

Community-based Sustainable Forest Management for Water Resources Conservation, Manipur (COSFOM)

Training Handout

(Land Use Land Cover (LULC) & Slope Mapping using Q-GIS/Arc GIS)

1. Introduction

Land use planning and slope mapping are important tools for sustainable land management, watershed development, soil and water conservation, and climate change adaptation. Geographic Information Systems (GIS) help analyse spatial data, identify suitable areas for different land uses, and support informed decision-making, particularly in hilly and mountainous regions.



QGIS is an open-source GIS software, while **ArcGIS** is a commercial GIS platform. Both can be used to prepare land use/land cover maps, generate slope maps, and conduct spatial analysis.

2. Objective



To prepare Land Use/Land Cover (LULC) maps



To generate slope maps from Digital Elevation Model (DEM) data.



To identify suitable areas for agriculture, forestry, settlements, and conservation



To assess erosion risks and support watershed management

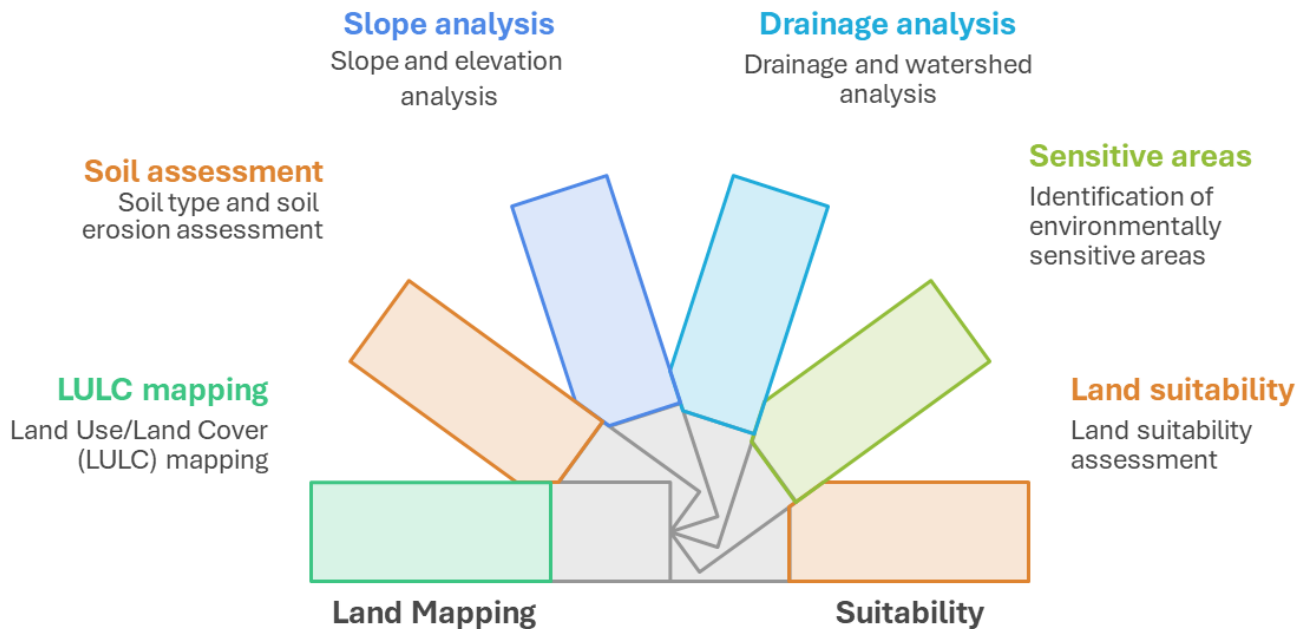


To facilitate scientific land use planning and natural resource management

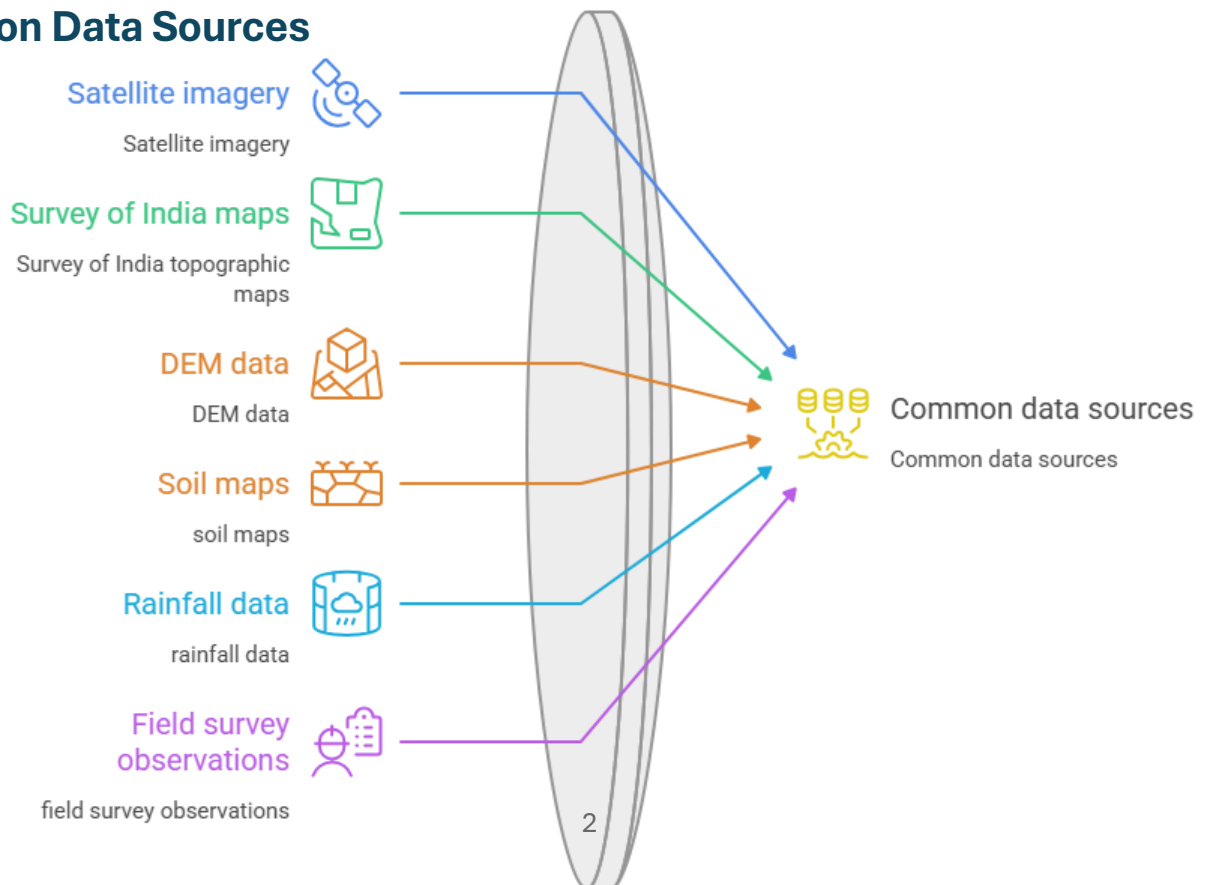
3. Land Use Planning

Land use planning is the systematic assessment and allocation of land for appropriate uses based on its physical characteristics, environmental conditions, and socio-economic requirements.

Land Use Planning Components



Common Data Sources



4. Slope Mapping

A slope map represents the steepness of the land surface. It is generally derived from a Digital Elevation Model (DEM), such as SRTM, ASTER GDEM, or other suitable elevation datasets.

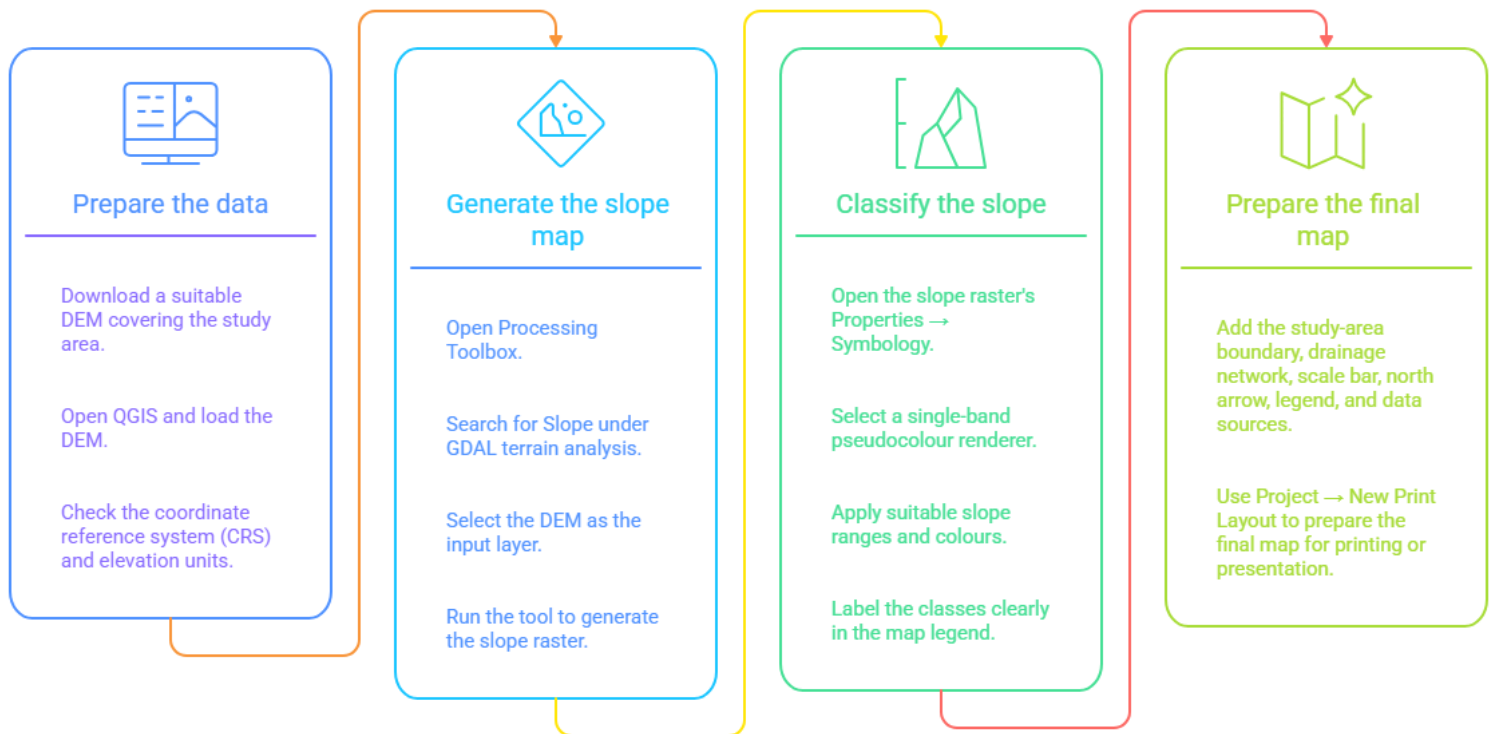
Slope is expressed in either **degrees (°)** or **percentage (%)**.

Land Planning by Slope Gradient

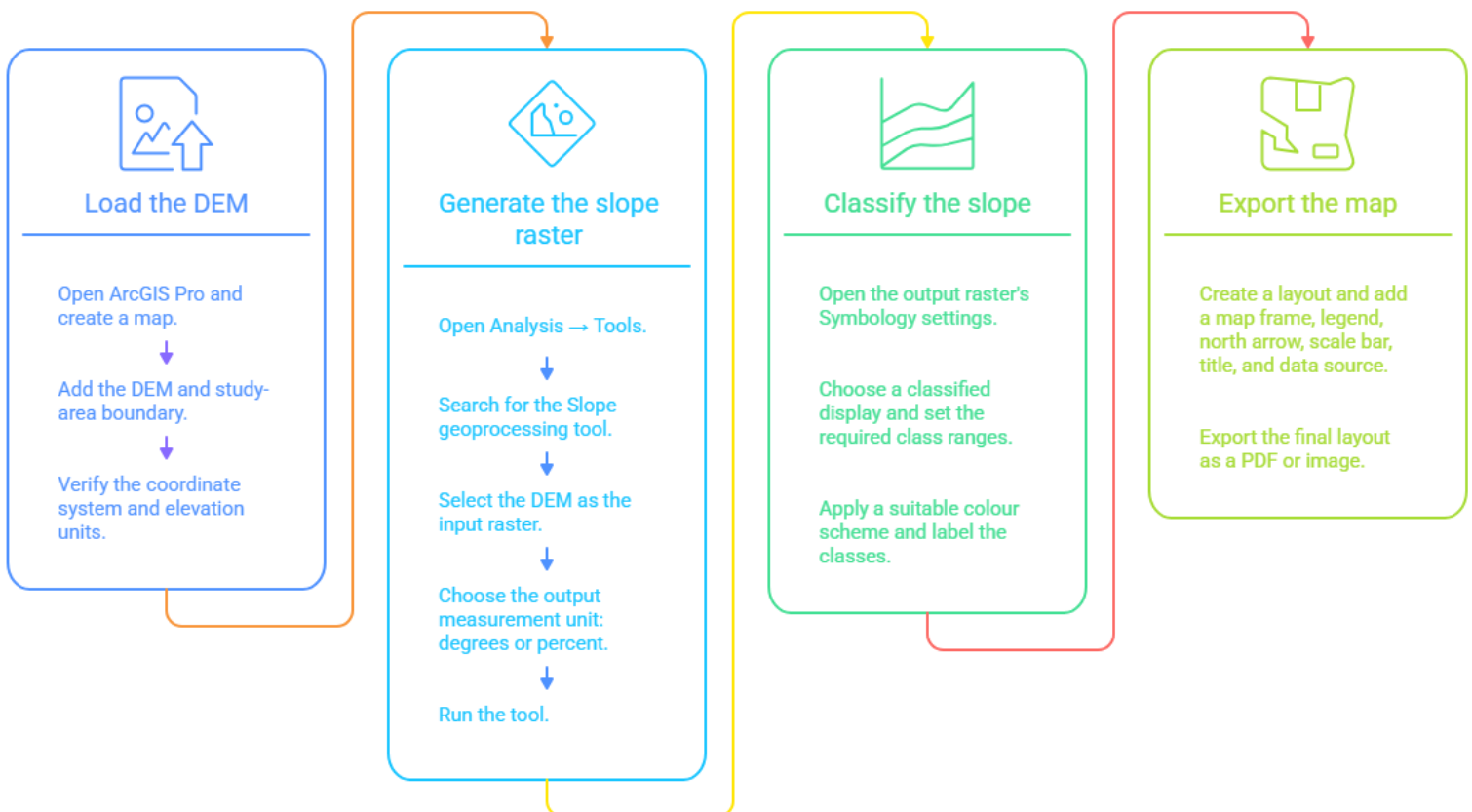


Note: These are indicative classes for preliminary planning. Final classes should be adapted to local terrain, soil, land use, and applicable planning guidelines.

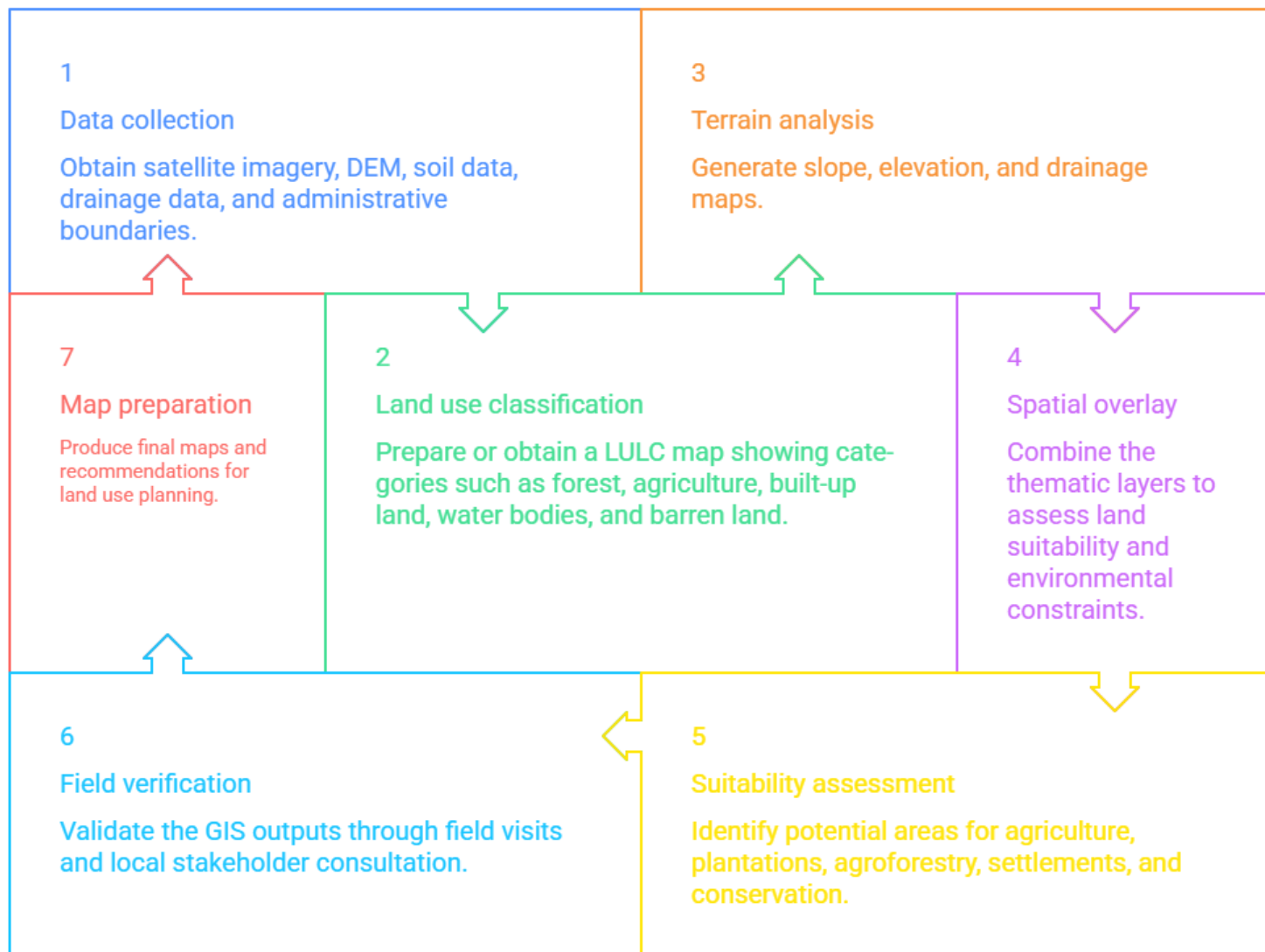
5. Slope Mapping Using Q-GIS



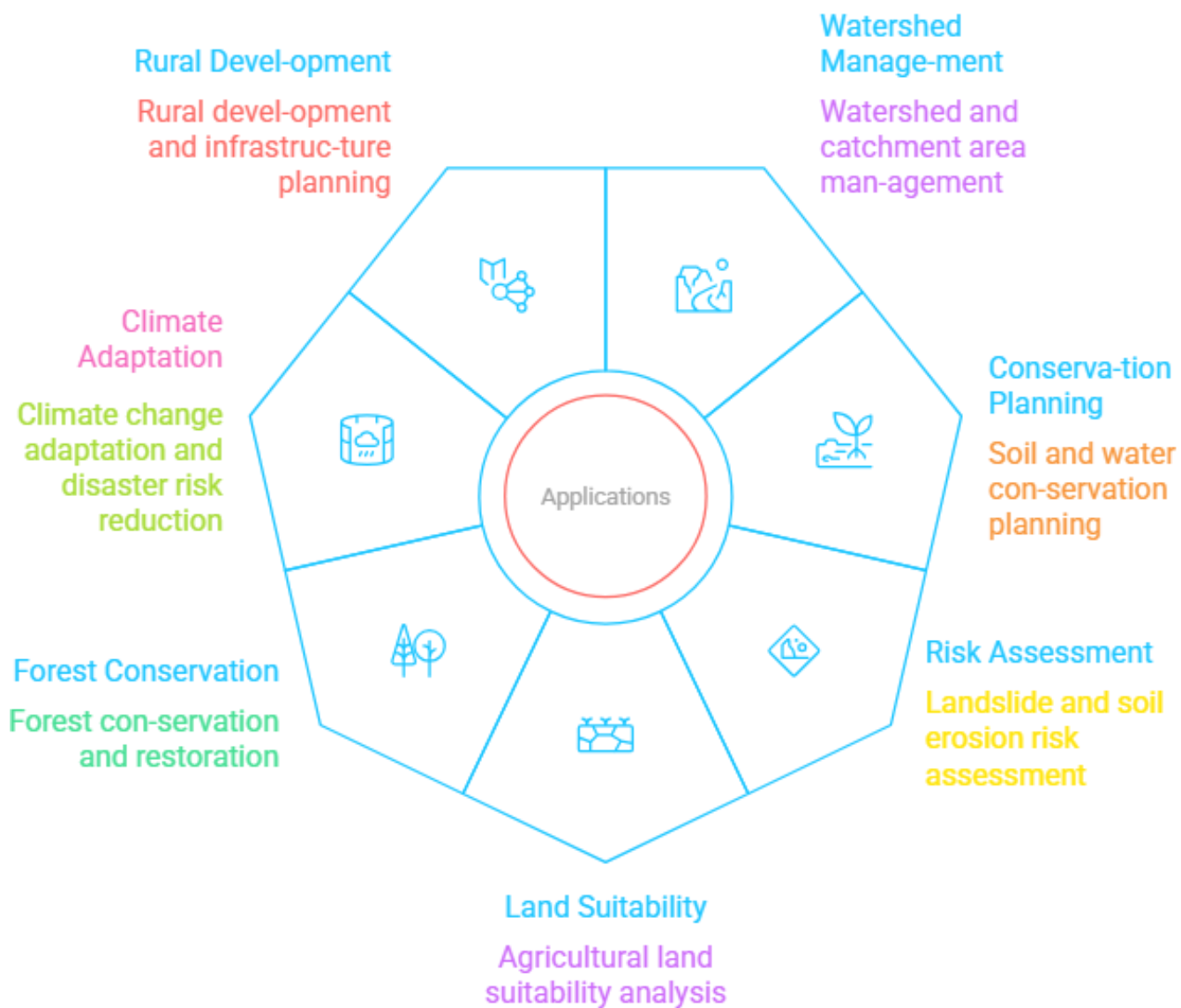
6. Slope Mapping Using Arc-GIS



7. Land Use Planning Using GIS



8. Applications of Spatial Analysis



9. Important Considerations

Validate Results

Validate the results with field observations wherever possible.



Consider Other Factors

Do not rely on slope alone to determine land suitability; consider soil, drainage, geology, land ownership, existing land use, and environmental regulations.



Consistent Slope

Use consistent slope classes for comparison and planning.



Check Elevation

Check for elevation-unit differences and vertical errors.



Project and Align

Ensure the DEM and other layers are correctly projected and aligned.



Suitable DEM

Use a suitable DEM resolution for the scale of the study.





Conclusion

QGIS and ArcGIS provide effective tools for land use planning and slope mapping. Integrating terrain analysis with land use, soil, drainage, and environmental data helps identify appropriate land uses, reduce land degradation, and support sustainable development. These techniques are especially valuable in hilly and mountainous landscapes, where terrain strongly influences agriculture, infrastructure, erosion, and ecosystem conservation.



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