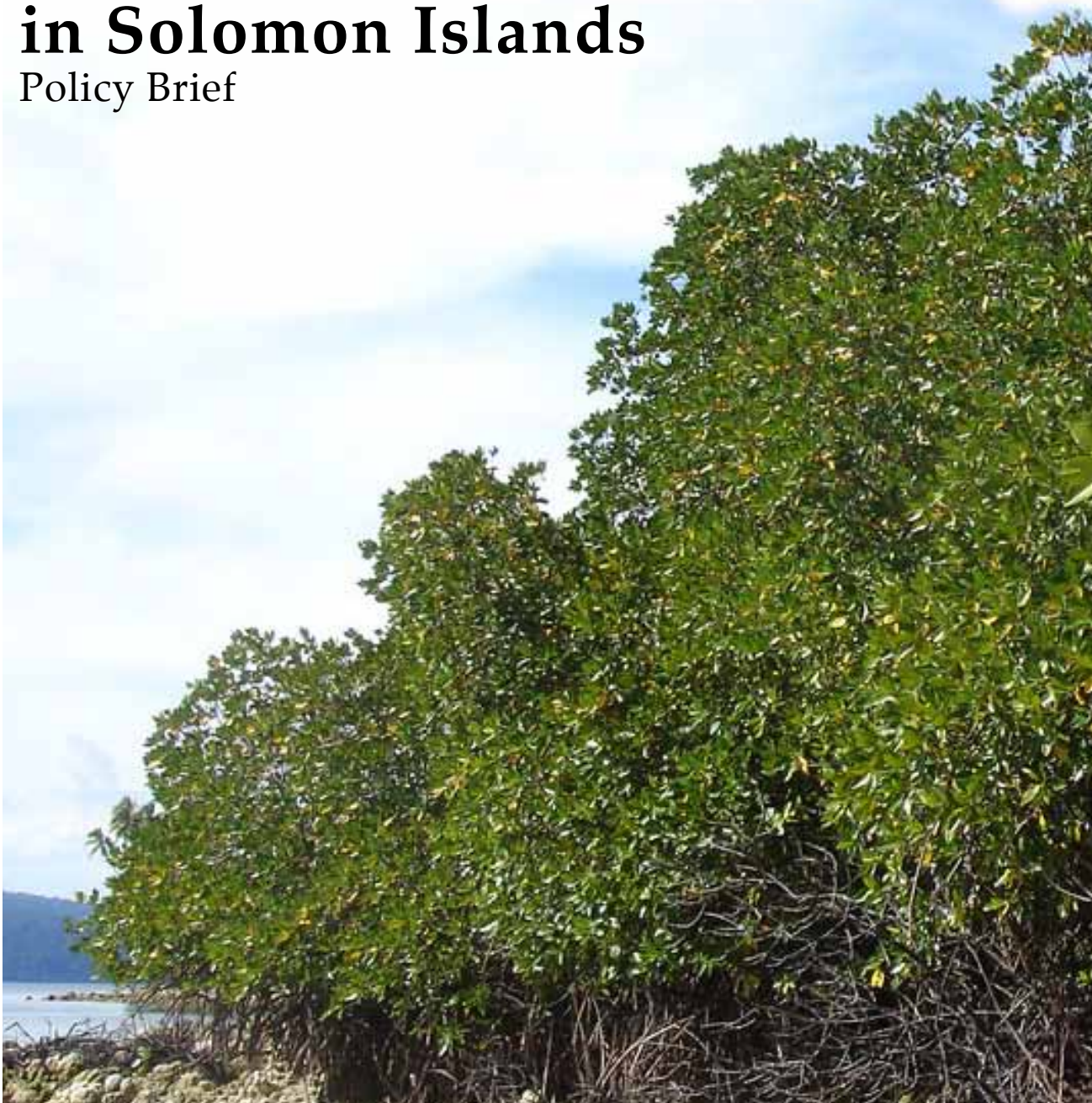


Mangrove Ecosystem Services and Payments for Blue Carbon in Solomon Islands

Policy Brief



**Research
Program on
Aquatic
Agricultural
Systems**

MAJOR FINDINGS

- Mangroves provide Solomon Island coastal communities with one quarter of their weekly food and cash incomes.
- Mangrove fruit (for food) and timber (for buildings and firewood) are the main goods valued by the study communities and represent an annual household value of SBD\$2,500 - \$10,700 (USD\$356 - 1,525), while fish and invertebrates from mangroves provide an additional SBD\$5,500-\$12,100 (USD\$784 - 1,724) in subsistence and cash income.
- Awareness of the primary ecosystem services provided by mangroves (fish nursery/habitat, storm protection, and linkages with coral reefs) is high; however, few community members recognize mangrove forests role in carbon sequestration.
- The above-ground component of the mangroves contained 190 430 Mg carbon ha⁻¹ - comparable to the carbon biomass of unlogged terrestrial forests in Solomon Islands. Mangrove soils and roots hold an additional reservoir of 350 2100 Mg carbon ha⁻¹.
- Over-harvesting mangrove forests in Solomon Islands, primarily for firewood and building materials can result in a substantial loss of carbon. At current cutting levels, the total loss of carbon in harvested mangrove forests is calculated to be equivalent to at least 1026 tonnes CO₂-e ha⁻¹.
- Payments for mangrove ecosystem services, like REDD+ have the potential to provide a direct economic benefit and the incentive to protect and sustainably use mangrove forests.
- Clear and well governed land tenure and carbon ownership rights are the critical criteria for selection of PES or REDD+ projects in Solomon Islands.
- Indigenous communities will not be winners in PES or REDD+ projects unless they and others become strong advocates for an equitable role for communities.
- Initially targeting the voluntary carbon market - with an ultimate goal of pursuing to sell to the regulatory compliance market is a good strategy to efficiently tap into the carbon market.
- For long-term success it is recommended that at least initially REDD + projects in Solomon Islands are selected based on:
 1. the existence of explicitly clear and legally defensible land/marine tenure;
 2. a large forest area size;
 3. the existence of strong community desire and support; and
 4. a combined mangrove and terrestrial forest REDD + project, since this will hold appeal to carbon buyers.

BACKGROUND

Mangrove forests are a key marine biome supplying valuable ecosystem goods and services such as water quality control, fisheries production, nursery habitats and storm protection. Like other forests, mangroves are efficient carbon dioxide sinks—and, along with seagrasses and other marine reservoirs they are collectively referred to as ‘blue carbon’. As blue carbon represents 55% of the biological carbon on earth, the conservation and restoration of these ‘blue carbon’ habitats can play an important role in climate change mitigation.

Globally, mangrove forests are being lost at an alarming rate from pollution, land clearing, coastal development, natural disasters and climate change. In the Pacific, climate change is expected to have pronounced effects upon marine ecosystems and will exacerbate existing pressures. Unless global and regional declines are arrested, the prospect of a world without mangroves is predicted within the next 100 years.

One possible mechanism to reduce the decline of mangrove forests is the use of payments for ecosystem services (PES). In the terrestrial sector, the ability of tropical forests to sequester (remove and store carbon from the atmosphere) has led to quantification, purchase and trade of this ecosystem service through carbon ‘credits.’ More recently, this has occurred within international and national programs to *Reduce Emissions from Deforestation and Degradation (REDD+)*, whereby developing countries are compensated for maintaining carbon sequestration functions of their forests. This must be through quantifiable activities and includes conservation. Recent assessments indicate that tropical mangroves are among the most carbon-rich forests in the tropics, thus PES and carbon credit systems may offer the opportunity to achieve dual goals of poverty reduction and protection of global marine carbon sinks.

Globally, efforts to protect blue carbon stocks through PES and REDD+ initiatives are new and relatively untried. The AusAID Development Research Project: *Poverty Alleviation, Mangrove Conservation and Climate Change: Carbon offsets as payment for mangrove ecosystem services in Solomon Islands* (# 49892) was designed to evaluate the potential for mangrove carbon revenue programs in Solomon Islands. The approach was to address three main questions: (1) How are mangrove ecosystem goods and services currently used and valued by coastal populations with a high reliance on a subsistence economy? (2) What is the total carbon stock held in mangrove ecosystems? and (3) Are carbon markets, whether compliance or voluntary, feasible options for Solomon Islands communities and

government to alleviate poverty, reduce mangrove forest resource degradation and contribute to climate change adaptation and mitigation?

The project was conducted through a partnership between the WorldFish Center and the Solomon Islands Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM). Here we present the project’s main research findings and concomitant policy implications for local communities and government agencies, NGOs and other stakeholders involved in climate change and REDD+ activities.

MANGROVE ECOSYSTEM GOODS AND SERVICES

Interviews with mangrove resource users in three Solomon Islands villages showed a strong reliance upon three main categories of mangrove goods for subsistence and cash: firewood, food, and building materials. Village-derived economic data suggests a minimum annual subsistence value for households of SBD\$2500-\$10,718 (USD356 - 1,527), or 38-160% of user’s cash incomes from the provision of these main goods. Fish and invertebrates from mangroves provided an additional SBD\$5,500-\$12,100 (USD784 - 1,724) in subsistence and cash income.

The study confirmed that the existence of ecological knowledge of mangroves and their function exists in rural Solomon Island communities, with fish/nursery habitat and storm protection the most widely recognized and highly valued services; mangroves role in global carbon cycles was the least-known service. All villagers perceived that mangroves are under threat, with overharvesting for firewood being the main human-caused threat. Most areas of Solomon Islands are



grounded in customary land and marine tenure, and this research suggests the type, strength/efficacy and clarity (legal, cultural) of traditional property (mangrove) ownership rights will influence the success of mangrove management and PES/REDD+ projects. It is anticipated this complexity may both complicate and facilitate carbon credit programs.

MANGROVE CARBON STOCKS

Mangrove forest composition, structure and carbon stocks were sampled for three mangrove species at two locations in Solomon Islands. These locations represent a comparison of high and low human population density and differing management regimes ('managed': some degree of control on harvesting and 'harvested': no formal control on cutting).

Solomon Island mangrove forests can form large dense stands that contribute to the global mangrove carbon biomass. The above-ground carbon biomass of the three mangrove species (*Rhizophora apiculata*, *Bruguiera gymnorhiza* and *Lumnitzera littorea*) measured in managed mangrove forests ranged from 190 – 430 Mg carbon ha⁻¹, comparable to the carbon biomass of unlogged terrestrial forest in Solomon Islands. Below-ground carbon biomass in the managed mangrove forests was also high and contributed to an additional 350 – 2100 Mg carbon ha⁻¹. Below-ground carbon includes the carbon present in the mangrove roots as well as the soil. In two of the three species measured (*R. apiculata*, *B. gymnorhiza*), the below-ground component contained 4 - 7 times more carbon than their above-ground carbon, due to the deep soil profile characteristic of these forest types.

In 'harvested' forests, the impact of harvesting was dependent on the extent of cutting and the mangrove species targeted. The above-ground carbon biomass of all three species was markedly lower in the harvested than the managed forests ranging from 40 – 200 Mg carbon ha⁻¹. There was no significant difference in the total amount of below-ground carbon between managed and harvested forests.

The results from this study show that in areas of high use and high population density, the cutting of mangroves (primarily for their use for firewood and building) causes a substantial loss of carbon from the above-ground biomass component. At current harvesting levels (12 – 72% of trees cut), we calculate that the loss of above-ground carbon biomass due to cutting is equivalent to 1026 tonnes CO₂-e ha⁻¹.

Payments for ecosystem services, like carbon offsets which would encourage the retention of carbon by providing cash to procure alternative fuel sources and



building materials, have the potential to support rural coastal Solomon Island communities by providing a direct economic benefit and incentive to protect and sustainably use their mangrove forests.



THE FUTURE FOR REDD+ AND BLUE CARBON IN SOLOMON ISLANDS

Mangrove ecosystem goods and services valuation surveys were a useful tool to facilitate discussion amongst communities about resource use and management as well as to identify key deforestation drivers and likely stakeholder conflicts or roadblocks to successful implementation of community-based REDD+ and carbon credit programs. The outcomes from this study highlight important lessons for the design and implementation of (mangrove) PES/REDD+ projects in rural coastal communities in Solomon Islands.

Community-Level Recommendations

- **Adopt a phased approach, beginning with capacity and awareness building, especially of climate change.** Knowledge about climate change was virtually non-existent in the study communities, creating a critical need for raising awareness prior to initiating carbon credit programs. These needs dovetail with phase 1 UN REDD+-readiness funding objectives and could be accomplished methodically and carefully through such means as phase 1 of REDD+ pilot projects.
- **Community must be actively involved at all stages of a PES/REDD+ project.** Without community desire, support and active participation—from first inception to final implementation and monitoring—PES/REDD+ projects will not succeed. Ideally, tribal communities in Solomon Islands should take a strong leading position and participation in all phases of the process: devising internal agreements and community awareness and project goals (cultural, financial, forest management); taking concrete early steps to ensure clear land tenure and secure carbon ownership rights; working with government, NGOs and stakeholders to devise and manage equitable and transparent financial disbursements mechanisms for monitoring of the REDD+ project. Community-based participation in data collection and monitoring (carbon stock, forest management and outcomes) is possible if supplemented with capacity training.



- **Build community level technical, legal and financial capacity to undertake PES/carbon projects.** Significant community awareness, capacity building and assistance flows can be achieved through government and NGO (legal, cultural, technical) involvement and utilization of available UN REDD+-readiness funds and activities. Global experience from other (large-scale) REDD+ projects involving indigenous tribes (e.g., Costa Rica, Brazil) showed that multiple years of assistance in clarifying land tenure and carbon ownership rights, inter- and intra-tribal negotiations, technical training and financial guidance is required.
- **Adopt smart REDD+.** Address deforestation drivers within REDD+ projects. For example, this study demonstrated a high reliance on mangrove-derived firewood and timber. Reduction and elimination of these deforestation drivers, such as through alternative fuels or more efficient cooking mechanisms to replace/reduce firewood demand, should be an explicit, quantitative goal of PES/REDD+ projects.
- **Recognise that communities are seeking ways to generate cash from mangrove forest and other natural resources.** The research highlighted the fact that if alternative sustainable financial mechanisms to logging and mining are not offered to communities, the remaining intact terrestrial and mangrove forests in Solomon Islands are under threat. The desire by Solomon Islands villages to conserve and/or replant mangrove forests can realistically be realized in exchange for long-term carbon revenue now. This



may not be the case in the future. At the project level, REDD+ projects should include early financial, awareness and capacity building benefits to give communities visible and immediate incentives to choose PES and carbon programs over unsustainable activities.

Recommendations

A review of PES/Carbon Credit/REDD+ experiences around the world revealed several lessons and convergent criteria relevant to the successful selection and implementation of the first carbon credit or REDD+ projects in Solomon Islands.

- **Choose sites with clear, well-governed tenure and strong community support.** Land tenure and accessibility delineate mangrove resource access, use and management. The existence of robust and clear land and marine tenure titles must be an overriding criterion for the identification, prioritization and establishment of PES and carbon credit projects in Solomon Islands. A lack of clear and legally binding land and carbon ownership rights, along with an absence of strong community support and awareness, have been shown to be two principal roadblocks leading to stakeholder conflicts prior to initiation of PES and carbon programs.
- **Be aware that transaction costs are high.** Capacity building and awareness activities, project design document preparation and verification/validation results in high transaction costs and can range from USD\$100,000-500,000 per project. This reality suggests the need for at least two initial strategies, including building in-country (NGO, government) technical and verification and validation capacity, and undertaking significant early project awareness and communication and capacity building with communities. These activities could occur as part of REDD+-readiness phases 1 and 2.
- **Build in-country expertise and avoid carbon cowboys: choose partners carefully.** Technical, financial and legal expertise is often lacking at both the village and government scales for development and implementation of successful carbon/PES projects. In many cases, global carbon traders and brokers fill this vacuum at high costs and, most significantly, at the expense of communities receiving an equitable share of revenues from their resources. Trustworthy, high quality NGOs with demonstrable previous experience in PES/REDD+ projects should be identified and vetted to assist in establishing

initial REDD+ projects in Solomon Islands. In-country capacity should be developed over the next 5 -10 years to develop REDD+ projects, complete Project Design Documents (PDDs), validate/verify projects, register/market credits and design financial mechanisms for disbursements. REDD-readiness and external grants will be needed to cover these capacity building costs.

- **Government can play the role as facilitator and technical partner.** Historically, in Solomon Islands and many other countries, disproportionate economic gain of forestry resources has benefited well-connected insiders (e.g., corrupt government departments, consultants) and outsiders. Today's successful models of national PES/Carbon institutions and frameworks, for example Costa Rica and Brazil, should be studied for their application to Solomon Islands. They suggest that a community-driven REDD+ system, with the government as facilitator, may be a good partnership. In particular, coordination and marketing functions, such as a state or national office to oversee the registration, buying and selling of credits, and a central site for marketing and financing of projects, are two institutional bodies that from the review appeared especially valuable to successful PES and carbon credit systems.



- **Design role of various players (NGOs, government) explicitly and carefully.** Transparency and public-private bodies to monitor government involvement and stakeholder conflicts are integral parts of successful models elsewhere. It is advised that government REDD+ systems ensure that revenues from carbon projects overwhelmingly accrue to indigenous communities, with perhaps pre-determined fixed costs (explicitly capped, e.g., <5% of total revenues) to support government advisory or technical activities completed by in-country departments or NGOs.
- **Start with existing or priority conservation areas and integrate PES/REDD+ within policy frameworks.** Successful PES and carbon policy frameworks and experience around the world often identified existing and priority future conservation areas as first candidates for REDD+ projects. PES/REDD+ projects can thus be integrated into existing conservation, sustainable forest and other policy frameworks, as well as through new PES/Carbon program policies. As an example, the first REDD+ projects in Solomon Islands could proceed within existing legal framework such as the Protected Areas Act, whereby a sustainable management plan for the project would be developed and the area formally registered, along with guidelines specific to REDD+ or carbon programs.
- **Identify and choose high quality, market-ready standard.** An understanding of the target market for the sale of credits (voluntary and/or compliance) is crucial. One strategy is to plan for the project credits to meet widely-accepted Voluntary Market standards (currently VCS-REDD+ and/or CCB standards, which currently represent ~50% of all credits sold), but with an eye towards also satisfying compliance market (e.g., Australia, California REDD+ forest methodologies) standards in the future (since these credits often garner higher prices). Many REDD+ projects elsewhere are thus setting their sights first on selling to the voluntary market and planning subsequently to shift to more lucrative regulatory compliance markets in the near future—a strategy that could be adopted by Solomon Island projects.
- **Market your carbon and create socially sustainable projects that “Tell a good story”.** Voluntary market buyers are concerned not only with carbon reductions but also with other facets of ecosystem services such as biodiversity, cultural, environmental and social issues. For example indigenous tribes in Brazil have branded their own “Suruí Carbon” to assure buyers that when they purchase these carbon credits that funds are indeed assisting local communities to preserve their threatened forests and cultural way of life—a unique, appealing and effective marketing tool. Solomon Islands, for example, could create the first combined mangrove/terrestrial forest REDD+ project to garner a high profile with buyers and investors.



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