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Public Loss and Damage Inventories to Reduce Disaster Risk in Poor Countries: The Assessment of Climate-Change-Related Extreme Events in Myanmar

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ABSTRACT

This paper comments on the recent trend in public policy towards disaster loss and damage databases (DLDs). Offering a literature review, it also imparts an empirical snapshot of a recent disaster and the ongoing establishment of a DLD by the government of Myanmar. While DLDs can accommodate data for all types of disasters, this contribution will limit itself to climate-related disasters and in particular to two different types of floods: The kind of flash flood which can be caused by dams, and floods that gradually worsen as an impact of climate change (CC). When considering the category of hydro-meteorological hazards, the latter phenomenon is increasingly expected to heighten the recurrence of the former category of extreme events. The resulting scenario of risk, and the public need for disaster risk management are purposefully illustrated here to indicate how DLDs are likely to become an important tool in global public disaster risk reduction (DRR) measures.

A case-study is provided to support the main arguments, consisting in the investigation by the author into a flash flood that occurred at the Thai-Myanmar border in August 2013. Vast inhabited plains were instantly inundated as a result of a too rapid release of waters from an upstream dam during the Monsoon season. The resulting disaster illustrates, in all its tragedy, the need for better public DRR with a specific focus on assessment and communication methods – even more so, in anticipation of CC-impacts. This case-study further describes the relief efforts that followed on to the abovementioned flash flood as well as the current status of the creation of a public DLD in Myanmar.

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More than 50 governments currently establish DLDs to bolster disaster risk reduction and climate change adaptation efforts. This paper therefore provides a methodological discussion of DesInventar, the most widely used Internet database for capturing losses and damage from climate-related disasters. Aiming at contouring this increasingly popular yet still flawed type of data collection for DRR, the author reviews a wide array of scientific and professional literature.

This paper concludes that, if properly set up and made publicly available, DLDs can be a useful tool for improved DRR and CC adaptation, mainly by improving risk assessment and communication. Ongoing efforts should continue to involve all relevant governmental units, sectors and stakeholders. Data could be exchanged more effectively via improved DesInventar-databases. Whereas private-public partnerships are recommended to achieve such improvements, ongoing efforts towards data disaggregation must also be made.

KEYWORDS: *Disaster risk reduction, public policy, loss and damage databases, climate change adaptation, DesInventar, methodology, risk assessment*

Introduction

The Government of the Republic of the Union of Myanmar (Myanmar) is in a transition towards liberal trade and democratic governance, which is partly still the consequence of a climate-related disaster that took place in 2004: super-storm Nargis. Whereas new public infrastructures, such as hydroelectric dams, may bring about development opportunities, large-scale technological interventions also entail risks, pollution and the release of additional greenhouse gases into the atmosphere. The interest of this paper lies with a particular, publicly owned format of data base management for climate change adaptation (CCA) and disaster risk reduction (DRR). Since 2004, Myanmar has received considerable international support, allowing its government to boost DRR and CCA activities. A subset of these efforts is about to culminate in the establishment of a publicly administered Disaster Loss and Damage Database (DLD).

In the absence of private insurance, citizens turn towards their government for help in the aftermath of a disaster. For example, the Economist newspaper reported in October 2013 that '[d]emonstrators clashed with police in the eastern Chinese city of Yuyao over the local government's flood-relief efforts' (The Economist, 2013b)[1]. This paper takes the stance that, to better protect poor communities from disasters, governments should own DLDs or – at least – have access to extant DLDs, private or public, ensuring that data would be put to the best possible use for DRR and CCA.

Although, to private enterprise, and first of all to the insurance sector, risk management is the core business model, many public authorities still lack access to DLDs of comparable quality. It is not clear, at this stage, whether governments can afford the same databases as the insurance sector, in terms of data quality and quantity. However, public risk management needs to permit effective risk assessment and disaster response.

Policy Context

[1] The quote further holds that: 'thousands of people were protesting that too little had been done to help residents in the wake of Typhoon Fitow' (The Economist, 2013b).

Efforts towards climate-related DRR and CCA include attempts at increasing the resilience of human communities by reducing their vulnerability and exposure to hazards (Holling, 1973; Clark, 2012). DRR-related programming is also currently being furthered by various policy processes surrounding the Hyogo Framework for Action (HFA)[2]. As it – along with the MDGs – will expire in 2015, UNISDR has announced that consultations for a second HFA are underway and are placing a greater emphasis on CC-related impacts (UNISDR, 2013a). As borders between the DRR- and CCA- strands are steadily being overcome, the IPCC's most recent Special Report on Extreme Events (SREX), for instance, reflects a stronger interest in DRR (IPCC, 2012). UNDP's climate risk management (UNDP, 2013b) and the World Bank's climate risk assessment (2011) approaches can be understood as being part of that same development trend.

Potentially the most important, development in this realignment of DRR and CCA policies is the common interest that both pools of experts share when it comes to DLDs. The growing popularity of this approach is well illustrated by the newest decision reports, which the Conference of Parties (COPs) has issued under the United Nations Framework Convention on Climate Change (see for example UNFCCC, 2013a: 21-24). To put this into context, UNFCCC and COPs are the prime international negotiating hubs for CC-related concerns.

UNFCCC had been gearing up its focus on losses and damages since COP 16 in Cancun, Mexico, in December 2010, and set forth the same trend at COPs 18 and 19. Already, at COP 16, Parties recognized the need to strengthen international cooperation and expertise in order to understand and reduce loss and damage associated with adverse CC-effects, including impacts related to extreme weather events and slow onset events - i.e. drought and sea-level rise. Typical damage, loss, and non-economic loss categories that apply to all types of disasters include the assets and sectors listed in Table 1.

[2] The initial HFA had been endorsed by the UN General Assembly in 2005, with the purpose of making the world safer from natural hazards

Table 1. Damages, Losses and Non-Economic Losses

DAMAGE	ECONOMIC LOSSES
House and household assets Schools and hospitals assets Roads and bridges Airports and seaports Agriculture, land crops and irrigation systems Water supply systems Heat and power supply systems	Revenue from schools and hospitals Toll fee from roads and bridges Revenue from closed airports and seaports. Or higher operational costs for keeping ports open Production costs in agriculture and related sectors High operational costs and loss of revenue in electricity, heat and water supplies
NON-ECONOMIC LOSSES Education sector: increased risks of child labor Health sector: increased risk of epidemics Housing sector: Land documents and personal identity papers Culture sector: Loss of manuscripts and documents Social loss: Gender based violence, human trafficking, risks of conflict and tensions, social unrest Loss of capacities and skills due to loss of life and injuries General negative impacts on families and households and 'social' risks	
Source: UNDP Internal Post-Disaster Needs Assessment (PDNA) Training. New York, November 2013.	

Since the nineteenth COP-session in November 2013, topics surrounding loss and damage from extreme and slow-onset climatic events have become of central concern. Whereas in the advent of COP 19, parties had agreed on an international mechanism to start addressing loss and damage institutionally, a rift between two opposing camps emerged over important details on the same topic during that conference. One camp favored reparation, with LDCs and emerging economies joining forces to claim automatic financial compensation for losses and damages (UNDP/BOTG/UNU, 2013). Another camp tended to prefer questions of how losses and damages could be better handled in the interest of poor communities. For this purpose they pushed their agenda in the direction of technical advances through ongoing development cooperation efforts (ODA) with an increased onus on DRR and CCA. Advances in this direction are already on offer – for example by UNDP's DLD programming (see for example UNDP, 2009 and 2013c). Proponents of the latter camp are – potentially an important political-ethical detail of future COPs – either indifferent or disinclined to a mechanism of automatic financial transfer to compensate all future losses and damages.

Unrealistic Reparation Claims

Blaikie *et al.* (1994: 129) illustrate the high need for disaster relief by example of the aftermath of a flood: 'uninsured people with no reserves of cash lose twice (...): they lose the goods, many of which are essential to life, and they lose the time which they have to spend on work to replace them, which is therefore not available for survival'. The poorest and most marginalized communities in all countries, i.e. the ones that are usually also most vulnerable and exposed to extreme climatic events, need DRR efforts for the sake of their own resilience and should therefore be considered as the prime beneficiaries of the above-mentioned types of support, technical and compensatory.

On one hand, the need for more or better-targeted public financial support in its multiple forms – ODA, humanitarian assistance, CCA measures or insurance policies – is strikingly obvious if DRR is to be geared-up. While, internationally, the number of poor countries is dropping, with several newly emerging economies joining the top spots in consumption and production statistics, a rising number of governmental authorities need to be convinced and encouraged to take DRR seriously at national level.

On the other hand, the present paper defends that the request of compensation that several countries of the so-called G77-group have submitted to industrialized ones, as described above, has little perspective. According to The Economist, India, China and other emerging economies, while still positioning themselves on the side of the G77, already account for about half of the world's greenhouse-gas (GHG) pollution: 'China's greenhouse-gas emissions were about ten percent of the world's total in 1990. Now they are nearer 30 percent. Since 2000 China alone has accounted for two-thirds of the global growth in carbon-dioxide emissions' (The Economist, 2013a).

An inter-generational mismatch could also come to deter compensation claims. Even if a significant causality could be established between rising GHG emissions in one country and CC accompanied by a certain disaster in another, the groups formerly releasing GHGs for their industrialization are unlikely the same than the ones that would pay future compensations. Rather than supporting claims for such reparations between governments, the present essay argues for a deeper understanding of how DLDs are already being used and how the same can be improved, with the purpose of reducing disaster risk.

Aiming at data-rich, publicly available DLDs matches another current trend of 'Statistics for Sustainability', based on the outcomes of the Rio+20 United Nations Conference on Sustainable Development. At that occasion Member States and other stakeholders started calling for a 'data revolution' as part of the post-2015 agenda: 'Improved data, disaggregated appropriately, will enable policy analysis – including application of gender analysis, assessment of CC-impacts and, where appropriate, analysis for conflict prevention – focused on the convergence between poverty, social equity, environmental and governance issues (UNDP, 2013a: 21). In Myanmar, one of the world's least developed countries, a public inventory system for losses and damages is currently being established.

Recent Natural Hazards in Myanmar

Myanmar is particularly prone to climate-related hazards, although earthquakes also constitute a major risk in central and northern parts of the country.[3] According to EMDAT

[3] For a broader discussion on DRR, i.e. covering issues outside the climate-focused sectors, see for example Blaikie (1994) and Hewitt (1997).

global database, about 70 percent of all disasters related to natural phenomena are meteorological, climatological or hydrological (CRED, 2013).

Myanmar's recent history was changed by a climate-related disaster, some of the aftermath of which is still tangible today. The country's densely populated Irrawaddy Delta was highly vulnerable and exposed when Cyclone Nargis struck in May 2008. Floods and winds adding to a storm surge combined to become one of the strongest storms ever recorded and led to a national disaster. After landfall, and once relief agencies had been granted access, estimates showed that 2.4 Million people had been affected with at least 130,000 dead or missing (Barber, 2009: 2). Authorities calculated and communicated economic losses at the height of four Billion US Dollars to the Guardian newspaper (Guardian, 2008). For international relations discussions on the initially delayed response to Cyclone Nargis, evoking the 'responsibility to protect', an approach that has been widely rejected in the meantime (Cohen, 2009; Barber, 2009; Welsh, 2009).

Situated between the world's highest mountain range and the inter-tropical convergence zone, Myanmar experiences seasonal Monsoon, with up to 750 mm of rainfall per month. France, in comparison, receives circa 619 mm of overall rainfall each year. D'Arrigo *et al.* (2011) provide a recent scientific account of the macro-climate of Myanmar and conclude that the country, in addition to the seasonal Monsoon, can be impacted by the so-called El Niño and La Niña climatic oscillations at a decadal basis.

Heavy rainfall and seasonal flooding mineralize downstream river basins in Southeast Asia. While this process fertilizes fields and thus benefits much of Myanmar's agriculture, it is likely subject to CC-trends and can be obstructed by the construction of upstream dams. Whereas average flooding is traditionally useful, extreme floods are generally perceived as putting more people at risk than any other disaster (Blaikie *et al.* 1994). Based on the IPCC's models for Southeast Asia, above-average flooding magnitudes and frequencies are likely to increase with global warming, thus resulting in more extreme events, also in Myanmar (IPCC, 2012: 10; 12-13). The country ranks within the top twenty of world's most fragile places in terms of both conflict and high vulnerability to natural hazards (Harris *et al.,* 2013: 9). Private and public buildings are usually built high enough above or distant enough from the main riverbed to accommodate for the average range of the water bodies' seasonal local extensions. The same infrastructure, however, is typically not resilient enough to withstand higher-than-average magnitude events and flash floods. The gradual impact of slow-onset flood-related disasters, expected to set on as a function of CC, is yet to be assessed.

In the aftermath of cyclone Nargis the Assistant of the Secretary General of the UN, Margareta Wahlström from ISDR visited Myanmar. Following this visit, as part of the launch of a wider programme for DRR in 2011, a high-level agreement was reached with the government on developing a DLD. More broadly, as a consequence of international disaster response and political pressure, the Government of Myanmar has started allowing foreign investments and a democratization process to take place on its territory. At the time of writing, rapid developments are taking place in almost all sectors of the country (see for example Fuller, 2013). The following section retains five thematic areas that seem highly relevant to the public administration of DLDs, thus hoping to clarify the main characteristics of this rather new research focus.

DesInventar: Methodology and Database

The so-called 'DesInventar' DLD was initially launched by academics and 'institutional actors linked to the Network of Social Studies in the Prevention of Disasters in Latin America

(LA RED). This DLD is also supported by UNISDR (DesInventar, 2013). In its endeavor to advocate for a more systematic use of DLDs in the arsenal or DRR-strategies, this paper cannot do without discussing the use and usefulness of DesInventar as a DLD. DesInventar owes its worldwide importance not least to its deployment in UNDP projects: 'The 57 databases that were analyzed cover five regions (Americas, Asia-Pacific, Africa, Arab States, EU-CIS), which includes 50 countries, four sub-national states, and two regions. 45 of these databases were developed using DesInventar and 11 have adopted stand-alone systems' (UNDP, 2013c: 21).

Pelling specifies that DesInventar was developed as a conceptualization, methodology and software tool for categorizing hazards such as ‘floods and storms’ without being limited to these (2006: 159, 167). The creators of DesInventar see their invention as ‘a system of acquisition, consultation and display of information about disasters of small, medium and greater impact, based on pre-existing data, newspaper sources and institutional reports’ that serves to prevent disasters deriving from: ‘Population growth and urbanization processes, trends in land use, increasing impoverishment of significant segments of the population, use of inappropriate technological systems in the construction of houses and basic infrastructure, and inappropriate organization systems, amongst others, are factors that have increased the vulnerability of the population vis-à-vis the wide diversity of physical and natural events’ (DesInventar, 2013).

According to its methodological guide, DesInventar is, both, a ‘retrospective and prospective analysis and of spatial-temporal representation of the effects (disasters) derived from conditions of threat and vulnerability, for the application of risk management - from mitigation work, to attention and recuperation post-disaster’ (DesInventar, 2009: 3). UNDP, promoting the use of DesInvenar, builds on this working definition by adding: ‘In DesInventar, a database is an inventory of the effects of disasters of diverse impact, with systematic information, brought together in a specific spatial resolution and with effect variables and homogeneous events’ (2013c: 6). Interestingly, although disasters are inherently multifarious and complex with interchanging cause-effect relationships and triggers, important functions of a database such as ‘categorization’ or 'classification' are not reflected in either of these definitions. The present paper will revert to this diagnosed lack of basic database functions of DesInventar after turning to other aspects of DLDs as well as the immediate context within which the latter are usually established.

Contextualization of risk, vulnerability and adaptation

Hydro-meteorological hazards are directly or indirectly triggered by atmospheric processes which, to some extent, make all these phenomena vulnerable to CC. When it comes to flooding, some experts tend to think of it more as a human-made disaster whereas others prefer to discuss it as a hydro-meteorological process. Considering this rather blunt distinction between flood as a disaster and as a cyclical phenomenon, the threat it poses to the human system is subject to a thorough understanding of risk. There seems to be a general agreement among most practitioners and scientists (see e.g. Brooks, 2003) that risk is the function of three variables: hazard, vulnerability and exposure.

Many villages in Southeast Myanmar were put at risk in August 2013 by the rapid release of waters from an upstream dam, across the border with Thailand. Keeping the water gates closed would have caused the structure to burst. As the decision was taken in extremis after ten consecutive days of heavy Monsoon rains, the sudden release of excess water caused a flash flood downstream. The triangular relationship between hazard, vulnerability/risk and threat/disaster breaks down the following way in this case:

(a) Hazard resulted from strong Monsoon rains and the hydrology of the delta plains, possibility worsened by CC and haphazard water release

(b) Vulnerability resulted from the presence of an upstream river barrage as well as the lack of protective infrastructure in villages against flash floods. People were vulnerable because they were not sufficiently warned. Infrastructure itself was vulnerable because the average flood levels it had been built for was exceeded

(c) People and infrastructure close to the average riverbed were directly exposed the hazard, water became a threat, thus resulting in disaster

As the assessment of risk had not been properly taken into account in this case - let alone preventive measures - this flash flood turned into a disaster affecting up to 38,000 people. For the purposes of this paper on DLDs, the reader may find the following definitions of risk, vulnerability and adaptation, as provided by the United Nations Office for DRR (UNISDR) and applicable throughout the UN system, useful. As such, risk is 'the combination of the probability of an event and its negative consequences'. Vulnerability is defined as 'the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard'. And adaptation is understood as 'the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities'.[4]

Climatic and hydro-meteorological hazard as well as the kinds of risks associated with these, are forecasted to increase proportionally with CC: The IPCC's SREX forecasts that intervals between extreme events for maximum daily temperatures ('virtually certain') and heavy rainfall ('likely') will decrease by the end of the 21st century (IPCC, 2012: 10; 12-13). In addition to reducing intervals between the recurrence of heavy rainfall and temperature extremes, thus causing rapid onset disasters, CC is also expected to gradually cause environmental deterioration via so-called slow-onset disasters. Building on the IPCC's findings, UNFCCC has recently called for 'the systematic observation of, and data collection on CC-impacts, in particular slow onset impacts, and accounting for losses, as appropriate' (UNFCCC, 2013a: 22). UNFCCC (2008: 4) also urges in its 'Bali Action Plan' in 2007 that 'enhanced action on CC adaptation' (CCA) must be made, in consideration of especially the least developed countries (...) affected by drought, desertification and floods' (UNFCCC, 2008: 4). Adger *et al.* (2007) provide an overview of current adaptation practices. As for losses and damages from climate-related disasters, according the UNFCCC's latest COP 19 these 'include, and in some cases involves more than, that which can be reduced by adaptation' (UNFCCC, 2013b).

The increasing overlaps between CCA and DRR communities of experts and policy makers have been mentioned above. Whereas the community of practitioners focusing on DRR has its origins in emergency responses to rapid-onset disasters, such as for example flash floods, the CCA-community is rather interested in long-term climatic variability and change, while trends of realignment between both communities are ongoing.

[4] For a further discussion of the concepts vulnerability, risk and adaptation, and as specifically pertaining to climatic hazards, see Brooks (2003, Füssel (2006; 2010) and Birkmann (2006; 2013).

Floods and dams as drivers for multiple disasters

According to Blaikie *et al.* (1994: 124) floods are normal in Southeast Asia, where seasonally elevated discharges serve agricultural productivity by mineralizing soils. However, as a result of the climatic extremes and dam construction, floods of higher frequency, magnitude, and onset speed are increasingly expected to turn hydrologic benefits into disasters. Floods become disasters when waters pass the thresholds to which human settlements have adjusted their boundaries or when waters transgress riverbanks, dams and canals.[5] Blaikie *et al*. warn that 'flood disasters are destructive of life not only through drowning and direct injury, but also because of associated diseases and famine' (1994: 124).

Looking back at ODA-sponsored activities of the last 50 years, one can, may reach the conclusion that building hydroelectric dams is good for economic development. Whereas hydroelectricity receives some extra support from the CC-community, most environmentalists and human rights activists scorn the high – and partly uncontrollable – impact of these structures (see e.g. Paterson *et al*., 2008: 2 or The International Rivers Initiative, 2014). In fact, constructions to dam rivers invariably change their environmental context: The well documented geological (e.g. silt block), biological (e.g. fish barrier), safety (e.g. bilharzia), atmospheric (e.g. increased evaporation rates), hydrological (flash floods) and chemical (e.g. eutrophy) alterations often turn dams into environmental hazards causing long-term deterioration. Dams heavily rely on hidden subsidies or come with negative externalities for the people who depend on the nearby environment, whereas the generated electricity is often sold to remote cities or given for free to private companies. The flash flood at the center of interest of this study can be considered as a composite technological, hydrological and climatological disaster, the typical recurrence of which likely to be increased by CC.

Insuring the livelihoods of the poor

Poor and marginalized communities are the most vulnerable as well as the most in need of community assistance in the aftermath of any disaster. According to Neumayer *et al*., the best DLD is currently owned by the reinsurance company Munich RE (2013: 5, see also Munich RE, 2014). Effective risk management, however, comes at a price, a price which can be too high, as insurance schemes are usually too expensive for poor rural communities (Blaikie, 1994). Yet, it is equally well established that financial mechanisms such as insurance, can, according to Adger *et al*. 'contribute to CCA' (2007: 723). The social benefits of widespread insurance are high, as shown by Ferguson (2008: 176-229) and property, health and crop insurance 'can efficiently spread risks and reduce the financial hardships linked to extreme events' (Adger *et al*., 2007: 723). A number of authors currently suggests that insurance schemes - if deployed according to their albeit diverging recommendations - can compensate their clients for disaster losses and damages (Adger *et al.,* 2007; Neumayer, *et al*. 2013; Wirtz *et al.* 2014). Skees *et al.* (2002) go as far as to defend this assertion specifically for less developed countries.

As for DRR and floods in particular, Blaikie *et al*. (1994) find that insurance schemes usually benefit the better-off groups. While Ferguson demonstrates that the commercialization of insurance schemes has played an important role in financial history, he also admits that insurances do not necessarily benefit the ones they claim to serve: One of his examples shows

[5] For a modeling approach to flood risk in Asia, see for example this publication by Dutta, Herath and Musiake (2006).

how vendors succeeded in copping out from the contracts that they had previously sold to the victims of Hurricane Katrina in the United States in 2005 (2008: 176-229). Commercial insurance had to be revised moreover as a direct consequence of the 2008 markets crash, which has exposed the lack of viability of many products. Hence, it is interesting to note in that context that Skees *et al*. (2002) had come forth before the 2008 economic meltdown. Accordingly, the political ecology argument is supported through this paper – in particular because poor communities are concerned that investments into insurances, as well as dams, primarily reflect the expected marginal profits of large corporate investments.

Options for Better Communication and Information

There are ongoing expert discussions as to the exact value of Information Technology (IT) for communication measures to improve risk management. With Satterfield *et al*. (2004: 115-129) it can be assumed that people who perceive themselves to be more at risk from environmental hazards can better prepare for the event of a hazard. There seems to be some dissent though over whether 'knowledge of CC causes, impacts and possible solutions' will actually lead to better adaptation (Adger *et al.,* 2007: 735). Yet, the IPCC advocates with 'high agreement, robust evidence' that 'integration of local knowledge with additional scientific and technical knowledge can improve' DRR and CCA (IPCC, 2012: 15) (UNISDR, 2011).

According to UNISDR 2011 '(...) human-computer interactions hold significant potential for future use in disaster management and risk reduction. They reduce the information load without omission of anything important, and allow interaction with data as in the real world'. The same UN agency holds that new technologies could thus 'facilitate all phases of a disaster through effective visualization support for situation analysis, decision making, and communication in the course of disaster management'.

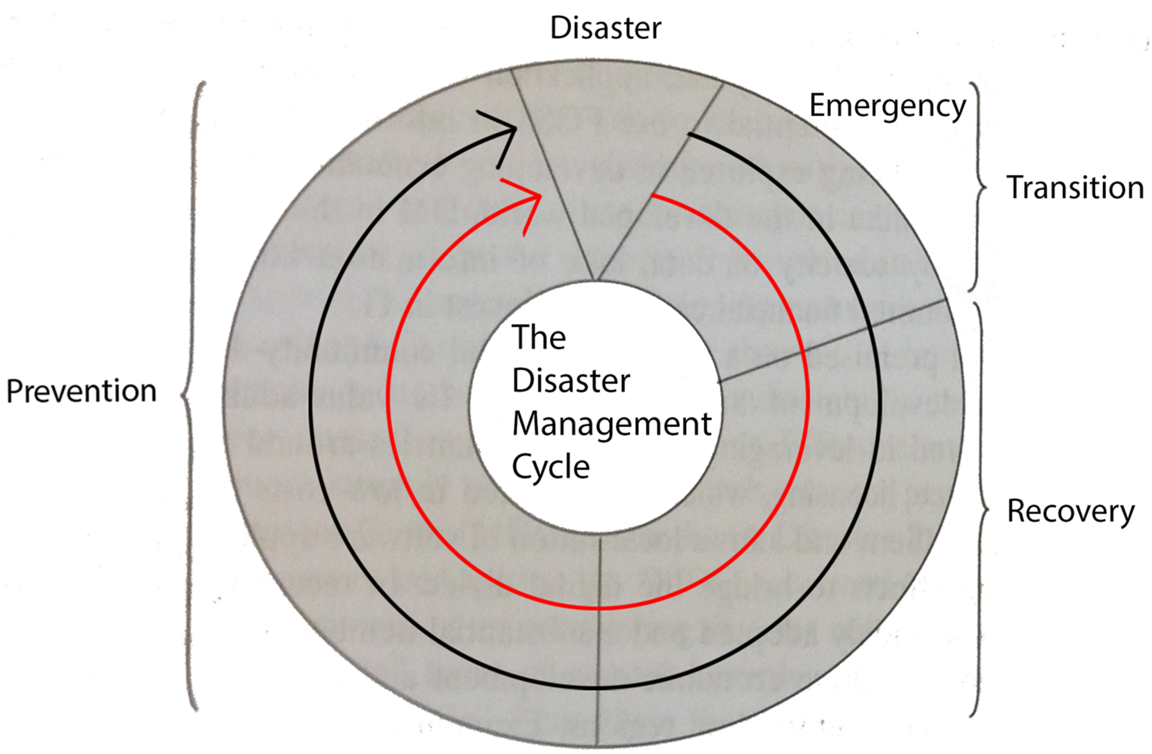
In this year's World Disaster Report, the International Federation of Red Cross and Red Crescent Societies devotes its attention to the rapidly rising importance of Humanitarian Information and Communication Technology (World Disaster Report, 2013: 13). Slow onset disasters entail those of incrementally higher magnitude and frequency. Climatic features that gradually worsen with CC, often leave disasters unnoticed, while already happening from a losses and damages perspective. In a way, all disasters reflect crises of communication and information. Conversely, information technologies (IT) can be used to improve risk assessment as well as disaster preparedness and response mechanisms. However, Neumayer *et al*. (2013: 5) point out that '[i]nitial reports on losses, which are usually available in the immediate aftermath of a disaster, are often highly unreliable'. In fact, the collective memory of disasters, even of the ones that attract a lot of media coverage, is typically flawed. Collective memory, media coverage and public awareness are, hence, particularly scarce when disasters develop either rapidly or particularly slowly. Losses and damages from these two types of disasters are thus difficult to assess, mainly because of failed or insufficient information, as well as a lack of data and communication.

DesInventar as a Free and Open Source IT and Communication

Unless privately operated, as explained for the case of insurance companies above, DLDs can be managed publicly. Zephenia's recent contribution (2012) highlights the usefulness of Free and Open Source Software (FOSS) opportunities for DRR: 'FOSS is premised on a collaborative and community-driven model of software development and maintenance' (2012: 127). FOSS for improved information and communication to support DRR is likely to become more commonplace in the arsenals of stakeholders that set out to reduce the disaster risks of poor communities.

Alas, Zephenia (2012) misses out on modeling, even roughly, the extensive scale of improvements that could be brought about by FOSS and in particular DLDs. In Figure I, DLD-benefits are shown by the black and red circular arrows. The size of the black arrow denotes traditional disaster management with larger losses, the red one has a smaller radius – representing fewer losses – because it draws on the advantages of DLDs in all stages of the DRR-cycle. The increasing availability of FOSS can help DLDs to be used easily by platforms of various private and public stakeholders, including the civil society. In fact, supported by UNDP and other UN agencies, governments across more than 50 countries have DLDs already in place, while activities are ongoing to expand this programme, e.g. in Myanmar (UNDP, 2013c: 14).

Figure 1. Disaster Management Life Cycle without DLD and with (in red)



Source: Modified after ZEPHENIA (2012: 128)

According to Zephenia (2012: 128) 'destruction of infrastructure and property' as well as 'losses of human and animal life' can be better avoided when improved communication systems such as FOSS are at hand. Without establishing the link between DLDs, FOSS, information and communication technologies, Zephenia (2012) has effectively promoted the deployment of DLDs in the interest of poorer communities, i.e. those that are not yet covered by insurance schemes. Building on Zephenia's argument, if DLDs are made publicly available as FOSS, DRR becomes 'resilient and allows [de-]localization of software applications, thus accelerating efforts to bridge the digital divide' (2012: 129). As such, DLDs could even be considered as a democratic approach to the technology transfer from post- to pre-industrial countries that is being discussed under the UNFCCC.

Hence the proposition to have databases as retrospectively and continually proliferating inventories of losses and damages, i.e. DLDs (see e.g. Pelling, 2006: 159, 167). The purpose of DLDs is to generate a systematic and homogeneous database on the negative effects of disasters across administrative units with the highest possible geographical and historical detail. In addition to the local, NGO-run and sector-specific DLDs, there are at least three more global ones that are worth mentioning: DesInventar, NatCat and EMDAT. DesInventar is the only one that features exclusively in the FOSS online segment.

EMDAT serves mainly humanitarian purposes and is managed by the Belgian Centre for Research on the Epidemiology of Disasters (CRED, 2013). Neumayer *et al*. (2013) provide an interesting account of the world's largest DLD, NatCat. The authors specify that '(…) with more than 20,000 entries of country years with recorded disaster damage over the period of 1980-2009, it is by far the most comprehensive existing global database on natural [sic!] disaster damage. The database reaches further back in time, but Munich Re acknowledges that before 1980 the data become increasingly unreliable and incomplete' (: 5). Data '(…) sources [are based on] government representatives, relief organizations and research facilities, but also information of insurance associations and insurance services as well as on claims made by Munich Re's customers' (Neumayer *et al.,* 2013: 5).

Every proliferating database reaches a threshold when traditional techniques for working with data are exhausted. At that point, managers draw upon high-performance computers and IT for data analysis and communication. According to Loukides (2011: 7) 'as storage capacity continues to expand, today's "big" is certainly tomorrow's "medium" and next week's "small"' (see also Zephenia, 2012). With growing data volumes, respect of the functions and premises of any database becomes more important. These include in chronological order the list of the following five basic stages (Loukides, 2011: 6):

- Data collection
- Disaggregation
- Classification or categorization
- Management of discrepancies and
- Analysis and communication

The subsequent section pertaining to the case-study will explore how DesInventar positions itself as one of the main DLDs against this general backdrop of guiding principles on database management and structure. DesInventar does not aim at classifying data. While the deeper reasons for this are complex, a first-hand explanation is already available: Its intrinsic methodology is, at this stage, unable to break collected data into statistically workable categories.

Research Method and Data Structure

Studying climatic events and meteorological processes today arguably allows science to better understand and anticipate the kinds of extremes that will mark climates at the end of the 21st century (see IPCC, 2012: 10, 12-13). While not aiming at discussing the possible exchanges between natural- and social-scientific methodologies, or contesting the IPCC's credibility for what it is, this paper seeks to strengthen the growing public policy efforts towards DRR and CCA. It further advocates for the establishment of DLDs as an effective strategy for preventing climatic hazard from turning into disaster. Heltberg, Siegel and Jorgensen (2008) argue that a lot of CC-mitigation and disaster reduction measures would already lead to much better risk control regardless of the exact timing and vigor of the anticipated climatic changes. The present paper chose the 'No Regrets' ethical approach to CC purported by the said authors (Heltberg, Siegel and Jorgensen, 2008: 12). In terms of a scientific method, this paper's central argument has been derived from a review of literature and further draws on empirical data from a case-study.

The case-study was conducted in two subsequent phases of data collection during the author's presence in Myanmar in August 2013: The first phase was his professional involvement in a DLD-management project in Yangon and the second was his private field visit to areas at the Thai-Myanmar border, flooded at the time.

The used methods reflect, in more detail, a mutually reinforcing and spontaneously adapting application of 'participant observation' and 'conversations with a purpose', theoretically described by Valentine (1997) and Bryman (2001)

The work-related phase of empirical input was dominated by an improved understanding of the discussions around development of DLDs. The focus was specifically put on Myanmar's DLD, after a global understanding had been gained by a prior literature review. The main research questions underlying the author's field study were around institutional funding and ownership, progress and prevailing challenges. More than three informal interviews were conducted during a three-day professional stay with the UNDP country office. Of these, one was held with the program analyst in charge of DRR and CCA, one with the manager of the DLD project and one with an expert-consultant who regularly advises the Government of Myanmar on DLDs.

At a second stage of data collection additional observation and interviewing took place. This phase was marked by a visit to the flood-affected areas and communities in Kayin State together with humanitarian workers from the United Nations Organization. The method used at this occasion was the same as in phase one, where involvement was less active. The author directed his main attention to the self-analysis of relief efforts by the humanitarian workers. In total, three interviews were conducted as an integral part of participant observation under this phase. One of these was done with a humanitarian worker on duty, another with the father of a family whose house was flooded and a third with a driver whose family was affected. Of the overall six interviews or 'conversations with a purpose' that were undertaken, three were done with women and three with men.

While, during the first phase, observation consisted mainly in understanding the dynamics of attempting to establish DLDs between a development agency and about twenty other stakeholders, observation during the second phase became a direct witnessing of some of the losses and damages that are caused by a flood as well as of targeted relief efforts. Upon completion of these two phases of fieldwork, the received visual, written and verbal material was compiled and re-worked through notes. Thus useful data-linkages between stakeholders, agendas, strategies, devices and real actions were retained. Those portions of the study, which are directly useful to this paper's take at developing a public DLD in Myanmar, are presented under point five below.

Case-Study

Internal communiqués that circulated between humanitarian agencies in early August 2013 reported that almost 40,000 villagers had to be evacuated from their dwellings in Southeast Myanmar as a result of a vast river flooding. After ten days of continued heavy rainfall, a dam across the border with Thailand had reached its maximum capacity Operators decided to suddenly release excessive waters to reduce the risk of the dam bursting. Due to a lack of a communication they could not inform all the dwellers of the downstream villages on time, who then had to either be urgently relocated or were dangerously affected and subsequently became the beneficiaries of relief efforts.

One international helper commented: ‘People put their cattle into classrooms to save it from drowning while their own huts were underwater’. The pillars upon which huts and houses are typically built were not high enough to prevent the floodwaters from entering their living space in this case. The Government of Myanmar, humanitarian agencies and organizations assisted the victims, and no casualties were reported.

The Government of Myanmar, supported by a DRR Working Group, UNDP, UN-HABITAT and UNISDR, is implementing an environmental programme with a DRR component. One of the main activities of this DRR component is the establishment of a DLD. Ongoing activities rely on the Relief and Resettlement Department as the leading government authority, also including the General Administration Department, the Ministry of Environmental Conservation and Forestry, the Department of Rural Development, the Ministry of Energy and the Department of Meteorology and Hydrology. Based on DesInventar technology, the planned DLD can be kept up-to-date in live by the circa 20 key stakeholders that are involved at this stage. It is being set up to reach 40 years back into the country’s history and to cover all its administrative units at national, regional and local levels.

Efforts to establish a public DLD are made by the Government of Myanmar at a time when urbanization and land grabbing rates are high and poor communities are still excluded from the expected benefits that the ongoing rush to the country's resources generates (Fuller, 2013). Yet, according to UNDP (2013c: 41), the data density of DLD records in Myanmar is still scarce. Key stakeholders that are involved in the current constitution of a DLD for Myanmar have relatively low budgetary and human resources capabilities, which explain the support of UNDP, UN-HABITAT and UNISDR. Yet these agencies might have underestimated the difficulties that project implementation is currently encountering while trying to obtain useful data from across ministerial mandates and sector silos. The project is progressing slowly while authority over the DLD is still being negotiated. As two of the supervisors put it: ‘Ownership for the project has yet to be built’. In addition, DesInventar has a fundamental flaw when it comes to data disaggregation.

The DesInventar 2009 methodological guide lacks a discussion on how to obtain non-disaggregated data from disasters and reports of such. As a logical consequence, the database is unable to deal with clearly defined, manageable units. To put it in general with Loukides, ‘data is frequently missing or incongruous and many sources of “wild data” are extremely messy. The first step of any data analysis project is “data conditioning,” or getting data into a state where it’s usable’ (Loukides, 2011: 6).

Instead of applying the five basic steps of any database, as outlined above in this paper, the methodological guide of DesInventar provides a vaguely political recommendation on how to understand the volumes of messy data that become available during a disaster: ’One of the objectives of DesInventar’s methodology, and precisely one of the motives for its development, is to validate or improve hypotheses about the relationship between disasters and conditions of vulnerability. For that reason, it should try to facilitate the relation between inventories and other social, economic or environmental variables' (DesInventar, 2009: 14).

Surprisingly, on the Internet landing page for the Desinventar methodology, the authors draw attention to the necessity of having disaggregated data: 'inventories require fully disaggregated data for each of the geographical units in the selected zoning system. [Disaggregating data] has tremendous implications on the work and the later usability of the information' (DesInventar, 2013). By this indication or self-warning, the authors of DesInventar have probably tried to correct the methodological flaw that they have retroactively become aware of - admitting themselves that: 'Unfortunately large and medium disaster information is very often not available in its disaggregated form' (DesInventar, 2013).

As one UNDP employee supervising the organization's global DRR activities has pointed out: 'Check [DesInventar], none of the data is disaggregated!' In fact, the authors of DesInventar seem to have had feedback already, as they explain that 'disaggregating data is a difficult task [that] will raise dramatically the level of effort. Researchers face the problem of disaggregating data very frequently and there are many instances where the problem has simply no solution' (DesInventar, 2013).

As part of project implementation, UNDP already deals with the problem of not being able to put raw data into categories that are useful from a scientific perspective: 'The aggregation of losses in this manner is possible in only six cases among the 57 surveyed – Jordan, Kenya, Lebanon, Solomon Islands, Vanuatu and Vietnam' (UNDP, 2013c: 27). Six of its projects have been able to establish DLDs that can be slightly better analyzed, by combining DesInventar with a supplementary disaster disaggregation tool, the global disaster Identifier, GLIDE. 'The GLIDE consists of: two letters to identify the disaster type (i.e. TS for Tsunami); the year in which the disaster event occurred; a six-digit, sequential disaster number; and the ISO country code, i.e. IDN for Indonesia. For example the GLIDE number that corresponds to the 2004 Indian Ocean tsunami is: TS-2004-000147-IDN' (UNDP, 2013c: 22). When used in conjunction with GLIDE, DesInventar is thus able to establish a slightly more manageable DLD. To become even more useful, in terms of understanding disaster impact and of preparedness options, much finer categories to understand disasters would have to be added.

In conclusion of this section, it can be stated that DesInventar is generally likely to generate database analyses of higher political and lower scientific value. Messages can be generated along the following: 'Indeed, there is loss and damage and it increases in the event of a disaster'. Unfortunately the public cannot be informed any further than this under current DesInventar methodology. In the six cases where the GLIDE-disaggregation adds to the latter, losses and damages can be broken down per type of disaster.

DesInventar does unfortunately not, at this time, provide data sets that are systematically disaggregated. Disaggregation would for example be useful, if done according to the categories outlined in Table 1. Pelling (2006:167) might thus have wanted to appreciate the qualities of DesInventar with greater caution, in particular so, when pointing out that this tool had advantages in terms of 'categorization'.

The fact that the DesInventar methodology generally lacks disaggregated data does not mean that all related projects have a weak methodology. In the case of most public sector projects, having more detailed databases would require more budget and experts than typically available to governments or agencies such as UNISDR, UNDP or the DesInventar consortium. The insurance industry has DLDs of much higher quantity of population and quality of disaggregation due to a direct interest in having reliable information that is much more vested, continued and specific. Regulation of this industry should thus be revisited in a way to improve public DRR by sharing the available data, which thus becomes deployable by public administration to reduce mortality, morbidity as well as losses and damages. At the same time, new ways must be explored to ensure fair competition between companies that enter new markets or want to operate in economies such as Myanmar, in terms of publicly available data.

As for the flood of August 2013, another helper commented: 'The number of 38,000 relocations remained unpublished in order to avoid cross-border tensions and to avoid political 'headaches' at the top levels of the concerned organization'. UNOCHA has merely come forth via the internet with estimates of 245 schools that were allegedly closed and 30,000 acres of farmland that were inundated (Reliefweb, 2013). For this event, having had a DLD would have allowed the Government of Myanmar to synthesize a comprehensive picture of the damage across sectors and townships and to compare it with similar events in the past. Sharing data from the DLD would thus have been an administrative reflex rather than a political move, potentially serving to improve the resilience of vulnerable populations.

Conclusion

The promise that governments might one day be able to claim compensation for CC-related disasters under the UNFCCC on the basis of forensically traced losses and damages, might boost their motivation to populate DLDs. This should, however, not be the main driving force behind such an investment. There is too little evidence available to date to establish a direct causal link between losses and damages and global climate change as the single overarching cause of all climatic and hydro-meteorological hazards. In fact, recent discussions over approaches to prevent losses and damages at COP19 have not evolved in that direction. The longer discussions prevail, the more likely the majority of countries that are now at the asking end will also eventually become GHG-contributors.

Although studying past disasters may not allow predicting future extreme events and related threats, DLDs encapsulate a great potential improvement in terms of natural hazard-related public disaster management. In order to ensure good and persistent administration through transparency, communication, and accountability in the DRR-sector, governments could set up, populate, and manage DLDs. Reinsurance companies already dispose of rich and disaggregated databases that serve them to understand what causes losses and damages, and how these can be avoided and partially compensated.

It can therefore be concluded that DLDs would help governments take informed DRR- and CCA-related decisions. Especially in countries like Myanmar, where vast, poor communities in cities and villages are highly vulnerable and exposed to natural hazards, it can be concluded that the available database is most useful when it is sufficiently well populated. Database operators should strive to properly structure and disaggregate data to the extent that it is not only useful as a basis for political statements but also as an empirical foundation to run statistical analyses. Once this is the case, DLDs can become effective tools on the basis of which to develop information packages to improve preparedness and early warning mechanisms and to develop broader communication and awareness raising tools for DRR and CCA. Disaster risk management would be improved through effective involvement of all key stakeholders and the bridging of sector boundaries.

As shown above, this argument holds true for flash floods and floods that cause long-term environmental deterioration, linked to CC. Ongoing efforts towards the creation of a disaster loss and damage database in Myanmar could continue to involve all relevant governmental units and stakeholders from across the affected sectors. Stakeholders here could take the lead in terms of data disaggregation for their public DLDs under the current UNDP quality assurance and thereby improve on the extant but flawed DesInventar methodology.

Stakeholders could centralize individual records of losses and damages by aiming at a rich DLD that contains data from the impacted sectors and by using best practices from the insurance sector in terms of database management. One of the main reasons for considering a private-public partnership for DLDs could be the statistically useful disaggregation of the available data that insurance companies have on offer. Such an improved database handling could be designed to improve flood preparedness and risk management of the smallholder farmers in the delta plains Myanmar. These groups are in high need of measures to prevent their livelihoods from extreme floods.

Communication before, during, and after disasters should be based on robust DLDs in order to reduce the vulnerability of those communities that are likely to face climatic and other hazards. A publicly managed DLD could become an integral part of any country's DRR strategy, as long as it is the government's decision to effectively improve the resilience of poor and vulnerable populations. In particular so, considering the anticipated CC-impacts.

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