Chapter 4

Invisible Risks
Extensive risk is associated with localised, mainly weather-related hazards with short return periods. These highly localised, yet frequent hazards include surface water and flash flooding, landslides, fires and both agricultural and hydrological drought. They are exacerbated by badly managed urban development, environmental degradation and poverty.

An analysis of the scale of economic losses shows that extensive risk continues to be underestimated. The real cost of these largely human produced risks is rarely highlighted. Although extensive risk events cause only 13 percent of total mortality, they are responsible for 42 percent or more of total economic losses.

These losses are hidden in largely invisible risk layers that no insurance covers. And yet they can amount to more than 10 percent or more of annual capital formation.

4.1 The production of extensive risk

In-depth analysis of new national disaster loss data confirms a previously recognised and yet regularly ignored truth: accumulated losses from small-scale, highly frequent and localised disaster events approach in magnitude those of major disasters and contribute to declines in social welfare, economic growth and ecosystems. Urban and rural areas alike, particularly in low and middle-income countries, experience regular small disasters that undermine local development as well as national competitiveness.

GAR09 (UNISDR, 2009) highlighted four underlying risk drivers that characterise the accumulation of extensive risks. (1) Badly planned and managed urban development, for example, can generate flooding, through factors such as increased run-off from a growing area of impermeable surfaces, inadequate investment in drainage and water management and the development of low-lying flood prone areas. (2) The decline of regulatory ecosystem services, such as wetlands, aquifers, forests, floodplains and mangroves, exacerbate and magnify hazard levels. (3) Low-income households are often unable to participate in the formal market to land and housing and urbanise hazard prone areas, through informal mechanisms. (4) Cities and regions with weak governance may either lose control over the above processes or contribute to them. Given that not only exposure and vulnerability but also hazards are produced through these underlying drivers, extensive risk is endogenous to and produced by urban and economic development.

Wealthier, better-governed city regions are likely, over time, to successfully manage the processes that generate extensive risk. Rapid urban growth often reflects economic success and major inflows of capital into infrastructure and productive development (Mitlin and Satterthwaite, 2012). In fact, in high-income and in many middle-income countries, the growth in GDP per capita has outpaced growth in urban population (UN-HABITAT, 2012). Although exposure and intensive risk increase over time, these cities and countries reduce their extensive risk, for example, through investments in protective infrastructure, environmental management and upgrading of informal settlements.

In contrast, in many low-income countries, growth in urban population has outstripped growth in GDP per capita (Ibid.) in part from population migration owing to declining rural economies and crises. In these cities, a greater proportion of low-income households participate in urbanisation through informal mechanisms of land acquisition (Johnson et al., 2012; Hamdan, 2012). Governments have little capacity to reduce risks over time, and both extensive and intensive risks lead to
higher rates of mortality. Almost by definition, informal settlements (and a significant proportion of social housing) occupy areas of low land value, such as low-lying flood-prone areas or on landslide-prone hillsides.

In the case of Cape Verde and Senegal, for example, in their capitals Praia and Dakar, flooding has intensified over the years (DARA, 2013). New studies at the local level in West Africa highlight that underlying drivers of flood risks are poor drainage systems related to land-use and newly built environments, and limited access to land. The studies point to West Africa’s continuous problems in expanding urban centres and the need for urban planning and sufficient public or private investments in adequate infrastructure. Local data of these studies were backed by national data that indicated similar problems in urban areas in Cape Verde, Ghana and Senegal (Ibid.).

In addition, the health of millions is threatened (Mitlin and Satterthwaite, 2012). For example, in Maputo, Mozambique, the limited coverage of the city’s sewage system is a serious cholera threat even in normal times, which becomes a major challenge for authorities during annual flooding (Thompson, 2004).

As Box 4.1 shows, investments in protective infrastructure, such as drainage and slope stabilisation, are often inadequate. Low-income households are also more likely to live in makeshift or poor quality constructions, further increasing their vulnerability. Disaster risks in rural areas may be particularly invisible, given the low density of produced capital and declining population. As Box 4.2 highlights, in the case of Colombia, rural populations with unsatisfied basic needs experienced the largest relative losses during the 2010–2011 La Niña episode.

Indirect losses and the wider effects of disaster loss for low-income households and communities are rarely accounted for. However, GAR09 (UNISDR, 2009) highlighted, through a set of microeconomic studies, negative welfare outcomes, including declines in school attendance, nutrition, health, productivity and increases in inequality and unemployment. Some of these outcomes can be transmitted across generations (Ole MoiYoi, 2012). GAR11 (UNISDR, 2011) also showed how extensive disasters negatively affect children and their future.

The social costs of extensive risk are not accounted for by either governments or business and are largely absorbed by low-income households and communities, undermining their potential for development and eroding resilience.
In Colombia, weather-related disasters are strongly correlated with ENSO episodes. But while the 2010–2011 La Niña was no stronger than others that had occurred in 1973–1976, 1998–2001 and 1988–89, the losses in terms of people affected and damage to housing were far greater (see Figure 4.1).

**Figure 4.1** Hydrometeorological disasters and losses in Colombia, 1970–2011

Most importantly, as Figure 4.2 shows, the proportion of the population affected in rural municipalities (rural index between 50 and 75) and with over 56 percent of unsatisfied basic needs was approximately 35 times greater than in the case of urban centres (rural index between 1 and 25) and with less than 27 percent of unsatisfied basic needs.

**Figure 4.2** Proportion of disaster-affected inhabitants in urban and rural areas (expressed by rural index) and with unsatisfied basic needs (expressed by UBN index) during the 2010-2011 ENSO episode in Colombia

(Source: UNISDR, adapted from Osso, 2012c)
4.2 Visualising the invisible

More than 50 countries are now recording local disaster losses, enabling them to visualize the real impact their society and economy is facing. This information is now available for governments, affected communities and businesses interested in investing in these markets.

Localised hazards can be modelled if the necessary data is available. For example, Figure 4.3 highlights the results of a study of landslide hazard in El Salvador.

However, given that extensive risks are characterised by short return periods, the analysis of historical loss data provides a valid approach to modelling risk patterns and trends. It is still not possible to provide a global vision of extensive risk. Box 4.3, however, highlights that a growing number of countries are developing detailed disaster loss databases that allow extensive risks to be modelled.

For businesses and governments that want to know more about these risks, a complete analysis of extensive risk patterns and trends is provided in Annex 2. Analysis on the selected set of more than 270,000 records of disaster impacts from 56 countries confirms the trends and patterns previously identified in smaller subsets of 22 and 11 countries (UNISDR, 2011 and UNISDR, 2009).

Table 4.1 shows that, although extensive disasters cause only 13 percent of total mortality, they are responsible for 42 percent of the total economic

Figure 4.3 Hazard (top) and exposure (bottom) to landslides induced by rainfall in El Salvador

(Source: UNISDR, adapted from NGI, 2013b)
As part of a process that aims at a global vision of local disaster losses, UNISDR, UNDP, the World Bank, Corporacion OSSO and other partners are supporting national governments to build information systems that systematically account for disaster losses and impact. Currently 56 countries engage in this effort.

In Latin America and the Caribbean, Guyana, Honduras, Jamaica, Nicaragua and Uruguay have all recently published disaster databases.

In Africa, Ethiopia, Kenya, Mali and Uganda have completed initial datasets that allow a more realistic view of disaster losses in countries where global datasets have little coverage. In the Arab states, new databases have been published in Djibouti and Lebanon.

In Asia, Lao People’s Democratic Republic, Timor-Leste and Viet Nam have completed disaster databases; in the Pacific Islands, a regional dataset covers 22 Small Island Developing States (SIDS). The Lao People’s Democratic Republic disaster database has been used for a National Assessment Report (Lao People’s Democratic Republic, 2012).

(Source: UNISDR)
losses recorded in the datasets. In countries that do not experience large-scale disasters, this figure may be much higher.

Losses associated with extensive risk, as in the example for Honduras and Uganda below, are spread over the entire country, affecting all municipalities (Figure 4.4).

The agricultural sector is one of the most affected by extensive risks, as initially highlighted by GAR11 with data from Mozambique. These impacts are further confirmed in the case of Lao People’s Democratic Republic (Government of Lao People’s Democratic Republic, 2012) and Lebanon (Figure 4.5).

Economic losses associated with extensive risk are also increasing rapidly in the 34 new country datasets included in this report and are consistent with the findings of GAR09 and GAR11 (Figure 4.6). Damage to educational facilities in particular is rising rapidly.

Table 4.1 Extensive and intensive risk impacts summary for 56 countries and 2 Indian states (1981–2011)

<table>
<thead>
<tr>
<th>Risk Type</th>
<th>Records</th>
<th>%</th>
<th>Deaths</th>
<th>%</th>
<th>Economic Loss (billion US$)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive</td>
<td>243,614</td>
<td>99%</td>
<td>15,111</td>
<td>13%</td>
<td>115.44</td>
<td>42%</td>
</tr>
<tr>
<td>Intensive</td>
<td>1,877</td>
<td>1%</td>
<td>525,429</td>
<td>87%</td>
<td>159.94</td>
<td>58%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>245,491</td>
<td></td>
<td>600,544</td>
<td></td>
<td>275.38</td>
<td></td>
</tr>
</tbody>
</table>

(Source: UNISDR)

Figure 4.4 Extensive risk direct economic losses per municipality, in Honduras (left, 1981–2011) and in Uganda (right, 1991–2011)

(Source: UNISDR)
Figure 4.5 Extensive risk, number of hectares of agricultural crops affected in Lebanon (left, 1981-2011) and Lao People’s Democratic Republic (right, 1991-2011)

Figure 4.6 Loss trends over time (1990–2011) in 34 countries not presented in previous GAR analysis (left: economic losses; right: education facilities)
4.3 **Hidden risk layers**

A newly applied methodology to evaluate direct loss and damage from extensive disaster events allows extensive risk to be expressed as a loss exceedance curve. This enables countries to develop a more complete analysis of risk and of their contingent liabilities associated with disasters.

Extensive risks are rarely recorded, and therefore not taken into account in national risk assessments, which usually only focus on intensive risks. GAR11 (UNISDR, 2011) presented a new hybrid loss exceedance curve as a way of combining and measuring both extensive and intensive risks at the country level. Additional hybrid curves have now been developed for eight Latin American countries.¹

Figure 4.7 shows the hybrid curve for Guatemala. The empirical curve, based on historical loss data, provides information on largely extensive risks with return periods of up to approximately 30 years but does not capture intensive risks with longer return periods. Similarly, the analytical curve estimated using a probabilistic risk model does not capture much of the extensive risk with shorter return periods. The hybrid curve captures both.

Figure 4.8, based on hybrid loss exceedance curves for ten Latin American countries (CIMNE et al., 2013b; ERN-AL, 2011), highlights the annual average loss (AAL) that would be expected from all disasters, intensive and extensive, both in absolute terms and expressed as a percentage of gross fixed capital formation (GFCF). Although Mexico has the highest probable AAL in absolute terms, in relative terms, Honduras stands to lose more than 12 percent of its gross fixed capital formation every year owing to direct disaster losses.

This kind of information is valuable to inform investments in disaster risk reduction. Often, the costs of

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¹ UNISDR, adapted from CIMNE et al., 2013b
extensive disasters are not fully absorbed by government, insurance or international assistance. Parts of these losses are absorbed directly by low-income rural and urban households but also by SMEs and businesses in the informal sector. Unless these losses are made visible and their fiscal impact understood, it is difficult to justify increased public sector investments in safe and resilient infrastructure. If indirect losses to business from extensive risks could be measured, then the private sector may become a key advocate for increased public sector investment.

Notes

i Rural populations are defined here using an Index of Rurality based on population density and the distance between smaller rural and larger urban centres (UNDP, 2011: Colombia Human Development Report).

ii The new countries are Djibouti, East Timor, Ethiopia, Guyana, Jamaica, Kenya, Lao People’s Democratic Republic, Lebanon, Mali, Nicaragua, Sri Lanka, Uganda, Uruguay, Viet Nam, plus 22 countries that have developed a joint Pacific islands regional loss database: American Samoa; Cook Islands; Fiji; French Polynesia; Guam; Kiribati; Marshall Islands; Micronesia, Federated States of; Nauru; New Caledonia; Niue; Northern Mariana Islands; Palau; Papua New Guinea; Pitcairn Islands; Samoa; Solomon Islands; Tokelau; Tonga; Tuvalu; Vanuatu; Wallis and Futuna Islands.

iii Bolivia (Plurinational State of), Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Peru and Venezuela (Bolivarian Republic of).