

A vibrant, futuristic cityscape under a clear blue sky. In the foreground, a bright green bus drives on a road with glowing blue and green lane markings. To its right, a sleek, white and blue high-speed train travels on an elevated track. In the background, a dense urban skyline with various skyscrapers is visible. To the right, there are wind turbines and a tall communication tower. Overlaid on the scene is a network of glowing blue lines connecting circular icons representing various IoT and smart infrastructure concepts: a Wi-Fi symbol, a cloud with rain, a server rack, a factory, a car, and a house. In the bottom right corner, a control room interface is shown with multiple screens displaying maps, data charts, and live video feeds of the city's infrastructure.

IoT-Driven Solutions for Disaster-Resilient Urban Mobility and Smart Infrastructure

ATAL Online 6 Days Faculty Development Program
SRM Madurai College for Engineering and Technology



SRM Madurai College for Engineering and Technology

Independent Director to MTC Chennai ,
TNSTC (Coimbatore) & TNSTC (Salem)



IOT-DRIVEN SOLUTIONS FOR DISASTER-RESILIENT URBAN MOBILITY AND SMART INFRASTRUCTURE



Contents

The background of the infographic is a dramatic cityscape at night, partially obscured by a massive, dark, swirling storm cloud on the left and a large fire consuming buildings on the right. The word 'Disaster' is prominently displayed in the center in a large, white, sans-serif font.

Disaster

Factors Affecting

- Human factors (person icon)
- Weather (cyclone icon)
- Sea (wave icon)

Types

- Natural (volcano icon)
- Man Made (factory icon)
- Technological (laptop icon)
- Health (virus icon)

Urban disasters are increasing in frequency and intensity.

Public Transport:
A Lifeline, Not Just a Service

IoT: Real-Time Decisions
Instead of Reactive Responses

Q & A

2

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Disaster Impacts on Cities & Transport Systems



- Loss of life, injuries, displacement



- Damage to roads, bridges, depots, utilities



- Breakdown of mobility & emergency access



- Risk of epidemics, shortages, panic



- Economic and social disruption

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Disasters : Unpredictable and Global Impacts

When and Where it Occurs?

Disasters can occur anytime and anywhere,
without geographical limitation.



Certain disasters are **predictable**
to some extent, while others are
completely **unpredictable**.



Warfare represents a special category
As it is deliberately planned with
intentional damage as the primary objective.

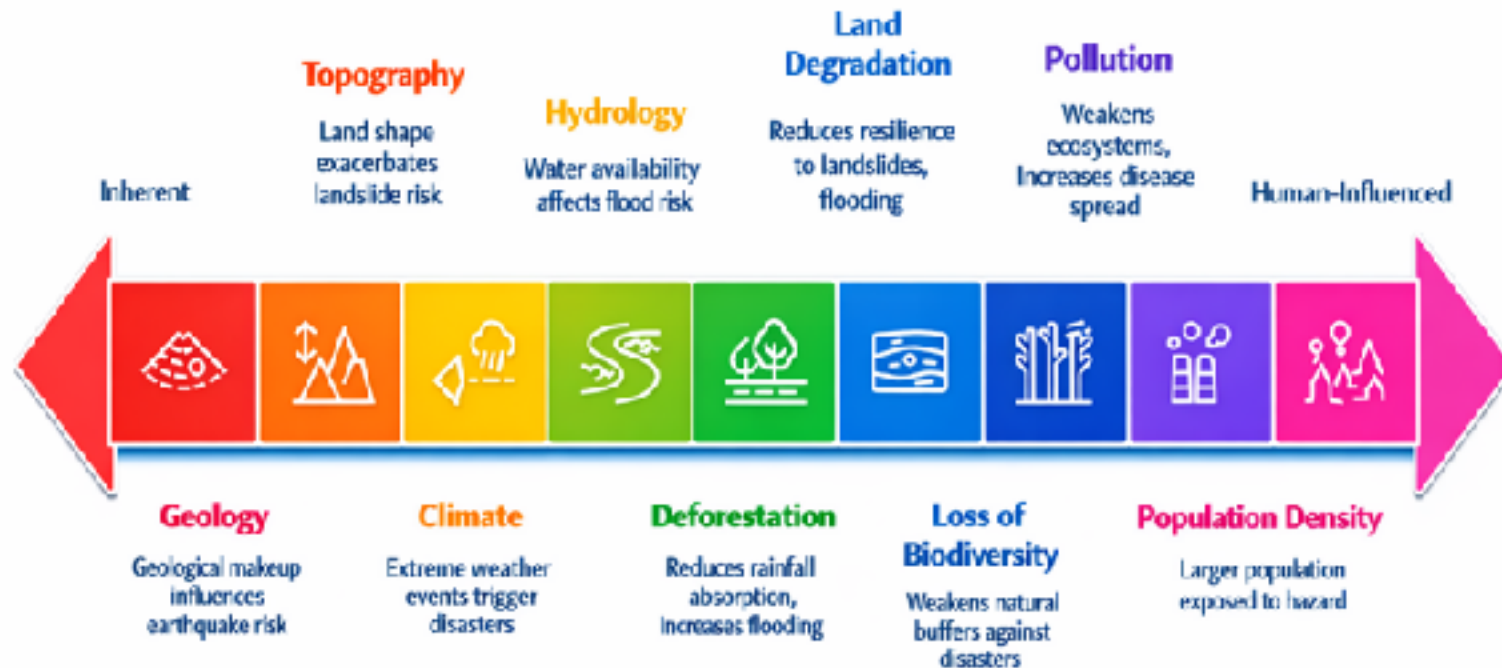
WARFARE

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Factors Affecting Disaster

Disaster vulnerability ranges from inherent to human-influenced factors.



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Types of Disasters :

Natural Disasters



Earthquake



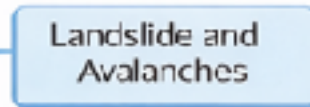
Floods



Cyclones



Tsunami



Landslide and Avalanches

Manmade Disasters



Chemical Disaster



Nuclear Disaster



Tsunami



Manmade Disasters



Chemical Disaster



Nuclear Disaster



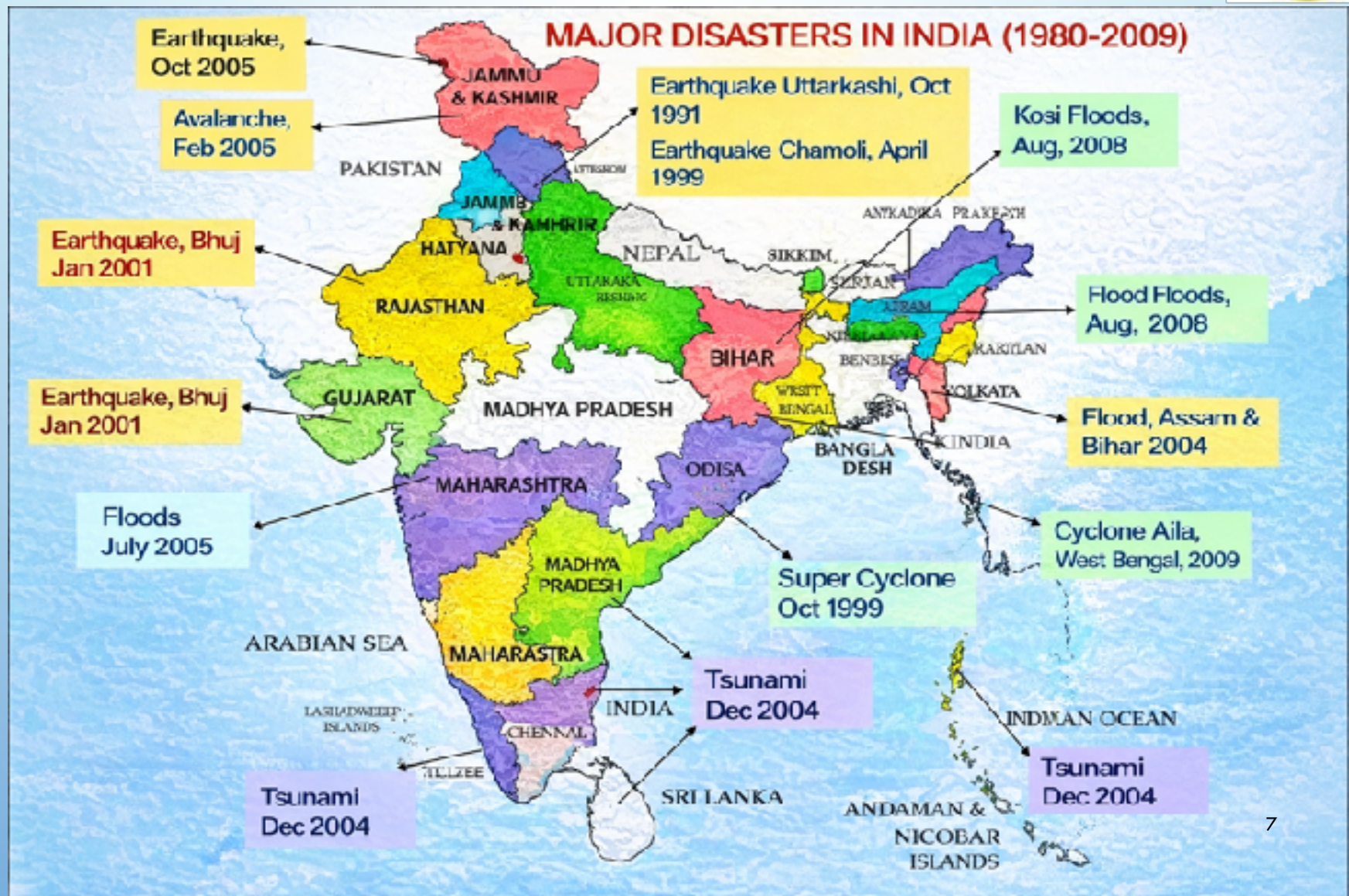
Biological Disaster



Examples

- **Natural disasters:** Earthquakes, landslides, volcanic eruptions, floods and cyclones
- **Man-made disasters:** Stampedes, fires, transport accidents, industrial accidents, oil spills and nuclear explosions/radiation. War and deliberate attacks may also be put in this category.

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Public Transport as Disaster Response Infrastructure



- Enables mass evacuation in short time



- Moves emergency responders & healthcare workers



- Ensures access to hospitals, shelters, relief centers



Maintains **minimum city mobility** during crises



- Supports low-income & transport-dependent populations

- Accelerates post-disaster recovery



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Urban Mobility Challenges During Disasters

Flooded Roads



Hinders vehicle movement and access

Power Failures



Disrupts traffic signals and communication

Communication Breakdowns

Prevents coordination and information flow



Manual Decision-Making

Slows down response and resource allocation



Driver Unavailability

Reduces available transportation resources

Driver Unavailability

Reduces available transportation resources

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What is Disaster-Resilient Urban Mobility

Ability to Anticipate Disruptions



Maintain minimum service continuity



Ensure rapid recovery



Enable safe evacuation



Adapt routes and operations dynamically

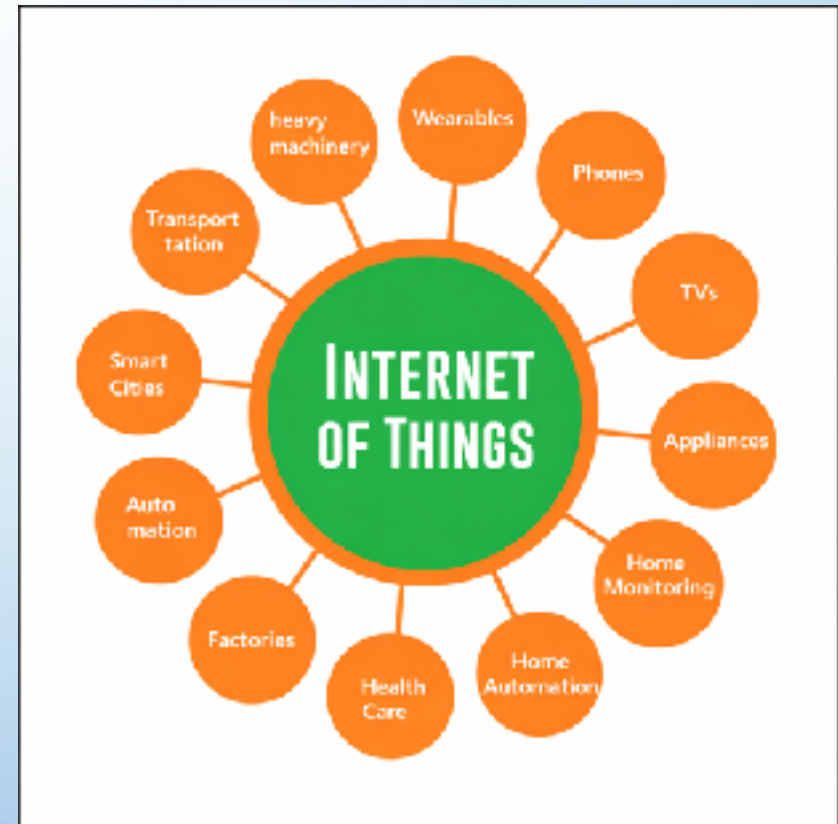


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What is IoT (Internet of Things)?

- Network of connected physical devices
- Sensors, software, and communication networks
- Collects and exchanges real-time data
- Enables monitoring, control, and automation
- Foundation of smart cities and smart transport



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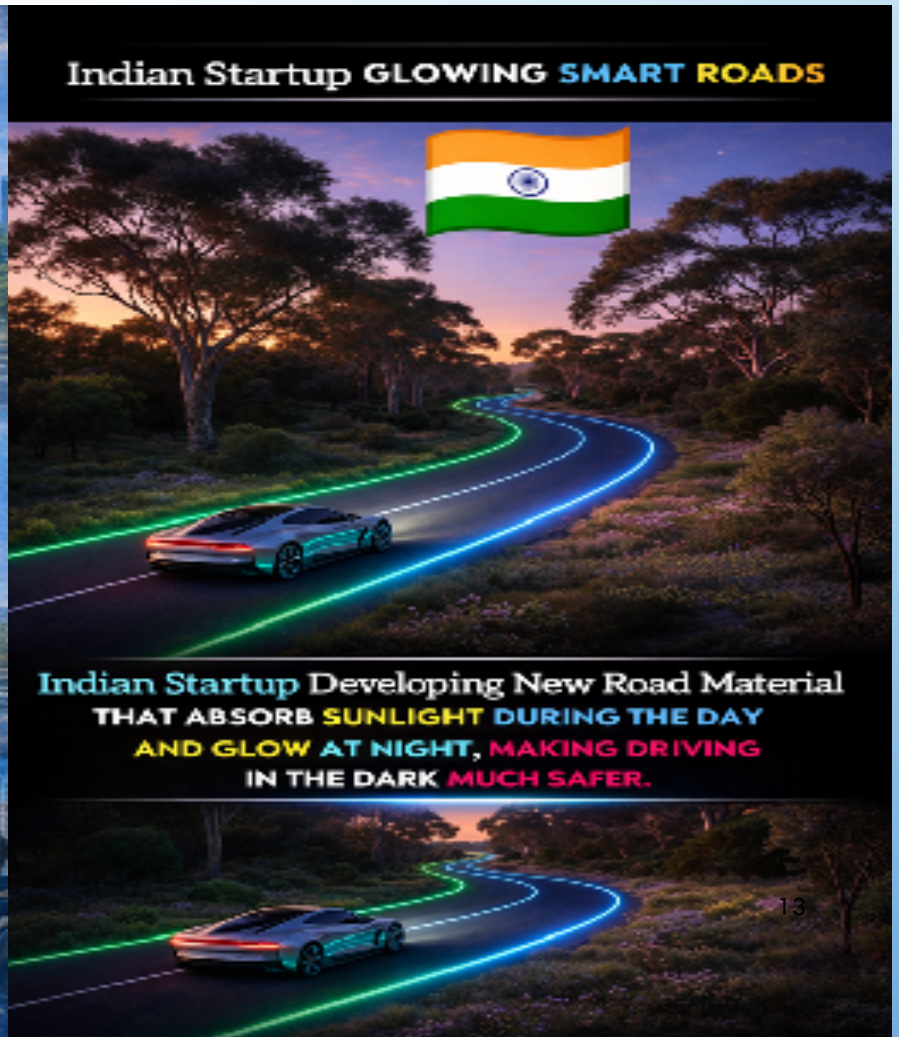


**Before technology, disaster response was reactive.
IoT makes it predictive.**



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Now that we know why IoT matters, let's see where it operates in transport



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IoT Architecture: Transport Perspective

Key Components



Bus GPS & vehicle health sensors



Depot flood, power & fuel sensors



Traffic, weather & water-level sensors



Integration with ICCC / Smart City Control Rooms



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IoT in Public Bus Operations

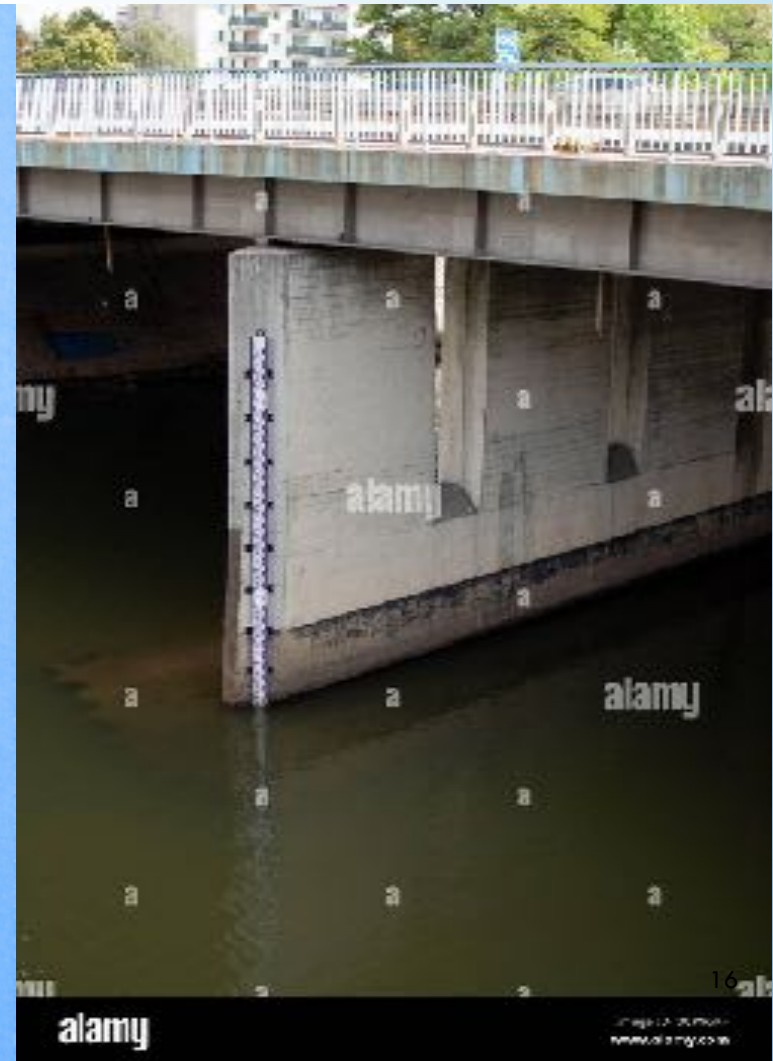


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Smart Bus Depots – Disaster Ready Depots

-  Flood and water-level sensors
-  Power backup and fuel monitoring
-  CCTV-based crowd and asset protection
-  Automated emergency shutdown systems

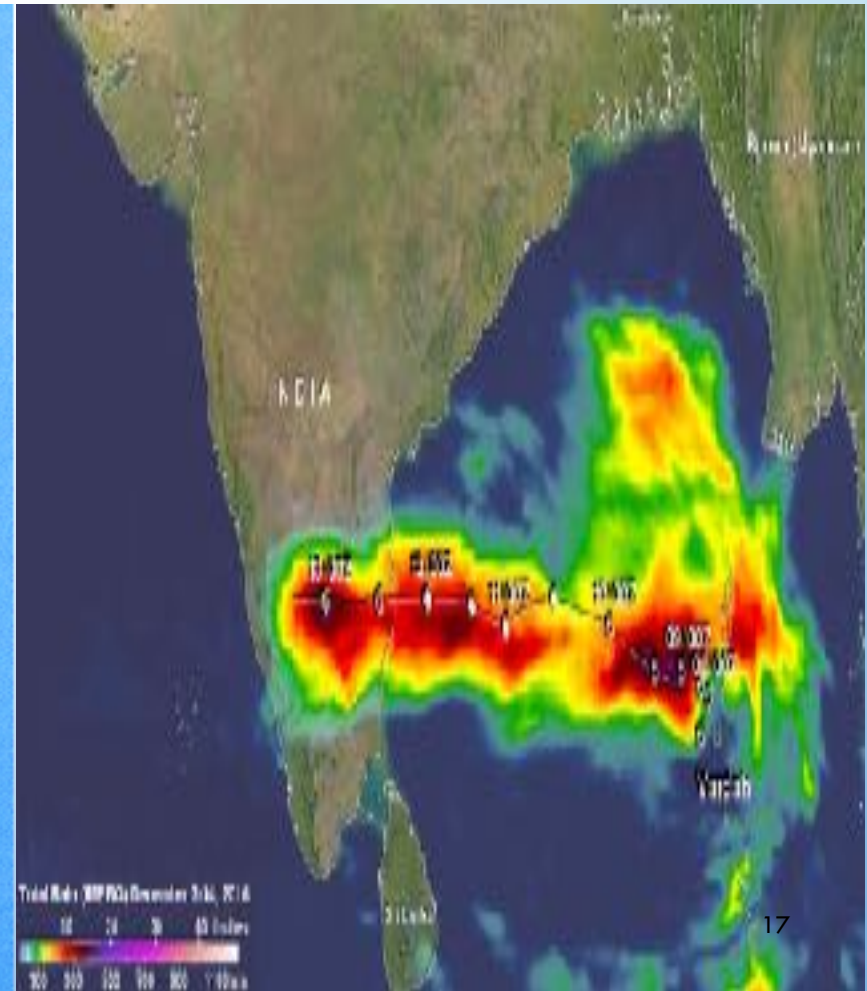


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Disaster-Aware Route Management

-  Avoidance of flood-prone roads
-  Priority corridors for emergency movement
-  Coordination with traffic police & district control rooms
-  Dynamic rerouting during floods or blockages



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Passenger Information Systems



Real-time alerts via displays, SMS, apps



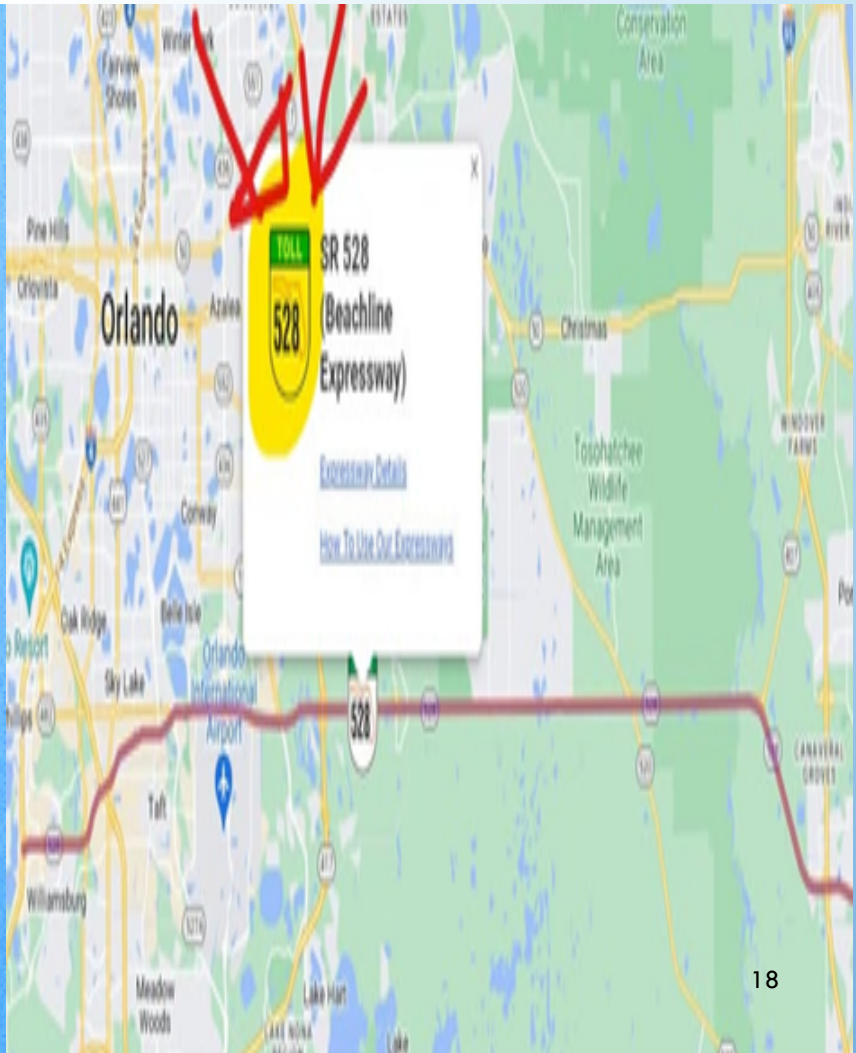
Route diversions and service updates



Emergency instructions



Reduces panic and misinformation



The map shows the Orlando area with SR 528 (Beachline Expressway) highlighted. A yellow toll sign is visible on the road, and a red arrow points to it. A white information box is overlaid on the map, containing the text 'SR 528 (Beachline Expressway)', 'TOLL 528', and links for 'Expressway Details' and 'How To Use Our Expressway'.

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Emergency Coordination Using IoT



Integration with:



Police



Fire & Rescue



Health departments



District administration

Unified dashboards for:

- ✓ Faster decisions
- ✓ Resource allocation
- ✓ Situation awareness



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Tamil Nadu Case: Flood Scenario

⚡ Chennai Floods – Lessons



Bus depots in low-lying areas

Sudden route submergence

Need for:



Real-time flood sensors



Dynamic route diversion



Bus deployment for evacuation



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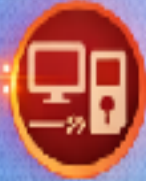


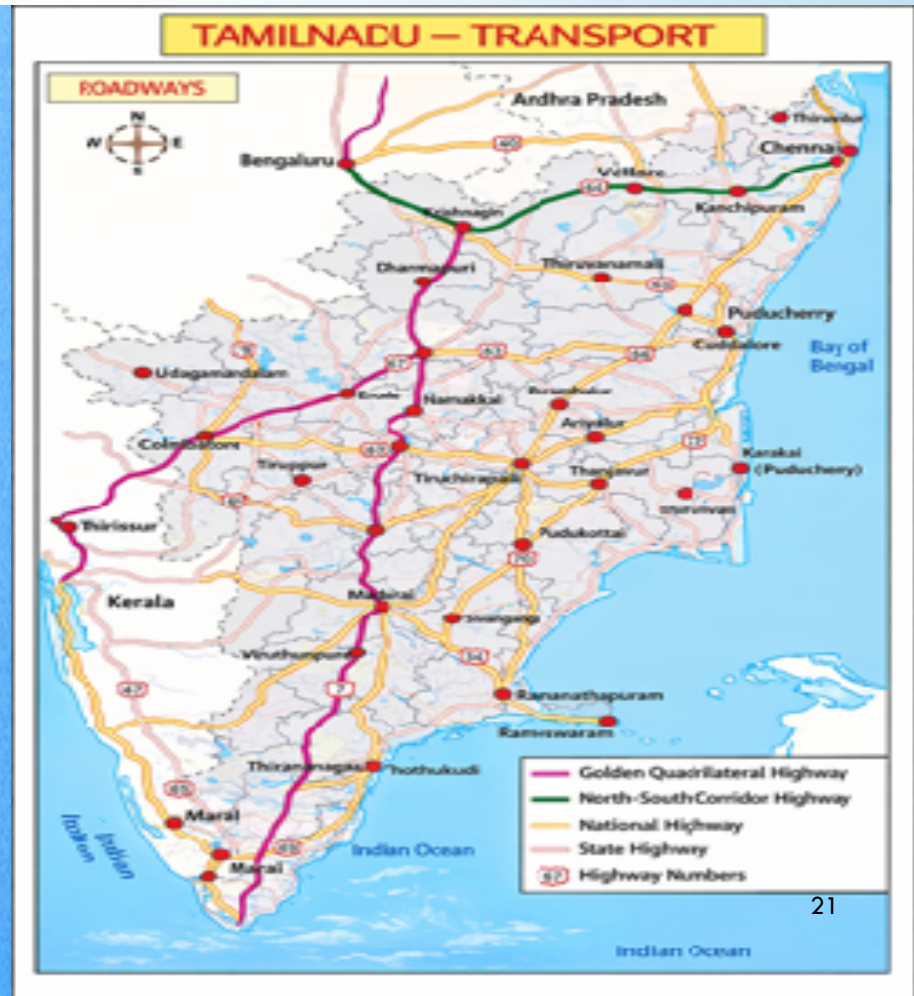
Tamil Nadu: Operational Insights

MTC & TNSTC act as **first responders**

 ICCC-based coordination improving response

Challenges:

-  Data sharing
-  Legacy systems
-  Inter-department coordination



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Policy & Operational Challenges



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Cybersecurity & System Reliability:

- Network failures during disasters
- Data integrity risks

Need for:



**Redundant
communication
systems**



**Secure
protocols**

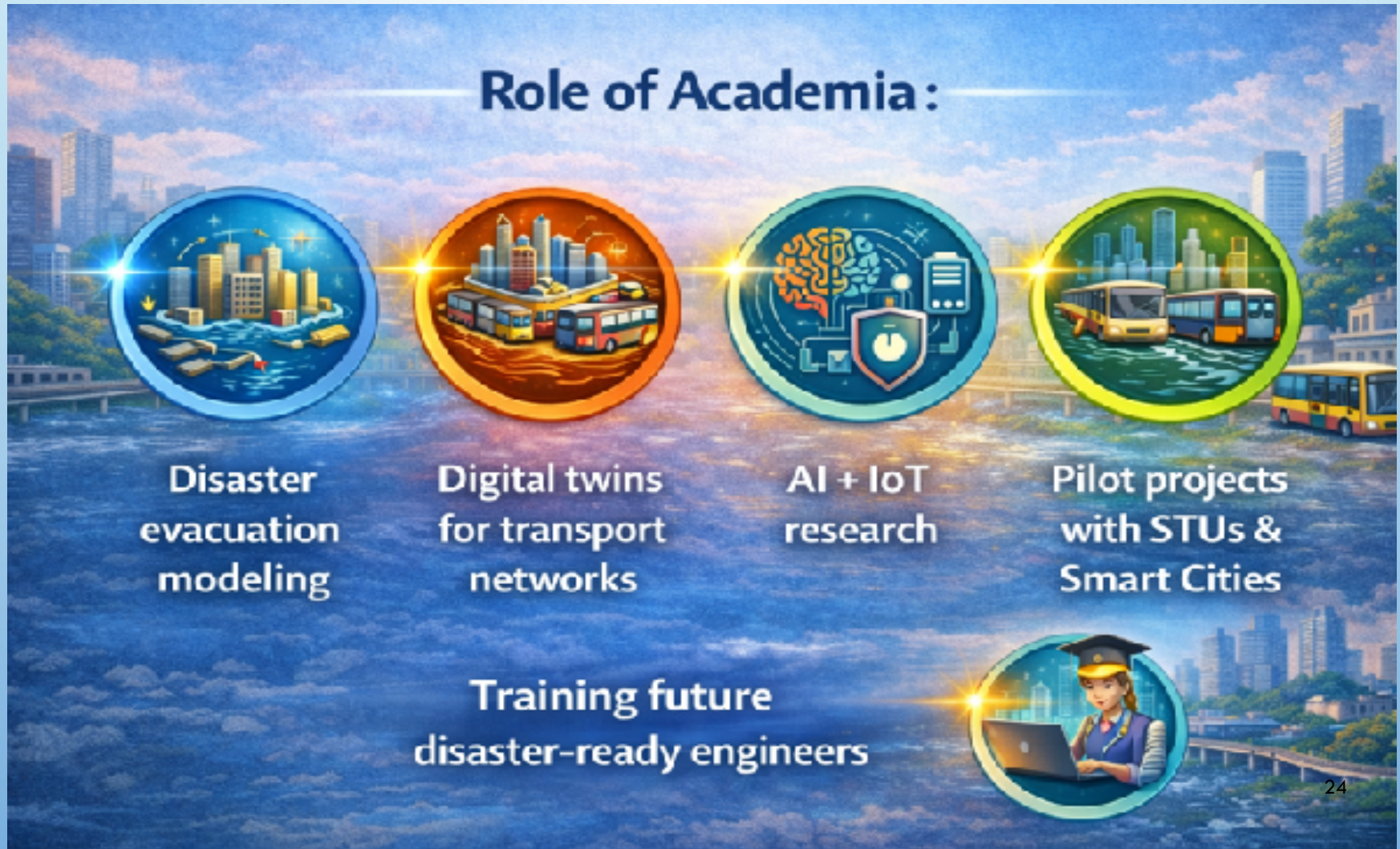


**Offline fallback
mechanisms**

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Role of Academia in Evolving Cities



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A.I. Work Flow



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A.I. – IoT Technical Architecture



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Learning Outcomes of this Session

All participants will be able to:

- ◆ Identify AI & IoT use cases for disaster-resilient mobility
- ◆ Design a basic AI-IoT workflow for urban transport systems
- ◆ Understand how predictive models support evacuation decisions
- ◆ Integrate transport systems with Smart City control rooms
- ◆ Propose pilot projects for Smart Cities / STUs
- ◆ Guide students towards applied research in disaster resilience



From theory to deployable solutions.

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Mini Case : Chennai Flood Scenario – Design an A.I.Solution



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Key Takeaways



Public transport is the backbone of disaster response

IoT improves visibility, speed, and coordination



Policy + Operations + Technology must work together

Academia has a key role in innovation and capacity building



Technology alone is not enough

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- DISCUSSION & INTERACTION

THANK YOU