

Sustainable Smart City Assistant – Planning & Logic Document

1. Project Planning Overview

The Sustainable Smart City Assistant is designed to provide accessible, AI-powered insights for citizens and city officials. It delivers document summarization, eco tips, chatbot interaction, anomaly detection, and KPI forecasting using IBM Granite LLM. This planning document outlines the architecture, flow, development sprints, and dependencies required to implement the system.

2. Development Phases

- Sprint 1: Streamlit UI setup, backend API creation, IBM Granite model integration
- Sprint 2: Summarization module, eco tips engine, multilingual chatbot
- Sprint 3: Anomaly detection, KPI forecasting, citizen feedback form
- Sprint 4: Admin dashboard, analytics view, cloud deployment

3. Component-Wise Logic Flow

3.1 Streamlit UI

- Presents interfaces for document upload, keyword input, chat, and feedback
- Sends data securely via POST to FastAPI backend
- Displays model-generated responses, forecasts, and analytics

3.2 FastAPI Backend

- Receives structured user input via API calls
- Builds prompts for IBM Granite or directs data to ML modules
- Manages .env configuration for secure keys
- Handles fallback logic and post-processing (formatting, disclaimers, etc.)
- Returns structured JSON to frontend

3.3 IBM Granite Model (Watsonx Integration)

- Accepts well-structured prompts (e.g., summarize, suggest, forecast)
- Returns safe, policy-aware, user-friendly results
- Supports summarization, chatbot, and eco advice logic

3.4 Forecasting & Anomaly Models (Sklearn-based)

- Accepts KPI dataset uploads
- Forecasts trends using regression techniques
- Detects outliers using Z-score or IQR thresholds
- Returns graphs and flagged data points

4. Error Handling & Fallbacks

- Backend validates input type, size, and structure
- API failures return friendly messages to the frontend
- Timeout and fallback responses handled using try/except logic
- GPT-2 fallback used if IBM Granite is unavailable

5. Future Logic Enhancements

- Add support for regional languages
- Include voice input using Whisper or WebRTC
- Enhance feedback capture with thumbs up/down rating
- Enable IoT device data integration for real-time alerts
- Export insights to PDF or email reports