
IMPROVING THE EVIDENCE BASE ON THE COSTS OF
DISASTERS TO INFORM BETTER POLICY MAKING FOR
DISASTER RISK MANAGEMENT:

TOWARD A FRAMEWORK FOR ACCOUNTING NATIONAL RISK
MANAGEMENT EXPENDITURES AND LOSSES OF DISASTERS¹

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In Annex 2 of this draft report the draft framework was applied using data from Australia, Switzerland and Japan. It shows how the framework could potentially look like applied to countries and should give an indication to country counterparts on how their data can be filled in and used in the future. 41

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1 WHY IS A FRAMEWORK FOR ACCOUNTING COSTS RELATED TO DISASTER RISK MANAGEMENT NEEDED?

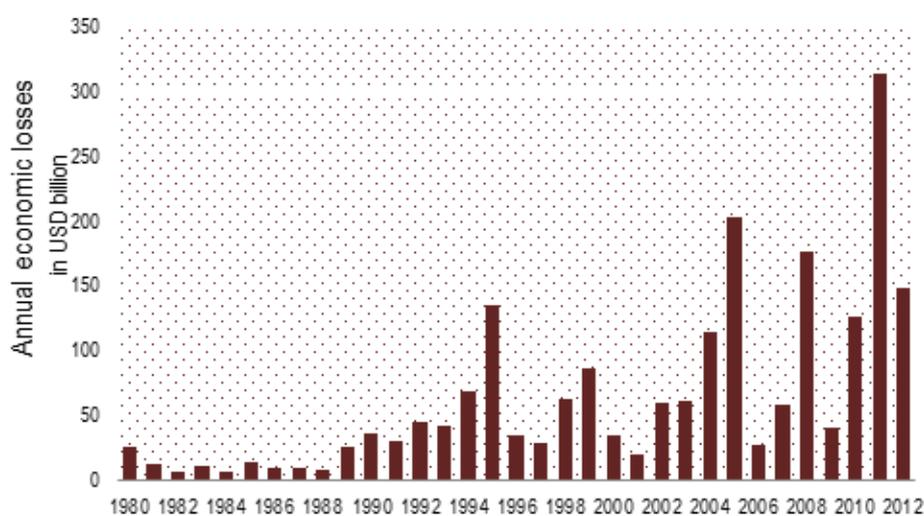
This section includes:

- *A brief review of the economic costs of past disasters*
- *An overview of the objectives and the output of the project and the present draft report*
- *A discussion on why better, comparable and standardised cost accounting methods and databases are needed*
- *An overview of the remainder of this draft report*

Recent shock events from natural hazards and man-made threats illustrate an increasing range of negative impacts to OECD societies and economies. Water-related disasters such as floods are among the most frequently occurring ones across OECD countries. The increases in economic damages, illustrated in Figure 1, have been higher than GDP growth in recent decades and are widely considered to outpace national investments in disaster risk reduction. The latter claim is more intuitive than supported by data driven analysis. Indeed there is hardly any comparable data available on the costs of disasters, neither in terms of national expenditure related to disaster risk management nor in terms of data on ex-post disaster losses, which are generally considered to be incomplete and underestimated.

The development of a standardised and comparable accounting framework for expenditure on disaster risk reduction and losses from disasters will help OECD countries and other non-governmental risk management stakeholders to evaluate the economic benefits from their disaster risk investments, and facilitate cross-country comparisons of such efforts. From an international perspective, such data would bring significant value and advantages to the inclusion of systematic indicators on global disaster risk reduction objectives, potentially envisaged as part of the post-2015 Sustainable Development Goals, or the successor to the current Hyogo Framework for Action.

FIGURE 1 ECONOMIC LOSSES DUE TO DISASTERS IN OECD AND BRIC COUNTRIES



Source: OECD (2014a)

1.1 OBJECTIVES AND OUTPUT OF THIS PROJECT

1.1.1 PROJECT OBJECTIVES

- First, it seeks to take account of ongoing national as well as international efforts that record ex-post economic losses stemming from disasters and by disaster-types. There are a number of databases that seek to systematically record disaster events that caused some extent of social and economic losses. Although their data may not be comparable due to different methods to collect and compute such information, it is worthwhile reviewing existing efforts and analyse their particular strengths and weaknesses. This can provide a good basis for developing methods in the future that are to overcome existing shortcomings and that set a new international standard and provide a repository for such information.
- The second objective is more ambitious and seeks to contribute to the far less developed expenditure-part of the cost accounting of disasters. The paper seeks to assess ongoing national efforts and propose a draft framework for assessing risk reduction-related public and private spending, with the aim of better understanding how much countries spend ex-ante in risk reduction, as well as ex-post in disaster management and rehabilitation. This should provide an essential piece of information for policy makers to track more systematically whether their spending efforts actually lead to future reductions in impacts suffered from disasters. The method proposed in this framework aims to be sufficiently comprehensive so as to account for most such expenditure items, while at the same time be broad enough to capture categories of similar expenditure measures across countries so as to be internationally comparable. The issues paper does not seek to collect information, construct performance indicators, but rather define a draft framework that could inform these steps in the phases taking this work forward.

1.1.2 EXPECTED PROJECT OUTPUTS

- A review of international and national data collection efforts and methods on disaster losses based on a set of selected OECD countries and existing international databases. This includes a discussion of comparability as well as shortcomings of current methods. This output can in the longer term and in a continuation of this work serve as a basis to informing guidelines or a manual on how to collect loss data information across different types of risk.
- A review of national expenditure accounting efforts for DRM.
- A draft framework to collect DRM expenditure information for public and private expenditure, across multiple types of hazards and sectors. A revised version will be proposed following an experts meeting.

Going forward, the OECD will test the draft framework on a pilot basis with 2-4 OECD member countries, which will provide guidance for refining the framework to become a standard assessment tool for regularly collecting such data across OECD countries and build an international repository for such information (see final section on steps going forward).

Generally speaking expenditure-related costs are slightly more straight-forward to calculate compared to economic losses, despite being difficult to assess. For example, it is relatively easy to derive the costs of the construction of a

protective dam against floods, including its operating and maintenance costs. Identifying such investments across public sectors is more difficult, as hardly ever cost identifiers pertaining to “disaster risk management” can be found in public accounting systems. Disaster losses can be more complex to assess, as they can include costs that are short-, medium-, or long-term in nature, are direct or indirect such as the immediate destruction of infrastructure or the indirect impacts felt through global value chain disruptions due to a disaster that occurred in one locality. Costs could mean damages to welfare or human and economic development, including loss of lives, health impacts, perturbation to daily life; damages to the environment and so on.

Comprehensive estimates of the costs of disasters, for water-related as well as other sources of natural hazards, are necessary to analyse the effectiveness of past and future risk management-related public expenditure. In particular, this information is needed to inform decision making and to develop more cost effective strategies and measures to prevent or reduce the negative impacts of hazards and threats. There is a need to know more precisely how much is spent ex-ante in preparation and reduction of negative impacts of disasters and ex-post on responding to and rehabilitating from disasters (Table 1).

TABLE 1 EXPENDITURE CATEGORISATION FOR DISASTER RISK MANAGEMENT

| Expenditures by | Ex-ante or ex-post | By phases of the DRM cycle | Sub-expenditure category |
|--|------------------------------------|---------------------------------------|---|
| - governments - citizens - private sector | Ex-ante | I. Risk Prevention and Mitigation | I.1 Strategic Planning |
| | | | I.2 Hazard Identification and Assessment |
| | | | I.3 Risk/Hazard Mapping |
| | | | I.4 Land-use Planning |
| | | | I.5 Planning, Developing and Constructing Protective Infrastructure |
| | | | I.6 Prevention measures for the existing built environment (houses, etc.) |
| | | | I.7 Prevention measures for critical infrastructure (energy, water, transport, road networks, ICT, etc.) |
| | | | I.8 Risk awareness and communication activities |
| | | | I.8 Risk Transfer Investments by the Public Sector |
| | | II. Preparedness | II.1 Development of Crisis Management Plans |
| | | | II.2 Early Warning Systems Development, Construction and Management |
| | | | II.3 Evacuation Planning and Management |
| | | | II.4 Emergency Supply Management |
| | | | II.5 Emergency Preparedness/Crisis Management Exercises |
| | | III. Emergency Response | III.1 Emergency Supplies |
| | | | III.2 Assistance Packages to affected regions, households etc. |
| | | | III.3 Payments to NGO's and other emergency support agencies |
| | | | III.4 Expenditure related to immediate response to public service disruption (energy and water supply, transport, etc.) |
| | III.5 Search and rescue operations | | |
| | Ex-post | IV. Rehabilitation and Reconstruction | IV.1 Rehabilitation of public infrastructure |
| IV.2 Rehabilitation of private assets | | | |
| IV. 3 Indemnity payments from government to households | | | |
| IV. 4. Indemnity payments from government to businesses | | | |

There are several underlying challenges in obtaining this information consistently across countries:

- First, and for what concerns the public expenditure-related costs of disaster risk reduction, countries usually do not have a central repository for collecting this information. Multiple agencies and levels of government have various spending items related to disaster risk reduction, with their own way of distinguishing hazards and type of risk reduction investment (e.g. planning, protective infrastructure, etc.). This becomes even more complex if expenditure is not aimed directly at risk reduction, but is “embedded” in another program or project, hence contributes indirectly to that purpose to some significant extent. For example, an agency mandated with preventing landslide-risks may distinguish an expenditure category such as “disaster risk prevention investments”, and a sub-category “afforestation” for the purposes of re-creating forests as a natural protective barrier against such hazards. At the same time, a forestry management branch of another ministry may have similar categories of “afforestation” as an expenditure item, which may to some extent serve a dual purpose of afforestation and risk prevention, without being directly categorised under the later. Another example of such an “embedded” risk management spending item may be a school construction that, beyond its obvious education purpose, serves an important risk management function, namely providing shelter in case of an emergency. Hence it requires much effort and considerable judgment to identify spending categories across sectors and levels of government.
- Secondly, for what concerns disaster loss accounting, countries may not have standardised accounting on economic losses caused by disasters, let alone internationally comparable data.
- Finally, not only public, but also private investments are undertaken ex-ante and ex-post to manage disaster risks. In most OECD countries these investments are even less systematically accounted for and are approximated by paid insurance premiums among households and businesses against disaster risks.

Before providing the cost assessments review and draft methodology for accounting for expenditures, an overview will be provided in section 2 of the potential uses and users of such data, to help orientate data collection efforts that follow. Sections 3 and 4 are dedicated to the analysis of existing losses and expenditure in risk management.

Section 1: Questions for Discussion and Feedback:

- ✓ Are the objectives and the expected outputs clear?
- ✓ Are their additional objectives that should be looked at? (suggestions can be made for refinements or future work, as ongoing resources to expand this work are largely committed and constraint)

2 WHO WOULD BE THE POTENTIAL USERS OF INFORMATION ON THE COSTS OF DISASTERS?

This section includes:

- *A discussion of the demand-side of loss and expenditure-related disaster risk management information, including a list of users of such information*

There are a number of stakeholders that have an interest in obtaining information about the costs of disasters (Hallegatte and Przulski 2011; Meyer et al. 2012):

- National and sub-national governments require such information (a) on a programmatic level: to inform budgeting processes, specifically to determine the share of funding to be allocated to risk reduction investments vis-à-vis other budgeting needs; and (b) on a project level: to decide on individual risk reduction investments ex-ante information is needed to calculate the expected costs and avoided losses among a set of alternative courses of risk reduction actions;
- National and sub-national governments also have ex-post information requirements to budget the ex-post assistance they need to provide as well as to assess whether risk reduction investments have been effective in actually reducing ex-post losses;
- (Re)Insurance providers are interested in the extent of potential damages to insurable physical and non-physical assets, such as houses and factory buildings or machinery, or short-term business interruption;
- Similar to insurance providers, businesses and private households should be interested in the potential damage to their assets to inform decisions about private risk reduction measures;
- Citizens may have a strong interest in knowing about how much their governments spends on DRM and whether its investments are effective in reducing losses that the society as a whole, but also citizens individually may suffer;
- The international community has an interest in obtaining cost information about the potential international knock-on effects of disasters cascading through the economic system and impacting public as well as private actors;
- The international community may also have an interest in such cost information to assess the achievement of global commitments to reduce losses from disasters, such as set out in the Hyogo Framework for Action, or potentially discussed in the framework of the post-2015 development agenda;
- Other actors that may have a less direct, but nevertheless a vested interest in such information are non-governmental organisations, research communities or civil society organisations engaged in increasing resilience against disasters; other public agencies responsible for the implementation of specific aspects of disaster risk management actions could equally be using such information, as are critical infrastructure providers.

Section 2: Questions for Discussion and Feedback:

- ✓ Is the list of potential interested stakeholders complete? If not, who is missing?
- ✓ Later on in the document the question to keep in mind is whether the suggested information collection on DRM related costs is relevant for those stakeholders or should be modified to cater better to their interests?

3 RECORDING LOSSES EX-POST OF DISASTER EVENTS AND ESTIMATING THEM EX-ANTE

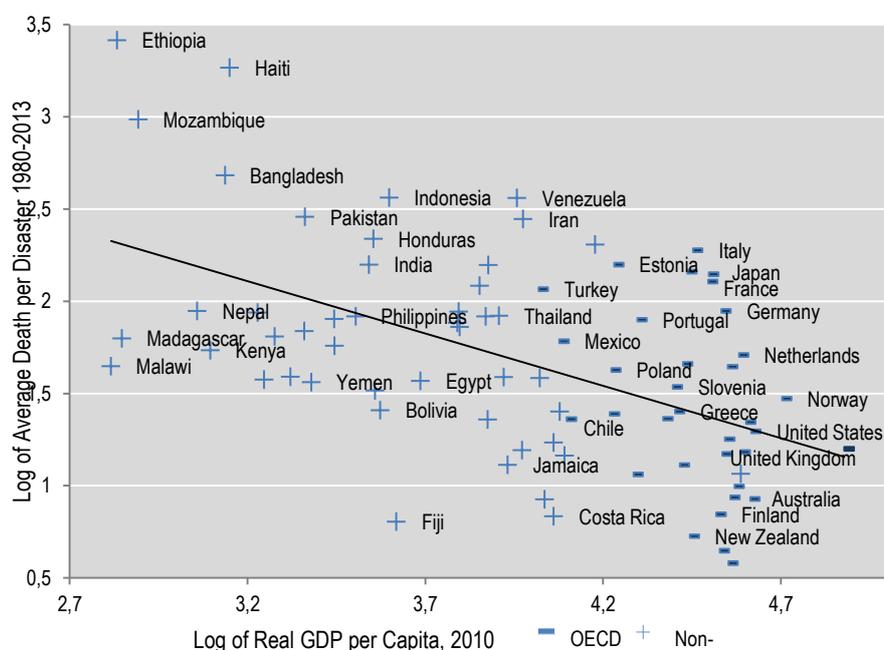
This section includes:

- An overview of existing international efforts to collect data on socio-economic losses of past disasters
- A selection of OECD countries for which an overview of national data collection on socio-economic losses of past disasters is provided
- An analysis of the comparability and differences between existing databases as well as a discussion of the needs and the potential to harmonise existing databases
- An overview of methods on ex-ante loss assessment and a case application to an OECD study on the expected economic costs of a large-scale flood of the Paris Metropolitan Area for the economy of France
- A check-list that includes the types of loss information that should be collected after a disaster and a suggested process that can be applied to manage such a data collection effort from the local to the national levels

3.1 OVERVIEW

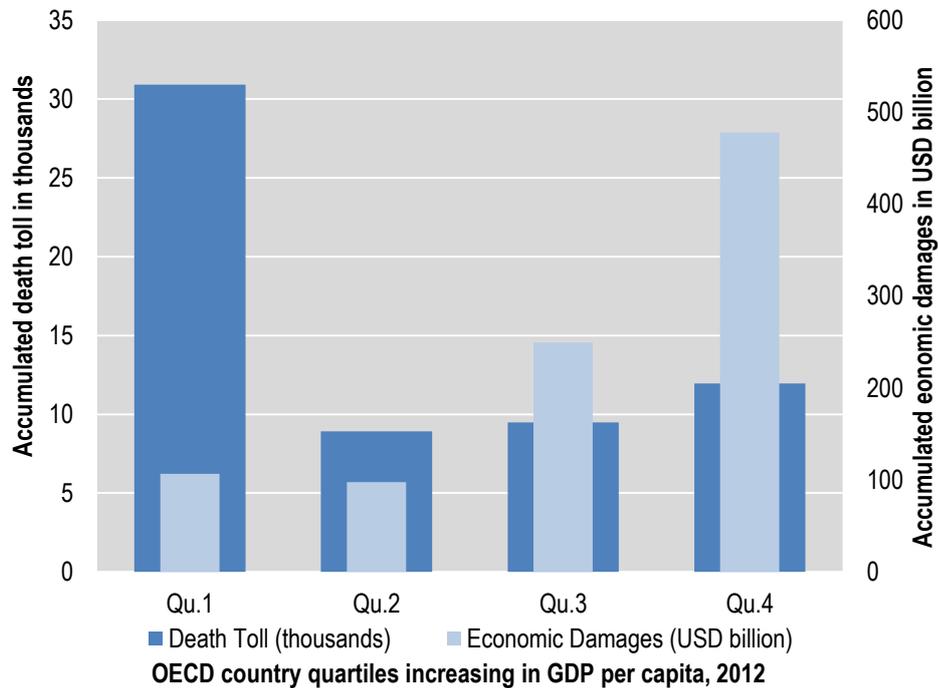
Resilience against natural disasters in OECD countries is high compared to non-OECD members. During the past 30 years, OECD members have experienced significantly lower average fatality rates per disaster than lower income countries reflecting significant progress in decreasing the exposure and vulnerability to natural disasters (Figure 2). However, Figure 3 also shows that higher income OECD countries experience larger economic losses compared to those with lower income per capita, progressively so as their income levels increase. To face this challenge, policy makers need a good understanding of past such losses. Only once a trend in losses is established will policy makers be able to understand whether their disaster risk investments have been effective in reducing them.

FIGURE 2 SIGNIFICANT DECREASE IN FATALITY RATES FROM DISASTERS WITH INCREASING INCOME 1980-2013



Source: OECD (2014a).

FIGURE 3 FATALITY RATES AND ECONOMIC DAMAGES TO OECD COUNTRIES BY INCOME QUARTILE, 1995-2010



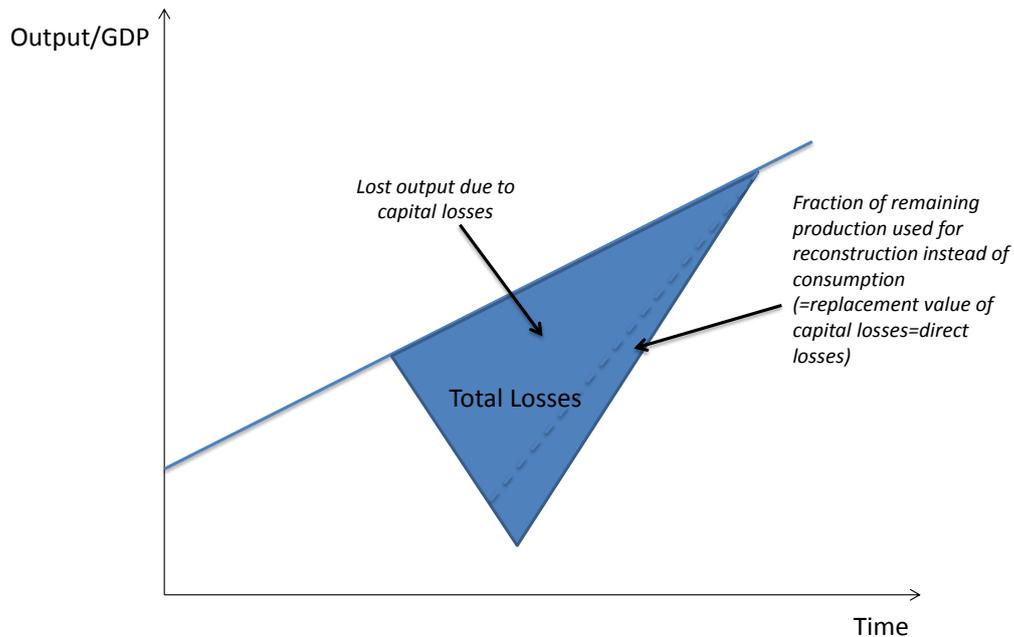
Source: OECD (2014a).

A number of costing frameworks have been developed to measure economic losses. The most comprehensive account of current approaches can be found in Meyer *et al.* (2012). The categories that are generally being distinguished in assessing economic losses are direct, business interruption and indirect losses (Figure 4) and are widely used in existing disaster loss databases:

- *Direct tangible costs* include the costs that accrue directly to assets, such as property due to the physical contact with the hazard. They include costs caused by the physical destruction of buildings, inventories, stocks, infrastructure or other assets at risk. The term tangible implies that a market, and hence prices, exist for these goods and services that allows to express them in monetary/economic terms.
- *Losses due to business interruption* are the costs accrued by the disruption of activities in areas directly affected by the hazard. The disruption includes work that is not carried out due to workplace destruction or obstruction to travel to work or a lack or destruction of an input to continue work (e.g. electricity to run IT systems of factory machinery). Sometimes this is referred to as direct damage as they occur as a result of the immediate impact of the hazard. Others refer to them as primary indirect damages, because losses do not result from physical damage to property but from interruption of economic processes
- *Indirect costs* include only those costs not caused by the hazard itself but induced by the knock-on impacts of either direct damages or losses due to business interruption. This includes the failure of production by businesses due lack of inputs by suppliers whose production was directly impacted. It

also includes forgone consumption or price increases due to increased scarcity faced by customers. Indirect costs can span a longer period of time than the direct costs caused by an adverse event itself and their perseverance and degree of impact heavily depend on the system's ability to recover (Hallegatte and Przulski, 2011).

FIGURE 4 TOTAL LOSSES: THE SUM OF DIRECT AND INDIRECT LOSSES



Source: Hallegatte and Przulski, 2011.

Sometimes, in addition to the main cost categories distinguished above, intangible costs are added to the loss equation. They include costs in goods and services that are not available to buy on traditional markets and hence have no obvious price attached to them. They are referred to as non-market values or costs. Such items include for example environmental impacts, health impacts and impacts on cultural heritage. As it takes effort to express them in monetary terms, they are often left out of the calculation, leading to incomplete estimates of total costs.

The above cost categories are usually part of traditional loss assessments. To be fully comprehensive however, the costs of reconstruction and recovery and costs of planning and implementation of risk prevention measures should be taken into account. This is hardly included in existing loss assessment information captured in international databases.

As discussed in the introductory section loss assessments of major disasters have been more consistently conducted and their results captured in national as well as international databases than the assessments of public expenditure related to disaster risk management. There are hence a number of existing databases containing information on loss assessments of past disasters. The below review will show that practically none of the existing databases has comprehensive cost assessments containing all cost categories outlined above. However, efforts are underway at the European level (EU) and the international level (CRED-EMDAT) to improve existing collection methods.

3.2 EXISTING NATIONAL AND INTERNATIONAL LOSS ASSESSMENT DATABASES

Depending on data availability, the data collection approach and purposes of reporting, databases on ex-post losses can be very different. Ex-post loss assessments conducted in the immediate aftermath of a disaster aim to give policy makers guidance on the financial needs for emergency assistance and potential rehabilitation and reconstruction. The rough estimates conducted immediately after an event are usually refined by more detailed ex-post loss assessments that are used for long-term planning and that are included in national loss databases. A number of national and international databases on disasters have been created by a range of different stakeholders, including international organisations, private sector agencies (e.g. insurers or re-insurers), public national agencies or research bodies (universities, think-thanks, etc.). According to their mission, their databases pursue different objectives and have different scales and scopes in terms of hazard and geographical coverage, and the variables they collect. Most record the occurrence and intensity of hazardous events, albeit for different geographical reaches. Some of them provide records on the extent of catastrophes in terms of social losses (such as people affected, missing, displaced or killed). Some databases are hazard-specific and only report on a selected hazard/s, while a number actually cover natural and technological hazards more broadly. Some of the existing databases include loss data in terms of the extent of physical damage, such as the number of buildings destroyed, infrastructure affected, or size of coastline impacted, but only few existing databases actually integrate them in a loss estimate providing a monetary value of the overall estimated economic damage. Finally, even among those that provide economic loss data, their entries are not necessarily comparable, and in fact differ to a significant extent, due to different methods used to compute economic loss estimates. Nevertheless, there are efforts ongoing to harmonise ex-post loss databases in Europe.

In the following we will provide a brief overview of existing national and international databases that are most relevant to the core purpose of this draft paper, which is providing information on costs related to losses of disasters and expenditures for disaster risk management. The overview does not aim to be comprehensive, but rather to include the most relevant databases that are currently in use. The purpose of the overview is to analyse the comparability and potential deficiencies of existing databases.

3.2.1 INTERNATIONAL DATABASES

There are four main well-established global loss databases including multiple hazard types (natural and technological or only natural hazards) (Table 2):

- *EM-DAT*² is a publicly accessible global, multi-hazard database provided by the Centre for Research on the Epidemiology of Disasters at the Louvain University in Belgium, maintained with the support of the World Health Organisation (WHO) and the United States Agency for International Development (USAID). EM-DAT is the most comprehensive international database containing loss data starting from around 1900, although earlier data entries are less complete than those of recent years.
- *DesInventar*³ is another publicly accessible multi-hazard loss database supported by the UN International Strategy for Disaster Reduction (UNISDR) and the UN Development Programme (UNDP). It contains consolidated, nationally-collected loss data from 45 countries covering about a fifth of the world's population. The database was initially set up in 1994 by governmental actors and academic partners affiliated to a regional

² EM-DAT: The OFDA/CRED International Disaster Database, Universit catholique de Louvain, Brussels, Belgium, www.emdat.be

³ DesInventarInventory Systems on the Effects of Disasters, <http://www.desinventar.org/>

social science network in Latin America. At the time the involved partners established the database for 9 Latin American countries to address the absence of such data in the region. Since then 45 countries have joined the effort feeding the database with information on disaster events and losses following a standard methodology provided by DesInventar.

- Swiss Re's *sigma*⁴ and Munich Re's *NatcatSERVICE*⁵ are two international databases provided by the private sector. Information is only partially accessible online (e.g. insured losses can only be accessed for total annual values and not disaggregated by event). *sigma* covers hazard data since 1970. Although some major catastrophes were recorded as early as 0079, the *NatcatSERVICE* includes exhaustive disaster information internationally only since 1980 and for some countries since 1974.

Table 2 provides an overview of the main characteristics of the four reviewed international, multi-hazard disaster databases that all contain information on social as well as economic losses. Although EM-DAT is the most comprehensive in terms of hazard coverage and recording events since early onwards, other databases, notably the ones provided by the private sector, have a lower threshold for making disaster entries, and hence cover a higher number of events. The variables included in the major international databases are very similar, and include social losses (such as casualties, injured or affected people) and physical/economic losses. What is remarkable is that almost all databases rely on very similar sources of information. They include reports provided by national governments, international organisations or specialised national agencies and NGO's, as well as frequently also newspaper sources. No evident scrutiny of the information is provided by the database managers. This means that information sources are fairly homogenous across databases and that reliability of the information rests with the organisation in charge of publishing official figures.

Most of the existing databases recording losses from past disasters include information on social as well as economic losses. The assessment of social losses, especially the number of fatalities seems relatively straightforward as compared to the assessment of economic losses. Nevertheless, looking at the available information their numbers still differ slightly across databases (Table 3). For example, the recorded fatalities from Hurricane Katrina that struck the Gulf of Mexico in 2005 vary from some 875 to 1836. Differences may arise from definitions, geographic scope or difficulties of assessing actual fatalities by a disaster. For example, some databases include people recorded missing in the casualty toll, while others do not. Another reason for finding differences could be different geographical scopes applied to recording fatalities. For some disasters such as the heat wave in Europe in 2003 the directly attributable fatalities may be difficult to disentangle from other causes of deaths. The recording divergences regarding "affected" people are even larger among the existing databases, since it can capture a wide range of definitions, such as for example people "injured", "displaced" or "homeless", or a combination thereof. Even though the accounting of social losses deserves close scrutiny in itself, this work is focused on the economic loss accounting, which is why in the following other social losses are not looked at in more detail.

⁴ <http://www.sigma-explorer.com/>

⁵ <http://www.munichre.com/en/reinsurance/business/non-life/natcatservice/index.html>

TABLE 2 MAJOR INTERNATIONAL (EX-POST) ECONOMIC LOSS DATABASES AND MAIN CHARACTERISTICS

| Name of database | Geographic coverage | Hazard coverage | Events covered since | Threshold levels | Variables covered | Total economic loss calculation | Source of information for hazards and losses | Accessibility |
|----------------------------------|---------------------|---|-------------------------------|---|--|--|---|------------------|
| EM-DAT | World-wide | All hazards (natural, technological) | 1900 (about 18,000 disasters) | 10 < casualties; 100 < affected; declaration of state of emergency; call for intern. assistance | Casualties, affected (injured, homeless, affected), estimated damage | Physical quantification: no Direct and indirect losses but does not include reconstruction costs (replacement costs for assets); direct losses include damage to infrastructure, crops, housing and indirect include loss of revenue, unemployment, market destabilisation | In descending importance: United Nations, National Governments, US Government/agencies, International Federation of the Red Cross (IFRC), World Bank, Re-Insurers, media and other related institutions | Fully public |
| DesInventar | 45 countries | All hazards (natural, socio-natural or technological) | Country-dependent | Only events that generated 'some kind of impact' | Casualties, affected (wounded, sick, relocated, evacuated, etc.); loss value, infrastructure impacts | Physical quantification: yes Direct tangible costs only | Newspaper sources; official government or public agencies' reports | Fully public |
| Natcat-SERVICE (MunichRe) | World-wide | Natural Disasters | 1980 (about 28,000 disasters) | Some socio-economic impact; small-scale property damage or 1-9 fatalities | Insured losses; total losses; injured; infrastructure areas and industries affected | Physical quantification: yes Partly relies on total economic loss figures provided by governments, multilateral finance institutions; if former is unavailable insured losses are extrapolated via insurance density of affected region based on type of event and exposure of affected region; if insured losses are not available, extrapolations are based on event type, exposure of affected region, population density and information on physical damages | Insurance industry, research organisations, government, UN, EU, NGOs, meteorological services, news agencies | Partially public |
| Sigma (SwissRe) | World-wide | All hazards (natural and man-made) | 1970 (about 9,000 disasters) | 20< casualties; 50< injured; 2000< homeless; total losses < USD 91,1 million | Casualties; missing; injured; homeless; insured losses (claims); total losses | Physical quantification: yes Insured plus uninsured losses (includes property and business interruption of insured losses and excludes liability and life insurance); total losses include financial losses due to damage to buildings, infrastructure, vehicles and other assets, business interruption; insured losses are gross of reinsurance; total losses do not include indirect financial losses (loss of earnings by suppliers, estimated shortfall in GDP, loss of reputation or quality of life impacts) | Newspapers, direct insurance and reinsurance periodicals, specialist publications and reports from insurers and reinsurers | Partially public |

TABLE 3 NUMBER OF CASUALTIES RECORDED ACROSS DIFFERENT NATIONAL AND INTERNATIONAL EX-POST LOSS DATABASES

| Year | Event | EM-DAT | Des-Inventar | NOAA earthquake database or Storm Events database | Dartmouth Flood Observatory | US Sheldus | Swiss Re explorer | Munich Re ² |
|------|-----------------------------|---------|----------------|---|-----------------------------|----------------|-------------------|------------------------|
| 2005 | Hurricane Katrina | 1 833 | Does not apply | 24 ³ | 1 053 | 875 | 1 836 | 1 322 |
| 2010 | Chile Earthquake | 562 | 675 | 521 | Does not apply | Does not apply | 562 | 520 |
| 2010 | Haiti Earthquake | 222 570 | 222 521 | 316 000 | Does not apply | Does not apply | 222 570 | 222 570 |
| 2011 | Great East Japan Earthquake | 19 846 | Does not apply | No estimate | Does not apply | Does not apply | 18 520 | 15 880 |
| 2012 | Hurricane Sandy | 54 | Does not apply | 68 ⁴ | 65 | No estimate | 237 | 210 ⁵ |

1. Data refers to the states Mississippi, Florida, Georgia, Alabama and Louisiana

2. Data are not taken from an interactive database but from their annual review of large natural disasters

<http://www.munichre.com/de/reinsurance/business/non-life/natcatservice/significant-natural-catastrophes/index.html>

3. Data refers to the states Mississippi, Florida, Georgia, Alabama and Louisiana

4. Data refers to the states New York and New Jersey

5. Data refers to the Bahamas, Cuba, Dominican Republic, Haiti, Jamaica, Puerto Rico, USA and Canada

In terms of economic loss data all four international databases record total losses, which to some degree include direct or indirect losses. Although more precise definitions of what is included are provided and listed in Table 2, it is not clear to what extent actual recorded figures follow them because no primary collection of data is undertaken and heavy reliance is put on the figures of official and newspaper sources that may not necessarily provide disaggregated data from which the databases can then choose to integrate in their calculations. In Table 4 one can observe that the recorded loss amounts in the major international databases are almost the same when one looks at the Chile earthquake of 2010, slightly different for Hurricane Sandy in 2012 reaching between USD 50 and 74 million and between USD 125 and 174 million for Hurricane Katrina in 2005. It is difficult to conclude whether the slight difference in figures is due to either different sources or estimation methods, because only few databases provide source information for each figure published.

In comparison, some hazard-specific databases (e.g. the Dartmouth Flood Observatory) or national databases (e.g. US Sheldus) provide selected loss information on only direct costs as opposed to reporting both direct and indirect costs (as it is generally done in international databases), such as the economic value of property damage or crop damage that cannot be compared to the total economic loss estimates provided by the international databases. Even though for example NOAA and US Sheldus both provide estimates on property and crop damages the results differ. NOAA uses a predefined damage function to estimate these values, which could explain the difference in values. For example, while NOAA estimates the property damage of Katrina at USD 43 million US Sheldus puts it at USD 75 million (Table 4).

TABLE 4 COMPARISON OF ECONOMIC LOSSES ACROSS INTERNATIONAL AND SELECTED NATIONAL DATABASES

| | Economic losses (in USD billion) recorded in: | | | | | |
|--------------------------------|---|-------------------------------------|----------------------------------|---|--|---|
| | <i>International databases</i> | | | <i>Other national or hazard-specific databases</i> | | |
| Name of database/Event | EM-DAT | <i>sigma</i> | <i>NatCatService</i> | National Oceanic and Atmospheric Administration (NOAA) ¹ | Dartmouth Flood Observatory ² | US Sheldus ³ |
| Chile Earthquake, 2010 | 30 | 33.28 (out of which insured: 8.88) | 30(out of which Insured: 8) | 30 | Does not apply | Does not apply |
| Hurricane Sandy, 2012 | 50 | 73.78 (out of which insured:36.89) | 65 (out of which insured:30) | Property damage: 24.91 | No estimate | No estimate |
| Hurricane Katrina, 2005 | 125 | 173.44 (out of which insured:80.37) | 125 (out of which Insured: 62.2) | Property damage:42.53; crop damage: 1.93 | 60 | Property damage:74.27; crop damage:2.12 |

1. <http://www.noaa.gov/>

2. <http://www.dartmouth.edu/~floods/>

3. <http://webra.cas.sc.edu/hvri/products/sheldus.aspx>

3.2.2 NATIONAL DATABASES

National databases (Table 5) containing information on hazard events and losses across different hazards are not consistently available across OECD Members and if they are available, they differ significantly in the way information is collected. Besides national-level information collection provided by *DesInventar* the following countries have been selected to study in terms of their loss information collection methods:

- Japan
- Australia
- Canada
- Italy
- Slovenia
- United States⁶.

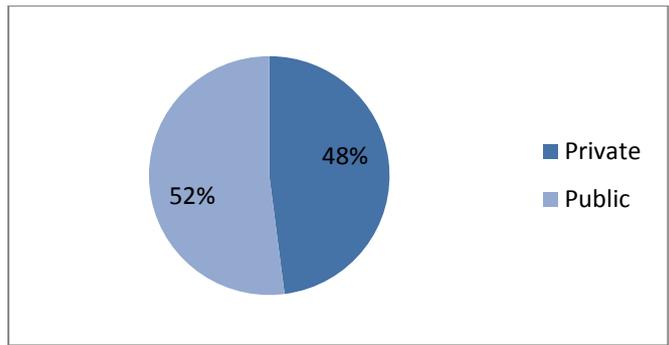
On the national level, differences exist in the methods of data collection, as well as the governance approaches to managing the data collection: in Slovenia data collection is organised centrally, where the Administration for Civil Protection and Disaster Relief (ACPDR) coordinates a loss assessment requested by a mayor of an affected municipality by providing methods and instructions for carrying out the data collection on the local level. Contrary to the relatively centralised Slovenian approach, in Italy, different institutions are involved in loss data collection at the national level. The National Department of Civil Protection (DPC), the National Research Council and the International Centre on Environmental Monitoring all collect loss data. This results in different hazard-specific loss databases for flood and landslides, earthquakes, forest fires, volcanic events, coastal risks and man-made disasters which are not integrated into one multi-hazard database.

The Japanese Ministry of Land, Infrastructure and Tourism (MLIT) utilises a relatively exhaustive loss accounting framework for flood disasters in Japan where direct costs of private and public assets and losses for public services and utilities due to business interruption are recorded directly after a flood disaster. Similarly to the Slovenian government, its data collection is centrally organised and aggregated (Figure 6). In addition to collecting costs per a specified local level (such as county level in the US Sheldus database) MLIT distinguishes flood damage records by general (private) properties, public facilities and public services. In the aftermath of a flood the municipality conducts a survey to evaluate private property damages, which include residential, agricultural and business properties. The Prefectural government collects information on the damages on public facilities (with the assistance of local municipalities) as well as costs suffered by public service providers due to business interruption. All collected information is sent by the Prefectures to MLIT which evaluates collected information in monetary terms and aggregates damages centrally. This allows for an exhaustive database that can be broken down by municipality and by type of damaged property. According to this methodology, Japan's government arrives at flood damage losses of 346 466 Million Yen in 2012⁷. Figure 5 shows that flood losses in 2012 are relatively evenly distributed between public and private damages (See Appendix 1 for detailed review of flood damages in the fiscal year 2012)

⁶ A comprehensive review would have to be undertaken to analyse available information across all national databases.

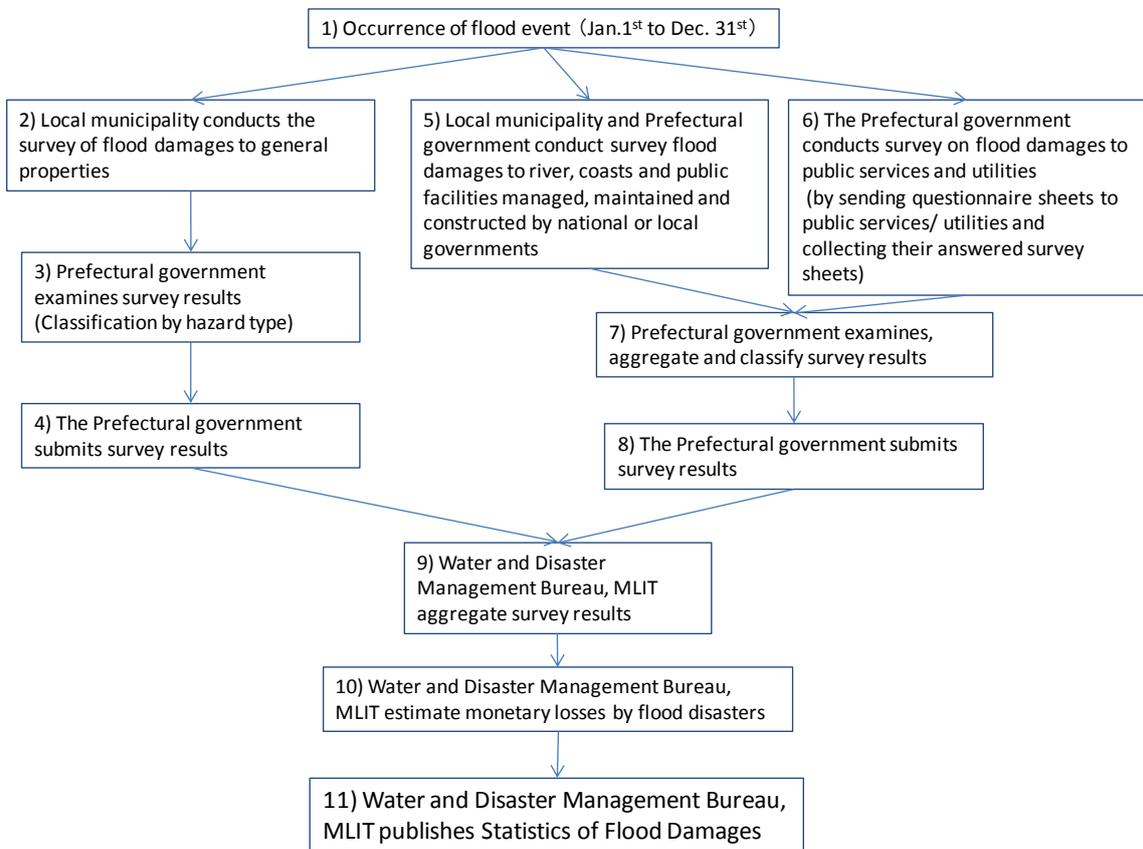
⁷ Not inflation-adjusted

FIGURE 5 PUBLIC AND PRIVATE FLOOD DAMAGES IN JAPAN, 2012



Source: Cabinet Office, Government of Japan (2014). "White Paper on Disaster Management 2014"

FIGURE 6 PROCESS FOR COLLECTING FLOOD LOSS DATA IN JAPAN



Source: Cabinet Office, Government of Japan (2014). "White Paper on Disaster Management 2014"

The variables included across national databases are quite similar. Most include casualties, insurance costs, property losses, and damages to crops or livestock. Estimated economic costs or the amount of government assistance were recorded only by half of the databases reviewed. As information on direct and indirect losses in national databases are generally obtained through surveys and investigations by local municipalities, their data is less exposed to questionable information sources and consistency problems as compared to international databases. Most international databases rely heavily on media sources, NGO reports and extrapolation calculations; and therefore

cannot maintain the same level of consistency or detail as national databases. Thus, a closer cooperation between international and national databases, especially the responsible government entity for disaster loss recording could benefit the harmonisation of recorded loss information.

TABLE 5 EXAMPLES OF NATIONAL EX-POST LOSS DATABASES

| | Canada ¹ | Australia ² | Slovenia | US (SHELDUS) ³ | Japan ⁴ |
|------------------------------------|---|---|---|--|--|
| Host Institution | Public Safety Canada, federal department of Public Safety and Emergency Preparedness | Australian Emergency Management | Administration for Civil Protection and Disaster Relief (ACPDR) | Hazards & Vulnerability and Research Institute at the University of South Carolina | Ministry of Land, Infrastructure, Transport and Tourism, Water and Disaster Management Bureau |
| Geographic coverage | Canadian territories and some countries abroad that have had disasters which affected Canadians | Australian territories and some countries abroad that have had disasters which affected Australians | Slovenia | USA (except Puerto Rico, Guam, or other U.S. territories) | Japan |
| Hazard coverage | All Hazards | All hazards | All hazards | Multi-natural hazard | Flood (landside waters (to verify with Japanese colleagues), storm surge, tsunami, sediment discharge, landslide, steep slope failure) |
| Events covered since | 1900 | 1753 | 2004 | 1960 | TBD: |
| Fatalities | Yes | Yes | No | Yes | Yes |
| Affected People | Yes (affected by disruption of utility services) | Yes (number of homeless) | No | No | Yes (number of missing, injured and affected households) |
| Estimated (Total) Costs | Yes | Yes (does not include costs incurred by emergency services; government and NGOs) | No | No | Yes |
| Government Assistance Costs | Yes | No | Yes | No | No |
| Insurance Costs | Yes | Yes | Yes | No | No |
| Property Losses | No | Yes (Number of destroyed houses and buildings) | Yes | Yes | Yes |
| Crop/Livestock Losses | No | Yes (Livestock losses) | Yes | Yes (Crop losses) | Yes |
| Sources of information | Federal institutions, provincial/territorial governments, non-governmental | Cost data from several sources including Government | Claim reports from municipal governments | National Climatic Data Center's monthly Storm Data publications, | Surveys on flood damages, Fire and Disaster Management Agency (source for |
| Collection method | Desk research and government reporting, updated and reviewed on a semi-annual basis | Entry of data from government agencies in database and | Standard method provided by central agency for locally organised data | Data is compiled and geocoded | Assessment of general properties by municipalities and evaluation of damages to |
| Accessibility | Fully public | Fully public | No public access | Fully public (except for the download of data) | TBD. Fully public? |

1. <http://cdd.publicsafety.gc.ca/srchpg-eng.aspx>

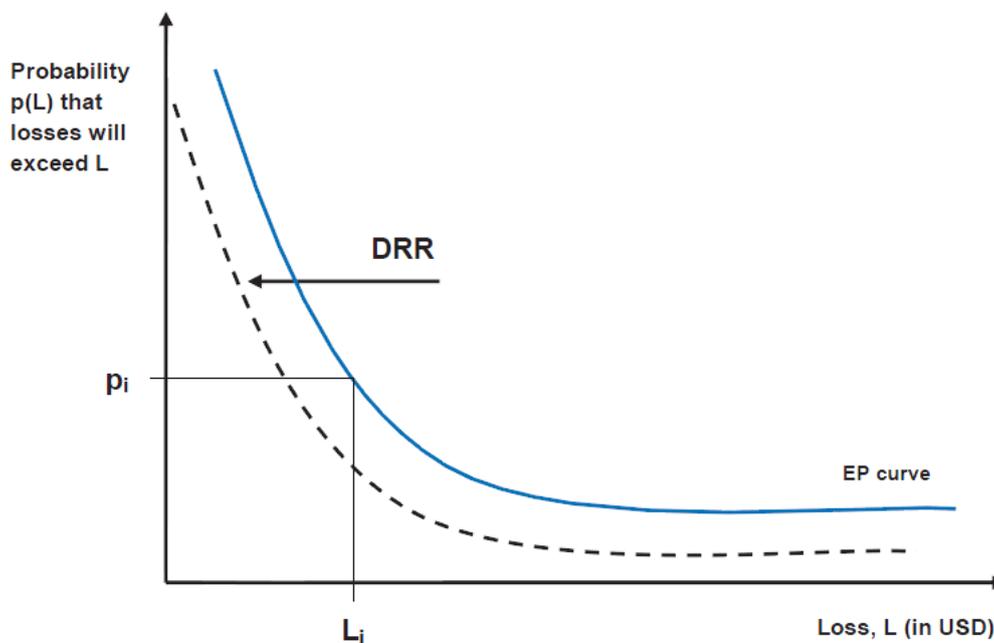
2. <http://www.emknowledge.gov.au/disaster-information/>

3. <http://webra.cas.sc.edu/hvri/products/sheldus.aspx>

4. Cabinet Office, Government of Japan (2014). "White Paper on Disaster Management 2014".

Box 1. The manual benefit assessment of flood and coastal erosion risk management in the UK

The Flood Hazard Research Centre (Middlesex University London) in collaboration with the UK Environment Agency and DEFRA has produced an exhaustive manual on the economic appraisal of flood risks which aims to provide guidance to assessing flood risk damage and prevention benefits ex-ante of disasters. It consists of a step-by-step guidance to estimating flood damage data in order to conduct project appraisals in flood and coastal erosion risk management. The handbook emphasises the importance of distinguishing economic and financial losses from flood risks. Unlike economic losses, financial costs do not take into account the depreciation of value to assets. Moreover, it includes VAT tax payments which represent losses to the affected individual but not on the national level and should therefore not be included in economic losses from flood risks. The appraisal of flood alleviation benefits derives from the calculation of annual average damages which represent the maximum-potential damage scenario. The suggested methodology to arrive at such annual average flood damage data is a synthetic collection assumed pre-flood values minus their depreciation rate of property components in a pre-defined benefit area and corresponding indirect costs such as emergency services (Police, ambulance etc.) which have been quantified at 10.7% of total property damages. This flood damage data of a pre-defined area is combined with its corresponding land-use category, floor area, threshold height of the property, the most appropriate level of detail for water depth/damage data and hydrologic/hydraulic profile data for each return period. After the collection of sufficient data, loss probability curves can be constructed which relate the extent of damage to their occurrence probability. These loss probability curves help to illustrate annual damages averted by potential prevention schemes.



Source: Flood Hazard Research Centre (2005)

3.3 OTHER AVAILABLE LOSS DATA

Disasters affecting developing countries often necessitate international assistance. In such cases methods for estimating damages are applied, such as the Post-Disaster Needs Assessment (PDNA)⁸ that is used by a number of international organisations to conduct loss assessments in the immediate aftermath of a disaster to estimate the level of support required by the international community. In an attempt to mainstream and standardise the PDNA method, the UN, the World Bank and the European Commission have been jointly working on developing methodological guidelines. Physical damages and economic losses are evaluated using the Damage and Loss Assessment (DALA) and human recovery needs are investigated through the Human Recovery Needs Assessment (HRNA) and a Recovery Framework (IRP, 2014). However, there is no central database to collect the results of PDNAs that had been conducted except for the countries covered in *DesInventar*. There have been a number of other event-specific loss assessments carried out by academia, the private sector, governments or international organisations. They have however been collected in a manner that makes comparisons across events and countries very challenging.

3.4 EX-ANTE LOSS ESTIMATION METHODS

Loss assessments can be carried out systematically ex-post, as seen in the above review, or ex-ante. Ex-ante loss estimations calculate the potential impact of a certain type and severity of a future disaster on the affected population and economy and can help policy makers at large to understand future damage potential and allocate public budgets towards the reduction of their impacts. They can also help them to assess the avoided costs obtained through specific risk reduction projects (e.g. the construction of a protective infrastructure). Box 2 summarises the outcome of such an ex-ante cost-assessment study that was conducted by the OECD to estimate the damages of a potential large-scale flood in the Paris metropolitan area. Such ex-ante assessments are conducted on a needs-basis and hence are not systematically carried out and captured in databases.

Box 2. Ex-ante direct and indirect loss estimation of a potential large-scale flood and its ripple effects in the Paris metropolitan area

The OECD developed a prospective damage loss methodology in the context of an OECD study on a potential large-scale flood of the Seine river in Paris. The framework examines two problems: the cascading effects of the interruption to critical networks on companies' activities and the long-term macro-economic impact at national level, given the importance of the Ile-de-France region in the French economy (30 % of national GDP in 2011). For this purpose, a hybrid hydraulic-economic loss assessment was developed, combining modelling of direct damages (based on the ALPHEE model), assessment of the losses due to the interruption of critical networks and general equilibrium modelling to estimate the short- and potential longer term wider economic damages.

Three flood scenarios, which are slight variations of the 100-year flood occurrence in Paris built the bases to assess prospective damages:

| Characteristics | Scenario 1 | Scenario 2 | Scenario 3 |
|----------------------------------|------------|------------|------------|
| Reference to flood in 1910 | 80% | 100% | 115% |
| Maximum water level (Austerlitz) | 6,90 m | 8,15 m | 9,11 m |
| Length of flood | 1 week | 2 weeks | 1 month |
| Number of affected people | 100 000 | 600 000 | 1 000 000 |

⁸ For methodology see <https://www.gfdr.org/fr/node/69> and http://www.recoveryplatform.org/pdna/pdna_guide

| | | | |
|-------------------------------------|---------|------------|------------|
| Perturbation of economic activities | 2 weeks | 1-2 months | 2-5 months |
|-------------------------------------|---------|------------|------------|

A combined hydraulic-economic model calculated the potential direct damage for private individuals and companies based on the ALPHEE model. ALPHEE uses specific spatial damage functions for households, enterprises and public infrastructure to estimate damages according to different flood scenarios. Its hydraulic component includes water level, flood duration and the percentage of flooded surface for each square of the sphere of influence of the river Seine. With regard to private households, six different damage functions and real estate prices of 2010 help to appraise their losses in case of a flood. The damage of private enterprises is based on a distinction of 19 different activities for which damage functions assess the losses to real estate, inventory and revenue due to business disruption. Furthermore, ALPHEE also entails damage functions for losses to public infrastructure.

To estimate second order impacts to critical infrastructure disruption the OECD conducted surveys and interviews with critical infrastructure operators to include the costs of a perturbation of critical networks in electricity, public transportation, roads, and water. These costs are counted partly towards public capital damages and towards revenue turnover losses as the perturbation of transport causes a loss of working hours and the disruption of electricity increases the affected surface by 50 % and raises the number of affected employees by a factor of 2.6, which translates one to one into business turnover reduction.

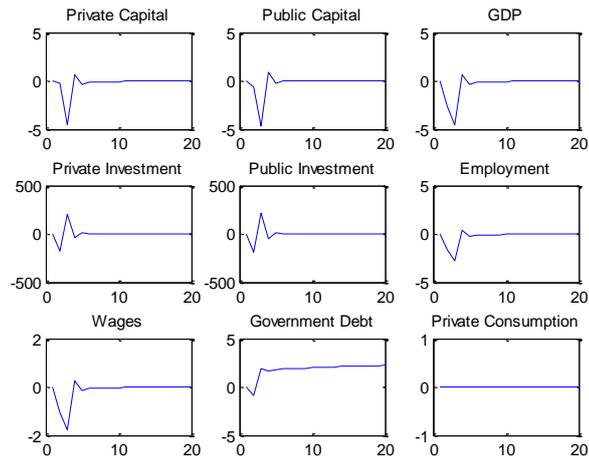
All estimated micro-economic impacts were added up to obtain an initial economic assessment of direct and indirect damages and losses. Results were regrouped into destruction of public and private capital stock and reduction of business turnover according to the three flood scenarios:

| Impacts (EUR billion) | | S1 | S2 | S3 | |
|-----------------------------------|---|------|-------|---------------------|------------------------|
| Destruction of capital | Private housing | 0.76 | 4.08 | 6.83 | |
| | Stocks (enterprises) | | | 8.54 | |
| | Equipment (enterprises) | 0.81 | 4.71 | | |
| | Buildings (enterprises) | | | | |
| | Destruction of private capital | 1.57 | 8.79 | 15.37 | |
| | Critical Operators : | | | | |
| | - Electricity | 0.25 | 0.50 | 1.00 | |
| | - Public transport | - | 1.00 | 5.00 | |
| | - Roads | 1.00 | 2.00 | 5.00 | |
| | - Water | 0.00 | 0.05 | 0.10 | |
| - Buildings | - | - | 1.00 | | |
| Public equipment et buildings | 0.35 | 1.12 | 1.93 | | |
| Destruction of the public capital | 1.60 | 4.67 | 14.03 | | |
| Reduction of business turnover | Bankruptcy of Small and Middle Income Enterprises (annual impact) | - | - | A 1.25-0.6-0.3-0 | B 3 - 1.5 - 0.7 - 0 |
| | Total turnover losses (trimester impact) : | 0.58 | 5.67 | 12.33 | 12.33+2.69*+0.98** |
| | - Direct effect of flood | 0.19 | 1.06 | 1.96 | 1.96 |
| | - Disruption effect of electricity | 0.19 | 2.59 | 3.20 + 1.47 | 4.67+0.73* |
| | - Disruption effect of transport | 0.19 | 2.02 | 3.74 + 1.96 | 5.70+1.96*+0.98** |

With regard to the wider macro-economic impact, a dynamic general equilibrium model was developed to assess the indirect effects on growth, employment and public finances and to incorporate the interactions between households, the governments and firms. This model enables the representation of the impact dynamically in the short, medium and longer term wherein a flood of the river Seine is modelled as a shock to the national economy, both destroying capital stock and reducing business turnover. The model was complemented with reconstruction reimbursements linked to the French natural catastrophe insurance system, CAT-NAT, since this may impact government debt after the reserves of EUR 5.7 billion are exhausted.

The model yields results on the development of private and public capital, GDP, private and public investment, employment, wages, government debt and private consumption under all three flood scenarios and under the assumptions of constant fiscal policies as well as increased public investment after the flood:

Macro-economic impact of the S3 flood scenario over 5 years



Note: these charts show the variation of the different parameters as a percentage of the initial state as a function of time with the quarterly measurement. The flood occurred during the first quarter.

Source : OECD (2014b), Étude de l'OCDE sur la gestion des risques d'inondation : la Seine en Île-de-France 2014, OECD Publishing, doi: 10.1787/9789264207929-fr

3.5 DRAFT CHECK-LISTS ON ESTIMATING DISASTER LOSSES

Table 6 gives a preliminary overview of the different types of loss information that can be recorded after the occurrence of a disaster. This check-list of cost categories can help governments collect different loss data points, and if applied more widely could serve as an international standard allowing for loss and damage comparisons across countries.

TABLE 6 CHECK-LIST OF COST CATEGORIES

| Cost Category | Cost sub-categories |
|---|--|
| Social losses: Losses pertaining to people | <ul style="list-style-type: none"> • Deaths • Missing • People affected <ul style="list-style-type: none"> ○ Displaced ○ Homeless |
| Direct tangible cost: Costs that accrue directly (to assets) | <ul style="list-style-type: none"> • Property losses (residential and commercial) <ul style="list-style-type: none"> ○ Housing ○ Vehicles ○ Business assets • Damage to infrastructure (transportation, bridges, sewage etc.) • Damage to agriculture <ul style="list-style-type: none"> ○ Crop losses • Cost of emergency services/ disaster assistance <ul style="list-style-type: none"> ○ Police ○ Ambulance ○ Fire Department ○ Military |
| Losses due to business interruption: Costs that accrue from the disruption of activities in areas directly affect by the disaster | <ul style="list-style-type: none"> • Loss of revenue • Losses due to the absence of public services <ul style="list-style-type: none"> ○ Loss due to lack of telecommunication ○ Loss due to lack of transportation ○ Loss due to lack of gas, water and electricity |
| Indirect costs: Costs that accrue from knock-on impacts of direct or business interruption losses | <ul style="list-style-type: none"> • Price increases • Increase in unemployment • Decline of GDP • Increase in government debt • Negative impacts on stock market prices • Cost of reconstruction and recovery⁹ • Cost of planning and implementation of risk prevention measures <ul style="list-style-type: none"> ○ Land-use practices ○ Hazard source control and area protection |
| Intangible costs: Costs that accrue to assets without an obvious market price (difficult to depict in monetary terms) | <ul style="list-style-type: none"> • Environmental losses • Health impacts • Cultural heritage losses • Loss of reputation • Psychological stress |

How should information be collected?

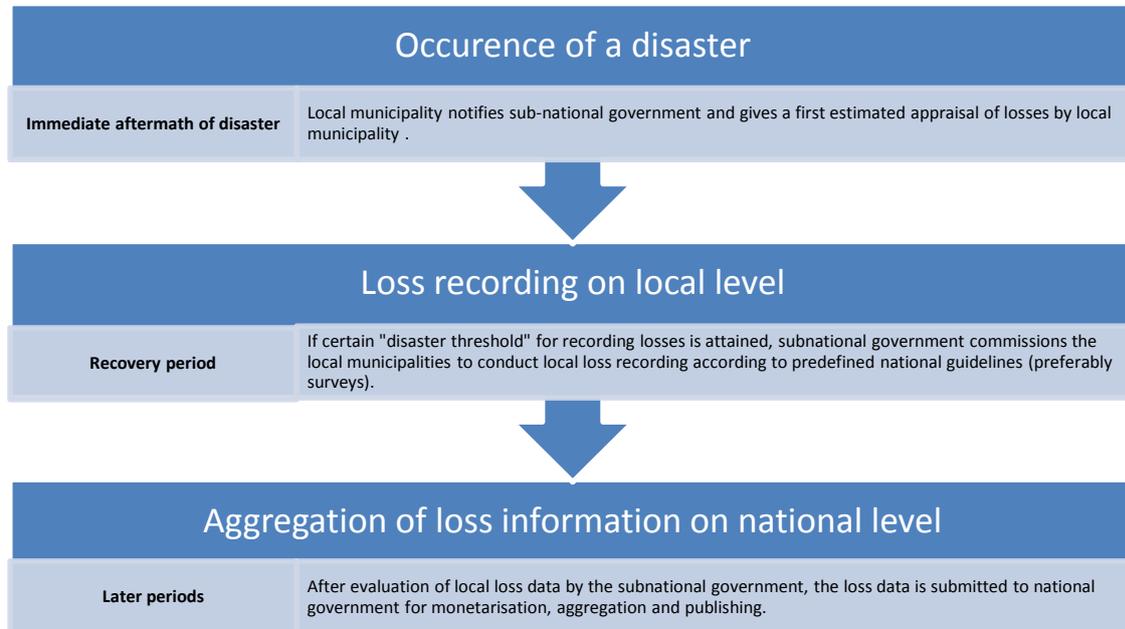
The review of several country best practices shows that the common local to national recording approach assures a high degree of detail and reliability of information. Survey and loss recording guidelines should be communicated to all responsible government entities to ensure overall consistency of data recoding. The check-list presented above could serve as an approximate guide for loss data collection. Social and direct costs as well as losses due to business

⁹ Should not be confused with reconstruction costs of directly affected buildings/infrastructure to avoid double counting

interruption could be collected by local municipalities shortly after the occurrence of a disaster whereas indirect and intangible costs can be estimated by national agencies that help to aggregate the loss data for research in the long-run. Figure 7 proposes such a possible bottom-up loss information collection methodology.

After such a loss information collection process is completed, aggregate data could be classified by hazard type, public and private losses, and according to the 5 cost categories mentioned above. This could benefit many policy relevant questions such as allocation of reconstruction and prevention aid, existence of insurance gaps etc.

Figure 7 Local to national collection process for disaster loss information



Section 2: Questions for Discussion and Feedback:

- ✓ How can variations in economic loss figures be interpreted throughout international databases? Should they be compared? Are the deviations informative (as for example one includes indirect losses whereas others do not) or random due different uses of source information? Do sources of information vary across international databases? If so, how?
- ✓ Is the checklist provided in table 6 complete? In complement to what has been included and reviewed here, can you recommend national documents that have developed such checklists or guidelines to collect information on losses and damages?
- ✓ To complement Figure 7, could you provide information on how loss data is collected ex-post of a disaster in your own county? Can you talk about its efficiencies and shortcomings?
- ✓ In complement to ongoing processes, what could the OECD contribute to further international comparative data collection on losses and damages?
- ✓ What has been the country demand to collect this information? To provide this information to international databases and to improve collection instruments?

4 ASSESSING PUBLIC (AND PRIVATE) EXPENDITURE FOR DISASTER RISK MANAGEMENT

This section includes:

- *A discussion of the existing needs for expenditure data on disaster risk management*
- *A discussion on the technical challenges for collecting expenditure-related information*
- *An overview of existing national efforts to systematically collect ex-ante and ex-post expenditure information*
- *A draft methodology for collecting OECD-wide, internationally comparable expenditure information for disaster risk management*

4.1 OVERVIEW

Assessing public (and private) expenditure for specific projects or programmes, such as risk reduction, is crucial to inform policy making in that area, as outlined in the introductory section. Establishing a cross-country database containing such expenditure information can help inform policy makers about good practices and benchmarks, and gives a comparative perspective to their own internal spending and prioritisation.

However, assessing specific expenditure items pertaining to a project or programme of activities is generally challenging within-country, and more so across countries. Expenditure accounts are essentially the result of budgeting processes, i.e. the decision making process through which the level of spending (and revenue generation) in public administration is set. The process is influenced not only by public governments and agencies, but also non-governmental organisations (such as the private sector). Budgeting processes differ largely across and within countries, depending on the political as well as the fiscal or federal system countries have adopted. Budgeting processes may be relatively transparent and open (even including participatory elements by citizens) and traceable for anyone interested, or taking place behind closed doors, whereby only the final outcome is made public.

Generally speaking, there is little academic guidance available on how to carry out public expenditure reviews or use standard methodologies to establish cross-country comparisons. Sectoral expenditure reviews can be conducted relatively easy within one country. Establishing comparative expenditure categories for one sector across countries may pose an already greater challenge. With regards to disaster-related expenditure reviews and developing a standard methodology for monitoring such expenditure over time, those challenges become even more marked:

- In most countries there is no central unit responsible for co-ordinating risk reduction activities.
- Risk-related activities entail cross-sectoral expenditure items within-country that are usually not thematically reported in public accounts. They may form part of public spending in infrastructure, environment, planning sectors and others.
- Breaking down risk reduction spending and activities within a sector may pose challenging as well. Each sector may have their own way of distinguishing hazards and types of risk reduction investment (e.g. prevention, preparedness, rehabilitation).
- Expenditure may be “embedded”, i.e. expenditure for a project may only partly pertain to risk reduction. For example staff in one sector may work both on risk reduction and on other activities, hence only part of their staff time can be counted as spending for risk reduction.
- Therefore, the challenge lies in first identifying disaster-related expenditure items in each sector and categorise them broadly. Based on this, comparable categories across sectors can be established that allow for aggregation into specific expenditure categories across sectors, which can in turn build the basis for a comparative framework across countries.

- Finally another challenge is to account for not only public, but also private spending on disaster risk management. This information sits within businesses and households and may be even more challenging to obtain in a systematic way and regularly over time.

The outcome of an expenditure framework for assessing risk management-related activities will necessarily be an approximation. This will be the consequence of establishing broad categories, based on appropriate levels of aggregation and meaningful classifications of expenditures related to risk reduction.

To inform the development of a methodology for assessing public (and potentially private) expenditure related to disaster risk management, existing national efforts are reviewed in the following. The section thereafter will propose a draft OECD expenditure accounting framework for DRM.

4.2 EXISTING NATIONAL PUBLIC EXPENDITURE FRAMEWORKS

Generally speaking the DRM expenditure reviews that exist at the national level are usually the result of a specific project or programme that was implemented to retrieve DRM expenditure information from sectoral budgets across relevant sectors and across different levels of government. This review found no national example where DRM expenditures are easily and annually retrievable from existing public accounts. The reason for this is because DRM does often not exist as an expenditure category as such in public accounts, but is “embedded” in other expenditure categories. Since it is not the objective of this work to change how public accounts are managed in OECD countries, this work should not be about how such revenue and spending streams can be depicted in public accounts, but rather how such information can be obtained from governments in a comparative way and on a continuous basis otherwise. The reviewed projects in the below therefore serve as good examples of how such an information collection process can be structured and a comparative framework for expenditure information established.

The great majority of the projects that this review has found were one-time efforts that have not been repeated regularly, although some have tried to retrieve such information for past years and not just the year or the year previous to when the project was conducted. That said there are only a few OECD and non-OECD countries that have engaged in such projects in the past to collect public expenditure data for DRM (Table 6).

Depending on their objectives, existing assessments focused on DRM expenditures along institutional functions or steps along the DRM cycle (such as disaster risk preparedness or response). Again others focused on classifying expenditures along specific risks. Hardly any of the reviewed expenditure assessments seemed to have been performed more than once, and hence were not part of a systematic effort to track DRM expenditures over time. Limited data availability and difficulties in identifying expenditure categories call into question some of the approaches discussed. The existing frameworks to collect information on DRM expenditures need a harmonised approach in support of comparability, and a more frequent data collection effort. An international platform such as the OECD may be a useful vehicle for inciting such a data collection instrument and international data repository in the future.

TABLE 6 EXISTING NATIONAL EXPENDITURE FRAMEWORKS

| | | Australia | France | Switzerl and | Austria | Indonesia | Nepal Colombia, Mexico | India | Japan |
|----------------|-----------------------------------|---------------------------------------|-------------------------------------|-------------------------------|--------------------------------|---------------|--|-----------|------------------|
| Classification | Institutions | Yes | Yes | Yes | Yes | No | Yes | Yes | No |
| | Hazard | No | Yes (only national level) | Yes | No | Yes | No | No | No |
| | Risk Management cycle (functions) | Yes | No (only prevention and mitigation) | Yes | No | Yes | No, but by HFA Priorities, Plan and Non-plan | No | Yes |
| | Other | No | No | Private Sector and Insurances | Budget type (recurrent or not) | No | Dedicated and embedded schemes | No | No |
| Scope | National | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes |
| | Subnational | Yes | Yes (annual average) | Yes | No | No | Yes | No | No |
| | Municipalities | Yes (extrapolation) | No | No | No | No | No | No | No |
| | Years | 1990 to 2002 (last two most detailed) | 2009 | Annual average of 2000 - 2005 | 2011 | 1998 and 2008 | 2005 and 2012 | 2002-2011 | 1962-2014 |
| Sources | Interviews | Yes | Yes | Yes | No | Yes | Yes | No | TO BE FILLED OUT |
| | Public Reports/budgets | Yes | Yes | Yes | Yes | Yes | Yes | Yes | TO BE FILLED OUT |
| | Survey | Yes | Yes | No | No | | No | No | TO BE FILLED OUT |

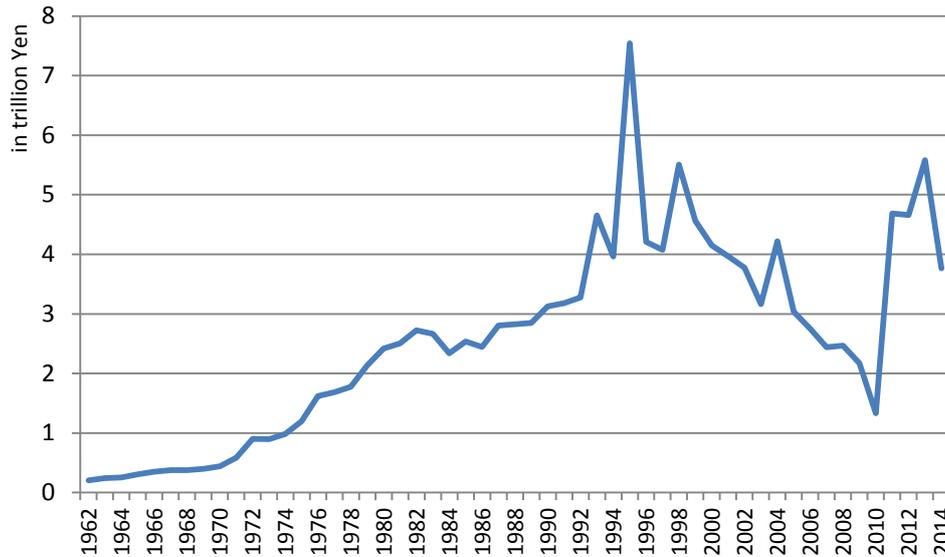
In the following a brief review is provided of the works we found to be most comprehensive to date:

4.2.1 JAPAN

With the White Paper on Disaster Management in 2014, the Japanese Government set out to assess the development of its disaster-related budget starting from 1962 to 2014. DRM related expenditures were allocated to 4 categories of disaster management: Science Technology Research, Disaster Prevention, Disaster Management and Disaster Recovery¹⁰. Over the last 50 years, total expenditure for disasters increased steadily (Figure 8) where the share for disaster recovery dominated over all other expenditure categories in recent years. Ex-ante DRM expenditures (i.e. science and technology research and disaster prevention) accounted for only 21% of total DRM expenditures in recent years (Figure 9).

¹⁰ Information missing: For which hazards was this done? Was this done across sectors? If yes which ones? Was this done on a national level? Do figures exist for expenditures across levels of government?

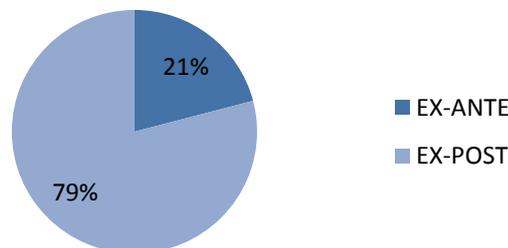
Figure 8 Total disaster-related expenditures in Japan, 1962-2014



Source: Cabinet Office, Government of Japan (2014)

Comment: Values are not inflation adjusted; It is important to note that due to changes in the budgetary framework in 2004 the comparison of budget estimates prior and after these changes became imprecise as not all budgetary items could be tracked under the same method anymore.

Figure 9 Ex-Ante¹ and Ex-Post disaster-related expenditures in Japan



Source: Cabinet Office, Government of Japan (2014)

Comment: 1 Ex-ante comprises categories “science and technology research” and “disaster prevention”

4.2.2 AUSTRALIA

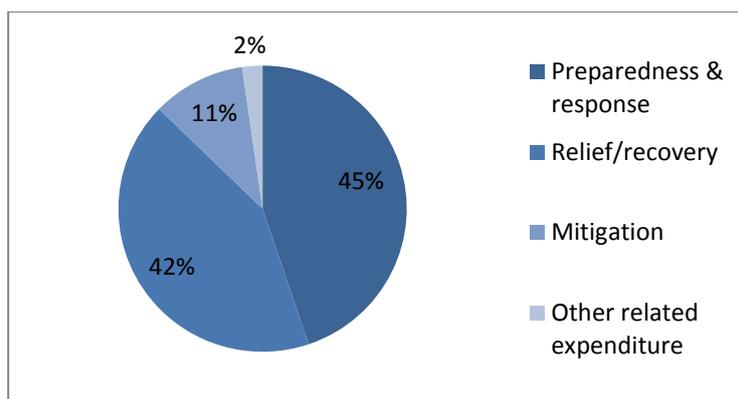
In 2001, the Council of Australian Governments (COAG), in co-operation with Australia’s Bureau of Transport and Regional Economics (BTRE), collected and analysed government expenditure data related to DRM at the Commonwealth and State/Territory levels (BTRE, 2001). Government spending related to DRM was categorized into phases of the DRM cycle: (i) preparedness and response¹¹(state emergency services, preparedness training); (ii) relief and recovery (central government assistance packages, payments to NGOs); (iii) mitigation (structural and non-structural mitigation programmes); and (iv) other natural disaster related expenditure (research, allowance for administration). Expenditure items relied mostly on natural hazards (and included bushfire, earthquake, flood,

¹¹ The rationale behind putting an obvious ex-ante and and ex-post expenditure category in one was to understand the response agency’s total natural disaster commitment. This includes both direct response costs and those associated with preparedness (eg. training).

storm, cyclone, storm surge, landslide, tsunami, meteorite and tornado). Other disasters such as technological accidents, epidemics or heat waves were not included. Information on expenditure was obtained by sending survey questionnaires to relevant agencies and conducting follow-up interviews.

Expenditure information was collected for the time period 1990 to 2002. However, due to the incompleteness of historical data only information provided for financial years 1999/00 and 2000/01 can give an accurate picture of total disaster related spending (Table 7). Expenditure data for these two years contain detailed accounts of salaries, administration costs, interest costs, depreciation and amortisation costs. Findings show that spending for ex-ante, mitigation¹² activities accounts for only a small part of overall total DRM spending. Between 1990 and 2002 the expenses for ex-ante spending never exceeded 15% of total expenditure (Figure 10).

FIGURE 10 DRM EXPENDITURE AUSTRALIA 2000/2001



National expenditure data can be disaggregated into spending by subnational levels (states and territories, but not local communities) or different national agencies. Subnational levels have higher disaster-related expenses than the national government for all investigated years. Table 7 shows that subnational spending makes for three quarters of total government spending for DRM in fiscal year 1999/2000 and for two thirds in the following fiscal year. More than half of the subnational expenditures were on preparedness and response, whereas the bulk of national spending was used for relief and recovery (Table 7).

¹² Other ex-ante expenditure categories such as preparedness could not be included because they were lumped together with ex-post categories such as “preparedness and response”

TABLE 7 COMMONWEALTH AND STATE/TERRITORY NATURAL DISASTER EXPENDITURE FOR 1999/00 AND 2000/01 (IN USD MILLION)

| Expenditure Category | 1990/00 | | | 2000/01 | | |
|---------------------------|---------------------|--------------|------------------------|---------------------|--------------|------------------------|
| | States& Territories | Commonwealth | Total Govt Expenditure | States& Territories | Commonwealth | Total Govt Expenditure |
| Preparedness & response | 383 | 13 | 397 | 441 | 13 | 454 |
| Relief/recovery | 183 | 123 | 306 | 167 | 263 | 430 |
| Mitigation | 51 | 41 | 92 | 60 | 47 | 106 |
| Other related expenditure | 8 | 12 | 20 | 10 | 14 | 23 |
| Total expenditure | 625 | 189 | 814 | 677 | 337 | 1,014 |

Source: BTRE/COAG (2002). COAG Review of Natural Disaster Relief and Mitigation Arrangements. BTRE (Bureau of Infrastructure, Transport & Regional Economics), Australia.

In response to the national expenditure collection effort, the Australian Local Government Association conducted an expenditure survey among selected local councils, based on which total local expenditure for DRM was extrapolated for Australia for 1998 to 2001. The survey found that on average 43 percent of local natural DRM expenditure was spent on mitigation measures. The survey may underestimate DRM expenditure at the local level and acknowledges inconsistencies in counting spending items for emergency management by different municipalities which complicate comparisons across states and territories.

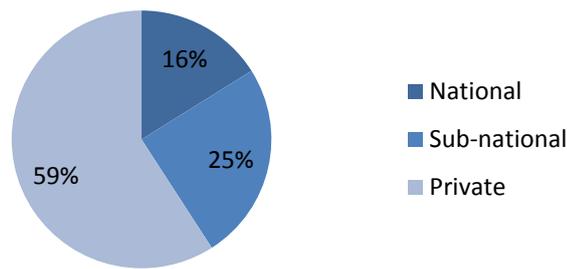
If one wants to look at the distribution of expenditures at the national compared to the subnational level, the Australian study shows that 43% of local expenditures on DRM were spent on mitigation, whereas mitigation spending never exceeded 15% at the national level.

4.2.3 SWITZERLAND

In 2007 the Swiss National Platform for Natural Hazards, PLANAT conducted a spending survey for DRM on the national as well as on subnational levels. It included expenses related to natural hazards (floods, avalanches, landslides, earthquakes, storms and extreme temperatures). Man-made disasters, volcanic eruptions, meteorites and epidemics were not taken into consideration. Publicly available databases on government expenses and around 80 interviews constitute the basis for their spending estimates. Based on their data sources, PLANAT arrives at an average value for DRM spending for the time period from 2000 to 2005. Unlike other expenditure frameworks, PLANAT also included DRM expenditure by private actors including private enterprises, households as well as public-private infrastructure operators through surveys and the consultations of experts.

PLANAT categorised all expenses by institution (national government, subnational governments, municipalities, and the private sector), hazard category (floods, landslides, avalanches, earthquakes, storms and extreme temperatures) and by DRM function (prevention, response, recovery, assessment and research). Although PLANAT notes that it concentrated mostly on knowing the costs of preventive nature, the ex-post categories do include some cost points such as for example “response” includes costs such as catastrophe trainings or the “recovery” includes costs to building shelters, reserve building etc. At the same time some ex-post categories contain costs that the OECD would classify as ex-ante (see 4.4). The findings suggest an annual risk expenditure amounting to nearly CHF 3 billion which is an equivalent of less than 1 percent of total government budget. Nearly 60 percent of total DRM spending is born by the private sector. Public spending amounts to over just a third of the total, namely CHF 1.18 billion wherein prevention accounts for the largest share namely CHF 717 million. Flood protection accounts for 30 % of annual total disaster prevention expenditure (Figure 11).

FIGURE 11 NATIONAL, SUB-NATIONAL AND PRIVATE DISASTER-RELATED EXPENDITURES IN SWITZERLAND



Source: PLANAT (2007).StrategieNaturgefahrenSchweiz. Umsetzung des Aktionsplans PLANAT 2005-2008.Jährliche Aufwendungen für den Schutz vor Naturgefahren in der Schweiz. National Platform for Natural Hazards, Switzerland.

However, PLANAT cautions against the precision of its estimates as many data gaps called for extrapolations and assumptions to arrive at the total sum for each institution, hazard type and DRM phase. National estimates could vary from +10 to -5 percent, subnational from + 20 to -10 percent. The highest degree of imprecision is expected for private sector estimates, potentially varying from +30 to -15 percent. If expenses could not be broken down by hazard type, distribution estimates were assumed. Expenses related to disaster response include recurrent costs for the provision of response teams but exclude the actual costs of the intervention during a disaster, which are not included to the framework. Insurance premiums paid by private households were also taken into account to determine the amount of DRM spending by private households. PLANAT plans to update the numbers in 2015 but does not expect any significant changes.

4.2.4 FRANCE

The French general commission for sustainable development (Commissariat Général au Développement Durable) within the Ministry of Ecology, Sustainable Development and Energy conducted a public expenditure analysis in 2009 focusing on ex-ante DRM expenditure¹³ which is comparable to the Swiss approach. Other, ex-post related expenditure such as response or rehabilitation was not included in the review. A focus on natural hazards (floods, forest fires, atmospheric disasters, avalanches, earthquakes, volcanic eruptions and landslides) was chosen, excluding other, man-made threats. The evaluation of expenses by the national government is based on the analysis of budget reports and yearly performance evaluations of individual programmes.

Estimates for DRM expenditure on the subnational level are derived from projects and programmes financed by national funds as well as individual interviews with stakeholders in local municipalities (with a population larger than 100,000), local basin organisations and other relevant stakeholders. All stakeholders had to indicate the origin of revenue flows in order to avoid double-counting. The estimated sum for subnational DRM spending in 2009 is likely an underestimation as programmes, as ex-ante DRM spending and expenditure by small municipalities were not counted. Expenditure items are assigned to hazard categories (Table 8), to functions (by ministry), or programmes and actions. DRM spending by public operators could not be tracked with the exception of public water agencies which invested EUR 5.3 million in prevention and mitigation of floods. In 2009, the French national

¹³ Ex-ante DRM spending includes: research, surveillance, communication, mitigation, crisis preparation, case studies after disasters

government spent EUR 340 million for ex-ante DRM, of which flood-related expenditures accounted for nearly half of all DRM spending. Most sources of funding for DRM expenditure items were financed by the Barnier Fund¹⁴.

TABLE 8 NATIONAL GOVERNMENT DRM EXPENDITURE IN 2009 BY HAZARD TYPE

| Hazards | Expenses by national government (in EUR million) | % of total expenditure |
|--------------|--|------------------------|
| Floods | 155 | 46 |
| Earthquakes | 62 | 18 |
| Forest Fires | 41 | 12 |
| Avalanches | 5 | 1 |
| Multi-risks | 77 | 23 |
| TOTAL | 340 | 100 |

Source: Nicklaus, D., Chaillou, D., Crespín, N. and Peinturier C. (2013). Les dépenses publiques et les bénéfiques de la prévention des risques naturels. Etudes & Documents, n.97, September 2013. Commissariat Général au Développement Durable

The estimated expenditure on the subnational level entails a high degree of imprecision as it derives from the calculated annual average of all projects in subnational governments, which are financed by national funds. All projects by subnational governments that received national government funding were analysed and an average spending estimate for 2009 was counted for each programme. This amounted to around EUR 230 to 244 million. Expenses at the subnational level could not be categorised into hazard categories as in the case of national DRM spending.

Finally the review included funding received from the European Union¹⁵ for risk prevention and mitigation. The annual funding received from the EU amount to an estimated EUR 21 million to co-finance prevention and mitigation of state-assisted projects. Counting all of the items together, an annual total of around EUR 596 to 610 million in public expenditure was estimated for ex-ante DRM spending in France. As mentioned earlier, this is likely to be an underestimation due to limited data from public infrastructure operators and local governments (Table 9).

TABLE 9 PUBLIC DRM EXPENDITURE IN 2009 BY GOVERNMENT INSTITUTIONS

| Actor or category | | Expenses (in EUR million) |
|--|-----------------------|---------------------------|
| National Government (including Barnier Fund) | | 340 |
| State owned critical operators (except water operator) | | Non-estimated |
| Water operator | | 5 |
| Sub-national Government | | 230-244 |
| | <i>Regions</i> | 56-58 |
| | <i>Departments</i> | 108-110 |
| | <i>Municipalities</i> | 66-76 |
| European Union | | 21 |
| Total | | 596-610 |

Source: Nicklaus, D., Chaillou, D., Crespín, N. and Peinturier C. (2013). Les dépenses publiques et les bénéfiques de la prévention des risques naturels. Etudes & Documents, n.97, September 2013. Commissariat Général au Développement Durable

4.2.5 AUSTRIA

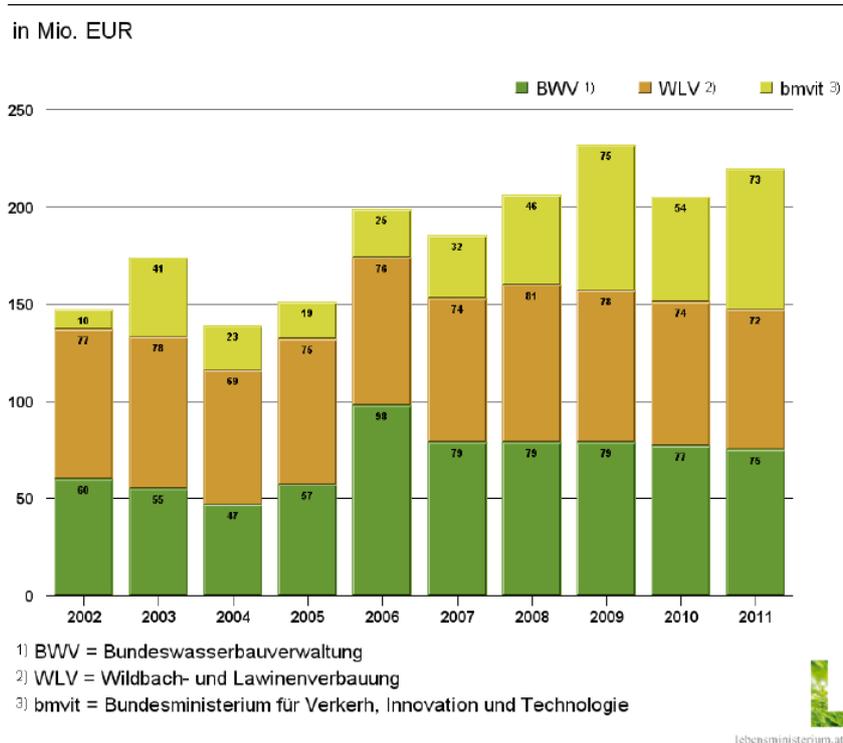
In Austria, the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) has been collecting expenditure data for natural hazards according to three different government institutions, the Hydraulic Department of the BMLFUW, the federal Ministry of Transport, Innovation and Technology and Flood and Avalanche Protection, continuously since 2002 based on the federal agencies in charge of risk prevention and

¹⁴ <http://www.eure.gouv.fr/Politiques-publiques/Securite-et-protection-de-la-population/Risques-naturels-et-technologiques-Nuisances/Risques-naturels/Complement-risques-naturels-et-technologiques/Fonds-de-prevention-des-risques-naturels-majeurs-Fonds-Barnier>

¹⁵ This concerns the European Regional Development Fund (ERDF) and the European Agricultural Fund for Rural Development (EAFRD)

mitigation. Figure 12 shows that expenditure has increased from an average of around EUR 150 million annually to above EUR 200 million during the last decade. The total expenditure data was also coded for different federal states.

FIGURE 12 NATURAL HAZARDS PREVENTION EXPENDITURE, AUSTRIA 2002-2011



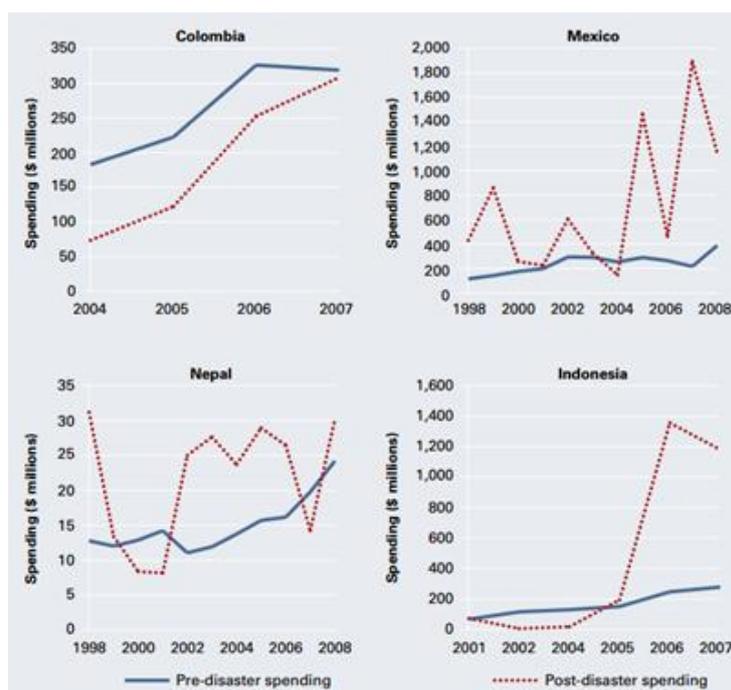
Source: BMLFUW (2012)

4.2.6 NEPAL, COLOMBIA, MEXICO AND INDONESIA

As part of a larger analytical work the World Bank conducted an expenditure study for DRM based on the assessment of a number of country cases including Nepal, Columbia, Mexico and Indonesia (De la Fuente, 2010). The study aimed at tracking expenditures over the time period 1998 to 2008. Unlike UNCDF, this study collected DRM expenditure items according to phases of the DRM cycle rather than according to ministerial or departmental functions. This allowed for obtaining a rough estimate of ex-ante and ex-post disaster spending in a country, but without capturing other characteristics such as for example whether they are recurring budgetary items, what type of costs (capital investments or other), or recipient department.

Within each hazard category each expenditure item is either classified into ex-ante disaster expenditure, such as preparedness, risk identification, mitigation and transfer or into an ex-post disaster expenditure category such as emergency response, rehabilitation and reconstruction efforts. The classifications on DRM entail expenses pertaining to measures of vulnerability reduction such as structural measures as well as land-use planning and building codes and social programs to promote risk awareness and set incentives for implementing mitigation measures. DRM expenses also included costs for risk mapping and hazard assessments as well as training and research. Risk transfer expenses such as insurance premiums for earthquake or crop insurances are also taken into account for the expenditure framework. In Mexico earthquake insurance expenses accrued to over 70 % of total ex-ante disaster expenses during the investigated time period. However the framework does not cover expenses made for capital investments that are only indirectly contributing to DRM and that are not labelled as a DRM budget item. Moreover, disaster expenditures on the sub-national level are not collected. The results of this expenditure framework indicate that ex-post disaster spending may exceed ex-ante disaster expenditures in Nepal, Indonesia and Mexico, but not in Colombia (Figure 13 and Table 11). Nonetheless, ex-ante spending has increased gradually suggesting an increasing importance of proactive disaster spending over the years.

FIGURE 13 PUBLIC EX-ANTE AND EX-POST DRM EXPENDITURE, 1998-2008 (IN MILLION USD, 2008 PRICES)



Source: De la Fuente, A. (2010). Government Expenditures in Pre and Post-Disaster Risk Management, World Bank, Washington, DC.

TABLE 11 ACCUMULATED EX-ANTE AND EX-POST DISASTER EXPENDITURE DURING 1998- 2008

| Country | Total (in USD million, 2008 prices) | Pre- to Post-expenditure ratio |
|-----------------|-------------------------------------|--------------------------------|
| Colombia | 1,807.52 | 1.89 (Pre: 58% and Post: 42%) |
| Mexico | 10,403.45 | 0.34 (Pre: 25% and Post: 75%) |
| Nepal | 401.56 | 0.69 (Pre: 41% and Post: 59%) |

Source: De la Fuente, A. (2010). Government Expenditures in Pre- and Post-Disaster Risk Management, World Bank, Washington, DC.

4.2.7 INDIA

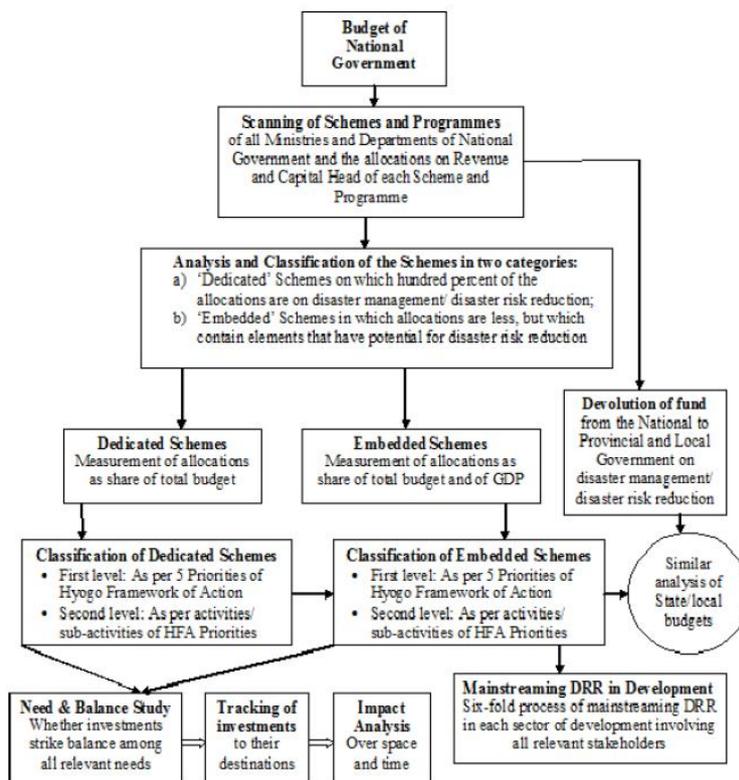
Dhar Chakrabarti (2012) tracked DRM expenditure in India between 2005 and 2012 by scanning all schemes and programmes related to DRM of all ministries and departments on the national level (Figure 14). The author distinguishes “dedicated schemes”, which entail expenditures directly designated to DRM, from “embedded schemes”, which contain indirect expenses for DRM that are not primarily targeted at disaster risk reduction. Within these two categories, expenses are either allotted to plan schemes, which include items on prevention and mitigation, or to non-plan schemes which correspond to response, relief and rehabilitation. However, on the subnational level, DRM related expenses are not analysed based on the same detailed framework. Instead revenues from the national government funds are lined up against expenditure streams related to DRM for all 28 states of India. The author used a comprehensive set of sources from official budget reviews to mid-term appraisals and external evaluations and audits and combined those with interviews with government officials.

For the financial year 2011-12, 37 dedicated schemes, corresponding to direct DRM expenditure, were identified within 8 Ministries/Departments of the national government, which equalled to USD 2.3 billion. In general there has been a rise in national government expenditure on DRM, growing at an annual rate of 13.17% between 2005 and 2012, whereby spending for non-plan schemes, i.e. ex-post disaster expenditure has continuously been higher, with an annual average share of around 84% of total direct DRM expenditure.

Another classification of expenditures by the author lumps them together into the five Hyogo Framework for Action (HFA) priorities. According to this classification, more than 80 % of the DRM expenditure under dedicated schemes falls under HFA priority 5 “Preparedness for Effective Response”, which includes expenses on response, relief, rehabilitation and reconstruction.

As for “embedded” DRM expenditure the author identifies 85 relevant embedded schemes within 75 national ministries or departments in 2011/12 representing 32.02 % of the total government budget. As these programmes are not primarily targeted at disaster management only a percentage of this budget can be allocated to DRM spending. Individual studies dedicated to determine the DRM percentage within each embedded scheme would lead to an accurate magnitude of DRM spending by the national government.

FIGURE 14 FRAMEWORK FOR ALLOCATION, MEASUREMENT AND TRACKING OF PUBLIC INVESTMENTS ON DRR IN INDIA



Source: DharChakrabarti, P.G. (2012). Understanding Existing Methodologies for Allocating and Tracking DRR Resources in India. Study commissioned by UNISDR/ADPC under IAP project “Regional Stocktaking and Mapping of Disaster Risk Reduction Interventions for Asia and the Pacific”.

Section 4: Questions for Discussion and Feedback:

- ✓ What are the purposes for countries to have such expenditure information, regularly and comparatively across countries?
- ✓ What information is it precisely that governments would be interested in or need to have with respect to expenditures?
- ✓ From our review no countries (except perhaps Japan) have DRM expenditure information clearly itemised in public accounts – does this reflect the reality in all or most countries? If this is the case, do you agree that a survey instrument is the way to go as this information cannot be easily captured in public accounts?
- ✓ Do you agree that in a first step private expenditures should be excluded in order to make things simpler and maintain a level of comparison? Or shall we include private expenditures by suggesting a rough approximation by “insurance compensations” paid out to businesses and households?
- ✓ Why have most expenditure reviews been conducted only once and not repetitively?
- ✓ From our initial analysis: why would France’s ex-ante spending be that much lower (looking at it from the size of the country) compared to Switzerland? EUR 610 Million compared to CHF 717 Million.

4.3 DRAFT EXPENDITURE FRAMEWORK METHODOLOGY

4.3.1 INTRODUCTION

In section 4.2 we have seen that public expenditure information on DRM is not easily retrievable in public accounts. In fact in none of the above examples public accounts had a spending category dedicated to DRM as such and each country from the above review engaged in a specific effort (project or programme) to retrieve such information from sectoral budgets at national and subnational levels. To ensure the obtained information reflects, at least approximately, the whole picture of DRM related investments most of the abovementioned studies undertook interviews with government officials across agencies and DRM national experts, in complement to the specific budget reviews of agencies relevant for DRM (Table 6).

Based on this experience, it is proposed the OECD framework proceeds along the same lines, as otherwise it would not be realistic to obtain any information. Based on the framework suggested below a questionnaire should be developed that is circulated among OECD governments that in turn circulate it within their specialised agencies and among their national experts.

4.3.2 THE DRAFT FRAMEWORK FOR COLLECTING DRM EXPENDITURE INFORMATION

Several aspects need to be considered when establishing an expenditure framework for risk-management related activities. First of all, we need to establish an overview of where such expenditure items can be found across public accounts. The following sources should be checked for systematically accounting such expenditure items (Jackson 2011; Pradhan 1996):

- It can be embedded in departments: there may be specific risk management departments. The departments may not be responsible for implementing all activities themselves, but rather co-ordinate and distribute budget. A central repository is thereby created that is relatively easy to track. With such a function, risk management becomes a key aspect in the budgeting process, and has clear visibility vis-à-vis policy makers and other expenditure priorities.
- It can be embedded or created into a function across departments, whereby resources are allocated through a central repository for this function. This may create redundancies and overlapping mandates, but if strong policy support is signalled, departments often seek to attract resources by finding ways to build this function into their responsibilities.
- Another option through which risk activities are managed and can be tracked in public accounts is through the creation of projects or programmes. Compared to a specific responsible department, this is not permanent and

hence no recurrent budget is allocated. Staff financed by recurrent budget may be seconded to such projects. Though not integrated in the mainstream budgeting process, a project or programme financing allows to raise the profile of risk-related activities, creates opportunities to collaborate across government, and with other actors, such as private sector or international organisations.

- Another way to track and to locate risk-related expenditure in public accounts would be through risk management plans or strategies. The Global Assessment Report shows that a number of countries actually have such plans, but little progress has been made in attaching concrete financing to them.

After having reviewed existing efforts to collect disaster-related expenditure information in the following we will propose an OECD methodology to collect such information in the future. The framework has been inspired by the national approaches reviewed in the above.

The objective of the framework is to obtain expenditure information in a triangulated way: by phase of the DRM cycle so as to be able to compare ex-ante versus ex-post DRM expenditure as well as by level of government and hazard type. The sub-categories should not be viewed as strict categories that need to be distinguished when providing the information, but rather as a check-list of what activities each phase of the DRM cycle can cover. If a government can provide this information that is excellent, but it is not necessary to have them in such detail.

Questions for discussion and feedback on the proposed framework:

- ✓ Is the framework capturing all relevant public (and private) expenditure data?
- ✓ Could the distinction of phases be an agreeable distinction? Equally the ex-ante and ex-post phases? This differs across countries and therefore it is important to find agreement of what phases of the DRM cycle should be distinguished and which phases fall under ex-ante or ex-post or whether the latter is helpful at all?
- ✓ Is it feasible to distinguish cost categories (staff, administrative etc?)
- ✓ Is it feasible to distinguish expenditure items by risk type?
- ✓ Within the DRM phases are the sub-categories helpful? (we do not expect countries to fill the sub-categories out, but rather see them as a check-list of what should go into the aggregate category)

DRAFT PUBLIC AND PRIVATE DRM EXPENDITURE FRAMEWORK (PER COUNTRY AND (FISCAL) YEAR)

| Expenditure item by phases of the DRM cycle ¹ | Sub-category within DRM cycle phase | By | | | Hazard type (Natural ³ or Man-Made ⁴) | Cost category - Staff Costs - Administrative Costs - Overheads - Capital Investment - Operations & Maintenance - Other |
|--|---|----------------------|---|--|--|--|
| | | Ministry/ Department | National/ Sub-national ² or other (such as EU) | Private (specify households or businesses) | | |
| I. Risk Prevention and Mitigation⁵ | I.1 Strategic Planning ⁶ | | | | | |
| | I.2 Hazard Identification and Assessment ⁷ | | | | | |
| | I.3 Risk/Hazard Mapping | | | | | |
| | I.4 Land-use Planning ⁸ | | | | | |
| | I.5 Planning, Developing and Constructing Protective Infrastructure | | | | | |
| | I.6 Prevention measures for the existing built environment (houses, etc.) | | | | | |
| | I.7 Prevention measures for critical infrastructure (energy, water, transport, road networks, ICT, etc.) | | | | | |
| | I.8 Risk awareness and communication activities | | | | | |
| | I.8 Risk Transfer Investments by the Public Sector ⁹ | | | | | |
| II. Preparedness | II.1 Development of Crisis Management Plans | | | | | |
| | II.2 Early Warning Systems Development, Construction and Management | | | | | |
| | II.3 Evacuation Planning and Management | | | | | |
| | II.4 Emergency Supply Management ^{10, 11} | | | | | |
| | II.5 Emergency Preparedness/Crisis Management Exercises | | | | | |
| | Tbc. | | | | | |
| III. Emergency Response¹¹ | III.1 Emergency Supplies | | | | | |
| | III.2 Assistance Packages to affected regions, households etc. | | | | | |
| | III.3 Payments to NGO's and other emergency support agencies | | | | | |
| | III.4 Expenditure related to immediate response to public service disruption (energy and water supply, transport, etc.) | | | | | |
| | III.5 Search and rescue operations | | | | | |
| IV. Rehabilitation and Reconstruction | IV.1 Rehabilitation of public infrastructure | | | | | |
| | IV.2 Rehabilitation of private assets | | | | | |
| | Tbc. | | | | | |

7 Includes vulnerability assessments;

Includes expenditures on research & development and capacity building/training in each category and sub-category

9 Excludes insurance payments by private sector and households; includes public expenditure for insurance/re-insurance purchases as well as administrative, R&D, training and other costs for running public risk transfer facilities

6 Includes activities to establish DRM strategies, investment or budget plans;

8 Includes costs related to activities of including DRM in land-use planning – i.e. development of land-use plans, changes in land-use regulations, enforcement expenditures etc.

1 Includes "dedicated" costs (directly related to DRM), or "embedded" costs (costs not clearly entitled DRM, but all or a portion of which may actually indirectly contribute to DRM)

11 Excludes emergency supplies

10 Include all expenses incurred in the immediate aftermath of a disaster

3 Within natural hazards one should distinguish: avalanches, flood, earthquake, extreme temperatures, storm, landslide, tsunami, volcanic eruption and others;

4 Within man-made hazards one should distinguish: industrial accident, terrorist attack, epidemic, and others

2 Subnational level to be specified according to country context (e.g. commune, department, region, etc.)

5 Defined as measures aimed at decreasing or eliminating impacts of disasters on society and economy.

In Annex 2 of this draft report the draft framework was applied using data from Australia, Switzerland and Japan. It shows how the framework could potentially look like applied to countries and should give an indication to country counterparts on how their data can be filled in and used in the future.

5. CONCLUSIONS AND STEPS FORWARD

This draft report seeks to provide an overview and an assessment first of the existing systematic recording of past disaster losses, especially in terms of social and economic losses, and secondly, of the existing efforts to monitor DRM-related expenditure at national levels.

Given the absence of a standard methodology and of a systematic international recording of DRM-related expenditure, this draft report seeks to provide a draft framework for collecting such information on an international, OECD-wide level. It does not propose a final definition of categories of expenditures or losses, nor does it collect information and construct indicators. In a next step this framework can be used to collect data and create performance measurements and indicators.

As a next step, and building on what was done in section 4.4, the OECD will put the framework into a data-collection survey instrument and test it among 2-4 OECD countries. The countries suggested for inclusion in this piloting are: Australia, Switzerland and Japan, depending on the country's interest to participate in a test-run of course. This survey testing should allow for adjusting the framework with the input of government officials in charge of expenditure monitoring as well as experts on DRM related expenditure reviews.

The results of the survey testing will be discussed at the OECD High Level Risk Forum in December 2014. The workshop in November 2014 will be used to exchange views on the refinement of the instrument and help inform a framework to be tested at a larger scale, across OECD countries and to be presented at the annual OECD High Level Risk Forum in December 2014.

Questions for continuing the development of the framework::

- ✓ Which types of risks should be included in the proposed OECD expenditure framework? Should the data collection start off with one specific risk (e.g. water) followed by others?
- ✓ What is the appropriate level of disaggregation for a questionnaire to be filled out by countries? Are there other national frameworks that could serve as a basis for such a data collection effort?
- ✓ How could the framework articulate ex-ante versus ex-post disaster expenditures? How could this be worked out through line ministries?
- ✓ What should be the role of the OECD in putting forward a cross-country data sharing platform?

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APPENDIX 2: TESTING THE OECD EXPENDITURE FRAMEWORK: JAPAN, AUSTRALIA AND SWITZERLAND

Japan's DRM expenditure for the fiscal year 2013 (in million Yen, current prices)

| | Expenditure item by phases of the DRM | National ¹ | |
|---------------------------------------|--|-----------------------|-------|
| Ex-Ante | I. Risk Prevention and Mitigation ² | 803 915 | 14.4% |
| | II. Preparedness ³ | 879 932 | 15.8% |
| Ex-Post | III. Emergency Response | | |
| | IV. Rehabilitation and Reconstruction ⁴ | 3 883 911 | 69.6% |
| Total National DRM expenditure | | 5 578 036 | |

1. The disaster (TBD: natural and other disasters?)-related budget of Japan represents the "supplementary budget", national expenditure to DRM
2. Based on the sum of the cost categories Science and Technology Research and Disaster Prevention: 15 339 + 788 576
3. Based on the cost for disaster management but part of these costs may be attributed to Preparedness, however, disentanglement of data was not possible with the data provided.
4. Based on the cost for Disaster Recovery

Australia's DRM expenditure for the fiscal year 2000/01 (in million Australian Dollars, current price)

| | Expenditure item by phases of the DRM | National government | | Sub-national government ⁴ | | Local government ⁵ | |
|------------------------------|--|---------------------|-----|--------------------------------------|-----|-------------------------------|-----|
| Ex-Ante | I. Risk Prevention and Mitigation ¹ | 94.36 | 18% | 67.7 | 10% | 87.8 | 39% |
| | II. Preparedness ² | 23.59 | 4% | 440.05 | 25% | 91.49 | 41% |
| Ex-Post | III. Emergency Response | | | | | | |
| | IV. Rehabilitation and Reconstruction ³ | 219.05 | 78% | 169.25 | 65% | 45.14 | 20% |
| Sub-total | | 337 | | 677 | | 222 ⁶ | |
| Total DRM expenditure | | 1 236 | | | | | |

1. Based on the sum of the cost categories mitigation and other related expenditure
2. Based on the cost category preparedness and response, which include costs that could fall both into preparedness (e.g.) training and response (e.g. services of fire departments)
3. Based on the cost category relief/recovery

4. Expenditure Data by phases of DRM are also available for each state/territory but not for each ministry agency.
5. Estimation of DRM expenditure by municipalities was not part of the BTRE analysis, estimates stem from the Australian Local Government Association which conducted a survey on local government expenditure. Estimates are calculated by extrapolating survey results for all local governments.
6. Total estimate and cost by DRM phases are not consistent due to rounding errors.

Switzerland's average annual expenditure for the fiscal years 2000 to 2005, in million Swiss Francs

| | Expenditure item by phases of the DRM | Total Hazards | | | | Floods | | | | Landslides | | | | Avalanches | | | | Earthquakes | | | | Storms/Hurricanes ⁷ | | | | Extreme Temperatures | | | |
|------------------------------|--|-------------------|-----|-----|-----|--------|----|---|---|------------|---|---|---|------------|---|---|---|-------------|---|---|----|--------------------------------|---|---|----|----------------------|---|---|---|
| | | N ¹ | S | L | P | N | S | L | P | N | S | L | P | N | S | L | P | N | S | L | P | N | S | L | P | N | S | L | P |
| Ex-Ante | I. Risk Prevention and Mitigation ² | 346 | 25 | 20 | 61 | 13 | 14 | 9 | 9 | 10 | 4 | 1 | 5 | 5 | 3 | 9 | 7 | 3 | 2 | 2 | 19 | 2 | 1 | 2 | 14 | 1 | 1 | 6 | 4 |
| | | | 2 | 6 | 0 | 0 | 0 | 8 | 4 | 4 | 2 | 6 | 7 | 9 | 2 | | 5 | 2 | 2 | 5 | 1 | 5 | 0 | 2 | | 9 | | 0 | 0 |
| | | 75% ⁸ | 79% | 52% | 70% | | | | | | | | | | | | | | | | | | | | | | | | |
| | II. Preparedness ³ | 21 | 44 | 18 | 14 | 3 | 8 | 2 | 2 | 2 | 2 | 7 | 3 | 3 | 5 | 1 | 5 | 2 | 6 | 2 | 4 | 8 | 1 | 6 | 10 | 3 | 8 | 3 | 1 |
| | | 5% | 14% | 46% | 17% | | | | | | | | | | | | | | | | | | | | | | | | |
| Ex-Post | III. Emergency Response ⁴ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | IV. Rehabilitation and Reconstruction ⁵ | 95 | 25 | 7 | 11 | 18 | 1 | 0 | 3 | 21 | 6 | 4 | 1 | 2 | 7 | 2 | 2 | 0 | 0 | 0 | 4 | 2 | 1 | 1 | 28 | 3 | 1 | 0 | 0 |
| | | 21% | 8% | 2% | 13% | | | | | | | | | | | | | | | | | | | | | | | | |
| Sub-total | | | 32 | 39 | 87 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 462 | 1 | 3 | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| Total DRM expenditure | | 2047 ⁶ | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. National (N), Sub-national (S), Local government (L), Private households(P)

2. Based on the cost categories prevention , assessment and research.

3. Based on the cost category response
4. The data provided did not allow disentangling emergency costs from their cost categories response and recovery.
5. Based on the cost category recovery. However, as the study concentrated on costs of preventive nature, it is highly probable that real ex-post costs are underestimated and that ex-ante costs will fall into preparedness or mitigation might be included in this category.
6. Total DRM expenditure exclusive of the expenditure of private households for insurances (which amount to 828 million CHF).
7. In the Swiss report expenditure data are provided separately for storms and hurricanes
8. Percentages refer to shares of cost categories of government sub-totals.