# ELCS 0045- DISASTER MANAGEMENT

LECTURE 6

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# Remote Sensing and GIS Applications in Disaster Management

# Introduction

- Modern disaster management relies heavily on technology for predicting, monitoring, responding to, and recovering from disasters. Two important technologies are used

- **Remote Sensing (RS)** – Collection of information about the Earth's surface without direct physical contact.

- A geographic information system (GIS)

is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data.

- GIS is a system that integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information

## Remote Sensing in Disaster Management

Remote sensing is the science of obtaining information about objects, areas, or phenomena from a distance using satellites, aircraft, drones, or sensors.

## Types of Remote Sensing

### A. Satellite Remote Sensing

Uses satellites to observe large areas of the Earth's surface.

Examples:

- Weather satellites
- Earth observation satellites

### B. Aerial Remote Sensing

- Uses aircraft and drones equipped with cameras and sensors.

Examples:

- Drone surveys after floods
- Aerial photography for damage assessment

# GIS integrates the five key components

- GIS software and hardware
- Data
- People
- Methods of implementation

# Roles of GIS in disaster management

- Risk Assessment and Planning

GIS can be used to assess and map areas prone to various hazards, such as floods, earthquakes, wildfires, or hurricanes. By integrating data on population density, infrastructure, topography, and historical event patterns, GIS helps in identifying high-risk zones, assessing vulnerabilities, and developing effective disaster management plans.

**Land Use Planning and Regulation for Sustainable Development**

- Remote sensing provides data for proper land management.

**Uses**

- Identifying safe settlement areas
- Monitoring urban growth
- Protecting wetlands and forests

## Situational Awareness

- Remote sensing, which involves the use of satellite image and aerial photography, provides up-to-date and high-resolution visual data of the affected areas. By integrating this data with GIS, emergency response teams can quickly assess the extent of the disaster, identify impacted areas, and monitor the progression of the event.
- This situational awareness helps in making informed decisions and allocating resources effectively.

**Damage Assessment**

GIS and remote sensing assist in rapid damage assessment after a natural disaster. By comparing pre-disaster and post-disaster satellite images or aerial photographs, emergency response teams can identify areas of destruction, assess the severity of damage to infrastructure (buildings, roads, bridges), and prioritize rescue and recovery efforts accordingly. This information aids in resource allocation and planning for reconstruction.

- **Hazard Mapping and Prediction**

GIS and remote sensing technologies contribute to hazard mapping and prediction. By analyzing historical data, topography, and other relevant factors, GIS can help identify areas at high risk of natural disasters, such as flood-prone zones or landslide-prone areas. Remote sensing data, including weather patterns and satellite imagery, is crucial for predicting and tracking the progression of natural events, such as hurricanes, storms, or floods. This information assists emergency response teams in issuing timely warnings and implementing evacuation plans.

- **Evacuation Planning and Route Optimization**

GIS plays a vital role in evacuation planning and route optimization. By considering factors like population density, road network, topography, and predicted disaster impact areas, GIS can help identify evacuation routes, determine capacity of evacuation centers, and estimate transportation requirements. It assists emergency response teams in efficiently evacuating people from high-risk areas, ensuring their safety.

- **Resource Management**

GIS facilitates efficient resource management during emergency response. By integrating data on available resources (e.g., medical facilities, emergency supplies, temporary shelters) and overlaying it with geospatial information, emergency response teams can quickly identify the nearest resources to affected areas and allocate them accordingly. GIS helps in coordinating logistics, optimizing resource distribution, and minimizing response time.

- **Communication and Coordination**

GIS-based platforms and tools provide effective communication and coordination among emergency response teams. They enable real-time sharing of geospatial information, such as situation maps, evacuation plans, and resource locations. GIS allows different response teams and agencies to collaborate, exchange data, and make informed decisions based on a common operational picture.

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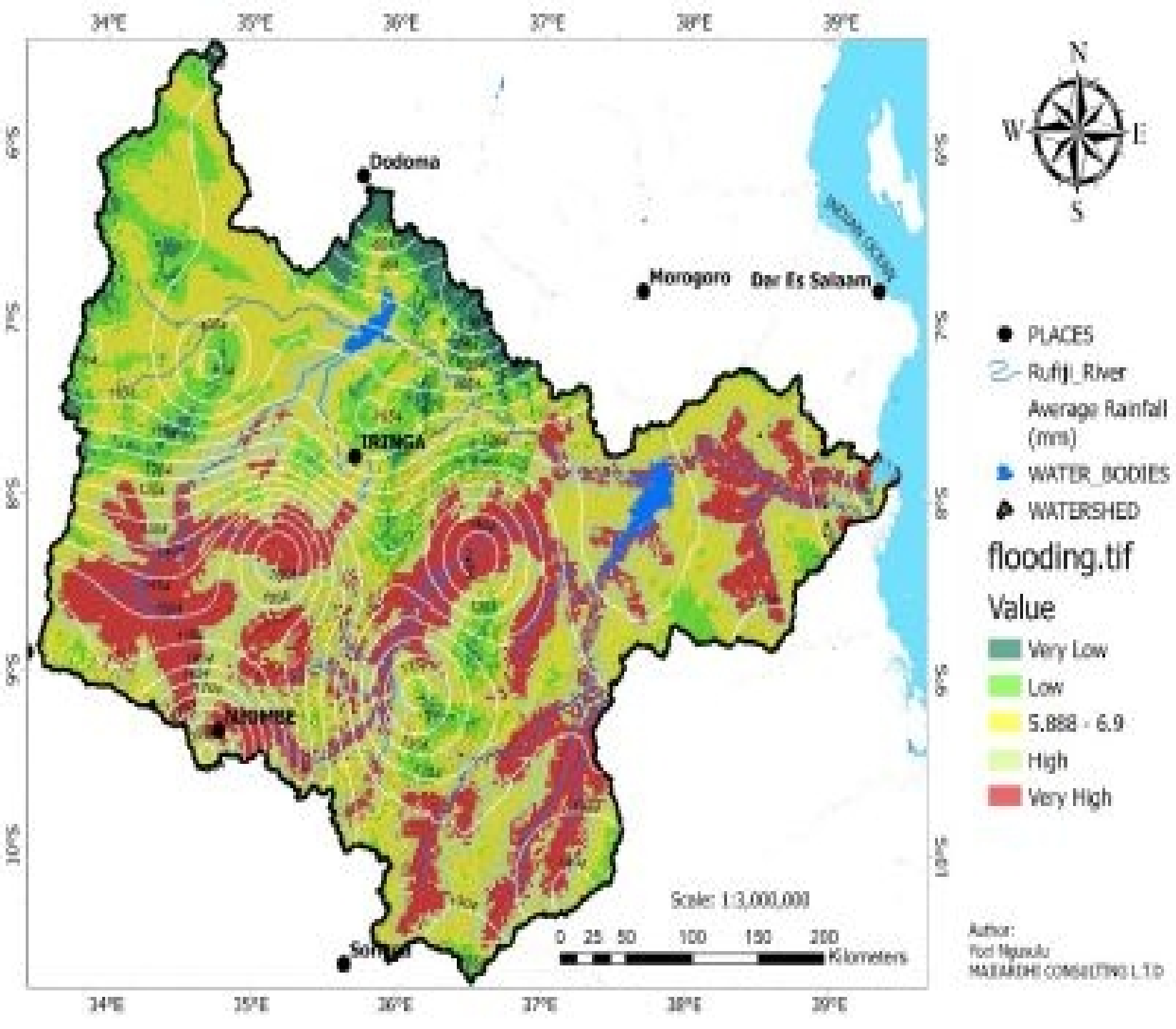
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34°E
35°E
36°E
37°E
38°E
39°E
5°S
6°S
7°S
8°S
9°S
10°S
Dodoma
Morogoro
Dar Es Salaam
INDIAN OCEAN
IRINGA
MBEYA
Scale: 1:3,000,000
0 25 50 100 150 200
Kilometers
N
W
E
S
PLACES
Rufiji_River
Average Rainfall (mm)
WATER_BODIES
WATERSHED
flooding.tif
Value
Very Low
Low
5.888 - 6.9
High
Very High
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