Research Agenda of Early Warning and Crises/Emergency Management: Geoinformatics and Cartography Potentials

Milan KONEČNÝ

President (Former) ICA
President (European Branch) IEAS
Vice-President, ISDE
Chair of ICA Commission Cartography for EW and CM
Director, GIS Laboratory in Masaryk University, Brno, Czech Republic
Member of EU-China DRM Project (of highest level)

Nanchang, P.R. China, December 06, 2013


0
500 km
AÇORES (P)
MADEIRA (P)
CANARIAS (E)
GUADELOUPE (F)
MARTINIQUE (F)
RÉUNION (F)
Paramaribo
SURINAME
GUYANE (F)
BRASIL
Reykjavík
ÍSLAND
SVERIGE
SUOMI
FINLAND
NORGE
Oslo
Stockholm
Helsinki
Helsingfors
Tallinn
EESTI
Rīga
LATVIJA
LIETUVA
Vilnius
Moskva
RUSSIJA
UNITED KINGDOM
IRELAND
ÉIRE
Dublin
Baile Átha Cliath
DANMARK
København
Minsk
BELARUS'
NEDERLAND
London
Amsterdam
Berlin
Warszawa
POLSKA
QAZAQSTAN
BELGIË
Brussel
Bruxelles
BELGIQUE
DEUTSCHLAND
LUXEMBOURG
Luxembourg
Paris
Praha
ČESKÁ REPUBLIKA
Kyiv
UKRAÏNA
SLOVENSKO
Bratislava
Wien
FRANCE
SCHWEIZ
SUISSE
SVIZZERA
LIECHTENSTEIN
ÖSTERREICH
Budapest
MAGYARORSZÁG
MOLDOVA
Chișinău
SLOVENIJA
Ljubljana
Zagreb
HRVATSKA
ROMÂNIA
SAKARTVELO
Tbilisi
AZƏRBAYCAN
BOSNA I HERCEGOVINA
Sarajevo
Beograd
București
PORTUGAL
ANDORRA
MONACO
SAN MARINO
SRBIJA I CRNA GORA
HAÏASTAN
Yerevan
Madrid
Lisboa
ESPAÑA
ITALIA
Roma
BĂLGARIJA
Sofija
IRAN
Skopje
Tiranë
PORANEŠNA JUGOSLOVENSKA REPUBLIKA MAKEDONIJA
SHQIPËRIA
Ankara
TÜRKİYE
ΕΛΛΑΔΑ-ELLADA
Αθήναι
Athinai
Alger
Rabat
Tunis
IRAQ
SOURIYA
ΚΥΠΡΟΣ
KYPROS
KIBRIS
Λευκωσία
Lefkosia
Lefkoşa
LIBNAN
Beyrouth
Dimashq
EL MAGHREB
EL DJAZÂIR
TOUNIS
Valletta
MALTA

Republic: Labe (Elbe) - Vltava (Moldau) - Morava - Odra (Oder)

- **Masaryk University, Brno, Czech republic**

CONTENT

1. Early Warning and Disaster Management: General Problems

2. Where we are? SDIs, GMES, Inspire, …and next?

3. Knowledge and lessons learned from disasters: where is our Cartography community position and tasks?

4. New Areas of Cartography: trends and expectations

5. Conclusions

The impacts of natural hazards continue to increase around the world;
the frequency of recorded disasters affecting communities significantly **rose from about 100 per decade in the period 1900-1940, to 650 per decade in the 1960s and 2000 per decade in the 1980s, and reached almost 2800 per decade in the 1990s.**

Hundreds of thousands of people are killed and millions injured, affected or displaced each year because of disasters, and the amount of property damage has been doubling about every seven years over the past 40 years.

Although earthquakes and tsunamis can have horrific impacts,

most disaster losses stem from climate-related hazards such as hurricanes, cyclones, other major storms, floods, landslides, wildfires, heat waves and droughts.

Current evidence demonstrates **that changes in the global climate will continue to increase the frequency and severity of climate-related hazards.**

The increases in costs of disasters are taking place in both developed and developing countries, which suggest that reducing the risks from hazards is not simply a matter of economic growth and development.

There is a great shortfall in current research on how science is used to shape social and political decision-making in the context of hazards and disasters.

These issues also highlight the **need for more systematic and reliable information on such events.**

Hyogo Framework for Action 2005-2015:

Building the Resilience of Nations and Communities to Disasters

KOBE - Hyogo Declaration:

it was recognized that a culture of disaster prevention and resilience,

and associated pre-disaster strategies, must be fostered at all levels, ranging from the individual to the international levels. Human societies have to live with the risk of hazards posed by nature.

People-Centred Early Warning Systems

The objective : - to empower individuals and communities threatened by hazards **to act in sufficient time and in an appropriate manner**

so as **to reduce** the possibility of personal injury, loss of life, damage to property and the environment and of livelihoods.

To be effective, ***early warning systems must be people-centred and must integrate four elements*** :

1.knowledge of the risks faced;

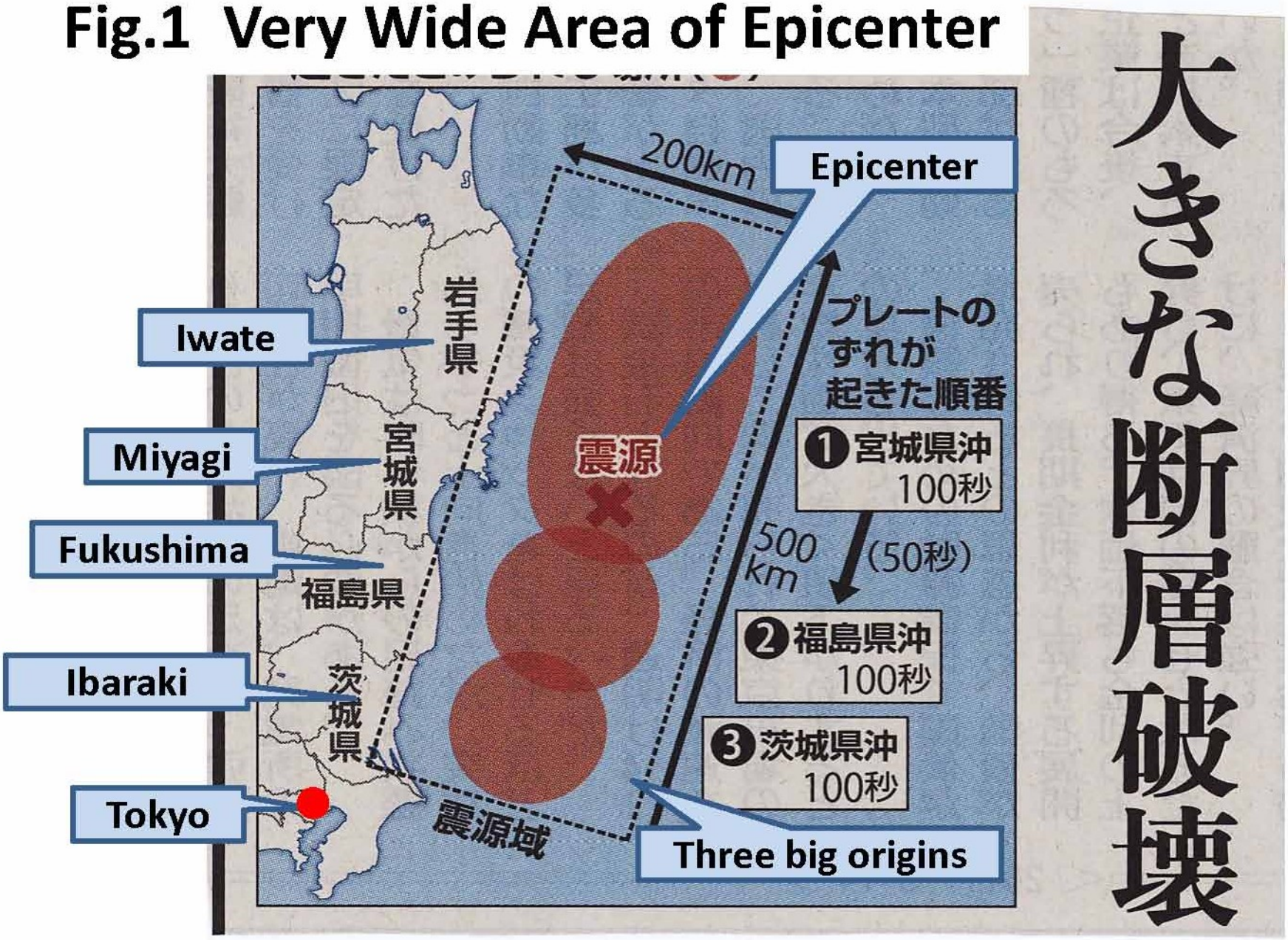
2. technical monitoring and warning service;

3. dissemination of meaningful warnings to those at risk; and

4. public awareness and preparedness to act.

Failure in any one of these elements can

Fig.1 Very Wide Area of Epicenter



Profile of the Earthquake

ADRC News 217/2011

Date and Time: 11 March 2011 at 14:46 JST (5:46 GMT)

- **Type of earthquake:** Plate-boundary thrust-faulting earthquake on or near the Japan Trench subduction zone
- **Hypocenter:** 130km off the Pacific coast of the Tohoku region (38°N, 142°E), 24km depth
- **Magnitude:** 9.0 (interim value, the largest in Japan)

The areas hit by the Great East Japan Earthquake are known to be vulnerable to tsunamis, as they have experienced tsunamis in the past. A large inter-plate

However the March 11 earthquake was much larger than predicted, at a magnitude of M9.0 and a rupture zone measuring **500 km long and 200 km wide.**

This was the fourth-strongest earthquake ever recorded in the history of the world. Some experts say that this kind of earthquake and tsunami occurs only once every thousand years.

c.f. 1960 Chile Earthquake M9.5,
1964 Alaska Earthquake M9.2,
2004 SumatraEarthquake M9.2

Fig.2a Tsunami attacking Miyako City, Iwate Pref. At 3pm, March 11, 2011 (The height: 10m)

Sunji Murai, 2011

Fig.2b A big boat flown on the roof of a building in Otuchi Town, Iwate Prefecture

Sunji Murai,
2011

Kamaishi City, Iwate Prefecture constructed huge breakwaters 2km long, 20m thick, 8m above sea level and 65m deep, which have been registered as the deepest breakwaters in the Guinness World Records (see Fig.4a and 4b).

Fig.4a The Deepest Water Break against Tsunami in Kamaishi Bay. Iwate Prefecture

Sunji Murai, 2011

Fig.4b Destructed Water Break in Kamaishi Bay By Tsunami

世界最深の防波堤 無残

Sunji Murai, 2011

Fig.3 Accident of Fukushima Nuclear Power Plants with Hydrogen Gas Explosion

Sunji Murai, 2011

We should have learnt the lessons that '*hardware'* including very high breakwaters, cannot save people
but

we need to use ***'software'*** including procedures for providing early warning and evacuation systems.

Five major characteristics of disasters that make them hard to overcome (NRC 2007,….):

1. Disasters are large, rapid-onset incidents relative to the size and resources of an affected jurisdiction.

   ….if pre-accident data are available, geospatial analysis can provide important insight into the nature and extent of changes wrought by disasters.

2. Disasters are uncertain with respect to both their occurences and their outcomes.

   …causal relationship between hazards and disasterr event is porly understood and risks are hard to memasure…

   Geospatial models: predisctions of locations, footprints, times, durations of events, the

3. Risks and benefits are difficult to assess and compare.

… accuracy of risk assessmement….

..Geospatial data are invaluable in making the necessary assessments of the geographic distribution of risk and in estimating the quality of each assessment.

4. Disasters and dynamic events.

…human actions and natural forces…Response strategies has to be flexible and argues for the value of analysis in helping responders undesrtand and adapt to the changing conditions they face.

….geospatial data and tools can help incident managers to visualize the event over time, track the activities of responders, and predict

5. Disasters are relatively rare.

……public service conserns readily displace disaster preparedness as a priority.

….Specialized capabilities, such as geospatial data and tools are especially vulnerableto budget cuts and resource realocation.

Magnitude, scope , uncertainity, dynamism, and infrequency of disasters give rise to some important QUESTIONS.

…. disaster prevention must be **integrated into other EU policies,** including development policy,

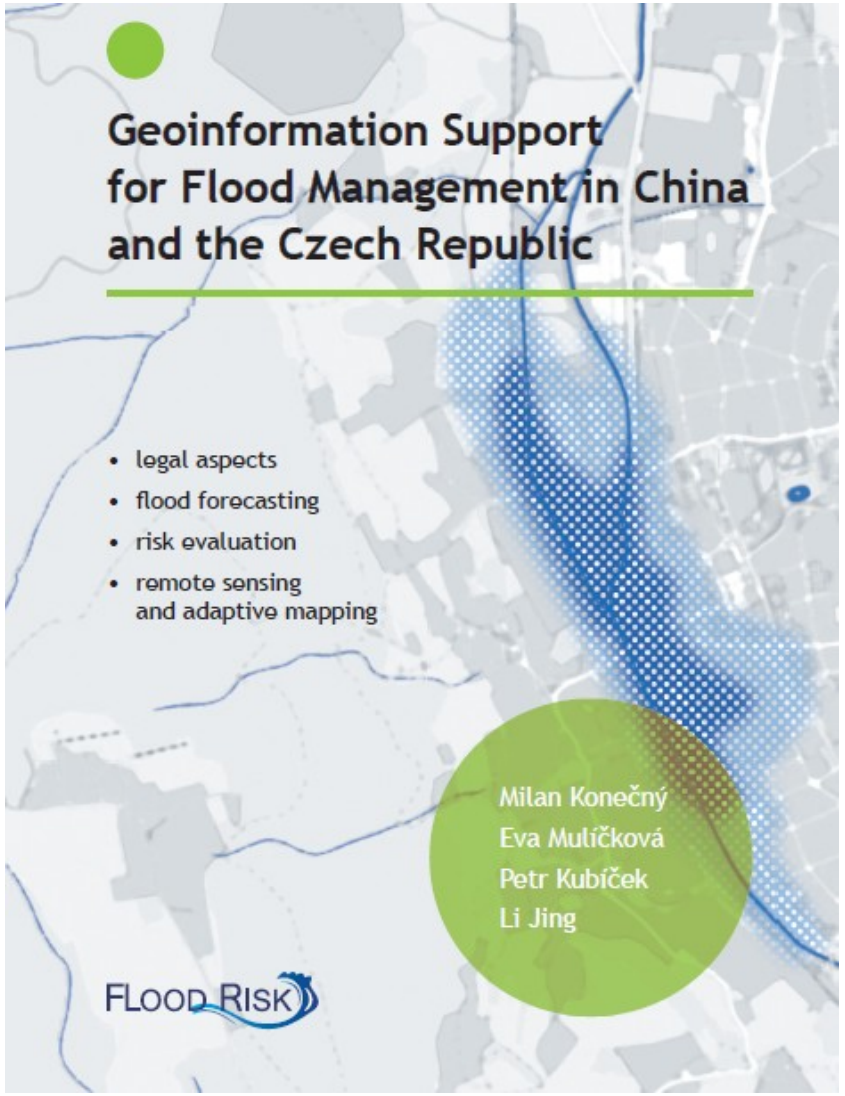
..establishing a European-wide inventory of existing information and best practices, **developing guidelines on hazard and risk-mapping,** and improving access to early warning systems,

disaster prevention within the EU should aim at further development of **knowledge-based disaster prevention policies** at all levels of government (i.e. local, regional, national and EU-level);

EU should support and encourage the **exchange of information** related to disasters and their **social, economic and environmental impact**.

Geoinformation Support for Flood Management in China and the Czech Republic

- **Result of Research Bilateral Project Czech republic – China.**
- **Targeted for selected aspects of geoinformation support of floods management.**



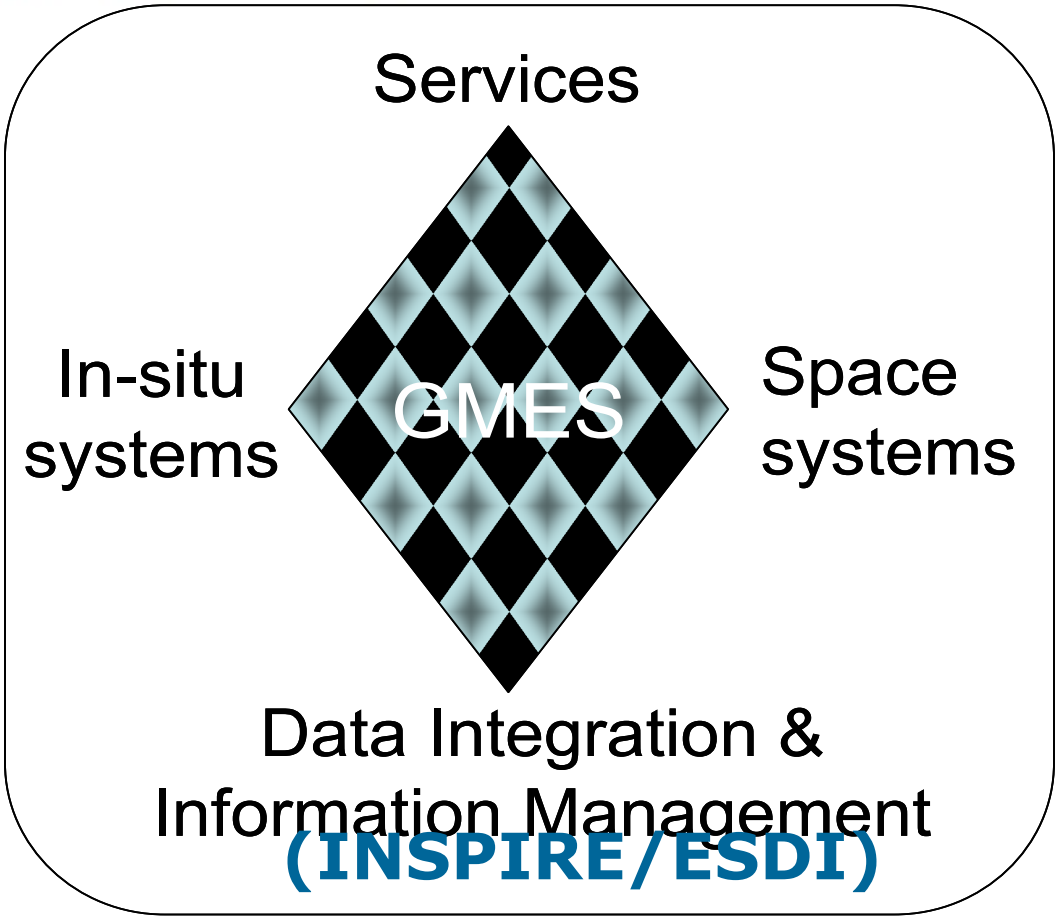
Where we are as Cartographic community? SDIs, GMES, INSPIRE, „„Digital Earth…and next?

President William J. Clinton (13 August 1994): *"Geographic information is critical to promote economic development, improve our stewardship of natural resources, and protect the environment. Modern technology now permits improved acquisition, distribution, and utilization of geographic (or geospatial) data and mapping. ...**NSDI** (National Spatial Data Infrastructure)*

Al Gore, January 1998: **Digital Earth** is "A multi-resolution, three-dimensional representation of the planet, into which we can embed vast quantities of geo-referenced data."

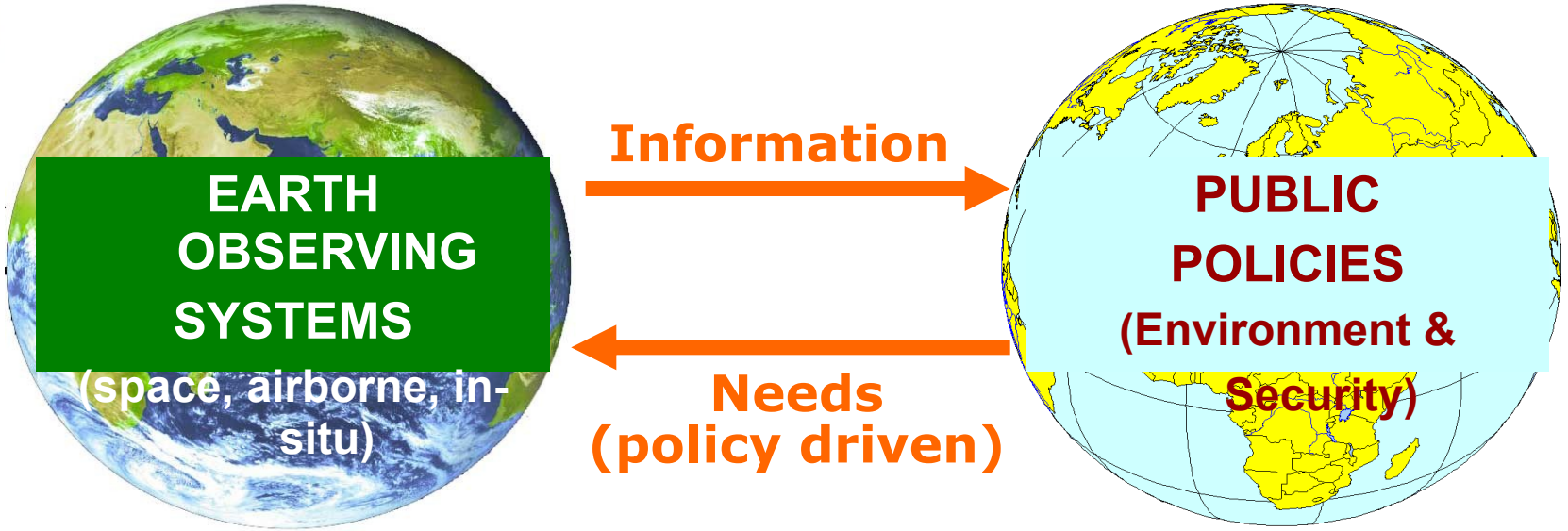
Chinese footprint: Internat. Society on Digital Earth (ISDE)

Global Monitoring for Environment and Security



Overall GMES objectives

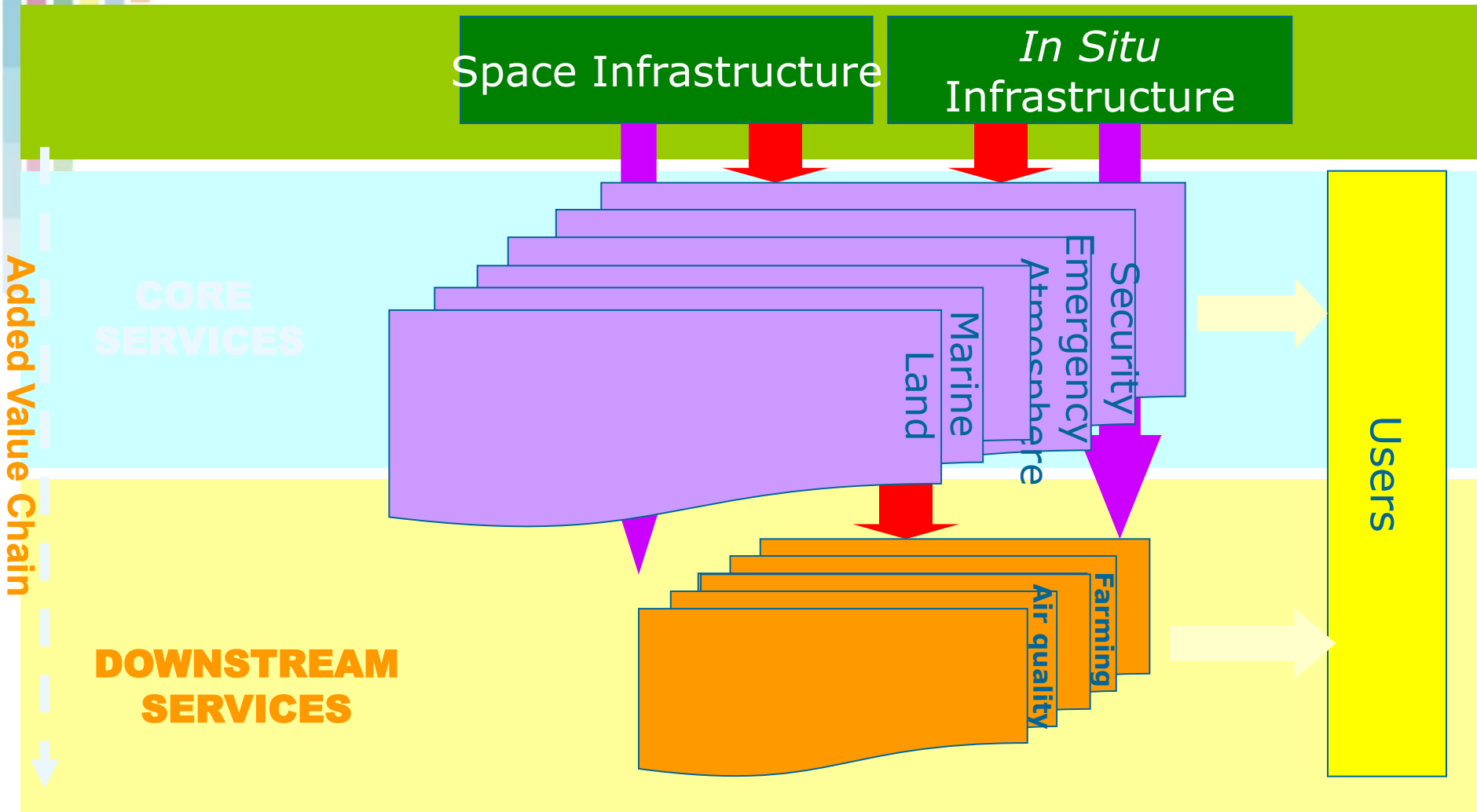
to provide information services to policy-makers and other users



Space Agencies
In-situ Observing systems
Scientific Community
EO Value Adding Industry

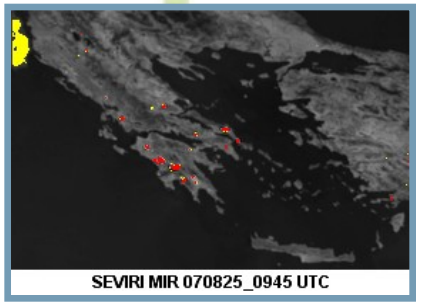
National Governments and Agencies
European Union Institutions
Inter-Governmental Organisations (IGOs)
Non Governmental Organisations (NGOs)

Overall architecture



Four main types of products:

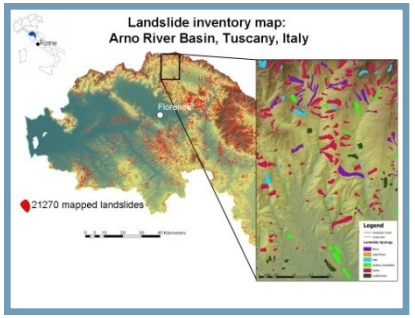
Early warning



Reference maps

Assessment maps

Thematic maps



For headquarters, decision-makers and in-field operatives In Europe and worldwide

ERCS 1st priority

Rapid mapping on demand in case of humanitarian crises, natural disasters, and man-made emergency situations within & outside Europe

- **Reference maps** available within 6 hours over crisis area
- **Damage assessment maps** available within 24 hours & daily updated
- **Situation maps and forecasts** of evolution of situations within the few days-weeks after crisis

INSPIRE

Infrastructure for Spatial Information in Europe

Annex I

1. Coordinate reference systems
2. Geographical grid systems
3. Geographical names
4. Administrative units
5. Transport networks
6. Hydrography
7. Protected sites

Annex II

1. Elevation
2. Addresses
3. Cadastral parcels
4. Land cover
5. Orthoimagery
6. Geology

Harmonised spatial data specifications more stringent for Annex I and II than for Annex III

Annex III

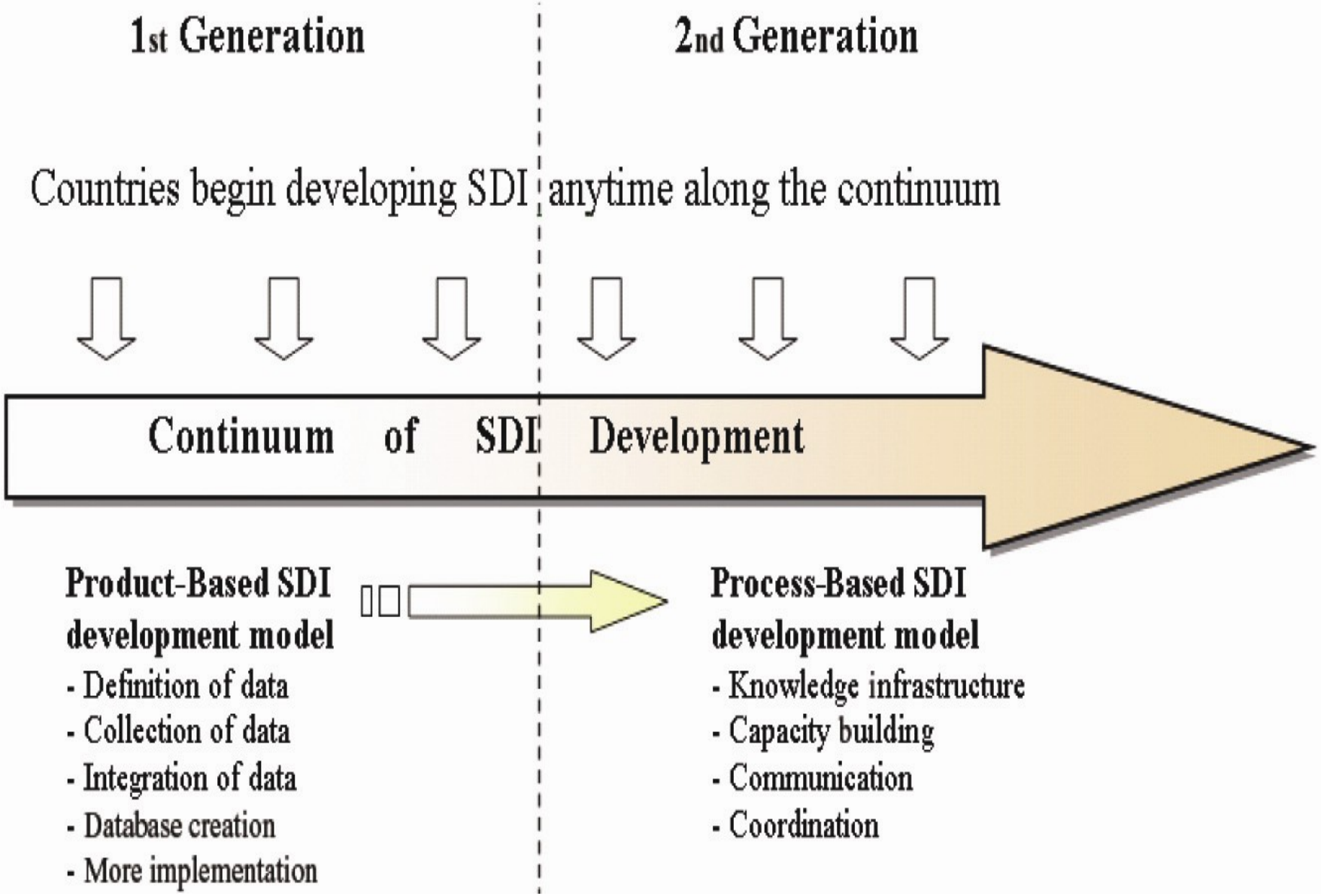
1. Statistical units
2. Buildings
3. Soil
4. Land use
5. Human health and safety
6. Utility and governmental services
7. Environmental monitoring facilities
8. Production and industrial facilities
9. Agricultural and aquaculture facilities
10. Population distribution – demography
11. Area management/restriction /regulation zones & reporting units
12. Natural risk zones
13. Atmospheric conditions
14. Meteorological geographical features
15. Oceanographic geographical features
16. Sea regions
17. Bio-geographical regions
18. Habitats and biotopes
19. Species distribution
20. Energy resources
21. Mineral resources

SDI Generations

From 1st to 2nd Generation

and to

Spatially-Enabled Society

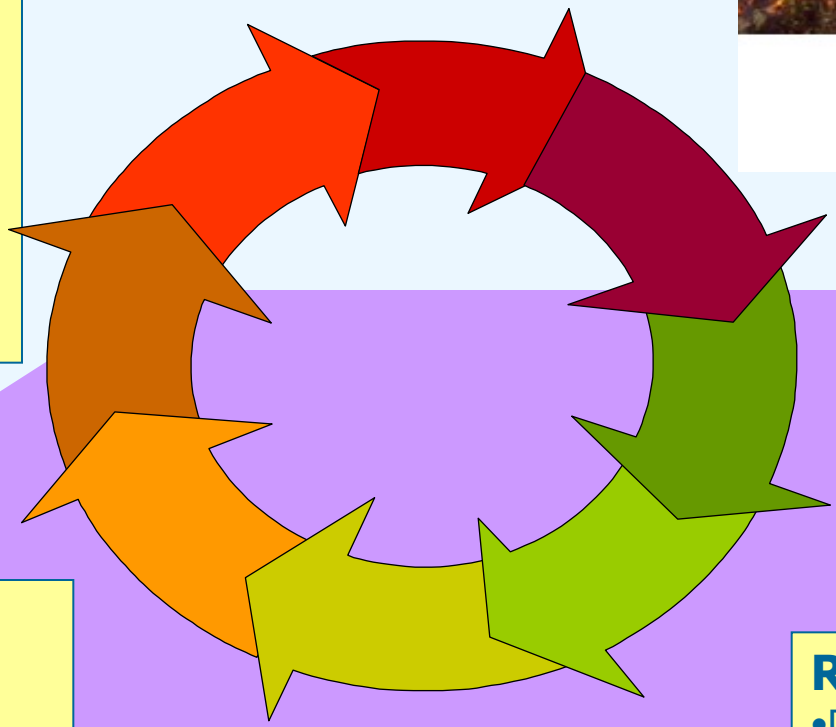


Relationship between the first and second generations of SDIs. (by Williamson Rajabifard, Binns, 2007, reprinted from Rajabifard at al.2006 with permission of the International Journal of GIS)

Disaster Management Cycle

Preparedness
- Scenarios development
- Emergency Planning
- Training

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



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

Knowledge and lessons learned from disasters: where is our GI communit position and tasks?

National Academy Reports in USA (after huricane Katrina)

Successful Response Starts with a Map. Improving Geospatial Support for Disaster Management, NRC. 2007

Elevation data for Floodplain Mapping. The National Academy. 2007.

Geospatial Data Needs

-Ability to assess risk and resilience,

-Pre-incident forecasts about hazard behaviour, likely damage, property vulnerability, and potential victims,

-Decision aids to support recommendations for pre positionning resources and evaluation,

-Timely, incident-specific locational information with respect to hazards, damage, victims, ….including information about people and their needs,

-Ongoing monitoring and evolving hazards, response efforts, and resource status, and

-Insight into the interdependence and status of infratsructure components (energy, water, sanitation, road, communications,….security system, etc.) and awareness of critical infrastructure and facility vulnerability and status (refineries, chemical facilities, hazardous waste sites, bridges,…..

Fig.3.1 Key Disaster-Related Functions by Level of Government and Phase-A

TABLE 3.1 Key Disaster-Related Functions by Level of Government and Phase

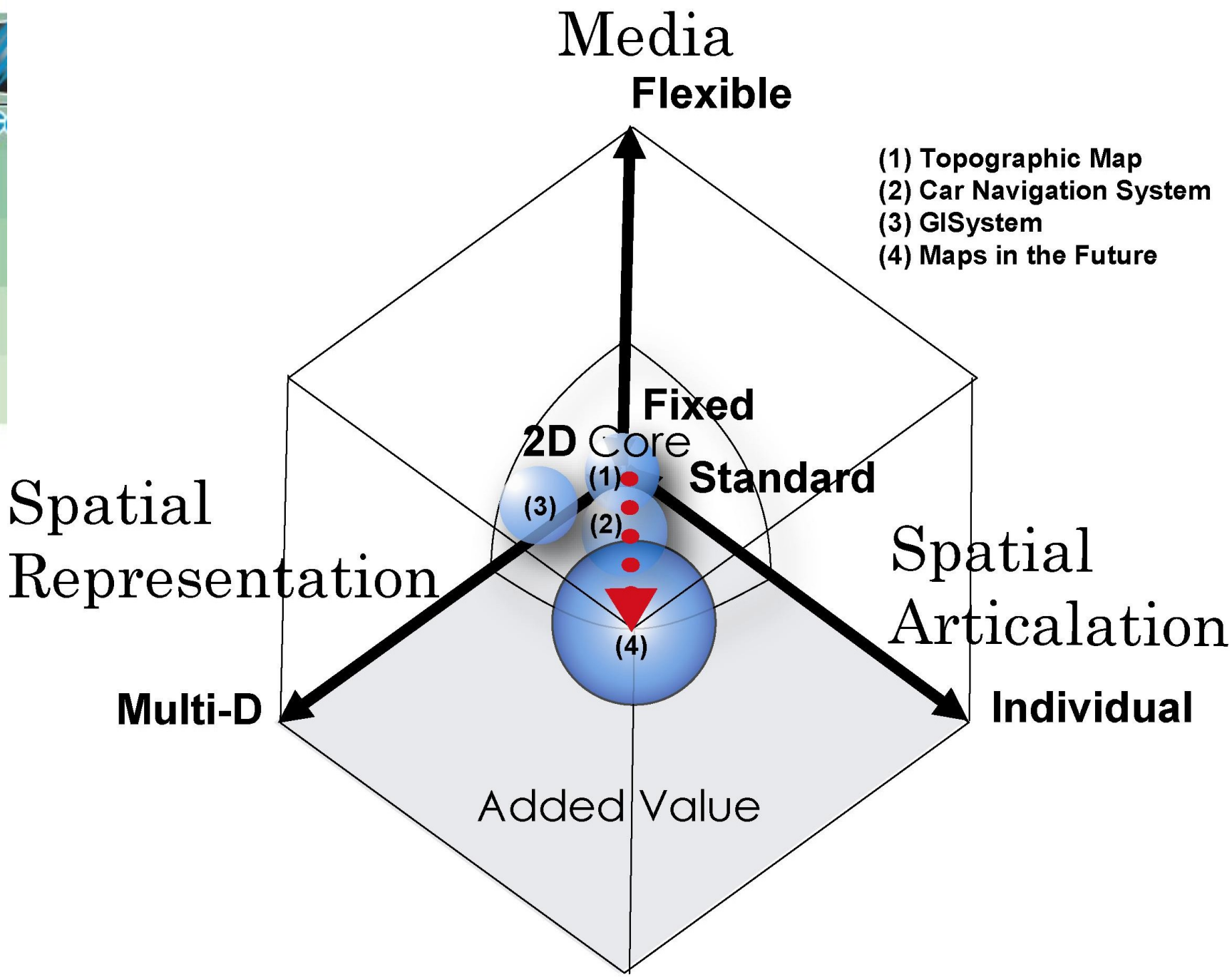
Level	Mitigation	Preparedness	Response	Recovery
Federal	• Supports research of hazard causes • Develops means to modify the causes of or vulnerability to hazards • Reviews and approves state mitigation projects • Provides training and technical expertise • Directs flood control program • Directs hazard prediction and mapping initiatives • Provides hazard mitigation grants • Provides funds to individuals for small projects to prevent losses • Funds coastal land-use planning • Creates geospatial data model • Provides federal flood insurance • Invests in development of new technologies	• Provides training and professional development programs • Provides public education • Coordinates warning system • Formulates, implements, and evaluates emergency management policy • Conducts inspection and assessment programs • Reviews, coordinates, and conducts federal, state, and regional exercises • Assesses and coordinates disaster plans • Provides grants for disaster planning, equipment, and training • Operates the national operations center • Specifies required response capabilities • Facilitates information sharing • Coordinates incident response planning • Synthesized intelligence • Generates threat assessments • Inventories critical infrastructure • Stockpiles equipment and supplies	• Collects data about the disaster • Creates and disseminates common operating picture • Assesses damage • President may declare disaster or emergency • Implements the National Response Plan and activates Emergency Support Functions • Designates principal federal official • Establishes Joint Field Offices to coordinate support • Provides atmospheric modeling • Can mobilize the military • Validates and makes recommendations in response to threat assessments • Provides food, water, temporary power, and technical assistance	• Restores economic stability • Provides crisis counseling • Provides legal assistance • Provides technical assistance, debris removal, communications, and public transportation, if requested • Provides temporary housing assistance, individual and family grants, funds to repair facilities, and disaster unemployment assistance • Provide loans for repair of homes, businesses, farms • Provides tax relief
State	• Conducts hazard identification • Conducts land-use planning • Develops, adopts, and enforces land-use standards • Regulates growth • Solicits mitigation projects and establishes funding priorities • Establishes legal basis for local ordinances • Regulates construction • Provides aid to localities	• Conducts risk and exposure assessment • Monitors and surveys potential hazards • Creates resource inventory • Conducts disaster planning • Coordinates plans of localities, facilitates interagency policy coordination • Stockpiles equipment and supplies • Conducts capability assessment • Provides public education • Conducts training and exercises • Provides technical expertise to localities • Obtains grant funding to support preparedness activities	• Mobilizes National Guard • Provides food, water, clothing, and shelter • Conducts damage assessment • Disseminates public information • Restores essential infrastructure • Executes state emergency plan • May request FEMA to assess damage • May seek presidential declaration • Runs EOC • Coordinates resources across jurisdictions • Funds mutual aid to other states • Provides aid to localities • Assists with evacuation	• Conducts debris removal • Restores public services and facilities • Restores infrastructure • Restores economic stability • Renews economic development • Restores governmental self-sufficiency • Prepares hazard mitigation plan • May request federal agencies to perform short-term tasks • Administers federal assistance • Provides technical assistance to localities • Provides relief funds to localities

continued

TABLE 3.2 Examples of Geospatial Needs and Capabilities

	Requirements	Current Capabilities	Gaps
Mitigation	• Framework data, particularly detailed elevation data • Models, information, and analysis that can be used to develop grant guidance, analyze grant proposals, and assess plans • Data archive from previous incidents to support research and analysis • Research studies that can improve image analysis and inform resource pre-deployment and disaster response approaches • Improved understanding of changing environmental conditions post-disaster (e.g., new vegetation or flood maps) • Foundation data and imagery that allow for identification and graphic relationships among critical facilities, hazards, and resources • Clear understanding of infrastructure inventories, locations, relationships, and interdependencies • Risk and hazard maps • Ability to communicate with public about risk • Effective land-use planning using current local graphic information with incorporated hazards information and GIS decision support tools • Public, private, and nonprofit organization client databases • Improved understanding of the distribution of target populations at risk	• Digital elevation models developed from ground-based survey or processing of remote-sensing data—LIDAR, photogrammetry, or radar • Intelligent query of multiple spatial databases • Pre-event and post-event analysis (change detection) using remote-sensing and other geographic data • Geospatial analysis of project proposals in line with state policies • Visualization technologies that incorporate geographic risk data • Land-cover or land-use classification, change detection, and mapping using COTS GIS spatial analytical tools • Hazard models from government or commercial sources • Comprehensive geospatial database with full attribute data (may not be available in all communities)	• Modeling capability that determines and describes multiple effects due to dependencies in infrastructure and a single or multiple failures • Data to drive these models lacking in many communities • Robust, easily understood procedures that identify specific features of interest to emergency response managers in image data
Preparedness	• Critical infrastructure database (including information on high-risk occupancy facilities such as schools, medical facilities, and nursing homes) that includes attribute information • Foundation data and imagery that allow for identification and graphic relationships among critical facilities, hazards, and resources • Comprehensive geospatial database tied to full demographic profile for communities to yield understanding of populations at risk • Detailed geospatial data on the location and characteristics of businesses and the size of their workforce • Detailed geospatial data on the location and characteristics of equipment and supply assets as well as human assets • Identification of alternate sites for critical facilities • Pre-event imagery • Pre-plans that include building interior data • Database of current resource status and locations (e.g., shelters, vaccines, communications) • Shared parcel-level information (linked to tax assessor's or insurance industry data) • Spatial distribution and classification of residential structures by resiliency to hazards • Spatial distribution of social support need in at-risk communities • Standing annual contracts for geospatial capabilities • Sophisticated damage estimation models • Redundant data storage in geographically disparate locations	• Critical infrastructure databases (where they exist) • Evacuation models and planning tools, and tools for monitoring traffic flow • Government and commercially developed framework mapping and standard COTS GIS products for mapping and spatial analysis • Image data from government programs such as the National Aerial Photography program, Google Earth, or commercial providers • Independent modeling of hazards impact • Land-cover classification for discriminating variation in residential structures using remote-sensing data supported by ground survey • Tools for tracking resource movement • Optimal location analysis capability in COTS GIS • Projected 24/7 population database that estimates population on 1 km grid resolution (ORNL Landscan population database—does not have age attributes)	• National cadastral database • National model or structure to share cost of database development • Comprehensive, current, accurate geographic database with census data and full attribute information for all features at the parcel level • A robust predictive model for estimating evacuation demographics—who will leave, where will they go, how long will they stay, who will come back—age is an important attribute • Incomplete up-to-date imagery (less than 3-5 years old) and detailed elevation data • Detailed geospatial data on the location and characteristics of equipment and supply assets as well as human resources

continued


Media
Flexible
(1) Topographic Map
(2) Car Navigation System
(3) GISystem
(4) Maps in the Future
Fixed
2D Core
Standard
(1)
(2)
(3)
(4)
Spatial Representation
Multi-D
Spatial Articalation
Individual
Added Value

Disaster management cycle

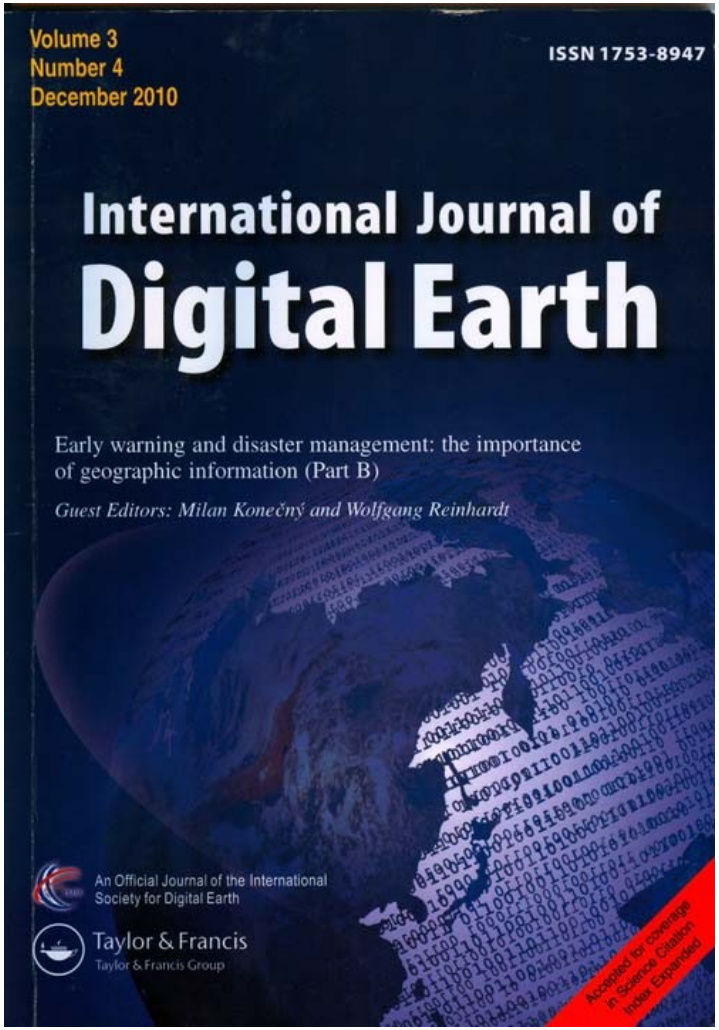
- User requirements and specifics differ within EM cycle
- Better cartographic support in all stages
- Consequences: minimizing of losses

Publications

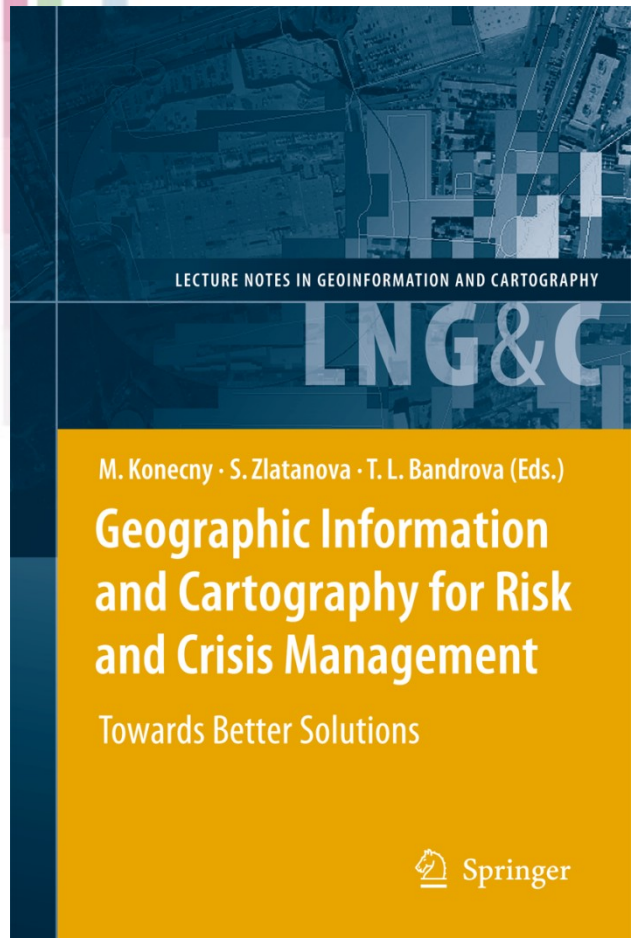
Editing of specialized double issues for EW and CM in International Journal on Digital Earth

Result:

Growth of IF from 0.853 to 1.222



Geographic Information and Cartography for Risk and Crisis Management



From publishing on March 25 2010, Geographic Information and Cartography for Risk and Crisis Management have been **3161** requests for chapter uploading. Statistics of last two years:

Yea	**Amount of uploadings**
2011	1261
2010	1900

Potentials of cartography: context and adaptive cartography

Legal framework for flood management in the Czech Republic

- **Prevention**
  - The Water Act (No. 254/2001)
  - The Czech National Flood Protection Strategy (No. 382/2000)

- **Emergency management**
  - The Act No. 239/2000 about integrated rescue system
  - The Act No. 240/2000 about emergency management

- **Recovery**
  - The Act No. (12/2002) about the state assistance by the recovery after natural disaster

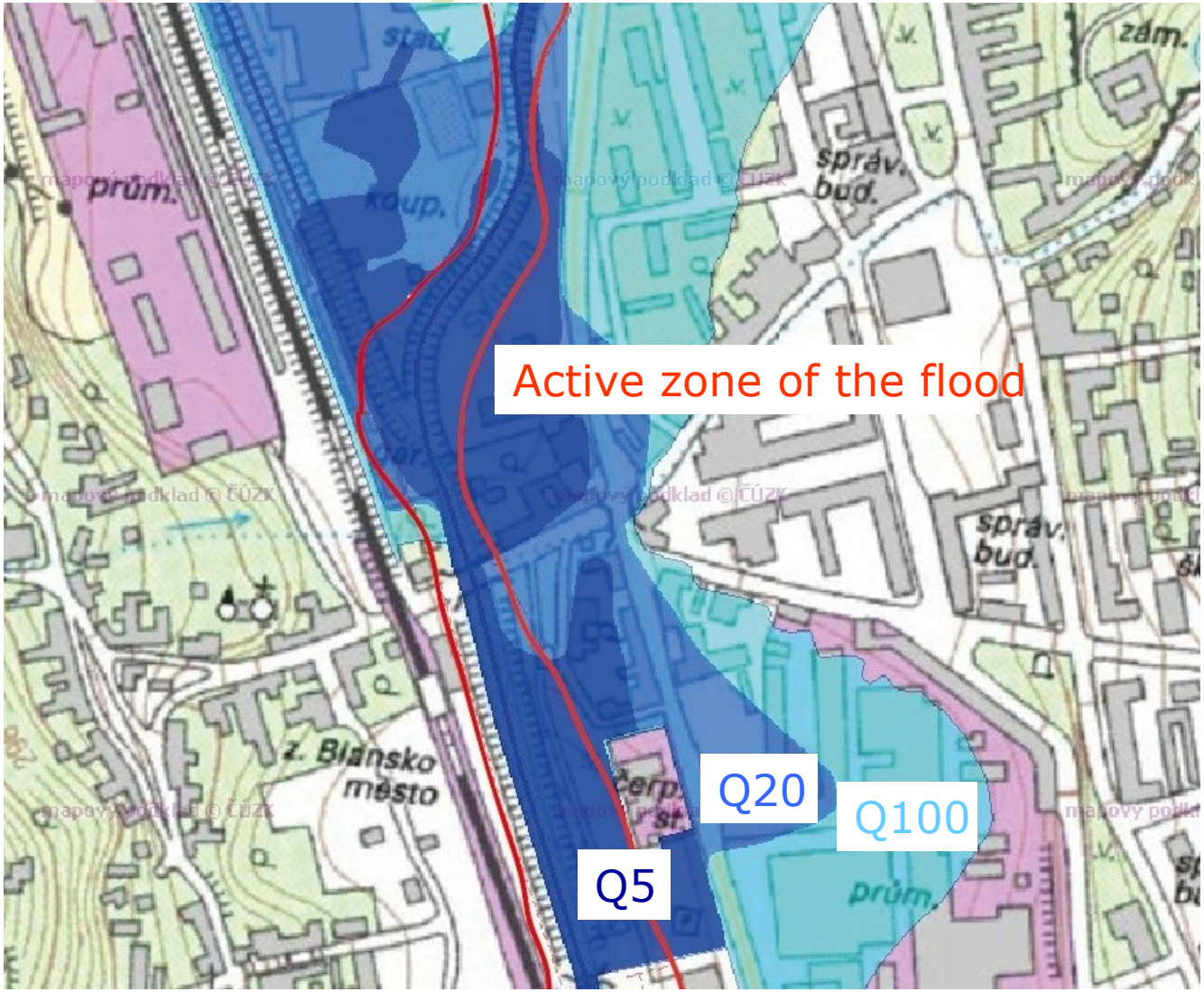
Stage 1: Prevention

Flood mapping in the Czech Republic

- **Flood zone map**
  - Public availability
- **Maps of historical floods**
  - Public availability
- **Insurance map**
  - Commercial bases

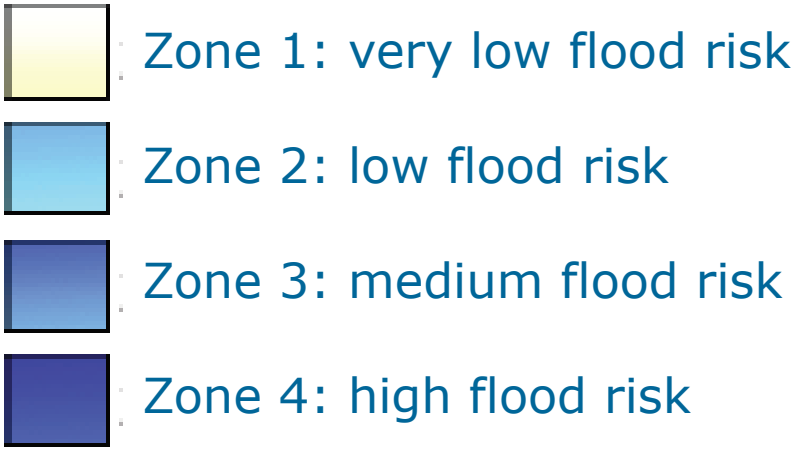
Determination of flood zones

- **Legal notice No. 236/2002 about process of elaboration of the flood areas**
- **Set for discharges that occure once per**
  - 5
  - 20
  - 100 years
- ***Active zone of flood area*: urban areas that influence drainage during floods**


Active zone of the flood
Q20
Q100
Q5
prům.
správ. bud.
zám.
z. Blansko město
prům.

Insurance maps

- **The system generates information on the flood risk exposure of the selected location and displays it on-screen.**
- **The tool distinguishes four different flood risk zones:**

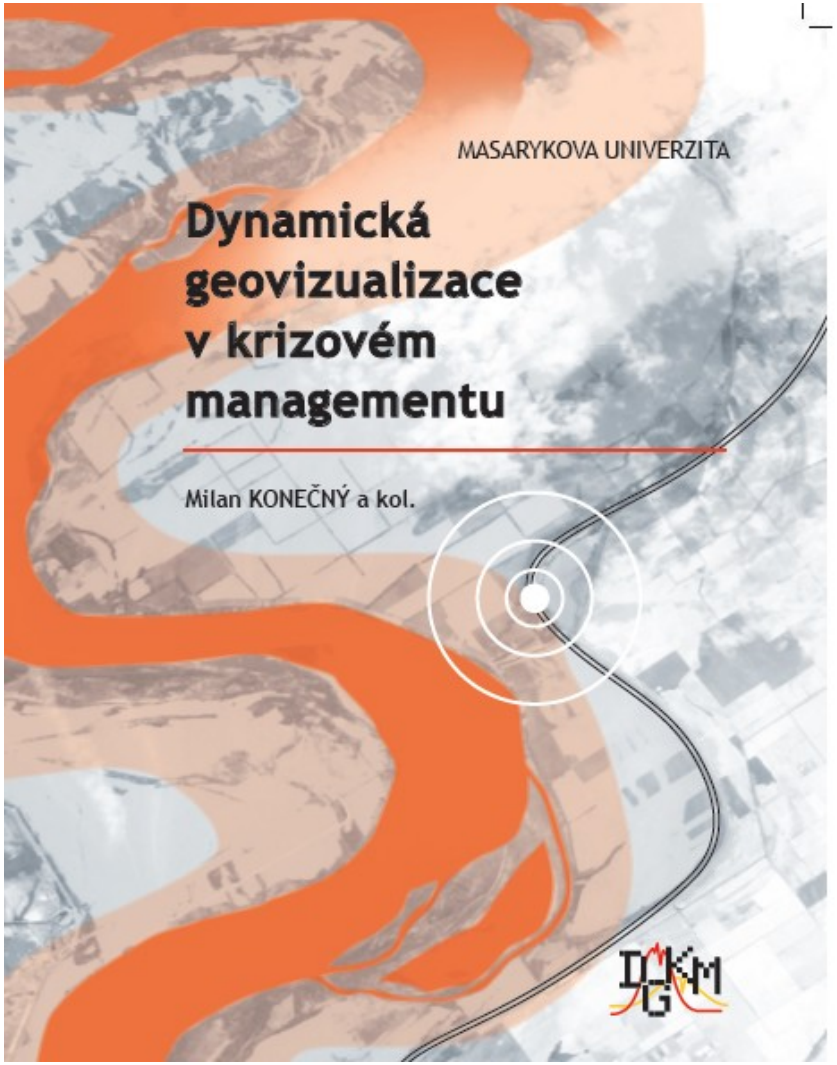


Dynamická geovizualizace v krizovém managementu

In English:

Dynamic Geovisualization in Crises Management

(with Englich Summary)



Traditional vs. adaptive map

- **Traditional map**
  - Static
  - Universal
  - As much information as possible (level of legibility)
  - Demand on high level of user knowledge
- **Adaptive map**
  - As little information as needed for interpretation
  - No redundancy of information
  - Individual

Adaptive cartography and context

What factors influence readability and usability of map

- IDENTITY CONTEXT --- *WHO*
- EMERGENCY CONTEXT
  - LOCATION --- *WHERE*
  - TIME --- *WHEN*
  - TASK --- *WHAT*
- FUNCTIONAL CONTEXT --- *HOW*

IDENTITY CONTEXT

- ***WHO* will use the map?**
  - **government and self-government authorities** – municipalities, municipalities with extended powers, region, state (central) authorities
  - legal entities,
  - self-employed natural persons,
  - basic and other units of the ***Integrated Rescue System*** (**Fire Rescue Service of the Czech Rep.**, Police of the Czech Rep., Ambulance Service etc.)
  - **River Basin Districts Authorities**
  - Watercourse managers
  - Public

EMERGENCY CONTEXT

EVENT

FLOOD
CAR ACCIDENT
FOREST FIRE

WHAT

TASK

PREDICTION

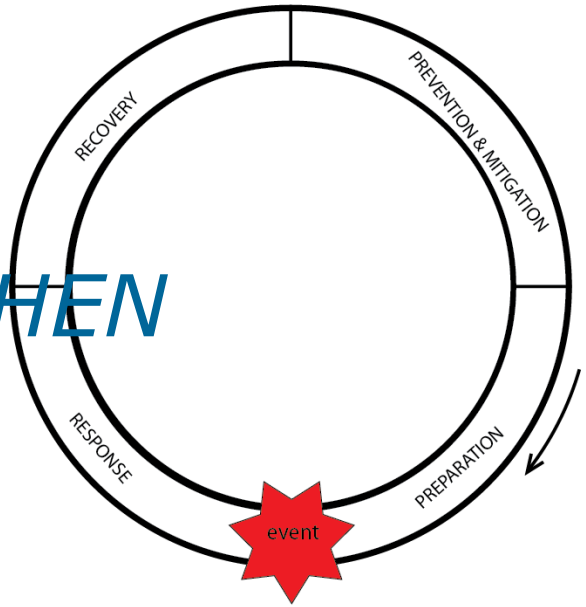
TECHNICAL SUPPORT

RESCUE

ORGANIZATION

INFORMATION

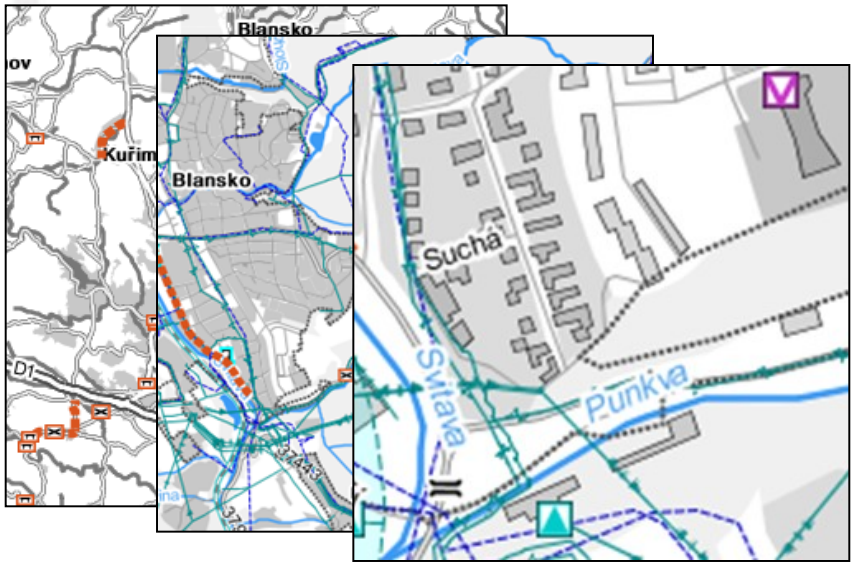
STAGE



WHEN

OPERATION RANGE

REGION-DISTRICT-MUNICIPALITY-LOCAL



WHERE

ADAPTIVE CARTOGRAPHY
Adaptability of Cartographic Representation

1. User level–operational units, dispatching units and stakeholders need different scales, themes and map extent, but over the same data.

2. User background–different educational and map use bias.

3. Theme importance – different features in map content and variable significance with changing emergency situation.

ADAPTIVE CARTOGRAPHY

4. New phenomena – new features reflecting the emergency status need to be inserted into map consistently.

5. Interaction device and environment – various electronic visualization devices are used and they are also in interaction with environment which is influencing visibility and amount of information used.

Context-Based Cartography

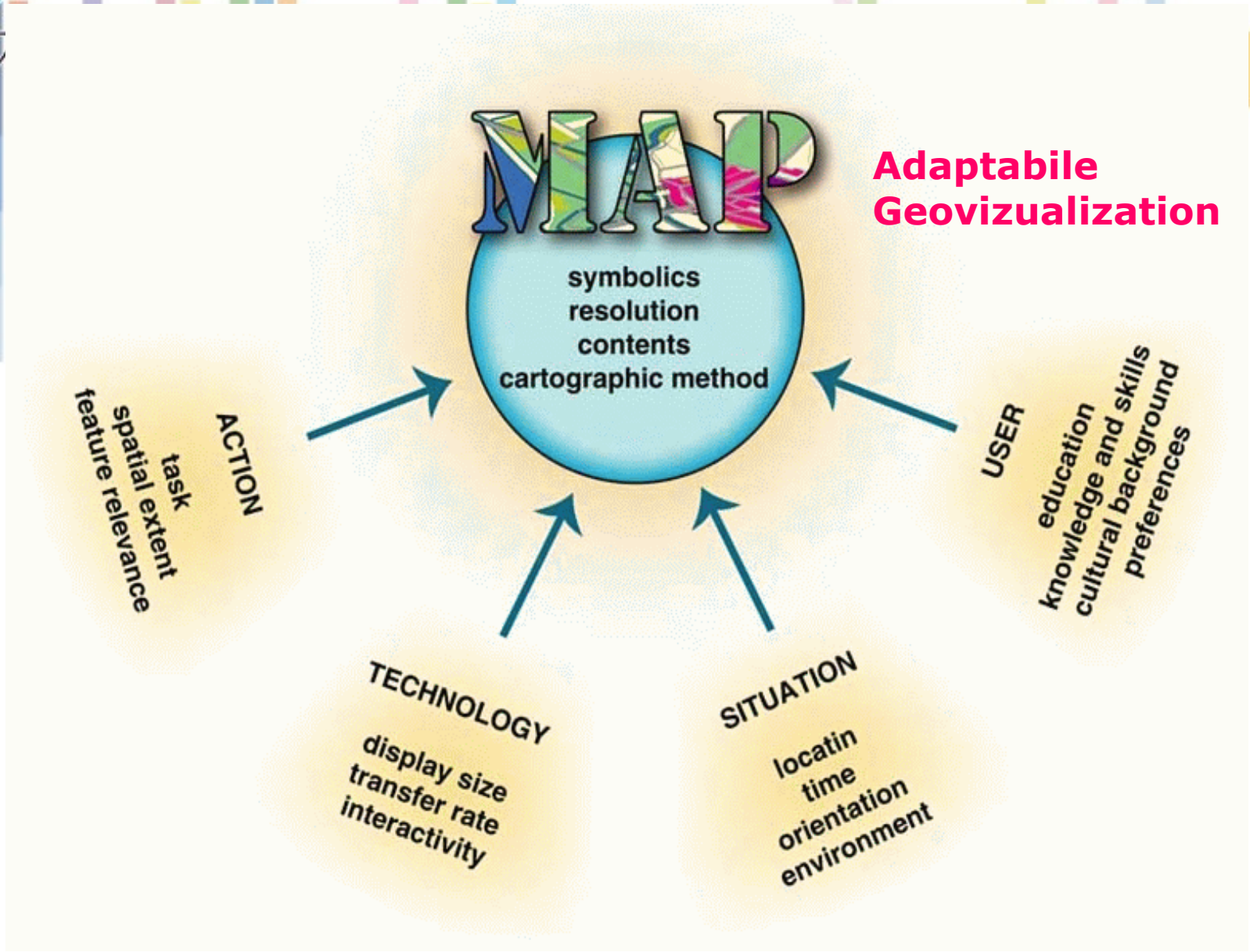


Figure: Examples of changes in visualization according to change of context (Friedmanová, Konečný and Staněk 2006)

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***.

The term **context** ***refers to a set of characteristics*** providing answers to the following questions:

Who is the map reader – information on abilities of the user to read maps, their visual preferences, level of knowledge and/or education. This information forms the user profile.

What is the purpose of the map – information on solved problems, spatial extent of the problem and information on hierarchy of map content items depending on the given problem.

Where is the map used – information on place, time, orientation and natural conditions influencing map perception (e.g. light conditions)

What is the device displaying the map – set of information related to parameters of the display, transmission capacity and software characteristics of client application.

Usability of Selected Base Maps for Crises Management - Users Perspectives

COGNITIVE STYLE

GI4DM, Torino 2010

Personality of map users

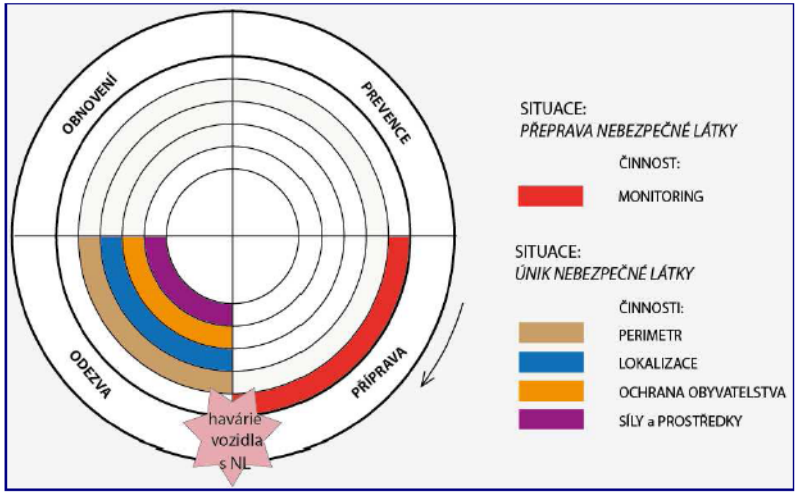
Cognitive style

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.)

Geoinformation support of emergency management

- Crises processes
- Metadata and data
- Geographical support of EM
- Security system and EM
- Quality and uncertainity of data

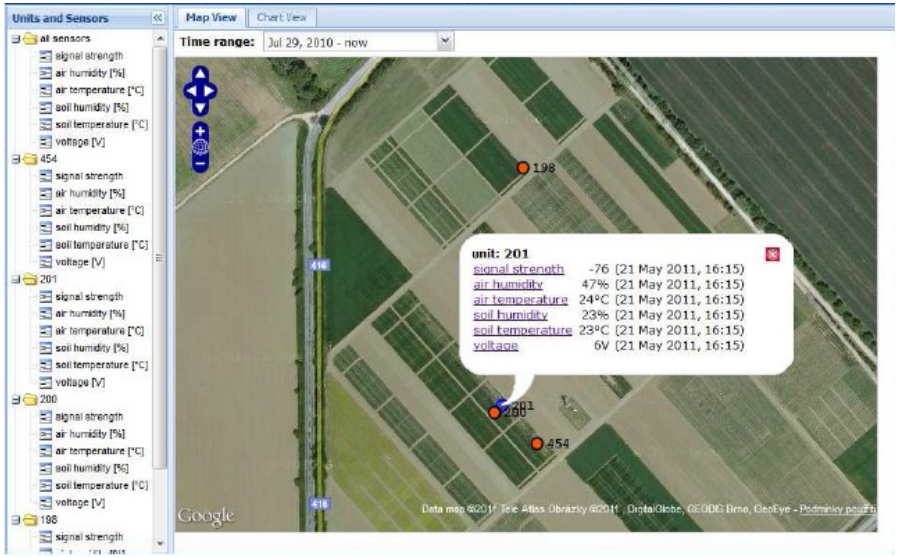


Obr. 5.10: Vymezení činností v jednotlivých fázích krizového cyklu – situace PŘEPRAVA NEBEZPEČNÉ LÁTKY a ÚNIK NEBEZPEČNÉ LÁTKY

Development of Methods of Adaptive Cartograhic Visualization

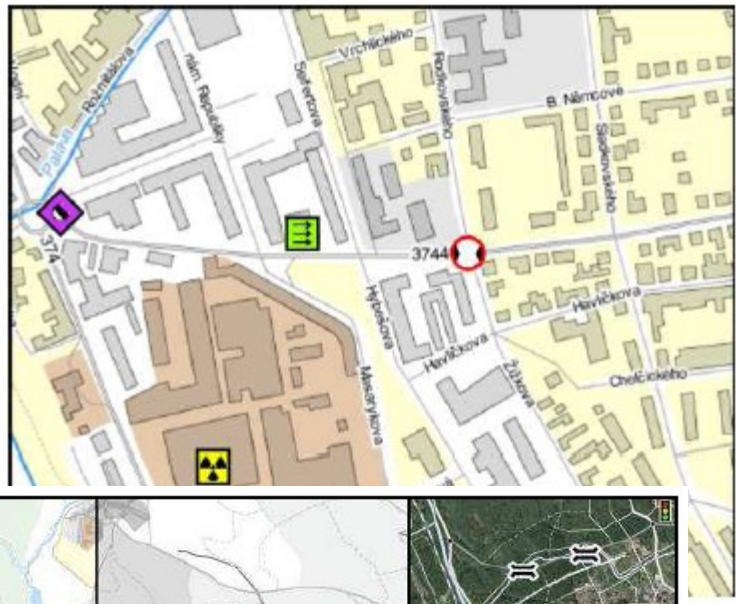
- **Methods**
- **Technologies CWMS – Sissi**
- **Pilot projects**
- **Integration of sensors and geoinformation infrastructures**

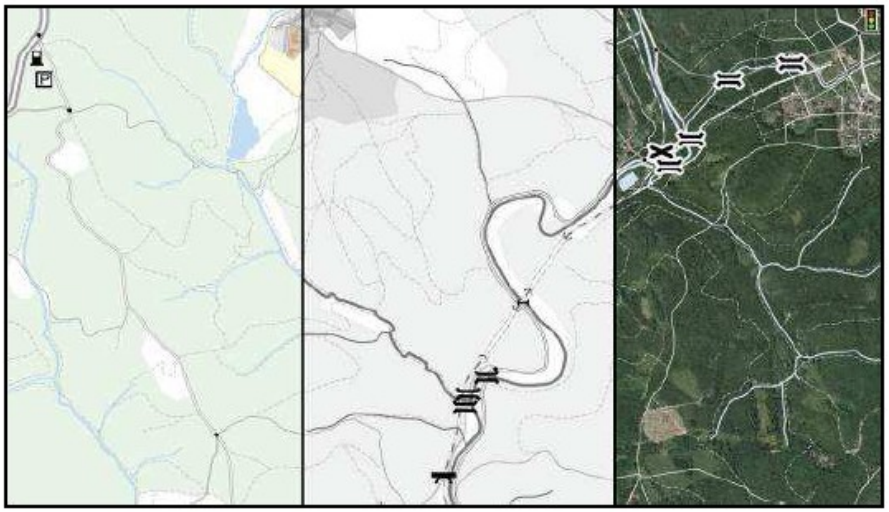
Co ?	Co se událo?	*SITUACE*
	Co má být provedeno?	*ČINNOST*
Kdy?	Kdy se krizový jev udál?	*DOBA*
	V jaké fázi se krizový jev nachází?	*FÁZE*
Kde?	Kde se krizový jev udál?	*MÍSTO*
	Jaký má krizový jev plošný rozsah a dosah? Jaký plošný rozsah má návazná činnost?	*OPERAČNÍ ROZSAH*
Kdo?	Kdo bude mapu využívat?	*UŽIVATELSKÉ SCHOPNOSTI*
	Kdo spravuje jaká data?	*SPRÁVA DAT*
Jak?	Jak bude mapa využívána?	*FUNKCE MAPY*
	Jaká je velikost zobrazovací jednotky?	*TECHNOLOGIE*



Cartographic Models and Cartographic infrastructure

- **Adaptation of map content.**
- **Adaptation of map symbols according to context.**
- **Evaluation of cartographic outputs according to personal characteristics of the user.**

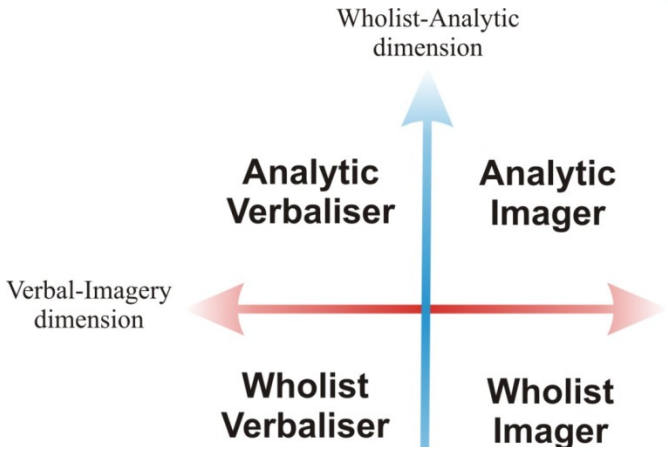


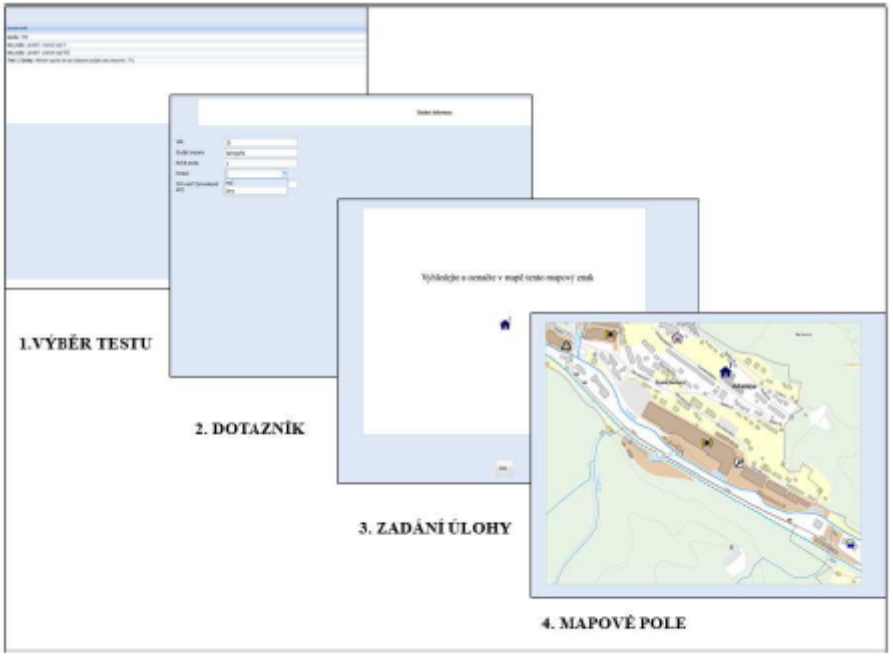


Obr. 10.10: Ukázka variantní vizualizace topografické báze BASETOPO v úrovni detailu MAX

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 – výbě testu, dotazník, zadání, úkol (upraveno podle ŠTĚRBA et al., 2011)

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)

The term asserted that geographic information draws attention to the fact that *such information is not subject to the normal checks and quality control mechanisms of those agencies*,

while neo-geography emphasizes the contrast between the grass-roots phenomenon and the current state of the academic discipline of geography.

Next relevant activities:

2013:

December 3-5, ICA Commission for Cartography for EW and Crises Management, Wuhan, China

2014:

InterExpo Geosiberiam April 18-18

5th Cartography and GIS Conference; Seminar on EW and CM, June 16- 20, 2014, Albena, Bulgaria

PRAGUE

BRNO


Welcome to the
Entertainment
Beer Hall!

FALEMINDERIT

CHVALA

Bardzo Dziekuje

Xie, Xie!!!!!

THANK YOU

Muchas Gracias

Terima Kasim

O Brigada

Kammsa Hamida

Aligator

SHUKRAN

BLAGODARJA

DĚKUJI (in Czech)

Danke Schon!!!!!

Rachmed
THANK YOU
Muchas Gracias
O Brigada
Kammsa Hamida
Aligator
SHUKRAN
BLAGODARJA

DĚKUJI (in Czech)