RESILIENT TRANSPORT

Making transportation networks safe, secure, and reliable

Whether they are acting as a connection to crucial services or as life-saving conduits during emergency situations, transport linkages are critical to disaster risk management. When planned strategically, transport systems are foundational to the resilience of urban and rural residents. GFDRR's transport program seeks to strengthen various modes of transport, reducing vulnerabilities and increasing the resilience of people and assets.

WHAT WE DO

- Help governments make transportation infrastructure less vulnerable to disaster and climate risks
- Ensure disaster-informed design at the time of construction
- Involve cities in creating transit networks that are more resistant to extreme events and natural disasters

$9.5 billion+

the combined value of the more than 50 World Bank Group-supported projects that integrate disaster risk management and transport

60%–70%

how much proactive disaster risk management can save in costs over the lifetime of transportation infrastructure

BY THE NUMBERS

Over 1/3

of all damage and loss in Sri Lanka from natural disasters over the past 15 years directly impacted the transport network

$2.1 trillion

the annual amount that countries invest in transport infrastructure worldwide ranges from $1.4 to $2.1 trillion.

42%

of businesses in Can Tho were affected by seasonal flooding from 2011–2014

4,793 km

(nearly 18%) of Peru's roads were destroyed and 46% (12,064 km) damaged by El Nino-related flooding in the first seven months of 2017 alone

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Global Facility for Disaster Reduction and Recovery

OUR APPROACH

A proactive, life-cycle approach to resilient transportation infrastructure.

GFDRR's work in resilient transport aims to move away from reactive responses to crises. Instead it seeks to foster a proactive approach to disaster risk management that considers residents, the environment, hydrology, and geology. The approach allows transportation infrastructure to remain resilient to changing risks and hazards and perform well throughout its lifetime by considering the entire life-cycle of the infrastructure—from planning, design, and construction to operations and maintenance. Climate and disaster risk management can be integrated in all phases of the infrastructure's lifespan:

ENSURING RISK-INFORMED DESIGNS

Transportation infrastructure is often built in high-risk areas, and may not consider long-term climate risks. Planning before implementation helps reduce these vulnerabilities.

GFDRR provides technical assistance to municipalities and governments, helping them conduct vulnerability and hazard assessments as part of the planning process, prioritize smart investment strategies, and plan redundancy of critical infrastructure to provide alternatives during a crisis. By reducing the need for future rebuilding, these efforts can reduce costs across the lifetime of the transportation infrastructure, as well as make it more resilient.

ENGINEERING RESILIENT INFRASTRUCTURE

Innovative materials and designs can enhance the robustness and flexibility of transportation infrastructure.

MANAGING EXISTING ASSETS

Assessments, codes, standards, and maintenance are essential to reduce risk, but are often either overlooked or of substandard quality.

After infrastructure is built, asset management and maintenance are key to ensuring that the levels of designed resilience continue to be sustained. The transport program stresses ongoing maintenance programs and financial planning to fund maintenance and emergency contingencies, ensuring that infrastructure is prepared for continuous use, extreme events, and changing average conditions.

The program also works to map transport using open technologies, and to develop online and interactive management portals.

PLANNING FOR EMERGENCIES

Even when transportation infrastructure is built well, there is the potential for failure, if the design conditions are exceeded or if maintenance is poor.

GFDRR guides local policies to improve responses to failure, investing in disaster response mechanisms and ensuring that linkages and flows exist for evacuation, communication, emergency response, and post-disaster recovery.

BUILDING PARTNERSHIPS TO IMPROVE TRANSPORTATION INFRASTRUCTURE FOR THE FUTURE

Partnerships help ensure that infrastructure has sustained and resilient capacity.

GFDRR works to connect governments with hydro-meteorological groups, civil defense agencies, and financial ministries, among others. Having a variety of stakeholders contributes to more accurate, more comprehensive risk information to inform construction and maintenance standards, and better planning and operation of emergency response systems and contingencies.

AZERBAIJAN.
ALLISON KWESELL / WORLD BANK

Weathering the Impacts

Natural hazards can have a deleterious effect on transport infrastructure, including road networks and railways, in addition to aviation, maritime, and information and communications networks. For example, heavy rainfall may cause erosion and scouring of roads and bridges, flooding and extreme waves may result in closures, and strong winds may bring debris that obstructs traffic flows across all transport modes. All of these have social impacts, as they reduce the usability of the roadways, cut off access to communities and services in cases with limited redundancy, and increase travel times. Economic impacts may include increased time and costs to move people and goods, and unplanned costs for infrastructure repairs.

Port Cities

As sea levels rise, port cities are becoming more vulnerable to disasters and climate impacts. Integrating port infrastructure with coastal defense mechanisms can reduce the risk of floods and attract people and assets to coastal cities. As the density of residents and assets increases, however, these systems must be supported with regular, proactive upgrading and upkeep to protect lives and livelihoods.

ACTIVE ENGAGEMENTS

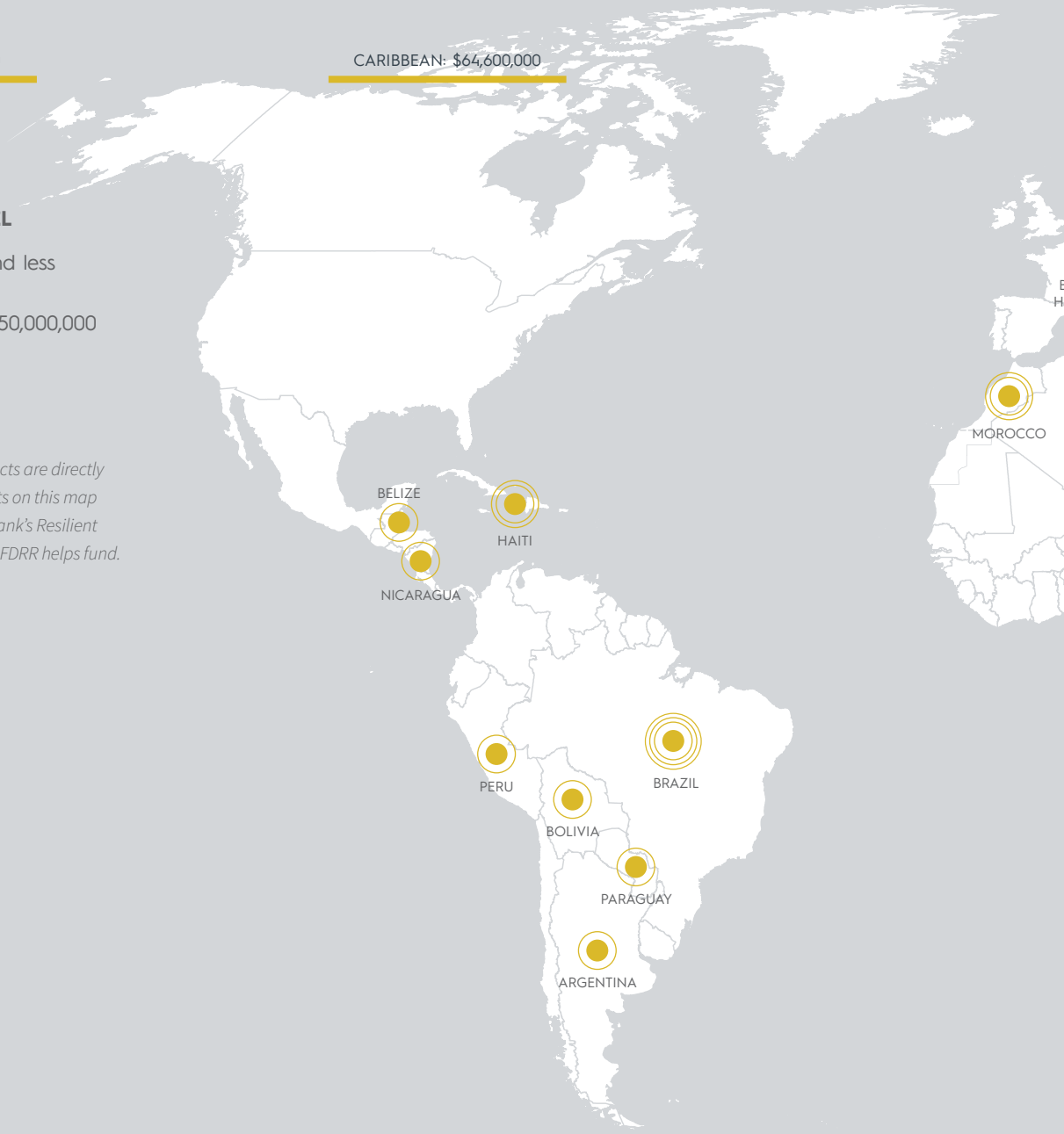
WORLD: $385,000,000

CARIBBEAN: $64,600,000

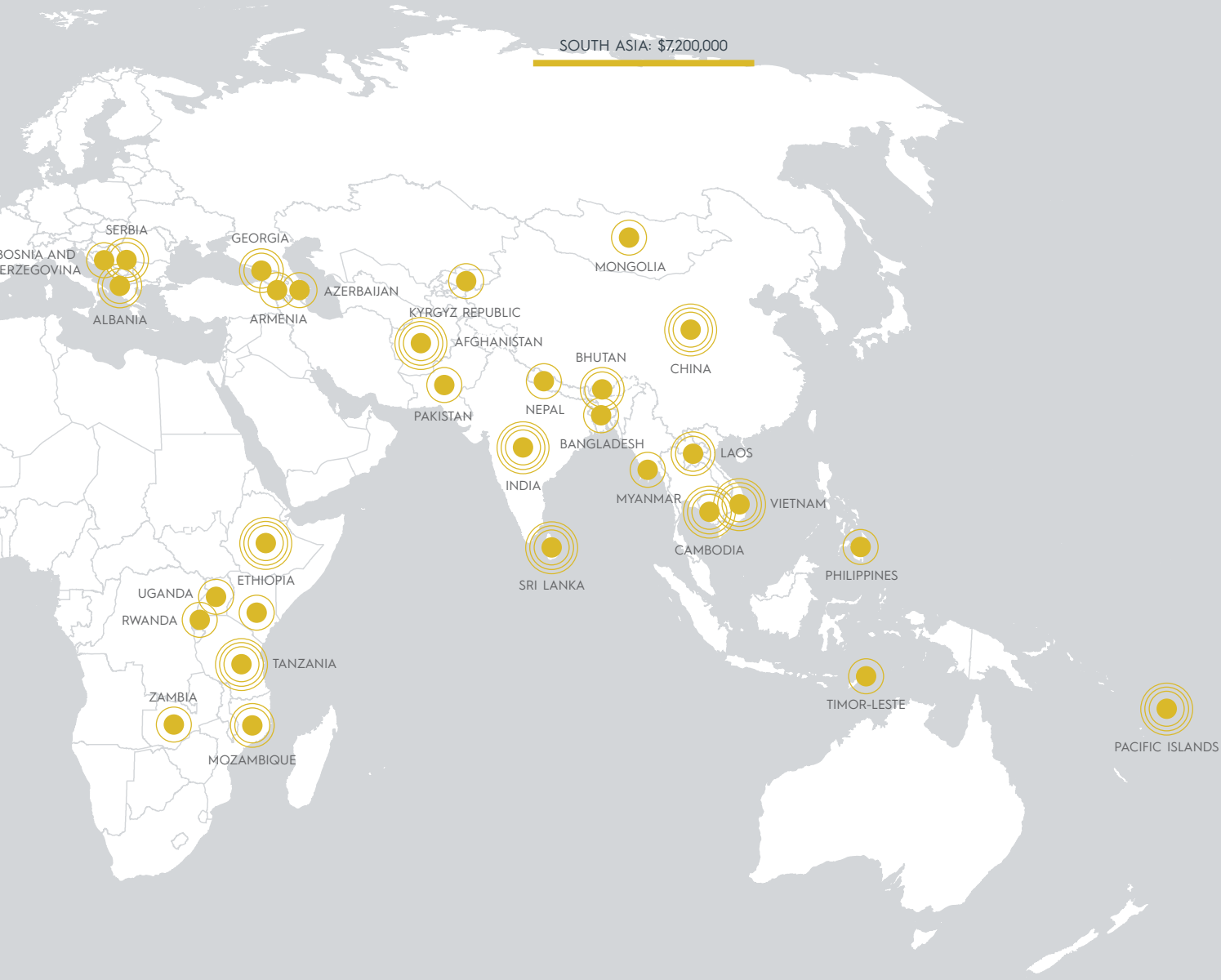
ENGAGEMENT LEVEL

- $50,000,000 and less
- $50,000,100–$150,000,000
- $150,000,100+

Note: A subset of these projects are directly funded by GFDRR. All projects on this map are financed by the World Bank's Resilient Transport Program, which GFDRR helps fund.



THE SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION 2015–2030 recognizes the need to "promote the resilience of new and existing critical infrastructure, including water, transportation and telecommunications infrastructure … to ensure that they remain safe, effective and operational during and after disasters in order to provide live-saving and essential services."



Next Steps

» **Operational work.** Disburse US$2 million for resilient transport projects across the globe.

» **Knowledge sharing.** Continue to execute biannual Technical Knowledge Exchanges between government officials from partner countries, World Bank project leads, and other experts, with the next event in late fall or winter

» **Flagship initiatives.** Deliver the FY17 flagship initiative – the small island developing states resilient road asset management program—at COP 23, secure funding, and roll out the program. Identify the next flagship initiative in spring of 2018

Belize

Hugging the coast of the Gulf of Mexico, Belize is one of the most vulnerable countries to hazards. Although it is the least-densely populated country in Central America, its population and economic activity are concentrated in an around a low-lying coastal area. Average annual losses from hurricanes alone are estimated at nearly $7.7 million.

Exacerbating Belize's vulnerability is a deteriorating road system with little redundancy. After a disaster, flooded or damaged roads impede connectivity and slow post-disaster recovery. Since 70% of the population lives near primary and secondary roads, any impassable roadway also cuts off access to critical emergency response.

In close partnership with government agencies, GFDRR supported a multi-pronged approach in Belize to strengthen transportation connections. Local teams created a road network database for the first time in the country's history, using a highly participatory process that brought in local, expert, and private-sector knowledge and engagement. The resulting online, interactive geospatial model now helps government actors make better decisions when investing in climate-resilient transport.

Methodology

1. **Define objectives and scope of the prioritization process**
2. **Understand the context**
3. **Collect data (both identifying existing data, and creating new data to fill gaps)**
4. **Evaluate your data**
5. **Assess climate-related risks**
6. **Informed decision-making**

The methodology developed and piloted in Belize (see infographic) is now a global model, and has been shared with transport and disaster risk specialists in Africa, Latin America, and the Pacific to inform future resilient transport efforts globally.

> "The multi-criteria evaluation of Belize's road … influenced our decisions on which roads to invest in and ensured that the selected investments will improve the country's resilience to climate change and climate variability …The participatory nature of the process certainly facilitated the adoption of the results."
> —**Yvonne Hyde,** Chief Executive Officer, Ministry of Economic Development

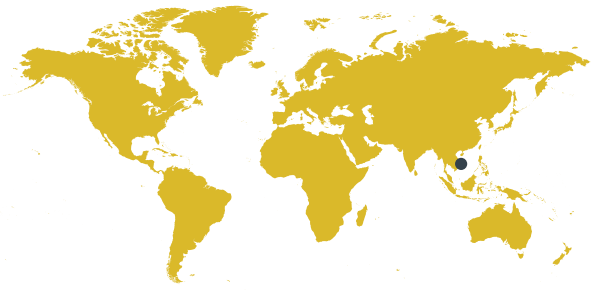
Vietnam

When floods sweep through the highly-populated coast and into the low-lying deltas of Vietnam, residents are sometimes forced to evacuate. Evacuation is a disruptive burden on families and businesses—but residents face an even larger problem when evacuation is impossible because of washed-out, destroyed, or damaged roads.

Over the past two decades in Vietnam, which faces six to eight typhoons each year, extreme weather events have caused over 13,000 deaths and more than $6.4 billion in property damage. Floods and storms often isolate communities, blocking routes that would allow evacuees out and emergency response in. With connections between cities and regions severed, recovery efforts are slowed. Trade flows also suffer, causing significant economic losses.

Vietnam has been working to make its road network more resilient, with technical assistance from GFDRR and financing from the World Bank, whose more than $1 billion of investment included over $140 million for climate and disaster resilience. The work starts at the planning and design stage, where climate-resilient designs call for flood-proof paving, protective structures, and road-drainage systems. Those designs are being implemented along new rural roads in flood-prone areas, and climate considerations are now a part of the operations manual that controls the design, construction, and maintenance of rural roads.

The government is also working with the World Bank and GFDRR to flood-proof the country's main transport corridor, National Highway 1A, and reduce the chance that communities will be cut off by floods. One major component of this work is maintenance that makes roads less likely to be damaged by flooding. For instance, more than 15,000 people from rural villages—mostly ethnic women from poor households—have helped plant trees along 4,667 kilometers of rural roads. Both men and women in rural areas are being trained to maintain local roadways, making the roads more resilient while giving the population an opportunity to earn extra income, and fostering a sense of shared ownership of the roads.



GFDRR Engagement Notes

Resilient Transportation

gfdrr.org

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The Global Facility for Disaster Reduction and Recovery (GFDRR) is a global partnership that helps developing countries better understand and reduce their vulnerability to natural hazards and climate change.

GFDRR is a grant-funding mechanism, managed by the World Bank, that supports disaster risk management projects worldwide.

Working on the ground with over 400 local, national, regional, and international partners, GFDRR provides knowledge, funding, and technical assistance.

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