A Disaster-related Statistics Framework (DRSF) and Monitoring of Internationally-agreed Disaster Risk Reduction and Sustainable Development Indicators.

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Abstract: This paper analyzes experience gained through pilot compilations of statistics under the Disaster-related Statistics Framework (DRSF) of the Asia-Pacific Expert Group on Disaster-related Statistics. The pilot compilations of detailed statistics were organized in four of the most disaster-prone countries in the world: Bangladesh, Fiji, Indonesia, and Philippines. The paper discusses the findings and available statistics identified through pilot studies from the perspective of the emerging demand for monitoring the agreed international targets for Disaster Risk Reduction (Sendai Framework) and for Sustainable Development (SDGs) as adopted by the United Nations General Assembly. The aim for the DRSF is to support national statistical systems to build capacities to produce and analyse internationally comparable statistics based on their existing databases. The DRSF is also a tool to help to bridge the domains of disasters and risk management information on the one hand with the existing standards for socio-economic statistics on the other. The bridge between these two domains of statistical information is essential for producing indicators.

I. Background

Natural disasters were not mentioned in the Millennium Development Goals (MDGs) targets and indicators and in the past disaster-related statistics has been treated as a specialized domain, largely outside the traditional scope of official statistics as coordinated by national statistical offices. However, in the indicators framework under development for the Sustainable Development Goals (SDGs), natural disasters are cited for at least 3 separate goals and targets and disasters are cited in relation to economic, social and environmental dimensions of sustainable development. Thus, statistical information related to disasters has emerged as an important and also multi-disciplinary or cross-cutting area for development of official statistics.

The current proposal before the Inter-Agency Expert Group on SDG Indicators (IAEG-SDGs) is to utilize a mix of 3 disaster-related indicators for monitoring the three relevant targets (annex I).

After adoption of the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR), an open ended intergovernmental expert working group on indicators and terminology (OEIWG) relating to disaster risk reduction was established by the UN General Assembly in 2014. OEIWG is developing a set of indicators to measure global progress in the implementation of the Sendai Framework. In a decision by the IAEG-SDGs at its 2nd Meeting in Bangkok, Thailand (26-28 October 2015), the IAEG-SDGs agreed to follow the conclusions of the OEIWG process to create coherence and synergy with SDG indicators. The General Assembly requested the OEIWG to conclude its work by the end of 2016.

The Sendai Framework lists 7 international targets that implicate demands for measuring the trends in relative impacts and also statistics for assessing risk reduction interventions. (*Annex II*). As of March 2016 a draft list of indicators is available on the OEIWG website. [1] The United Nations (UNISDR), with offers for collaboration from other agencies such as UNEP, has indicated that it will take responsibility of international monitoring of the Sendai Framework and related SDG indicators (after OEIWG has completed its work).

The draft list of Sendai Framework indicators is far more extensive in the details as compared to relevant indicators for the SDGs (Annex I) and also slightly wider in scope than the SDG indicators (for example, in the SDGs there is no mention of disruptions to basic services) . However, the indicator frameworks contain many of the same basic core variables that are instructive for defining the scope for a basic minimum range of disaster-related statistics and analysing current availability quality of statistics as a baseline for monitoring the targets.

The Asia and Pacific Expert Group on Disaster-related Statistics organized and reviewed a pilot study of current practices on compilations for a basic range disaster-related statistics from the official sources in four volunteer countries: Bangladesh, Fiji, Indonesia and the Philippines. This paper summarizes some general findings from the pilot study.

II. Sources of Data for Calculating the Indicators

Based on the descriptions for the indicators developed thus far for the SDG targets 1.5, 11.5 and 13, as a minimum requirement, sources of official statistics in countries should be able to collect variables on the topics listed below. In order to compile indicators in an international database for comparisons, the variables should be measured and made accessible by the official authorities in countries and harmonized, as much as possible with a set of international recommendations for statistical methodology (which have not yet been developed for disaster statistics):

[1] http://www.preventionweb.net/files/47136_workingtextonindicators.pdf

- Occurrence of disasters (as the defining object for counts of affected populations and economic loss)
- Counts of deaths, missing persons, and persons otherwise affected by a disaster occurrence
- Baseline population for relative measures of affected population (e.g. total population or population in areas exposed to the relevant natural hazard)
- Direct economic loss from a disaster occurrence
- GDP for relevant economies
- Information on national and local disaster risk reduction strategies

Relevant data on these topics come from a very wide variety of data collection instruments managed by a variety of government departments or agencies. Countries involved with this study and in the Asia and Pacific Expert Group on Disaster-related Statistics have established inter-agency technical coordination committees, which can greatly help with inter-agency accessibility to relevant data and also be used to make decisions to harmonize methods across agencies.

Usually, a disaster occurrence will be incorporated into national disaster-related statistical database upon some type of declaration of state of emergency by an official source at the national or local level. A clear example is the case of the Philippines, which records statistics on the occurrence of a disaster, including the relevant impacts to population or to infrastructure, for all cases where there is a Declaration of State of Calamity, as defined by the Philippine Disaster Risk Reduction and Management Act of 2010.

The logic of utilizing an official national (or local) declaration for establishing the occurrence of a disaster stems from the fact that the same government agencies responsible for managing disaster risk and responses to official emergencies are also typically the official sources of data and statistics on disaster impacts. So, it is practical and logical that such a declaration would initiate the process to collect data for measurement of a disaster occurrence and impacts.

Statistics on affected population will usually be produced from a combination of many different types of data sources, including the administrative records on the disaster response and recovery effort, post-disaster surveys of households and enterprises (where available), and estimations calculated based on monitoring, including remote sensing or satellite data.

The baseline statistics on population are generally demographic and social statistics gathered by national statics offices as one of the core functions of NSOs in all countries, including through population censuses, household surveys, and civil registration systems.

Information on exposure to natural hazards is one of the relatively more developed components for a basic range of disaster-related statistics. Disaster management agencies within countries or regions tend to have the best adapted knowledge of local hazards and the history of exposure. Detailed hazard exposure information (often in the form of "hazard maps") are available and used by disaster management agencies to manage risk or to respond to disasters in all countries.

A lot of different types of data are useful or necessary for calculating statistics on economic loss. Usually, before calculation or assessment of the monetary value of direct impacts of a disaster, impacts are observed in some kind of “physical units”, e.g. number of dwellings destroyed, or hectares of agricultural land damaged. These data should be retained as useful information for analyses in their own right, particularly since methods or interpretations for monetary valuation of damages or economic losses may vary across studies. When it comes to monetary valuation, the preferable approach, which is the most consistent with current international standards for economic statistics, is to utilize observations of actual transactions incurred to pay for replacing or reconstructing the damaged or destroyed assets; this is called the replacement costs method.

GDP is one of the key outputs from the national accounts and may be calculated as a principle residual balancing item from the accounting tables for an economy (usually national, though in some cases regional estimates of national accounts aggregates are also published, periodically). National accounts integrate data on stocks and flows in the economy from multiple sources in order to produce the best possible estimates of economic activity according the principles and boundaries defined by the national accounting standard (SNA 2008). GDP is a measure of production, which is the activity in the economy resulting in output (including both goods and services). Virtually every United Nations member State produces national accounts and publishes the main outputs, including GDP. Among the most important tools or data sources for national accounting are enterprise surveys (or economic censuses) and government finance statistics.

Basic statistics on disaster risk reduction can be retrieved by reviewing sources of information from central and local governments, including from national strategies for disaster risk reduction, government expenditure and records on official development assistance (ODA). However, the private sector may also be involved in disaster risk reduction activities as a means to protect businesses own assets or economic interests and/or as part of efforts to accept corporate-responsibility for the communities where they conduct business. For example, hotels or other establishments might become involved in disaster risk reduction strategies in order to help protect areas that could be important for tourism but are exposed to natural hazards. Statistics on involvement of the private sector in DRR activity could, in theory, be gathered

through the normal economic statistics source, such as enterprise surveys, but international methodologies for collecting this data have not yet been developed.

III. Methodological Issues

The identification of an occurrence of a disaster is vital because, unlike most other types of official statistics, the disaster-related goals, targets and indicators refer to specific and individual events happening during a specific and discrete time period. In order to monitor impacts from disasters, first statistics compilers need a clear and consistent method for identifying disaster occurrences.

Broadly, there are six types of descriptive information for each individual disaster: name or unique identifying code for the event, the underlying hazard (e.g. flood, cyclone, or earthquake) which is the natural source of the disaster, location (area impacted), timing, and, potentially, some indication of scale of the emergency (e.g. local or national). A basic challenge for disaster management agencies is to design national databases in a flexible relational format so that the database can be queried to produce summary statistics across multiple events but also so that the variables retain their links to the descriptive characteristics for each individual event (e.g. counts of deaths for a specific region or by hazard types, etc.).

Producing a simple table of affected population statistics (see sample below) is deceptively complex, even for a single individual disaster event. For example, the same individuals may be affected by the same event in different ways, so to calculate a total affected population, the compiler needs to be able to adjust for double-counted individuals.

While the OEIWG is now working to create standardized terminology on the elements of the affected population, in practice some of the existing statistics from historical disasters are not harmonized. A key example is the element of evacuations. There is a need to develop recommendations on scope of measurement to improve the international comparability of the basic statistics. The OEIWG Technical Paper on Indicators[2] cites measurement of evacuated, relocated and displaced persons. Currently, these terms are used differently for measurement by different countries and in some cases also by different office within a county and there are other measurement questions not yet being addressed in the OEIWG terminology, such as whether to include voluntary evacuations. After the OEIWG has completed its work on terminologies for Sendai Framework monitoring at the end of 2016, further review of the current methods applied to compile statistics should be conducted as a reference r to develop advice to help governemnt with aligning existing measurement approaches and data sources, as much as possible, to the requirements of the OEIWG's outcomes.

[2] Technical Collection of Concept Notes on Indicators for the Seven Global Targets of the Sendai Framework for Disaster Risk Reduction, http://www.preventionweb.net/documents/oiewg/Technical%20Collection%20of%20Concept%20Notes%20on%20Indicators.pdf

1.1	Human, affected population (total)
1.1.1	Deaths or missing
1.1.1.1	Deaths
1.1.1.2	Missing
1.1.2	Injured or ill
1.1.2.1	Injured
1.1.2.2	Ill
1.1.3	Evacuated, relocated or displaced
1.1.5	Houses damaged or destroyed
1.1.6	In need of food aid
1.1.7	Otherwise affected
1.1.7.1	Voluntary evacuations
	Multiple counts, individuals (minus)

In establishing the Asia and Pacific Expert Group on Disaster-related Statistics via Resolution 70/2, the Economic and Social Commission for Asia and the Pacific (ESCAP) emphasized the importance of disaggregated statistics and the need for evidence-based policies in support of the most vulnerable groups.

Disaggregated statistics on affected populations could be made available, to some extent, by age and by gender from a variety of sources, including household surveys, post disaster assessment studies, and administrative records from disaster recovery efforts. New modules need to be developed to supplement existing international statistical guidance, in order to improve availability of social disaggregated statistics on disasters, including impacts to the income poor or to disabled people. [3]

A two-step process can be conducted, and has been utilized in many cases reviewed in this study, to calculate direct economic impacts from a disaster to economic assets like roads, bridges, hospitals, schools, private homes and businesses, and so forth. The first step is observations of damages to assets in "physical terms", meaning material observations of impacts, such as hectares of agricultural land, lengths of roads, numbers of dwellings, or numbers of other types of buildings. One of the objectives for pilot study investigations conducted by the Expert Group was to study current practices with respect to measurement units for observations of direct impacts to assets (e.g. hectares, km, numbers of buildings). Further research is needed to further develop a menu of recommendations for measurement units depending on the demand and availability of data. For example, instead of counting numbers of health facilities, statistics compilations could make use of a tier-system classification for health facilities, which is linked to the size of the facility , e.g. from large public hospitals tier 1) to small clinics (tier 3). Information demands will vary but, where possible, statistical databases should retain and store the detailed data on assets damages in physical terms, as much as possible.

The second step is to convert to monetary units through valuation of the direct impacts. For this step, the official statistics should retain consistency, as much as possible, to the

[3] For example, the Washington Group on Disability Statistics has developed recommendations for a short set of questions for identifying disability () which, could theoretically be applied, on a trial basis, to collect stastistisc on populations affected by a disaster or exposed to hazards.

international standard for national accounts (SNA) so that there is coherence with the other core economic indicators used to describe the economy. This means referring to the SNA framework's asset boundary to understand what can realistically be valued in monetary terms and also referring to the SNA's valuation principle of utilizing, where available, observable transactions and market prices – in this case, meaning the actual reparation or restoration costs for the direct damages to assets.

When analyzing the economic impacts of disasters, it's important to clearly distinguish the difference between stocks and flows. Assets are stocks, so the direct impacts to assets affect measures of stock whereas measures of production (i.e. GDP) are flows and therefore disasters do not affect GDP or other flow measures directly. Impacts to production or consumption in the economy will happen as consequences of a disaster in the months and years after the emergency period, and these are the indirect impacts from disasters. Estimates of indirect impacts are useful for a variety of purposes and commonly calculated as part of the post-disaster analyses conducted after very large events, but these measures are beyond the scope of the direct economic loss indicator.

Any calculations made in monetary terms can, of course, be compared to the GDP for a certain period of time as a ratio indicator (e.g. direct economic loss / GDP from the most recent year) as has been suggested for monitoring this target in SFDRR and the SDGs. However, it' s important to clarify for users that this ratio indicator represents a valuation of losses to economic assets *relative to* GDP and not direct losses to GDP.

Another important caveat for economic impact indicators is that valuation using replacements costs will principally include all of the relevant costs associated with restoring that asset, including if there are marginally additional costs from "building back better". If the marginally additional costs from "building back better" can be isolated than this information would be very useful as an additional indicator related to measuring disaster risk reduction . However, in many cases, these values will not be available as isolated figures, and so the general observed costs of reconstruction will be the best available valuation for valuing the direct economic impacts.[4]

IV. Conclusions & Further Research

[4] The relationship between observable price differences and identifying qualitative differences between the objects of measurement is a general challenge for economic statistics, for which some practical guidance exists from the SNA and other sources.

The scope of the DRSF pilot study is based on indicators developed through the agreements on the SFDRR and the SDGs. The goal for the DRSF and its attached technical guidance is to help national statistics systems (NSSs) with strengthening a basic range of official statistics that serve multiple purposes, including for producing indicators that will used by policy makers at local and national levels and for monitoring the internationally developed goals and targets.

There are many areas of methodological development for disaster statistics that could benefit from a follow-up or 2nd phase for the study. Analyses of existing statistics compilation practices in countries can help facilitate practices discussions to develop reference guidelines for measuring the core variables on the human and other impacts from disaster for producing the aggregate indicators and also for produce disaggregated statistical analyses for vulnerable groups.

National statistical systems are holding a lot of data with strong relevance for calculating variables needed to report figures for the indicators for SDGs and SFDRR. Moreover, enhanced coordination between national agencies and stakeholder groups within countries can lead to major enhances to the quality and availability of disaster-related statistics very quickly. However, technical discussions should continue at the international level to help improve the comparability dimension of the quality criteria used to assess official statistics. As a cross-cutting topic, disaster related statistics methodological guidance will be able to borrow heavily from, and build upon, the existing international recommendations and standards for social, economic and environmental statistics. But detailed descriptions of more harmonized approaches to measurement are required for many of the topics or measurement objects that are special or unique to disasters.

Annex I: Disaster-related SDG Indicators

Goal 1	Target	IAEG-SDGs proposed Indicator
1: End poverty in all its forms everywhere	5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and	1.5.1 Number of deaths, missing persons and persons affected by disaster per 100,000 people
		1.5.2 Direct disaster economic loss in relation to global GDP, including disaster damage to critical infrastructure and disruption of basic services
		1.5.3 Number of countries with national and local disaster risk reduction strategies

	other economic, social and environmental shocks and disasters	
11: Make cities and human settlements inclusive, safe, resilient and sustainable	5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	11.5.1 Number of deaths, missing persons and persons affected by disaster per 100,000 people
		11.5.2 Direct disaster economic loss in relation to global GDP, including disaster damage to critical infrastructure and disruption of basic services
13: Take urgent action to combat climate change and its impacts	1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.1 Number of countries with national and local disaster risk reduction strategies
		13.1.2 Number of deaths, missing persons and persons affected by disaster per 100,000 people

Annex II: Sendai Framework Targets

1. **Reduce global disaster mortality**
2. **Reduce the number of affected people**
3. **Reduce direct disaster economic loss**
4. **Reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities**

5. **Increase the number of countries with national and local disaster risk reduction strategies**

1. **enhance international cooperation**

2. **Increase the availability of and access to multi-hazard early warning systems and disaster risk information**