UNBREAKABLE

Building the Resilience of the Poor in the Face of Natural Disasters

Stephane Hallegatte
Adrien Vogt-Schilb
Mook Bangalore
Julie Rozenberg
Puerto Rico lost $43 billion after Hurricane Maria, according to govt. report

“Given the magnitude of the natural disaster, the economic sectors will keep feeling the impact for an undetermined amount of time,” the report says.
Hurricane Florence damage estimated at $17 billion to $22 billion and could go higher — Moody’s Analytics

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Patti Domm
@PATTIDOMM

KEY POINTS

• Property damage from Hurricane Florence is estimated at $17 billion to $22 billion, and that forecast could be conservative, depending on further flooding, says Moody’s Analytics.

• Economists so far see a minimal impact to growth from the hurricane, which Moody’s sees shaving 0.2 percentage points from third-quarter GDP.
Hurricane Irma's Damage Could Cost Us $300 Million, Antigua and Barbuda PM Says

BY TARA JOHN / ANTIGUA  SEPTEMBER 12, 2017
Increased flooding may cost the world $1 trillion by 2050

John Roach
Published 4:42 AM ET Mon. 19 Aug 2013

Reyes Garcia wades through floodwater to inspect flood damage to a building April 10, 2013 in Des Plaines, Illinois.
ASSET LOSSES
Avoiding disasters/impacts

**ASSET LOSSES**
1. Hazard  
2. Exposure  
3. Vulnerability

**WELL-BEING LOSSES**
1. Hazard  
2. Exposure  
3. Vulnerability

**4. Socioeconomic resilience**

Managing residual risk/impacts
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This figure shows the distribution of consumption in the region II – Cagayan Valley. The large majority of families in the region consume between 10,000 and 30,000 pesos per year.
The same distribution, but after the 100-year typhoon hit the region
In the case of the 100-year typhoon, around 176,000 people fall in poverty, and 230,000 even fall below the subsistence line.

Stress testing all regions for all hazards, we find that about half a million Filipinos face transient consumption poverty every year due to their exposure to disasters.
the regions identified as priorities for risk-management interventions differ depending on which risk metric is used. Each metric translates in quantitative form a different set of policy objectives.
The potential from (and cost of) adaptive social protection in Sri Lanka
Recommendations Solutions Diagnosis
The lack of resilient infrastructure is harming people and firms
Damages and repair costs are significant …

$30 billion
Annual global damages to transport and power generation

$18 billion
Annual damages to low- and middle-income countries
... but repairs are only part of the problem.

$391–$647 billion

The annual cost of infrastructure disruptions on households and firms in developing countries.

Firms
- Reduced utilization rate ($151 billion)
- Lost sales ($82 billion)
- Self-generation costs ($65 billion)
- Increased inventories
- More expensive localization choices
- Higher barriers for entry of new firms
- Less competition and innovation
- Labor-biased technologies

Household
- Willingness-to-pay ($90–$343 billion)
- Health expenditures ($3–$6 billion)
- Income impact and gender implications
What fraction is caused by natural hazards?
Zoom on Tanzania.

Total utilization losses per year: $640 million
Or 1.8 percent of GDP

Weather-related losses per year: $250 million
Or 0.7 percent of GDP

40.2% Losses due to disruptions caused by rains & floods

47% Losses due to disruptions caused by rains & floods
Investing in more resilient infrastructure is sound, profitable, and urgent
Criticality analyses show where strengthening is more important and beneficial

a. Impacts of disruption on households

b. Impacts of disruption on international clients
With the right data, strengthening assets would cost $11–$65 billion per year—3 percent of total needs.
Investigating the uncertainty on benefits using 3000 scenarios

Net present value of more resilience infrastructure (US$, trillions)

- No climate change
- With climate change
Altogether: Investing in resilience is sound, profitable, and urgent

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<th>$4</th>
<th>$4.2 trillion</th>
<th>$100 billion</th>
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<tr>
<td>In net benefit for each $1 invested in infrastructure resilience</td>
<td>Net benefit from building new infrastructure to higher resilience standards</td>
<td>Cost of delaying action by one year</td>
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Good infrastructure management is the necessary basis for resilient infrastructure—but targeted actions are also needed.
Spending more improves the reliability of transportation systems ...
... but only if governance improves as well

If governance improves with spending
If governance does not improve
Priority areas for financial support—how can we spend better?

FULL INFRASTRUCTURE COSTS

COST TO REGULATORS AND GOVERNMENT
- Master planning, regulation design, and enforcement
- Data and model development, research, training, education

LIFECYCLE COST TO (PUBLIC OR PRIVATE) INFRASTRUCTURE SERVICE PROVIDERS
- Project design and preparation
- Upfront investment cost
- Operational costs
- Maintenance and repair costs (and decommissioning)
Priority areas for financial support—how can we spend better?

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For instance, $1 invested in maintenance is worth $1.5 in new investment.
Team members

- The report has been prepared by a team led by Stephane Hallegatte, with Jun Rentschler and Julie Rozenberg.
- **Power sector:** Claire Nicolas, with a team composed of Christopher Arderne, Diana Cubas, Mark Deinert, Eriko Ichikawa, Elco Koks, Ji Li, Samuel Oguah, Albertine Potter van Loon, and Amy Schweikert.
- **Water sector:** Zhimin Mao, working with Laura Bonzanigo, Xi Hu, Elco Koks, Weeho Lim, Raghav Pant, Patrick Ray, Clementine Stip, Jacob Tracy, and Conrad Zorn.
- **Transport sector:** Julie Rozenberg, with Xavier Espinet Alegre, Charles Fox, Stuart Fraser, Jim Hall, Elco Koks, Mercedeh Tariverdi, Michalis Vousdoukas, Conrad Zorn.
- **Telecommunication sector:** Himmat Sandhu and Siddhartha Raja.
- **Firm and household surveys:** Jun Rentschler, with Paolo Avner, Johannes Braese, Alvina Erman, Nick Jones, Martin Kornejew, Sadick Nassoro, Marguerite Obolensky, Samet Sahin, and Eugene Tan.
- **Resilient industries and supply chains:** Shinji Ayuha, Célian Colon, Etienne Raffi Kechichian, Maryia Markhvida, Nah Yoon Shin, Shoko Takemoto and Brian Walsh.
- **Public-private partnerships:** Sanae Sasamori and Naho Shibuya
- **Engineering solutions and cost estimates:** Miyamoto International
- **External advisors:** Yasuyuki Todo, Adam Rose, Guillaume Prudent-Richard
- **Sponsored by the Japan—World Bank Program for Mainstreaming Disaster Risk Management in Developing Countries and the Global Facility for Disaster Reduction and Recovery (GFDRR).**