SPREP-USAID Choiseul Ecosystem based Adaptation to Climate Change

ECOSYSTEM BASED ADAPTATION MANAGEMENT PLAN FOR SASAMUNGA (Draft)

22nd September 2015

1.0 INTRODUCTION

The SPREP USAID Choiseul Ecosystem based Adaptation (EbA) to Climate Change project seeks to increase the ability of communities to adapt to climate change and to reduce the impact of natural disasters. This is to be done through the implementation of practical initiatives to help communities adapt to the impacts of climate change.

This document outlines a climate change adaptation plan that uses an ecosystem based adaptation (EbA) framework developed in conjunction with the communities living in the Pirini Village of Sasamunga, on the southern side of Choiseul Province in Solomon Islands.

Sasamunga

Sasamunga is located on the South coast of Choiseul Island about 60 km or a one – two hour boat ride south of Taro, the capital of Choiseul Province. Sasamunga is one of the main towns and population centres in southern Choiseul, it is a key centre for church activities and hosts the main hospital in the region. The population of Sasamunga is around 800 people, within this, Pirini Village is home to about 135 people and contains the water catchment that supplies water for the village and hospital.

Local livelihoods and climate change

As in other parts of Solomon Islands, the population of Sasamunga are predominantly engaged in subsistence agriculture and fishing for their livelihoods. The main livelihood activities are based on garden crops, vegetables, fish, shellfish and harvest of forest products. Sources of cash income are mainly copra and marketing of garden crops, vegetables, fish and to a limited extent cocoa and sawn timber.

Climate change will impact on the natural systems upon which these livelihoods depend. Natural, or ecosystem based, solutions can help communities and ecosystems adapt to the impacts of climate change, helping to ensure the ongoing provision of ecosystem services and local livelihoods. Further discussion of the expected impacts of climate change in Choiseul and the role of ecosystem based adaptation is provided later in this section.

Management plan structure

This management plan identifies a number of priority issues associated with expected climate change impacts and proposes EbA management options ('EbA activities') that could be incorporated into an integrated approach to climate change adaptation for Sasamunga and Pirini village in particular. An outline of the main sections is below:

- Section 1 provides background to the Sasamunga area and the expected impacts of climate change on the local environment and communities. Priority issues associated with climate change are identified.
- Section 2 summarises each priority issue, the associated ecosystem services that could be impacted, and the proposed EbA activities[1].
- Section 3 outlines an implementation plan for the proposed activities over the coming 2 years including the likely organisations involved an indication of the resources required.

[1] This report does not describe in detail the ecosystems of Sasamunga. Such additional descriptions of the ecosystems in the area and the services they provide are included in a companion report for this project.

The proposed EbA activities use two main strategies. Firstly, improving the health of existing ecosystems that provide key ecosystem services, such as protection from storm surge. This is primarily done via the management or removal of activities that degrade those ecosystems. The second approach is to restore biodiversity into key areas to support ecosystem services that are not currently provided.

Climate change impacts in Solomon Islands

Over the last 100 years the global climate has warmed by approximately 0.74^0C and is expected to rise a further 1.3 to 1.8^0C by the end of the century. This projected rise is primarily in response to anthropogenic greenhouse warming. In Solomon Islands, the average temperature is expected to rise by 0.8^0C by 2030 relative to a 1980 to 1999 baseline. Corresponding with the rise in global and regional temperatures are a raft of changes in other climate and physical processes including more extreme rainfall days during the wet season and potential intensification of cyclones. In addition the region can expect altered ocean currents and a rise in sea level of between 4 and 15 cm by 2030.

Reduction in long term climate change requires meaningful reductions in global greenhouse gas emissions. This however is beyond the means of small developing nations such as the Solomon Islands acting alone and regardless of how fast the world moves toward a sustainable, low-carbon economy, greenhouse gas concentrations are expected to rise for many years, the biosphere will continue to warm, and ecosystems and the services they provide will inevitably change.

Understanding ecosystem based adaptation to climate change

Many Pacific Islands Countries, such as Solomon Islands, are highly vulnerable to the impacts of these physical and biological changes. In these vulnerable countries and communities the impacts of climate change, through the potential devastating effects of extreme events and sea level rise as well as more subtle changes in rainfall patterns and reliability, pose a direct threat to people's livelihood and survival. In response to the increasing risks from climate change many governments and communities are devising strategies for adapting to the negative impacts of climate change that are now seen as unavoidable.

Climate change adaptation strategies should be designed to help communities to plan and implement actions that can assist them to minimise negative impacts, and hopefully allow them to prosper in the future. Adaptation to climate change happens at many levels and can happen at a government level via broad activities such as, altering policies and legislation, providing education about impacts and developing early warning systems. At the community and local level these can include more concrete actions such as, changing cropping practices and the redesign and construction of new engineering infrastructure such as sea walls.

Another very important part of adaptation involves, using nature to help adapt to climate change. This is referred to as ecosystem-based adaptation or EbA. *EbA involves the use of biodiversity and ecosystems (or the natural assets of an area) as part of an overall adaptation strategy to help communities adapt to the impacts of climate change*. This means tackling problems with solutions based on nature such as maintaining healthy co to minimize the impact of storm surge.

Healthy ecosystems already deliver critical goods and services for Sasamunga, such as providing food and fuel, water from the catchments and preventing inundation and coastal erosion. People depend on these goods and services for their wellbeing and livelihoods. Ecosystems, and the biodiversity and services they support, are dependent on climate and any modifications of these climate parameters will result in changes and impacts on biological systems. Indeed, there is already evidence that climate change over the last 100 years has had significant impact on global ecosystems. These

impacts and changes are expected to increase as the amount (and potentially the rate) of change increases. However, because of climate change and other human impacts, many ecosystems have become degraded, with negative impacts on people's lives. Conversely, by maintaining healthy ecosystems many of the impacts of climate change on the communities of Sasamunga can be minimized.

Important ecosystems for Sasamunga

The main ecosystems in Sasamunga that have been considered in developing this management plan include costal vegetation, regenerating forests and coral reefs. An outline of these ecosystems and their functions is provided below.

Coastal vegetation

Coastal vegetation and beach areas occur in a narrow and dynamic zone between the ocean and the land. The area they occupy is particularly volatile as they are subject to erosion from storm surge and wave attack but also build up or accretion from windblown sediment and sand deposition. Coastal vegetation can play an important role in this process by binding and protecting the beach sediments in their root systems thereby providing some protection from storm wave erosion as well as assisting in dune growth by trapping wind blown sand. Coastal vegetation can also provide important wildlife habitat, food resources (e.g. coconuts), improve the visual amenity and provide shade.

In Sasamunga and in the Pirini Village much of the coastal vegetation has been removed either to provide access to the beach or in the case of the larger trees for fuel or timber. Where ground cover vegetation exists in the form of low grasses and low growing coastal vines such as *Canavalia* sp. and *Ipomea* sp. beach areas appear to be more stable. These species are important sand colonizers and play a significant role in the stabilising and trapping sand as they often cover large areas and form a relatively continuous mat that stabilizes the sandy soils.

Regenerating forests

Forests have important values as biodiversity habitat as well as important cultural and spiritual values. Forests also provide a range of other ecosystem services including providing food, fibre and medicinal resources. Forest cover provides soil protection from high rainfall storm events and is important in maintaining the quality and the regulation of water flows within a catchment. Tropical forests in particular help to improve soil quality and increase the storage of organic carbon in the soil. This allows the forest soils to absorb and store more water during rain events and then release it more slowly over time thereby evening out the flow of water in streams. This is an important property of forest in catchments as it improves water security during dry or drought periods.

The catchment above the Pirini Village dam is currently a mixture of regenerating natural forest including trees such as Pandanus, Ngali Nut, Akwa, Figs, Teak plantations and former garden areas with Sago Palm and Coconuts still prevalent. In the garden areas in the catchment there is evidence of accelerated erosion during storms and the drying out of soils during dry periods affecting streamflow into the small dam. Importantly, studies in tropical regions have shown that regenerating forest can provide many of the benefits of mature forests in terms of soil carbon and water retention within a relatively short space of time. Regenerating forests are also important sources of food and medicinal plants and over time provide improved habitat values for native biodiversity compared to the former garden areas they replace.

Coral reefs

Coral reefs are diverse and structurally complex habitats that form in shallow coastal waters of the tropics. Coral reefs are created by millions of tiny sedentary animals called cnidarians that build external skeletons of calcium carbonate (limestone) that can form very diverse and complex structures. The majority of the coral reef is made up of the dead coral skeletons that have been laid down over very long periods of time. They feed on both microscopic zooplankton in the water but get most of their energy via the photosynthesis as well as their colour from micro algae (zooxanthellae) that live within the coral structures in a mutually beneficial relationship.

The coral reefs of Solomon Islands are particularly diverse ecosystems and Solomon Islands has one of the highest diversities of coral and fish species anywhere in the world. The coral reefs of Choiseul are also part of the globally important Coral Triangle. This region, which includes Indonesia, the Philippines, New Guinea and Solomon Islands, is home to almost 75 percent of all known coral species and 40 percent of reef fish species.

The coral reefs off the coast of provide a number of ecosystem services including raw materials (for lime), coastal protection via the reduction of wave energy and providing habitat for a large range of important fisheries. Another important ecosystem service provided by coral reefs is coastal protection or the buffering of shorelines from severe weather, thus protecting coastal human populations, structures and property.

Priority climate change issues for Sasamunga

Priority climate change issues for Sasamunga and associated EbA initiatives have been identified, these are based on community concerns raised with SPREP, stakeholder consultations with the Pirini community during field assessments and supported by climate change projections for Choiseul Province. These priority issues and associated EbA initiatives are:

- Water security and water catchment management:
  - Including installation of water storage tanks and infrastructure; forest restoration and silvicultural management to promote a reliable water supply; and consideration of sanitation and community water demand.
- Shoreline stabilisation:
  - Including shoreline revegetation in Sasamunga to promote coastal vegetation as a means of reducing the impacts of erosion and storm surge, initially to be conducted in three trial areas in central Sasamunga.
- Management of marine ecosystems:
  - Including programs to increase awareness of local marine areas such as coral reefs and consideration of establishing a local protected area or similar management framework for these areas.

These issues, the associated threats to ecosystems services and proposed EbA activities are described in Section 2.

2.0 PRIORITY ISSUES AND EBA MANAGEMENT OPTIONS

PRIORITY ISSUE 1: Water security and water catchment management

Major ecosystems and ecosystem services provided

Water security

Adequate water storage is an important element of water security. Recognising this, the Pirini community and SPREP have collaborated in installing water tanks and associated infrastructure (pipes and fittings) to provide a consistent water supply to the community and hospital. Consistent water quality can also be maintained by temporarily shutting off inlet pipes during times of high sediment loads.

Such 'hard' engineering options are not of themselves an Ecosystem based Adaptation, however they complement other more 'natural' adaptations and, in this case, have addressed the most immediate concerns of the Pirini community allowing for focus on the other initiatives that are outlined below.

Water catchment management

The catchment above the Pirini Village dam is currently a mixture of regenerating natural forest, teak plantations and former garden areas.

Ecosystem services: the catchment is critical in providing water for the village and the hospital. The area is also an important food resource and as the forest regenerates will provide protection from soil erosion and landslides.

Threats to ecosystem services

The main threats to the ecosystem services provided by water catchment is encroachment of gardening into the catchment area and the cutting down of trees for fuel and timber.

Sediment laden water runoff during heavy rain

Nursery established by Pirini community to supply seedlings for regeneration of the water catchment

Vegetation in upper catchment showing mix of coconut, garden and native forest species

Gardening adjacent to upper parts of water catchment

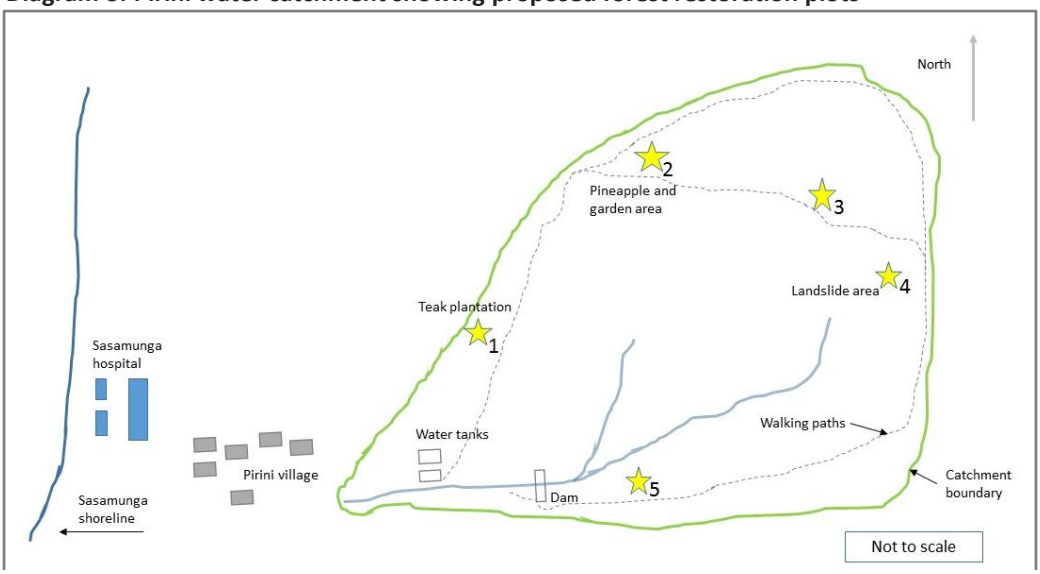
EbA management options

The Pirini community has already taken proactive actions in limiting gardening activities and tree cutting in the catchment and has also established a nursery with the intent of providing seedlings for tree planting. SPREP has complemented these community actions by facilitating the installation of water tanks to increase on-site water storage from the existing weir.

Building on this work, the next step in the process is to regenerate the native forest to encourage improved reliability of water flow. In doing this, the following initiatives and key activities are proposed:

- Forest restoration activities in Pirini water catchment, initially within five trial areas;
- Silvicultural treatment of the timber plantation within the water catchment; and
- Education for community members of the benefits of forest restoration for water security.

Diagram of Pirini water catchment showing proposed forest restoration plots



Human waste disposal and sanitation

Beyond the immediate initiatives outlined above, it is also proposed that SPREP support the Pirini community in considering options for long term solutions for sanitation and water demand.

As long term water security is improved there will be increasing demand for water based human waste disposal such as flushing toilets. Community members have expressed a desire to increase the number of septic tanks and flushing toilets. Though this would improve sanitation in the short term there are some long term implications for water security and the impacts of septic waste disposal on soils within the village area. To ensure appropriate management of water resources, there is a need to provide background information on the water resource demands and the waste disposal capacity of the village soils.

PRIORITY ISSUE 2: Coastal erosion and shoreline stability

Major ecosystems and ecosystem services provided

Coastal Vegetation

Ecosystem services: shoreline protection, reduction of coastal erosion, visual amenity, habitat values and food resources (including coconuts).

Threats to ecosystem services

The main threats to the ecosystems services provided by coastal vegetation include:

- The cutting down of coastal vegetation for timber and firewood and access to the beach areas.
- Lack of regeneration of coastal vegetation, which will become a greater problem as the existing trees age and die and are not replaced.

Sasamunga shoreline during storm event showing vulnerability to erosion

Intact shoreline vegetation showing relatively stable front dune

EbA management options

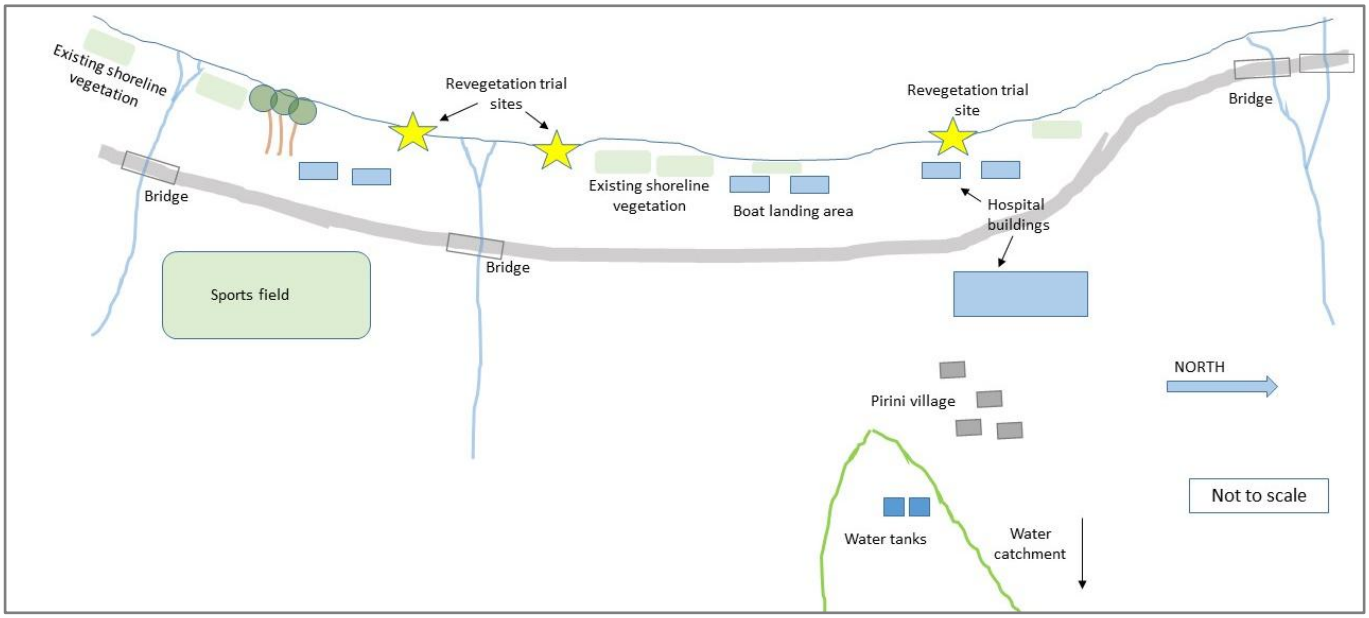
The following initiatives and key activities are proposed to address these threats to ecosystems services:

- Coastal vegetation protection:
  - Community education on tree protection and vegetation management.
  - Trial revegetation sites to restore coastal vegetation on key parts of the Sasamunga shoreline.
  - Signage to increase awareness of vegetation management and discourage tree cutting.

Proposed revegetation site opposite community hall, showing existing seedlings and organic matter on the front dune

Proposed revegetation site behind hospital buildings

Diagram of Sasamunga shoreline showing proposed revegetation trial sites.



PRIORITY ISSUE 3: Marine ecosystem management (coral reefs and seagrass areas)

In identifying this issue, it is recognised that maintenance of a healthy reef system will be an important longer term EbA in relation to rising sea levels and potentially the intensification of storm surge.

Major ecosystems and ecosystem services provided

Coral Reefs

Ecosystem Services: Coastal protection, wave and storm surge and partial tsunami protection, fish habitat, visual amenity, food security.

Sea Grass beds

Ecosystem Services: Coastal protection, fish habitat, visual amenity, food security, minor wave attenuation habitat for threatened species.

Coral reef and shoreline area near Sasamunga

Fishing and food gathering in lagoon area

Threats to ecosystem services

The main threat to the ecosystem services provided by marine ecosystems is currently considered to be pressure from high levels of fishing removing key grazing fish species, which can lead to excessive algal growth and impact on coral health.

EbA management options

The following initiatives and key activities are proposed to address these threats to ecosystems services:

- Marine ecosystem management:
  - Education program on the value of coral reefs for ecosystem services.
  - Consider the establishment of a marine protected area for Sasamunga.

3.0 EbA implementation plan

EbA management options to address the above priority issues have been developed in conjunction with the communities of Sasamunga, particularly the Pirini community (Table 1) and are presented here for consideration by SPREP and its stakeholders.

Table 1: EbA management options for the SPREP Choiseul EbA project in Sasamunga

Initiative	Key activities[2]	Component tasks	Who involved	Resources required	Timing (Start time and duration)	Monitoring indicators
PRIORITY ISSUE 1: Water security and water catchment management						
Water security	Installation of water reservoirs	• Procure materials and equipment • Undertake tank and pipe installation and connection to existing water supply for village and hospital	SPREP, Pirini community	• Materials and equipment (tanks, pipes and fittings, tools) • Engineer to oversee installation works	2015. 3 months	Tanks and pipes installed. Monitor performance and supply at 3 and 6 months.
Water catchment management	Forest restoration in Pirini water catchment	• Undertake forest restoration works in five plot areas within the Pirini water catchment.	SPREP, Pirini community	• Technical inputs to support community in establishing forest restoration plots • Tools such as bush knives, shovels and picks for tree planting. • Possibly shade cloth and other materials to support ongoing maintenance of the community nursery, if required. • Possible SPREP project signage near the restoration areas.	2015 Ongoing	Trail sites established. Monitor vegetation at 3 months, 6 months and 12 months.
	Silvicultural	• Undertake thinning (i.e.	SPREP, Pirini	• Technical inputs to support	2016	Thinning

[2] Additional detail on this proposed activities of shoreline rehabilitation, forest restoration and silvicultural treatment is provided in a companion report for this project.

	treatment in timber plantation	harvest) of some of the poor performing trees in the teak plantation • After thinning, re-plant into canopy gaps with native or plantation species.	community	community in consideration of thinning in teak plantation. • Chainsaws or handsaws to harvest the trees. • Tools such as bush knives, shovels and picks for re-planting after thinning.	3 months	conducted. Re-planting conducted.
Sanitation and community water demand	Assess options for human waste management and water use	• Undertake study to look at possible impact of flush toilets on water security and disposal ability of soils. • Investigate alternative toilet system such as composting toilets.	SPREP Pirini community	• Sanitation engineer to conduct studies to determine capability of soils to treat waste and impact on water security. • Provision of technical report on alternate waste disposal mechanisms.	2 years	Pirini village has agreed method for long term treatment of human waste
PRIORITY ISSUE 2: Shoreline stabilisation						
Shoreline revegetation in Sasamunga	Establish trial revegetation areas with community members	• Establish three trial areas for revegetation activities on the shoreline within central Sasamunga. • Activities to be guided by the SPREP *Coastal Ecosystem-based Rehabilitation Guide*.	SPREP, Sasamunga community	• Technical inputs to support community in establishing revegetation areas. • Local materials to construct small fences and related works. • Possible SPREP project signage near the revegetation areas.	2015 Ongoing	Trail sites established. Monitor vegetation at 3 months, 6 months and 12 months.
PRIORITY ISSUE 3: Marine ecosystem management						
Awareness and management of local marine environment	Education program	• Education program on value of coral reefs for ecosystem services	SPREP, Sasamunga community,	• Education package on importance of coral reef protection	3 years	Process in place to discuss long term protection of reef areas
	Establish a marine protected area for	• Facilitate consultation meetings to consider a	SPREP, Sasamunga	• Consultation meetings • Technical support to draft a	Consultation meetings in	Meetings held. Plan completed.

	Sasamunga reef.	marine protected area and support the development of a draft management plan. • Support the establishment and early operation of a local protected area management committee (or similar body).	community, TNC, LLCTC	protected area management plan. • Possible financial and operational support for protected area management committee.	2016. MPA management plan developed by late 2016. MPA management on going.	Sources of financial support identified.

Annex 1: Community management arrangements

The EbA Implementation Plan identifies a number of initiatives and activities that will require community input for their effective implementation, making ongoing community engagement essential. This engagement could initially be through existing community structures, including local chiefs and groups such as women's, youth and church groups. It may be useful to identify community representative/s to 'champion' the respective EbA activities. This would assist with ensuring broad community involvement in the activities, their timely completion and appropriate monitoring.

Community management arrangements should be adapted to suit the specific EbA activities, arrangements that may be appropriate for some of the key proposed EbA activities include:

- Shoreline stabilisation – youth groups and/or schools to be involved in replanting activities and monitoring to ensure fencing is maintained.
- Water catchment management – undertake demonstration activities, initially as a 'demonstration day', identify 1-2 interested community members to conduct periodic monitoring and maintenance of trial sites.
- Marine ecosystem management – arrangements for this work could be informed by the outcomes and learnings from implementation of the above two activities.

Annex 2: Plant species recommended for forest restoration

The Pirini water catchment is relatively small, covering around 5 ha with an altitude from approximately 20-100 m above sea level. It is a disturbed area that has been used at different times for coconut plantation, gardening and temporary settlements, mixed with remnant areas of native vegetation mainly on ridge tops and valleys. Beyond the catchment itself, the surrounding areas are similar disturbed forest and garden sites.

The Pirini Community is interested in restoration of the forest within the water catchment as a means of improving water supply and quality. To support this objective, the community has established a nursery and is raising seedlings with the intent of planting within the catchment area. The nursery includes coastal species, mango, native forest species, and understory species such as palms and ferns.

The SPREP EbA Project should work with the Pirini community to undertake forest restoration activities with the intent of facilitating the natural regeneration that is already occurring. The main objective of forest restoration activities would be to fill existing canopy gaps, to ultimately establish natural forest species across the site. This objective fits with community ideas of ensuring that the 'bush' is intact in order to protect their water resources. Given this objective, it is suggested that the community simply seek to establish species that are already occurring in the catchment area, possibly with a preference over time towards native species.

The list below identifies some of the main species that were observed in Pirini water catchment that could be used as a guide for species to be used in forest restoration activities and for establishment in the existing community nursery. This list is based on preliminary observations only and it is recommend that further input be sought from local botanists at an appropriate time.

Understorey species

- Ferns (various species)
- Palm (various species)
- Gooseberry (*Tibouchina*)
- Ginger (*Heliconia*)

Garden species

- Sago Palm (*Metroxylon*)
- Coconut (*Cocus*)
- Mango (*Mangifera*)
- Cut nut (Barringtonia)

Native forest species

- *Pandanus*
- Ngali Nut (*Canarium*)
- Vasa (*Vitex*)
- Akwa (*Pometia*)
- Figs (*Ficus*)
- *Camnospermum*
- Kwila (*Instia*)

Timber plantation species

- Teak (*Tectona grandis*)