

Challenges and opportunities for Earth observation in the context of the Sendai Framework for Disaster Risk Reduction 2015 - 2030

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Management and Emergency Response
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Overview

- **UNOOSA / UN-SPIDER**

- **The Sendai framework for Disaster Risk Reduction 2015 - 2030**
 - **Capabilities and opportunities for Earth observation**

- **Summary**

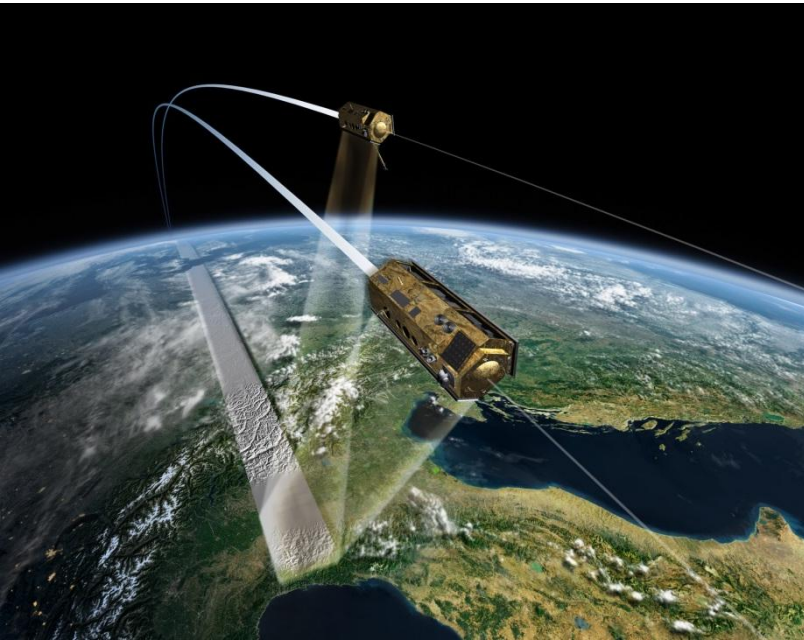


UNOOSA / UN-SPIDER

- Contribute to the development of International conventions and frameworks
- Value adding of space-based information to measure targets, indicators and to evaluate implementation
- Enable countries to access and use space-based information



UN-SPIDER: Mission statement

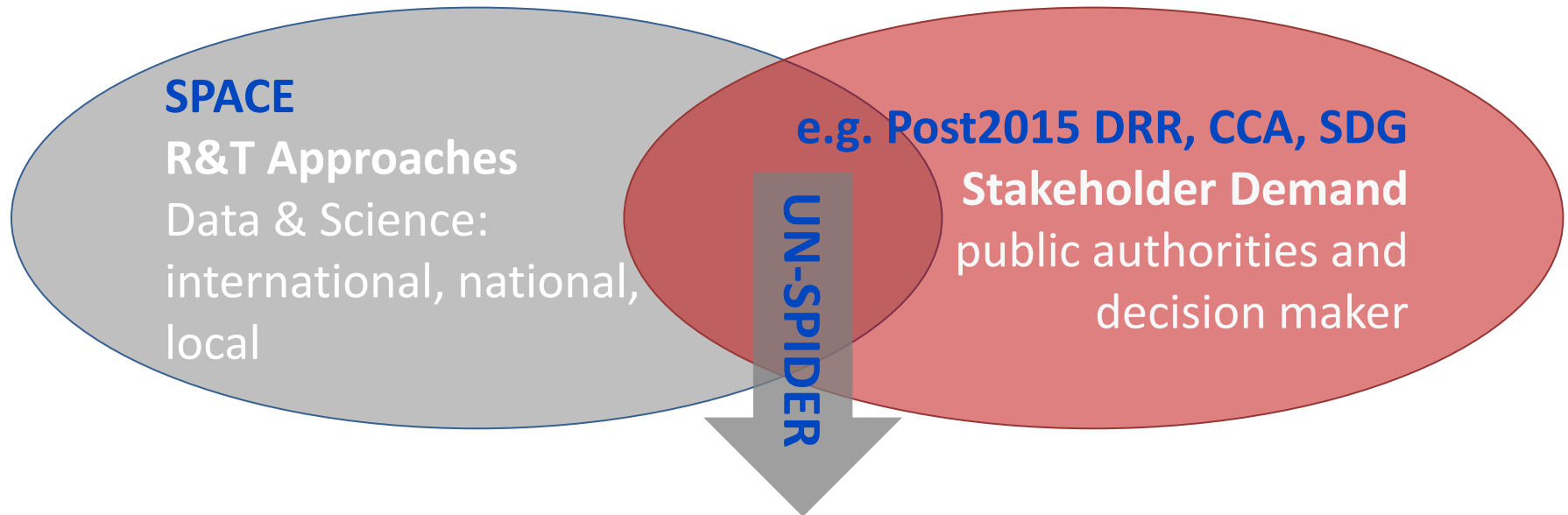


„Ensure that all countries have access to and develop the capacity **to use all types of space-based information** to support the **full disaster management cycle.**“

General Assembly Resolution 61/110 (2006)



Challenges: Science - Practice

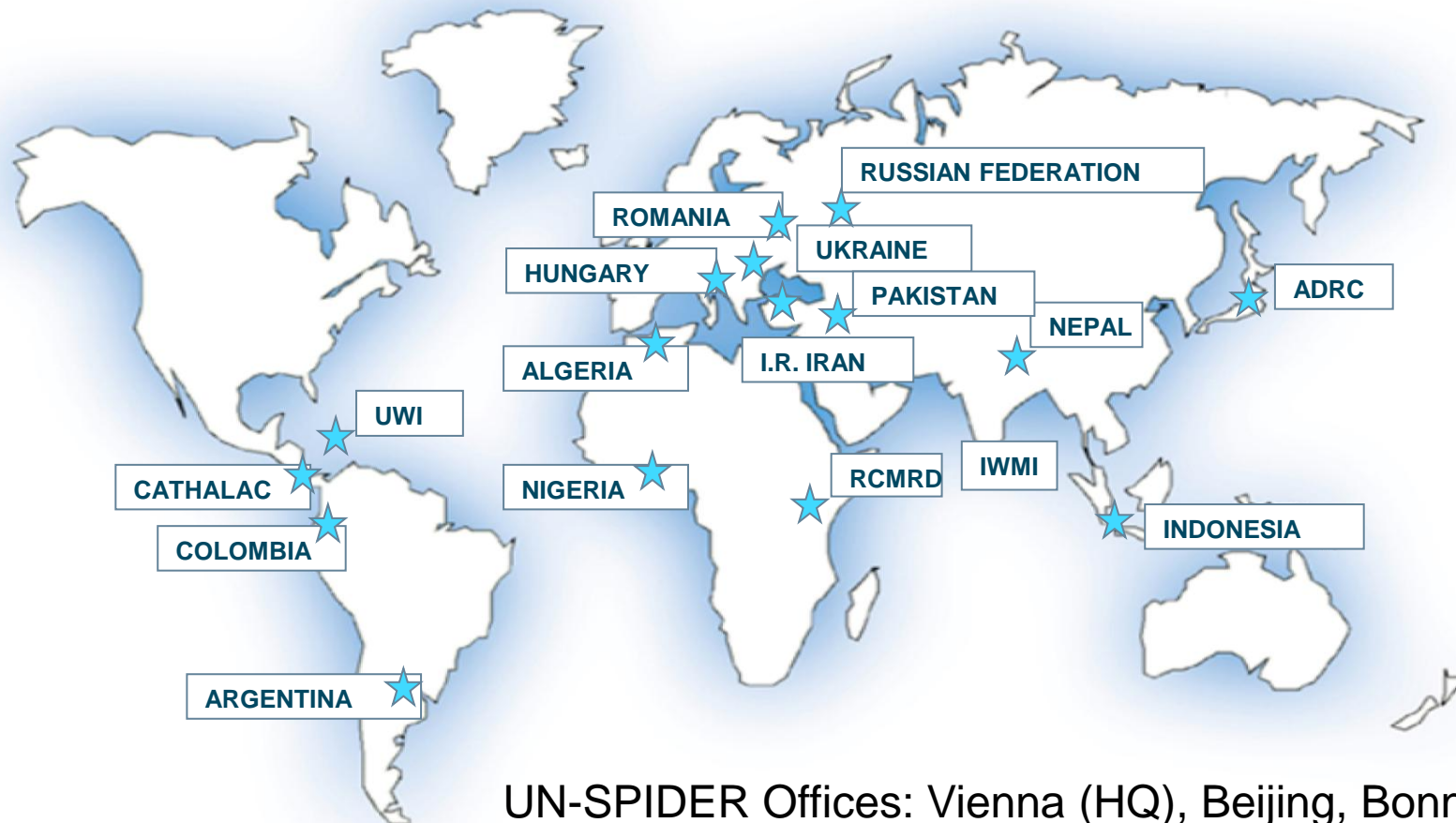


- **Knowledge management and Recommended practices**
- **Capacity Building**
- **Technical Advisory Support**
- **International Cooperation**



International cooperation

UN-SPIDER Network of Regional Support Offices



UN-SPIDER Offices: Vienna (HQ), Beijing, Bonn
6 Space Training Center, ~46 National Focal Points



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14-18 March 2015

Third UN World Conference on Disaster Risk Reduction

187 Member States met in Sendai, Japan to agree on a new global framework for disaster risk reduction for the period 2015-2030





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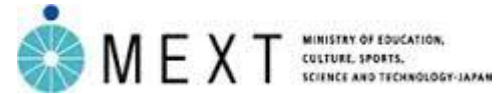
Global partnership EO for SFDRR Implementation



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Disaster Management Centre

7 GLOBAL TARGETS

Reduce

Mortality/

global population

2020-2030 Average << 2005-2015 Average

Affected people/

global population

2020-2030 Average << 2005-2015 Average

Economic loss/

global GDP

2030 Ratio << 2015 Ratio

Damage to critical infrastructure & disruption of basic services

2030 Values << 2015 Values

Increase

Countries with national & local DRR strategies

2020 Value >> 2015 Value

International cooperation

to developing countries

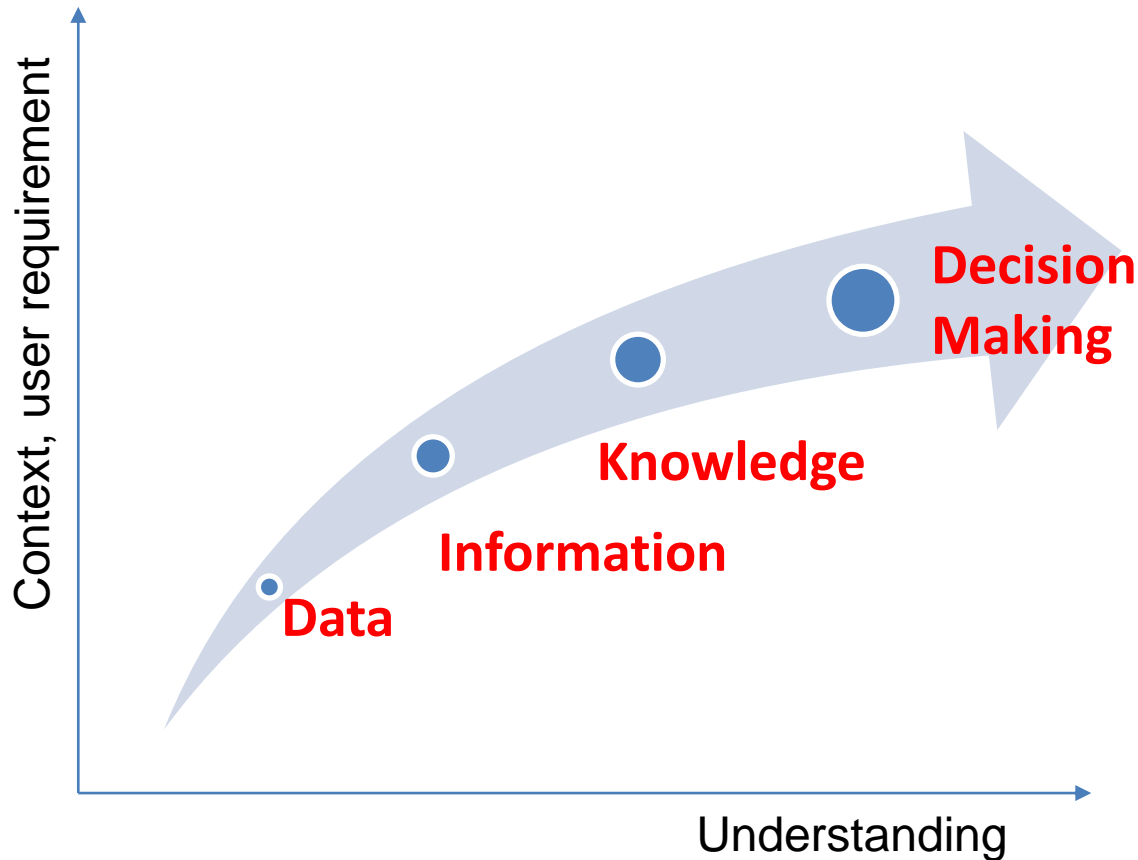
2030 Value >> 2015 Value

Availability and access to multi-hazard early warning systems & disaster risk information and assessments

2030 Values >> 2015 Values

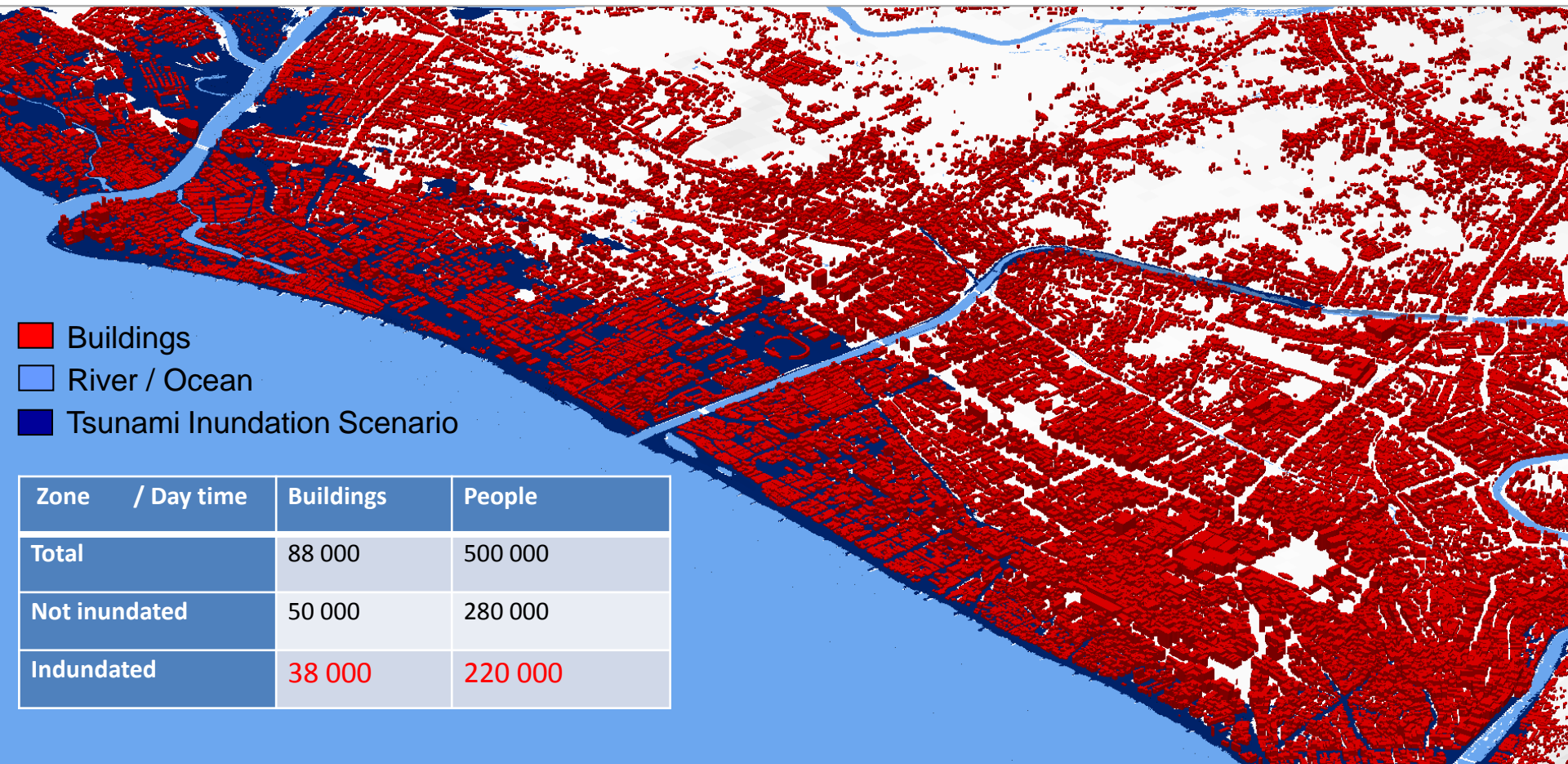


Data – information – knowledge – decision making





Decision making





Measuring the targets

<ul style="list-style-type: none"> Target C: Reduce <i>direct disaster economic loss</i> in relation to global gross domestic product (GDP) by 2030 	people	on
<ul style="list-style-type: none"> C-1 Direct economic loss due to hazardous events in relation to global gross domestic product. (This indicator should be computed based on indicators C-2 to C-7 and GDP figures). 	5	the
<ul style="list-style-type: none"> C-2 Direct agricultural loss due to hazardous events 	icators	5-
<ul style="list-style-type: none"> C-5 Direct economic loss due to houses damaged by hazardous events Note: C-5 and C-6 are mutually exclusive. 	icators	
<ul style="list-style-type: none"> C-6 Direct economic loss due to houses destroyed by hazardous events 	icators	
<ul style="list-style-type: none"> C-7 Direct economic loss due to damage to critical infrastructure caused by hazardous events 	vents	

4 PRIORITIES FOR ACTION

Priority 1 Understanding disaster risk

Policies and practices for DRR should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment.

Priority 2 Strengthening disaster risk governance to manage disaster risk

Disaster risk governance at the national, regional and global levels is of great importance for an effective and efficient management of disaster risk.

Priority 3 Investing in disaster risk reduction for resilience

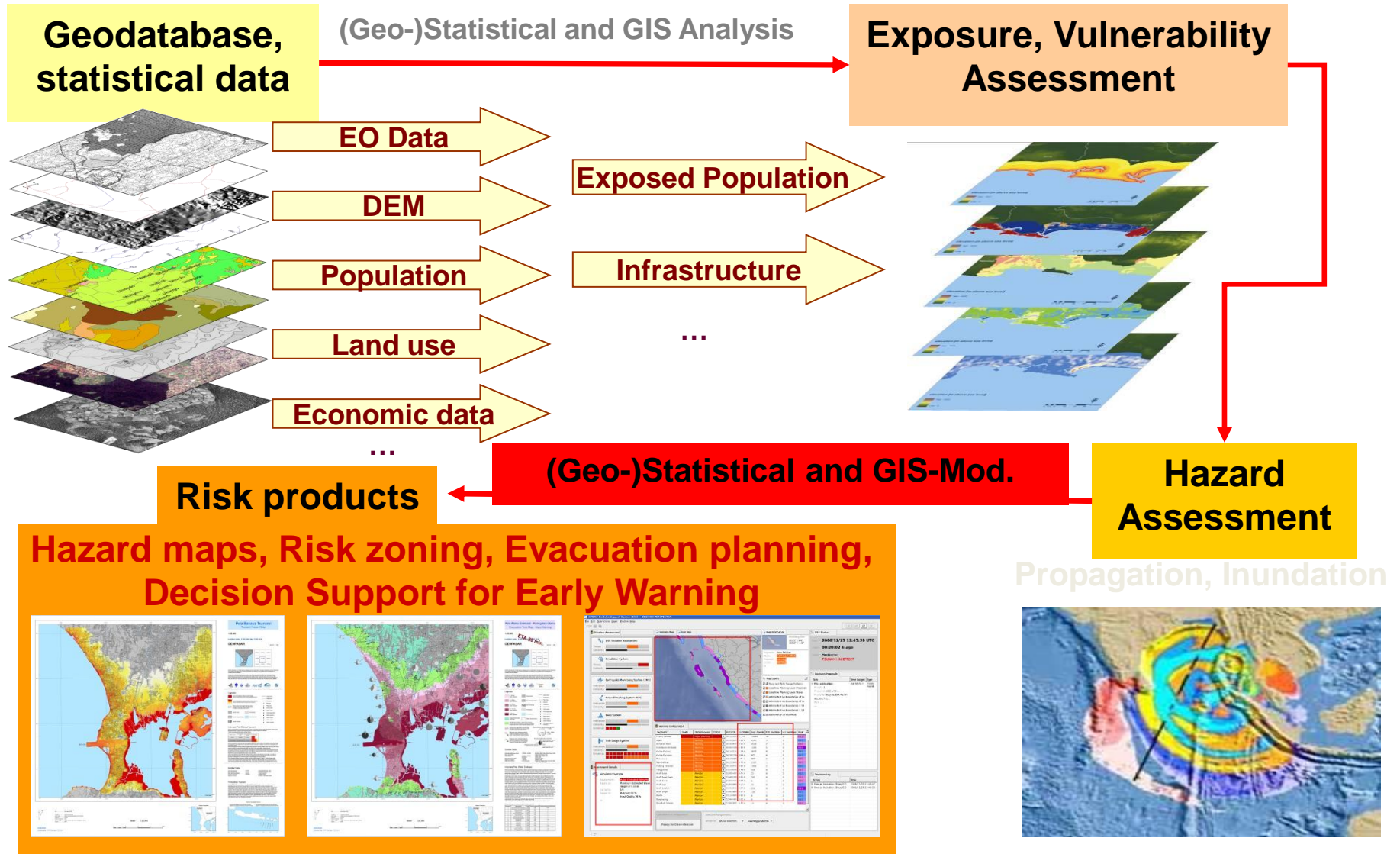
Public and private investment in DRR are essential to enhance the economic, social, health & cultural resilience of persons, communities, countries, their assets, as well as environment

Priority 4 Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction

Strengthened disaster preparedness for response, recovery, rehabilitation and reconstruction are critical to build back better

National and local dimensions

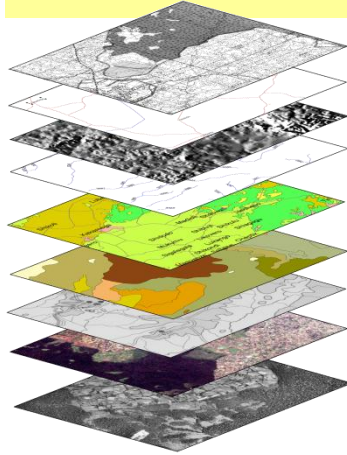
Regional and global dimensions



**Geodatabase,
statistical data**

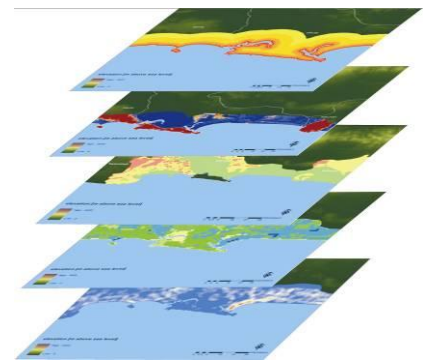
(Geo-)Statistical and GIS Analysis

**Exposure, Vulnerability
Assessment**



- EO Data**
- DEM**
- Population**
- Land use**
- Economic data**
- ...

- Exposed Population**
- Infrastructure**
- ...



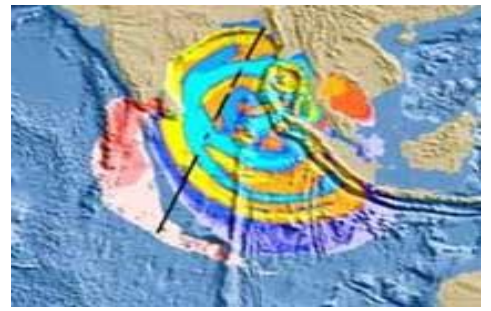
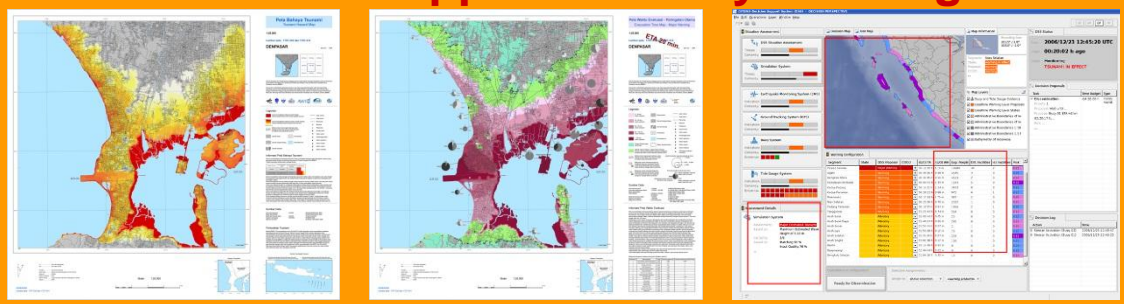
Risk products

(Geo-)Statistical and GIS-Mod.

**Hazard
Assessment**

Propagation, Inundation

**Hazard maps, Risk zoning, Evacuation planning,
Decision Support for Early Warning**





Hazard Assessment

Estimation of: area, intensity, probability

e.g. for flood:

- Inundation area
- Estimated Time of Arrival / Duration
- Water depth / velocity
- Flux in the inundated area

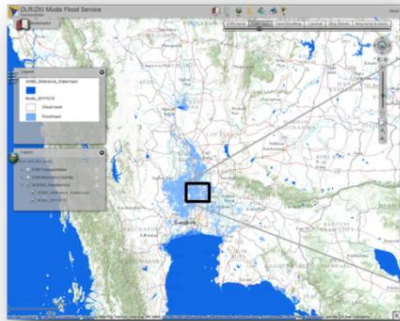
Methodology

- Simulation modelling
- Historical Event data
- Statistics
- In-situ data
- Remote Sensing

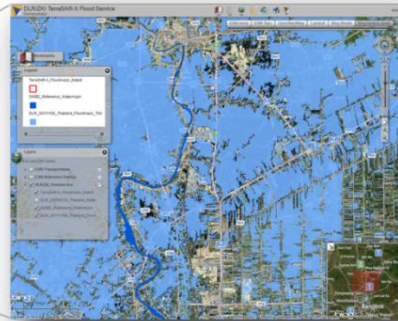


Example EO flood service DLR-DFD

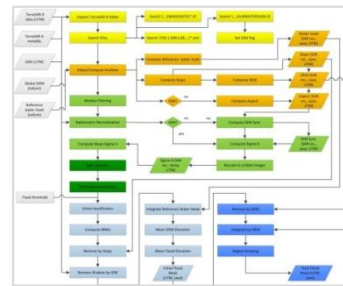
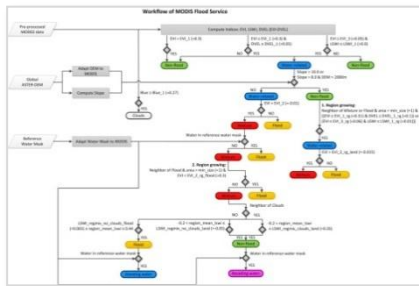
EO-based processing chains and services



MODIS Flood Service



TerraSAR-X Flood Service



Extension



Sentinel-1



Sentinel-2



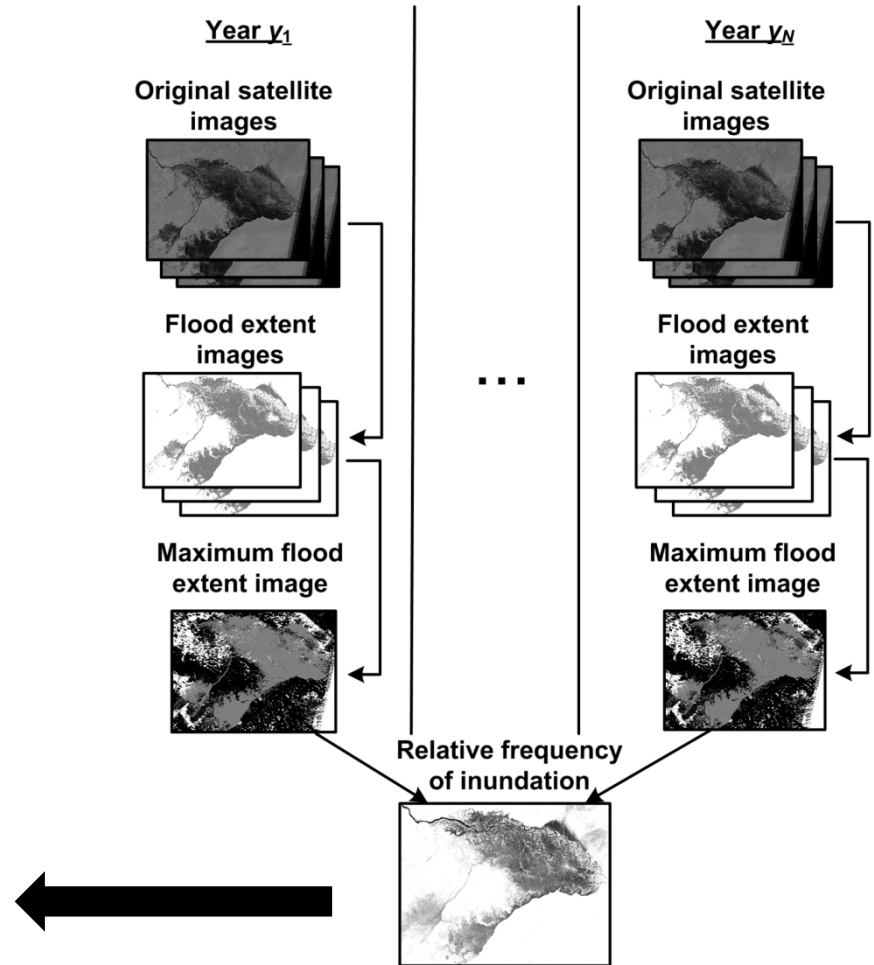
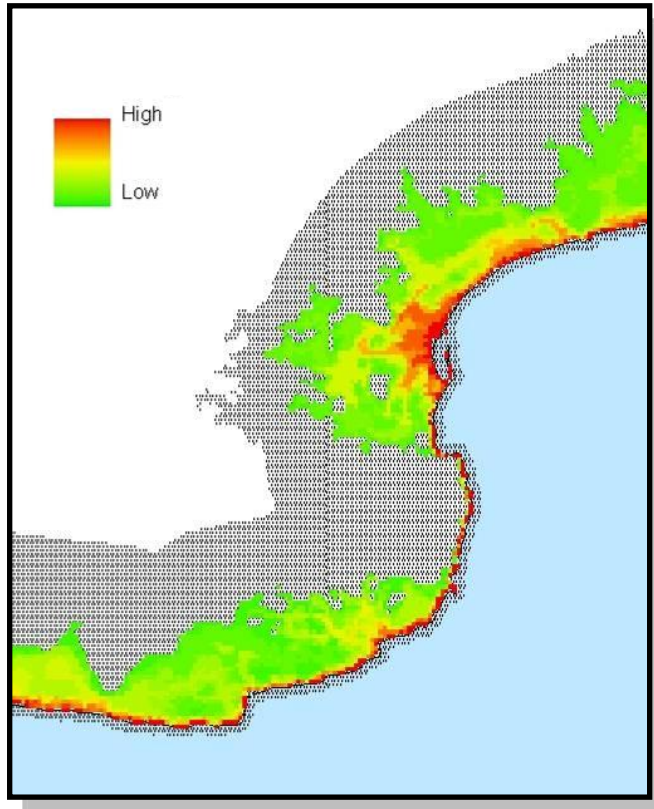
Sentinel-3

Credit:





EO based flood frequency estimation

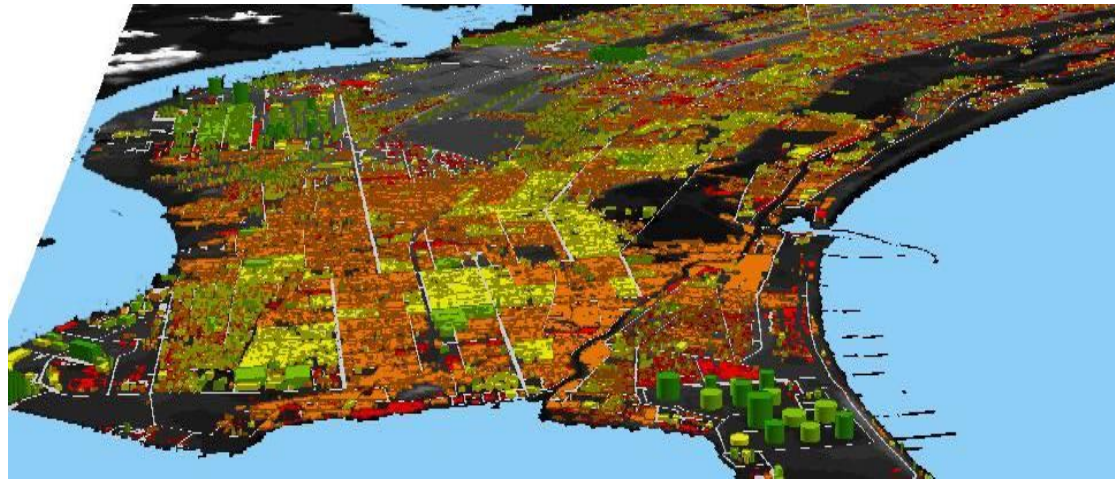




Exposure

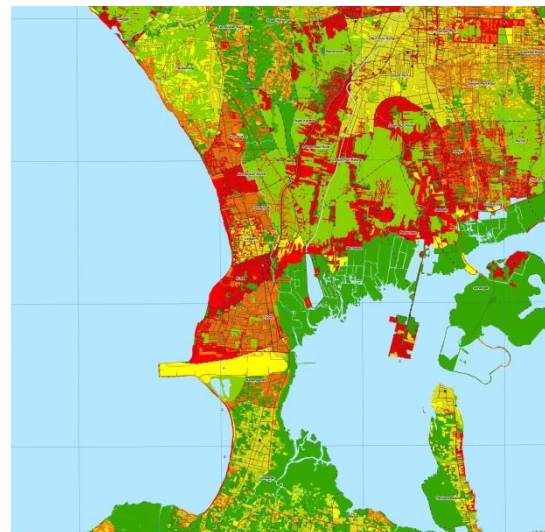
Mapping of elements at risk, e.g.

- Land use / cover
- Urban morphology
- Critical infrastructure and facilities




Human exposure:

- Population distribution
- Temporally resolved: day and night-time



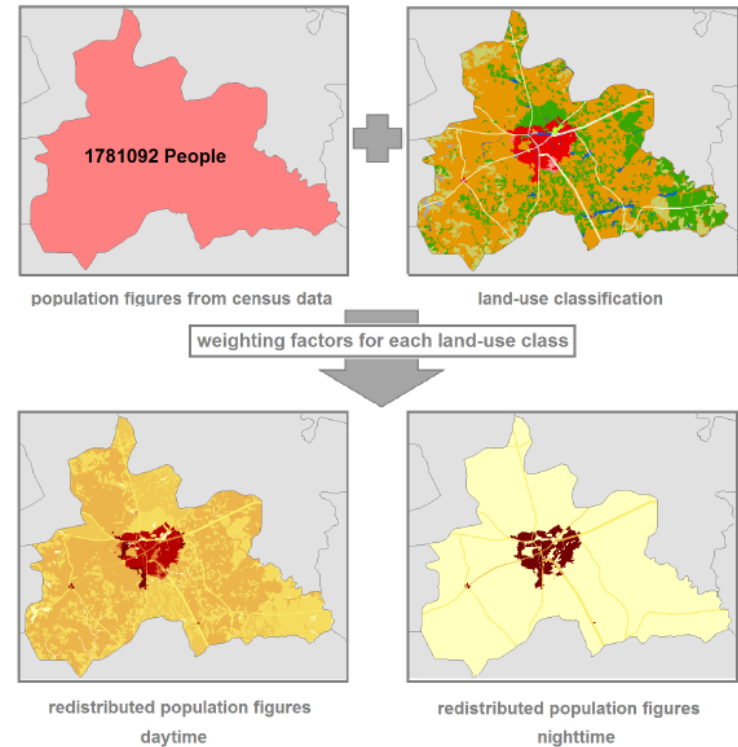
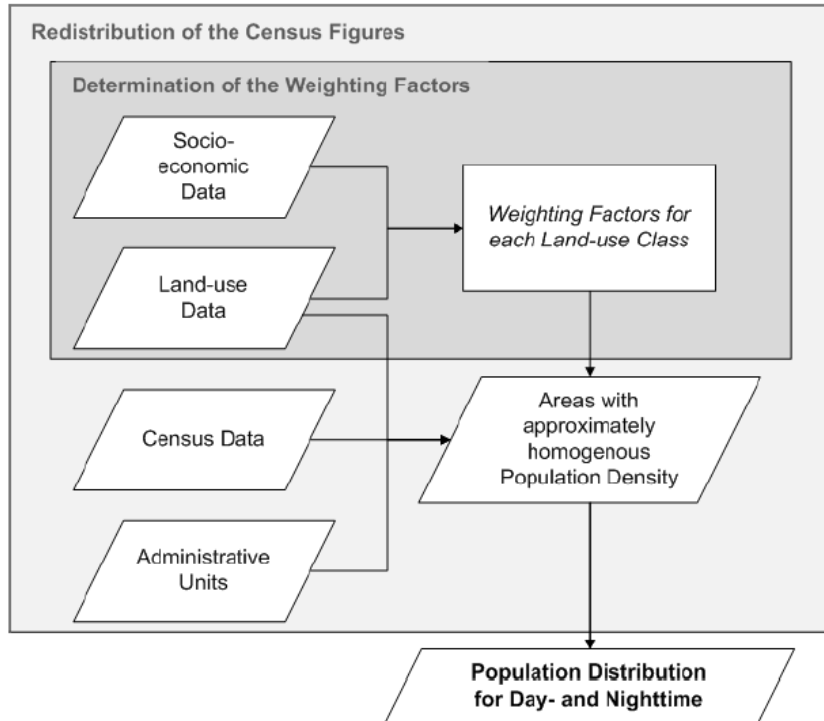
Legend

People density per square kilometer:

-  < 100 (highly sparse)
-  100 - 1000 (sparse)
-  1000 - 2500 (quite dense)
-  2500 - 5000 (dense)
-  > 5000 (highly dense)



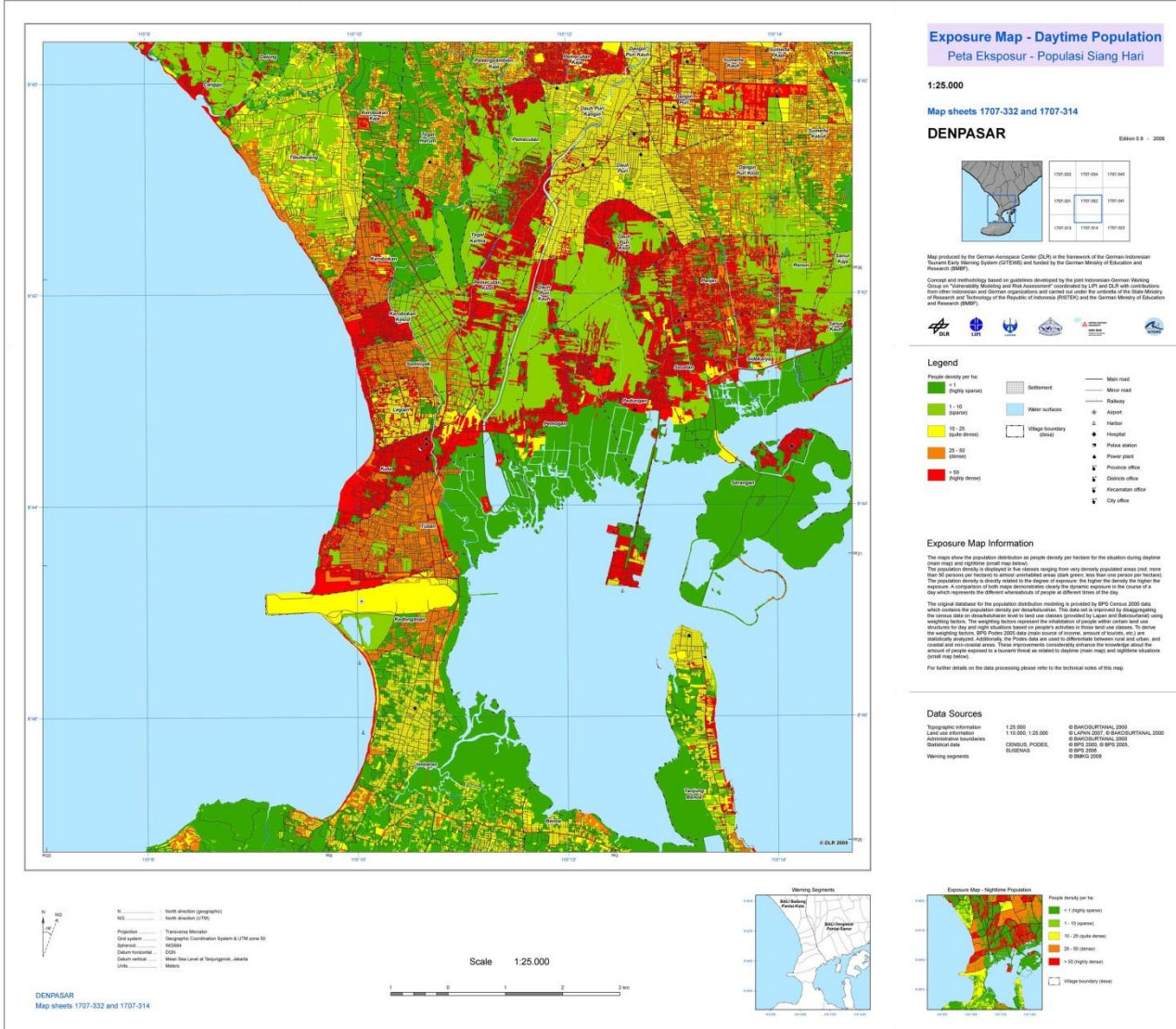
Population disaggregation



Required Data: Socio-economic data (employment figures, distribution of employees across different branches, age distribution), land use, census data, administrative units



Human Exposure - Bali





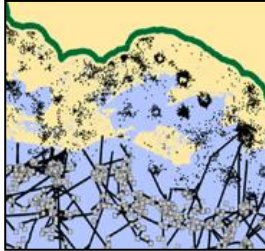
Vulnerability



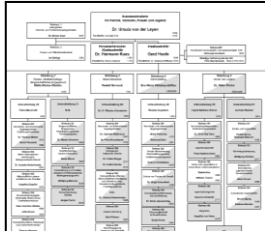
Human Social



Economical, infrastructures



Environmental

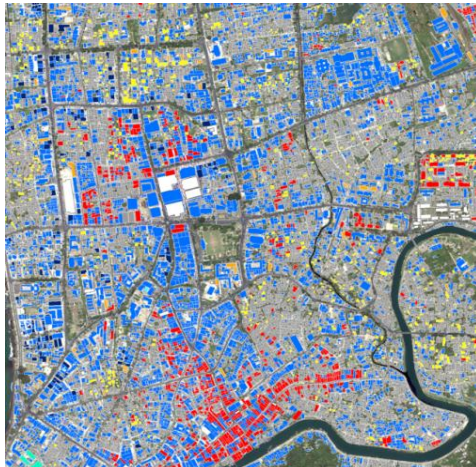


Institutional



Infrastructure Vulnerability (Geiß et al. 2012, 2013)

Classified building inventory

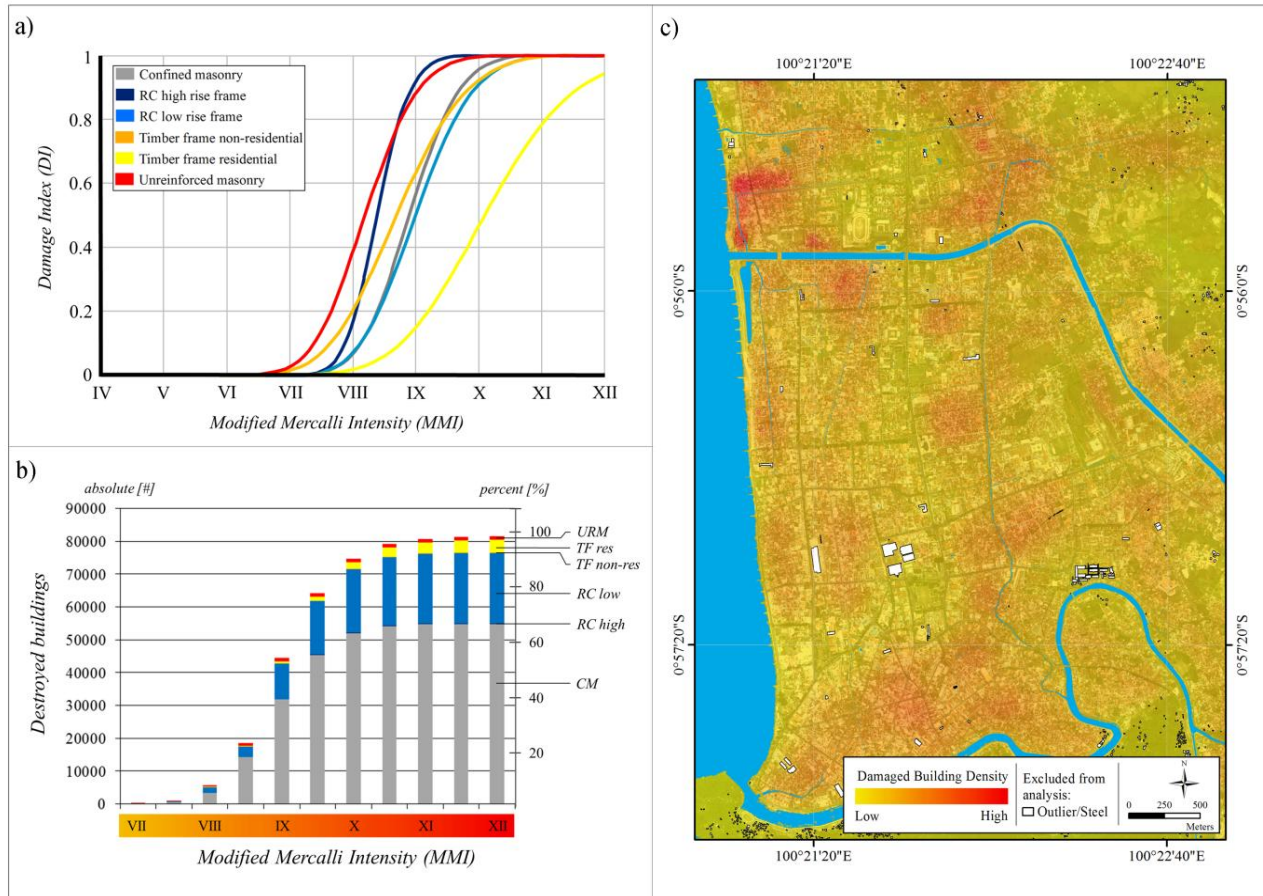


Confined masonry



Reinforced concrete high

Modeling the behavior under seismic load

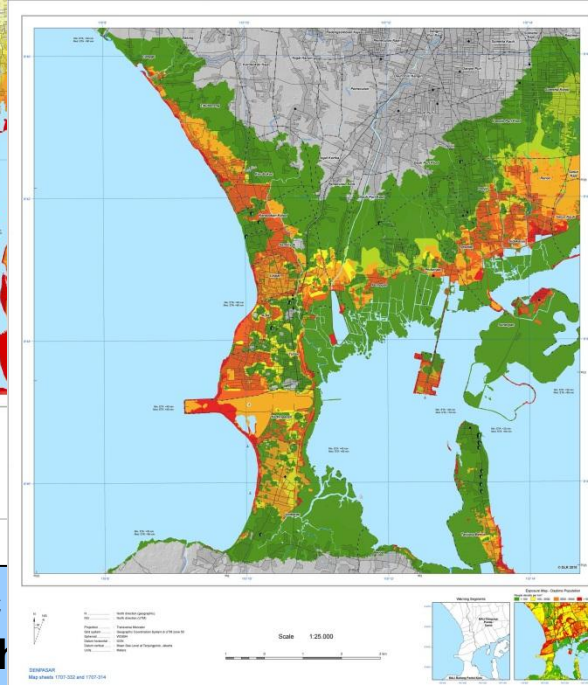
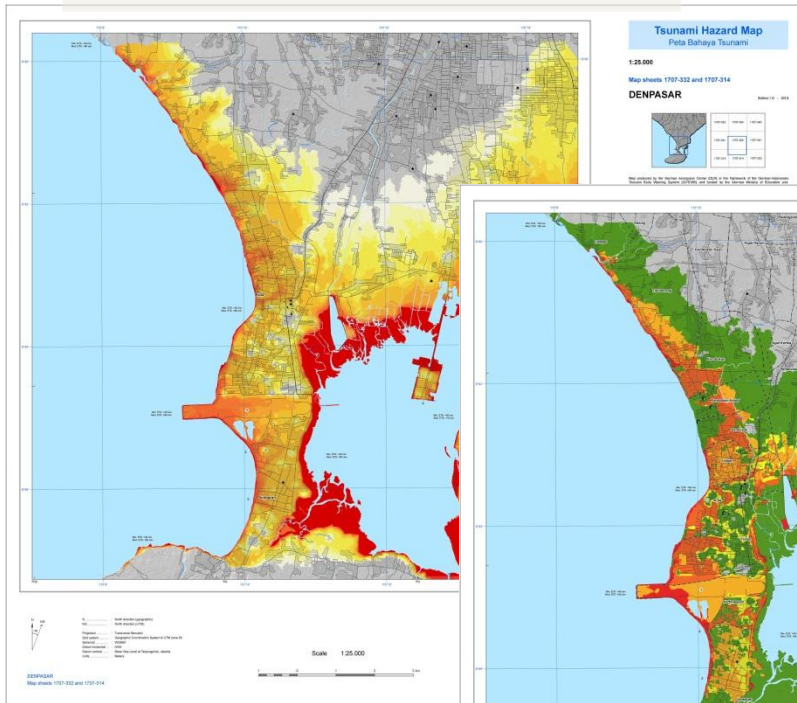


Scenario with MMI = 9: 44,401 out of 81,904 buildings destroyed

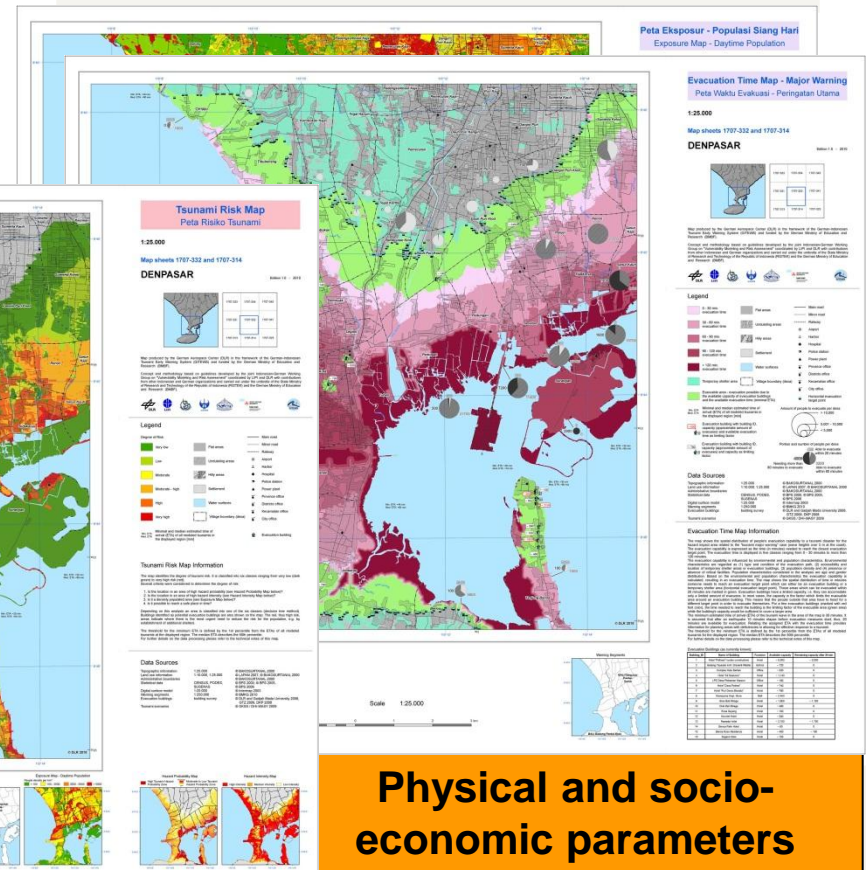


Risk assessment and products

Hazard information



Vulnerability information



e.g. deterministic scenario approach

Physical and socio-economic parameters

Risk information

$$\text{Risk} = f(\text{hazard, exposure, vulnerability})$$



Summary: EO for SFDRR

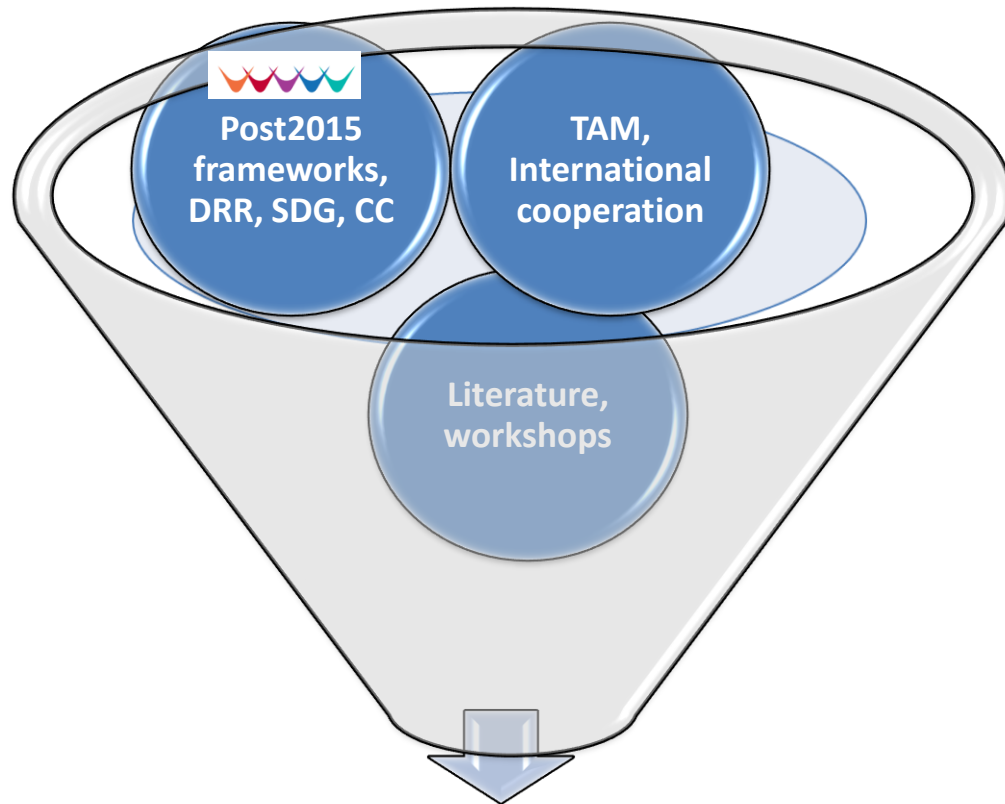
- **High potentials for Earth observation**
 - Measuring and monitoring of targets and indicators
 - Important for Understanding risk, prevention, response, recovery (Priority for Action 1, 4)

- **Opportunities for R&D to support SFDRR implementation needs**

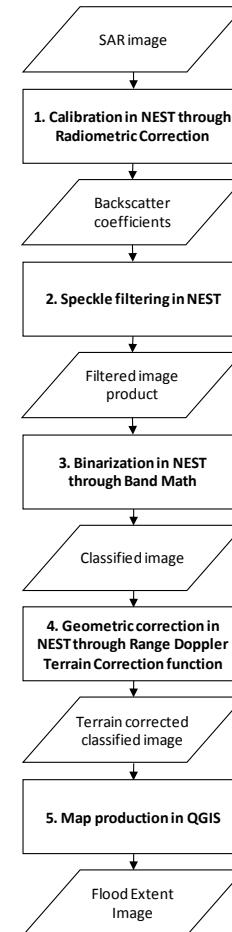
- **Science to praxis transfer important**



Example Science to practice transfer UN-SPIDER Recommended practices initiative



Information Demand



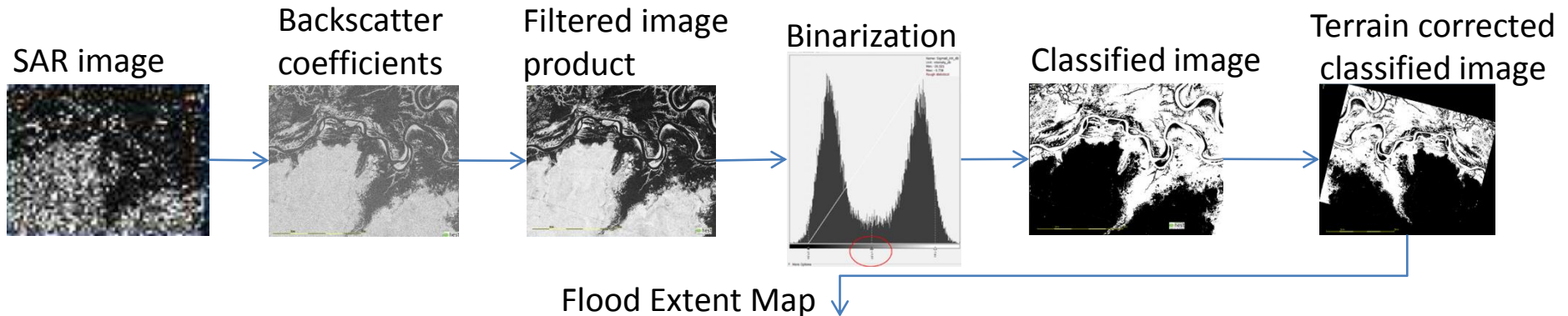
**Recommended
practice**



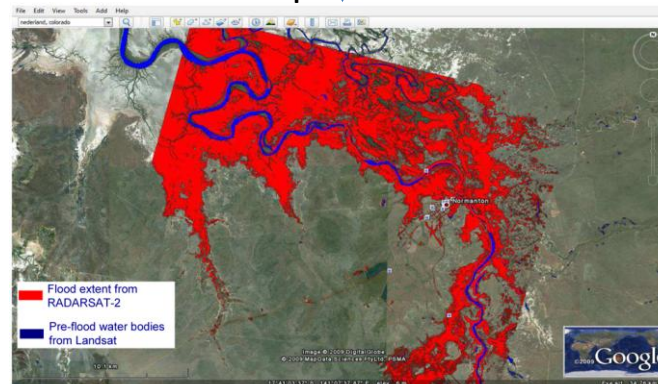
Recommended Practice Flood Extent Mapping

How can I create a flood extent map based on SAR data using free software?

Recommended practices by UN-SPIDER's Ukrainian Regional Support Office provides step-by-step instructions.



Flood Extent Map

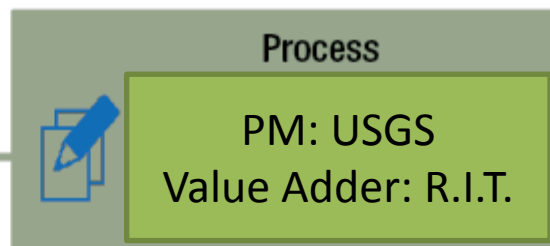
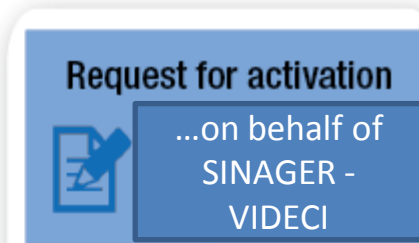
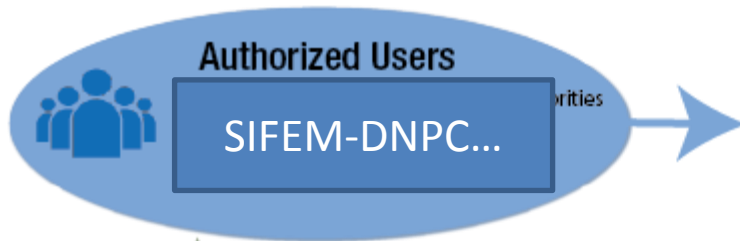
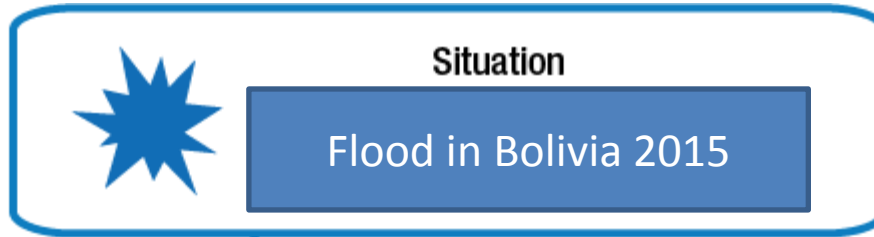


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Recommended Practice Flood Extent Mapping – Use Case



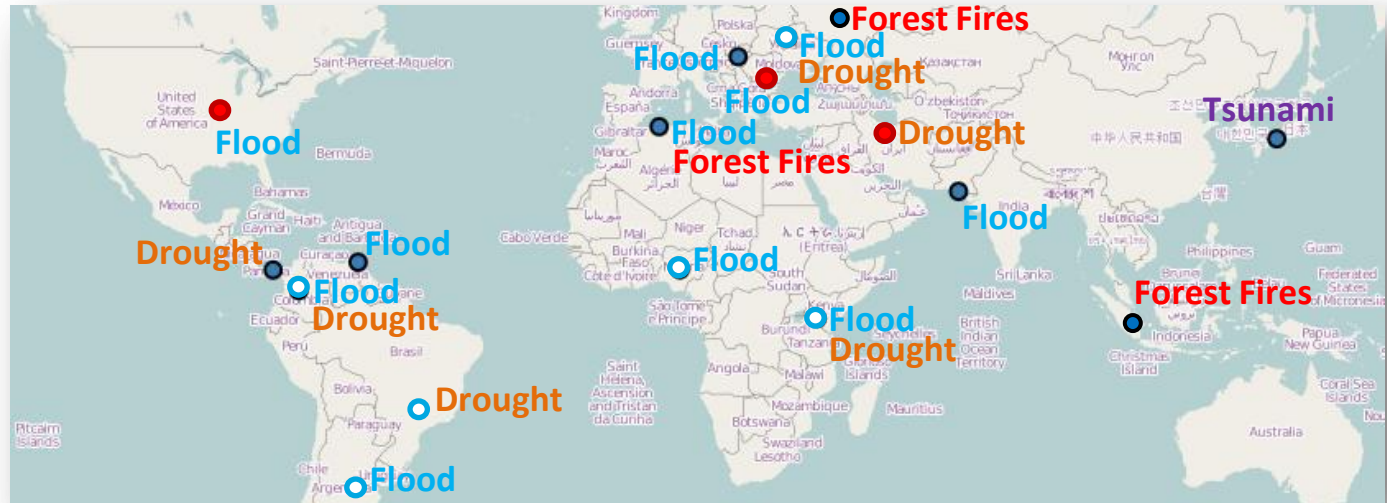
International Charter "Space and Major Disasters"



Recommended practices: Next steps

Legend

- finalized
- RSO commitment
- RSO submission



Testing – Validating across scales and regions based on defined criteria set

Suggesting SOP for recommended practices, capacity development

Establishing a peer group of experts

Seeking cooperating partners and funding



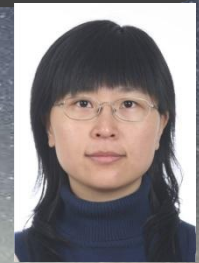
Summary

- **Sendai framework offers opportunities for value-adding of EO**
- **National and global level information requirements should stimulate research efforts**
- **UN-SPIDER facilitates SFDRR implementation**
- **UN-SPIDER highly interested in applied research projects and can provide expertise in the science to practice transfer**

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Thank You

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