DISASTER LOSS DATA SYSTEMS IN THE EU
Second technical workshop on an EU approach for recording loss data

Joint Research Centre of the European Commission, Ispra, Italy
13-14 February 2014

Outcomes of the workshop

1 Participants

- Maxx Dilley (UNDP) – by video conference;
- Maryam Golnaraghi (WMO) – only first day;
- Julio Serje (UNISDR);
- Jaroslav Mysiak (FEEM);
- Antonios Pomonis (Cambridge Architectural Research Ltd. / GEMECD);
- Roberto Rudari (CIMA, Italy);
- Scira Menoni (Politecnico di Milano, Italy);
- Gregorio Pascual Santamaría (Procivil, Spain) – by video conference;
- Almudena Bustamante Gil (Procivil, Spain) – by video conference;
- Xavier Romão (Faculdade de Engenharia da Universidade do Porto, Portugal);

- Esmeralda Vila Pouca (Faculdade de Engenharia da Universidade do Porto, Portugal);
- Rudolf Schmidt (Federal Ministry of Agriculture, Forestry, Environment and Water Management, Austria);
- David Demeritt (Kings College London, UK);
- Dennis Wagenaar (Deltares, Netherlands);
- Tom De Groeve (JRC);
- Karmen Poljansek (JRC);
- Daniele Ehrlich (JRC);
- Luca Vernaccini (JRC);
- Apollonia Miola (JRC);
- Gustavo Naumann (JRC);
- Jonathan Spinoni (JRC);
- Juergen Vogt (JRC)

Figure 1. From left to right: Julio Serje, Karmen Poljansek, David Demeritt, Luca Vernaccini, Tom De Groeve, Dennis Wagenaar, Esmeralda Vila Pouca, Roberto Rudari, Xavier Romão, Antonios Pomonis, Scira Menoni, Daniele Ehrlich

2   Introduction and summary of key conclusions

For disaster risk reduction, forensics and scientific risk and impact modelling, impacts of disasters must be recorded at quite detailed level and using methodologies that allow aggregation over space and time. Moving from anecdotal evidence driven mainly by media coverage of disastrous events to a scientific method to consistently and accurately recording losses is essential, and partnerships between scientific organisations, academics, governments and private firms are necessary.

In a successful first workshop on recording loss data (15 November 2013 in Brussels) representatives of Member States (MS), the private sector, academia, international organisations and staff from Commission services agreed to work together on this issue. It was planned to hold a second, more technical workshop, looking at details of existing databases and technical issues like for example hazard technology classification and discussion on event identification numbers. The purpose of the second loss data workshop was to create an inventory of loss data recording systems in EU Member States, compare technical specifications, and explore opportunities for standardization.

The specific objectives were:

- Have concise technical presentations on the data structures and methodologies to collect loss data
- Identify common approaches and areas that need further standardization
- Understand current limitations and identify the best opportunities for improvement
- Form an informal working group to develop an EU technical standard

During the workshop, participants discussed issues of sharing loss data at EU level as well as at international level as a part of the post-2015 HFA2 process. Having in mind the tight deadlines of the HFA2 consultation process, the participants of the workshop agreed on common language and definitions regarding loss data that should be advocated during HFA2 consultations.

Overall, the workshop has successfully met the initial objectives and continued a process of an informal working group within the EU, but also with non-EU partners, developing guidelines and standards related to disaster loss data recording.

2.1 Loss reporting at EU level

Common approaches and areas that need further standardization of loss inventories in EU Member States currently in the network of contact points were identified. From the presentations of national representative it emerges that losses data in European countries are recorded, but differently. Some countries (Slovenia) have a more structured recording process based on assets, or a sectorial approach (Spain); others have more fragmented based on aggregated figures and related to the hazard and the institutions in charge (Italy). Inevitably recording relates to the disasters experienced in the country (i.e. snow avalanches and flash floods for Austria). Recording always serves the purpose of the institution in charge. If the benefits of loss recording are not clearly identified, the sustainability process of loss recording is jeopardized.

Regarding sharing loss data at EU level, the following issues have been found important:

- Cross-referencing loss data with hazard event databases and exposure datasets and not having everything in one database. In the first case the event ID number is needed. The cross-reference with exposure datasets is essential to provide the loss figures in relative terms as well as to get the figures of the ex-ante status (A. Pomonis). However, everybody seems to agree that recording exposure may turn out to be very difficult.
- Providing guidelines on the methodology of recording losses (disaggregation by sector/municipality/event/loss ownership on NUTS2 level) to increase the consistency among the existent databases.
- Data sharing and policy is an issue to be solved.
- Identifying the sources of uncertainty and how to record it next to codified values.
  - o Many approaches exist for estimating uncertainty used in various scientific disciplines. Practical guidelines need to be developed to come up with minimum requirements and good practices. Qualitative methods (codified uncertainty classes), probabilistic methods, engineering practices, etc.
  - o A pedigree matrix was also proposed (like used in FCC, based on likelihood and confidence)
  - o The method used for estimating uncertainty must be recorded
- There was agreement to use as much as possible official figures. However, the quality of official figures will vary according to disaster type (e.g. accurate for floods, uncertain for droughts). Avoiding the use of biased reports is an issue.
- Addressing direct and indirect losses with proper taxonomy (an update of ECLAC concepts)
  - o Economists have standard definitions (stock, flow; tangible, intangible). A typical issue with stock and flow is that damages may be double counted.
  - o UNFCC has different definitions: damage = repairable, loss = unrepairable
  - o Taxonomy should match the governments structure and approach
- An agreement that damages (physical) should be always recorded in the databases before being converted to losses. The losses can then be computed based on the physical damages when possible. Therefore it is necessary for the loss indicators to cover:
  - o physical damage (building stock) measured as damage, and
  - o converted in losses measured in monetary value,
  - o Indirect losses could be based on multiplication factors based on direct losses and the type of hazard.

- Having solid definitions of human loss indicators, for example:
    o Deaths (with all the limitations)
    o Injured (with all the limitations)
    o Affected (exposed for that event) / number of people requiring assistance as proposed by M. Dilley / people in need.
- Regarding human loss indicators, some disaggregation dimensions were found to be useful in different phases of DRM, like:
    o Need for gender disaggregation of human loss indicators
    o Time component is an option to be considered
    o Evacuated (mutually exclusive fields): pre-event and post-event
    o Homeless (not mutually exclusive fields): temporary without shelter and permanently without shelter – no place of return
    o Other options important for emergency response: Evacuated (mutually exclusive fields): displaced (without shelter), sheltered and relocated (friends, relatives).

At European (and international) level, disaster loss data work relates to **accounting**. The detail for forensic and risk modelling should be recorded and maintained at the national level. However, for loss accounting the detail used in the aggregation process will determine the reliability of the datum. Imposing a reliability measure to the data records will weed out the "unreliable" records. Databases based on desk reporting will then be inevitably supplanted.

In Europe we should consider a **network of databases** based on certain standards (S. Meloni). Maybe based on our needs to influence their recording in order to match the international standards.

We cannot impose standardization. In the information and technology section standardization refers to making sure to understand what everybody is doing (R. Rudari). Setting standards for loss data means understanding what and how things are done. It is a way to talk to each other.

For **Accounting** (M. Golnaraghi) we have to get to the **<u>minimum denominator</u>** of the databases.

Some methodologies should be better evaluated. For example ECLAC seems to be based on old concepts (J. Miroslav) that need to be updated.

In certain disasters, secondary losses may account for more than the primary losses. For example Fukushima, the floods in Thailand, earthquake in Emilia Romagna, these disrupted the computer industry for months. In fact, **attribution** of the disasters to a hazard (peril classification very important) is far from trivial.

2.2 Loss reporting at international level

The participants contributed with their critical expert opinion and helped a lot towards the proposed definition of loss reporting for the HFA2 process.

HFA2 will provide guidance on measuring and reporting national disaster loss statistics. To ensure comparable, coherent and complete figures, technical definitions and requirements must be agreed upon.

With reference to the JRC report, this group proposes the following:

> Countries will report on **direct tangible losses** for the **whole country** by **peril type** and **per year** aggregated over **all sectors** and **all loss owner categories** by providing the **official maximum absolute** values along with a **qualification** of the **uncertainty** of those estimates

- Direct tangible losses include (a) people directly affected and (b) monetary value of physical damage to property.
  - People directly affected: reference to **UNISDR/UNDP standard**[1]: people killed, affected, requiring assistance
  - Monetary value of physical damage to property: reference to **DALA methodology**[2].
- Whole country
- Peril type: reported losses should be categorized by peril type. Reference to **IRDR classification**[3] of perils.
- Per year: for reporting purposes, yearly aggregates are appropriate
- Sectors: reported losses should encompass losses in all economic sectors, including, but not limited to, residential, commercial, industry, agriculture and governmental. Reference to **DALA methodology**.
- Loss owner categories: reported losses should encompass losses of all loss owners, including, but not limited to, individuals, private and public sector. Reference to **NRC** Framework[4].
- Maximum: reported losses should consist of a reasonable maximum estimate
- Absolute: absolute numbers (counted in people or euro/US$). This is opposed to relative values, which are calculated by dividing the absolute numbers by the total exposed value/people. It is assumed that relative values can be calculated *ex post* and don't need to be stored.
- Qualification of uncertainty: reported numbers must be qualified by an uncertainty qualification such as a narrative, quantitative estimation (range, standard deviation), probabilistic estimation. Guidelines must be developed for this (e.g. assessments based on physical damage recording increase quality; recording uncertainty by peril type increases quality; event-based methodologies increase quality).

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[1] Not published yet
[2] https://www.gfdrr.org/fr/node/69
[3] Not published yet
[4] NRC, 1999. The Impacts of Natural Disasters: A Framework for Loss Estimation. National Research Council, March 1999.

3   Presentations overview

3.1   Experiences with building databases of past events

The first session focused on the experiences of databases of past events. They are usually based on physical damage and dealing with a lot of missing values. What should be minimum criteria of recording in such cases?

Spanish civil protection (Procivil) introduced the National Catalogue of Historical Floods (CNIH) database created in 1983 with the first record from 1st century BC. It is a well-structured loss database allowing disaggregation by event/sector/province/municipality. Data is collected on an annual basis. There is a formal process of data validation. In 2011 it was updated with Compensation Data of Insurances, which are georeferenced loss data records. Their challenge is to apply the same approach to an earthquake damage database. The driver behind the database is a legal requirement to compensate victims. The national insurance scheme is funded from a percentage of private insurance contracts.

AVI database in Italy (Roberto Rudari, Italy, CIMA) for floods spans from late 1800 to 2013. From 1950 to January 2011, it has been put in the EU Flood Directive DB Schema; temporarily becoming the National Flood DB. The process is driven by legal requirements of the Flood Directive, and is owned by the Civil Protection Department, delegating data collection to national and regional agencies.

The EU Flood Schema has some problems as well; it enables to record disaster origin, mechanism, characteristics of the event only and not for the location. Furthermore it does not allow to register secondary/cascade events and does not allow to register (in a codified format) the loss owner. Severity of the event is recorded qualitatively (insignificant to high). It was also pointed out that in Italy there is a need to record damages/losses in the cultural sector.

UNISDR Loss Data collection (Julio Serje, UNISDR) based on **Desinventar methodology** has been now introduced in more than 70 countries worldwide, among others also Albania, Serbia and Turkey. The methodology allows historical research and daily collection phase. They capture also data of small and medium events, and that accumulates to more than 50% of total economic loss. The final output is the hybrid model for loss-exceedance curve that is based on at least 25-year of historical loss recording. The base of the methodology is the asset damage accounting, which provides transparent and consistent economic loss calculation.

3.2   Requirements for the asset based database fit for risk assessment

The second session of presentations focused on asset based databases fit for risk assessment. The main goal is the development of damage functions/vulnerability curves that require detailed description of physical damages on asset scale.

Scira Menoni (Italy, Politecnico di Milano) presented a post-flood events damage data collection method carried out by **Politecnico di Milano** with the aim of developing/validating flood damage functions in Italy. Finally, the test was carried out in the Umbria region at asset level using damage assessment forms adapted from post-earthquake assessment forms. A specific comment was made regarding the time after event that the damage was recorded and an option was given to iterate the process by returning to the site several times after the event. Furthermore, there is a need for

legislation regarding the damage recording that would set the time constraints, identify the authority responsible for collection of data and assure comprehensive integrated bottom-up approach with data sharing policy between local and regional datasets. Current operations are funded on a project basis.

An event on loss data will be organized on 11-12 April 2014, and participants are welcome to attend.

Deltares (Wagenaar Dennis, Netherlands) is an independent research institute providing cost-benefit analyses. A recent law requires the assessment of maximum probability of dying from floods, requiring detailed flood loss models. They are struggling with limited available loss data needed for food impacts models that are used for optimal design failure probabilities of defenses, fatality risk estimates, prioritizing investments in defense improvement and risk reduction of other flood risk management measures. Their current flood model has about 40 different damage categories, also number of inhabitants of flooded area and fatalities number georeferenced with postal codes. Netherlands has no standardized collection of damage/loss in floods. This is because the Netherlands has had a policy of zero floods since 1953 making flood loss events extremely rare.

GED4GEM (Pomonis Antonios, Cambridge Architectural Research Ltd., GEMECD) is a system of collecting earthquake damage and consequences data (40 loss indicators). It has multilevel (4 tiers) structure depending on the detail of the information required. The main focus of the project is risk modelling due to ground shaking and secondary induced events (tsunami, landslides, liquefaction, fire following). Therefore, it has a detailed taxonomy of buildings based on numerous earthquake-resistant specifications. One of the outputs is a damage matrix for buildings and casualty matrix. There was a question on how to follow a trend that, with the implementation of earthquake resistant building codes, the loss of structural damage is decreasing and the loss is taken over by nonstructural damage.

3.3 Future Loss Accounting system

A third session of presentation focused on future loss accounting system that should be fit for EU and global statistic. It is agreed that is should cover the following dimensions: at least direct loss disaggregated by ownership of losses, loss types and sectors (i.e., like ECLAC/DALA or Solidarity Fund art.3). Insurance and re-insurance companies possess data only of insured loss while the uninsured loss is in a majority of cases only estimation in terms of the ratio of insured loss. Similarly, the indirect loss is only the multiplication of calculated direct losses considering the facts that hydromet events have much higher ratio of indirect vs direct losses than geological events. It was mentioned as well that the clean-up and emergency relief costs (Julio Serje) should be an important part of disaster loss accounting.

The **United Kingdom** (Demeritt David, United Kingdom, King's College of London) has, at the moment, an early warning system based on a flood risk matrix based on likelihood and impact. The UK has no comprehensive loss database. Because all the insurance companies are private, the main obstacle is the motivation for collection of losses which raises the question of funding and governance. Identifying drivers and demand in the UK context is critical, as there is no legal obligation in the current legal context. However, new developments like the UK Met Office's Weather on the Web (WOW) can represent innovative new sources for loss databases based partially on crowdsourcing.

WMO (Golnaraghi Maryam) is an ISO recognized international standardization body and has a lot of experience in data exchange policy. Maryam Golnaraghi insisted in offering a frame for institutionalizing loss recording to the WMO standardization initiative. She is active and offers a networking event at the Understanding Risk 2014 in London on the topic of hazard data standardization.

Austria (Rudolf Schmidt, Federal Ministry of Agriculture, Forestry, Environment and Water Management, Austria) has developed GIS-based software for documenting event data for avalanches and torrents related to emergency action. Part of the documentation is physical damage assessment. At federal level, data is collected for prevention measures. At local level, loss data is collected for compensation accounting. In the current legal context, the most detailed data is under local mandate and the federal government cannot easily set standards. Austria is working on data sharing policies and mechanisms where federal funding would be linked to providing standardized loss reports.

ICORP disaster database of cultural heritage (Romão Xavier, Faculdade de Engenharia da Universidade do Porto) is a project that started 10 months ago to document the physical damage and the repair costs of cultural buildings and monuments worldwide due to damage caused by, but not limited to, natural disasters and armed conflicts. The recorded data accounts for their value and how much of the value was lost. Since no existing DB records damage and loss in cultural heritage, the main motivation is to collect a significant amount of scattered data worldwide to be used for risk and loss mitigation**.**

4   Way forward

The workshop participants agreed to take this work further with the following actions

1) To expand the current network of technical (governmental, academic, institutional and/or private) contact points for disaster loss data in EU Member States
2) To contribute to coherent technical recommendations for loss reporting requirements in the HFA2 process
3) To share best practices/approaches in recording disaster loss in its various dimensions (collection methods, database structure, aggregation methods, reporting method), its three elements (hazard, exposure, loss) for various applications (disaster risk reduction, forensics and risk modelling) for the purpose of supporting cost-benefit analyses of disaster loss approaches for EU Member States
4) JRC to produce an Issues Paper by November 2014

Concrete actions

- Share contacts in missing countries, expand network
- Next workshop 19-21 May 2014, jointly with IRDR
- Share data as possible for further analysis: (a) full databases, (b) data for case studies (L'Aquila earthquake 2009, Xynthia storm 2010, Elbe floods 2002)
- Collect metadata for databases in EU (updated of Excel table)