Empowered lives.
Resilient nations.

Integrating Disaster Information: Key Issues and Possible Solutions

THEORY, TECHNOLOGY & PRACTICE

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Outline

- Key Issues around Disaster Information
- Modeling Disaster Information
- Designing National Disaster Database
- Developing Technologies for National Disaster Observatory (NDO)
- Practice in Countries

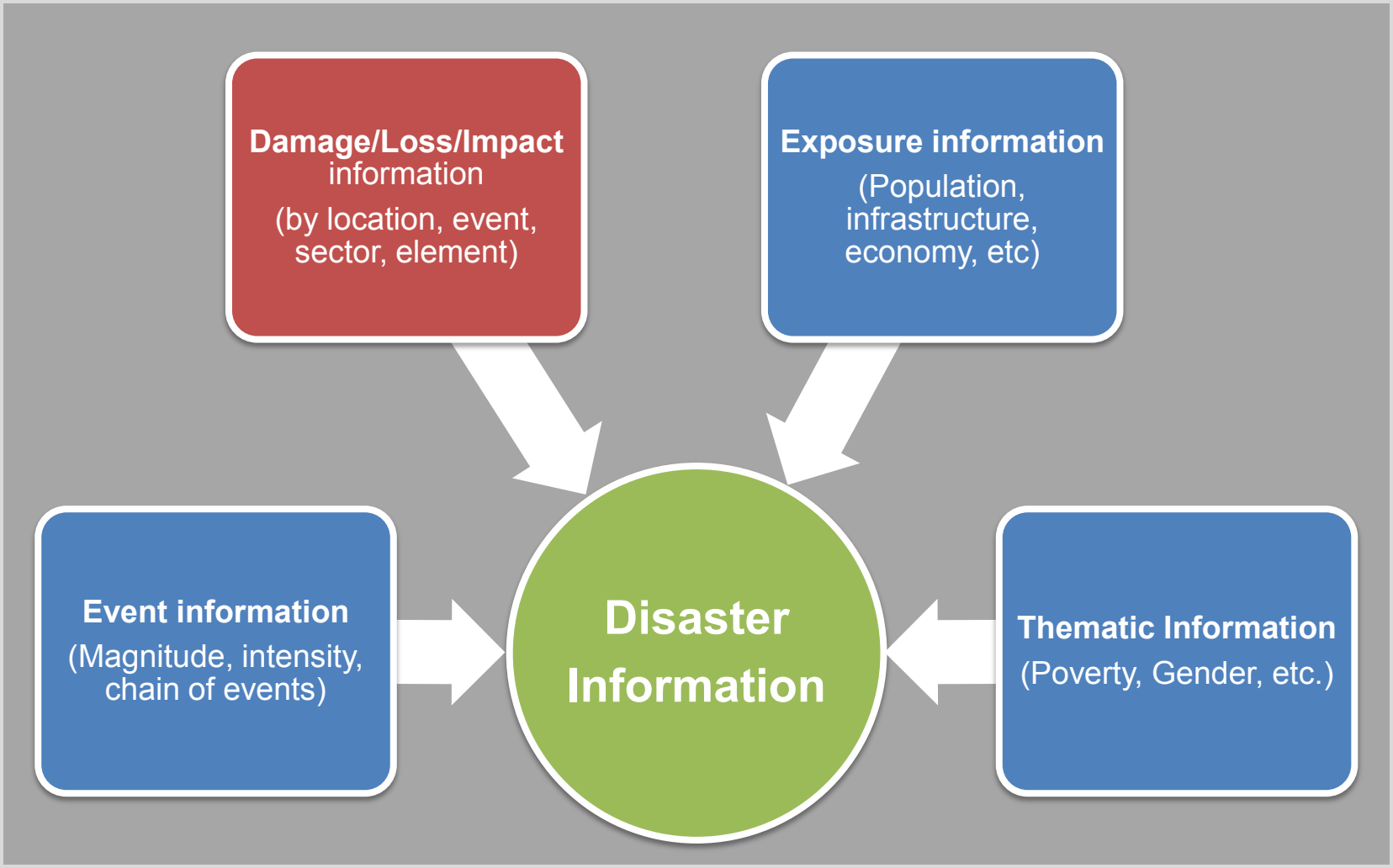
Common Issues with Disaster Information

- No systematic collection of information about hazard events and their impacts for better disaster preparedness and response;
- Disaster-related information are scattered among various agencies without any coherence and coordination;
- No standardized methodologies and tools for disaster information collection;
- No meaningful analysis to understand the trends, spatial and temporal impacts and hence poor understanding of potential risks and their impacts;
- Not used to learn from the past to improve the safety of our community and disaster response.

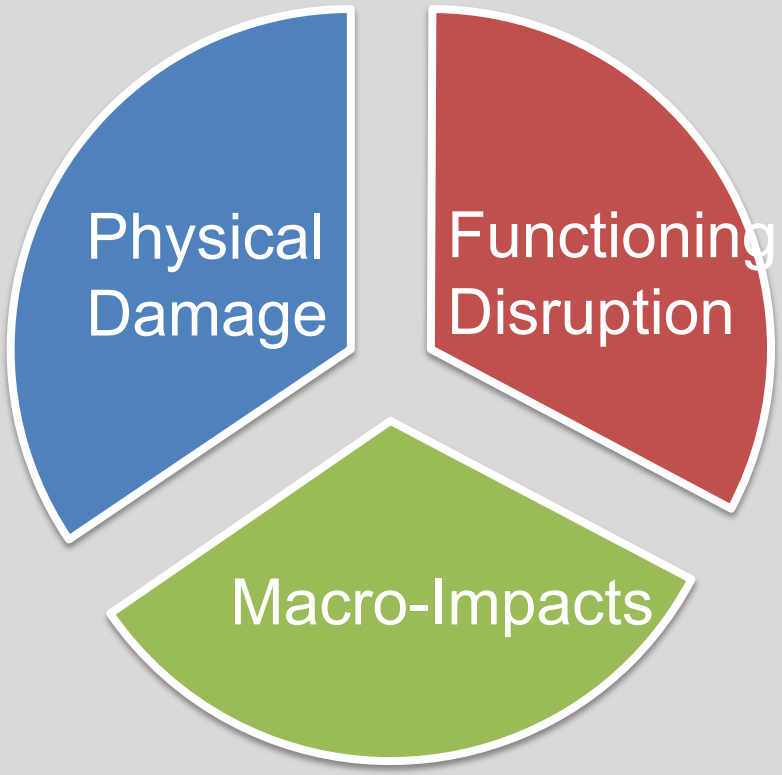
What is Disaster Information?

- Information on Extreme Events and their Impacts
  - Date, location, damage and loss, intensity and impact severity, etc.
- Information on Disaster System
  - Hazard events + Disaster events + Geophysical settings + Human system
- Information on Disaster Process
  - Disaster Impact Spreading over space and time

Conceptual Disaster Information Model



Loss Information for Public Decision Making



Public policy & decision makers are more concerned about functioning disruption and macro-impacts.

Impacts of the 1987 Earthquake of Ecuador

Physical damage to the o
Pipeline in Amazon Fores

Physical Damage:
- 60 km pipeline, $$?

Functioning Disruption:
- Six months no oil export
- 70% annual revenue lost, $$$?

Macro-Impact:
- Five year economic recession, $$$$$$?
- The whole nation was affected.

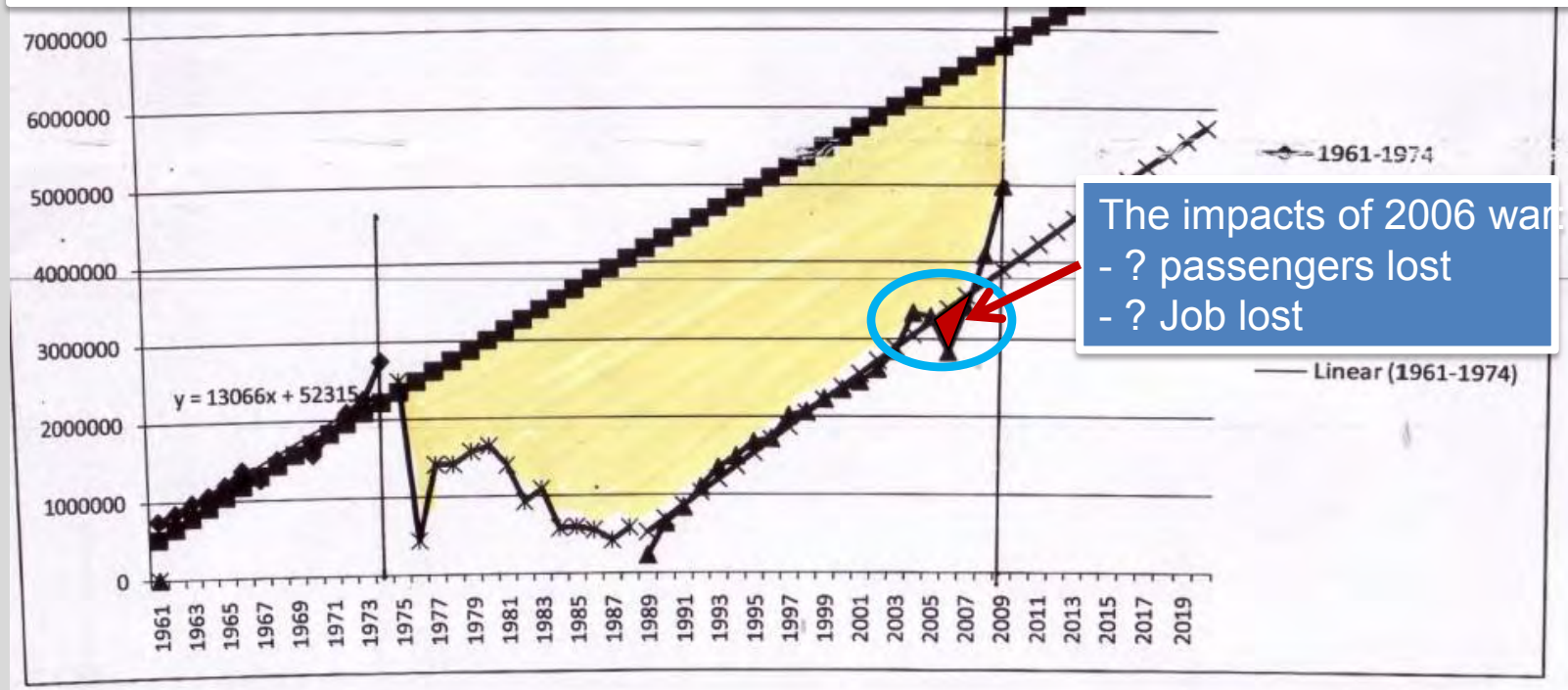
Impacts of Iceland Volcanic Disaster

- **Physical Damage**: minor
- **Functioning Disruption:** (by April 19, 2010, EASO):
  - Around 30 countries' airspace closed or restricted
  - 313 airport closed or paralyzed
  - 63,000 flights cancelled
  - 6.8 million passengers stranded
- **Impacts:**
  - important socio-political occasions cancelled or affected
  - Decrease in tourism growth rate by 1-2% in EC
  - Kenya flower export lost 2 million US$/per day
- **Total Direct Loss:** 1.7 billion US$ globally (IATA)

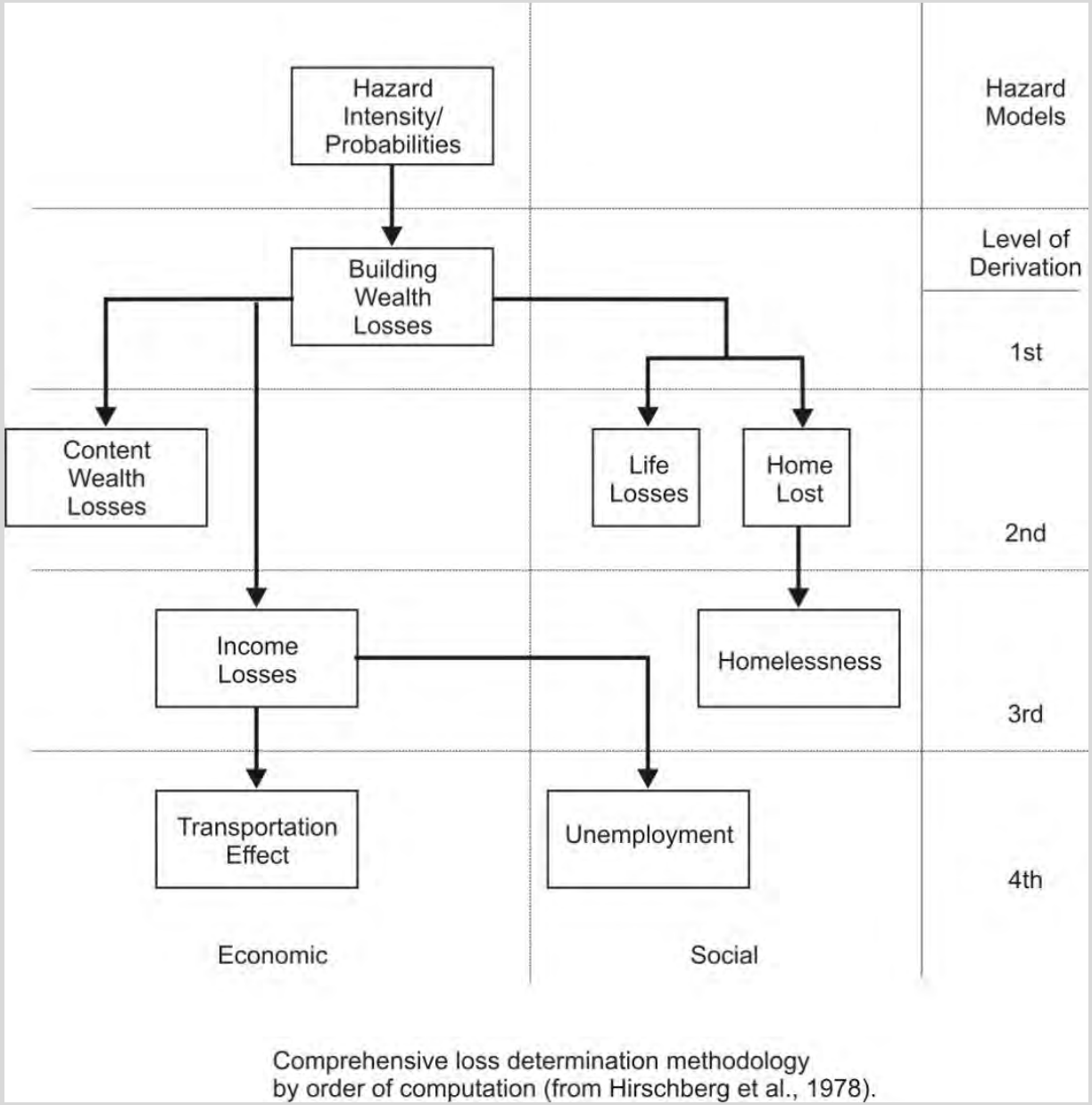
Long-term Impacts of a Disaster

The Impacts of the 1975 War on Lebanon's Avaition:

- 99 million passengers lost
- 500,000 jobs lost



HazUS' Loss Model



Comprehensive loss determination methodology
by order of computation (from Hirschberg et al., 1978).

Generic Loss Model

	Tangible		Intangible
	Primary	**Secondary**	
Direct	Building structure, contents, critical infrastructure, agriculture	Land & environment recovery	Loss of life, injuries, Displacement, effected population
Indirect	Business interruption. livelihood	Impact on regional & national economy	Health, mental damage

Key Issues in Disaster database Design

1) Disaster loss information is not geospatially disaggregated
2) Incompleteness of disaster loss information
3) Criteria for the inclusion of disaster events are not normalized
4) Lack of necessary disaster-related context information
5) No disaster classification
6) No tracking of event chain
7) No tracking of disaster impact spreading
8) Aggregation of different losses vertically and laterally

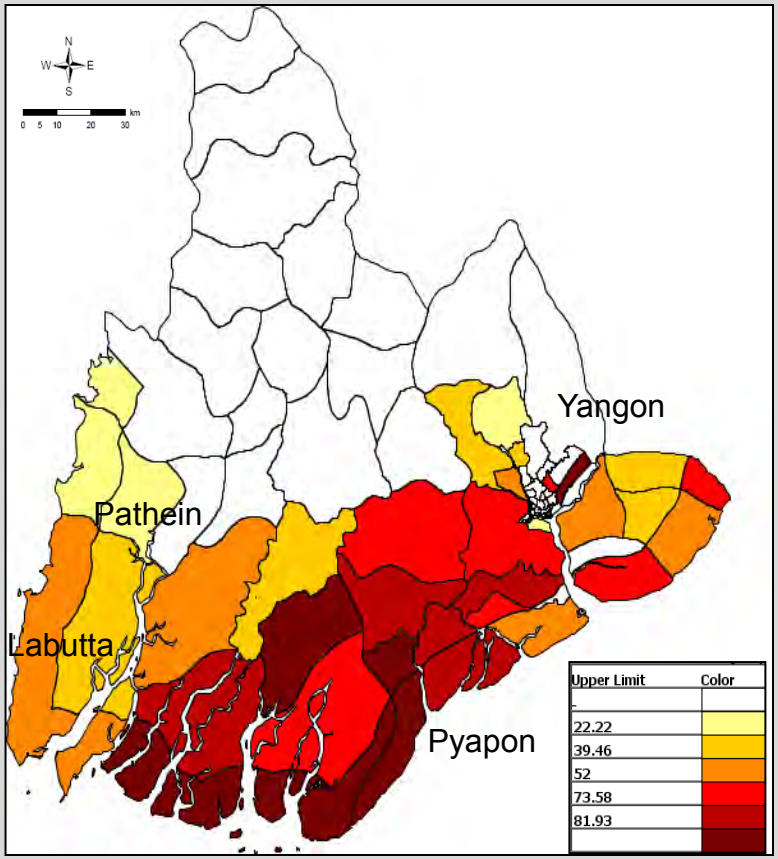
Two Ways to Record Disaster Damage & Loss

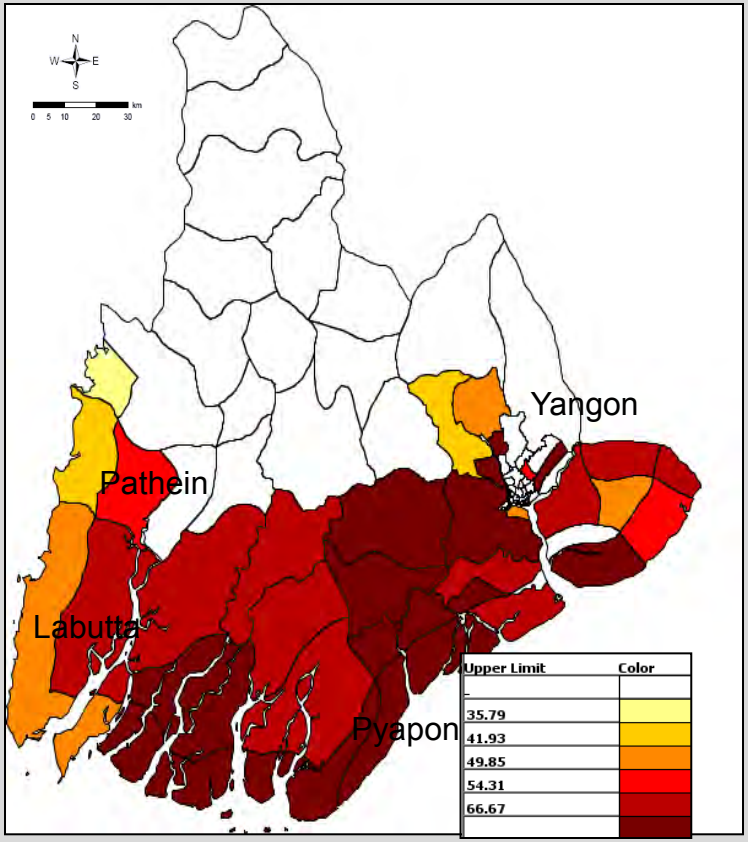
Records	Hazard Type	Damage & Loss
Record 1	Flood	

Records	Hazard Type	Damage & Loss
Record 1	Flood	
Record 2	Flood	
Record 3	Flood	
Record 4	Flood	

Impacts of Nargis Cyclone Disaster:

Houses destroyed (Left), Houses in Bamboo after the disaster





Source: Village Tract Assessment (VTA) component of the PONJA (Post Nargis Joint Assessment) project developed jointly by the ASEAN, the Government of Myanmar, and the UN.

Three Approaches for Disaster Database Design

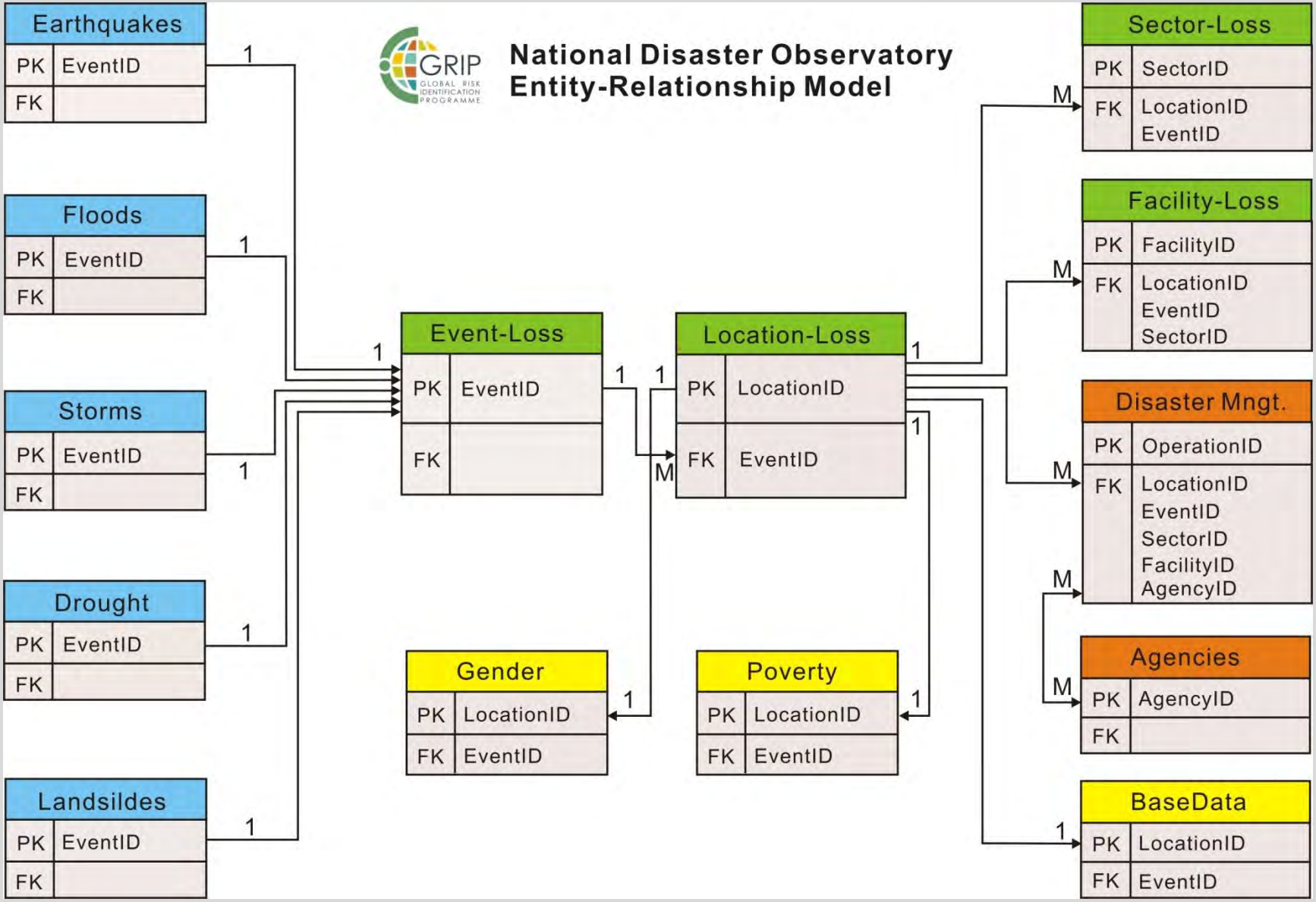
Approach	Disaster Information	Data Analysis	Outputs
Event-based	Disaster damage & loss	Statistic analysis	Disaster pattern and trend over time
System-based	Damage & loss + Context information	Spatial, sectoral, and thematic analysis; disaster mapping	Spatial distribution of damage and loss; spatial correlation among various components of a disaster system
Process-based	Damage & loss + Context information + Process information	Dynamic risk and disaster modeling and mapping	Chain of events; Cascading effects; systemic risk

Disaster Databases: Examples and Practice

Coverage	Examples	Database Type	Practice
Global	EM-DATA, NatCat, Sigma, GDACS, ReliefWeb, IFRC's Disaster Database	Event-based	
Regional	ADPC's, ADRC,	Event-based	Asia Pacific, LAC
National	DesInventar	System-based	LAC, Asia Pacific, partially Africa
	NDO Disaster Database (GRIP)	System-based	Pilot in Bolivia, Armenia, since 2010

Five Emerging Issues with Recording Disaster Information by Administrative Unit

- Necessary disaster-related context information should be included.
- Disasters must be classified.
- Event chains must be tracked to avoid duplicating disaster loss accounting.
- Changes in administrative boundaries must be tracked.
- Records in the database can’t be directly used to statistic analysis.


National Disaster Observatory
Entity-Relationship Model
GRIP
GLOBAL RISK IDENTIFICATION PROGRAMME
Earthquakes
PK EventID
FK
Floods
PK EventID
FK
Storms
PK EventID
FK
Drought
PK EventID
FK
Landsildes
PK EventID
FK
Event-Loss
PK EventID
FK
Location-Loss
PK LocationID
FK EventID
Gender
PK LocationID
FK EventID
Poverty
PK LocationID
FK EventID
Sector-Loss
PK SectorID
FK LocationID
EventID
Facility-Loss
PK FacilityID
FK LocationID
EventID
SectorID
Disaster Mngt.
PK OperationID
FK LocationID
EventID
SectorID
FacilityID
AgencyID
Agencies
PK AgencyID
FK
BaseData
PK LocationID
FK EventID
1
M

Developing Technologies for National Disaster Observatory (NDO)

National Disaster Observatory (国家灾情观测系统) is a Disaster Information Management System designed for systematically collecting, storing, analyzing, and disseminating of disaster-related data and information (Disaster Information), with key applications to:

- Disaster Loss Accounting (灾损统计)
- Disaster Forensics（灾情分析）
- Disaster Risk Modeling（灾难风险建模）

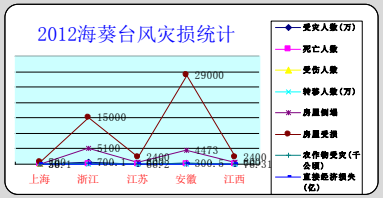
Key Functionalities of National Disaster Observatory

Customized Information Dissemination

Access to the public

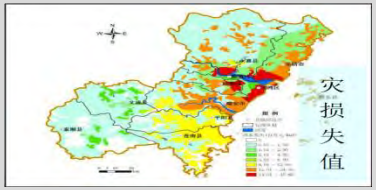
Dynamic Visualization at Emergency Operation Centre

Instant Disaster Analysis and Mapping

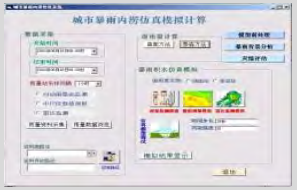


Disaster Loss Statics

Typhoon Path Monitoring

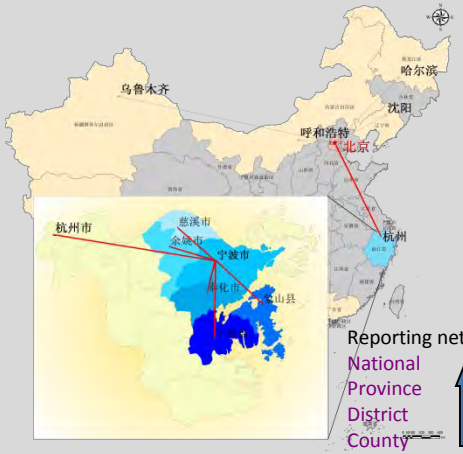


Disaster Loss Mapping



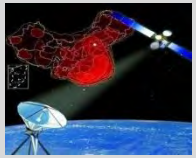
Flooding Simulation

Innovative Data Collection



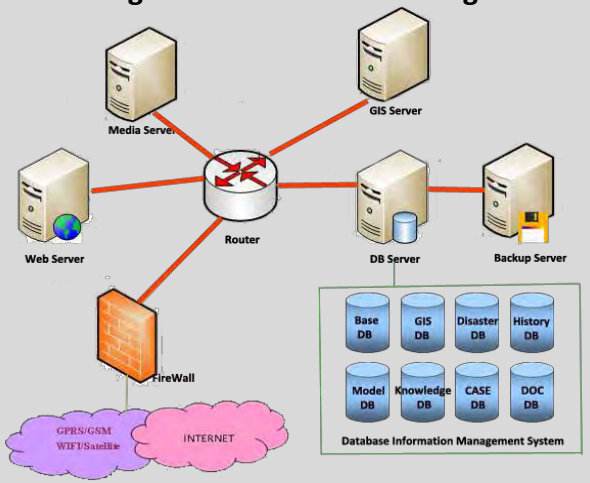
Mobile Devices

Reporting network
National
Province
District
County



Satellite systems

Integrated Information Management



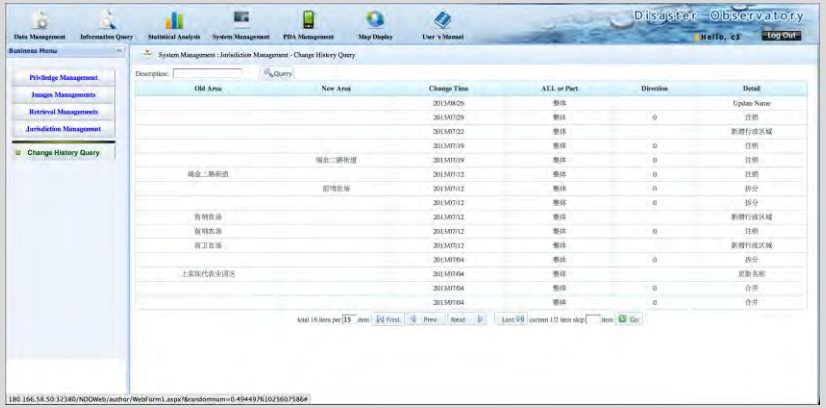
GUI of NDO Disaster Database

Key Features of NDO Database

- Built-in event catalogues
- Socio-economic context information
- Multimedia information from crowding sources
- Tracking event chains
- Tracking changes in administrative boundaries

Event Chain Tracking

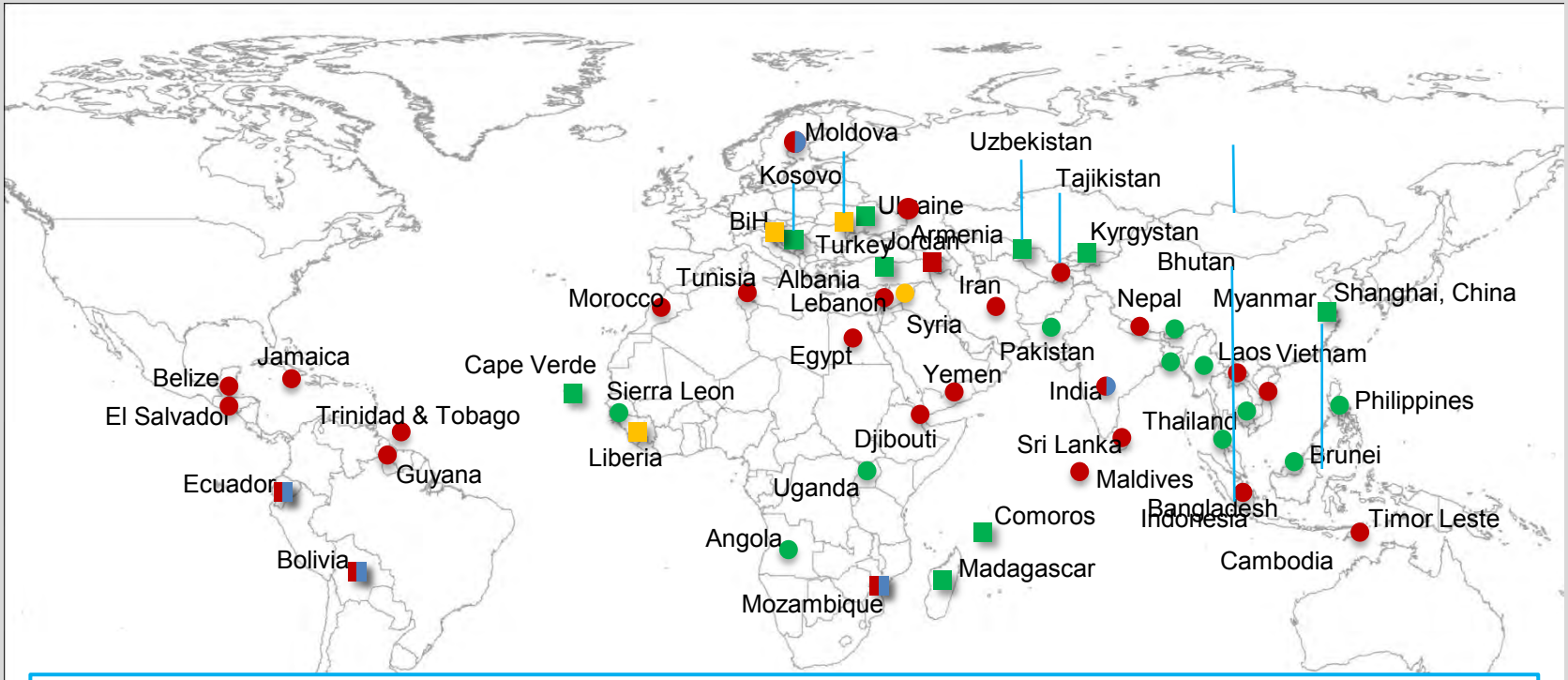
Changes in Administrative Boundaries



Use of Satellite Imageries in Developing National Disaster Observatory (NDO)

- Geo-referencing historic hazard events
- Building historic exposure inventories
- Rapid interpretation of damage and losses during an emergency and/or disaster

UNDP-supported NDO Practice in Countries



Legend

National Damage & Loss Database

- Fully Established
- Partially Covered
- Ongoing
- Initiated, but little progress

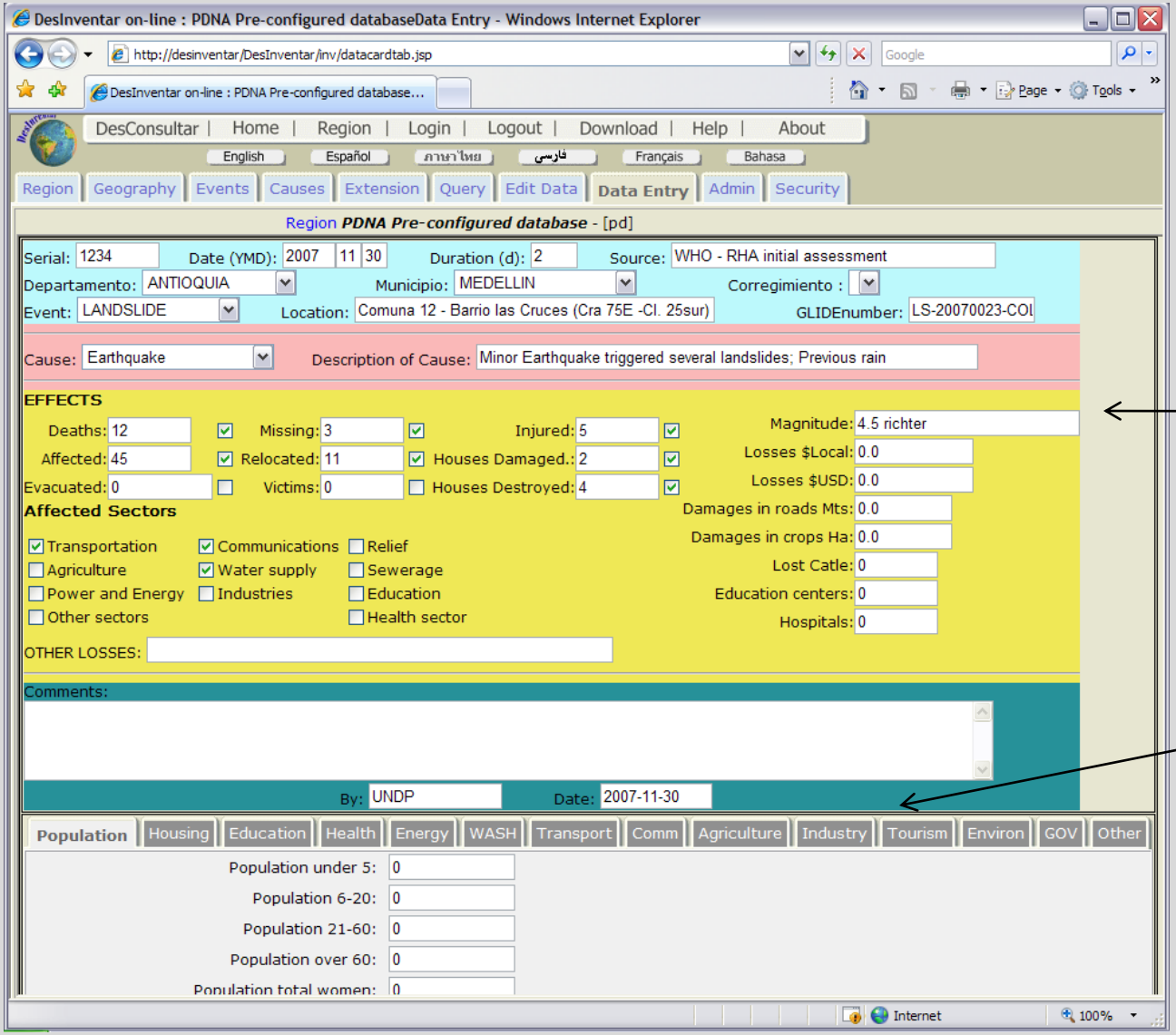
National Disaster Observatory (NDO)

- Fully Established
- Partially Established
- Ongoing
- Initiated, but little progress

Facts and Achievements (2005-2013)

- 50 countries supported to collect, integrate, and analyze disaster information through two practices – Developing Damage & Loss databases and National Disaster Observatories (NDO).
- 23 fully-established damage & loss databases
- One established NDO; three partially established NDOs
- Six historic country disaster profiles developed for initiating national DRR strategy.

Loss Databases using DesInventar



The actual screen for data capture.

It can be customized by users.

Standard Effects (killed, injured, affected, etc.)

Extension (Sectorial detail information)

National Disaster Observatory of Bolivia

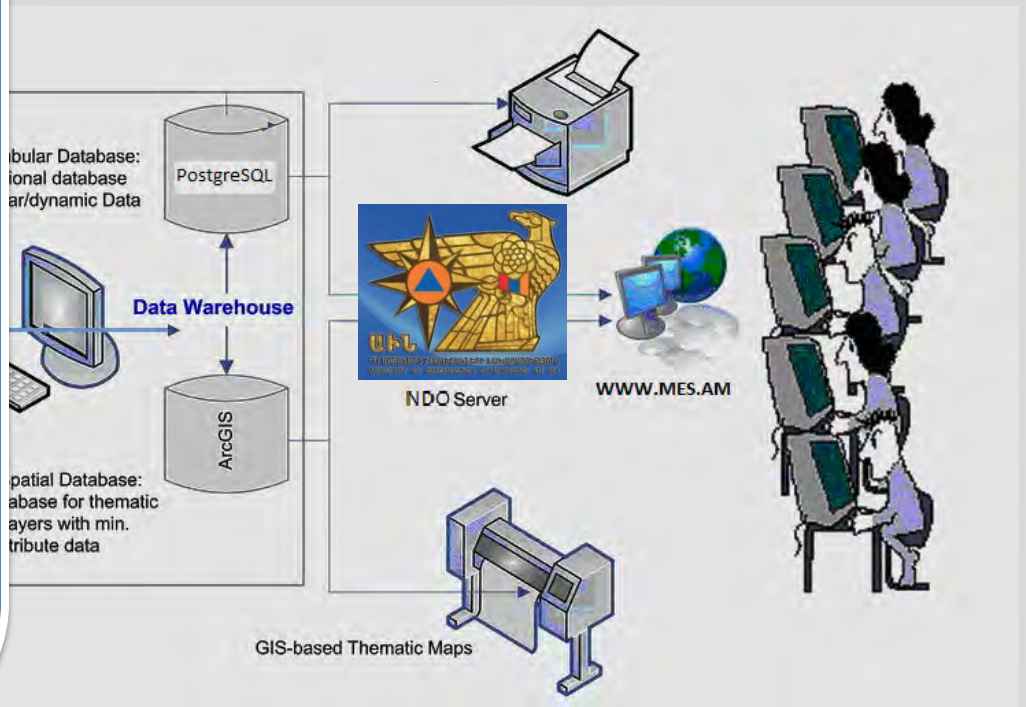
Event Visualization

Event Report

National Disaster Observatory of Armenia

Network of Disaster Observers
- Ministry of Emergency Situations
  - Armenian Rescue Service
  - Hydrometeorological and Monitoring Service
- Ministry of Territorial Administration
  - State Committee of Water Management
- Ministry of Urban Development
- Ministry of Nature Protection
- Ministry of Agriculture
- Ministry of Economy
- Ministry of Health
- Ministry of Energy and Natural Resources
- Ministry of Transport and Communication
- National Academy of Sciences
- Marzs (local governments)
- State Nuclear Regulatory Commission by the Government
- State Committee of Cadaster of Real Estate
- Armenian Electrical Line Company
- Armenian – Russian Gas Company
- Viva sell, Beeline, Orange Communication Company
- Geocom LTD
- Georisk LTD
- GIS LLC
- Armenian Red Cross
- SF "International Center Garni"
- Armenian Association of Seismology and Physics of Earth

WWW.MES.AM



Summary

- A useful disaster database should include geospatially disaggregated disaster information, which consists of disaster loss and associated context information such as hazard events, exposure, other thematic data, etc.
- The impacts of direct damage / losses should be evaluated, either quantitatively or qualitatively.
- Disaster events should be classified in terms of their severity and the chaining effects and the criteria for inclusion should be normalized.
- National Disaster Observatory (NDO) provides a comprehensive solution to develop an integrated national disaster information system.

Contact Information

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