Phase 3: Implementation of Project

Title :Urban Planning and Design Optimization System

Objective

The goal of Phase 3 is to implement the foundational components of a Smart Urban Planning and Design Framework based on concepts and strategies developed in Phase 2. This includes the creation of a digital urban simulation model, stakeholder engagement interface, preliminary sensor integration for data collection, and the application of data governance protocols.

1. Urban Simulation Model Development

Overview

The core of the system is a simulation model that helps urban planners visualize spatial layouts, forecast impacts of development, and simulate policy outcomes.

Implementation

- 3D GIS and BIM Integration: Integration of GIS (Geographic Information Systems) and BIM (Building Information Modeling) for simulating land use, zoning, infrastructure, and mobility patterns.
- Data Source: Based on municipal planning datasets, zoning maps, traffic data, and environmental impact assessments.

Outcome

By the end of this phase, the model should simulate various urban development scenarios and help identify optimal planning decisions.

2. Stakeholder Engagement Platform

Overview

A digital platform will be created to allow community members, planners, and stakeholders to participate in the planning process.

Implementation

- User Interface: An interactive dashboard will allow users to view proposed plans, provide feedback, and run simple simulations.
- Language Support: The platform will initially support English, with multilingual expansion planned.

Outcome

An accessible and interactive planning portal that facilitates participatory design and inclusive decision-making.

3. IoT Sensor Integration (Optional)

Overview

Preliminary integration of urban IoT sensors to collect data on traffic flow, air quality, noise levels, and public space usage.

Implementation

- Environmental Data: Collect real-time urban metrics via connected sensors placed in test zones.
- API Integration: Use city data platforms or third-party APIs to feed into the urban simulation.

Outcome

By the end of Phase 3, the system should begin incorporating real-world data to validate and refine planning scenarios.

4. Data Governance and Security

Overview

Due to the sensitivity of urban and citizen data, basic governance policies and data protection mechanisms will be implemented.

Implementation

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3. Sensor Coverage

- Challenge: Limited deployment of urban sensors.

- Solution: Use synthetic data or simulations during early development.

Outcomes of Phase 3

1. Functional urban simulation tools integrated with GIS/BIM systems.
2. Live stakeholder engagement portal with feedback mechanisms.
3. Initial integration of urban environmental sensors (optional).
4. Secure data handling protocols established.
5. Community feedback collected through pilot programs.

Next Steps for Phase 4

1. Model Calibration and Accuracy: Improve simulation models using real-world data.
2. Expansion of Engagement Tools: Add multilingual support, mobile apps, and AR/VR planning tools.
3. Scalability: Prepare the system for citywide adoption and more complex datasets.

screenshot of coding and progress

Coding :

```python
# urban_planning_app.py
import streamlit as st
import geopandas as gpd
import pandas as pd
import matplotlib.pyplot as plt

st.title("Smart Urban Planning Simulation")

zone_type = st.sidebar.selectbox("Choose zone type", ["Residential", "Commercial", "Industrial", "Mixed Use"])
population_growth = st.sidebar.slider("Estimated Population Growth (%)", 0, 100, 20)
green_space_addition = st.sidebar.slider("Green Space Increase (%)", 0, 50, 10)

data = {
    'Zone': ['Zone A', 'Zone B', 'Zone C'],
    'Type': ['Residential', 'Commercial', 'Industrial'],
    'Population': [5000, 2000, 1000],
    'Green_Space (%)': [10, 5, 2]
}
df = pd.DataFrame(data)
```

output :