A resilience measures towards assessed urban flood management – CORFU project

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Outline

• Introduction

• Urban systems – scaling and mapping

• The resilience concept
  – Urban flood management and flood resilience
  – Evaluating flood resilience

• Conclusion
Urban flooding and urban systems
What have past events brought us?

- Undeveloped disaster culture - ‘zero myth’
- Traditional flood risk management
Water in the city?

Thailand – 2003

Switzerland – 2005

USA - 2001

France - 2003

Algeria - 2001

France - 2001
Urban systems – scaling and mapping

- Different developing modes
- Performing activities
- Mapping the city
  - Urban functions, Services
- Scaling the city
  - City, District, Block, Parcel

Number of centers

Monocentric Polycentric

Concentration

Dispersed
Urban systems – scaling and mapping

Urban Functions

City Services

- Housing
- Education
- Food
- Work
- Safety & Governance
- Health
- Religion
- Leisure & tourism

- Water
- Energy
- Solid Waste
- Communication
- Transportation

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Urban systems – scaling and mapping

- Parcel
- Block
- District
- City

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Example – city of Nice, France

Nice:
Old city, Medecin and Carabacel districts

Identification of location of urban functions and its transport infrastructures

Legend
- Governance & Safety
- Health
- Food
- Housing
- Working
- Mix (housing + working)
- Education
- Religion
- Leisure
- Study area boundary
- Building
- Primary road
- Secondary road
- Residential road
- Railway
- Tramway
- Waterbody
- Railway station
- Tramway station

Source:
Background map, Bing 2010
City of Nice
The resilience concept

- System from an ecological point of view doesn’t need to define the conditions which will provide some functionality and structure
- Driving approach to improve sustainability of urban systems to flooding processes (resilience concept)
- Resilience of physical and social components of urban system
- How to describe and assess flood risk in urban systems (city)?

[Diagram showing the relationship between carrying capacity, vulnerability, and resilience, with labels for maximum tolerable damage and measure and assess carrying capacity of a urban system]
The resilience concept

- Not a general definition for resilience
- Resilience of urban systems – to what? Up to what level?
- It can be defined by identifying what system attributes are to be resilient, and to what kind of disturbances.

3 Directions for preventing an urban system to become unstable

- Adjusting the thresholds of a system in respect to changes in response to flood waves
- Defining the level to which system is capable of self organizing
- Define the level to which system is able to build and increase capacity for learning and adaptation
Towards new environments

Convergence of processes & approaches

New urban environments based on urban cells integrating services (specific scale)

Energy grid / smart grid → Convergence/ Resilience

Water grid / water cell → Convergence/ Resilience

Risk management → Convergence/ Resilience

New urban environments based on urban cells integrating services (specific scale)
Urban flood management and flood resilience

- Measures taken to:
  - increase capacity building of human resources,
  - better land use management,
  - increased flood preparedness and
  - emergency measures that are taken during mostly usually and after flood event
Flood resilience measures

- Information
- Communication
- Education
- Spatial planning
- Building regulations
- Flood resistant buildings
- Cascading flood compartment
- Financial response
- Emergency response
- Emergency infrastructure
- Recovery

- Capacity building of human resources
- Land use control
- Flood preparedness
- Contingency measures

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Capacity building of human resources

Information
- Inundation maps
- Flood risk maps
- Info material

Education – communication
- Face-to-face learning
- Web-based learning
- Training
- Collaborative platforms
Land use control

Terrestrial buildings

Amphibious buildings

Inner dike line of flood compartment

Main levee line

adaptation to flooding by dry- and wet-proofing

adaptation to flooding by floatable buildings and buildings on piles
Flood preparedness

- Improved resistance of internal walls, floors, and fittings to improve the ability of materials to withstand the effects of internal flooding.
- Raise electrical sockets above flood level.
- Valves to prevent backflow.
- Flood barriers for doorways.
- Covers for airbrick and interwall vents.
- Improved resistance of walls and floors to prevent water ingress.

Flood Resistant home by Dion Seminara
Evaluating resilience

- Defining an index – Flood Resilience Index (FRI)
Evaluating resilience

- This data template is created based on several dimensions and its variables. It is in a form of a questionnaire survey.
- The calculated averaged WMI of one dimension is the Flood Resilience Index (FRI) for that dimension. Rating scales have assigned numbers 1, 2, 3, 4 corresponding to very low, low, high and very high respectively.

Based on qualitative assessment and it’s subjective

Sample for presentation of FRI in radar chart form (Rajib Shaw and IEDM Team (2009))
Flood resilience curve

- FRM strategies are based on concept ‘living with floods’
- Urban community are moving to a risk culture
Conclusion

• Necessary to analyze flooding processes in the context of urban spatial development

• The dynamic characteristic of resilience challenges the urban flood management

• Bring urban water management to the minds of citizens, talk to the stakeholders. They will define the most reasonable systems if they understand the challenge....

• Necessity for enrolment of new building procedures, emergency protocols for inhabitants, special medical services during and after disaster etc is significant.
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Thanks for your attention!

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