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A COMPARATIVE REVIEW OF COUNTRY-LEVEL AND REGIONAL DISASTER LOSS AND DAMAGE DATABASES

United Nations Development Programme

BUREAU FOR CRISIS PREVENTION AND RECOVERY

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ACRONYMS AND ABBREVIATIONS

ADRC	Asian Disaster Reduction Center
APRC	UNDP's Asia-Pacific Regional Center
ASEAN	Association of Southeast Asian Nations
BCPR	Bureau for Crisis Prevention and Recovery
COs	Country offices
CRED	Centre for Research on the Epidemiology of Disasters
DIBI	Disaster Data and Information of Indonesia
DisDat	Disaster data collection initiative portal
DMC	Disaster Management Center of Sri Lanka
DRR	Disaster risk reduction
ECLAC	United Nations Economic Commission for Latin America and the Caribbean
ENSO	El Niño Southern Oscillation
EU-CIS	Europe – Commonwealth of Independent States
FAO	UN Food and Agriculture Organization
FCSS	OCHA Field Coordination and Support Section
FGDC	U.S. Federal Geographic Data Committee
GAR	Global Assessment Report
GLIDE	Global disaster identifier
GRIP	Global Risk Identification Programme
HFA	Hyogo Framework for Action
ICSU	International Council for Science
IFRC	International Federation of Red Cross and Red Crescent Societies
IRDR	Integrated Research on Disaster Risk initiative
ITC	Information technology and communication
MoES	Ministry of Emergency Situations
NA	Not available
NDO	National Disaster Observatory
NGO	Non-governmental organization
OCHA	UN Office for the Coordination of Humanitarian Affairs
PERI	Public Entity Risk Institute
PREDECAN	Prevención de Desastres en la Comunidad Andina

RDRAs	Regional Disaster Reduction Advisors
SNGR	Secretaría Nacional de Gestion de Riesgo of Ecuador
SWOT	Strengths, weaknesses, opportunities and threats
UNDP	United Nations Development Programme
UNDP RP	UNDP Regional Programme on Capacity Building for Sustainable Recovery and Risk Reduction
UNFCCC	UN Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Reduction
USAID/OFDA	Office of Foreign Disaster Assistance of the United States Agency for International Development
USD	US Dollars
WFP	World Food Programme
WHO	World Health Organization
WMO	World Meteorological Organization

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EXECUTIVE SUMMARY

This review focuses on disaster loss and damage database implementation at country and regional levels. It documents UNDP's role in the institutionalization of such systems and examines all known, publically-accessible regional and country-level databases' contents. The findings and lessons provide a basis for a set of conclusions and recommendations to enhance the quality, credibility and usability of these data with the aim of informing future UNDP and international support in this area.

Systems for tracking loss and damage associated with natural hazard events are in place in over 57 countries. Over time, the data provide a basis for monitoring loss and damage spatial patterns and temporal trends, calibrating investments in disaster risk management, and evaluating the efficacy of risk reduction measures. Loss and damage data also provide input for calculating risks of future losses.

Loss and damage data constitute the principal outcome indicator for disaster risk reduction (DRR) and the main international DRR policy framework, the Hyogo Framework for Action (HFA). They are also a key input for disaster risk and risk management research. The vast majority of disaster loss and damage globally is associated with hydro-meteorological hazards. Increasingly loss and damage has become a priority issue in the context of international climate change negotiations. Thus these data are both important for country-level DRR as well as being of growing importance in the international policy arena.

Many, although not all, regional and country level databases are currently implemented with international support including by UNDP, UNISDR, and CRED among others. Supporting the institutionalization of systems to track disaster losses and damage over time at country level has been a major area of work for UNDP over the past decade. To date UNDP has supported the development of 25 databases covering all regions (see Annex 1). UNDP support has ranged from limited, one-off contributions (i.e. UNDP provided financial support for the development of the databases of El Salvador, Egypt and Bangladesh) to comprehensive, long-term support in establishing, institutionalizing and maintaining the database (financial support, training and technical advisory were provided by UNDP to Armenia, Mozambique, Indonesia and Sri Lanka for example). These experiences have highlighted the need for sustained engagement at country level in order to institutionalize maintenance and use of the data. More importantly, UNDP experience suggests that support for these systems is best provided within the context of a larger overall programme of disaster risk management capacity development. The benefit of this approach is that the capacities acquired lead to data improvements, and, at the same time, the data also become an increasingly effective resource for disaster reduction.

Despite significant progress over the past two decades, a review of currently accessible databases reveals a number of issues with respect to data completeness and currency, quality assurance and access.

The results of the analysis show that:

- **Currency** – 73% of the databases provide data through 2010, 63% through 2011 and only 28% through 2012 (as of December, 2012);
- **Completeness** – the majority of databases contain blank or zero values for the key parameters of deaths and economic losses for more than 80% of their entries. The majority of databases have 30% or more entries for which all values are blank or zero;
- **Gaps** – more than 50 % of the databases appear to contain data gaps (years for which no data was entered), which are most prevalent in the earlier years for which the databases contain entries;
- **Quality assurance** – 17% databases have been documented as using a quality control procedure;
- **Applications** – for research purposes or for policy-support, the documentation could only be located for 36% of the databases;
- **Accessibility** – 85% databases provide open data access, 16% databases have limited or no access;
- **Standardization** – although the majority of the databases surveyed use a standardized methodology (DesInventar), lack of universally accepted standards affects data comparability and aggregation. Standardization issues include how the parameters for loss and damage data are collected, defined and how loss and damages are attributed to hazard events.

Databases having a relatively high number of desirable characteristics against the above criteria include Australia, Bolivia, Canada, Djibouti, Ecuador, Guyana, Indonesia, Morocco, Orissa, Panama, Sri Lanka, Tamil Nadu, Venezuela, Nepal, U.S., Jamaica and Colombia, among others.

Concrete recommendations for improvement emanating from the above analysis include addressing the following priority areas for improvement of disaster loss databases:

- Developing country capacity for systematic disaster data collection, interpretation, use and clear policy/ operational benefit;
- Improving the quality of disaster loss data (especially economic losses);
- Implementing quality control and validation procedures;
- Defining a set of well-defined minimum parameters to be collected;
- Completing and applying standards for hazard event recording and loss attribution;
- Promoting disaster loss database use (especially policy applications);
- Exploring the use of new information technology and communication (ITC) technologies for loss and damage assessment.

At the core of realizing many of these improvements is the need to institutionalize data collection and use in sustainable settings and strengthening host institution's ability to obtain, maintain, use and distribute the data. Enhancement in the way these data are obtained, formatted and managed would enhance their quality, utility and credibility and serve the DRR community at international and national levels.

INTRODUCTION

This report compares regional and country-level loss and damage databases, analysing their contents, operational characteristics, quality, uses and applications. As UNDP has been a major source of support for loss and damage database implementation at country level, the report includes an overview of UNDP's work and lessons learned as a guide to future UNDP support in this area. The analysis, results and conclusions are further used to suggest areas for improvement in disaster loss and damage accounting generally.

Data on loss and damage is a critical input for disaster risk management generally and specifically for HFA implementation[1] including at country level. The UN Framework Convention on Climate Change (UNFCCC) work programme on loss and damage similarly recognizes the importance of these data sets to better understand the potential losses and damages caused by climate-related impacts.

Loss and damage databases track impacts of hazard events[2] over time. Losses and damages are recorded across a number of parameters typically including deaths, economic losses, and physical damages and losses in each affected sector (housing, infrastructure, etc.). The geographic area affected and the types of hazard involved are also typically recorded. Over time, the accumulated data provides information on cumulative loss and damage, its geographic distribution, the main hazards, the types of loss and damage that occur, and temporal trends.

The ideal loss and damage database, therefore, is one that is sustainable, continuous, credible, publicly accessible, quality assured and applied for decision-making. Specific disaster and risk management applications of loss and damage data include:

1. **Guiding relief, recovery and reconstruction programmes following disasters** – Physical damage and its economic equivalencies provide a basis for identifying recovery and reconstruction financing requirements;
2. **Assessing risks of future disasters** – Although past loss and damage is not a complete indicator of future losses – in light of climate change, growing societal hazard exposure and changes in patterns of hazard vulnerability – it is nonetheless essential data for generating vulnerability curves necessary for assessing the risks of future loss and damage and for validating and calibrating risk assessments;
3. **Calibrating the cost-effectiveness of investments intended to reduce losses**;
4. **Tracking loss patterns and trends**, including progress towards achieving the HFA expected outcome of a substantial reduction of disaster losses;
5. **Performing thematic analysis** (e.g. gender differences in morbidity and mortality, assessing sector-specific losses);
6. **Tracking, monitoring and evaluating the outcome indicators on loss and damage** for a number of international policy frameworks in the areas of disaster reduction and climate change such as the HFA and UNFCCC for example (Gall M. and Kreft S., 2012).

There has been keen interest among some national governments in Asia to establish loss and damage databases as a means of supporting mandates for evidence-based disaster reduction policy- and decision-making in the post-2004 Indian Ocean tsunami and HFA contexts. Both the tsunami and the HFA heightened awareness of the need for DRR and catalysed institutional and legal reforms for DRR, particularly in the Asian region.

In the pages below, Section II provides an overview of the types of loss and damage databases and a set of regional overviews, followed by examples of UNDP's role in supporting them. Section III is an analysis of database contents, the methodology used in the analysis, and a summary of the results. Finally, Section IV provides recommendations for future work in this area.

The analysis is based on available data and thus may not completely capture all important aspects of particular databases nor cover all databases being implemented currently globally. One particular difficulty, for example, is the case of "dark," i.e. non-publically accessible, databases which are known to exist but which, in the absence of information about them, could not be reviewed here.[3]

II

THE CONTEXT

II.1 Current landscape

Numerous loss and damage databases have been developed over the last several decades which systematically collect and maintain data at global, regional, national and sub-national level. UNDP's Global Risk Identification Programme (GRIP)[4] has identified 62 disaster loss databases worldwide which collect data on mortality, morbidity and physical damage across the social, infrastructure and productive sectors of the economy (Table 1). Eight additional ones under development in Cambodia, Myanmar, Tunisia, Moldova, Belize, Liberia, Uganda and Pakistan are not included in the analysis as no metadata is currently available. Within this sample, Latin America and Asia have better coverage than other regions.

Table 1 Disaster loss and damage database types surveyed

Geographic Coverage	Number of databases
Global	5
Regional	2
National	50
Sub-national	4
Event-based (Hurricane Mitch)	1
Total	62

Global loss and damage databases include:

- *EMDAT*, the International Disaster Database, maintained by the Center for Research on the Epidemiology of Disasters (CRED), Université Catholique de Louvain (www.emdat.be);
- *NatCatSERVICE*, maintained by Munich Reinsurance (http://www.munichre.com/en/reinsurance/business/non-life/georisks/natcatservice/default.aspx); and
- *Sigma*, maintained by Swiss Reinsurance (e.g. http://media.swissre.com/documents/sigma1_2011_en.pdf);
- *Disaster database project,* maintained by University of Richmond (http://learning.richmond.edu/disaster/index.cfm);
- *The on-line Global disaster identifier (GLIDE) database,* maintained by the Asian Disaster Reduction Center (ADRC) (http://www.glidenumber.net/).

Of these, *EMDAT* offers limited on-line data access through different search options; raw data is available upon request. Munich Re's NatCatSERVICE offers access outside the insurance industry for scientific projects and offers a huge range of analyses on their website. Swiss Reinsurance provides access only to their clients. All three sources issue annual reports.

Region-specific and country-level databases are implemented by local institutions and actors. Hosting arrangements for these databases vary and can be grouped in four main categories:

- Governmental institutions, in most cases those responsible for disaster management;
- Academic organizations such as research institutions (i.e. on social, territorial, disaster risk reduction studies, etc.) and universities;
- Consortiums and institutional networks;
- Local or international non-governmental organizations (NGOs).

Most databases are hosted by governmental institutions (44). The rest are hosted by research institutions, universities, consortiums or NGOs.

Of the 57 regional, country- and sub-national level loss and damage databases 45 are organized in a common format, called *DesInventar* (disaster inventory), initially developed by *La Red*, an NGO consortium in Latin America. The rest are in a variety of different formats. Details on the different formats are provided in III.2.

Many, although not all, regional and country level databases are currently implemented with international support. UNISDR has supported many countries in building and updating disaster databases, frequently in partnership with UNDP. UNISDR support ranges from funding to technical assistance, including updating, training, advocacy, dissemination and institutional support. In particular, UNISDR has provided technical assistance to all countries that use the DesInventar software in the areas of software development, applications and analysis. UNISDR has undertaken, in partnership with UNDP, the development and hosting of the Open Source initiative. The software that was developed thanks to this initiative has been used for the implementation of new DesInventar databases. Other specialized UN agencies, such as the World Health Organization (WHO), the UN Food and Agriculture Organization (FAO), and others support countries to document sector-specific losses.

Multi-stakeholder forums for addressing the general issue of loss and damage data include the Disaster Loss Data Expert Working Group under GRIP, which continued the work initiated during the early 2000s by the Working Group 3 of the UNISDR system, and, recently, the International Council for Science (ICSU) Working group on "Disaster Loss Data and Impact Assessment" of the Integrated Research on Disaster Risk initiative (IRDR). Currently there is no single, overarching mechanism, however, for systematically coordinating technical and financial support for the establishment, institutionalization, maintenance and enhancement of loss and damage databases.

Loss and damage data are available on-line in most cases (49) (for example see http://www.gripweb.org/gripweb/?q=disaster-database, which is maintained by GRIP and provides access to around 50 databases, and http://www.DesInventar.net/, maintained by UNISDR and La Red, that provides access to 45 DesInventar-based databases, together with http://www.preventionweb.net/english/hyogo/gar/2011/en/what/ddp.html). Some of the national databases (i.e. Indonesia) are maintained in national servers and the data is made available through the webpage of national hosting institutions in addition to through the above links. In such cases, the data is updated regularly in the national servers but not on the DesInventar website which may reflect these updates only after the national dataset has been re-mirrored in the DesInventar server. Documented database applications encompass resource allocation decision-making, research, risk profiling and policy formulation.

II.2 Regional overview

The **Americas** is the region with highest number of disaster loss databases (26) (Table 2). These databases cover the majority of the countries in the region: the U.S., Canada, all of Central and South America except French Guiana, Suriname and Brazil. In the Caribbean, however, only Jamaica, Trinidad and Tobago, and the Dominican Republic have databases. One of the two regional databases, the Andean, is a compilation of national ones.

Most of databases in this region (20) have been developed using DesInventar. Development of DesInventar was initiated in 1994 in Peru by La Red – an NGO consortium in Latin America – at its Fifth General Meeting (GRIP and OSSO, 2010). The DesInventar methodology allows the collection of historical disaster losses data in a systematic and homogeneous manner at a low administrative level based on a pre-defined set of definitions and classifications (http://www.DesInventar.net/methodology.html). The pilot phase (1994-2000) led to the development of 12 databases in selected pilot countries. This phase was followed by the development of databases within the framework of three different projects: a La Red project on the El Niño phenomenon, the PREDECAN[5]-OSSO Corporation project for Andean countries including Venezuela, and the UNISDR Global Assessment Report (GAR). UNDP and UNISDR promoted and financed their development for the 2009, 2011 and 2013 GAR and supported the updating and analysis of inventories.

Table 2 Overview of disaster loss databases in the Americas region

Regional Overview: Americas	
Number of databases	26 (out of which 23 national, 2 regional, 1 event-based)
Countries in the region having a database	60%
Countries developing their database	1 (Belize)
Number of databases using DesInventar	20
Number of databases using stand-alone methodology	6

In the **Asia-Pacific region**, the coverage of disaster loss databases is quite good with 19 databases (and three under development) (Table 3). In this region, there is an interesting mix of databases developed with DesInventar (14) and with stand-alone methodologies (five including Australia, Bangladesh, the Philippines, Thailand and Vietnam). The Philippines and Vietnam databases are being migrated to DesInventar. Pakistan's is being developed and will use DesInventar, while Thailand's database has ceased operation.

Table 3 Overview of disaster loss databases in the Asia-Pacific region

Regional Overview: Asia-Pacific	
Number of databases	19 (out of which 15 national, 4 sub-national)
Countries having a database	30%
Countries developing their database	3 (Pakistan, Cambodia and Myanmar)
Number of databases using DesInventar	14
Number of databases using stand-alone methodologies	5

Africa has five databases, in Mozambique, Mali, Morocco, Kenya and Ethiopia, which were developed using DesInventar and are currently hosted by national institutions (Table 4). A database for three regions in Liberia and one for Uganda are under development.

Table 4 Overview of disaster loss databases in the Africa region

Regional Overview: Africa	
Number of databases	5 (national)
Countries having a database	10%
Countries developing their database	2 (Uganda and Liberia)
Number of databases using DesInventar	5
Number of databases using stand-alone methodologies	0

In the **Arab states**, there are six national databases in Djibouti, Egypt, Jordan, Lebanon, Syria and Yemen (Table 5). A database for Tunisia is under development.

Table 5 Overview of disaster loss databases in the Arab States region

Regional Overview: Arab States	
Number of databases	6 (national)
Countries having a database	30%
Countries developing their database	1 (Tunisia)
Number of databases using DesInventar	6
Number of databases using stand-alone methodologies	0

The Europe – Commonwealth of Independent States (**EU-CIS)** region has one database in Armenia and one under development in Moldova (Table 6).

Table 6 Overview of disaster loss databases in the EU-CIS region

Regional Overview: EU-CIS	
Number of databases	1 (national)
Countries having a database	12%
Countries developing their database	1 (Moldova)
Number of databases using DesInventar	0
Number of databases using stand-alone methodologies	1

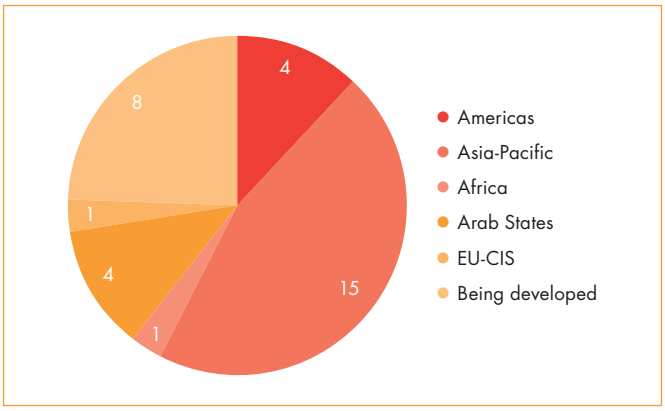
Additional databases[6] are known to exist through HFA's national progress reports for 2007-2009, 2009-2011 and 2011-2013 reporting cycles (although the latter will end at the end of April 2013), but were not included in this analysis, either because the data is not publically available or the databases are still under development.

II.3 Disaster loss and damage databases: UNDP's role

Of the international agencies involved in this work, UNDP is the only major actor with global country-level presence. UNDP has supported the development of 25 databases covering all regions (see Annex 1) with support on-going for an increasing number of others (Figure 1). In these cases, UNDP's support can range from limited, one-off contributions (i.e. UNDP provided financial support for the development of the databases of El Salvador, Egypt and Bangladesh) to sustained engagement in establishing, institutionalizing and maintaining the database (financial support, training and technical advisory was provided by UNDP to Armenia, Mozambique, Indonesia and Sri Lanka for example). In 2009 UNDP published *Guidelines and Lessons for Establishing and Institutionalizing Disaster Loss Databases in Asia* to capture in-depth experience with database development at national and sub-national level in that region. The experiences in Latin America were also extensively documented (GRIP and OSSO, 2010).

These experiences have highlighted the need for sustained engagement at country level in order to institutionalize maintenance and use of the data. To address this need, UNDP works with government authorities and partners to create an enabling environment for DRR, identifying an appropriate institutional home for the database within the national DRR framework to ensure sustainability. Supporting the institutionalization of systems to track disaster losses and damage over time at country level has been a major area of work for UNDP over the past decade. Capacity development of the institutions which collect and maintain these data is a key underlying requirement in this regard and a cornerstone of UNDP approach.

Figure 1 UNDP support by region[7]



UNDP supports the collection, entering and validation of data as well as analysis and data management. For the GAR UNDP cooperated with UNISDR to formulate a methodology for analyzing the linkages between disasters and poverty using these data.

In addition, UNDP has been at the forefront of promoting standardization in disaster loss accounting. In 2008, *Disaster Loss Data Standards* were developed and published jointly by UNDP/GRIP, Asian Disaster Reduction Center (ADRC), CRED, La Red, and Munich RE as a contribution in this area. UNDP has also cooperated in an effort led by CRED with Munich Re, Swiss Re, the International Federation of Red Cross and Red Crescent (IFRC), UNISDR and the World Food Programme (WFP) to characterize and standardize definitions and terminology of human impacts associated with disasters (CRED, 2011).

Building on its experience at country level, UNDP promotes the following guiding principles for the development of loss and damage databases, developed by UNDP's Asia-Pacific Regional Center (APRC):

- Developing national capacities for establishing and maintaining disaster loss databases;
- Establishing and sustaining nationally led processes in the countries to create ownership of the database and increase its usefulness and relevance to national and sub-national contexts;
- Establishment of national disaster loss database is guided by the overall institutional and legal context of disaster risk reduction in the country;
- The disaster loss database should address the needs and priorities of the country and the analysis must provide inputs to the policy and decision-making processes at all levels within the government;
- The database and any analysis should be shared with all key stakeholders and the public for developing wider understanding of risks and warranting actions from all sections of society.

The following provides an overview of selected UNDP support, presented by region and in a chronological order. The complete list of databases supported by UNDP is available in Annex 1. Annex 2 provides details on the disaster loss and damage databases.

In Latin America, UNDP and UNISDR promoted and financed the development of disaster loss databases and supported the updating and analysis of inventories in **El Salvador**, **Guyana**, **Jamaica**, **Trinidad and Tobago**. The development and implementation of these databases proceeded in three phases:

- Phase I (1994-2000) – which consisted of the development of eight databases in Latin America, using DesInventar. The results of this phase were shared and discussed during the "DesInventar en América Latina y el Caribe: Balance y Perspectivas" [DesInventar in Latin America and the Caribbean: Assessment and Perspectives] workshop held in Paracas, Peru, in March 2000. The database which was developed in this phase with UNDP support was the one in El Salvador.
- Phase II (2000-2005) – which consisted of the updating of some of the databases developed in phase I and the development of new ones (Jamaica, Trinidad and Tobago and Guyana developed with La Red in the framework of the regional UNDP project for the Caribbean). This phase also included the analysis of the data collected as part of a project focused on El Niño Southern Oscillation (ENSO) and disasters in the region.

- Phase III (2006-2009) – which consisted of the revision and updating of the databases for the GAR 2009, to which UNDP contributed one chapter as well as funding. Several supporting papers which made use of disaster loss data were also prepared.

UNDP is also currently supporting the development of a database in Belize and National Disaster Observatories (NDOs) in Bolivia and Ecuador.

Asia Pacific is the region with the highest number of databases supported by UNDP (15). The first countries to be supported by UNDP to develop databases were the tsunami-affected countries – Sri Lanka, Tamil Nadu (India), Thailand, Maldives and Indonesia – under the framework of the UNDP Regional Programme on Capacity Building for Sustainable Recovery and Risk Reduction (RP) (UNDP, 2009). The success of the UNDP RP, initiated in response to the 2004 Indian Ocean tsunami, in establishing these databases proceeded from the fact that they were embedded in broad DRR programmes with strong commitment of all partners. The capacity, expertise, local knowledge of the region, and experience in DRR developed through the three years of implementation were a significant contribution to the knowledge base of UNDP, DRR practitioners and the target countries. This capacity was vital for promoting database establishment, maintenance and use.

Building on the experiences of the RP, UNDP continued to provide technical support to several other countries in a second phase, including Vietnam, Laos, Cambodia, Timor Leste and Myanmar through a regional crisis prevention and recovery programme. Taking stock of several years of experience in a variety of institutional, legal and capacity contexts, UNDP has developed an approach and a methodology to establish disaster loss and damage databases and embed them in national contexts and build upon existing institutional processes.

Most recently, building on the experiences of the RP, UNDP APRC has continued to support the development of loss databases in several countries beyond the RP countries including jointly with UNISDR. Since 2012 in Southeast Asia UNDP has begun working within the Association of Southeast Asian Nations (ASEAN) framework for enhancing capacity of member states in risk identification. The number of databases developed with UNDP support in the Asia-Pacific region has grown to 15 since the establishment of the RP, all of them owned and hosted by national governments.

In the **Maldives**, UNDP worked with the National Disaster Management Centre, the focal agency for data and information management during the 2004 tsunami, to develop a disaster loss database. Immediately after the tsunami, before the UNDP RP was rolled out, UNDP supported the initial establishment of the disaster loss database to monitor the loss caused by the tsunami. The database was immediately used by government and donors, who considered it the best reference material on disaster loss from the tsunami. As the focus moved towards recovery and reconstruction, and attention to the collection and entry of data diminished, UNDP initiated implementation of the RP to ensure continued momentum for the work. This included engagement with the National Disaster Management Centre directly to build on achievements to that point and institutionalize the disaster loss database.

A similar process occurred in **Sri Lanka**, where the disaster loss database developed with UNDP support through the RP is one of the most developed in the region. The process was supported by a renewed push to develop the national DRR system, including the enactment in 2005 of the Disaster Management Act which established the National Council for Disaster Management and the Disaster Management Center (DMC). Under the DMC's leadership, and with strong UNDP support, data was collected from different government organizations, including the Epidemiology Unit of the Ministry of Health, the Department of Wildlife Conservation, National Building Research Organization and others. UNDP also supported the training of more than 90 officers from the national and district levels for data collection. In 2007, the Sri Lanka Disaster Information System was launched and has been subsequently used by the government to manage early recovery activities and to inform its DRR programme. Data from the Sri Lanka DesInventar – Disaster Information System was incorporated into a broader "Integrated Strategic Environment Assessment (www.isea.lk)" to inform the post conflict development process in 2010 and 2011 with support from UNDP. In addition it was used by Asian Development Bank to develop the "Sri Lanka Climate Change Adaptation Strategy." The database provided the data for the development of national hazard profiles for coastal erosion, drought, floods, landslides, lightning, sea level rise, storm surges, tropical cyclones and tsunami (www.hazard.lk). To ensure its sustainability, the Sri Lanka database was entirely handed over to DMC beginning in early 2011 and is being maintained by the Emergency Operation department. The hand-over process was completed in early 2013. The establishment of the Disaster Information System and the strengthening of the capacities within the DMC in Sri Lanka were part of a broader national DRR programme supported by UNDP, composed of seven different projects. Jointly, the projects led to the establishment of a tsunami and multi-hazard early warning system, the creation of a community-based flood and landslide monitoring system and early warning

dissemination mechanism, the strengthening of local level action and overall coordination through the establishment of national and district level emergency operation centers. In the Sri Lanka context the Disaster Information System is therefore part of an overall package of activities designed to increase access to disaster information by local communities and to reduce the economic and social impacts of disasters.

In **Indonesia**, with UNDP support, the National Disaster Management Agency was able to develop a digital national disaster loss database. The Disaster Data and Information of Indonesia (DIBI) database system includes data over a period of at least 30 years, and is used to analyse historical and geographic trends on natural hazards and resulting disasters that have occurred in the country. The database was initially piloted in one province, and then extended to all eight target provinces of the programme, and an additional two provinces outside the programme. The database currently covers all provinces. Several additional provincial databases hosted by provincial governments were also developed with UNDP's support – for the Aceh, West and Southeast Sumatera, Bengkulu, Yogyakarta, Central and East Java, Maluku, North Sulawesi, Bali, Nusa Tenggara Timur provinces. Fully supported by the government, and hosted in a government Internet domain, the database is being used for developing a national disaster risk index, provincial risk assessment, formulating disaster management plans, allocating funding for local authorities and coordinating disaster response. The Indonesia national disaster loss database website (hosted by the National Agency for Disaster Management) allows overlying the historical loss data with multi hazard risk maps.

The DesInventar methodology is also being used by the National Planning Agency for poverty monitoring in Indonesia (http://simpadu-pnpm.bappenas.go.id) and community based disaster risk management database (http://cbdrrdatabase.bnpb.go.id/DesInventar). Thanks to high level political commitment to DRR and the use of disaster loss data from Indonesia's database, this database has contributed to the allocation of 1% of the annual national budget to disaster risk management, a significant achievement.

Finally, in **Laos** the disaster loss data has been used for disaster profiling.

Similar to the Asia-Pacific region, in other regions the approach adopted by UNDP for supporting the development of these national databases has put capacity development and national ownership at the center. In **Armenia** and **Mozambique**, the process for the development and implementation of these databases has been fully led by national institutions, which currently host these databases (the Ministry of Emergency Situations in Armenia (MoES) and the National Disaster Management Institute, in Mozambique). To support this process, UNDP has provided financial and technical support through training workshops, advisory services towards establishing, institutionalizing and maintaining the database. In **Armenia**, with UNDP/GRIP's assistance, the MoES in 2011 established an NDO to inform policy and decision making processes. An NDO is a sustainable institution for the systematic collection, analysis and interpretation of disaster data. The main objective of the NDO is to expand and improve the evidence base on disaster-related losses, by promoting and supporting the systematic organization of disaster data into national databases for analysis and use, and to institutionalize these efforts at national level. The NDO consists of a disaster database and a network of organizations/institutions from all sectors (housing, education, etc.). In order to integrate this work with the broader government's institutions and coordination system in Armenia, focal points representing the NDO have been appointed in all 18 Ministries. Armenia has become a model country for disaster risk reduction in the region. Lessons-learned and experiences are being shared with other countries including Tajikistan, Montenegro and Moldova. The latter, with Armenia's help, is expected to establish an NDO of its own (BCPR, 2011; UNDP, 2012).

In the Arab States, UNDP has jointly developed disaster loss databases with UNISDR in four countries. UNDP's support has varied from country to country. In **Egypt**, **Lebanon** and **Syria** UNDP has provided financial support. In **Yemen** UNDP has also supported the development and implementation phases. UNDP is also currently providing support to establish a new database in Tunisia.

III

THE ANALYSIS

III.1 Methodology

As databases proliferate and the data they contain are being applied in an increasingly wide range of policy- and decision-making contexts, it is important to have a clear idea of what these databases contain, how the data are organized, how losses and damages are attributed to hazard events, and how quality is assured. Towards this end we undertake an assessment of the regional and country-level databases identified in II.1 and Annex 2. The results are then used to suggest priority areas for improvement in disaster loss and damage accounting.

III.1.1 Scope

The analysis focuses on the 57 disaster loss databases at regional, national and sub-national level. The eight databases which are under development are not included, as no metadata is available. Each database is profiled and assessed in terms of its geographic coverage, length of record, contents, characteristics of the hosting institution, quality assurance practices and procedures, accessibility, documented uses and the nature of UNDP's support. Full results of the analysis are contained in the Annex 2.

III.1.2 Sources of information

The following sources were drawn on for this analysis:

- the DesInventar (www.DesInventar.net) and national database websites (please refer to the Annex 2);
- the disaster data collection initiative portal (DisDAT), a collaboration between CRED and GRIP, with the financial support of the Office of Foreign Disaster Assistance (OFDA) of the United States Agency for International Development (USAID);
- Guidelines and Lessons for Establishing and Institutionalizing Disaster Loss Databases in Asia (UNDP, 2009);
- Establishing and Institutionalizing Disaster Loss Databases in Latin America – Guidelines and Lessons (GRIP and OSSO, 2010); and
- Moving towards Harmonization of Disaster Data: A Study of Six Asian Databases (Below et al., 2010).

The information collected for each database has been validated across the above sources and with five UNDP Regional Disaster Reduction Advisors (RDRAs), UNISDR and 10 database focal points.

III.1.3 Indicators

Five aspects are considered in the analysis. The indicators considered are listed below (the order does not reflect a priority order):

1. **Database characteristics:**
   - *Area covered*: a region, country, or province/state;
   - *Region*: one among the five regions of interest (Americas, Asia-Pacific, Arab States, Africa, Europe and the Commonwealth of Independent States);
   - *Type of system*: the system used to house and maintain the database;
   - *Type and name of institution*: hosting the database;
   - *Language*: the language used for storing the data in the database.
2. **Database contents profile:**
   - *Years of record*: the year of first and last entry (and the time period covered by the database);
   - *Year of database establishment*: the year in which the database was established. Please note: this information is only available for a small number of databases;
   - *Geographic coverage*: indicating if the database is a regional, national or sub-national database;
   - *Types of hazards*: which types of hazards are covered by the database (geological, hydrological, meteorological and climatological[8]);
   - *Types of losses*: which type of disaster losses are contained in the database (human and/or economic (in US dollars (USD) and/or local currency)).
   - *Data sources used*: indicating if official and/or unofficial sources were used (assessment of the quality of data sources is beyond the scope of this analysis);
   - *Completeness of records*: the percentage of zero or blank values contained in the database. Zero and blank values distinguish between no losses versus no data, respectively. In DesInventar databases this distinction is not made, however, and zero values are used in both cases. Thus in DesInventar databases only non-zero values are meaningful. Therefore for DesInventar databases the percentage of zeros has been calculated as an indicator of data completeness. For the rest of the databases the percentage of blank values (no data available – NA) has been calculated. Percentage of blank values (or zeros, in the case of DesInventar) are calculated for the number of deaths, economic losses, affected population and for each database overall. The percentage of entries containing all blank/zero values across all parameters is also calculated.
   - *Data gaps*: indicating if the database presents gaps and in which years of record;
   - *Disaster event identification number*: indicating if a unique disaster event identification number is used or not – this is essential for hazard-loss attribution, interoperability and aggregation/disaggregation of data;
3. **Quality assurance:**
   - *Standards*: indicating if standards are applied and if database related documentation is available;
   - *Quality control and validation*: indicating if a quality control and validation procedure is applied, for example plausibility checks.
4. **Accessibility:** indicating the policy applied for data access, which can be open, limited or restricted (no access).
5. **Database uses:**
   - *Applications*: for which type of applications the data is used (i.e. research (for example: forensics, disaster trends, disaster impact assessment, climate variability, risk assessment, hotspots analysis of historical losses), policy (for example: disaster response, DRR, recovery, reconstruction, preparedness, national resource allocation, development planning));
   - *Users*: types of users of the database (i.e. government, international organizations, NGOs, private sector etc.).

Additional indicators/evaluation criteria will be included for further investigation (i.e. geographic resolution, georeferencing, usability, etc.).

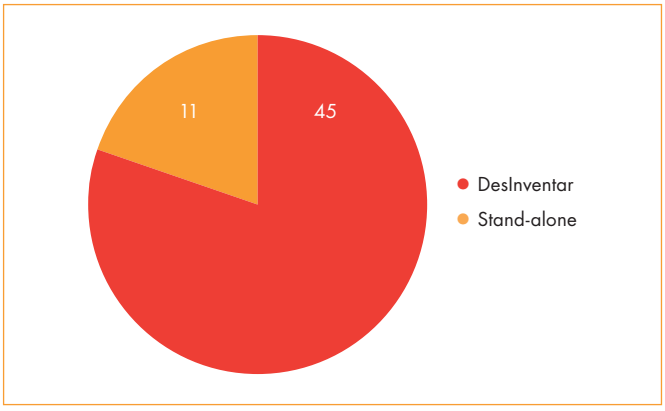
III.2 Results: General overview

The results are organized according to the five aspects considered in the analysis as follows:

1. **Database characteristics**

The 57 databases that were analysed cover five regions[9] (Americas, Asia-Pacific, Africa, Arab States, EU-CIS), which includes 50 countries, four sub-national states, and two regions (see Table 1).[10] 45 of these databases were developed using DesInventar and 11 have adopted stand-alone systems (information for Thailand is not available) (Figure 2).

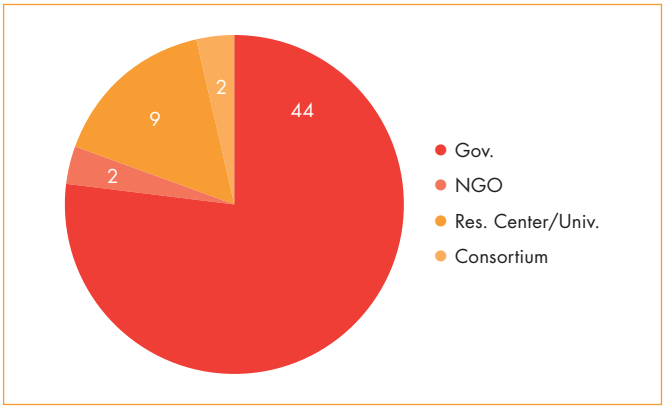
Figure 2 Type of system used to develop the disaster loss and damage databases



The wide usage of DesInventar could be attributed to its easy-to-use approach, open access to the data archives, a website which provides analytical functions, and fully downloadable data into usable formats (i.e. excel, CSV). The DesInventar.net website is visited by 12,000 people per month.

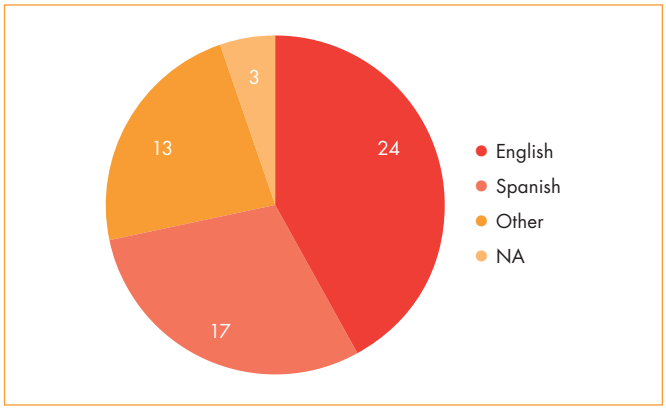
Of the 57 databases, 44 are hosted by Governmental institutions, two hosted by NGOs (National Society for Earthquake Technology (NSET) in Nepal and OSSO Corporation in Colombia), nine hosted by research centers/universities (in Argentina, Chile, the Dominican Republic, Guatemala, Jamaica, Peru, Trinidad and Tobago, U.S. Sheldus and the U.S. Public Entity Risk Institute (PERI) Presidential Disaster Declaration database), and two hosted by consortiums (La Red in Mexico and Nicaragua) (Figure 3).

Figure 3 Disaster loss and damage databases host institutions



24 out of the 57 databases provide the data in English, 17 in Spanish and 13 in other local languages (Figure 4).[11]

Figure 4 Language used to store the data in the disaster loss and damage databases



The parameters included in the database vary across the different types of databases. For example:

- The disaster information in Desinventar-format databases includes: type of event, province/State, district, date, location. The loss information includes deaths, missing, injured, affected, victims, evacuated, relocated, houses damaged, houses destroyed, crops and woods (hectares), livestock (lost), educational centres, hospitals, loss value in local currency and USD (calculated according to the exchange rate on the date of the disaster), roads affected, and others up to a maximum of 17 parameters (including data sources for each of the records). Two parameter definitions are unclear and can be subject to misinterpretation (such as for example "victims[12]" versus "affected[13]"). This could imply errors in the registration of the data as the parameters' definitions can be subjectively interpreted. Registration errors may also arise as a result of translating between local terms and English. DesInventar-based databases include a serial number (but which is not standardized across databases).

- The stand-alone databases include a smaller set of parameters which in most cases do not encompass sectoral information. The parameters included for hazard characterization and losses information differ from one database to another. For example, the Bangladesh database provides maps, event time of occurrence, duration, disaster type, geographic coverage, damage info, Global disaster Identifier (GLIDE) unique event identification numbers (see III.2, below), and comments. The U.S. Sheldus database includes a start and end date, hazard type, state, county, injuries, fatalities, property damage and crop damage. Canada's database includes event type, place, event start date, fatalities, injured/infected, evacuated and estimated costs. Australia's database includes an event title, zone, region, category, start date, end date, dead, injured and the insured total losses due to the disaster itself. The Vietnam database includes type of damage (indicating the sector affected), item (which indicates the type of loss), unit (person, school, etc.) and type of event.

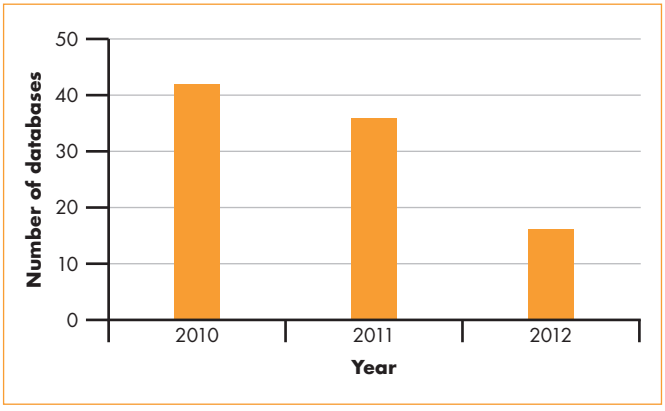
2. Database contents

As of 1 December 2012, out of the 57 databases, 42 provide data through 2010, 36 through 2011, and 16 through 2012 (Figure 5). In 2010, six databases stopped recording data (Egypt, Ethiopia, Jordan, Mizoram (India), Vanuatu and Vietnam).

19 of the databases out of the 42 that provide data through 2010 were updated with funding from UNISDR for the GAR 2011. Of these, one last recorded data in 2010 (Jordan), 11 in 2011 and seven through 2012 (Colombia, El Salvador, Indonesia, Orissa, Panama, Sri Lanka and Venezuela). Out of the 19, two of the databases were updated by independent experts (Guatemala and Mexico) while the rest were updated by the host institution. Although the GAR is evidently serving a useful purpose in providing an incentive to keep these databases up to date, long-term sustainability will require that they become embedded in country-level DRR systems and decision-making processes.

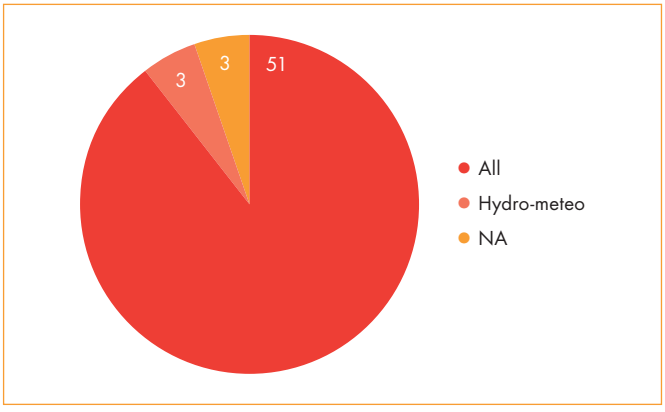
39 databases provide 30 or more years of record, 16 less than 30 years (this information is unavailable for the Andean region and Caribbean databases).

Figure 5 Number of databases containing data for 2010-2012 (as of December 2012)[14]



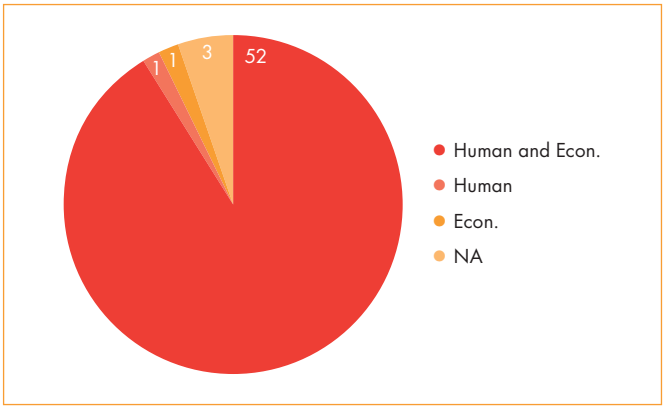
51 of the databases cover all types of hazards (geological, hydro-meteorological and climatological), three only hydro-meteorological hazards (Vietnam, Honduras and U.S. Natural Hazards Statistics) while for the rest the information is not available (for the Andean region, Caribbean and Thailand) because the database is not publicly accessible (Figure 6).

Figure 6 Number of loss and damage databases and the types of hazards covered



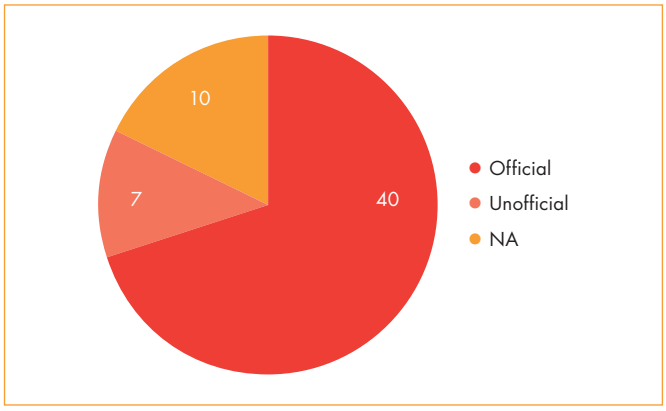
52 databases provide data on human and economic losses, one database covers only human losses (U.S. Natural Hazards Statistics), and one database only economic losses (U.S. Presidential Disaster Declaration database) while for the remaining three databases the information is not available (Figure 7). Nine databases contain gender-disaggregated data.

Figure 7 Types of losses covered by the disaster loss databases



40 databases use official or a mix of official and unofficial sources, seven use unofficial ones (Chile, the Dominican Republic, Lebanon, Nicaragua, Trinidad and Tobago, Uruguay and Uttar Pradesh), and 10 do not provide this information (Figure 8).

Figure 8 Data sources used by the disaster loss databases



2.1 Completeness of records

All datasets were evaluated to establish how many of the entries had blank or zero values for numbers of deaths (Figure 9), economic losses in USD (Figure 10), affected population (Figure 11) and all values in an entire record (Figure 12).

Figure 9 Number of databases with percentage, by range class, of blanks/zeros contained in the parameter "deaths" (for five databases this information is not available).

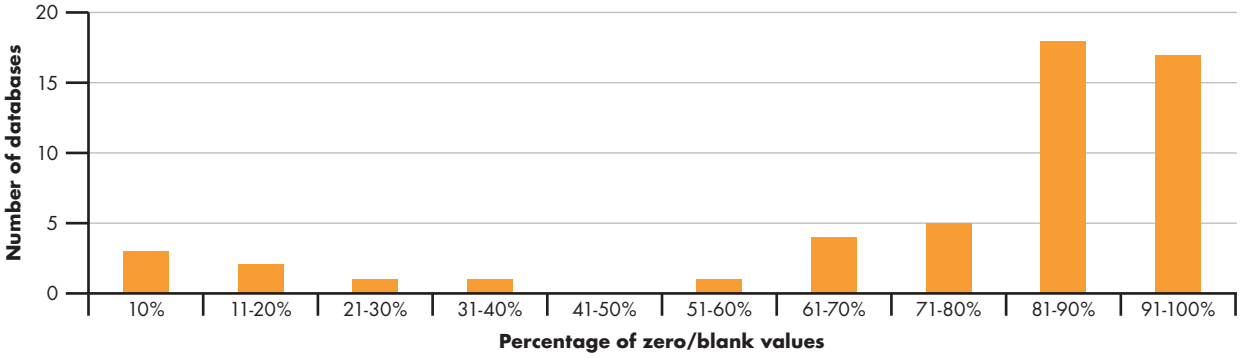


Figure 10 Number of databases with percentage, by range class, of blanks/zeros contained in the parameter "economic losses in USD" (for seven databases this information is not available)

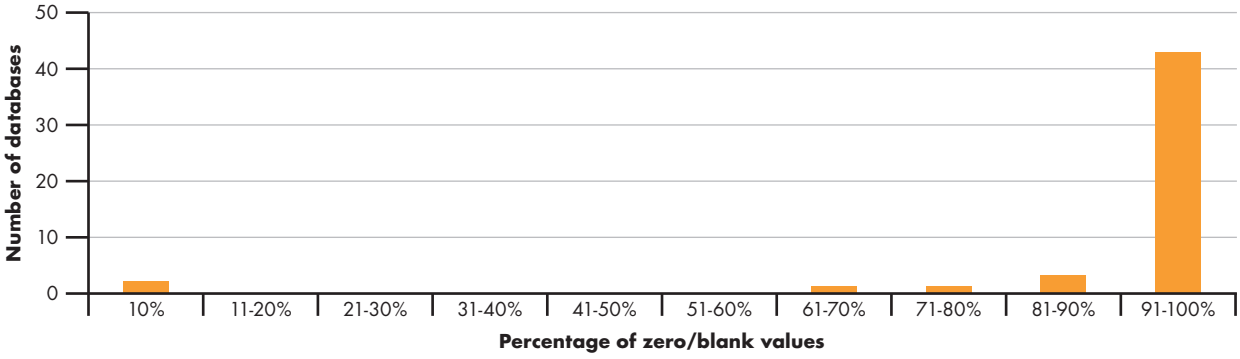


Figure 11 Number of databases with percentage by range class of blanks/zeros contained in the parameter "affected population" (for 10 databases this information is not available)

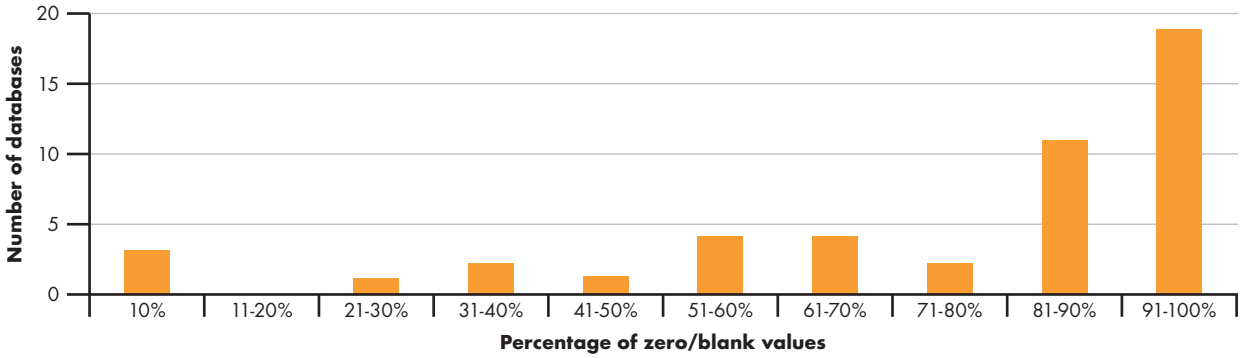
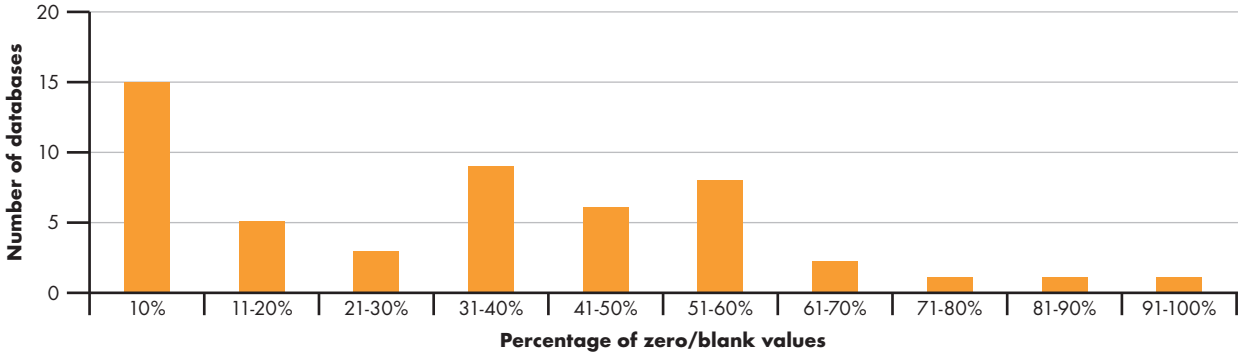


Figure 12 Number of databases with percentage, by range class, of entries with all values blank or zero (for six databases this information is not available)



The majority of databases contain blank or zero (DesInventar format) values for these individual key parameters for more than 80% of their entries. The fact that entries are made if there is data for any one parameter leads to many zero/bank values for other parameters. The majority of databases have 30% or more entries for which all values are blank or zero (DesInventar format).

In the case of databases not in the DesInventar format, where missing values are left blank, a high percentage of blanks can be interpreted as a high number of missing values for these fundamental parameters. For databases in the DesInventar format, instances in which it has been confirmed that no losses occurred cannot be distinguished from missing data owing to the fact that both are accorded values of zero.

In Desinventar-based systems, qualitative data (in the form of comments and qualitative indicators of damage with Yes/No values) is available for some records. Additional custom indicators that Desinventar might have in some cases were not taken into account in this analysis.

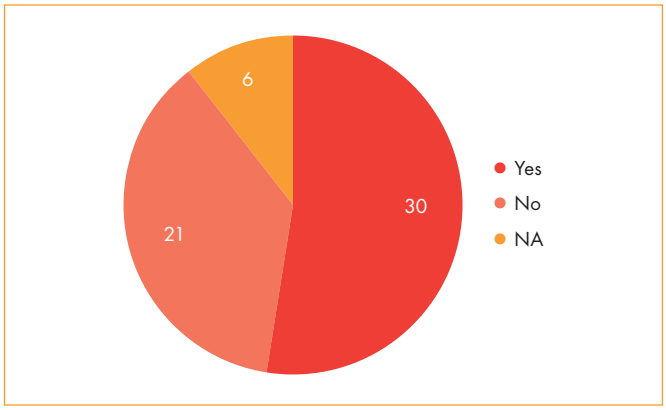
2.2 Data gaps

30 databases contain gaps (years for which no data was entered) for multiple years of record, 21 databases do not contain gaps and for six databases this information is not available (Figure 13). Gaps can mean either that no disasters occurred during the period or that disasters occurred but the event was not registered in the database. Data gaps do not necessarily reflect poor data quality but could also reflect the country's situation (i.e. conflict, political or institutional instability which led to discontinuity in disaster data collection/registration).

The database with greatest number of years of gaps is Vanuatu's with a gap of 1311 years (as the first recorded event in Vanuatu's database dates back to the year 549 but it is only after 1860 that the data was recorded continuously). The longest interval without gaps is 150 years (Vanuatu). The majority (25) of the databases contain data gaps in the earliest years for which the databases contain entries. Out of the

57 databases, if we consider the 44 that have at least 20 or more years of recording there are 17 that do not have gaps, 23 that have gaps in the early period of event recording, two for which this information is not available (Bangladesh and the Philippines) and two that contain gaps within the time frame in which continuous recording has started (Canada and Ethiopia). Canada's database contains gaps only in two separate years (in which data was not recorded) and Ethiopia's has gaps for a period of 16 consecutive years.

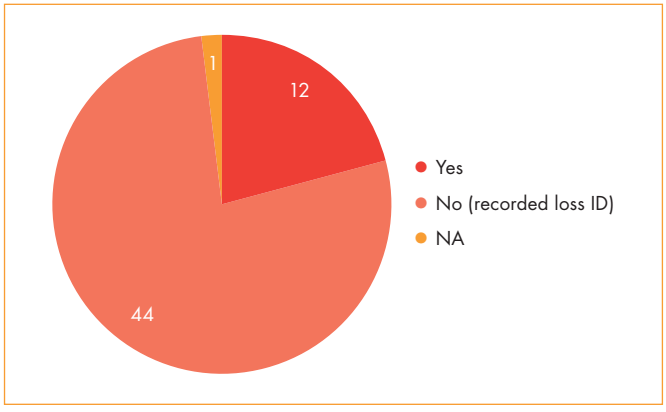
Figure 13 Number of dabatabases that contain gaps; out of the 30 that contain gaps, 25 of them contain gaps in the earlier years of recording



2.3 Disaster event identification number

Only 12 out of the 57 databases surveyed assign a unique disaster identification number to each event (Figure 14). The rest assign an index number that is associated with the recorded loss (rather than with the overall hazard event with which the losses are associated). In the latter case an index number may be assigned to each individual administrative unit in which loss or damage has occurred, for example. For one of the databases this information is not available.

Figure 14 Number of databases that use a disaster event identification number; out of the 12 that do, only nine use GLIDE (see below)



A unique event identifier provides an unambiguous reference for each disaster for such purposes as comparing loss and damage values for the same event in different databases (e.g. a country-level database and a global one), for attributing loss and damage unambiguously to hazards in a standardized manner (e.g. all loss and damage associated with Hurricane Mitch) and for linking loss databases to hazard databases for risk modelling. Nine of the 12 databases (Australia, Bangladesh, Jordan, Kenya, Lebanon, the Philippines, Solomon Islands, U.S. Sheldus, Vanuatu) that use a unique disaster identifier use the GLIDE. GLIDE is a globally common unique ID code for disasters to allow disaster information to be easily exchanged among different organizations, retrieved or linked together from various sources.

Since its inception by ADRC in 2001, with the support of CRED, the UN Office for the Coordination of Humanitarian Affairs (OCHA)/ReliefWeb, OCHA Field Coordination and Support Section (FCSS), UNISDR, UNDP, WMO, IFRC, USAID/OFDA, FAO, La Red and the World Bank, GLIDE has developed into an operational standard and has been adopted by a number of information services. Once a disaster occurs (and which exceeds certain thresholds), GLIDE operators will generate a new GLIDE number associated to that event by using the GLIDEnumber.net. The web site automatically links the information to other databases that use the GLIDE. The GLIDE consists of: two letters to identify the disaster type (i.e. TS for Tsunami); the year in which the disaster event occurred; a six-digit, sequential disaster number; and the ISO country code (i.e. IDN for Indonesia). For example the GLIDE number that corresponds to the 2004 Indian Ocean tsunami is: TS-2004-000147-IDN.

Assigning unique IDs to disaster events facilitates the comparison and analyses of loss data, which in turn can lead to more accurate and comprehensive recording of loss data. By enabling automated communication among multi-tiered disaster databases and sources, GLIDE can be a key element in improving the evidence base available for DRR. The adoption of GLIDE enables databases to be interoperable, to allow disaster information to be integrated from different sources, and to aggregate/disaggregate loss and damage associated with primary and secondary hazards (e.g. a cyclone accompanied by local rainfall-triggered landslides).

Nevertheless, the GLIDE currently presents a number of technical and governance issues that limit its use. There are issues with the GLIDE number format, how GLIDE numbers are generated and by whom, unaddressed multi-stakeholder coordination requirements and unclear governance arrangements that would need to be addressed for the GLIDE to be universally adopted as a global standard. Currently use of the GLIDE is limited – only 10% of the databases analysed employed it. Aspects to be considered for GLIDE improvement include controlling GLIDE requests and issuance, quality control when generating GLIDE numbers, developing capacity for using the GLIDE and formation of a governing body.

DesInventar-based databases contain individual entries for each geographic area affected during a given disaster and 89% of these databases do not use the GLIDE. Each database has adopted its own numbering system (i.e. some databases use increasing numbers (1, 2, 3) others use year-number etc. (2001-1, 2001-2, 2001-3)). Each entry reflects the losses and damages associated with that specific geographic area rather than the total losses associated with the disaster. For a given event, which may involve primary and secondary hazards, the total disaster loss consists of the aggregation of all losses across all affected geographic areas (hazard identification and event chaining still remains a challenge discussed further in section IV.2). By assigning the same unique identifying number to all affected areas, the use of GLIDE would permit the losses to be aggregated into a single figure for the entire disaster event, while preserving the disaggregated loss and damage data at sub-national levels.

The aggregation of losses in this manner is possible in only six cases among the 57 surveyed (Jordan, Kenya, Lebanon, Solomon Islands, Vanuatu and Vietnam), however, as these six databases use the GLIDE (although not for every entry). Among these six databases, five are DesInventar-based (Jordan, Kenya, Lebanon, Solomon Islands and Vanuatu).

3. Quality assurance

3.1 Standards

53 databases reflect explicitly-defined standards (for four out of the 57 databases this information is not available). The 45 DesInventar-format databases have common standards in terms of definitions, parameters used for data collection, disaster event classification which are available at http://www.desinventar.net/; in addition, U.S., Canada, Australia, Vietnam, the Philippines, Bangladesh (Below et al., 2010) and Armenia have adopted and documented standards. Existing standards fall in two main categories:

- DesInventar standards concerning disaster losses, hazard definitions and disaster reporting format;
- standards of stand-alone databases that: a) have tailored existing standards to their needs (i.e. Armenia following CRED's) or b) developed their own standards following national ones (i.e. U.S. Sheldus and Canada that follow the U.S. Federal Geographic Data Committee (FGDC) standards

for geographic data and metadata) or c) developed their own (i.e. Australia) or d) databases that have standards but are not documented (i.e. Vietnam, the Philippines, Bangladesh as reported by Below et al. (2010)).

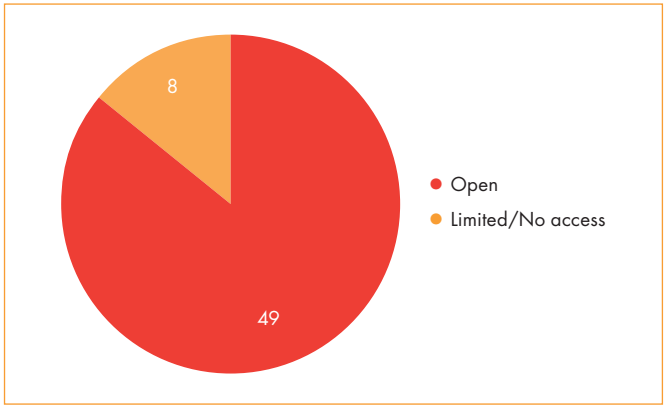
3.2 Quality control and validation

Only 10 databases have been documented as using a quality control procedure including Mozambique, the U.S., Australia, Canada, and Ecuador (GRIP and OSSO, 2010). For Nepal, the Philippines, Vietnam, Indonesia, Sri Lanka, Below et al. (2010) reports that validation and quality control procedures are applied, but the documentation is not available. In Mozambique for example, the data sources used have been classified as primary, secondary and tertiary according to the level of credibility (i.e. tertiary sources are media and newspapers). The quality control and validation procedure consists of validating the information collected from the primary sources with the secondary and tertiary ones before entering the data in the database. In Ecuador, since 2007, Provincial Boards coordinate with the other agencies, such as fire departments, the Red Cross and police to collect and validate information for the database. The U.S. Sheldus database is quality controlled and validated three times by three different people by hand, in addition to a first automatic screening done by the system once the data is entered online. The Australian database is verified and updated regularly, while for the Canadian database, the data is updated and reviewed on a semi-annual basis.

4. Accessibility

Out of the 57, 49 databases provide open data access through a freely accessible website which allows data searches and downloads into easy to use formats (i.e. excel, CSV etc.), eight databases have limited or no access (the Andean region, Armenia, Bangladesh, Caribbean, Ethiopia, Kenya, the Philippines, Thailand) (Figure 15). The Andean database link is not functioning and Armenia, Ethiopia, Kenya and Thailand do not provide access to the data. The Caribbean database provides limited access as the data has to be requested online and only data for one day within the current month can be requested. The Bangladesh database provides limited access as the data can be viewed on-line but cannot be downloaded. The Philippines database also provides limited access as the data is available in the form of disaster reports (in pdf format) and cannot be downloaded as a complete dataset. Links to the accessible databases are provided in Annex 2.

Figure 15 Database accessibility



5. Database uses

Applications have been documented for 21 databases and 24 database users (international organizations, NGOs, governments, research, media, private sector). DesInventar records the number and statistics of on-line users (http://www.desinventar.net/stats/) which records up to 12,000 users per month.

For each of the 21 databases there are one or more applications. Details are provided in the Annex 2. Note: This analysis is based on documented applications retrieved from the sources used (section III.1.2); additional applications which might exist but are not publically available were not included in this analysis.

The following database applications were found:

- Research:
  - Forensics, disaster trends and disaster impact assessment: Argentina, Bolivia, Chile, Colombia, Costa Rica, Ecuador, Honduras, Indonesia, Mozambique, Nepal, Panama, the Philippines, Peru and Sri Lanka. For example in Honduras, the data from the national database was used by United Nations Economic Commission for Latin America and the Caribbean (ECLAC) (1999) for the assessment of the damage caused by hurricane Mitch (1998) and its implications on economic and social development and the environment;
  - Climate variability: Argentina, Chile, Colombia, Costa Rica, Ecuador and Peru. For example in Colombia, as part of an ENSO disaster risk management in Latin America project, the data from the disaster loss database was used to assess the possible correlation between ENSO and disaster losses. A report was published to synthesize the results: "Colombia El Niño's Path 1980-2001: Some interpretations, opportunities and uses;"
  - Risk assessments: Argentina, Bolivia, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Indonesia, Peru, Sri Lanka, Trinidad and Tobago and Venezuela. For example in Sri Lanka, the disaster loss data was used to support the development of national multi-hazard profiles for coastal erosion, drought, floods, landslides, lightning, sea level rise, storm surges, tropical cyclones and tsunami;
  - Hotspots analysis of historical losses: Mozambique and Costa Rica. For example in Mozambique, the data was used to perform a loss hotspots and disaster trends analysis that was presented at a ministerial meeting in 2011 to inform the government on the location of potentially high risk areas and disaster trends (i.e. it showed that human-animal conflict was a new emerging and hitherto neglected threat);
- Policy:
  - Disaster response: Armenia and Indonesia. In Armenia the data is used by the Crisis Management Center, which is part of the Ministry of Emergency situations, to support disaster response;
  - DRR: Armenia, Ecuador, Indonesia, Mozambique, Nepal, the Philippines, Sri Lanka and U.S. Sheldus. In Nepal for example, the data from its national disaster loss database is used to inform DRR policy decisions (NSET, 2011). In Ecuador, the data from the national disaster loss database has been used to develop risk profiles as an evidence base for development of a national DRR plan (Demoraes and D'Ercole, 2001);
  - Recovery: Peru and Sri Lanka. For example in Peru the data was used as an input into the "Strategic Framework for Sustainable Recovery and Vulnerability Reduction in the area affected by June 23 earthquake in Peru";
  - National resource allocation: Bangladesh, Indonesia, Sri Lanka and Vietnam. For example in Indonesia, the database is used to inform policy decisions and has contributed to the allocation of 1% of the annual national budget to disaster risk management;
  - Development planning: Colombia, Nepal and Sri Lanka. For example the Sri Lanka disaster loss data was incorporated into the "Integrated Strategic Environment Assessment" to support the post conflict development process in 2010 and 2011.

In addition to being useful at the country level, the GAR in 2009, 2011 and 2013 made use of many of these national and sub-national databases to identify 'extensive risk' i.e. small-scale loss events (UNISDR, 2009; UNISDR, 2011; UNISDR, 2013).

Out of the 21 databases with documented applications:

- 13 are hosted by a government – which implies that 28% of the databases hosted by governments have applications. These applications include eight policy applications (i.e. NSET, 2011; Demoraes and D'Ercole, 2001) and seven research/analysis ones (i.e. ECLAC, 1999);
- Two are hosted by NGOs (Colombia and Nepal) – Both databases have both policy and research applications;
- Six are hosted by research institutes/universities (Argentina, Chile, Guatemala, Peru, Trinidad and Tobago, U.S. Sheldus) – All six databases have research applications of which only one was policy-related (U.S. Sheldus).

The proportion of databases for which applications of the data have been documented is higher for the non-governmental group than for the group of databases hosted by governments. The number of databases with documented applications remains low overall. Extracting value from disaster data requires capacity development not only on how to collect and organize data but also on applications and/or analyses. Moreover, in order to be useful, the database needs to fulfil certain minimum requirements that allow for use of its data. Key aspects to be taken into consideration are, for example: currentness of the data, continuity, credibility, accessibility and quality. These aspects will be further discussed in section IV.1 where each database is assessed against good practice criteria to highlight strengths and weaknesses that would bring to light the areas for further improvement of each database (Annex 2). Additional criteria that would indicate if the database is "fit" for a specific application would depend on the specific application, for example:

- Research applications:
  - Forensics, disaster trends, disaster impact assessment and hotspots analysis: use of disaster event ID that allows to aggregate/disaggregate losses, as well as access to/availability of archived disaster loss and damage data;
  - Climate variability: availability of data on key climate variables and attribution of associated losses;
  - Risk assessments: availability of data with the necessary level of details at appropriate administrative scale as well as use of disaster event ID that allows to link the disaster loss database to hazard databases;
- Policy/operational applications:
  - Disaster response: timeliness of disaster loss data and hazard information;
  - DRR: risk assessments based on realized risk (disaster loss data) and forward looking scenarios that take into account additional variables such as climate change, population growth, urbanization, environmental degradation etc.

Multi-stakeholder strengths, weaknesses, opportunities and threats (SWOT) analyses performed for specific databases for specific applications would be instrumental in setting directions for further tailoring of database development in specific contexts.

IV

IMPLICATIONS AND THE WAY AHEAD

The above analysis suggests a number of areas for further work to contribute to database sustainability, national ownership, continuity, credibility, accessibility, quality and application. Conclusions and lessons learnt are grouped to respond to two main questions (see IV.1, IV.2).

IV.1 What progress has been achieved towards developing disaster databases that are sustainable, continuous, credible, publicly accessible, quality assured and applied?

Historical loss and damage data are generally only useful if data is captured continuously over time. Although some hazards occur frequently, generally disasters are not daily events and tracking their behaviour requires continuous monitoring, ideally over decades. Even then, impacts of infrequently occurring geophysical events, such as earthquakes, volcanic eruptions and tsunamis will be inadequately reflected unless the period of record is very long. Usability also depends on accuracy and reliability since if the data are bad, conclusions and decisions based on them will be compromised. Finally, the entire exercise of data collection, quality control, etc. is only justified insofar as the data are used for risk management and loss reduction. The ideal database, therefore, is one that is sustainable, continuous, credible, publicly accessible, quality assured and applied for decision-making.

These characteristics are summarized in the following six criteria:

1. Up-to-date: a database that provides data until 2011/12;
2. Continuous (over a certain period of time): ideally a database does not have data gaps during the period of continuous recording and a percentage of blank/zero values greater than 40% over a minimum of 30 years – which has been selected as a period sufficient for a representative number of events to have occurred (with the aforementioned exception of those involving infrequent hazards);
3. Credible: a database that uses official data sources where possible (or a combination of official and unofficial ones);
4. Publicly accessible: a database that provides public access to the data (i.e. through a website);
5. Quality assured: a database that uses a quality control and validation procedure (although even if not documented a database might still be quality assured);
6. Applied: a database that has documented applications (research or policy applications for which the data provide evidence).

Databases are grouped in two groups and are analysed and compared according to the extent to which they meet the above good-practice criteria:

I. Group 1 includes the databases that are hosted by governments;
II. Group 2 includes the databases that are hosted by NGOs, research institutions/universities, and consortiums.

Annex 2 provides details for each database used to assess the degree to which the criteria are met.

IV.1.1 Group 1: Government-hosted databases

Analysing the 44 government hosted databases against the six best-practice criteria it appears that the majority are publicly accessible, credible, and up-to-date. Fewer databases meet the criteria related to continuity, applications and quality assurance (Table 7).

Table 7 Analysis of government hosted databases against the six best-practice criteria

Criteria	Number of government-hosted databases
1: Up-to-date	27 (61%)
2: Continuous	3 (7%) or 14 (32%) if databases with gaps in the earliest part of the recording period are included
3: Credible	31 (70%)
4: Publicly accessible	36 (82%)
5: Quality Assured	8 (18%)
6: Applied	13 (30%) Applications include: 8 policies, 5 analysis, 6 research

Among the 44 government-hosted databases, the database that best meets the above standards – and is up-to-date, continuous, credible, publicly accessible, quality assured and applied for decision-making (Demoraes and D'Ercole, 2001) – is Ecuador. **Ecuador's national database is an example to follow** among the government-hosted databases.

Box 1

The DesInventar database for **Ecuador** was developed under the responsibility of the National Polytechnic School, within the framework of different projects fostered by La Red and OSSO Corporation. The database is hosted by Secretaría Nacional de Gestion de Riesgo (SNGR) and provides information at national level covering the period between 1970 and 2011. The disaster related information provided includes all hazard types and both human and economic losses (in local currency and USD). This information was collected from official reports of the Civil Defense Provincial Boards, ministries, 911, fire departments, emergency centers, research institutes, the Red Cross, and several newspapers: El Comercio de Quito, and El Universo de Guayaquil. Since 2007, Provincial Boards coordinate with the agencies with which data were collected to validate information before entering it in the database. The database has been used for analyses, reports and studies to support decision-making processes. Users include research institutions and international organizations including UNISDR, OXFAM and others.

Several databases also have a relatively high number of desirable characteristics. Out of the 44 databases which are hosted by governments, those that are up-to-date, continuous (over 30 years minimum), credible and publicly accessible include 13 databases: Australia, Bolivia, Canada, Djibouti, Ecuador, Guyana, Indonesia, Morocco, Orissa, Panama, Sri Lanka, Tamil Nadu, Venezuela. Some of these databases contain data gaps and not all have a quality control procedures nor documented applications. Nevertheless they provide good examples for further examination. Among the 13 databases, three do not contain gaps (Bolivia, Ecuador and Orissa), nine contain gaps in the first period of recording and Canada has gaps of only two years.

A key criterion that could be only partially assessed in the current analysis is the extent to which the data are being used to guide decision-making. Further investigation into which characteristics lend themselves to database uptake (accessibility being an obvious one) is needed.

10 out of the 13 databases identified above, (Bolivia, Canada, Djibouti, Ecuador, Indonesia, Orissa, Panama, Sri Lanka, Tamil Nadu and Venezuela) have one characteristic in common: they are integrated into the broader national institutions and coordination systems, such as the Civil Protection system, local governments, Operational Emergency Centers etc. Being present at local level, they are closer to the ground when disasters happen leading to collection of reliable and timely disaster information. The above suggests that **the integration into existing national systems should be promoted when developing disaster loss accounting systems** instead of creating stand-alone systems. In addition, this not only represents an economically convenient solution but also leads to systems that provide up-to-date, reliable, credible and continuous disaster information over time.

IV.1.2 Group 2: Non-government hosted databases

Analysing the 13 non-government hosted databases (two hosted by NGOs, nine by research institutes/universities, two by consortiums) against the six best-practice criteria it appears that all are publicly accessible and the majority are up-to-date, credible and applied. Fewer databases meet the criteria related to continuity and quality assurance (Table 8).

Table 8 Analysis of non-government hosted databases against the six best-practice criteria

Criteria	Number of non-government hosted databases
1: Up-to-date	9 (69%)
2: Continuous	4 (31%) (Jamaica, Nepal, U.S. Sheldus, U.S. PERI) or 5 (with Colombia) (38%) if databases with gaps in the earliest period of recording are included
3: Credible	9 (69%)
4: Publicly accessible	13 (100%)
5: Quality Assured	2 (15%)
6: Applied	8 (62%) Applications include: 8 research, 3 policy, 2 analysis

Among the 13 non-government hosted databases the databases that best meet the best-practice criteria – and are up-to-date, continuous, credible, publicly accessible, quality assured and applied for decision-making – are **Nepal** and **U.S. Sheldus**. Additional databases that are up-to-date, continuous (over 30 years minimum), credible and publicly accessible include **Jamaica and Colombia**, although the latter has recording gaps in the early part of the recording period.

IV.1.3 Comparing government and non-government hosting arrangements

The comparison between the characteristics of databases hosted by governmental and non-governmental institutions suggests that non-governmental hosting arrangements leads to higher accessibility, continuity and use of the databases (Table 9).

Table 9 Analysis of government versus non-government hosted databases against the six best-practice criteria

Criteria	Number of government-hosted databases	Number of non-government hosted databases
1: Up-to-date	27 (61%)	9 (69%)
2: Continuous	3 (7%) or 14 (32%) if databases with gaps in the earliest period of recording are included	4 (31%) (Jamaica, Nepal, U.S. Sheldus, U.S. PERI) or 5 (38%) if databases with gaps in the earliest period of recording are included
3: Credible	31 (70%)	9 (69%)
4: Publicly accessible	36 (82%)	13 (100%)
5: Quality Assured	8 (18%)	2 (15%)
6: Applied	13 (30%) Applications include: 8 (42%) policies, 5 (26%) analysis, 6 (32%) research Note: percentages are calculated on the total number of applications for this type of databases (19)	8 (62%) Applications include: 3 (23%) policy, 2 (15%) analysis, 8 (62%) research Note: percentages are calculated on the total number of applications for this type of databases (13)

The main substantial difference that emerges between the two groups is how the data from these databases are applied and used. The analysis shows that the percentage of databases hosted by non-governmental institutions with documented applications is higher than in the case of databases hosted by governments. Nevertheless, the non-governmental hosting arrangement leads mainly to research type applications of databases, while the governmental hosting often leads to policy

applications of those databases. This means that research appears to be an application that is able to sustain the on-going functioning of disaster loss databases hosted by non-governmental institutions. This result also shows that non-governmental institutions appear to be a valid hosting arrangement that can lead to databases that present several desirable characteristics. Nevertheless, looking at only research applications, the databases hosted by non-governmental institutions might not reach their full potential of informing disaster risk reduction decision-making. In addition, as mentioned in paragraph IV.1.2, in case of databases hosted by non-governmental institutions, policy applications are highly desirable also because it appears that they ensure maintenance and good quality of the databases (as in the cases of Nepal and U.S. Sheldus)

IV.2 The way ahead: what are some priority areas for improvement?

The priority areas for improvement of disaster loss databases that emerge from the above analysis include:

- Developing country capacity for systematic disaster data collection, interpretation, use and clear policy/ operational benefit;
- Improving the quality of disaster loss data (especially economic losses);
- Implementing quality control and validation procedures;
- Defining a set of well-defined minimum parameters to be collected;
- Completing and applying standards for hazard event recording and loss attribution;
- Promoting disaster loss database use (especially policy applications);
- Exploring the use of new information technology and communication (ITC) technologies for loss and damage assessment.

The following section provides more detail on each of these lessons learned which lead to recommended actions for improving loss databases.

- **Capacity plays a key role in achieving up-to-date, continuous, credible, accessible and applied disaster loss databases.**

The most successful examples of national databases (such as Ecuador, Indonesia, Colombia, and Armenia) show that capacity plays a key role in achieving up-to-date, continuous, credible, accessible and applied disaster loss databases. Moreover, the quality of the data depends on this capacity. In particular, through its experience in supporting the development databases in Asia, UNDP recognized that the establishment and support of an enabling environment for disaster risk reduction to assist with the institutionalization and long-term sustainability of a disaster loss database must be in place for implementing best-practice databases. Implementing databases in conjunction with other DRR capacity building activities and embedding them within national structures ensures local ownership and management of the data that contribute to its continuity and use.

In particular, the following factors contribute to successful database institutionalization:

1. Existence of a national disaster management organization with the mandate to perform loss data collection and analysis;
2. Existence of minimum infrastructure to support establishment and maintenance of database (such as a dedicated server, set of computers and monitors, network attached storage for back-up, high quality network connection, etc.);
3. Human resources dedicated to collecting data and maintaining the database.

- **Economic losses and number of deaths are the most frequently used parameters for tracking disaster losses trends. Nevertheless most databases collect such information in an incomplete and discontinuous manner (especially economic losses).**

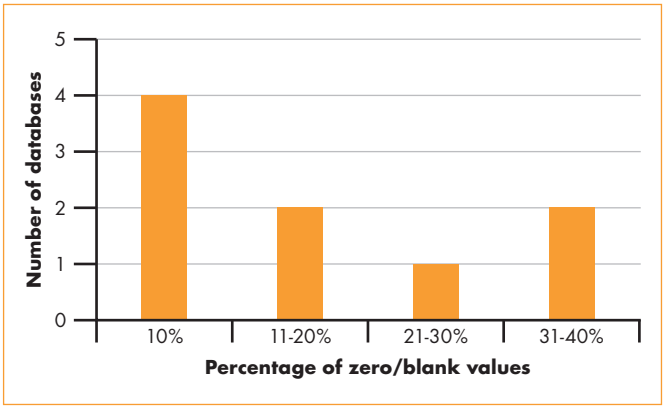
Out of the 57 databases analysed, 81% have a percentage of blank or zero values for economic losses in excess of 80%. Moreover, 63% of the databases have a percentage of blank or zero values for deaths greater than 80%. The fact that zero values are not distinguished from missing data in many databases makes it impossible to establish the extent to which these high numbers of zero values are due to the fact that not all disasters involve deaths versus the extent to which mortality data is unavailable. In the case of economic losses, since by definition all disasters involve physical loss and damage, it is likely that the large number of missing values arises from infrequent conversion of physical damage and loss into its economic equivalencies. GAR 2013 will present a methodology to estimate economic losses based on DesInventar

physical damage parameters. The parameter which appears to be the most complete is affected population, the parameter with the most ambiguous definition. This suggests that further efforts are needed to establish systems for the routine collection of loss and damage data at local level on an event-by-event basis and for the consistent reporting of that data to the institution responsible for maintaining the database. This may require formalization of mandates, assessment guidelines and reporting procedures (for example a standard data collection format with well established procedures and guidelines) and dedicated staff with continuity.

- **Quality control and validation not only leads to good data quality but also to increased data use.**

Only 10 out of 57 databases appear to have a quality control and validation procedure being applied (Australia, Canada, Ecuador, Indonesia, Mozambique, the Philippines, Sri Lanka, Vietnam, Nepal and U.S. Sheldus) (Figure 16). Out of these 10 databases, eight are hosted by governmental institutions (Australia, Canada, Ecuador, Indonesia, Mozambique, the Philippines, Sri Lanka and Vietnam), one by NGO (Nepal), one by research center/university (U.S. Sheldus). Seven out of the 10 provide data through 2011-2012 (Australia, Canada, Ecuador, Indonesia, Nepal, Sri Lanka, and U.S.) and all 10 use official sources. Quality control appears to improve the issue of database completeness as 40% of the databases have less than 20% blanks/zero (DesInventar) values for deaths. Nevertheless a high percentage (70%) of them have more than 70% blanks/zero (DesInventar) values for economic losses. Quality control and validation, therefore, appear not to be a panacea for improving the quality of economic losses data, which will rely on more consistent application of standardized economic damage and loss estimation methods. All 10 databases using quality control procedures have a percentage of records with all blanks/zeros (DesInventar) of less than 40% and four have a percentage of less than 10% (Australia, Canada, Sri Lanka, U.S.). UNISDR provides quality control procedures for Desinventar-format databases (UNISDR, personal communication). Universal quality control standards remain to be developed and widely adopted.

Figure 16 Number of quality-controlled databases with percentage, by range class, of entries with all values blank or zero. For the Philippines database this information is not available as it provides limited data access



Quality control procedures not only lead to better quality data but among quality-controlled databases there is a high percentage of databases for that have been utilized (80% for policy applications). 70% of the users are governments. 60% of the quality controlled databases have multiple types of users in addition to the hosting institution (i.e. government, research, NGOs, media, international organizations). This suggests that these databases have acquired credibility as a consequence of quality controlled data leading to widespread use. Highly significantly, 90% provide open access to the data.

In conclusion, the analysis shows that having a quality control and validation procedure applied brings important benefits in terms of better quality and greater use of the data. Nevertheless, most of the databases do not have such a procedure (or it could not be documented).

If databases do not yet use such procedures, they are encouraged to do so, as this allows errors to be identified, results of analyses to be more reliable and the data to be more credible and widely used. Increased use of the data in turn contributes to sustainability.

- **Too many parameters, often with unclear definitions, are being collected leading to discontinuous and incomplete data records.**

77% of the databases (DesInventar ones) collect between 14 and 17 parameters, many of which have unclear or potentially confusing definitions. This leads not only to discontinuous and incomplete databases but also to human errors in data collection or registration or both.

25% of the databases have multiple parameters for which no non-blank (or non-zero in the case of DesInventar) values have been recorded. In the future it would seem advisable to reduce the number of parameters being collected and to develop a standardized set of clearly defined, essential ones that should fall into mutually exclusive categories and have precise measurement units for each variable, a minimum commonly agreed spatial unit and level of associated uncertainty for each parameter (for example it would be critical to have a precise location and time). Additional parameters important for local applications, e.g. dog bites and elephant attacks, etc. could be incorporated into specific databases idiosyncratically. Standardized fields should, as much as possible, conform to standardized assessment methodologies, e.g. Multi-stakeholder Initial Rapid Assessments and Post Disaster Needs Assessments or national standards, and align with these assessment methodologies' sectoral constituent data elements. This way, data collected through post-disaster assessments can be routinely imported directly into the databases through standing reporting channels. Moreover, the adoption of a disaster event ID would allow disaster loss and damage databases to link with other databases containing, for example, sectoral data and hazard information. This will reduce the need for a centralized database with too many parameters and lead instead to a decentralized system made up of different databases contain relevant ancillary information.

- **Further work is needed to complete and apply standards for how hazard events are recorded and how losses are attributed to them on an event-by-event basis.**

Assuming a loss and damage database records data on losses and damages associated with hazard events, such a database should be able to reliably specify:

- The type of hazard event involved;
- The geographic area affected; and
- The losses and damages which have occurred.

Hazard event characterization

A hazard event can be characterized in terms of duration, magnitude, location, and timing. Internationally-accepted standards exist for characterizing some hazards in these terms, but not all of them, drought being a notorious example. Some hazards are routinely observed and reported by government institutions or scientific networks whereas others are not. Hazard events are sometimes difficult to isolate, e.g. three weeks of widespread, intermittent but heavy rainfall associated with a spatially- and temporally-extensive low-pressure system. And one hazard event can trigger another, e.g. heavy rainfall leading to a landslide. These challenges make hazard event definition for the purpose of loss attribution genuinely challenging. A number of guidelines for addressing these challenges have been proposed (Below et al., 2009; Low and Wirtz, 2010; Canada's hazard classification). These guidelines are not universally applied, however. Although such guidelines may reflect international standards for hazard characterization where such exist, the guidelines themselves do not currently enjoy official international standard status. WMO is initiating an initiative for standardization of data and metadata for more than 20 meteorological, hydrological and climate related hazards for geo-referencing the loss and damage data as one of its key aspects.

Recently the issue of loss and damage has become an important consideration within the framework of the UN Framework Convention on Climate Change. In this context climate-related losses and damages can include those associated with long-term, incremental processes (often referred to as slow-onset events) as well as extreme hazard events. Incremental loss and damage such as coral bleaching and coastal erosion could be annualized, as opposed to captured on an event-by-event basis. Incorporating these types of losses could require an expanded set of parameters, and the degree to which these could be standardized would require further investigation. The application of unique event numbers in this context would also need to be reconsidered. These types of losses and damages associated to incremental processes (often referred to as slow-onset events) are otherwise comparable to those associated with hazard events, however, as long as they can be attributed to an environmental change or process and the unit of losses and their economic equivalencies can be estimated.

Geographic area affected

Databases have adopted different strategies for characterizing the geographic area affected. DesInventar, the platform for most of the databases reviewed here, contains an entry for each sub-national geographic area in which losses have occurred. A single entry in EM-DAT (a global database), on the other hand, contains all losses associated with a hazard

or related hazards and includes a description of the geographic area affected. Eight out of the 57 databases analysed adopt a similar approach to EMDAT. Australia's database, for example, records a disaster event, and its associated losses, in one entry and describes the area affected by recording the "zone(s)" and "region(s)" affected. The Bangladesh database records the geographic information in only one parameter called "coverage" while in Canada's database this information is recorded as "place." The DesInventar structure has the potential to provide better geographic precision and the particular hazard associated with the damages in a particular locality can be identified. But it is difficult to then aggregate up across all affected areas to arrive at a total loss and damage figure for large-scale hazards affecting large geographic areas.

One solution which has been developed to address this involves the use of a unique disaster event identifier, such as the GLIDE (described earlier). Out of the 57, only 12 databases use a unique disaster event identification number, however. As described previously this affects comparison of data across databases and inhibits consistent attribution of losses and damages to hazard events. In DesInventar, for example, where the unit of analysis for an entry is the municipality rather than the hazard event, assigning a common event identifier to each hazard event would allow losses and damages associated with a given hazard to be aggregated across all affected locations.

Characterization of losses and damages

Two issues in this category are the degree to which there is clarity and standardization in the definition of a set of loss and damage parameters, and the accuracy and regularity with which the requisite data can be collected. The latter issue is a function of the robustness of the loss assessment and reporting system. The two issues are related because even a robust assessment and reporting system would fail to result in reliable and accurate data when the nature of the parameter itself is unclear. A contrast can be drawn, for example, between the commonly occurring parameters "killed" and "affected" population. For mortality, the primary problem is not with the definition but rather with data collection and hazard attribution (drought being a particularly problematic case). Conversely, "affected" has no universally-understood meaning and therefore data on affected population is no more than broadly indicative. Similar difficulties arise with respect to definitions of "victims," housing, agriculture and so on. Yet it may be that internationally, or at least nationally, accepted norms and standards could exist that could strengthen how this data is collected at field level and recorded subsequently in loss and damage databases. An effort on disaster human impacts characterization that aims to compare existing terminology and develop standardized terms has been led led by CRED, UNDP/GRIP, Munich Re, Swiss Re, IFRC, UNISDR and WFP (CRED, 2011).

The issue of how to handle missing versus zero values is also fundamental. Ideally, parameters for which data is not collected or not reported, or the levels and damage are otherwise not known, would be flagged as missing. Conversely, when it has been confirmed that no losses have occurred – e.g. no deaths, or no losses in a particular sector, such as housing loss and damage during a drought – the losses would be recorded as zero. This important consideration has a major impact on data interpretation and usability and is an appropriate point concerning which guidance and standards should be developed.

As mentioned earlier, some standardization of parameters may be possible, so that core values, such as gender-disaggregated mortality are consistently recorded. Guidelines, standards and tools for converting physical losses and damages into economic equivalencies would improve the quantity and quality of economic loss data.

Further sustained and focused investigation into each of the above areas would help in determining the extent to which standards exist which could be adopted to address the various complexities involved in arriving at complete, accurate and reliable data. Definition and systematic application of such standards internationally would contribute to not only better country-level disaster loss and damage reporting and analysis but would also be a means of significantly strengthening the credibility and usability of loss and damage data for estimating the disaster burden on development globally as well. A multi-stakeholder consultative process to promote convergence on best-practice standards is envisioned as a useful follow-up to the current study. Additional indicators/criteria will be included in any further investigation with more in-depth regional focus.

- **Finally, there is the need to invest in a complete overhaul of existing software and make use of information technology and communication (ITC) technologies for loss and damage assessment.**

Current ITC technologies have the potential to improve disaster loss and damage assessment and reporting (i.e. crowd-sourcing), a potential which remains to be fully exploited. There is the need to invest in such technologies in disaster loss data collection, reporting, access etc. For example, tools with user-friendly interfaces could help in standardizing data collection and reporting processes and promote uniform quality criteria.

Endnotes

1 The Hyogo Framework for Action (HFA) is an international framework for disaster reduction endorsed by 168 countries at the World Disaster Reduction Conference in 2005. The HFA has a logical framework-type structure, with five priority areas for action that, undertaken together, are expected to yield a substantial reduction in disaster losses.

2 Geological, hydro-meteorological and climatological.

3 These include for example databases for the West Sumatra province in Indonesia and the Online Southeast Asia Disaster Inventory hosted by the Pacific Disaster Center (http://www.pdc.org/osadi), which are password protected, and the Nusa Tenggara Timur, Central and East Java, Maluku, Bali and North Sulawesi province databases whose websites at the time of this writing were not functioning.

4 Hosted by UNDP, GRIP is a multi-stakeholder initiative that aims to promote sustainable development by reducing the impacts of natural disasters in high risk countries. With the mission of providing "Better risk information for sound decision making", GRIP facilitates the generation of evidence-based risk information, and its application to policy and decision making. Officially launched as a United Nations' International Strategy for Disaster Reduction (UNISDR) Thematic Platform for Risk Identification in 2007 at the 1st session of the Global Platform for Disaster Risk Reduction, GRIP has been adopted by the UNISDR system to support worldwide activities to identify and monitor disaster risks. With the completion of GRIP's planned multi-year programme cycle this year, the current report will provide strategic guidance for UNDP's future work in this area.

5 PREDECAN (Prevención de Desastres en la Comunidad Andina [Disaster Prevention in the Andean Community]) is a cooperation project between the General Secreteriat of the Andean Community and the European Union in the area of risk management and disaster prevention.

6 These include: Anguilla, Antigua and Barbuda, Bahrain, Botswana, Barbados, Belarus, Burkina Faso, Cape Verde, China, Croatia, Cuba, Fiji, Finland, France, Georgia, Ghana, Greece, Hungary, Italy, Japan, Kazakhstan, Kyrgyzstan, Madagascar, Malawi, Nigeria, Nauru, Niger, Norway, State of Palestine, Paraguay, Portugal, Romania, Rwanda, Samoa, Slovenia, Sweden, Switzerland, Tanzania, Tonga, Turkey and Zambia.

7 In addition, UNDP is supporting Bolivia and Ecuador to establish a National Disaster Observatory.

8 For definitions, please refer to Below et al. (2009).

9 Note: regions are not entirely covered by the 57 databases analysed.

10 These include 53 national, four sub-national databases (Mizoram, Uttar Pradesh, Tamil Nadu and Orissa in India), two regional (Caribbean and Andean) and one event-based databases (for hurricane Mitch).

11 For the remaining three this information is not available – for the Andean region, Caribbean, and Thailand, because the database is not publically accessible.

12 In DesInventar, "victims" is defined as: "The number of persons whose goods and/or individual or collective services have suffered serious damage, directly associated with the event. For example, partial or total destruction of their homes and goods; loss of crops and/or crops stored in warehouses, etc. If the information refers to families, calculate the number of people according to available indicators."

13 In DesInventar, "affected" is defined as: "The number of persons who suffer indirect or secondary effects related to a disaster. This refers to the number of people, distinct from victims, who suffer the impact of secondary effects of disasters for such reasons as deficiencies in public services, commerce, work, or because of isolation. If the information refers to families, calculate the number of people according to available indicators."

14 Out of the 57 databases analyzed, 13 provide data through 2009, and 42 through 2010. Out of the 42 which recorded data at least until 2010, six last recorded data in 2010, 36 recorded data through 2011 and 16 through 2012 (for two databases this information is not available).

V

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Annex 1 Country-level databases supported by UNDP

Country	UNDP's Support
1. Armenia;	Financial and technical.
2. Bangladesh;	Financial (with European Union and UK Department for International Development).
3. Belize	(Under-development).
4. Bhutan;	Technical support and training provided by UNDP Asia-Pacific Regional Center (APRC).
5. Bolivia	(NDO Under-development).
6. Cambodia	(Under-development).
7. Ecuador	(NDO Under-development).
8. Egypt;	Financial.
9. El Salvador;	Financial.
10. Guyana;	Within the framework of UNDP regional project (Risk Management in the Caribbean), a component called DesInventar Caribbean was formulated. This component was implemented through a Memorandum of Understanding signed between La Red and United Nations Office for Project Services. The main goal was to develop a disaster inventory in four Caribbean countries in order to prove its benefits and, if appropriate, implement disaster inventories in all the countries of the Caribbean Basin. The inventories were to cover the period between January 1, 1971 and December 31, 2000 and Cuba, Jamaica, Trinidad and Tobago and Haiti were initially selected. Guyana was later added but Cuba and Haiti were dropped from the list.
11. Indonesia;	Support in implementing disaster loss databases has included financial support for acquiring equipment, provision of full-time staff, training for the staff, technical assistance in the development of work plans and database customization, as well as guidance on the implementation process. (UNDP, 2009).
12. Iran;	Support to database development, implementation and hosting.
13. Jamaica;	See 10.
14. Laos;	Yes.
15. Lebanon;	Financial.
16. Liberia	(Under-development).
17. Maldives;	See 11.
18. Mizoram (India);	Support to database implementation.

Country	UNDP's Support
19. Moldova	(NDO Under-development).
20. Mozambique;	Support to database development and implementation.
21. Myanmar	(Under-development).
22. Nepal;	Support to database implementation (UNDP, 2009).
23. Orissa;	Support to database implementation.
24. Pakistan	(Under-development).
25. Sri Lanka;	See 11.
26. Syria;	Financial.
27. Tamil Nadu;	See 11.
28. Thailand;	See 11.
29. Timor Leste;	Support to database development and implementation.
30. Trinidad and Tobago;	See 10.
31. Tunisia	(Under-development).
32. Uganda	(Under-development).
33. Uttar Pradesh;	Support to database implementation.
34. Vietnam;	Support to database implementation.
35. Yemen.	Support to database development and implementation.

ANNEX 2

Database Characteristics						Database Contents Profile																				Quality Assurance		Uses		Accessibility		Focal point(s)
Region	**Area**	**System**	**Type of hosting institution**	**Hosting institution**	**Language**	**Year first entry**	**Year last entry**	**Year of database establishment**	**Time frame covered**	**Geographic coverage**		**Type of hazards**	**Type of losses**	**Data source(s)**	**% zero/ blank values in deaths**	**% zero/ blank values in economic losses USD**	**% zero/blank values in affected**	**% records with all values equal to zero/ blank**	**Parameter with most complete dataset**	**Parameter with least complete dataset**	**Number of entries in the database**	**Definition of database entry**	**Data gaps**	**Years of data gaps**	**Longest interval w/o gaps**	**Disaster event identification number (ID)**	**Availability of standards**	**Availability of quality control procedure**	**Type of applications**	**Type of users**	**Accessibility**	**Access**	
Name	Name	Name	Government, Research Institute/ University, NGO, Consortium, Other	Name	Local, English	yyyy	yyyy	yyyy	number of years	National, Regional, Local, Event		Climatological, Meteorological, Hydrological, Geological	Human and/or Economic	Official, unofficial	% records containing zero/blank values in deaths	% records containing zero/blank values in economic losses in USD	% records containing zero/blank values in affected	% records containing all zero/blank values	Parameter with dataset with lowest % zero/ blank values	Parameter with dataset with highest % zero/blank values	Number of data entries in the database (as of 1, December 2012)	Disaster event, Recorded loss	Yes (in which years), No	Number of years	Number of years	Yes (which ID is used), No	Yes, No	Yes, No	Policy, Research	International Organizations (IOs), NGOs, Government, Research, Media, Private sector, Other	Yes, No, Limited	Link	Name(s) (E-mail)
AMERICAS	Andean	Andean Information System for Disaster Prevention and Relief (SIAPAD)	Government	CAPRADE (Comité Andino para la Prevención y Atención de Desastres)	NA	NA	NA	NA	NA	Regional		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	No	No	No	No	No	Website not functioning	Ruben Vargas (rdvargas@comunidadandina.org)
AMERICAS	Argentina	DesInventar	Research Institute/ University	Centro de Estudios Sociales y Ambientales (CENTRO)	Local	1970	2009	1994-2000	39	National		All	Human and Economic	Official, unofficial	91	98	95	59	evacuated (80.76%)	ec.losses in local currency (99.9%)	16211	recorded loss	No	0	39	No	Yes	No	Research (disaster trends, climate variability, risk assessment)	Research, IOs, Governement, Private sector	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=ar11	CENTRO (cesamargentina@gmail.com)
EU-CIS	Armenia	Stand-alone (MS access)	Government	Ministry of Emergency Situations	Local	1996	2011	2011	15	National		All	Human and Economic	Official	NA	NA	NA	NA	NA	NA	NA	disaster event	NA	NA	NA	Yes (disaster event ID)	Yes	No	Policy (response, DRR)	Government	No	NA	CMC Nikolay Grigoryan (nik@emergency.am)
ASIA-PACIFIC	Australia	Emergency Management Australia Disasters Database	Government	Emergency Management Australia	English	1753	2012	NA	259	National		All	Human and Economic	Official	19	NA	NA	4	deaths (19)	ec.losses (78)	630	disaster event	Yes (before 1900)	147	112	Yes (GLIDE)	Yes	Yes	No	No	Yes	http://www.disasters.ema.gov.au/	disastersdatabase@ag.gov.au
ASIA-PACIFIC	Bangladesh	Disaster Incidence Database (DIDB) of Bangladesh	Government	Disaster Management Information Center (DMIC)	English	1970	2009	NA	39	National		All	Human and Economic	Official, unofficial	62	NA	NA	NA	NA	NA	76	disaster event	NA	NA	NA	Yes (GLIDE, CRED, 2010)	Yes (CRED, 2010)	No (CRED, 2010)	Policy (national resource allocation)	Government, Research	Limited	www.dmic.org.bd/didb	Tasdiq Ahmed (tasdiq@gmail.com), Shahidul Islam (ms_islam@yahoo.com)
ASIA-PACIFIC	Bhutan	DesInventar	Government	Department of Disaster Management	English	2009	2012	NA	3	National		All	Human and Economic	NA	94	100	97	5.15	houses damaged (10)	ec.losses in USD, missing, relocated, evacuated, damage in crops (100)	194	recorded loss	yes (2010)	1	2	No	Yes	No	No	No	Yes	http://202.144.148.131:8080/DesInventar/main.jsp	Mr. Tshering Wangchuk
AMERICAS	Bolivia	DesInventar	Government	Viceministerio de Defensa Civil y Cooperación al Desarrollo Integral - LA RED	Local	1970	2011	NA	41	National		All	Human and Economic	Official, unofficial	88	98	82	39	victims (66)	relocated (99)	3993	recorded loss	No	0	41	No	Yes	No	Research (disaster trends, risk assessment)	Government, Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=bol	Viceministerio de Defensa Civil y Cooperación al Desarrollo Integral (videcicode@gmail.com)
AMERICAS	Canada	Canadian Disaster Database	Government	Public Safety Canada	English	1900	2012	NA	112	National		All	Human and Economic	Official	4.3	74	1	1	affected (2.4%)	NGO payment (99%)	1004	disaster event	Yes (1932, 1926)	2	86	No	Yes	Yes	No	No	Yes	http://www.publicsafety.gc.ca/prg/em/cdd/index-eng.aspx	cdd-bdc@ps-sp.gc.ca
AMERICAS	Caribbean	Caribbean Disaster Events Database	Government	CDERA	NA	NA	NA	NA	NA	Regional		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	No	No	No	No	Limited	http://www.cdera.org/doccentre/disasterevents.php	CDERA (cdera@caribsurf.com)
AMERICAS	Chile	DesInventar	Research Institute/ University	University of Chile	Local	1970	2011	2000-2005	41	National		All	Human and Economic	Unofficial	85	99	94	43	victims (78)	relocated (99)	13237	recorded loss	No	0	41	No	Yes	No	Research (disaster trends, climate variability, risk assessment)	Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=chl	Alejandro Leon (aleon-a@uchile.cl)
AMERICAS	Colombia	DesInventar	NGO	OSSO Corporation	Local	1914	2012	1994-2000	98	National		All	Human and Economic	Official, unofficial	89	99	57	32	affected (57)	ec. losses in USD (99)	33817	recorded loss	Yes (before 1937)	23	75	No	Yes	No	Policy (development planning), Research (disaster trends, risk assessment, climate variability)	Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=col	OSSO (osso@osso.org.co); Camillo Polanco (cpolanco@eafit.edu.co)
AMERICAS	Costa Rica	DesInventar	Government	Comisión Nacional de Prevención de Riesgo y Atención de Emergencias (CNE)	Local	1968	2011	1994-2000	43	National		All	Human and Economic	Official, unofficial	97	98	98	48	houses damaged (63)	missing (99)	14116	recorded loss	Yes (before 1970)	2	41	No	Yes	No	Research (disaster trends, hotspots, climate variability, risk assessment)	Government, Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=cri	CNE (comunicaciones@cne.go.cr)

Database Characteristics						Database Contents Profile																						Quality Assurance		Uses		Accessibility		Focal point(s)
Region	**Area**	**System**	**Type of hosting institution**	**Hosting institution**	**Language**	**Year first entry**	**Year last entry**	**Year of database establishment**	**Time frame covered**	**Geographic coverage**		**Type of hazards**	**Type of losses**	**Data source(s)**	**% zero/ blank values in deaths**	**% zero/ blank values in economic losses USD**	**% zero/blank values in affected**	**% records with all values equal to zero/ blank**	**Parameter with most complete dataset**	**Parameter with least complete dataset**	**Number of entries in the database**	**Definition of database entry**	**Data gaps**	**Years of data gaps**	**Longest interval w/o gaps**	**Disaster event identification number (ID)**	**Availability of standards**	**Availability of quality control procedure**	**Type of applications**	**Type of users**	**Accessibility**	**Access**	
Name	Name	Name	Government, Research Institute/ University, NGO, Consortium, Other	Name	Local, English	yyyy	yyyy	yyyy	number of years	National, Regional, Local, Event		Climatological, Meteorological, Hydrological, Geological	Human and/or Economic	Official, unofficial	% records containing zero/blank values in deaths	% records containing zero/blank values in economic losses in USD	% records containing zero/blank values in affected	% records containing all zero/blank values	Parameter with dataset with lowest % zero/ blank values	Parameter with dataset with highest % zero/ blank values	Number of data entries in the database (as of 1, December 2012)	Disaster event, Recorded loss	Yes (in which years), No	Number of years	Number of years	Yes (which ID is used), No	Yes, No	Yes, No	Policy, Research	International Organizations (IOs), NGOs, Government, Research, Media, Private sector, Other	Yes, No, Limited	Link	Name(s) (E-mail)
ARAB STATES	Djibouti	DesInventar	Government	Centre d'Études et de Recherches de Djibouti (CERD)	Local	1944	2012	NA	68	National		All	Human and Economic	Official, unofficial	80	100	53	34	affected (53)	houses destroyed, houses damaged, relocated, ec.losses in USD, ec.losses in local currency, education centers, hospitals (100)	1308	recorded loss	Yes (before 1979)	35	33	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=dji	
AMERICAS	the Dominican Republic	DesInventar	Research Institute/ University	Latin American Faculty of Social Science (FLACSO)	Local	1966	2000	2000-2005	34	National		All	Human and Economic	Unofficial	86	99	98	55	houses destroyed (85%)	hospitals (99.9%)	2111	recorded loss	No	0	34	No	Yes	No	No	Research	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=rdo	Lourdes Meyrelles (lourdesmeyrelles@hotmail.com)
AMERICAS	Ecuador	DesInventar	Government	Secretaría Nacional de Gestion de Riesgo (SNGR)	Local	1970	2011	1994-2000	41	National		All	Human and Economic	Official, unofficial	83	99	80	40	affected (80)	hospitals (99)	9417	recorded loss	No	0	41	No	Yes	Yes (but documentation NA)	Policy (DRR, preparedness), Research (disaster trends, climate variability, risk assessment)	Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=ecu	SNGR (informacion@snriesgos.gob.ec)
ARAB STATES	Egypt	DesInventar	Government	Information and Decision Support Center (IDSC)	Local	1980	2010	NA	30	National		All	Human and Economic	NA	79	100	96	51	injured (77)	victims, relocated, ec.losses in USD, education centers, hospitals (100)	83	recorded loss	Yes (coarse before 1991)	11	19	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=egy	Mohamed Fawzi (mohfawzi@idsc.net.eg)
AMERICAS	El Salvador	DesInventar	Government	National Service of Territorial Studies	Local	1900	2012	1994-2000	112	National		All	Human and Economic	Official, unofficial	90	99	80	53	affected (80)	relocated (99)	8528	recorded loss	Yes (before 1913)	13	99	No	Yes	No	No	Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=slv	SNET (ComunicacionesSNET@snet.gob.sv)
AFRICA	Ethiopia	DesInventar	Government	Ministry of Agriculture	English	1901	2010	NA	109	National		All	Human and Economic	Official, unofficial	87	100	37	33	affected (37)	missing, victims, evacuated, ec. Losses, education centers, hospitals (100)	23724	recorded loss	Yes (1961-77)	16	60	No	Yes	No	No	No	No		
AMERICAS	Guatemala	DesInventar	Research Institute/ University	Latin American Faculty of Social Science (FLACSO)	Local	1988	2011	1994-2000	23	National		All	Human and Economic	Official, unofficial	85	87	89	30	victims (70)	relocated (99)	5467	recorded loss	No	0	23	No	Yes	No	Research (risk assessment)	Research	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=gtm	Gisela Gellert (gisela_gellert@trespassers-w.com)
AMERICAS	Guyana	DesInventar	Government	Civil Defence Commission of Guyana	English	1972	2012	2000-2005	40	National		All	Human and Economic	Official, unofficial	91	92	83	26	houses destroyed (42%)	missing (100%)	899	recorded loss	Yes (before 2003)	31	9	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=guy	CDC (info@cdc.gy)
AMERICAS	Honduras	DesInventar	Government	COPECO (Commission Permanente de Contingencias)	Local	1998	1998	1994-2000	0	Event		Hydrological, Meteorological	Human and Economic	Official	70	100	100	42	victims (54%)	damage in roads, lost cattle, houses destroyed/ damaged, relocated, ec.losses education centers (100%)	304	recorded loss	No	0	1	No	Yes	No	Research (disaster impact assessment)	Government, Research	Yes	http://www.desinventar.net/DesInventar/main.jsp?countrycode=ho	COPECO (copeco@copeco.hn)
AMERICAS	Honduras	DesInventar	Government	COPECO (commission Permanente de Contingencias)-LA RED	Local	1915	2011	NA	96	National		All	Human and Economic	Official, unofficial	96	90	96	43	injured (78%)	relocated (99%)	13112	recorded loss	Yes (before 1968)	53	43	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=hnd	COPECO (copeco@copeco.hn)
ASIA-PACIFIC	Indonesia	DesInventar	Government	National Agency for Disaster Management (BNPB)	Local	1815	2012	NA	197	National		All	Human and Economic	Official	86	100	90	21	houses destroyed (75)	ec.losses in USD (100)	13370	recorded loss	Yes (before 1998)	183	14	No	Yes	Yes (but documentation NA)	Policy (national resource allocation, response, DRR), Research (disaster trends, risk assessment)	Government (national and local)	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=idn	Mr. Ridwan Yunus (ridwan.yunus@undp.org)

Database Characteristics						Database Contents Profile																					Quality Assurance		Uses		Accessibility		Focal point(s)
Region	**Area**	**System**	**Type of hosting institution**	**Hosting institution**	**Language**	**Year first entry**	**Year last entry**	**Year of database establishment**	**Time frame covered**	**Geographic coverage**		**Type of hazards**	**Type of losses**	**Data source(s)**	**% zero/ blank values in deaths**	**% zero/ blank values in economic losses USD**	**% zero/blank values in affected**	**% records with all values equal to zero/ blank**	**Parameter with most complete dataset**	**Parameter with least complete dataset**	**Number of entries in the database**	**Definition of database entry**	**Data gaps**	**Years of data gaps**	**Longest interval w/o gaps**	**Disaster event identification number (ID)**	**Availability of standards**	**Availability of quality control procedure**	**Type of applications**	**Type of users**	**Accessibility**	**Access**	
Name	Name	Name	Government, Research Institute/ University, NGO, Consortium, Other	Name	Local, English	yyyy	yyyy	yyyy	number of years	National, Regional, Local, Event		Climatological, Meteorological, Hydrological, Geological	Human and/or Economic	Official, unofficial	% records containing zero/blank values in deaths	% records containing zero/blank values in economic losses in USD	% records containing zero/blank values in affected	% records containing all zero/blank values	Parameter with dataset with lowest % zero/ blank values	Parameter with dataset with highest % zero/ blank values	Number of data entries in the database (as of 1, December 2012)	Disaster event, Recorded loss	Yes (in which years), No	Number of years	Number of years	Yes (which ID is used), No	Yes, No	Yes, No	Policy, Research	International Organizations (IOs), NGOs, Government, Research, Media, Private sector, Other	Yes, No, Limited	Link	Name(s) (E-mail)
ASIA-PACIFIC	Iran	DesInventar	Government	Ministry of Interior Iran, UNDP	English	1895	2011	NA	116	National		All	Human and Economic	Official, unofficial	80	99	99	64	deaths (80)	hospitals (99)	17194	recorded loss	Yes (before 1957)	62	54	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=irn	Victoria Kianpour, victoria.kianpour@undp.org
AMERICAS	Jamaica	DesInventar	Research Institute/ University	University of West Indies	English	1973	2011	2000-2005	38	National		All	Human and Economic	Official, unofficial	88	92	81	40	ec. losses in local currency (79)	missing (99)	1247	recorded loss	No	0	38	No	Yes	No	No	Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=jam	NA
ARAB STATES	Jordan	DesInventar	Government	Jordan Civil Defense	Local	1981	2010	NA	29	National		All	Human and Economic	NA	89	100	90	58	evacuated (87)	relocated, ec.losses in USD, hospitals (100)	454	recorded loss	No	0	29	Yes (GLIDE)	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=jor	private_office@cdd.gov.jo
AFRICA	Kenya	DesInventar	Government	National Disaster Operations Centre	English	1997	2012	NA	15	National		All	Human and Economic	Official, unofficial	85	100	69	47	affected (69)	ec.losses in USD, education centers, hospitals (100)	1356	recorded loss	Yes (1997-2002)	5	10	Yes (GLIDE)	Yes	No	No	No	No		
ASIA-PACIFIC	Laos	DesInventar	Government	National Disaster Management Office (NDMO)	Local	1990	2011	NA	21	National		All	Human and Economic	NA	96	100	40	12	ec.losses in local currency (38)	evacuated (100)	3516	recorded loss	Yes (before 1995)	5	16	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=lao	Mr. Phetsavang Sounnalath (ndmo@laotel.com)
ARAB STATES	Lebanon	DesInventar	Government	Office of the Prime Minister	English	1980	2011	NA	31	National		All	Human and Economic	Unofficial	97	99	98	67	damages in crops Ha. (79)	hospitals (99)	2521	recorded loss	No	0	31	Yes (GLIDE)	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=lbn	
ASIA-PACIFIC	Maldives	DesInventar	Government	Ministry of Defense of Maldives	English	1946	2008	NA	62	National		All	Human and Economic	Official, unofficial	98	100	90	56	houses damaged (66)	ec.losses in USD (100)	2071	recorded loss	Yes (before 1969)	23	39	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/main.jsp?countrycode=mal&continue=y	Ministry of Defense (media@mndf.gov.mv)
AFRICA	Mali	DesInventar	Government	Protection Civile Mali	Local	1994	2012	NA	18	National		All	Human and Economic	Official, unofficial	93	100	46	2	affected (46)	missing, evacuated, ec.losses in USD, hospitals (100)	1437	recorded loss	Yes (before 1999)	5	13	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=mli	Protection Civile Mali (coloneltraore@yahoo.fr)
AMERICAS	Mexico	DesInventar	Consortium	LA RED - Centro de Investigaciones y estudios superiors en antropologia social (CIESAS)	Local	1970	2011	1994-2000	41	National		All	Human and Economic	Official, unofficial	85	99	95	58	deaths (85)	ec.losses in USD (99)	37608	recorded loss	No	0	41	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=mex	Virginia Jiménez (coordina@desenredando.org)
ASIA-PACIFIC	Mizoram (India)	DesInventar	Government	State Disaster Management Authority	English	1992	2010	NA	18	Local		All	Human and Economic	Official	100	100	1	0	affected (1.47)	deaths, injured, missing, victims, relocated, evacuated, ec. losses USD, education centers, hospitals (100)	68	recorded loss	Yes (1995-1997, 1998-2009)	13	3	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/main.jsp?countrycode=miz&continue=y	
AFRICA	Morocco	DesInventar	Government	Ministry of Environment	Local	1960	2011	NA	51	National		All	Human and Economic	Official, unofficial	69	66	92	2	damages in crops Ha. (54)	relocated, lost cattle (100)	106	recorded loss	Yes (in 1960-1990 data is very coarse)	30	30	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=ma	Ministry of Environment (see@water.gov.ma)
AFRICA	Mozambique	DesInventar	Government	National Disaster Management Institute (INGC)	Local	1979	2009	NA	30	National		All	Human and Economic	Official, unofficial	80	99	59	39	affected (58)	hospitals (99)	4919	recorded loss	Yes (data coarse before 1997)	18	12	No	Yes	Yes	Policy (DRR), Research (disaster trends, hotspots analysis)	Government, Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=moz	Antonio Queface (antonio.queface@gmail.com)
ASIA-PACIFIC	Nepal	DesInventar	NGO	National Society for Earthquake Technology	English	1971	2011	NA	40	National		All	Human and Economic	Official, unofficial	62	100	70	12	deaths (62)	ec.losses in USD (100)	21651	recorded loss	No	0	40	No	Yes	Yes (CRED, 2010)	Policy (development planning, DRR), Research (disaster trends)	Government, Research, NGOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=npl	Gopi Basyal (gbasyal@nset.org.np)
AMERICAS	Nicaragua	DesInventar	Consortium	LA RED	Local	1992	2011	NA	19	National		All	Human and Economic	Unofficial	87	93	67	20	affected (67%)	relocated (99%)	1051	recorded loss	No	0	19	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=nic	NA

Database Characteristics						Database Contents Profile																				Quality Assurance		Uses		Accessibility		Focal point(s)
Region	**Area**	**System**	**Type of hosting institution**	**Hosting institution**	**Language**	**Year first entry**	**Year last entry**	**Year of database establishment**	**Time frame covered**	**Geographic coverage**		**Type of hazards**	**Type of losses**	**Data source(s)**	**% zero/ blank values in deaths**	**% zero/ blank values in economic losses USD**	**% zero/blank values in affected**	**% records with all values equal to zero/ blank**	**Parameter with most complete dataset**	**Parameter with least complete dataset**	**Number of entries in the database**	**Definition of database entry**	**Data gaps**	**Years of data gaps**	**Longest interval w/o gaps**	**Disaster event identification number (ID)**	**Availability of standards**	**Availability of quality control procedure**	**Type of applications**	**Type of users**	**Accessibility**	**Access**	
Name	Name	Name	Government, Research Institute/ University, NGO, Consortium, Other	Name	Local, English	yyyy	yyyy	yyyy	number of years	National, Regional, Local, Event		Climatological, Meteorological, Hydrological, Geological	Human and/or Economic	Official, unofficial	% records containing zero/blank values in deaths	% records containing zero/blank values in economic losses in USD	% records containing zero/blank values in affected	% records containing all zero/blank values	Parameter with dataset with lowest % zero/ blank values	Parameter with dataset with highest % zero/ blank values	Number of data entries in the database (as of 1, December 2012)	Disaster event, Recorded loss	Yes (in which years), No	Number of years	Number of years	Yes (which ID is used), No	Yes, No	Yes, No	Policy, Research	International Organizations (IOs), NGOs, Government, Research, Media, Private sector, Other	Yes, No, Limited	Link	Name(s) (E-mail)
ASIA-PACIFIC	Orissa (India)	DesInventar	Government	Orissa State Disaster Management Authority OSDMA	English	1970	2012	NA	42	Local		All	Human and Economic	Official, unofficial	56	100	61	9	deaths (56)	ec. losses USD (100)	12145	recorded loss	No	0	42	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=019	NA
AMERICAS	Panama	DesInventar	Government	Sistema Nacional de Proteccion Civil (SINAPROC)	Local	1929	2012	1994-2000	83	National		All	Human and Economic	Official, unofficial	73	94	57	15	affected (57)	hospitals (99)	5711	recorded loss	Yes (before 1983)	54	29	No	Yes	No	Research (disaster trends)	Government	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=pan	Arturo Alvarado (direccciongeneral@sinaproc.gob.pa)
AMERICAS	Peru	DesInventar	Research Institute/ University	Centro studios y prevencion de desasters (PREDES)	Local	1970	2011	1994-2000	41	National		All	Human and Economic	Official, unofficial	87	92	95	59	victims (86%)	relocated (99%)	21578	recorded loss	No	0	41	No	Yes	No	Research (climate variability, disaster trends, risk assessment, disaster impact assessment)	Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=per	PREDES (postmast@predes.org.pe)
ASIA-PACIFIC	the Philippines	Calamidat	Government	Office of Civil Defense, National Disaster Coordinating Council	English	1969	2009	NA	40	National		All	Human and Economic	Official	14	NA	NA	NA	NA	NA	590	disaster event	NA	NA	NA	Yes (GLIDE, CRED, 2010)	Yes (CRED, 2010)	Yes (CRED, 2010)	Policy (DRR), Research	Research, Government, IOs, NGOs	Limited	http://www.ndrrmc.gov.ph/	Amor Rosana (amyrosana@yahoo.com.ph) Emilia Tadeo (emiliatadeo@yahoo.com)
ASIA-PACIFIC	Solomon Islands	DesInventar	Government	Pacific Islands Applied Geoscience Commission (SOPAC)	English	1568	1964	NA	396	National		All	Human and Economic	NA	99	100	100	85	hospitals (91)	ec.losses in USD and local curreny (100)	289	recorded loss	Yes (before 1920)	352	44	Yes (GLIDE)	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=slb	SOPAC (director@sopac.org)
ASIA-PACIFIC	Sri Lanka	DesInventar	Government	Disaster Management Center (DMC)	English	1965	2012	NA	47	National		All	Human and Economic	Official, unofficial	95	96	10	9	affected (9.8)	missing (98)	41750	recorded loss	Yes (before 1973)	8	39	No	Yes	Yes (but documentation NA)	Policy (development planning, national resources allocation, DRR, Early recovery), Research (risk assessment, disaster impact assessment)	Government, NGOs, Research, Media	Yes	http://www.desinventar.lk/DesInventar/main.jsp?countrycode=sr&continue=y	Dinesh Rajapaksha (epadinesh@yahoo.co.uk)
ARAB STATES	Syria	DesInventar	Government	Ministry of Local Administration	Local	1980	2009	NA	29	National		All	Human and Economic	NA	94	100	82	39	ec. losses Local (61)	ec. losses in USD (100)	7326	recorded loss	Yes (data coarse before 1989)	9	20	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=sy11	NA
ASIA-PACIFIC	Tamil Nadu (India)	DesInventar	Government	State Commissioner of Tamil-Nadu	English	1968	2011	NA	43	Local		All	Human and Economic	Official	84	99	97	2	ec. losses in local currency (33)	ec. losses in USD (99)	31184	recorded loss	Yes (before 1976)	8	35	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=033	Thiru C. Rajendran IAS (gdc@tn.nic.in)
ASIA-PACIFIC	Thailand	NA	Government	Department of Disaster Prevention and Mitigation	NA	2006	2006	NA	0	National		NA	NA	Official	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	No	No	No	No	No	NA	NA
ASIA-PACIFIC	Timor Leste	DesInventar	Government	East Timor National Disaster Management Directorate	Local	1992	2012	NA	20	National		All	Human and Economic	NA	96	100	25	1	affected (24)	ec.losses in USD, ec. Losses in local currency, Hospitals, missing (100)	667	recorded loss	Yes (before 2001)	9	11	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=etm	Francisco Rosario (francisco_ndmo07@yahoo.com)
AMERICAS	Trinidad and Tobago	DesInventar	Research Institute/ University	University of West Indies	English	1970	2000	2000-2005	30	National		All	Human and Economic	Unofficial	95	90	97	75	ec.losses in USD (90.7%)	hospitals (100%)	445	recorded loss	No	0	30	No	Yes	No	Research (risk assessment)	Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=tt	NA
AMERICAS	Uruguay	DesInventar	Government	Sistema Nacional de Emergencias	Local	1959	2011	NA	52	National		All	Human and Economic	Unofficial	88	98	86	50	affected (86%)	relocated (100%)	1409	recorded loss	Yes (before 1990)	31	21	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=ury	NA
AMERICAS	US	Sheldus	Research Institute/ University	University of South Carolina	English	1960	2012	NA	52	National		All	Human and Economic	Official	0	0	NA	0	NA (the complete DB cannot be downloaded)	NA (the complete DB cannot be downloaded)	NA (the complete DB cannot be downloaded)	disaster event	No	0	52	Yes (GLIDE, Presidential disaster declaration, major disaster)	Yes	Yes	Policy (DRR), Research	Government, Research	Yes	http://webra.cas.sc.edu/hvri/products/sheldus2.aspx	Dr. Susan L. Cutter (scutter@sc.edu), Dr. Christopher Emrich (emrich@sc.edu)
AMERICAS	US	US Natural Hazards Statistics	Government	NOAA National Weather Service (NWS)	English	1995	2011	NA	16	National		Hydrological, Meteorological	Human	Official	0	0	NA	0	0	0	17	disaster event	No	0	16	No	No	No	No	No	No	http://www.nws.noaa.gov/om/hazstats.shtml	NWS (w-nws.webmaster@noaa.gov)

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AMERICAS	US	Presidential Disaster Declaration database	Research Institute/ University	University of Delaware	English	1953	2009	NA	56	National		All	Economic (FEMA money spent for the disaster)	Official	NA	98	NA	0	ec.losses due to tornado (29%)	ec.losses due to tsunami (98%)	1857	disaster event	No	0	56	Yes (declaration number)	Yes	No	No	No	Yes	http://www.peripresdecusa.org/mainframe.htm	Prof. Richard Sylves (sylves@udel.edu)
ASIA-PACIFIC	Uttar Pradesh (India)	DesInventar	Government	State Commissioner	English	1991	2005	NA	14	Local		All	Human and Economic	Unofficial	29	100	82	2	deaths (29)	ec.losses, relocated, evacuated, hospitals, education centers (100)	3361	recorded loss	No	0	14	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/main.jsp?countrycode=up&continue=y	
ASIA-PACIFIC	Vanuatu	DesInventar	Government	Pacific Islands Applied Geoscience Commission (SOPAC)	English	549	2010	NA	1461	National		All	Human and Economic	Official, unofficial	100	100	99	99	ec. losses in local currency (99)	deaths, injured, missing, victims, relocated, evacuated, ec.losses in USD, education centers, hospitals, loss in crops (100)	929	recorded loss	Yes (before 1860)	1311	150	Yes (GUDE)	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=vut	
AMERICAS	Venezuela	DesInventar	Government	Direccion de Proteccion civil y Administracion de desastres - CENAPRAD	Local	1530	2012	1994-2000	482	National		All	Human and Economic	Official, unofficial	83	99	88	36	houses damaged (81)	ec. losses in USD (99)	6590	recorded loss	Yes (before 1970)	440	42	No	Yes	No	Research (risk assessment)	Research, IOs	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=ven	Luis Díaz Curbelo (lcurvelo@pcivil.gob.ve)
ASIA-PACIFIC	Vietnam	Damage and Needs Assessment system (DANA) of Vietnam	Government	Department of Dyke Management, Flood and Storm Control (DDMFSC); Disaster Management Centre (DMC)	Local	1989	2010	NA	21	National		Hydrological, Meteorological	Human and Economic	Official	38	100	96	15	deaths (38)	victims, relocated, evacuated, ec.losses in USD, education centers, hospitals, damages in crops (100)	1469	recorded loss	No	0	21	Yes (CRED, 2010)	Yes (CRED, 2010)	Yes (CRED, 2010)	Policy (national resource allocation)	Government	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=vnm	Le Minh Ba (leminhba@ccfsc.org.vn)
ARAB STATES	Yemen	DesInventar	Government	Ministry of Water and Environment	Local	1971	2011	NA	40	National		All	Human and Economic	NA	91	99	99	9	injured (16)	education centers (100)	8945	recorded loss	Yes (coarse before 1994)	23	17	No	Yes	No	No	No	Yes	http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=yem	Ministry of water and environment (mwe@mweye.org)

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