

# RESILIENCE SOURCEBOOK

INSPIRED BY THE 2013 MILSTEIN SCIENCE SYMPOSIUM  
*UNDERSTANDING SOCIAL AND ECOLOGICAL RESILIENCE IN ISLAND SYSTEMS*  
*INFORMING POLICY AND SHARING LESSONS FOR MANAGEMENT*



## CASE STUDIES OF SOCIAL-ECOLOGICAL RESILIENCE IN ISLAND SYSTEMS

 AMERICAN MUSEUM OF NATURAL HISTORY

**CENTER FOR BIODIVERSITY  
AND CONSERVATION**

## CONSERVATION ORGANIZATIONS AND AGENCIES UNITE TO ADDRESS THE SEDIMENTATION THREAT TO PALAU'S COASTAL ECOSYSTEMS

BABELDAOB, PALAU

Umai Basilius<sup>1</sup>

### THE SETTING

Covering 331 square kilometers, the island of Babeldaob – located at 7°21'N, 134°28'E – is the largest of the 250 islands that make up the Republic of Palau. 21,000 people live in Palau.

Like many other nations in Micronesia, Palau has a dynamic history of contact with foreign powers. Following World War II, the United States governed Palau and the other Freely Associated States as part of the Trust Territory of the Pacific Islands. Palau became a full sovereign nation in 1994 under a Compact of Free Association with the United States. Palau's government structure is modeled after that of the United States, with national and state governments and legislative, judicial, and executive branches. Palau has sixteen states across its islands and each has its own governor. Tax revenue can be a challenge at the state level since Palauan law only allows income tax to be levied at the national level. Most state budgets are very tight, only really covering basic personnel and not leaving much room for infrastructure development. For natural resource management and environmental protection, Palau's Environmental Quality Protection Board (EQPB) is in charge of environmental regulation and administers the many national level laws governing the environment.

Tourism, fishing, and agriculture are the mainstays of Palau's economy. Most tourism is concentrated on Koror, the island south of Babeldaob and the country's population and economic center. Most Palauans fish for their own consumption, which accounts for as much as 60% of the total domestic catch and has contributed to declines in some valued fishes, such as the Bumphead Parrotfish (*Bolbometopon muricatum*).

<sup>1</sup> Palau Conservation Society



### THE DISTURBANCE

Sedimentation is a major threat to Babeldaob's reefs. Palau's islands are geologically very old (32-38 million years old), so soils are highly weathered. The soils are made up of a thin topsoil (about 10cm) over a base of clay and are very vulnerable to erosion. Palau's tropical climate, with heavy and frequent rains, means that land-based activities that leave exposed soil lead to erosion. Babeldaob's many streams provide a conduit for the soil from the land to the reefs.

The sedimentation problem around Babeldaob can be attributed to changing settlement patterns. About 40 years ago, people moved from Babeldaob to Koror for education and employment opportunities. With the completion of an island-wide road system in 2007, however, people are slowly starting to move back to Babeldaob. In order to accommodate families returning to Babeldaob from Koror, a large increase in the construction of new housing developments has been observed. In addition, familial living arrangements have changed over

the last few decades; although Palau's population has remained steady at around 20,000 since the late 1990s, people have begun to live in smaller, nuclear family units rather than in larger family groups with multiple generations, meaning that more housing is needed for the same number of people.

The construction of these new houses has led to the construction of numerous secondary roads from the main road system. Due to lack of funds, most of these secondary roads remain unpaved and routinely get washed away. Secondary road maintenance routinely consists of dredging sand from the reefs and repacking it on these side roads – which then would get washed away again.

The sediment originating from road construction and maintenance smothered coral reefs and seagrass beds and hardened mangroves. Some mangroves were so packed with sediment they were almost like concrete. These mangroves were no longer vibrant ecosystems; fiddler crabs and clams could not survive under these conditions. In reefs, sedimentation led to a reduction in coral recruitment, affecting coral resilience.

Addressing this threat through legislation and enforcement alone was a challenge. While existing national-level legislation in Palau addressed environmental impacts of road construction, the problematic secondary road construction was under the local state government jurisdiction. At the state level, there were no regulations or institutions to address this problem, and local or state-level institutions did not have the funds to pave these roads. Sometimes grants from international aid organizations have been used to pave roads, but these resources remain inadequate.

## **THE RESPONSE**

The Palau Conservation Society (PCS), a local non-governmental organization (NGO), recognized the sedimentation problem and began an outreach campaign to bring this problem to the attention of Palauan public in 2007. Because Palauans rely so heavily on wild-caught fish for their diets, the

degradation of coastal ecosystems is a food security issue. PCS emphasized this human perspective when conducting outreach in the community.

PCS worked in partnership with government agencies and other conservation NGOs to identify and codify best management practices for environmentally sensitive road construction and maintenance. The agents of the Palau office of the U.S. Natural Resources Conservation Service were helpful in identifying structural features related to road design that could help reduce erosion. Palau's EQPB also developed stormwater management recommendations. Belau Watershed Alliance, a quasi-governmental entity, also provided support. Finally, Internet research yielded some additional strategies. Three communities in Babeldaob then agreed to trial test these proposed best practices. The participating communities – Ngardmau, Aimeliik and Ngchesar – were members of the Babeldaob Watershed Alliance. These states were interested in the pilot program because they saw increased siltation in their streams and sedimentation of their reef flats.

The uniquely collaborative tradition of the Palauan conservation community aided this initiative. The Palau Conservation Consortium, a partnership of conservation NGOs and government agencies, enables and encourages collaboration between conservation actors. Officially created in 2010, the Palau Conservation Consortium began in response to a major initiative relating to ecosystem-based management in Babeldaob. Through the work relating to this initiative, Palau's conservation organizations recognized that capacity was always going to be a challenge in Palau because of the country's small population. The only way to get enough people for many projects was to collaborate between organizations. The on-the-ground, technical staff of the different conservation NGOs and government agencies in Palau began to meet monthly for lunch to see how they could help one another. The benefit of having these lunches restricted to the on-the-ground staff is that they can negotiate with one another without worrying too much about budgets or allocations. So, if one group is having trouble getting something done

alone then they might have more success if they do it in partnership with others. Groups take turns hosting the monthly lunches; the system is successful in part because the members want to see their colleagues and also enjoy a free meal.

### **THE RECOVERY**

Thanks to widespread adoption of the best management practices, coastal erosion has decreased in Babeldaob. Reef recovery has been variable, however, due to variable currents. For example, the barrier reefs have recovered better because of the currents' natural flushing action. Reefs in the island's bays have not fared as well, since there is less current in these areas. Manual removal of the sediment in the bay would be required for reefs there to recover. This is an expensive proposition that is unlikely in the current political and economic climate.

### **LESSONS LEARNED AND RECOMMENDATIONS**

- *Community buy-in takes time.* To achieve success, the community needs to own these efforts, so conservation organizations must find a community member or a community group to be the face of the initiative they are proposing. This means that the conservation organization must take a backseat and work with their speed, which may not be in synch with that of the organization or their donors. Significant time and resources may need to be invested in order to build community capacity in understanding the issue so that they are invested in the project's outcome. This groundwork cannot be skipped; it is time consuming and fraught with headaches but will yield sustainable outcomes.
- *Strong social relationships between collaborators facilitate work.* It is harder to say "no" to a collaborator when you sit down with them for a monthly lunch. These ties mean that consortium members will go the extra mile to do a favor for one another. In a small country like Palau, this collaboration and cooperation enables much more to be achieved.
- *Reach beyond the choir.* In this project, it

was relatively easy to persuade community members about the importance of reducing sedimentation. Communicating with and convincing decision makers, on the other hand, was more difficult. The challenge was being able to raise this issue to the level where it required action. Conservation has many passionate people, but we are often preaching to the choir. Complementary skills, like financial analysis, might enable us to be more effective communicators.

### **LEAD ORGANIZATIONS**

- Palau Conservation Society  
<http://www.palauconservation.org>

### **PARTNERS**

- Palau's Environmental Quality Protection Board  
<http://palaueqpb.org>
- Palau International Coral Reef Center  
<http://www.picrc.org>
- Belau Watershed Alliance  
<http://www.palauconservation.org/cms/index.php/conservation-programs/policy-and-planning/belau-watershed-alliance-bwa>
- Belau National Museum
- Office of the Palau Automated Land and Resources Information System  
<http://palau.chm-cbd.net/palaris-land-and-resources-gis/about-office/office-palau-automated-land-and-resource>

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<http://www.packard.org>

*As told to Georgina Cullman.*

## THE MILSTEIN SCIENCE SYMPOSIUM

The collection of this case study and others like it results from the April 2013 Milstein Science Symposium, Understanding Ecological and Social Resilience in Island Systems: Informing Policy and Sharing Lessons for Management. Held at the American Museum of Natural History, the Milstein Science Symposium convened local resource managers, researchers, educators, island leaders, policy makers, and other leading conservation practitioners to examine characteristics, qualities, and processes that may foster resilience for coastal and marine systems as well as explore interactions, linkages, and feedback loops in complex social-ecological systems and what this means for management. The Milstein Science Symposium was organized in collaboration with The Nature Conservancy, the Gordon and Betty Moore Foundation, the National Science Foundation, The Christensen Fund, the Coral Reef Alliance (CORAL), the Scripps Institution of Oceanography at the University of California San Diego, the University of California Santa Barbara, the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries, and Small Island Developing States (UN-OHRLS), and the Wildlife Conservation Society.

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<http://cbc.amnh.org>



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<http://tinyurl.cbc-resilience-cases>

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