



# Cartographical Challenges in Disaster Risk Reduction Efforts

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To be in.....

Science and Applications

Basic Research and contemporary  
Applied Research

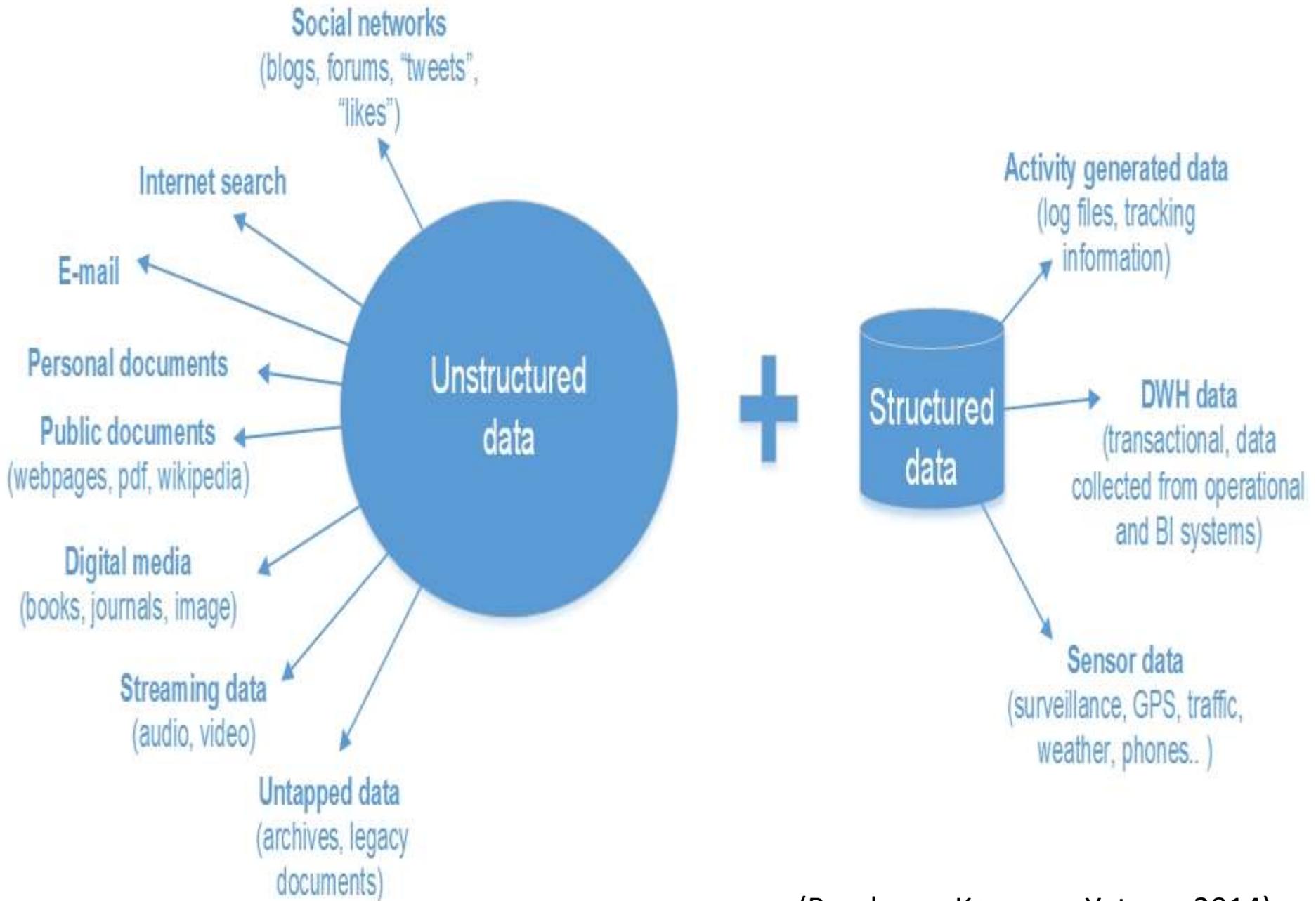
Houston, Shenzhen, Katrina hurricane,  
Irma hurricane, Switzerland landslides,....

# **1. Big Data: buzz word or reality?**

Information superhighway,

SDI's,

System of Systems concepts (GEO, GEOSS,..)



(Bandrova, Konecny, Yotova, 2014)

Zucker, S., (2014) :

“a popular **term** used to describe the exponential growth and availability of data, both structured and unstructured” .

**“There is no rigorous definition of big data.** Initially the idea was that the volume of information had grown so large that the quantity being examined no longer fit into the memory that computers use for processing, so engineers needed to revamp the tools they used for analyzing it all” (Mayer-Schönberger V., Cukier K., 2013).

“Big Data” BD:

It is the **ability of society to harness information in novel ways to produce useful insights or goods** and services of significant value .

The **bridge between BD and the society cannot be done only by the existing technologies and computers.**

The presence of professionals should be more active in the process of transforming BD in useable variant to users and society.

**BD needs to establish teams with people coming from branches which did not work together to now.**

Design new complex approaches.

Geographers (physical and human and economical ones), cartographers and geoinformatics + RS want to add their knowledge to enhance such linkages and **develop paradigm for and supportive approaches of higher level usage of BD** in everyday decision making, solving problems and improvement of life of inhabitants.

**Smart? What Does it Mean?**

Influential firms, Jack Dangermond, Mike Goodchild, Trimble, etc., are proclaiming that if things are collected together it would guarantee smartness.

**Is really process giving new technologies together enough for smart solutions?**

**And what does mean to be smart?**

## **2. ICA Agenda: from DRM to DRR (Sendai 2015)**

**.....based on SDIs, INSPIRE,  
COPERNICUS, initiative U.N. GGIM**

# Disaster Management Cycle

## Prevention and Mitigation

- Hazard prediction and modeling
- Risk assessment and mapping
- Spatial Planning
- Structural & non structural measures
- Public Awareness & Education..

## Preparedness

- Scenarios development
- Emergency Planning
- Training



Disasters



## Alert

- Real time monitoring & forecasting
- Early warning
- Secure & dependable telecom
- Scenario identification
- all media alarm

## Post Disaster

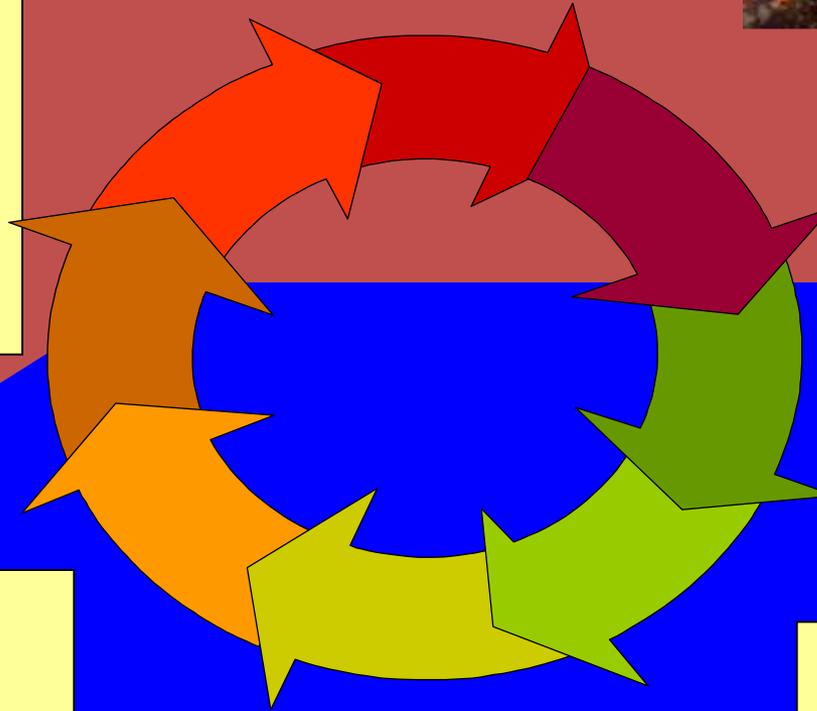
- Lessons learnt
- Scenario update
- Socio-economic and environmental impact assessment
- Spatial (re)planning

## Recovery

- Early damage assessment
- Re-establishing life-lines transport & communication infrastructure

## Response

- Dispatching of resources
- Emergency telecom
- Situational awareness
- Command control coordination
- Information dissemination
- Emergency healthcare





HFA

# Hyogo Framework for Action 2005-2015:

Building the Resilience of Nations  
and Communities to Disasters

## **Priorities for action – UN DRR Sendai**

### **Priority 1:**

**Understanding disaster risk.**

### **Priority 2:**

**Strengthening disaster risk governance to manage disaster risk.**

### **Priority 3:**

**Investing in disaster risk reduction for resilience.**

### **Priority 4:**

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

## **Priority 1:**

### **Understanding disaster risk. National and local level**

(c) To develop, periodically update and disseminate, as appropriate, location-based disaster risk information,

**including risk maps,**

to decision makers, the general public and communities

at risk of exposure to disaster in an appropriate format by using, as applicable, geospatial information technology;

The vision of disaster risk reduction:

building resilience into sustainable development

### The six principles of sustainability

[www.colorado.edu/hazards/publications/informer/infrmr3/informer3c.htm](http://www.colorado.edu/hazards/publications/informer/infrmr3/informer3c.htm)



### **3. New trends influencing cartography: VGI and VGE**

VGI Volunteer Geographic Information

**How to manage volunteer geographic information?  
Chaos or help?**

Volunteer geographic information **VGI**:

“The terms, “*crowdsourcing*” and “*collective intelligence*” draw attention to the notion that the collective contribution of a number of individuals may be more reliable than those of any one individual.

The term VGI refers specifically to geographic information and to the contrast between the actions of amateurs and those of authoritative agencies.” Goodchild (2009, p. 18)

# Traditional SDI versus VGI

(podle McDougall, GSDI 12, Singapore)

	<b>Government-centric SDI</b>	<b>User-centric VGI</b>
<b>SDI Structure</b>	<b>Highly structured</b>	<b>Ad-hoc and simplistic</b>
<b>Standards</b>	<b>Close adherence to standards</b>	<b>Loose based on communication standards</b>
<b>Maturity of data holdings</b>	<b>Highly mature</b>	<b>New and current but variable</b>
<b>Spatial Accuracy</b>	<b>Complying with mapping standards</b>	<b>Variable</b>
<b>Metadata</b>	<b>Contain detailed metadata</b>	<b>Few standards – ICT based</b>
<b>Openness</b>	<b>Highly controlled</b>	<b>Often new data sets</b>
<b>Data Update</b>	<b>Often slow and overly bureaucratic</b>	<b>Fast and flexible</b>
<b>Potential data maintenance and collection base</b>	<b>Limited to the budget and staffing</b>	<b>Potentially a huge user and contributor base</b>
<b>Adaptability</b>	<b>Low – retrained by mandate, resources and bureaucracy</b>	<b>High</b>

*H.J. Miller and M.F. Goodchild (2014) **Data-driven geography**. GeoJournal. DOI: 10.1007/s10708-014-9602-6.*

„The context for geographic research has shifted **from a data-scarce to a data-rich environment**,

in which the most fundamental changes are not just the volume of data, but the **variety and the velocity** at which we can capture georeferenced data;

**Michael Batty** first used the term **‘virtual geography’** in **1997 (Batty 1997)**, the term **‘Virtual Geographic Environments’ (VGEs)** was formally proposed by **Lin and Gong** as a concrete study object of the discipline of virtual geography (Lin and Gong, 2001).

Combined with the two terms above, a VGE can be regarded as a typical virtual-based geographic environment that allows users **to ‘feel the geographic scenarios in person’** and **‘know the geographic laws beyond reality’** (Lin et al. 2013b).

Lin et al. (2013a, 2013b) re-described their proposed **VGEs as a new generation of geographic analysis and computer-aided geographic experiment tools.**

VGEs are **'a type of typical web- and computer-based geographic environment'** built **'by merging geographic knowledge, computer technology, virtual reality technology, network technology, and geographic information technology', .....**

.... and ‘with the objective of **providing open, digital windows into geographic environments** in the physical world,  
to allow users to ‘**feel it in person**’ by a means for **augmenting the senses** and to ‘**know it beyond reality**’ through geographic phenomena **simulation** and **collaborative** geographic experiments’.

VGE will ‘**contribute to human understanding of the geographic world and assist in solving geographic problems at a deeper level**’ (Lin et al. 2013b). .....  
definition of a VGE has a closer relationship to geography.

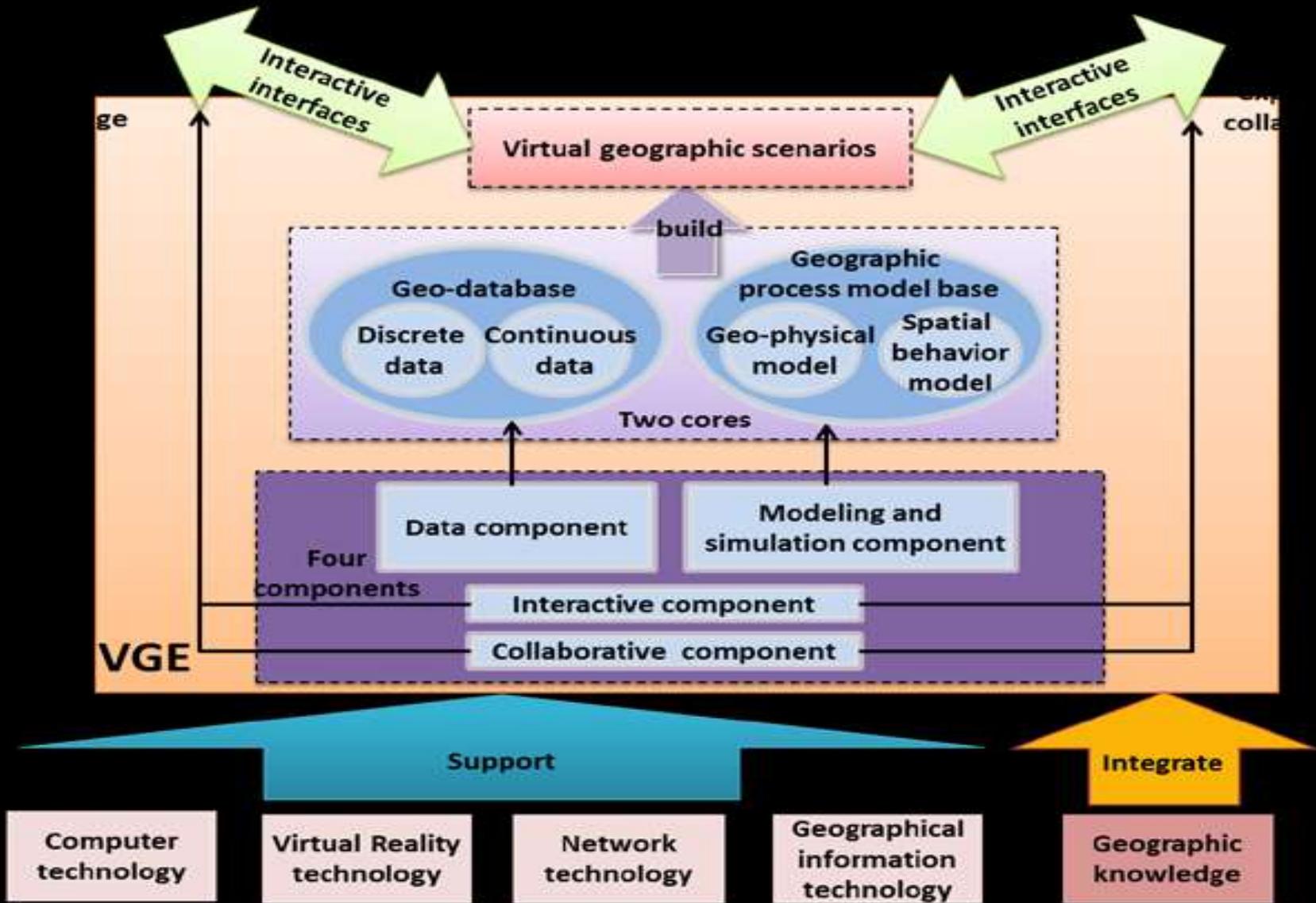


Figure 1. Current structure of a complete VGE (modified from Lin et al. 2013b)

VGE based on these foundational technologies and factors,

**four components** (i.e., the data component, modeling and simulation component, interactive component, and collaborative component) **and two cores** (i.e., a geo-database and a geographic process model base) should be equipped within a complete VGE. Finally the virtual geographic scenarios are built for the **public immersion and providing their spatial knowledge** and for the researchers conducting collaborative geographic experiments.

## **4. Trends inside of cartography**



**SUCCESSFUL  
RESPONSE  
STARTS  
WITH A MAP**



Improving  
Geospatial Support  
for Disaster  
Management

NATIONAL RESEARCH COUNCIL  
OF THE NATIONAL ACADEMIES

**Successful  
Response Starts  
with a Map:  
Improving  
Geospatial  
Support for  
Disaster  
Management, NRC  
(2007)**

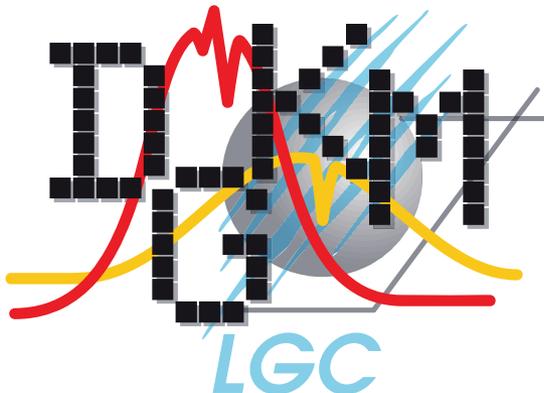
# DYNAMIC GEOVISUALIZATION

in

# CRISES MANAGEMENT

CONTEXT and ADAPTIVE MAPPING

Prof. RNDr. Milan KONEČNÝ, CSc.  
and Team



# ADAPTIVE CARTOGRAPHY

## Adaptability of Cartographic Representation

### Context-Based Cartography

The subject-matter of adaptive cartography is **automatic creation of correct geodata visualization with regard to situation, purpose and the user.**

Adaptive maps are still maps in the conventional sense – they are correct and well-readable medium for transfer of spatial information. The user controls map modifications ***indirectly via modification of context.***

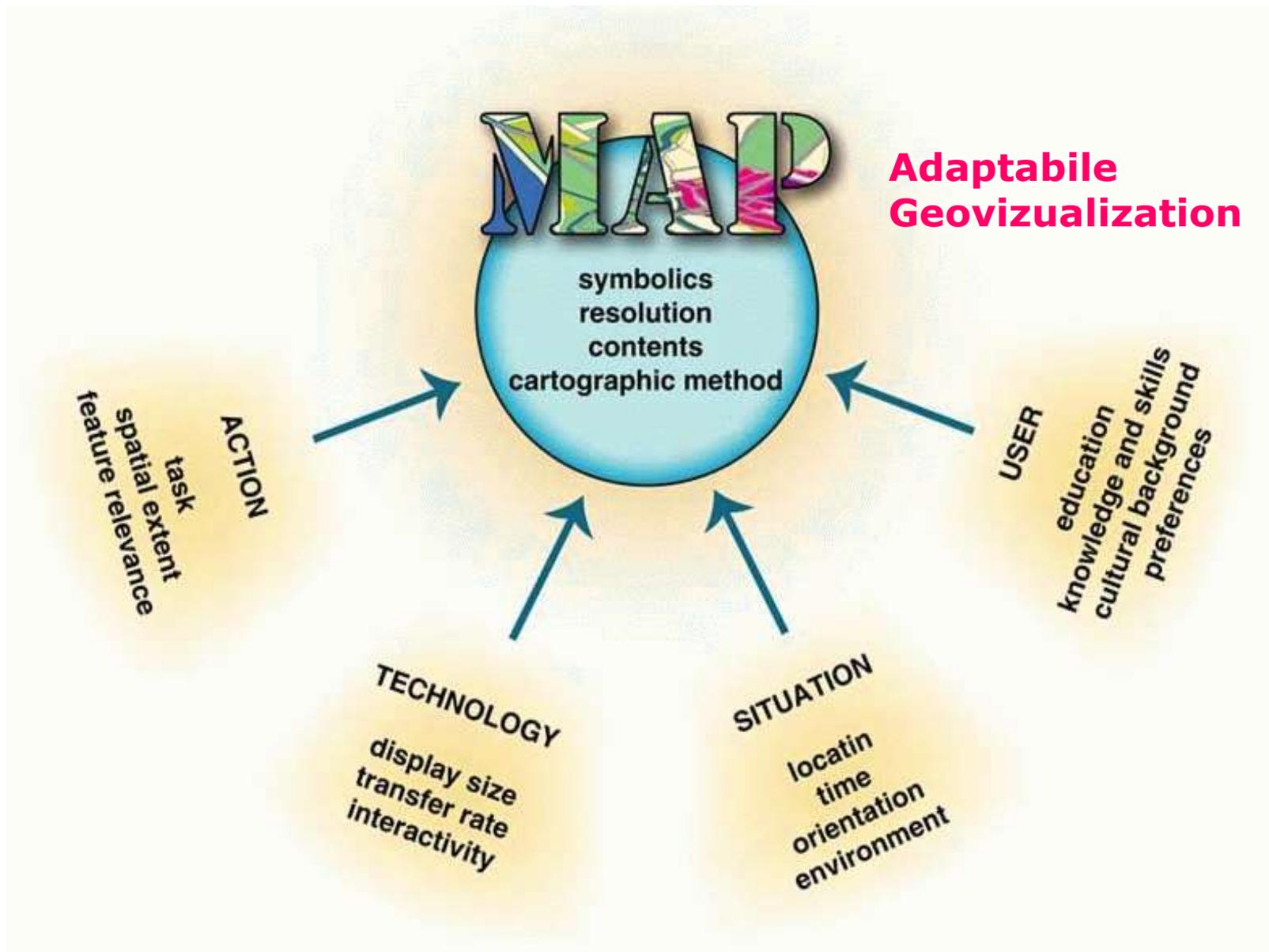


Figure: Examples of changes in visualization according to change of context (Friedmanová, Konečný and Staněk 2006)

# Personality of map users

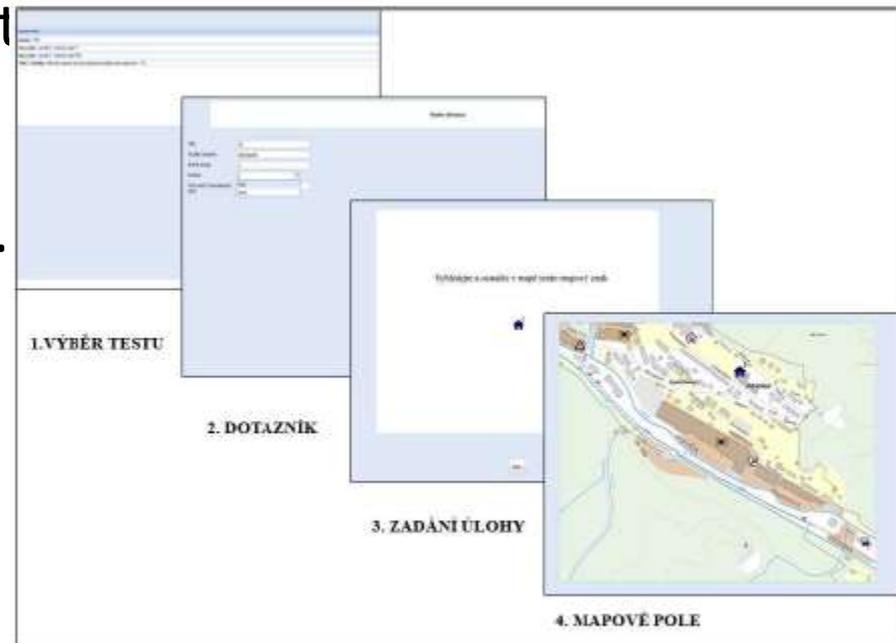
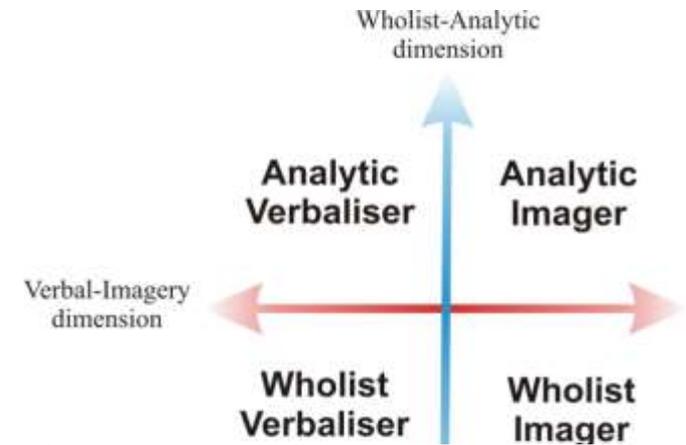
## **Cognitive style**

**Cognitive style** or "thinking style" is a term used in cognitive psychology to describe the way individuals think, perceive and remember information, or their preferred approach to using such information to solve problems. Cognitive style differs from cognitive ability....

*(Konecny et al., 2011 Usability of selected base maps for crises management – users perspectives. Applied Geomatics, DOI 10.1007/s12518-011-0053-1. Springer JW. 2011, pp. 1-10. ISSN 1866-9298.)*

# Cognitive Aspects of Geovisualization

- Interdisciplinary research.
- Theory of cognitive styles.
- Concept and design of test environment (MuTeP).
- International cooperation.



Obr. 11.7: Posloupnost jednotlivých snímků testu v programu MUTEP – výběr testu, dotazník, zadání úkol (upraveno podle ŠTĚRBA et al., 2011)

# **6. Real-time information and support**

**Sensors, Web's**

**But also elaborated information for public  
administraation (Lienert)**

Michele Campagna, Cagliari, Italy:

## **Social Media Geographic Information (SMGI)**

the opportunities offered by the *analysis of social media data* for *knowledge building and decision-making* support in Geodesign.

**Geodesign:** term identifying an approach to planning and design deeply rooted in geographic analysis and able to inform collaborative decision-making.

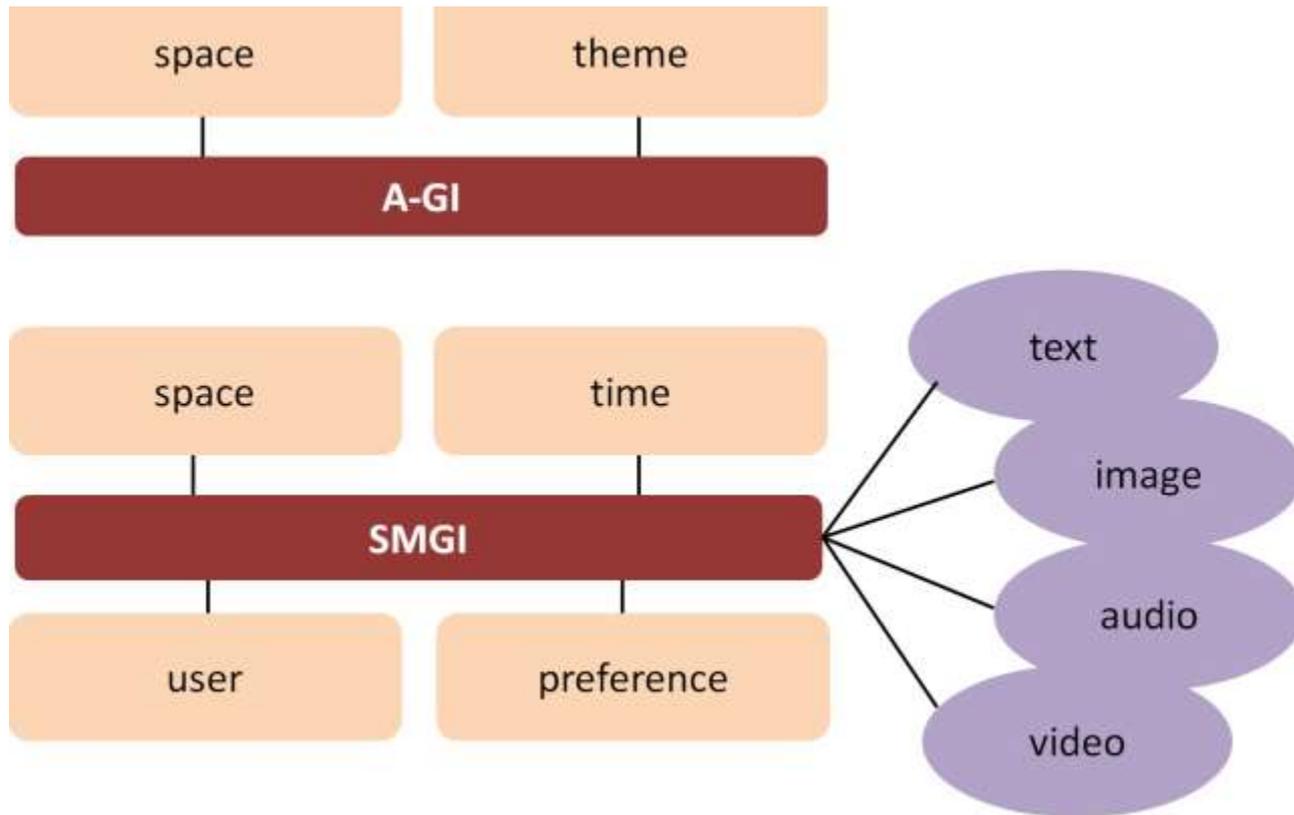
Currently, two major categories of spatial data resources may be considered suitable for Geodesign approaches, namely

**Authoritative Geographic Information (A-GI)** from Spatial Data Infrastructures (NEBERT 2004) and

spatial **User Generated Contents (UGC)**, commonly referred

to as **Volunteered Geographic Information (VGI)** (GOODCHILD 2007).

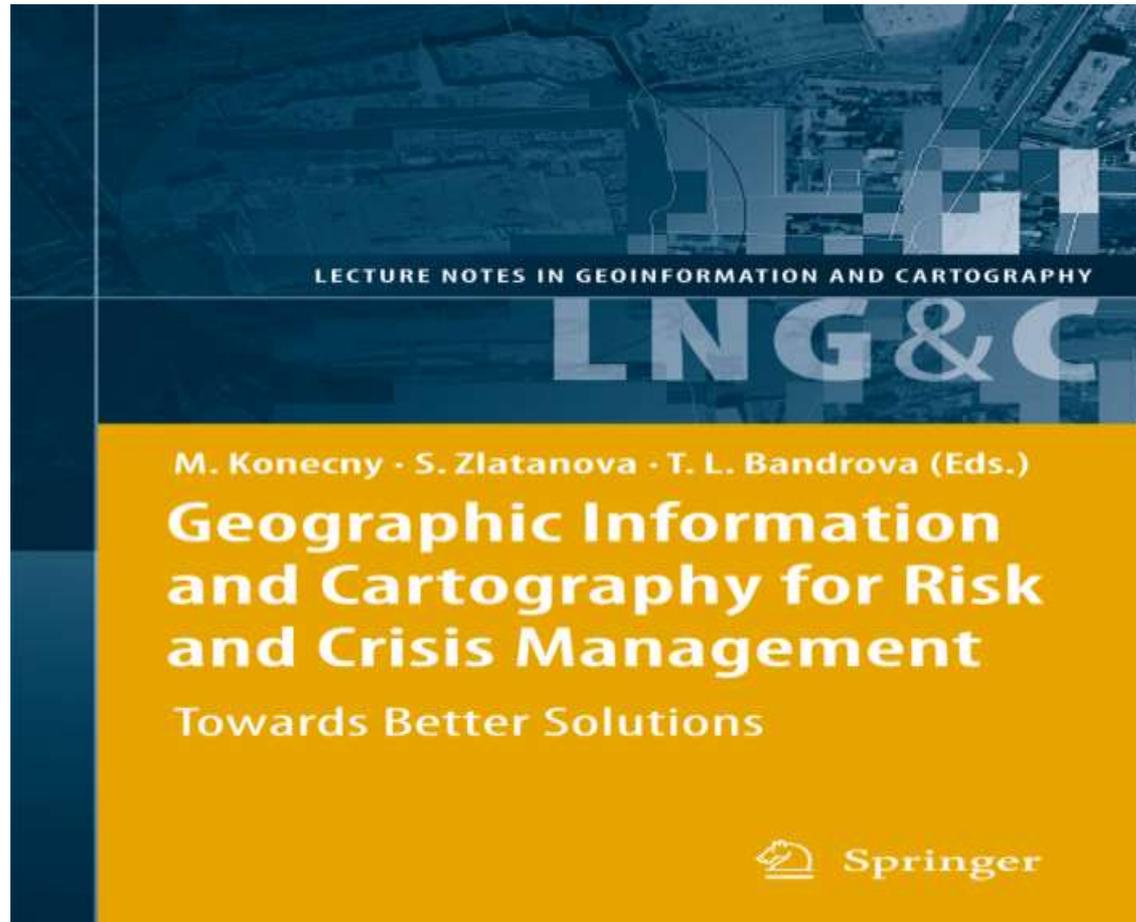
**Fig. 1:** Differences between A-GI (up) and SMGI (down) data models



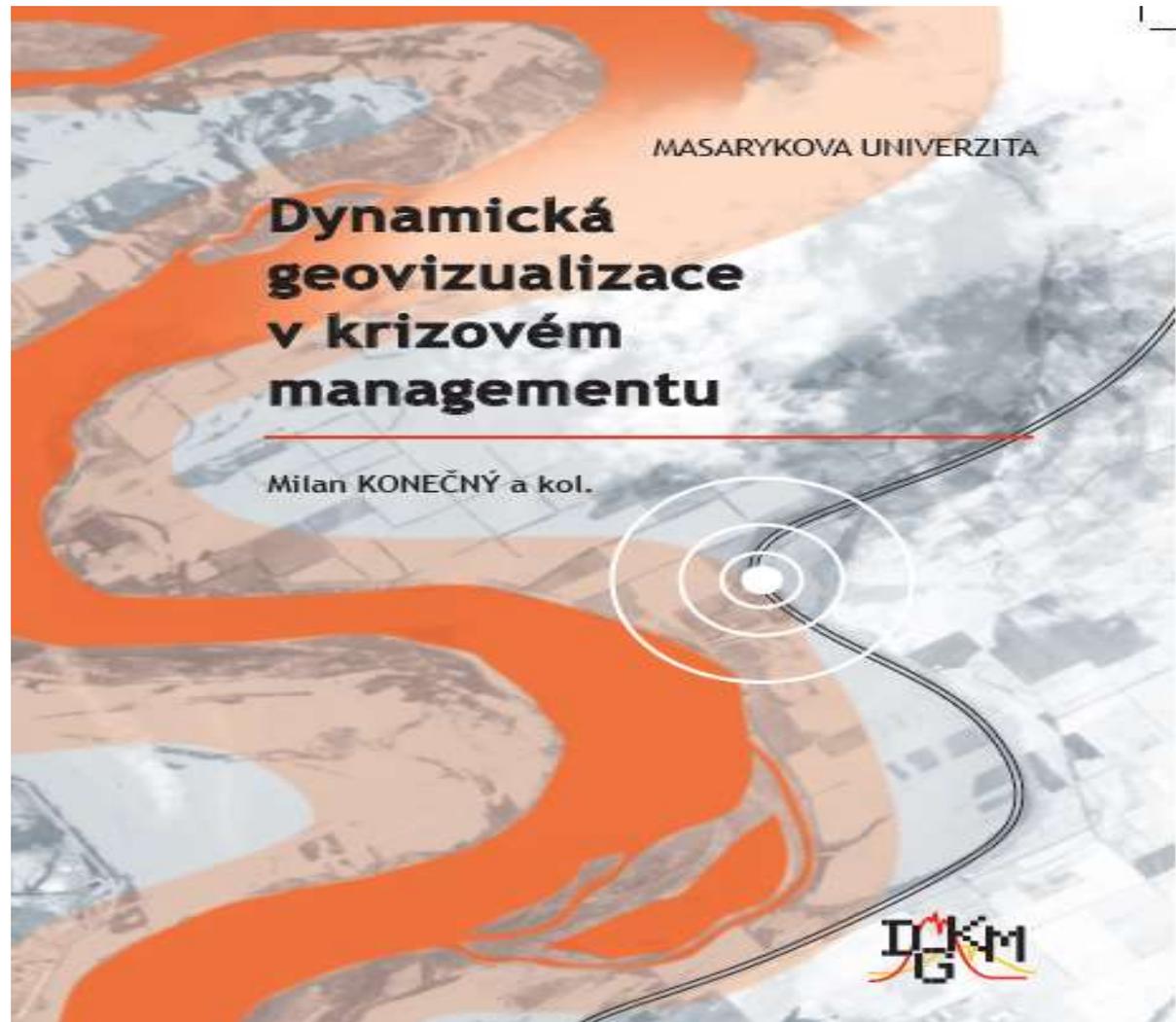
Michele Campagna, Pierangelo Massa, Roberta Floris, The Role of Social Media Geographic Information (SMGI) in Geodesign.

p. 164, 2016

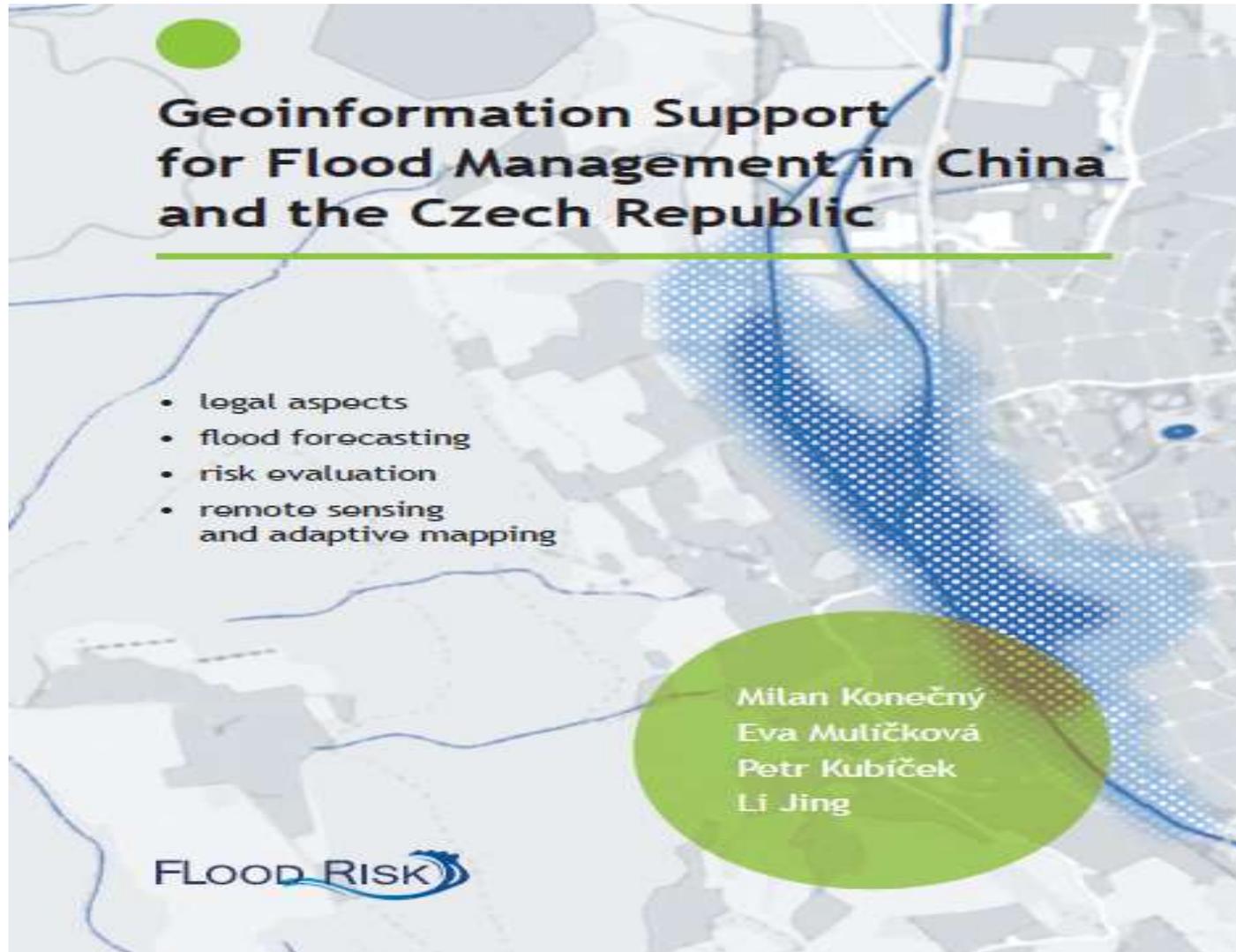
# Geographic Information and Cartography for Risk and Crisis Management



# Dynamic geovisualization in Crises Management



# Geoinformation Support for Flood Management in China and the Czech Republic





# **Communication with communities**

Liqui Meng (Albena 2016):

**Cartography** and its *connecting role*

Confirmation that integrative approaches  
we need also in EW and Crises

Management and

**Disaster Risk Reduction approaches.**

**System of Systems also in EW and CM**

Let' s go to develop these and some new trends which will appear.

Keep geoinformatics, cartographic specifications which do our disciplines ***specific, attractive,..... and necessary.***

# **DRR means wider approach than DRM**

- Solutions together with sustainable development and global warming;
- More economical aspects;
- Developed and developing countries; commons and specifications;
- New approaches: smart cities

- Prepare people for disaster risks with target of their

**REDUCTION**

- **INTEGRATION** of spatially oriented efforts (GEO)

Etc.

## **Next commission events:**

**October 17, 2017, Brno, Czech Republic**

**April 2018, Novosibirsk, Russia**

**June 18-23, 2018, Sozopol, Black Seaside, Bulgaria**

**November 2018, Shenzhen, P.R. China**

***Hvala !!!!!***

***THANK YOU***

***Xie, Xie. O Brigado***

***Muchas Gracias***

***Terima Kasim***

***Kammsa Hamida***

***Aligator***

***SHUKRAN***

***BLAGODARJA***

***DĚKUJI ( in Czech)***