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Q15

How can Artificial Intelligence (AI) and drones be effectively used along with GIS and RS techniques in locational and areal planning?

UPSC Civil Services Mains 2025 · GS I · 15 marks · Indian Heritage and Culture

Indian culture will cover the salient aspects of Art Forms, literature and Architecture from ancient to modern times.

Core demand of the question

- Define GIS and RS as the locational base
- Show AI and drones as new eyes and brains on that base
- **Give planning uses:** land use, disaster, farming, cities, with Indian examples

Revision summary

Remote sensing supplies pictures of land and water; GIS stores them with administrative boundaries.

Drones add cheap, repeatable local maps for disasters, utilities and village layouts.

Artificial intelligence classifies pixels and can forecast flood, heat or sprawl on that GIS base.

Indian platforms such as **Bhuvan** and Gati Shakti already try to combine these tools.

Planning still needs ground checks and a public purpose, or the map only watches the poor.

Introduction

Remote sensing is the satellite or aircraft picture of the Earth. **GIS** is the software that stacks those pictures with roads, plots and census. Together they answer **where**. **Drones** fly the last metre. **Artificial intelligence** finds patterns in the pile of pixels that a tired planner would miss. Locational and areal planning is the craft of putting the right land use in the right polygon.

Body

The older pair, still the base

A **Resourcesat** or **Cartosat** scene shows crops, built-up sprawl and flood water. GIS lets a municipality overlay that on **property tax maps**, a **master plan**, and a **ward** boundary. Without this base, a drone is only a toy and an algorithm has nothing honest to learn from.

Drones as the close survey

Drones make **orthomosaic maps** of a village, a mine, or a disaster site in a day. They inspect **power lines**, count trees, and map a **landslide** when a satellite pass is cloudy. In planning they can update a slum footprint faster than a five-year survey. Rules under India's **drone policy** still matter: privacy, no-fly zones, and who owns the image.

AI as the classifier and the forecast

Machine learning can **classify land cover**, detect **illegal construction**, flag **crop stress**, and predict **flood extent** from rainfall and elevation. Combined with GIS, a city can see **which wards lack parks** or **which census tracts will heat** under a climate scenario. **PM Gati Shakti** and many State GIS portals already try to be that stack. **Bhuvan** is the public window.

- **Effective use means** ground truth: an algorithm that misreads a hut as a tree will plan injustice. It also means **open data** so a panchayat, not only a consultant, can see the layer. Planning ethics: surveillance of the poor is not the same as a drain that gets built.

The four tools are a chain. RS and GIS locate. Drones refresh. AI speeds the reading. The planner still chooses the **public purpose**.

Flow diagram

Satellite RS -> GIS layers

Drones -> GIS layers

GIS layers -> AI classify and forecast

AI classify and forecast -> Locational areal plan

Conclusion

GIS and remote sensing give the map. Drones give a fresh, close picture. AI reads change at scale. Together they can plan land, disaster response and cities, if the data is true and the purpose is public.

Facts & figures

Bhuvan

ISRO's geoportal that gives public access to Indian remote-sensing layers.

PM Gati Shakti

A national GIS effort to align infrastructure planning on one map.

Cartosat / Resourcesat

Indian satellite series used for high-resolution mapping and resource monitoring.

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