International Journal of Disaster Risk Reduction ∎ (∎∎∎∎) ∎∎∎–∎∎∎

Contents lists available at ScienceDirect

International Journal of Disaster Risk Reduction

journal homepage: www.elsevier.com/locate/ijdrr

Data sources on small-scale disaster losses and response – A Swedish case study of extreme rainfalls 2000–2012

Magnus Johansson [a,b,*]

[a] Centre for Climate and Safety, Karlstad University, Karlstad, Sweden
[b] Lessons Learned Section, Swedish Civil Contingencies Agency, Karlstad, Sweden

ARTICLE INFO

Article history:
Received 5 September 2014
Received in revised form
12 December 2014
Accepted 12 December 2014

Keywords:
Data sources
Small disasters
Hazards
Losses
Extreme rainfall
Verification

ABSTRACT

Societal interest to evaluate and learn from disasters is scale dependent. Low frequent hazards with small impacts are often invisible at national level from an evaluation point of view and limited possibilities exist to compile publicly available data on losses and management in the aftermath. This study presents an inventory of possible data sources for 14 extreme rainfall events in Sweden 2000–2012. The sources, such as official sectorial institutions and media, and their content are analyzed in relation to reliability and verification opportunities. The use of free-text fields in official reporting systems and questionnaires, primarily designed for basic data capture from daily occurring accidents, is highlighted as important to achieve enhanced data that can be used to verify information from other sources, especially media archives.

1. Introduction

Collecting and comprising information from past incidents and accidents, is a tightrope walk with quality considerations weighting on one side and reasonable efforts on the other. Basic data, primarily health-related and evidence based, are typically collected for daily accidents in different societal sectors (e.g. traffic, hospital, etc.) and made visible on national level as statistics, but mainly limited to answer questions like *how often* and *how many*. In preventive safety work, the basic statistics rapidly pose more in-depth questions about *consequences*, *coping capacity* and *why things happened*, which require more data with higher resolution. In a perfect system all desired variables are collected and analyzed for all types of accidents in our society, but the task to do so is unfeasible due limited time and resources in relation to the number of accidents. Still, within politically prioritized areas, enhanced data for accidents that are unusual in some way, unexpected, widespread, disastrous and/or less frequent, are often collated to complement and deepen our knowledge. It can be done systematically with a possible statistical scale up of results supporting national or international analyses, for instance as the case with the European Injury Database [10]. However, when historical damage and loss data are to be comprised from publicly available sources, not originally designed for this purpose, statistical means can rarely be achieved with accuracy [9,11,50]. Different sources of information may also contain dissimilar or contradictory data for the same event, with limited verification possibilities [38]. Nevertheless, after disasters that cause extreme stresses in society, data capture and learning are regarded as key components, together with reorganizing activities and transformational changing over time, in building the ability to cope with future risks in resilient societies [4,23,34].

Disasters may be natural, technical or man-made in origin, but typically they are the consequence of extreme weather and climate variability [47]. According to the UNISDR, [45], disaster implies “a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources”. The combination of exposure to a hazard and the prevailing conditions of vulnerability determine broadly the consequences [4]. Disasters can be small, moderate, large or extreme in scale, but the impacts of small and moderate disasters are often not visible on national level and therefore not regarded as disasters, nor registered and comprised, in international disaster databases and statistics [21,25]. Lavell [20] points out that small disasters have frequent negative influence on excluded, marginal groups and Wisner et al. [49] stress the importance of their accumulated economic, social and human impacts. Evaluations of databases built on the DesInventar method [16,19,24,25,46] have also shown

* Correspondence address: Centre for Climate and Safety, Karlstad University, 65188, Karlstad, Sweden.
E-mail address: magnus.johansson@kau.se

http://dx.doi.org/10.1016/j.ijdrr.2014.12.004
2212-4209/

that over time, the accumulated effect of small disasters can be equivalent to the impacts of the much less frequent large scale disasters, which are registered and collected in non-proprietary global datasets like the Emergency Events Database (EM-DAT) (www.emdat.be) or databases held by international reinsurance companies like NatCatSERVICE (www.munichre.com) and Sigma (www.swissre.com).

In this paper a simple model that describes common strategies within practical data collecting, from daily accidents to yearly disasters, is presented and used as a theoretical framework in a study on possible data gathering for learning after small-scale disasters in connection with extreme pluvial (rain-related) flooding in Sweden during 2000–2012 ($n=14$). Extreme rainfall in a Swedish context mean >90 mm/day over 1000 km^2 [39]. Suitable sources of information for inventory, such as official sectorial institutions and media, will be used and their content explored in relation to reliability and verification ways and means. Accordingly as a contrast, information about the great storm "Gudrun" in 2005 [26] is inventoried to highlight scale as a determinant factor for societal interest to evaluate and learn from disasters.

2. Basic and enhanced data collection – a systematic approach

The aforementioned tightrope walk could also be described by putting data resolution against completeness (Fig. 1). Here, basic data is the attempt, or ambition, that various actors at national or regional level have to capture all types of incidents and accidents that occur on a daily basis within their area of responsibility. In a Swedish context input may as example come from public hospitals, where information regarding in-patients have been stored and compiled since the 1960s by the National Board of Health and Welfare, or local rescue services through their incident reports, collected and analyzed since 1998 by the Swedish Civil Contingencies Agency (MSB). The level of resolution for basic data varies for different types of accidents depending on actors awareness of benefit, interest and willingness to document and report, relative risk profile and political priorities within certain accident types.

In a perfect system all accidents are thoroughly investigated to explain accident causation and all conceivable relevant variables are collected, but this is too resource intensive and impractical. Instead as a rule, attendant in-depth information, or enhanced data, are collected and analyzed occasionally for mostly more severe or unusual accidents, where there tentatively is something to be learned for society (Fig. 1). Initiatives to extended accident investigations may come from the local rescue services after an observed deficiency in their response management of a daily accident, but the onset may also come from sector responsible national agencies, especially after events that comprise multiple accidents, e.g. car collisions, derailment of a train, industrial accidents or impacts from natural hazards. In general, natural hazards like storms, floods, extreme precipitation or earthquakes, imply multiple accidents, sometimes with cascading effects, emerging more or less simultaneously over a wide area resulting in many different accident scenes. Exceeded coping capacities cause large stresses on actors and there is an obvious risk for perfunctory documentation *ex post* the response phase.

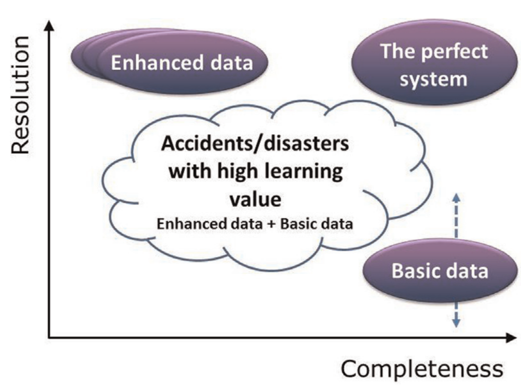

Fig. 1. Common data collecting strategies to support risk assessments in society. The central "cloud" in the middle describes the coverage of data inventories after major accidents or disasters as a consequence of *ad hoc* approaches with many different methods.

Beside injury, infrastructural failures and other type of impact data, cause and evolution of the event, operational tactical decision making, response measures and intervention results are sometimes occurring data in extended accident investigations. However, without any clear systematic control data capture after such *high learning value events* (HLVE) will be of *ad hoc* type, possibly impact driven, and tend to float around in the middle of the diagram (Fig. 1), limiting possible analyzing of data trends across several events. Type-specific guidance for accident investigation and standardization of data variables are necessary for analytical reasons (trends over time) within application areas like disaster loss accounting, disaster forensics or risk modelling [6] and have long been much in demand [5,11,13,33,38,50], not least in the Hyogo Framework for Action 2005–2015 [44] and the EU disaster prevention framework [6,7]. There is a present strong international movement for capturing more accurate and voluminous loss and damage data, and especially desired as decision support for global, inter-state, commitments about risk reduction and adaptation to climate change aspects [17,48].

3. Potential data sources

Potential data sources have in different approaches been explored in relation to the basic need to assess risk-focusing on potential future losses, realized risk or past disaster data [38]. In general, this means a search for data broadly categorized into hazard and vulnerability.

The DesInventar methodology, developed since 1994 by several researchers, academics, and institutional actors linked to the Network of Social Studies in the Prevention of Disasters in Latin America (Red de Estudios Sociales en Prevención de Desastres en América Latina-LA RED), is focused on systematic gathering of information about past disasters of small, medium and greater impact, associated with natural hazards [8]. The data is produced and archived in the aftermath of an event and may come from official data, institutional reports, newspaper sources or academic records. With the support from UNDP and UNISDR the method has been implemented in c. 70 countries worldwide (2014), where publicly available disaster loss accounting data systems now are available [8]. These systems have been important as input to the Global Assessment Reports (GAR) on disaster risk reduction, the latest published in 2013 [47]. Only three countries in Europe have adopted and implemented the Desinventar method until 2014; Albania, Serbia and Turkey.

The Desinventar list of classified sources of information for disaster data, recommended to be included in an inventory on national level, is applied in this case study as guidance. The sources are ordered by the priority they should be used (if available at all), based on reliability and quality considerations [8]:

1. Official emergency management agencies.
2. Official sectorial institutions.
3. Relief or aid organizations.
4. Academic and scientific institutes.

Please cite this article as: M. Johansson, Data sources on small-scale disaster losses and response – A Swedish case study of extreme rainfalls 2000–2012, International Journal of Disaster Risk Reduction (2015), http://dx.doi.org/10.1016/j.ijdrr.2014.12.004