Chapter 3: Assets at Risk and Potential Impacts

Subchapter 3.1: Methodologies for Disaster Impact Assessment

Section 3.1.8: Databases and information sources on disaster impacts

Version: 1.1

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ABSTRACT

Databases are of fundamental importance for risk management. There are many types of disaster impact, exposures or loss data (EUROSTAT, ERDMS, EM-DAT, COPERNICUS, national databases, etc.). The important point is – are they reliable, geo-referred, and harmonized with other thematic datasets and integrated with other impact data sources, as Assets, Critical infrastructure, Natural resources, etc. A general problem of national and EU statistics is the use of summarized non geo-referred information. The result is – a generalized and unfocused evaluation of disaster impact, but without adequate assessment of local impact, inefficient emergency response and lack of prevention assessment on efficient future measures. A second problem is the lack of various data harmonization. Different thematic databases are not coordinated, as result - missing information, contradictions and discrepancies. A third problem is the interpretation of data or the taxonomic identification. New methodologies and standards are available and must be implemented – the case of INTOSAI, ISO 31000, ISO 19144-1, 2, etc. There is a need of new standardization of basic datasets as – land cover/land use. Another need is the regular monitoring of changes and results, applying combined remote/ in-situ data, based on unambiguous characteristics of Earth natural and artificial surface.

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1. GLOBAL DATABASES ON DISASTER IMPACTS

There are currently a number of (more or less) global information systems, which are directly accessible via the Internet serving to assisting decision-making in risk management, as:

- EM-DAT: the International Disaster Database - www.emdat.be;
- The National Map (US) - https://viewer.nationalmap.gov/advanced-viewer - possibility for adding information for disasters on US territories;
- NOAA Natural Hazards Viewer- https://maps.ngdc.noaa.gov/viewers/hazards
- Asia-Pacific Natural Hazards and Vulnerabilities Atlas from Pacific Disaster Centre, Hawaii - https://disasteralert.pdc.org/disasteralert;
- Swiss Re: Worldwide Natural Hazard Atlas CatNet - http://www.swissre.com - complicated login procedure;
- Munich Re: NATuralHazards Assessment Network, NATHAN, - www.munichre.com/nathan - complicated login procedure;

Visual information repositories are also being developed for floods, fires, sand storms, volcanoes, tropical cyclones and others:

- MODIS Rapid Response system - https://earthdata.nasa.gov/earth-observation-data/near-real-time/rapid-response/modis-subsets;
- Worldview Snapshots - https://wvs.earthdata.nasa.gov;
- Global Imagery Browse Services (GIBS) - https://worldview.earthdata.nasa.gov
- The International Charter on Space and Major Disasters (ESA, CNES, CSA, ISRO, NOAA, CONAE)
- http://www.disasterscharter.org/;
- NASA Earth Observatory Natural Event - https://earthobservatory.nasa.gov/topic/natural-event;
- Global Earth Observation Systems of Systems (GEOSS) - http://earthobservations.org;
- NASA Disasters Program - https://disasters.nasa.gov/disasters-program-2018-highlights;
- European Flood Awareness System (EFAS) - https://www.efas.eu;
- European Forest Fires Information System (EFFIS) - http://effis.jrc.ec.europa.eu;
- GDACS - Global Disaster Alerting Coordination System - http://www.gdacs.org;
- RSOE EDIS - Emergency and Disaster Information Service - http://hisz.rsoe.hu/alertmap/index2.php;
- Global Risk Map - http://globalriskmap.terria.io.

2. STATE AND LOCAL INFORMATION SOURCES

The world's most valuable resource is no longer oil, but data.

According mass media, the world's most valuable resource is no longer oil, but data. An important information source are the databases and inventories, supported on state and local level, as they are much more important for national and local stakeholders and users. An extraction of national inventories on natural disaster risk management is listed below:

Table 1: List of EU-Member States national inventories (prepared in collaboration with DG JRC-E1- DRMKC)

N	CNTR_ID	Link
1	AT	http://www.hora.gv.at/
2	BE	http://geoapps.wallonie.be/inondations ; http://gdiviewer.agiv.be/
3	BG	http://gis.mrrb.government.bg/; http://www.nsi.bg/en/content/13266/crisis-events;- not working temporary; bsbd.org; bd-dunav.org; earbd.org; wabd.bg ;
4	CH	http://www.natural-hazards.ch/home/current-natural-hazards/floods.html
5	CZ	http://hydro.chmi.cz/cds
6	DE	https://www.cedim.de/english/riskexplorer.php
7	DK	http://miljoegis.mim.dk/cbkort?profile=miljoegis_oversvoemmelsesdirektiv
8	EE	https://xgis.maaamet.ee/maps/XGis
9	EL	http://floods.ypeka.gr/index.php
10	ES	http://sig.magrama.es/snczi/visor.html?herramienta=DPHZI
11	FI	http://paikkatieto.ymparisto.fi/tulvakartat/Html5Viewer_2_7/Index.html?configBase=http://paikkatieto.ymparisto.fi/Geocortex/Essentials/REST/sites/TulvakarttapalveluEN/viewers/HTML5270/virtualdirectory/Resources/Config/Default
12	FR	http://www.onrn.fr/site/rubriques/indicateurs/cartographie.html
13	HR	http://korp.voda.hr/
14	HU	http://www.vizugy.hu/index.php?module=content&programelemid=62
15	IE	http://www.floodmaps.ie/View/Default.aspx
16	IT	http://www.geoservices.isprambiente.it/arcgis/rest/services/RischioIdraulico/Superficie_aree_pericolosita_idraulica/MapServer - a bit slow;
17	LT	http://gis.gamta.lt/potvyniai/
18	LV	http://ozols.daba.gov.lv/pub/
19	NL	http://www.risicokaart.nl/en/
20	NO	https://gis3.nve.no/link/?link=flomsone
21	PL	http://mapy.isok.gov.pl/imap/
22	PT	https://www.apseguradores.pt/cirac_V2/
23	RO	http://gis2.rowater.ro:8989/flood/ - a bit slow;
24	SE	http://vattenwebb.smhi.se/
25	SI	http://gis.arso.gov.si/atlasokolja/profile.aspx?id=Atlas_Okolja_AXL@ARSO&culture=en-US
26	SK	http://mpomprsr.svp.sk/ - Locked! You don't have permission to access on this server.
27	UK	http://apps.environment-agency.gov.uk/wiyby/37837.aspx
28	UK_Scot	http://map.sepa.org.uk/floodmap/map.htm
29	UK_N_Irland	http://riversagency.maps.arcgis.com/apps/webappviewer/index.html?id=fd6c0a01b07840269a50a2f596b3daf6
30	UK_Wales	https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default

Many local municipalities and cities are developing thematic databases and support internet sites, related to risk management with different approach. Some examples are listed below:

- Navarre, Spain, GIS web platform - https://idena.navarra.es/navegar;
- Oreiras municipality, Portugal, GIS web platform - http://geoportal.cm-oeiras.pt;
- Thessaloniki, Greece, SDI - https://gis.thessaloniki.gr/sdi/?lang=EN
- Matera, Italy, WebGIS - http://www.europeandataportal.eu/mapapps/?lang=en&type=WMS&dataset=085d842a-44d9-4917-875c-9b0d3393d69d;

- Lithuanian municipalities - https://www.geoportal.lt/geoportal/web/savivaldybes/savivaldybiu-zemelapiai;

There are many inventories, developed under EU funded projects, which have started very promising and then (in most cases after the end of a European funding) lost vitality, due to lack of additional regular support and interest.

3. DATABASES NEEDS

Data are crucial for understanding status quo and tendencies, management and planning in all sectors of life, from global and macro-regional strategies to the local single risk prevention measure.

3.1 Data accuracy and harmonization

Accuracy and harmonization between different data sets are essential as very often there is not compliance between various databases – fig. 1

Fig. 1 No Compliance between cadaster map and satellite image – missing water body in the map

This was one of the main reasons for the development and approval of the Directive 2007/02/EC[1] , which is still not applied properly. Especially on disasters in the frame of INSPIRE Directive were developed some useful products as - Data Specification on Utility and Government Services https://inspire.ec.europa.eu/file/1518/download?token=sGDcVnQQ or

Data Specification on *Natural Risk Zones* – Technical Guidelines: https://inspire.ec.europa.eu/file/1541/download?token=MK-3mZr-. In any cases, accuracy and harmonization must be open and to be required to all kinds of data, not just in a particular area.

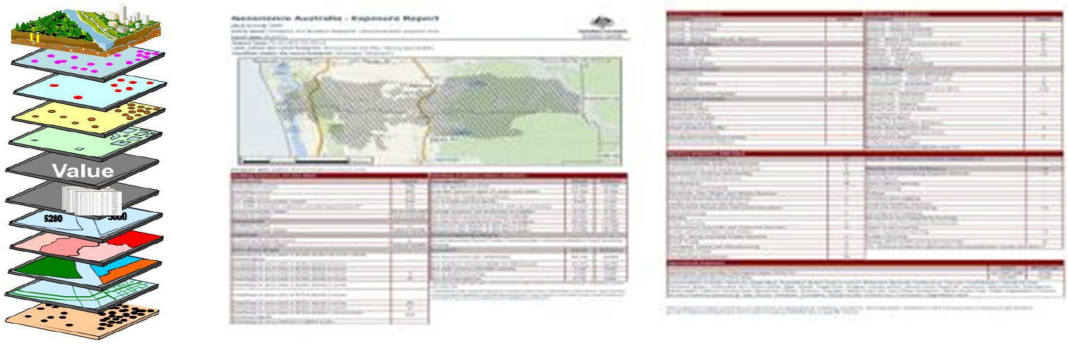
3.2 Data interpretation

Integrated Methods - Methods for solving tasks to retrieve regularities and potential impacts, as well as the methods of using them and additional data sources for defining decision-making rules, should be used jointly as a single complex. There are many examples of an integrated data collection

[1] The INSPIRE Directive (2007/2/EC of 14 March 2007) aims to create a European Union spatial data infrastructure for the purposes of EU environmental policies and policies or activities which may have an impact on the environment - http://inspire.ec.europa.eu/

and interpretation aiming to understand the interconnections between different data sources and their interrelated effect. Among many, a good example on data integration, combined with fast maps in the sector of disaster risk management is the Geoscience Australia activity -fig.2 (http://www.ga.gov.au; www.bnhcrc.com.au)

Fig.2 – The Geoscience Australia Exposure Report – Exposure data sets and Example of bushfire footprint



Complex Data Management - To understand how to use better data missives on risks prevention we need appropriate approach towards data interpretation and organizing in efficient to use data sets structures. Efficient data classification methods require simple approach and on other side they must provide the possibility of upgrading the data content and features. A good example is the Land Cover Classification System (LCCS) of UN-FAO (http://www.fao.org/3/a-i5232e.pdf) and the associated standard – ISO 9144-2 – Land Cover Meta Language (https://www.iso.org/standard/44342.html). Many different data sources must be assessed and integrated to get a reliable and successful result, which means that on one side the used algorithms must be developed on the level to work parallel with different data structures, and on other side it needs collaboration between different data providers on local, state and regional level. As a good example of such approach we may list the program-instrument complex CONFOR (an abbreviation from CONcept FORmation)[2], using data organized in growing pyramidal structures.

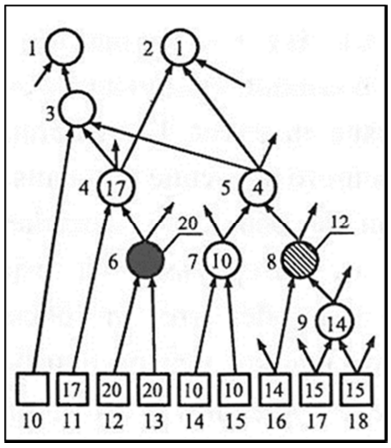
The main functions of CONFOR are:

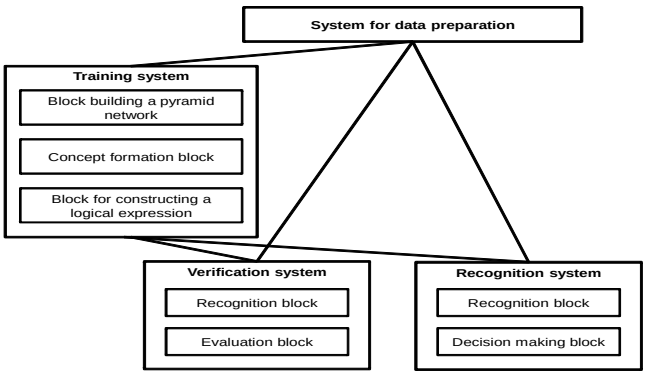
- discovering regularities that characterize class situations;
- use of regularities for classifying situations and choosing an appropriate preventive solution;

An extremely important component of such smart complexes is the system for data preparation, verification and recognition. The universal apparatus of growing pyramid networks can be applied for attribute risk analysis. An example of a possible CONFOR architecture is presented on fig.3

Fig. 3 – Building a pyramidal network and architecture of CONFOR

[2] В.Гладун. Партнерство с компютером. Киев, Порт-Роял, 2000





3.3 Data mining

Data mining – As a process of finding patterns in big databases through different methods and algorithms, data mining is an important part of the risk management policy. It is also a very quickly developing area of the Artificial Intellect programs globally. It is surprising the way such capacity is still neglected in the field of risk management, despite powerful devices as Google and Amazon. As example Amazon's Kindle are able constantly to collect data on their users as they are reading books. On your smartphone your Kindle can monitor which parts of a book you read quickly and which slowly. Such a tool can be upgraded with face recognition software and other sensors, thus providing all needed information for real-time challenge response.

The freely accessible European Media Monitor (EMM) system (http://emm.newsbrief.eu), developed by the Joint Research Center, is a fully automatic system that analyses both traditional and social media. Such a tool may be enlarged the possibility of collecting data on natural and anthropogenic risks and upgraded with applications for automatic analysis or even artificial intellect capacities. For the most efficient results such European systems must be supported with parallel state and local data mining systems, to avoid misunderstandings, misuse of data analysis (data dredging) and wrong interpretations. An example of local aggregation and analysis system, which monitors continuously, filters and extracts news about disasters which happen on the territory of a Member State (in this case-Bulgaria) which can easily collaborate with EU sites, as EMM, EDAS, EFFIS is shown on fig.4 - www.bsdi.asde-bg.org/riskwatch.php

Fig.4 – Possible collaboration between EU and state/local data interpretation systems, supporting artificial intellect

4. REGULAR MONITORING AND TRANS BORDER DATA COLLABORATION

Regular monitoring of changes is "sine qua non" for the efficient risk management.

Regular monitoring of changes (including data accuracy and harmonization) is "sine qua non" for the efficient risk management and reliable results. In the globalised world monitoring activity rarely is linked only to a local area, as we live in a time of free movement of people, capital and resources. As for nature and disasters, they do not respect administrative boundaries. This leads to the need of common understanding and interpretation of the incoming information. As land cover and land use evaluation is a major task in understanding status of the natural, agricultural and urbanized environment we need common approach and understanding on the basic classification elements. As example – if you look on the Corine Land Cover 2018 map legend (https://land.copernicus.eu/pan-european/corine-land-cover/clc2018), you will see the classification element - 124: Airports. This is wrong; airport is a land use feature, not land cover. A solution is to change the name of the map, as Corine Land Cover & Land Use system. Another database which is under discussion is NATURE 2000 - the data used for its establishment in some countries was far from accurate and the linear method for establishment of boundaries of habitats and protected areas is not applicable for the case. A good example of applying elementary or basic physical land cover feature, for data interoperability, synchronised with the globally accepted methodology was the proposed by JRC experts „tegon" – fig. 5 a (http://publications.jrc.ec.europa.eu/repository/handle/JRC92804). A bit similar solution was developed under a UN-FAO supported project, using the LCCS methodology. The so-called „urban-brick", as an elementary/basic land cover/land use classification element for urbanized areas was identified – fig 5 b.

Fig. 5-a – The JRC MARS „tegon"

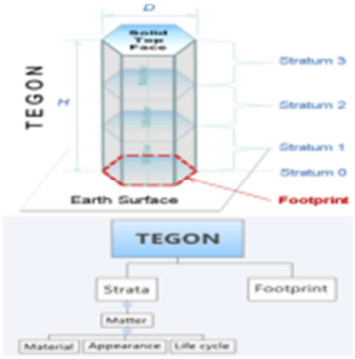
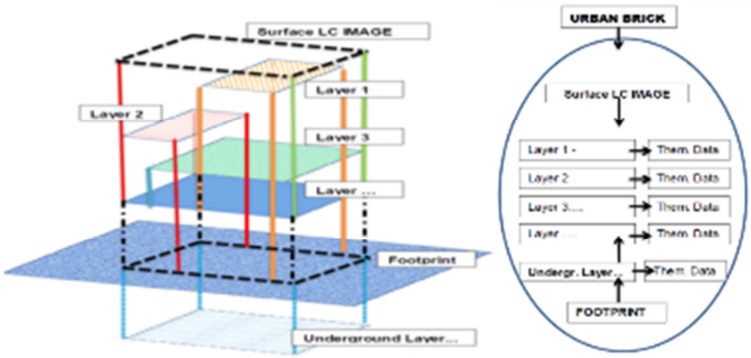


Fig.5-b the ASDE – „urban-brick"



Urgent actions in this filed are needed especially for the EU trans-border regions, for the need of major EU policies, as CAP, regional policy, transport, environment, home affairs, etc. A good examples of integration between regional and trans border information systems are The Danube Reference Data and Services Infrastructure (DRDSI) is a publicly available online platform and database - http://drdsi.jrc.ec.europa.eu and The common spatial database (SDB) of Bulgarian and Romanian territory (Project Code: MIS ETC Code 171) – http://cbc171.asde-bg.org.

5. CONCLUSIONS

- In accurate, integrated and regularly monitored Big Data we trust. But for good risk management, we need specific, wisely selected information rather, than a huge amount of data from here and there;
- There is a need of systematic approach to collecting risk data; this would greatly reduce the time spent on extra work on interpreting, analysing and pre-processing primary data. Under a systemic approach, we understand on one side the existence of clear definitions regarding the ways, the type, the quantity and the periodicity of data collection; and on other - clearly defined rights, roles and responsibilities of actors and institutions in this process;
- Big Data management and operating systems (Oracle, DB2, SAP Sybase ASE, Informix, BigArm) are very good tools and can do a great job, but they cannot correct the wrong input data or fill data incompleteness, as „garbage in - garbage out";
- There are frequent cases of "spatial incompleteness of data, i.e. data is collected only for the territory of a particular project or task concerned and does not cover the territory of the entire municipality, district or state. As a result, time and resources are lost for further processing, interpretation, interpolation, as often the task is - "Better inaccurate than any result". Such a platform often is leading to a wrong approach of risk management - treating the consequences, not the causes;
- We need simplified methods and regulations on data, as well as interpretation, based on efficiency, efficacy and economy;
- There is a need of a new approach and review to obsolete transnational information systems, databases and maps, as example NATURE 2000;
- All data, even statistics, must be geo-referred and all databases at least in a country must be integrated and harmonized;
- Basic classification elements with flexible and complex structure must be defined and applied for information interpretation and understanding challenges in nature, urban and agricultural environment.

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International Disaster Database - www.emdat.be

The National Map- https://viewer.nationalmap.gov/advanced-viewer - possibility for adding information for disasters on US territories;

NOAA Natural Hazards Viewer- https://maps.ngdc.noaa.gov/viewers/hazards;

Asia-Pacific Natural Hazards and Vulnerabilities Atlas from Pacific Disaster Centre, Hawaii - https://disasteralert.pdc.org/disasteralert;

Swiss Re: Worldwide Natural Hazard Atlas CatNet - http://www.swissre.com; - complicated login procedure;

Munich Re: NATuralHazards Assessment Network, NATHAN, - www.munichre.com/nathan. - complicated login procedure;

MODIS Rapid Response system - https://earthdata.nasa.gov/earth-observation-data/near-real-time/rapid-response/modis-subsets;

Worldview Snapshots - https://wvs.earthdata.nasa.gov;

Global Imagery Browse Services (GIBS) - https://worldview.earthdata.nasa.gov;

International Charter on Space and Major Disasters (ESA, CNES, CSA, ISRO, NOAA, CONAE) http://www.disasterscharter.org/;

NASA Earth Observatory Natural Event - https://earthobservatory.nasa.gov/topic/natural-event

Global Earth Observation Systems of Systems (GEOSS) -http://earthobservations.org/.

NASA Disasters Program - https://disasters.nasa.gov/disasters-program-2018-highlights

European Flood Awareness System (EFAS) - https://www.efas.eu

European Forest Fires Information System (EFFIS) - http://effis.jrc.ec.europa.eu

GDACS - Global Disaster Alerting Coordination System - http://www.gdacs.org

RSOE EDIS - Emergency and Disaster Information Service - http://hisz.rsoe.hu/alertmap/index2.php

Global Risk Map - http://globalriskmap.terria.io

List of EU-Member States national inventories (prepared in collaboration with DG JRC-E1- DRMKC) – http://www.asde-bg.org/

https://inspire.ec.europa.eu/inspire-legislation/26;

https://inspire.ec.europa.eu/file/1518/download?token=sGDcVnQQ;

https://inspire.ec.europa.eu/file/1541/download?token=MK-3mZr-;

http://www.fao.org/3/a-i5232e.pdf;

https://www.iso.org/standard/44342.html**).**