# Global Assessment Report on Disaster Risk Reduction

2015

## The Pocket GAR 2015

Making Development Sustainable:
The Future of Disaster Risk Management

United Nations

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# Summary

## The future of development at stake

2015 is a critical year for the future of development. This year marks the conclusion of three international processes which will set the agenda through which disaster risk reduction, sustainable development and climate change action are approached and addressed in the years to come.

In March 2015, at the Third World Conference on Disaster Risk Reduction in Sendai, Japan, UN Member States are expected to adopt a framework to succeed the Hyogo Framework for Action (HFA). The new framework will guide countries in their efforts to achieve a substantial reduction of disaster losses in the future.

By September 2015, governments will have agreed on a set of Sustainable Development Goals (SDGs) building on the outcome of the 2012 Rio+20 Conference and the Millennium Development Goals (MDGs). For the first time, these new goals will be designed for universal application.

Finally, the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) and the 11th session of the Meeting of the Parties to the Kyoto Protocol will be held in Paris in December 2015, with the objective of reaching a global agreement on climate change.

The 2015 Global Assessment Report on Disaster Risk Reduction (GAR15) has assembled compelling evidence to demonstrate that a strengthened commitment to and investment in disaster risk reduction is critical to the success of all three global processes as well as to achieving synergies between them.

## Sustainable development cannot be achieved unless disaster risk is reduced

Globally, the expected average annual losses (AAL) from earthquakes, tsunamis, tropical cyclones and river flooding are now estimated at US$314 billion in the built environment alone. This figure would be even higher if it included other hazards, such as drought, and other sectors, such as agriculture. Average annual loss represents the value of all future losses annualized over the long term and can be understood as the amount that countries should be setting aside each year to cover future disaster losses.

If this risk is not reduced, expected future losses will become a critical opportunity cost for development. Especially in those countries where disaster risk now represents a significant proportion of capital investment and social expenditure, the capacity for future development will be seriously undermined. In such circumstances, it is difficult to achieve sustained, let alone sustainable, development.

In many countries, climate change is magnifying risks and increasing the cost of disasters. In the Caribbean, for example, the average annual losses associated with tropical cyclone winds alone are projected to increase by as much as US$1.4 billion by 2050. Many small island developing states (SIDS) already face disproportionately high disaster risks. Reducing those risks is therefore essential to protect those countries from the impact of climate change.

## Disaster risk reduction is a good investment

Investing in disaster risk reduction is thus a precondition for developing sustainably in a changing climate. It is a precondition that can be achieved and that makes good financial sense. Global average annual loss is projected to increase due to new investment requirements, for example, in urban infrastructure, currently estimated at US$90 trillion up to 2030.[1] However, this is not inevitable. Annual global investment of US$6 billion in appropriate disaster risk management strategies, would generate total benefits in terms of risk reduction of US$360 billion.[2] This is equivalent to an annual reduction of new and additional AAL by more than 20 per cent.

Such an investment in disaster risk reduction represents only 0.1 per cent of the US$6 trillion per year that will have to be invested in infrastructure over the next 15 years. But for many countries, that small additional investment could make a crucial difference in achieving the national and international goals of ending poverty, improving health and education, and ensuring sustainable and equitable growth.

## Managed disasters, unmanaged risks

Twenty-five years after UN Member States adopted the International Decade for Natural Disaster Reduction (IDNDR) and ten years after the adoption of the HFA, global disaster risk has not been reduced significantly. Despite success in reducing mortality and economic loss in certain countries and cities and for some hazards, overall disaster risk is still increasing.

Measured in terms of lost human life years, disasters represent a setback to development comparable to diseases such as tuberculosis. Around 42 million human life years are lost in internationally reported disasters each year. These losses are disproportionately concentrated in low and middle-income countries.

One especially alarming development is that both the mortality and economic loss associated with smaller-scale, recurrent localized disasters are trending up. These extensive risks are closely associated with drivers such as inequality, environmental degradation, badly planned and managed urban development, and weak governance. They are a central concern for the low-income households and small businesses that depend on public infrastructure and for the local governments that provide it.

The HFA has generated a substantial investment in and commitment to disaster risk reduction by stakeholders at all levels, including national governments, municipal authorities, utility providers, non-governmental organizations, scientific and technical institutions, regional and international organizations, and the private sector.

However, while the HFA gave detailed guidance on managing underlying risks and their drivers, most countries have understood and practised disaster risk reduction as disaster management, mainly by strengthening their disaster preparedness, response and early warning capacities and by reducing specific risks.

While this approach is an appropriate way to manage disasters, it has proved far less effective in managing the underlying risks. Given that these risks are generated *inside* development,

addressing them requires actions such as reducing poverty, planning and managing cities appropriately, and protecting and restoring ecosystems.

This is the area where progress has been limited in most countries during the HFA. Cases where disaster risk considerations are fully factored into social and economic investments or where risk knowledge is integrated into development plans and practice are still the exception. As such, and despite notable improvements in disaster management, new risks have been generated and accumulated faster than existing risks have been reduced.

## The future of disaster risk reduction

Disaster risk is already undermining the capacity of many countries to make the capital investments and social expenditures necessary to develop sustainably. At the same time, growing global inequality, increasing hazard exposure, rapid urbanization and the overconsumption of energy and natural capital threaten to drive risk to dangerous and unpredictable levels with systemic global impacts. In particular, as the planet's biocapacity is overwhelmed, there is now a very real possibility that disaster risk will reach a tipping point beyond which the effort and resources necessary to reduce it will exceed the capacity of future generations. This poses a critical challenge to the future of disaster risk reduction.

If an accelerated increase in disaster risk is to be avoided, there is a growing consensus that these drivers of risk, will have to be addressed. The understanding that beyond a given threshold social progress and human development are not dependent on unlimited economic growth and rising energy consumption is increasingly well accepted and is now informing the global discussion on sustainable development.

The private sector, citizens and cities have generated increasing momentum to transform development practices in renewable energy, water and waste management, natural resource management, green building and infrastructure, and sustainable agriculture. These development transformations also contribute to reducing disaster risks: for example, moving to a low-carbon economy reduces the risk of catastrophic climate change; protecting and restoring regulatory ecosystems can mitigate a variety of hazards; and risk-sensitive agriculture can strengthen food security.

In order to support these transformations in development, however, it is also necessary to reinterpret the way in which disaster risk reduction has been approached. Managing the risks *inherent* in social and economic activity, rather than mainstreaming disaster risk reduction to protect against *external* threats, is very different to the current approach to disaster risk reduction. It implies that managing risk, rather than managing disasters as indicators of unmanaged risk, now has to become inherent to the art of development; not an add-on to development, but a set of practices embedded in its very DNA.

The key message of GAR15, therefore, is that an appropriate set of mutually supportive strategies for disaster risk management that weave and flow through development decisions is critical to facilitating transformation and to the success of all three international frameworks

currently under discussion. Without the effective management of disaster risks, sustainable development will, in fact, not be sustainable.

# Main findings

## Disaster losses remain substantial

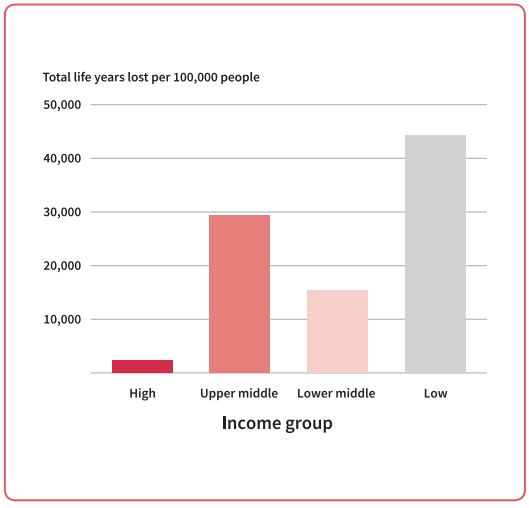
Twenty-five years after UN Member States adopted the International Decade for Natural Disaster Reduction (IDNDR) and ten years after the adoption of the Hyogo Framework for Action (HFA), global disaster risk has not been reduced significantly. While improvements in disaster management have led to dramatic reductions in mortality in some countries, the economic losses from disasters are now reaching an average of US$250 billion to US$300 billion each year.[3] More critically, the mortality and economic loss associated with extensive risks in low and middle-income countries are trending up.

## The cost of disasters is equivalent to that of major diseases and is an economic and social burden

The concept of human life years can be used to provide a better representation of disaster impact, as it provides a metric describing the time required to *produce* economic development and social progress. Between 1980 and 2012, around 42 million life years were lost in internationally reported disasters each year, a setback to development comparable to diseases such as tuberculosis.[5]

If these figures show that disaster loss is as much a critical global challenge to economic development and social progress as is disease, they also show that it is a challenge unequally shared. Over 90 per cent of the total life years lost in disasters are spread across low and middle-income countries (Figure 1).

**Figure 1** Share of life years lost relative to population by income group, 1990-2012




*(Source: UNISDR with data from Noy, 2014.[4])*

## Global risk poses a significant opportunity cost

While historical losses can explain the past, they do not necessarily provide a good guide to the future. Most disasters that could happen have not happened yet. A new Global Risk Assessment[6] highlights that the average annual losses (AAL) from earthquakes, tsunamis, tropical cyclones and river flooding are now estimated at US$314 billion in the built environment alone. The AAL can be interpreted as the amount that countries should be setting aside each year to cover future disaster losses; it thus represents an accumulating contingent liability. This is a significant opportunity cost, as these resources could be used for critical development investments.

## Expected future losses threaten economic development and social progress in lower-income countries

If this risk were shared equally amongst the world's population, it would be equivalent to an annual loss of almost US$70 for each individual person of working age,[7] or two months' income for people living below the poverty line.[8] This represents an existential risk for people already struggling for survival on a daily basis.

Where disaster risk represents a significant proportion of economic metrics such as levels of capital investment or social expenditure, the development challenge becomes obvious. For example, annual social expenditure is about 400 times greater in high-income countries than in low-income countries. However, the average annual loss in low-income countries is equivalent to about 22 per cent of social expenditure, compared to only 1.45 per cent in high-income countries (Figure 2).

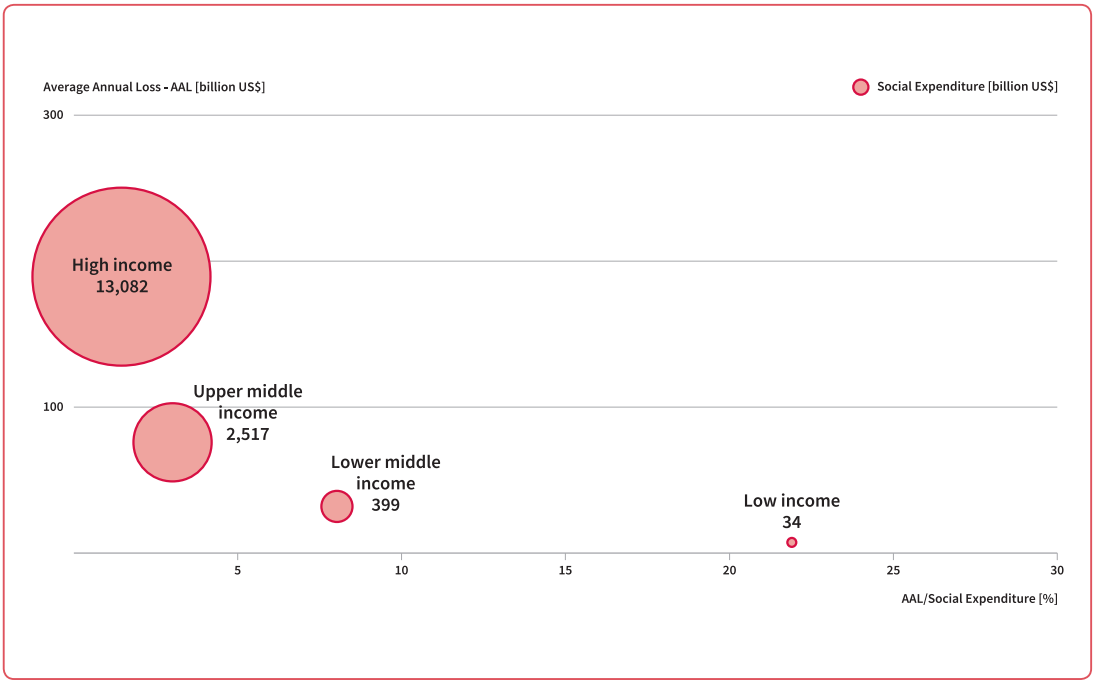
Unless disaster risk is reduced, therefore, these countries will not be able to make the necessary investments in social protection, public health and public education to achieve their development goals.

## Sustainable development in SIDS

For small island developing states (SIDS), expected future disaster losses are not just disproportionately high; they represent an existential threat. For example, in relative terms, SIDS are expected to lose 20 times more of their capital stock each year compared to Europe and Central Asia. Relative to capital investment or social expenditure, the expected losses in SIDS are also higher than in other regions.

In four SIDS, the resources that should be set aside each year to cover future disaster losses from tropical cyclones actually exceed the

**Figure 2** Estimated future losses from earthquakes, floods, tropical cyclones and tsunamis compared to social expenditure




*(Source: UNISDR with data from Global Risk Assessment and the World Bank.)*

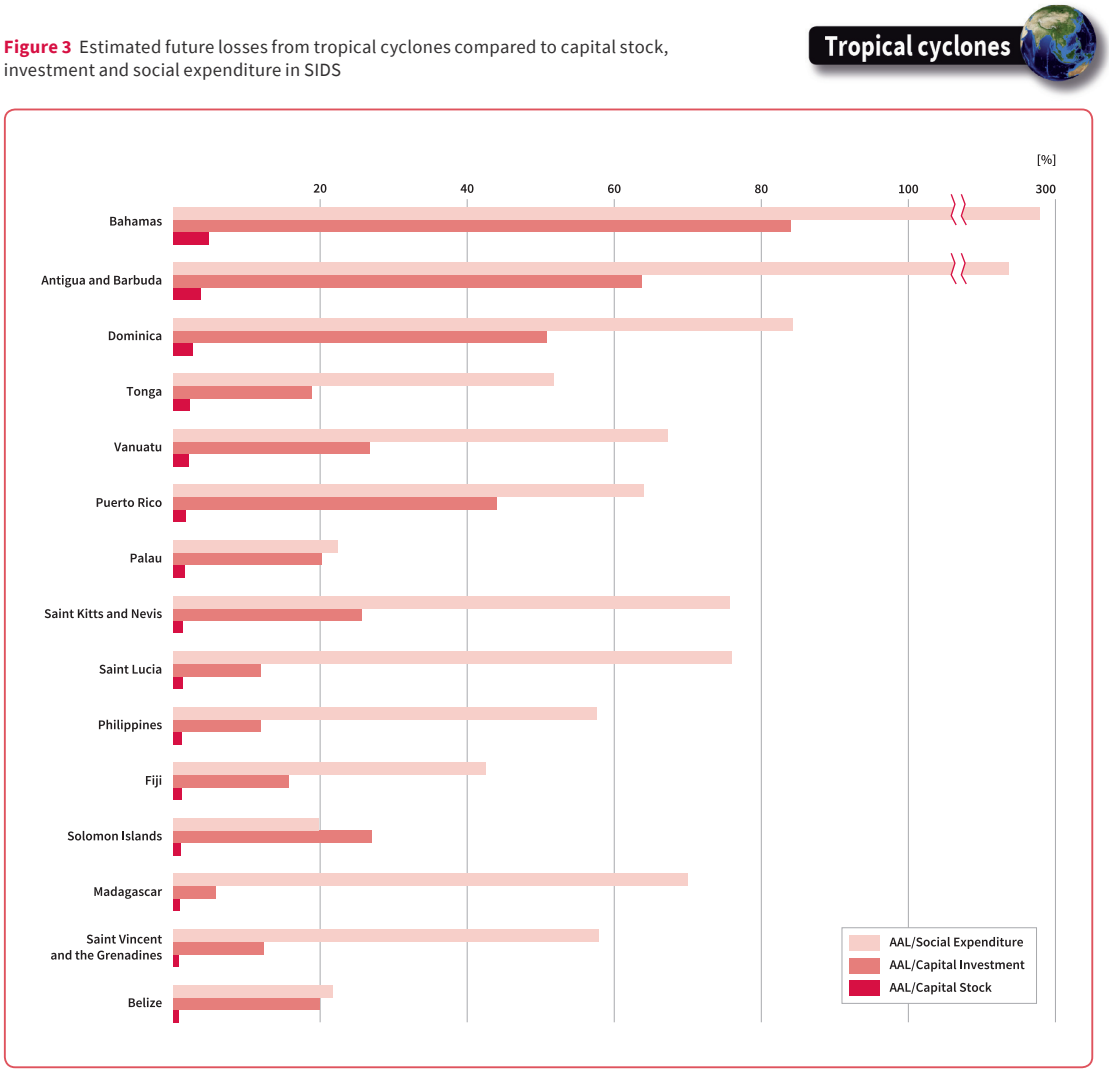
countries' total annual social expenditure (Figure 3), while in another five countries, the average annual loss is equivalent to over 50 per cent of what their governments are currently able or willing to spend on education, health and social protection combined.

## Increasing disaster risk due to climate change in the Caribbean basin

Climate change will have a significant impact on these expected future losses. In the Caribbean, for example, climate change will contribute an additional US$1.4 billion to expected annual losses by 2050 (Figure 4). This figure only represents the losses associated with increased wind damage and excludes additional losses from storm surge due to sea level rise.

With climate change, risk doubles in Honduras and increases fivefold in Trinidad and Tobago. In contrast, Mexico would actually see a reduction in risk, highlighting that the effects of climate change are not evenly distributed but will affect different countries in different ways.

**Figure 3** Estimated future losses from tropical cyclones compared to capital stock, investment and social expenditure in SIDS




*(Source: UNISDR with data from Global Risk Assessment and the World Bank.)*

## Uneven impacts of climate change on agricultural productivity

According to the IPCC, "climate change is very likely to have an overall negative effect on yields of major cereal crops across Africa, with strong regional variability in the degree of yield reduction".[9] This regional variability may even involve increases in maize production in eastern Africa.

In Kenya, Malawi and Niger, income from agriculture accounts for a substantial share of GDP and thus constitutes an important productive sector in all three countries.

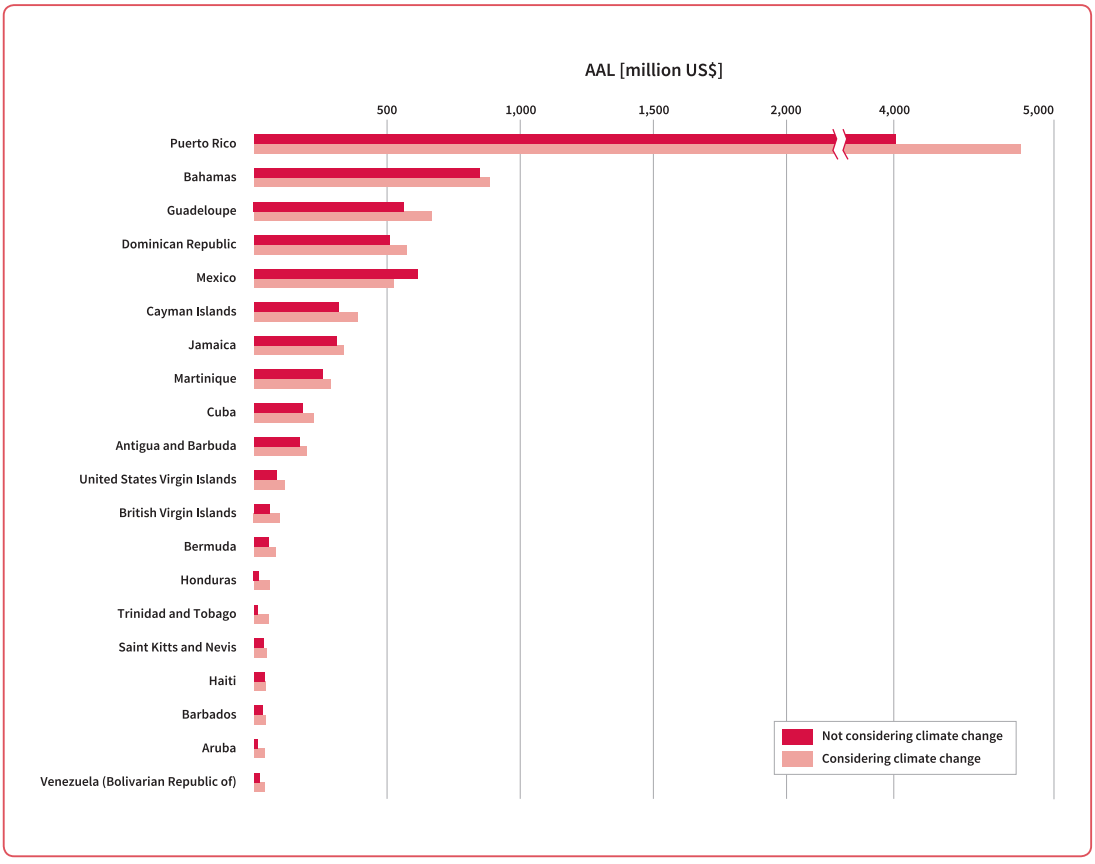
Based on near-future climate change scenarios, losses in maize production from drought in Malawi are projected to increase both in terms of absolute values and as a percentage of GDP.[10] Given that agriculture contributes 30 per cent to Malawi's GDP, this could push the country over a resilience threshold in terms of the national economy as well as poverty.

However, in Kenya and Niger, where agriculture generates 30 and 38 per cent of GDP (respectively), the losses would actually decline in the same climate change scenario.

## Extensive risk as a poverty factor

Unlike intensive risk, extensive risk is more closely linked to drivers such as inequality and

**Figure 4** Additional losses from climate change in the Caribbean basin



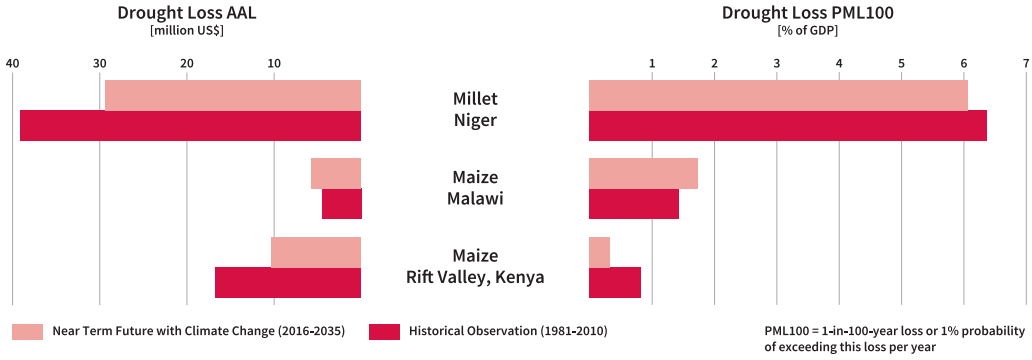

*(Source: UNISDR with data from Global Risk Assessment.)*

poverty than to earthquake fault lines and cyclone tracks. But precisely because extensive risk is constructed through development-related drivers, it is both manageable and avoidable with appropriate investments in disaster risk reduction.

Extensive risk is responsible for most damage and it represents an ongoing erosion of development assets, such as houses, schools, health facilities, roads and local infrastructure, particularly in low and middle-income countries (Figure 6).

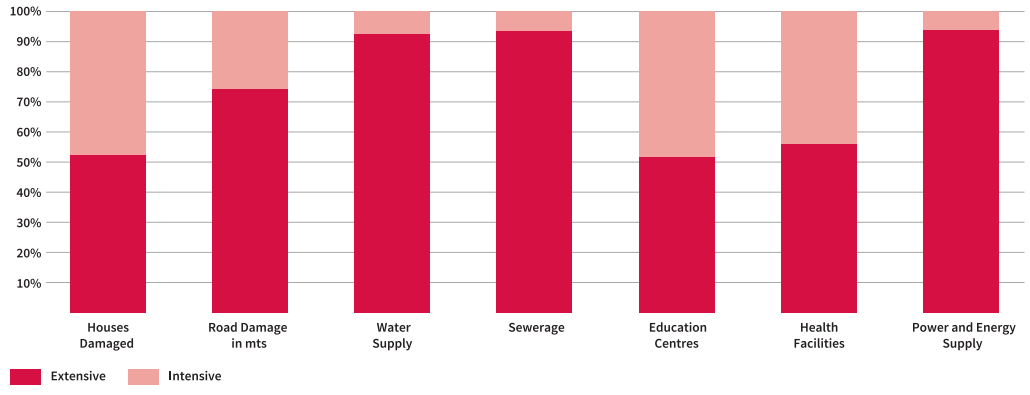
In the last decade, losses due to extensive risk were equivalent to US$94 billion in the 85 countries and territories where data is now available.[11] Insured losses and losses from intensive disasters are usually assessed and reported. In contrast, the cost of extensive risk is usually not accounted for. These losses are absorbed by the people affected, becoming an important poverty attribute in the process.

**Figure 5** Average annual loss from drought for maize and millet crops in Kenya, Malawi and Niger, observed and considering climate change




*(Source: Jayanthi, 2014.[12])*

**Figure 6** Damage due to extensive and intensive risk since 1990



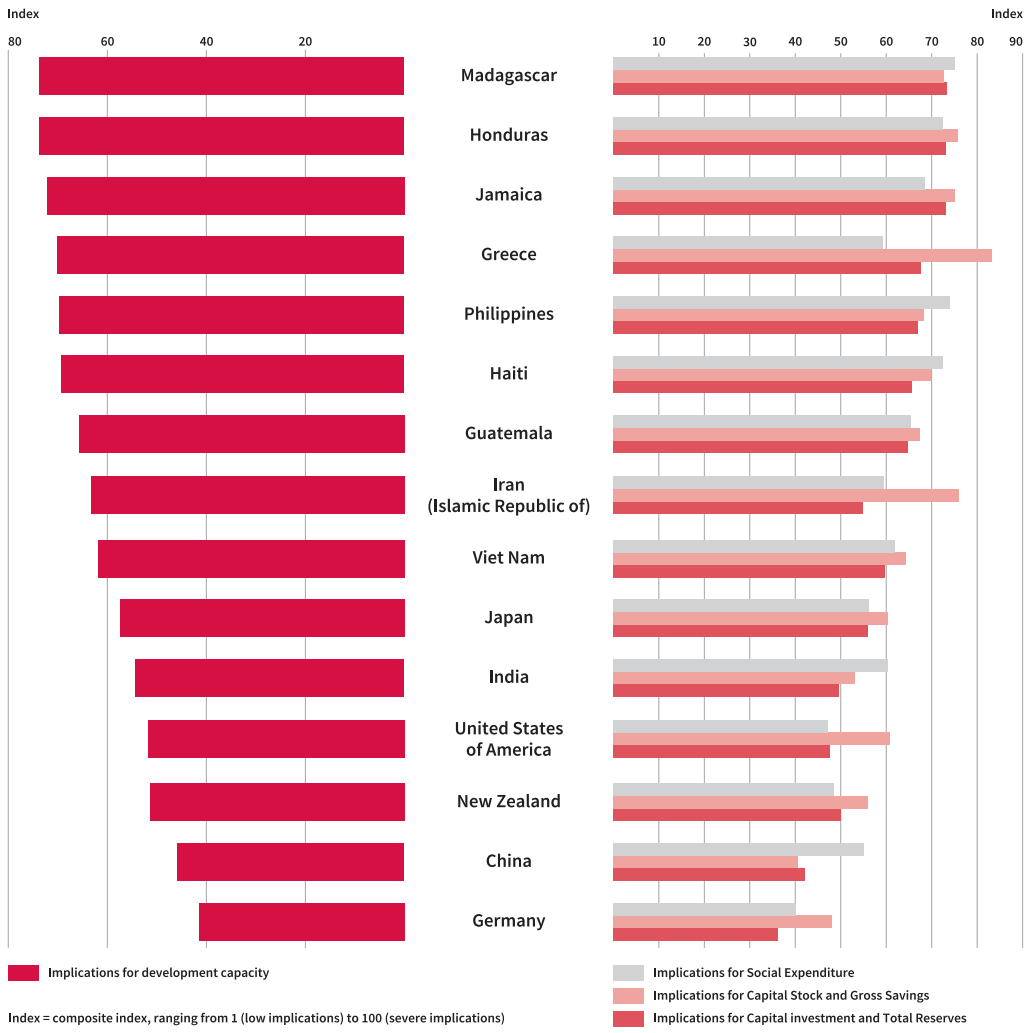

*(Source: UNISDR with data from national loss databases.)*

## Multi-dimensional risks

In countries with a high ratio of average annual loss to their capital stock and savings, disasters can lead to severe economic disruptions. In those with a high ratio of risk to capital investment, future economic growth can be compromised. And in those with a high ratio of risk to social expenditure, social development may be challenged.

A number of countries are characterized by all three scenarios, implying that disaster risk could seriously undermine their capacity to develop across multiple dimensions (Figure 7). This is a challenge not only for low-income countries such as Madagascar and Haiti, but also for middle-income countries like Honduras, Jamaica and the Philippines, and for high-income countries like Greece.

**Figure 7** Implications of disaster risk for development capacity




*(Source: UNISDR with data from Global Risk Assessment and the World Bank.)*

Although Jamaica and Greece have far lower relative risk compared to the Philippines, Fiji, Honduras and Madagascar, the negative implications for development are very similar. However, different countries are affected more in some dimensions than in others. While the principal challenge to Greece relates to economic growth, the main challenge facing the Philippines is one of social development.

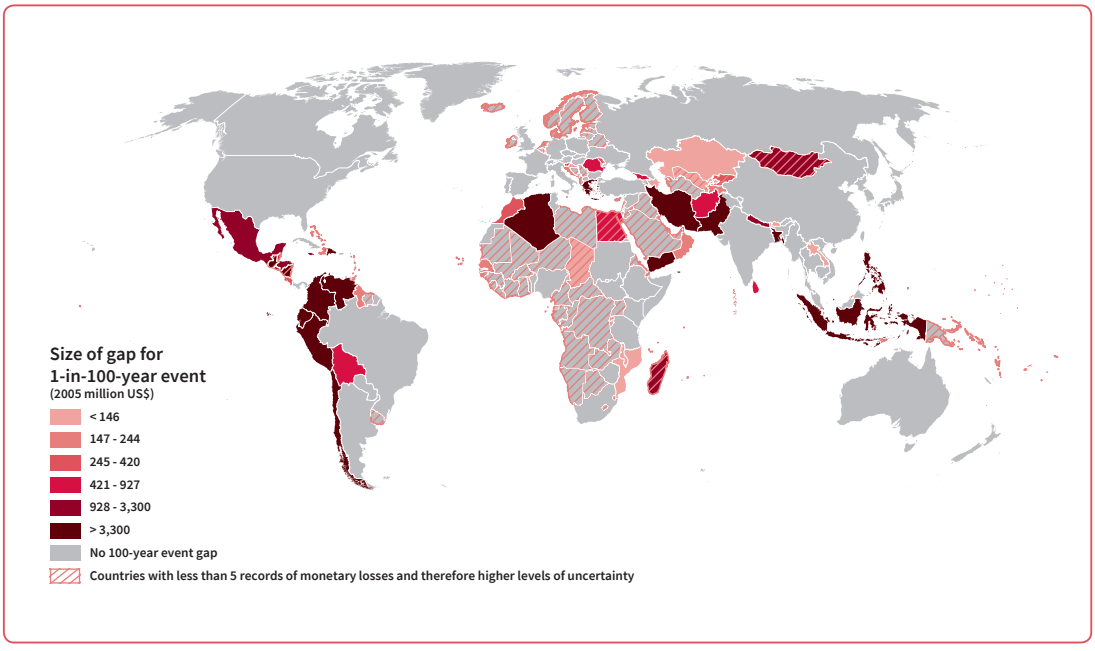
## Fiscal resilience challenged

Even if a country can finance its expected annual losses, it will not necessarily have the economic and fiscal resilience to cope with extreme but infrequent losses. In higher-income countries, a significant proportion of economic losses are insured, which strengthens fiscal resilience. In contrast, many countries with lower incomes and smaller economies, including least developed countries (LDCs) and SIDS, would face severe challenges in the event of extreme losses.

In these countries, most risk is uninsured and governments do not have the financial reserves or access to contingency financing that could allow them to absorb losses, recover and rebuild. In particular, countries with large budget deficits are usually unable to divert funding from revenues to deal with large disaster losses and therefore need to use other mechanisms, including taxation, national and international credit, foreign reserves, domestic bonds, aid and risk financing instruments.

As such, many countries would not pass a stress test of their fiscal resilience to a 1-in-100-year loss (Figure 8). Canada, the United States, Japan and European countries, for example, would not have a financing gap in the case of a 1-in-100-year loss. In contrast, the fiscal resilience of countries as diverse as Algeria, Chile, Greece, Indonesia, Iran, Nicaragua, Pakistan and the Philippines would be severely challenged.

**Figure 8** Countries facing a financing gap for a 1-in-100-year event




*(Source: Williges et al., 2014.[13])*

## Strengthened disaster management

The strengthening of institutional and legislative arrangements for disaster risk reduction under the HFA is an area where countries have reported substantial progress in only a short period of time (Figure 9). According to the HFA Monitor,[14] over 100 countries now have dedicated national institutional arrangements for disaster risk reduction. Since 2007, more than 120 countries have undergone legal or policy reforms, over 190 have established focal points for disaster risk reduction and 85 have created national multi-stakeholder platforms.

In practice, however, HFA progress reports highlight that most resources and efforts continue to be invested in strengthening capacities for disaster management.

Progress in ensuring that other sectors adopt policies, norms, standards and regulations to manage and reduce risk has been more modest. Similarly, there has been little systematic engagement with the private sector, except through the lens of corporate social responsibility.

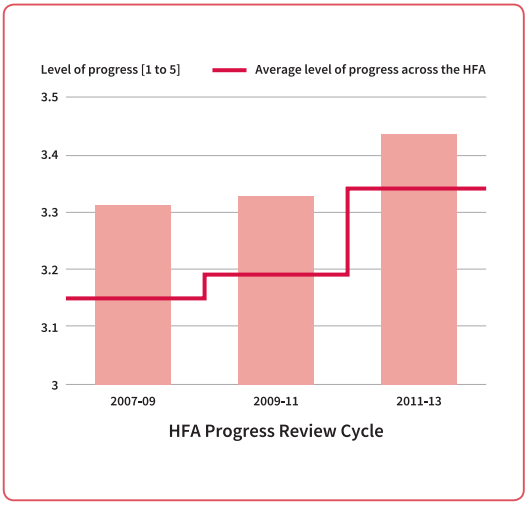
## Risk information and awareness

Since the adoption of the HFA, investment in risk identification and assessment has also increased considerably (Figure 10). However, as these efforts rarely account for the social and economic constraints or opportunities that condition how households, communities, businesses, local and national governments manage their disaster risks, they have not necessarily generated a *culture of prevention*.[15]

In parallel, and at all levels, the production of risk information has also increased significantly, accompanied by commensurate growth in the risk modelling community of practice, in the risk data available and in the scientific and technical capacities to transform that data into risk information.

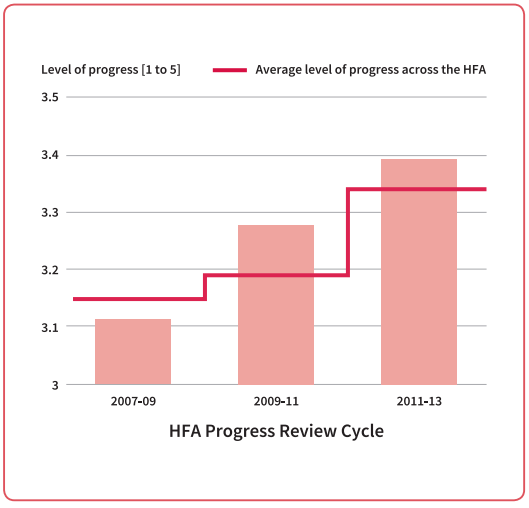
Yet, there is little evidence that the risk information produced is really informing development or disaster risk reduction. The production of risk information generally continues to be supply-driven and is rarely translated into risk knowledge for different potential users.

**Figure 9** Progress in disaster risk governance and policy formulation




*(Source: UNISDR with data from the HFA Monitor.)*

**Figure 10** Progress in risk identification and assessment




*(Source: UNISDR with data from the HFA Monitor.)*


## Early warning systems

The development and implementation of early warning systems is one area where significant progress has been made during the HFA. Success stories from Bangladesh, Chile, India, the Philippines and other countries show that timely and effective warning and communication, coupled with risk information and a prepared population, can significantly reduce disaster mortality.

In high-income countries and at the regional level, the growing sophistication of monitoring and forecasting has greatly enhanced the accuracy of forewarnings with regard to tropical cyclones, storms, floods, droughts, tsunamis and other hazards. At the same time, the communication of early warnings to end-users has been transformed by exponential increases in global connectivity, in particular mobile phone usage.

However, there are still major gaps in hazard monitoring, particularly in low-income countries, which may have difficulties maintaining the necessary technical and institutional infrastructure. The integration of available risk information into early warnings is still weak, meaning that not all alerts provide information about the level of risk. At the same time, levels of local preparedness to act on warnings are still very uneven.

## Disaster preparedness

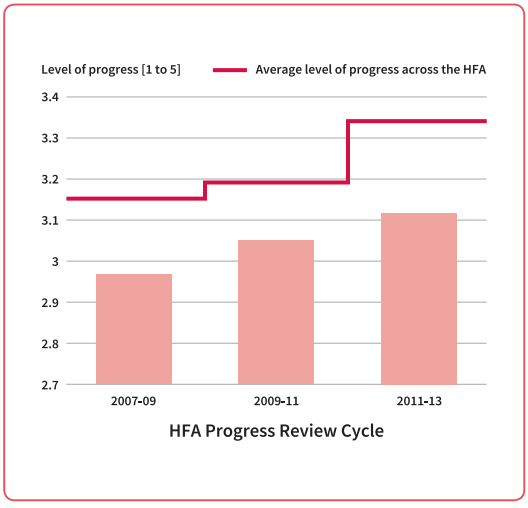
HFA progress reports highlight that the majority of countries have effected real improvements in disaster preparedness and made major investments in strengthening the necessary capacities, often supported by strengthened regional mechanisms. Success stories during the HFA, such as significant reductions in disaster mortality in Bangladesh, Mozambique, India and Cuba, can be attributed to a combination of strengthened preparedness and more effective early warning mechanisms.

However, some low-income countries still face challenges in developing and sustaining the necessary level of preparedness, particularly at the local level. Weak or non-existent local capacities also undermine even strong national disaster management arrangements. At the same time, preparedness plans and response may reflect preconceptions regarding the affected population or fail to account for the specificities and complexity of local risk scenarios, leading to unintended or negative consequences at the local level.

## Building back better

Recovery and reconstruction received little attention in the HFA despite having always been described as an integral part of disaster risk reduction. And according to national self-assessments, global progress in this area has been limited (Figure 11).

**Figure 11** Progress in recovery and reconstruction




*(Source: UNISDR with data from the HFA Monitor.)*

Reviews indicate that real progress has been made in ensuring that disaster risk reduction is factored into needs assessments and recovery frameworks. However, the incorporation of slogans such as *building back better* into such assessments is rarely actionable unless fully factored into operational recovery plans and budgets and ultimately into a more comprehensive approach to disaster risk management.

Once recovery is judged complete, many countries do not necessarily continue to *build back better,* but rather revert to *business as usual.* This highlights just how difficult it is to take advantage of the window of opportunity that opens after a disaster and to ensure that new development prevents and avoids disaster risks rather than reconstructing them.

## Addressing the underlying risk drivers

While Strategic Goal 1 and Priority for Action 4 of the HFA provided ample space for addressing underlying risks, this approach has been *the path less travelled.* As a result, all the evidence indicates that HFA Strategic Goal 1, the *integration of disaster reduction into sustainable development policies and planning,* has been achieved only to a limited extent.

However, this apparent shortfall masks a more complex reality. Rapid innovation and progress in other agendas, including those related to social protection, risk financing, climate change, environment, water, urban design and management, and sustainability, are transforming development policies and practices with direct or indirect risk reduction co-benefits that have not necessarily been captured in HFA progress reports.

However, these transformations are taking place against a backdrop of increasing risk. There is now mounting evidence that four interlinked global drivers (increasing hazard exposure, high levels of inequality, rapid urban development, and environmental degradation) may increase risk to unsustainable and dangerous levels.

## Increasing hazard exposure of economic assets

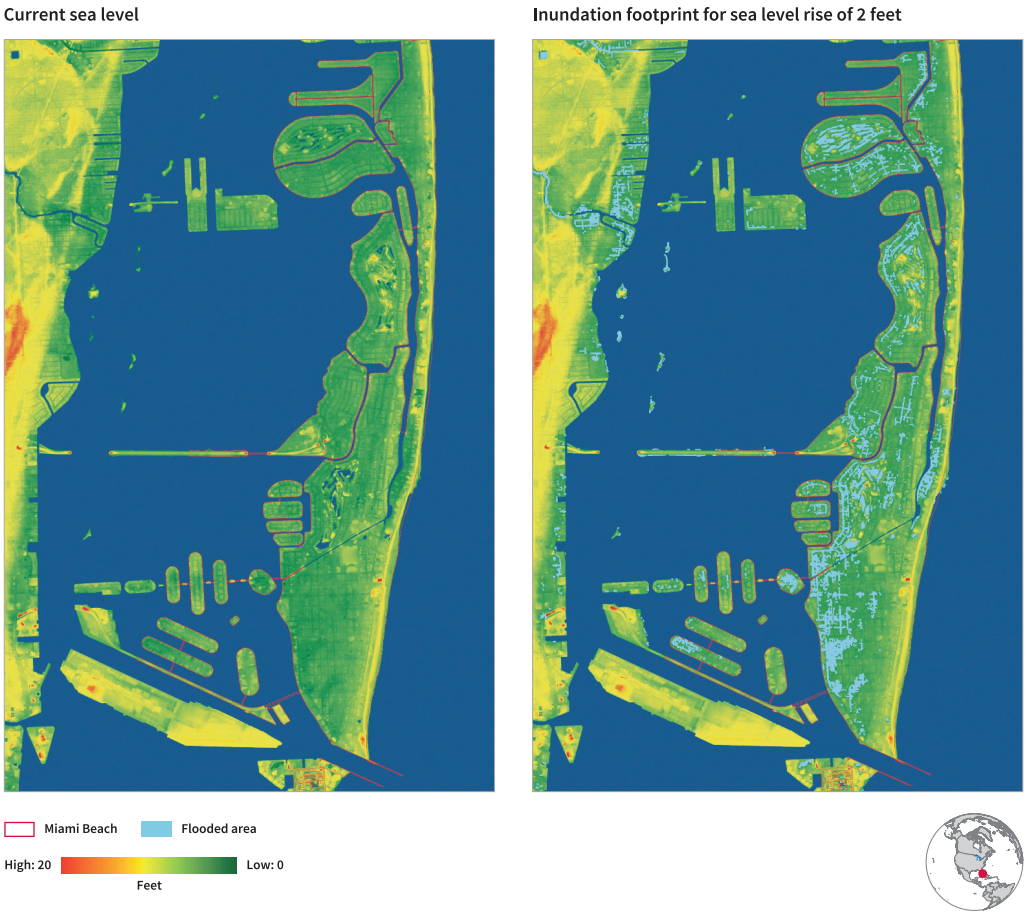
Global GDP per capita increased by 122 per cent between 1990 and 2010.[16] As the economy becomes more global, investment tends to flow to locations that offer comparative advantages, including low labour costs, access to export markets, infrastructure, stability and other factors.

Investment decisions rarely take into account the level of hazard in those locations, or they discount the risk excessively due to the short-term profits to be made. As a consequence, large volumes of capital continue to flow into hazard-prone areas, leading to significant increases in the value of exposed economic assets (Figure 12).

At the same time, innovative initiatives designed to promote risk-sensitive public and private investment have started to emerge. For example, Latin American countries such as Peru, Costa Rica, Guatemala and Panama have made sustained efforts to include disaster risk in their public investment planning, although these processes are still challenged by factors such as the availability of appropriate risk information and weak capacities at the local level.[17]

To date, however, opportunities for short-term capital accumulation have continued to outweigh concerns about future sustainability. The absence of accountability in the face of both neglectful and deliberate risk generation means that consequences are rarely attributed to the decisions that generated the risks. At the same time, this lack of attribution creates perverse incentives for continued risk-generating behaviour.

**Figure 12** Miami today and after a sea level rise of approximately 60 cm




*(Source: Peter Harlem, FIU.[18])*

Given the growing interconnectedness of urban systems, global supply chains and financial flows, this implies that unless risk valuations change, disaster risk will become increasingly systemic.


## Growing risk inequality

The concentration of capital generates social and territorial inequalities. The richest 2 per cent of the world's adult population now own over 50 per cent of global wealth,[19] whereas the bottom 50 per cent own less than 1 per cent of global wealth.[20] This represents a global Gini coefficient of 0.89,[21] meaning that the world is nearing what can be considered absolute levels of inequality.

As a result, sectors and territories without comparative advantages for capital accumulation face increasing risks due to low levels of investment in risk-reducing infrastructure, an absence of social and environmental protection, and rural and urban poverty, amongst other factors. The geography of risk inequality occurs at all

scales, between geographical regions and countries, within countries and even within cities and localities.

During the HFA, the agriculture, food and social welfare sectors have made considerable progress in addressing poverty and inequality. For example, food security is improving in many regions, and social protection coverage is increasing.[22] However, the ability to invest in social protection or disaster risk reduction remains limited in many countries, with stark differences in the capacity of local governments to meet the needs of citizens (Figure 13).

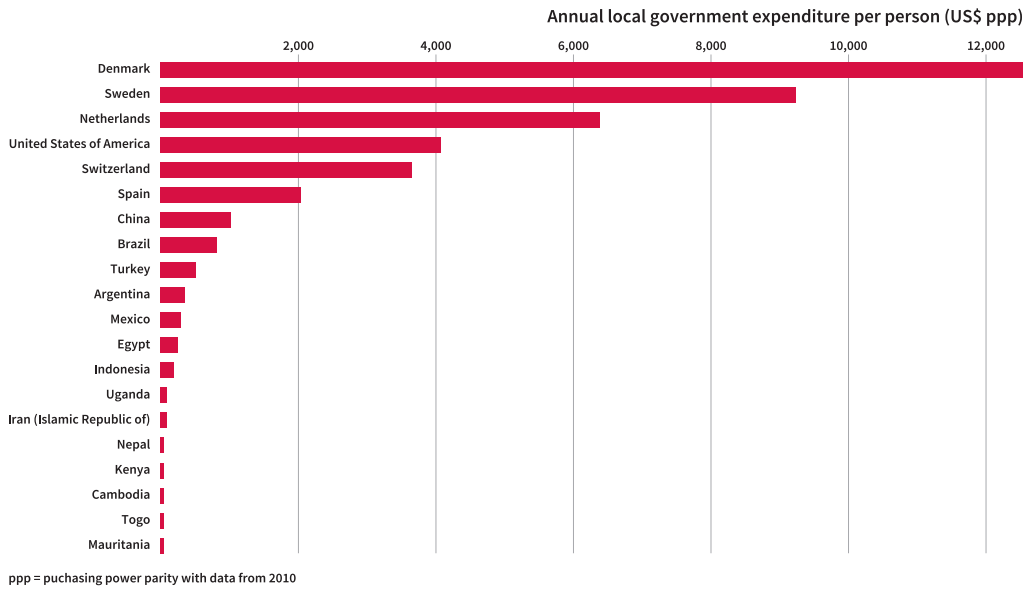
As a mechanism to bolster household, business and fiscal resilience, risk financing has also attracted growing interest during the HFA, and significant progress has been made in this area. Nationally and regionally, risk pooling schemes and catastrophe bonds are becoming an increasingly common tool to strengthen resilience.

While insurance markets are well capitalized, only a minority of low and middle-income countries have developed mechanisms to access capital markets for risk financing. And only a small proportion of households and businesses in those countries currently have access to catastrophe insurance. Countries report obstacles to progress such as a lack of capacity in their domestic insurance sectors or limited awareness of the costs and benefits of catastrophe insurance amongst potential beneficiaries, together with difficulties in pricing risk in the absence of accurate and credible risk metrics.

## Segregated urban development

As urbanization mirrors economic growth, rapid

**Figure 13** Local government expenditure per person in selected countries

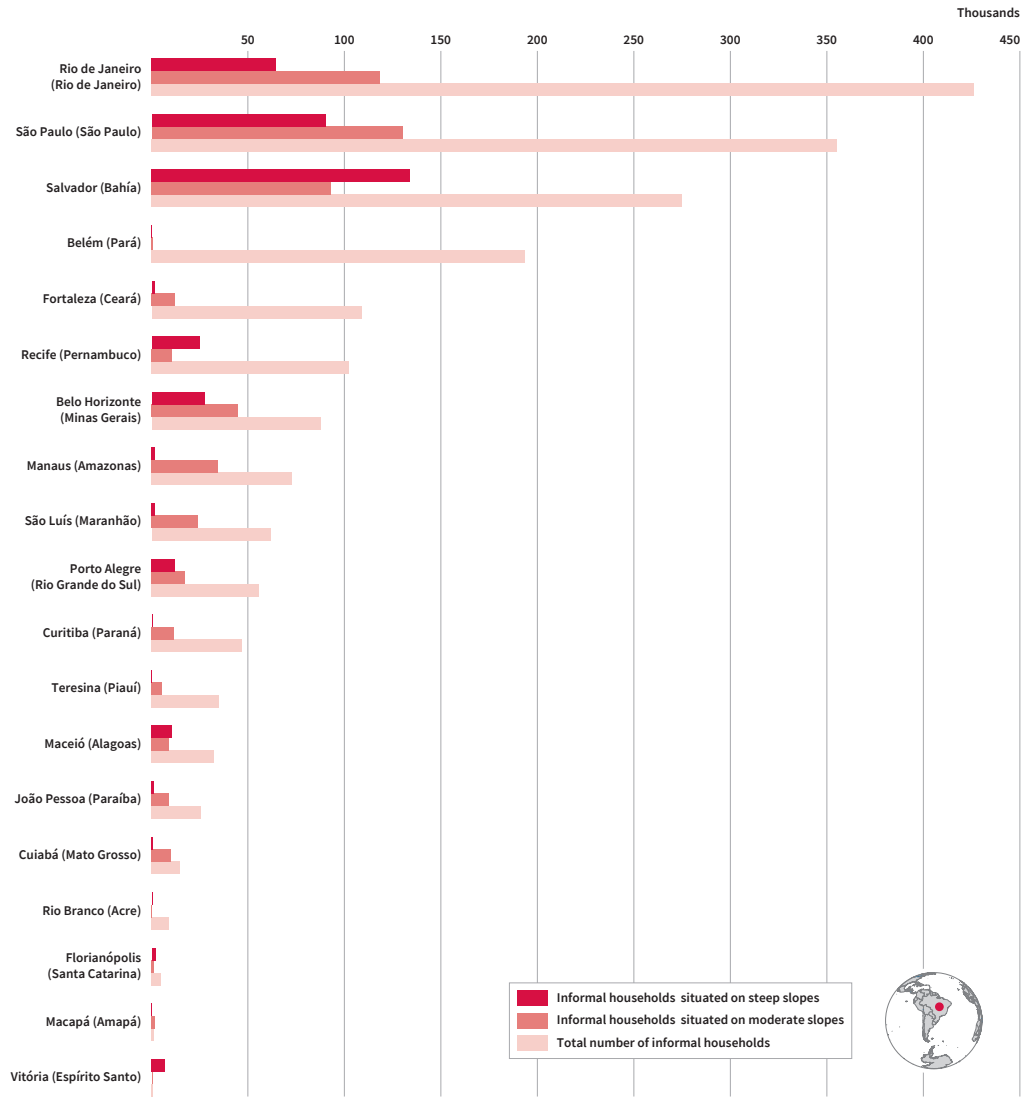



*(Source: UNISDR based on data from Satterthwaite and Dodman, 2013.[23])*

urban development *per se* contributes to the concentration of risk in hazard-exposed locations. However, in most low and middle-income countries urban development is also usually characterized by highly unequal access to urban space, infrastructure, services and security.[24]

The result is socially segregated urban development, which in turn generates new patterns of both extensive and intensive disaster risk (Figure 14). Low-income households in particular

**Figure 14** Informal households situated on moderate and steep slopes in selected Brazilian cities




Note: Steep slope: equal to or greater than 30% (16.7°); moderate slope: between 5% (2.9°) and 30% (16.7°).

*(Source: Alvalá et al., 2014.[25])*

are often forced to occupy hazard-exposed areas with low land values, deficient or non-existent infrastructure and social protection, and high levels of environmental degradation.

The HFA provided ample space for countries to engage in risk-sensitive urban development. Higher-income countries and some larger cities in middle-income countries have made sound progress in this area during the HFA. Some of the most promising developments in recent years are cases where cities have been able to regain control of their planning and management and to strengthen their urban governance through innovative partnerships between local governments, households and communities.

However, many low and middle-income countries have lacked the capacities to plan and manage urban development in an appropriate and risk-sensitive way, in particular in small urban centres. As a consequence, urban disaster risks have grown at a faster rate than they have been reduced.

An enormous volume of capital is expected to flow into urban development in the coming decades. Only around 40 per cent of the area expected to be urbanized by 2030 has been built to date. The projected expansion of urban land cover between the years 2000 and 2030 is in the range of 56 to 310 per cent.[26] The future of disaster risk reduction will depend heavily on ensuring that this future urban development is risk-sensitive.

## Consumption of natural resources

The pursuit of unlimited economic growth has led to an increasing and unsustainable overconsumption of energy, fresh water, forests and marine habitats, clean air and rich soil at the global scale. The ecological footprint from this overconsumption of energy and natural capital now exceeds the planet's biocapacity by nearly 50 per cent (Figure 15).

The planetary boundary for $CO_2$ emissions has been set at 350 ppm,[28] but current levels are continuing to rise and are now approaching 400 ppm.[29] Through changing temperatures, precipitation and sea levels, amongst other factors, global climate change is modifying hazard levels and exacerbating disaster risks in some territories and sectors.

At the same time, the environment sector has been able to use the HFA to strengthen international and regional policy and to exert an influence on practice. Similarly, the climate change sector has generated important additional political and economic support and momentum.

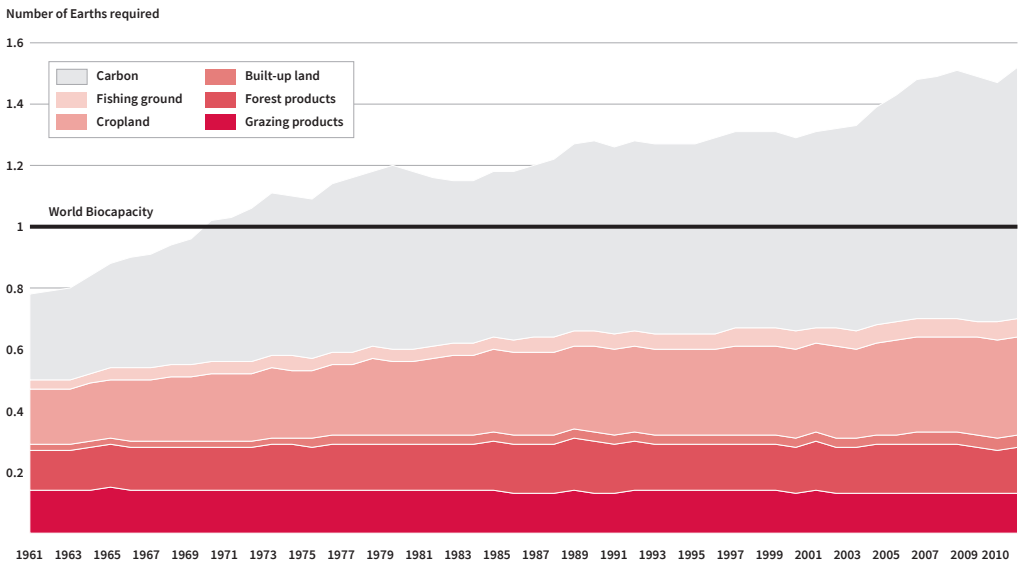
Disaster risk reduction is now better integrated into agendas relating to biodiversity, water, sustainability, energy and climate change than at the beginning of the HFA. A number of approaches and tools in environmental management, including environmental impact assessments, now take explicit account of disaster risk, while increasing investments are now being made in ecosystem approaches to disaster risk management at all levels.

## The future of disaster risk reduction

As disaster risk has increased rapidly during the HFA, disaster risk reduction itself is rapidly evolving. New stakeholders, including city governments, businesses and the financial sector, are driving change. Innovations in areas as diverse as risk governance, risk knowledge, cost-benefit analysis and accountability are challenging old assumptions and creating new opportunities.

Rather than a *programme* or *framework* for action, GAR15 presents a discussion on the future of disaster risk reduction that recognizes ongoing

**Figure 15** Global ecological footprint exceeds biocapacity by nearly 50 per cent




*(Source: Global Footprint Network.[27])*

innovation. The purpose of the report is to stimulate further reflection, debate and improved practice as countries begin to address the challenges posed by the new international agreements on disaster risk reduction, climate change and sustainable development in 2015 and beyond.

## Reforming governance

Countries will continue to require a dedicated and specialized disaster management sector to prepare for and respond to disasters. To the extent that risks continue to grow, there will be more rather than less demand for such a sector.

However, disaster and climate risks in development need to be approached through strengthened governance arrangements in sectors and territories. This requires a combination of prospective risk management to ensure that risks are appropriately managed in new investments, corrective risk management to reduce the risk present in existing capital stock, and efforts to strengthen resilience at all levels.

## From risk information to risk knowledge

Managing risks in this way requires greater risk awareness and knowledge. The social production of risk information itself needs to be transformed, with a shift in focus from the production of risk information *per se* towards information that is understandable and actionable by different kinds of users: in other words, risk *knowledge*.

An increasing sensitivity to extensive risk is particularly important. Because of its pervasiveness, this form of risk relates directly to the day-to-day concerns of households, communities, small businesses and local authorities. At the same

time, because it is configured to a large extent by social, economic and environmental vulnerability, it can be reduced effectively through risk management and sustainable development practices.

## Assessing the costs and benefits

The costs and benefits of disaster risk management need to become fully encoded into public and private investment at all levels, into the financial system and into the design of risk-sharing and social protection mechanisms.

Cost-benefit analyses can be expanded to highlight the trade-offs implicit in each decision, including the downstream benefits and avoided costs in terms of reduced poverty and inequality, environmental sustainability, economic development and social progress. They can also help to identify who retains the risks, who bears the costs and who reaps the benefits. Such a broad approach to cost-benefit analysis can increase the visibility and attractiveness of investments in disaster risk reduction.

Within financial systems, this approach can help to identify the potential risks inherent in asset and loan portfolios, in credit and debt ratings, and in economic forecasts, linking investment decisions more closely to their consequences for disaster risk. It can also provide a rationale to encourage the expansion of risk financing and social protection measures to low-income households, small businesses and local governments.

## Strengthening accountability

It will only be possible to consider the full costs and benefits of disaster risk management in investment decisions, the financial sector and risk-sharing mechanisms if those responsible can be held to account for their decisions. If societies become more sensitive to both the causes and consequences of disaster risk, responsibility for the subsequent losses and impacts will become a societal issue that can be subjected to social discourse and negotiation. This can lead to enhanced accountability not only for realized disaster loss and impacts, but also for the generation and accumulation of future risks.

Social demand and accountability go hand in hand. Without bottom-up demand, even high levels of political support for disaster risk management will fail to create the type of accountability mechanisms required.

At the same time, the different powers within countries will have different roles to play. Accountability is dependent on regular monitoring and reporting against agreed benchmarks and targets. While the executive branch may have the ability to set goals and targets, several countries are currently experimenting with mechanisms such as parliamentary committees and national control or audit offices to provide oversight, as well as reinforcing the role of the judicial branch in ensuring compliance.

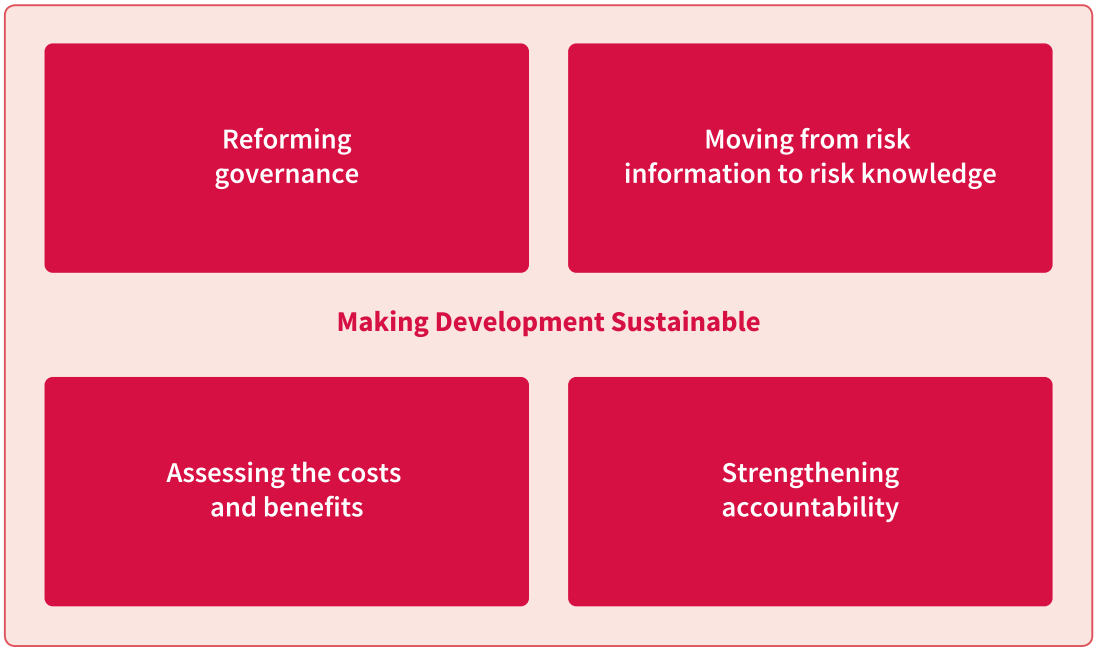
Voluntary standards also have great potential as a means of strengthening accountability. They can help raise awareness and engagement in risk management by offering simple and agreed metrics put forward in a language and formats that are familiar to businesses, local governments and communities.

## Making development sustainable

As these and other innovations start to challenge the way disaster risk has been managed up to now, disaster risk reduction has the potential to become a truly transformational force.

Reducing poverty, improving health and education for all, achieving sustainable and equitable economic growth, and protecting the health

**Figure 16** The Future of Disaster Risk Management




*(Source: UNISDR. )*

of the planet now depend on the management of disaster risks in the day-to-day decisions of governments, companies, investors, civil society organizations, households and individuals. Strengthened disaster risk reduction, therefore, is essential to make development sustainable.

## Notes

**1** Global Commission on the Economy and Climate, 2014: Better Growth, Better Climate: The New Climate Economy Report. Washington: WRI. UNCTAD, 2014: World Investment Report 2014 - Investing in the SDGs: An Action Plan. Geneva, Switzerland.

**2** Estimates depend on the benefit-cost ratio (BCR) and discount rate applied.

**3** Munich Re, 2013: 2013 Natural Catastrophe Year in Review. January 2014. Munich, Germany. Swiss Re, 2014: Natural catastrophes and man-made disasters in 2013: large losses from floods and hail; Haiyan hits the Philippines. No. 1/2014.

**4** Noy, I., 2014: A new non-monetary global measure of the direct impact of natural disasters. Background Paper prepared for the 2015 Global Assessment Report on Disaster Risk Reduction.

**5** Based on assessment of life years lost by Noy, I., 2014: A new non-monetary global measure of the direct impact of natural disasters. Background Paper prepared for the 2015 Global Assessment Report on Disaster Risk Reduction. Calculated using data on DALYs from the WHO: http://www.who.int/healthinfo/global_burden_disease/estimates/en/index2.html.

**6** The UNISDR-led Global Risk Assessment presented in GAR15 is a unique effort of many scientific institutions, international organizations, governments and experts that has produced the first global probabilistic risk assessment of its kind. For details on the methodology, see Annex 2 of the main report.

**7** Persons aged 15 to 64 based on data from the United Nations; see http://esa.un.org/unpd/wpp/index.htm.

**8** Based on the World Bank definition, under which people below the poverty line live on US$1.25 or less per day.

**9** IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Working Group II, 31 March 2014. Cambridge, United Kingdom: Cambridge University Press.

**10** Jayanthi, H., 2014: Assessing the agricultural drought risks for principal rainfed crops due to changing climate scenarios using satellite estimated rainfall in Africa. Background Paper prepared for the 2015 Global Assessment Report on Disaster Risk Reduction.

**11** Analysis based on data from national loss databases.

**12** Jayanthi, H., 2014: Assessing the agricultural drought risks for principal rainfed crops due to changing climate scenario using satellite estimated rainfall in Africa. Background Paper prepared for the 2015 Global Assessment Report on Disaster Risk Reduction.

**13** Williges, K., S. Hochrainer-Stigler, J. Mochizuki and R. Mechler. Modeling the indirect and fiscal risks from natural disasters: Emphasizing resilience and “building back better”. Background paper prepared for the 2015 Global Assessment Report on Disaster Risk Reduction.

**14** The HFA Monitor facilitates and collects national self-assessments of progress against the HFA. For details on the Monitor and national progress reports, see http://www.preventionweb.net/english/hyogo/hfa-monitoring.

**15** OECD, 2014: Disasters Derail Development. So why aren’t we doing more about them? How better incentives could help overcome barriers to disaster risk reduction in development programming. Background Paper prepared for the 2015 Global Risk Assessment on Disaster Risk Reduction.

**16** Data from the World Bank Development Indicators: http://data.worldbank.org.

**17** Lavell, A., 2014: Disaster Risk Reduction and Public Investment Decisions: The Peruvian Case. Technical Note, First Edition, August 2014. Lima, Peru.
GIZ, 2012: Disaster risk management and adaptation to climate change. Experience from German development cooperation. Edited by Lutz, W., M. Siebert and E.Wuttge. Frankfurt am Main, Germany.

**18** Maps provided to UNISDR by Peter Harlem at Florida International University, November 2014.

**19** Davies, J., R. Lluberas and A. F. Shorrocks, 2012: Measuring the Global Distribution of Wealth. 2012 OECD World Forum New Delhi. 17 October 2012.

**20** Credit Suisse, 2013: Global Wealth Report 2013. Research Institute, October 2014. Zurich, Switzerland.

**21** The Gini coefficient ranges from a minimum value of 0 to a maximum of 1, where 0 is perfect equality and 1 is perfect inequality.

**22** FAO , IFAD and WFP, 2014: State of Food Insecurity in the World In Brief. Strengthening the enabling environment for food security and nutrition. Rome, Italy: FAO.
Arnold, M., R. Mearns, K. Oshima, V. Prasad, 2014: Climate and Disaster Resilience: the Role of Community-Driven Development. Background Paper prepared for the 2015 Global Assessment Report on Disaster Risk Reduction.

**23** Satterthwaite, D. and D. Dodman, 2013: Towards resilience and transformation for cities within a finite planet. Environment and Urbanization 2013, Volume 25 (2): 291-298.

**24** Mitlin, D. and D. Satterthwaite, 2013: Urban Poverty in the Global South. Scale and Nature. USA and Canada: Routledge Publishing.

**25** Alvalá, R, C. Nobre and V.Marckezini, 2014: Lições aprendidas com os desastres naturais: a criação de uma estrategia nacional de gestão de riscos no Brasil. Case study provided to UNISDR for the 2015 Global Assessment Report on Disaster Risk Reduction.

**26** IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Working Group II, 31 March 2014. Cambridge, United Kingdom: Cambridge University Press.

**27** Data provided by the Global Footprint Network to UNISDR in preparation of the 2015 Global Assessment Report on Disaster Risk Reduction.

**28** ppm = parts per million, i.e. the ratio of the number of gas molecules to the total number of molecules of dry air.

**29** NOAA monthly data on $CO_2$ concentrations: http://www.esrl.noaa.gov/gmd/ccgg/trends/global.html.

# GAR15 products

• The Pocket GAR summarizes the main evidence and messages of the report in a concise, easy-to-read format.

• The main report contains further enhanced content links which provide access to dynamic maps, videos, photos, and case studies for users with smartphones and tablets.

• Tablet computer and smartphone users can also enjoy the free GAR for Tangible Earth (GfT) application. The GfT (or "gift") is a fully interactive stand-alone application which features a 3D globe interface with decades of dynamic earth science data sets, including disaster events from all GARs. These data sets are illustrated with interactive risk scenarios, maps and photos, and can be searched by time (including real-time), place, risk driver, hazard, disaster event, and more.

• GAR15 is also available as a web version, with much of the functionality available in products such as:

Interactive main report in English
Main report (PDF) in Arabic, Chinese, French, Russian and Spanish
The Pocket GAR in Arabic, Chinese, French, Japanese, Russian and Spanish
Appendices
Background papers
Interim national progress reports on the implementation of the Hyogo Framework for Action
Access to disaster loss and risk databases

All GAR15 products can be accessed via:

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