GI support for sustainable development of regions in crisis,
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DRM and DRR Challenges and Potentials: Are Sendai Framework Results Enough?

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3. Sendai Framework: New Tasks and Realization
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1. Introduction

Main Concepts in the Science We are dealing with:

- Information Society and Building Knowledge Based Societies

- Big Data, 4G, 5G, GIS Science (GIS, Remote Sensing, Apps, others), Digital Earth Concepts, Virtual Reality, Artificial Intelligence, IoT, Metaverse

- Digital Transformation process.

From Hyogo to Sendai

Sendai – key document for World Efoorts

HFA

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 mean failure of the whole early warning system.

2. DRM and DRR Definitions

Disaster Risk Management

Definition of U.N. Office for Disaster Risk Reduction – UNDRR (2024)

Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses.

Annotation: Disaster risk management actions can be distinguished between prospective disaster risk management, corrective disaster risk management and compensatory disaster risk management, also called residual risk management.

Prospective disaster risk management activities address and seek to avoid the development of new or increased disaster risks. *They focus on addressing disaster risks that may develop in future if disaster risk reduction policies are not put in place.* Examples are better land-use planning or disaster-resistant water supply systems.

Corrective disaster risk management activities address and seek *to remove or reduce disaster risks which are already present and which need to be managed and reduced now.* Examples are the retrofitting of critical infrastructure or the relocation of exposed populations or assets.

Compensatory disaster risk management *activities strengthen the social and economic resilience of individuals and societies in the face of residual risk that cannot be effectively reduced.* They include preparedness, response and recovery activities, but also a mix of different financing instruments, such as national contingency funds, contingent credit, insurance and reinsurance and social safety nets.

Community-based disaster risk management promotes the involvement of potentially affected communities in disaster risk management at the local level. This includes community assessments of hazards, vulnerabilities and capacities, and their involvement in planning, implementation, monitoring and evaluation of local action for disaster risk reduction.

Local and indigenous peoples' approach to disaster risk management is the recognition and use of traditional, indigenous, and local knowledge and practices to complement scientific knowledge in disaster risk assessments and for the planning and implementation of local disaster risk management.

Disaster risk management plans *set out the goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives.*

They should be guided by the Sendai Framework for Disaster Risk Reduction 2015-2030 and considered and coordinated within relevant development plans, resource allocations, and program activities. National-level plans need to be specific to each level of administrative responsibility and adapted to the different social and geographical circumstances that are present. The time frame and responsibilities for implementation and the sources of funding should be specified in the plan.

Linkages to sustainable development and climate change adaptation plans should be made where possible.

Disaster Risk Reduction

Definition of U.N. Office for Disaster Risk Reduction – UNDRR (2024)

Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development.
Annotation: Disaster risk reduction is the policy objective of disaster risk management, and its goals and objectives are defined in disaster risk reduction strategies and plans.

Disaster risk reduction strategies and policies define *goals and objectives across different timescales and with concrete targets, indicators and time frames.*

In line with the Sendai Framework for Disaster Risk Reduction 2015-2030, these should be aimed at *preventing the creation of disaster risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience.*

A global, agreed policy of disaster risk reduction is set out in the United Nations endorsed Sendai Framework for Disaster Risk Reduction 2015-2030, adopted in March 2015, whose expected outcome over *the next 15 years is:*

"The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries".

1. Sendai Framework: New Tasks and Realization

UNEP 2030 Agenda

UN disaster risk reduction Agenda

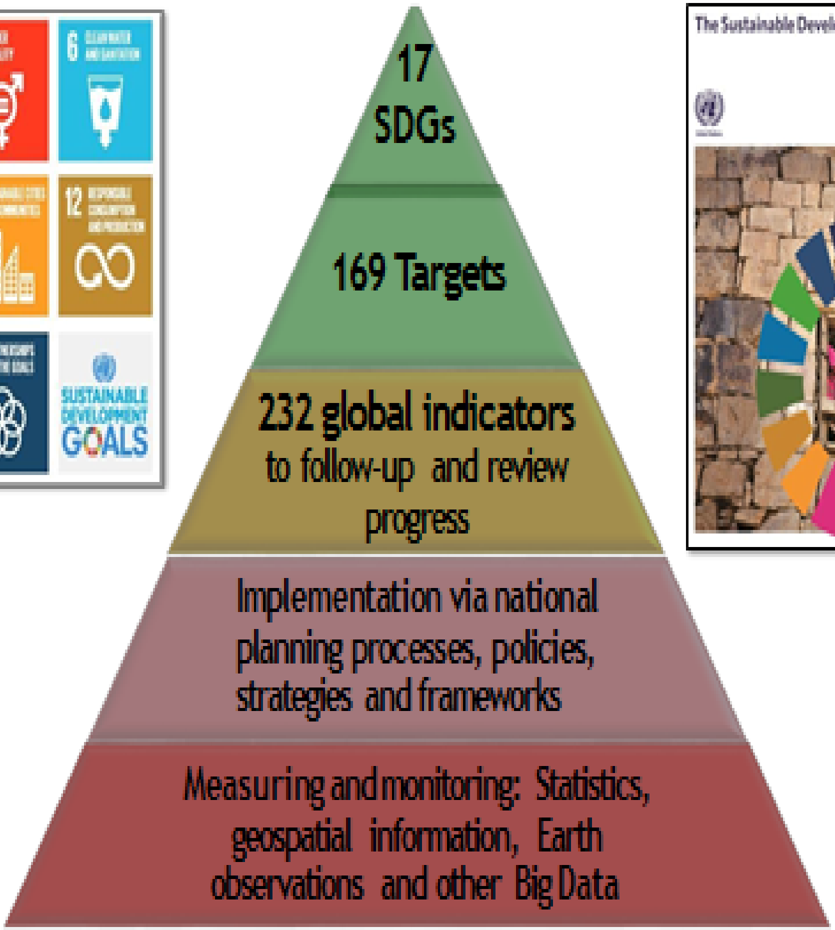
Snowstorm, Drought , Earthquake, Flood, Hurricanes, Cyclones and typhoons, Landslide, Tornado , Tsunami, Volcanic eruption, Wildfires

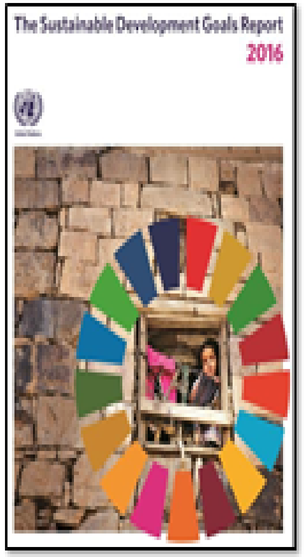
UNISDR

Sendai Framework for Disaster Risk Reduction 2015 - 2030

2018 AMCDRR

2030 Agenda: Goals, targets, indicators





Disasters Risk Reduction Agenda: Sendai Framework, targets and global indicators


Eyjafjallajokull
www.boston.com

In the Third U.N. World Conference on DRR, March 14, 2015, in Sendai, Japan.

As never before the conference in its materials mentioned the role of ICTs, GIS, remote sensing, mapping, sensors, volunteer geographic information, etc.

In Sendai framework, **four new priorities** of action are defined:

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 (United Nations General Assembly, 2015).**

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;

(f) To promote real time access to reliable data, make use of **space and in situ information**,

including geographic information systems **(GIS),** and use information and communications technology innovations

to enhance measurement tools and the collection, analysis and dissemination of data;

Global and regional levels

To achieve this, it is important:

(a) To enhance the development and dissemination of **science-based methodologies** and tools to record and share disaster losses and relevant disaggregated **data and statistics**, as well

as to strengthen disaster risk modelling, assessment, **mapping**, monitoring and multi-hazard early warning systems;

Global Indicators of Sendai Framework

Global indicators for the global targets of the Sendai Framework aim to operationalisate **seven targets (A-G).**

They have been selected and as well as related and reflected to the SDGs items **no. 1 - Poverty, 11 – Sustainable Cities and 13 – Climate Action** (Figures 1 and 2).

Seven Global Targets of Sendai Framework for Disaster Risk Reduction. Source: Policy Area Secure (2018).

Sendai Framework Indicators

A set of 38 indicators was identified to measure global progress in the implementation of the Sendai Framework for Disaster Risk Reduction.

The indicators will measure progress in achieving the global targets of the Sendai Framework, and determine global trends in the reduction of risk and losses.

Global target E: Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.

E-1 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030.

E-2 Percentage of local governments that adopt and implement local disaster risk reduction strategies in line with national strategies.
Information should be provided on the appropriate levels of government below the national level with responsibility for disaster risk reduction.

DBAR and U.N. GGIM: descriptions, commons and differences

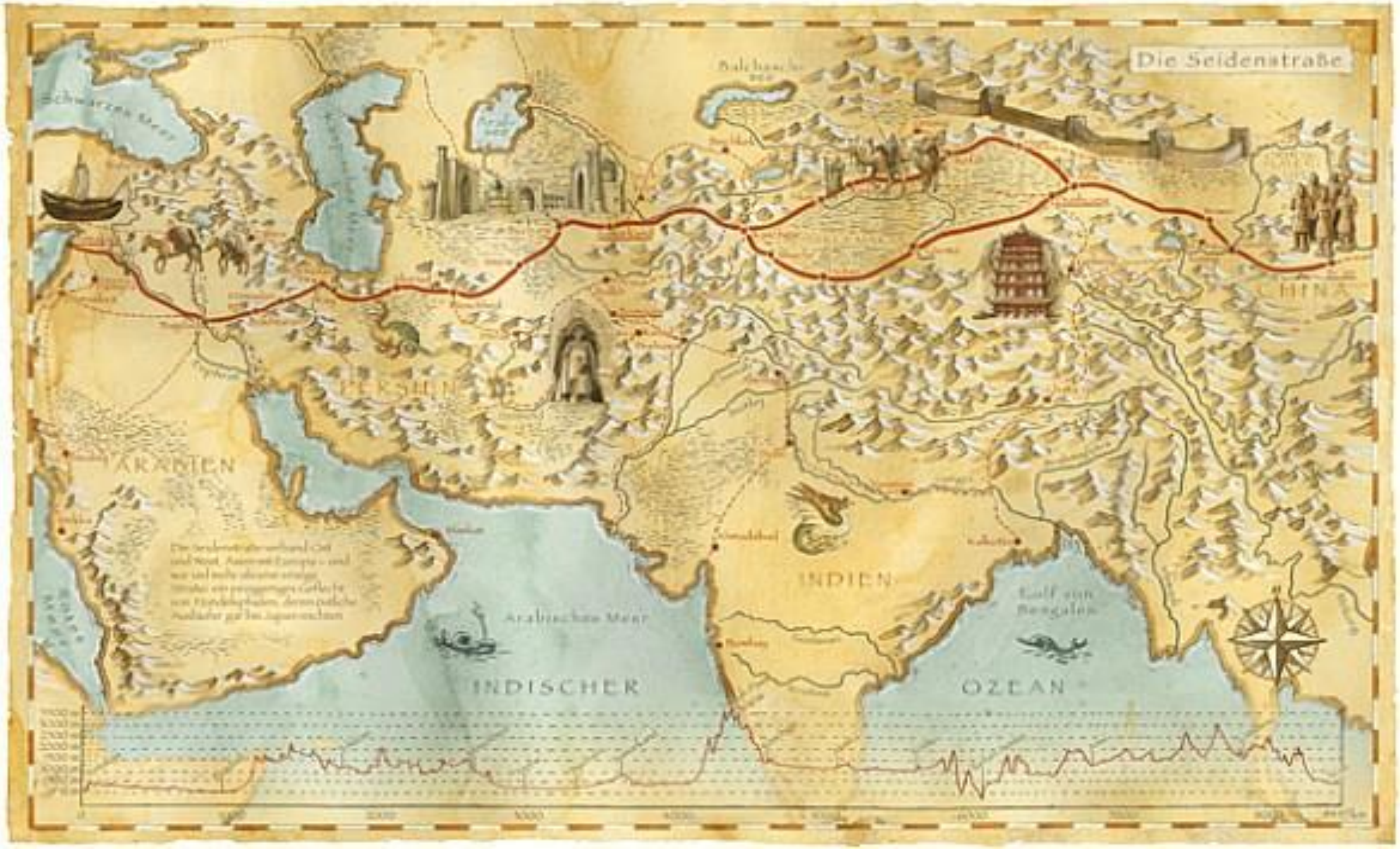
ISDE

Digital Earth Alliance

Digital Belt and Road Program (DBAR)

and

Digital Silk Road Alliance (DSRA)



Ferdinand von Richthofen's Map of the Silk Road in 1877. Source: http://www.silkroutes.net/orient/mapssilkroutestrade.htm

U.N. GGIM and Global Data Ecosystem

UN-GGIM

- **AIMS AND OBJECTIVES**
  The United Nations initiative on Global Geospatial Information Management (UN-GGIM) aims at playing a leading role in setting the agenda for the development of global geospatial information and to promote its **use to address key global challenges**.

- **UN-GGIM: Strengthening the Global Data Ecosystem**

In U.N. GGIM case G. Scott defined data needs for the 2030 Agenda by following way (Scott, 2018):

„The scope of the 2030 Agenda requires high-quality and disaggregated data that are ***timely, open, accessible, understandable and easy to use for a large range of users, including for decision making at all levels.***

There is a need for a reporting system on the SDGs that would have benefit from the sub-national (local) to the national level; and allow for global reporting that builds directly on the data shared by countries.

It is important to create an opportunity for countries to ***directly contribute*** to the global reporting.

While the challenges are immense, ***the digital technology*** that is available today ***allows*** the necessary transformation.

An aspiration is to strengthen countries' national geospatial and statistical information systems to facilitate and enable a ***'data ecosystem'*** that leverages an ***accessible, integrative and interoperable local to global system-of-systems***."

Strengthening the Global Data Ecosystem

UN-GGIM

2017-2021 Strategic Framework

CONTEXT						
	VISION	***Positioning geospatial information to address global challenges***				
	MISSION	***Operating within agreed policies and institutional arrangements, and as an interconnected global community of practice, the Committee of Experts will ensure that geospatial information and resources are coordinated, maintained, accessible, and able to be used effectively and efficiently by Member States and society to address key global challenges in a timely manner***				
	MANDATED STRATEGIC OBJECTIVES	Provide leadership in setting the agenda for the development of global geospatial information and to promote its use to address key global challenges	Provide a forum for coordination and dialogue with and among Member States and relevant international organizations on enhanced cooperation	Provide a platform for the development of effective strategies to build and strengthen national capacity and capability concerning geospatial information, especially in developing countries	Propose work-plans, frameworks and guidelines to promote common principles, policies, methods, standards and mechanisms for the interoperability and use of geospatial data and services	Make joint decisions and set the direction for the production and use of geospatial information within and across national, regional and global policy frameworks

REQUIREMENTS	GLOBAL POLICY FRAMEWORK	**Transforming our World: The 2030 Agenda for Sustainable Development** **Sendai Framework for Disaster Risk Reduction 2015-2030** **SIDS Accelerated Modalities of Action (SAMOA) Pathway** **Addis Ababa Action Agenda** **Paris Agreement on Climate Change** **HABITAT III Urban Agenda**
	GEOSPATIAL CHALLENGES & DRIVERS	Environmental management, Disaster management, Sustainable development, Population Urban planning, Humanitarian assistance, Food security, Education, National security Land management, Climate change, Water scarcity, Oceans & marine, Institutional governance Legal & policy, Health & welfare, Poverty reduction, Sustainable cities, Socio-economic metrics
	DIRECT NATIONAL BENEFITS & EFFICIENCIES	• Reduced duplication of effort in the capture, management, and delivery of fundamental geospatial information • Authoritative, reliable and maintained geospatial data available nationally, regionally, and globally • Increased return on investment through better coordination, use and reuse of data, information and systems • Better evidence-based decision making, supported by good data, science and policy • More open, accountable, responsive and efficient governments • Presentation and delivery of timely and 'fit for purpose' data in times of need • Increased collaboration and integration of national data and information systems across all levels of government • Best practices and use cases for enriching national processes on geospatial information management
	OPERATING PRINCIPLES	Sound Nat. Policies, Legal Frameworks & Institutional Arrangements Provision of Fundamental Authoritative Data and Information Agreed Standards, Methods, Guides and Frameworks Principles on Geospatial Information and Open Data Integration and Interoperability of National Information Systems Information Sharing and Knowledge Transfer Building Local to Global Capacity & Capability
DELIVERABLES	WORKING ACTIVITIES AND OUTPUTS	• Geospatial Information for Sustainable Development: 2030 Agenda, Sendai Framework, etc. • Integration of Geospatial & Statistical Information: Implement the Global Statistical Geospatial Framework • Geospatial Information and Services for Disasters: Implement Strategic Framework • Global Geodetic Reference Frame: Roadmap to Implement • Determination of global fundamental data themes • Marine geospatial information • Land administration and management • Legal and policy frameworks • National institutional arrangements • Implementation and adoption of standards for the global geospatial information community • National geospatial data and information systems


Digital Evolution
NSDI
Big Data
A WORLD THAT COUNTS
Digital Earth
Global Data Ecosystem
Digital Transformation
Implementing Nationally Integrated Information Systems
SUSTAINABLE DEVELOPMENT GOALS
Digital Divide
Digital Maturity

DBAR is coming with ***new approach how to look for and elaborate data*** mainly based on satelite images.

There is ***still missing concept*** how deliver data to interesting groups, private sector and individual inhabitants.

Different political systems and different data, information and knowledge policies;

5. Some of new selected efforts: Social and psychological Research in Cartography; context based and adaptive maps, communication with people

Content

1. The history of the cartographic communication model and first works about perception and (a)perception in cartography (in 80s) J.Svancara, M. Konecny).

2. Psychological Concepts in Cartography – Dynamic Geovisualization - Users Needs. Adaptive and Context Cartography.

3. Process of the Digitalization of the World – New Conditions and New Potentials of Cartography

If you like to have **The first textbook of GIS in the World (1985),** Write me and I will send it to you in .pdf.

In Czech language with few parts in English.

Looking back - modern social oriented definition of GIS:

GIS first Textbook in Brno, 1985, Konecny Milan, Karel Rais, Folia Geographia, 21, 26,13, p.9:

„GIS is a system of people, technical and organizational means that collect, transfer, store and process data to create information suitable for further use in geographic research and its practical applications."

Citation of book is: **KONEČNÝ, M. – RAIS, K.** ***Geografické informační systémy*****. Folia Geografia, roč. XXVI, Geographia 21, č. 13. Brno,1985. 196 p.**

China-Czech Intergovernmental Science and Technology Cooperation Project 2017.4-2019.12

Dynamic mapping for risk and crisis management in big data era

The project responded to the ***unresolved issue in the field of early warning and crisis management*** and builds on current trends of cartography ***in the era of big data.***

The main benefit of the project is the development of ***methods for dynamic generation of maps*** from **heterogenous (and abnormal) data** for different regions and crisis events using methods of web cartography using appropriate rules for crisis management.

The aim is to create a software environment for creating maps for crisis management in real time, which will be verified in both participating countries.

Goals

Why Big data in disaster management?

- The amount of data is constantly increasing.
- Including data available for disaster management.

- Such amount of data is difficult:
  - **to verify**
  - **to harmonise**
  - **to analyse**

The goal is a dynamic generation of maps from **heterogenous data** that will be used to support the solution of crisis situation.

Heterogenous data

- **Data from various Czech institutions and companies**
  - Brno Municipality
  - Hydrological Directorate of the Morava river
  - Directorate of Road and Motorway Network in the Czech Republic
  - O2 mobile operator

- Different topics:
  - traffic data
  - meteorological data
  - air quality data
  - hydrological data
  - localization of mobile phones

Heterogenous data

- Different characteristics
- Different density of sensor network
- Different time intervals of mesurements
- Different formats (CSV, XLS, XML, TXT…)
- Different ways of data providing

- **Data collected by volunteers (VGI data)**
  - Data verification needs to be solved

System of interactive map for disaster management

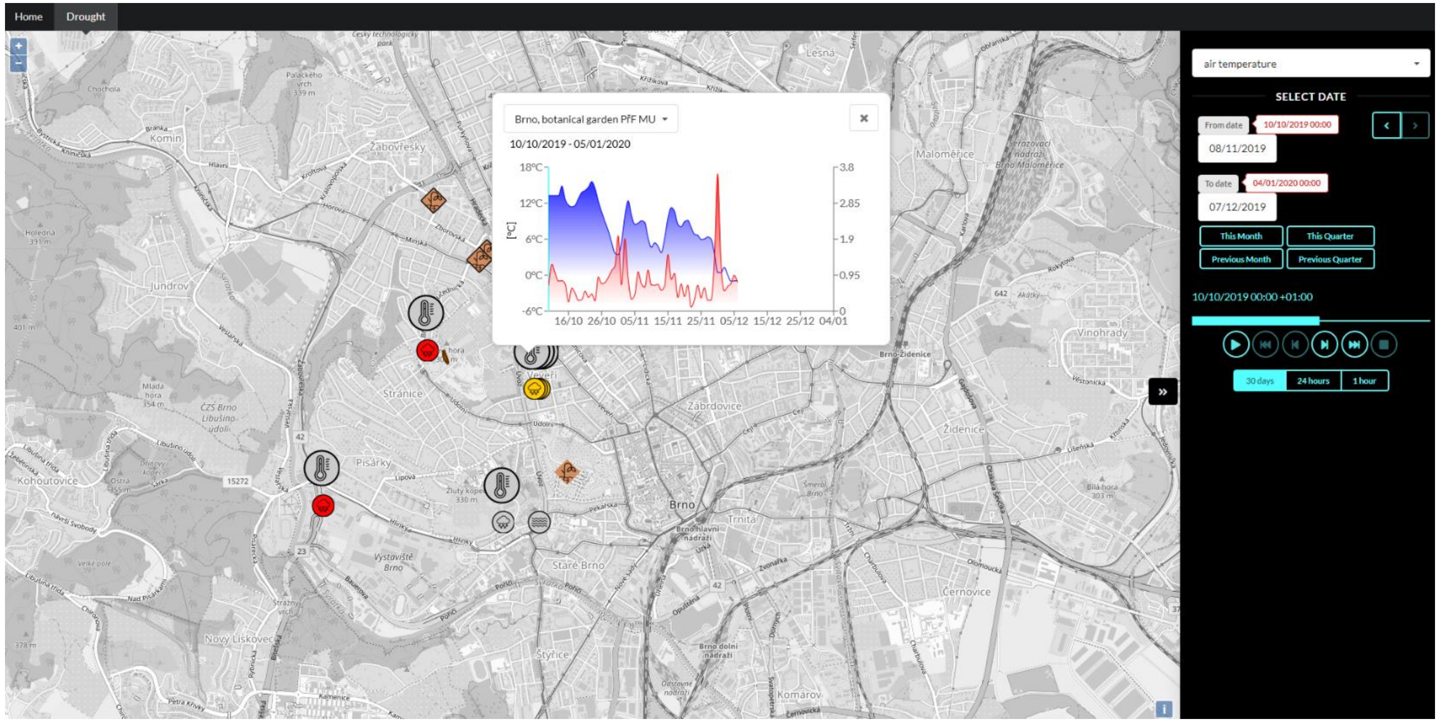
- **harmonisation** of heterogenous data from various sources
- different characteristics, different formats, different ways of data providing, different spatial and time resolution…
- Heterogenous data are transformed to database structure inspired by ISO 19156 Geographic information – Observations and measurements.
- Some values are pre-calculated (e.g. daily or monthly average) that will be used for subsequent data processing.

System of interactive map for disaster management

- Map compositon is prepared from harmonised data stored in database.
- Possibility of interactive exploration of data.
- Set of time windows can be defined and aggregated values (e.g. averages) can be calculated.
- **Anomalies** in time series are identified and visualised.
    - It allows **identification** and **analysis** of abnormal situation which could trigger a crisis situation (e.g. extreme rainfall).

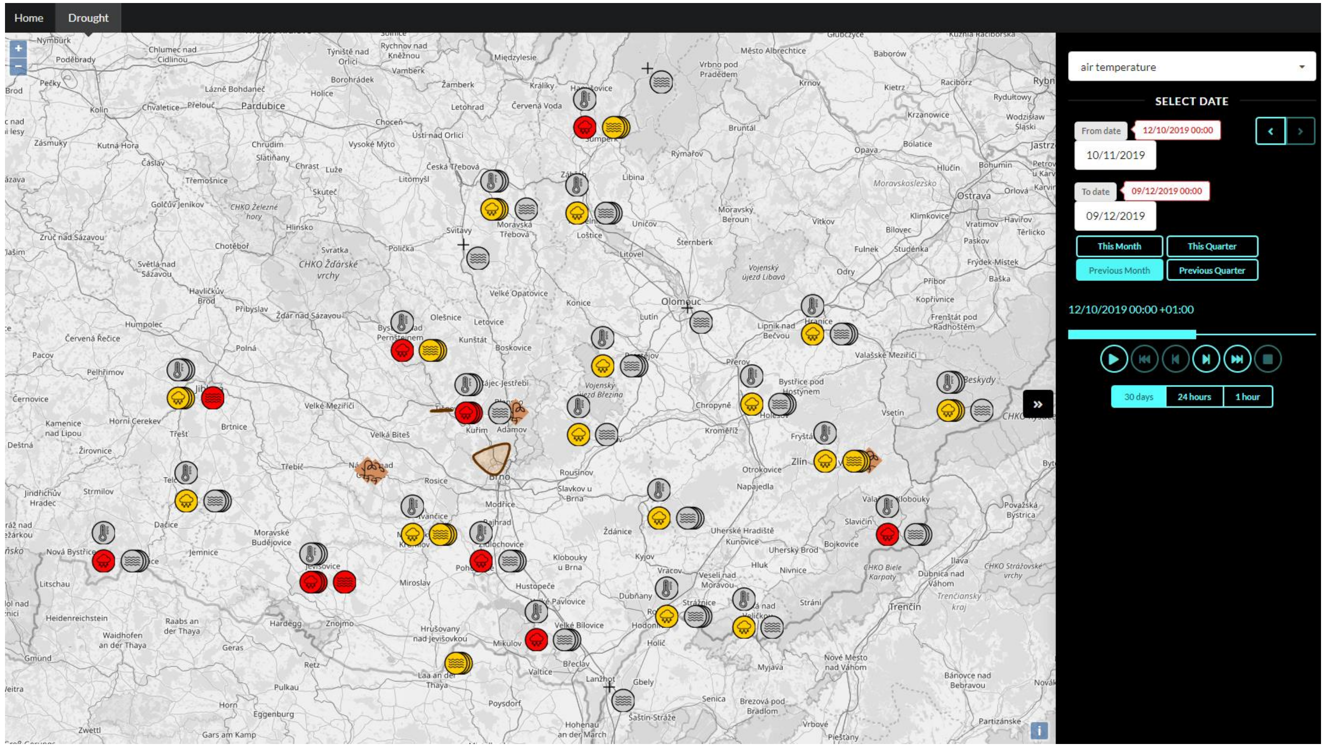
System of interactive map for disaster management

https://poster.sci.muni.cz/topics/drought/



System of interactive map for disaster management

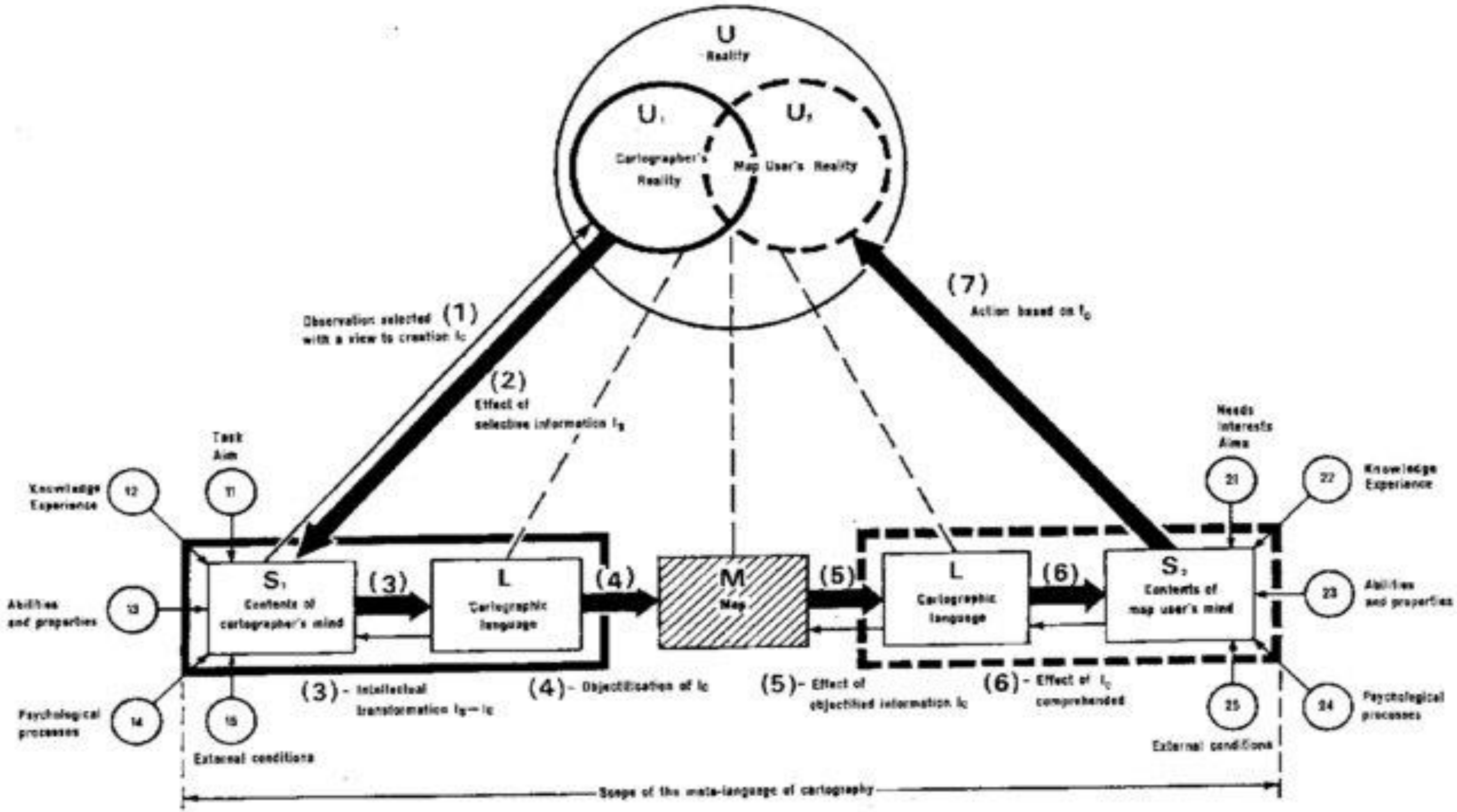
- https://poster.sci.muni.cz/topics/drought/
- prepared also for mobile phones



KOLÁČNÝ, 1969: Schema of the Proces of Communication of Cartographic Information, relations between cartographer and a user

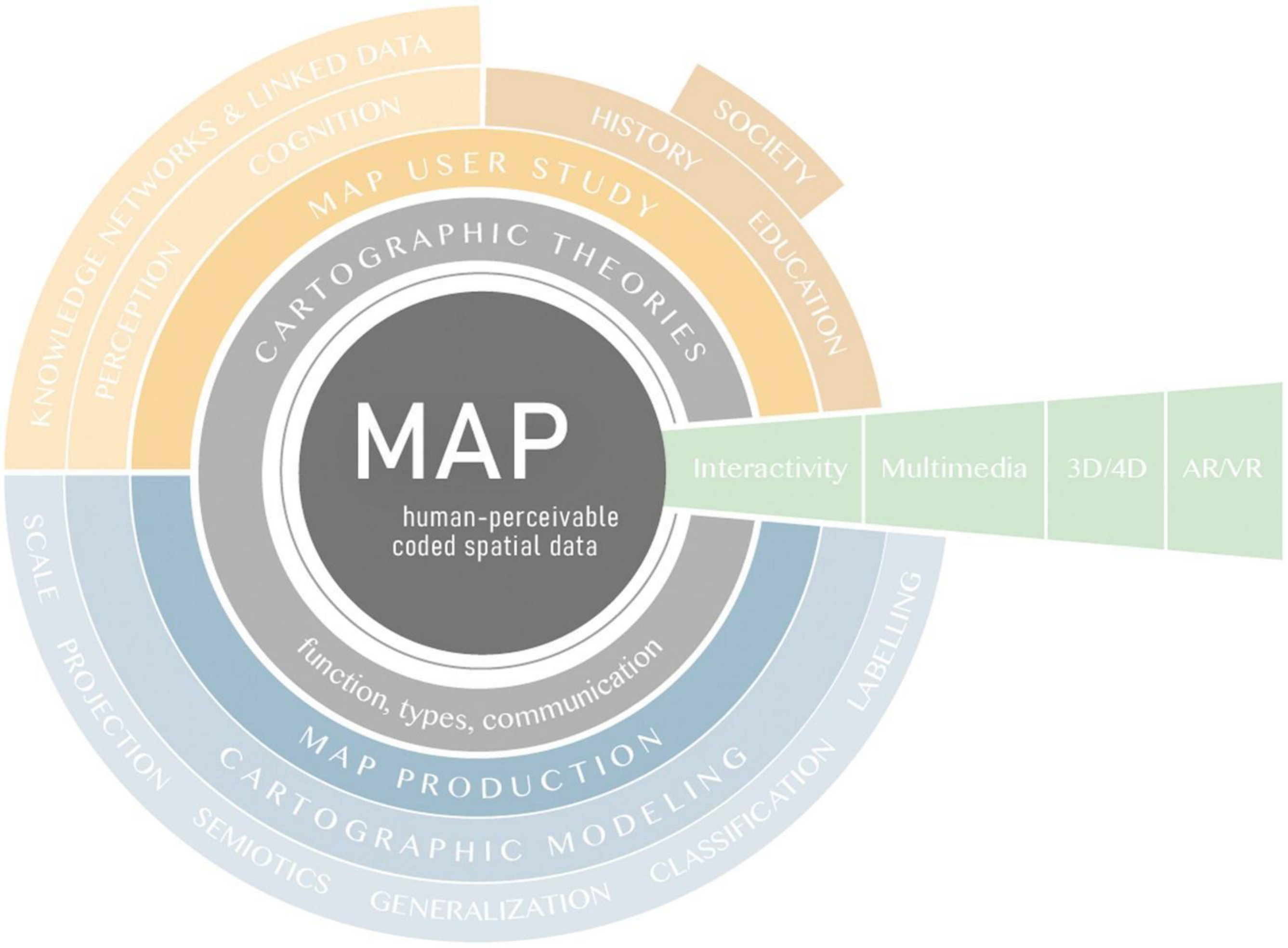
Communication of cartographic information **(Kolacny, 1969)** proposed a communication model where a **cartographer encodes cartographic information into a map,** based on his/her own perception of reality, and communicate that information in terms of **cartographic language** through the map **to the map user.**

The interactions between cartographers and map users are shown in Figure below.


U
Reality
U1
Cartographer's Reality
U2
Map User's Reality
(1)
Observation selected with a view to creation Ic
(2)
Effect of selective information Is
(7)
Action based on Ic
Task Aim
11
Knowledge Experience
12
Abilities and properties
13
Psychological processes
14
15
External conditions
S1
Contents of cartographer's mind
(3)
L
Cartographic language
(4)
M
Map
(5)
L
Cartographic language
(6)
S2
Contents of map user's mind
Needs Interests Aims
21
22
Knowledge Experience
23
Abilities and properties
24
Psychological processes
25
External conditions
(3) - Intellectual transformation Is → Ic
(4) - Objectification of Ic
(5) - Effect of objectified information Ic
(6) - Effect of Ic comprehended
Scope of the meta-language of cartography

Fairbairn et al, 2021:

„Because the map today is almost universally intangible, it would be preferable to define it by identifying characteristics of function, rather than characteristics of form.

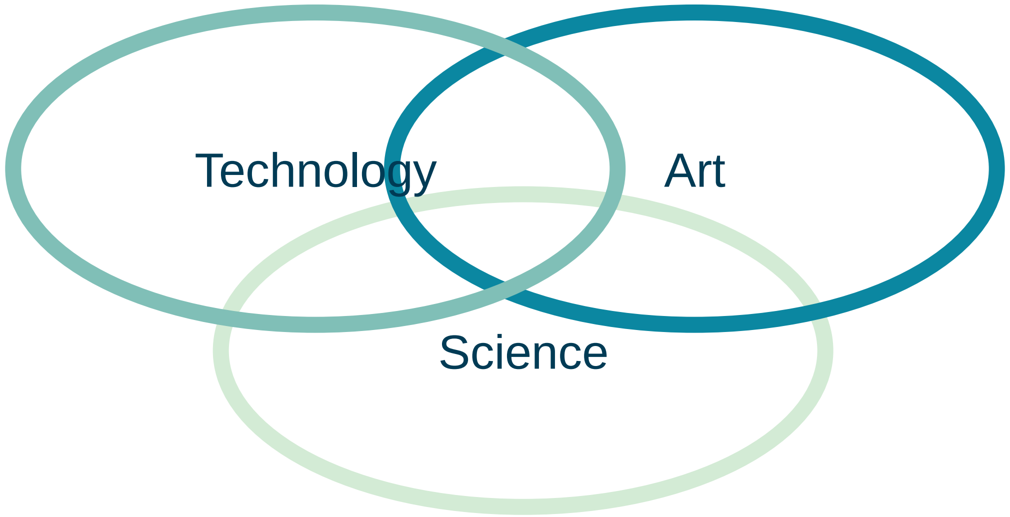


2. Psychological Concepts in Cartography – Dynamic Geovisualization - Users Needs.

Adaptive and Context Cartography.

Content

- The beginnings of psychological research in cartography
- Collaboration of psychology and cartography at MUNI
- Research intention
- Graduates
- Follow-up research and activities



Perception = the ability to see, hear, or become aware of something through the senses.

and

Apperception = the process of understanding something perceived in terms of previous experience.

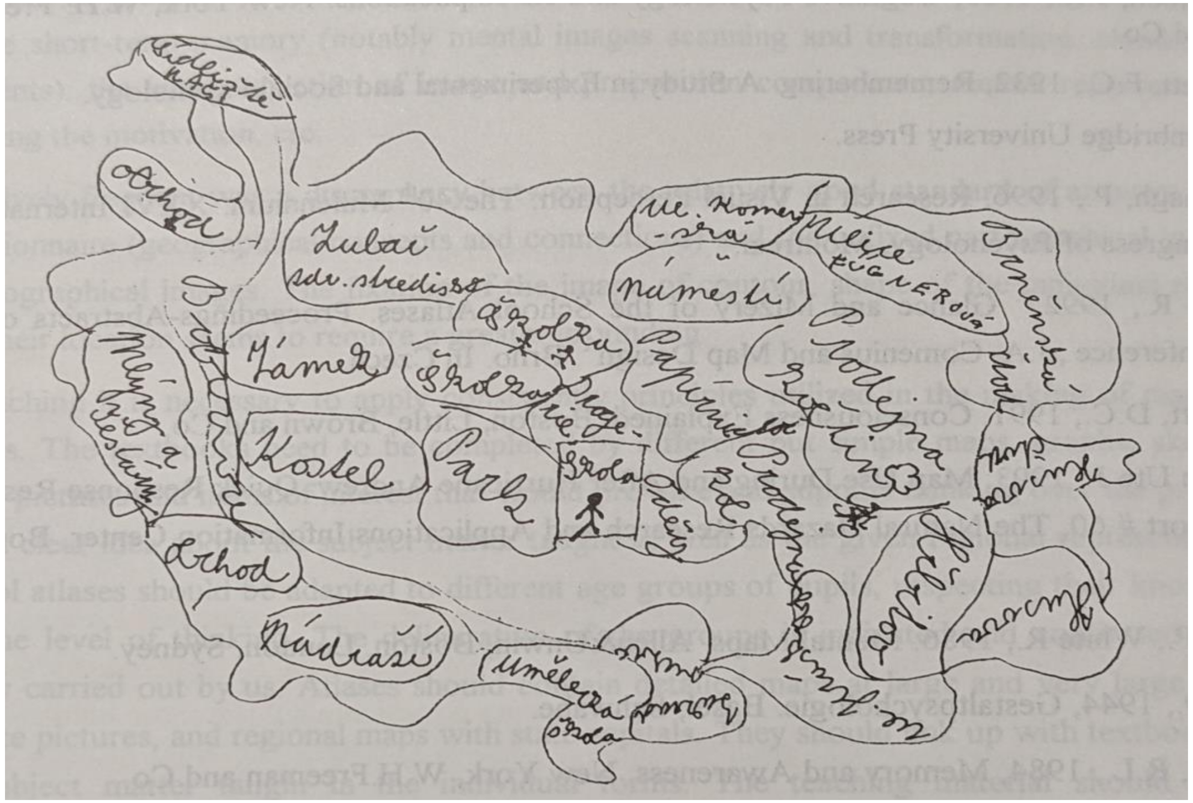
Interdisciplinary cooperation – CARTOGRAPHY and PSYCHOLOGY

+

Prof. Milan Konecny, cartographer

Prof. Josef Švancara, psychologist

KONEČNÝ, M. & ŠVANCARA, J. (**1996**). (A) perception of the Maps by Czech School Chidren. In T. Kanakubo & K. Kanazawa (Eds.). Cognitive map and Children and Education in Cartography (137- 146), Gifu: International Cartographic Association.



Dynamic Geovisualization in Crises Management – GEOCRIMA)

- 2005 – 2011 (Ministry of Education and Youth of Czech Republic)

– **Target of WP5** is provide support for cartographic visualization based on the interaction of then user with the visualization.

Support of ergonomy by visualization in both, standard (normal) and crises situations.

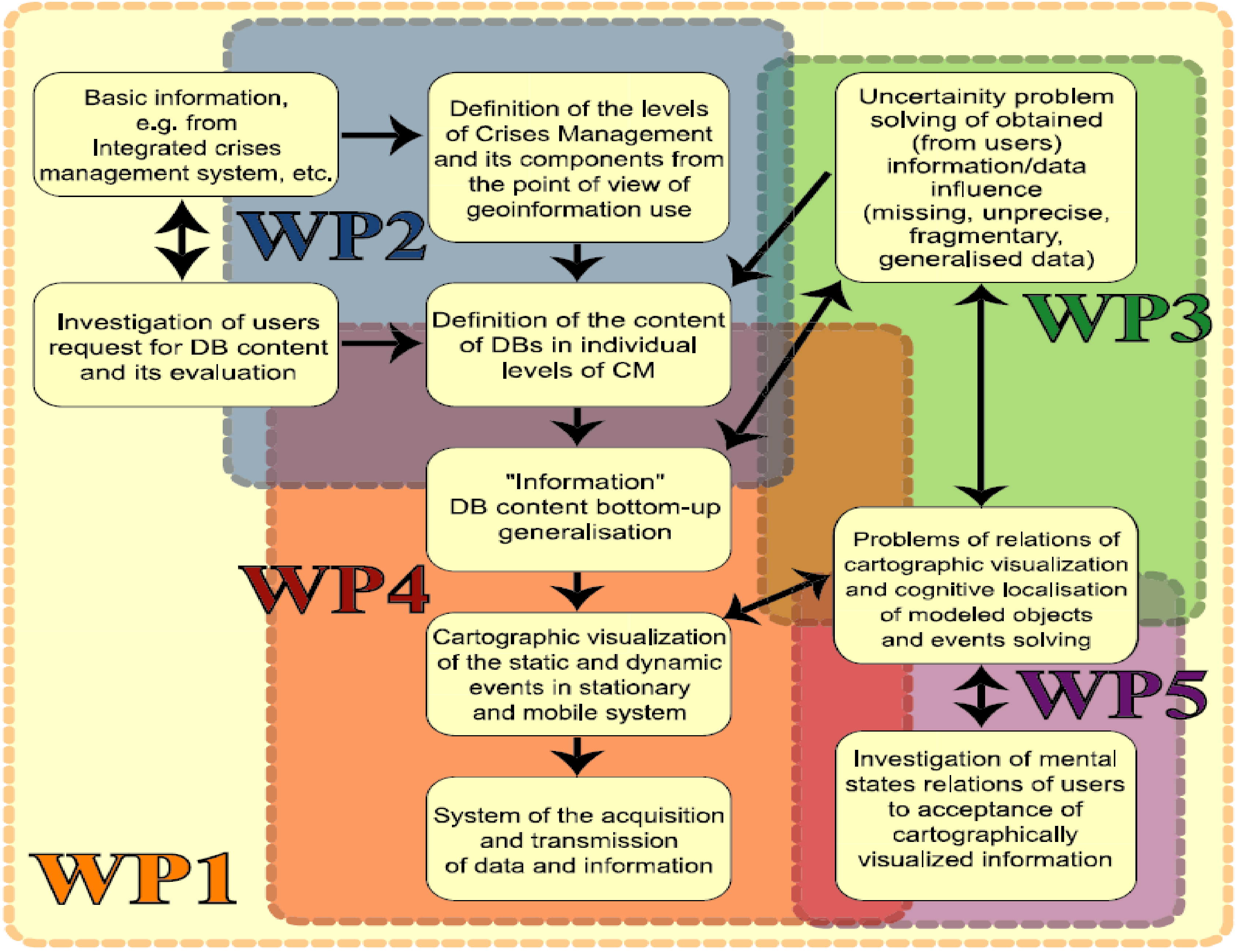
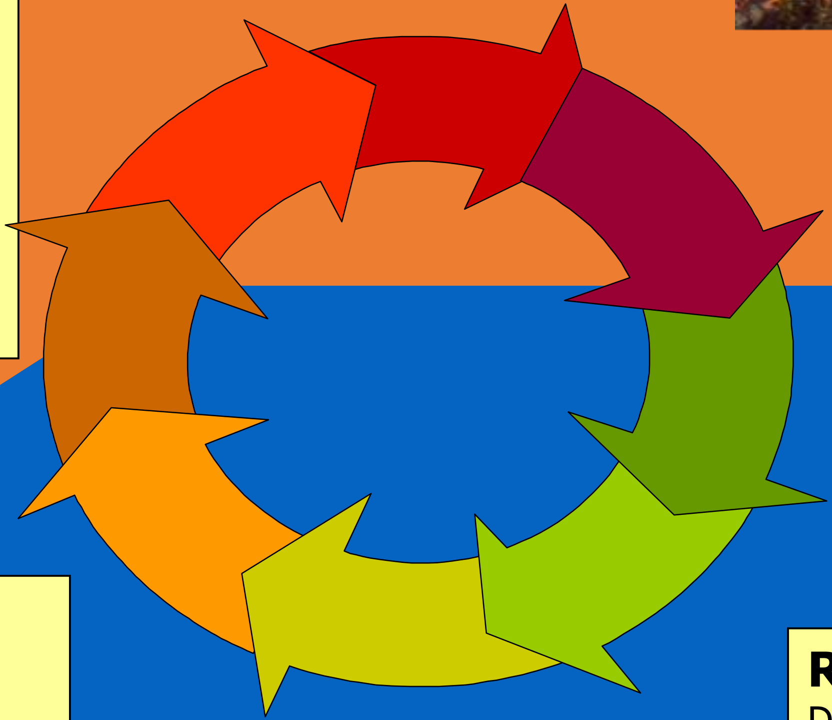


Fig. 2: Diagram of interactions of WPs

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



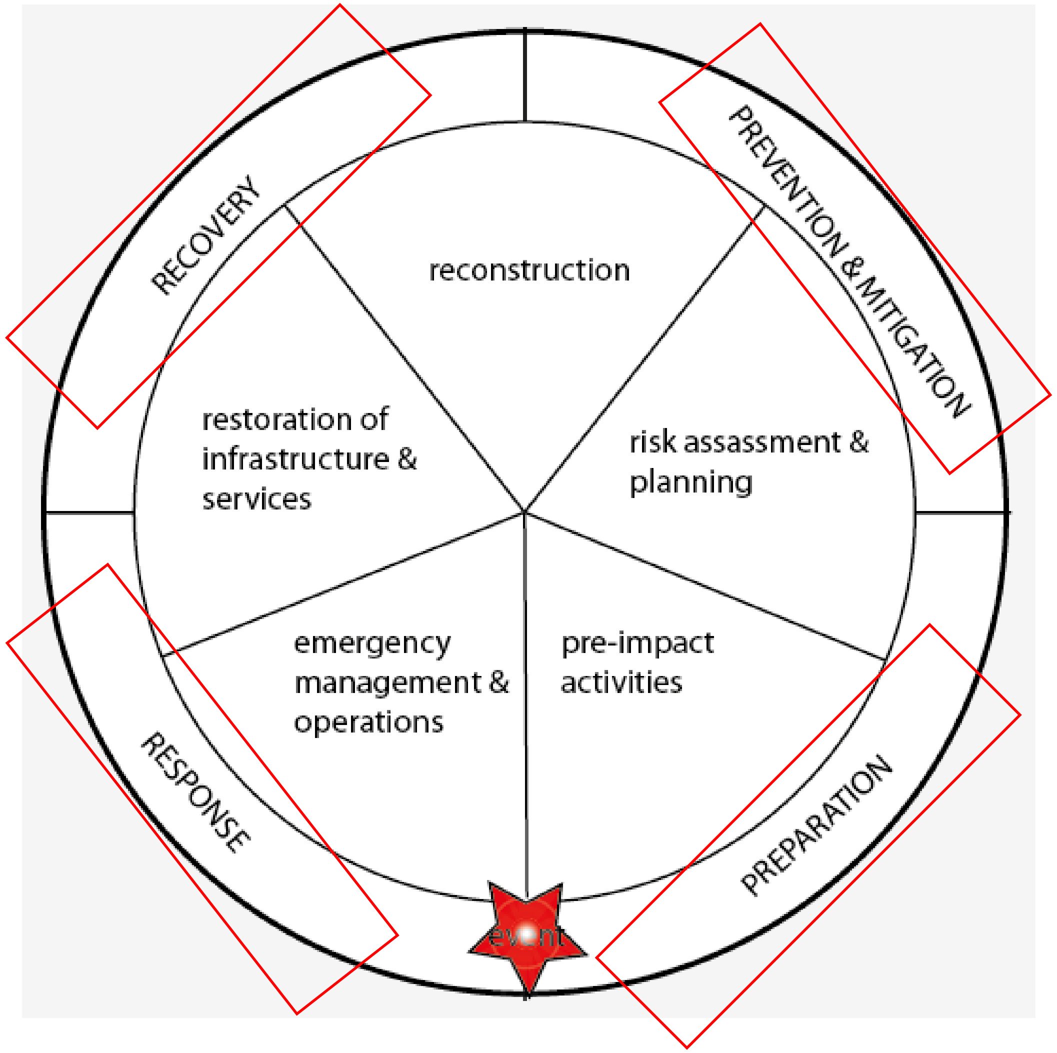
Alert
Real time monitoring
& forecasting
Early warning
Secure &dependable telecom
Scenario identification
all media alarm

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

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

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

Disaster management cycle

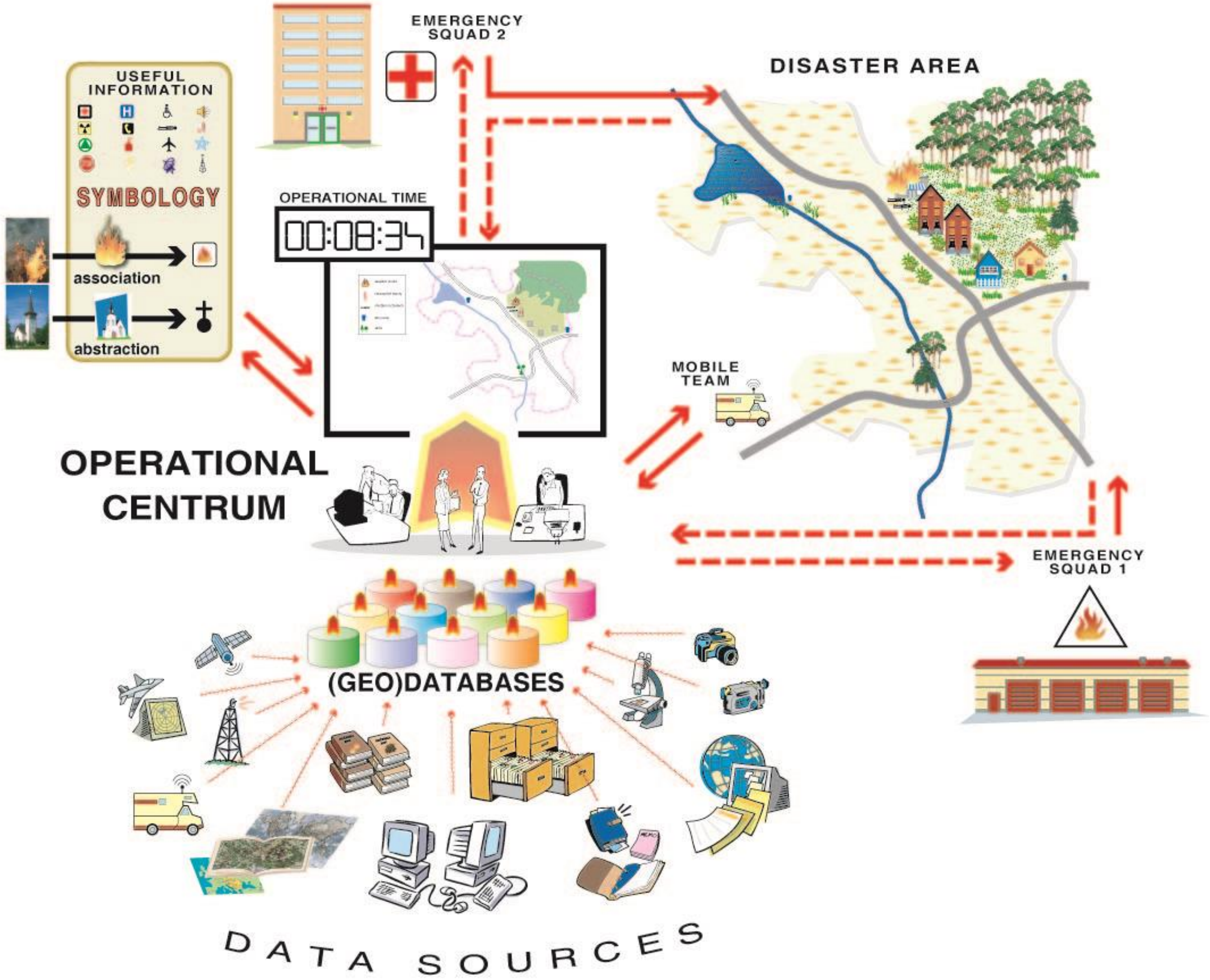


- User requirements and specifics differ within EM cycle
- Better cartographic support in all stages
- Consequences: minimizing of losses

Stage 1: Prevention

Flood mapping in the Czech Republic

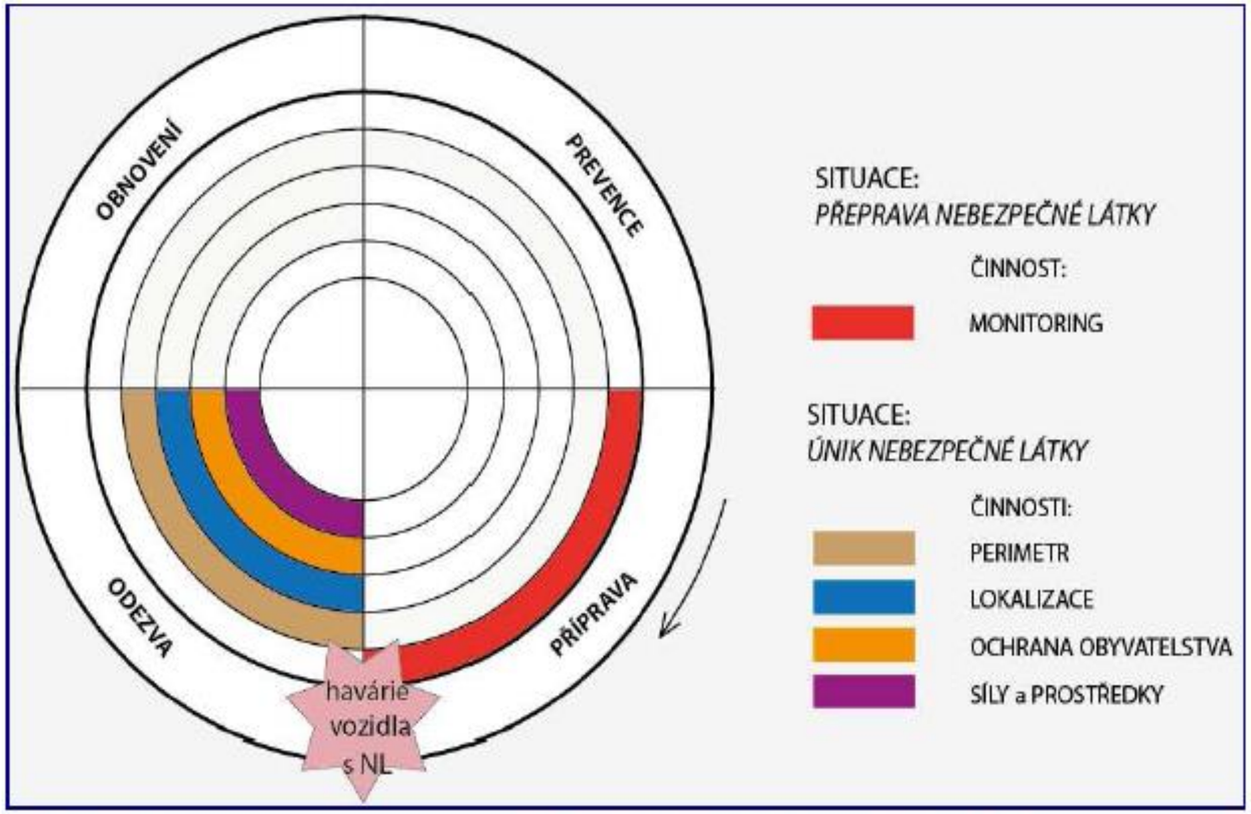
- Flood zone map
  - Public availability
- Maps of historical floods
  - Public availability
- Insurance map
  - Commercial bases



GEOINFORMATICS IN EMERGENCY MANAGEMENT

Geoinformation support of crises management

- Crises processes
- Metadata and data
- Geografic support of CM
- Safety/Security systém and CM
- Quality and uncertainity of data



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

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

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

Adaptability of Cartographic Representation

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

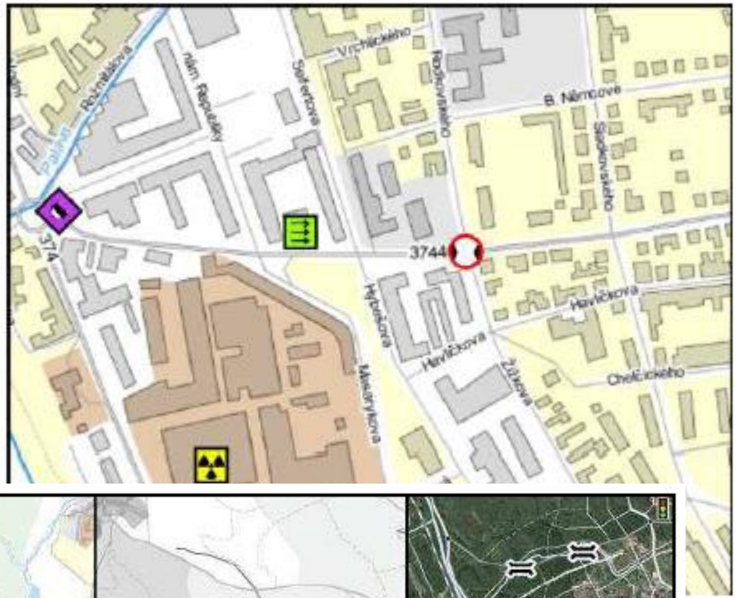
5. Interaction device and environment – various electronic visualization devices are used and they are also in interaction with environment which is influencing visibility and amount of information used.

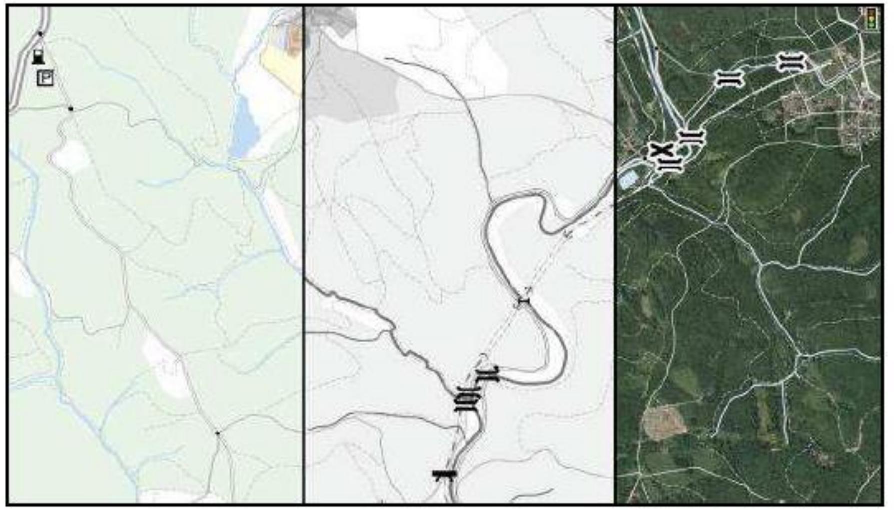
The subject-matter of adaptive cartography is **automatic creation of correct geodata visualization with regard to situation, purpose and the user.**

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***.

Cartographic models and cartographic infrastructure

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





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

Context-Based Cartography

Context Type Definitions

		context types
What ?	What happened?	*SITUATION*
	What needs to be done?	*ACTIVITY*
When?	When the event occured?	*TIME*
	In which phase the activity is realised?	*PHASE*
Where?	Where the event occured?	*LOCATION*
	What is the extent of the event? What is the extent of the activity?	*OPERATIONAL RANGE*
Who?	Who will use the map?	*USER ABILITY*
	Who administers spatial data?	*DATA MANAGEMENT*
How?	How the map will be used?	*MAP FUNCTION*
	What is the size of the display unit?	*TECHNOLOGY*

Personality of map users

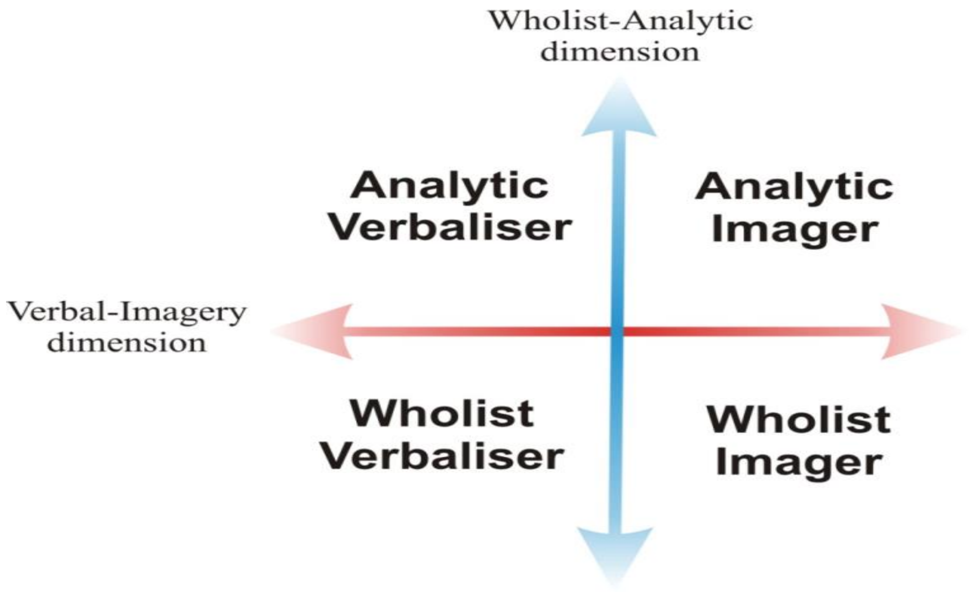
Cognitive style

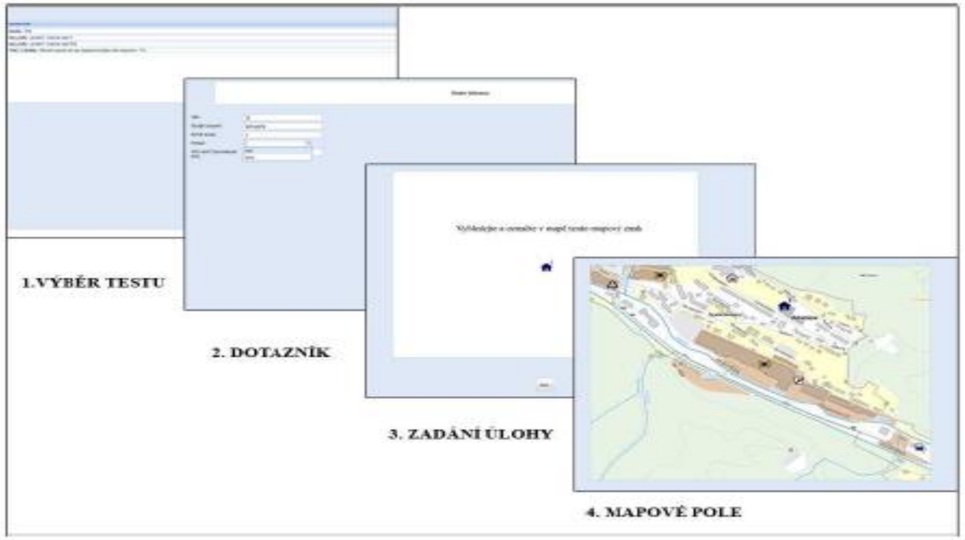
Cognitive style or "thinking style" is a term used in cognitive psychology to describe the way individuals think, perceive and remember information, or their preferred approach to using such information to solve problems. Cognitive style differs from cognitive ability....

(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 geovisualization

- Interdisciplinary research
- (psychologists, etc.)
- Theory of cognitive styles
- Concept and design of a testing 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)

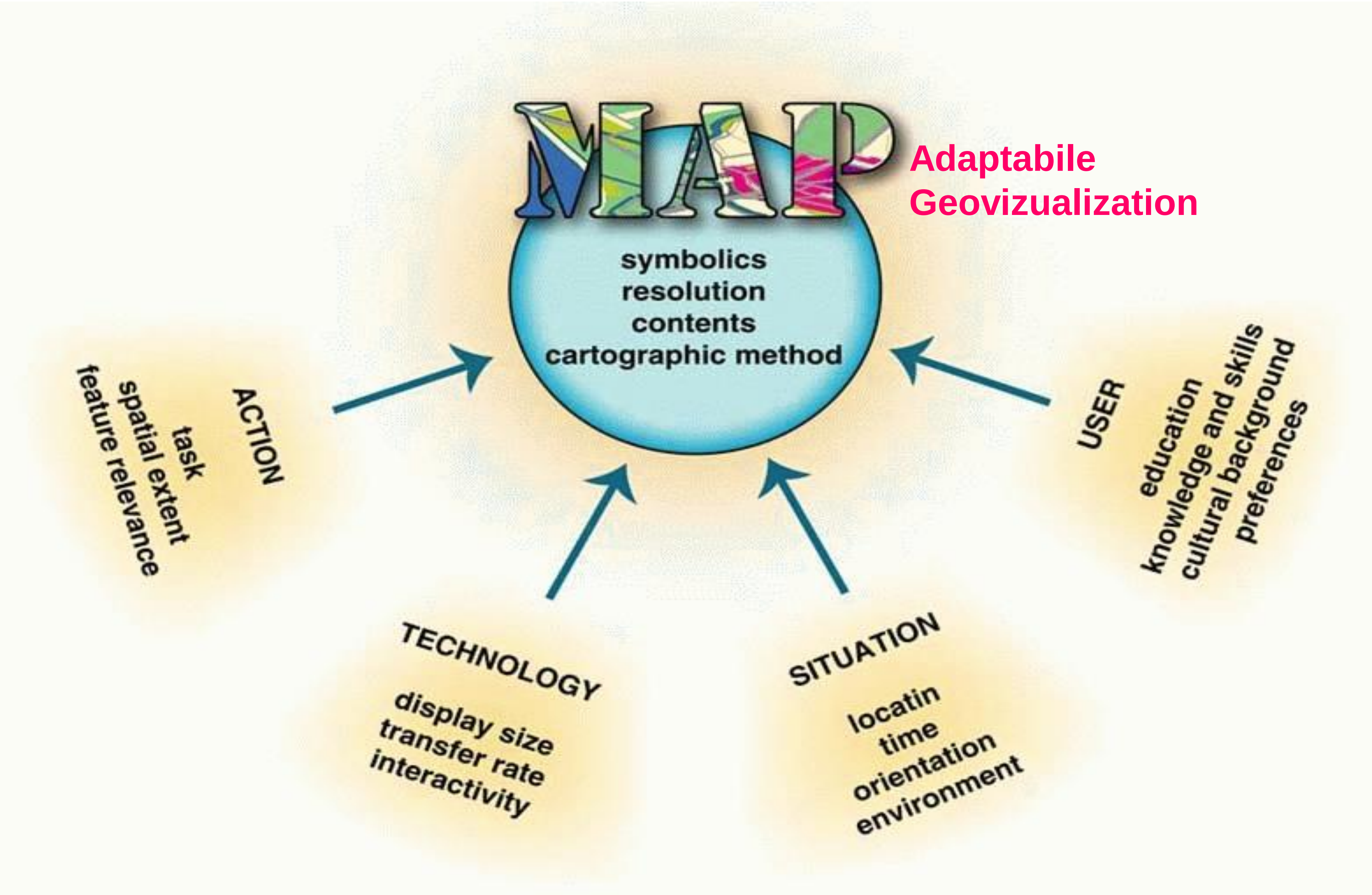


Figure: Examples of changes in visualization according to change of context (Friedmanová, Konečný and Staněk 2006)

Influence of new media for cognition: colaborative immersive virtual environment (IVE) in education process

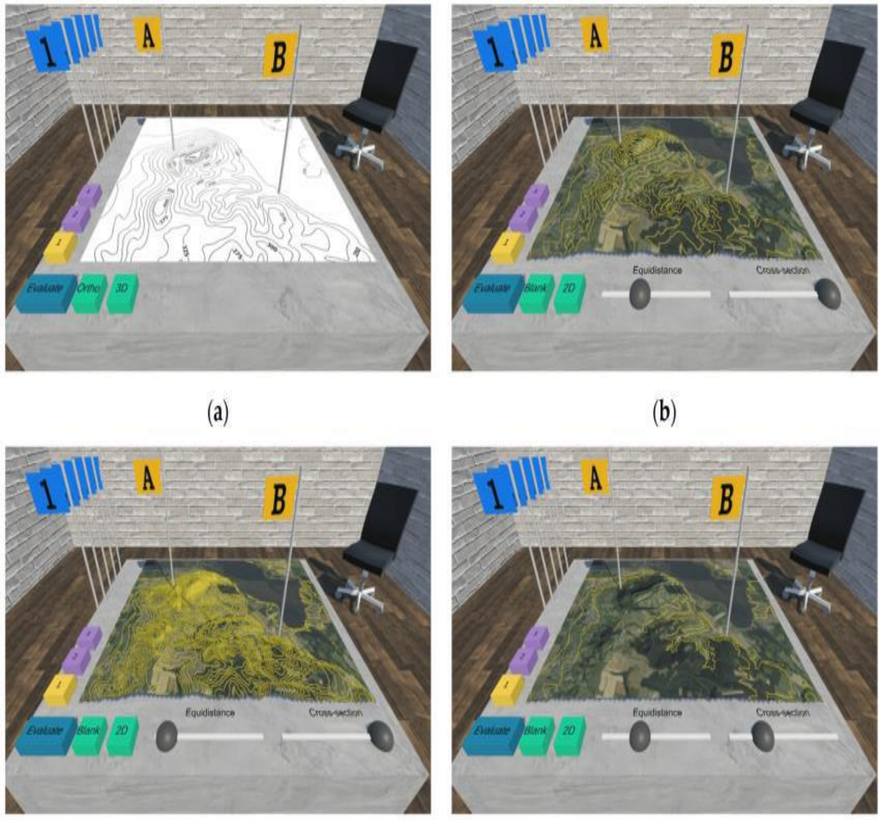
Using of potencial of IVE for 3D interactivity visualization

Embodied cognition

Improved Education

Concept of relief - Izolines
Switching between 3D model and 2D visualization
– exploration of the event.

Immersive Virtual Reality vs. Desktop



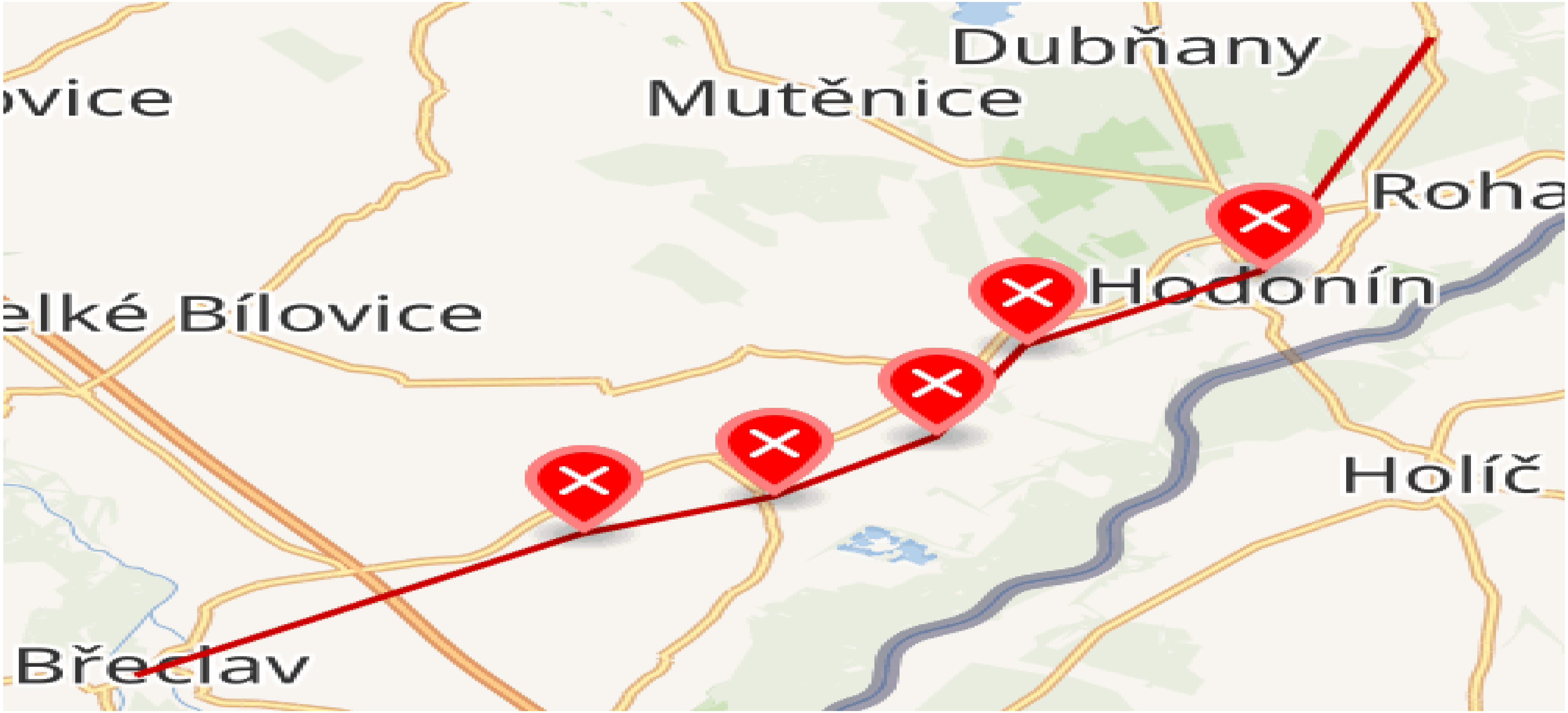
(a) (b) (c) (d)

The most affected southern part of Hrušky village - 2 weeks after the storm

An extreme storm with hail and tornado passed through several villages on the border of the region of Břeclav and Hodonín in South Moravia on Thursday, June 24, 2021, around 7:20 p.m. in the evening.

It was a strong tornado accompanied by suction vortices that reached F4 strength on the Fujita scale (the second strongest level of tornado strength).

It passed through a section 26 kilometers long and roughly half a kilometer wide (with variations). Seven municipalities were critically affected, the most affected were Moravská Nová Ves, Mikulčice, Hrušky, Lužice and parts of Hodonín Bažantnice and Pánov.



The path of the tornado was 26 kilometers long and 500 meters wide

About **1,600 structures were destroyed** in the affected municipalities, including public, agricultural and industrial buildings, as well as a large number of trees and vehicles.

The infrastructure, including the second railway corridor, was heavily affected.

According to estimates, damage to private and public property was calculated at **15 billion Czech crowns. (1 RMB = 3,20 CZK)**

About 200 houses were slated for demolition.
During the evening and the following day, several hundred injured persons were treated, and a **total of six persons died.**

On a European scale, it was the deadliest tornado since 2001, and at the same time the strongest and deadliest meteorological event in Europe in 2021.

With a measured intensity of F4, it is also the historically strongest recorded tornado on Czech territory - the only evidence of a similarly destructive tornado is from Kosm's Chronicle of the Czech Republic for the territory of Prague and on July 30, 1119.

Coming paper

Spatio-Temporal Patterns of Disaster Impact and Recovery in YouTube Content

Jiří Hladík 1 , Lukáš Herman 1 , Dajana Snopková 1 and Milan Konečný 1
1 Department of Geography, Faculty of Science, Masaryk University, Brno, Czech Republic

Int. Journal of Digital Earth, Taylor and Francis.

Soon!!!

This study investigates *the utilization of YouTube as a data source in crisis management, focusing on human behavior* during a tornado event in the Southern Moravia Region, Czech Republic, in 2021.

Utilizing YouTube Data API, we harvested video metadata and content to explore spatio-temporal patterns in disaster impact and recovery. Our analysis reveals how YouTube content reflects the immediate and long-term responses to the disaster, offering insights into community reactions, damage extent, and recovery processes.

By integrating automated and manual content analysis, *we uniquely demonstrate YouTube potential in enhancing spatial analyses and visualizations for disaster management.* This research underscores the value of social media data in providing real-time and ex-post multiple perspectives on human behavior during and after disaster dynamics, contributing to a nuanced understanding of disaster impact and community resilience.

6. Conclusions

Liqiu Meng (Albena 2016):

Cartography and its ***connecting role***

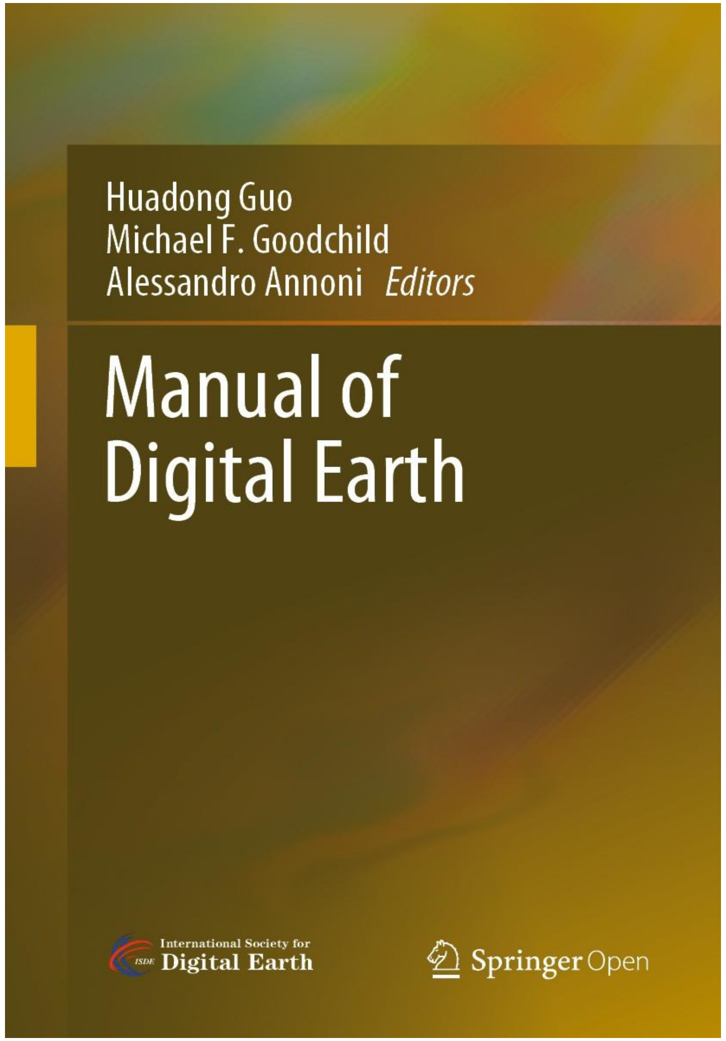
Confirmation that integrative approaches we need also in EW and Crises Management and **Disaster Risk Reduction approaches.**

System of Systems also in EW and CM

Two new and very important books reacting for newest World challenges.

My presents for YOU

1. ***Manual of Digital Earth | SpringerLink*** https://link.springer.com/book/10.1007/978-981-32-9915-3#editorsandaffiliations.



Major Challenges for Digital Earth

- Big Data Management
- DE Platforms implementation and construction
- Developing an Ecosystem for DE
- Addressing Social Complexities
- Diversified curricula toward DE Education

2. Abbas Rajabifard Greg Foliente Daniel Paez, eds.COVID-19 Pandemic, Geospatial Information, and Community Resilience Global Applications and Lessons. Taylor & Francis Group, ISBN: 978-0-367-77531-5 (hbk) , ISBN: 978-1-032-02045-7 (pbk) , ISBN:978-1-003-18159-0 (ebk), 532 p. DOI: [10.1201/9781003181590-33](10.1201/9781003181590-33)

Geospatial Intelligence in Dealing with COVID-19 Challenges in Czechia Milan Konecny, Jiri Hladik, Jiri Bouchal, Lukas Herman and Tomas Reznik

pp. 393-398

Open access:

https://library.oapen.org/bitstream/handle/20.500.12657/49450/9781000402926.pdf

RACHMET!!!!

THANK YOU
SPASIBO
Xie, Xie
Muchas Gracias
O Brigada
Kammsa Hamida
Aligator
SHUKRAN
BLAGODARJA

DĚKUJI (in Czech)

PRAGUE

BRNO