List of Suggestions for further study (Research agenda)

Asia Pacific Expert Group on Disaster-related Statistics
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The following is a brief summary of items mentioned for further methodological study in the final version of the Disaster-related Statistics Framework (May, 2018). These items comprise the measurement issues identified in relation to developing a basic range of disaster-related statistics at the national level (or lower). These are topics identified by the Expert Group during its proceedings between 2014-2018 in which additional research, proof-of-concept testing, or improved documentation and sharing of methodologies are required towards harmonized statistics for internationally comparable analysis and for evaluating trends across disasters.

1. **Timing and geographic area of disasters**

Timing and geographic location of disasters are basic characteristics that should be recorded as part of the descriptions of historical disasters. This information is important for developing statistics on trends and for understanding risk and identifying hotspot locations. Superficially, this seems like a very simple task (each disaster must happen somewhere at some time). However, standard practices for specifying timing and location of disasters have not yet been developed and there are some hidden challenges for developing consistent methods across disasters and across countries.

Disasters can happen at almost any geographic scale, including multi-national scales For the temporal scale, a disaster can last anywhere from (in extreme cases) just a few minutes to several years.

Geographic areas could refer to administrative regions affected or to a uniquely drawn area (polygon) on a map specifically affected by a disaster ('affected area' or 'disaster footprint').

In the DRSF, it is proposed to use emergency periods, based on operational decisions or reactions, as a simple and generic indicator (or proxy) of timing for a disaster. Emergency management practices vary significantly between countries and may be affected by differing emergency response capacities. However, the period of a (declared or undeclared) emergency situation is associated with the observance of the conditions of a disaster and initiates the collection of relevant data.

Most agencies y refer to administrative regions when referencing geographic location for disasters in the current practices, but the scale of this assessment varies. Also variable are how nations are divided up into sub-national administrative regions (Amin. Region 1, 2, 3, …) and the choice of geographic scale used for post-disaster analysis.

For questions of timing and location, it's important to recall the differences between a hazard and a disaster. However, it's also very important to focus on making use of data that are already available and base the decisions on the practical uses for policy applications.

2. **Hazard mapping**

Methods for hazard mapping vary and there is a wide spectrum of useful data sources, particularly for use in producing statistics for disaster risk assessment. Global-scale examples of hazard maps or variations of hazard maps combined with other elements of risk assessment can be accessed for download on the internet, such as via the data portal of the Group on Earth Observations (GEO): geoportal.org.

The available global maps draw from a disparate collection of methodological sources. Practices among countries at the national level also vary significantly. There is a rich collection of inputs for pre-disaster exposure analyses and some documented methodologies that could be evaluated and potentially implemented more exhaustively and for varying scales of analysis. Some of the hazard maps currently being produced and accessible via the internet are more rigorously developed, more sophisticated, or more timely than others. It might be useful for researchers to conduct a synthesis review and evaluation of methods and statistical qualities for the hazard maps that are currently available internationally. The ultimate aim is to increase accessibility to hazard maps and to improve the statistical qualities and the transparency of methods.

Some of the data sources used in current practices according to the research conducted thus far by the Expert Group include:

- Elevation map, also known as the digital elevation model (DEM)
- Meteorological data (for predicting flood, landslide, drought)
- Distribution of soil types (important for predicting risk associated with earthquakes, landslides, etc.)
- Values for surface roughness (used in assessing tropical cyclone hazard)
- Slope and river flow values (flood)
- Supply and use of freshwater
- Geographic mapping of historical hazards and disasters

Hazard maps are probabilistic approximations based on imperfect information. For many hazards, they involve dynamic factors, such as climate, and thus need to be periodically evaluated and updated. Risk assessments will never have perfect accuracy, but methods could be improved, and capacities of national agencies strengthened through increased transfers of knowledge on good practices. The goal for further research should be to identify and document technical details of current good practices with developing hazard maps so that these methods could potentially be replicated and adapted, as appropriate, by the responsible agencies at the national level (i.e. the disaster management agencies).

3. Review of hazard types classifications

For international reporting of the indicators for the Sendai Framework Monitor, definitions for hazard types are provided in the Report of the Open-Ended Intergovernmental Working Group to the UN

General Assembly on indicators and terminology relating to r disaster risk reduction (A/71/644, December, 2015)[1] and in the IRDR Peril Classification and Hazard Glossary (2014).[2]

The global monitoring of the Sendai Framework indicators by UNISDR provides a special opportunity, at the international level, to study and assess comparability of the scope of measurement of disaster-related statistics from the perspective of the types of hazards that are included in the national databases. In some cases the scope or definitions for hazard types used in statistics compilations are determined by national laws. Comparing current practices or mandates with respect to compiling information on hazards with the scope of hazards for international reporting is a relatively simple and potentially valuable review exercise for national agencies.

This research should include investigating relationships between hazard types, analyses of climate change, and also further research on how the demands for statistics vary according to different hazard types. Another objective for research on this topic could be to review feasibility for potentially revising IRDR recommendations towards a new international hazard type classification for statistical purposes.

4. **Disaggregation of statistics related to populations**

There is a need for further progress to increase the availability of disaggregated statistics on the populations impacted by disasters. Sustainable Development Goal (SDG) target 17.18 is to build capacities of national agencies to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts. In the case of disaster-related statistics, the UNISDR Technical Guidance for Monitoring and Reporting on Progress for the Sendai Framework indicators3, desirable disaggregation for indicators for Sendai Framework Targets A (on deaths or missing), B (affected population) are by:

- Hazard (type)
- Geography (Administrative Unit)
- Sex
- Age
- Disability (before the disaster)
- Income

The need for disaggregated population statistics related to disasters also extend, for some analyses, to the indirect (and potentially long-term) impacts of disasters to the population.

In addition, these disaggregated statistics are important for exposure and vulnerability assessments related to assess risks from potential future disasters. Further research at national (or subnational) level should include further investigations of factors of vulnerability, including, for example dimensions related to gender, income, and housing.

[1] https://www.preventionweb.net/drr-framework/open-ended-working-group/
[2] http://www.irdrinternational.org/wp-content/uploads/2014/04/IRDR_DATA-Project-Report-No.-1.pdf
[3] https://www.unisdr.org/we/inform/publications/54970

The requirements for increased availability of disaggregated population statistics related to disasters include further research and pilot testing, by national agencies, which may include utilization of new and innovative approaches in official statistics. This includes approaches to linking multiple datasets, such as through small area estimation or through increased utilization, with confidentiality protections, of administrative data. Related research also involves use of geographic information systems (GIS) for observing or estimating the specific characteristics of populations in areas exposed to a hazard or a disaster.

5. **Displacement after a disaster**

The Open-ended Intergovernmental Expert Working Group on indicators and terminology relating to disaster risk reduction (OEIWG) determined that counting displaced persons as one of the consequences or reactions after a disaster was not feasible for comparable measurement across countries and therefore was excluded from the scope of the global Sendai Framework monitoring.

There are multiple situations and multiple types of displacement – some statistics exist or could be produced from administrative records after the disaster or estimated based on survey or census questions. Temporary or permanent displacement could happen as direct or indirect consequences of disaster.

There will be significant limitations in the analysis, and challenges, as observed by OEIWG, for comparability due to large differences in the context according to the country and the hazards. However, it could be important to research how statistics on displacement might be produced through a systematic approach and utilized for analysis of movements of people associated with disasters.

International and internal (domestic) migration of people is already identified as an important development issue in many countries and thus its more accurate measurement is already on the research agendas for statistical agencies in some countries. Documents[4] from a meeting on this broader topic organized by the UN Statistics Division last June, 2017, provides an overview of many of the key statistical issues. The relationship with disasters would be an important opportunity to advance measurement on population movements with disaster management policy applications as well as other broader applications.

6. **Review and testing of provisional classification of objects of material impacts from disasters**

Recommendations for classifications in the Disaster-related Statistics Framework were developed as provisional proposals and as a starting point for statistical agencies interested in their further development or testing at the national level. The need for a listing, with definitions, for the objects of material impacts from disasters is as a reference for determining and reporting on the scope of measurement for statistics material impacts of a disaster. These data are used for calculating direct economic loss. Not all items in the listing are expected to be measured in every instance, but the classification should be exhaustive and should bring greater harmonization and improved metadata for measurement of economic impacts across

[4] https://unstats.un.org/unsd/demographic-social/meetings/2017/new-york--egm-migration-data

countries and across disasters.

The provisional proposal in the DRSF should be compared against current practices in countries to study possibilities for improving the draft and perhaps identifying a multi-tiered approach for scope of measurement of impacts. For example, focussing on the list of definitions for critical infrastructure as tier 1 elements for the post disaster assessments.

7. **Pilot testing for DRR Expenditure Satellite accounting**

The idea of the Disaster Risk Reduction (DRR) expenditures and transfers satellite account has not yet been pilot tested in a national statistical system. Estimations for disaster-risk reduction expenditure studies can be found online, with varying methodologies. But, usually these are not national accounts-approaches to disaster risk reduction expenditure measurement. A national accounting approach would help maintain coherence with other key economic aggregates, like GDP and total expenditure, and would facilitate making maximum use out of existing data sources used by national accounts compilers.

A close and relevant example comes from the OECD Statistics on Official Development Assistance (ODA). Although there is no standard for collecting flows of transfers specifically for disaster risk reduction, OECD has managed to compile the flows of ODA by categories of purpose or by sector (see data.oecd.org), including for humanitarian aid.[5]

There are several purposes to producing such statistics, including for monitoring progress related to actionable priorities in the Sendai Framework and SDGs, such as SDG targets 1.5 (build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters); 1b (accelerated investment in poverty eradication actions); and priority 3 of the Sendai Framework: "Investing in disaster risk reduction for resilience".

Another important use of these statistics is to demonstrate to policy-makers and to development financiers how investments in disaster risk reduction not only can save lives and help reduce poverty but also can be wise investments from the cost-benefit economic point of view.

8. **Weighted measurement units for impacts to infrastructure**

Material impacts from disasters are initially observed and recorded in physical units – such as area (square meters) or number of units. Some of the units of measurement used in these data collections are more informative than others. For example, when impacts are recorded in terms of number of buildings or number of health facilities, the meaning might not be entirely clear. There is a difference between damages to a small one-storey or one-room building compared to a multi-unit high-rise building. Likewise, it's hard to determine the importance of impacts to a road or other services-oriented asset without knowledge of its usual use or capacity.

[5] See also: OECD (2017), Development Co-operation Report 2017: Data for Development, OECD Publishing, Paris. http://dx.doi.org/10.1787/dcr-2017-en

The economic perspective provides a common denominator that meets most of the aggregated analytical purposes – such as the aggregated assessment of direct economic loss from a disaster. However, as there are multiple economic perspectives (such as the indirect impacts perspective) to be considered over time, it is always important to retain in the databases, as much as possible, clearly documented data on the originally observed material impacts from a disaster in physical terms.

One of the promising approaches is to utilize national official classification systems for infrastructure by types, where they are available. For example, many countries have a tiered classification and coding of public and private health facilities, ranging from small locally-oriented small clinics (tier 3) to large high-capacity hospitals (tier 1). Both types of facilities provide critical services, but if a tier 1 facility is damaged or destroyed, the disruptions are likely to be much more severe.

Another useful approach is to develop an empirical approach through a weighting scheme, in which the basic capacity characteristics, e.g.: number of beds (for a hospital or accommodation), average daily (or seasonal) volume of traffic for roads, etc. are used to produce weighted statistics on impacts to critical infrastructure. So, for example, numbers of roads damaged would be multiplied by relative measures of average traffic before the disasters. These statistics could provide useful value-added information to complement with the Sendai Framework global monitoring indicators for Target D on damages to infrastructure and disruptions to Basic Services.

9. Investigate developing a composite index of human impacts for international comparison

For most purposes, the Sendai Framework indicator on "Affected Population" combined with the indicator on number of deaths or missing are sufficient for analyses after a disaster, including for assessing trends over time. It will be very useful to have, from the Sendai Framework Monitor at then end of the monitoring period in 2030, a collection of these headline indicators measured consistently over time and, as much as feasible, for all countries of the world.

In addition to monitoring trends over time, another purpose for statistics on the human impacts of disasters is in risk assessments, which often make use of indices to summarize the scale of impacts for use in predicting long-term future losses across whole countries or regions. Sometimes, mortality is used in these studies as a base indicator because the counts of deaths from disasters are expected to be the relatively good in terms of quality and coverage. Where statistics of good quality are available for a greater number of variables, such as for all four sub-indicators in the Sendai Monitor composite Affected Population indicator, another application of these statistics could be develop an index of human impacts from disasters as input into risk assessments and other broader types of studies, like human development studies and sustainability assessments. In this index, number of deaths should probably have the relatively highest weight in the scoring, but other types of human impacts could be incorporated to produce an overall estimate of exposure and vulnerability of populations to impacts from disasters.

10. **Further research on valuation of impacts for assessing economic losses**

During the development of the Disaster-related Statistics Framework, many valuation techniques were identified from current practice or from the theoretical literature for calculating economic effects of a disaster in terms of money.

Valuation approaches for the direct economic loss indicator, as featured in the Sendai Framework and SDGs monitoring systems, were established based on definitional discussions byf the OEIWG, which established an overall approach to measurement of direct economic losses, according to the costs of reconstruction or replacement. The Sendai Framework direct economic loss indicators is an estimate the true costs of rebuilding or replacing infrastructure damaged or destroyed from a disaster.[6]

The values aggregated in the direct economic loss indicator are actual expenses used for the post-disaster recovery. One of the reasons that this is a sensible approach is because, as part of the productive activities in the economy, these values are comparable with GDP and with total government expenditure. These are are flow values, which are conceptually distinct from the changes in value of the stocks (or volume) of assets of the economy. The latter measurement is already included in the System of National Accounts as the "catastrophic losses" in national asset accounts (see DRSF Chapter 4, for further discussion).

While the theory for measuring direct economic losses is well established, further practical experience with identifying and accessing correct data for applying the methods is needed.

Other types of values of potential interest in the post-disaster assessment may include the economic effects from temporary losses of losses of services, the indirect effects on income and employment, potential long-term effects on supply or demand for specific industries and other potential financial costs (such as increased debt or insurance premiums) associated with recovery or other post-disaster expenses.

11. **The potential for producing disaggregated economic statistics related to disasters,**

For a better understanding of how disasters relate to poverty, migration for economic reasons and economic impacts of disasters, one solution is to improve the availability for disaggregated economic statistics for areas at risk or recently affected by a disaster or disasters. This includes statistics such as shares of employment or shares of production according to hazard areas or administrative areas in hotspot regions.

There are no specific requirements for these statistics for the reporting of the internationally agreed indicators for monitoring the Sendai Framework. However, these statistics could be important for other national purposes, such as for estimating indirect losses, like the impacts of a disaster on GDP, which is often one of the popular requests of users.

Most of the post-disaster loss assessments of major disaster occurrences, including those done according to Post-disaster needs assessment (PNDA) methodology developed originally by UN-ECLAC, estimate

[6] Some exceptions were needed, and are accounted for in particular for the agricultural sector, through the thorough contributions made by experts of FAO for the cases of losses to perennial crops and livestock.

indirect economic impacts, which typically relies on access to geographically disaggregated economic statistics, including, where necessary, via targeted post-disaster surveys. The indirect economic impacts have the potential to affect a larger group of people and often have a much larger overall magnitude of effects as compared to the direct economic loss.

It's also important for to connect the economic loss statistics with Sustainable Development Goal 1n eradicating poverty. Analyses related to poverty will require developing approaches for disaggregated statistics on the economic impacts for different households or communities within countries.

The need for evidence for disaggregated analyses of impacts of disasters on the economy must be balanced by the requirements of retaining confidentiality of individuals and individual businesses. This can be managed by restricting access to the detailed records used in the analysis and providing public access to anonymized, re-aggregated tabulations.

Several methods are worth further investigation, particularly those involving increased use of administrative data, increased use of post-disaster surveys, and estimation using GIS.