

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