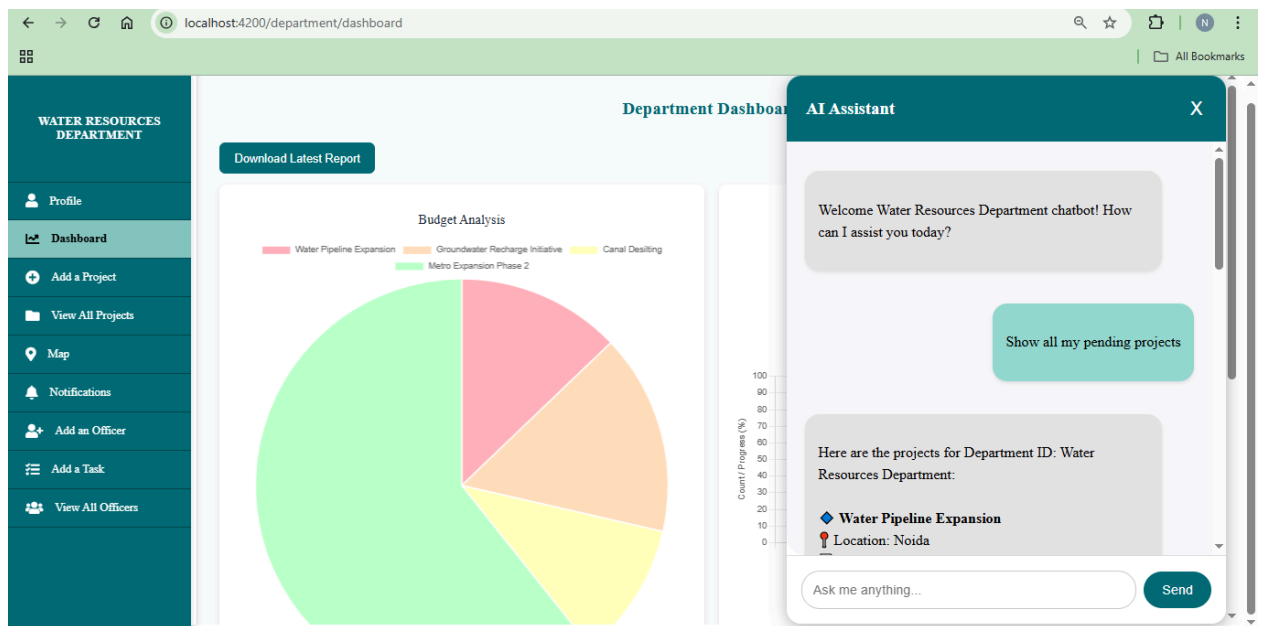


Figure 1. Dashboard Page

The Water Resources Department dashboard featuring overview metrics of current projects and tasks. Displays cards showing pending projects, recent tasks, total projects count, total tasks count, and active officers count, along with a chatbot helper in the corner.



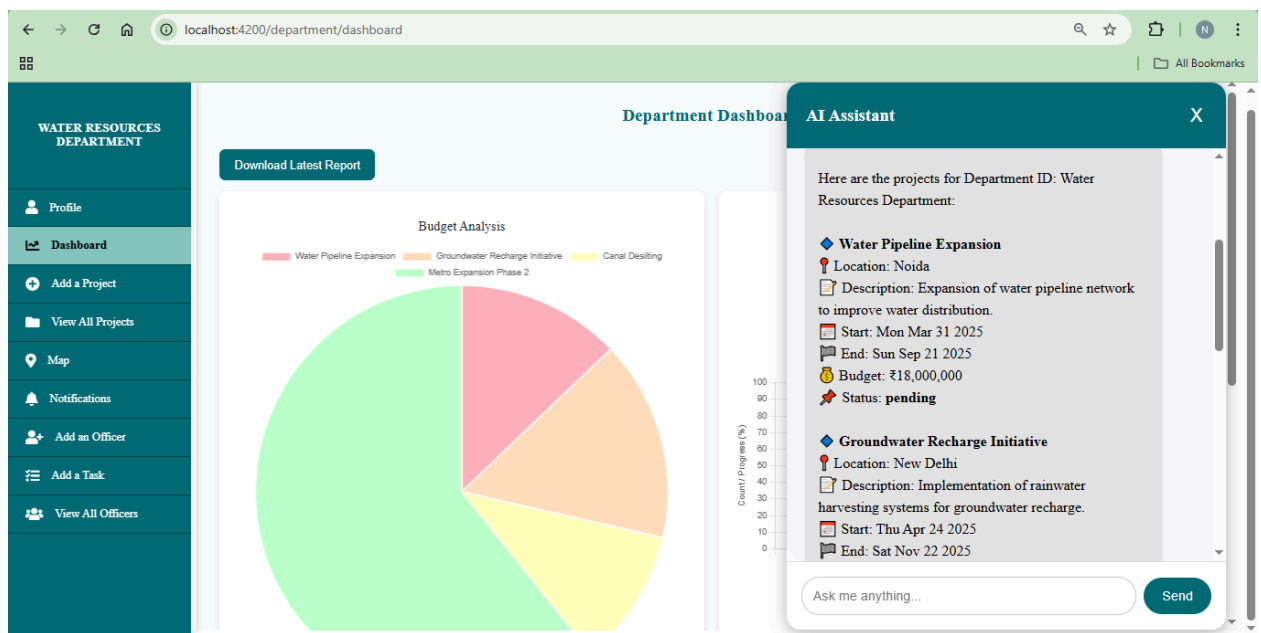


Figure 2. Chatbot

An AI assistant interface for the Water Resources Department with a conversation panel. The chatbot displays project information upon request, showing details of two department projects: Water Pipeline Expansion and Groundwater Recharge Initiative with their respective start dates, end dates, and budgets.

The screenshot shows the 'Add a New Project' form within the Water Resources Department system. The sidebar on the left is identical to the dashboard. The main content area is titled 'Add a New Project' and contains several input fields: 'Project Title' (text), 'Project Location' (text), 'Project Description' (text area), 'Latitude' (text), 'Longitude' (text), and 'Start Date' (text with a date picker icon). A chatbot icon is visible in the bottom right corner of the form area.

Figure 3. Add a project Page

A form interface for adding new projects with fields for Project Title, Location, Description, Latitude, Longitude, and Start Date. The clean layout follows the department's teal color scheme with a sidebar navigation panel for accessing other functions.

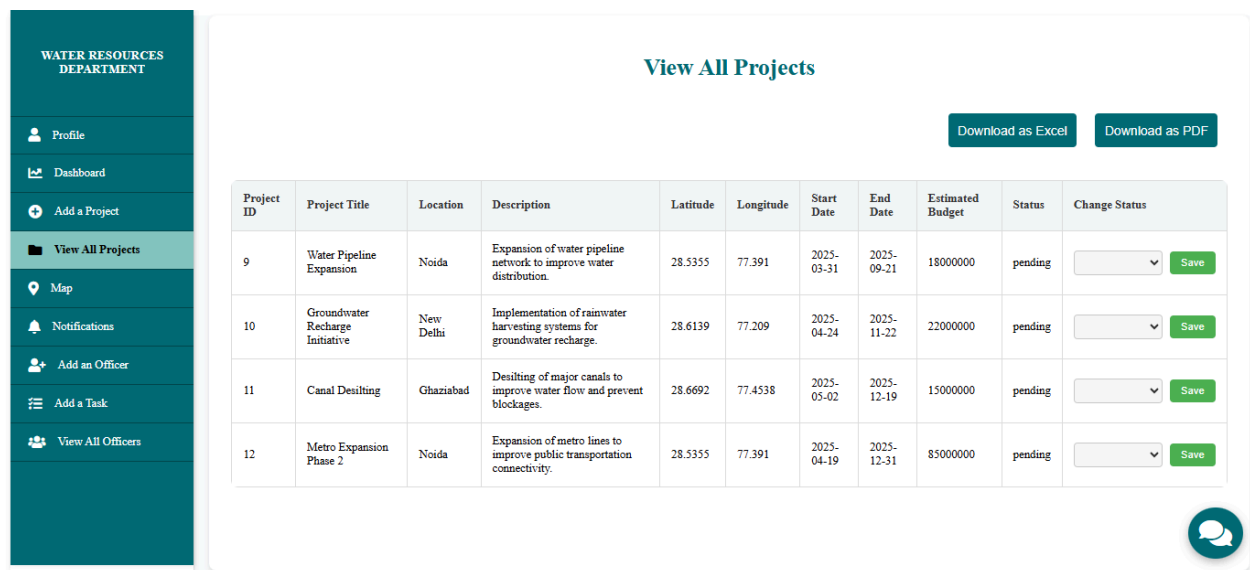


Figure 4. View all projects Page

A comprehensive table showing all projects under the Water Resources Department with options to download as Excel or PDF. Projects displayed include Water Pipeline Expansion, Groundwater Recharge Initiative, Canal Dredging, and Metro Expansion, each with edit action buttons.

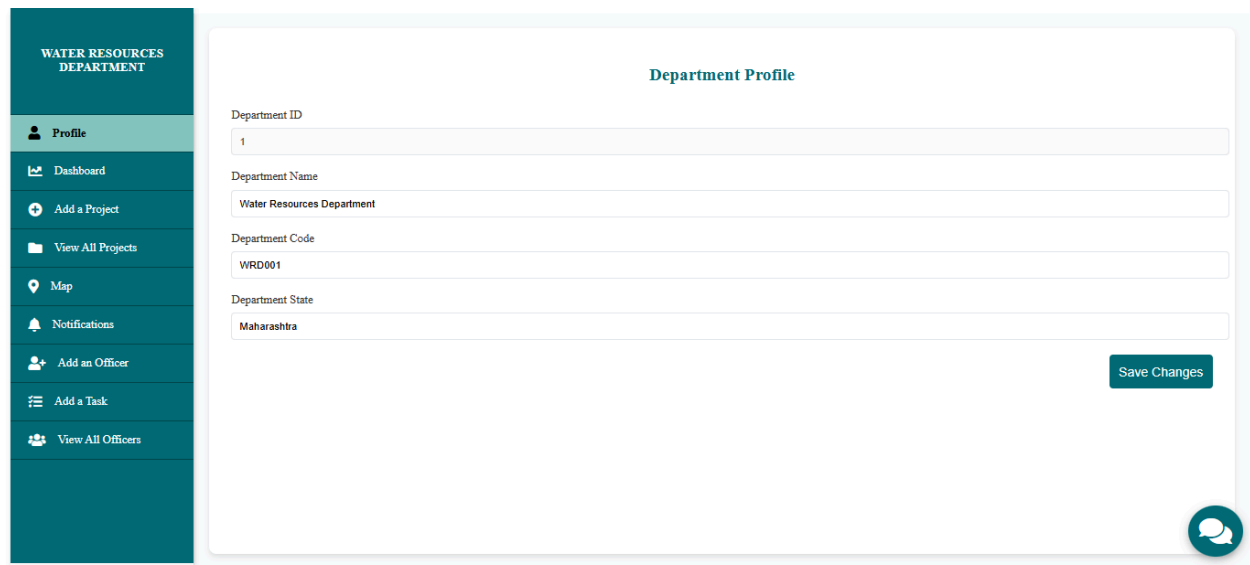


Figure 5. Profile Page

The department profile management page showing department details including ID, Name (Water Resources Department), Code (WRD001), and State (Maharashtra). Features a "Save Changes" button for updating department information after edits.

Figure 6. Add a officer Page

A form for adding new officers to the department with fields for Officer Name, Email, Department (pre-filled as Water Resources Department), and multiple file upload sections for Officer ID, Certificate/Documents, and Additional Proof documents.

Figure 7. Add a task Page

A task creation interface with fields for Department (pre-filled), Task Title, Description, Officer Assignment dropdown, Project Assignment dropdown, and Start Date. The form allows department managers to delegate specific responsibilities to officers.

C. Officer page

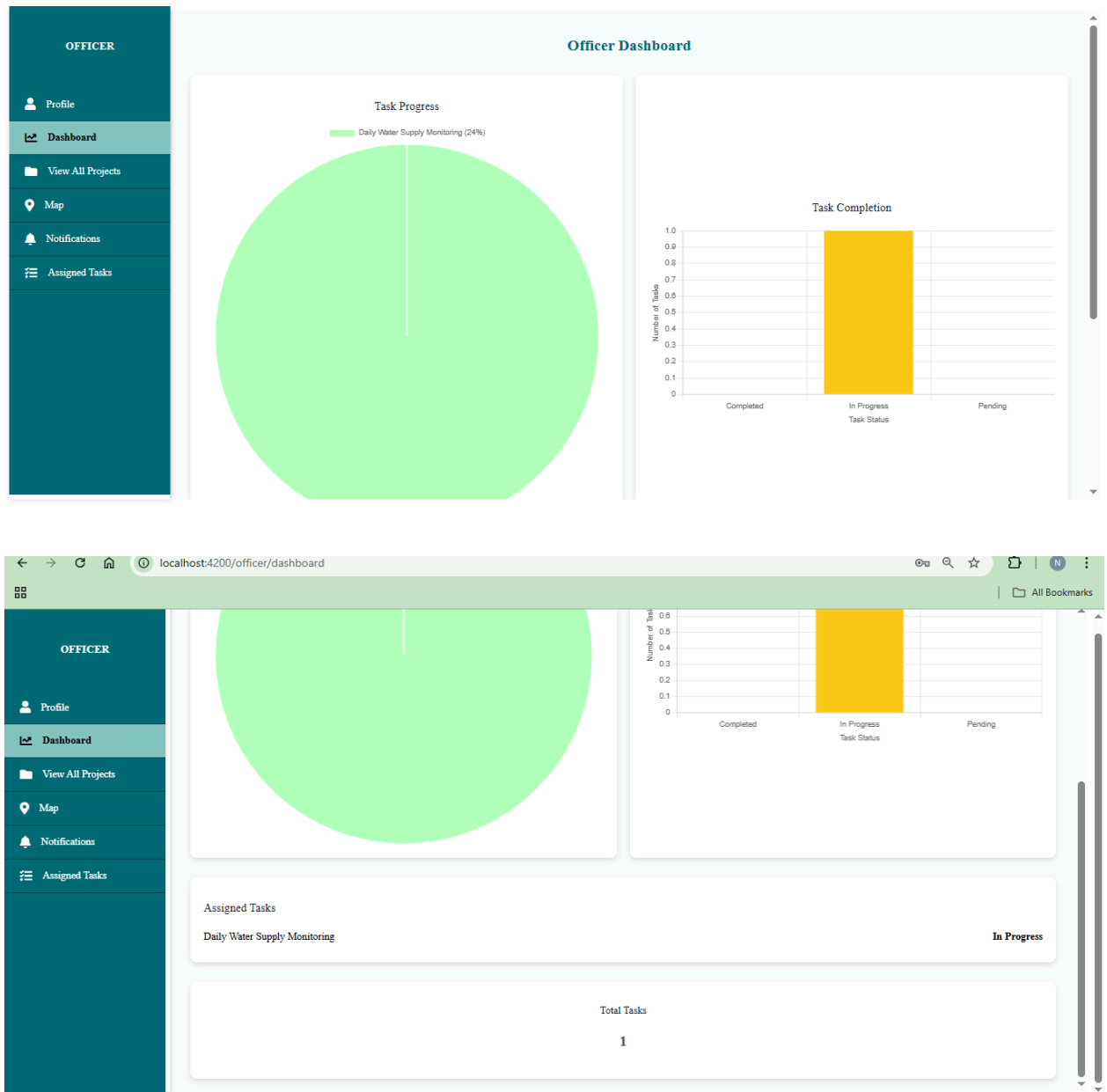


Figure 1. Dashboard Page

The Officer Dashboard showing task progress with a large pie chart predominantly in green indicating high completion rate, and a bar graph showing task completion statistics. The interface combines data visualization with a project list view below.



Figure 2. View all projects Page

A project list view for officers showing all water-related projects they have visibility into. Each entry includes project title, location, description, coordinates, dates, budget, and status indicators, with a clean tabular layout for easy scanning.

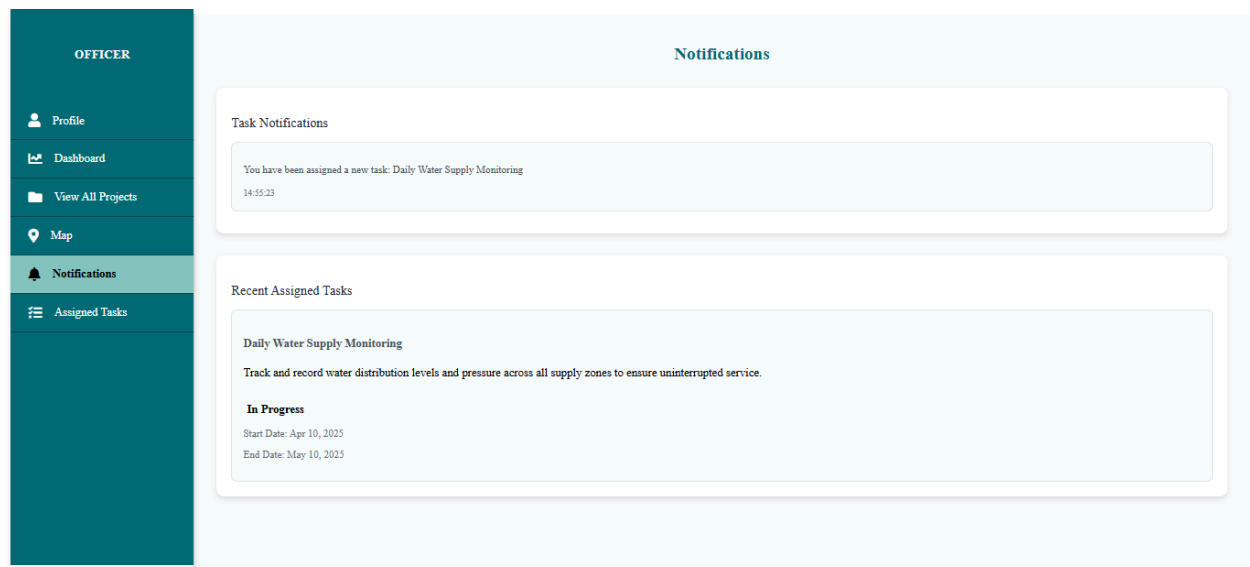


Figure 3. Notifications Page

A notification center for officers showing task notifications and recent assigned tasks. The interface displays details about water supply monitoring tasks including status indicators, due dates, and priority levels to help officers track their responsibilities.

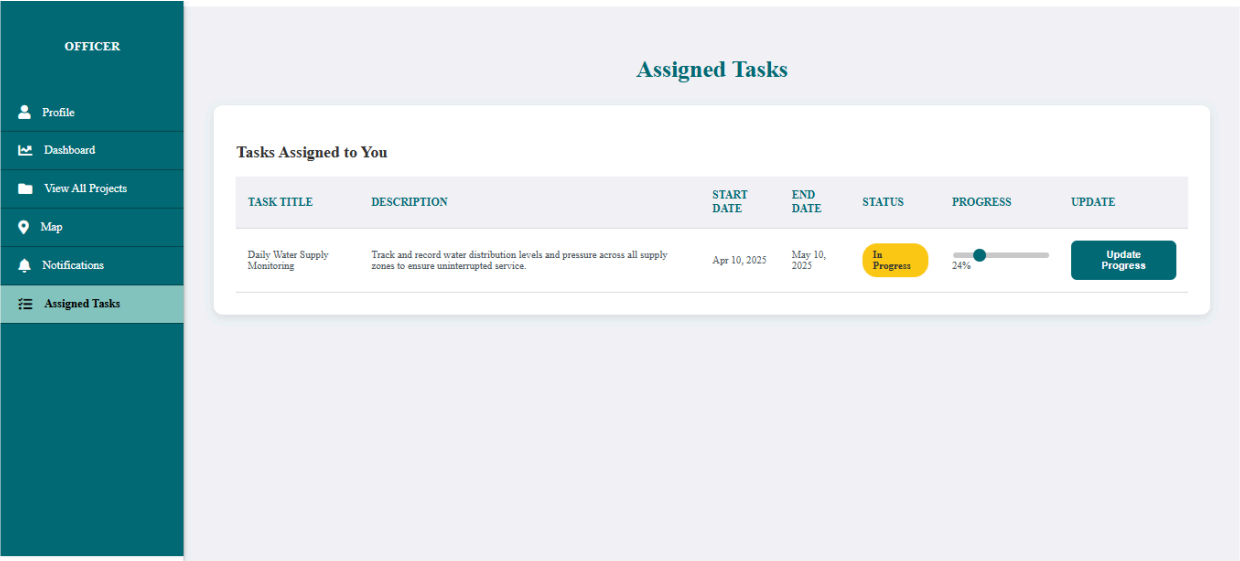


Figure 4. Assigned tasks Page

A comprehensive view of tasks assigned to the officer with details including task title, description, start/end dates, status (shown as "In Progress"), a visual progress bar, and an update button. Designed for tracking individual workload and progress.

7.2. Performance Evaluation measures

- **Budget Efficiency Score**
Measures whether the estimated budget aligns with impact and duration.
Formula: (Estimated Budget / Project Duration) normalized
- **Timeliness Index**
Evaluates how soon a project will begin and how long it will take.
Formula: Inverse of Start Date Delay + Inverse of Duration
- **Geographic Priority**
Gives priority to rural/underserved areas using proj_location and coordinates.
- **Project Readiness Score**
Based on project status (Planned, In Progress) and approval status (isApproved field).
- **Strategic Importance Score**
Scores based on alignment with key sectors (e.g., Education, Health, Transport)

7.3. Input Parameters / Features considered

- **proj_title, proj_desc**
- **proj_location, proj_latitude, proj_longitude**
- **proj_start_date, proj_end_date (used to calculate duration)**
- **proj_estimated_budget**
- **proj_status**
- **isApproved (if used by the system)**
- **dept_id (could be used to weigh based on departments)**

7.4. Inference drawn

Based on the recommendation engine, projects such as **"Higher Education Digital Labs"**, **"Inclusive Education for Tribal Areas"**, and **"Urban Housing Scheme"** emerge as top priorities. These projects have:

- High impact sectors (Education, Housing)
- Timely start and long duration coverage
- Budget allocations that align well with the scope
- Strategic geographic targeting (tribal, urban poor)

Projects like **"E-learning Access Expansion"** and **"Health Monitoring IoT Devices"** also rank high due to sector relevance and wide demographic benefit, though may be pending approval.

8. Conclusion

8.1 Limitations

Despite the capabilities of the PlanItUrban platform, certain limitations exist that could impact system performance and scalability:

- **Data Dependency:**

The effectiveness of the platform relies heavily on the accuracy and availability of departmental data. Inconsistent or outdated information may affect decision-making.

- **Limited Spatial Awareness:**

Although project locations are mapped using coordinates, the platform may face challenges in accurately identifying overlaps in complex urban layouts or informal settlements.

- **Real-time Communication Lag:**

Notifications between departments are dependent on server-side triggers and scheduled tasks, which may introduce slight delays during peak usage.

- **Scalability Constraints:**

As the number of registered departments and projects increases, database load and response times may degrade unless optimized backend resources are provisioned.

- **Device and Network Constraints:**

Users in areas with limited connectivity may experience slower load times or difficulties accessing resource-heavy modules like Google Maps integration.

8.2 Conclusion

PlanItUrban offers a robust and centralized solution for improving coordination in urban governance. By streamlining communication, project management, and resource sharing across departments, the platform:

- Enhances operational efficiency.
- Reduces project overlaps and delays.
- Encourages data-driven decision-making.
- Promotes transparency and accountability among agencies.

The integration of key modules like meeting scheduling, alert notifications, and dashboard analytics supports better planning and collaboration, ultimately contributing to the development of smarter, well-coordinated cities.

8.3 Future Scope

To enhance the functionality and scalability of the **PlanItUrban** platform, the following future developments are proposed:

- **Mobile Application Integration**

A cross-platform mobile app will be developed to enable real-time project updates, push notifications, and seamless on-the-go access for department officials and field staff.

- **AI-Based Conflict Detection**

Implementation of AI/ML models to automatically detect potential project overlaps or conflicts based on geolocation, department activity, and timelines. This will further improve planning efficiency.

- **GIS and Satellite Integration**

Integrating GIS mapping and satellite imagery will provide a more granular view of project zones, improving spatial accuracy and land-use insights.

- **Inter-City Collaboration**

Expansion of the platform to support collaboration between multiple cities and states, enabling knowledge sharing and coordinated urban development across regions.

- **Public Portal and Feedback Mechanism**

A citizen-facing module will be added for public transparency, allowing people to view approved projects and submit feedback or raise concerns.

- **Automated Reporting and Analytics Dashboard**

Advanced data visualization tools and automated report generation will be introduced to support high-level policy decisions and performance tracking.

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