The future will be urban –

Capabilities and solutions from remote sensing for risk assessment and management

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in der Helmholtz-Gemeinschaft

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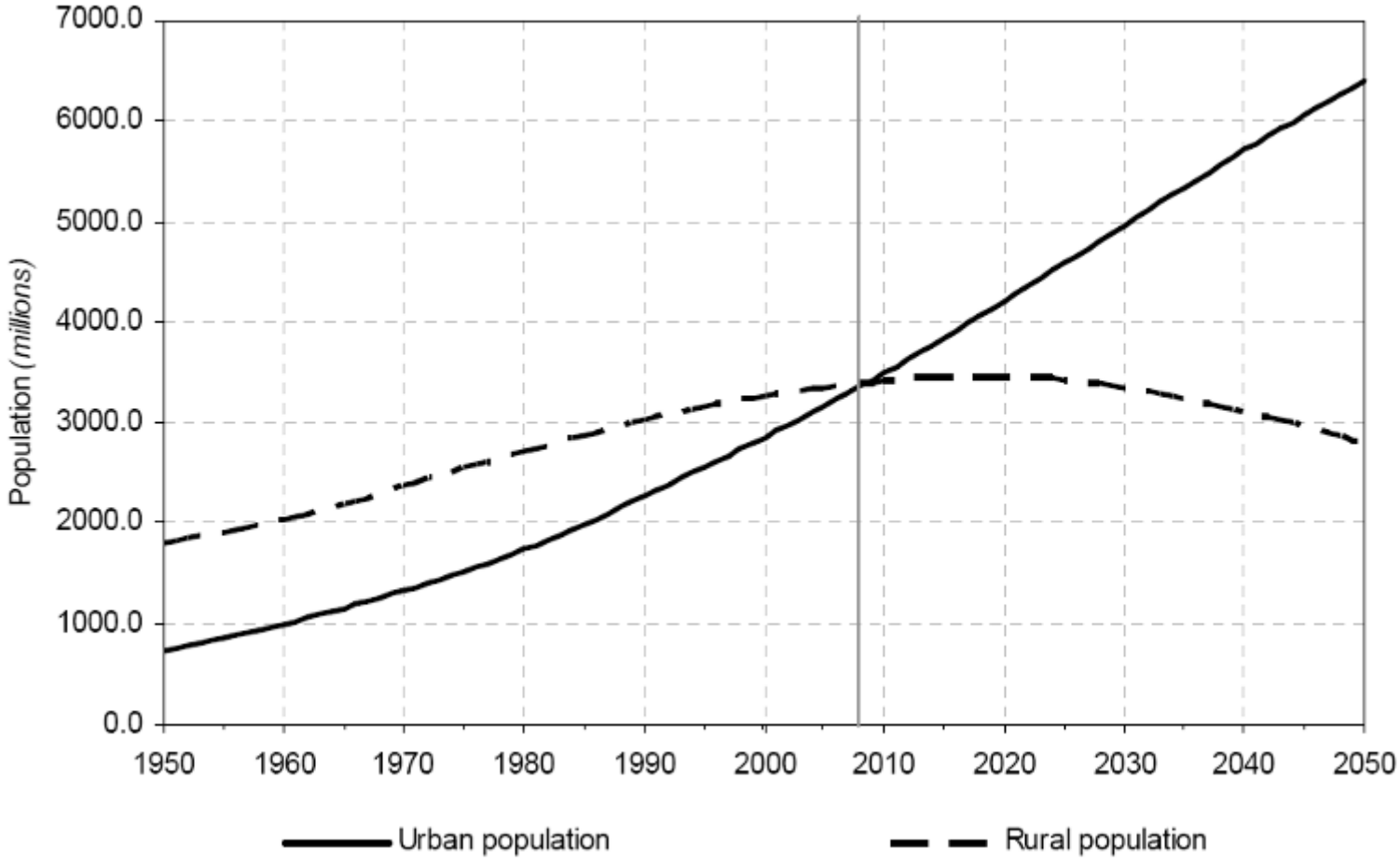
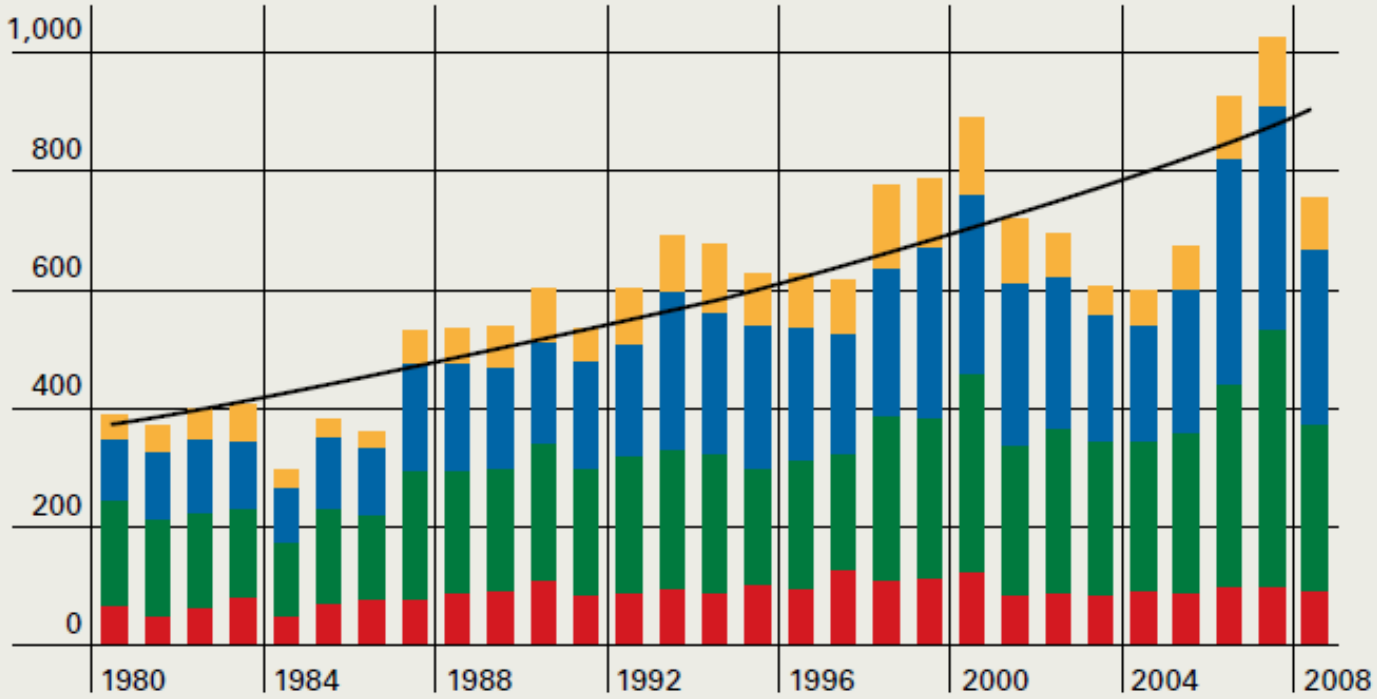
WÜRZBURG

The future will be urban!



Number of natural catastrophes 1980–2008



Geophysical events
Earthquake, volcanic eruption

Meteorological events
Tropical storm, winter storm, severe weather, hail, tornado, local storm

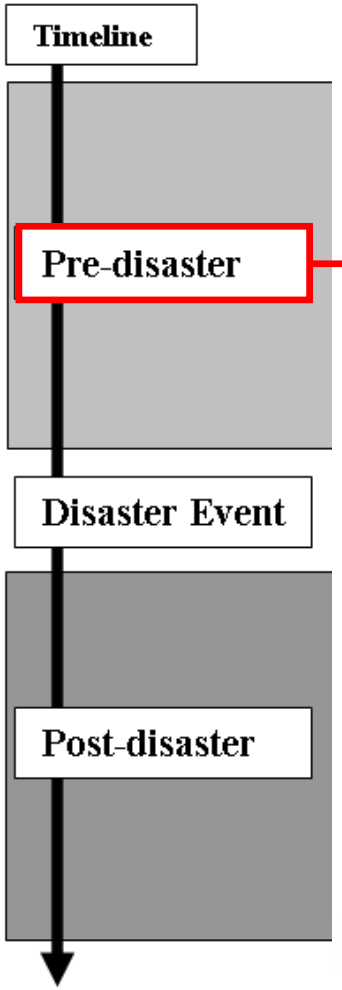
Hydrological events
Storm surge, river flood, flash flood, mass movement (landslide)

Climatological events
Freeze, wildland fire, drought

Trend

Munich Re Topics Geo 2008

Risk = f(Hazard, Vulnerability)



- Where are exposed areas?
- What would be affected?
- How many people would be affected?
- Who would be affected?
- How large will be the damage?

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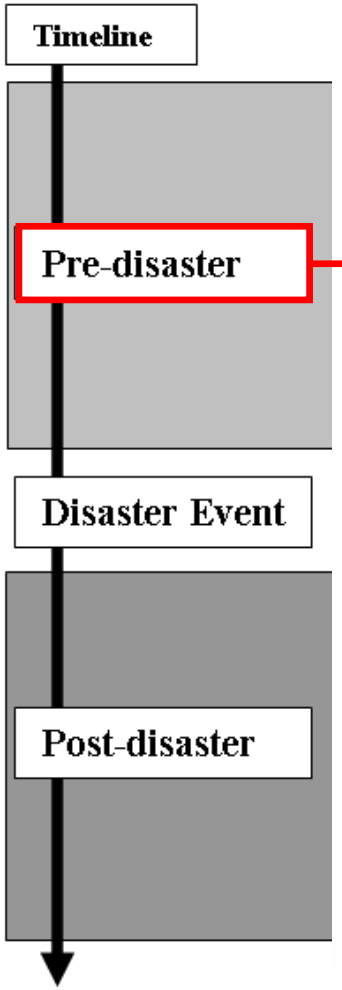

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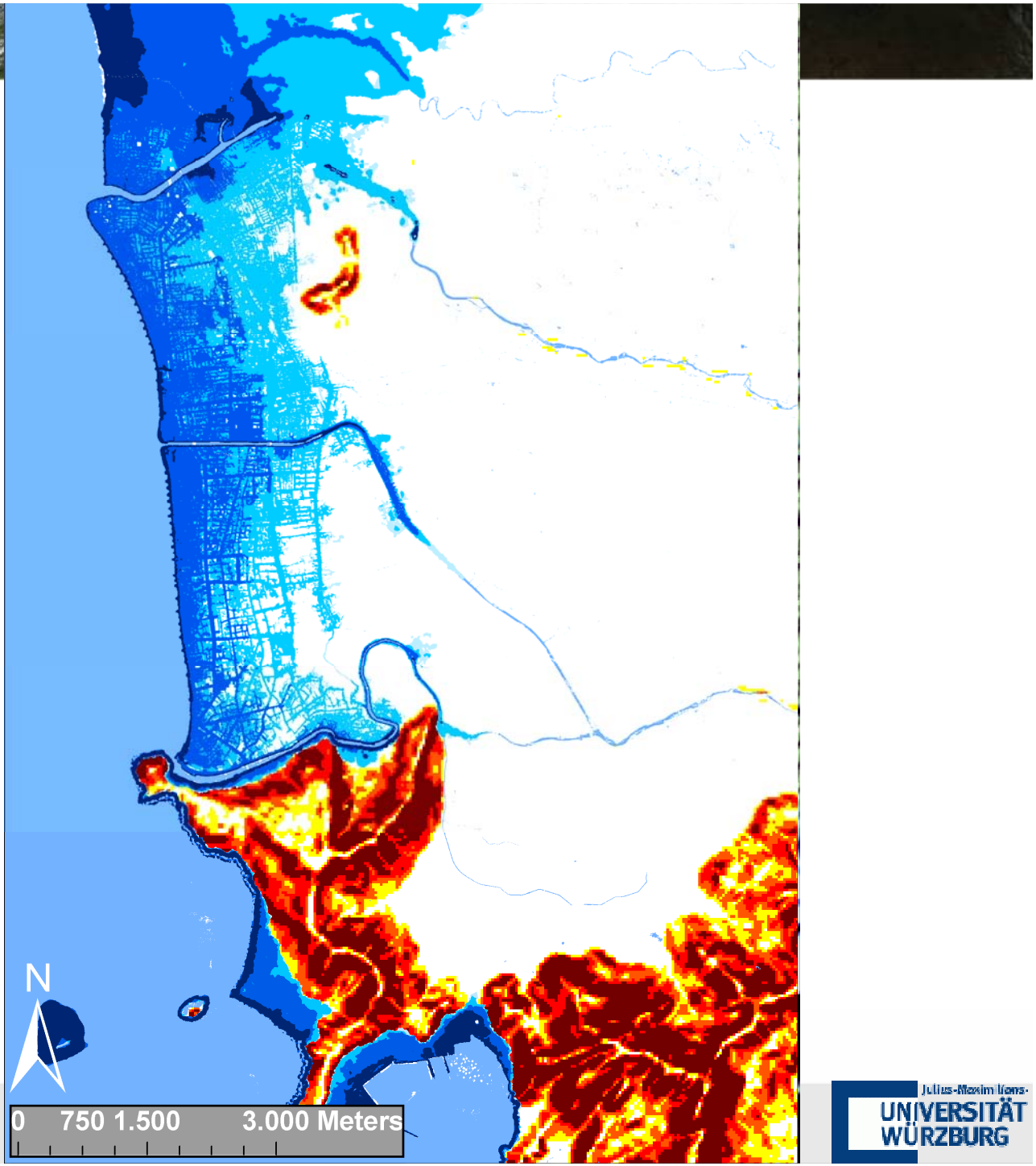

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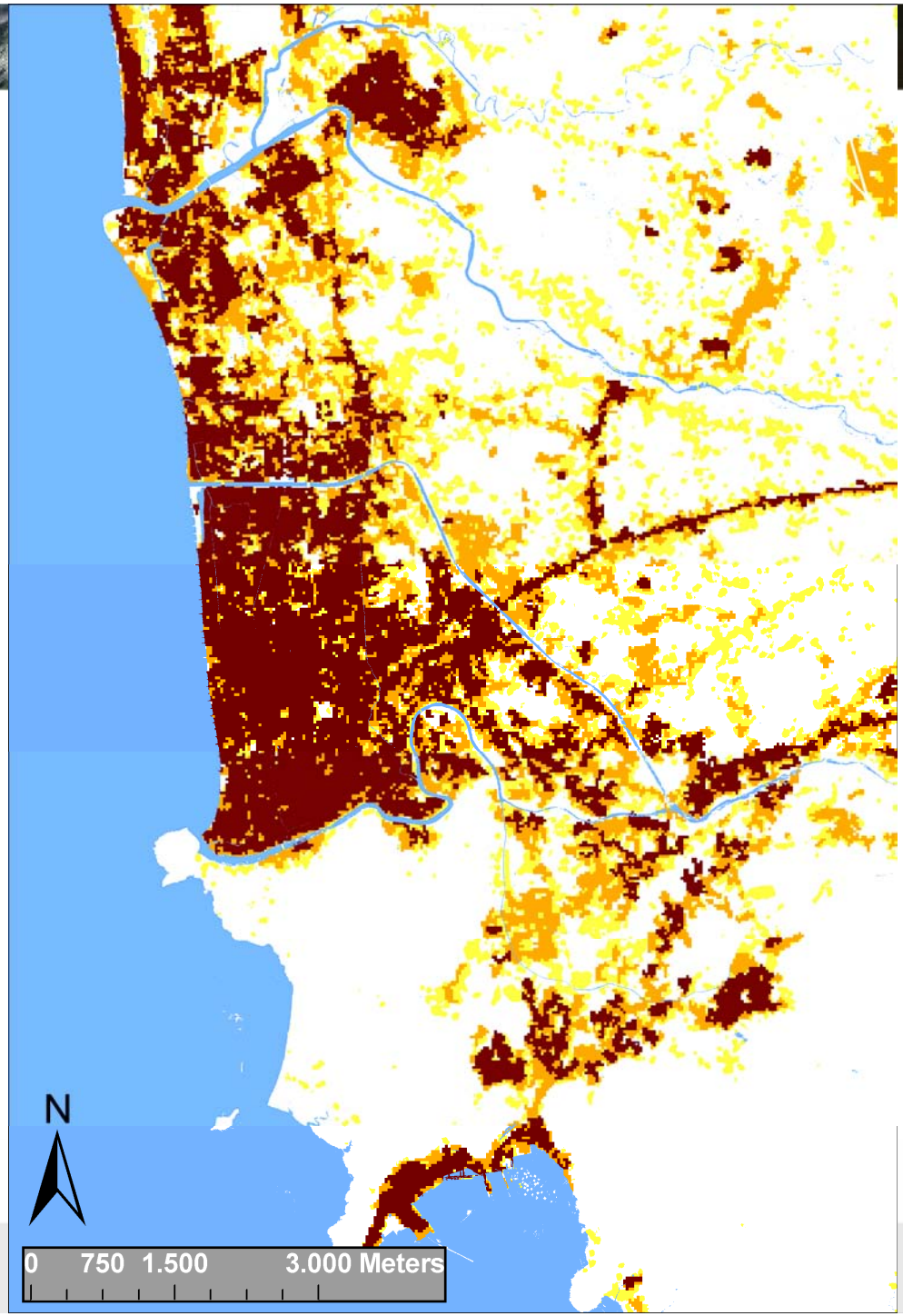
Where are exposed areas?

Urbanized areas

- 1989
- 2000
- 2009



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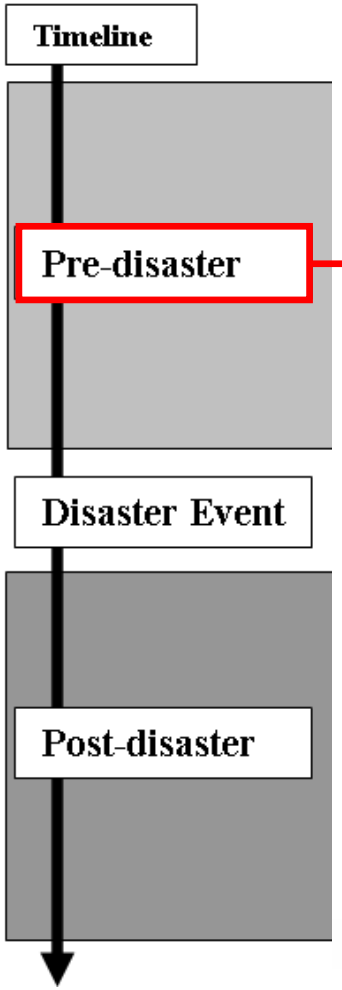

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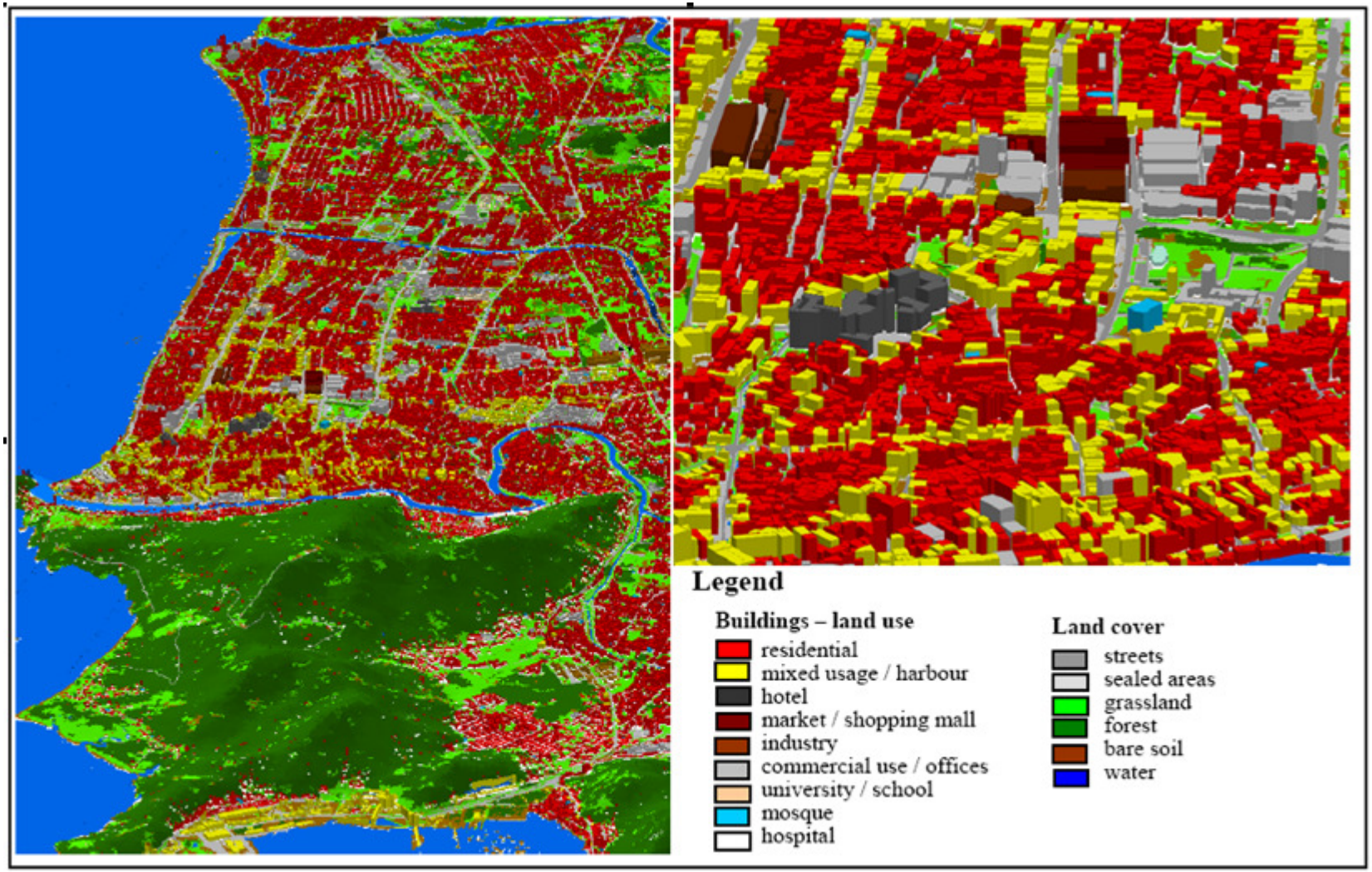
Land cover classification

Ikonos imagery, 2005

Three-dimensional city model



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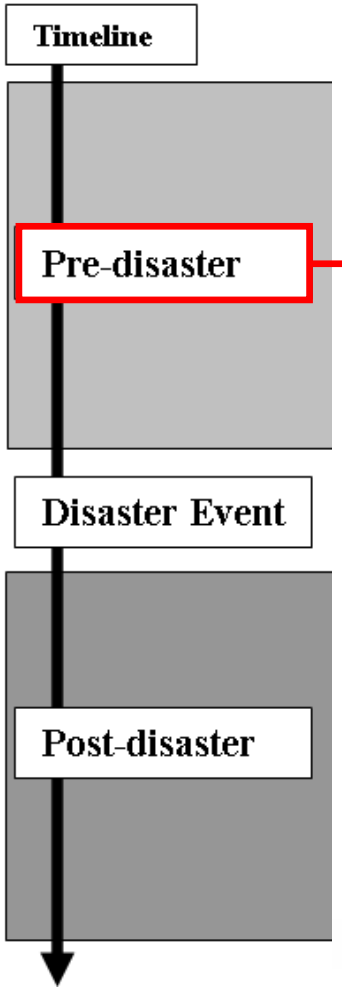

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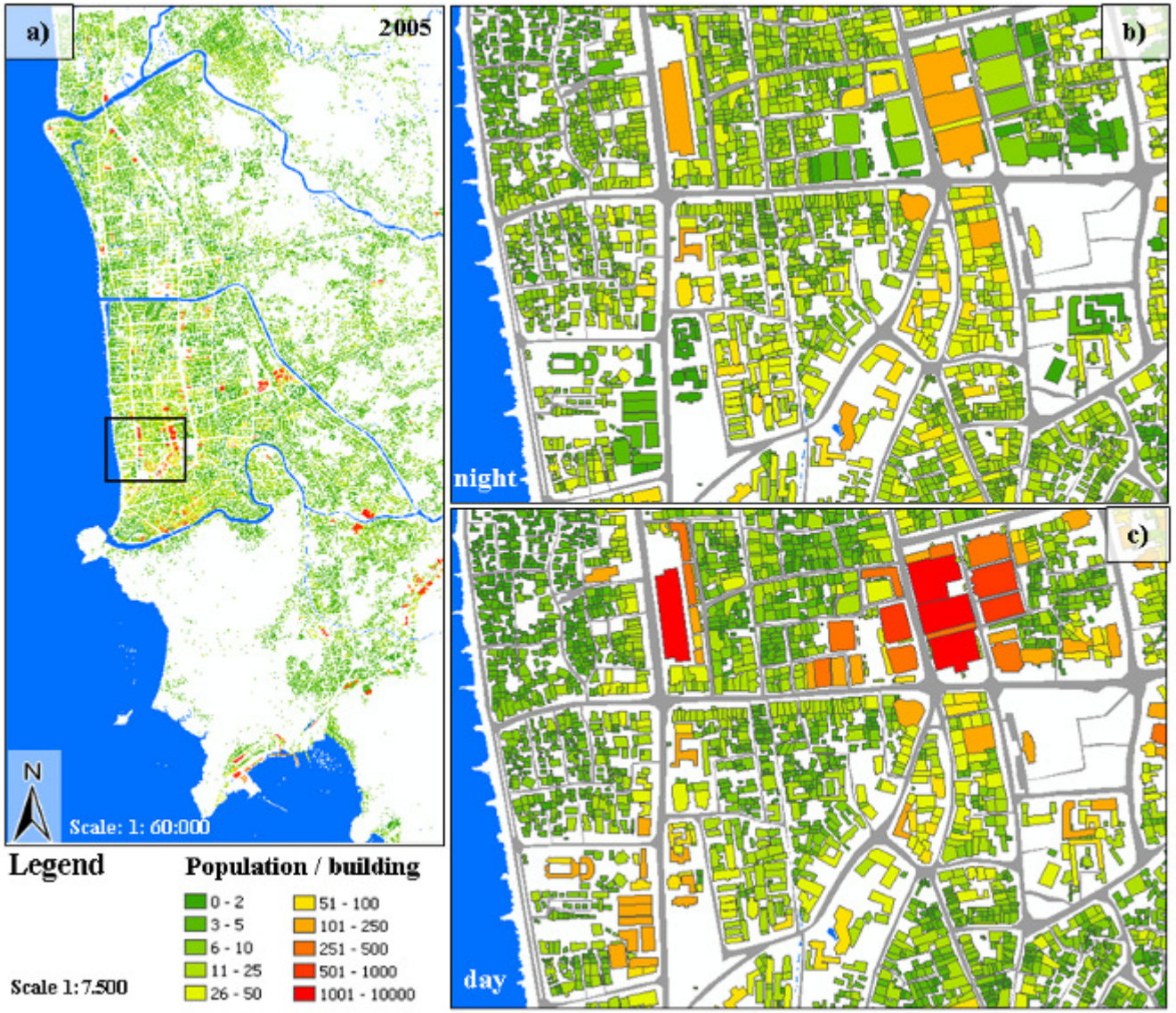
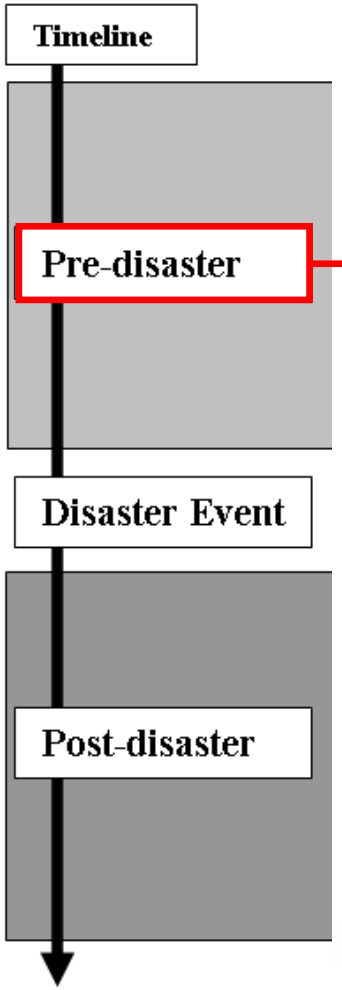

a)
2005
b)
night
c)
day
N
Scale: 1: 60:000
Legend
Population / building
0 - 2
3 - 5
6 - 10
11 - 25
26 - 50
51 - 100
101 - 250
251 - 500
501 - 1000
1001 - 10000
Scale 1:7.500

Risk = f(Hazard, Vulnerability)



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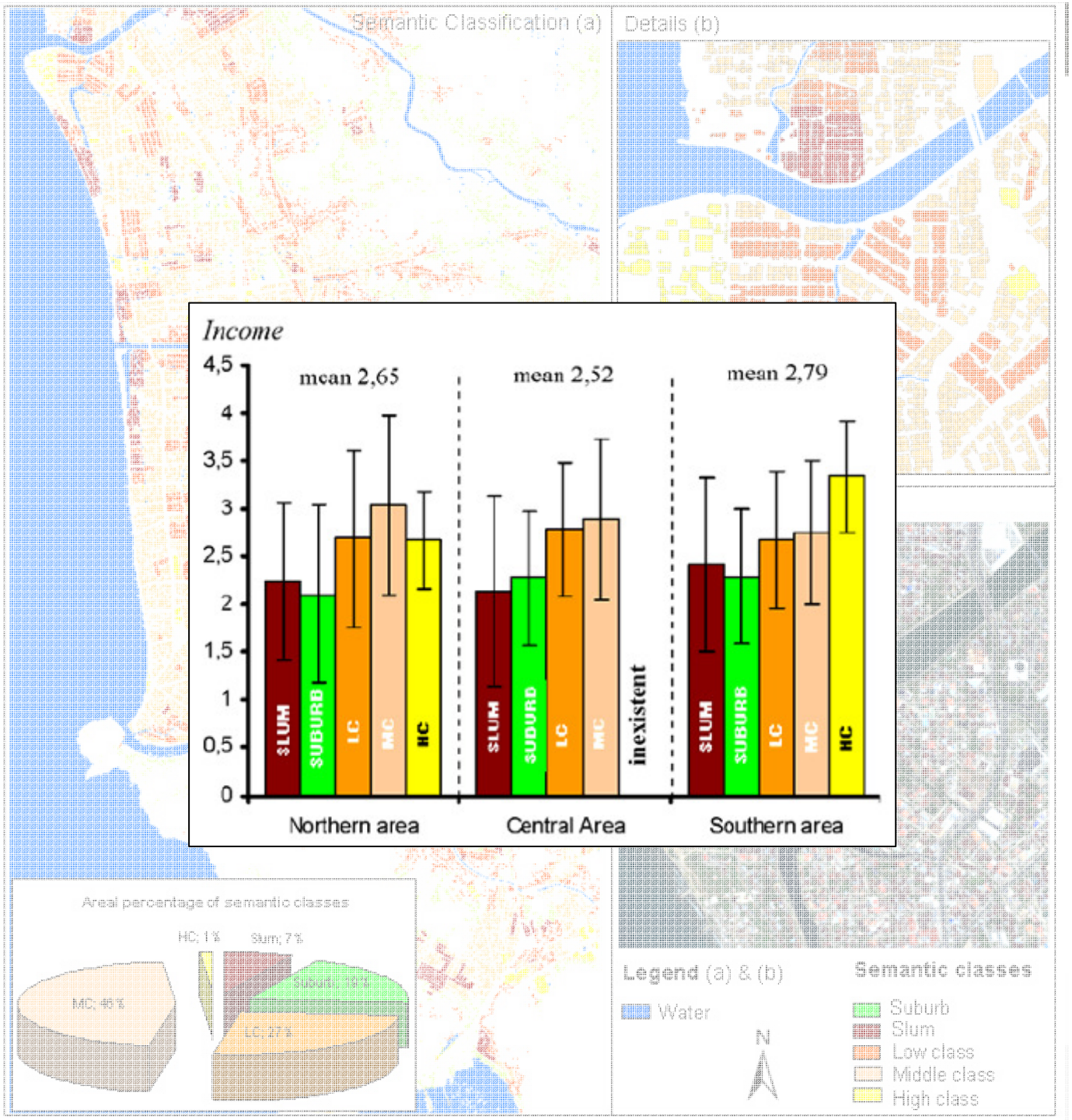
Semantic classification

- „Idea of semantic classification aims at a first assumed interrelation between physically homogeneous sectors within the complex urban morphology and the socioeconomic characteristics of people residing there“.

- Correlation of remotely sensed results and punctual field work data provided by UNU-EHS

Semantic classification



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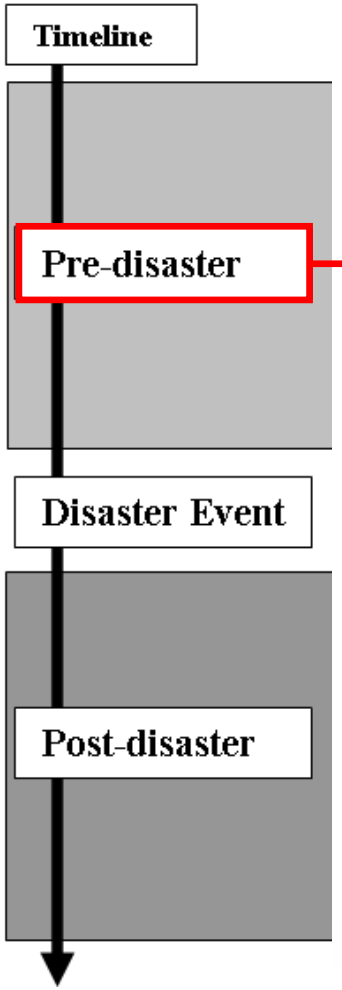

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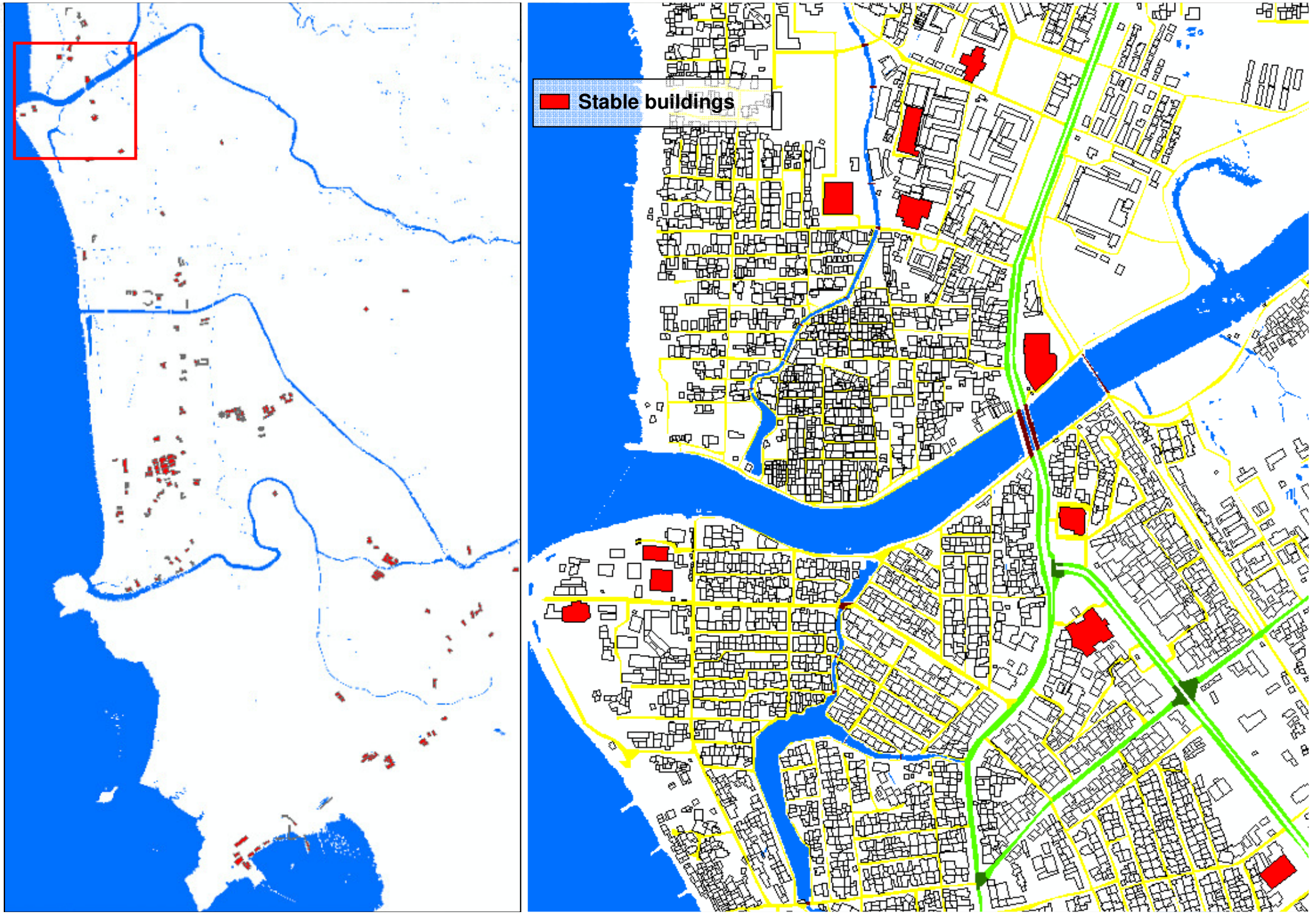
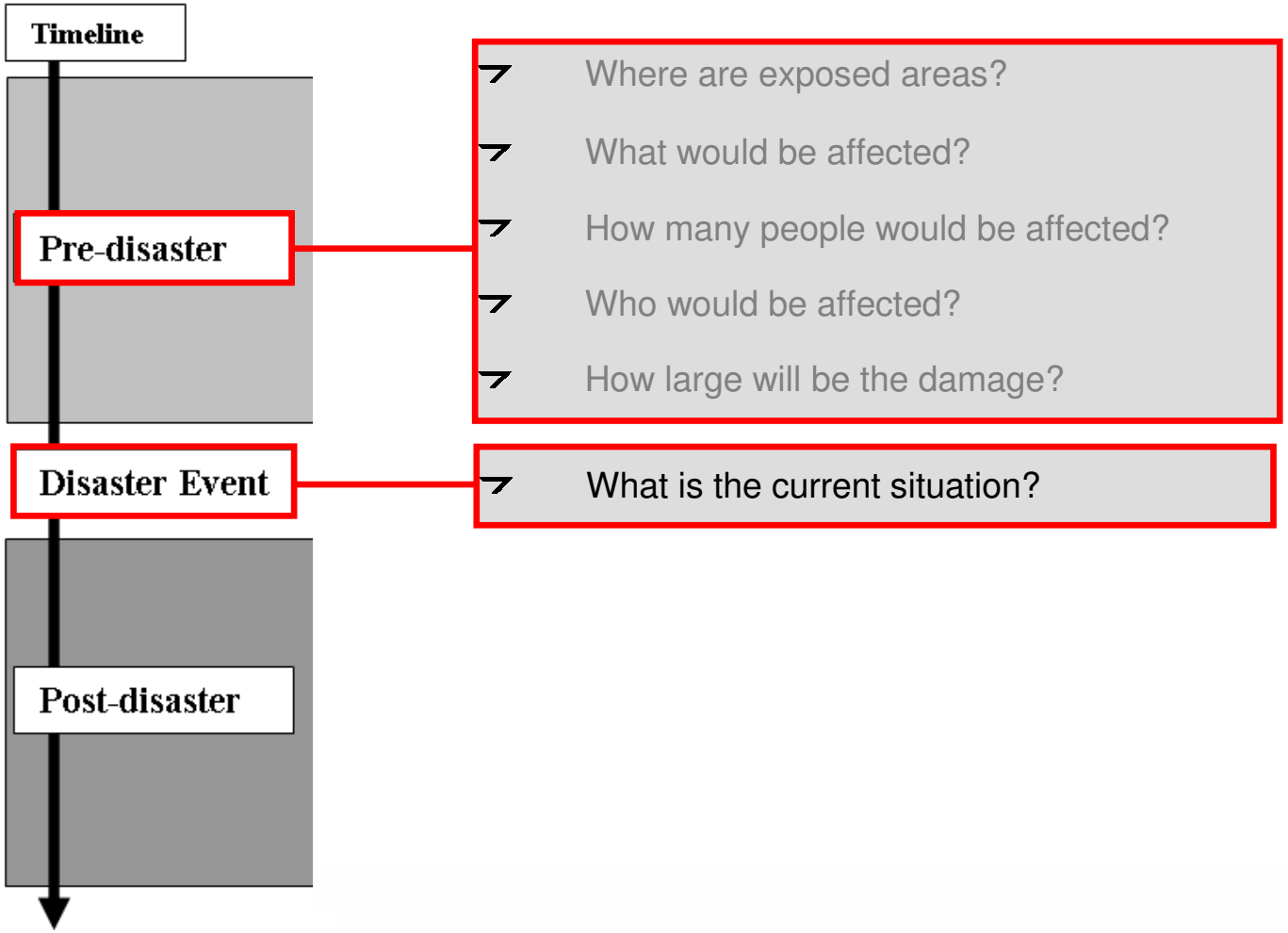
Interdisciplinary approach of civil engineering and remote sensing

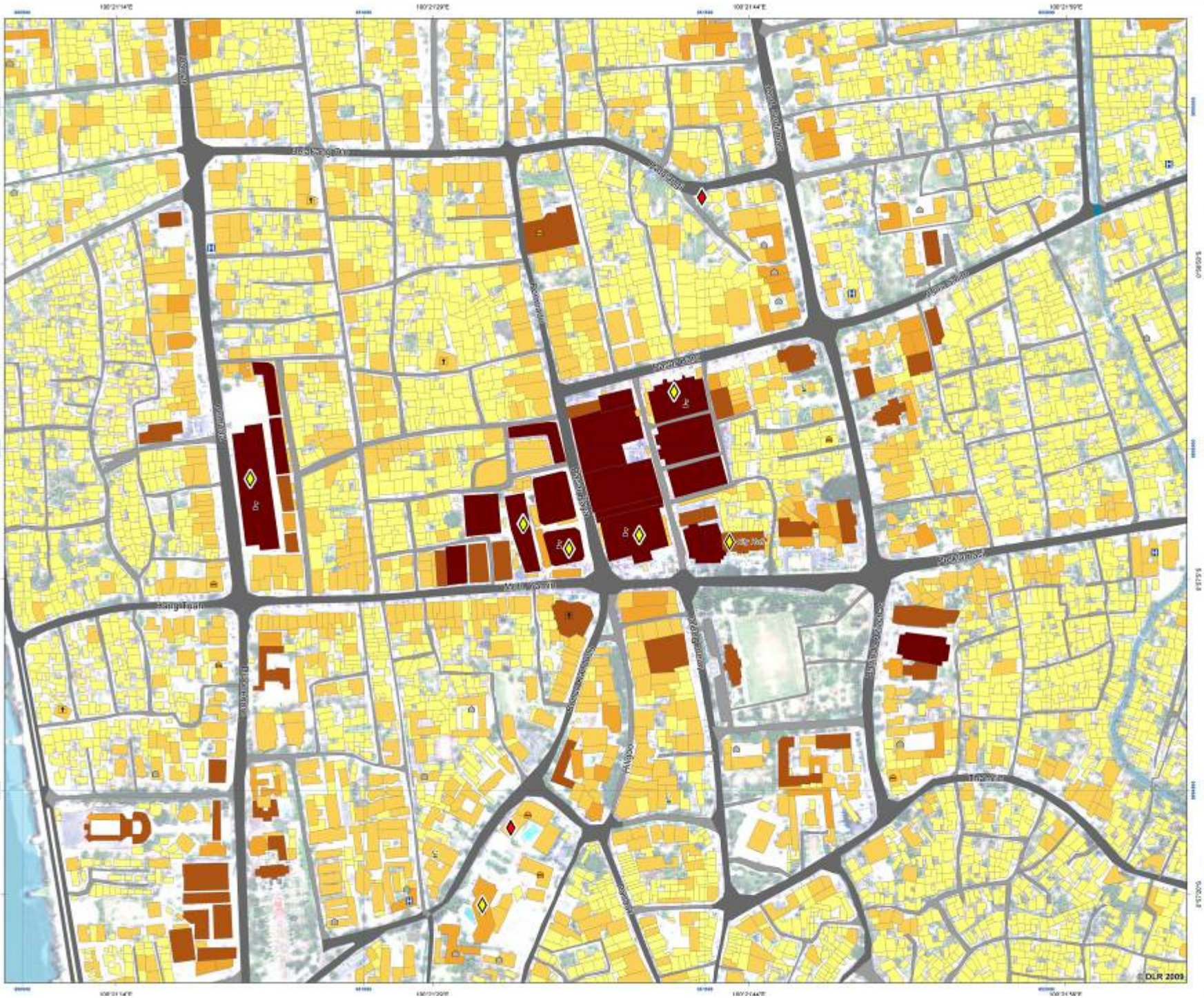
No.	Structural stability components	Weighting
1	Building height	4
2	Material of the main structural element	10
3	Material type of the wall	2
4	The foundation of main structures	5
5	Existence of a tie beam	7
6	Existence of column	8
7	Dimension of the main column	5
8	Main bending reinforcement of the main column	8
9	Diameter of the reinforcement of the main column	2
10	Number of reinforcement of the main column	2
11	Existence of stirrup	5
12	Stirrup diameter of the main column	2
13	Spacing of the stirrup of the main column	2
14	Average value of the Hammer test of the main column	12
15	Practical (Complimentary) column	2
16	Existence of main beam (for storey building)	4
17	Dimension of the main beam	2
18	Existence of perimeter (ring) beam	6
19	Material of the roof	2
20	Damage due to previous earthquake	4
21	Type of the builder	6


Stable buildings

Risk = f(Hazard, Vulnerability)



30.09.2009: Earthquake of magnitude 7.9



Charter Call ID 274, Product n° 06
GLIDE number: TS-2009-000211-IDN

INDONESIA - Padang

Population Density - Detail
Padang Center

Scale: 1:2,500

Location Diagram

Legend

Infrastructure
- Major road
- Minor road
- Bridge

Hydrography
- Water body

Population Density (people per building)
- < 10
- 10 - 50
- 51 - 100
- 101 - 250
- > 250

Points of interest
- Hospital
- Mosque
- Church
- School
- Market
- Hotel

Destroyed or damaged structures
- Completely destroyed
- Partly destroyed

Interpretation

On September 30, 2009 an earthquake of magnitude 7.6 and depth of 85 km occurred offshore of the highly populated Province of Sumatera Barat in Indonesia.
The city of Padang with about 900.000 inhabitants was strongly affected.
The map shows central Padang including buildings and important infrastructure. Number of people per building was derived by correlating population information and living space of each building at daytime. As the earthquake occurred in early evening hours, results may be inaccurate in some cases.
An IKONOS image acquired on April 12, 2009 was used as backdrop.

0 50 100 150 m

N

Projection & Grid Information

	Reference Grid	Geographic Grid
Projection:	UTM Zone 47 South	Geographic (LatLon)
Spheroid:	WGS 84	WGS 84
Datum:	WGS 84	WGS 84

Satellite Information

Satellite:	IKONOS
Pixel Size:	1m
Acquisition Date:	April 12, 2009
Georeferencing:	Orthorectification
Accuracy:	+/- 5 metres RMSE

Credits & Copyright

• IKONOS	© GeoEye 2009
• Vector Data	© DLR 2008, 2009 © BakosurtanaI 2009 © UNU-EHS 2009
• Street Names	© Google.Com 2009

Date:	October 2, 2009
Edition:	1.0
Print Dimensions @ 1:2,500:	ISO A1 size (841 x 594mm)

Map generation:

Center for Satellite Based Crisis Information
- Emergency Mapping & Disaster Monitoring -

German Remote Sensing Data Center
German Aerospace Center

DLR

Data and information provision:

GITEWS

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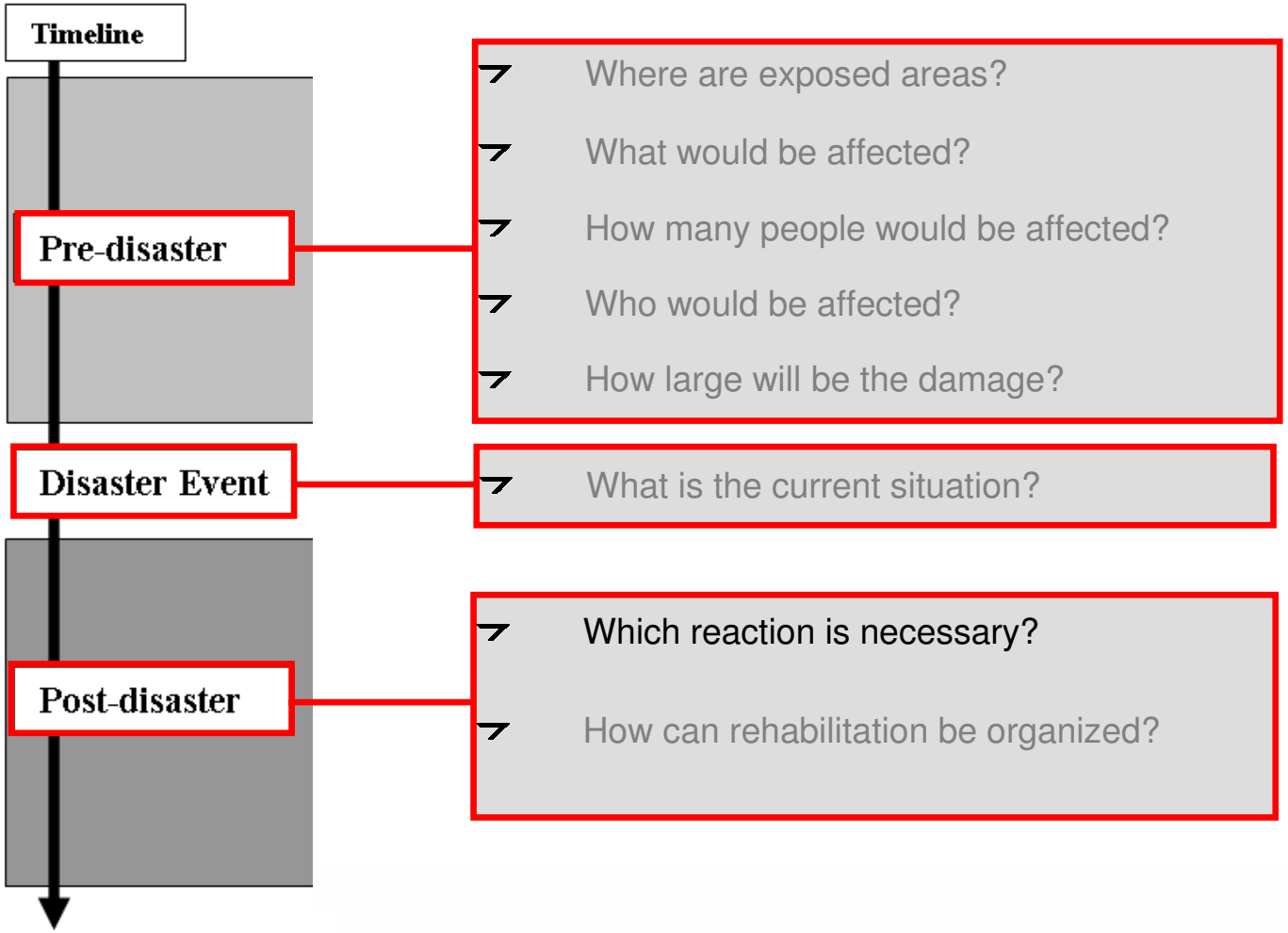
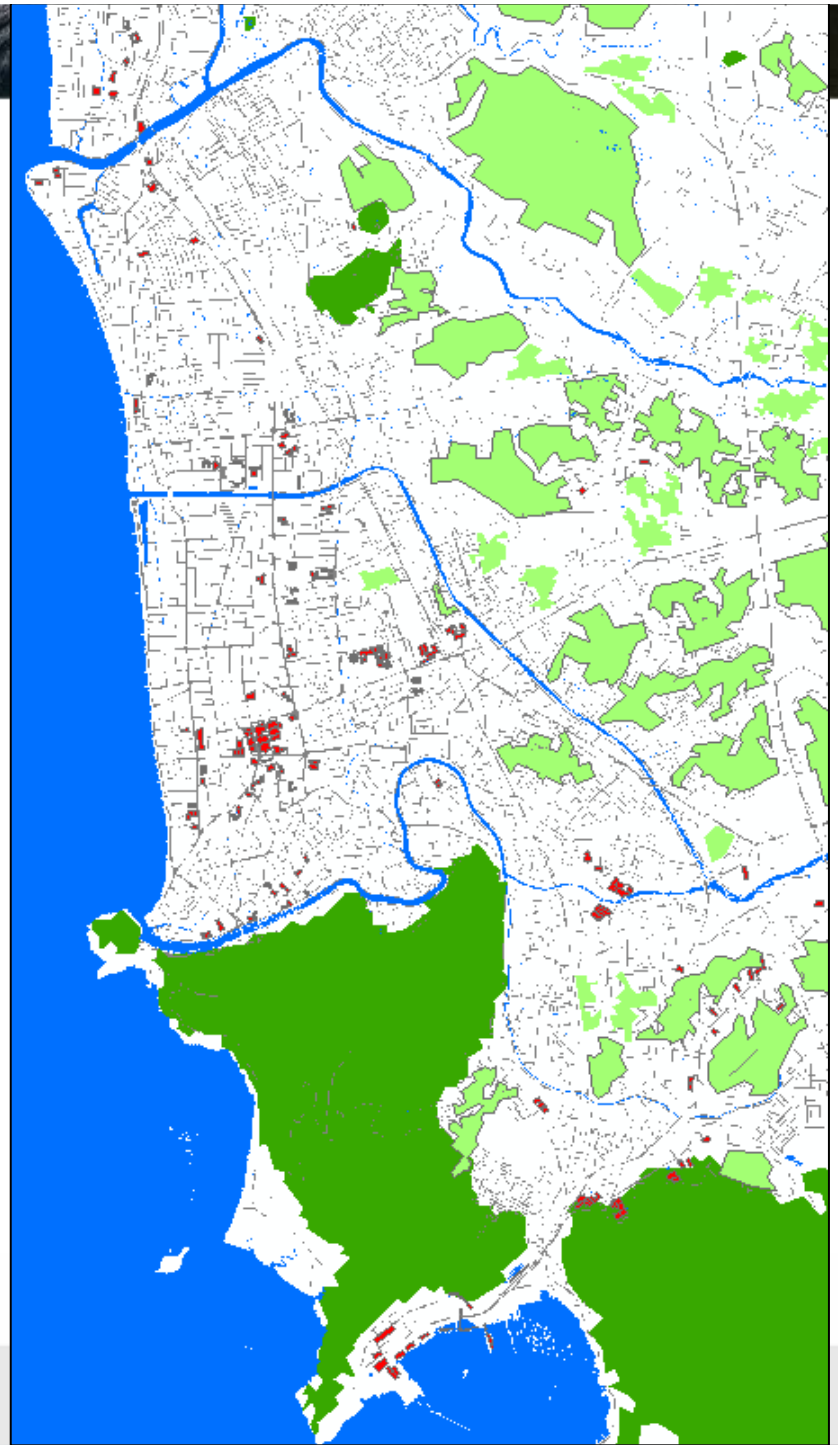


Which reaction is necessary?

- identification of rescue areas, transport lines, etc.



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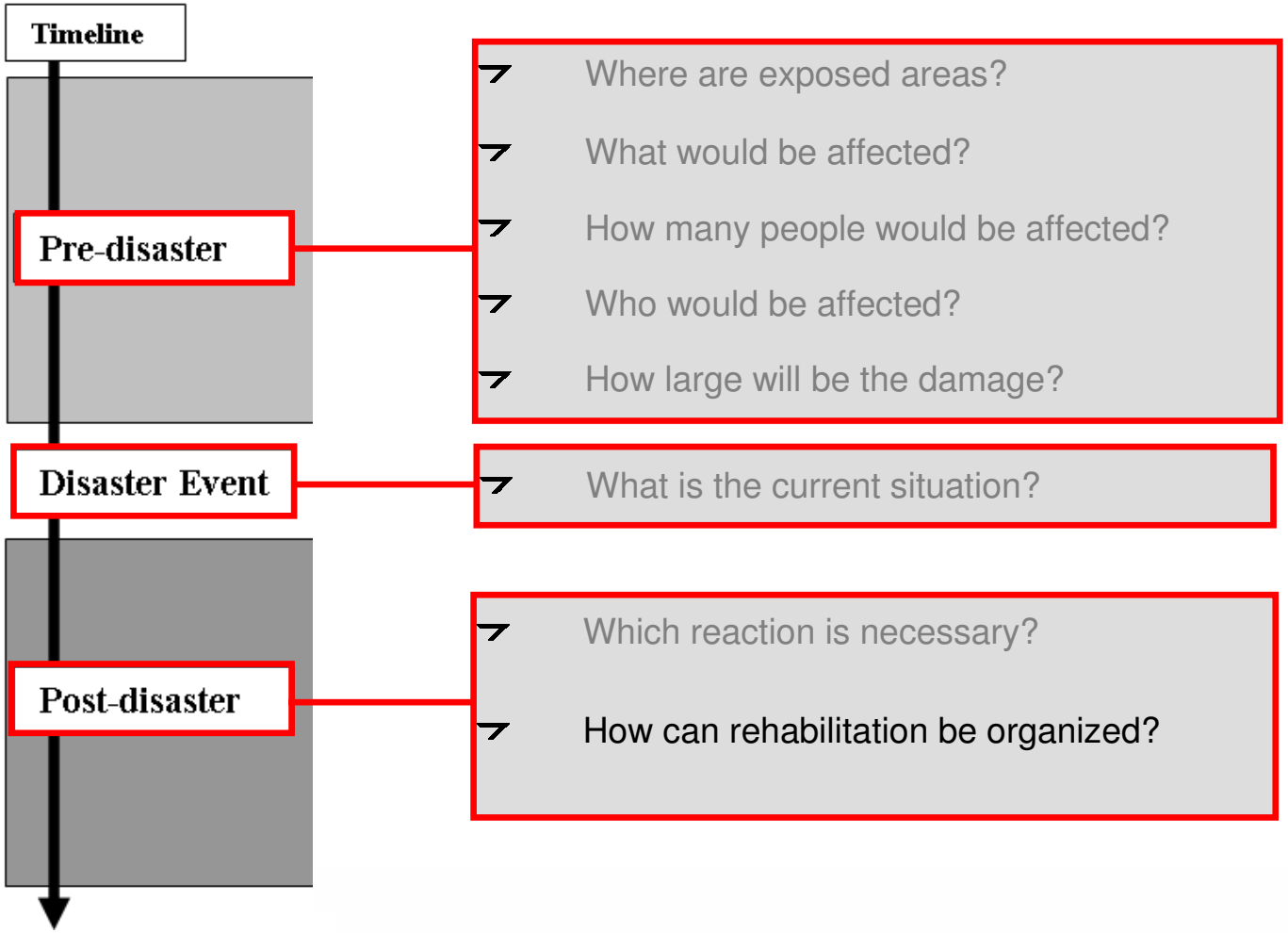
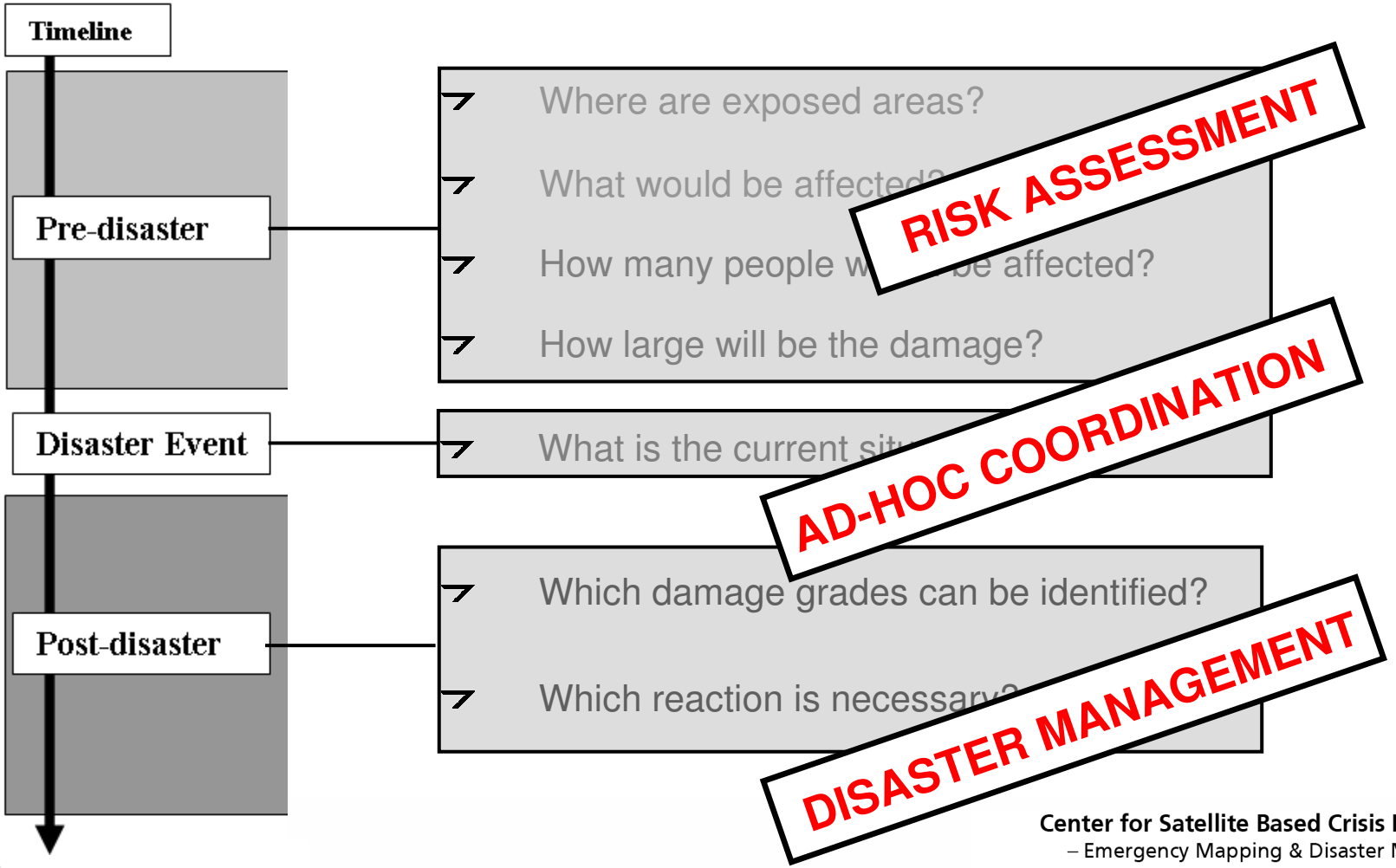
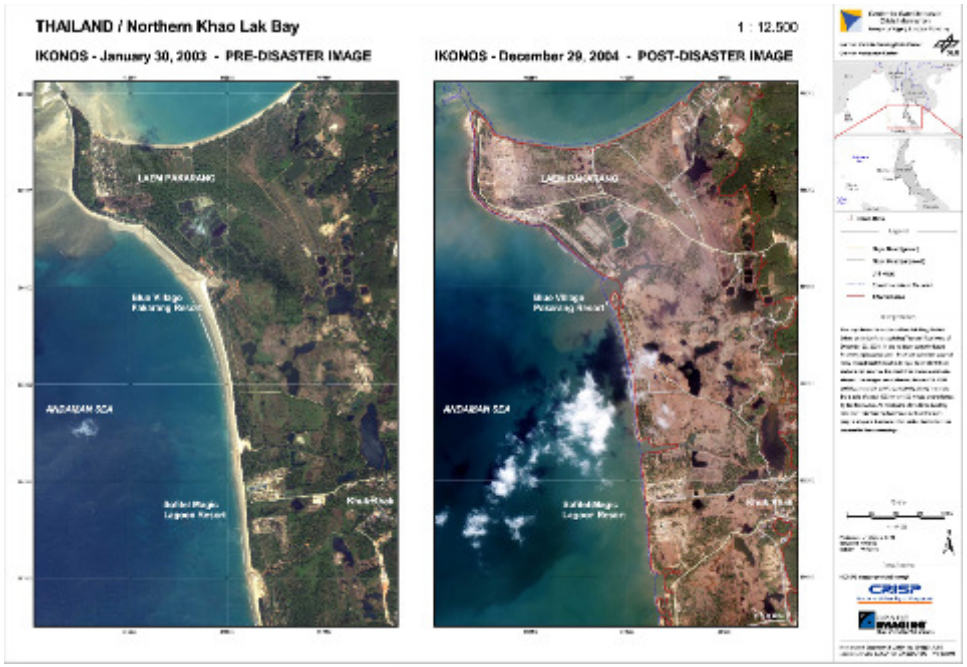


Summary – DLRs Earth Observation Activities for Risk- and Vulnerability Assessment





Center for Satellite Based Crisis Information
– Emergency Mapping & Disaster Monitoring –
a service of DFD

Thank you very much for your attention!