Project Design Phase-II

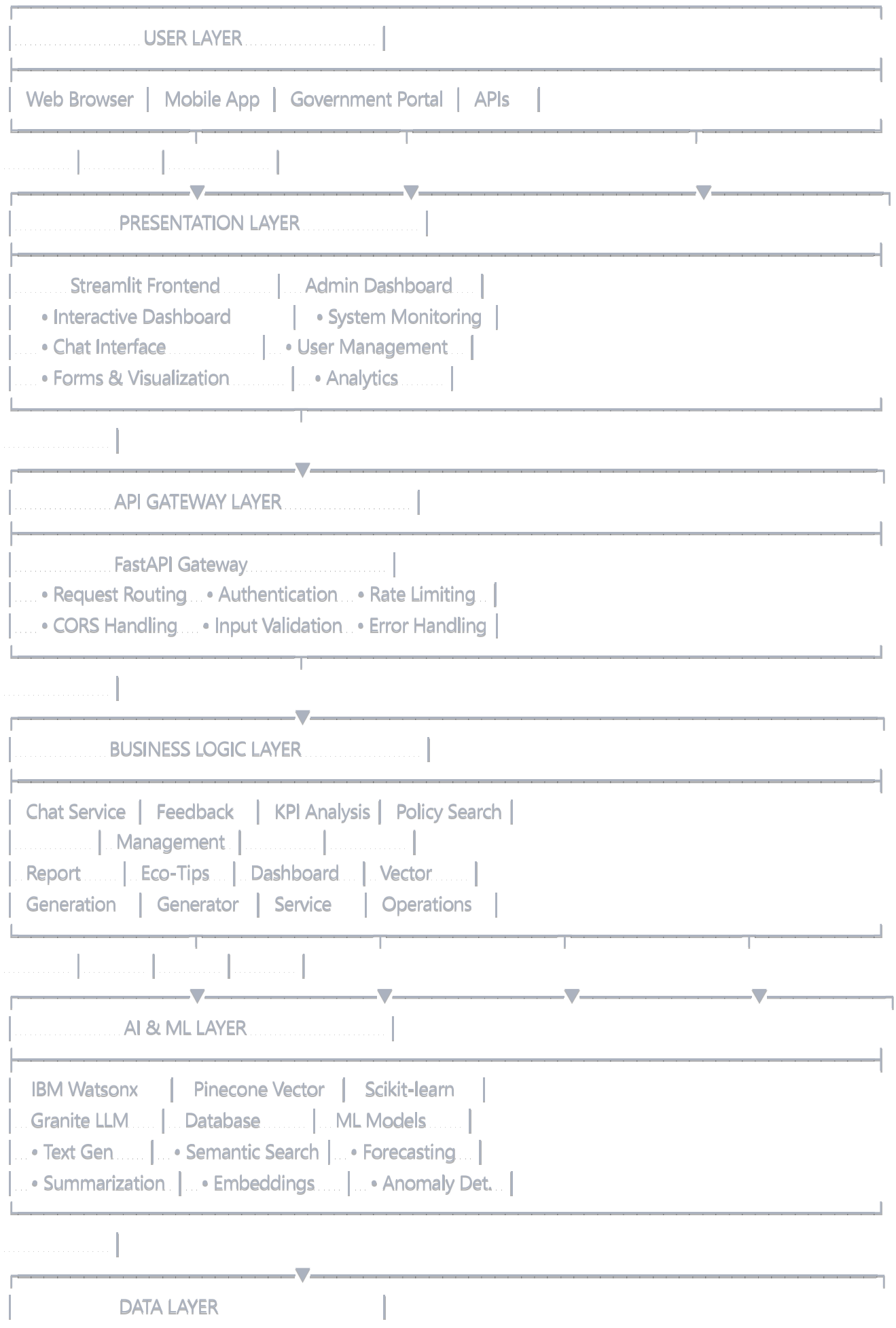
Technology Stack (Architecture & Stack)

Date: 2 July 2025
Team ID: LTVIP2025TMID21203
Project Name: Sustainable Smart City Assistant
Maximum Marks: 4 Marks

Technical Architecture:

The Sustainable Smart City Assistant follows a **modern microservices architecture** with clear separation between frontend, backend, and AI services. The system is designed for scalability, maintainability, and high performance.

System Architecture Diagram:


USER LAYER
Web Browser
Mobile App
Government Portal
APIs
PRESENTATION LAYER
Streamlit Frontend
Admin Dashboard
• Interactive Dashboard
• System Monitoring
• Chat Interface
• User Management
• Forms & Visualization
• Analytics
API GATEWAY LAYER
FastAPI Gateway
• Request Routing
• Authentication
• Rate Limiting
• CORS Handling
• Input Validation
• Error Handling
BUSINESS LOGIC LAYER
Chat Service
Feedback
KPI Analysis
Policy Search
Management
Report Generation
Eco-Tips Generator
Dashboard Service
Vector Operations
AI & ML LAYER
IBM Watsonx Granite LLM
Pinecone Vector Database
Scikit-learn ML Models
• Text Gen
• Semantic Search
• Forecasting
• Summarization
• Embeddings
• Anomaly Det.
DATA LAYER

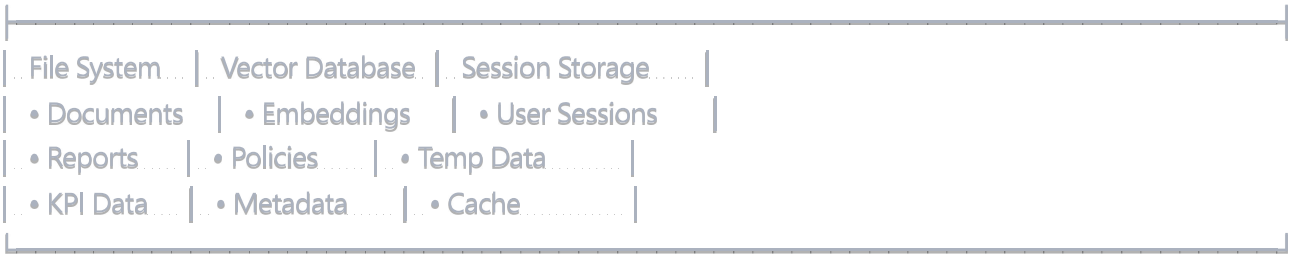


Table-1: Components & Technologies

S.No	Component	Description	Technology
1.	User Interface	Interactive web dashboard for citizens and officials	**Streamlit** with custom CSS, HTML5, JavaScript
2.	API Gateway	Central request handling and routing	**FastAPI** with Uvicorn ASGI server
3.	Chat Assistant Logic	AI-powered conversational interface	**IBM Watsonx Granite LLM** integration
4.	Document Processing	Policy document analysis and summarization	**IBM Watsonx** + **Sentence Transformers**
5.	Vector Database	Semantic search and document retrieval	**Pinecone Vector Database**
6.	Machine Learning Models	KPI forecasting and anomaly detection	**Scikit-learn**, **Pandas**, **NumPy**
7.	Data Storage	Document and data file management	**Local