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Enhancing Road Resilience in Pacific Island Countries

World Bank Assisting Adaptation to Climate Change

Sean David Michaels[1]

Pacific island countries are experiencing higher temperatures, rising sea levels, and extreme weather that is increasingly frequent and intense.[2] The resulting damage has likewise been extreme. Between 2012 and 2015, for example, losses from three cyclones ranged from 11% to 64% of GDP in Samoa, Tonga, and Vanuatu.[3] In many of these countries, primary roads and critical infrastructure are adjacent to the coast, and the majority of the population lives within 1 kilometer of the sea. Expected climate change effects will place coastal assets and communities at a higher level of risk. Governments are well aware of these challenges. Today, more than one-fourth of the World Bank's transport commitments support mitigation and adaptation to climate change (a share that is growing), and its work with Pacific island countries is one of the ways it is responding to the rising demand for climate action. The demand from Pacific island countries in recent years has focused on road resilience, and early lessons will provide a strong basis for further progress.

The World Bank's support for enhancing the resilience of vulnerable road networks and neighboring communities in Pacific island countries encompasses four pillars:

1. Sectoral and strategic spatial planning that is informed by risk-based assessments of vulnerability and hazards
2. Resilient infrastructure solutions that are fit-for-purpose, such as raising road elevations, installing drainage, relatively new technologies such as geocells for low-volume roads, and strengthening coastal infrastructure
3. Enabling environment: institutional and capacity support, awareness raising, and finance to enhance the capabilities of the relevant stakeholders at the policy and regulatory level
4. Post disaster risk and recovery support to ensure that risk and resilience regarding short- and long-term climate change is integrated into rebuilding efforts

Spatial, Risk-Based Planning

Risk-informed planning is fundamental to mitigating the impact of climate change and extreme weather events, and it is feasible for all governments given the advent of new tools that work

[1] The author is grateful for helpful comments from Christopher Bennett and Michel Kerf.
[2] See The Pacific Climate Change Science Program, *Climate Change in the Pacific: Scientific Assessment and New Research—Volume 2: Country Reports*, 2011, www.pacificclimatechangescience.org/publications/reports.
[3] The World Bank has active engagements in 10 Pacific island countries: Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

well even in low-capacity environments. Samoa and Tonga are already using Light Detection and Ranging (LiDAR) technology, which provides high-resolution aerial photographs to generate elevation data that will strengthen spatial hazard mapping analysis.

Samoa will use the data to update plans developed through Coastal Infrastructure Management (CIM)—a tool focused on citizen engagement that assesses the resilience of coastal infrastructure, identifies solutions, and assigns responsibilities for implementation.

Fit-for-Purpose Infrastructure

Complex design solutions are often not fit-for-purpose in Pacific island countries, given their limited resources. Near- to medium-term design efforts center on installing drainage and raising low-lying coastal roads. A key paving innovation to reduce maintenance needs for low-volume roads are geocells, a labor-based approach to constructing durable pavement at low cost that is already in use in Kiribati. Finally, coastal infrastructure is also being improved to help protect adjacent roads. Green options to replace or complement basic hard infrastructure such as seawalls and breakwaters include living shorelines and recovery of coastal habitats for mangrove replanting. These basic hard and soft options are suitable for low-capacity environments and generally less expensive than solutions used in wealthier countries.

Stronger Enabling Environment

Project management support, a core component of all resilience projects, includes resilience-related training for ministry staff members and civil society organizations. New and amended legal frameworks will enable governments to mobilize funding and create programs. On the regulatory side, reform includes incentives to support resilience-focused maintenance and stakeholder engagement in the design of regulations.

Supporting Postdisaster Recovery

Practical measures are critical to recovery, including the rapid assessment of road network damage to identify key areas needing attention. Rapid clearing of drains and culverts and repairs to protective infrastructure (e.g., seawalls) are necessary given the threat of concurrent severe weather events. More broadly, advance government procurement and retroactive financing are imperative for effective emergency operations. Tonga is considering framework agreements to speed the mobilization of contractors for cleanup and recovery. Wherever feasible, relocation of affected roads, communities, and infrastructure further from the coast should be a priority in recovery operations.

Initial Lessons Learned

Experience gained from projects in Kiribati, Samoa, and Tonga are helping make ongoing interventions there and in other Pacific island countries more effective and would be relevant for consideration among nations in the V-20.[4]

Anticipatory action is vital to protect roads, which provide connectivity essential to growth. Identifying the type and locale of road damage can focus planning and improvements to infrastructure, reduce damage, and limit the need for recovery efforts.

Financial sustainability requires long-term donor engagement. Domestic resources have been insufficient for the long-term needs of fiscally constrained Pacific island countries.

Road authorities often prioritize quick repairs over resiliency measures. In response, task teams have helped persuade agencies that ancillary infrastructure, such as drainage, and risk-based planning tools ensure the long-term sustainability of their road networks.

Project design and implementation must be simple and engage local communities from start to finish. Samoa's Second Infrastructure Asset Management Project made effective use of multilevel stakeholder planning through its best-practice CIM plans.

[4] The Vulnerable Twenty Group of Ministers of Finance (www.v-20.com).

For more information on this topic:

Kiribati; Samoa(A); Samoa(B); Tonga(A); Tonga(B)

Spatial, Risk-Based Planning: www.worldbank.org/transport/resilience

Connections is a weekly series of knowledge notes from the World Bank Group's Transport & Information and Communication Technology (ICT) Global Practice. Covering projects, experiences, and front-line developments, the series is produced by Nancy Vandycke and Shokraneh Minovi.

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