

## **Krátký podkladový text (shrnutí) ke zkoušce z Globálních prostorových datových projektů**

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### **14.3. Digital Earth and other World Activities for Disaster Mitigation Solutions**

#### ***14.3.1 Digital Earth***

For over 20 years, Digital Earth (DE) has been an activity that has witnessed the ebb and flow of interest from the world's scientific community. Initially, it was looking for a place between activities focused strictly on maps, data and information (Global Map, GSDI, etc.). Later on, it began to push through with its comprehensive concept and emphasis on the need to integrate not only data and information, but also impulses and knowledge coming from the scientific realm, the private sector, and the needs of people in different parts of planet Earth. Today, solutions of the new type are expected from DE, which will also significantly help to realize the DRR and / or Disaster Mitigation projects. After Worldwide success of SDI and NSDI Al Gore (US vice-president) came with concept of Digital Earth in his speech in Los Angeles in 1998. On January 1998 he said that Digital Earth is: “A multi-resolution, three-dimensional representation of the planet, into which we can embed vast quantities of geo-referenced data. “

The DE concept encouraged a lot of activities in all World. First DE global conference was held in Beijing in 1999. Many participants requested to combine approach of Al Gore with growing development of Sustainable Development (SD). According to Radermacher (...) SD is a set of the equal important aspects: - economic, - ecological, - technological, - social, - cultural, and - ethical.

Digital Earth, except of USA and China started to be developed also in New Zealand, Australia, Canada, and European Union countries. Digital Earth implies:

- a) A multi-resolution, three-dimensional representation of the planet;
- b) A new framework for integrating a wide variety of geo-reference data, including natural, cultural and historical components, not limited to 3D space, but also able to deal with time;
- c) Excellent for modelling processes is in short term hazards, or long term climate change, geological processes, etc.

Original NASA's Digital Earth initiative brings together Federal, state, and local agencies, industry, academia, and other contributors to facilitate the development of next generation technology, standards, and enhanced content necessary for realization of the Digital Earth. First working committees were oriented for: - Charter development; -Reference model/architecture; -Public/private partnership, and -Current Digital Earth inventory. In China the First International Symposium on Digital Earth titled Towards Digital Earth was organized on Nov.29- Dec.2, 1999 in Beijing with main topics: - Vision and concepts of Digital Earth; - Theories and Technologies; - Applications and Potentials. The “Beijing Declaration on Digital Earth” was published.

In 2008, M. Goodchild pointed out, that „Digital Earth includes four aspects: visualization, ease of use, interoperability and mashups, modelling and simulation”.

There have been continental initiatives with global influence. Important role are playing two basic Platforms of Digital Earth: Scientific Platform (SP) - Scientific projects relating to digital earth science and various practices of earth science, and Commercial Platform (CP) - Digital earth software developed in commercial corporations. International Society for DE (founded in 2006) aimed to:

- Analyzed from a national demand point of view indicates that Digital Earth contributes, to some extent, to meet the national needs of resources environment and sustainable development.
- Digital Earth gives support to a country's social and economic development and national security, and drives the continuous development of a country in the fields of space, information, etc. (Xu, 2000; Craglia, et al., 2008).
- In short, Digital Earth is becoming an urgent need for mankind's development and for solving global issues.

One of the best analyses testing potentials of Digital Earth concept in EU was SWOT analyses from (citace).Annoni at all, Nessebar 2006 a asi publikováno v IJDE. Study showed positive and attractive aspects based on the political and economic support of influential countries, like USA, China and newly (2018) Russia. Contemporary they found also obstacles coming from too complex DE approaches which did not fit to research tender concepts of European Union. Also clarification of DE leadership was in question.

There have been developed also others, very important activities documenting efforts of communities and organizations dealing with geospatial data to assist, help and improve above described efforts in DRR, climate changes and sustainable development. First between such activities was Global Map (GM).

Global Map ([www.gsi.go.jp/kankyochiri/globalmap\\_e.html](http://www.gsi.go.jp/kankyochiri/globalmap_e.html)) project was launched following the United Nations Conference on Environment Development, Rio de Janeiro, 1992. The main goal was to bring together the efforts of all countries and organizations involved and to create and provide easy and open access to global geographic information (GI) at a scale of 1: 1 million, as a tool to solve global scale problems.

GI is key factor for the implementation of global environmental agreements and conventions, monitoring major environmental phenomena and stimulating economic growth within the context of sustainable development. National/Regional version of the GM were created with raster and vector data. Vector ones were used for Boundary, Transport, Drainage, and Population centers, whereas Raster ones for Elevation, Land use, Land cover and Vegetation. Global version contains Elevation, Land cover, and Vegetation. World Summit for Sustainable Development in Johannesburg (2002) adopted “Implementation Plan which mentions “Promotion of Initiative and Partnership for global mapping”. The Revision of Global Map Specifications (2007-2009) aimed to: Innovation in geospatial information field, and Increase of Global Map data users and a change in user base. GM version 1.0 was demonstrated at the Global Mapping Forum in Hiroshima, Japan, in November 2000, GM version 2 was released.in 2013.

First time proposed creation of such map for our entire planet Prof. Albrecht Penck (1858-1945) at 5th International Geographic Congress in 1891 at Berne. The project was never completed and officially closed in 1986.

### ***14.3.2 Spatial Data Infrastructure (SDI) and National Data Infrastructure (NSDI)***

Many other supportive projects and initiatives are based on the SDI concept. Great interest in the World aroused the USA Executive Order 12906 titled „Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure“signed by President William J. Clinton on April 11 1994. The document included a definition of geographic information and steps to build a National Spatial Data Infrastructure:

“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.” The National Performance Review (citace Radime zdej The National Performance Review, NSDI do Google, nepousti me to)) has recommended that the executive branch develop, in cooperation with State, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure (NSDI) to support public and private sector applications of geospatial data in such areas as transportation, community development, agriculture, emergency response, environmental management, and information technology.

There is also definition of NSDI, which means the technology, policies, standards, and human resources necessary to acquire process, store, distribute, and improve utilization of geospatial data.

Initiative was elaborated also by Global Spatial Data Infrastructure organization and later Global Spatial Data Infrastructure Association (GSDIA). Their definitions and descriptions highlighted some other aspects:

The term Spatial Data Infrastructure (SDI) is used to encapsulate the technologies, policies, institutional arrangements, financial and human resources that facilitate the availability, access and effective usage of geographic data.

The SDI provides the means for discovery, access and application of spatial data for policy-makers, planners and managers, citizens and their organizations. SDI technologies consist of a set of data services that provide geographic data and their attributes.

Services and data are documented with meta-data which that subsequently offer the means to discover visualize and evaluate the data through the Web. Additionally, methods are provided to access the data. Applications are built to solve specific needs on the data service layer. (GSDIA,...myslím, že je to v COOK book-dohledat prosím. Another European activity is COPERNICUS and its part INSPIRE.

### 14.3.3 COPERNICUS (GMES) and Infrastructure for Spatial Information in Europe (INSPIRE)

COPERNICUS (earlier Global Monitoring for Environment and Security – GMES) is based on observation data received from Earth Observation Satellites and ground based information. These data are coordinated, analyzed and prepared for end-users. Through GMES the state of our environment and its short, medium and long-term evolution would be monitored to support policy decisions or investments.

COPERNICUS is a set of services for European citizens helping to improve their quality of life regarding environment and security. COPERNICUS is built up gradually: it started with a pilot phase which targets the availability of a first set of operational GMES services by 2008 followed by the development of an extended range of services which meet user requirements. By a combination of measurements at terrestrial level and from space, it rapidly became clear that new operational services could be offered in fields such as oceanography, precise mapping of land use, and rapid mapping at times of emergency for the civil protection field or air quality monitoring.

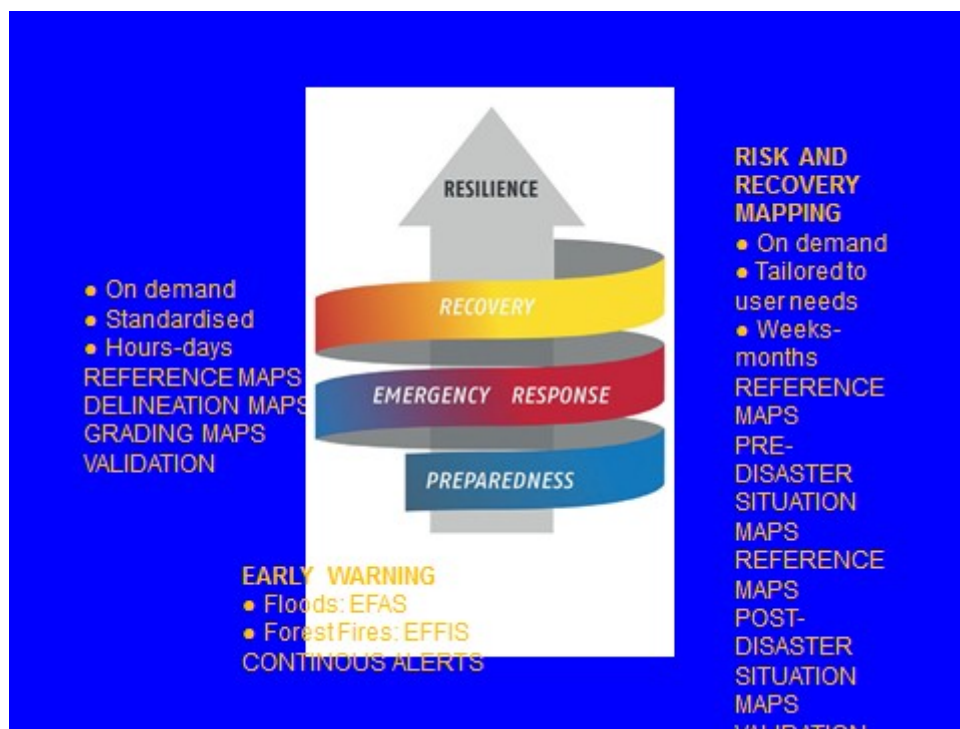


Figure: \_\_\_\_\_

COPERNICUS will mainly support decision-making by both institutional and private actors. Decisions could concern either new regulations to preserve our environment or urgent measures in case of a natural or man-made catastrophes (i.e. floods, forest fires, water pollution).

But to take decisions, it is necessary to anticipate, intervene and control. COPERNICUS integrates these functions by assembling the information acquired in a reliable, valid and compatible manner and makes them available for user friendly exploitation. The services will be used by environmental agencies, local, regional and national authorities, civil protection organizations, etc. The new observation techniques and analysis of data will permit these actors to better anticipate potential threats, to intervene timely and to increase the efficiency of the intervention.

The services provided by COPERNICUS can be classified in three major categories:

- Mapping, including topography or road maps but also land-use and harvest, forestry monitoring, mineral and water resources that do contribute to short and long-term management of territories and natural resources. This service generally requires exhaustive coverage of the Earth surface, archiving and periodic updating of data.
- Support for emergency management in case of natural hazards and particularly civil protection institutions responsible for the security of people and property. This service concentrates on the provision of the latest possible data before intervening.
- Forecasting is applied for marine zones, air quality or crop yields. This service systematically provides data on extended areas permitting the prediction of short, medium or long-term events, including their modelling and evolution.

The widespread and regular availability of technical data within COPERNICUS will allow a more efficient use of the infrastructures and human resources. It will help the creation of new models for security and risk management, as well as better management of land and resources.

COPERNICUS offers four main types of products: maps with early warning information, reference maps, assessment maps, and thematic maps. Rapid mapping is mapping on demand in case of humanitarian crises, natural disasters, and man-made emergency situations within & outside Europe. First time in the history of civil cartography there are defined also time limits:

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

COPERNICUS is the European contribution and participation in the worldwide monitoring and management of our planet Earth organized by the Group on Earth Observation (GEO). The global community acts together for a synergy of all techniques of observation, detection and analysis.

#### ***14.3.4 INSPIRE***

The INSPIRE de facto begun in September 2001, than the first INSPIRE, or at that time the E-ESDI Expert group, was convened in Brussels. The most important step appears on 11 April 2002 when

Memorandum of Understanding between Commissioners Wallström, Solbes, Busquin titled Infrastructure for Spatial Information in Europe (INSPIRE) has been signed

INSPIRE is based on common principles:

- Data should be collected only once and kept where it can be maintained most effectively;
- It should be possible to combine seamless spatial information from different sources across Europe and share it with many users and applications;
- It should be possible for information collected at one level/scale to be shared with all levels/scales; detailed for thorough investigations, general for strategic purposes;
- Geographic information needed for good governance at all levels should be readily and transparently available;
- Easy to find what geographic information is available, how it can be used to meet a particular need, and under which conditions it can be acquired and used.

The INSPIRE concept is based on availability, accessibility and legislation rules.

Three Appendixes with items of data which are collect, kept, up-date, elaborate and offer (according to Aarhus convention - <http://ec.europa.eu/environment/aarhus/>) requests) are defined. Many of that data are useful for EW, DRM and DRR.

Background of INSPIRE approach is shown in schema from discovery to interoperability: (image no).

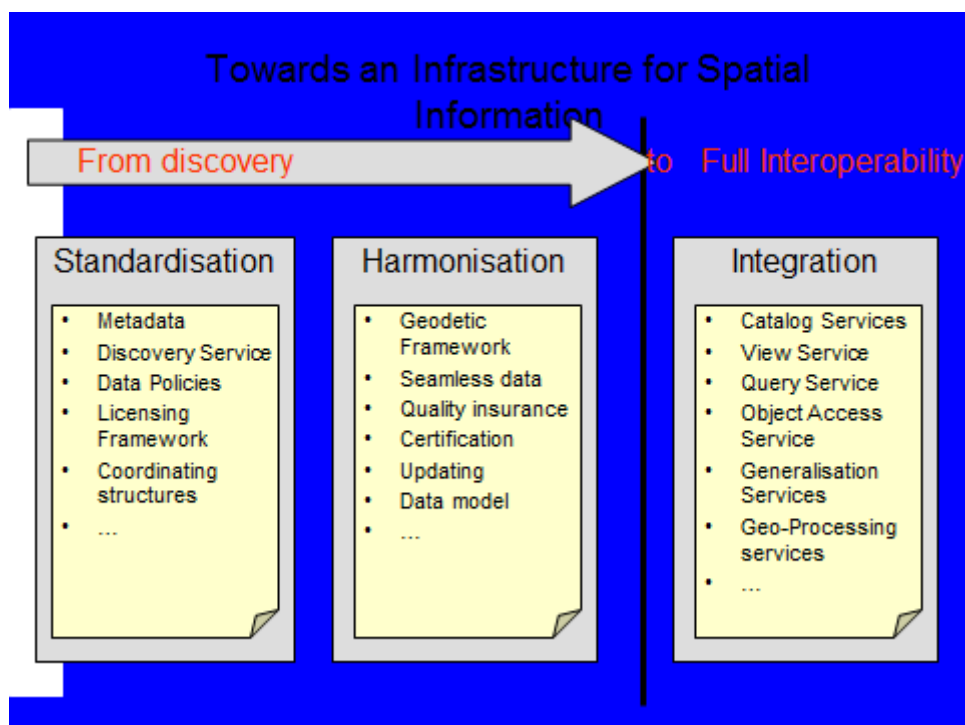


Figure: \_\_\_

INSPIRE offers these kinds of services: Network services are necessary for sharing spatial data between the various levels of public administration. Those network services should make it possible to discover, transform, view and download spatial data and to invoke spatial data and e-commerce services. The services of the network should work in accordance with commonly agreed specifications and minimum performance criteria in order to ensure the interoperability of the infrastructures. The network of services should also include the technical possibility to enable public authorities to make their spatial data sets and services available. The following network services have been defined within INSPIRE

- (a) Discovery services making it possible to search for spatial data sets and services on the basis of the content of the corresponding metadata and to display the content of the metadata;
- (b) View services making it possible, as a minimum, to display, navigate, zoom in/out, pan, or overlay viewable spatial data sets and to display legend information and any relevant content of metadata;
- (c) Download services, enabling copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly;
- (d) Transformation services, enabling spatial data sets to be transformed with a view to achieving interoperability;
- (e) services allowing spatial data services to be invoked.

In EU the realization of INSPIRE is changing situation in access to environmental data and as well as improved approaches and efforts of all EU mapping services in data organization, up-dating and preparation new products for wide publicity.

Today the importance of INSPIRE analyses, new knowledge and new approaches is visible in U.N. GGIM initiative which uses many of approaches created by INSPIRE.

#### ***14.3.5 GEO and GEOSS***

At the World Summit on Earth Observation in Washington in July 2003, the Group on Earth Observations (GEO) was established, with the goal of addressing the information requirement for the environment on a global scale. This work was completed in Brussels in February 2005 by the adoption of a 10 year implementation plan of an integrated Global Earth Observation System of Systems (GEOSS). One of them is Disasters. A number of operational systems for supporting disaster response have made steady to strong progress. Collaborative ‘‘Supersites’’ have been established so that the scientific community can monitor and analyze volcanoes and earthquakes more rapidly and effectively; for example, Supersites have improved assessments of earthquakes in Haiti, China, Chile, Indonesia. SERVIR provides mapping for disaster response and has assisted countries in Central America and the Caribbean to respond to hurricanes, earthquakes and other extreme events ([www.earthobservations.org/geoss](http://www.earthobservations.org/geoss))

### ***14.3.6 Digital Belt and Road Program (DBAR) and Digital Silk Road Alliance (“DSRA”)***

Both relatively new activities have been initiated by Silk Belt and Road Initiative (BAR). Digital Belt and Road Program (DBAR) is a pioneering international venture to share expertise, knowledge, technologies and data to demonstrate the significance of Earth Observation Science and Technology and Big Earth Data applications for large-scale sustainable development projects. The extensive geographical scope of the “BAR” initiative calls for smart uses and applications of Big Earth Data in the design, development and implementation of diverse projects related to infrastructure improvement, environmental protection, disaster risk reduction, water resource management, urban development, food security, coastal zone management, and the conservation and management of natural and cultural heritage sites. DBAR is committed to implement projects and actions relevant to the 17 Sustainable Development Goals (SDGs) adopted by the United Nations in September 2015 (citace z naší lit. [www.un.org/.../sustainable-development-goals](http://www.un.org/.../sustainable-development-goals)). It will also strive to integrate green, low-carbon and sustainable approaches to social and economic growth that are vital for the implementation of the Paris Agreement (2015).

The ‘BAR’ initiative promises huge Chinese financial investment in some 60 countries. The main aim is socio-economic development through improving the routes for land and sea trade. The initiative will also boost science and technology across the region, for example through research into artificial intelligence, nanotechnology, quantum computing and smart cities (see [go.nature.com/2mvfec6](http://go.nature.com/2mvfec6)).

Natural hazards are another important item. Belt and Road nations experience about 85% of the world’s major earthquakes, tsunamis, typhoons, floods, droughts and heatwaves. For example, more than 86,000 people were killed or reported as missing in a massive earthquake in Wenchuan, China, in May 2008. And the 2004 Indian Ocean earthquake and tsunami killed hundreds of thousands of people. Seven of the top ten countries that saw major losses from disasters between 1995 and 2014 are in this region (Guo 2018, p.26). The program will monitor different types of ecosystem and their evolution, including grasslands, forests, glaciers, urban areas, farmland and coastal regions. Environmental and socio-economic information will be shared through a platform for big Earth data, scheduled for roll-out between 2016 and 2026. This open-access gateway will allow researchers, policymakers and the public to track changes, development and trends. The programme will investigate indices and indicators to feed into the UN’s 2030 Sustainable Development Goals (GUO 2018, p.27)



