A FOLLOW-UP TO THE **UNBREAKABLE** REPORT

BUILDING BACK BETTER

Achieving resilience through stronger, faster, and more inclusive post-disaster reconstruction

GFDRR
Global Facility for Disaster Reduction and Recovery

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FOREWORD

The 2017 Unbreakable report made the case that disaster losses disproportionately affect poor people. The report showed that they have limited ability to cope with disasters, and estimated that the impact on well-being is equivalent to consumption losses of about $520 billion a year around the world—outstripping previous estimates of pure asset losses by as much as 60 percent.

The Caribbean Hurricane season of 2017 was a tragic illustration of this. Two Category 5 hurricanes wreaked destruction on numerous small islands, causing severe damage in places like Barbuda, Dominica, and Saint Martin. The human cost of these disasters was immense, and the impact of this devastation was felt most strongly by poorer communities in the path of the storms.

And yet, amidst the destruction it is essential to look forward and to *build back better*. In this report we follow up on the *Unbreakable* report and explore how countries can strengthen their resilience to natural shocks through stronger, faster, and more inclusive post-disaster reconstruction. It shows that reconstruction needs to be strong, so that assets and livelihoods become less vulnerable to future shocks; fast, so that people can get back to their normal life earlier; and inclusive, so that nobody is left behind in the recovery process.

This report shows how the benefits of building back better could be greatest among the communities and countries that are hit by disasters most intensely and frequently. For a selection of small island states, this report shows that stronger, faster, and more inclusive recovery would lead to an average reduction in disaster-related well-being losses of 59 percent. For Antigua & Barbuda, the reduction is as large as 74 percent.

"This report shows how the benefits of building back better could be greatest among the communities and countries that are hit by disasters most intensely and frequently."

Indeed, small island developing states have been at the forefront of the fight against the devastating impacts of climate change. High exposure to natural hazards, high event frequency, and the concentration of assets mean that many small islands face far higher risks to assets and well-being than other countries. In these places, building back better can mean the difference between standing tall or repeated devastation.

Of course, strategies for building back better cannot replace measures for disaster prevention and preparedness. However, they can be integrated into comprehensive disaster risk management frameworks and can help communities seize opportunities for building resilience. This report provides estimates for the benefits of resilient recovery. Various case studies tell the stories of countries that have emerged stronger from devastating disasters and offer lessons to be shared with the rest of the world.

Francis Ghesquiere
Head, Global Facility for Disaster Reduction and Recovery

INTRODUCTION AND SUMMARY

The 2017 hurricane season in the Caribbean will surely be remembered for years to come. Hitting the region in mid-September, Hurricane Irma was followed within days by Hurricane Maria both of which reached the highest category of intensity, allowing no respite to people across the Caribbean. They wreaked destruction on numerous small islands, causing severe damage in places like Barbuda, Dominica, and Saint Martin.

The human cost of disasters like these is immense: many lives were lost, although early warning systems and timely evacuations were able to save many more. And many survivors have lost lifelong savings, homes, and livelihoods. Destruction in the infrastructure and residential sectors is likely to exceed 100 percent of GDP on several islands. In Dominica, 70 to 80 percent of all houses and buildings sustained major storm damage, from ripped-off roofs to total destruction. Entire regions lost access to basic services, such as electricity and safe drinking water, and some remote communities were cut off completely for days. Returning to normality will take years.

The risk of hurricanes is a growing annual threat: the Caribbean hurricane season extends from the beginning of June through the end of November each year, and the frequency and intensity of storms may be exacerbated by climate change in the decades to come. In addition, continued urbanization and population growth in coastal areas around the world are putting more communities in harm's way.

Considering these trends, the destruction caused by disasters reveals the need, but also the opportunity, to *build back better*. As highlighted in Priority 4 of the Sendai Framework for Disaster Risk Reduction adopted in 2015, reconstruction offers an opportunity to build more resilient societies. These are characterized as more able to withstand future shocks by better managing the risks they face: with new buildings located outside flood zones and with structures designed to resist high winds; with roads, bridges, and electric grids that are able to endure the next storm; and with human settlements that provide a better quality of life and enable higher productivity. Such a *stronger* recovery can reduce the impact and the cost to well-being associated with future disasters.

Beyond this traditional understanding of building back better, there are many opportunities to improve the recovery and reconstruction phase that follows a disaster, so that well-being impacts can be minimized. A *faster* recovery can ensure that people restore their income and assets as early as possible, making it possible to use their savings to maintain consumption levels. And a *more inclusive* recovery can ensure that the poorest and the most vulnerable can access the support they need to reconstruct. In the absence of such support, they are the most likely to experience the long-term consequences caused by health issues and disability, loss of schooling and education, or simply the inability to save or borrow to rebuild or replace lost assets. A rapid and more inclusive reconstruction is key to preventing poor people from falling into poverty traps that can magnify the impacts of disasters.

In this study, therefore, *building back better* means that the repaired or replaced assets are more resilient, but also that the recovery process is shorter and more efficient, and that the entire recovery process does not leave anyone behind—i.e. that even the poorest and most vulnerable receive the support they need to fully recover. The study investigates the potential benefits of building back better, building on the framework and model described in the *Unbreakable* report, and considering the three dimensions, independently and together:

- **Building back stronger** reduces well-being losses by ensuring that reconstructed infrastructure can resist more intense events in the future. If all countries were to "build back stronger" in the next 20 years—ensuring that rebuilt assets can resist hazards with a 50-year return-period—then global well-being losses due to natural disasters would be reduced by 12 percent, a gain equivalent to US$65 billion annually. Stronger reconstruction would reduce overall well-being losses due to natural disasters by more than 40 percent in ten countries in particular: Antigua and Barbuda, Dominica, Vanuatu, Myanmar, Laos, Tonga, Guatemala, Trinidad and Tobago, Peru, and Fiji.

- **Building back faster** reduces disaster impacts by accelerating reconstruction through measures such as contingent reconstruction plans, pre-approved contracts, and financial arrangements. Estimates in this report show that if the average reconstruction speed is reduced by two thirds (without compromising the quality of reconstruction), global well-being losses could be reduced by 14 percent—equivalent to increasing global consumption by over US$75 billion per year. These gains are especially pronounced in countries with frequent events, such as small island countries or Sub-Saharan countries.

- **Building back more inclusively** ensures that post-disaster support reaches all affected population groups. This emphasizes the importance of providing reconstruction support

to low-income households, which are typically more exposed, more vulnerable, and less comprehensively supported. If all countries had the ability to provide the poorest people with the post-disaster support found in developed countries, global well-being losses due to natural disasters could be reduced by 9 percent, equivalent to a US$52 billion increase in annual global consumption. The effect is particularly pronounced in countries with high inequality, and where poor people have little access to social protection and financial instruments. In Angola, Benin, Comoros, the Republic of the Congo, the Central African Republic, the Democratic Republic of the Congo, Russia, Gabon, Haiti, and Lesotho, building back more inclusively could reduce disaster losses by 27 percent or more.

If implemented together, these three strategies—rebuilding *stronger*, *faster*, and *more inclusively*—could generate major benefits, totaling US$173 billion per year, or 31 percent of current well-being losses due to natural disasters.

Building back better is particularly important in small island countries, due to their high current levels of vulnerability, and their small scale. In the small island states included in this analysis, building back better could lead to an average reduction in disaster-related well-being losses of 59 percent.

Using the reconstruction process to upgrade assets and increase their productivity—for example, by using the most recent technologies or adapting old infrastructure systems to current and future needs—would generate further economic benefits, making it even more attractive to invest in a better recovery and reconstruction process.

Such resilient and effective recovery and reconstruction is possible only if the appropriate policies and tools are made available to affected households, firms, and local and national authorities *before the disaster hits*. These are usually incorporated into a *disaster recovery framework* that include contingency plans and institutional arrangements with a clear allocation of responsibility in the recovery period, access to practical knowledge and information, and strong and inclusive financial protection provided by a combination of disaster-response social safety nets, insurance mechanisms, and access to borrowing to finance the reconstruction.

While a better recovery and reconstruction process cannot replace investments in disaster risk reduction and prevention, this study provides many examples of policies and interventions that have made countries better able to face the next disaster and that could be replicated in the rest of the world to contribute to a more resilient future.

BEYOND ASSET LOSSES:
Assessing socio-economic resilience and losses in well-being

Most assessments of losses due to natural disasters focus on damages to assets—including buildings, infrastructure, equipment, and production. According to such estimates, in 2017, global economic losses due to weather-related natural disasters—from hurricanes and wildfires to droughts and floods—totaled more than $330 billion (Munich Re, 2018).

However, as highlighted in the *Unbreakable* report (Hallegatte et al., 2017), the focus on asset losses fails to inform us on how disasters affect people's well-being. The report highlighted the fact that the overall well-being impact of a disaster depends critically on two factors.

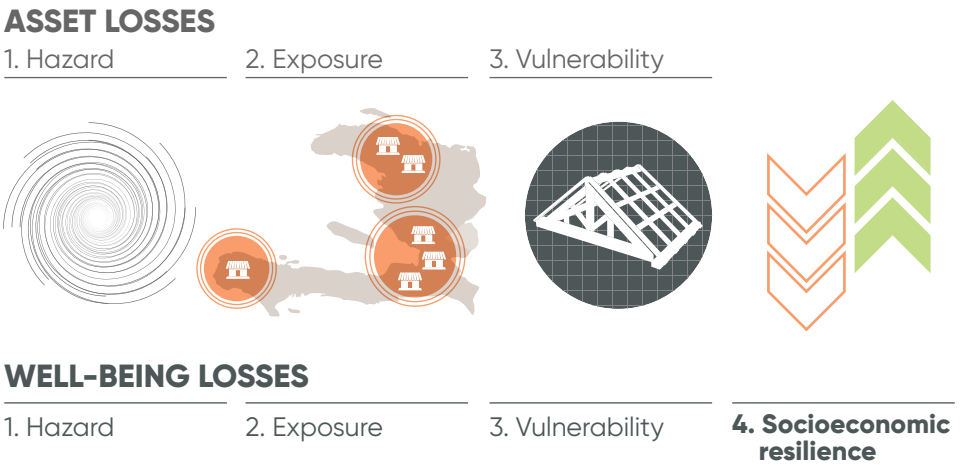
First, it depends on how asset losses affect income and consumption during the recovery and reconstruction phase. For example, the same asset losses have different impacts depending on whether reconstruction takes place over a few months or several years, and on whether savings make it possible to smooth the impact on consumption.

Second, the impact on well-being depends on who is affected. Clearly, a one dollar loss is experienced differently by a rich person than by a poor person. The same loss affects poor and marginalized people far more because their livelihoods depend on fewer assets, their consumption is closer to subsistence levels, they cannot rely on savings to smooth the impacts, their health and education are at greater risk, and they may need more time to recover and rebuild.

To account for this important difference between asset and well-being losses, the *Unbreakable* report developed a new resilience metric to measure how natural disasters affect people's well-being. It accounts for the exposure and vulnerability of people: how often they are affected, and how much they lose when they are affected. But the framework also includes their socio-economic resilience, defined as an ability to cope with a disaster, receive support, and recover and reconstruct (Figure 1).

BEYOND ASSET LOSSES

Figure 1. People's well-being losses due to a disaster depend on their resilience, i.e. their ability to cope, receive support, and recover.



By examining well-being instead of asset losses, the report provided a deeper (and grimmer) view of natural disasters than does the usual reporting—and indeed, this view takes better account of poor people's vulnerability.

In doing so, the report also highlights new opportunities for interventions to minimize disaster losses by boosting people's resilience—for example, through appropriate targeting of social expenditures, or improved access to financial instruments from saving accounts and borrowing to insurance. While these measures do not reduce asset losses—the typical metric used in disaster risk management—they can very efficiently mitigate their impacts on people's livelihood and well-being. This benefit can be captured using well-being losses as an additional metric for disaster impacts.

Since the publication of the *Unbreakable* report, the model has been used in targeted analysis of the vulnerability of transport systems in Small Island Development States (World Bank, 2017a), and in country-level analysis in Fiji (Government of Fiji and World Bank, 2017) and the Philippines, where the work is still under way.

Resilience to natural disasters is never constant; it depends on a wide range of dynamic factors. These include changing exposure due to population growth and rapid urbanization, intensifying hazard levels due to climate change, and strengthened ability to cope and recover due to effective disaster risk management.

BOX 01
QUANTIFYING SOCIOECONOMIC RESILIENCE AND WELL-BEING LOSSES

Based on the resilience model presented in the Unbreakable report, this update report calculates the risk to well-being by considering the four drivers of the loss in well-being as described above. These are:

- **hazard** (the probability an event occurs);
- **exposure** (the population and assets located in the affected area);
- **asset vulnerability** (the fraction of asset value lost when affected by a hazard), and;
- **socio-economic resilience**, which is defined as the ratio of asset losses to well-being losses:

$$\textbf{socioeconomic resilience} = \frac{\text{asset losses}}{\text{well-being losses}}$$

Based on this definition, socio-economic resilience is a driver of the risk to well-being, along with the three standard drivers:

$$\textbf{Risk to well-being} = \frac{\text{expected asset losses}}{\text{socioeconomic resilience}} = \frac{\text{(hazard) * (exposure) * (asset vulnerability)}}{\text{socioeconomic resilience}}$$

The *Unbreakable* report used this approach to quantify the risk to well-being in 117 countries, based on the latest available data in 2016, and estimates of asset losses from the United Nations Global Assessment Report on Disaster Risk Reduction—the so-called GAR (UNISDR, 2015). It calculated well-being losses for multiple hazards, considering return periods from 2 to 1,500 years. These hazards included river floods, coastal floods due to storm surge, windstorms, earthquakes, and tsunamis. A detailed description of the model is provided by Hallegatte, Bangalore, and Vogt-Schilb (2016), and the model is publicly available.[1]

To understand how resilience to natural disasters is evolving in countries around the world, these diverse factors must be tracked and evaluated continuously.

In this section, the computation of the resilience indicator from *Unbreakable* is updated using the latest available data on socio-economic trends. More specifically, updated data include:

- economic activity (GDP);
- urbanization;
- income inequality;

- level and coverage of social protection schemes;
- contingent finance instruments (especially the World Bank's Catastrophe Deferred Drawdown Option (Cat-DDOs)); and
- sovereign credit ratings.

Credit ratings are not used here as a measure of the risk of defaults, but more generally as a measure of the quality of public finance management in a country, and thus of its ability to reallocate and mobilize financial resources in the case of a contingency.

This analysis also extends the calculation from 117 countries in the initial report to 149 countries today, covering 95.5 percent of the world's population, and 94 percent of global GDP.

Any indicator is only as good as the data it is based on, and the uneven pace at which new data becomes available means that different variables are updated at different times, in different countries. Measures of income inequality, for example, are based on household surveys that are typically not conducted annually. While the updated resilience indicator in this report is based on the latest available data, not all variables in all countries will have been updated. Since data updates occur at different times for different countries, any comparison across countries should be made with caution. The resilience indicator and its subsequent updates primarily serve the purpose of tracking the resilience of individual countries across time.

Socioeconomic resilience in 2017

In the 149 countries, and still based on the assessment from UNISDR (2015), the total risk to assets reaches US$382 billion, the annual average cost of repairing and replacing assets after natural disasters.[2] Risk to assets, expressed as a share of GDP, disproportionately affects low-income countries (Figure 2). This difference arises from better disaster protection in high income countries—for example dikes and seawalls for floods—and the higher quality of buildings and infrastructure. High-income countries tend to have risks to assets of below 1 percent of GDP, while for low income countries risk to assets can reach almost 10 percent of GDP for some small states.

Using the latest data available in 2018, the global socioeconomic resilience is estimated at 69 percent. National-level estimates display a similar pattern to the earlier estimates (Figure 3).[3] Countries with higher average incomes tend to be more resilient than lower income countries. At the same time, resilience levels in

low-income countries vary substantially, indicating the importance of factors other than income in determining resilience. Differences in socioeconomic resilience are explained by differences in inequality, financial inclusion, housing quality across income classes, access to financing, and social protection coverage and generosity.

Figure 2. Risk to assets as a share of GDP.

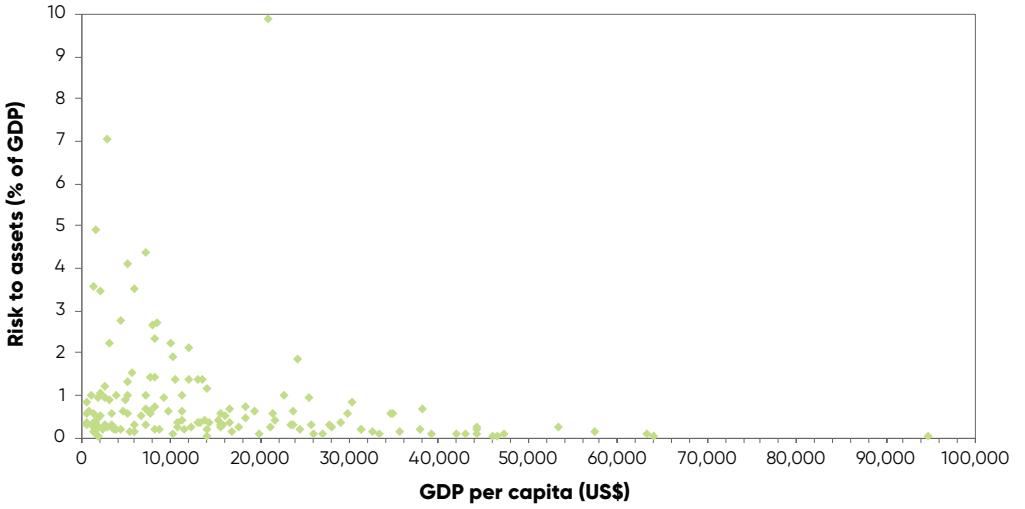
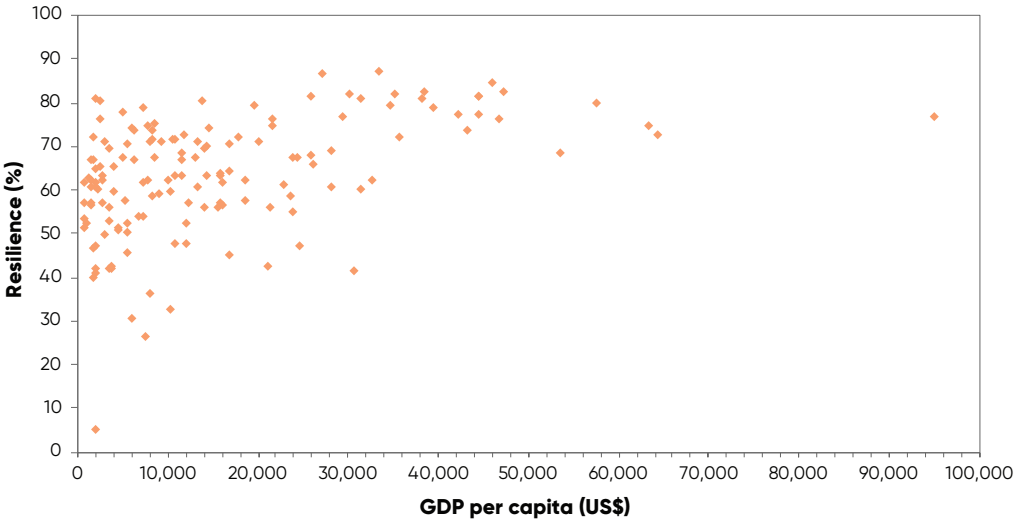


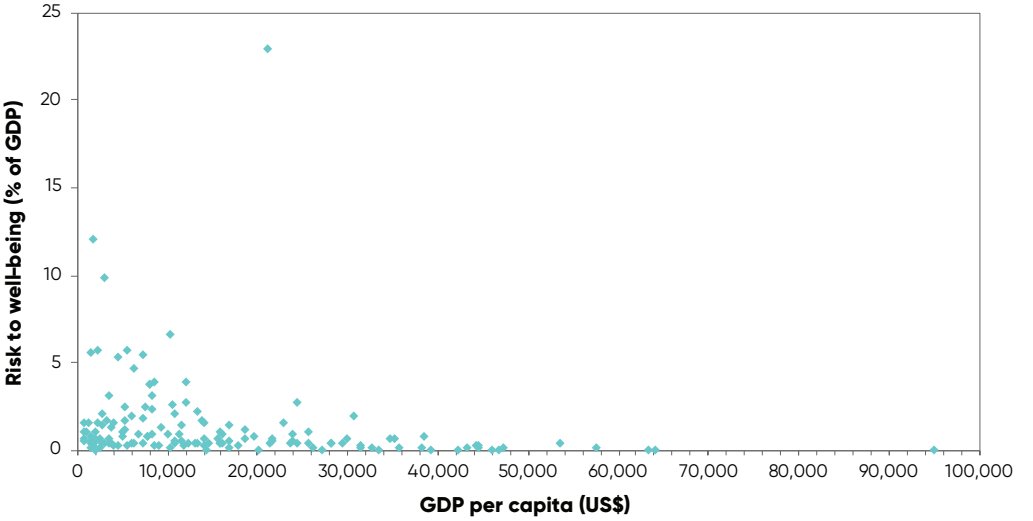
Figure 3. Socio-economic resilience to natural disasters.



The risk to well-being, measured as a share of GDP, is particularly high in low-income countries (Figure 4). This high risk is mostly driven by higher risks to assets,

but is magnified by a lower level of resilience. Globally, annual average well-being losses are estimated at US$555 billion for the 149 countries included in this analysis.

Figure 4. Risk to well-being as a share of GDP.

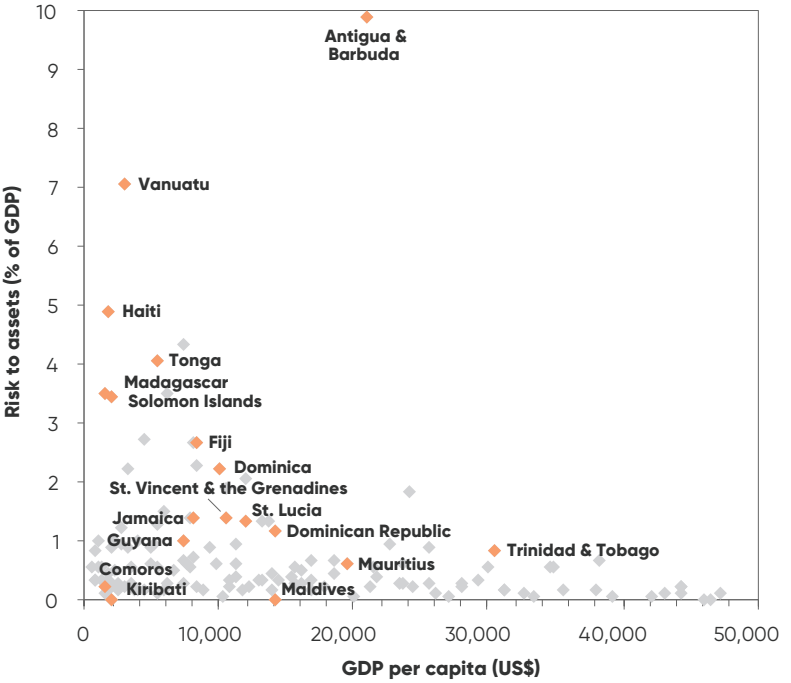


Small island developing states

For years, small island developing states have been at the forefront of the fight against the devastating impacts of climate change. These countries experience tropical storms, storm surges, floods, and landslides at a higher frequency than most countries—and often when they are hit, a large share of their population and assets are affected. The 2017 hurricane season in the Caribbean is an illustration of this: several Caribbean countries experienced loss of life, as well as severe damages to the majority of their building stock and infrastructure. For some islands, asset losses alone were estimated at over 100% of annual GDP.

Despite their high exposure to natural hazards, small island states are not regularly featured in in-depth studies, such as the 2017 *Unbreakable* report—primarily due to a lack of data. This follow-up report provides evidence for an additional 32 countries (on top of the 117 in the original *Unbreakable* report), and many of these are small island states from the Atlantic, Indian, and Pacific Oceans. The data on disaster asset losses in small island states—as for all countries in this analysis—are based on the Global Assessment Report 2015 (GAR15).

Figure 5. Risk to assets in small island states (orange).



Other countries are indicated in grey.

The estimates of socio-economic resilience, risk to assets, and risk to well-being confirm the story highlighted above: high exposure to natural hazards, high event frequency, and the concentration of assets means that many small islands face far higher risk to assets and well-being (as a share of GDP) than other countries (Figures 5 and 7). In addition, among small island states, a similar pattern emerges as for all countries: poorer island states, i.e. those with lower per capita income, tend to face higher risks to well-being, as they are less able to cope with and recover from natural shocks (Figure 6).

However, the estimates also show that not all small islands have high levels of risk to assets and well-being. For instance, Kiribati and the Maldives are spared from one of the most devastating natural hazards—tropical cyclones—and thus experience lower levels of risk than many other islands. This analysis is however limited to five hazard types (floods, wind, storm surge, earthquakes, tsunami), which means that other hazards such as droughts are omitted, and losses are likely to be underestimated. Also, such analyses based on global databases and models are limited, especially when considering small geographic areas such as small islands. This means that the estimates offered in this analysis are indicative, and cannot replace a detailed country level hazard assessment.

Figure 6. Socio-economic resilience to natural disasters in small island states (green).

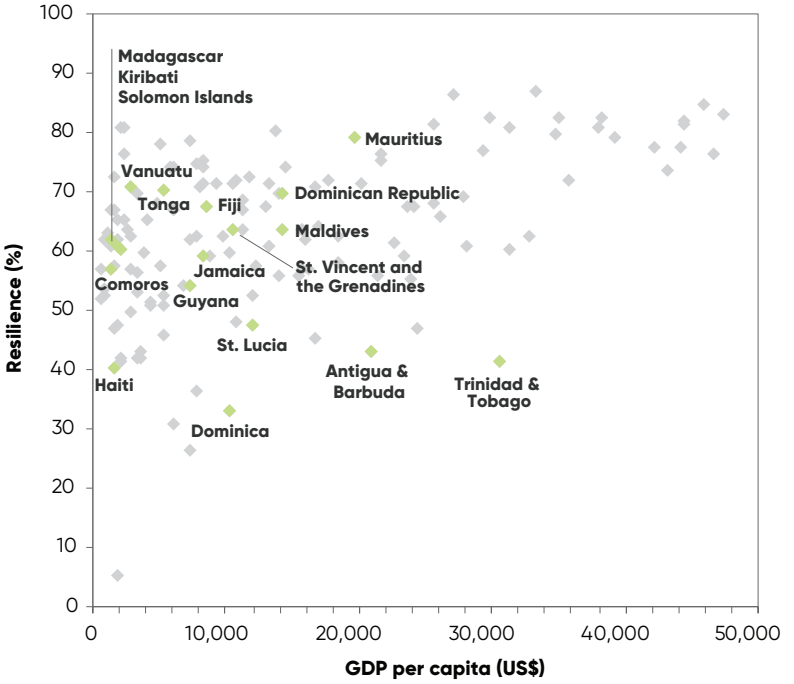
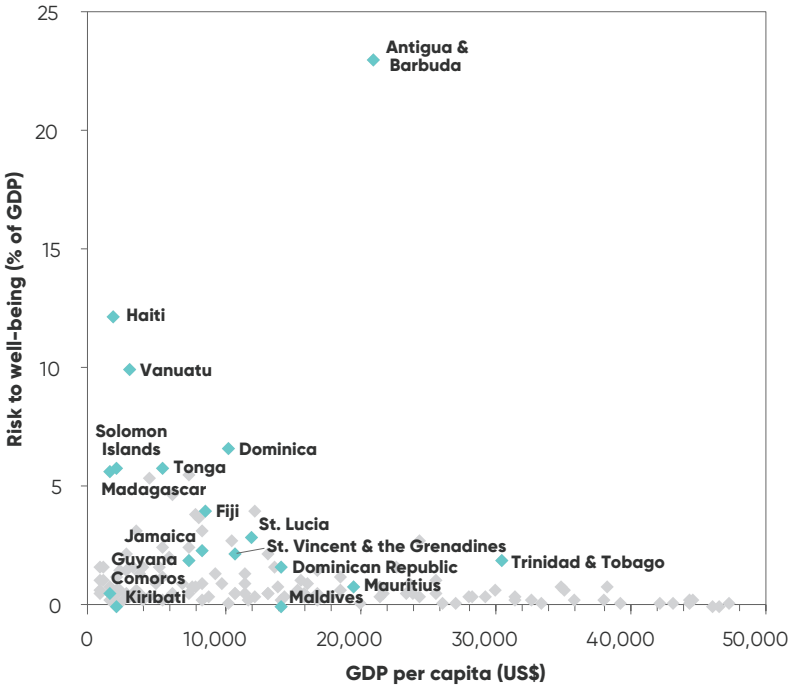


Figure 7. Risk to well-being in small island states (blue).



RESILIENT RECOVERY AND BUILDING BACK BETTER

The long and difficult recovery process begins at the moment a disaster strikes. This process is extremely challenging, combining the usual issues of infrastructure and building construction with the urgency and confusion of the post-disaster context.

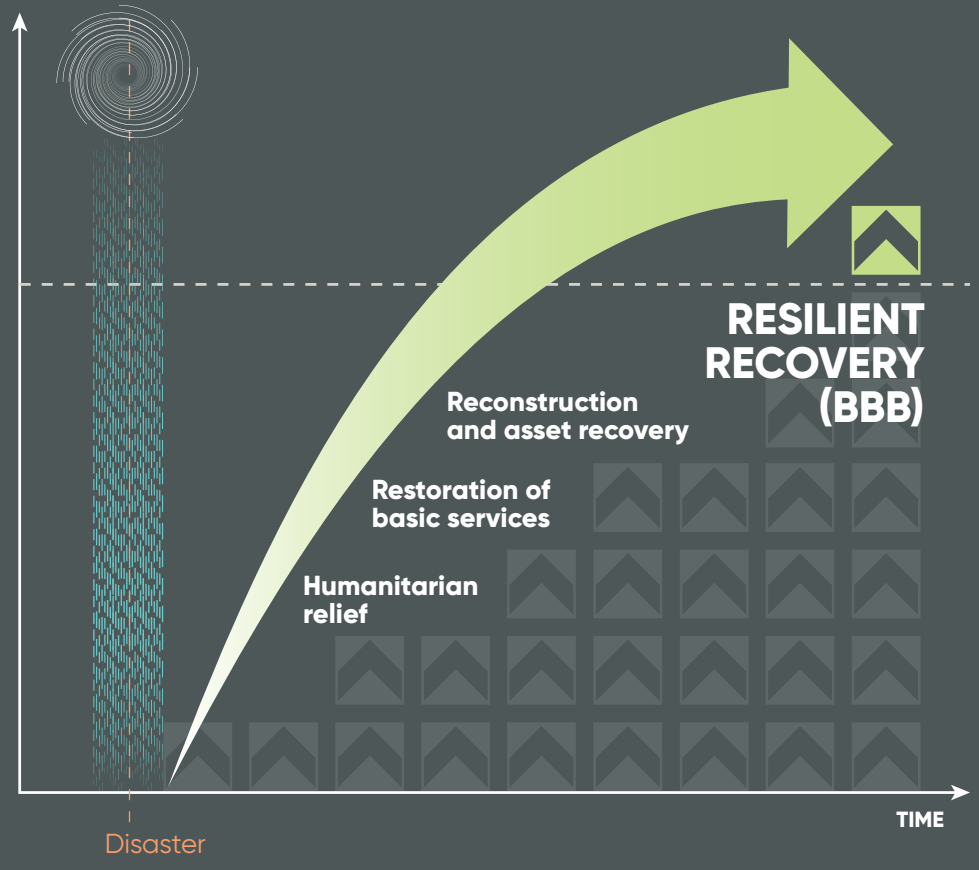
The recovery process is usually structured by three main stages: (i) humanitarian relief, including search and rescue, and medical care; (ii) restoration of basic services, including the supply of clean water, food, and sanitation, basic energy, mobility, and health care needs; and (iii) the reconstruction phase, including infrastructure reconstruction, the repair or replacement of building and production equipment, and asset recovery by households—typically the longest and most costly phase of recovery (Figure 8).

The concept of building back better is aimed at improving the three phases of this recovery process, to ensure that the recovery contributes to a more resilient society. It is defined by the United Nations Office for Disaster Risk Reduction (UNISDR) as "the use of the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies, and the environment."[4]

The recovery and reconstruction phase after a disaster offers incomparable opportunities to rebuild in a way that prevents the same hazards from leading to the same impacts, through the improvement of land-use planning (e.g., deciding not to reconstruct in a highly-vulnerable area), the application of construction norms (e.g., ensuring that rebuilt buildings can resist the next earthquake better), or the deployment of prevention and preparedness options (e.g., designing a neighborhood to facilitate evacuation) (UNISDR, 2017). These opportunities are present mainly in the last phase of the recovery, when assets and infrastructure are repaired or rebuilt.

But a better recovery can do more than reduce the impact of future disasters: it can also reduce the impact of the disaster that caused the damages in the first place:

Figure 8. An illustration of the post-disaster recovery and its three phases.



The vertical axis refers to a range of aspects, from the stock of assets, to the income, consumption and well-being of the affected population. Building back better means that the recovery process is stronger compared to pre-disaster levels, but also faster and more inclusive.

RESILIENT RECOVERY

- A *faster* recovery and reconstruction process can restore the income and assets of the affected population earlier, reducing the cumulative income losses and making it easier to rely on savings to maintain consumption levels. As a result, a faster recovery minimizes the disaster's impact on economic growth and poverty reduction (Hallegatte and Vogt-Schilb, 2017).

- Also, people in poverty and members of disadvantaged groups are the most likely to experience long-term consequences—or even a poverty trap—as the result of a disaster: such effects can result from health impacts, especially for children who may be undernourished or forgo health care in a disaster aftermath, or simply from the inability of poor people to use savings or borrow to repair or replace their lost assets (Baez and Santos, 2007; Carter et al., 2007). A more inclusive recovery—one that supports the most vulnerable populations to ensure they can rebuild and do not suffer from long-term consequences—reduces the overall impact of a disaster.

In this study, building back better means that the repaired or replaced assets are more resilient, but also that the recovery process is shorter and more efficient, and that the entire recovery process does not leave anyone behind—i.e. that even the poorest and most vulnerable receive the support they need to fully recover.

Better recovery and reconstruction cannot replace risk reduction and prevention, which remain the main instruments for the reduction of losses of assets and thus well-being. However, this study explores the contribution that preparedness and *building back better* can provide, as a complement to the other components of the disaster risk management toolkit (see the *Unbreakable* report for a full review of this toolkit).

To assess the importance of building back better, we use policy simulations to explore how policies that favor a better recovery and reconstruction after disasters can reduce the current and future impact of disasters on people's well-being. We use the model described in the previous section to compare the current level of risk (to assets and well-being) with the level of risk that would be attained under four policy scenarios, corresponding to (i) building back stronger; (ii) building back faster; (iii) building back more inclusively; and (iv) combining the three policies to build back stronger, faster, and more inclusively.

Building back *stronger*

Reconstruction phases provide rare opportunities to reduce the vulnerability of affected regions and countries (UNISDR, 2017). This could be achieved through risk-informed construction standards and smart spatial planning. For example, the large-scale physical destruction experienced in 2017 by several Caribbean island states, including Dominica and Antigua & Barbuda, offers the opportunity to ensure that destroyed assets are reconstructed to more resilient standards—i.e. that they can withstand more intense events in the future.

In practice, the foundation for building back stronger is best laid before a disaster: Strengthening the institutional and technical capacities of public and private sectors is crucial for ensuring that there is sufficient design, construction, and quality assurance capacity in a post-disaster situation. This should extend from individual builders and carpenters, to contractors, to building officials at all levels of government. The spotlight at the end of this section provides case studies to illustrate these measures.

Estimating well-being benefits of building back stronger

To estimate the benefits of building back stronger, we assume that destroyed assets are reconstructed to a resilience standard that is able to withstand shocks of up to a 50-year return period.[5] Building back stronger reduces the risk to assets, and thus the risk to well-being.

The estimates suggest that if all countries were to build back stronger during a 20-year window, then global asset losses due to natural disasters would be reduced by 11.2 percent from US$382 billion to US$339 billion annually. The benefits for well-being are even greater: well-being losses due to natural disasters would be reduced by 11.7 percent from US$555 billion to US$490 billion annually.

The issue of building back better in island countries has received particular attention in the wake of the 2017 hurricane season in the Caribbean. Figure 9 (left) provides an overview of the countries where stronger recovery would lead to the greatest reduction in average well-being losses. The estimates show that stronger recovery could reduce overall well-being losses due to natural disasters by more than 40 percent in ten countries: Antigua & Barbuda, Dominica, Vanuatu, Myanmar, Laos, Tonga, Guatemala, Trinidad & Tobago, Peru, and Fiji. Unsurprisingly several small island states are among those with the highest potential to benefit from stronger

recovery. Figure 9 (right) provides estimates for ten selected small island states. The well-being losses in these small island states would, on average, be reduced by 37.3 percent through stronger reconstruction (compared to 11.7 percent globally).

Figure 9. Left: Top 10 largest reductions in average well-being losses due to building back stronger. Right: Reductions in average well-being losses for selected small island states.

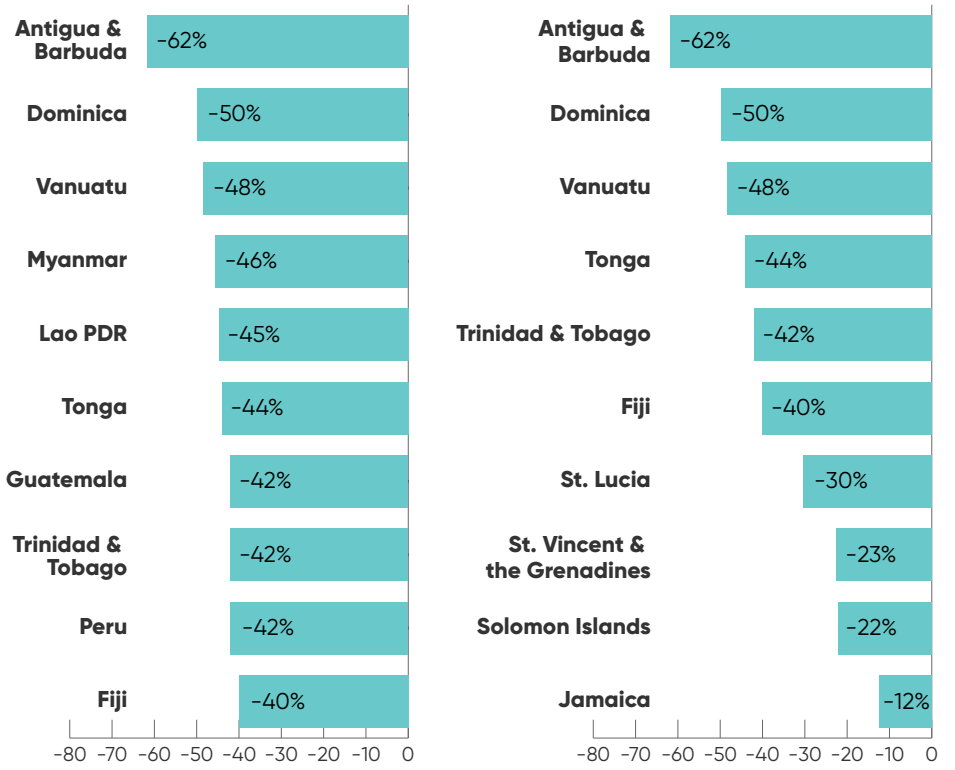
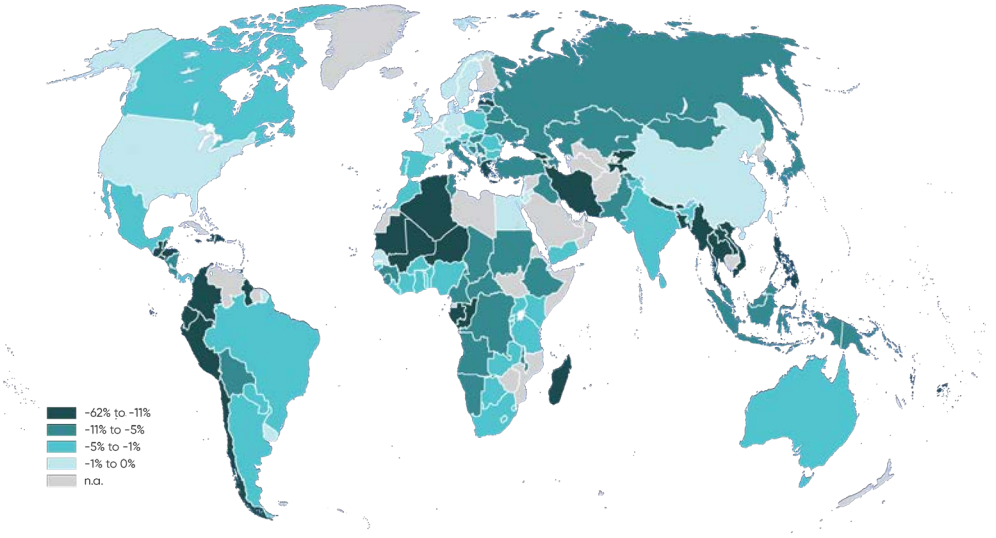


Figure 10. Percentage reduction of well-being losses associated with stronger recovery.



Countries are sorted into quartiles (i.e. same number of countries for each color).

These estimates show that post-disaster reconstruction offers an opportunity for implementing resilience standards and reducing losses from future events. However, this also implies that the same argument applies to all new infrastructure construction, regardless of whether or not a disaster has occurred recently. Many developing countries are in the process of rapidly developing their infrastructure in response to population growth, urbanization, and economic growth. In order to avoid increasing exposure and vulnerability, all of these infrastructure investments need to take natural hazards and risks into account.

Moreover, when determining resilience standards, it is important to recognize that climate change will mean that past disaster risk probabilities (and return periods) do not offer robust guidance for the long-term future (Hallegatte, 2009). As extreme weather events become more frequent, for example, a Category 5 hurricane that has a 50-year return period today may have only a 20-year return period in the course of the lifetime of an infrastructure investment. Such uncertainty must be accounted for in the design and construction or reconstruction of infrastructure. Decision-making under uncertainty (DMU) is one approach that can help to eliminate strategies with catastrophic outcomes, and prioritize strategies that perform robustly under a wide range of future climate change scenarios (Kalra et al., 2014).

SPOTLIGHT

Resilient housing and infrastructure reconstruction in Nepal, China, Fiji, and Dominica

Major earthquakes rocked Nepal in April and May 2015, with devastating consequences: the Government of Nepal reported the death toll at approximately 8,700 and those injured at 25,000. In an early post-disaster needs assessment (PDNA), total recovery needs were estimated at US$6.7 billion, or about a third of Nepal's economy. The single largest need identified in the PDNA (US$3.27 billion) was for "housing and human settlements": 490,000 houses were destroyed and another 265,000 damaged to an extent that they were at least temporarily uninhabitable.

The Government of Nepal, in partnership with a number of development partners[6], launched the Rural Housing Reconstruction Program (World Bank, 2016b). Building back stronger is at the heart of this housing reconstruction program. It aims to ensure that houses destroyed in the most affected districts of the country will be rebuilt using earthquake-safer building techniques, through training, grants, and technical support to eligible households. Specifically, the program will provide training to local artisans, facilitate the building of material markets, and disseminate information on earthquake-resilient construction techniques, all in coordination with partner organizations, to assist the reconstruction process.

While consistently ensuring resilient building standards, the program does not restrict the individual choices of households: beneficiary households may choose to rebuild houses themselves and/or hire labor, such as masons and carpenters, according to their needs. There is also no restriction in the use of materials as long as it complies with the earthquake-resilient construction techniques defined by the program. Overall, 55,000 households benefit directly from reconstruction grants, while another 490,000 households receive technical assistance. Moreover, the Government had several pre-approved reconstruction designs ready before the earthquake struck. This meant that reconstruction was not only stronger, but was also accelerated through foresight and preparedness.

Earthquake damage in Nepal.

China, too, emerged stronger from a severe disaster. In 2008, an 8.01 magnitude earthquake struck southwestern China; with over 69,000 fatalities, 374,000 people injured, and about 18,000 missing, it was one of the deadliest earthquakes in recent history (World Bank, 2018). In addition to the human toll, the disaster destroyed or severely damaged 34,000 km of highways, thousands of schools, hospitals, and wastewater systems, as well as more than 4 million homes. In response to this disaster, the government of China adopted a building back stronger approach.

It ensured that the reconstruction of affected infrastructure followed higher seismic standards and flood risk management codes, while ensuring a balance between reconstruction activities and laying a foundation for the longer-term sustainable economic recovery and development of the affected areas. In fact, the restored infrastructure was not only built to be more resilient to natural hazards than before the disaster—it also greatly enhanced the service quality and access to essential public services, including water, sanitation, roads, health and education. For example, 300 roads were rebuilt or renovated to new seismic standards, and upgraded through the addition of modern traffic management and drainage systems.

A similar story comes from Fiji: Cyclone Winston in February 2016 was the most intense cyclone to be recorded in the Southern Hemisphere—and to make landfall in Fiji. 44 people lost their lives, and about 30,000 houses were destroyed. In the aftermath of the storm, a massive rebuilding and recovery effort got underway, led by the Government of Fiji and supported by numerous relief and development organizations. As part of this effort, the government placed strong emphasis on the need to build back stronger, working with humanitarian actors to train hundreds of community carpenters and workers in order to mainstream resilient building techniques to ensure that houses—and people—could better withstand future cyclones. To this end, the Government of Fiji operates the dedicated program "Help for Homes", which offers grants, materials, and technical training to assist people in the construction and reconstruction of safer and more resilient homes.

In the Caribbean, the hurricane season of 2017 brought two category 5 hurricanes and, in addition to the loss of lives, caused severe damages to the building stock of several island states. In Dominica, 70 to 80 percent of all houses and buildings sustained major storm damages, ranging from ripped-off roofs to total destruction. Supported by the World Bank, the Government of Dominica has launched a housing reconstruction project that aims to follow the principle of build back stronger. By rebuilding houses that can withstand future storms of the same intensity as the 2017 hurricanes, Dominica's reconstruction efforts are helping to protect people and their livelihoods from future shocks.

RESILIENT RECOVERY

Building back *faster*

People's ability to generate income is fully dependent on the stock of assets, including private assets, public infrastructure, and human and social capital. When these assets have been lost or damaged, incomes are reduced, and with them consumption and well-being, as well as the ability to save and invest in the future. And of course, the longer it takes to recover these assets, the greater the impact on people's well-being and prospects (Hallegatte and Vogt-Schilb, 2017).

It is a different story to experience a reduction in income for a few months than to have to cope with many years of depressed income. This is especially true because people tend to rely on savings to smooth consumption in the months following a disaster, but people's savings rarely represent more than a few months of normal expenditures, making it impossible to maintain consumption if reconstruction takes several years. The speed at which assets and public infrastructure are reconstructed after a disaster is thus a major factor determining the overall impact on people's well-being.

In contrast with building back stronger, building back faster does not reduce future asset losses. But it does reduce well-being losses immediately, by making it easier for affected people to cope with the shock. It is therefore an important component of a good recovery and reconstruction.

In countries affected by frequent events—such as many small island countries—the length of the reconstruction period has another dimension: since these countries are particularly vulnerable during post-disaster recovery periods—for example because public services and infrastructure may still not be fully functional when the next disaster hits—building back faster can make the difference between resilience and stagnation (Hallegatte et al., 2007).

In practice, recovery speed is highly dependent on the level of preparedness and resources available for a quick and resilient recovery. Measures that can ensure rapid recovery and reconstruction include: (i) contingency plans to ensure that the coordination of the recovery and reconstruction efforts is effective and that responsibilities are clearly allocated among government agencies; (ii) contingent financial arrangements—such as contingent credit lines or insurance products—to ensure that financing is immediately available and is not delayed by budgetary procedures; (iii) pre-arranged contracts to accelerate procurement, for example ensuring that debris removal can start as soon as possible to facilitate reconstruction;

and (iv) international cooperation to share costs of staff and equipment needed for the recovery and reconstruction, including the use of innovative technologies.

The main challenge to ensuring rapid recovery and reconstruction is that the process depends on many factors that need to progress in parallel. The overall speed can be constrained by a delay in one dimension, such as the procurement or the approval of building permits, that can create a bottleneck regardless of the progress achieved in other dimensions.

To illustrate this challenge, it is useful to consider one of the major bottlenecks to a rapid reconstruction process: the difficulty of removing debris from reconstruction sites. Particular challenges in this process can include the contracting of private construction firms and the identification of suitable equipment. As Jha et al. (2010) emphasize, various measures can significantly speed up debris removal—provided that they have been prepared before the disaster: (i) pre-identifying public resources that are available to assist with debris collection and management; (ii) pre-identifying contractors that own heavy equipment needed for debris removal and collection (including bulldozers, dump trucks) and that can provide skilled operators to run the equipment; (iii) pre-qualifying firms, pre-arranging contracts, and pre-defining contract scope, terms and prices; and (iv) analyzing the financial resources available for debris management and developing a financial plan, which may include taxes, user fees, donations, and resources from a higher level of government. With these preparatory measures in place, governments can execute a fast and well-coordinated debris management plan in the immediate aftermath of a disaster, and thus pave the way for faster reconstruction.

Estimating the well-being benefits of building back faster

The potential benefits from these measures are substantial: faster recovery can significantly reduce average well-being losses due to natural disasters. For a reconstruction time of 3 years—which is the baseline considered in this study—losses are US$555 billion. If the average recovery speed is reduced to one year, global well-being losses could be reduced to US$480 billion—a 13.5 percent reduction compared to the basis of 3 years (Figure 11)—or a 23.3 percent reduction compared with a 5-year reconstruction duration. Figure 12 shows the reduction in average well-being losses due to faster recovery for the ten countries with the largest absolute losses.

Figure 11. Global well-being losses associated with different recovery durations.

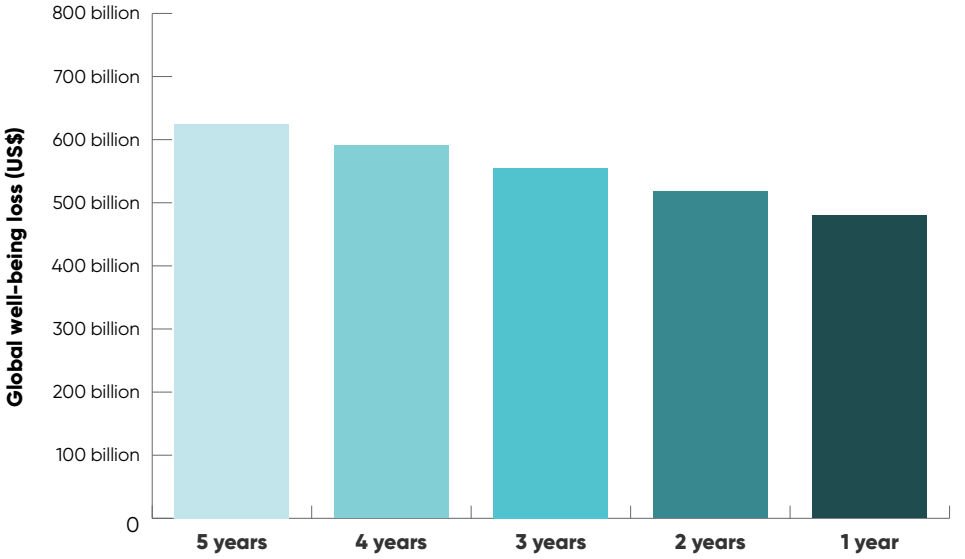
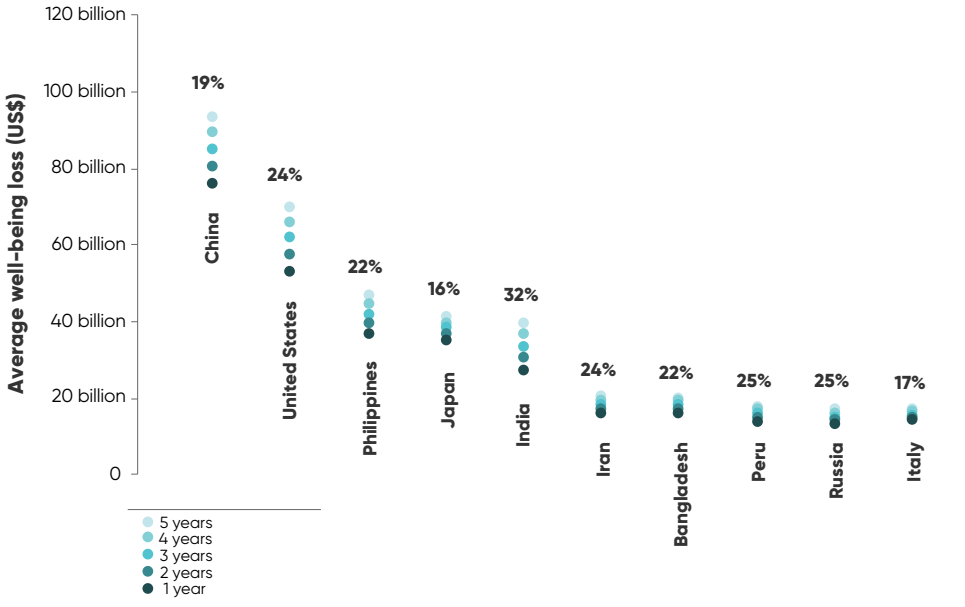


Figure 12. Reduction in average well-being loss due to faster recovery for the top ten countries in terms of losses.



Note: The top point refers to the well-being loss associated with a five-year reconstruction period, while the bottom point refers to a one-year reconstruction period. Percentages indicate the reduction in well-being losses by speeding up recovery from five years to one.

As suggested above, the importance of 'building back faster' differs across countries. Countries where indirect losses are the largest (i.e. countries with low socioeconomic resilience) are bound to benefit most from accelerated recovery. Figure 13 presents the ten countries with the largest relative reduction in well-being losses due to faster recovery, which include in particular small island states and low-income African countries. Figure 14 provides a global overview illustrating that the countries that benefit most from faster reconstruction tend to be lower-income developing countries.

Figure 13. Ten largest reductions in average well-being losses due to faster recovery (reduced from five years to one).

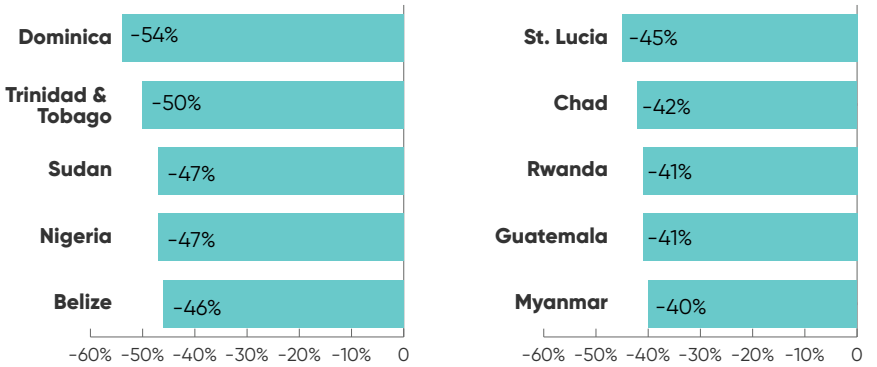
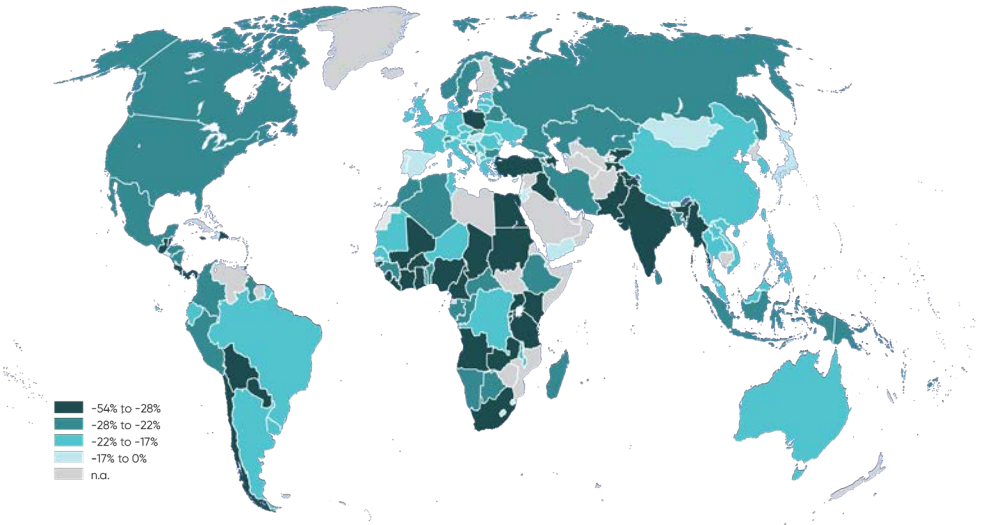


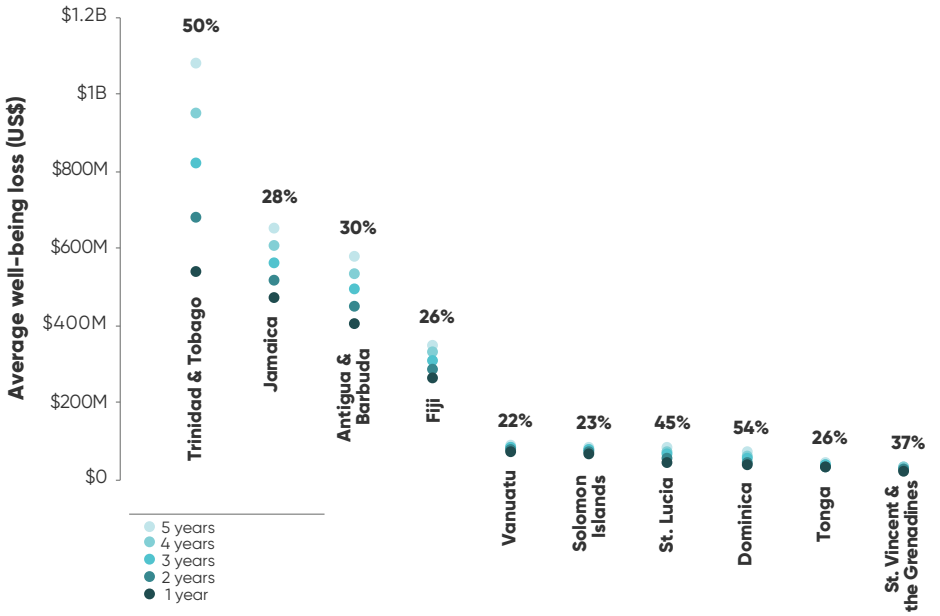
Figure 14. Percentage reduction of well-being losses associated with faster recovery (reduced from five years to one).



Countries are sorted into quartiles (i.e. same number of countries for each color).

Figure 15 presents the reduction in average well-being losses due to faster recovery for ten selected small island developing states. Unsurprisingly, small islands are among the countries where the benefit of rebuilding faster is the greatest, with a reduction of 34 percent on average, compared to 23 percent globally. In Trinidad and Tobago, measures to accelerate recovery could even halve the annual well-being losses.

Figure 15. Reduction in average well-being loss due to faster recovery for ten selected small island developing states.



The top point refers to the well-being loss associated with a five-year reconstruction period, while the bottom point refers to a one-year reconstruction period. Percentages indicate the reduction in well-being losses by speeding up recovery from five years to one.

These results underestimate the value of building back faster, as they do not account for the higher vulnerability of assets that have been damaged and cannot be fully repaired before the next event. For example, houses with damaged roofs or power systems operating thanks to "quick fixes" may be revealed as unable to cope with another hurricane, leading to compounding losses.

SPOTLIGHT

Streamlined processes for rapid reconstruction and recovery in Indonesia, Turkey, and Colombia

In December 2004 an earthquake and subsequent tsunami devastated much of the coast of Aceh, Indonesia, and other coastal areas around the Indian Ocean. In total, 286,000 people in 14 countries lost their lives, including 221,000 killed or missing in Aceh alone. Nearly US$7 billion in contributions flowed in from the Indonesian government and international donors, fueling a boom in reconstruction activity and a successful reconstruction (World Bank, 2012). Nearly ten percent of these funds were contributed through the Multi Donor Fund for Aceh and Nias (MDF).

This experience helped to establish strong policies and institutions, including the newly-formed National Board for Disaster Management (BNBP) and the Indonesia Disaster Fund (IDF) which is largely modeled on the Aceh MDF. These institutions have helped to significantly streamline the post-disaster processes for rapid response and recovery in the country.

Several key principles are now integral to Indonesia's disaster risk management and response strategy, which is based on the maxim of building back faster. For instance, the government follows a phased approach that prioritizes the rapid rebuilding of homes and basic infrastructure (e.g. sanitation), then progresses to infrastructure, and finally to economic development. It has also established streamlined budgetary processes to ensure that funds can be disbursed and transmitted quickly and efficiently to where they are most needed. Moreover, the government emphasizes community-based development for the rebuilding of homes and local infrastructure, in order to mobilize local capacity and commitment to rapid community recovery. In addition, cross-cutting elements are integrated into all recovery projects, including disaster risk reduction, capacity building, gender inclusiveness, environmental protection, and capacity development, in order to enhance not only the speed, but also the quality of reconstruction.

In the years following the 2004 disaster, Indonesia was struck by earthquakes, tsunamis, and volcanic eruptions (World Bank, 2012). Although these events led to

Flooding in Colombia.

loss of life and destruction of property, the lessons learned in Aceh had equipped the government with significant expertise in disaster management, and strengthened its preparedness. The newly formed institutions and strategies enabled more effective and faster recovery and reconstruction.

With the same objective of strengthening preparedness and accelerating recovery processes, the Government of Turkey started implementing a seismic risk management and emergency preparedness project in 2005, guided in part by the lessons of the Marmara earthquake, which claimed over 17 000 lives in 1999. The Government focused on strengthening the effectiveness and capacity of the provincial and municipal public safety organizations in Istanbul (World Bank, 2016a). The package of measures ranged from the improvement of public awareness and institutional capacity, modernization of emergency communications systems, establishment of an emergency management information system, and expansion of existing emergency response capacity.

Following the principle of building back faster, the Government, at the central level, prepared a National Response Plan and assigned responsibility to the provincial directorates to prepare response plans at the local level. These response plans define all service groups needed for an efficient response, including the private sector. Information management and decision-support systems and databases established for the plan also include a comprehensive inventory of construction firms, detailing their capacities and equipment in major cities. The overall objective of this emergency management system was to improve the ability of authorities at all levels to mobilize resources rapidly and effectively, and to jump-start debris removal and reconstruction in a pre-arranged and well-coordinated manner.

In addition, the preparation of contingent financing instruments can also help governments to strengthen their ability to respond to shocks quickly and effectively. Contingent finance instruments like the World Bank's Catastrophe Deferred Drawdown Option (Cat-DDO) provide countries with a pre-approved credit line that can be accessed immediately after the declaration of an emergency following a natural disaster. While the amounts provided by a Cat-DDO are usually well below the full cost of reconstruction, the rapid mobilization of pre-approved funds is designed to accelerate effective recovery measures and ensure that reconstruction starts as quickly as possible. In addition to providing immediate liquidity following a disaster, this instrument also supports policy programs to strengthen the preparedness and response capacity of governments and risk management institutions.

In 2010, Colombia experienced one of the worst rainy seasons in decades, resulting in severe flooding and landslides. However, before this disaster the Government of Colombia and the World Bank had prepared a contingent credit (a Cat-DDO) worth US$150 million. The disaster triggered the disbursement of the contingency funds (World Bank 2010). This helped the government to signal its resilience and preparedness to financial markets, and contributed to expediting the post-disaster recovery. Several other countries—including low-income countries with high exposure to natural hazards and more limited access to international credit markets—are exploring or preparing such contingent finance instruments; they include Saint Lucia, Cabo Verde, Kenya, Malawi, and the Maldives.

The Government of Mexico created the Natural Disaster Fund (FONDEN) in 1996 in response to delays faced in the post-disaster financing of emergency and recovery activities (GFDRR 2012). FONDEN is a financial mechanism that provides federal agencies and the Mexican states with immediate liquidity to finance recovery efforts. It has a mandate to (1) finance post-disaster emergency assistance (through a revolving fund), and (2) provide the 32 Mexican states and the line ministries (for example, the Ministry of Infrastructure, Ministry of Health, Ministry of Education, and Ministry of Human Development) with financial resources in case losses from natural disasters exceed their budget capacity. FONDEN finances the post-disaster recovery and reconstruction of public assets (100 percent of federal assets and 50 percent of state and municipal assets) and low-income houses. In 1999 the FONDEN Trust Fund was established to help finance the FONDEN program through a catastrophe reserve fund that accumulates the unspent disaster budget of each year. Overall, FONDEN is credited with playing a critical role in strengthening Mexico's disaster preparedness and ability to build back faster and better—and can provide valuable lessons for other countries.

Building back *more inclusively*

As the *Unbreakable* report has shown, poor people are not only more vulnerable to natural hazards, they also tend to have access to fewer post-disaster support mechanisms, such as insurance, borrowing, or remittances, and have fewer savings to draw on. As a consequence, they tend to experience higher losses relative to income, and often have to resort to "negative coping mechanisms" such as reducing food intake, cutting down on health care, or reducing education spending.

For instance, in response to weather shocks in Sub-Saharan Africa, asset-poor households provide children with lower-quality nutrition (Alderman, Hoddinott, and Kinsey, 2006; Dercon and Porter, 2014; Yamano, Alderman, and Christiaensen, 2005), and they are less likely to take sick children for medical consultations (Jensen, 2000). These behaviors have short- and long-term impacts, particularly for children younger than two. Within this group, in households reducing nutrition, children's average height fell by 0.9 centimeters within six months of a disaster (Yamano, Alderman, and Christiaensen, 2005), and the stature of children in these households was permanently reduced by 2–3 centimeters (Dercon and Porter, 2014).

Impacts on education are also prevalent. In Africa, enrollment rates have declined 20

percent in regions affected by drought (Jensen, 2000). Such findings are not restricted to Africa; similar post-disaster impacts on health and education have been found in Asia, Latin America, and elsewhere (Baez, de la Fuente, and Santos, 2010; Maccini and Yang, 2009). In Mexico, once children have been taken out of school, even for a temporary shock such as a flood, they are 30 percent less likely to proceed with their education, compared with children who remain in school (de Janvry et al., 2006).

A single disaster can irreversibly affect a child's life. After Hurricane Mitch hit Nicaragua in 1998, the probability of child undernourishment in regions affected by the hurricane increased by 8.7 percent, and child labor force participation increased by 5.6 percent (Baez and Santos, 2007). In Guatemala, Storm Stan increased the probability of child labor by 7.3 percent in departments hit by the storm (Bustelo, 2011).

Even when impacts on human capital can be avoided, major losses can have long-term consequences for some households—such as when people become locked in poverty traps because their asset base has fallen below a critical threshold. For example, there is little chance that herders with only few animals left after a natural disaster will be able to quickly regrow their herd (Carter and Barrett, 2006). Marginalized and disadvantaged groups—including women—are especially at risk of experiencing such poverty traps, not least because they tend to have fewer support systems available to them.

The long-term cost of these negative coping mechanisms and poverty traps can be very high, and this is why adaptive social protection and social safety nets that can respond quickly to natural disasters have substantial benefit-cost ratios. Case studies suggest that the cost of a drought to households can increase from zero to about US$50 per household if support is delayed by four months, and to about US$1,300 if support is delayed by six to nine months (Clarke and Hill, 2013).

However, providing rapid support to poor people cannot be easily improvised when a disaster occurs. Instead, it requires the development—before the crisis—of social safety nets that are adaptive and can react to shock, and of appropriate delivery mechanisms that cover vulnerable populations.

It requires, for example, large and flexible social registries that include both potential and existing beneficiaries, and contingency plans for when and how support will be provided, and where the financial resources will come from.[7] It also requires efficient

delivery mechanisms that can cover the poorest and most vulnerable people. For instance, by providing more convenient and affordable financial services, mobile money accounts offer promise for reaching unbanked adults traditionally excluded from the formal financial system such as women, poor people, young people, and those living in rural areas (Demirgüç-Kunt et al., 2015).

One example of a system enabling a more inclusive recovery is Kenya's Hunger Safety Net Program (HSNP), which is a safety net that is active every year but can be scaled up in case of adverse weather conditions. In 2015, it delivered support to more than 100,000 additional households in response to the drought. Transfers could proceed two weeks after the decision to scale up was made, but this was possible only through the use of satellite data and clear pre-determined thresholds to trigger the scale-up, the pre-registration of all households in the covered counties, and the provision of bank accounts to all potential beneficiaries. Only preparedness allowed such a rapid and inclusive response.

Estimating well-being benefits of building back more inclusively

In this context, building back more inclusively means that post-support and recovery and reconstruction measures can cover the entire population, including the poorest, and that the amounts of transfers do not favor richer households as is sometimes observed (Noy and Patel, 2014).

For the sake of illustration, the estimates in this section assume that all countries set up a dedicated system that ensures that all affected households have access to post-disaster support, regardless of their pre-disaster income level or social marginalization, and receive the same amount, regardless of their wealth and losses. The amount of resources available to all countries is assumed sufficient for governments to cover 80 percent of the losses of the poorest in each country. The estimates suggest that if all 149 countries could implement these measures, global well-being losses due to natural disasters could be reduced by 9.4 percent from US$555 billion to US$502 billion annually.

Figure 16 provides an overview of the countries in which a dedicated system for a more inclusive recovery would lead to the largest reduction in average well-being losses. The estimates show that inclusive recovery could reduce overall well-being losses due to natural disasters by up to 41 percent in the case of Angola. Such dedicated systems tend to be particularly effective in lower-income developing

countries, countries with high inequality and limited coverage and generosity of social protection, and countries with low sovereign credit ratings (which affects their ability to finance post-disaster support measures in the absence of a dedicated system). Figure 18 shows that building back more inclusively tends to yield higher reductions in well-being losses in countries with high pre-existing inequality.

However, in high-income countries, a dedicated system shows little benefit—mainly because social protection systems are already relatively well-equipped to target and support even the lowest income groups. Deryugina (2016) shows for instance that in the US, a large fraction of post-disaster support is provided by social protection instruments that are not designed primarily as post-disaster systems—such as unemployment and health insurance systems.

Figure 16. Left: Top 10 largest reductions in average well-being losses due to more inclusive recovery. Right: Reductions in average well-being losses for selected small island states.

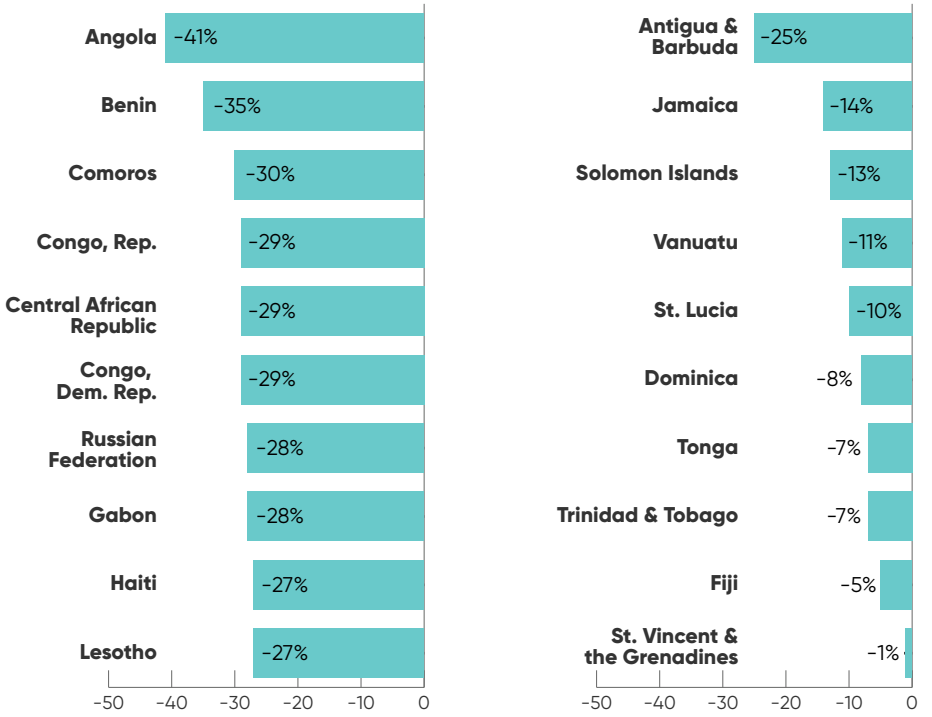
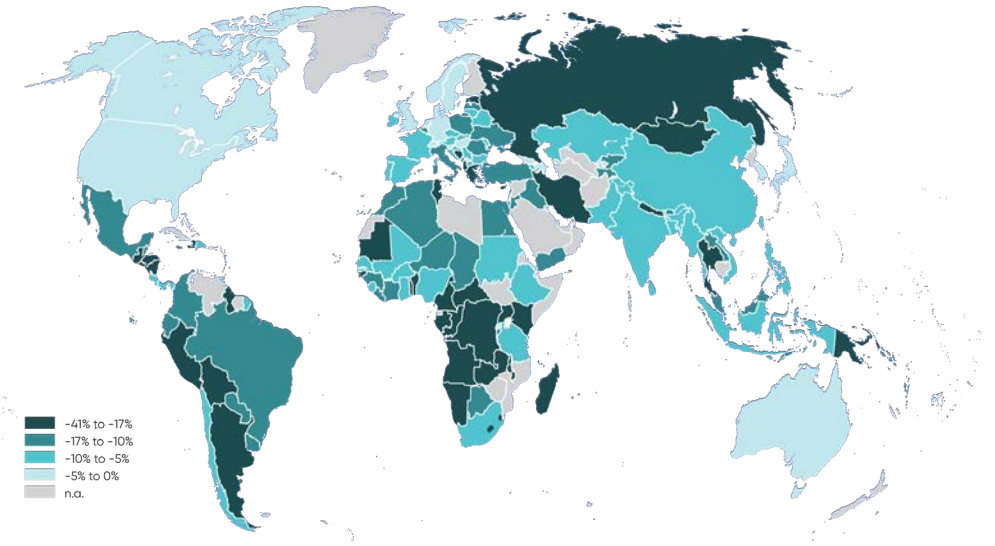


Figure 17. Percentage reduction of well-being losses associated with more inclusive recovery.



Countries are sorted into quartiles (i.e. same number of countries for each color).

Figure 18a. The benefits of more inclusive recovery increase with the level of pre-existing income inequality.

SPOTLIGHT

Adaptive social safety nets to ensure inclusive recovery in Fiji

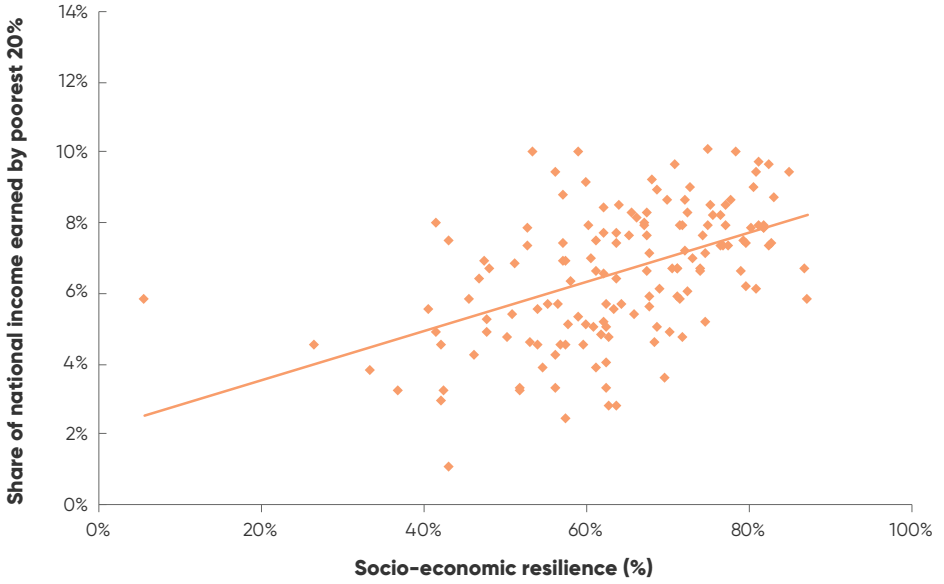
Fiji has a long history of providing social assistance to vulnerable populations which are struggling to meet their basic needs—including in the aftermath of major natural shocks. The country's social protection system has evolved over the years to be gender-sensitive and rapidly responsive. The core social protection programs are the Poverty Benefit Scheme (PBS), Care and Protection Allowance (CPA), and Social Pension Scheme (SPS). PBS, rolled out in 2013, targets the poorest 10 percent of households in Fiji. In addition, the SPS was introduced to provide social pensions to elderly people who fell outside the coverage of social assistance programs. Since 2009, the government has significantly increased investment in its social protection portfolio: funding increased from US$40 million in 2009 to US$66 million in 2015, in recognition of the importance of social assistance programs.

In 2016, the category 5 tropical cyclone Winston struck Fiji, leaving behind severe destruction: 44 lives were lost, and the assets losses alone were estimated to be around US$1.4 billion. The strength of the existing social protection system allowed the government to act swiftly and efficiently to provide support to the affected population. The government scaled up its three main social assistance programs to provide existing beneficiaries with top-up payments equivalent to three months' worth of their regular benefit amounts, and a total of US$5 million was disbursed within one month of the disaster. Under the PBS, 22,802 households were paid a lump sum of US$300. Some 17,782 pensioners in the SPS over the age of 68 received an additional US$150. Finally, 3,313 families under the CPA received a total of US$150. The cash top-up payments were intended to help people meet immediate expenses following Winston and were provided to all existing beneficiaries, irrespective of whether they resided in the affected areas.

A comprehensive impact evaluation of the government's response to Winston shows adaptive safety nets were effective in helping households cope (Mansur et al., 2018). The evaluation shows that three months after the cyclone took place, beneficiaries under the PBS (who belong to the poorest 10 percent of the population) were more likely to have recovered from the shocks they faced than comparable households that did not receive the additional assistance. This includes having recovered from sickness or injury, repaired their dwelling, replenished their food stocks, remedied the damage to their agricultural land, repaired village or neighborhood infrastructure, and resolved problems of conflict, violence, or insecurity. According to the analysis provided in Government of Fiji and World Bank (2017), this intervention has a benefit-cost ratio higher than 4.

Through a strong focus on building back more inclusively, Fiji has ensured that the poorest and most vulnerable population groups received the targeted support they needed. In this way, the government was able to lessen the disproportionately adverse impacts on poor people and ensure that recovery efforts do not systematically overlook a significant fraction of the population.

Figure 18b. High inequality (i.e. low share of national income earned by poorest 20 percent) tends to reduce countries' level of socio-economic resilience.



Building back better: stronger, faster, and more inclusively

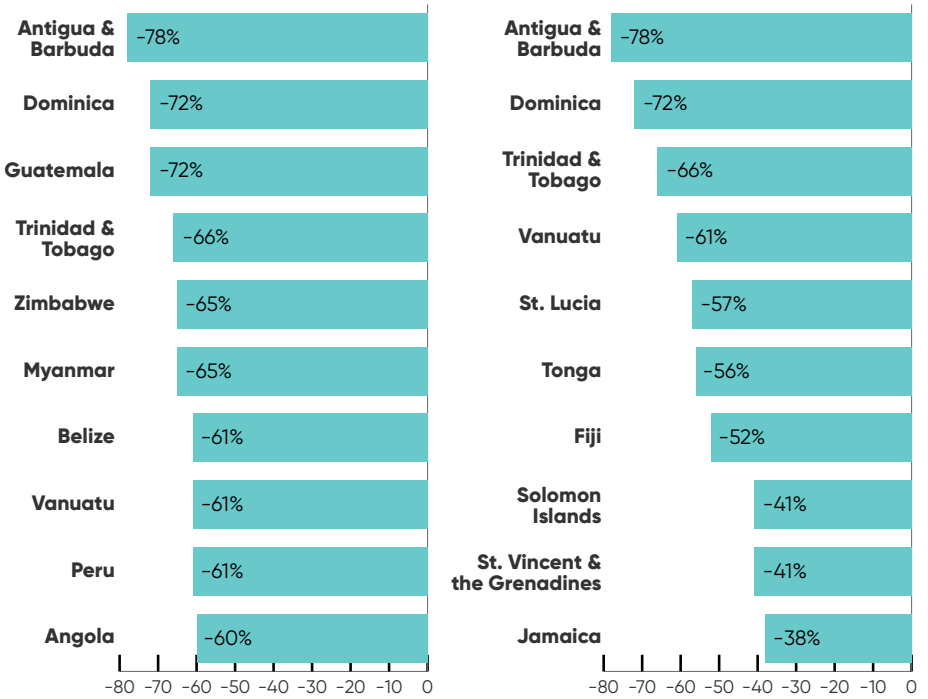
Taken separately, there are large benefits in making the post-disaster recovery stronger, faster, or more inclusive. But of course, the benefits are maximized if these three objectives can be achieved together.

Doing so creates specific challenges. For instance, while accelerating reconstruction is crucial to minimize the well-being impacts of disasters, fast should not come at the expense of strong—i.e. efforts to increase the speed of reconstruction should not lead to rebuilding assets that are more vulnerable. All the benefits from a faster recovery could easily disappear if a hastened reconstruction made it impossible to improve the vulnerability of the asset to future hazards.

If successfully achieved together and in the 149 countries analyzed here, *building back stronger, faster, and more inclusively* would reduce global well-being losses by 31.2 percent from US$555 billion to US$382 billion. Figure 19 (left) provides an overview of the countries in which the full building back better package would lead to the

largest reduction in average well-being losses. The estimates show that overall well-being losses due to natural disasters would be more than halved in all of these countries. As in the previous sections, several small island states are among the list with the largest benefit potential from a better recovery; their reduction in well-being losses due to natural disasters is on average 58.8 percent (Figure 19, right).

Figure 19. Left: **Top 10 largest reductions in average well-being losses due to building back stronger, faster, and more inclusively.** Right: **Reductions in average well-being losses for selected small island states.**

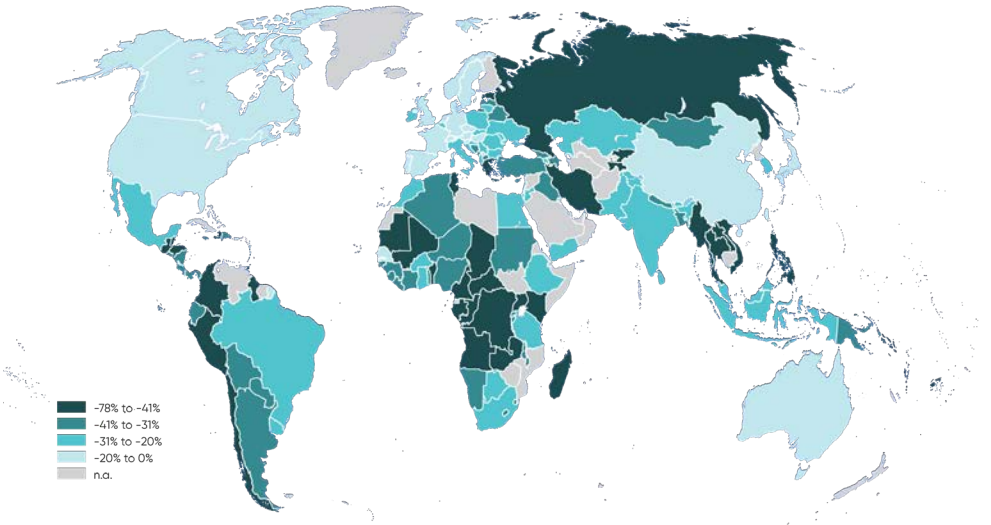


The reconstruction after a disaster can offer further opportunities for improving the post-disaster outcome. In particular, the destroyed assets can be replaced so that they are not only more resilient, but also better adapted to current and future needs, and using the most recent technologies, which have higher levels of productivity.

Examples of such upgrading of assets are: (i) for *households*, the reconstruction of houses with better insulation technologies and better heating systems, allowing for energy conservation and savings; (ii) for *companies*, the replacement of old production technologies by new ones, like the replacement of paper-based management files by computer-based systems; and (iii)

for *government and public agencies*, the adaptation of public infrastructure to new needs, like the reconstruction of larger or smaller schools when demographic evolution justifies it.

Figure 20. Percentage reduction of well-being losses associated with building back better.



Countries are sorted into quartiles (i.e. same number of countries for each color).

Capital losses can, therefore, be compensated by higher productivity of the economy in the aftermath of an event. This process, if present, could increase the pace of technical change and represent a positive consequence of disaster. This effect, often referred to as the "productivity effect", has been mentioned by Albala-Bertrand (1993), Okuyama (2003) and Benson and Clay (2004), inter alia, and highlighted in the case of the Chicago fire in Hornbeck and Keniston (2017). While it has been shown that the productivity effect cannot turn natural disasters into desirable events (Hallegatte and Dumas, 2009), it can reduce their overall impacts on economic growth and well-being.

The large potential benefits of *building back better*—and using more-recent and higher-productivity technologies—provides a strong incentive to introduce policies and tools that help ensure the highest possible quality of the reconstruction. However, these policies and tools need to be in place before the disaster hits for their benefits to be realized. They are usually incorporated into a *disaster recovery framework* and include contingency plans and a clear allocation of reconstruction responsibilities, financial protection—through insurance or social protection systems—and more general financial inclusion, with access to credit to finance the reconstruction, and the availability of information and knowledge on how to implement modern solutions and technologies.

BUILDING MORE RESILIENT SOCIETIES

In 2017, Hurricanes Irma and Maria caused large-scale destruction across the Caribbean. While these events were extreme, they were by no means unique. These disasters happened in the context of increasingly frequent and intense extreme weather events—a trend that is not limited to the Caribbean, as other countries have also been heavily affected by exceptional disasters in recent years. Continued urbanization and population growth, especially in coastal areas, as well as climate change, are likely to intensify these trends in the next decades.

In this context, the destruction caused by disasters highlights the need to *build back better*—and also the opportunities it brings. Reconstruction offers an opportunity to build more resilient societies, better able to withstand future shocks.

However, building back better is just one of many measures for increasing resilience, and can only be truly transformative if integrated into a more comprehensive strategy of disaster risk reduction and management. For example, if resilient building standards are not systematically applied to new and existing facilities and infrastructure, there are bound to be capacity constraints to implementing and enforcing these in a post-disaster situation.

While post-disaster reconstruction offers opportunities for fast and significant progress, ex-ante actions are of paramount importance. Financial inclusion, retrofitting of buildings, social safety nets, and risk-informed land-use planning are some of the ex-ante measures that not only help to reduce the losses in the case of a disaster—but also contribute to sustainable and resilient development more generally.

ACRONYMS AND ABBREVIATIONS

BNBP	Indonesia's National Board for Disaster Management
Cat-DDO	Catastrophe Deferred Drawdown Option
CPA	Fiji's Care and Protection Allowance
DMU	Decision-making under uncertainty
FONDEN	Mexico's Natural Disaster Fund
GDP	Gross Domestic product
GFDRR	Global Facility for Disaster Reduction and Recovery
IDF	Indonesia Disaster Fund
MDF	Multi Donor Fund for Aceh and Nias
PBS	Fiji's Poverty Benefit Scheme
PDNA	Post-disaster needs assessment
SPS	Fiji's Social Pension Scheme
UNISDR	United Nations Office for Disaster Risk Reduction

ENDNOTES

1. The *Unbreakable* model is available at https://github.com/GFDRR-Unbreakable
2. In this report, local currencies are translated into US$ using 2011 Purchase Power Parity rates.
3. These results use the model of the *Unbreakable* report with a few minor changes—but all results shown in this report have been produced with the same model, ensuring that changes over time arise from changes in parameters, not changes in the model.
4. United Nations General Assembly. 2016. Report of the Open-Ended Intergovernmental Expert 2 Working Group on Indicators and Terminology Relating to Disaster Risk Reduction. Seventy-First Session, Item 19(c). A/71/644.
5. Countries that already have assets able to resist the 50-year return period event do not benefit from this measure. A time frame of 20 years is chosen for this purpose: every asset destroyed by a natural disaster within a 20-year time frame is reconstructed to the new standard. The estimated reduction in well-being losses are the amount that can be achieved at the end of this time frame. (To simplify the interpretation of the results, we assume that everything else remains unchanged—i.e. we remove the effect of population and economic growth during this period.)
6. Including the US Agency for International Development (USAID), the Swiss Agency for Development and Cooperation (SDC), the World Bank, and the Japan International Cooperation Agency (JICA)
7. In the absence of the required data, self-targeting methods (public work programs) and subsidies can be used, but they also require preparation.

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