Compendium of Good Practices on Integrated Risk Information Systems

This compendium of good practices was developed by the CADRI Partnership under the leadership of UNDRR Regional Office for Asia and the Pacific region in February and April 2020.

I. Definition

"Disaster" and "disaster risk" are connected but different – the former being the event and the latter being the probability of occurrence of that event, and hence the two call for different types of information.

Disaster risk information refers to comprehensive information on **all dimensions of disaster risk**, including hazards, exposure, vulnerability and capacity, related to persons, communities, organizations and countries and their assets. Disaster risk information includes all studies, information and mapping required to understand the disaster risk drivers and underlying risk factors (for instance land use, food insecurity maps, forest coverage, drainage network, etc.).

Disaster information refers to information on the **disaster event**, its effects, response operations and resources involved, and impacts in a society. Disaster information, commonly managed through historic (extreme) event catalogues and disaster loss databases, encompasses information on the hazard event's intensity, location and time of occurrence and the disaster's damages, losses and their impacts across human, material, economic and environmental dimensions (e.g. disruption of education services, livelihoods destruction, etc.). Information on disaster/emergency response is often captured in emergency response operational information systems linked with telecommunication systems, disaster/emergency response resource database and resource allocation.

An information system is understood as an organizational system designed to collect, store, and process data, for distributing information, knowledge, and for providing information products to support decision-making, coordination, lanalysis and visualization. It is composed of four components: people, structures (or roles), processes and technology (including software and hardware).

An integrated information system can be understood as combination of interconnected information systems from various sources, system mechanisms (interfaces and networks) and system operations (control and management) for data integration, visualization and modelling.

II. Relevance

Disaster risk reduction is about decisions, choices and development pathways, to prevent new risks, reduce existing ones and strengthen resilience. Key to making informed decision is developing an understanding of risk, including its root causes and drivers, which requires both disaster information and disaster risk information to understand the past and projected future risks.

Access to information from a variety of sources can facilitate the transformation of raw data regarding the risks at hand into actionable insights and wisdom to inform the mitigation, prevention, and recovery efforts. Information on risk and disaster risks is relevant for different purposes and applications:

- ***Risk prevention:*** hazard information is essential to decide on construction locations and to design resilient critical infrastructure and development of nature-based solutions. *Mitigation*: Retrofitting weak building structures, developing disaster resilient building codes and designing flood and storm surge protection measures.
- ***Preparedness:*** Disaster impact information reveals hotspots of vulnerability, combined with risk information and hazard monitoring make possible to develop impact-based forecasting and early warning, scenarios, plan evacuation routes and mechanisms, designate shelters, and run drills and simulation exercises.
- ***Response:*** Risk information, especially exposure and vulnerability of population and assets, can help provide initial and rapid estimates of human, physical damage and losses to support emergency relief and initial rehabilitation. Disaster information can shed a light on hotspots where response efforts should be concentrated
- ***Recovery:*** Risk information on hazard and vulnerabilities is essential to ensure the recovery process mitigates pre-existing risk and avoids creating new risk by following the 'building back better' principles. Disaster information on the level of disruption, damage and economic losses is essential to assess the impacts of disasters, identify recovery needs, plan and manage a more resilient recovery.
- ***Risk financing and financial protection:*** Reliable disaster and risk information can aid in the development of risk transfer mechanisms such as insurance, reinsurance, and capital market solutions (e.g. disaster bonds) and build the case for investments in disaster risk reduction.

Integrated risk information systems are meant to make selected information on ***prevailing hazards (hydro-meteorological, geological, biological, technological etc.)*** and ***vulnerability*** (people, infrastructure, livelihoods etc.), including census and socio-economic data, available to help planners understand disaster and climate risk vulnerabilities, as well as to produce impact-based warning information relevant to those exposed. Understanding the interconnectedness and interdependences of systems is essential to minimize cascading disaster impacts.

Integrated disaster and disaster risk information systems can enable the applications listed above if access to relevant information products and data is given to multiple users: public and private sector, communities, households.

An integrated information system can also solve many of the common complaints caused by fragmented systems such as limited sharing of data, lack of standardization, lack of cross-analysis and limited coordination and cooperation between agencies and sectors.

Integration of information systems **does not necessarily imply a super-system should be developed to encompass all pre-existing systems** but rather points at the need to ensure system-to-system communication and interoperability for seamless and timely communication, secured data access, exchange, interpretation and reuse.

III. Key principles emerging from the review of good practices

Digital development principles provide insightful guidance derived on applying technologies to development programs. These nine living guidelines designed to help integrate best practices into technology-enabled development programs encompass: 1) design with the user; 2) understand the existing ecosystem; 3) design for scale; 4) build for sustainability; 5) be data driven; 6) Use Open Standards, Open Data, Open Source, and Open Innovation; 7) Reuse and Improve; 8) Address Privacy and Security; 9) Be collaborative.

User-centric: The first step prior to defining the parameters of a risk information system is to understand user needs. A risk information system should be designed to meet the needs and

requirements of the users to support operational and strategic decision-making. This includes developing clear and intuitive visualization options with simple icons and user-friendly interfaces.

Disaggregation. The collection of geographic, income group, sex, age and disability disaggregated risk and disaster impact data is essential to design inclusive disaster risk management policies and programs that address the inequalities and disproportionate impact of disasters on the most vulnerable.

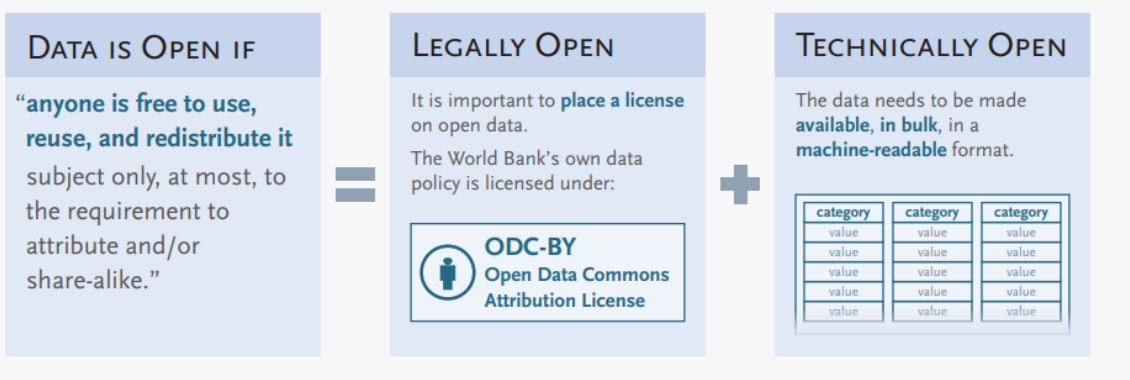
Data Standards. Data standards for risk and disaster information are essential for systems interoperability. Existing data are usually heterogeneous, sometimes not comparable, and in many cases not digitized or available/accessible to partners and third parties. API (Application programming interfaces) first design approach should be considered. Building APIs which are consistent and reusable allows data to be consumed by different applications and maintained efficiently for all device, platforms and operating systems enabling information systems to connect to each other efficiently.

National Spatial Data Infrastructure - known as NSDI - offer an opportunity for the enforcement of metadata standards which is key to enable exchange and sharing of geographic information and services.

Data ecosystems for risk-informed development: Integrated information systems need to consider governance aspects (policies, regulations and processes such as information sharing protocols and access rights) which are essential for interoperability among information systems and to ensure end-users can access the information services and products they need to make decisions.

Connecting resources: Linking risk information systems with the larger data and information management systems of government line agencies (and non-government institutions such as academia when relevant) is essential. To enable a better understanding of the sectorial impact of disasters and sector-specific vulnerabilities, the capacities of line agencies need to be strengthened to collect and analyse risk and disaster information. Sector-specific information systems should incorporate relevant information on risk and disasters, while risk and disaster information systems require up to date baseline information on the sector assets and systems exposed, vulnerabilities, replacement costs, etc.

Open data and open standards: Open data principles refer to technically and legally open data, accessible, interoperable and reusable data. Adherence to this can promote civil society use of public data, as well as to facilitate the interoperability of government information systems.



Source: GFDRR. World Bank. 2014. Open Data for Resilience Field Guide. Washington, DC: World Bank.

Institutionalization and sustainability: Availability of risk information is necessary but not sufficient to build an integrated risk information system. Moving from a platform to share information to a system that is sustainable would require extensive regulations and governance related standard operation procedures (SOP) and workflows. Policy incentives are needed to institutionalize data

collection and motivate planners at all levels to apply the information and consider impact of development initiatives on risk generation or mitigation.

Advanced data querying and analytics such as machine learning techniques are recommended to process the vast amount of available data and highlight what is significant. Crowdsourcing is an important development, where digital volunteers offer their time and expertise to complete micro-tasks such as micro-mapping in order to analyse big data.[1]

> *"There are many portals stakeholders could access to gain the information they need to respond to a disaster event; however, understanding which portals are most relevant, which subsets of relevant information might be contained in each, and particulars of the user interface with each multiply the complexity of getting any **usable** information at all"*
>
> ***Stakeholder consultation: Disaster SDI OGC***

IV. Examples of good practices & resources

Good Practices

The examples reviewed below have not been systematically assessed against agreed expert criteria. They rather represent interesting examples on how some organizations have addressed some of the challenges related to managing disaster and disaster risk information in a more systematic manner. None of them could be identified as the best practice that should be replicated and followed by NDMO Iran. The intention is of this quick review is to provide some examples with promising features that could be further explore by the Islamic Republic of Iran's government entities and partners to identify which concrete experiences could inspire and guide the development of national contextualized solutions.

Integrated Disaster Risk Information Systems

1) National Disaster Management Information System (NDIMS), Afghanistan

Developed by the Afghanistan State Ministry for Disaster Management and Humanitarian Affairs/ Afghanistan National Disaster Management authority (ANDMA) with support by the International organization on Migration (IOM), NDIMS is a web-platform that serves as the national disaster information management system of Afghanistan. The system is geared towards strengthening preparedness and enabling emergency response. It contains ten different modules: assessment (initial and rapid); beneficiary distribution, warehouse/stock module; early warning; digital content management; mitigation, 3Ws (Who, Where, What); and reports. The system has been rolled out with the national emergency operations (EOC) center and the provincial EOCs, which has allowed the ANDMA to improve its collection of quantitative and qualitative information on disasters events to analyze impacts, identify hotspots of vulnerability and develop contingency plans.

Highlights

[1] UNDRR Global Platform 2019, Issue briefs for working session on multi-hazard early warning systems. Contribution by Marc van den Homberg on "Big data for more effective functioning of EWS".

- ✔ The reporting module allows the end user to view and generate different types of reports with different visualization and graph options. These reports can be used for planning, decision making, implementing disaster risk reduction activities and other disaster management activities.
- ✔ The mitigation module works as a decision support tool to identify which structural mitigation measures are required for the different risks identified through site assessments.

2) Building Information Platform Against Disaster (BIPAD) System, Nepal

Building Information Platform Against Disaster (BIPAD) is Nepal's national disaster management information system, developed by the Ministry of Home Affairs of Nepal. BIPAD was developed by pooling all credible digital and spatial data that are available within different government bodies, non-governmental organizations, academic institutions and research organizations on a single platform.

The system employs a bottom-up approach to data collection, involving the provincial and municipal governments to engage in verifying and collecting data. BIPAD serves the Emergency Operation Centers at the national, provincial and municipal tiers of the government, in addition to the Nepal Police, who are often the first responders to disasters. BIPAD can inform users about the details of an incident, for both natural and non-natural hazards, to enable response and for historical analysis of loss and damage. While the system has been upgraded to incorporate additional disaster impact variables, relevant indicators, sex, age and disability disaggregation still need to be incorporated for alignment with Sendai Framework reporting requirements.

Highlights

- ✔ The alert feature allows early actions to mitigate disasters. Moreover, BIPAD aims to provide users with crucial information on the capacity and resources of different partners in relation to the incidents, such as on health institutions, financial institutions, schools, banks, stockpiles, road network, inventories, NGOs, government agencies, etc. to minimize impact and enable response.

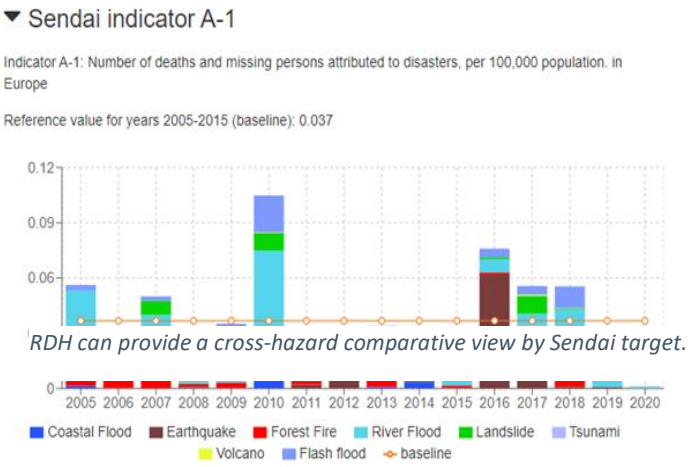
3) Joint Research Center's Risk Data Hub (RDH), European Union

This GIS web platform is managed by the European Commission's Disaster Risk Management Knowledge Centre - DG Joint Research Center - Directorate for Space, Security and Migration. The Risk Data Hub is designed as a point of reference for curated EU-wide risk and disaster data, either through hosting relevant datasets or through linking to national datasets.

Developed as a decision support system that integrates spatial data along with statistical analysis, it helps decision makers have an indication for time and spatial coverage of economic damages and human losses across Europe from hazardous events, upon which consistent decisions can be made.

Highlights

- ✔ It *comprises three main analytical tools on risk analysis*: damage and losses; facts and figures with EU-region aggregates of values for the indicators of the seven Sendai Global targets; and cross-hazard comparative view of both past and future hazards.
- ✔ One feature under development is the visualization of the potential losses due to climate change under three scenarios (temperature increases of 1.5°C, 2°C or 3°C). This feature will allow end-users to better understand climate change as a risk driver. While currently the risk analysis module contains mostly exposure and hazard information, RDH is expected to develop a vulnerability frame which will include social, political, economic, physical and environmental dimensions, which will be combined with the empirical vulnerability extracted from the past losses and damages suffered in the area.



RDH can provide a cross-hazard comparative view by Sendai target.

4) Myanmar Unified Platform for Disaster Risk Application (MUDRA), Myanmar

The Myanmar Unified Platform for Disaster Risk Application (MUDRA) is an online interactive portal that provides disaster risk information for strategic planning. The development of MUDRA was led by the Department of Disaster Management (DDM) of the Ministry of Social Welfare, Relief and Resettlement, along with the Department of Meteorology and Hydrology (DMH), in close collaboration with various sector departments, and was supported by the Asian Development Bank (ADB) and Canada.

The current portal includes risk information for priority hazards, riverine floods, coastal floods (storm surges) and cyclone winds. Several types of exposure data are included, such as population density, building locations, agriculture and critical infrastructure. The portal is intended to act as a common platform across agencies in Myanmar for developing, collaborating and sharing disaster risk information to promote risk-informed development.

5) InaRISK, Indonesia

InaRISK is a risk analysis information system managed by the Badan Nasional Penanggulangan Bencana (BNPB), the National Disaster Management Agency. InaRisk covers each of the core risk elements: hazard exposure, vulnerability and capacity. The methodology employs data analyses across space, utilizing a gridded assimilation approach to predict probabilities of impacts from disasters, including: potential losses of life, financial losses, physical damage, and exposed natural resources. The assessments are currently conducted for nine different types of hazards, with varying characteristics in terms of frequency and possibility of advanced warning.

The National Development Planning Agency (Bappenas) has used projections from InaRISK for formulating the national Medium-Term National Development Plan (RPJMN) 2020-2024 and the long-term disaster management plans (RIPB) 2015-2045.

Highlights

- ✔ InaRISK has been instrumental in the establishment of a disaster risk index covering 497 districts and allowing for the identification of high-risk district/municipalities for priority support. Calculated since 2015, this index also reflects existing DRM capacities at different levels. InaRISK helps both central and local governments, and other interested parties, design strategic programs, policies, and activities to reduce disaster risk at national and subnational levels[2].
- ✔ Associated with InaRisk, BNPB has developed the app *InaRisk Personal* for smartphones, which allows individuals to understand how risky their current location is and enable users to receive warning messages for any forecasted hazard event.
- ✔ InaSAFE is free software that was developed jointly by Indonesia, Australia and the World Bank (GFDRR). It started as a tool for disaster managers who wanted to understand the potential impacts of disasters. InaSAFE analysis functionalities allow the overlaying of hazard layers (such as ground shaking, water depth or ash load) and exposure layers (such as population density or building footprints) to develop an impact function and a report. The software also allows for calculating derivative indicators. Initially developed for Indonesia, InaSAFE has been adopted for use in many other countries.

6) Platforms for Real-time Information Systems (PRISM), World Food Programme (WFP)

A risk analytics platform and monitoring system, PRISM was developed by the World Food Programme (WFP) to serve as a real-time risk and disaster information system that enables access to the latest available climate hazard information alongside vulnerability data through a map-based dashboard. PRISM combines information from satellites and other remote sensing sources with WFP's data on vulnerability to create actionable climate information for decision makers, allowing them to prioritize assistance to those most in need.

The primary outputs of PRISM are interactive maps and charts, along with tables and reports. The system can generate standard climate risk monitoring indicators as well as risk and impact analytical products, which are adapted for each hazard and the populations at risk.

Highlights

- ✔ The indicators on hazards – including so far droughts, floods and cyclones depending on countries – can be monitored over time through intuitive and interactive maps. Charts and related tables help to quantify the extent of a hazard by administrative area (such as provinces and districts). In addition, the system can automatically produce risk and impact indicators based on the known vulnerabilities and exposure to hazards at any point in time. All of this information can be exported from the system for further analysis and reporting.
- ✔ PRISM integrates with mobile data collection platforms – including open source solutions such as ODK and the Kobo Toolbox. This allows users to visualize data collected from impacted areas in real-time, alongside the hazard information automatically generated by the platform.

7) Rapid Analysis and Spatialization of Risk (RASOR.EU)

Supported by the EU and World Bank's GFDRR, the Rapid Analysis and Spatialization of Risk (RASOR) is an open platform, with open source data and models useful to enable communities to perform multi-hazard risk analysis for the full cycle of disaster management, including targeted support to critical infrastructure monitoring. A scenario-driven query system simulates future scenarios based on existing

[2] ADB 2018, Conference report: Risk informed development using risk information for resilience.

or assumed conditions and compares them with historical scenarios. Initially developed for Europe, RASOR will ultimately offer global services to support in-depth risk assessments and full-cycle risk management.

RASOR is structured along two tracks: a global risk assessment service and SME-led national and local services through innovative partnering arrangements. These tracks have been validated in five geographic locations with end users and practitioners, as well as with international organizations.

Highlights

- ✔ The RASOR mobile includes the RASOR web platform and the QGIS plug-in. The app was designed to allow the user to create and/or characterize exposure layers during field surveys.

8) National risk management information system or Sistema de Información para la Gestión del Riesgo de Desastres (SIGRID),Peru

Developed and maintained by the Peruvian national center on risk estimation, prevention and reduction (CENEPRED), SIGRID is a web geospatial platform to query, visualize, share, analyze and monitor information related to hazards, vulnerabilities and risks. As defined by extensive legislative and regulatory development, SIGRID is a center-piece on the national system for disaster risk management of Peru (SINAGERD).

Highlights

- ✔ Interactive scenario building and spatial analysis tools.
- ✔ SIGRID Collect is a mobile application to collect georeferenced information on hazard zones, disaster events, public investment projects and household socioeconomic data.

9) myDEWETRA

Developed by CIMA Foundation and currently in use in 13 countries, including Italian Department of Civil Protection, myDEWETRA is a real-time system for hydro-meteorological forecasting and monitoring. A web based platform that systematically organizes data and information produced by multiple institutions and agencies, from local to national and international levels.

MyDEWETRA is the link between data producers and civil protection operators while assisting users to prepare real time risk scenarios based on the available data.

Highlights

- ✓ MyDEWETRA data infrastructure is built to minimize the data transmission time and to share data in real-time to different users in order to reduce the reaction time and have all the information available in one unique system-platform.

Disaster information systems

10) DesInventar Sendai

DesInventar is a computer-based information management system that helps with the systematic collection, documentation and analysis of data about damage and losses caused by disasters associated to natural hazards. UNDRR currently hosts the global server for Desinventar.net.

The DesInventar system supports historical data collection over long periods by using a standardized disaster data registration template. The software also provides data analysis support through the integrated DesInventar software package (database query, statistics, reporting and mapping capabilities).

Highlights

The DesInventar system includes a software product with two main components:

- ✔ *The Administration and Data Entry* module is a relational and structural database where data be entered in predefined fields (space and temporal data, types of events and causes, sources) and by both direct and indirect effects (deaths, houses, infrastructure, economic sectors).
- ✔ *The Analysis module* allows access to the database by queries that may include relations among the diverse variables of effects, types of events, causes, sites, dates, etc. This module allows those queries to be represented with tables, graphics and thematic maps.

The DesInventar methodology proposes the use of historical data about the impact of disasters, which are collected in a systematic and homogeneous manner, to identify hazards and vulnerabilities and thus risks in specific regions. Data must be collected by following a set of standards and is time-stamped and geo-referenced and disaggregated to a relatively small geographic unit, usually a low-level administrative unit.

In order to support countries in complying with their reporting commitments under the Sendai Framework, a new version of DesInventar Sendai was launched by UNDRR (UNISDR at the time). This new version allows users to export data to the Sendai Framework monitoring system and allows for finer data disaggregation, customization along with simpler definitions and the use of metadata.

- Locally customized versions of DesInventar
  - DIBI (Indonesia) Data Informasi Bencana Indonesia
- Locally hosted DesInventar databases (Camdi, Sri Lanka)
  - Disaster information management system - Sri Lanka
  - Camdi National Committee for disaster management - Cambodia

11) Philippine Disaster Resilience Foundation (PDRF), the Philippines

The private-sector led Philippine Disaster Resilience Foundation inaugurated an emergency operation center (EOC) in 2018 to address business sector needs in times of disaster. To support the EOC, PDRF implemented a disaster information management system based on a customized version of ESRI's ArcGIS online platform for Hazard and Disaster Analysis for Business Resilience (HANDA). The platform also allows companies to plan relief and rehabilitation efforts that complement business continuity plans and programs.

Highlights

- ✓ The key features of this information system are: Incident Reporting; Incident Monitoring; Incident Management; and Hazard Monitoring. The source hazard data comes from various government agencies. The information system allows PDRF members to plot their facilities' assets and to properly assess the threats presented by different hazards around the country.

Resources

Principles for digital development

A set of living guidance intended to help practitioners succeed in applying digital technologies to development programs. The Digital Principles were created in a community-driven effort, the result of many lessons learned through the use of information and communication technologies (ICTs) in development projects.

They include guidance for every phase of the project life cycle, and they are part of an ongoing effort among development practitioners to share knowledge and support continuous learning.

The website **https://digitalprinciples.org/** is an entry point to the community, where more than 800 development practitioners are sharing ideas and questions about digital development. The website also offers resources that are available to help incorporating each Principle into specific work, including case studies, toolkits, and how-to guidance.

World Bank – GFDRR Online utilities

1) GFDRR ThinkHazard!

ThinkHazard! provides a general view of the hazards, for a given location, that should be considered in project design and implementation to promote disaster and climate resilience. The tool highlights the likelihood of different natural hazards affecting project areas (very low, low, medium and high), provides guidance on how to reduce the impact of these hazards, and where to find more information. The hazard levels provided are based on published hazard data, provided by a range of private, academic and public organizations.

2) OpenDRI

Open Data for Resilience Initiative (OpenDRI) applies the concepts of the global open data movement to the challenges of reducing vulnerability to natural hazards and the impacts of climate change. OpenDRI supports World Bank Regional Disaster Risk Management Teams to build capacity of client countries and long-term ownership through open data projects that are tailored to meet specific needs and goals of stakeholders. OpenDRI engages with client governments in three main areas: sharing; collecting and using data.

Highlights

- ✔ As part of this initiative a toolkit has been developed for implementing Open Data Readiness, which includes a readiness assessment. Key categories in the assessment include: leadership; policy and legal framework; institutional, government data availability and findability; data demand/reuse; ecosystem; financing; and infrastructure.
- ✔ The Open Data for Resilience Index is a joint initiative led by the Open Data for Resilience Initiative (OpenDRI), in partnership with the CIMA Foundation, Global Earthquake Model and Deltares. The Index is presented as a free online tool to identify, assess and compare – for any location – the availability of key datasets for disaster risk management. The Index aims to advance the state of open data for disaster and climate risk management around the world by providing a better picture of what is available as open data and identifying essential data that is not yet available.

3) GFDRR Understanding Risk: Review of Open Source and Open Access Software Packages Available to Quantify Risk from Natural Hazards

This document presents an objective analysis of freely available hazard and risk modelling software in order to facilitate selection of appropriate tools for various DRM activities. There have been previous evaluations of freely available modelling tools across various natural hazards, but this is the first multi-hazard systematic review using a set of consistent criteria. The analysis covers hazard risk models for cyclone (wind), storm surge and tsunami, earthquake, and flood. Over 80 open access software packages - excluding commercial software packages - were considered in the evaluation.

This review provides initial guidance to users on the appropriateness of the various modelling tools for specific purposes and offers an introduction to the connectivity that is possible between models. The findings of the review suggest a potential for valuable synergy between existing software packages to generate a multi-risk model with multiple views of a hazard.

4) GeoNode

GeoNode is a web-based, open source software developed by GFDRR and partners which enables users to access, share, and visualize geospatial data. As a geographic content management system (CMS), the platform was built on the principles of open source data and is mainly aimed at collaborative sharing and editing of geographic layers and maps. It provides an easy-to-use interface for the users to share data and create interactive maps. The GeoNode software allows one or more organizations to upload geospatial data sets that comply with open standards to a central location. GeoNodes can also be federated, so that each organization can retain stewardship of their own data sets and open specific data to others from outside the organization via web services.

It is also designed to be a flexible platform that software developers can extend, modify or integrate against to meet requirements in their own applications. Once the data are uploaded, GeoNode allows the user search for it geographically or via keywords. All the layers are automatically projected to Web Mercator for maps display, making it possible to use different popular base layers, like Open Street Map, Google Map or Bing Map layers.

GeoNode comes with helpful cartographic tools for styling and composing maps graphically. Once data layers are uploaded and saved, it is possible to overlay them for visualization or make a PDF copy for printing. Cartographic tools make it easy for anyone to assemble a web-based map with functionality traditionally found in desktop GIS applications. The GeoNode web application can be used to:

- Upload, manage, and share geospatial data.
- Create and share interactive maps.
- Collaborate and interact with other users.

Highlights

- ✓ Users can also manipulate the data directly in their browser, via GeoNode's user interface, and can even save their changes permanently on the server when they have authorization to do so.
- ✓ GeoNode can acts as a platform on which users can develop their own tools and analysis

Systems based on GeoNode:

- Pacific risk information system
- Afghanistan GeoNode
- Sri Lanka
- Charim GeoNode
- GeoSinager
- Malawi Spatial Data Platform (MASDAP)

Related references

- *Harnessing Geospatial Data through* GeoNode: this publication review experiences and successes in deploying GeoNode to support disaster preparedness and emergency relief, as well as a diverse range of applications including city planning, agriculture management, Ebola response, etc.

  http://documents.worldbank.org/curated/en/545781493014624318/Harnessing-geospatial-data-through-geonode

- *Open Data for Resilience Initiative Field Guide:* This field guide provides planners and program officers with a map of how to implement the collective effort of OpenDRI initiative. It is aimed at a person who needs to write a strategic vision, craft a budget, hire personnel, and evaluate

the impact of open data. The guide explores the theory and practice around the collation of existing data, collection of new data, and the catalysis of an ecosystem of contributors around open data.

https://www.gfdrr.org/sites/gfdrr/files/publication/opendri_fg_web_20140629b_0.pdf

5) Caribbean Handbook for risk information management (CHARIM)

This handbook is presented in a web-platform and was developed by a consortium led by the Faculty of Geo-Information Science and Earth Observation (ITC) of the University of Twente as part of the World Bank Caribbean Risk Information Program, which was funded by the ACP-EU Natural Disaster Risk Reduction Program. The handbook provides an overview of existing methods, both quantitative and qualitative, that can be applied for the assessment of landslide and flood hazards and risk, and of how risk maps can be used in disaster risk management.

Highlights

- ✔ The *Use Case Book* is a central component of the Caribbean Handbook for Risk Information Management (CHARIM). It contains several examples of applications of hazard and risk information for different tasks performed by land use planners, engineers and geo-information specialists within the Caribbean countries. The use cases illustrate the methodological process needed to conduct a range of activities that are common in the region, rather than detailed efforts to produce specific recommendations for action in specific applications. Each example indicates the basic required information depending on the scale of the work and the objectives of the use case

6) OpenStreetMaps

The OpenStreetMap community provides a free and open map of the world. With over 1.5 million registered users, it mobilizes members to collect data at the local level with handheld GPS units and paper maps. It also mobilizes its members to trace overhead imagery.

OpenStreetMap is a confederation of organizations and technologies. OpenSteetMap.org contains a database with over 2.2 billion map "nodes" hosted by Imperial College, London. The Humanitarian OpenStreetMap Team (HOT) is a US non-profit corporation that applies the "principles of open source and open data sharing for humanitarian response and economic development." HOT provides support to emergency operations and training around the collection of mapping data in communities at risk.

7) Open Geospatial Consortium

The Open Geospatial Consortium (OGC) is an international consortium of more than 500 companies, government agencies, research organizations, and universities participating in a consensus process to develop publicly available geospatial standards. OGC standards support interoperable solutions that "geo-enable" the web, wireless and location-based services, and mainstream IT. OGC standards empower technology developers to make geospatial information and services accessible and useful with any application that needs to be geospatially enabled.

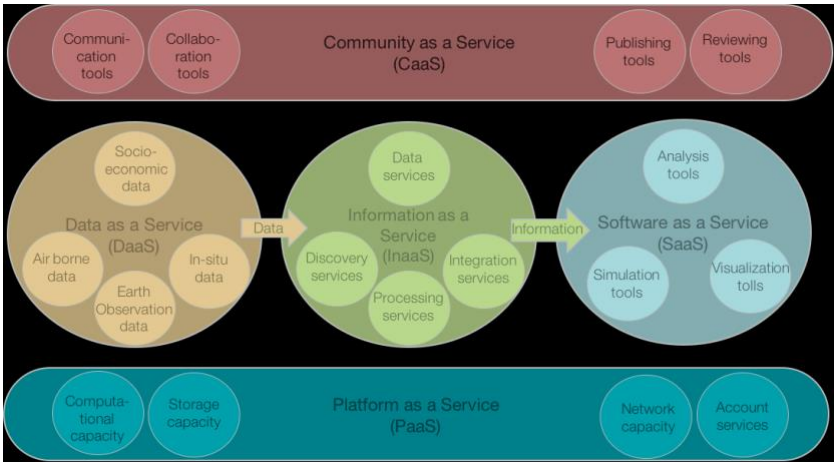
8) OGC Development of Disaster Spatial Data Infrastructures for Disaster Resilience

This document explores user requirements for the development of disaster spatial data infrastructures and proposes a high-level architecture for an integrated disaster information system. The main components proposed for an integrated information system are[3]:

i. ***Community as a Service (CaaS***): Collaborative tools for users to publish, share and discuss their results, information, data and software/code on the platform. Social networking makes online collaboration among communities of practice possible.
ii. ***Data as a Service (DaaS):*** On-demand data sharing through discovery, access, and transportation. Data sets can cover earth observation, air-borne and in-situ sensors, as well as other socio-economic data. The emergence of service-oriented architecture has rendered the actual platform on which the data resides less relevant.
iii. ***Information as a Service (InaaS):*** The ability to provide standardized and secure methods to create, manage, exchange, and extract meaningful information from all available data in the right format at the right time.
iv. ***Software as a Service (SaaS):*** Delivery and management of applications and tools by the platform or its users that are used remotely on the platform. Provides users with the capability to deploy user-created or acquired applications
v. ***Infrastructure as a Service (IaaS):*** The provision of computing resources, complemented by storage and networking capabilities, as shared resources, scalable on-demand, and enabling cost efficiencies.

Two key approaches for the development of *Spatial Data Infrastructure (SDI)* are proposed:

- *Disasters SDI as a closely architected infrastructure* that provides data and apps as services. Thus, the defined architecture caters for a defined set of services (includes re-hosted services) that are operated and maintained by an SDI control board, i.e., a group with control over the individual components.
- *Disaster SDI as loose confederation approach*. The focus of this approach is on infrastructures, platforms, and geoportals as they currently exist and emphasizes their integration into a loose confederation. This approach concentrates on service interfaces and encodings. It allows an entirely decoupled and loosely federated infrastructure with minimized necessary a-priori knowledge required to interact with the various components.



Source: OGC, https://www.ogc.org/disastersresilience

- OGC Disaster interoperability concept development study

[3] OGC 2018, OGC Development of Disaster Spatial Data Infrastructures for Disaster Resilience

9) UN ESCAP Disaster-related Statistics Framework (DRSF)

The objective of this international statistical framework is to harmonize, as much as feasible, across national statistics systems towards comparable measurements of disaster risk, disaster impacts, and risk reduction interventions.

The DRSF has the potential to address the challenge of creating coherence across data sources and to incorporate statistics related to all types of disasters (regardless of scale), towards a nationally centralized and internationally-coherent basic range of disaster-related statistics.

10) United Nations Global Geospatial Information Management (UN GGIM)

IGIF – 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 is comprised of three separate but connected parts: Part 1 is an Overarching Strategic Framework; Part 2 is an Implementation Guide; and Part 3 is a Country-level Action Plan. The three parts comprise a comprehensive Integrated Geospatial Information Framework 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.

11) UN-GGIM Working Group on Geospatial Information and Services for Disasters

12) UN ECOSOC E/RES/2018/14, Strategic Framework on Geospatial Information and Services for Disasters

This framework proposes guiding principles and five priorities for action to achieve quality geospatial information and services that can be available and accessible in a timely and coordinated in a way to support decision-making and operations within and across all sectors and phases of disaster risk management.

The 5 priorities outlined refer to:

- Priority 1: governance and policies
- Priority 2: awareness-raising and capacity-building
- Priority 3: data management
- Priority 4: common infrastructure and services
- Priority 5: resource mobilization

13) MRSAC Maharashtra Remote Sensing Applications Centre (India)

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