



Global Platform for Disaster Risk Reduction

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Leaders' Forum for Disaster Risk Reduction

Background Paper

Investing in resilience to protect investments and reduce economic loss

Introduction

Protecting investments and reducing economic losses require a number of urgent measures. These measures are embodied in the *Sendai Framework for Disaster Risk Reduction 2015-2030* and its global targets, which call for a major commitment to risk-sensitive investment, particularly in critical infrastructure; ecosystem management and land-use planning; and for the development and design of partnerships to build resilience, especially with the private sector.

Globally, economic losses due to disasters are increasing dramatically. For the first time annual economic losses from disasters have exceeded \$100 billion for five consecutive years (\$132 billion in 2010, \$364 billion in 2011, \$156 billion in 2012, \$119 billion in 2013, and \$110 billion in 2014). Over the last decade these economic losses have reached almost \$1.4 trillion. Regrettably, the lack or limited amount of sex and age disaggregated data does not allow to account for losses and damages affecting particular categories of the population.

Disasters are obstacles to economic growth and to achieve sustainable development. The indirect costs of disasters with potential cascading and global effects are a real threat to economic stability and growth. For example, poor people are twice as likely as the rest of the population to live in buildings that can be completely wiped out by disasters, and all of their wealth is in material form, vulnerable to disasters. Extensive risks, or risks caused by frequent but small hazards, affect poor people disproportionately.

Although extensive disasters do not cause significant fatalities, they are responsible for a large proportion of damage to local infrastructure and livelihoods of low-income households and communities, with a particularly devastating impact on women and girls, the elderly and persons with disabilities. The number of houses damaged relative to population growth in 21 countries and states has increased six-fold since the 1990s. This reflects how the risks generated by rapid economic growth are transferred to low-income households and communities who least enjoy its benefits.¹ Also disasters make it more difficult to reduce poverty – by one estimate, disasters make at least 26 million people fall into poverty every year.²

¹ UNISDR, *GAR 2009, GAR 2013*

² *GFDRR, Unbreakable*

Economic growth, the rapid pace of urbanization, and population growth have influenced the movement of people, jobs and economic assets. Many of these changes have taken place in hazard-prone areas, increasing the hazard risk for livelihoods, assets and business supply chains. The impacts of climate change, with more frequent and larger storms, due to higher temperatures, variable rainfall and more intense and extreme weather related events.

The global need for infrastructure investment is estimated at \$4.5-5.4 trillion per year, with an additional premium of 9-27% to make this infrastructure low-carbon and climate resilient. However, there are major constraints to mobilizing private capital to meet this need, especially in developing countries.³

Small and medium-sized enterprises (SMEs) are at the forefront of high exposure and vulnerability. The private sector contributes from 70 to 85 percent of total economic investment in most countries. Therefore the extent to which these investments are risk-informed is one of the determinants of the future of disaster risk⁴. Investors need to place sufficient attention to the exposure of businesses to hazards and the threat this represents to profits, competitiveness and sustainability.

Also, disaster risk management (DRM) is a vital contribution to sustainable economic growth and to sustainable economic development in general. It should also be viewed as an opportunity to enhance competitiveness and strengthen resilience to increasing risks and shocks.

In the short term, resilient investments can accelerate jobs and growth. In the medium term, DRM can help ensuring structural sustainability of public and private finances, by reducing the detrimental impact of natural and man-made disasters on growth and public and private budgets. In the long-term, good disaster risk management provides strong economic sense.

In addition, expanding financial inclusion, disaster risk and health insurance, social protection and adaptive safety nets, and universal access to early warning systems would also reduce well-being losses from natural disasters.

The main issues explored below include actions on promoting resilience in public investment, private investments, tools such as land-use planning and ecosystems-based risk reduction, and finally collaborative approaches and public and private partnerships. These options have been selected based on the potential for mobilizing actions to produce the greatest impacts in reducing present and future risks and reduce global economic losses.

Resilient public investment

Investing in disaster-resilient infrastructure can be an effective way to reduce risks and to increase the resilience in particular of public assets. The inclusion of known hazards and risks in the economic planning process is an important consideration. The process involves risk identification and the assessment of the exposure and vulnerability of critical infrastructure. In particular, strengthening and enforcing building practices, building codes, and land use plans are important aspects whose implementation can be improved. Recent examples of resilient public investment include the following:

³ *GFDRR, Investing in Urban Resilience*

⁴ *UNISDR, GAR13*

- Over the past two decades, disasters have cost China on average 2.38% of its GDP. China's *Comprehensive Disaster Prevention and Reduction Plan (2011-2015)* proposed to reduce losses to less than 1.5% GDP per year by 2015. This ambitious target has reportedly been achieved through investments in early warning, risk assessment, information and communications technology for disaster risk reduction, community based disaster risk reduction, education and awareness raising. China invested \$3.15 billion on flood control between 1960 and 2000, which averted losses estimated at about \$12 billion⁵.
- The Rio de Janeiro flood reconstruction and prevention project in Brazil yielded an internal rate of return exceeding 50 percent⁶.
- Bangladesh's cyclone preparedness programme has greatly reduced the loss of life from this recurring hazard.⁷
- Bangladesh has also invested to raise agricultural productivity in low-lying areas, to improve flood protection and drainage in urban areas, as well as implementing irrigation schemes to allow for dry season crops, and brought in coastal 'greenbelt' projects. These have contributed to reducing disaster losses from \$ 4.3 billion in a 1998 cyclone to just \$0.27 billion in losses in a similarly powerful cyclone in 2009⁸
- The disaster mitigation and preparedness programmes in Andhra Pradesh, India yielded a benefit/cost ratio of 13:1.⁹
- Turkey's *Earthquake Strategy and Action Plan (2012-2023)* aims to build the country's seismic resilience. Existing buildings of critical importance will be retrofitted and seismic standards will be applied to new construction. The Strategy includes raising awareness among the population on how to cope with seismic events and identifies mandates and responsibilities for action in 13 governmental institutions¹⁰.
- Norway has rigorous building safety standards to address floods and storm surges. Critical infrastructure, such as schools and hospitals, must be built to withstand a 1-in-1000 year flood, housing must be able to withstand a 1-in-200 year flood, and "third tier" structures, such as storage units, must be able to withstand a 1-in-20 year flood¹¹
- Iran's health system adopted the WHO Hospital Safety Index (HSI) and has integrated the related assessment program into the governments health information system, which includes 145 indicators covering structural, non-structural and functional capacity. Hospitals were classified by three safety classes (low, average and high). An analysis in 2015 identified 82 unsafe hospitals, and 339 averagely safe hospitals. Overall, the average safety score of hospitals increased between 2012-2015 from 34.0 to 43.0¹².

⁵ National Disaster Reduction Center

⁶ <http://www.worldbank.org/en/news/feature/2012/11/19/Brazil-natural-disaster-management-costs-development>

⁷ UNISDR, ESCAP. 2012 Asia Pacific Disasters Report

⁸ UNISDR, ESCAP. 2012 Asia Pacific Disasters Report

⁹ http://www.wmo.int/pages/prog/dra/vcp/documents/7607_Climate-Change-DRR.pdf

¹⁰ https://www.afad.gov.tr/upload/Node/4311/files/National_Earthquake_Strategy_Action_Plan_NESAP_Turkey_20150909103246.pdf

¹¹ <http://www.bangkokpost.com/print/377921/>

¹² <https://www.ncbi.nlm.nih.gov/pubmed/27602564>

- Following a resolution of the Pan-American Health Organization (PAHO), in 2006 México created the Safe Hospital Programme, coordinated by the Ministry of Interior (SEGOB) and the Ministry of Health. Its objectives give priority to the assessment, classification and certification of hospitals according to indicators aimed at measuring their level of safety in case of disaster. Hospitals are assessed to identify their level of exposure to risks according to an index of hospital safety designed by PAHO. A plan of actions is then developed to reduce the hospital's vulnerability, as well as to ensure that it can appropriately evacuate its patients, maintain critical operations and provide medical care to an important number of victims in case of disaster.¹³
- Western Attica (Greece) has serious flood problems. The EC Cohesion Fund financed an €80 million flood protection project along the Eschatia river. This protects 134,000 local residents and their property from floods in the suburbs of Athens. It also created over 700 jobs and promoted urban regeneration in a low-income area. The construction of new flood defence structures stops floods now, and it will also allow for future development of areas upstream.¹⁴
- A €2 million investment by the European Union supports to improve the defence centre against forest fires in Vélez-Blanco, Andalusia (Spain) and covers 11 municipalities and 150,000 residents in a region at high risk of fire. A new heliport means better collaboration with other rescues services in the area. The project also links closely to parallel efforts in forest management, and training and awareness raising.¹⁵
- With €8 billion for climate change adaptation and risk prevention and management; EU Cohesion Policy is one of the most important sources for funding this area. Twenty EU Member States have already selected risk prevention as a priority for their 2014-2020 funding period. Many activities to support risk prevention and management can be funded through this Policy, including the development of strategies, the reinforcement of monitoring and early warning systems, awareness raising and education, flood and coastal defence, logistical support for civil protection units, ecosystem based solutions, and disaster resilience and climate proofing of public infrastructure. These investments will help protect 13.3 million people from floods and 11.8 million from forest fires.¹⁶
- The Mexican Federal Government has done a considerable work on strengthening the Mexican Seismic Network, with the objective of having a Standardize Network of Seismological Observatories and complementary seismological stations that ensure nationwide coverage able to register earthquakes starting from 3.8 of magnitude, on a homogeneous way. Through this investment the continuous operation of the National Seismological Service will be assured for the timely emission of seismicity reports and the generation of intensity maps, even under highly unfavorable conditions that may occur in any environmental context regardless of its origin. The goal will be to achieve an annual availability level of 99% for the monitoring centers.¹⁷

¹³ Source: Direct communications from the Office of Civil Protection of Mexico

¹⁴ EC Submission

¹⁵ EC Submission

¹⁶ EC submission

¹⁷ Office of Civil Protection of Mexico

Resilient private investments

The critical role of the private sector in building resilience to hazards at local, regional and national level is increasingly becoming appreciated by both government and private sectors. A key priority is to identify existing, and develop new models of private sector engagement and disseminate lessons learnt and smart practice.

Natural hazards can affect companies directly through their operations, or indirectly through their value chains. For example, the 2010 volcanic eruption in Iceland led to major economic losses in travel, tourism and trade; amounting to \$4.7 billion losses globally in just the first week. Similarly, the private sector bore about 95% of the colossal economic losses (\$44 billion) incurred during the 2011 Thailand floods. The 2011 Great East Japan Earthquake and Tsunami resulted in suspension of production in 80% of automotive plants in Japan, at enormous economic cost, both in Japan and globally.

Natural hazards can damage private sector infrastructure, such as factories, information infrastructure and disrupt supply chains. The immediate impacts can, in turn, trigger cascading impacts to both the private and public sectors, as the recent disasters in Japan and Thailand so visibly demonstrated.

Private sector capacity, resources, technology and innovation are essential to reducing disaster risks in the sector and produced by the sector, as well as within the communities where businesses operate.

However, the greatest disaster economic losses are borne by private citizens. For example the Post Disaster Needs Assessments done after Typhoon Ketsana (2009) in the Lao People's Democratic Republic, typhoon Ondoy (2009) in the Philippines, and Pakistan floods (2010) – have shown that it is private citizens who pay for a majority of disaster losses. In the above cases, the maximum damage and losses were reported in productive sectors, especially agriculture in urban areas affecting poor urban households.¹⁸ Informal non-agricultural employment and subsistence farming account for a significant share of GDP of many countries vulnerable to disasters. However, losses and damages in these sectors, predominated by women, are often not recorded¹⁹. Urban investment will continue to escalate during the period of the Sendai Framework implementation.

With some exceptions like the Thailand Floods of 2012, the largest share of disaster losses are on non-business private investment, both planned and un-planned. Importantly, both the public and business private sectors directly and indirectly affect the resilience quality of urban non-business private investment. Unfortunately, the current institutional, financial and economic development policy frameworks are not adequately motivating and incentivizing more resilient non-business private investment. The challenge therefore is what needs to change and who needs to act and implement these changes.

There is urgency in motivating action. Urbanization, climate change and other drivers are resulting in an increase in exposure and vulnerability to natural hazards resulting in growth in economic damages and losses as well as human impacts. At the same time, there is a tremendous window of opportunity: more than 60% of areas expected to be

¹⁸ UNISDR and ESCAP, *Asia Pacific Disaster Report 2012*.

¹⁹ *Women and men in the informal economy: a statistical picture (second edition) / International Labour Office – Geneva: ILO, 2013*

urban by 2030 have yet to be built, while one billion new housing units will required by 2060 ²⁰ The opportunity is now, to make these investments resilient.

Among the options to reduce disaster risk in the private sector are: promoting resilient investments in households, building resilient supply chains, promoting risk-informed private investments, promoting business continuity planning, including in small and medium-sized enterprises (SMEs), programmes to reduce industrial accident and environmental emergency risk, investing in research to improve business resilience, and removing barriers to cooperation between public and the private sector. Some specific examples follow:

- Property-owners in the US Gulf States who implemented hurricane protection methods employed at nearly 500 locations avoided \$500 million in property losses from Hurricane Katrina, after customer investments of only \$2.5 million. These customers sustained eight times less damage than those who choose not to implement the protection measures²¹.
- The Nissan automobile company, lost 270,000 automobiles-worth of production capacity due to damage to six of its production facilities and 50 of its suppliers during the 2011 Great East Japan Earthquake and Tsunami. However, Nissan ended 2011 with a 9.3% increase in production compared to 9.3% reduction for the rest of the industry in Japan, as it was prepared with a readiness plan including its suppliers, an earthquake emergency response plan, a business continuity plan and disaster simulations²².
- SM Prime Holdings Incorporated, that owns 56 malls in the Philippines with an average daily foot traffic of over four million people and approximately 15,000 tenants, allocated 10% of its capital expenditures for disaster resiliency. One of its malls, SM City Marikina, which opened in 2008 built on concrete stilts. During extreme floods the parking floors are vacated and the supportive stilts allow for the free flow of water through the lower levels. The mall then becomes a refuge for stranded people and food seekers, and as a re-packing center for relief goods.
- The 2011 Great East Japan Earthquake and Tsunami temporarily shut down an SME manufacturer of a pearl-lustre pigment that makes car paint sparkle. This closure impacted the World's major auto companies including Toyota, Nissan, Ford, Chrysler, Volkswagen and General Motors as they tried to identify another supplier. According to a survey of businesses in 17 APEC economies, 67% of companies, large and small, said they did not know about business continuity planning. Among small and medium enterprises, this figure jumped to 83 percent²³.
- The South-Sanriku earthquake which struck the Miyagi Prefecture in 2003, affected considerably the OKI's Group manufacturer of semiconductors factory: Miyagi Oki Electric Co. Losses due to fire, equipment damage, and loss of productivity rounded the \$15 million U.S. Learning from the experience OKI's group invested \$600,000 U.S. in retrofits and earthquake early warning controls to automatically shut down hazardous chemical systems and manipulate sensitive equipment into a safe position. In two similar subsequent earthquakes, the losses were reduced to only \$200,000 U.S. a savings of \$7.7 million U.S. per earthquake while ensure the safety of

²⁰ <http://sdg.iisd.org/news/un-organizations-address-sustainable-resilient-cities/>

²¹ http://www.wmo.int/pages/prog/dra/vcp/documents/7607_Climate-Change-DRR.pdf

²² http://www.nissan-global.com/EN/DOCUMENT/PDF/SR/2012/SR12_E_P008.pdf

²³ <http://reliefweb.int/report/world/preparing-smes-disasters>

local residents and employees, and reassure customers that interruptions to production will be kept to a minimum.²⁴

- San Francisco, a small coastal town in Cebu Province in the Philippines prone to typhoons, won the top UN Sasakawa Award for Disaster Reduction in 2011 for their innovative self-organization within villages (also known as Purok system) where members voluntarily contribute to a money bank used by those in need of emergency funds after a disaster. The Purok System also allows for the award winning waste management system in the Municipality that not only improves drainage, and reduces health problems, but also provides for local livelihoods among households.²⁵

Land-use Planning and Ecosystems-based risk reduction

Land use planning is critical to reducing the exposure of people and infrastructure to hazards. Many planning tools, such as mapping, zoning and participatory planning methods, can integrate disaster risk reduction and resilience building practices in urban planning and development. By preparing regulations and guidelines as well as allocating affordable and low-risk land for future urban development, land-use planning will help to control the expansion of settlements and infrastructure in high-risk areas.

In addition, innovative urban design practices and the use of nature-based solutions and ecosystems management can decrease risk and protect communities and investments. Examples include the protection or creation of green areas to absorb and store excess water, planting mangrove forests to reduce exposure to storm surges, and flood and drought prevention through rain harvesting.

Among recent examples of the use of such spatial planning tools are:

- Following the Canterbury earthquakes of 2010 and 2011, New Zealand developed a strategic plan to manage future growth called the Greater Christchurch Urban Development Strategy. Threats posed by natural hazards, such as earthquakes, floods and rock falls, were incorporated in to ensure the most appropriate land was identified for development. The implementation of the strategy focuses on improving the settlement pattern, transport network, urban design and housing, central city revitalization and water management²⁶
- National planning and policy in Scotland has virtually eliminated construction on flood plains since 1995. The approach is founded on public-private partnerships with strong involvement of real estate developers and insurers. Local governments are legally obliged to set up Flood Liaison Advice Groups as non-statutory bodies of public and private sector representatives²⁷.
- In Maryland, wetlands reduced property damages by nearly 30%, and in New Jersey, wetlands prevented US\$425 million in property damages. In Ocean County, NJ, the conservation of salt marshes is predicted to reduce average annual coastal property losses by more than 20%²⁸.

²⁴ https://www.oki.com/en/csr/report/2006/pdf/OKI_CSR2006e.pdf

²⁵ UN Sasakawa Award submission by San Francisco Municipality, 2011.

²⁶ UNISDR, ESCAP. 2012 Asia Pacific Disasters Report

²⁷ <http://news.trust.org/item/20130701083848-mav3e/>

²⁸ <http://www.nature.org/newsfeatures/pressreleases/coastal-wetlands-save-hundreds-of-millions-of-dollars-in-flood-damages-durin.xml>

- Researchers studied ecosystem restoration efforts in China 2000-2010 to assess if investments in ecosystem restoration were paying dividends. They found increases in six of seven outcomes, including several related to hazard mitigation: soil retention: +12.9%; flood mitigation: +12.7%, Sandstorm prevention: +6.1%.²⁹
- A global study of the effectiveness of coastal nature-based defenses demonstrated that on average, coastal habitats reduce wave heights between 35% and 71%, coral reefs reduce wave heights by 70% salt-marshes by 72%, mangroves by 31% and seagrass/kelp beds by 36%. Depending on the water depth, mangrove projects in Vietnam can be three to five times cheaper than a breakwater, and salt-marsh projects across Europe and the USA vary from being just as expensive, to around three times cheaper.³⁰

Partnerships for resilient investments

Public-private collaboration is key to ensure effective governance, planning and management of risks at the national and local level. Examples from urban planning and development have shown that bringing public decision-makers and private actors together from the beginning of the planning process can greatly enhance short-term efficiency and mid- to long-term resilience of investments.

Public-Private Partnerships brings private sector expertise and experience in risk reduction and management to the government and public sector risk reduction and management efforts. They also accelerate the development and institutionalization of voluntary standards and guidelines that incentivize risk-sensitive investment decisions by public and private entities. Public-Private Partnerships combine the expertise and experience in planning, risk management and governance to advance the development of innovative local solutions that further risk-sensitive and sustainable business investments and development practice. Some recent examples of these partnerships are as follows:

- In Tago Nishi in Sendai City, Japan a partnership between the community, government, private corporation Kokusai Kogyo and Tohoku University achieved a major relocation of both residential, commercial and public infrastructure and services to areas less exposed to hazards³¹
- The Marikina Watershed Initiative in the Philippines is a Private-Public Partnership for the Environment between the Philippine Government and the Philippine Disaster Resilience Foundation to rehabilitate the Marikina Watershed. Its goal is to protect 15,000 hectares of watershed areas from deforestation and erosion within 5 years in order to prevent another 2009 Typhoon Ketsana-like disaster from affecting downstream municipalities³²
- The “Hotel Resilient Initiative,” developed internationally recognized standards for risk reduction and disaster preparedness for hotels and resorts. It has now been implemented in Indonesia, the Maldives, Myanmar, the Philippines and Thailand.

²⁹ <http://science.sciencemag.org/content/352/6292/1455.full>

³⁰ <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0154735#sec010>

³¹ UNISDR, ESCAP. 2012 Asia Pacific Disasters Report

³² June 2016 PDRF Presentation at the ISDR support group

Started as a joint initiative between the Government of Bali in Indonesia, local hotels, the Pacific Asia Travel Association (PATA), and the German Government aid program focussing on tsunami preparedness, the initiative includes an initial certification process that can later contribute to a full third-party certification process.³³

Under the Pacific Risk Resilience Programme, telecommunications company Digicel partnered with the Government of Vanuatu and UNDP for outreach to remote communities for disaster risk reduction awareness by applying Digicel's mobile network to reach the most remote locations. The partnership allows the use of mobile networks as a two-way data-sharing tool for collecting information from communities for real-time disaster events, research purposes, and for community communications.³⁴

³³ <https://www.gidrm.net/activities/hotel-resilient/>

³⁴ http://www.pacificdisaster.net/pdnadmin/data/original/PHT2014_S13_Digicel_Driving_Collaboration.pdf