

Helpdesk Research Report

Impact of extensive disasters

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Question

Please identify literature which captures the impact of extensive disasters on vulnerable communities (and if possible makes comparisons with the impact of intensive disasters). Please provide a summary of the literature and annotated bibliography.

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1. Overview

Extensive risk is defined by the United Nations International Strategy for Disaster Reduction (UNISDR) as 'The widespread risk associated with the exposure of dispersed populations to **repeated or persistent hazard conditions of low or moderate intensity**, often of a highly localized nature, which can lead to debilitating cumulative disaster impacts'¹. UNISDR further describes extensive risk in the 2009 Global Assessment Report on Disaster Risk Reduction² as causing frequently occurring low-intensity losses, particularly emphasising the large **number of people affected** and **damage to infrastructure**. Extensive disasters do not generate major mortality or destruction of economic assets, but expose vulnerable people to low and moderate intensity hazard.

Examples of types of extensive disasters are given in the literature as floods, landslides, storms, fires and so on – these are often weather-related. This report collates available literature discussing the impacts of extensive risk and extensive disasters, in the form of a summary and annotated bibliography.

¹ <http://www.unisdr.org/we/inform/terminology#letter-e>

² United Nations International Strategy for Disaster Reduction Secretariat (UNISDR). (2009). *Global Assessment Report on Disaster Risk Reduction: Risk and poverty in a changing climate: Invest today for a safer tomorrow*. United Nations. www.preventionweb.net/gar09

2. Summary of the literature

Many experts do not use the term 'extensive disaster' (Expert comment). A search for the basic terms "extensive disaster" impact' yielded only 178 results (from 2002 to present) in Google Scholar. The **term is derived from UNISDR and has not yet spread into common usage**. This report therefore draws heavily on the UNSIDR Global Assessment Reports from 2009, 2011 and 2013, and their associated background papers. Additionally, in this work the term is generally 'extensive risk' rather than 'extensive disaster'. A broader search for terms such as 'small disaster'; 'silent disaster'; and 'cumulative disaster' revealed some relevant literature which is included here. A more extensive search would be able to pick out relevant impacts from papers which look at low-level and small-scale disasters which do not explicitly use the UN definition of 'extensive disaster'.

The literature collected for this report tends to describe the environment of extensive disaster but not focus much on the impacts. Most literature is critical and academic, and much consists of analysis of existing disaster databases, rather than experimental research or case study observation. Extensive disasters are not always recorded and tracked in disaster databases, so there is **limited evidence** of impacts and costs. Most literature concentrates on Disaster Risk Reduction (DRR) and approaches for responding to disasters. There is a considerable crossover with urbanisation literature and climate change research, and to some extent social protection responses.

Although there is a **small evidence base**, the literature is quite consistent in describing that the major difference in impacts of extensive and intensive disasters is that the former produces **loss of economic assets and livelihoods**, while the latter has much higher rates of mortality and direct economic loss. Intensive disasters are often classified as such based on the mortality rate; while extensive disasters are considered to have lower impacts as they do not kill as many people:

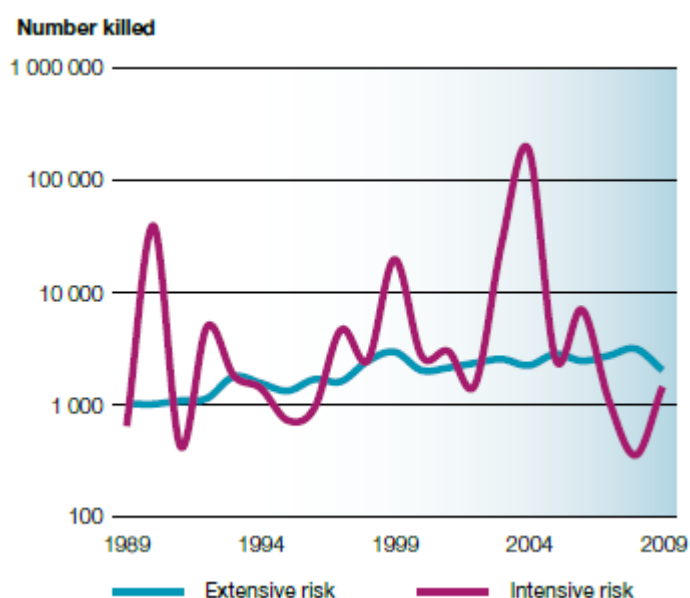


Figure 1: Mortality from extensive and intensive disasters, 1989–2009 in 20 countries in Africa, Asia, Latin America and the Middle East

Source: (United Nations, 2011: 36, Figure 2.20).

However, the literature is agreed that extensive risk and disaster produces **high levels of economic asset and livelihoods loss** (such as crops, infrastructure, housing, etc.) and high levels of **loss of public services**, which indirectly affects livelihoods (United Nations, 2011). The strongest focus in the literature is on economic damage, which some reports estimate to be very considerable, and growing (e.g. UN, 2011). This includes **infrastructure damage** to private and public property, often measured through damage to

educational and health facilities. Extensive disasters may comprise a higher percentage of total economic losses due to disasters than intensive disasters (United Nations, 2013).

A secondary impact from extensive risk is damage to **health and wellbeing**. It is regularly cited that floods can cause disease outbreaks and/or loss of safe drinking water (e.g. UN, 2013). Infrastructure damage and physical hazards also heighten the risk of injury. Drought and floods which affect agriculture will also likely cause nutritional impacts, particularly on growing children. Health, hygiene and sanitation impacts are thus felt as a result of extensive disasters (Pando & Lavell, 2012).

A reasonable number of papers in the literature reviewed identify that **certain populations are more vulnerable** to these impacts than others. **Children** are particularly noted as suffering disproportionately, as the loss of school infrastructure can cause school dropout, and loss of household food supplies and income can lead to malnutrition and stunted development (UN, 2011). Other vulnerable groups are the same as in many situations: **women, older people, and minority groups**. The literature very clearly observes a strong **link between poverty and vulnerability** (Serje, 2010) – the poorest always experience the most negative impacts of disasters, as they tend to live in areas without good infrastructure and services, do not often have insurance, and lack political voice to claim reconstruction support (Dodman et al., 2013).

3. Global Assessment Report (GAR)

Revealing Risk, Redefining Development. Global Assessment Report on Disaster Risk Reduction 2011

United Nations. (2011).

<http://www.preventionweb.net/english/hyogo/gar/2011/en/home/index.html>

The GAR 2011 identifies extensive risk as mainly associated with storms, flooding, fires and landslides, and linked to climate variability; and **damaging housing, crops, livestock and local infrastructure**, particularly affecting **low-income households and communities**. The report highlights that poorer households experience worse impacts than richer ones. Extensive disasters cause **fewer mortalities** than intensive disasters, but much **higher levels of damage to public assets** (e.g. schools, health facilities, other infrastructure) and **livelihoods and assets of low-income groups**. Loss of housing may cause internal displacement.

Most extensive disaster losses are not systematically tracked by governments. The 'data universe' of GAR comprises disaster reports from different countries, of which there are 200,000 local level reports from 20 countries over 40 years. Analysis of the data shows: extensive risk accounts for (across all disasters recorded) 9.6 per cent of the deaths; 20 per cent of the houses destroyed; 55 per cent of health facilities damaged; 54 per cent of houses damaged; 45 per cent of schools damaged; 80 per cent of people affected; and 83 per cent of people injured.

The report states that **extensive disasters have increased in the past 20 years**, measured through increases in the number of reports of losses, people and houses, schools and health facilities affected. Extensive disasters are also expanding geographically. Some of this is due to improved reporting, but not significantly. Countries assessed to have stronger risk governance capacities appear to use this to reduce mortality, but are less able to reduce housing damage and numbers of people affected by disasters.

Children are particularly affected by disasters, as they are most vulnerable. Loss of household assets and livelihoods compound the loss of school infrastructure, which can cause school dropout; and loss of food supplies can cause malnutrition and stunted growth and development.

From Shared Risk to Shared Value: the Business Case for Disaster Risk Reduction. Global Assessment Report on Disaster Risk Reduction 2013

United Nations. (2013).

<http://www.preventionweb.net/english/hyogo/gar/2013/en/home/index.html>

GAR 2013, which focuses on businesses, identifies that large global businesses are not often at risk from extensive disasters. However, more than 90 per cent of **damage to roads, power and water supplies** comes from extensive risk, which causes indirect impacts on business. Smaller businesses are less able to recover than larger ones. In this most recent report, extensive risk is responsible for 13 per cent mortality and 42 per cent total economic losses across all disasters recorded. These small-scale disasters account for **nearly as much accumulated loss** as major disasters.

The report identifies extensive risk as mainly weather-related hazards including surface water and flash flooding, landslides, fires and agricultural and hydrological drought, which are exacerbated by badly managed urban development, environmental degradation and poverty. In particular, flooding in urban areas is known to cause health problems, e.g. cholera in Maputo, Mozambique. This **disproportionately affects the poor**, who are more likely to live in flood-prone and poorly managed areas. Further social impacts are not accounted for by governments, but it is clear they are mostly absorbed by the most vulnerable sectors of society. It is not currently possible to generate a global vision of extensive risk, due to the **lack of data** for modelling. However, 56 countries are collecting data on disaster damage, so this may be possible soon. Much data is available in Annex 2 of the report.

GAR13 suggests that extensive risk primarily affects the **agricultural sector**, while damage to **educational facilities** is also rising rapidly.

Small Businesses: Impact of Disasters and Building Resilience

United Nations Development Programme (UNDP) Crisis Prevention and Recovery. (2013) (Background Paper prepared for the Global Assessment Report on Disaster Risk Reduction 2013). Geneva: UNISDR

<http://www.preventionweb.net/english/hyogo/gar/2013/en/bgdocs/UNDP,%202013.pdf>

This report finds that Micro, Small and Medium Enterprises (MSMEs) are disproportionately affected by disasters, but have greater flexibility in response than bigger firms. **Quick responses and networks** seem to have maximised MSME comparative advantage over larger firms, which has enabled quick recovery. Extensive risk attracts much less attention from funders and researchers, meaning there are **large evidence gaps** on how extensive disasters impact MSMEs. The report suggests that particularly poor and vulnerable communities are likely to suffer more than better-off areas: **informal MSMEs have higher vulnerability and less access to risk-management tools**. Lack of business and health insurance creates higher vulnerabilities.

Economic impacts such as **loss of assets and staff** reduce the financial viability of MSMEs, and they have fewer coping strategies than large firms. Damage to basic services can cause **population displacement** which compromises business viability. When infrastructure is damaged, this can cause **temporary business closure** while repairs are made (which has direct financial costs if businesses are uninsured). Disruptions to public services may also force closure: electricity, water supply and sewage, fuel, transportations and telecommunications.

Different sectors show different impacts: retail MSMEs, particularly informal entrepreneurs, can recover faster; manufacturing MSMEs can lose assets and staff which creates longer-term closures; tourism MSMEs tend to bounce back quickly; construction MSMEs sometimes gain new business from reconstruction efforts; while environment-dependent MSMEs may be the worst off. Recovery strategies usually rely on personal savings, which may have longer-term impacts.

Exposure to extensive risk can also cause a cycle of adaptation and better coping. If this does not happen, however, businesses may find themselves trapped in a cycle of continuous risk and repeated exposure.

Urban Development and Intensive and Extensive Risk

Dodman, D., Hardoy, J., Satterthwaite, D. (2009). (Contribution to the 2009 Global Assessment Report on Disaster Risk Reduction). International Institute for Environment and Development.

http://www.preventionweb.net/preventionweb-files/english/hyogo/gar/2011/en/bgdocs/GAR-2009/background_papers/Chap4/Dodman-Hardoy-Satterthwaite-Urban-Poverty-and-Disaster-Risk.doc

This paper defines extensive risk as ‘the risk of **premature death, injury and impoverishment** from all events whose impact is too small to be classified as major disasters’ (p.6). It identifies that a disaster must produce an international call for assistance to be recorded in most databases; thus there is a **lack of evidence and knowledge** on extensive disasters. The report highlights that there is much more information on the environment of extensive risk than there is on its impacts, or understanding of the relationship between intensive and extensive risk, or the scale of extensive vs. intensive impacts.

Most extensive risk hazards comprise either biological pathogens spreading disease or physical hazards such as floods, storms and transport accidents. The impacts are therefore individual **physical traumas; deaths and serious injuries or illnesses**. The report notes that extensive risk-prone populations are likely to be highly vulnerable, and therefore likely to be subject to intensive risks as well.

Preliminary extensive risk analysis for the Global Assessment Report on Disaster Risk Reduction GAR 2011

Serje, J. (2010). (Contribution to the 2011 Global Assessment Report on Disaster Risk Reduction).

<http://www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/Serje2010a.pdf>

This background paper for GAR11 gives a high level of detail on the data for measuring and describing extensive risk at the global level. The data shows that **mortality due to extensive risk has steadily risen since 1989**. The data includes the USA, and this shows that mortality trends are much lower in developed economies, but **economic damage and disaster frequency remain similar across all countries** studied. **Housing damage and destruction is increasing** in all countries over time. Mozambique has the most developed disaster database in Sub-Saharan Africa, and shows high levels of impact on livelihoods and housing assets due to extensive risk.

Extensive and Intensive risk in the USA: a comparative with developing economies

Serje, J. (2010). (Contribution to the 2011 Global Assessment Report on Disaster Risk Reduction).

http://www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/Serje_2010.pdf

There is a large amount of high-quality data available for the USA, which makes an interesting comparison possible. The main finding is that the highest-intensity mortality from disasters in the USA is still lower than mega-disasters in Asia and Latin America. However, in the USA, the **majority of disaster casualties arise from extensive disasters** rather than intensive disasters (the reverse is true in developing economies). Patterns of **loss and asset damage are similar** to developing economies, and these are increasing. There is a correlation between **low-income areas and higher mortality and economic losses**, suggesting that the poverty-vulnerability link exists even in the USA.

4. Other resources

Revealing the socioeconomic impact of small disasters in Colombia using the DesInventar database

Marulanda, M.C., Cardona, O.D. and Barbat, A.H. (2010). (Disasters, 34: 552-570).

<http://dx.doi.org/10.1111/j.1467-7717.2009.01143.x>

This paper analyses the data in the DesInventar Colombia database and shows the increase in small or invisible disasters resulting from climate variability and vulnerability to economic, environmental and social issues. It demonstrates that the **impacts and effects of small disasters are as great** as large disasters. It concentrates on the natural hazard events of small and moderate size, typically a result of socio-ecological processes, for example avalanches, flooding, and landslides. It refers to these as 'small' or 'invisible' disasters rather than 'extensive disasters'. It also proposes a new version of the Local Disaster Index.

DesInventar Colombia contains information from 1914 to 2002, and totals 23,386 entries. This paper covers a 32-year period (1971–2002) and is based on analysing 19,202 entries. The paper shows that the impacts and effects of small disasters are as great as large disasters (pp.559-565). Over the 32-year study period, the total economic loss from damaged houses and hectares of damaged crops exceeds USD 1,650 million. These material losses are 6.7 times greater than the 1985 Nevado del Ruiz volcanic disaster, which the authors approximate to mean that **every 30 years, losses to agriculture and housing due to small disasters are similar to those produced by a large event** (p.562).

In relative terms, the **number of people affected** by small disasters is 7.5 times greater than the figure for large disasters. The total number of **destroyed houses** is 2.5 times greater for small disasters than the 1999 Quindio earthquake and more than 17 times greater than the total for Armero and Chinchina in the Nevado del Ruiz volcanic eruption (p.561). In absolute terms, small and moderate disasters killed 9,500 people, affected 1,745,500 people, destroyed 93,000 houses, affected 217,000 houses, and destroyed 2,174,700 hectares of crops (p.559). Most of these impacts were felt by **low-income communities**, who received no reconstruction assistance. Many lost their livelihoods, **perpetuating poverty**.

Recent Trends in Disaster Impacts on Child Welfare and Development 1999-2009: Global Report. Oxford Policy Management

Tarazona, M. & Gallegos, J. (2011). (Children in a Changing Climate Research). Oxford Policy Management

http://www.preventionweb.net/preventionweb-files/english/hyogo/gar/2011/en/bgdocs/Tarazona_&_Gallegos_2010.pdf

This paper describes how disasters impact on children; beyond mortality and economic loss, communities also experience **long-term impacts on health, education and nutrition**, which disproportionately impact children. The paper analyses intensive and extensive risk for impacts on children's welfare, and shows that there are considerably different results. Seven case study countries are examined (Bolivia, Indonesia, Mexico, Mozambique, Nepal, Vietnam, The Philippines) and intensive/extensive risk and results presented for children in each.

Table 1: Summary of extensive disaster outcomes

Sector	Negative	Positive
Education	<ul style="list-style-type: none"> ▪ Bolivia: reduce net enrolment rates in preschool, increase preschool dropout rates and increase gender gap in primary achievement rates ▪ Nepal: reduce primary gross enrolment rates and gross intake ratios for grade one ▪ Vietnam: reduce number of classes, reduce total number of primary schools and reduce total number of primary students 	<ul style="list-style-type: none"> ▪ Bolivia: increase primary net enrolment rates ▪ Indonesia: increase net enrolment rates for primary and secondary school ▪ Nepal: increase number of students enrolled in secondary education and total number of schools (per province) ▪ Vietnam: increase net enrolment rate (lower secondary), increase total number of students (upper secondary), increase number of secondary schools and teachers ▪ Philippines: reduce secondary drop-out rates and increase secondary cohort survival rates
Health	<ul style="list-style-type: none"> ▪ Bolivia: increase incidence of diarrhoea per 1000 of the under 5s ▪ Mexico: reduce the share of children accessing water and sanitation (urban) ▪ Mozambique: increase low birth weights 	<ul style="list-style-type: none"> ▪ Mexico: increase the share of children accessing sanitation (rural) ▪ Nepal: reduce the incidence of ARI per 1000 under 5s and reduce incidence of pneumonia per 1000 under 5s

	<ul style="list-style-type: none"> ▪ Nepal: increase total fatality rates ▪ Nepal: Increase the proportion of malnourished children (< 3 years old) and ARI fatalities ▪ Vietnam: increase infant mortality rates, reduce percentage with access to improved sanitation and improved water sources 	<ul style="list-style-type: none"> ▪ Vietnam: reduce percentage of severe underweight
Poverty	<ul style="list-style-type: none"> ▪ Indonesia: increase percentage of people living under the poverty line 	

The analysis shows **mixed results and differing impacts** in different contexts. The educational gains appear to be predominantly in the secondary sector, except for Bolivia. Health outcomes are largely negative, particularly in the nutritional outcomes, which show the long-term effects of continuous exposure to low-level risk. The differences in results are largely **due to country context** – for instance Indonesia received large volumes of aid following the tsunami, and much of this was invested in the education sector, which may reflect on following outcomes. Potential gains may be cancelled out by cumulative extensive disasters, or a larger-scale intensive disaster following on from an extensive disaster. The **results are inconclusive** and difficult to draw generalised conclusions.

Understanding the nature and scale of urban risk in low-and middle-income countries and its implications for humanitarian preparedness, planning and response

Dodman, D., Brown, D., Francis, K., Hardoy, J., Johnson, C., & Satterthwaite, D. (2013). (Human Settlements Discussion Paper Series, Climate Change and Cities 4). International Institute for Environment and Development

<http://pubs.iied.org/pdfs/10624IIED.pdf>

This paper builds on the above previous work. It takes a vulnerability approach and states that those **at most risk** from extensive disaster events are those living in **informal settlements and the poor**, as their urban living environments lack provision for 'water, sanitation, solid waste collection drainage, street lighting and all-weather roads' (p.2). Informal settlements may also be on unsafe land, which residents may not have rights to, which may also reduce official assistance after disasters. They likely do not have sufficient political influence to improve these conditions. Within this environment, some groups are more at risk than others: **children, older people, IDPs, and women**.

The impacts they face from extensive disasters (listed here as often being floods, high winds, fires, cholera epidemics, traffic accidents, violence) are given in terms of **lack of access to public services, damage to infrastructure, increased likelihood of disease, injury and death**.

Extensive and every day risk in the Bolivian Chaco: Sources of crisis and disaster

Pando, L.R.R., and Lavell, A. (2012). (Revue de Géographie Alpine, Journal of Alpine Research, 100-1).

<http://dx.doi.org/10.4000/rga.1719>

This paper narratively describes the extensive disaster situation in the Bolivian Chaco between 2009 and 2010. It provides a holistic analysis of causes, effects and responses, but does not focus specifically on disaster impacts. Impacts identified are: falls in temperature creating **lower food availability and access**; limited access to safe water, creating **health and hygiene problems; nutritional problems; compromised livelihoods**. The paper highlights that all these impacts were heightened by social factors associated with vulnerability: social exclusion; remote location; few effective authority and communication structures. The conclusion emphasises that risk management processes should not focus exclusively on lives saved or economic losses, but also on establishing the ‘conditions for social survival’ and structural risk factors which should be avoided, i.e. the process should also be one of adaptation and mitigation.

From everyday hazard to disasters: the accumulation of risk in urban areas

Bull-Kamanga, L., Diagne, K., Lavell, A., Lertise, F., MacGregor, H., Maskrey, A., Meshack, M. Pelling, M., Reid, H., Satterthwaite, D., Songsore, J. Westgate, K. and Yitambe, A. (2003). (Environment and Urbanization 15(1), 193-204).

<http://eau.sagepub.com/content/15/1/193.full.pdf+html>

This is an early and highly-cited paper identifying the need to focus on ‘everyday hazard’ and contesting the definition of disasters – at the individual level a single illness or death can be disastrous. Within urban areas, ‘everyday events cumulatively kill or injure more people than large disasters’ (p.198). The paper uses the examples of **infectious diseases and accidents** as the type of impacts people experience from everyday hazards.

5. About this report

Key websites

- GAR 2013: <http://www.preventionweb.net/english/hyogo/gar/2013/en/home/index.html>
- International Federation of Red Cross and Red Crescent Societies – Silent Disasters Campaign: <http://www.ifrc.org/silentdisasters>

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