

# Sustainable Smart City using IBM Granite LLM

## Team Members

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## Introduction

- The Sustainable Smart City project leverages IBM Granite LLM to analyze city-related data, optimize resource usage, and provide AI-driven insights for urban planning.
- By integrating Generative AI with IoT, urban infrastructure, and citizen services, this project aims to create a greener, efficient, and people-centered smart city ecosystem.

## Project Description

- Processes urban planning documents, policies, and real-time IoT data.
- Extracts key sustainability challenges such as energy waste, traffic congestion, and pollution.
- Generates recommendations, reports, and code snippets for smart city applications.

## Features

- Requirement Analysis: Extracts sustainability goals (energy efficiency, waste management, smart mobility, water conservation).
- AI-Powered Insights: Generates strategies and city management guidelines.
- Smart Code Generation: Auto-generates code for IoT dashboards and energy monitoring apps.
- Interactive UI: Built with Gradio for user interaction.
- Report Generation: Creates structured sustainability reports with visualizations.

## Technology Stack

- IBM Granite LLM (Natural language understanding & generation)
- Hugging Face Transformers
- Python
- Gradio (UI)
- IoT Data Simulation (traffic, energy, pollution datasets)
- ReportLab / Matplotlib (visual reports & charts)

## System Architecture

- Input Layer – Accepts documents (city plans, IoT data, reports).
- Processing Layer – Extracts sustainability requirements using Granite LLM.
- Generation Layer – Produces AI recommendations and code snippets.
- Presentation Layer – Provides interactive Gradio interface.

## Workflow

- Upload city planning documents or IoT datasets.
- IBM Granite LLM analyzes sustainability requirements (energy, waste, mobility).
- AI generates strategies and prototype code for smart apps.
- Outputs shown in interactive reports & dashboards.

## Use Cases

- Urban Planning: Suggests sustainable designs & zoning strategies.
- Smart Energy Management: Generates code for monitoring systems.
- Traffic Optimization: Provides AI-driven congestion solutions.
- Citizen Services: Chatbots for waste segregation and eco-tips.
- Research & Academia: Supports AI-driven sustainability planning.

## Limitations

- Limited handling of large-scale city datasets.
- Recommendations may require expert validation.
- Internet dependency for Granite LLM updates.
- Scope limited to predefined urban sectors.

## Future Enhancements

- Real-time IoT integration with live sensor feeds.
- Expand to more urban domains (healthcare, education).
- Integrate with GIS tools for spatial analysis.
- Build a mobile-friendly citizen app.
- Enable collaborative planning dashboards.

## Conclusion

- Demonstrates how Generative AI can revolutionize urban planning.

- Reduces resource wastage and improves city efficiency.
- Empowers decision-makers with AI-driven insights.
- Supports sustainability goals for future-ready cities.