

## **REMOTE SENSING**

### **PROBLEM STATEMENTS**

#### **1. Satellite-Based Urban Growth Analysis System**

##### **Problem Statement**

Rapid urban expansion puts pressure on infrastructure, land resources, and the environment. Traditional ground surveys are slow and incomplete. A satellite-based GIS system is required to monitor and analyze urban growth efficiently over time.

##### **Core Challenge**

- Analyze multi-temporal satellite imagery
- Classify urban, semi-urban, and non-urban regions
- Detect and quantify land-use changes
- Integrate GIS layers such as roads and population data
- Generate insights for urban planning decisions

#### **2. Remote Sensing–Driven Flood Risk Mapping System**

##### **Problem Statement**

Flood risks are increasing due to climate change and land-use changes, while static flood maps fail to capture evolving conditions. A dynamic flood risk mapping system using remote sensing and GIS is required.

##### **Core Challenge**

- Process satellite imagery and elevation data
- Identify flood-prone areas using hydrological indicators
- Integrate rainfall, river basin, and drainage data

- Generate flood risk and vulnerability maps
- Support early warning and disaster preparedness

### **3. Digital Twin–Enabled Urban Environment Monitoring**

#### **Problem Statement**

Urban environments change rapidly, but static GIS models cannot reflect real-time conditions or future scenarios. A digital twin approach is required for continuous urban monitoring and simulation.

#### **Core Challenge**

- Build a digital twin using satellite and GIS data
- Incorporate near-real-time remote sensing updates
- Simulate urban growth and infrastructure stress
- Analyze environmental factors like urban heat islands
- Support data-driven planning and policy decisions

### **4. GIS-Based Groundwater Potential Zone Mapping**

#### **Problem Statement**

Groundwater depletion threatens water security in many regions. Identifying groundwater recharge and potential zones is critical for sustainable water management.

#### **Core Challenge**

- Integrate satellite, geological, and hydrological data
- Analyze terrain slope, soil, and drainage patterns

- Generate groundwater potential maps
- Validate predictions using historical water data
- Support long-term groundwater conservation