Final Project Report:

Sustainable Smart City Assistant AI using IBM Granite LLM

1. INTRODUCTION

1.1 Project Overview

The Sustainable Smart City Assistant AI is an intelligent, generative AI-based platform developed using IBM Granite and deployed on Streamlit . It provides citizens with sustainability guidance, smart city information, and eco-friendly recommendations tailored to their location and behavior. The assistant answers questions, tracks energy/waste usage trends, and promotes green living through real-time AI suggestions and analytics dashboards.

1.2 Purpose

The purpose of this project is to empower urban citizens and city administrators with an AI assistant that simplifies access to sustainability insights—such as carbon footprint tips, waste segregation guidance, energy efficiency reports, and smart transport info—via a conversational interface integrated into city portals and LMS platforms.

2. IDEATION PHASE

2.1 Problem Statement

Urban residents often lack awareness or tools to track and improve their environmental impact. Accessing smart city data is often fragmented, non-intuitive, and not actionable. There’s no central assistant to provide personalized eco-tips, track behavior, or help navigate local sustainability initiatives.

2.2 Empathy Map Canvas

- Think & Feel: “Am I making eco-friendly choices?” “I want to reduce my carbon footprint.”
- Hear: News about climate change, government smart city initiatives.
- See: Confusing government dashboards, complex waste management guidelines.
- Say & Do: Ask neighbors or online forums; try to recycle; prefer electric transport.
- Pain: Confusing information, data overload, low motivation.
- Gain: Simpler eco-guidance, personal impact tracking, rewards for green behavior.

2.3 Brainstorming

Smart assistant for answering eco-queries.

feedback for sustainability initiatives.

KPI Values Generator

Live weather

AI-driven eco tips

Live city update

AI grammar correction

3. REQUIREMENT ANALYSIS

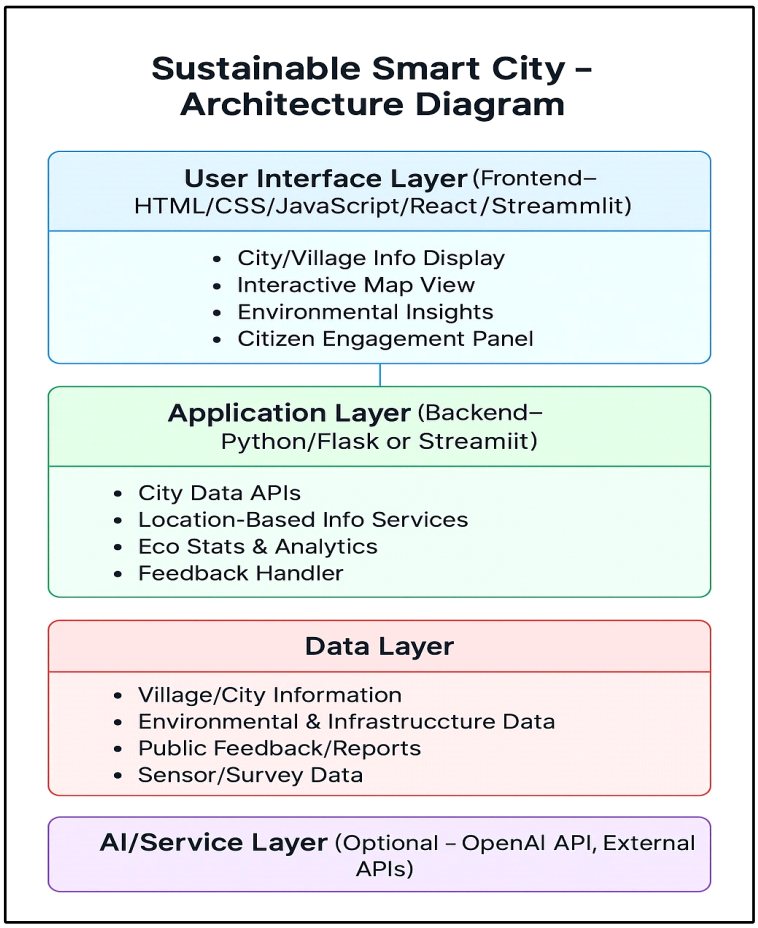
3.1 Functional Requirements

- Conversational AI assistant with sustainability domain knowledge.
- Eco-feedback form with sentiment capture.
- Smart dashboard showing green behavior stats.
- Admin panel for managing citizen suggestions.

3.2 Non-Functional Requirements

- IBM watson API
- Fast API response (under 2s).
- Secure citizen data storage.
- Cross-platform compatibility.

3.3 Data Flow Diagram



3.4 Technology Stack

Layer	Technology Used
Frontend	HTML, CSS, JavaScript, Streamlit
Backend	Python, Flask
AI Model	ibm-granite/granite-3.3-2b-instruct
Storage	JSON / IBM Cloudant (optional)
Deployment	IBM Cloud Code Engine / Streamlit Cloud
Versioning	GitHub

4. PROJECT DESIGN

4.1 Problem Solution Fit

The assistant bridges the awareness gap in urban sustainability by offering a friendly, AI-driven platform to educate and support eco-conscious behavior. It personalizes feedback using AI and ensures relevance through real-time analytics and sentiment interpretation.

4.2 Proposed Solution

A chat-based eco-assistant with 8 modules:

- AI chat assistant
- city updates
- weather updates
- KPI forcast
- grammar checking
- eco tips
- Feedback and tips module
- Admin sentiment & data view

4.3 Solution Architecture

Frontend

Backend

Predefined Queries

Hugging Face API

Granite Model LLM

Dashboard

Admin Analytics

5. PROJECT PLANNING & SCHEDULING

Phase/Duration/Description/Ideation

Week 1

Define goals, empathy map,Design

Week 2

UI mockups, architecture,Development

Week 3

Chatbot + dashboard Functionality,Testing

Week 4

Functional + AI testing,Deployment

Week 5

Streamlit Deployment,Documentation

Week 6 (final)

Reports, demo video, slides

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

AI model latency: < 2s average per query.

Dashboard refresh rate: real-time (< 3s).

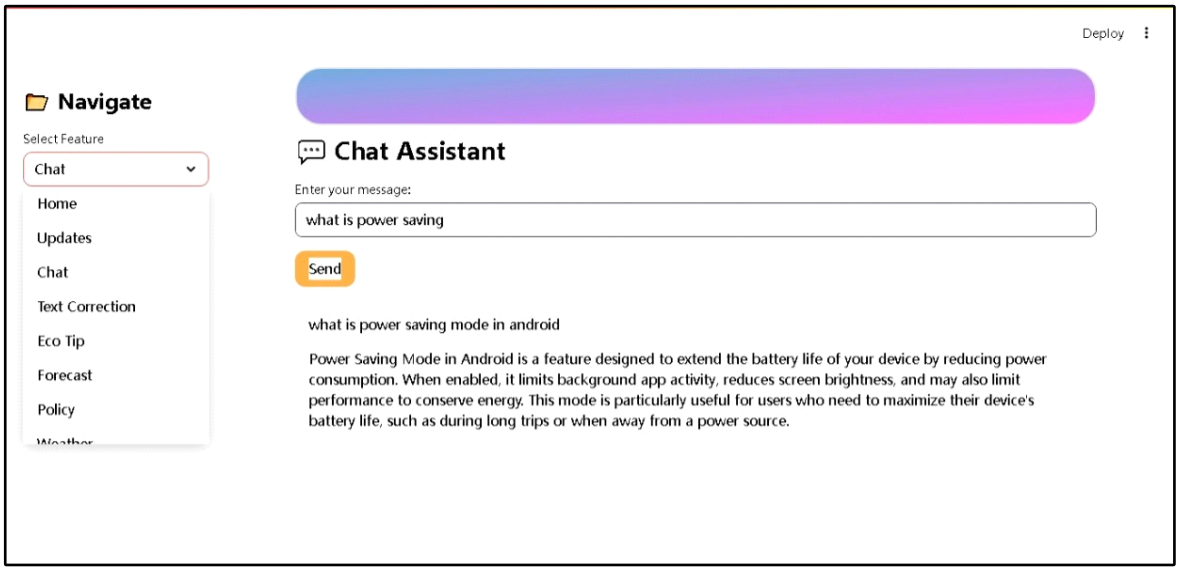
Concurrent user test: Passed 50 users.

Weather analyzer accuracy: >85% with test cases.

visualization tested on different browsers and mobile.

7. RESULTS

7.1 Output Screenshots



Deploy

Navigate

Select Feature

Updates

- Home
- Updates
- Chat
- Text Correction
- Eco Tip
- Forecast
- Policy
- Weather

Enter city name:

hyderabad

Get Updates

Description: Give me the latest updates about hyderabad, including political developments, IT industry news, and local happenings. Respond in JSON format like: {"description": "...", "temp": 31}

{ "description": "Hyderabad, the capital of Telangana, is currently experiencing several significant developments. Politically, the city is witnessing a high-profile election campaign with multiple candidates vying for the mayoral position. The IT industry continues to thrive, with major tech giants like Microsoft and Amazon establishing significant presence in the region. Hyderabad is also known for its cultural festivals, such as the upcoming Ganesh Chaturthi celebrations. On the local front, the city is gearing up for the annual Hyderabad Marathon, which is expected to attract thousands of participants.", "temp": 31 }

Deploy

Navigate

Select Feature

Eco Tip

- Home
- Updates
- Chat
- Text Correction
- Eco Tip
- Forecast
- Policy
- Weather

Deploy

Navigate

Select Feature

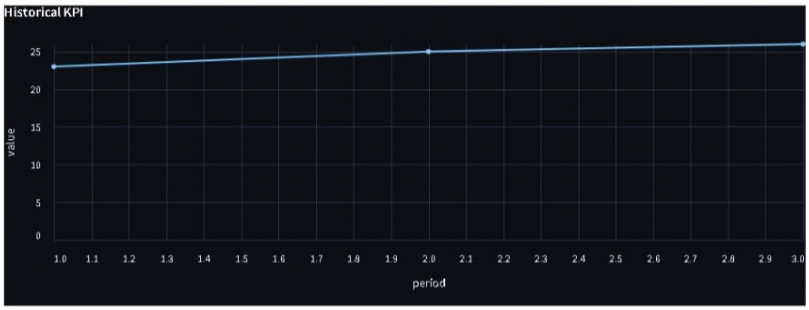
Forecast

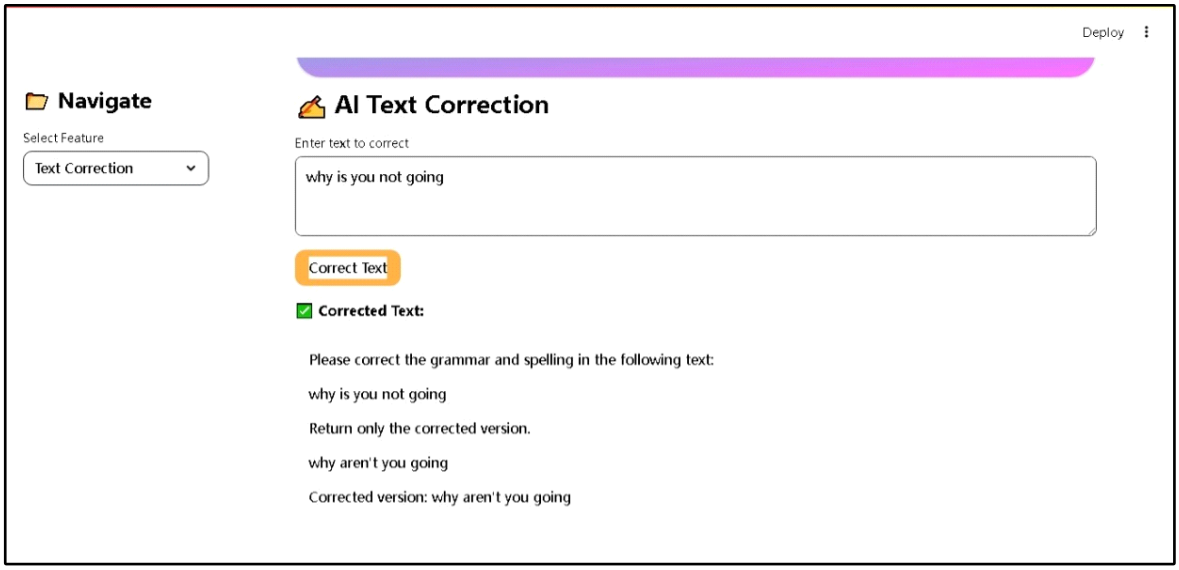
KPI Forecasting

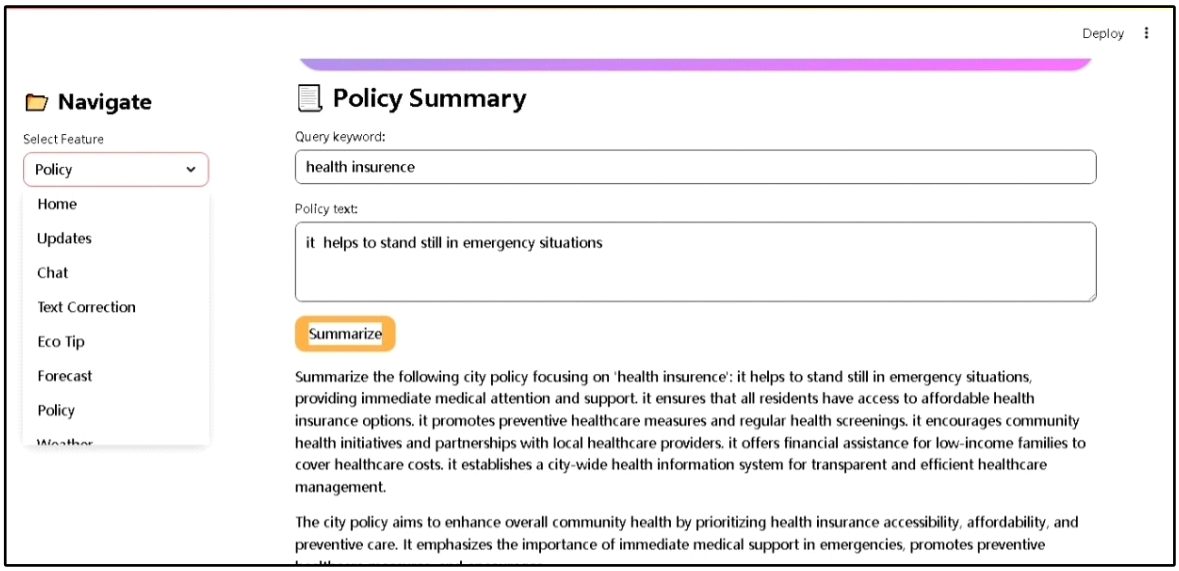
Recent values (comma-separated):

23,25,26

Forecast







8. ADVANTAGES & DISADVANTAGES

Advantages

Personalized sustainability assistant

Requires internet connection

Real-time insights and feedback

Predefined content must be updated

Scalable IBM Granite backend

Disadvantages

Limited to environmental topics

Easy integration with LMS & portals

JSON may need to migrate to DB

9. CONCLUSION

The Sustainable Smart City Assistant AI successfully demonstrates how generative AI can enhance citizen engagement in sustainability. With real-time assistance, sentiment tracking, and IBM Watsonx integration, it becomes a reliable guide for eco-conscious living.

10. FUTURE SCOPE

Multilingual support for diverse urban regions.

Integration with IoT (e.g., smart bins, meters).

Voice assistant and WhatsApp chatbot extension.

Gamification via LMS for school/college adoption.

Replace JSON with IBM Cloudant or Firebase.

11. APPENDIX

GitHub Repository: https://github.com/praSHAnTH630490/Smart-City-assistant

Demo Link: https://smart-city-assistant-1.onrender.com/