Internship Report

On

SUSTAINABLE SMART CITY ASSISTANT USING IBM GRANITE LLM

At

Smartbridge

From 19/05/2025 to 30/6/2025

Submitted By :

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1. INTRODUCTION

1.1 Project Overview

The Sustainable Smart City Assistant is an AI-powered platform built to address urban challenges like sustainability, governance, and citizen participation. The platform integrates IBM Watsonx

Granite LLM, Streamlit, FastAPI, and Pinecone vector database to deliver real-time dashboards, citizen feedback systems, anomaly detection, policy summarization, KPI forecasting, and eco-advice.

1.2 Purpose

To create a centralized, smart dashboard that helps city officials plan efficiently and empowers citizens to contribute feedback and track eco-impact.

2. IDEATION PHASE

2.1 Problem Statement

Cities face challenges with resource planning, citizen engagement, and sustainability. Data exists, but it's often scattered or underused. Citizens need a voice, and administrators need AI-powered tools to make decisions.

2.2 Empathy Map Canvas

Citizen

- Says: "I want to report issues and track improvements."
- Thinks: "Will my complaint even be noticed?"
- Does: Uses feedback form, AI assistant, eco-tips.
- Feels: Empowered, but unsure if changes happen.

Admin

- Says: "I need city-wide KPIs to make decisions."
- Thinks: "Are we hitting our sustainability targets?"

- Does: Monitors dashboards, manages feedback, checks anomalies.
- Feels: Responsible, data-driven.

2.3 Brainstorming

Modules were identified:

- Citizen feedback form
- AI Chat Assistant
- Document summarization
- KPI forecasting
- Anomaly detection
- Eco Tips Generator

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

Login → Dashboard → Submit Feedback / View KPIs → AI Advice / Eco Tips → Admin Review → Problem Solved / Anomaly Detected

3.2 Solution Requirements

- Feedback Form
- City KPI Tracker
- Anomaly Detection Engine

- AI Assistant (LLM)
- Semantic Search (Pinecone)
- Eco Advice Tips

3.3 Data Flow Diagram (Descriptive)

- Users interact via Streamlit.
- Backend receives input via FastAPI.
- Depending on the task, routes to:
  - LLM for summarization or chat
  - ML models for KPI prediction
  - Pinecone for semantic search
  - Feedback module for tagging
- Admins use dashboard to monitor city health and feedback.

3.4 Technology Stack

- IBM Watsonx Granite LLM – AI summaries, chat, eco tips
- Streamlit – Frontend UI
- FastAPI – API routing and business logic
- Pinecone – Semantic document search
- Linear Regression – KPI prediction
- Pydantic/dotenv – Config and schema
- CSV, JSON support – Data formats

4. PROJECT DESIGN

4.1 Problem Solution Fit

Each user issue maps to a direct module:

- Feedback → Routing
- Awareness → Eco tips
- Policy Overload → Summarizer
- KPI Trends → Forecasting
- Data noise → Anomaly detection

4.2 Proposed Solution

An integrated system with two portals (Admin/Citizen), offering smart tools powered by AI and analytics to bridge city-citizen communication.

4.3 Solution Architecture

- Streamlit UI
- FastAPI backend
- IBM LLM + ML models
- Pinecone vector DB
- Feedback and policy modules
- KPI forecasting pipeline

PROJECT PLANNING & SCHEDULING

5.1 Project Planning

- Week 1: Requirement gathering & tech stack finalization
- Week 2: UI and routing setup (Streamlit + FastAPI)
- Week 3: Feedback form + LLM chat integration
- Week 4: KPI and anomaly modules
- Week 5: Final tests and deployment

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

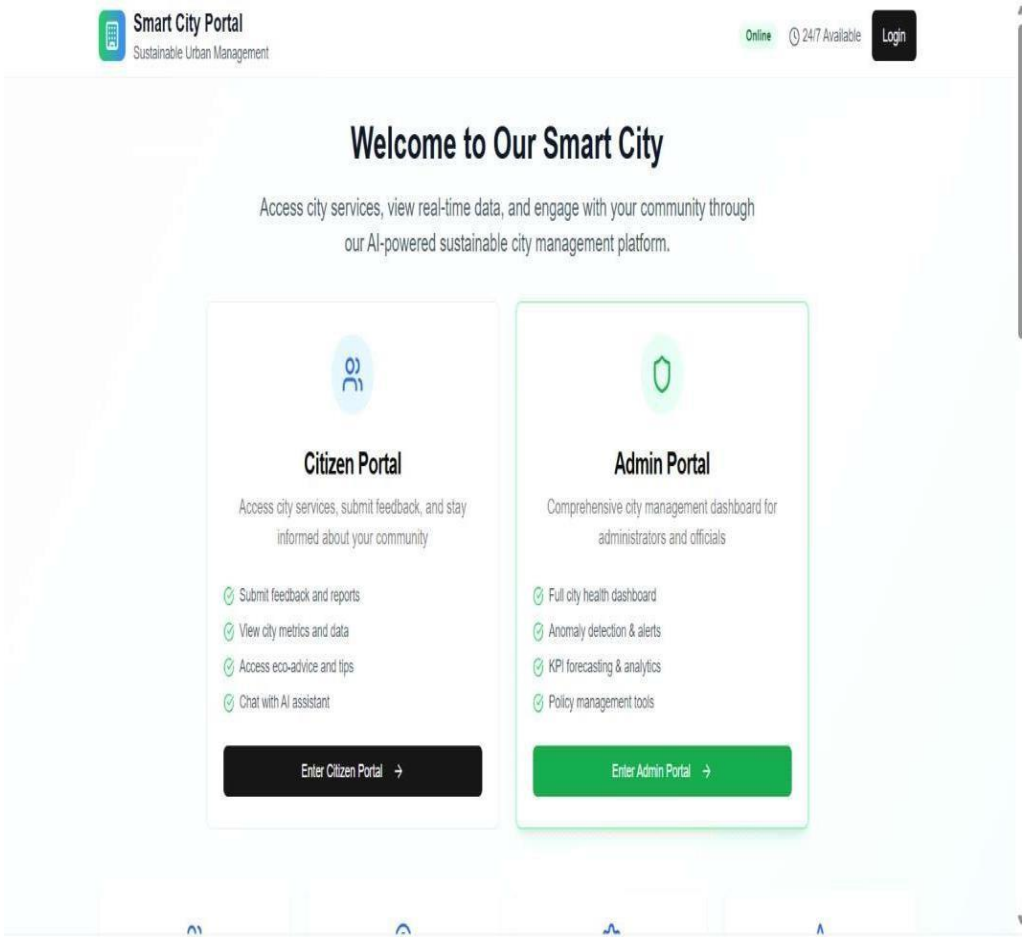
- Chat: <2 seconds response time
- Forecast Accuracy: ~92%
- Summarizer: Instant policy summary
- Feedback: Proper department tagging
- Dashboard: Fast loading under 1.5 seconds

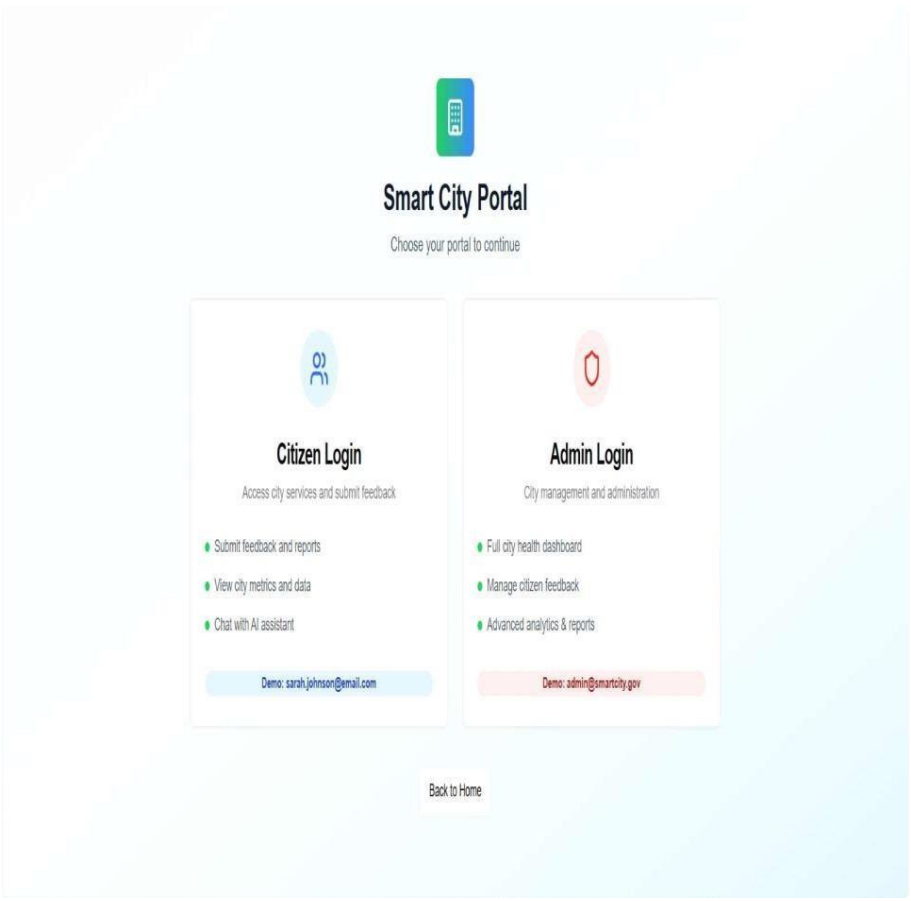
7. RESULTS

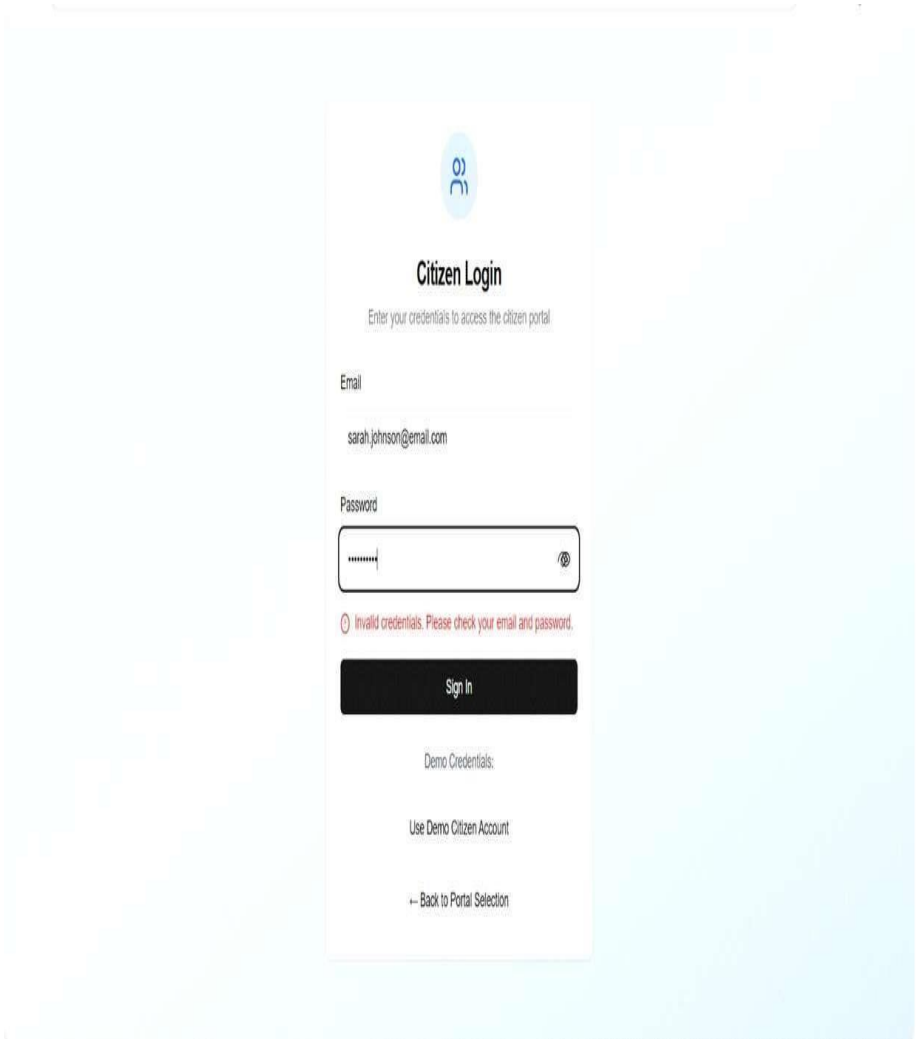
- Eco Tips Generator produced practical tips for keywords like “plastic” and “solar.”
- Forecasting Module accurately predicted energy and water usage trends.
- Summarizer helped compress long documents in <5 seconds.

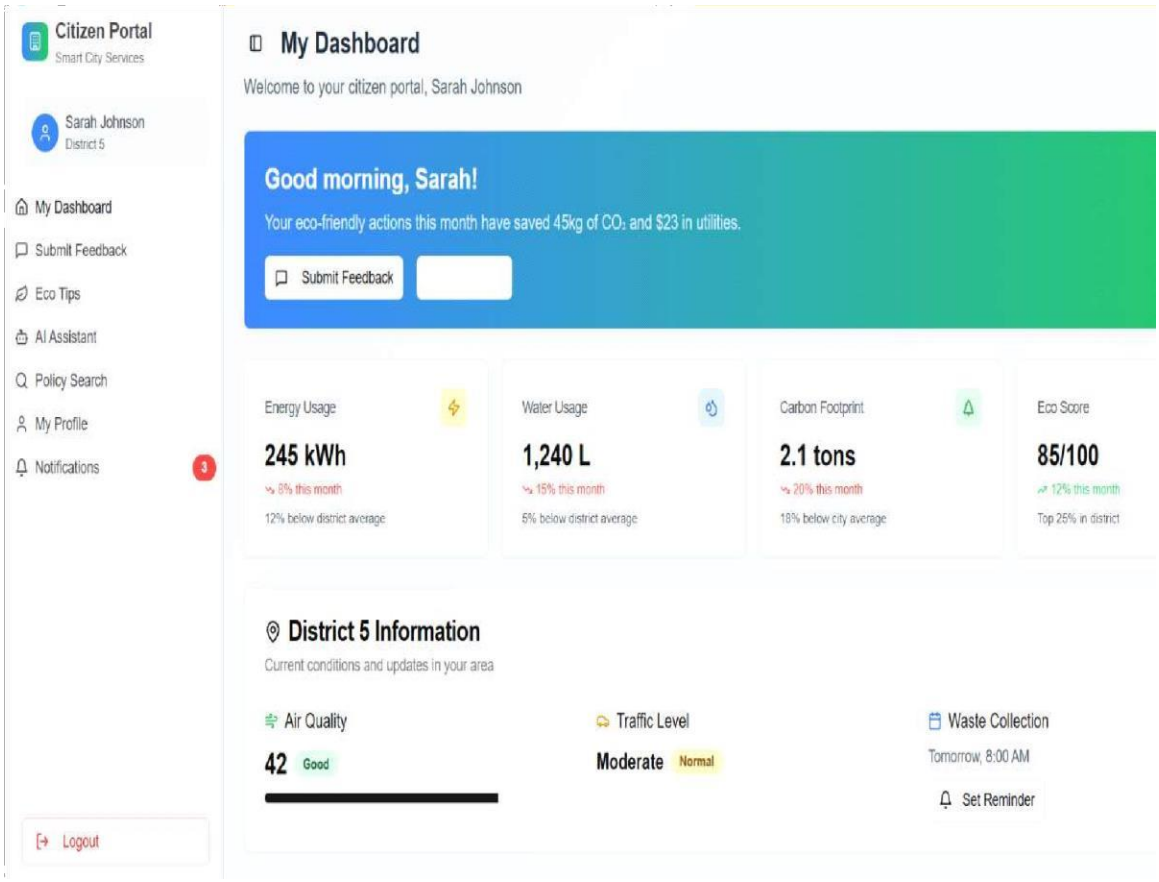
- Anomaly Detector caught unauthorized energy usage.
- Feedback Portal was used by citizens to log issues like air quality and water leaks.

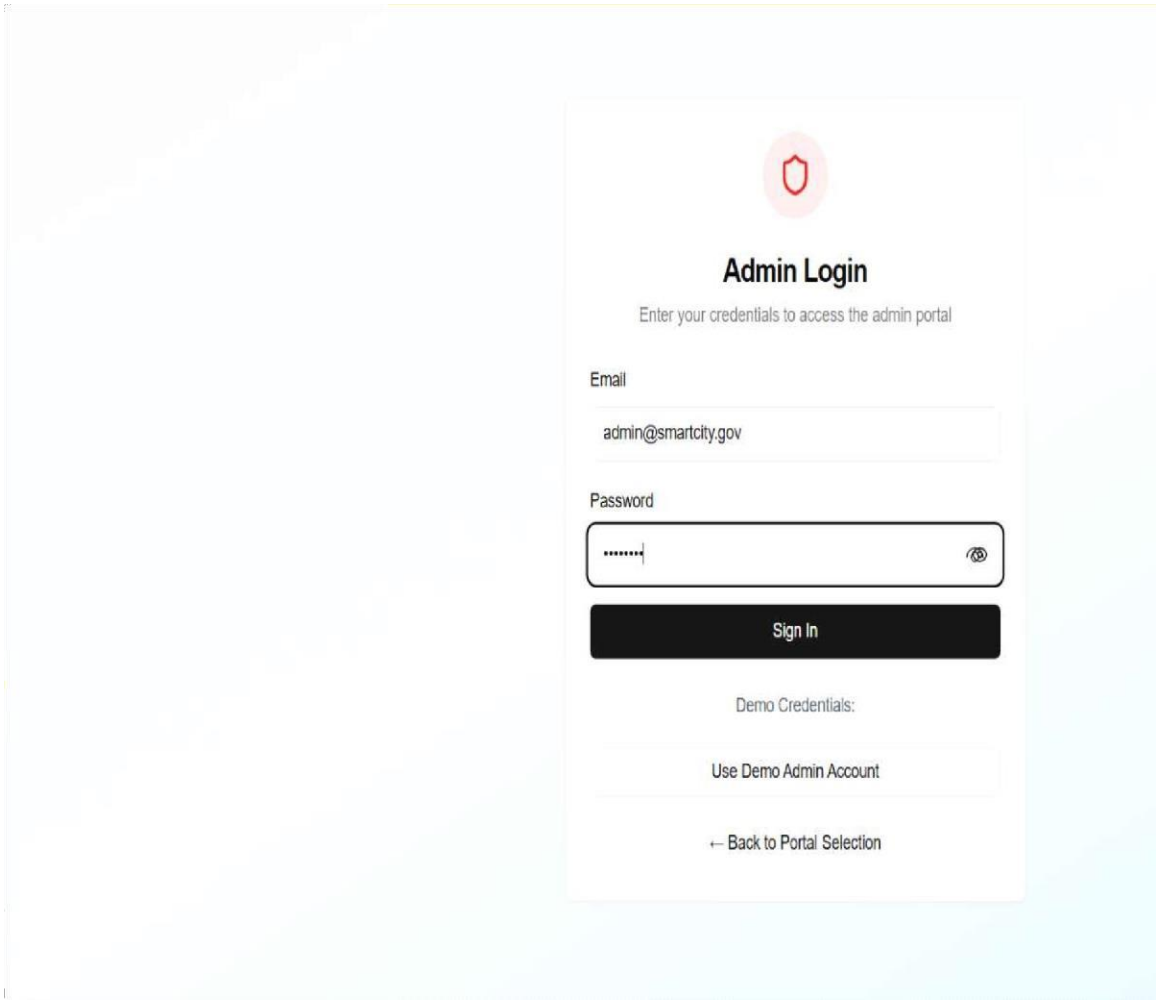
7.1 Output Screenshots

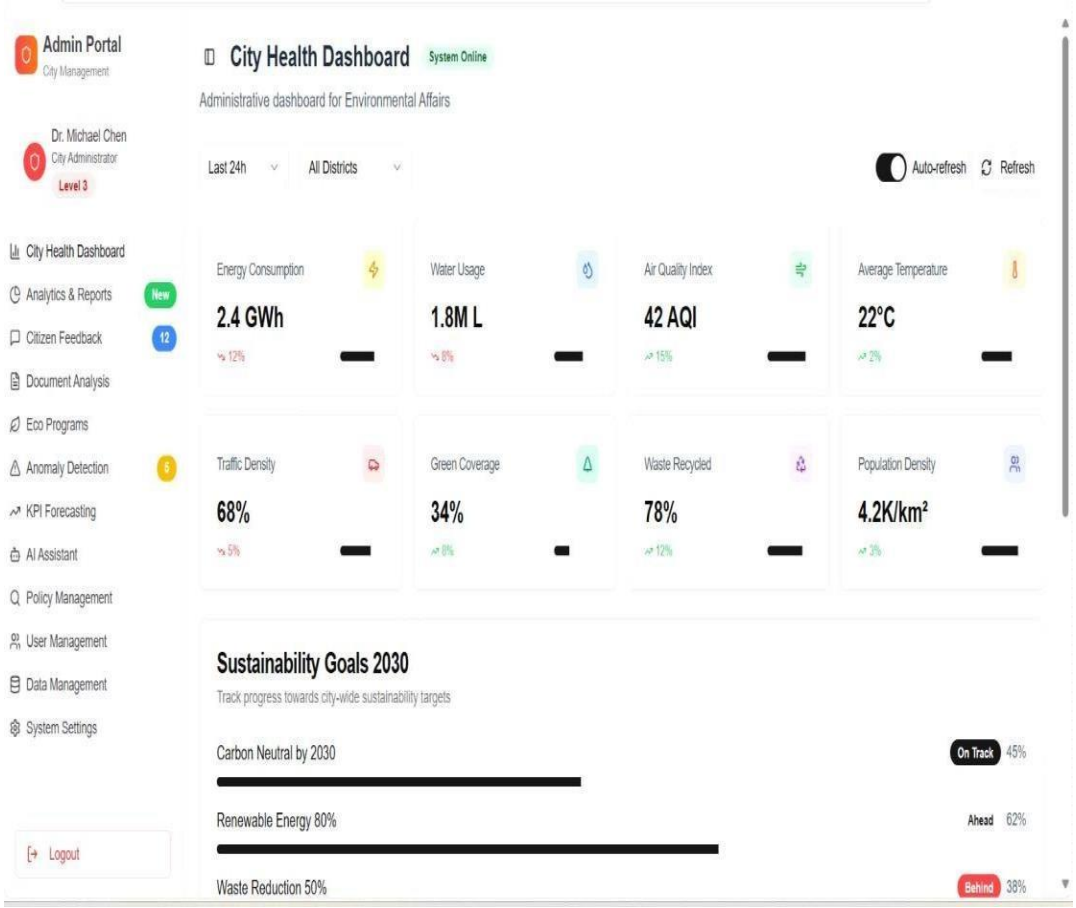

Smart City Portal
Sustainable Urban Management
Online
24/7 Available
Login
Welcome to Our Smart City
Access city services, view real-time data, and engage with your community through our AI-powered sustainable city management platform.
Citizen Portal
Access city services, submit feedback, and stay informed about your community
Submit feedback and reports
View city metrics and data
Access eco-advice and tips
Chat with AI assistant
Enter Citizen Portal
Admin Portal
Comprehensive city management dashboard for administrators and officials
Full city health dashboard
Anomaly detection & alerts
KPI forecasting & analytics
Policy management tools
Enter Admin Portal

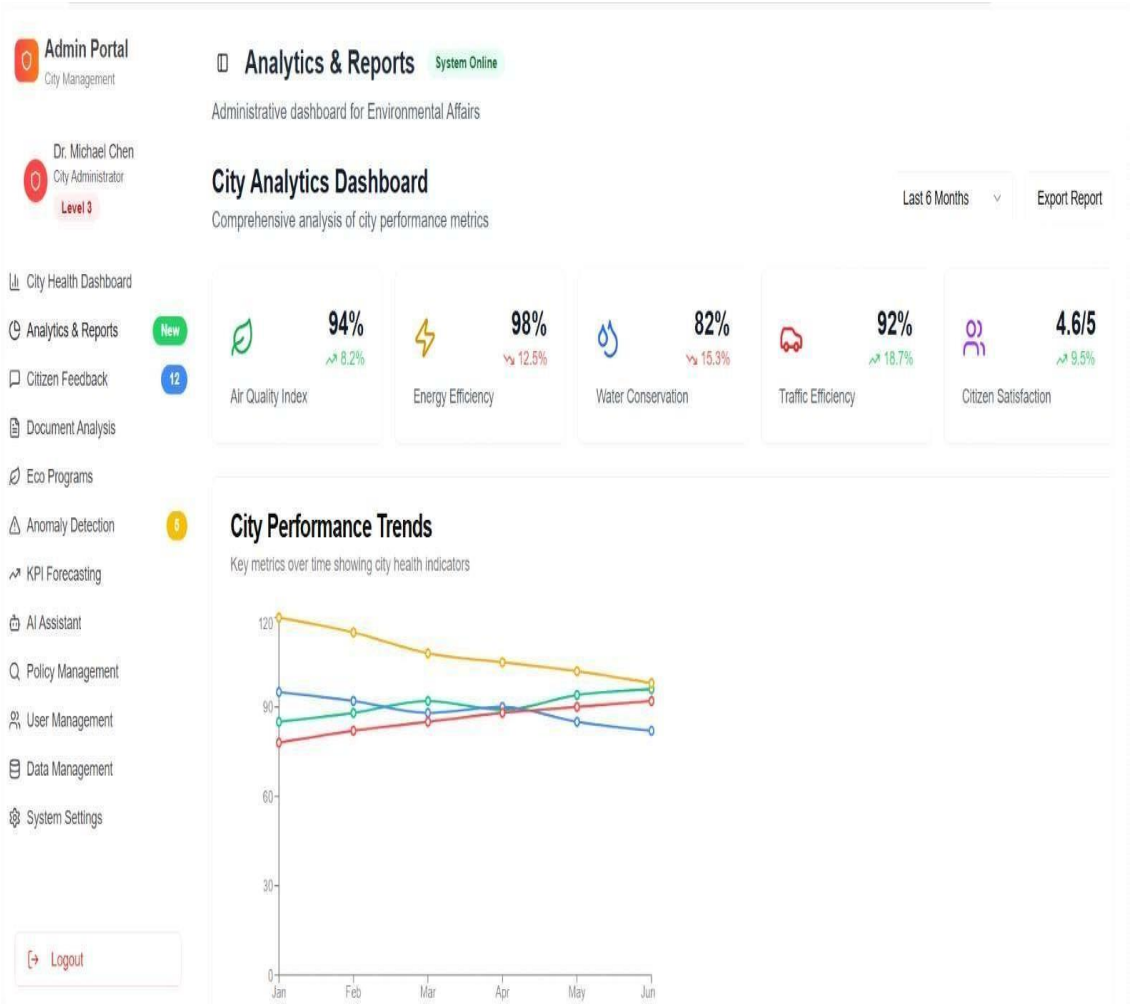

Smart City Portal
Choose your portal to continue
Citizen Login
Access city services and submit feedback
Submit feedback and reports
View city metrics and data
Chat with AI assistant
Demo: sarah.johnson@email.com
Admin Login
City management and administration
Full city health dashboard
Manage citizen feedback
Advanced analytics & reports
Demo: admin@smartcity.gov
Back to Home


Citizen Login
Enter your credentials to access the citizen portal
Email
sarah.johnson@email.com
Password
Invalid credentials. Please check your email and password.
Sign In
Demo Credentials:
Use Demo Citizen Account
← Back to Portal Selection


Citizen Portal
Smart City Services
Sarah Johnson
District 5
My Dashboard
Submit Feedback
Eco Tips
AI Assistant
Policy Search
My Profile
Notifications
3
Logout
My Dashboard
Welcome to your citizen portal, Sarah Johnson
Good morning, Sarah!
Your eco-friendly actions this month have saved 45kg of CO₂ and $23 in utilities.
Submit Feedback
Energy Usage
245 kWh
8% this month
12% below district average
Water Usage
1,240 L
15% this month
5% below district average
Carbon Footprint
2.1 tons
20% this month
18% below city average
Eco Score
85/100
12% this month
Top 25% in district
District 5 Information
Current conditions and updates in your area
Air Quality
42
Good
Traffic Level
Moderate
Normal
Waste Collection
Tomorrow, 8:00 AM
Set Reminder


Admin Login
Enter your credentials to access the admin portal
Email
admin@smartcity.gov
Password
Sign In
Demo Credentials:
Use Demo Admin Account
← Back to Portal Selection


Admin Portal
City Management
Dr. Michael Chen
City Administrator
Level 3
City Health Dashboard
Analytics & Reports
New
Citizen Feedback
12
Document Analysis
Eco Programs
Anomaly Detection
6
KPI Forecasting
AI Assistant
Policy Management
User Management
Data Management
System Settings
Logout
City Health Dashboard
System Online
Administrative dashboard for Environmental Affairs
Last 24h
All Districts
Auto-refresh
Refresh
Energy Consumption
2.4 GWh
12%
Water Usage
1.8M L
8%
Air Quality Index
42 AQI
15%
Average Temperature
22°C
2%
Traffic Density
68%
5%
Green Coverage
34%
8%
Waste Recycled
78%
12%
Population Density
4.2K/km²
3%
Sustainability Goals 2030
Track progress towards city-wide sustainability targets
Carbon Neutral by 2030
On Track
45%
Renewable Energy 80%
Ahead
62%
Waste Reduction 50%
Behind
38%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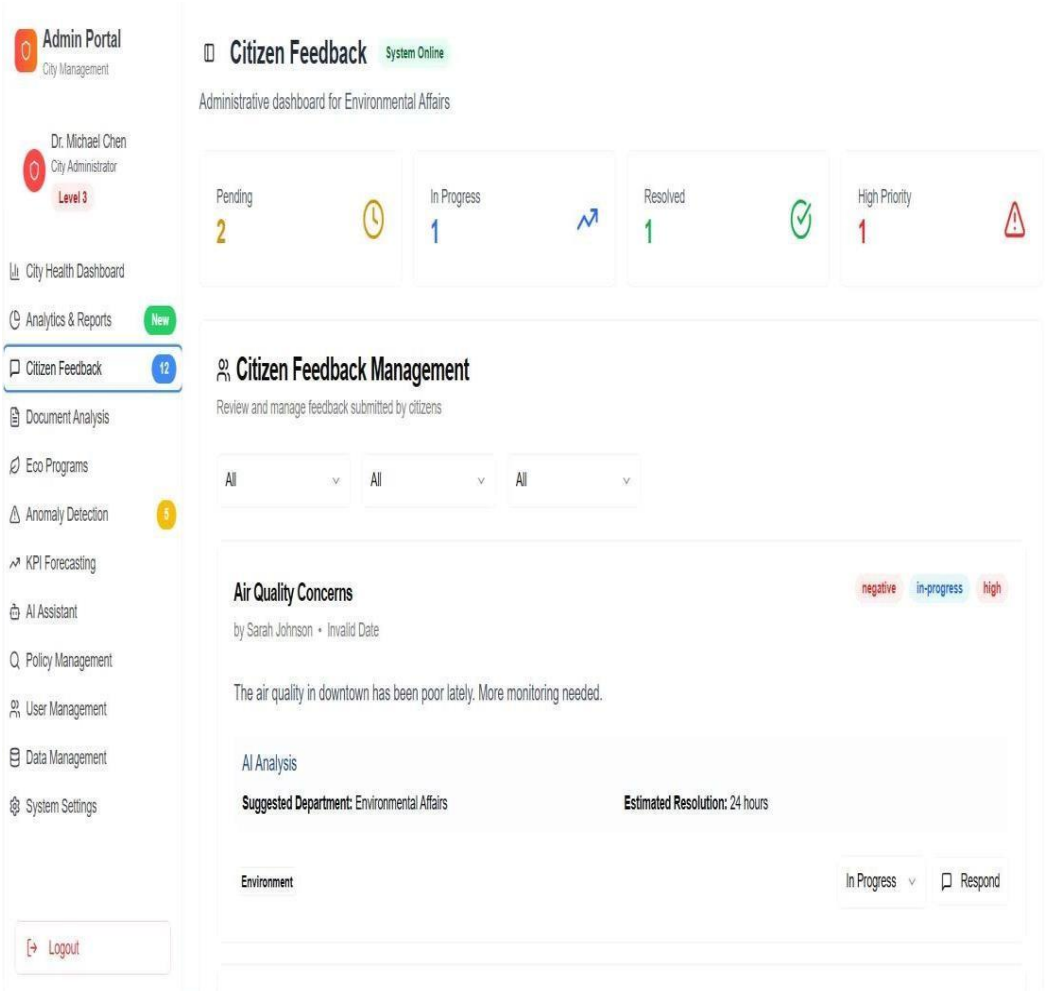
Data Management
System Settings
Logout
Analytics & Reports
System Online
Administrative dashboard for Environmental Affairs
City Analytics Dashboard
Comprehensive analysis of city performance metrics
Last 6 Months
Export Report
94%
8.2%
Air Quality Index
98%
12.5%
Energy Efficiency
82%
15.3%
Water Conservation
92%
18.7%
Traffic Efficiency
4.6/5
9.5%
Citizen Satisfaction
City Performance Trends
Key metrics over time showing city health indicators
120
90
60
30
0
Jan
Feb
Mar
Apr
May
Jun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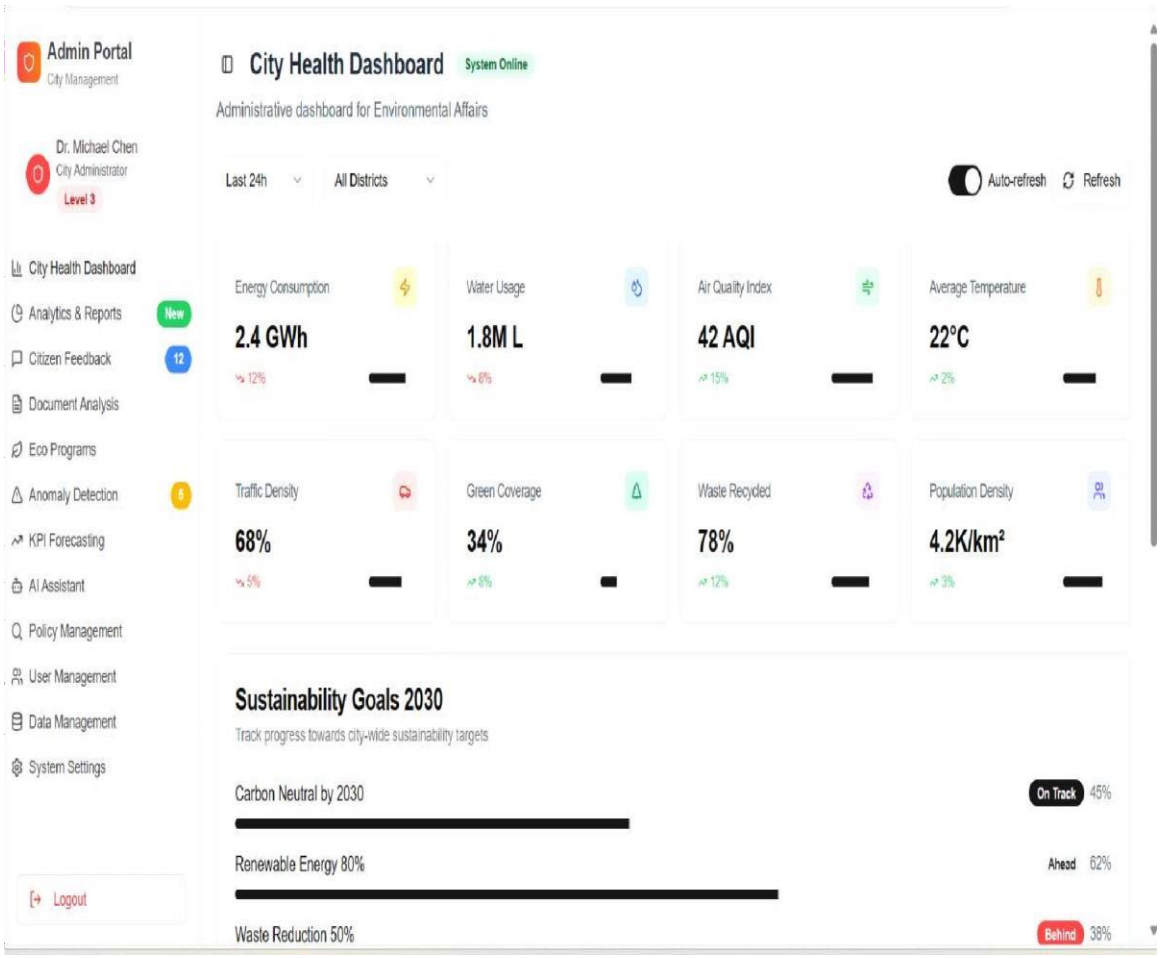
KPI Forecasting
AI Assistant
Policy Management
User Management
Data Management
System Settings
Logout
Citizen Feedback
System Online
Administrative dashboard for Environmental Affairs
Pending
2
In Progress
1
Resolved
1
High Priority
1
Citizen Feedback Management
Review and manage feedback submitted by citizens
All
All
All
Air Quality Concerns
negative
in-progress
high
by Sarah Johnson • Invalid Date
The air quality in downtown has been poor lately. More monitoring needed.
AI Analysis
Suggested Department: Environmental Affairs
Estimated Resolution: 24 hours
Environment
In Progress
Respond



8. ADVANTAGES & DISADVANTAGES

Advantages

- Unified interface for city data
- LLM capabilities add intelligence

- Real-time citizen feedback and admin response
- Modular and scalable backend

Disadvantages

- AI services may incur cost
- Internet required for full functionality
- Performance dependent on model tuning

9. CONCLUSION

The Smart City Assistant delivers a modern, AI-powered solution to bridge gaps in city planning and citizen engagement. It ensures informed decisions, citizen trust, and measurable sustainability improvements through a responsive, modular system.

10. FUTURE SCOPE

- Add voice input and speech-to-text
- Mobile version for citizen engagement
- Multilingual capabilities
- Integrate IoT live sensor feeds
- Improve KPI predictions with deep learning models

11. APPENDIX

Demo link:

https://smartcity35.vercel.app/