UNISDR
The United Nations Office for Disaster Risk Reduction

GAR
Global Assessment Report
on Disaster Risk Reduction

2015

BACKGROUND PAPER

Prepared for the 2015 Global Assessment Report on Disaster Risk Reduction

WHO NEEDS LOSS DATA?

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2014

Geneva, Switzerland, 2015

Abstract

This paper provides an overview of the loss data landscape in the United States. It outlines the various organizational efforts for collecting and disseminating loss data. Numerous governmental organizations collect loss estimates but there is not a single governmental entity that consolidates and disseminates this information in a standardized and publicly accessible manner. The premier loss database in the U.S. - the Spatial Hazards and Events Loss Database for the United States (SHELDUS®) - is maintained by the University of South Carolina. SHELDUS® is among a small number of databases worldwide that track losses at the sub-national/county-level. As a result, many U.S. state and local governments along with many government contractors rely on this database for risk reduction activities. This paper provides practical examples of integrating loss data into research, emergency management, and planning activities. Particular focus is given to hazard mitigation planning and the benefits as well as obstacles of integrating loss data into disaster risk reduction. It also touches on issues such as data quality and next steps to improve hazard loss monitoring, including downscaling losses to more localized areas, broadening hazard coverage, and incorporating indirect losses and other non-economic measures into databases.

1. Introduction

The overarching goal of the Hyogo Framework for Action (HFA) is "the substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries" (UNISDR 2007, 3). In order to assess progress towards this goal or even determine if this goal has been achieved, inventories of disaster losses are key and consequently a priority area for action in the HFA. Tracking and documenting disaster losses provides valuable information on a country's or a community's loss profile. Monitoring disaster losses over space and time offers the capacity to answer questions such as: Are losses decreasing? Are there hotspots of losses? Is a singular hazard or specific hazard event driving the loss profile? Where should funding for disaster risk reduction be spent? Knowing hazards and their impacts is "the starting point for reducing disaster risk and for promoting a culture of disaster resilience" (UNISDR 2007, 7).

Since the inception of the HFA, the number of countries with disaster loss inventories has increased from a few to more than 50 national loss databases – about 35 of which are financially and/or technically supported by UNDP (UNDP/BCPR 2013). The mere existence of loss inventories, however, is not sufficient to answer the questions posed above. Loss inventories must contain a lengthy period of records and data of adequate quality in order to draw reliable and valid conclusions. In fact, the temporal and spatial coverage as well as the quality and accuracy of existing loss inventories varies considerably between countries (Gall and Kreft 2013; UNDP/BCPR 2013). Only a few countries possess loss inventories of adequate quality and sufficient temporal length to allow for trend analyses in disaster loss reduction. Using the United States, an example of a data rich environment, this paper outlines the national loss data landscape and quality of loss inventories available. The paper also provides an analytical example illustrating trends in loss reduction in the United States.

2. Background

2.1 What are loss data?

The terms "loss" and "damage" are often used interchangeably in reference to the adverse impacts of disasters on society, economies, and the environment. In the context of disaster loss inventories, losses are quantifiable measures expressed in either monetary terms (e.g., market value, replacement value) or counts such as number of fatalities and injuries. Damage is a generic term without quantitative characteristics, though it does not mean that damage cannot be measured and expressed as a loss. The damage to a roof, for instance, can be translated into monetary terms (the cost of repairs), which in turn can be included in loss inventories.

Both "loss" and "damage" are classified based on the type (e.g., direct, indirect, tangible, non-tangible) and nature (e.g., social, psychological, economic, cultural, environmental, etc.) of the impact (Gall and Kreft 2013). Direct and indirect losses distinguish between the immediate, physical or structural impact caused by the disaster such as the destruction of infrastructure caused by the force of high winds, flooding, ground shaking and so on. Indirect effects are the subsequent or secondary results of the initial destruction such as, business interruption losses. For example, a business that can no longer operate because its building and machinery has been destroyed will incur both direct as well as indirect losses. The destruction to the building and machinery would be quantified as direct loss – measured in monetary terms using real estate value and/or replacement or depreciation values for the machinery - whereas the lost income to the business owner would be quantified as indirect, business interruption losses also expressed in monetary values. Other examples of direct losses would be the number of drowning deaths due to a tsunami or the number of homeless, evacuated, or sheltered people. The destruction of culturally significant sites by a natural hazard is also a direct loss although quantifying the value of such loss may arguably be difficult. Based on the definitions used in this paper, only the replacement or real market value of the site and its buildings would be applied without considering the social and cultural meaning or the services provided by the site to its community. However, methodological approaches such as the quantification of ecosystem services could be applied to the valuation of cultural losses as well (Daniel et al. 2012) and then entered into a loss inventory.

Although direct economic as well as direct human losses dominate existing loss inventories (see upper right quadrant in Figure 1), the nature of disaster impacts is not solely restricted to economic and human impacts. Psychological (post-traumatic stress), cultural, and environmental (contamination of drinking water, saltwater intrusion, etc., see lower left quadrant in Figure 1) impacts are rarely captured in disaster loss inventories. While important, they are usually not assessed in a systematic manner and translated into monetary terms for inclusion in loss inventories. The same goes for recovery expenditures or so-called costs incurred by individuals, organizations, businesses, and governments. For an in-depth discussion of costs and how economists differentiate losses in stocks and flows see elsewhere (Rose 2004; Cochrane 2004; NRC 2012).

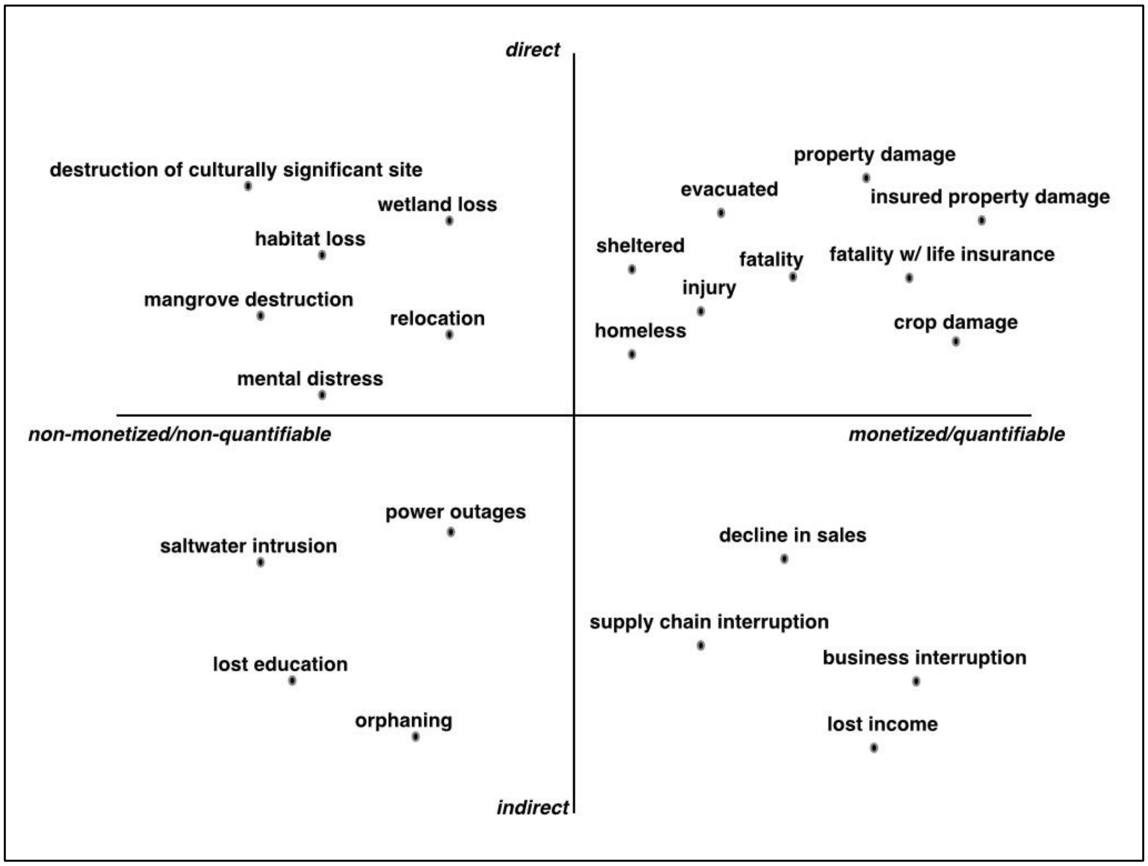

Figure 1: Examples of direct and indirect losses as well as quantifiable and non-quantifiable losses (adapted from Gall and Kreft 2013).

2.2 What is a loss inventory?

To identify key hazards and areas of large losses and to establish loss trends over space and time, disaster losses must be systematically assessed, documented and archived – ideally in a comprehensive manner. Under this scenario, all loss records should be contained within a single system, or within independent systems that can communicate with each other. Commonly though, national agencies document only a subset of hazards and/or losses depending on agency mission and scope. Geological agencies tend to focus on earthquakes, mass movements, tsunami and volcanic activities whereas national weather agencies are responsible for meteorological and hydrological hazards. Thus, most countries experience a separation in data collection by hazard type or causal agent.

Traditionally, geological or weather agencies focus on documenting, monitoring, and forecasting the occurrence and physical characteristics of a hazard – wind speeds, earthquake magnitude, etc. – not their impacts on society. As a result, the scientific understanding of how hazards form and where they occur has significantly improved with advancements in instrumentation, modeling, and forecasting (Johns and Doswell 1992; Diaz and Murnane 2008). Estimating the quantifiable impacts on society, however, has received less attention and only a few national agencies are mandated to do so. In fact, loss estimation is largely left to emergency responders, U.N. agencies, the media, non-governmental entities such as the Red Cross, and private insurers or reinsurers. Thus, disaster loss data are generally crude estimates - not actual determinations or models of losses (with the exception of loss estimates by private insurers) - of variable quality and quantity depending on the data source and time of estimation.

Compiling and sharing these loss estimates through a loss inventory poses multiple challenges, particularly when consolidating conflicting estimates from multiple sources. Ultimately, most loss inventories contain some form of bias depending on the data source and type of information used in the inventory as well as the type of hazards documented. As outlined by Gall et al. (2009), common data distortions are: a) a hazard bias, not all types of hazards are equally represented in the inventory since it is "easier" to get loss data on some hazards than others; b) a temporal bias, recent loss estimates are more accurate and reliable than loss estimates for historic events; c) threshold bias, many inventories utilize a subjective threshold to determine which events to include/exclude, and this tends to tilt the inventory to infrequent large-impact disasters rather than low-impact, high frequency events; d) accounting bias, quantifiable direct losses (fatalities, injuries, economic impact) are included in most inventories whereas indirect and other difficult to quantify measures of impact are excluded; and e) geography bias, loss reports from rural or remote areas are more difficult to obtain than from urban or highly populated areas.

A sixth (systemic) bias is introduced at the outset when designing the loss inventory system that stores the actual loss data. The most common system for a loss inventory is a database structure that allows for data entry, data querying, and data retrieval. Every database has a unique data architecture tailored to the needs and mission of the inventory owner with little consideration for data compatibility between databases. This is not a problem as long as the inventory is a stand-alone system without any need to communicate with other systems. Questions arise, however, when data from multiple loss inventories and databases must be consolidated: Is the nomenclature and definition of a landslide the same in database A as in B? Is a crop loss the same in database A as in B? Is a homeless person the same in database A as in B?

To reduce systemic bias and improve the compatibility of loss inventories, the Integrated Research on Disaster Risk (IRDR) has initiated a working group (DATA) devoted to standardizing definitions of hazards and loss indicators for the operational use in loss databases, which builds upon previous standardization efforts spearheaded by Munich Re, EM-DAT, Swiss Re, UNDP, and the Asian Disaster Reduction Center (Below et al. 2009). The IRDR working group DATA recently revised and expanded the peril classification system and hazard terminology (IRDR DATA 2013). Simultaneously, the World Meteorological Organization is venturing into disaster risk reduction and risk identification including an initiative on standardization of hazard monitoring and documentation of loss data (Di Mauro et al. 2013; WMO 2013).

2.3 What are the benefits of a loss inventory?

Loss inventories are tools of accountability and transparency for disaster risk reduction. Despite all current shortcomings, they are the best available tool at present for documenting a country's disaster burden. Loss inventories establish an historic baseline for monitoring the level of impact on a community or country. The impact of individual hazards becomes quantifiable enabling communities to focus their disaster risk reduction efforts on key hazards rather than the last disaster. Resources can be allocated by community or by hazard and used for prioritizing areas of heightened risk (hot spots) and/or by focusing on a particular hazard.

Loss information can also be harnessed for and integrated into all aspects of fostering community resilience. Loss and hazard profiles can inform land use planning, zoning, and development decisions, local ordinances on building codes and housing density, taxation and budget decisions, and policy setting at local to national levels. A sound understanding of the drivers and causes of losses as well as their societal, environmental and economic implications enables communities to move from a reactionary to a proactive approach of managing hazards and disasters.

Consistent updates of loss inventories as well as expanding the historic record provide the basis for temporal studies and trend analysis of losses. Whenever high-quality loss data of good temporal and spatial resolutions are available, such data can be coupled with ancillary data like disaster risk reduction expenditures or demographic information. It then becomes possible to evaluate the effectiveness and efficacy of policies and to answer questions such as: Are disaster risk reduction expenditures making a difference in loss trends? Are disaster risk reduction efforts effective? Is the mere presence of more people driving the rise in losses? Is climate change affecting losses?

Using the U.S. as an example of a good quality, data-rich environment, the following section illustrates the reality of disaster loss data and loss inventories. The usage of loss data in both research and planning environments is highlighted to illustrate progress on the HFA Priority for Action 2/Core Indicator 2 "Systems are in place to monitor, archive and disseminate data on key hazards and vulnerabilities". This background paper is independent of the information provided by U.S. national self-assessments, which tend to provide uncritical discussions focused entirely on governmental efforts without reflecting on the current community of practice and the work of non-governmental entities.

3. Loss Data in the United States

3.1 Loss Data Providers and Data Quality

In the U.S., the National Weather Service (NWS), more specifically the National Climatic Data Center (NCDC) provides loss estimates for the majority of meteorological and hydrological hazards. NCDC reports the date, location, type(s) of hazard and associated fatalities and injuries as well as direct property and crop damage. Data are publicly accessible online from January 1996 to present. For any records prior to 1996 and dating back to 1950, users can download a less user-friendly Microsoft Access database containing raw data.

Although NCDC provides the data, it does not collect them. Instead, all 124 NWS Forecast Offices submit monthly loss estimate reports to the NWS Headquarters where the data are compiled into a single database and then forwarded to NCDC, which integrates these monthly updates into their Storm Data product. The data source for the monthly loss estimate reports range from local law enforcement to insurance and emergency management officials as well as the general public, local media or NWS damage surveys (NCDC 2013). Since only few events receive on-site damage surveys by the NWS, there are many events for which only crude, unverified or no loss estimates at all exist. In fact, the NWS "does not guarantee the accuracy or validity of the information" (NCDC 2013). The only exception are flood losses, for which, the U.S. Army Corps of Engineers always requires a best guess estimate (NWS 2009).

Since the loss reporting occurs by local weather service offices, losses are reported by U.S. state and county and not by event (e.g., Hurricane Katrina). In order to approximate the cumulative impact of a large-scale event, losses from all affected areas must be aggregated, which is very difficult since the NWS does neither use nor provide specific event identifiers. Furthermore, many events are reported by a NWS-specific administrative unit (so-called forecast zones) or larger regions (i.e., multi-county areas), which sometimes coincide with the administrative boundaries of a county but more often, cross multiple counties. Thus, loss reporting by the NWS does neither follow an event-logic nor a strict administrative, spatial system. This limits the utility of NWS loss data for planners and other users who are interested in a break-down of losses by administrative units and do not have the capacity to unravel the complexities of NWS-specific units such as forecast zones.

Estimates on geological hazards are provided by NOAA's National Geophysical Data Center (NGDC). Loss estimates on earthquakes (1500 – present), volcanic eruptions (1900 BC – present) and tsunami (1500 – present) are available in three separate global event databases and supplemented with technical reports from the U.S. Geological Survey. Unlike the NWS Storm Data, NGDC reports losses on an event basis with very limited information of losses outside the epicenter. Less than 50 percent of the geological events come with loss estimates (death, injuries, monetary damage, and number of houses destroyed). The NGDC loss indicator "damage" does not equate directly to NCDC property damage as reported for hydrological and meteorological damage. Furthermore, it is unclear if the NGDC damage category includes direct and indirect losses.

There are other loss inventories (for example, the Extreme Weather Sourcebook by the National Center for Atmospheric Research, or the NCDC Billion Dollar Events.). However, these inventories have a very specific audience and are not maintained for operational planning use.

In sum, there is no federal U.S. agency (including the Federal Emergency Management Agency/FEMA) that has a mandate to consolidate the various loss inventories into a user-friendly format geared towards disaster risk reduction. Instead, the Hazards and Vulnerability Research Institute at the University of South Carolina maintains the nation's de facto premier loss database – the Spatial Hazard Events and Losses Database for the United States (SHELDUS®) (Table 1) without any federal support or mandate. Born out of an academic research project and initially supported by extramural funding, this database has grown to be the country's go-to loss inventory for disaster risk reduction planning. It consolidates the loss inventories from NCDC, NGDC, and other federal agencies along with third party information such as research reports on landslides and disaster mortality (HVRI 2013). Furthermore, SHELDUS® georeferences losses to county boundaries and eliminates agency-specific geographies such as NCDC's forecast zones. In addition, the database offers the ability to inflation-adjust losses to facilitate temporal loss comparisons. Thus, any U.S. state or county can quickly determine their location-specific hazard and loss profile without any additional data analysis. Aside from location-specific queries, SHELDUS® allows users to query the database by major disasters (equivalent to the NCDC Billion Dollar disaster events), IRDR peril categories as well as GLIDE[1] numbers. If SHELDUS® would not be available to hazard mitigation planners and emergency managers, the U.S. would lose its ability to comprehensively monitor, archive, and disseminate data on key natural hazards.

Table 1: SHELDUS® at a glance).

Spatial Coverage	*Temporal Coverage*	*Hazard Coverage*	*Loss Indicators*	*Number of Records*	*Data Sources*	*Owner*
All U.S. counties except U.S. territories	1960-present	Geological, hydrological, meteorological	Killed, injured, direct property loss, direct drop loss	>800,000	NCDC, NGDC, USGS, and scientific reports	Hazards and Vulnerability Research Institute, University of South Carolina, USA www.sheldus.org

[1] Global unique identifier number issued by the Asian Disaster Reduction Center

3.2 Loss Data Users

With the passage of the Disaster Mitigation Act in 2000, the U.S. federal government mandates hazard mitigation planning (disaster risk reduction planning). Every U.S. State, local and Indian tribal government must develop a hazard mitigation plan in order to maintain eligibility for federal disaster funds. A key element of a hazard mitigation plan is the risk and hazard assessment, which describes past hazard occurrences and incurred losses. At least 50% of U.S. states and hundreds of counties use SHELDUS® data to document both. The ability to generate location-specific, inflation-adjusted loss profiles across all meteorological, hydrological and geological hazards makes SHELDUS® a more user-friendly database for hazard mitigation planners than NCDC's Storm Data, which excludes geological hazards and does not offer the ability for inflation adjustment. Even FEMA explicitly references the use of SHELDUS® in its guidelines on hazard mitigation planning (FEMA 2013). U.S. federal reliance on SHELDUS® is significant.

Beyond federal, state and local hazard mitigation planners as well as private consultants supporting mitigation planning, the SHELDUS® loss inventory is also widely used in academic research. Since 2005, more than 70 peer-reviewed journal publications appeared utilizing SHELDUS® data spanning disciplines such as engineering, public health, sociology, economics, tourism, geography, political sciences public administration, urban planning, and more. Even beyond the U.S., students and researchers integrate SHELDUS® into thesis, dissertations, and academic research. With SHELDUS® data being freely available online, some universities also incorporate SHELDUS® in their planning and hazard mitigation curriculum (e.g., Texas A&M University PLAN 647, Louisiana State University ENVS 4250, University of South Carolina GEOG 530). SHELDUS® was featured in the 2011 GAR report to illustrate extensive risk in the U.S (UNISDR 2011).

Overall, the extensive usage of SHELDUS® by the disaster risk reduction and research communities is not only reflected in citations and publications but obviously also in the download activity and user feedback. For five months in 2012 alone, the cumulative download request aggregated to 23.8 million records from 730 different locations in the U.S (Figure 2). Please note that Figure 1 does not show international data downloads since this background paper focuses on the use of loss data within the U.S.

Thematically, users draw upon SHELDUS® data largely for assessments of risk (Czajkowski et al. 2013), resilience (Brewton et al. 2010; Zahran et al. 2011), vulnerability (Yoon 2012), and economic impacts (Heatwole and Rose 2013; Ash et al. 2013; French et al. 2010) along with policy and planning studies (Brody et al. 2009; Michel-Kerjan et al. 2012). When supplementing SHELDUS® with ancillary data such as voting behavior (Healy and Malhotra 2009), national park visits (Woosnam and Kim 2013), new and interesting linkages between environmental, economic, and social phenomena can be discovered that previously seemed to have no apparent connection to disasters. Thus, providing access to loss information generates a wealth of unexpected findings and new knowledge. This lays the groundwork for the integration of disaster risk reduction efforts into planning and policy decision-making beyond emergency management.

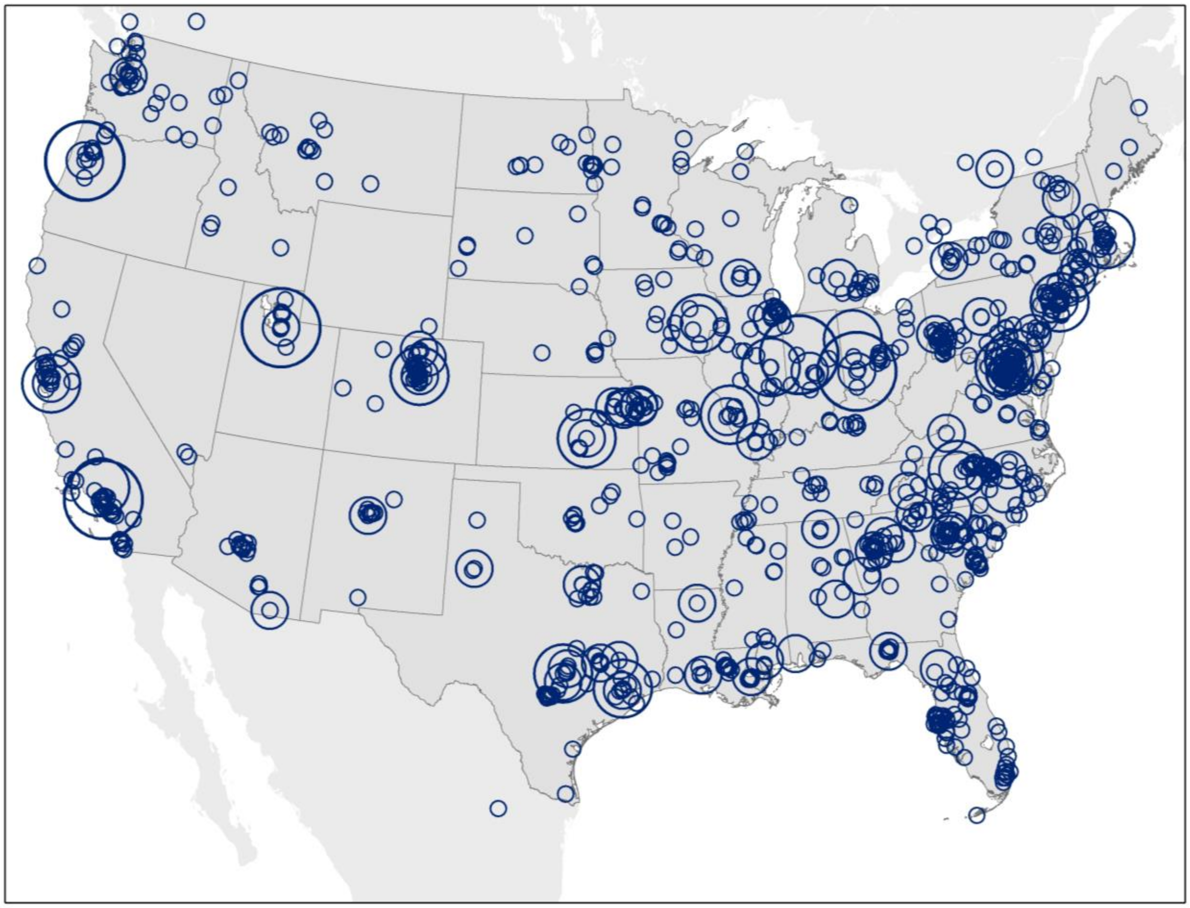

Figure 2: SHELDUS® v12 download locations and number of downloaded records between July and December of 2012. There are four graded circles with the smallest circle indicating less than 25,000 records followed by downloads between 25,000 and 250,000 records as well as between 250,000 and 800,000 records. The largest circle shows downloads of more than 800,000 records or a multiple of the entire database.

3.3 Is the U.S. reducing disaster losses?

Given the availability of information on hazards and losses, one could surmise that the U.S. must have a clear understanding of its burden of disasters and has taken steps towards loss reduction. While the mandate for hazard mitigation planning has significantly advanced our understanding of where hazards occur and which areas are most at risk through the use of loss data and other data, it has not (yet) led to a change in business as usual. More people live along the coast and in floodplains than ever before (Crossett et al. 2004; NOAA 2011). Few homeowners go beyond minimum building standards in regard to wind and flood resistance (Kunreuther and Michel-Kerjan 2009). In many areas along the U.S. Gulf coast, building codes are only in force since 2005. As a result permitting, code compliance and code enforcement for residential homes run counter to traditional approaches of home construction and are not strictly enforced (Friedland and Gall 2012).

Today, Gilbert White's statement - "better hazard maps, more refined forecasts, and more efficient emergency operations will be important but they will not necessarily reduce damages, and they neglect the measures that might assure sound use of hazardous areas" (1994, 1240) – still holds true. Although hazard mitigation planning has improved significantly, a sound commitment to disaster risk reduction measures and changing behavior is still missing in the U.S. Thus far, the effects and benefits of hazard mitigation and disaster risk reduction have not yet materialized and the U.S. loss curve is still trending upward (Gall et al. 2011). Since 1960, the U.S. has suffered nearly $800 billion in direct property and crop losses. The majority of these losses - more than 70% (about $553 billion) –accumulated during the disaster-intensive years of the 1990s and 2000s (Figure 3). Drivers of increasing losses are mostly hurricane and flood events whose losses have tripled over the past decades. In fact, Gall et al. (2011) estimate that with perpetual loss escalation direct losses of $300 to $400 billion within a single decade alone are possible in the future.

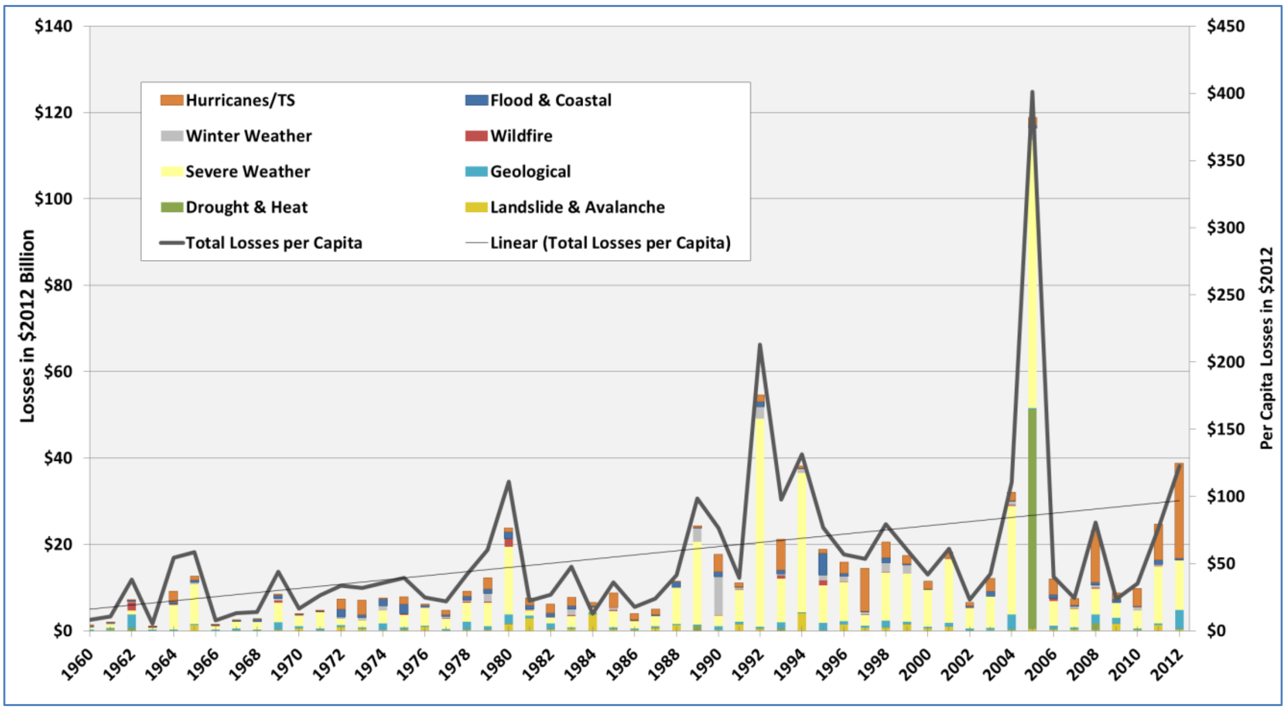

Figure 3: Inflation-adjusted losses between 1960 and 2012 show a distinctive upward trend (data source: SHELDUS).

Some researchers (Pielke et al. 2007; Bouwer et al. 2007) cite the increase in population and wealth as the culprits behind loss escalation. A few recent studies show, though, that when accounting for population and wealth growth, losses are still trending upward although not as steeply (Gall et al. 2011; Barthel and Neumayer 2012) (Figure 4). Yes, if there are more people and assets at risk, more losses accumulate but that alone does not explain the continuous rise in losses. Hazard losses are outpacing population growth and increases in wealth. Thus, existing disaster risk reduction strategies are not enough to slow loss escalation and perhaps become nullified by eroding resilience, heightened resilience and/or impacts of climate change.

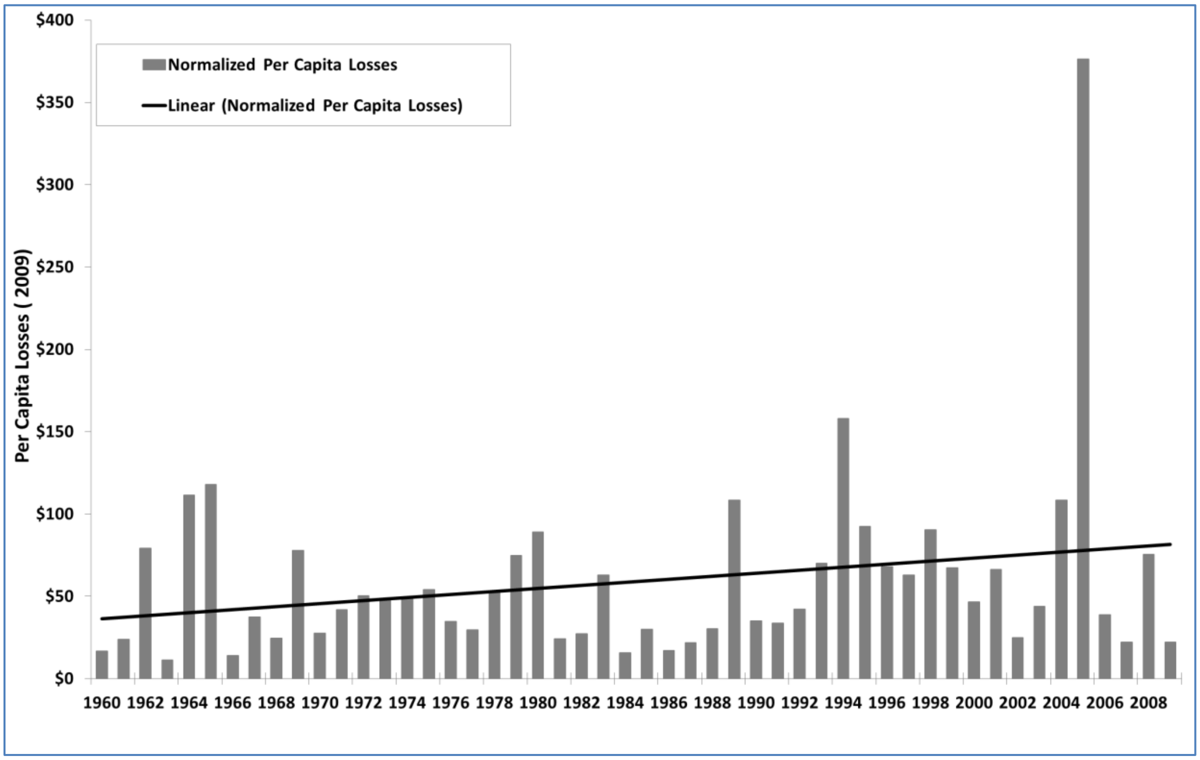

Figure 4: Losses normalized by increases in wealth and population over time continues to show an upward trend (data sources: SHELDUS, U.S. Census and U.S. Bureau of Economic Analysis).

Perhaps more significant than the overall trends in losses, is the relative impact such losses have on local places. When applying the International Monetary Fund's definition of a disaster (exceeding 0.5% of GDP), the U.S. surpassed this threshold only once during the record year of 2005 – a year with the most active Atlantic hurricane season on record and the costliest hurricane (Katrina) in U.S. history. Passing a threshold of 0.5% of GDP is rare for a country with a high GDP and says little about what constitutes a disaster, particular at the local level. However, when disaggregating U.S. loss data to the sub-national scale (U.S. counties), many more events qualify as a disaster (more than 0.5% of county GDP) with economically significant damage. Instead of only the 2005 event being labeled as a disaster, Ash et al.'s (2013) relative impact analysis showed that 585 out of 3109 U.S. counties suffered catastrophic losses between 1980 and 2009. The focus on studying losses at the national scale downplays the significance of local impacts – and the local scale is the most important because "all disasters are local" (FEMA).

3.4 Are risk reduction monies allocated and prioritized for high loss areas?

Losses, particularly direct losses, paint only a partial picture of the economic burden of disasters. Post-event communities and countries spent millions of dollars on recovery. In the U.S., federal support comes in the form of so-called public and/or individual assistance, tax dollars appropriated by the U.S. Congress and released after the President declared a major disaster or emergency. These assistance monies allow communities to remove debris, repair or replace disaster-damaged public facilities and provide individuals with crisis counseling, unemployment assistance as well as funds when their property was destroyed or damaged. During the 2000s, the federal government spent $12 billion every year on disaster recovery alone (Schultz and Elliott 2012).

Unfortunately, allocating recovery funds is as much a political process as it is driven by the degree of impact. Research utilizing data on presidential disaster declarations in conjunction with SHELDUS® shows that federal dollars do not necessarily go to areas with the highest losses (Schmidtlein et al. 2008; Salkowe and Chakraborty 2009). This is due to the fact that the process of presidential disaster declarations along with congressional appropriations and funding release is inordinately political (Garrett and Sobel 2003; Langabeer et al. 2012) as delays in Superstorm Sandy funds reinforced just recently. This politicization of recovery funds also effects funding for subsequent mitigation projects. Post-disaster funds explicitly to be used for hazard mitigation projects and planning are allocated as a share of aggregated federal disaster assistance, generally ranging between 7.5% and 15% (FEMA 2010). These funds can then be spent on measures identified in the State's Hazard Mitigation Plan.

As a result of this process, the release of recovery and hazard mitigation funds is not simultaneous. Hazard mitigation efforts are therefore often implemented with a significant time lag or entirely after the recovery period. Consequently, hazard mitigation and disaster risk reduction are not an integral part of recovery in the U.S.

Conclusion: What is missing?

Using the U.S. as a case study, this paper illustrates that disaster risk reduction and loss reduction are not the same. We show that the U.S. has not been particularly successful in reducing economic losses despite a sophisticated system of early warning and hazard monitoring systems. The country's federal disaster loss collection system is fragmented and largely relies on crude estimates by third parties and archived with little ongoing federal support. Improving the quality and reliability of loss data requires improved loss estimation through post-disaster surveys and improved modeling capabilities and cannot be accomplished through better weather forecasting systems. Monitoring hazards is not the same as monitoring or measuring losses. Conflating these two issues causes mission creep for weather agencies, which may neither be qualified nor adequately staffed to determine the societal impacts of a hazard. To improve loss inventories, better loss data collection systems must be developed that go beyond third party reports and common loss inventory standards must be applied consistently across all loss databases.

Furthermore, loss inventories should be expanded to cover other components of disaster impacts such as recovery, mitigation, and insurance expenditures. Only a comprehensive assessment of losses and costs incurred from a disaster provides a sound planning baseline from which to judge the efficacy of disaster risk reduction efforts. In addition, loss inventories are of limited use if key stakeholders such as planners and decision-makers cannot access or utilize the data. Loss inventories must be tailored to user needs. If inventories are not user-friendly and cannot facilitate the decision-making process, they are essentially useless.

The use of loss inventories as an accountability tool has yet to be recognized. In the U.S., proactive hazard mitigation planning has only been mandated since the early 2000s. Thus far, little research exists on measuring the effectiveness of specific actions and planning activities post-implementation. Instead, individual mitigation projects are evaluated *ex ante* based on the ratio of avoided future losses and implementation costs. While this is laudable, it is a highly theoretical exercise with no follow-up evaluation. The system of mitigation actions must be evaluated on a community by community basis to determine if the collective actions truly make a difference in losses and resilience.

Lastly, the HFA call for loss inventories has been adopted and amplified by the climate change community (Warner and Zakieldeen 2012). With an increased focus on climate adaptation, the U.N. Framework for Climate Change is highlighting the need to document loss and damage from both disasters as well as climate change (UNFCCC 2012). Thus far, existing loss inventories focus solely on the impact from disasters and due the lack of inventory standards are not yet ready to respond to the needs of the climate change community. Perhaps, it would be useful if the standardization efforts lead by IRDR and WMO explored the feasibility of integrating climate change loss and damage into existing loss inventories.

Again though, loss (and damage) inventories for the purpose of documenting impacts are of little value if the information is not utilized in decision-making. It is generally, the citizens and businesses that bear the brunt of disasters and failed policies. But as Burby (2006, 178) poignantly pointed out "one would expect that avoidance of losses would be a high priority of local officials. The paradox is that this is typically not the case." As long as officials are not held accountable for inadequate or failed risk reduction policies, the added accountability and transparency through loss inventories dissipates quickly.

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