Ecopolis – AI-Driven Urban Biodiversity Planner
Domain: Machine Learning, GIS, Data Analysis, Web/App Development

As urbanization continues to expand, it often replaces ecosystems with concrete infrastructure, threatening local biodiversity. Urban planning tools have typically ignored or underutilized biodiversity considerations. The challenge is to develop a tool that helps urban planners make decisions that preserve and enhance biodiversity.
Your task is to create an AI-driven urban biodiversity planner that leverages geographic information system (GIS) data, climate variables, and land use information to predict the impact of urban planning decisions on local ecosystems and offer recommendations for sustainable, biodiversity-friendly modifications.

What to Build and How to Present It:

- **GIS-based Biodiversity Visualization (200 Points)**

    - GIS Data Handling: Use publicly available GIS data to map out urban areas, vegetation, water bodies, and biodiversity hotspots. You can use tools like QGIS or Python libraries like Geopandas to handle and visualize spatial data.

    - Biodiversity Hotspots Visualization: Design a tool that shows areas of high biodiversity and areas at risk from urban development. The data could include parameters such as local vegetation, species richness, or green cover.

    - Interactive Interface: Allow users to zoom into a city map and click on regions to view biodiversity metrics for specific locations.

  You can present this as an interactive web app using Flask or Dash for a simple, accessible user interface that shows maps and related data.

- **Impact Prediction Model (250 Points)**
  Build a machine learning model that predicts the impact of urban development on local biodiversity based on factors like climate data (temperature, precipitation), land use changes (conversion of green spaces to buildings), and vegetation cover.
  The model will analyze the effects of infrastructure development on flora and fauna, providing a biodiversity risk score for each development scenario. It can be executed locally on your laptops, with a small dataset or simulated data to showcase the predictions.

- **Sustainability Recommendation System (100 Points)**
  Based on the impact prediction, design a recommendation engine that suggests changes to urban plans to minimize biodiversity loss.
    - Optimal Green Corridors: Identify areas suitable for green spaces that could help wildlife move between fragmented habitats.
    - Native Vegetation Preservation: Recommend areas where native plants should be preserved or planted.
    - Biodiversity-Friendly Infrastructure: Suggest infrastructure changes, such as incorporating vertical gardens or green roofs.
      The recommendations should be generated dynamically based on user inputs, such as urban expansion plans or specific biodiversity goals.

- **User Interface for Urban Planning (50 Points)**
  Design a basic web interface or CLI tool that allows users to:
    - Upload urban planning data (GIS files, climate data).
    - View biodiversity hotspots and areas at risk.
    - Input potential urban development scenarios (e.g., areas planned for construction).
      The tool will then display predicted biodiversity loss and recommendations for each area based on the inputs.

Case Study (Optional, but Recommended)
Apply the tool to a real-world urban area (e.g., a city that has undergone significant urbanization) and demonstrate how the tool could help in preserving biodiversity. Present data and predictions for the selected area using maps and scenarios.

Suggested Datasets:

- Urban and Biodiversity GIS Data: Use publicly available data from sources like OpenStreetMap or USGS Earth Explorer for GIS data of urban regions.
- Climate Data: Use climate data from sources like NOAA or WorldClim.
- Land Use Data: Use land use classification datasets to track how urbanization changes the environment.

Deliverables Summary:
The deliverable will be a **single app (either a web app or mobile app)** that can visualize biodiversity hotspots, predict the effects of urban development on local ecosystems, and suggest actionable recommendations for sustainable urban planning. This app will run locally on your laptops or can be deployed to cloud platforms like Heroku or GitHub Pages.
