October 27 2021

OSN (United Nations) Iniciativy

Agenda 2030 a Sendajský rámec

U.N. GGIM a DBAR

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1.World Global Challenges: Sustainable Development Approach and Disaster Risk Reduction

2. Agenda 2030, Sustainable Development Goals, targets, indicators

3. Main Supportive Data and Information Efforts: DBAR and U.N. GGIM

4. Development of Early Warning, Disaster Risk Management and Disaster Risk Reduction

5. Sendai Framework – The United Nations Conference on Disaster Risk Reduction (U.N. DRR)

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7. Disaster Examples: hurricane Katrina, Fukushima nuclear power station disaster

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10. Selected examples of research efforts: VGI, Dynamic Mapping, disaster management in agriculture

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1. World Global Challenges:

Sustainable Development Approach

and Disaster Risk Reduction

Sustainable Development – General Comments

Sustainable Development:

a set of the equal important aspects:

- economic,
- ecological,
- technological,
- social,
- cultural,
- ethical.

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

S.Briceno, Nanjing, 2016

U.N. Sustainable Development Goals (SDG's) and indicators

Global development policy framework

United Nations
Framework Convention on
Climate Change

Addis Ababa Action Agenda
of the Third International Conference on
Financing for Development
(Addis Ababa Action Agenda)

FINANCING FOR DEVELOPMENT

UNITED NATIONS
SUSTAINABLE
DEVELOPMENT
SUMMIT 2015
25 - 27 SEPTEMBER

UNITED NATIONS
PARIS CLIMATE
AGREEMENT
SIGNING CEREMONY
22 APRIL 2016

TRANSFORMING OUR WORLD:
THE 2030 AGENDA FOR
SUSTAINABLE DEVELOPMENT

HABITAT III
2016

THE
OCEAN
CONFERENCE
UNITED NATIONS, NEW YORK, 5-9 JUNE 2017

Sendai Framework
for Disaster Risk Reduction
2015 - 2030

ISLAND
VOICES
GLOBAL
CHOICES
UN Conference on
Small Island
Developing States
Apia, Samoa | 2014

SUSTAINABLE DEVELOPMENT GOALS

UN-GGIM
United Nations Secretariat
Global Geospatial Information Management

Positioning geospatial information to address global challenges

ggim.un.org

UNEP 2030 Agenda

UN disaster risk reduction Agenda

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

UNISDR

2018 AMCDRR

1-6

- POVERTY
- HUNGER AND FOOD SECURITY
- HEALTH
- EDUCATION
- GENDER EQUALITY AND WOMEN'S EMPOWERMENT
- WATER AND SANITATION

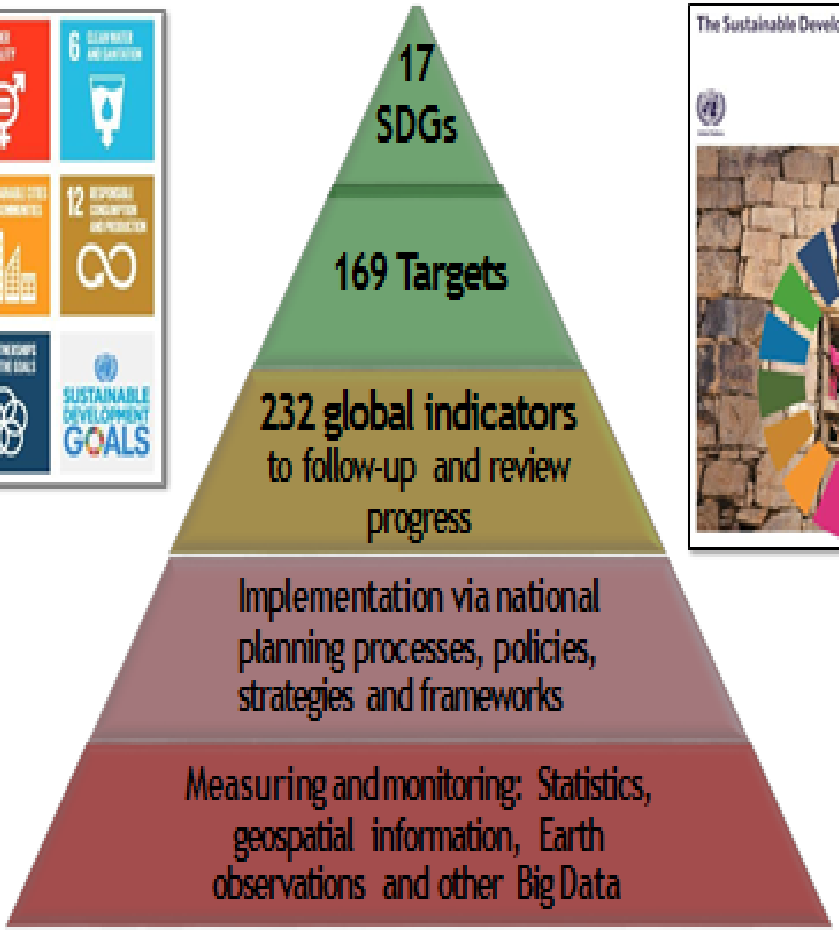
7-12

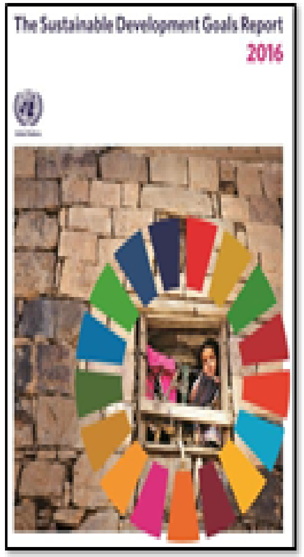
- ENERGY
- ECONOMIC GROWTH
- INFRASTRUCTURE, INDUSTRIALIZATION
- INEQUALITY
- CITIES
- SUSTAINABLE CONSUMPTION AND PRODUCTION

13-17

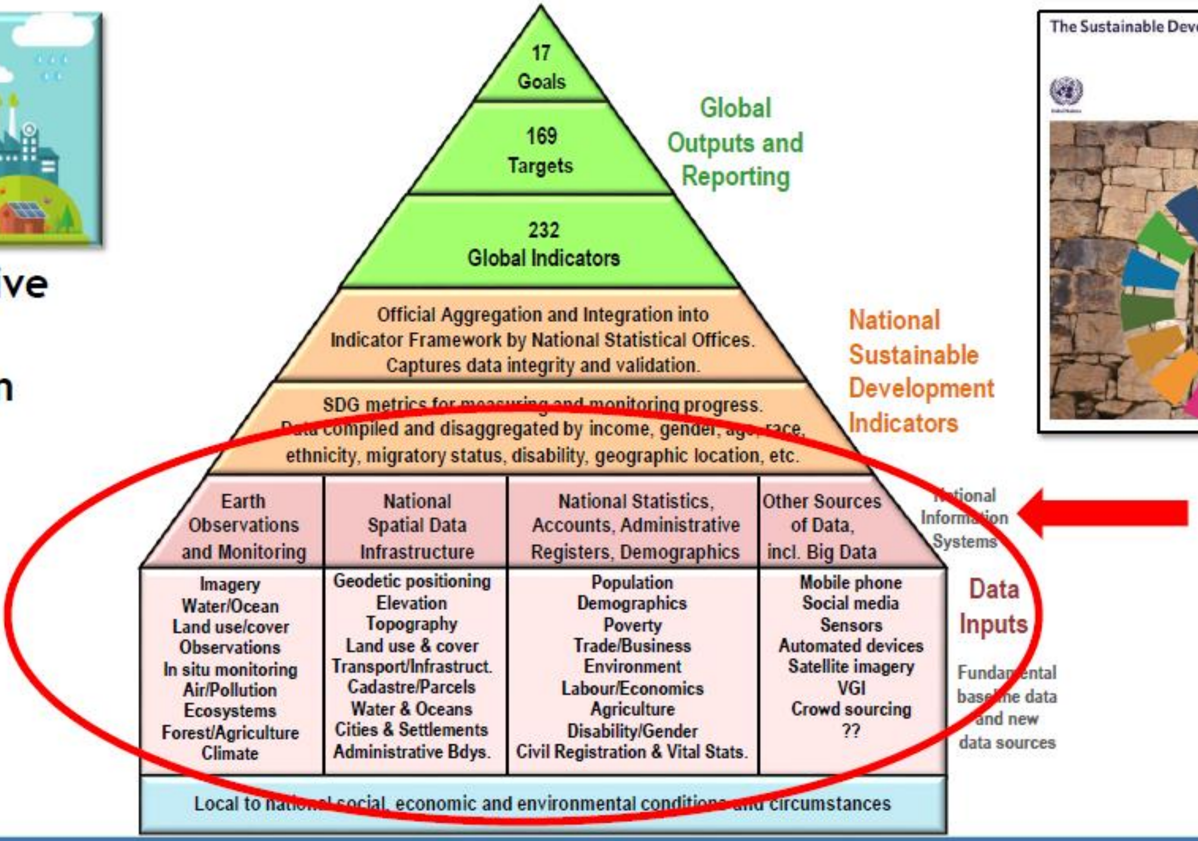
- CLIMATE CHANGE
- OCEANS
- BIODIVERSITY, FORESTS, DESERTIFICATION
- PEACE, JUSTICE AND STRONG INSTITUTIONS
- PARTNERSHIPS

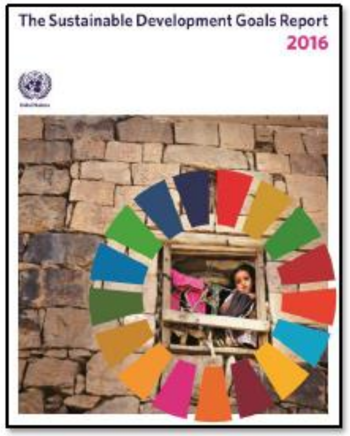
2030 Agenda: Goals, targets, indicators





An integrative data ecosystem





SDGs global indicators

February 2020: https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/
To facilitate the implementation of the **global indicator framework**,

all indicators are classified by the IAEG-SDGs into **three tiers based on their level of methodological development and the availability of data** at the global level, as follows:

Tier Classification Criteria/Definitions:

Tier 1: Indicator is conceptually clear, has an internationally established methodology and standards are available, and data are regularly produced by countries for at least 50 per cent of countries and of the population in every region where the indicator is relevant.

Tier 2: Indicator is conceptually clear, has an internationally established methodology and standards are available, but data are not regularly produced by countries.

Tier 3: No internationally established methodology or standards are yet available for the indicator, but methodology/standards are being (or will be) developed or tested.

All indicators are equally important, and the establishment of the tier system is intended solely to assist in the development of global implementation strategies. For tier I and II indicators, the availability of data at the national level may not necessarily align with the global tier classification and countries can create their own tier classification for implementation.

Please note that Tier I and II indicators' metadata are available in the metadata repository. Tier III indicators require work plans to be developed outlining the methodological development of the indicators for approval by the IAEG-SDGs.

Supportive acticity

Pilot study of OECD "Measuring the distance to the goals of sustainable development". OECD- Organization for Economic Co-operation and Development

OECD And SGDs

As part of the OECD Action Plan, a reporting methodology entitled **"Measuring Distance to the SDG Targets"** was developed in 2016, 2017 and 2019.

Their aim was to assist Member States in implementing the 2030 Agenda for Sustainable Development.

The measurement **results gradually improve the overview of the strengths and weaknesses of the implementation process across the SDGs** in individual countries and help to orientate in the complexity of the SDGs and to determine their priorities within the broad Agenda 2030.

The reports aim to assist Member States in their implementation, measurement and prioritization of data for Agenda 2030.

The first was a pilot edition of the report in 2016, the second and third were in June 2017 and May 2019 (https://www.oecd.org/sdd/measuring-distance-to-the-sdgs-targets.htm)

The report **uses a unique methodology** for assessing the amount of work that OECD countries have yet to do to meet all the objectives of the SDGs.

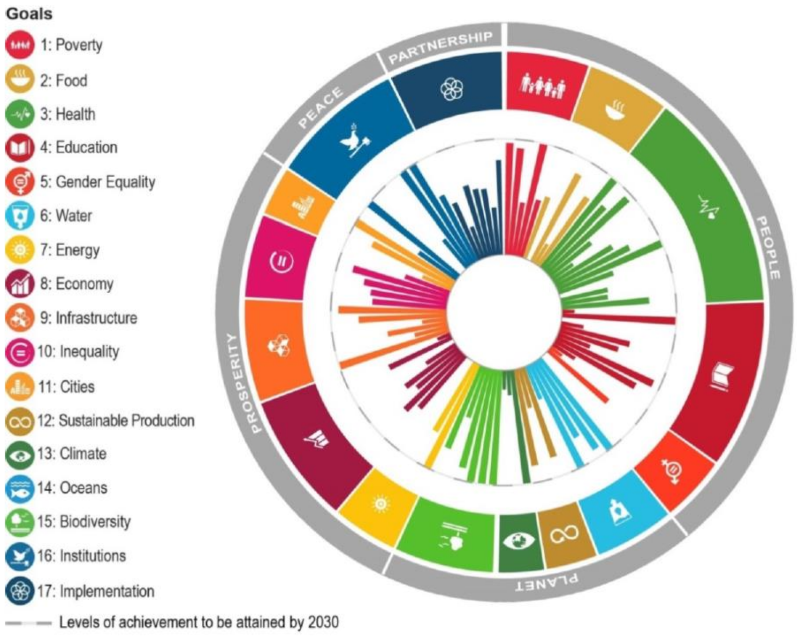
The procedure is based on the UN IAEG Global List of Indicators and uses publicly available data from OECD and UN SDG databases.

The results are visualized using special graphs on the status of SDGs solutions in individual countries and allow their comparison.

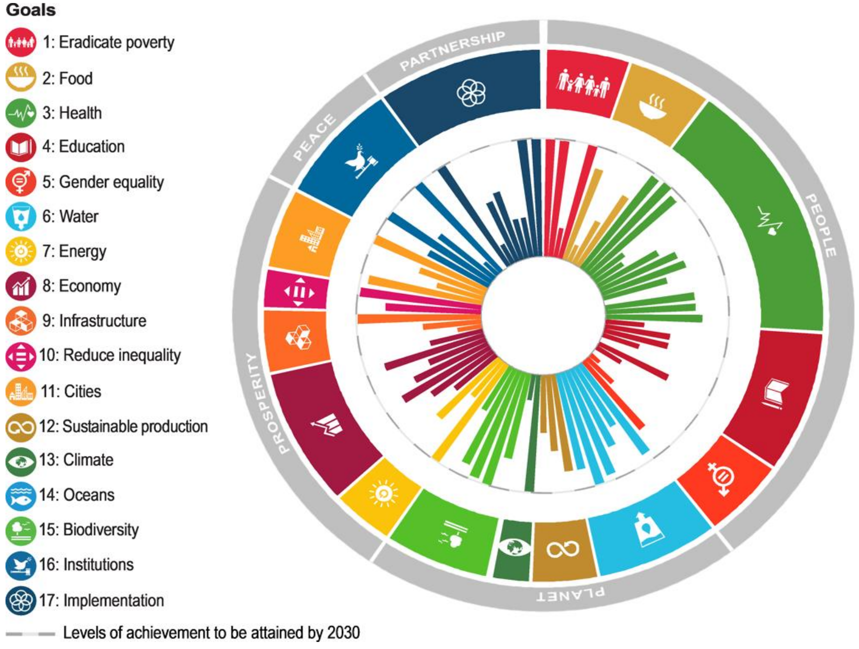
Trends since 2005 are assessed according to **76 indicators**.

The OECD measurement - distance to meet SDGs targets

ČR 2017



ČR 2019



What is the purpose of this study? What does it do?

- Tool to help countries navigate the 2030 Agenda and identify priorities for action
- Measures how far OECD countries are from 2030 targets, allowing comparison across goals, targets and indicators
- OECD average and country-level analysis
- Based on the internationally agreed *UN Global Indicator List*
- Analysis of performance over time (trends) and exploration of transboundary impacts

3. Main Supportive Data and Information Efforts

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

Digital Earth Alliance

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


NSDI
Digital Evolution
Big Data
A WORLD THAT COUNTS
Digital Earth
Global Data Ecosystem
Digital Transformation
Implementing Nationally Integrated Information Systems
SUSTAINABLE DEVELOPMENT GOALS
Digital Maturity
Digital Divide
UN-GGIM
United Nations Secretariat
Global Geospatial Information Management
Positioning geospatial information to address global challenges
ggim.un.org

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***."

Do we really understand the scale of the problems, where they are, whom they impact, what are the causes, and how they can be remedied?


Do we have the data for development??
Can we make it ‘production ready’ information for all?
7 AFFORDABLE AND CLEAN ENERGY
6 CLEAN WATER AND SANITATION
11 SUSTAINABLE CITIES AND COMMUNITIES
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
14 LIFE BELOW WATER
17 PARTNERSHIPS FOR THE GOALS
8 DECENT WORK AND ECONOMIC GROWTH
1 NO POVERTY
4 QUALITY EDUCATION
13 CLIMATE ACTION
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
5 GENDER EQUALITY

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

<table>
<tr><td rowspan="5">REQUIREMENTS</td><td rowspan="2">GLOBAL POLICY FRAMEWORK</td><td colspan="7">Transforming our World: The 2030 Agenda for Sustainable Development</td></tr>
<tr><td>Sendai Framework for Disaster Risk Reduction 2015-2030</td><td colspan="2">SIDS Accelerated Modalities of Action (SAMOA) Pathway</td><td>Addis Ababa Action Agenda</td><td colspan="2">Paris Agreement on Climate Change</td><td>HABITAT III Urban Agenda</td></tr>
<tr><td>GEOSPATIAL CHALLENGES & DRIVERS</td><td colspan="7">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</td></tr>
<tr><td>DIRECT NATIONAL BENEFITS & EFFICIENCIES</td><td colspan="7">• 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</td></tr>
<tr><td>OPERATING PRINCIPLES</td><td>Sound Nat. Policies, Legal Frameworks & Institutional Arrangements</td><td>Provision of Fundamental Authoritative Data and Information</td><td>Agreed Standards, Methods, Guides and Frameworks</td><td>Principles on Geospatial Information and Open Data</td><td>Integration and Interoperability of National Information Systems</td><td>Information Sharing and Knowledge Transfer</td><td>Building Local to Global Capacity & Capability</td></tr>
<tr><td>DELIVERABLES</td><td>WORKING ACTIVITIES AND OUTPUTS</td><td colspan="7">• 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</td></tr>
</table>

Integrated Geospatial Information Framework (IGIF)- part of UN GGIM

The Integrated Geospatial Information Framework (IGIF) provides a basis and guide for developing, integrating, strengthening and maximizing geospatial information management and related resources in all countries. It will assist countries in **bridging the geospatial digital divide, secure socio-economic prosperity, and to leave no one behind.**

The IGIF comprises three parts as separate, but connected, documents:

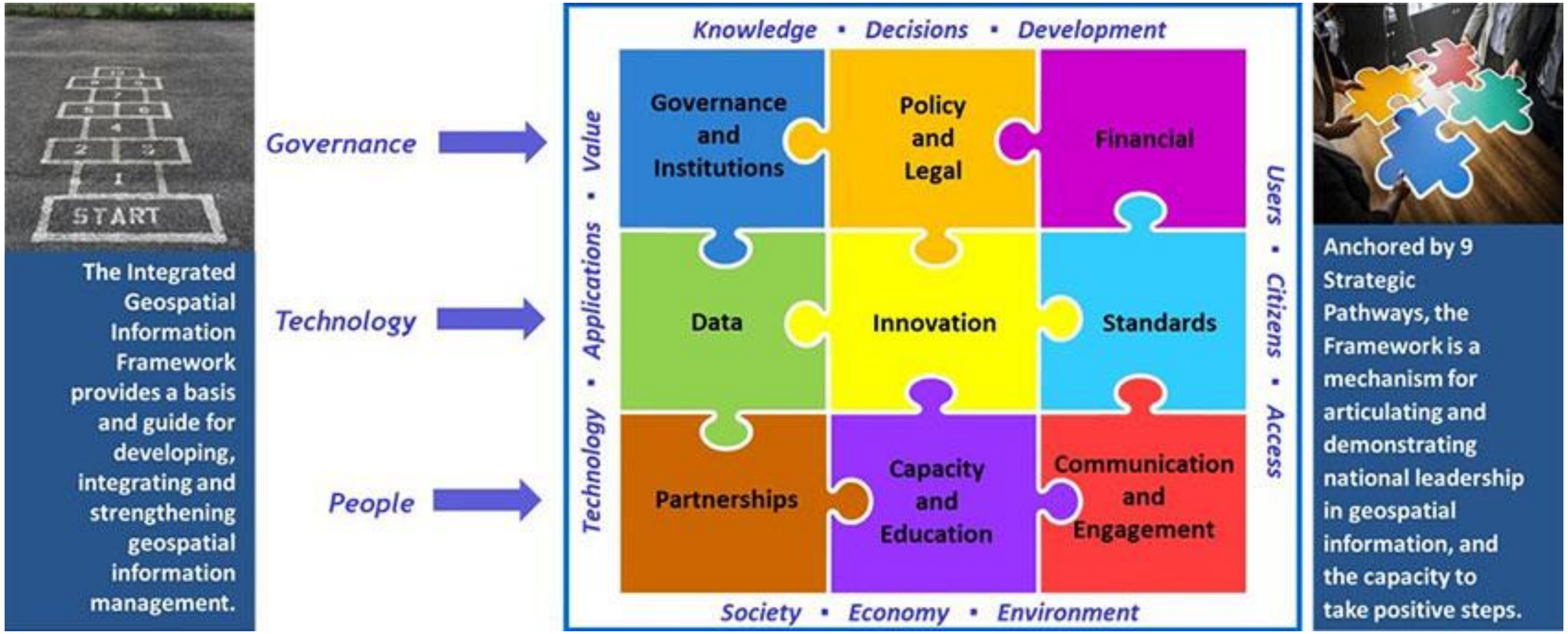
1) an Overarching Strategic Framework;
2) an Implementation Guide; and
3) a Country-level Action Plan.

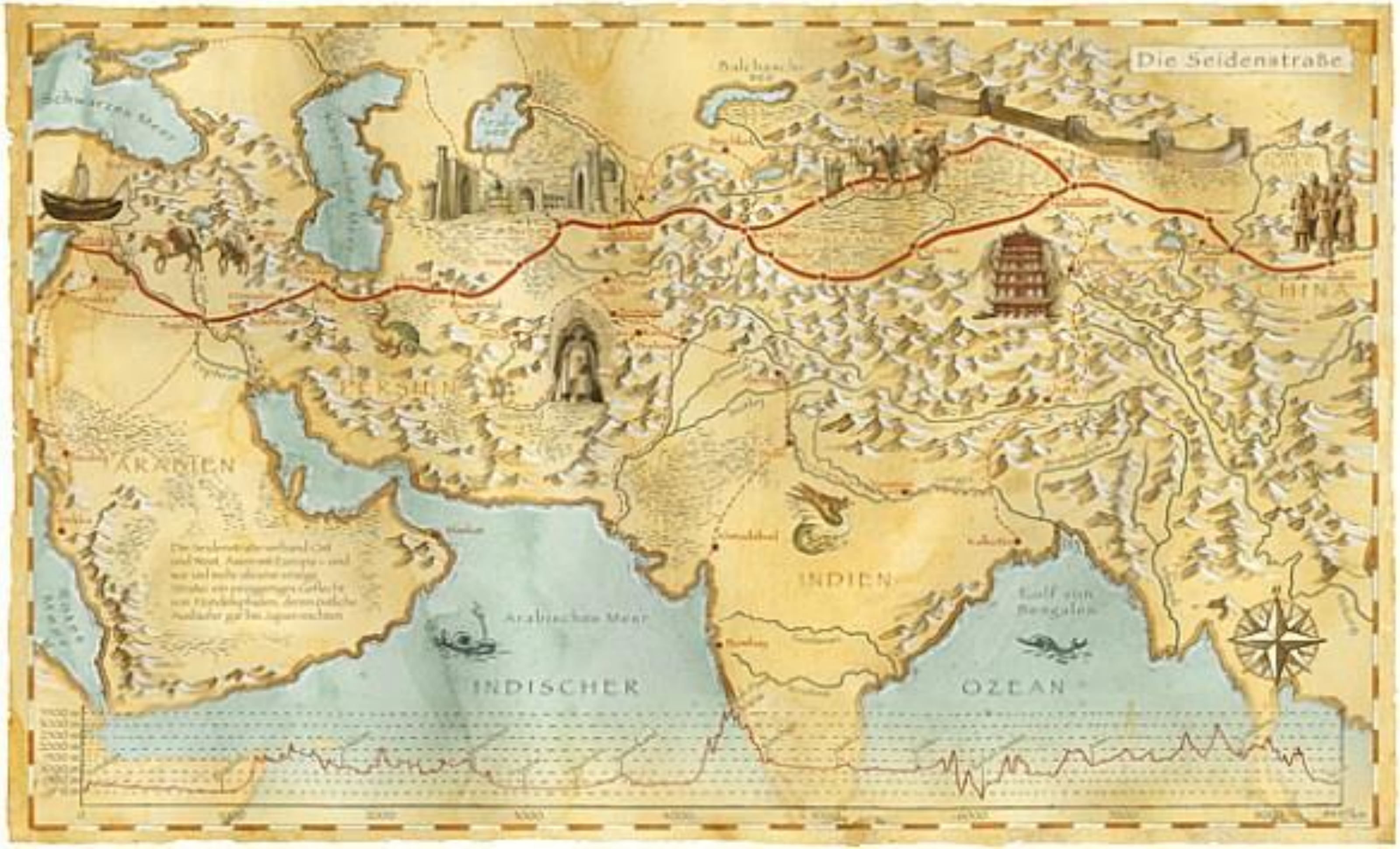
The three parts **comprise a comprehensive** IGIF that serve a country's needs in addressing economic, social and environmental factors; which depend on location information in a continually changing world.

The Implementation Guide communicates to the user what is needed to establish, implement, strengthen, improve, and/or maintain a national geospatial information management system and capability.

The IGIF focuses on location information that is integrated with any other meaningful data to solve societal and environmental problems, acts as a catalyst for economic growth and opportunity, and to understand and take benefit from a nation's development priorities and the Sustainable Development Goals.

Anchored by 9 strategic pathways, the Framework is a mechanism for articulating and demostrating national leadership in geospatial information, and the capacity to take positive steps.


The Integrated Geospatial Information Framework provides a basis and guide for developing, integrating and strengthening geospatial information management.
START
Governance
Technology
People
Knowledge • Decisions • Development
Technology • Applications • Value
Users • Citizens • Access
Society • Economy • Environment
Governance and Institutions
Policy and Legal
Financial
Data
Innovation
Standards
Partnerships
Capacity and Education
Communication and Engagement
Anchored by 9 Strategic Pathways, the Framework is a mechanism for articulating and demonstrating national leadership in geospatial information, and the capacity to take positive steps.



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

The commercial weight of the New Silk Roads affected by the large regions in 2014. Source: http://www.hellenicshippingnews.com/commodities-crash-boosts-chinas-new-silk-road/

GUO Huadong-1:

Scientific Big Data and Earth Big one

As a branch of big data, **SCIENTIFIC Big Data** is a typical representative of data-intensive science.

Scientific big data has a number of characteristics, including

complexity, comprehensiveness, and global coverage, as well as high degree of integration with information and communication technology.

GUO Huadong-2:
Earth science research, like atmosphere, land and ocean, has produced huge data-sets derived from satellite observations, ground sensor networks, and other sources. This is collectively called **Big Earth data**.

It has features in common with scientific big data, but also has its own particular characteristics. ….
as ***being massive, multi-source, heterogeneous, multi-temporal, multi-scale, high-dimensional, highly complex, nonstationary, and unstructured.*** It provides support for data-intensive research in the Earth sciences

GUO Huadong-3:

Modern Earth science requires globally established, quasi real-time, all-weather Earth data acquisition capabilities, and ***has developed an integrated space-air-ground observation system with high spatial, temporal, and spectral resolutions. (Guo 2017, p.9)***

Commons and differences

between

U.N. GGIM and DBAR

At this moment it looks like that **U.N. GGIM** is mature project connected with stabile governmental and public infrastructures tending to solve SDG’s and Sendai DRR needs. Covering needs of civil society and its organization.

DBAR has similar ambitious but coming mainly to the countries where SDI still was not fully developed according to Silk Belt and Road.

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;

- In DBAR huge investments are coming which create ***hopes for fast improvement of situation,*** but data and information are only part of the all efforts, incl. DRR

- In many countries are unappreciated geoinformatics and mainly cartography. ***Maps are created without knowledge*** how will be accepted by users (context and adaptive maps) and ***how information should be delivered for professionals and public ones***. Very important in EW, DRM and DRR.

Why U.N. GGIM contemporary leader?

Reacting and realizing for ***needs of „normal" people.***

Trying to solve SDG's.

But till now officially not calculating with activities comming from Silk Road and Belt initiative, e.g. DBAR started by International Society of Digital Earth in cooperation with Chinese Academy of Science.

New approaches, like VGI – volunteer geographic information more developed in UN GGIM ......

FUTURE?

It would be welcome if both approaches UN GGIM and DBAR, with commons and differences will develop together and support by smart solutions the human society.

New Initiative supportive for realizing of SDGs was announced on **September 6 2021** in Beijing.

The 1st International Forum on Big Data for Sustainable Development Goals (FBAS) is inviting scientists, engineers, policymakers and experts from diverse backgrounds from around the world for improved partnerships and networking towards collaborative and collective efforts in Big Data to support the SDGs

Sessions, e.g.: Big Data on Earth supports SDG's multiple goals: tradeoffs and synergies

Key objectives to discuss challenges in translating Big Data to information relevant to the SDGs and use of Big Data is:

to enable science-informed policy and decision support.

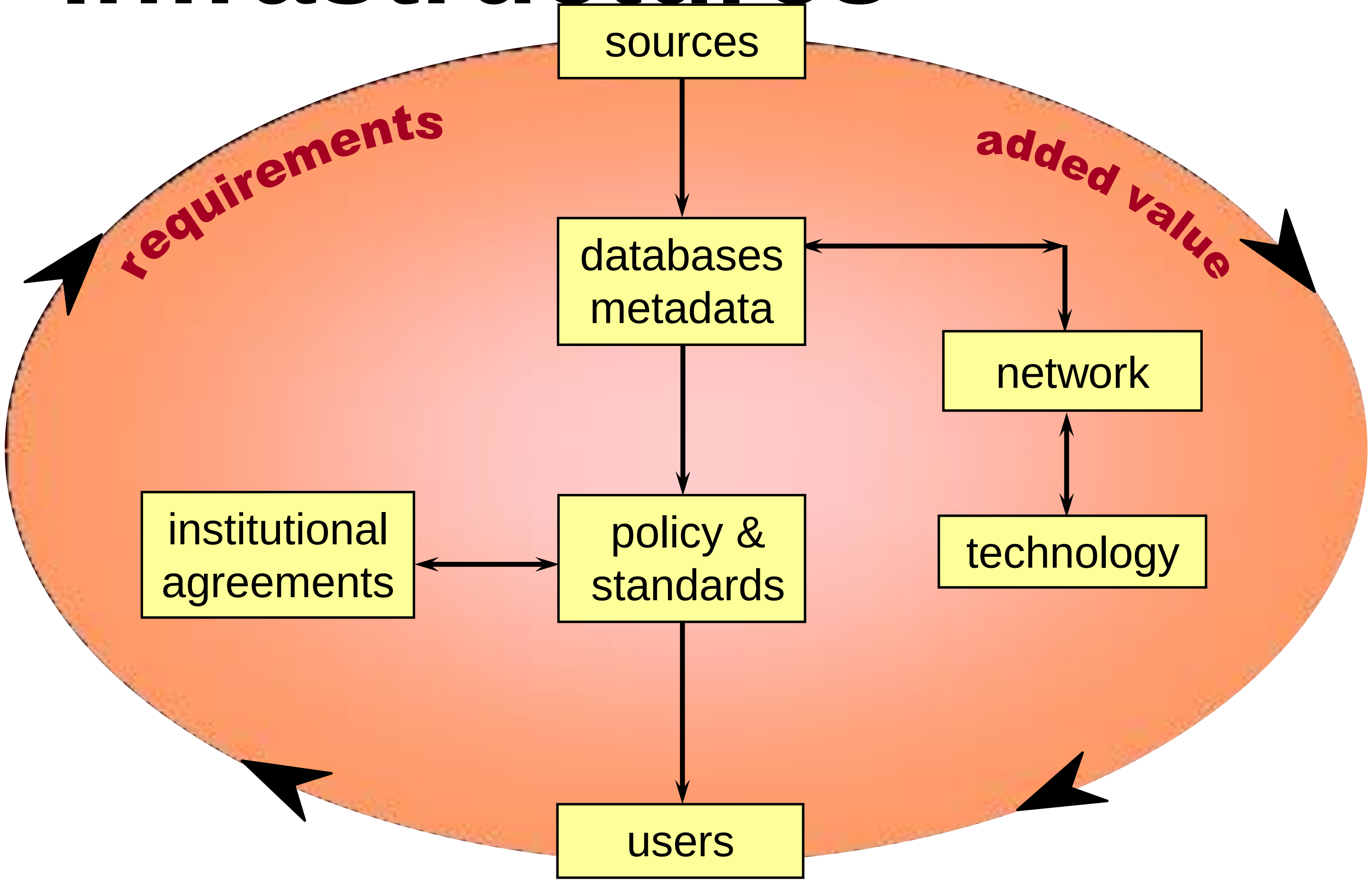
The Forum also marks the occasion of the **inauguration of the International Research Center of Big Data for Sustainable Development Goals (CBAS)**, an important milestone for China's commitment to facilitate global efforts in science, technology and innovation towards the UN's Sustainable Development Goals.

For additional information on the Forum please visit the official website at https://fbas2021.scimeeting.cn/en/web/.

4. (National) Spatial Data Infrastructures

In all contemporary Data and Information Efforts - SDI

Spatial Data Infrastructures



GSDI Cookbook:

“The term “Spatial Data Infrastructure” (SDI) is often used to denote the relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data.

The SDI provides a basis for spatial data discovery, evaluation, and application for users and providers within all levels of government, the commercial sector, the non-profit sector, academia and by citizens in general….

WILLIAM J. CLINTON

XLII *President of the United States: 1993-2001*

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.

(Executive Order 12906, April 11, 1994)

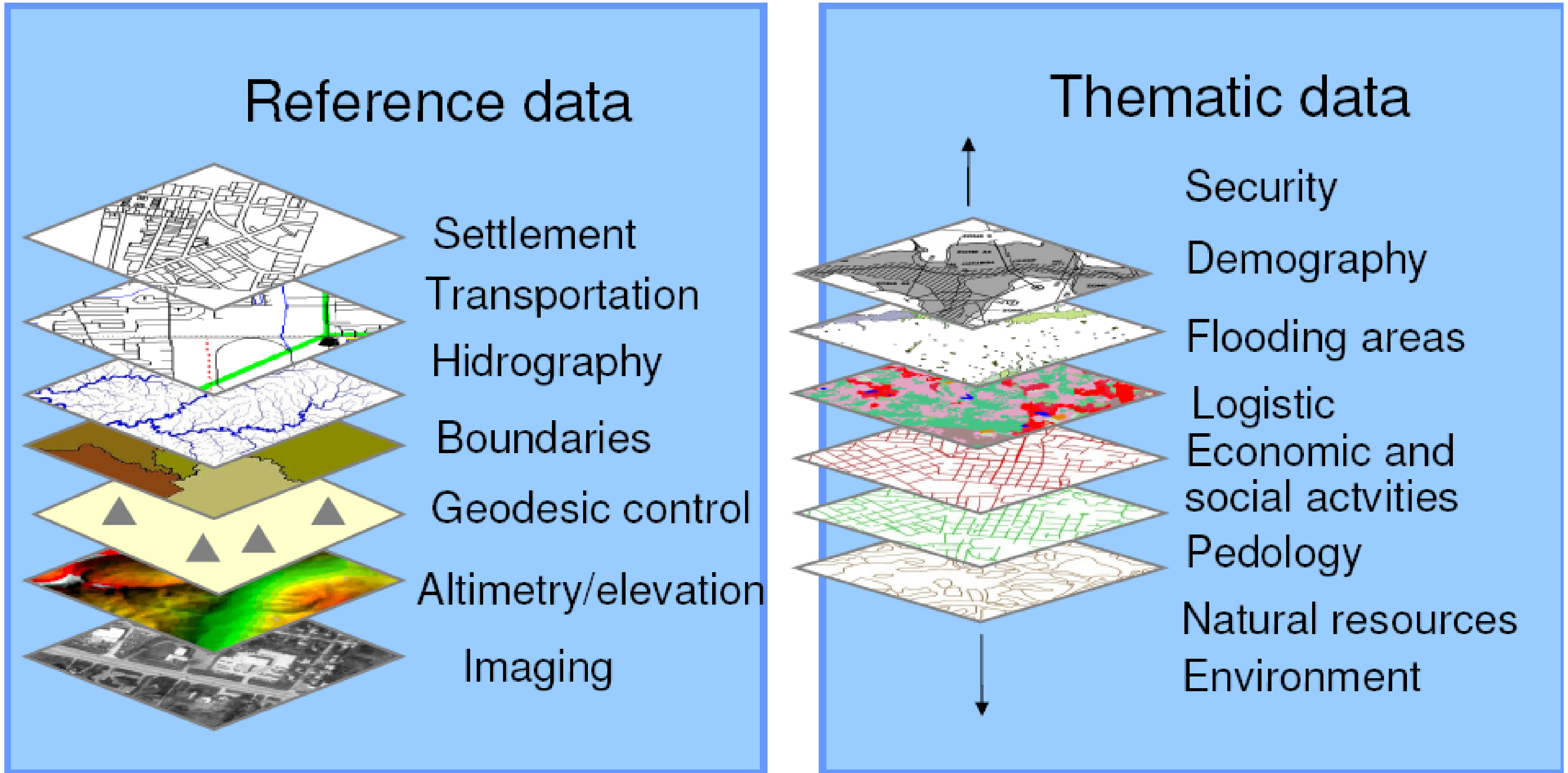
(b) **"Geospatial data"** means information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. This information may be derived from, among other things, remote sensing, mapping, and surveying technologies. Statistical data may be included in this definition at the discretion of the collecting agency.

(c) The **"National Geospatial Data Clearinghouse"** means a distributed network of geospatial data producers, managers, and users linked electronically.

Why SDI ?

Access and data sharing, Interoperability, Local Management, Portability.

Build once, use many times!



4. Development of Early Warning, Disaster Risk Management and Disaster Risk Reduction

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.**

Development of Early Warning (EW), Disaster Risk Management (DRM) and Disaster Risk Reduction (DRR) Concepts

1. ***Environmental***, linked to finding the most appropriate environmental approaches to solve planet Earth problems.

They are mainly oriented for concepts of sustainable development (SD). As a first important document mentioning ***also natural disasters in the Report on Approaches to Crisis Management Issues Related to Development UN environmental policies*** was created in United Nations Conference on the Human Environment, Stockholm, 5-16 June 1972, (http://www.biblebelievers.org.au/gc1972.htm).

Later this approach was documented in United Nations Conference in Rio de Janeiro, 1992; Johannesburg in 2002 and many others.

2. Crisis risk management (early warning, disaster management and disaster risk reduction).

The second line includes the Yokohama and Hyogo World Conferences (1994 and 2005), the ***Global Platform for Disaster Risk Reduction in Geneva in 2010*** and key concept of "U.N. International Strategy for Disaster Reduction" (ISDR – United Nations International Strategy for Disaster Reduction);

another on is a concept developed in disaster risk research, which addresses the problem of natural and Human-Induced Environmental Hazards of IRDR (Integrated Research on Disaster Risk) (Konecny et al., 2010).

Lessons from disaster management situations

The World Conference on Disaster Reduction, Kobe from 18-22 January 2005

HFA

Hyogo Framework for Action 2005-2015:

Building the Resilience of Nations and Communities to Disasters

Priority Action 1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.

Priority Action 2: Identify, assess and monitor disaster risks and enhance early warning.

Priority Action 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels.

Priority Action 4: Reduce the underlying risk factors.

Priority Action 5: Strengthen disaster preparedness for effective response at all levels.

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.

Key activities for realization of the topic in the field of National and local risk assessments were formulated:

Develop, update periodically and widely disseminate **risk maps** and related information to decision-makers, the general public and communities at risk in an appropriate format.

J.Egeland about Early Warning (Hyogo):

- We need to go to the people at risk; to help them understand what is at stake, and to get them actively involved in the development of their early warning systems;

- We need the political weight and commitment by governments, to protect their people with early warning systems;

- And we need international support and funds to help countries develop their systems and be part of the global system.

In the United Nations report the Global Survey of Early Warning Systems is summarizing that:
„to be effective, early warning systems must be people-centered and must integrate four elements:

-**Knowledge of the risks faced;**
-**Technical monitoring and warning service;**
-**Dissemination of meaningful warnings to those at risk; and**
-**Public awareness and preparedness to act.**

Failure in anyone of these elements can mean failure of the whole early warning system.“

Early warning is more **processing oriented activity.**

Information and data coming from various sources are permanently handled, identified, interpreted, visualized and responsible persons or institutions can recognized which kind of dangerous situation can happen.

These methods have been successfully used in EU, Czech Republic etc. for operational steps towards BSA, bird flu or flu epidemic.

RISK KNOWLEDGE

Systematically collect data and undertake risk assessments

Are the hazards and the vulnerabilities well known?

What are the patterns and trends in these factors?

Are risk maps and data widely available?

MONITORING & WARNING SERVICE

Develop hazard monitoring and early warning services

Are the right parameters being monitored?

Is there a sound scientific basis for making forecasts?

Can accurate and timely warnings be generated?

DISSEMINATION & COMMUNICATION

Communicate risk information and early warnings

Do warnings reach all of those at risk?

Are the risks and the warnings understood?

Is the warning information clear and useable?

RESPONSE CAPABILITY

Build national and community response capabilities

Are response plans up to date and tested?

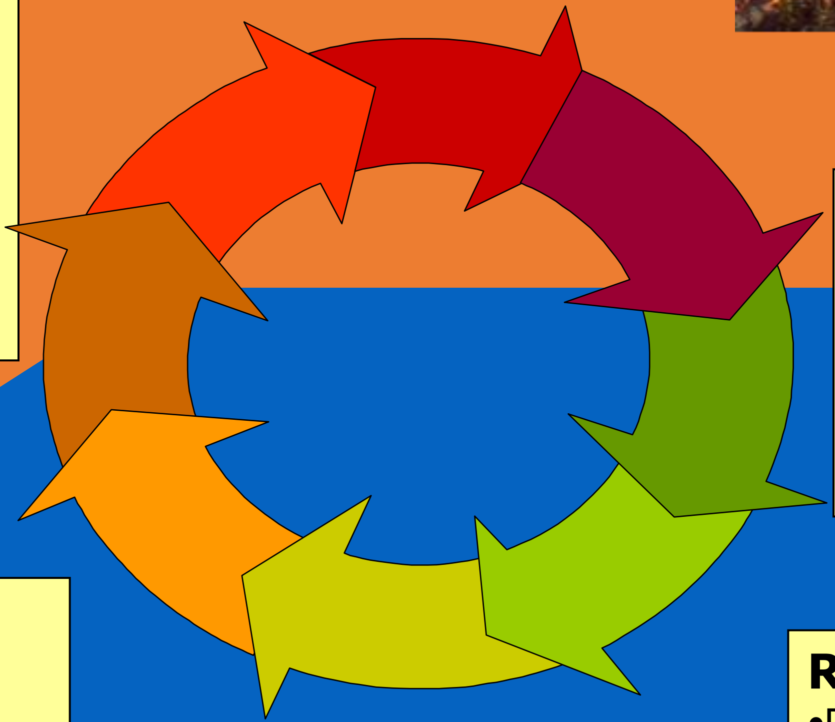
Are local capacities and knowledge made use of?

Are people prepared and ready to react to warnings?

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

6. Sendai Framework – The United Nations Conference on Disaster Risk Reduction (U.N. DRR)

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;

6. Disaster Risk Reduction Sendai Targets and Global Indicators

Resolution adopted by the General Assembly on 2 February 2017

[without reference to a Main Committee (A/71/L.54and Add.1)]

71/276.Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction

71/644 ***IV. Recommendations of the open-ended intergovernmental expert working group on global indicators for the global targets of the Sendai Framework for Disaster Risk Reduction 2015-2030 and on the follow-up to and operationalization of the indicators (Global Indicators A-G, see next slides)***

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

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable

- **11.1** By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums
- **11.2** By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

- **11.1.1**Proportion of urban population living in slums, informal settlements or inadequate housing
- **11.2.1**Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable

- **11.3** By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries

- **11.4** Strengthen efforts to protect and safeguard the world's cultural and natural heritage.

- **11.3.1** Ratio of land consumption rate to population growth rate

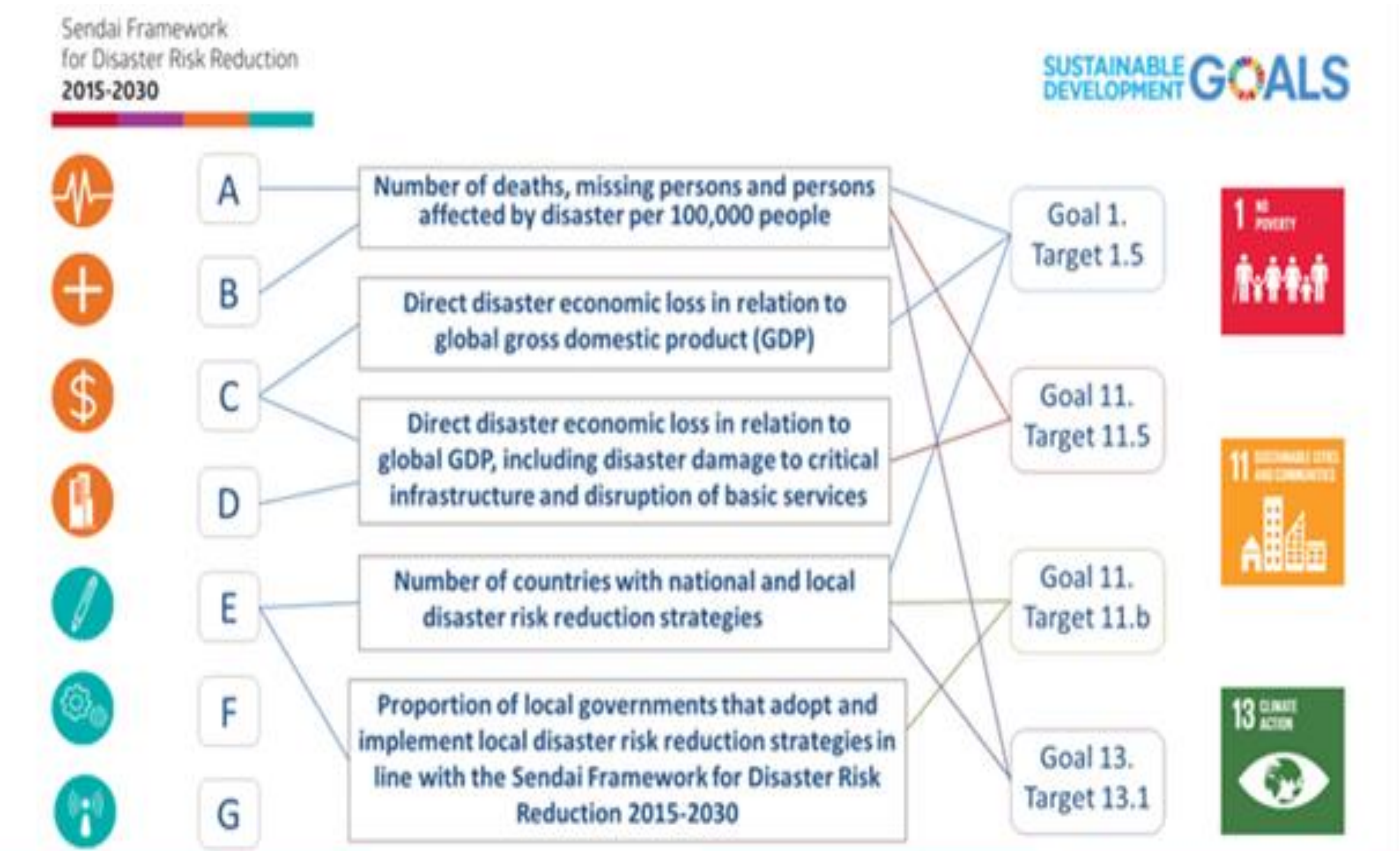
- **11.3.2** Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically.

- 11.4.1Total expenditure (public and private) per capita spent on the preservation, protection and conservation of all cultural and natural heritage, by type of heritage (cultural, natural, mixed and World Heritage Centre designation), level of government (national, regional and local/municipal), type of expenditure (operating expenditure/investment) and type of private funding (donations in kind, private non-profit sector and sponsorship)

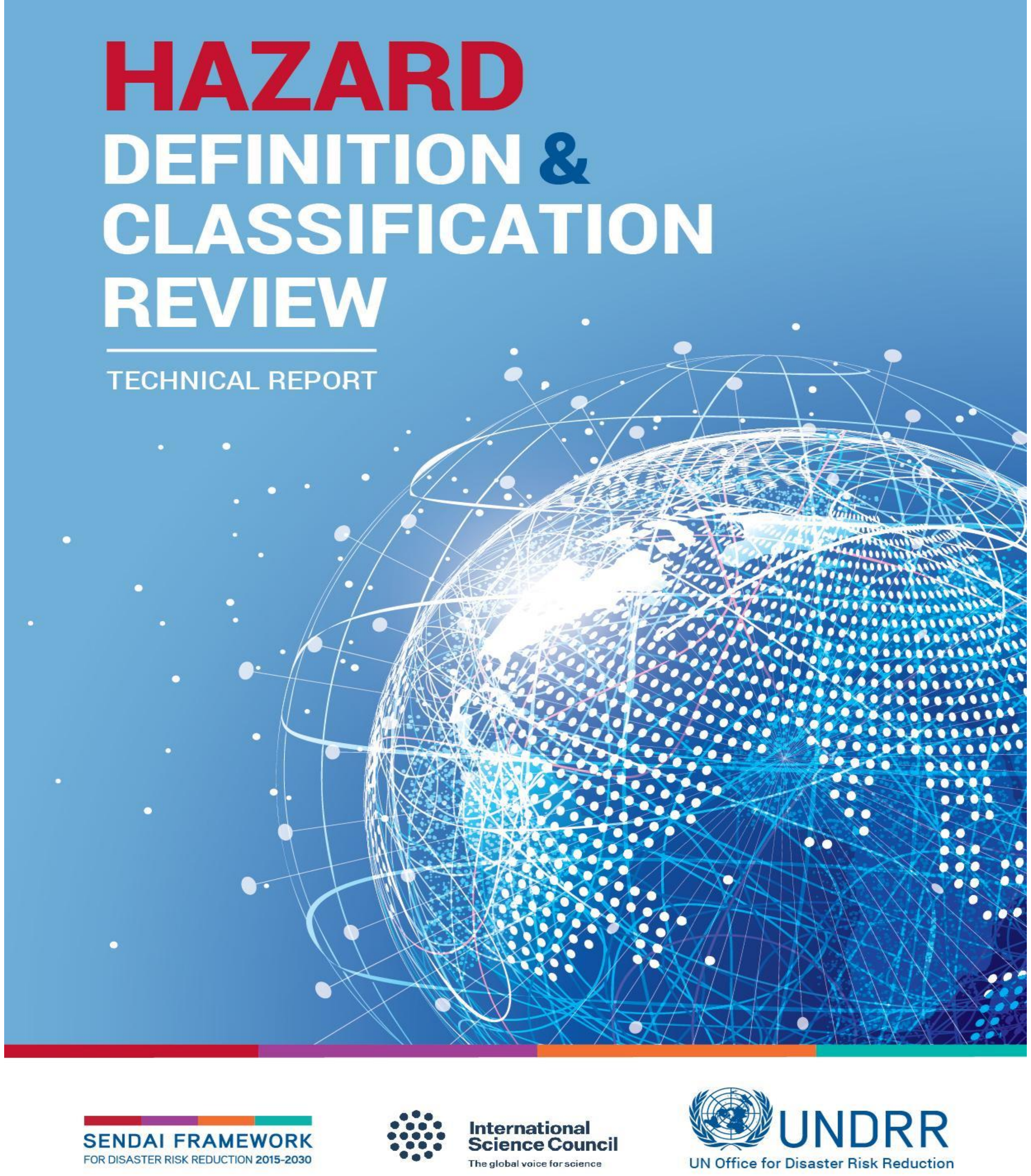
INTEGRATED MONITORING OF THE GLOBAL TARGETS OF THE SENDAI FRAMEWORK AND THE SUSTAINABLE DEVELOPMENT GOALS

The Sendai Framework targets and indicators contribute to measuring disaster-related goals and targets of the 2030 Agenda for Sustainable Development of above mentioned SDGs.

Outcomes are a product of complex and interconnected social and economic processes with overlap across the two agendas.



Integrated Monitoring of the Global Targets of the Sendai Framework and the Sustainable Development Goals. Source: PreventionWeb (2020).



Hazard Definition and Classification Review: Technical Report.

United Nations, 2020

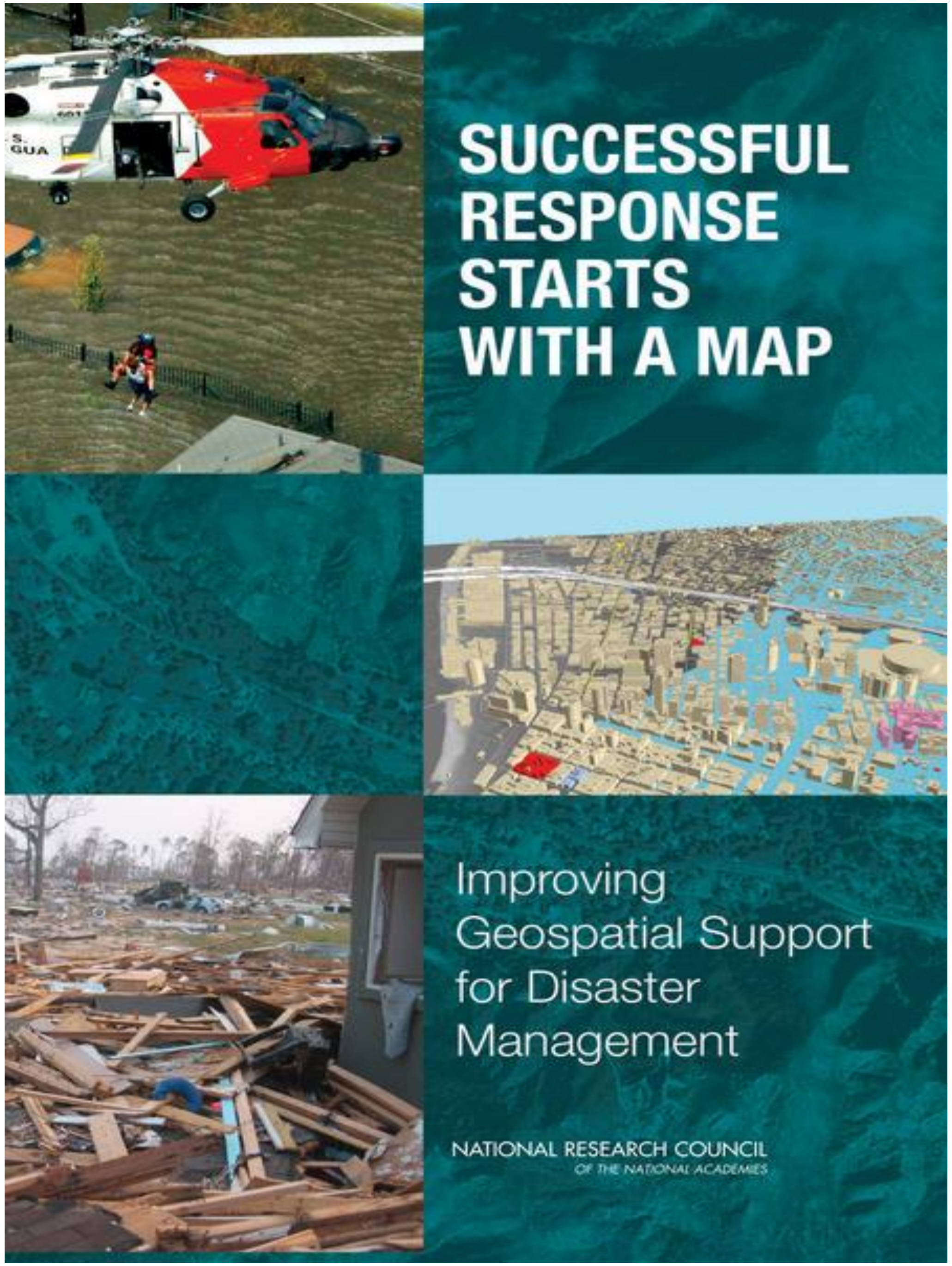
7. Disaster Examples: hurricane Katrina, Fukushima nuclear power station disaster

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.

Hurricane Katrina

Video



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

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 brought by disasters.

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

   …causal relationship between hazards and disasterr event is poorly understood and risks are hard to measure…

   Geospatial models: predictions of locations, footprints, times, durations of events, the damage they may cause, so that jurisdiction can better prepare for them

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 the outcomes of various courses of action.

QUESTIONS:

- How can we increase the resilience of communities to disasters-e.g. By adding levees, raising the elevation of the living floor in homes, or imposing zoning regulations?

-How can we reduce the impact of disaster events, e.g. Through more effective warning systems or better evacuation plans?

-How can we most effectively provide assistance to those who have been affected – through development of a common operating picture and common situational awareness shared by all emergency responders or through better search-and-rescue procedures?

Fig. 3.1. Emergency Management cycle.

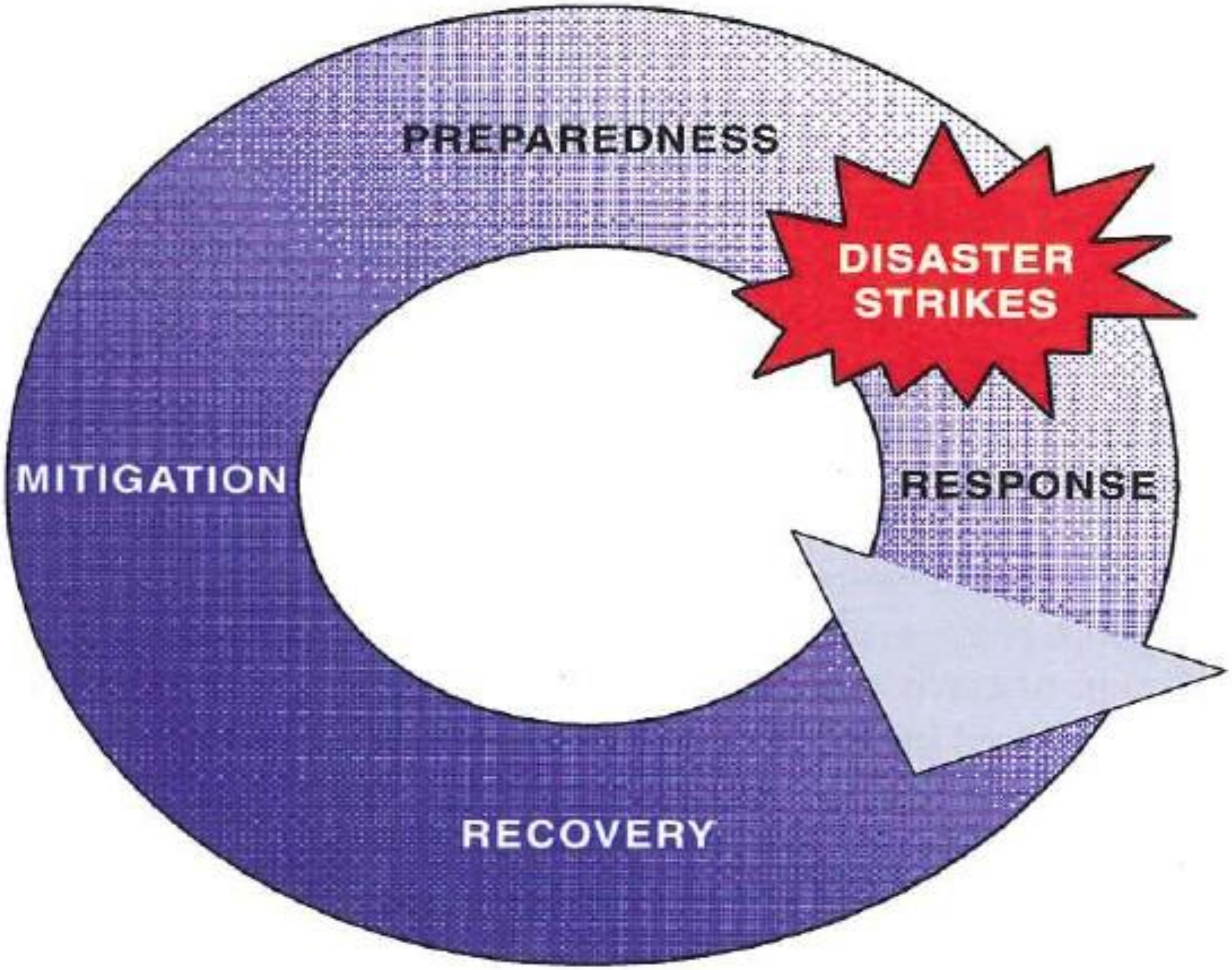


FIGURE 3.1 Emergency management cycle.

Relevant Actors

1. Emergency managers and responders

2. Public sector geospatial support

3. Geospatial Support from Universities and the Private Sector

4. International Activities

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

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 informationabout úeople 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,…..

See Table 3.2

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

TABLE 3.2 Continued

	Requirements	Current Capabilities	Gaps
		• Shared geospatial databases within individual cities and counties • State- or county-funded image acquisition • Visualization technologies	
Response	• Ability to warn the public and notify responders • Ability to compare damage with client databases to calculate expected demand • Ability to track resource locations and status, including shelter sites • Ability to track the activities of public, private, and nonprofit service providers; maps of where current assistance is being provided • Rapid identification and categorization of the extent and type of damage over a widespread area, assessment of damage severity, including maps of damage areas and affected populations • Common operating picture based on shared geospatial data and analysis and continuous, real-time data about incident, damage, resources • Creation of an archive of social, economic, and geographic issues and responses for the incident • Detailed information on refugee and stranded demographics especially age and location and maps of needy and underserved areas • Robust communication system that supports data transmission from point of service to site of definitive analysis and decision making • Understanding of critical infrastructure damage (e.g., road and bridge closures, power outages) • Ability to provide coordinate locations for planning and executing search-and-rescue operations	• Application-specific remote-sensing data (i.e., multispectral data for environmental assessment or true-color, off-nadir high spatial resolution for structural assessments) with sophisticated image exploitation tool set • Coordinated access to government-developed response database • Correlation of individual-level data across data sets • Hazard model input to parcel-level geographic database for prediction of at-risk population • NOAA and FEMA Public Alert Warning System and reverse 911 • Residential structures damage estimation (RSDE) database • Robust geospatial analytical capability—COTS GIS, products for mapping and spatial analysis, and the ability to incorporate model output • Sophisticated, nearly incident-specific, remote-sensing, image acquisition, and exploitation capabilities • The ability to geo-code coordinates to support search-and-rescue operations	• Rapid dissemination of maps with hazard and victim locations to responders • Capability to track the location and characteristics of equipment and supply assets as well as human assets • Fleet tracking systems that provide full resource location in a dynamic context (possible but not used) • SOPs for remote-sensing and GIS technologies in emergency management agencies • Integrated system for real-time reception of remote-sensing data to forward deployed capability • Coupled modeling capability to spatial decision support system or simple GIS • RSDE system is not integrated with GIS database for real-time automated update • Integrated, location-based field data acquisition system linked to central GIS for use by initial response teams and recovery teams • Dynamic update of geospatial database content from any approved point in the response activity • Assured communication system for geography-specific public alert and feedback from affected population on status and need • Coordinated, detailed information on post-incident population movement • Rapid damage assessment identifying extent and severity of damage

continued

TABLE 3.2 Continued

	Requirements	Current Capabilities	Gaps
Recovery	• Ability to provide information to public about rebuilding and regrowth • Ability to track resource locations and status, and the locations and activities of service providers • Access to response geospatial database for transition of response to recovery • Geospatial tools for land-use planning • Identification and analysis of optimal landfill, shelter, long-term housing sites, disaster recovery centers, and recovery team staging areas • Integrated monitoring system for recovery operations at the parcel level • Maps of how population shifts as a result of disaster—age is an important attribute • New information required to issue building permits • Remote-sensing acquisitions to monitor recovery progress on a regional basis • User-friendly decision support tools to systematically evaluate short- and long-term demands such as allocation of resources, capacity shortfalls, and status of restoration	• Optimal location analysis using image data, geographic data, and spatial modeling • COTS GIS tools for spatial analysis of optimal siting and land-use planning (e.g., landfill, shelter) • Commercial or government-provided remote-sensing acquisitions to monitor recovery progress on a regional basis • Land-cover or land-use classification, change detection, and mapping using COTS image analysis tools • Correlation of individual-level data across data sets • Multiple overlay and spatial relationships and comparison • Standard COTS GIS products for mapping and spatial analysis (but data may not be available)	• Fleet tracking or location-based service to tag field activity with a handheld device; used by private sector (e.g., FedEx) but not by FEMA • Dynamic models that incorporate real-time geographic data of response activity within a GIS for full understanding of resource use and changing need • Coordinated, detailed information on post-incident population movement • Simple geocoding capabilities that allows nontechnical staff to provide coordinates for search and rescue operations

NOTE: COTS = commercial, off the shelf; ORNL = Oak Ridge National Laboratory; SOP = Standard Operating Procedure.

Disasters

Fukushima Earthquakes

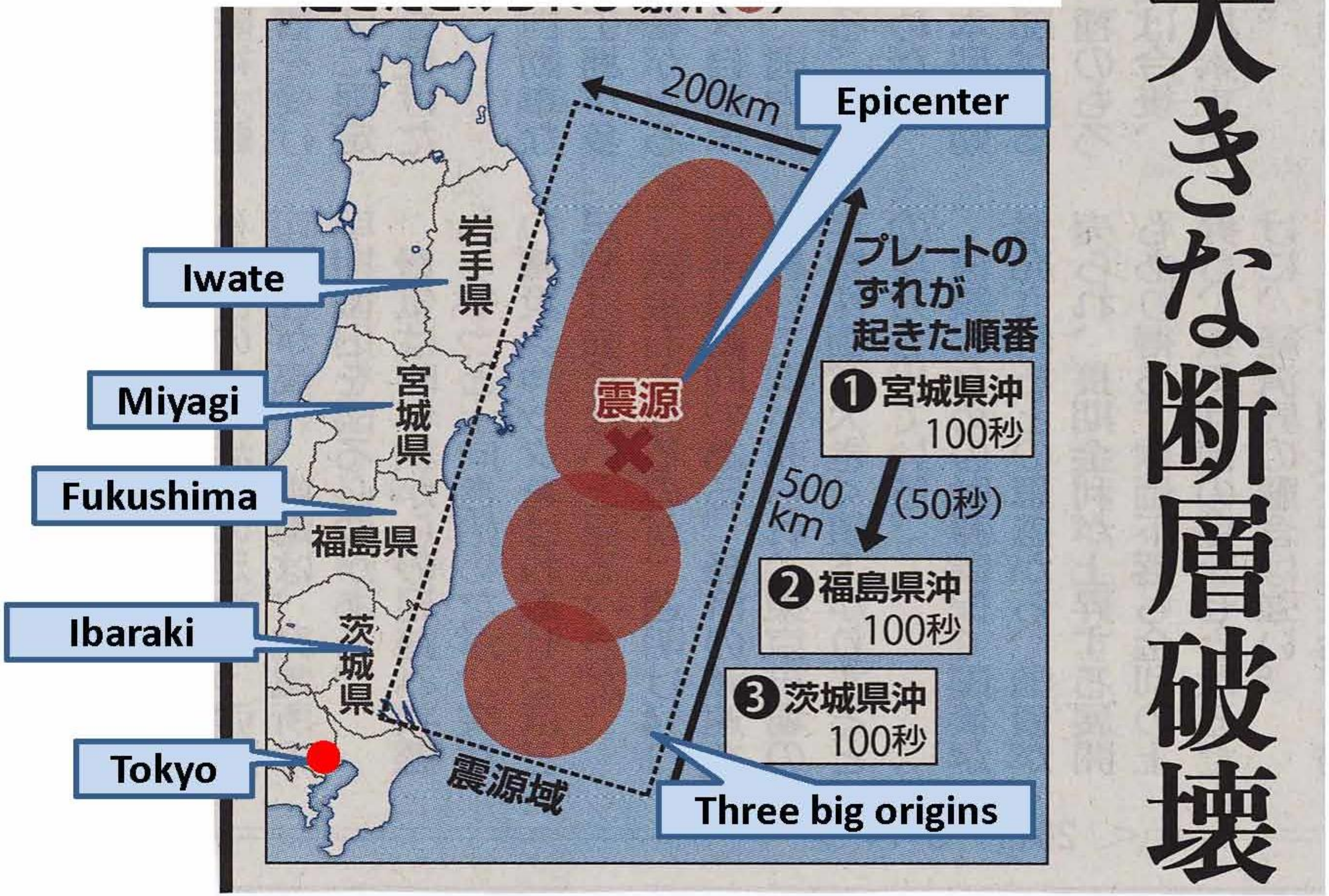
Fires: Russia, Australia, Greece, Portugal

Floods: also Central Europe…

Earthquakes: Japan, Chile, Turkey, Iran…

Fukushima Earthquake and Tsunami

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
earthquake had been predicted for this region, with a 99% probability within 30 years, at magnitudes ranging from M7.5 to M8.0.

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

Tidel Tsunami

Video New Tsunami

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

©Yu Tube

Sunji Murai, 2011

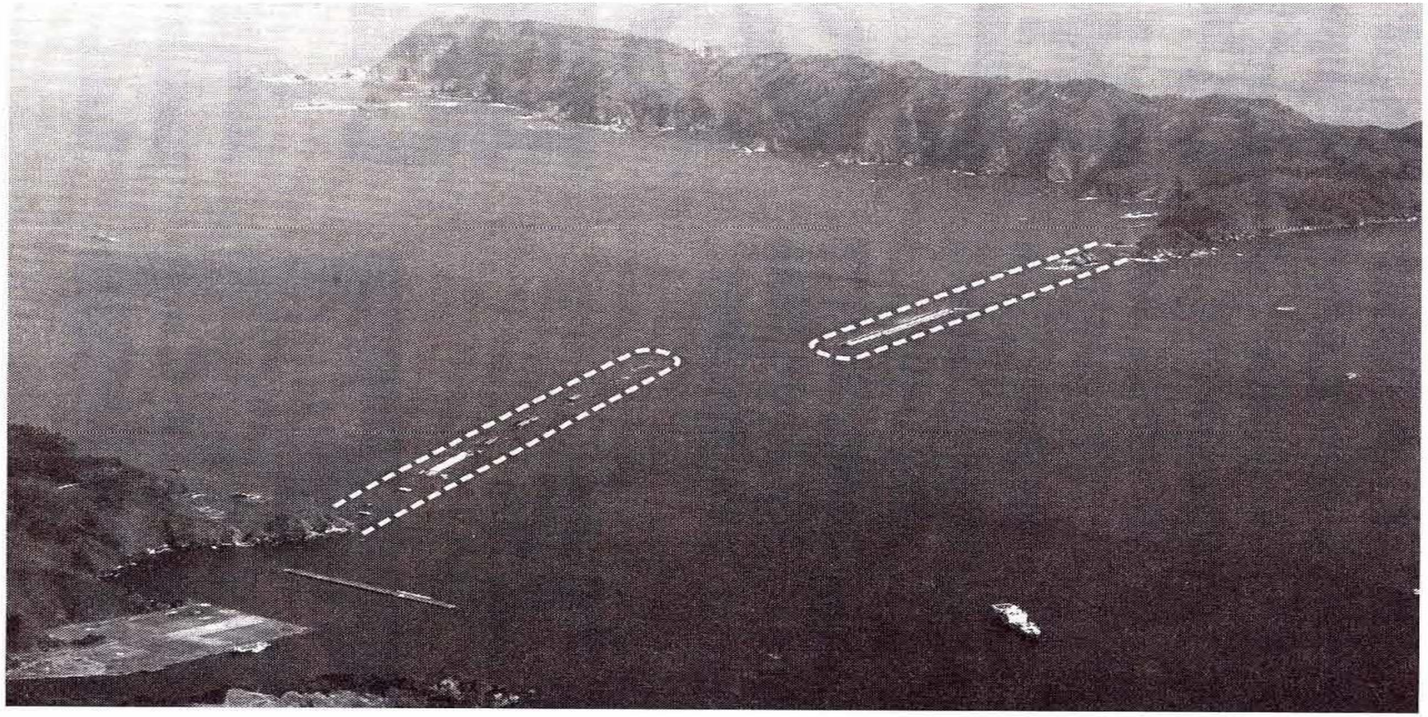
Kamaishi City, Iwate Prefecture constructed huge breakwaters 2km long, 20m thick, 8m above sea level and 65m deep, which have been registered as the deepest breakwaters in the Guinness World Records (see Fig.4a and 4b).

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

©Google

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

Sunji Murai, 2011

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

©Digital Globe

Sunji Murai, 2011

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

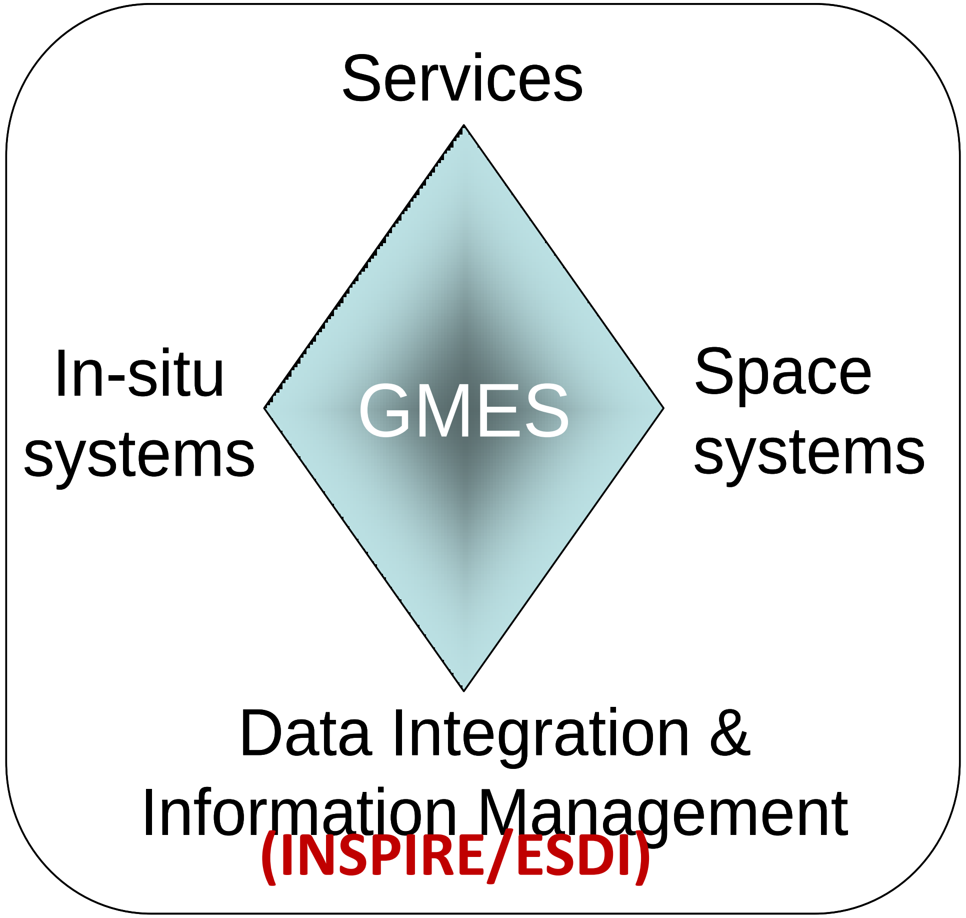
we need to use ***‘software’*** including procedures for providing early warning and evacuation systems.

Prof. Shunji Murai

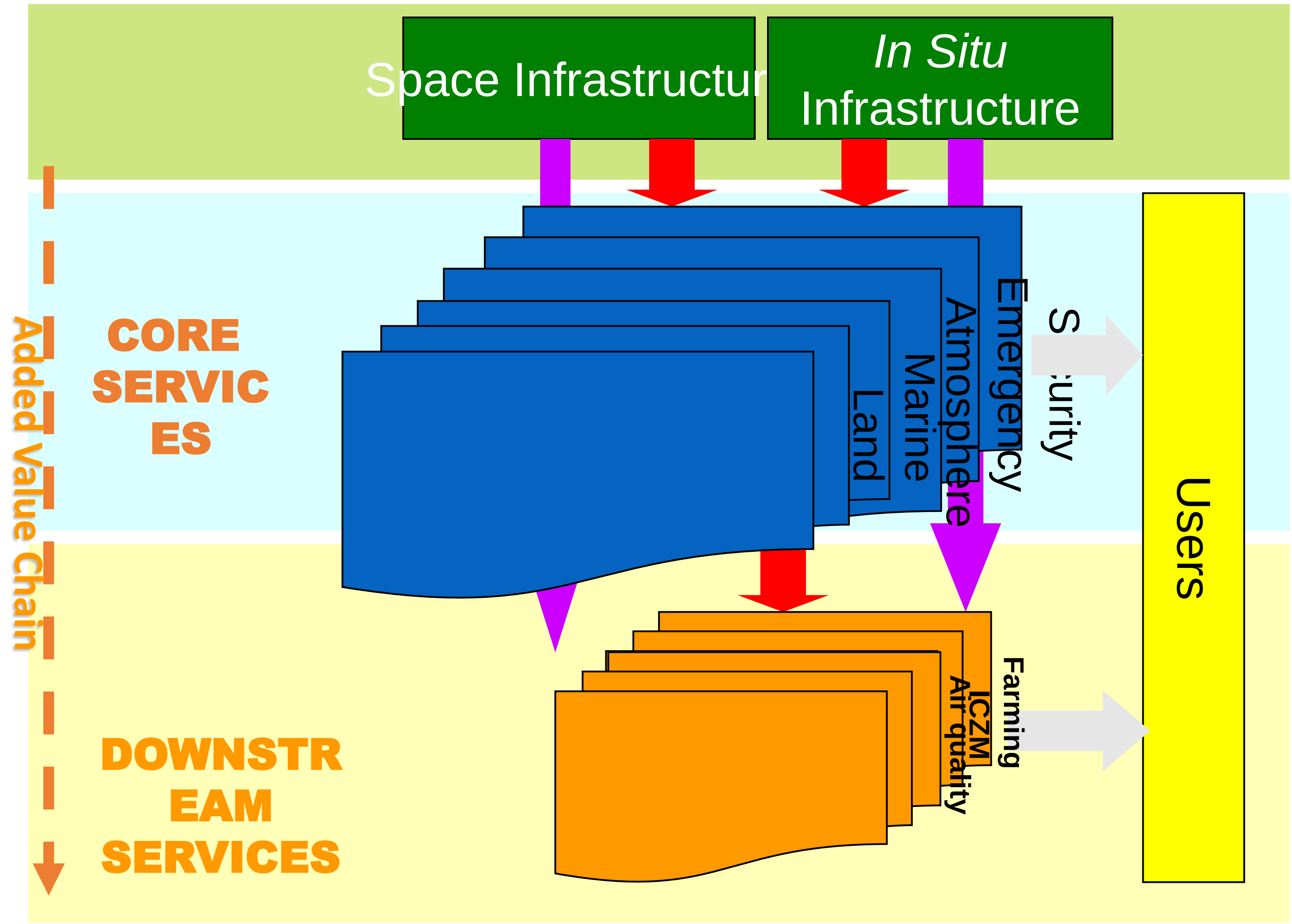
European Union Preparedness

COPERNICUS

Global Monitoring for Environment and Security

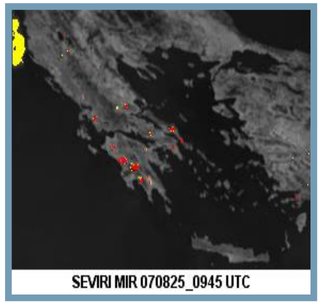


Overall architecture



Four main types of products:

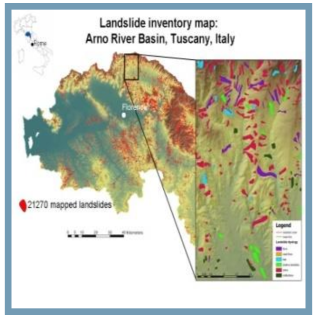
Early warning

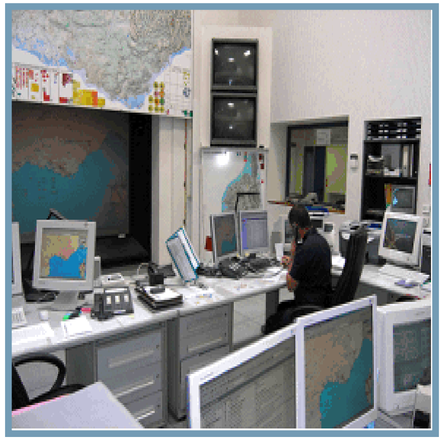


Reference maps

Assessment ma

Thematic maps





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

9. The Challenges of Geospatial Sciences (incl. Geodesy, Cartography, RS, etc.)

The Role of Geospatial Sciences and Societies

There are two world operating organisations of United Nations, the International Strategy for Disaster Reduction **(U.N. ISDR or ISDRR**) and the Integrated Research on Disaster Risk (**IRDR**).

Activities of prominent World research organisations:
Commission for Early Warning and Disaster Risk Management - International Cartographic Association - **ICA** (in 2004 resp. in 2007 arranged by M. Konecny).
The International Society for Photogrammetry and Remote Sensing **(ISPRS**) which started organisation of GI4DM conferences (Sisi Zlatanova); last one was organized in Prague (Lena Halounova, Orhan Altan); Sydney – end 2020.
The International Federation of Surveyors **(FIG**) which organised at the time of Working Week 2016 in Christchurch, New Zealand. First concept president Stieg Enmark (2008)




Joint Board of Geospatial Information Societies United Nations Office for Outer Space Affairs

Geoinformation for Disaster and Risk Management

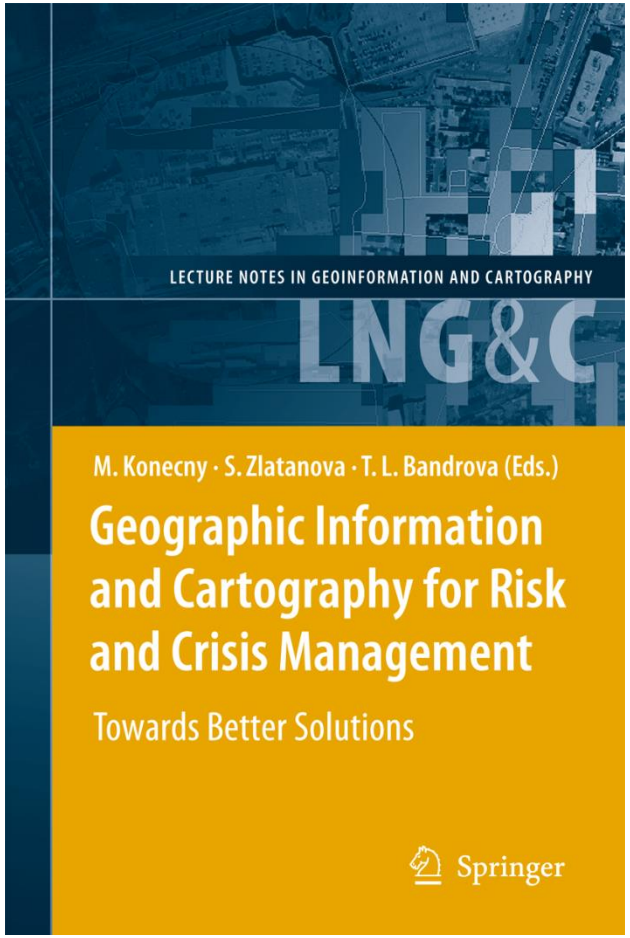
Examples and Best Practices




Orhan ALTAN, Robert BACKHAUS, Piero BOCCARDO, Sisi ZLATANOVA (2010)

ICA: KONEČNÝ, Milan - CARTWRIGHT, William. International Cartographic Association

More books and proceedings:



The Value of Geoinformation for Disaster and Risk Management (VALID)

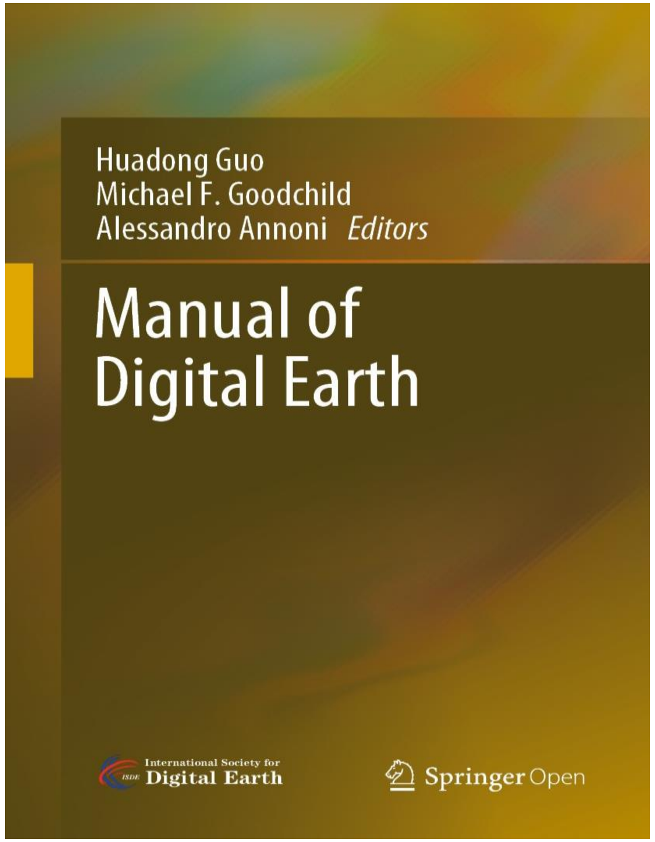
Benefit Analysis and Stakeholder Assessment

International Council for Science - GeoUnions

Joint Board of Geospatial Information Societies

United Nations Office for Outer Space Affairs

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

My present for you: [*Manual of Digital Earth | SpringerLink*]

The ICA Example: Sendai Framework Challenges
ICA CEW&CM provided general concept to:

Provide leadership in the development of concepts, ontologisation and standardisation for early warning, hazard, risk and vulnerability mapping.

Promote the cartographic use of remotely sensed and other geospatial data for early warning and crisis management through scientic conferences, seminars and workshops.

Investigate the psychological condition of end-user given by their personal character and situation and psychological condition of rescued persons (with support of ubiquitous and adaptive mapping).

Foster quality mapping and cartographic modelling, including state-of-the-art visualisation technologies, geospatial processing and publishing tools, for early warning and crisis management through topic related publication activities.

Participate and contribute to global initiatives in early warning and crisis management through the maintenance of a websites, newsletters and social network channels.

Promote the development of dynamic and real-time cartographic visualisation concepts and techniques for enhanced operational early warning activities through active collaboration with governmental authorities.

Establish and cultivate professional networks for the exchange of information among stakeholders in the domains of crisis management and early warning.

Develop mechanisms of command and control systems integration as well as improve real-time data-centric intelligence based on sensors for purposes of Crisis Management.

Develop mapping methodologies and technologies for EW&CM in children perspectives. Promote the process of teaching, understanding and using maps for EW&CM in children aspects.

10. Selected examples of research efforts:

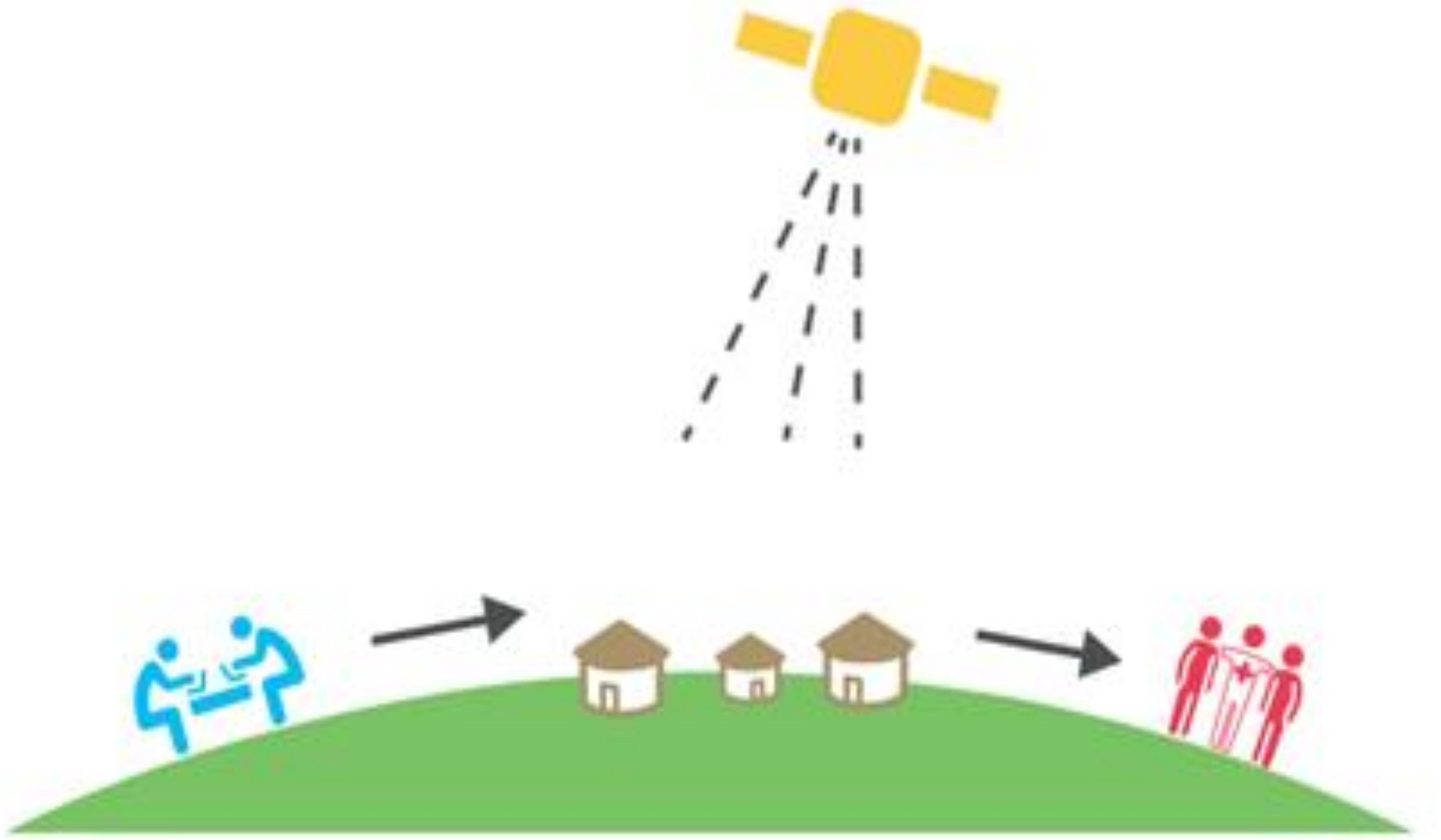
VGI, Dynamic Mapping, disaster management in agriculture

Using volunteers and VGI for DRR and Crisis Management

The main role of G.I. Science in DRR is creation, providing and sharing of spatial data and providing analyses of data.
The development of electronics, networks, databases, data sharing brings new possibilities for data collection, management and providing.

Big gap between technological and financial possibilities of developed and developing countries.

The possible way how to bridge this problem is using of volunteers – both for disaster risk reduction and crisis management



General concept of VGI (GIS Unit, Médecins Sans Frontières). Source: HOTOSM (2014).
KONEČNÝ M. et al., 2020, Vol. 1, 8th Cartography and GIS Conference, Nessebar,…

Example of using VGI data and open-access platforms are **Humanitarian OpenStreetMap Team (HOT**, https://www.hotosm.org/) and **Missing maps project** (https://www.missingmaps.org/). Both projects are deeply connected to each other. HOT is one of Missing Maps project founder.

They are examples of connections and differences between crisis management and disaster risk reduction.

DYNAMIC MAPPING METHODS ORIENTED TO RISK AND DISASTER MANAGEMENT IN THE ERA OF BIG DATA Masaryk University and Nanjing Normal University Project

2019

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

Dynamic mapping for risk and crisis management in big data era

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 Catchment
  - 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

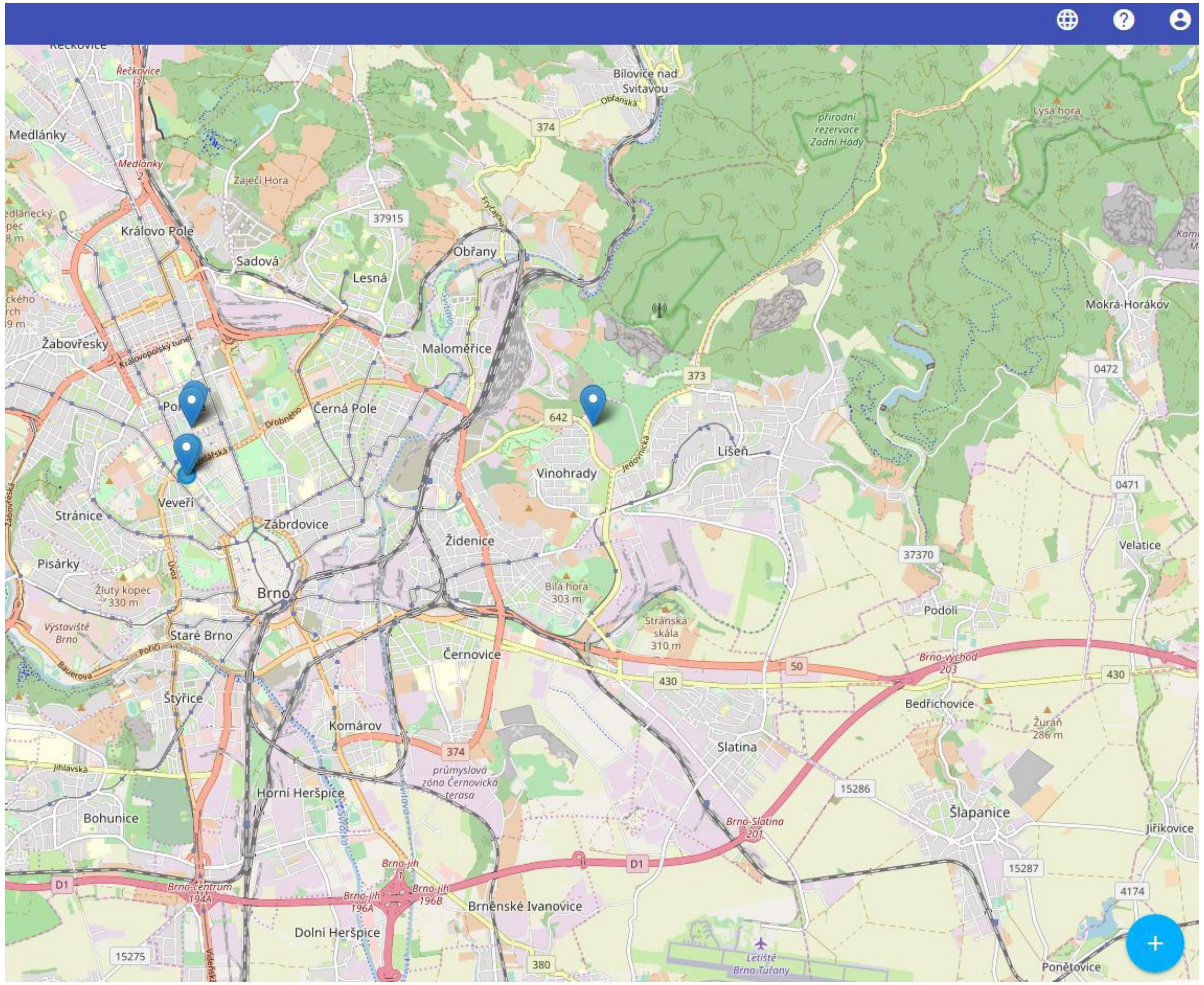
- **Data collected by volunteers (VGI data)**
  - Data verification needs to be solved

Results

- VGI based system for collection of geodata
- **System of interactive map for disaster management**
- Cross-cultural cognitive testing for purpose of the disaster management
- International seminars

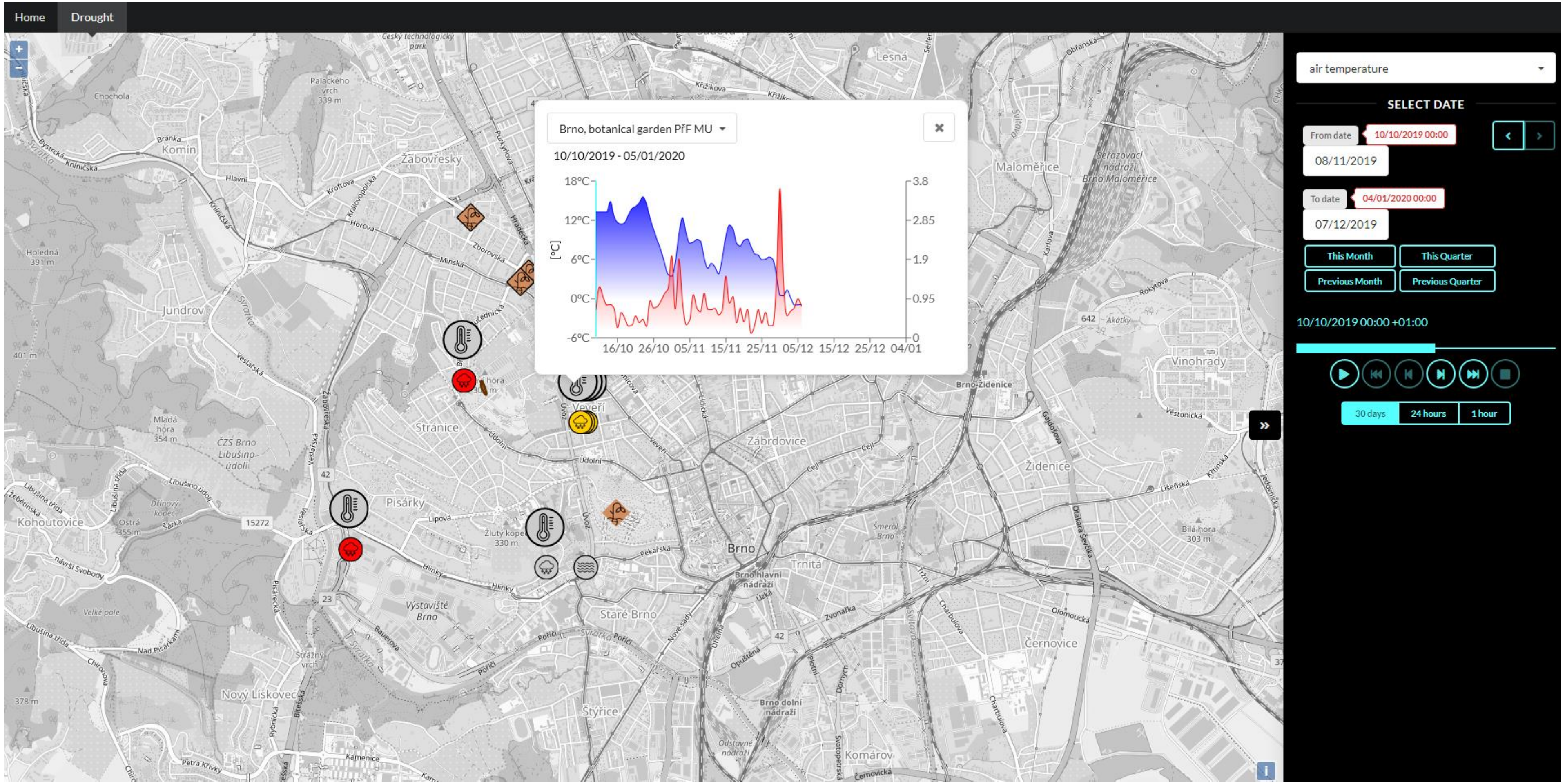
VGI based system for collection of geodata

- For mobile phones
- System of **verification** of collected VGI data



System of interactive map for disaster management

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



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

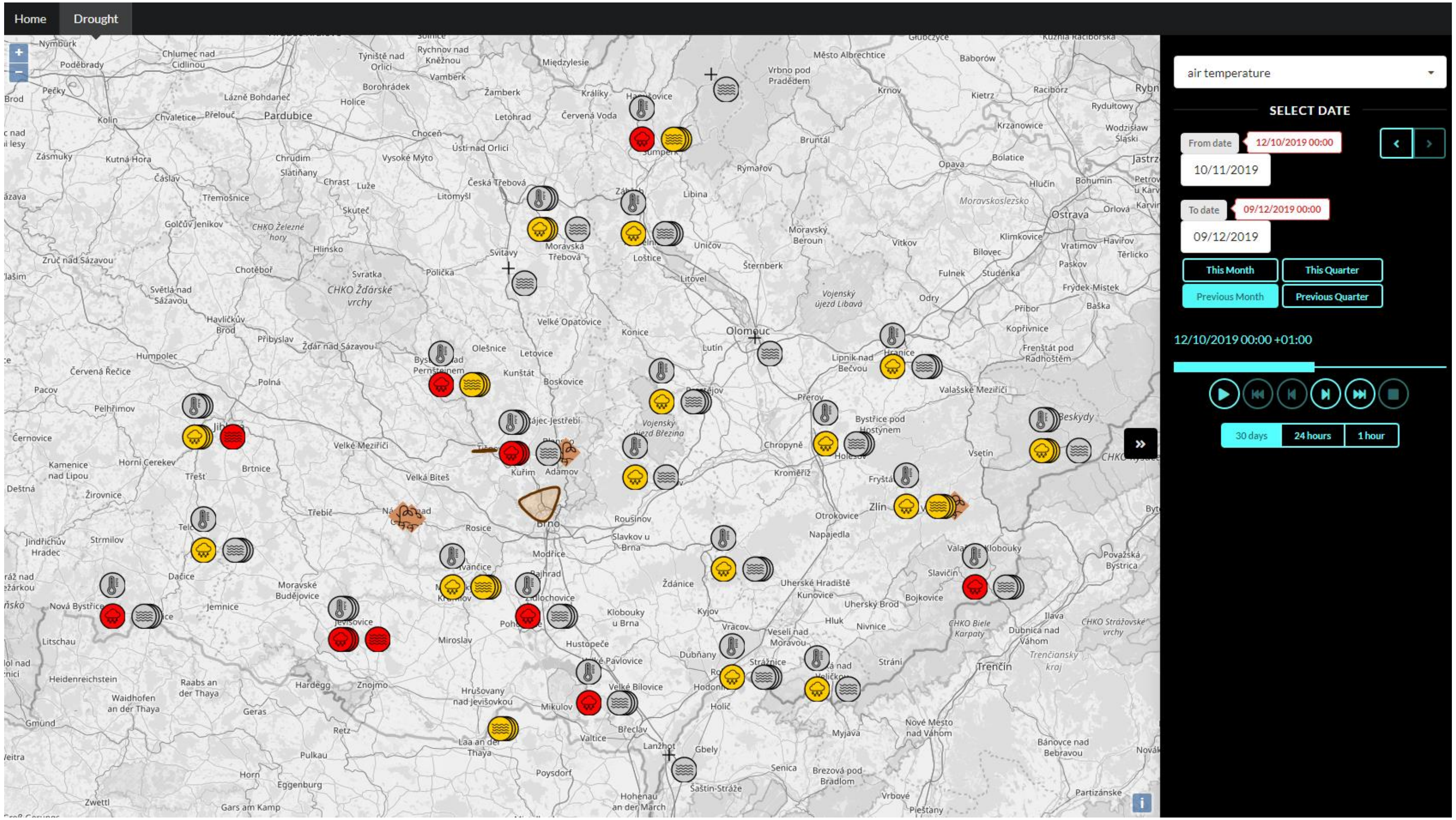
- Map compositon is prepared from harmonised data stored in database.

- Possibility of interactive exploration of data.

- Set of time windows can be defined and aggregated values (e.g. averages) can be calculated.

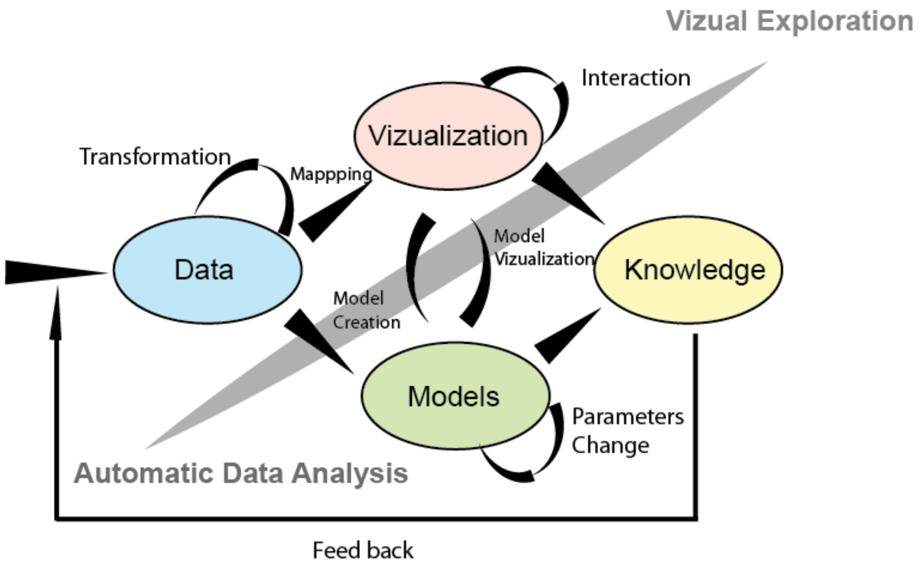
System of interactive map for disaster management

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



Adopted system of cartographic visualization

- Topographic background - greyscale
- Data types (different nature)
  - Measurements (simple or compound sign)
  - Observations (simple sign)



- System of compound signs
  - Phenomena selected by the user

PRIMARY + SECONDARY

TERTIARY ...

Anomalies

- Anomalies in data are identified and visualised.
  - It allows **identification of abnormal phenomenon** which could trigger a crisis situation (e.g. extreme rainfall).
  - This is possible way how to deal with amount of Big data.
  - To **identify** values that are possibly important.

- Anomalies are represented:
  - by color of symbols,
  - by red line in charts.

Anomalies

- Luminol – library for anomaly detection and correlation – is used.

- Internal test environment using real project data exists:
  - https://poster-production-jupyter.aladin.sci.muni.cz

  1) choose station and characteristics

  2) test various detectors and parameters to detect anomalies

- Actually detector of anomalies "LinkedIn bitmap" is used in system. But it can be changed, if analysis will show that other detector has better results.

Possible extensions of results

1) Detection of anomalies

- e.g. using different detectors on different data

2) Most of measured data are stored as time series. Sophisticated tools for time series analysis could be used.

3) Analysis could be not only in time series but also in space.

- e.g. interpolation

4) System should be as maintenance-free as possible.

SIEUSOIL

SIno-EU Soil Observatory for Intelligent Land use Management

SIEUSOIL PROJECT INTRODUCTION

Very first information

Tomáš Řezník, Masaryk University (MU)

OGC technical meeting (Leuven, Belgium, 24/06/2019)

www.SIEUSOIL.eu

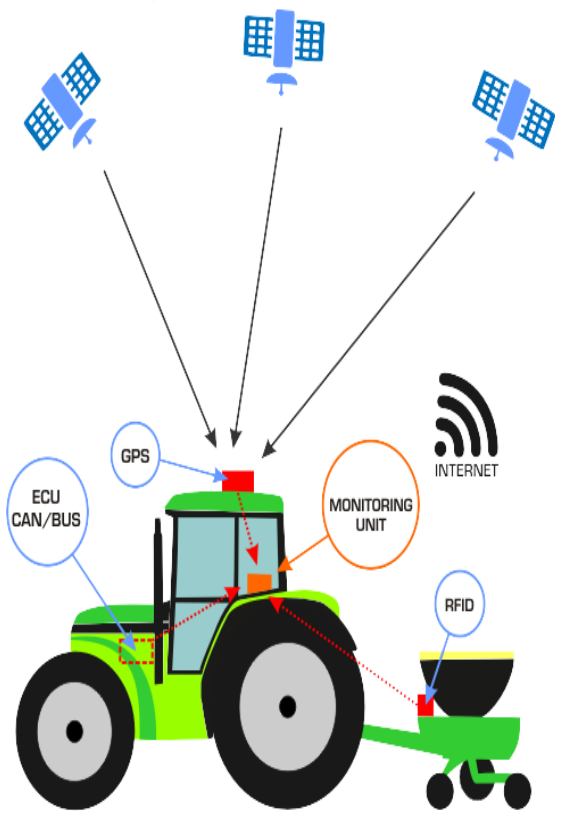
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818346

European Commission

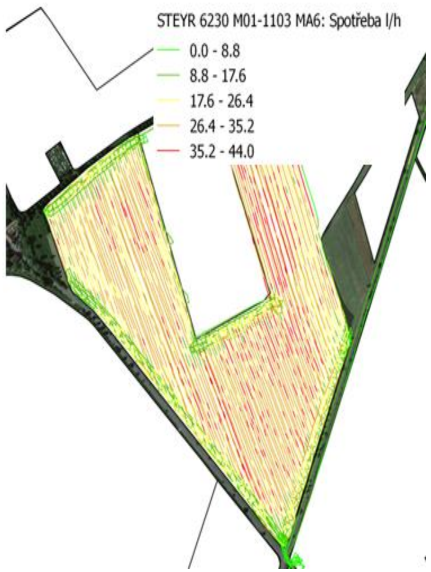
Horizon 2020 EU-China

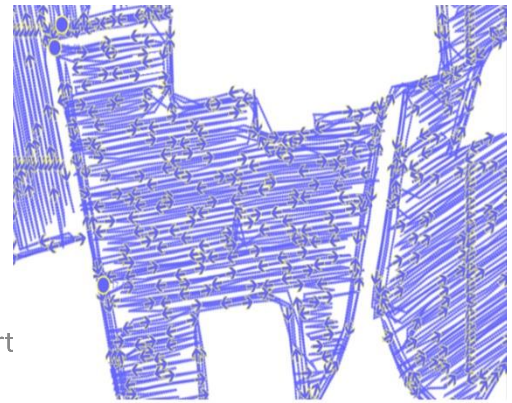
Call: H2020-SFS-2018-2020
(Sustainable Food Security)
Topic: SFS-38-2018
Type of action: RIA
Proposal number: SEP-210522327
Proposal acronym: SIEUSOIL

Monitoring of agricultural machines

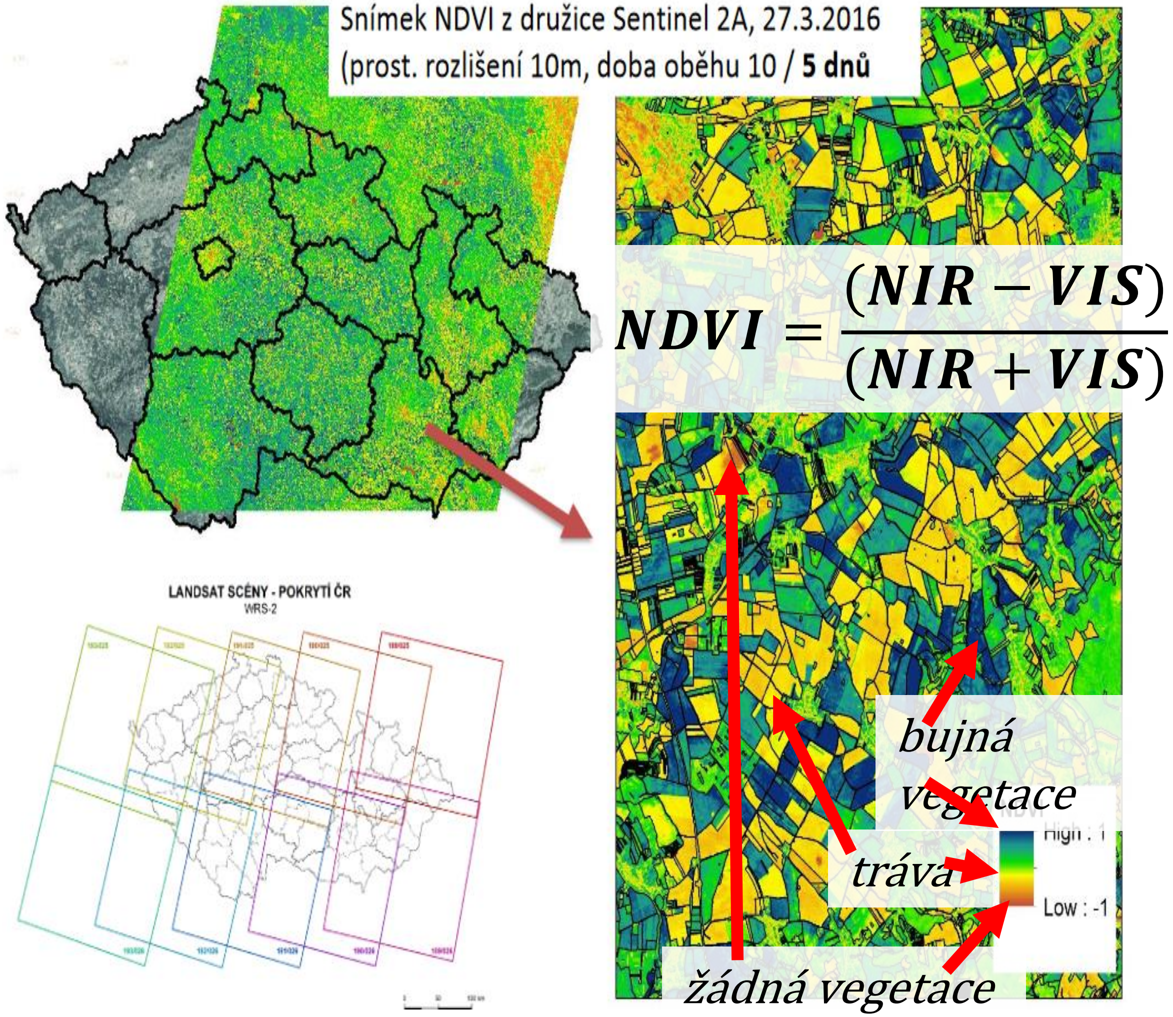


One farm of 1'000 ha generates 10 MB of sensor data per day

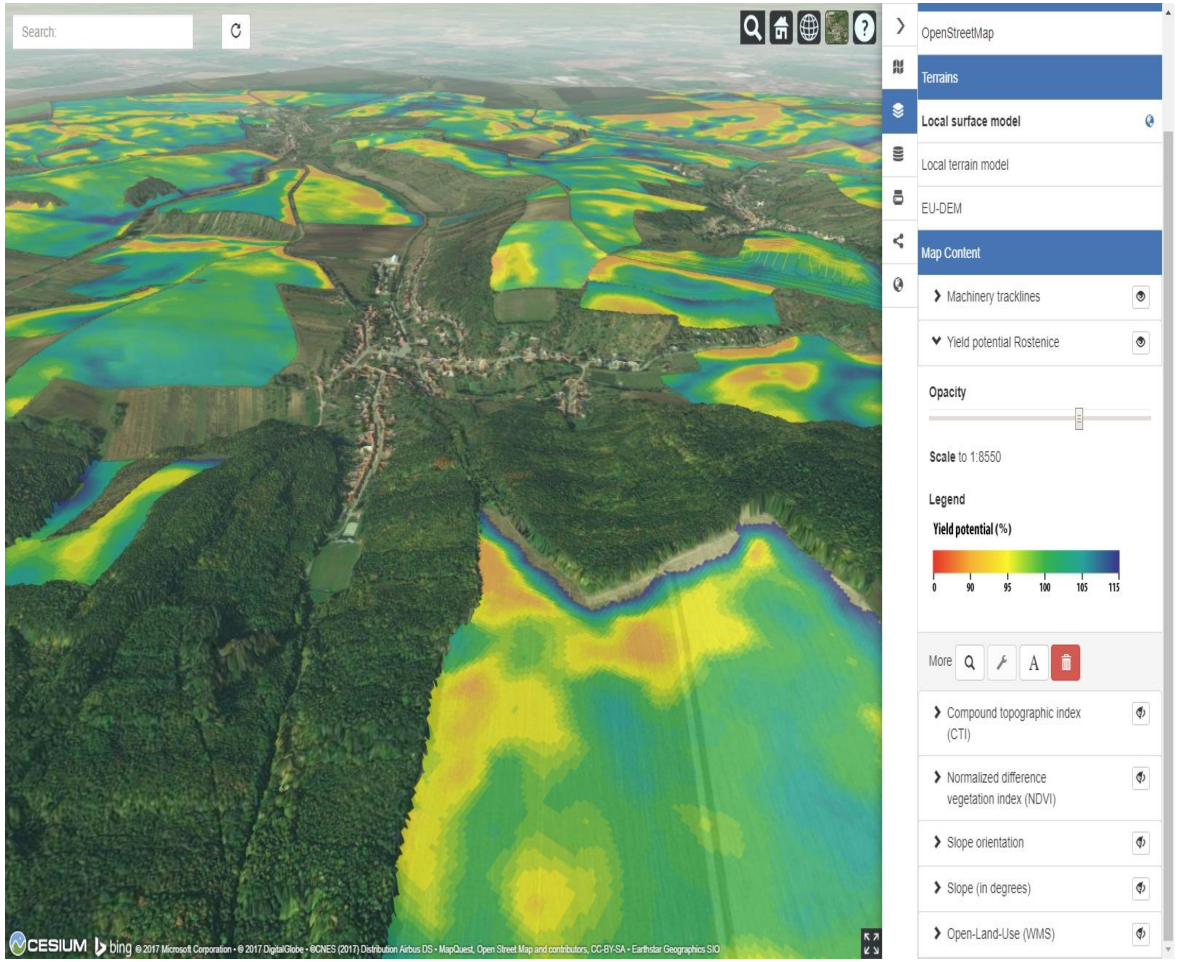




Basic principles of satellite monitoring



3D vizualization



Cattle tracking

- A true tailor-made solution

bell (delivered by the farmer; 0, - €)

elastic solar panels (80,- €)

GNSS (GPS) receiver (120,- €)

RFID chip (automatic check when passing through the enclosure; 5,- €)

GIFTS for students – Free Publications

KONECNY Milan, BANDROVA Temenoujka, KUBICEK Petr., MARINOVA Silvia., STAMPACH Radim, STACHON Zdenek and REZNIK Tomas (2020) ***Digital Earth for Disaster Mitigation,*** pp. 495-526. In: **Manual of Digital Earth Ed. Guo H., Goodchild M.F., Annoni,** A. DOI https://doi.org/10.1007/978-981-32-9915-3, 2020, Publisher Name Springer, Singapore, Print ISBN 978-981-32-9914-6, Online ISBN 978-981-32-9915-3, , https://link.springer.com/book/10.1007/978-981-32-9915-3#editorsandaffiliations. 852 p.

KONEČNÝ Milan, Temenoujka BANDROVA, Petr KUBÍČEK, Zdeněk STACHOŇ, Radim ŠTAMPACH, Jie SHEN, Irina ROTANOVA, Jan BRODSKÝ and Pavel ŠPULÁK: ***Strategies of Disaster Risk Reduction on The Background of U.N. GGIM and Digital Belt and Road Efforts, pp. 572-588.*** Proceedings Vol. 1, 2020, Nessebar, Bulgaria © Editors: Temenoujka Bandrova, Milan Konečný, Silvia Marinova. © Publisher: Bulgarian Cartographic Association. ISSN: 1314-0604. 760 p. https://iccgis2020.cartography-gis.com/proceedings-vol-1/

Present for **my students**:

All book:

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

My (our) Chapter: p.393-398

DĚKUJI ZA POZORNOST

BLAGODRJA!!!
Köszönöm
THANK YOU
SPASIBO
Xie Xie
RACHMED
Muchas Gracias
O Brigada
Kammsa Hamida
Aligator
SHUKRAN

PRAGUE


BRNO