Disaster Loss Characterization: Review of human and economic impact indicator definitions

Working Paper {Draft}

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1. Introduction

Within the context of the EM-DAT project, sponsored by the United States Agency for International Development's Office of Foreign Disaster Assistance (USAID/OFDA), the Centre for Research on the Epidemiology of Disasters (CRED) is currently involved in an activity focusing on the development of guidelines, standards and training material for disaster databases. One of the main objectives within this activity is to establish standardized human and economic disaster loss definitions, in order to increase data reliability, quality control and interoperability of global and national disaster databases. Since the quality of disaster databases depends on the quality of the data sources, international efforts are needed to establish commonly agreed loss definitions.

Overcoming the lack of clear standards and definitions is nowadays acknowledged as one of the major challenges in the compilation of reliable disaster loss data, as well as evidence-based disaster risk management and reduction (see for example references 1,2,3,4,5,6,7,8,9). The use of loss terms (such as affected people or economic damages) varies between disaster databases as well as between situation reports coming in from the fields.

The interoperability and the sharing and use of information among different actors would be greatly facilitated by developing a common terminology and adopting standard measurement indicators, as well as interoperable assessment formats with a minimum set of standard indicators.

For example, the Inter-Agency Standing Committee (IASC) in its 'Guidelines for Common Operational Datasets in Disaster Preparedness and Response'1 mentions the following mandatory data characteristics for data on the humanitarian profile: Internally Displaced, Non-displaced affected, Host family/resident community affected, Refugee, Dead, Injured, Missing. Only for internally displaced people and refugees are definitions indicated.

Whereas increasing attention has been paid in the recent years on defining disaster related terms such as 'disaster', 'risk' and 'vulnerability' (e.g. UNISDR, UNOCHA[10,11,26,34,]), human and economic loss indicators are still poorly defined and often even lacking.

This working paper provides an overview of the current state of available disaster loss definitions. The paper is developed based on key informant consultation and an internet-based review of relevant documents. It describes which definitions are used in the global disaster occurrence and impact databases. It also outlines which indicators and definitions are applied by field agencies and within international frameworks and strategies as well as methodologies. The working paper provides a basis for further discussions to identify which actions need to be undertaken to standardize and harmonize disaster loss definitions. The working paper does not intend to be exhaustive nor provide the 'best' definitions to be used to describe human and economic impact indicators. Merely, it should be used for further discussion and elaboration.

Following this Introduction, in Chapter 2 international disaster occurrence and impact databases are described. In Chapter 3, the focus lies on the Damage and Loss Assessment methodology (DaLA) as one of the main initiatives to estimate socio-economic damages and losses. In Chapter 4, the use of indicators and definitions by field agencies is outlined. Chapter 5 provides an overview of human and economic loss definitions established by disaster risk reduction and humanitarian frameworks and strategies. Finally, Chapter 6 contains a conclusion and way forward.

Box 1: Multilingual Dictionary of Disaster Medicine and International Relief[12]

The Multilingual Dictionary of Disaster Medicine and International Relief, created in 1990, was one of the first attempts to standardize disaster related terminology between humanitarian actors. The following relevant indicators are listed:

- *Disaster victim: Person or population stricken by a disaster.*
- *Displaced person(s): Persons who, for different reasons or circumstances – natural disasters, wars, conflicts or internal troubles – have been compelled to leave their homes. They may or may not reside in their country of origin, but are not legally regarded as refugees.*
- *Evacuee: a person temporarily displaced from one place to another to safeguard his health or his security.*
- *Fatality (synonym mortality): The severity of a disease as judged by the frequency of the deaths that occur among the patients of that disease in relation to the total number of sick persons. This concept is commonly employed to calculate the ratio of the number of fatal cases in a specific clinical or epidemiological experience. The ratio is disease-specific: thus fatality in diphtheria is about 5 percent.*
- *Returnee: Person who, after having crossed an international boundary as a refugee, returns voluntarily to his country of origin or of usual residence.*

2. Databases

In this section the global disaster occurrence and impact databases, EM-DAT, NatCatSERVICE, Sigma and Desinventar, are briefly described. The available definitions of human and economic loss indicators are provided. At the end, a matrix provides an overview of the definitions applied by each database.

2.1. CRED EM-DAT[13]

The EM-DAT database managed by CRED is a publicly accessible international disaster database including information on global natural and technological disasters. The database contains approximately 19,000 entries with an average of 700 new entries per year and covers the period from 1900 to present. It is updated on a daily basis and made available to the public every 3 months after validation of the figures. Criteria for inclusion in the database are as follows: ≥ 10 people killed, and/or ≥ 100 people reported affected, and/or a declaration of a state of emergency, and/or a call for international assistance. Events are entered on a country-level basis and information collected includes, amongst other, location, date, number of people killed/injured/affected, number homeless, and estimated damage costs. Sources include governments, UN agencies (UNEP, UNOCHA, WFP, FAO), NGOs (IFRC), research institutions, insurance companies (Lloyds) and press agencies. Amongst disaster databases, EM-DAT provides one of the most comprehensive and transparent explanations of the methodology employed. The database is searchable by country, disaster type, or time period. Due to the nature of the inclusion criteria, EM-DAT maintains a "global observation level and a national resolution level". This makes some smaller scale disasters "invisible" and creates difficulties for agencies attempting to disaggregate disasters at a local or municipal level.

- Killed: Persons confirmed as dead and persons missing and presumed dead (official figures when available).
- Missing: - (*included in 'killed'*)
- Injured: People suffering from physical injuries, trauma or an illness requiring immediate medical treatment as a direct result of a disaster.

- Homeless: People needing immediate assistance for shelter.
- Affected: People requiring immediate assistance during a period of emergency, e.g. requiring basic survival needs such as food, water, shelter, sanitation and immediate medical assistance. This may include displaced or evacuated people. Appearance of a significant number of cases of an infectious disease introduced in a region or a population that is usually free from that disease.
- Economic losses (direct/indirect):
  The economic impact of a disaster usually consists of direct (e.g. damage to infrastructure, crops, housing) and indirect (e.g. loss of revenues, unemployment, market destabilisation) consequences on the local economy. In EM-DAT estimated damage are given in US$ ('000). For each disaster, the registered figure corresponds to the damage value at the moment of the event. Several institutions have developed methodologies to quantify these losses in their specific domain. However, there is no standard procedure to determine a global figure for economic impact.
- Aid contribution: -
- Composite indicators:
  o Total affected: Sum of injured, homeless and affected
  o Victims: Sum of killed and total affected

2.2. MunichRe NatCatSERVICE[14]

NatCatSERVICE is a private international level disaster database maintained by MunichRe. NatCatSERVICE collects information and assesses losses on natural disasters (excluding technological disasters) and entries cover a period from 79AD to the present (prior to 1980 only major events are recorded). There are over 30,000 entries in the database with approximately 800 new entries per year, in part due the inclusion criteria applied. Events are entered on a country and event level and recorded information includes number of people killed/injured/affected, economic and insured losses, and scientific data such as wind speed, magnitude, and geocoding. Sources include national insurance agencies, reports from clients and loss adjusters, insurance related journals, press and media, UN agencies, NGOs, world weather services and scientific institutes. Priority is given to clients and branches, and insurance industry reports. Due to the availability of resources, NatCatSERVICE is able to provide detailed economic and insured loss data which is not always found in databases that rely on humanitarian agencies in the field. The database is partially accessible to the public, and more is only available to clients of MunichRe. The publicly available information can be downloaded and includes annual statistics, great natural catastrophes, significant natural catastrophes and focus analyses. There is no publicly accessible search function of the database.

- Killed: -
- Missing: -
- Injured: -
- Diseases: -
- Displaced: -
- Evacuated: -
- Economic losses (direct/indirect)
- Insured losses (divided by sectors)
- Lines of business affected:
  o Business interruption
  o Industry, Supply industry, Commercial sector
  o Construction sites
  o Agriculture, Aquaculture, Livestock, Forestry
  o Marine, Onshore, Offshore
- Infrastructure/Lifeline

- o Roads, Railways, Bridges
- o Water supply, Irrigation, Sewage
- o Food supply
- o Electricity, Communication
- o Transport (air, rail, shipping)
- Environmental damage
- Housings:
  - o Damaged
  - o Damaged/destroyed
  - o Destroyed
  - o Health centres
  - o Public buildings
  - o Boats
  - o Cars

2.3. SwissRe Sigma[15]

Swiss Re maintains the Sigma database, a limited-access global natural and man-made disaster database. Events are recorded from 1970 to the present. There are over 9,000 entries in the database with only 300 new entries per year, depending on how many natural and man-made disasters occurred. Sigma requires at least one of the following for inclusion in the database; ≥20 deaths and/or missing, and/or ≥50 injured, and/or ≥2000 homeless, and/or insured losses >US$17.9 million (Marine), >US$35.8 million (Aviation), >US$44.5 million (all other losses), and/or total losses in excess of US$88.9 million. Disasters are recorded on an event entry basis and recorded information includes dead, missing, injured and homeless, along with detailed accounting of insured and uninsured damages. Sources of information include national disasters co-ordination bodies' publicly released information, press, industry reports, aid agencies reports, as well as internal primary research carried out by Swiss Re underwriting and claims assessors. Sigma database is a proprietary disasters database and it is not publicly available data. However, sigma does provide a yearly sigma report listing all events for the year and associated human, insurance and economic impact details.

- Killed: -
- Missing: -
- Victims (Casualties): number of individuals killed or missing
- Injured: Number of individuals requiring in-patient or ambulatory at a medical facility to treat injuries suffered as a direct consequence of the event
- Homeless: Number of people unable to occupy their primary dwelling for a period longer than overnight because it is destroyed, sustained damaging rendering in uninhabitable, or is otherwise inaccessible due to consequences of the event
- Economic losses (direct/indirect):
  - o Direct: Financial losses attributable to the event, including physical property damage, and business interruption as a result of property damage caused by the event. Losses are both insured and uninsured
  - o Indirect: Economic losses suffered outside of the area affected by the event. For instances these would include losses suffered by businesses unable to obtain goods from producers that suffered business interruption as a result of property damage caused by the event (indirect economic losses not included in estimates of total economic losses)
  - o Insured losses: Losses covered by property insurance claims payments. The definition does not include liability or life insurance claims payments even if losses are directly attributable to the event.

2.4. DesInventar[16]

The Network for Social Studies on Disaster Prevention in Latin America (LA Red) began developing the DesInventar methodology in 1994 to capture disaster data in Latin-America. This effort was then picked up by UNDP and UNISDR who sponsored the implementation of similar systems in the Caribbean, Asia and Africa. The DesInventar open source Disaster Information Management System maintains approximately 23 national level natural and technological disaster databases[1]. The databases are accessible through downloadable software on an individual national-level. Though DesInventar utilizes government agencies, NGOs, and research institutes for source data, it relies heavily on news media as a priority source. Currently, no validation methodology is applied for data in the databases.

Impacts in DesInventar are the sum of losses or adverse effects which take place in a specific geographical unit. These are the direct indicators of conditions of vulnerability in communities, regions and countries. DesInventar works with a list of variables of effects commonly generated by a disaster such as, those that affect people, homes, vital infrastructure, and economic sectors. The effects of disasters have been classified in four groups: Related to people; Related to homes; Related to infrastructure and Economic losses.

- Deaths: The number of persons whose deaths were directly caused. When final official data is available, this figure should be included with corresponding observations, for example, when there are differences between officially accepted figures and those of other sources.
- Missing: The number of persons whose whereabouts since the disaster is unknown. It includes people who are presumed dead, although there is no physical evidence. The data on number of deaths and number of missing are mutually exclusive and should not be mixed.
- Injured, sick: The number of persons whose health or physical integrity is affected as a direct result of the disaster. This figure does not include victims who die. Those who suffer injuries and or illness, if the event is related to a plague or epidemic, should be included here.
- Affected: 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.
- Relocated: The number of persons who have been moved permanently from their homes to new sites. If the information refers to families, calculate the number of people according to available indicators.
- Evacuated: The number of persons temporarily evacuated from their homes, work places, schools, hospitals, etc. If the information refers to families, calculate the number of people according to available indicators.
- Economic damages=
  - Loss value: Sum of losses directly caused by the disaster in local currency.
  - Loss value US$: The equivalent in dollars (US$) of the value of losses in local currency, according to the exchange rate on the date of the disaster. This figure is useful for comparative evaluations between databases.
- Victims: 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.

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[1] See: http://online.desinventar.org/. Accessed on 26 September 2011.

Table 1: Human and economic loss definitions used in EM-DAT, NatCatSERVICE, Sigma, Desinventar and DaLA.

Indicator**	Indicator sub-type	CRED EM-DAT	MUNICHRE NatCatSERVICE	SWISSRE SIGMA	DESINVENTAR	UNECLAC DALA
Killed		Persons confirmed as dead and persons missing and presumed dead (official figures when available).			The number of persons whose deaths were directly caused. When final official data is available, this figure should be included with corresponding observations, e.g. differences between officially accepted figures and those of other sources.	
Affected		Number of people requiring immediate assistance during a period of emergency, e.g. requiring basic survival needs such as food, water, shelter, sanitation and immediate medical assistance. This may include displaced or evacuated people. Appearance of a significant number of cases of an infectious disease introduced in a region or a population that is usually free from that disease.*			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.	People affected by the direct effects of the disaster and consists of the dead, the injured and the disabled (primary trauma victims), as well as those who suffer material losses as a direct and immediate consequence of the disaster. This segment is made up of people who were in the affected area at the time the disaster occurred ('primary affected population').
Victims		Sum of killed and total affected.		Number of individuals killed or missing ('casualties').	The number of persons whose goods and/or individual or collective services have suffered serious damage, directly associated with the event, e.g. partial or total destruction of their homes and goods; loss of crops and/or crops stored in warehouses.	
Injured		People suffering from physical injuries, trauma or an illness requiring immediate medical treatment as a direct result of a		Number of individuals requiring in-patient or ambulatory at a medical facility to treat injuries	The number of persons whose health or physical integrity is affected as a direct result of the disaster. This figure does not	

		disaster.		suffered as a direct consequence of the event.	include victims who die. Those who suffer injuries and or illness, if the event is related to a plague or epidemic, should be included here.	
Homeless		People needing immediate assistance for shelter.		Number of people unable to occupy their primary dwelling for a period longer than overnight because it is destroyed, sustained damaging rendering in uninhabitable, or is otherwise inaccessible due to consequences of the event.		
Missing					The number of persons whose whereabouts since the disaster is unknown. It includes people who are presumed dead, although there is no physical evidence. The data on number of deaths and number of missing are mutually exclusive and should not be mixed.	
Relocated					The number of persons who have been moved permanently from their homes to new sites.	
Evacuated					The number of persons temporarily evacuated from their homes, work places, schools, hospitals, etc.	
Economic losses		The economic impact of a disaster usually consists of direct (e.g. damage to infrastructure, crops, housing) and indirect (e.g. loss of revenues, unemployment, market destabilisation)	Affected lines of: Business (Business interruption; Industry-Supply industry- Commercial sector; Construction sites; Agriculture-Aquaculture-Livestock-		Sum of losses directly caused by the disaster in local currency. The equivalent in dollars (US$) of the value of losses in local currency, according to the exchange rate	Affected assets (direct damages); the flow for the production of goods and services (indirect losses); and the performance of the main macroeconomic aggregates of the affected country (macroeconomic effects).

		consequences on the local economy. In EM-DAT estimated damage are given in US\$ ('000). For each disaster, the figure corresponds to the damage value at the moment of the event. Several institutions have developed methodologies to quantify these losses in their specific domain. However, there is no standard procedure to determine a global figure for economic impact.	Forestry;Marine-Onshore-Offshore); Infrastructure/lifeline (Roads-Railways-Bridges;Water supply-Irrigation-Sewage;Food supply; Electricity-Communication; Transport-Air-Rail-Shipping); Environmental damage; Housings(Damaged;Destroyed; Health Centers;Public buildings;Boats;Cars)	on the date of the disaster.	
	Direct economic losses			Financial losses attributable to the event, including physical property damage, and business interruption as a result of property damage caused by the event. Losses are both insured and uninsured.		Direct damages (complete or partial destruction) may be inflicted on immovable assets and on stock (including final goods, goods in process, raw materials, materials and spare parts). This category consists of damage to assets that occurred right at the time of the actual disaster. The main items in this category include physical infrastructure, buildings, installations, machinery, equipment, means of transportation and storage, furniture, damage to farmland, irrigation works, reservoirs and the like. In agriculture, the destruction of crops ready for harvest must also included.
	Indirect economic losses			Economic losses suffered outside of the area affected by the event. For instances these would include losses suffered by businesses unable to obtain goods from producers that suffered business interruption as a result of property		The flows of goods and services, expressed in current values, that will not be produced or rendered over a time span that begins after the disaster and may extend throughout the rehabilitation and reconstruction periods. The indirect losses result from the direct damage to production capacity and social and economic infrastructure. Indirect losses also include disaster-induced increases in current outlays or costs in the provision of essential

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				damage caused by the event (indirect economic losses not included in estimates of total economic losses).		services, as well as diminished expected income in cases where these services cannot be provided under normal conditions or at all.
	Insured losses			Losses covered by property insurance claims payments. The definition does not include liability or life insurance claims payments even if losses are directly attributable to the event.		
	Macro-economic effects					The manner in which the disaster modifies the performance of the main economic variables of the affected country, provided the proper national authorities make no adjustments. The most important macroeconomic effects of a disaster are those that have a bearing on growth in gross domestic product and in sectoral production; the current account balance (due to changes in the trade balance, tourism and services, as well as outflows to pay for imports and foreign services, etc.); indebtedness and monetary reserves; and public finances and gross investment. Depending on the disaster's characteristics, an estimate of the effects on price increases, employment and family income is often relevant, as are changes to sovereign debt ratings, liquidity and domestic interest rates.

*EM-DAT defines 'Total affected' as the sum of injured, homeless and affected.

**'Displaced' and 'Aid contribution' are defined by none of the databases.

3. Methodologies

This section describes the relevant methodologies that have been developed to capture the economic and social damages, losses and needs following disasters. First, the DaLA methodology and its definitions are described, followed by the associated methodologies of the GFDRR and the PDNA. It is very difficult to measure the exact economic costs of a disaster.

3.1. UNECLAC DaLA

The Damage and Loss Assessment (DaLA) Methodology was initially developed by the UN Economic Commission for Latin America and the Caribbean (UN-ECLAC) in 1972. It has since been improved in collaboration with WHO, PAHO, World Bank, Inter American Development Bank, UNESCO and ILO to capture the closest approximation of damage and losses due to disaster events.

The UN-ECLAC handbook for estimating the socio-economic and environmental effects of disasters[17] includes three types of damages:

1. impacts of disasters on assets (direct damages). Direct damages occur at the moment of the disaster or within the first few hours;
2. impacts on the flow for the production of goods and services (indirect losses);
3. impacts in terms of performance of the main macroeconomic aggregates of the affected country (macroeconomic effects).

The latter two types of damages can extend over a period of up to five years. During slowly evolving or long-duration events –such as droughts or the effects of El Niño – direct damages may occur over an extended period and recur several times if the affected infrastructure was initially repaired and subsequently damaged again.

For convenience, use is made of the term damage or loss; however, disasters may also have a positive result. The assessment is therefore aimed at determining the net effect, giving due consideration to both negative and positive results.

A description of damage types is provided as follows:

- Direct damages (complete or partial destruction): may be inflicted on immovable assets and on stock (including final goods, goods in process, raw materials, materials and spare parts). In essence, this category consists of damage to assets that occurred right at the time of the actual disaster.

The main items in this category include the total or partial destruction of physical infrastructure, buildings, installations, machinery, equipment, means of transportation and storage, furniture, damage to farmland, irrigation, reservoirs and the like. In the special case of agriculture, the destruction of crops ready for harvest must also be valued and included as direct damage.

Direct damages in the health sector

Direct damages in the health sector are those caused to the health system infrastructure, as well as to the stock of medical equipment and inputs. The following components are usually the most affected:

- Hospitals, health centers, clinics, dispensaries and rural and urban health-care stations belonging to the national health or social security system;
- Health sector offices;
- Laboratories and blood banks;
- Rural and urban private sector hospitals and clinics;
- Medical and auxiliary equipment and medical and surgical instruments;
- Non-medical equipment and supplies used in the health sector;
- Furniture and basic material;
- Stocks of medications and vaccines.

- Indirect losses: refers essentially to the flows of goods and services –expressed in current values– that will not be produced or rendered over a time span that begins after the disaster and may extend throughout the rehabilitation and reconstruction periods.

The indirect losses result from the direct damage to production capacity and social and economic infrastructure. Indirect losses also include disaster-induced increases in current outlays or costs in the provision of essential services, as well as diminished expected income in cases where these services cannot be provided under normal conditions or at all (which in turn will be reflected in macroeconomic effects).

Indirect losses in the health sector

Indirect effects include the reduction in the level of normally available services, the additional cost of caring for victims, including the cost of relocating services and personnel into emergency services, the cost of maintaining idle human resources as a result of the impact on infrastructure, the reinforcement of epidemiological surveillance, the increased cost of medical treatment, lost income, activities associated with emergency care, delivery of medications and other inputs, vector control, vaccination, psychological care and so on. The nature of indirect losses varies greatly. The following are some of the main types:

- The costs of monitoring and controlling the spread of infectious and contagious diseases and the harmful effects on health;

- The public and private cost of hospital and outpatient care;

- The cost of reinforcing primary care in rural areas and for vulnerable groups;

- The decline in the victim's well-being and living standards due to the general erosion of the standards of public hygiene;

- The general decline in activity in the formal and informal productive sectors resulting from the psychological trauma suffered by the affected population (this is usually measured in the estimates for the corresponding productive sector);

- The additional cost of treatment and health care for the affected population;

- The additional cost incurred to reduce the vulnerability of the sector's buildings.

- Macro-economic effects: reflect the manner in which the disaster modifies the performance of the main economic variables of the affected country, provided the proper national authorities make no adjustments. The most important macroeconomic effects of a disaster are those that have a bearing on growth in gross domestic product and in sectoral production; the current account balance (due to changes in the trade balance, tourism and services, as well as outflows to pay for imports and foreign services, etc.); indebtedness and monetary reserves; and public finances and gross investment. Depending on the disaster's characteristics, an estimate of the effects on price increases, employment and family income is often relevant, as are changes to sovereign debt ratings, liquidity and domestic interest rates.

In terms of the population that is affected by a disaster, the handbook defines the following:

- Primary affected population: includes people affected by the direct effects of the disaster and consists of the dead, the injured and the disabled (primary trauma victims), as well as those who suffer material losses as a direct and immediate consequence of the disaster. This segment is made up of people who were in the affected area at the time the disaster occurred.
- Secondary and tertiary affected populations are defined as: those segments of the population that suffer a disaster's indirect effects. The difference between the two groups is that the secondary affected population is located within or near the boundaries of the affected area, while the tertiary affected population usually resides outside or far away from the affected area.

GFDRR

The Global Facility Disaster Reduction and Recovery's (GFDRR) Damage, Loss and Needs Assessment Guidance Notes[18] build on the UN-ECLAC handbook for estimating the socio-economic and environmental effects of disasters. They define the following definitions of disaster effects:

- Damage: total or partial destruction of physical assets existing in the affected area. Damage occurs during and immediately after the disaster and is measured in physical units (e.g. square meters of housing, kilometers of roads, etcetera). Its monetary value is expressed in terms of replacement costs according to prices prevailing just before the event.
- Losses: changes in economic flows arising from the disaster. They occur until full economic recovery and reconstruction is achieved, in some cases lasting for several years. Typical losses include the decline in output in productive sectors (agriculture, livestock, fisheries, industry and commerce) and the lower revenues and higher operational costs in the provision of services (education, health, water and sanitation, electricity, transport and communications). Also considered losses are the unexpected expenditures to meet humanitarian needs during the post-disaster emergency phase. Losses are expressed in current values.

The value of *damage* is used as the basis for estimating reconstruction needs while the value and type of *losses* provide the means for estimating the overall socio-economic impact of the disaster and the needs for economic recovery.

The socio-economic impact analysis includes an estimation of the disaster's likely effects on economic performance and the temporary macro-economic imbalances that may arise, as well as the temporary decline in employment, income and well-being of affected individuals and households.

- Impact on macro-economic variables: analysis of the post disaster performance on gross domestic product (GDP), the balance of payments (BOP) and the fiscal sector. The impact on GDP refers to the temporary negative repercussions of disaster losses on the performance of the economy, and to the positive effects on the construction and other sectors due to the initiation of the reconstruction program. The impact of damage on gross investments may not necessarily occur in the same year as the disaster, but is measured in the following years as asset restoration or replacement gets underway (depending on construction sector capacity and available financial resources). The impact on the balance of payments involves estimating the increase in imports and the decline of exports arising from the disaster, as well as possible reinsurance payments from abroad and relief donations from the international community. The analysis of disaster impact on the public sector budget is estimated in terms of increased operational costs and lower revenues; whenever the public sector directly owns sectoral enterprises, its budget would sustain losses. In regard to the impact on personal or household well-being—which is a different and separate viewpoint of disaster effects and impact—the analysis normally includes an estimation of employment and income decline due to the losses sustained in the productive and services sectors, as well as higher than normal family or personal expenditures.

PDNA

A Post Disaster Needs Assessment (PDNA) is a synthesis of DaLA and the Human Recovery Needs Assessment (HRNA). The HRNA is a qualitative primary field assessment of the perceptions of people and communities about how to do what must be done based on community perceptions of the implications of the damages, losses and related needs.

A Post Disaster Needs Assessment and Recovery Framework (PDNA/RF) is a government-led exercise that pulls together information into a single, consolidated report detailing information on the physical impacts of a disaster, the economic value of the damages and losses, the human impacts as experienced by affected populations, and related early and long-term recovery needs and priorities.

The PDNA/RF is governed by institutional, legalized agreements between the World Bank, the UN system and the EC. The PDNA/RF serves as the primary modality by which these institutions maximize coherence in order to ease the impact of demands placed by international organizations on governments dealing with natural catastrophes. A Guide to Multi-Stakeholder Post-Disaster Needs

Assessment and the Recovery Framework is under development for cases where other international agencies (such as the United Nations, the EC, and other multi-lateral development partners) are requested to undertake assessments of disaster impact and estimations of needs jointly with the World Bank.

4. Field agencies and data sources

In this section, an overview is provided of the main field agencies and data providers. An attempt is made to capture established methodologies and definitions for reporting the human and economic impact at a disaster site.

The 2002 Symposium on Best Practices in Humanitarian Information Exchange[19], followed by the Global Symposium+5 on Information for Humanitarian Action in 2007[20], focused on best practices for maintaining data and information quality. One of the recommendations relates to defining ambiguous terminology:

> "*Clarify commonly misused terms such as "affected" or "refugee" to avoid misinterpretation by different users and audiences*".

More broadly, it was recommended to:

> "*Update and disseminate existing international standards terminology related to humanitarian information management in order to strengthen credibility of information and analysis of needs, including through the creation of an international thesaurus on humanitarian terminology. Examples of such terminology include ISO, Sphere, the Protection Information Systems Taxonomy, and the International Thesaurus of Refugee Terminology, among others.*"

4.1. UNOCHA

UNOCHA plays a role in operational coordination in crisis situations. This includes assessing situations and needs; data and information management, and reporting. Following a rapid assessment of damage and needs with tentative information, field situation reports are developed.

The UNOCHA report on the Assessment and Classification of Emergencies (ACE) project, named 'Mapping of key emergency needs assessment and analysis initiatives'[21] stated that:

> "*Clusters and sectors should agree on common definitions for selected key terms, such as affected, homeless, vulnerable groups etc. to ensure a common understanding of a particular crisis setting.*"

The standard reporting format for field situation reports of the United Nations Disaster Management Team (UNDMT)[2] to UNOCHA includes, amongst other types of information: the nature of the disaster, area affected, impact, damage by sector, effects on population: number of dead, missing, injured, and people affected in specific ways, e.g. homeless. It is advised to specify the manner in which they have been affected, specify effects on vulnerable groups (women, children), round off confirmed casualty/damage figures, make a distinction between those who are homeless due to repairable damage and those whose houses have been destroyed, (as well as those who were homeless before the disaster, if applicable), report housing damage extensively and try to specify extent of damage[22]. Working definitions of some relevant terms, such as 'Disaster' are established.

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[2] The United Nations Disaster Management Team (UNDMT) usually includes a core group of OCHA, FAO, UNDP, UNICEF, WFP, WHO, and UNHCR.

However, no definitions exist for the terms and indicators for human and economic losses that are used in the report.

UNOCHA and the International Federation of the Red Cross/Red Crescent (IFRC) co-chair the Needs Assessment Taskforce (NATF), which is mandated by the Inter-Agency Standing Committee (IASC). The NATF aims to develop tools (e.g. the Humanitarian Dashboard) and guidance based on standardized information that support humanitarian organizations' initial planning and response.

The IASC Needs Assessment Task Force on Operational Guidance for Coordinated Assessments in Humanitarian Crises[23] provides guidelines, but no definitions, for human impact:

> "People in Need of Humanitarian Response: The demographics of people in need of humanitarian response will very much depend on the context and type of hazard. It will be up to the HCT to determine the most relevant demographic information that they would like to highlight in the tool. The number of 'people in need of humanitarian response' will vary from cluster/sector to the next. However, the overall number of people in need of humanitarian response should be an aggregate based on the estimated number of people in need of humanitarian response per cluster/sector and should take into account the extent to which the targeted population per cluster/sector overlap. This figure will usually be as big as the cluster figure with the most number of people in need of humanitarian response - but could also be larger depending on the extent to which the cluster figures overlap."

The UN Consolidated Appeals Guidelines[24] contains a 'Humanitarian Dashboard' template. The Humanitarian Dashboard is a tool to consolidate and present needs assessment and other core humanitarian information in an accessible format, to facilitate analysis and evidence-based decision-making. The dashboard template includes: Affected, People in need, Displaced, Refugees and Women & children, and also the following humanitarian indicators: Crude mortality rate, <5 mortality rate, <5 global acute malnutrition, <5 severe acute malnutrition, % of population in worst quintile of functioning, including those with severe or extreme difficulties in functioning. Noting that a discussion with partners around the key terms will most likely be required, they give the following indications for human impact indicators:

− Affected people: include all people impacted by the crisis in one way or the other. Not all affected people need humanitarian assistance.
− People in need: the sub-group of the affected people who require humanitarian assistance in one form or the other.
− People targeted: include all people that the cluster system is trying to assist. This will most likely be a sub-group of the people in need taking into consideration that many are being assisted by actors not participating in the cluster system (Red Cross/Red Crescent movement, NGOs, government), though the cluster should map and account for that coverage too.
− People reached: include those that have received some form of assistance from a cluster member. This figure says nothing about how long and how well the assistance is helping the beneficiary.
− People covered: a more meaningful figure because it refers to a standard (e.g. Sphere). There is a significant difference between following two statements: 1000 people received water (people reached), or, 1000 people received enough water to cover their needs (15 litres per person per day) for the next two weeks.

The IASC Needs Analysis Framework[25] is a tool to help UNOCHA humanitarian coordinators and country teams organise and present existing information on humanitarian needs in a coherent and consistent manner. However, in the framework it is stated that: "IASC Country Teams are not

expected to fill out the framework from A to Z, if some of the information required is unavailable. The indicators and descriptors are suggestions that help systematize existing information".

ReliefWeb, the humanitarian information project of UNOCHA, has developed a glossary compiled from existing glossaries and other reference material available to the public, with a focus on their common usage and understanding within a humanitarian context, particularly as relating to natural disasters, complex emergencies and disaster risk reduction[26]. However, human and economic impact indicators are not defined.

4.2. WHO

Various World Health organization (WHO) programmes and offices are dedicated to prepare for, respond to, and recover from emergencies, disasters and crises.

WHO's Health Action in Crises (HAC) provides situation reports and updates. HAC has a reporting template for collecting information on the needs of the affected population as a step for orienting the response and mobilizing the resources. Instructions for collecting the information and completing the situation report can be downloaded as a separate document, as well as the most common reference values useful for interpreting the findings. The template for the first situation report is accessible online. Information on the affected population is reported as Characteristics (e.g. residents, refugees, IDPs), Number/estimates, Sex/age breakdown, Patterns of settlement/movement and Source of information & method of data collection. The health impact is estimated by the Crude mortality rate, the Under-five mortality rate and Malnutrition. Also, reports or rumours of outbreaks are advised to report. Other reasons for concern, such as injuries, are also advised to report. A different, simpler template is often used for progress reports (i.e. follow-up reports that inform regularly on changes or progress of the general and health situation). Its main use is to update programme resource requirements and to indicate progress of the response.

The HAC website contains a definitions section[27], but this section contains only one human impact definition:
- Affected people: People who are adversely affected by a crisis or a disaster and who are in need of urgent humanitarian assistance.

The WHO Unit on Disease Control in Humanitarian Emergencies (DCE) works towards reducing mortality and morbidity due to communicable diseases in populations affected by humanitarian emergencies (conflict, natural disasters, food insecurity). DCE provides both technical and operational epidemiological services for the surveillance, monitoring, prevention and control of communicable diseases in humanitarian emergencies to WHO country and regional offices, national authorities, other United Nations agencies, and non-governmental and international organizations. One of its areas of work is the publication of technical standards, guidelines and tools. In this context, DCE provides risk assessment reports in case of acute emergencies. A protocol for communicable disease risk assessment is developed, however no definitions are provided[28].

The WHO Environmental Health and Emergency Team developed a practical guide on 'Environmental health in emergencies and disasters'[29], which includes a glossary of emergency-related terms. However, no definitions of human or economic disaster impact indicators are available in this guide. On the website, the following definition of displaced people is provided:
- In the context of emergencies, displaced people are people who have had to leave their homes as a result of a natural, technological or deliberate event ... Displaced people include internally

displaced people (people who remain in their own countries) as well as refugees (people who cross international borders).

4.3. IFRC / ICRC

The IFRC/ICRC Guidelines for assessment in emergencies[30] and Disaster Preparedness Training Manual[31] provide advice on how to carry out an assessment. All assessments are based on the International Federation's vulnerability and capacity framework. The guidelines provide a framework within which an assessment can be organized. In the guidelines, the IFRC states that "Indicators are useful for continual assessment. They are, however, difficult to define and using them incorrectly can be dangerously misleading. They should only be used if they have been designed by specialists in the relevant sector." The guides include standard Disaster Needs Assessment Report Forms with instructions, but no standardized definitions for human and economic disaster impact terms. The field assessment forms include: affected, deaths, injured, missing, homes damaged/destroyed, families displaced and evacuated.

Figure 1: IFRC First 24 hours Rapid field assessment form[30]

4.4. IOM[32]

One of the International Organization for Migration's recent activities focuses on the interaction between migration, the environment and climate change. The IOM states that migration can result from different environmental factors, from the gradual environmental degradation (including

desertification, soil and coastal erosion) to the natural disasters (such as earthquakes, floods or tropical storms).

- *Environmental migrants* are defined as:

Persons or groups of persons who, for reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to have to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their territory or abroad.

While no internationally accepted definition for persons moving for environmental reasons exists to date, IOM has put forward a working definition of "environmental migrant" in an attempt to capture the complexity of the issue. This working definition recognizes that:

- − Environmental migrants are not only those displaced by extreme environmental events but also those whose migration is triggered by deteriorating environmental conditions;
- − environmentally-induced movement can take place within as well as across international borders;
- − it can be both short and long term;
- − population movements triggered by environmental factors can be forced as well as a matter of choice.

People migrating for environmental reasons do not fall squarely within any one particular category provided by the existing international legal framework. Terms such as "environmental refugee" or "climate change refugee" have no legal basis in international refugee law.

The IOM furthermore defines the following relevant indicators:

- *Displaced*: A person who flees his/her State or community due to fear or dangers other than those which would make him/her a refugee. A displaced person is often forced to flee because of internal conflict or natural or manmade disasters.
- *Externally displaced persons:* Persons who have fled their country due to persecution, generalized violence, armed conflict situations or other man-made disasters. These individuals often flee en masse. Sometimes they are also referred to as "*de facto* refugees*"*.
- *Internally displaced persons:* Persons or groups of persons who have been forced IDPs or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized State border (*Guiding Principles on Internal Displacement, UN Doc E/CN.4/1998/53/Add.2*.).

4.5. USAID/OFDA

The Field Operations Guide for Disaster Assessment and Response[33] has been developed by the U.S. Agency for International Development/Bureau for Democracy, Conflict, and Humanitarian Assistance/Office of U.S. Foreign Disaster Assistance (OFDA) as a reference tool for individuals sent to disaster sites to undertake initial assessments or to participate as members of an OFDA Disaster Assistance Response Team (DART).

The guide includes a standard field situation reporting format. The form identifies the basic information needed by OFDA or the Response Management Team for use in assisting and supporting the DART and for assembling the OFDA situation report product. Each disaster will dictate additional information to be included in the field situation report cable. One of the items to include is named 'Disaster data, including the sources of the information'. It consists of:

- − Number affected, dead, displaced, injured.

- Crude mortality rate (measured in deaths per 10,000 people per day).
- Global acute malnutrition (GAM) and Severe acute malnutrition (SAM).
- Availability of food and water and Water supply and sanitation conditions.
- Epidemics and Number vaccinated.
- Location of displaced camps.
- Extent of damage (buildings damaged and destroyed, areas of flooding, amount of damage to roads and bridges, areas of drought, areas of civil strife, etc.) and Status of transportation systems for emergency response.

The guide includes a list of commonly used acronyms and definitions of terms. However, no standard definitions are provided for the common human and economic disaster impact indicators.

The USAID/OFDA Fact Sheets contain information on the total number of affected population, deaths, missing people and aid contribution. In some cases, information on the number of IDP's, refugees and people requiring humanitarian assistance is reported.

5. Frameworks and strategies

Within disaster risk reduction frameworks and strategies, increased attention is paid to developing a common language of disaster related terms. Although up to now the focus has been directed towards hazard and risk terminology, more consensus is being reached on the need for standardized human and economic loss definitions, as well as technical standards.

5.1. UNISDR

UNISDR developed basic definitions on disaster risk reduction to promote a common understanding on the subject for use by the public, authorities and practitioners. In the UNISDR terminology[34] human, material, economic or environmental losses and impacts from disasters are referred to, however human and economic loss terms are not yet defined.

5.2. The Sphere standards and Health and Nutrition Tracking Service (HNTS)

The Health and Nutrition Tracking Service (HNTS) is an initiative for humanitarian health and nutrition data collation, analysis, synthesis and dissemination. It is a collaboration of UN agencies, bilateral donors and non-governmental organizations (NGOs), and is hosted by WHO. HTNS intends to standardize and improve the collection of health information in emergencies.

The Sphere project Humanitarian Charter and Minimum Standards in Disaster Response clearly states on the sharing of information[35]:

> "Organisations identifying critical needs should make them known to the wider community as quickly as possible … Wherever possible, recognised terminology, standards and procedures should be used to help others mobilise their responses more quickly and more effectively. The use of standard survey formats and associated guidelines, agreed among the host government and agencies at country level, can help significantly in this regard."

The Sphere handbook offers a set of Minimum Standards and key indicators that inform different aspects of humanitarian action. Based on a study by the HNTS[36] it was recommended to reduce the number of key indicators and select indicators that are quantifiable and related to human survival and health. Although mortality and malnutrition are well-defined, definitions of affected, homeless, evacuated, missing etc. are not available.

5.3. EC Risk Assessment and Mapping Guidelines for Disaster Management

In the working paper on Risk Assessment and Mapping Guidelines for Disaster Management[37], the European Commission Humanitarian Aid and Civil Protection highlights that achieving a common terminology remains a challenge. They point out that scientists and practitioners use different terminologies between various disciplines. The working paper draws upon the standards from International Organisation for Standardisation (ISO 31000, ISO 31010,ISO Guide 73), in combination with the more targeted UNISDR terminology on disaster risk reduction, and a number of proposals specifically adapted to the working paper. The following impacts are defined:

- *Human impacts* are the number of deaths, the number of severely injured or ill people, and the number of permanently displaced people. This is regarded as Number of *affected* people.
- *Economic and environmental impacts* are the sum of the costs of cure or healthcare, cost of immediate or longer-term emergency measures, costs of restoration of buildings, public transport systems and infrastructure, property, cultural heritage, etc., costs of environmental restoration and other environmental costs (or environmental damage), costs of disruption of economic activity, value of insurance pay-outs, indirect costs on the economy, indirect social costs, and other direct and indirect costs, as relevant. Economic/environmental impacts can be estimated in terms of *costs/damage* in Euro.
- *Political/social impacts* are usually rated on a semi-quantitative scale and may include categories such as public outrage and anxiety, encroachment of the territory, infringement of the international position, violation of the democratic system, and social psychological impact, impact on public order and safety, political implications, psychological implications, and damage to cultural assets, and other factors considered important which cannot be measured in single units, such as certain environmental damage. The semi-quantitative scale comprises of a number of classes, e.g. (1) limited/ insignificant, (2) minor/ substantial, (3) moderate/serious, (4) significant/ very serious, (5) catastrophic/ disastrous.

6. Conclusions and way forward

It has been widely acknowledged that standardized definitions are lacking and greatly needed by information teams. Discussions are necessary between all actors, including UN agencies, NGO's and database holders, to increase the level of standardization of disaster loss definitions in order to capture and disseminate reliable information on the human and economic impacts of disasters and strengthen evidence-based disaster risk reduction and management.

Overall, the current picture of applied disaster loss definitions used by database holders as well as field agencies is varied. Whereas database holders have developed definitions for the main human and economic impact indicators, several definitions are still incomplete. Moreover, definitions vary greatly between databases. Field agencies on the other hand have developed standardized needs assessment templates including the main human impact indicators, but impact indicators are rarely defined. Also, quantitative information on economic damages is often not included. International strategies and frameworks have over the years developed disaster-related standardized terminologies, however no definitions for human and economic impacts exist today.

It is important to discuss and tackle the main difficulties in establishing and applying human and economic disaster loss definitions to measure the impact of disasters. Database should reach consensus on a set of basic definitions for quantifying the human and economic losses brought by disasters, keeping in mind the link to how information is collected and reported in the field.

Data quality in disaster databases can be improved by agreeing on working definitions between databases (interoperability) and increasing knowledge on data collection and reporting by data sources (data accuracy). Existing definitions can be built upon (collaboration).

This initiative is a step further towards strengthening the systematic and standardised collection of information and data on the occurrence and impacts of disasters as an essential tool for governments and institutions in charge of relief and recovery activities, as well as for disaster risk management and reduction.

Box 2: Indicators in Field Situation Reports

To shed more light on the type of human and economic indicators used in field situation reports from IFRC and UNOCHA, we performed a small comparative exercise. For each type of disaster[3], we compared one situation report from both sources and analyzed which indicators were reported. The comparison addressed differences and resemblances of indicators between disaster types and between sources. The main findings of this comparison were:

Use of indicators between disaster types:
− Some indicators almost consistently used for the different disaster types: Affected, Killed, Houses damages/destroyed, and often: Missing, Injured.
− For drought and famine specific indicators reported (e.g. Number of children malnourished, Number of people in crisis, Refugees).
− Less consistently used indicators: Homeless, Number of people rescued, Sick.

Use of indicators between IFRC/OCHA:
− Several indicators in commonly used by both sources: Affected, Killed, No. houses damaged/destroyed, Missing, Injured.
− Both use diverse terminology for some indicators: Evacuated, Displaced, Relocated, In camps.

In general:
• Certain indicators are used rather consistently across reports: Affected, Killed, Houses damages/destroyed, and if available: Missing, Injured.
• Divers terminology is used for some indicators: Evacuated, Displaced, Relocated, In camps.
• To have a complete overview of indicators, several subsequent reports have to be combined.
• No explanation or details in reports on what is meant by the indicators.
• Economic damages not often reported.

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[3] The list of disasters includes : Pakistan flood (2010-0341), Philippines storm (2009-0414), Chile earthquake (2010-0091), Somalia drought (2010-9082), Indonesia volcano (2010-0562), Uganda landslide (2010-0084), Bangladesh cold wave (2007), Israel wildfire (2010-0627). The numbers refer to the EM-DAT disaster identification number (DisNo). See www.emdat.be.

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