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Urban flood risk and hydrology

International Conference on Flood management education
in frame of the project **InterFloodCourse**
by the National University of Public Service, Faculty of Water Sciences
and University of Belgrade, Faculty of Civil Engineering
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Definition

Urbanization is

,,the process by which more and more people leave the countryside to live in cities."

(Cambridge Dictionary)

banization

1900 | 2 out of every 10 people lived in an urban area

1990 | 4 out of every 10 people lived in an urban area

2010 | 5 out of every 10 people lived in an urban area

2030 | 6 out of every 10 people will live in an urban area

50 | 7 out of every 10 people will live in an urban area

Defined by UN HABITAT as a city with a...

The Causes of Urbanisation

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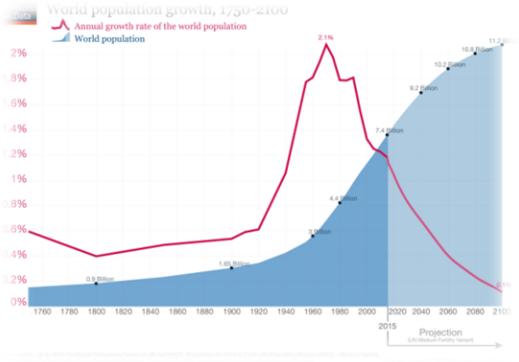
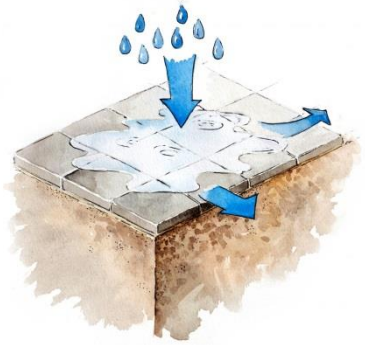
Basic characteristics of our present day cities





concentrated population,
huge, impermeable surfaces,
solid and liquid waste accumulation without treatment,
clogged drainage systems,
intensive economic activity,
extremely valuable infrastructure and property,
flats without hygiene and sanitation,
regional changes around the cities.

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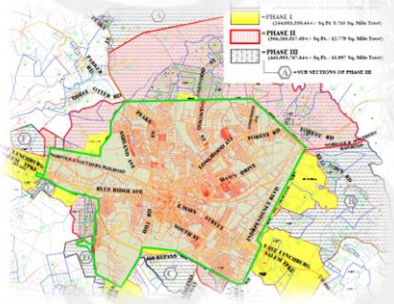


What is risk?

- risk is the **'effect of uncertainty on objectives**',
- **risks are future problems** that can be avoided or mitigated, rather than current ones that must be immediately addressed,
- **risk is the probable frequency and probable magnitude of future loss**.
- risk as the product of the probability of a hazard resulting in an adverse event, times the severity of the event,
- risk is defined as "the potential that a given threat will exploit vulnerabilities of an asset or group of assets and thereby cause harm to the organization",
- financial risk is often defined as the **unexpected variability or volatility of returns** and thus includes both potential worse-than-expected as well as better-than-expected returns,
- the related term "hazard" is used to **mean something that could cause harm,**
- risk is the **probability of damage causation of accidental events**,
- risk is quantity determination of the probability of the loss,
- **flood risk is defined as the probability of occurrence multiplied by its impact.**
- **flood risk means the combination of the probability of a flood event and of the potential adverse consequences for human health, the environment, cultural heritage and economic activity associated with a flood event**

Explanation of the urban flood risk

Meteorological factors

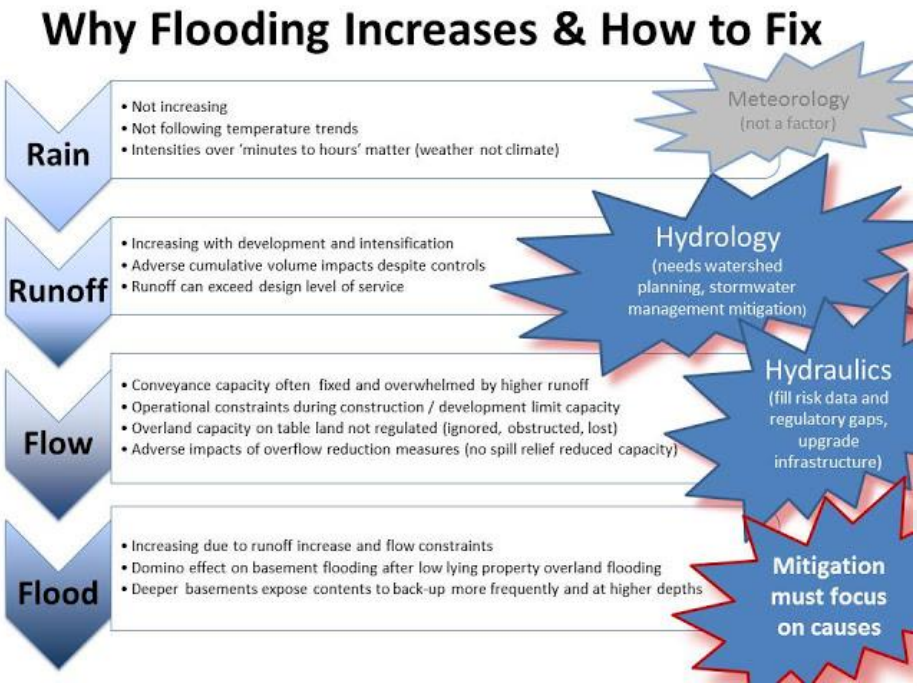
- rainfall
- cyclonic storms,
- small-sized storms,
- temperature,
- snowfall and melting.

Hydrologycal factors

- the moisture content of the soil,
- ground water level
- quantity of the natural surface infiltration,
- the cross-section of a bed and the roughness,
- concerted run-off from the different parts of the river basin.

Human factors

- the changing of the land use due to the urbanization (increase run-off),
- the use of the floodplains (restrain the natural flowing),
- the unprofessional and the non-sustained infrastructure,
- the rainfall on the upper part of the river basin contribute to the flood peaks,
- the effects of the climate change onto the extent and frequency of floods,
- urban microclimate may bring precipitation.



http://www.cityfloodmap.com/2015/11/why-flood-damages-are-increasing-in.html

(Source: WMO/GWP Associated programme on flood management, urban flood risk management, A tool for integrated flood management, associated programme on flood management, March 2008)

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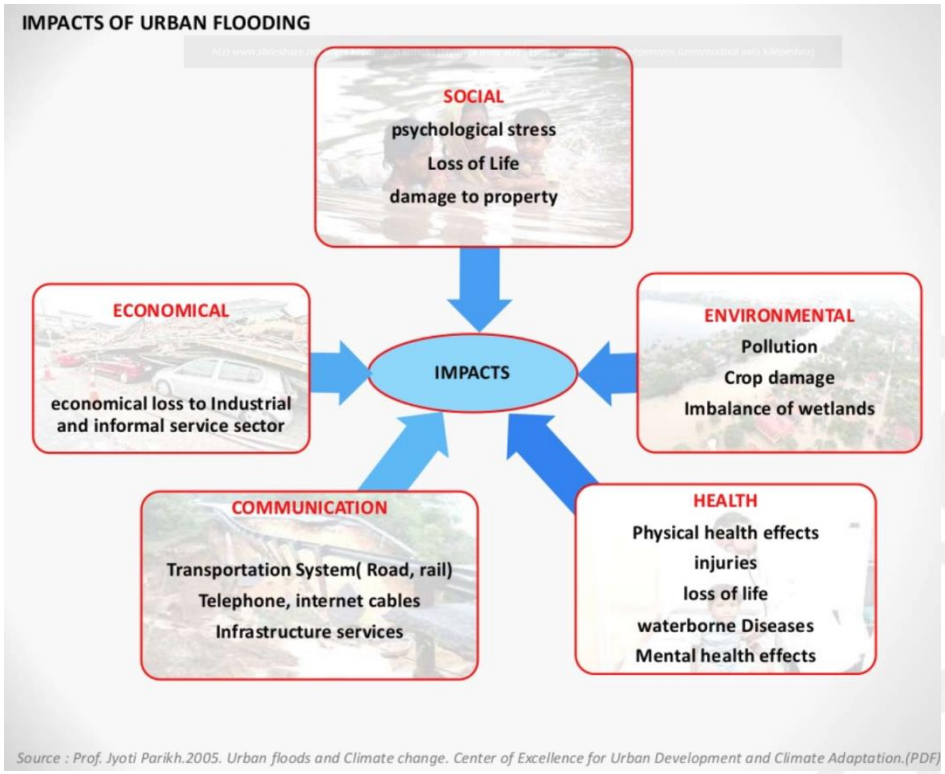


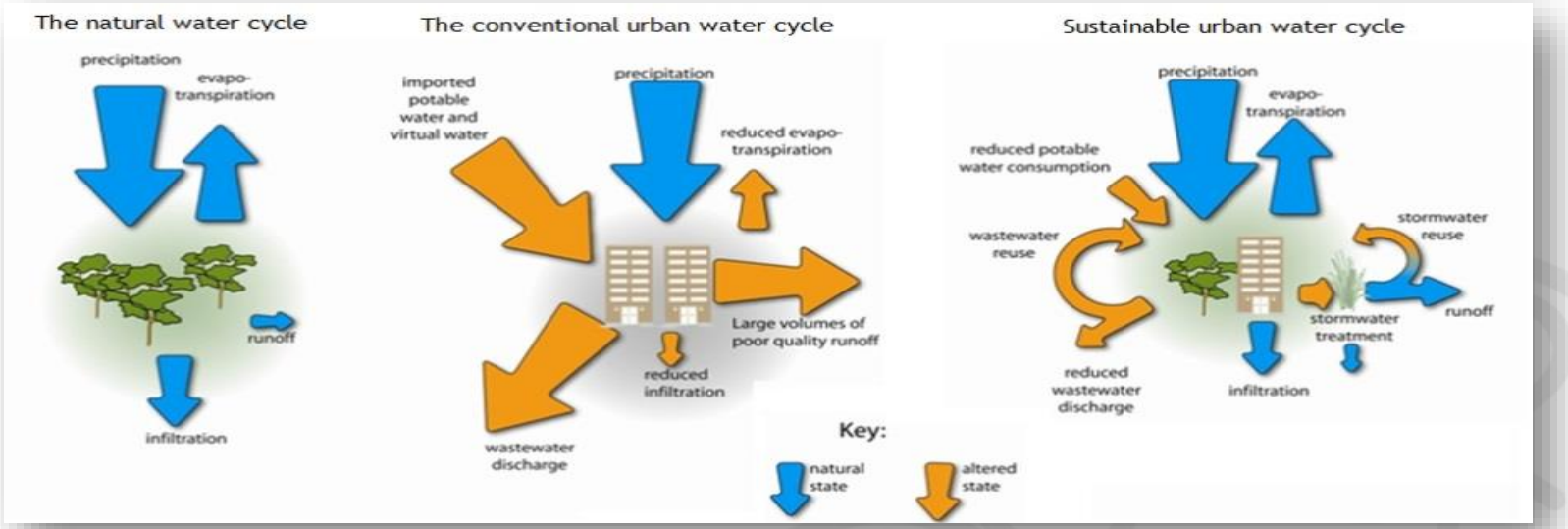
The effects of the urban floods

1. Exposure

2. Vulnerability
   - the physical vulnerability,
   - the unfavourable organizational and economic conditions, and
   - the conformation and responsibility.

3. Institutional requirements
   - existing shortcomings
   - institutional arrangements
   - participation in the planning process of the measures

Urban hydrology - Urban storm water management - Urban hydrological cycle



Integrated Urban Water Management includes the following activities:

- Improve water supply and consumption efficiency,
- Ensure adequate water quality for drinking water as well as wastewater treatment through the use of Environmentally Sound Technologies (ESTs) and preventive management practices,
- Utilise alternative water sources, including rainwater and reclaimed and treated water,
- Engage communities to reflect their needs and knowledge for water management,
- Establish and implement policies and strategies to facilitate the above activities,
- Support capacity development of personnel and institutions that are engaged in IUWM,
- Improve economic efficiency of services to sustain operations and investments for water, wastewater, and stormwater management.

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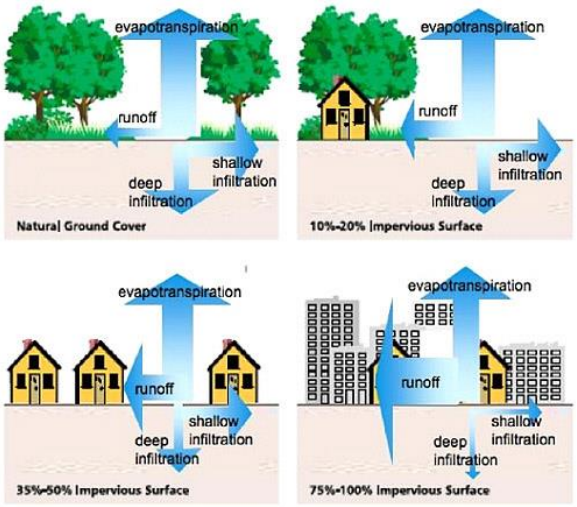

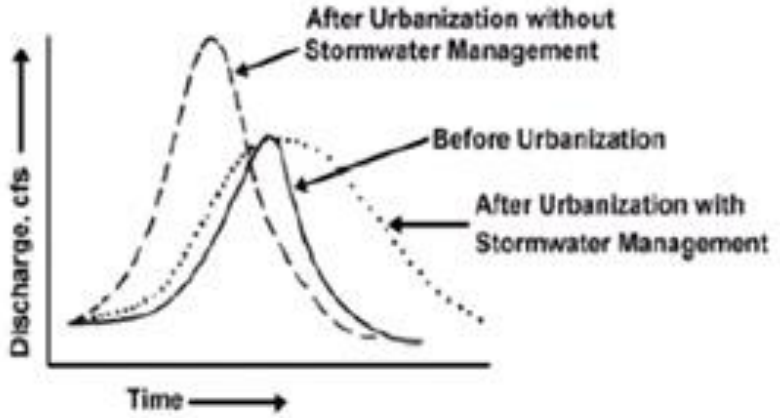

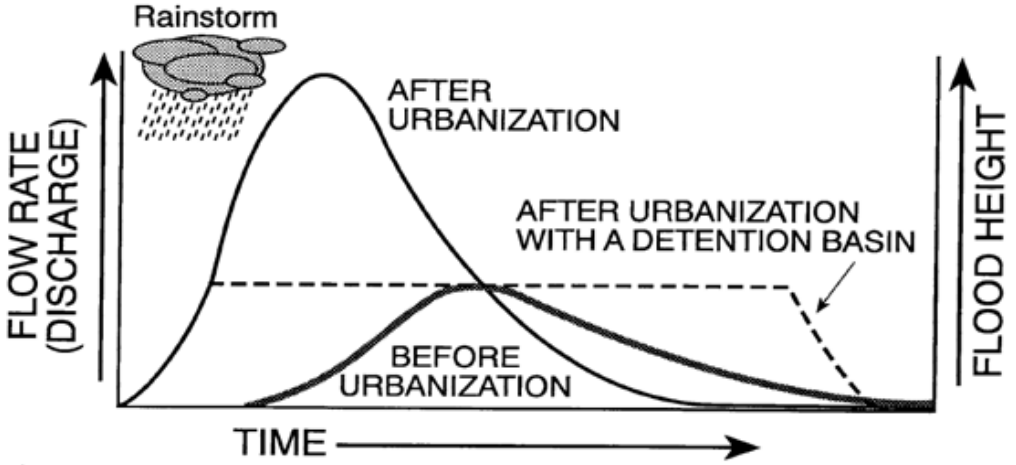

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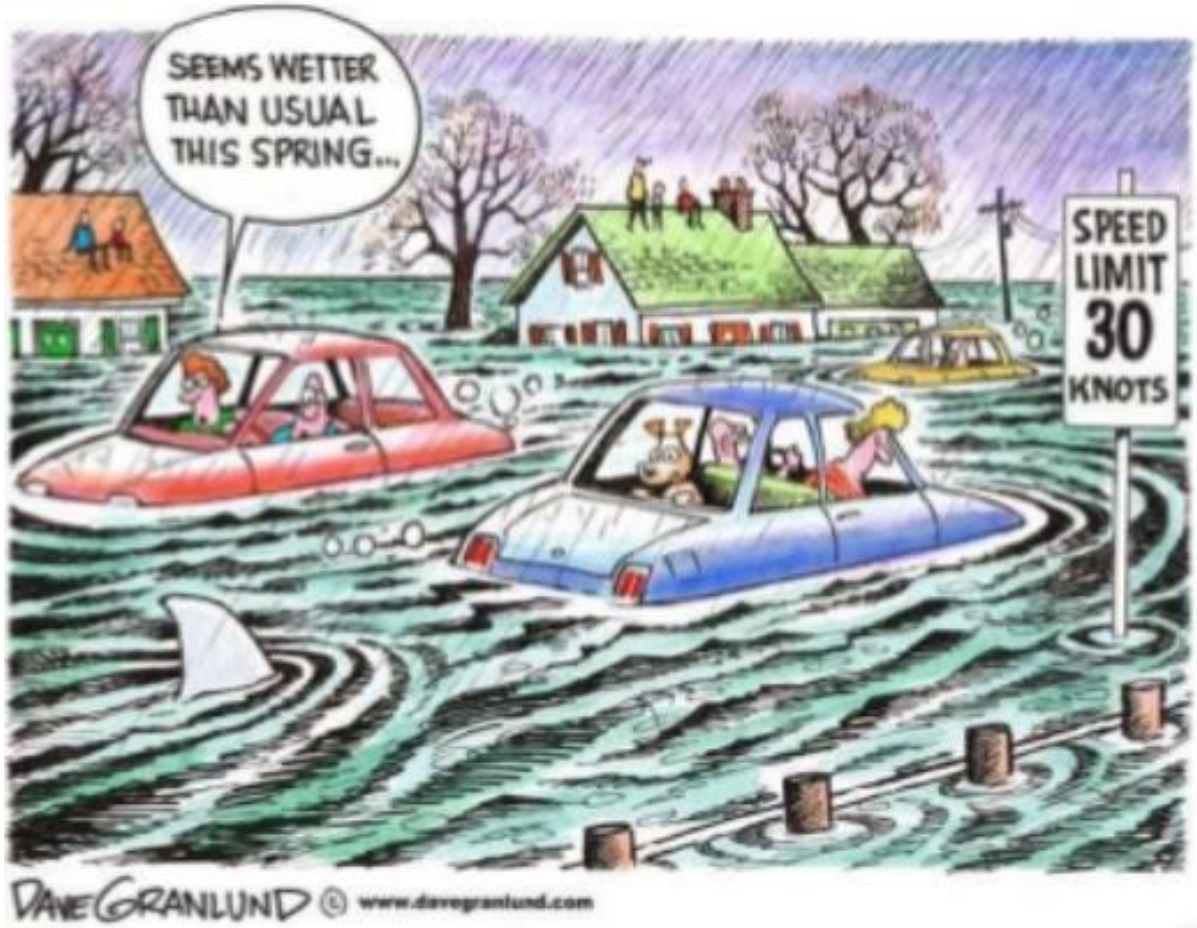
Conclusions and recommendations



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Thank you very much
of your kind attention!

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