# 🌆 Sustainable Smart City Assistant Using IBM Granite LLM

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## 📌 Project Overview

The **Sustainable Smart City Assistant** is a lightweight, AI-powered application built to support urban sustainability, data awareness, and citizen engagement. Designed to run entirely within a Google Colab environment, the assistant integrates multiple intelligent modules to process, forecast, summarize, and interact with various forms of city-related data. Its modular architecture and simple UI ensure accessibility for researchers, policymakers, and everyday citizens.

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### 🔧 Modules Included:

* 📄 PDF Policy Summarization
* 🧠 Chat Assistant using IBM Granite or Mistral-7B
* 📊 KPI Forecasting using Linear Regression
* 🚨 Anomaly Detection on CSV data
* 🌱 Eco Tips Generator
* 📝 Feedback Form
* 📈 KPI Dashboard Summary Cards
* 🖨️ AI-based Report Generator (with PDF Export)

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## 🔑 Key Technologies Used

| **Category** | **Tools & Frameworks** |
| --- | --- |
| LLM | IBM Granite-2B-Instruct |
| Frontend UI | Gradio (Tabbed Interface) |
| Development Platform | Google Colab (with GPU Support) |
| ML Algorithm | Linear Regression (Forecasting) |
| PDF Tools | PyMuPDF (reading), FPDF (writing reports) |
| Data Format Support | CSV, PDF, Text |
| Language Libraries | Transformers, Torch, Scikit-learn, Pandas, NumPy |

## 💼 Use Case Scenarios

### 📄 Policy Summarization

A municipal planner uploads a complex city policy document to the assistant’s interface. Within seconds, the system generates a concise, citizen-friendly summary using IBM Granite or Mistral-7B, simplifying interpretation and planning.

### 🗣️ Citizen Feedback Collection

A city resident reports a leaking pipeline using the in-built feedback form. The feedback is instantly logged and displayed with the submitter’s name, helping authorities track local issues in real-time without complex backend integration.

### 🔮 KPI Forecasting

A city officer uploads a CSV of last year’s energy consumption. The system applies linear regression and forecasts next quarter’s usage, aiding infrastructure planning and budget allocation.

### 🚨 Anomaly Detection

A CSV with water usage across districts is uploaded. The anomaly module highlights unexpected spikes, flagging a zone for further inspection—potentially preventing overuse or resource misuse.

### 🌱 Eco Tips for Awareness

During a school awareness program, the assistant generates 3 simple daily sustainability tips at random. Tips are short, easy-to-follow, and change with each click.

### 🤖 AI Chat Assistant

Citizens ask questions like, “What can my city do to become carbon neutral?” The LLM suggests tailored recommendations such as solar subsidies, public transport improvements, and green infrastructure.

### 🖨️ Report Generator

The user provides summary content or KPI results. The assistant compiles this into a structured, downloadable PDF report using FPDF.

## 👨‍💻 Team Details

* **Team ID:** TEAM-175
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* **Track:** Generative AI with IBM Cloud

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