Disaster Risk Reduction and Sustainable Development

Mark Pelling, Reid Basher, Joern Birkmann, Susan Cutter, Bina Desai, S.H.M. Fakhruddin, Ferruccio Ferrugini, Tom Mitchell, Tony Oliver-Smith, John Rees, and Kuniyoshi Takeuchi

Abstract

Scientific research and practitioner experience have revealed that disasters, development and poverty are intimately linked. Destruction of assets and livelihoods in disasters set back hard-won development gains and worsen poverty, often for extended periods of years. Progress in ending extreme poverty may be reversed in the face of a disaster event and poverty re-entrenched. Disaster impacts are growing, amplified by rapid growth and unsustainable development practices that increase the exposure and vulnerabilities of communities and capital assets. Governments increasingly recognise that the reduction of disaster risks is a foundation for successful sustainable development, and that disaster risk is a crosscutting issue, requiring action across multiple sectors.

Keywords

Sustainable Development Goals • Poverty • Risk drivers

Introduction

The discussion set out in this paper was prepared by experts associated with the Integrated Research on Disaster Risk (IRDR) programme for the Seventh Session of the UN General Assembly Open Working Group on Sustainable Development Goals, New York, 6–10 January 2014. For further information see http://www.irdrinternational.org. The IRDR is jointly sponsored by the International Council for Science (ICSU), the International Social Science Council (ISSC) and the UN Secretariat of the International Strategy for Disaster Reduction (UNISDR). The paper was supported by the British Geological Survey and followed extensive discussion within the wider membership of the IRDR community, Reid Basher acting as the expert author and Mark Pelling as overall project coordinator and editor.

M. Pelling (✉) • R. Basher • J. Birkmann • S. Cutter • B. Desai • S.H.M. Fakhruddin • F. Ferrugini • T. Mitchell • T. Oliver-Smith • J. Rees • K. Takeuchi
e-mail: mark.pelling@kcl.ac.uk

Overview

Increasing Disaster Impacts and the Downward Spiral

Globally, the impacts of disasters have risen rapidly over recent decades, affecting almost all sectors and rich countries and poor countries alike (UNESCAP 2010, 2012; UNISDR 2013a; World Bank 2013). Several hundred million people are affected annually and losses reached a record US$ 371 billion in 2011 (CRED 2012). This figure may underreport the true losses by 50 % or more (UNISDR 2013b). It does not incorporate knock-on impacts across economies and it undervalues the relative economic impacts on individual and particularly poor households. In some regions numerous smaller-scale and unreported events are a major source of aggregate loss, especially in developing countries and poor communities (Bull-Kamanga et al. 2003; UNISDR 2013b). A particular concern is that disaster-damaged livelihoods and economies can set the preconditions for further rounds of excessive exposure, susceptibility and loss, blocked escapes from poverty and negative spirals of development failure. This may occur at any level, from household to state.

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Underlying Risk Factors The United Nations-sponsored Hyogo Framework for Action 2005–2015 (UN 2005), which seeks to build the resilience of nations and communities to disasters, includes the integration of disaster risk considerations into sustainable development processes as a key strategy. One of its five priorities is the reduction of underlying risk factors, involving environmental, social and economic actions, but it is here that least progress has been achieved according to reporting by Governments (see http://www.preventionweb.net/english/hyogo/progress).

Explicit recognition of disaster risk reduction in the Sustainable Development Goals will provide critical weight to help drive the substantive work on underlying disaster risk in the parallel post-2015 framework planned to succeed the Hyogo Framework for Action.

The Disaster Risk Process and Risk Management Disasters can be considered an outcome of an ongoing "risk process", in which the prevailing circumstances of hazards, exposure and vulnerabilities combine to generate disaster risk. The risk may grow and accumulate over time, becoming evident as greater losses only when a hazard event strikes. This is a radical shift from earlier ideas of disasters as acts of God or as natural events. A geophysical hazard event may be natural but its impacts depend on the circumstances of people, households and societies, which in turn arise from diverse micro- to macro-level political, social, economic and environmental processes. Knowledge of the driving factors in disaster risk is the essential basis for pre-emptive policy and action to reduce the risks. Integrated approaches will improve outcomes and opportunities for both disaster risk reduction and sustainable development. A basic requirement in both cases is to systematically monitor disaster risk.

Linkages with Climate Change It is well accepted that disaster risk reduction measures will play an important role in responding to the projected increases in weather- and climate-related hazards including sea-level rise (IPCC 2012). Good management of today's existing risks is clearly the starting point for facing tomorrow's changed risks, whether from climate change, globalization or development. These three policy arenas share interests in monitoring changing risks, reducing exposure and vulnerability and advancing the transformation to resilience and sustainability.

Targets and Indicators High-level meetings have identified the need to address resilience and disaster risk reduction in the Sustainable Development Goals (UN 2012, 2013). Targets and indicators work can draw on the experience gained in monitoring progress on the Hyogo Framework for Action. Various global and national databases are available for natural hazards, exposure and disaster losses, and research is advancing on measures of vulnerability and resilience (see final section).

Disasters and Sustainable Development

Disaster Events Undermine Poverty Eradication The livelihoods, productive economic activity and public capacities that keep poverty at bay are compromised when the underpinning assets and resources of households and countries are destroyed in disasters (Shepherd et al. 2013). This can generate new poor as well as deepening existing poverty. For example, a study of 2,454 municipalities for a 5-year period showed significant impacts from disasters, with a 0.8 % decrease in the Human Development Index in affected areas, similar to a 2-year setback, and a 3.6 % increase in extreme food poverty (Rodriguez-Oreggia et al. 2010).

Disaster Linked to Unsustainable Growth In 1998, Central America suffered massive losses associated with Hurricane Mitch, with thousands of deaths, millions of displaced people and estimated losses of about US$6 billion. Studies (Ensor 2009) show that the impacts were particularly severe where the development model sought agricultural diversification and export-led growth but at the expense of floodplain exploitation, deforestation and soil degradation and reduced opportunities for small farmers. The social and economic processes involved rendered the environment, infrastructure and population exceptionally vulnerable to the hurricane. In this way, disaster risk was actively created through human action. Similar lessons have been learned in developed countries, for example as a result of major flood loss events in Europe and North America over recent decades.

Disasters and Inequality On average, disasters disproportionately affect women, children, the aged and disabled (Enarson 2012). For example, a study of villages affected by the 2004 Indian Ocean tsunami (Guha-Sapir et al. 2006) showed that the death rate was highest for young children and the elderly and was 40 % higher for women than for men. These patterns are related to the prevailing social roles and expectations. Disadvantaged groups also are often excluded or not catered for in disaster response and recovery stages (IFRC 2007). While disasters can thus amplify social exclusion, economic inequality and poverty, they also provide an opportunity, through risk reduction action and post-disaster recovery, to address such issues as part of the promotion of resilience and sustainable development.

Magnified Impacts for Small Developing Countries The greatest absolute losses occur in larger and richer countries, but the greatest relative losses occur in small countries and particularly small island countries. In some years, the disaster losses can exceed the annual GDP. One study showed that 26 countries have an average annual economic impact of more than 1 % of GDP, with seven countries above 2 % GDP (World Bank 2011). Most of these countries are small-island developing states or small coastal countries. Such high average impacts represent a serious drag on long-term development. The problem arises partly because hazard events such as a storm or earthquake may cover most of a small country leaving the remaining unaffected parts unable to internally fund the recovery.

Disaster Impacts on Cities Cities are engines of economic development. Large cities exposed to cyclones and earthquakes will more than double their population by 2050 (from 680 million in 2000 to 1.5 billion in 2050). The resulting growth in exposure will need to be matched by substantial reductions in urban vulnerability if disaster losses are to be restrained in these cities as they grow. Cities struck by major hazards can take years to recover. An economics study of the 1995 Kobe earthquake (DuPont and Noy 2012) showed that in 2008, 13 years after the event, the city's per capita GDP was lower by 12 %. This impact is persistent, clearly observable, and attributable to the earthquake, and it occurred despite the relative wealth of the country and the considerable recovery support provided to the city. Another study (Hallegate et al. 2013) has estimated a ninefold increase in the global risk of floods in large port cities between now and 2050, as a result of rapid population increases, economic growth, land subsidence and climate change, with a similar increase in losses, rising to US$ 52 billion. The cost of required flood management for the 136 cities studied is estimated at around US$ 50 billion per year.

Globalisation and Cascading Risk Globalised systems involving highly interactive and optimised production give rise to large-scale vulnerabilities. In some countries, electricity failures arising from minor technical problems have cascaded to affect millions of people for several days. Imbalances in global grain supply and demand in 2008, precipitated by poor harvests in major grain production countries and market speculation led to a severe spike in food prices, with wheat prices rising to more than double the price of the previous 5 years. The impacts were mainly felt elsewhere, in poorer countries and communities, leading to food crises and urban food riots. The 2011 Tohoku earthquake and tsunami led to a cascade of power outages, radioactive pollution, closure of nuclear plants, reactivation of fossil fuel plants, and disruption of global industrial supply chains.

Disaster Impacts Extend Widely Disasters bring a range of indirect and secondary impacts in addition to the direct losses (mortality, injury, physical damage and economic loss). Individuals may suffer long term disability, psychological harm, degraded living circumstances, interrupted education, increased disease occurrence, loss of employment and relocation. Prolonged drought can lead to reduced nutrition and stunting. Expertise, skills and resources will be diverted from growth activities to recovery activities. Businesses and investment may fail and sectors may not reach their production targets and development targets. Government finances are often severely disrupted. A key lesson is that disaster risk is a systemic issue and must be managed on a system-wide basis.

Economic Impacts and Hazard and Development Status A review of econometric literature (Benson 2012) has shown that: (1) disasters have larger relative impacts on developing, than developed, countries; (2) the nature of impact varies between types of hazard; (3) climatological hazards have negative long-term economic impacts, particularly in lower-income countries; (4) earthquakes may have positive long-term macroeconomic consequences for middle- and upper-income countries but negative consequences for lower-income states; and (5) severe disaster events do not have positive economic impacts under any circumstances. Indirect losses and secondary effects can increase sharply if post-disaster contraction and reallocation of government resources delay reconstruction and dampen the pace of capital accumulation. An alternative countercyclical response may be more cost-effective, by spurring recovery and reconstruction, and "building back better", with reduced risk and future losses.

Development Opportunities Involve Risks Taking on risks and proactively managing them is a natural element of development. This includes disaster risk, which is often associated with favourable economic assets such as fertile floodplains and volcanic soils and coastal zones. A key need is for shared action on risks which individuals or enterprises cannot handle alone. Governments have a critical role in managing systemic risks, providing an enabling environment, and channelling support to vulnerable groups. Measures to reduce damages from earthquakes, floods and tropical storms can have median benefit-cost ratios of 2–5, while the provision of earlier warnings of disasters in developing countries could yield estimated benefit-cost ratios of 4–36. By way of example, a national system that provides flood warnings up to 10 days ahead to millions of Bangladesh villagers and supports community-level planning and household action to preserve assets and livelihoods generates 10-year savings of US$ 40 for each dollar invested, according to one study.

Private Sector Roles The private sector is responsible for 70–85 % of all investment worldwide in new buildings, industry and small- to medium-size enterprises (UNISDR 2013b). The pursuit of short-term gains can be a major factor in disaster risk generation, for example through inappropriate land use or building construction practices. Private sector enterprises are vulnerable to disasters not only through direct effects on plant, equipment and personnel but also through disruption of supporting infrastructure for inputs such as water and electricity and transportation to maintain supply chains and product distribution. When these lifelines are cut, costs rise, competitiveness and reputation suffer, and businesses may close or move elsewhere. The business sector is an important partner in systematic risk reduction action, alongside community and government sectors.

Broad Economic Policy Can Reduce Disaster Risks One economics study (DuPont and Noy 2012) suggests that substantial reductions in risk could be achieved through relatively inexpensive interventions in broader policy settings, particularly in respect to information availability, the functioning of markets, the role of public infrastructure and the effectiveness of public institutions. Adequate funding of infrastructure, data gathering, basic services, early warning and evacuation systems will have high payoffs.

Humanitarian Intervention and Resilience Large sums are expended on international emergency assistance, approaching US$ 12.4 billion in 2010. This is in effect a risk transfer mechanism, as it helps in smoothing the economic impacts on the affected communities, albeit at a very basic level. Only about 4.2 % of official humanitarian aid was invested in disaster risk reduction between 2006 and 2010. However, more timely interventions and sustained multi-year support to risk management and resilience building can pay handsomely. In one case studied, resilience building activities over 20 years cost US$21 billion less than the more common late humanitarian response. Good linkages between humanitarian relief, rehabilitation and reconstruction can lead to more sustainable, resilient and adaptive outcomes and avoid the common trap of re-creating the original risk profile (Venton 2012).

Status of Disaster-Related Goals, Targets and Indicators

Existing Capabilities The risk process described in the Overview provides the basis for disaster-related goals, targets and indicators. The key elements are: (1) the hazard profile; (2) the exposure (of people and assets); (3) the vulnerability of people and assets to hazards (including community and institutional capacities and the related concept of resilience); and (4) the losses that occur, such as mortality, morbidity, livelihood and asset loss, social and macroeconomic impact, etc. The field relies on the physical, environmental and social sciences and relevant sector expertise.

Links to the UN Disaster Reduction Strategy The Hyogo Framework for Action has stimulated the development of reporting and databases. A process of national self-reporting has been put in place to monitor progress against measures of national achievement on the priorities and tasks.[1] Most of the measures address inputs and processes, rather than outcomes. The experience to date provides a valuable foundation for the consideration of disaster-related goals and targets in the Sustainable Development Goals process. A post-2015 successor arrangement to the Framework is being developed, in parallel with the Sustainable Development Goals process. Many United Nations member states have called for stronger targets and upgraded accountability in the new framework (UNISDR 2013c).

Expert Workshop A meeting of experts on disaster targets and indicators in July 2013 reviewed options for supporting the Sustainable Development Goals process (UNDP 2013). The meeting welcomed the target proposed by the High-Level Panel (UN 2013) to "build resilience and reduce deaths from natural disasters by x%" and its positioning within the goal to "end poverty." It also welcomed several other Panel-proposed targets that aim at increased resilience. The group reviewed a number of disaster-related indicators, and concluded that a range of indicator types should be pursued, including outcome indicators where possible, but also process indicators and input indicators.

Hazards, Exposure and Losses Data gathering, historical databases and data modelling for hazards, exposure and losses are relatively well developed (see http://www.preventionweb.net/english/hyogo/gar/2013/en/home/data-platform.html) and can readily support indicator development, although the spatial scale rarely reaches down to community level. Hazard modelling is most developed and can be combined with population and asset data to form maps and indexes of exposure. However, disaster loss databases lack consistency in what they measure and in their geographic

[1] The term "risk management" refers to the systematic approach and practice to minimise potential harm and loss, whereas "disaster risk reduction" may be seen as a policy objective, one that depends heavily on the tools of risk management. For further definitions see *2009 UNISDR terminology on disaster risk reduction*, available at http://www.unisdr.org/we/inform/publications/7817, and the glossary of IPCC, 2012.

coverage. Consideration could be given to more informative indicators of disaster loss, such as working days lost, days of school closure, price of seasonal produce, etc.

Vulnerability and Resilience Vulnerability and resilience are widely used concept, albeit with varied interpretations and with limited systematic collection of data. However, with improved data systems at local and national levels there is good scope to generate data sets and indicators, and to measure long-term changes (Birkmann 2013). Both can be represented by surrogates such as household income or community-level capacities. The establishment of vulnerability lines alongside poverty lines is a possibility. Observation and indexing of vulnerability (and associated capacity) is most developed at the community level, but there also exist a number of national and global tools, as well as some common frameworks. Indexes of relative vulnerability, expressed as the proportion of people or assets exposed to hazard types that suffer harm from events (e.g. mortality, homelessness, livelihood loss), or that benefit from protective capacities (e.g. early warnings, building codes, insurance), are simple to generate and communicate (UNDP 2004). Specific targets for vulnerability reduction and adaptation to extreme events also need to be defined to monitor progress.

Risk Measures Are Least Developed Risk requires the integration of hazard, exposure, vulnerability and capacity, and while this is difficult, models do exist. Risk management capability is also captured in some models but this relies on self-reporting by country officials. Comparative analysis and analyses of over time within a single unit are possible. Progress in the management and reduction of risk can only be demonstrated from data and longitudinal studies that span a decade or more.

Indicators of Disaster Risk Reduction Action These include measures of public commitment, such as the availability and effective application of legislation, the level or proportion of annual government spending allocated to disaster risk reduction, and the integration of disaster risk assessment into private sector development projects. Though simple in concept, their implementation requires considerable effort and cooperation among countries and between different administrative levels.

Uncertainty of Loss Events A particular challenge for the application and communication of disaster-related indicators lies in the high variability of many hazards. In particular, the losses during a year may be substantial, despite major risk reduction efforts, or conversely may be minimal despite high risks and small efforts. This means that monitoring progress on disaster risk reduction cannot rely solely on direct disaster loss information, and that a variety of indicators are necessary to track exposure, vulnerability, risk and risk reduction actions.

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