Integrated Research on Disaster Risk (IRDR)

Guidelines on Measuring Losses from Disasters

Human and Economic Impact Indicators

DATA Project Report No. 2

IRDR
Integrated Research on Disaster Risk

IRDR

The Integrated Research on Disaster Risk (IRDR) Programme was established by the International Council for Science (ICSU) in 2010, in co-operation with the International Social Science Council (ISSC) and the United Nations International Strategy for Disaster Reduction (UNISDR). IRDR's main legacy will be an enhanced capacity around the world to address hazards and make informed decisions on actions to reduce their impacts. This will include a shift in focus from response–recovery towards prevention–mitigation strategies, and the building of resilience and reduction of risk through learning from experience and the avoidance of past mistakes.

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Contents

1. Introduction

Understanding and documenting impacts from natural hazards is the foundation for decision-making and policy-setting in disaster risk reduction. The impacts range from human effects such as displacement, homelessness and death, to environmental (wetland loss, desertification) and economic losses (damage to property and crops). Documenting impacts in a standardised and comprehensive way is challenging largely due to the lack of common terminologies for perils, measurement methodologies, and human loss indicators. The inability to compare losses across hazards, geographic locations, and time hampers the assessment of the burden of disasters from global to local levels.

To overcome these challenges, the Integrated Research on Disaster Risk (IRDR) programme established a project on disaster loss data (DATA) to "study issues related to the collection, storage, and dissemination of disaster loss data" (IRDR 2013, 10). A recent product of the DATA Project Working Group (IRDR 2014) is a standard hazard terminology as well as peril classification for operational use in loss databases, which was agreed upon by all members of the Working Group. It focused exclusively on perils without discussing the measurement of associated losses such as human or monetary impacts.

The documentation and measurement of human and economic impacts are highly variable across disaster loss databases. There are inconsistent definitions as well as different sets of indicators that are used. This document, based on two earlier working papers from the Centre for Research on the Epidemiology of Disasters (CRED) (CRED 2011, 2012) in collaboration with Munich Re and Swiss Re provides guidance on a minimal set of human and economic loss indicators and their definitions that should be part of any operational disaster loss database. The document also provides an aspirational list of impact indicators that should be monitored as part of future disaster loss databases.

2. Why Human and Economic Loss Database Standards are Important

In recent years the international community has made significant advances in improving the documentation of losses from natural hazards. These advancements are clearly visible in the increasing number of countries that now operate disaster loss databases, either through governmental, non-governmental, academic and/or private organisations. At present there are three global loss databases (CRED's EM-DAT, Munich Re's NatCatSERVICE, and Swiss Re's sigma). At the national level there are currently more than 55 loss databases, with a large majority utilising the DesInventar database model, although they vary in data quality, temporal coverage, loss indicators, and update frequency (see Annex). About 35 national databases that offer loss data through 2014 could only do so through financial and/or technical support provided by the United Nations Office for Disaster Risk Reduction (UNISDR) for their biennial Global Assessment Reports (GAR) (UNDP/BCPR 2013). Thus, database sustainability and long-term maintenance are critical needs for many database operators (Wirtz et al. 2014).

The need for standardised human and economic impact indicators in loss accounting has been widely recognised (CRED, 2011; Wirtz et al. 2014; DeGroeve et al. 2013, 2014). Most databases record some form of human and economic losses (e.g., number of people killed, property damage), but there is neither a common set of loss indicators across all databases nor are these indicators defined based on a common understanding or standard (Gall et al. 2009, Gall et al. 2011). This variability between indicators from different databases introduces uncertainty (Borden et al. 2008, Kron et al. 2012). Furthermore, obtaining impact figures for historical events is generally fraught with (epistemic) uncertainty because data are of variable quality, are often difficult to obtain retroactively, and depending on the reliability of data provider, may not include all the relevant indicators (Ash et al. 2013). Field agencies such as the United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA) or the International Federation of Red Cross and Red Crescent Societies (IFRC) are among data providers who collect and report primary impact data through standardised needs assessment templates. While such assessments contain a similar set of human impact indicators (e.g., deaths, missing and injured persons) to those found in global databases, the specific definitions of these indicators are often missing, incomplete, or inconsistent over time.

Data quality in disaster databases can be improved by agreeing on working definitions of loss measures. This will also improve the interoperability of loss information between databases, especially those that rely on data providers for inputs. Furthermore, establishing measurement guidance or standards will inform the collection of loss information, which ultimately improves data accuracy and data quality. By harmonising loss measures, integration of different databases becomes possible and new understanding of loss patterns can emerge. A common approach to loss accounting will facilitate data analyses across space, over time and by event, and enable comprehensive analyses on the burden of disasters.

Agreement on common definitions and measures of human and economic loss is therefore a key objective of the IRDR DATA Project. To improve the comparability of existing loss databases and reduce uncertainty in the estimates, impact indicators must be standardised. A consistent impact classification scheme will allow data users to compare losses across databases knowing that mortality, for example, means the same in each database (only deaths, not deaths and missing persons, for example).

The aim of this document is to provide guidance to disaster loss data compilation initiatives on how to register human and economic impacts in a disaster loss database. This guidance is not an assessment of existing loss methodologies and approaches, but instead it represents definitional guidance that can be widely applied in existing disaster loss databases. We first propose a conceptual framework for human and economic impact measures that highlights the minimum set of desired indicators (primary) for inclusion in all disaster loss databases. We further expand this minimum list with more comprehensive assessments of human and economic losses as a future or aspirational goal. The indicator definitions are simple and language independent in order to be clearly understood by producers, collectors and users of data, irrespective of their roles, skills and education levels. This approach of providing simple definitions for the indicators, but also allowing for the possibility of including more detailed information where needed is important, especially in the future development of loss accounting. Important considerations are listed for each impact indicator. Because human and economic impacts differ according to natural disaster types or peril, examples and additional explanations are given for selected different hazards.

3. Conceptual Framework for Human and Economic Impacts for Disaster Loss Accounting

Human impact indicators can be categorised into three different levels (Figure 1). Primary indicators are those that should be (and generally are) included in most disaster loss databases. The five primary human indicators are: *deaths, missing -, injured, - exposed, and economic loss* as cumulative estimates without distinguishing between direct or indirect impacts. The next tier (labelled secondary), includes refinements of the primary indicators such as deaths, which can be further disaggregated into *direct deaths* and *indirect deaths*, or *economic loss*, which can be further refined into *direct loss* and *indirect loss*. The secondary level also includes measures related to population movements and displacements such as *homeless*, *relocated* or *evacuated* or characterisations of the exposed population such as *affected*. The tertiary level is designed to provide further detailed information on each of the primary and secondary levels. For example the primary indicator *injured* can be further refined by accounting for *gender*, *age*, or the *location* where the injuries occurred; or *direct economic losses* can be broken down by *sector* (e.g., agricultural, residential).

It is expected that loss databases include at a minimum indicators at the primary level. As loss accounting improves, expansion of databases to include secondary and tertiary indicators is highly desirable in order to provide a more comprehensive view of human impacts of disasters. In addition, it is recommended to include information regarding the reliability of impact figures such as a quality score or uncertainty level to aid data users in their interpretation of the information. For example, the attribution of quality or confidence in the metric (e.g., high confidence, moderate confidence, low confidence, no confidence) would alert users of potential issues with the data.

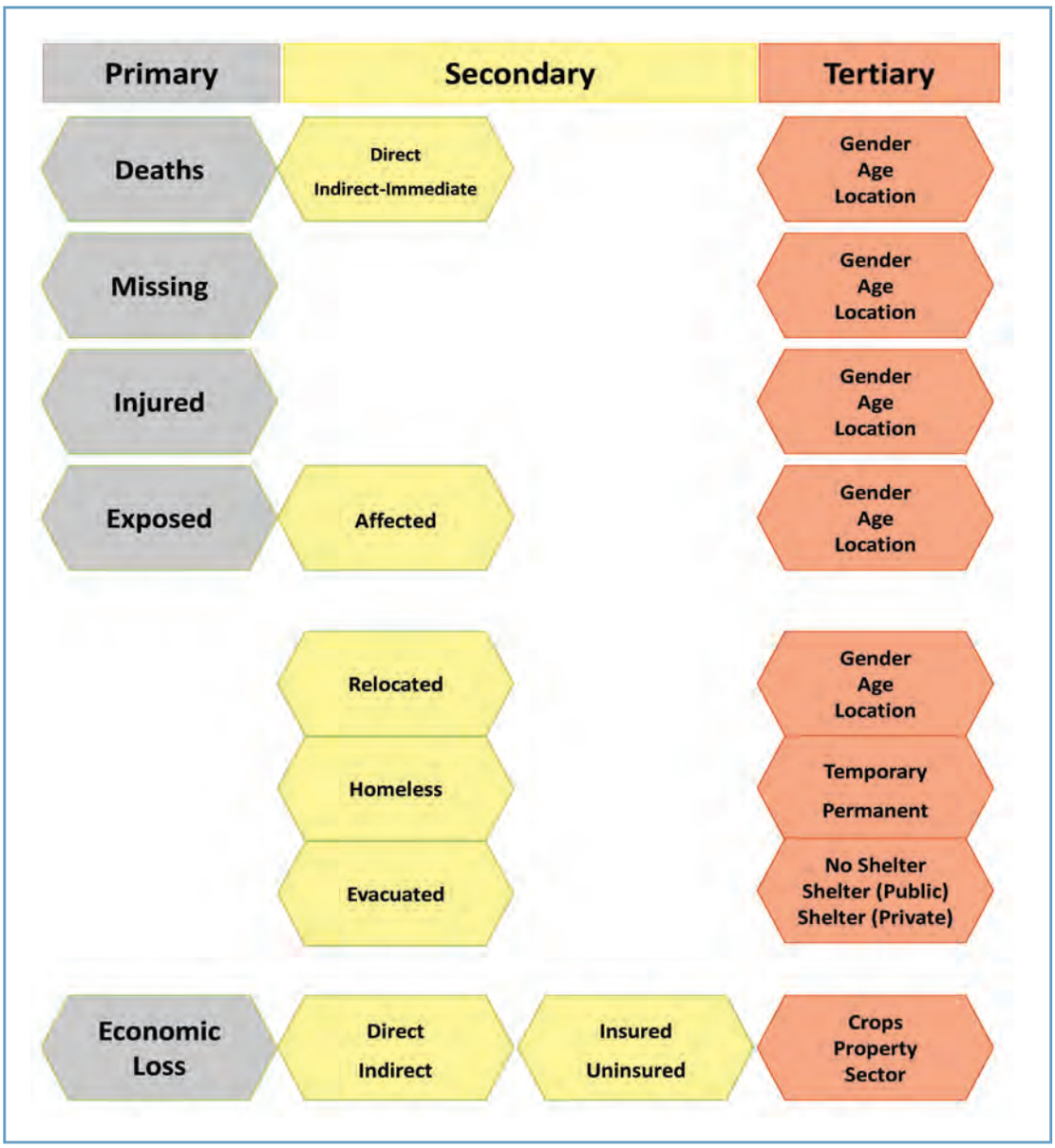

Figure 1: **Conceptual Framework for Human Indicators in Disaster Loss Databases**

4. Primary Human Impact

In this section, each of the primary human impact indicators is further defined. Specific examples by hazard (or peril) illustrate the implementation.

4.1 Deaths

Definition: *"Number of people who lost their life because the event happened."*

- The number of deaths (mortality) registered in a disaster loss database corresponds to the figure when the reporting by the original data sources is stable and no longer changing.

- The number of deaths is the sum of direct and the indirect immediate deaths (see below and Table 1). The number of delayed indirect deaths is generally excluded.

- The number of deaths does not include missing persons.

- A comment field is useful to enter detailed information on the reported causes of death if available (e.g., deaths were caused by electrocution following an earthquake, or suicide due to severe psychological stress). It is also useful to track changes in the mortality figures over time as new information becomes available.

- To maintain a clear and unambiguous terminology, the terms 'killed,' 'victims' and 'fatalities' are preferably not used.

4.1.1 Secondary and tertiary indicators

- The number of deaths can be subdivided to include secondary information such as direct or indirect immediate deaths. *Direct deaths* are persons who died as a direct result of a disaster (e.g., crushed by a building during an earthquake, or drowned in a storm surge). *Indirect immediate deaths* include persons who died of other causes (within days, weeks to months depending on the peril) that were the result of the disaster occurring such as heart attacks from snow shovelling, or traffic accidents during wildfire evacuations. Data sources used by global disaster loss databases often report the direct deaths and the indirect immediate deaths, but this is highly variable among the databases.

- Indirect delayed deaths are caused by longer-term effects of a disaster and are only visible and measurable well after the disaster happened (years to decades) such as radioactive exposures after a tsunami event. These figures are less often reported by data sources. Indirect delayed deaths are not included in the registered number of deaths.

- Sub-indicators for further disaggregation (tertiary level), such as *gender* or *age* or specific *location* of the deaths are desirable in a loss accounting database.

4.1.2 Examples from specific perils

Because human impacts vary according to the type of disaster, details related to the classification of direct deaths, indirect immediate deaths, and indirect delayed deaths per main disaster type are provided in Table 1. The table also lists examples and guiding principles to be taken into account when classifying deaths.

Table 1: **Examples and guiding principles for the classification of deaths, direct deaths, indirect immediate deaths and indirect delayed deaths per main disaster type1**

Disaster type	Deaths	Direct Deaths	Indirect Immediate Deaths	Indirect Delayed Deaths
Drought	The number of deaths registered in a disaster loss database relate to indirect immediate deaths.	Not applicable	Indirect immediate deaths include those persons who died of famine after drought.	Indirect delayed deaths due to drought are related to a deterioration of health due to food shortage, often occurring after several years of drought (famine).
Earthquake	The number of deaths registered in a disaster loss database relate to direct and indirect immediate deaths. Most primary sources only report direct deaths.	An example of direct deaths due to an earthquake is persons who died because of the collapse of a building, or people who died later from their injuries.	Indirect immediate deaths include those who died of events associated with the earthquake, such as persons who died in traffic accidents because the earthquake disrupted roads, suicides following post-traumatic stress, or persons who died in fires following the earthquake.	Indirect delayed deaths due to an earthquake are the persons who died because of the negative health effects of an earthquake-destroyed nuclear power plant that released radioactivity into the environment; or delayed deaths caused by epidemics.
Epidemic	Epidemic-related deaths can be reported as direct deaths (e.g., seasonal epidemics) or as indirect immediate deaths (e.g., epidemic after floods) in case the epidemic is triggered by a disaster.	Direct deaths caused by epidemics are people who die from the virus or disease agent of the epidemic.	Not applicable	Not applicable
Extreme temperature	The number of deaths registered in a disaster loss database includes direct deaths and indirect immediate deaths.	Direct deaths from extreme temperatures include elderly people who died because of dehydration in case of a heat wave, or homeless people frozen to death in case of a cold wave. Deaths from extreme heat and cold can be estimated from excess mortality data.	Indirect immediate deaths can be persons who went into extremely cold water during a heat wave and subsequently died, or deaths due to carbon-monoxide intoxication when people heat their house during a cold wave using sub-standard heating systems.	Not applicable
Flood	The number of deaths registered in a disaster loss database includes direct and indirect immediate deaths.	Direct flood deaths primarily include persons who drowned.	Indirect immediate deaths are for example people who died of heart attacks, vehicle-related accidents, electrocution, or epidemics.	Famine-related deaths after recurrent, huge floods that destroyed crops are considered as indirect delayed deaths caused by floods.

Fog	**The number of deaths registered in a disaster loss database includes indirect immediate deaths.**	**Not applicable**	**Indirect immediate deaths can be persons who died in traffic accidents.**	**Not applicable**
Mass movements/ Landslides	The number of deaths registered in a disaster loss database includes direct and indirect immediate deaths.	Direct deaths caused by mass movements are, for example, the persons who were buried or struck by falling debris due to ground movements	Indirect immediate deaths include infectious diseases resulting from injuries.	Not applicable
Storms (Convective, Extra-tropical, Tropical)	The number of deaths registered in a disaster loss database includes direct and indirect immediate deaths.	Examples of storm-related direct deaths are the persons who died from falling trees or flying debris, storm surges, flooding, building collapse, or electrocution from downed power lines.	Indirect immediate deaths are caused by car accidents due to dangerous and slippery roads during the storm. Accidents during an evacuation, cleanup, and recovery operation are also included.	Not applicable
Volcanic activity	The number of deaths registered in a disaster loss database includes direct and indirect immediate deaths.	Direct deaths due to volcanoes are the persons who died from volcanic gasses or were killed by ash, lava, lahars, or pyroclastic flows.	Examples of indirect immediate deaths are caused by heart attacks, and transportation accidents. These deaths took place because the disaster happened.	Volcano-related indirect delayed deaths include, for example, deaths from lung cancer caused by toxic air particles released by the volcano, or deaths due to famine after the crops were destroyed.
Wildfire	The number of deaths registered in a disaster loss database includes direct and indirect immediate deaths.	Direct deaths from wildfires are caused by fire trapping, burns and smoke inhalation.	Indirect immediate deaths can be caused by traffic accidents during evacuations, and poor visibility from smoke leading to traffic accidents.	Indirect delayed deaths can include cardiovascular and respiratory diseases from the smoke and the wildfire particulate matter.

[1] *For the disaster agent (or peril) typology see IRDR (2014), Peril Classification and Hazard Glossary. Beijing: Integrated Research on Disaster Risk DATA Project Report No. 1.*
Sources: Finlay et al. 2012; Goldman et al., 2013; Landesman 2012; Menne and Murray 2013; and Stanke et al.2013.

4.2 Missing

Definition: *"The number of people whose whereabouts since the disaster are unknown, and presumed dead based on official figures."*

- The number of missing includes people who are presumed dead, although there is no physical evidence (e.g., death certificate, human remains).

- The figures for the number of deaths and the number of missing are mutually exclusive. In the source reporting there should be a clear description in order to know the difference between missing and actual recorded deaths.

- There is no time limit for the period that the person is missing. For example, in certain countries a person is presumed dead after being missing for a specified period. This is not taken into account in the registration of missing in a disaster loss database.

- The number of missing people should be considered as a rough estimate or indication of the likely number, rather than an absolute figure, since figures often are not always updated by reporting sources.

- The goal for loss accounting should be to compile the latest available updated figure for missing people.

- This indicator is important in guiding search and rescue operations after disasters.

- The number of missing is not as applicable to extreme temperatures, fog, droughts and epidemics.

4.3 Injured

Definition: *"People suffering from physical injuries, trauma, or an illness requiring immediate medical assistance as a direct result of a disaster."*

- The number of injured (morbidity) includes people who are sick and sought medical attention.

- The inclusion of the severity or degree of an injury can be optional for a database.

- For epidemics, people who need medical treatment are called cases or incidences, but for database consistency purposes they are classified as injured.

4.4 Exposed

Definition: *"Number of people who permanently or temporarily reside in the hazard area before or during the event."*

- This is the number of people who are potentially exposed to the adverse effects of the event. It can be determined geographically by delineating the potential hazard area (such as flood zone, or a coastal zone) and then use population data to ascertain the number of

people in that area. The use of geospatial technologies such as Geographic Information Systems (GIS) and remote sensing make computing these figures easier and more reliable and is recommended for modelling exposure.

- If the exposed area or if the footprint of the event (impacted area) cannot be spatially delineated through geospatial analyses, then administrative units such as parishes, districts, cities, provinces and regions can be used.

- The number of people exposed is a critical indicator, as it determines what percentage of the total population of the region or nation is at risk. It is also useful in determining the denominator on magnitude estimations of human impacts, e.g. number of deaths/exposed population rather than number of deaths per capita.

5. Secondary and Tertiary Human Indicators

There are additional indicators that are useful in describing human impacts, which go beyond the refinement or disaggregation of primary indicators discussed previously. Among the most important are measures of the *homeless*, those that have *evacuated,* and those populations that have *relocated.* It is important to note that *'evacuated,' 'homeless'* and *'relocated'* are not mutually exclusive, and they may involve double counting. For example, some of the evacuees may become homeless later (after the initial return to their houses), and some of the homeless may be relocated (some may rebuild in the same place, or return after a period of time). These three indicators correspond to the three stages of the disaster cycle: before and during a disaster (*evacuated*); immediate aftermath of a disaster (*homeless*); and at the recovery and reconstruction stage (*relocated*).

The indicator *affected* is often reported and is widely used by different actors to convey the extent, impact, or severity of a disaster in non-spatial terms. The ambiguity in the definitions and the different criteria and methods of estimation produce vastly different numbers, which are rarely comparable. For this reason, **affected population is no longer recommended for inclusion as a primary indicator,** but is used as a secondary indicator to further characterise the exposed population.

5.1 Homeless

Definition: *"Number of people whose house is destroyed or heavily damaged and therefore need shelter after an event."*

- The number of homeless should be reported as the number of individuals. Data sources may only report the number of families, and the size of families varies. The current procedure is to convert all figures into individuals by multiplying the number of families by the average family size of the affected area, which may over- or under-estimate the number of homeless.

- Homeless populations can be further described with tertiary indicators such as *gender, age,* or *location* (street, neighbourhood, village, informal settlement, etc.).

5.2 Evacuated

Definition: *"People who mobilise or are mobilised as a precautionary measure before, during and after the event."*

- This indicator relates to the period before, during and after a disaster, including the initial recovery phase.

- Evacuated populations can be further described based on the type of sheltering needs, how many people are in public shelters, in private shelters or private accommodations, and those with no shelter.

5.3 Relocated

Definition: *"People who have been moved permanently from their homes to new sites."*

- This indicator relates to the reconstruction process, and not to the impact phase of a disaster.

- The indicator can be further divided into those who require permanent relocation or temporary relocation until their homes or villages can be reconstructed.

5.4 Affected

Definition: *"The number of people who were injured or suffered a direct economic loss in the exposed area."*

- Not everyone in the exposed/impact area experiences an impact or suffers a loss.
- The number of affected people cannot exceed the exposed population.
- Deaths and missing are not included in this definition of affected.

6. Economic Loss Indicators

In this section the primary, secondary and tertiary economic loss indicators are described.

6.1 Primary economic loss

Definition: *"The amount of damage to property, crops, and livestock and to the flow of goods and services expressed in monetary terms."*

- Economic loss is the sum of direct and indirect losses.

- Direct loss is the monetary value of physical damage to capital assets. Indirect loss refers to damages to the flow of goods and services. Direct losses are concrete, comparable, countable, verifiable and easier to measure than indirect losses.

- Most loss databases report direct damage, which include damage to crops and livestock as well as damage to residential, commercial, institutional and industrial buildings, infrastructure and inventory (stock losses). Time-element losses, including business interruption (flow losses) may or may not be included in the direct overall loss estimation.

- Economic losses are generally reported in the local currency in current values, i.e. what the currency was worth at the time the disaster occurred.

- Global databases tend to convert local currencies into U.S. dollars for comparability purposes.

- Economic losses are mostly best estimates and not exact figures. Estimates depend heavily on the loss estimation process, which varies in completeness and comprehensiveness as well as accessibility.

- Livelihood losses generally are not reported in global loss databases.

6.2 Secondary and tertiary economic loss

- Damage can be further divided into insured and uninsured. Insured losses are those that are covered by the insurance sector and paid directly to the owner of the damaged or destroyed property or crops and livestock or the primary insurance company (in case of reinsurance). Uninsured losses are not covered by insurance policies.

- Economic losses can be further differentiated based on whether they are related to structural property losses or crop losses, both of which are widely used in the insurance and re-insurance sectors.

6.3 Sector-based economic loss

- Economic losses can also be differentiated by sector, such as those related to tourism, agriculture, transportation, power generation, or manufacturing.

- Sector-based loss information is often only available for select large events. As a result, such detailed information is often missing for the vast majority of records in a loss database.

- Impacts documented by sector are mostly related to primary industries and critical infrastructure.

- The unit of measurement for sector-based indicators is neither consistent nor standardised and ranges from simple counts to percentages, monetary figures, or spatial units.

- Examples of non-monetary sector-based indicators include:

    - Transportation (e.g., measured as length in kilometres of damaged/destroyed roads and railways; number of damaged/destroyed bridges, airports, marine ports);

    - Water and Sanitation (e.g., measured as length in kilometres of damaged/destroyed water infrastructure; number of damaged/destroyed water and waste treatment facilities);

    - Energy (e.g., measured as length in kilometres of damaged/destroyed power grids, number of damaged/destroyed power plants, number of offshore energy platforms, miles of pipeline);

    - Communication (e.g., measured as length in kilometres of damaged/destroyed telephone communication or broadband cables, number of cell phone towers damaged/destroyed);

    - Education (e.g., measured as number of schools damaged/destroyed);

    - Health infrastructure (e.g., measured as number of hospitals damaged/destroyed);

    - Government and Public Buildings (e.g. measured as number of buildings damaged/ destroyed); and

    - Agriculture and Forestry (e.g., measured as number of livestock lost, tonnes/acreage of crops damaged/destroyed, timber loss, crop insurance payments).

7. Conclusion

This IRDR DATA report and broader initiative is a further step towards strengthening the systematic and standardised collection of information and data on the occurrence and human impacts of disasters. We believe that the information in this report is an invaluable tool to inform governments and institutions responsible for disaster risk reduction and management. The harmonised definitions of human and economic impact indicators and recommendations regarding their inclusion in loss databases provides guidance for the future development of national and sub-national databases as well as the reconciliation of indicators in existing loss databases.

References

Ash, K., S. L. Cutter, and C. T. Emrich, 2013. Acceptable losses: The relative impacts of natural hazards in the United States, 1980-2009. Intl. Journal Disaster Risk Reduction 5:61-72.

Borden, K. A. and S. L. Cutter, 2008. Spatial patterns of natural hazard mortality in the United States, Intl. J. Health Geographics 7 (64): 31 pp.
Available at http://www.ij-healthgeographics.com/content/pdf/1476-072X-7-64.pdf

CRED, 2011. Disaster Loss Characterization: Review of Human and Economic Impact Indicator Definitions. Working Paper. Brussels: Centre for Research on the Epidemiology of Disasters, Université catholique de Louvain.

CRED, 2012. Human impact indicators (Draft). Internal Working Paper. Brussels: Centre for Research on the Epidemiology of Disasters, Université catholique de Louvain.

DeGroeve, T., K. Poljansek, and D. Ehrlich, 2013. Recording Disaster Losses: Recommendations for a European Approach. JRC Scientific and Policy Reports EUR 26111EN. Ispra, Italy: European Commission.

DeGroeve, T., K. Poljansek, D. Ehrlich, and C. Corbane, 2014. Current Status and Best Practices for Disaster Loss Data Recording in EU Member States. JRC Scientific and Policy Reports EUR 26879EN. Ispra, Italy: European Commission.

Finlay, S.E., A. Moffat, R. Gazzard, D. Baker, and V. Murray, 2012. Health impacts of wildfires. PLOS Currents Disasters Nov 2. Edition 1. doi: 10.1371/4f959951cce2c.

Gall, M., K. A. Borden, C. T. Emrich, and S. L. Cutter, 2011. The unsustainable trend of natural hazard losses in the United States. Sustainability 3: 2157-2181.

Gall, M., K. A. Borden, and S. L. Cutter, 2009. When do losses count? Six fallacies of natural hazards loss data. Bulletin, American Meteorological Society (BAMS) 90 (6): 799-809.

Goldman, A., B. Eggen, B. Golding, and V. Murray, 2013. The health impacts of windstorms: a literature review. Public Health 128 (1): 3-28.

Integrated Research on Disaster Risk, 2013. Integrated Research on Disaster Risk Strategic Plan 2012-2017. Beijing, China.
http://www.irdrinternational.org/wp-content/uploads/2013/04/IRDR-Strategic-Plan-2013-2017.pdf.

Integrated Research on Disaster Risk, 2014. Peril Classification and Hazard Glossary (IRDR DATA Publication No. 1). Beijing: Integrated Research on Disaster Risk. Available at http://www.irdrinternational.org/2014/03/28/irdr-peril-classification-and-hazard-glossary/.

Kron, W., M. Steuer, P. Löw, and A. Wirtz, 2012. How to deal properly with a natural catastrophe database—analysis of flood losses. Natural Hazards and Earth Systems Sciences 12:535-550.

Landesman, L.Y., 2012. Public Health Management of Disasters: The Practical Guide, 3rd Edition. Washington D.C.: American Public Health Association.

Menne, B. and V. Murray (eds.), 2013. Floods in the WHO European Region: Health Effects and Their Prevention. Copenhagen: World Heath Organization Regional Office for Europe. Available at http://www.euro.who.int/__data/assets/pdf_file/0020/189020/e96853.pdf.

Stanke, C., M. Kerac, C. Prudhomme, J. Medlock, and V. Murray, 2013. Health effects of drought: a systematic review of the evidence. PLOS Currents Disasters Jun 5. Edition 1. doi: 10.1371/currents.dis.7a2cee9e980f91ad7697b570bcc4b004.

UNDP/BCPR, 2013. A Comparative Review of Country-Level and Regional disaster Loss and Damage Databases. New York: UNDP.
Available at http://www.undp.org/content/undp/en/home/librarypage/crisis-prevention-and-recovery/loss-and-damage-database/.

Wirtz, A., W. Kron, P. Löw, and M. Steuer, 2014. The need for data: natural disasters and the challenges of database management. Natural Hazards 70(1): 135-157.

Appendix: Human and Economic Indicators in Existing Loss Databases at a Glance

		EM-DAT (global)	NatCatService (global)	sigma (global)	DesInventar (local)	SHELDUS (USA)	CDD (Canada)	EMADD (Australia)	EU
Primary Indicators	Deaths	x	x	x	x	x	x	x	x
	Injured	x	x	x	x	x	x	x	x
	Missing	x	x	x	x				x
	People Exposed								
	Economic Loss	x	x	x	x	x	x		x**
Secondary Indicators	Affected	x	x		x				x
	Homeless	x	x	x					
	Evacuated		x		x		x		x
	Relocated				x				
	Direct Economic Loss	x	x			x			x
	Indirect Economic Loss	x					x		
	Insured Loss	x	x	x				x	x
	Uninsured Loss								x
	Indirect Immediate Deaths								
	Indirect Delayed Deaths								
Tertiary Indicators	Gender				x				
	Age				*				
	Location				*				
	Permanent Relocation								
	Temporary Relocation								
	Sector Breakdown of Economic Losses	x	x		x			x	
	Government Assistance						x	x	
	Crop loss	x	x						
	Property loss	x	x						
	Evacuation shelter type								

* DesInventar offers the ability to customise the data entry interface and add any number of tertiary indicators based on user needs. While this is rarely done, the Turkish Disaster Loss Database maintained by the Prime Ministry for Disaster and Emergency Management Presidency (AFAD), for example, contains demographic and health status information on persons injured or killed in a disaster.

** Only direct losses.

About IRDR

The impacts of natural hazards continue to increase around the world; the frequency of recorded disasters affecting communities has risen significantly over the past century. Although earthquakes and tsunamis can have horrific impacts, most disaster losses stem from weather and climate-related hazards such as hurricanes, cyclones, other major storms, floods, landslides, wildfires, heat waves, and droughts.

The Integrated Research on Disaster Risk (IRDR) programme is a decade-long integrated research initiative co-sponsored by the International Council for Science (ICSU), the International Social Science Council (ISSC), and the United Nations International Strategy for Disaster Reduction (UNISDR) – the Co-Sponsors. It is a global, trans-disciplinary research programme created to address the major challenges of natural and human-induced environmental hazards. The complexity of the task is such that it requires the full integration of research expertise from the natural, socio-economic, health and engineering sciences as well as policy-making, coupled with an understanding of the role of communications, and public and political responses to reduce the risk.

Unfortunately, there is a great shortfall in current research on how science is used to shape social and political decision-making in the context of hazards and disasters. Addressing this problem requires an approach that integrates research and policy-making across all hazards, disciplines, and geographic regions. The IRDR programme endeavours to bring together the natural, socioeconomic, health and engineering sciences in a coordinated effort to reduce the risks associated with natural hazards.

The programme is guided by three research objectives:

1. Characterisation of hazards, vulnerability and risk.
2. Understanding decision-making in complex and changing risk contexts.
3. Reducing risk and curbing losses through knowledge-based actions.

Three cross-cutting themes support these objectives:

- Capacity building, including mapping capacity for disaster reduction and building self-sustaining capacity at various levels for different hazards.
- Development and compilation of case studies and demonstration projects.
- Assessment, data management, and monitoring of hazards, risks, and disasters

Attainment of these objectives through successful projects will lead to a better understanding of hazards, vulnerability and risk; an enhanced capacity to model and project risk into the future; better understanding of decision-making choices that lead to risk plus how they may be influenced; and how this knowledge can better guide disaster risk reduction.

Members of the IRDR DATA Project Working Group

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