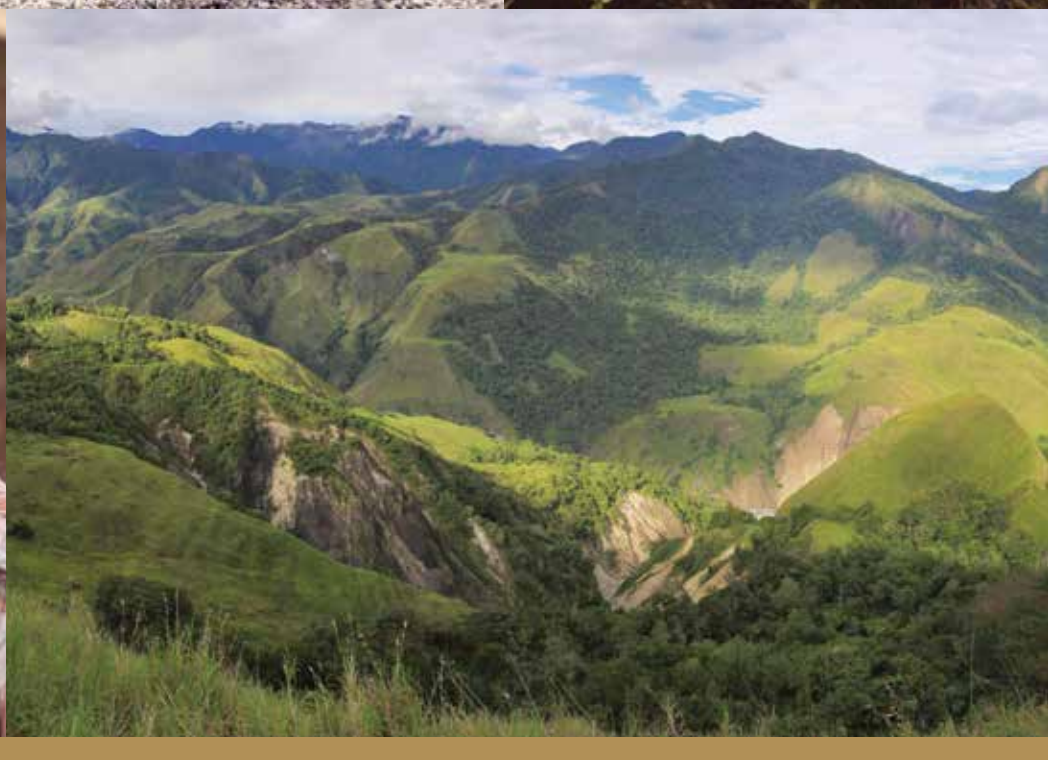
YUS Landscape Plan 2013-2015



WOODLAND PARK ZOO

TREE KANGAROO CONSERVATION PROGRAM

YUS CONSERVATION ORGANIZATION

CONSERVATION INTERNATIONAL

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

kfw ENTWICKLUNGSBANK

Yopno Valley. Photo: Zachary Wells

YUS Landscape Plan 2013-2015

A landscape plan prepared by Dr. Ashley Brooks (Woodland Park Zoo's Tree Kangaroo Conservation Program, Landscape and Management Planner), for the people of the YUS Landscape, Morobe Province, Papua New Guinea, 2012.

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Foreword

Building on the YUS Conservation Area as the first protected area in Papua New Guinea (PNG) under the PNG Conservation Areas Act, the YUS Landscape Plan is another first for YUS and for PNG. This comprehensive and detailed Plan serves both as a management tool for the YUS Conservation Area as well as a strategic guide for integrated efforts in YUS. It represents a remarkable collaboration and history between the Tree Kangaroo Conservation Program and the YUS community, along with many partners and supporters. The YUS Landscape Plan is designed to provide guidelines and support to the YUS landowners and TKCP for maintaining a sustainable landscape. It is considered a living document that will be revised on a regular basis incorporating new information and responding to the needs of the YUS community.

Dr. Ashley Brooks, TKCP's YUS Landscape and Management Planner, has done an incredible job of synthesizing and analyzing extensive data, maps, and anecdotal knowledge, as well as incorporating information from ongoing land-use planning workshops in YUS and TKCP strategic planning workshops. What he has produced is a model for other future protected areas in PNG.

The Plan demonstrates a way to integrate protected area management into provincial and national government plans and priorities, and provides an innovative approach for collaboration between NGO's and government for building sustainable landscape-level conservation programs in Papua New Guinea. We welcome other NGO's, government, and universities to learn from this document as well as provide us feedback on adapting this work to their own use.

This work was supported by Woodland Park Zoo, Conservation International, the German Government, James Cook University, TKCP, the YUS community, and the many colleagues and supporters of the Tree Kangaroo Conservation Program.

Dr Lisa Dabek,
Senior Conservation Scientist/Director of the Papua New Guinea Tree Kangaroo Conservation Program

Inaugural ranger workshop, Sapmanga Village March 2012. Photo: Mark Ziembicki

Acronyms, Abbreviations and Definitions

Acronym	Definition
AZA	Association of Zoos and Aquariums
BMU	Ministry for Environment Nature Conservation and Nuclear Safety, Germany
CA	Conservation Area
CAMC	Conservation Area Management Committee
CBD	Convention on Biological Diversity
CI	Conservation International
CIC	Coffee Industry Corporation
CITES	Convention of International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CO	YUS Conservation Organisation
CO2	Carbon Dioxide
CR	Critically Endangered
DEC	Department of Environment and Conservation, PNG
DNPM	Department of National Planning and Monitoring, PNG
DSP	Development Strategic Plan
EN	Endangered
GIS	Geographic Information System
GPS	Global Positioning Service
HH	Household
ID	Identification
ILG	Integrated Landholder Group
ISSG	Invasive Species Specialist Group
IUCN	International Union for Conservation of Nature
JCU	James Cook University
JDP&BPC	Joint District Planning And Budget Priority Committee
JPP&BPC	Joint Provincial Planning And Budget Priority Committee
KBA	Key Biodiversity Area
KDA	Kabwum District Administration
LLG	Local Level Government
LP	Landscape Plan
LP2	Landscape Plan 2016-2020
LUP	Land Use Planning
M&E	Monitoring and Evaluation
MDG	Millennium Development Goal

Acronym	Definition
MOU	Memorandum Of Understanding
MPG	Morobe Provincial Government
MTDP	Medium Term Development Plan
NBSAP	National Biodiversity Strategy and Action Plan
NCD	National Capital District, Port Moresby
NGO	Non-Government Organisation
NRI	National Research Institute
NSO	National Statistics Office
OCCD	Office of Climate Change and Development, PNG
PA	Protected Area
PNG	Papua New Guinea
PNGFA	Papua New Guinea Forestry Authority
PNRESP	Convention on the Protection of Natural Resources and Environment of the South Pacific Region
POWPA	Programme Of Work On Protected Areas
PPL	Petroleum Prospecting License
REDD	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
SBSAP	Subnational Biodiversity Strategy and Action Plan
SDP	Strategic Development Plan
SPREP	South Pacific Regional Environment Program
TBD	To Be Developed
TKCP	Tree Kangaroo Conservation Program
TK-SSP	Tree Kangaroo Species Survival Plan
TNC	The Nature Conservancy
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
USD	United States Dollars
VU	Vulnerable
WHC	World Heritage Commission
WPZ	Woodland Park Zoo
YUS	Yopno, Uruwa, Som River catchments

Abbreviation	Definition
YUS	Derived from the names of the three main rivers of the landscape: Yopno, Uruwa and Som.
YUS Landscape Plan, or The Plan	Encompasses only the land of participating communities across the Yopno, Uruwa and Som river catchments.
LP 1, LP 2, LP 3	Landscape Plan 1 (2013-2015); Landscape Plan 2 (2016-2020); Landscape Plan 3 (2021-2025).
YUS vs Yus	The capitalised acronym, "YUS", is the YUS Landscape. "YUS" is used to refer to the spatial area covered by the extent of TKCP's landscape program and what is the scope of the LP: the outer boundaries of clan land of the people living within the Yopno, Uruwa and Som River catchments (which transcend LLG, district and provincial administrative boundaries) and extending down to the Bismarck Sea in Wasu LLG, and also into small parts of Deyamos, Rai Coast, and Wantoat-Leron LLGs. YUS therefore refers to the whole landscape. Where non-capitalised "Yus" is used (in keeping with protocol used in government documents), this refers to the Yus Local Level Government (LLG) administrative area which does not follow the three river catchment boundaries, and does not include the lower reaches (the coastal area at the Bismarck Sea) of the catchments which are within the Wasu LLG area, nor does it include the clan land of YUS people that extends into Deyamos, Rai Coast, and Wantoat-Leron LLGs.
Tambu	Refers to the traditional concept of avoidance, restriction, or outlawing in PNG. A tambu area is therefore one that is locally recognised to be restricted from access, use, or exploitation, and is governed by local law in PNG.
YUS CO	YUS Conservation Organisation, the local community-based organisation for YUS landowners that have pledged land for the YUS Conservation Area. It serves as an advisory organisation to TKCP-PNG.
Forest classifications	Where montane forest (1,000m-4,509m altitude) is used, this encompasses both 'upper' (2,800-4,509m) and 'lower' montane (1,000-2,800m) forest classifications following Shearman et al (2011). Where necessary, upper and lower montane forests are disaggregated. 'Lowland' forest is used to describe forests in the altitude range 0-1,000m following Shearman *et al* (2011).
TKCP-PNG	Tree Kangaroo Conservation Program PNG, a nationally registered NGO devoted management of the YUS Conservation Area.

Photo: Mark Ziembicki

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Juvenile White-Winged Robin *(Peneothello sigillatus saruwagedi)*. Photo: Mark Ziembicki

Photo: Mark Ziembicki

Photo: Mark Ziembicki

Introduction

The YUS Landscape

The evolution and growth of the YUS Landscape protected area has mirrored the trajectory of conservation initiatives globally. Beginning in 1996 as an endangered species research study led by Dr. Lisa Dabek looking at population, status, threats, and ecology of the Matschie's tree kangaroo, the initiative moved quickly into a collection of discrete conservation actions in partnership with landowners of the tree kangaroo habitat to respond to immediate threats. Noting decreasing wildlife population trends, particularly for hunted species, researchers and landowners began discussing developing a protected area to serve as a "wildlife bank". Anticipating that hunted species would reproduce in such an area and disperse into adjacent hunting grounds, clans started to pledge land for conservation and designated them *tambu* ground (off limits to hunting). Interest in protecting the species as a sustainable resource grew across adjacent villages, and it became obvious that there was a groundswell of support for a larger habitat protection initiative that encompassed the multiple locally valued native species. The tree kangaroo served as the flagship for habitat conservation, which ultimately served to protect a range of threatened and rare species. These include, among others: dwarf cassowary, long beaked echidna, New Guinea Harpy eagle, pademelons, multiple species of parrot, and seven birds of paradise species. Each are valued locally for their utility, be it for meat, feathers or skin, *and* for the cultural act of hunting them, which is firmly embedded in local tradition.

As the conservation effort showed significant signs of having such wide environmental and cultural outcomes locally, a series of village-based workshops were held to discuss possible legal recognition of local efforts by seeking one of PNG's formal protected area classifications. Following deliberation, local landowners elected to begin garnering support for a formal designation of the *tambu* areas under the banner of a PNG Conservation Area, a classification which had not previously been used. Such a designation ensured that the scope of the solution (i.e. conservation activities across a protected area) matched the scale of the challenge (i.e. tree kangaroo home range, associated habitat and conservation threats). The workshops resulted in two key outcomes: the inclusion of the coastal communities within the Wasu LLG who requested their participation and thereby heralded the start of a true reef-to-ridge conservation effort; and second, community consensus and endorsement for the pursuit of national gazettal of the YUS Conservation Area (YUS CA).

With generous support from Conservation International (CI), the German government through Conservation International, and Woodland Park Zoo (WPZ), the establishment of the YUS Conservation Area, the first conservation area nationally, became a reality in January 2009. Since then the Tree Kangaroo Conservation Program (TKCP) developed into a coordinated program of work in conservation, research, community ownership and support, and governance.

Ultimately, the YUS CA is a true IUCN Category VI landscape protected area initiative, achieving significant milestones for both species and local people:

- The first protected area ranger force nationally;
- The first community-based ecological monitoring program for a Conservation Area;
- The first LLG-wide Land Use Planning program – including wildlife corridors, protected cloud forests, alpine grasslands and riparian corridors;
- The facilitation of sale of organic, shade-grown coffee *direct* from YUS coffee growers to a US-based buyer/roaster;
- Mapping of vegetation types in YUS, local YUS languages, and clan and village boundaries;
- The development of a comprehensive knowledge base of species, ecosystems, carbon stocks and drivers of deforestation;
- The establishment of a landscape-wide community representative body – the YUS Conservation Organisation (YUS CO) – which serves as a landowner advisory to TKCP;
- The establishment and convening of biannual meetings of the Conservation Area Management Committee (YUS CAMC) – bringing national and local government together along with landowner representatives and NGO partners; and
- The establishment of a YUS Conservation Endowment that provides support for management of the YUS CA in perpetuity.

The final key milestone has been the elevation of the Tree Kangaroo Conservation Program from being a discrete 'program' to a registered PNG NGO. TKCP-PNG is a site-based NGO established with an explicit mandate to support conservation management and sustainable use at a single site. This is pivotal to the success and sustainability of the YUS CA, as it provides long term commitment of support to landowners, allows robust relationships to develop locally, and fundamentally provides a mechanism for local employment. At the time of writing, TKCP-PNG has a technical staff of conservation, livelihoods and community development professionals and rangers totalling 24 people (19 of which are YUS landowners, three PNG nationals from outside Morobe Province, and two international staff). The strength of the TKCP model is in its proximity to the people, its flexibility, and the high degree of participation of local stakeholders in its activities. TKCP provides efficient, innovative and cost-effective approaches to managing the interface between people and nature across the landscape. This is not a simple undertaking, and it has often been convenient globally to exclude humans from nature in order to focus solely on protecting nature through exclusion and strictly managed parks and reserves. But this is unworkable in the YUS Landscape. In an area where the over 12,000 residents rely on natural resources for their daily lives, reinforcing the links between resource use and conservation has to be central to management action.

For both the protection of environmental assets and their sustainable use, the people of YUS must be the key part of the solution. A protected landscape such as YUS offers this foundation for success. The YUS Landscape Plan:

- recognises connections with land, links between biodiversity and cultural practice, and customary ownership patterns;
- accommodates traditional use in conservation programs, and support for sustaining local livelihoods; and
- engages communities in stewardship by supporting individual and community responsibility for resource management.

Importantly, the landscape approach also means that the potential to protect species and habitat within the *tambu* areas that weave across YUS is greatly enhanced due to their connectivity across YUS and along the entire elevational gradient from 4,100m down to the Bismarck Sea.

The YUS Landscape and the YUS Landscape Plan also reflect national government priorities:

- PNG Medium Term Development Plan (2011-2015), Goal 5.6, Deliverable 4.1: Endangered species and habitat conservation and management plans for marine and terrestrial protected areas (DNPM 2010);
- National Capacity Self-Assessment: Noted the lack of management plans across PNG's protected area network. Identified the lack of such management plans, and the need for support to communities to implement them, as key constraints to the implementation of the Convention on Biological Diversity (CBD) (Wickham *et al.* 2010); and
- PNG's Fourth National Report to the CBD: A National Terrestrial Gap Analysis, implemented as part of PNG's commitment to the Program of Work on Protected Areas included two goals for protected area management: Goal 4, to substantially improve site-based protected area planning and management, through incorporation of clear biodiversity objectives, targets, management strategies and monitoring programs, and long-term management plans with active stakeholder involvement; and Goal 14, to evaluate and improve the effectiveness of protected area management, through frameworks for monitoring, evaluating and reporting protected area management effectiveness at sites (DEC 2010). In their fourth national report, the PNG Department of Environment and Conservation (DEC) also called for a review of the 2007 National Biodiversity Strategy and Action Plan (NBSAP) and to include within that review the development of management plans for protected areas (DEC 2010).

The YUS Landscape Plan

The formulation of the YUS Landscape Plan (the Plan, or LP) is the culmination of over 17 years of site-based work (Annex 2 and 3 provide details). It was only through the KfW grant and partnership with Conservation International that support for a landscape management plan became a specific programmatic goal. In 2011 long term targets for the YUS Landscape were established, and a Landscape and Management Planner was recruited.

At this point the synthesis of existing information, collection and collation of new information, and facilitation of community support and feedback began.

To ensure alignment of the Plan with government priorities in the long term, the Plan (and all subsequent YUS Landscape Plans) is aligned with PNG government planning periods as per the PNG Vision 2050, DSP 2030, and the five yearly MTDPs (Table 2). The present YUS Landscape Plan, or LP 1, is therefore a bridging Plan that runs 2013-2015. All subsequent plans (LP 2, LP 3, etc.) will conform wholly with the five year MTDPs (2016-2020, 2011-2025, etc.). This allows each plan to capture changes to local and sectoral development plans that emerge over time, but also allows for input into local government planning processes to allow for best possible outcomes for YUS.

Purpose of the Plan

The overarching purpose of the Plan is to implement the landscape approach as a functional mechanism for both the protection of endangered species and habitat, and the preservation of cultural practices and sustainable resource use.

The YUS Landscape Plan will continue to inform the work of TKCP through a coordinated approach that has the full support of YUS landowners, local leaders and government representatives at all levels; is backed by the best available scientific and government data; and is aligned with the long term strategic development plans of PNG through its Vision 2050. The Plan:

- identifies issues, needs and priorities, and sets targets and actions to respond to them;
- helps direct and coordinate individual projects and activities based on a long term vision;
- serves as a bridge among community representatives, the YUS CO, TKCP and all levels of government;
- encourages closer linkages across landscape communities through development of joint actions;
- encourages and guides actions in conservation and socio-economic development;
- aligns with, and contributes to the long term policies and strategies of the PNG Government;
- ensures that program activities are aligned, are complementary, and are all contributing to the same management targets;
- helps prioritise and guide funding proposals for donor support to YUS;
- facilitates opportunities for new partnerships in research and development; and
- elicits recognition and institutional support for the activities across the YUS Landscape from PNG government, other NGOs and the private sector.

Summary and structure of the Plan

The YUS Landscape Plan is a threat abatement management plan. The development of the Plan started with the identification of management values of YUS (initially the Matschie's tree kangaroo, and later encompassing habitat and cultural values), then setting long term targets and goals for these values, identifying the threats to the goals, and then actions to achieve them (for details refer Annex 2). The structure of the Plan itself follows this overall framework.

Section 1: Strategic platform and direction

Section 1 builds the management foundation of the Plan. It defines the management targets and goals, the legal and policy context of the Plan and management, and outlines the context and values of the site overall. This section concludes with a discussion of threats to the management targets and an overview of the organisations responsible for implementing the strategies to achieve the long-term targets.

Table 1: Summary of management targets and goals of the Plan

The Vision				
A sustainable, healthy and resilient Huon Peninsula landscape which supports the area's unique biodiversity, human communities, and culture.				
Programmatic Targets to 2025				
Target 1: Alpine Grasslands	**Target 2: Montane and Lowland Rainforest**	**Target 3: Tree kangaroos and other hunted species**	**Target 4: Marine ecosystems**	**Target 5: Civil society, partnership and collaboration**
1: Conserve and maintain area	1: Area of montane rainforest is stable or increases	1: Population inside CA is stable or increases	1: Develop a marine ecosystem program	1: CAMC functioning
2: Ensure ecosystem integrity and health	2: Area of lowland rainforest is stable or increases	2: Population outside CA is stable or increases		2: Support to YUS CO functioning
		3: Population density is stable or increases		3: Support to sustainable resource use and management

Montane Rainforest. Photo: Ryan Hawk

Section 2: Addressing threats to management targets

Section 2 details the five management strategies designed to mitigate threats to management targets. Each strategy includes multiple programs, which in turn include specific objectives, activities and indicators for the period of the Plan.

Various programs across the strategies are new or foundational, and therefore serve to fill information gaps, or establish baselines to be used in LP 2 and beyond.

Strategy 1: YUS Conservation Area management

The eight programs that make up Strategy 1 constitute the YUS CA Management Plan, and fulfil all obligations under the Act.

Programs

1. YUS Rangers
2. Enforcement
3. Ecosystem resilience and biodiversity conservation
4. Ecological monitoring
5. Signage, mapping and awareness
6. Fire management
7. Invasive species
8. Reporting

Strategy 2: Research to inform resource and landscape management

This strategy consists of seven programs that that feed into and inform the YUS Landscape programs into the future. Some of the research is new and some is a continuation of the work conducted over many years across the YUS Landscape, and will continue to foster existing and new institutional partnerships to ensure scientific rigour and local relevance.

Programs

1. Research collaboration
2. Hunted species
3. Terrestrial ecosystems
4. Marine and aquatic ecosystems
5. Social / anthropology
6. Sustainability
7. Climate change

Strategy 3: Sustainable resource use and environmental services

This strategy consists of two inextricably linked programs focussing on community-based long term planning for resource use, and enhancing the ability of communities to continue to access benefits from ecosystem services. Both programs align directly with national and local plans to balance rural development and environmental protection.

Programs

1. Land-use planning
2. Environmental services

Strategy 4: Community services, livelihoods and healthy families

The programs that make up this strategy are aimed at building the capacity of local leaders, supporting livelihoods and market integration, and supporting the YUS CO to facilitate the government support and services to which the communities are entitled. The strategy also allows the Plan the ability to maintain the positive linkages with communities through responding to needs if and when they arise.

Programs

1. Developing leadership
2. Economic livelihoods – quality and markets
3. Responding to local needs

Strategy 5: Implementation and management

The three programs that make up the strategy are the basis and guide for the effective, transparent, adaptive and professional implementation of all the actions within the Plan. While the programs are divided into discrete processes of management, they are inextricably linked. It is vital for effective implementation of actions across the landscape that TKCP staff act as facilitators who ensure that the linkages between planning, research, monitoring, and community consultations are maintained and that any field programs reflect community desires and YUS Landscape values.

Programs

1. Stakeholder linkages and an effective workforce
2. Monitoring and assessing effectiveness
3. Financing

Matschie's tree kangaroo *(Dendrolagus matschiei)*. Photo: Mark Ziembicki

1 YUS Landscape Management Platform


Panoramic toward Uruwa Valley. Photo: Ashley Brooks


Yopno Zone. Photo: Zachary Wells

1.1 Vision

A sustainable, healthy and resilient Huon Peninsula landscape which supports the area's unique biodiversity, human communities, and culture.

1.2 Scope

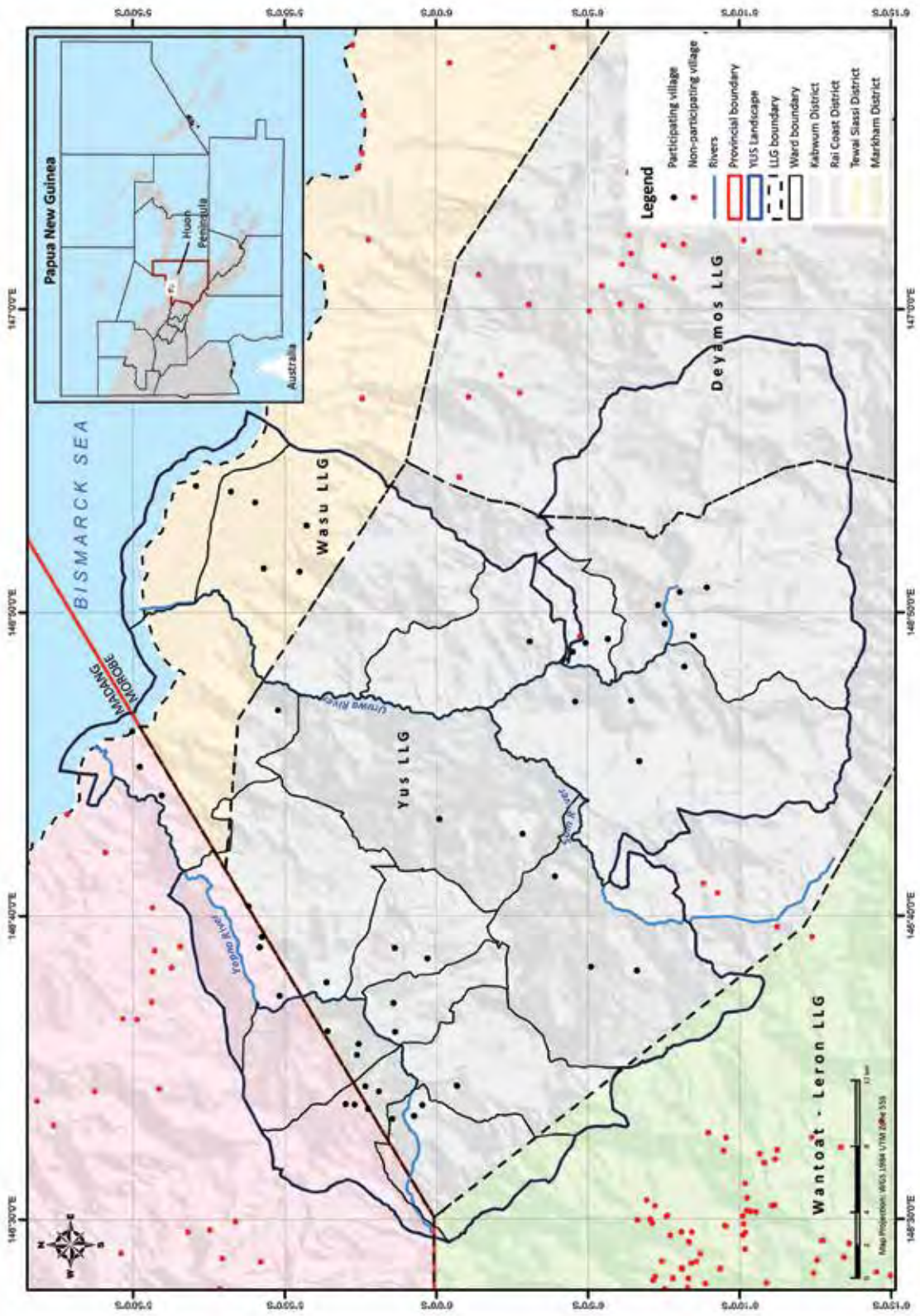
The scope of this Landscape Plan encompasses all areas and communities of the YUS Landscape that have elected to participate in the YUS Conservation Area initiative.

Geographically, the YUS Landscape straddles the Sarawaget mountain range, and is defined by the outermost boundaries of customary land owned by the people living within the Yopno, Uruwa and Som River valleys of the Huon Peninsula, PNG (Map 1 and Map 3). Administratively, the upper reaches of the three river catchments cover the majority of the Yus Local Level Government (LLG) area of Kabwum District, small areas of neighbouring LLGs within Morobe Province (namely Deyamos and Wantoat-Leron LLGs), and part of the Rai Coast District in Madang Province. The lower reaches of the three rivers extend down to the Bismarck Sea in the Wasu LLG area of Tewai-Siassi District, Morobe Province. Culturally the YUS Landscape spans six local languages and dialects in addition to Tok Pisin and English (Map 6).

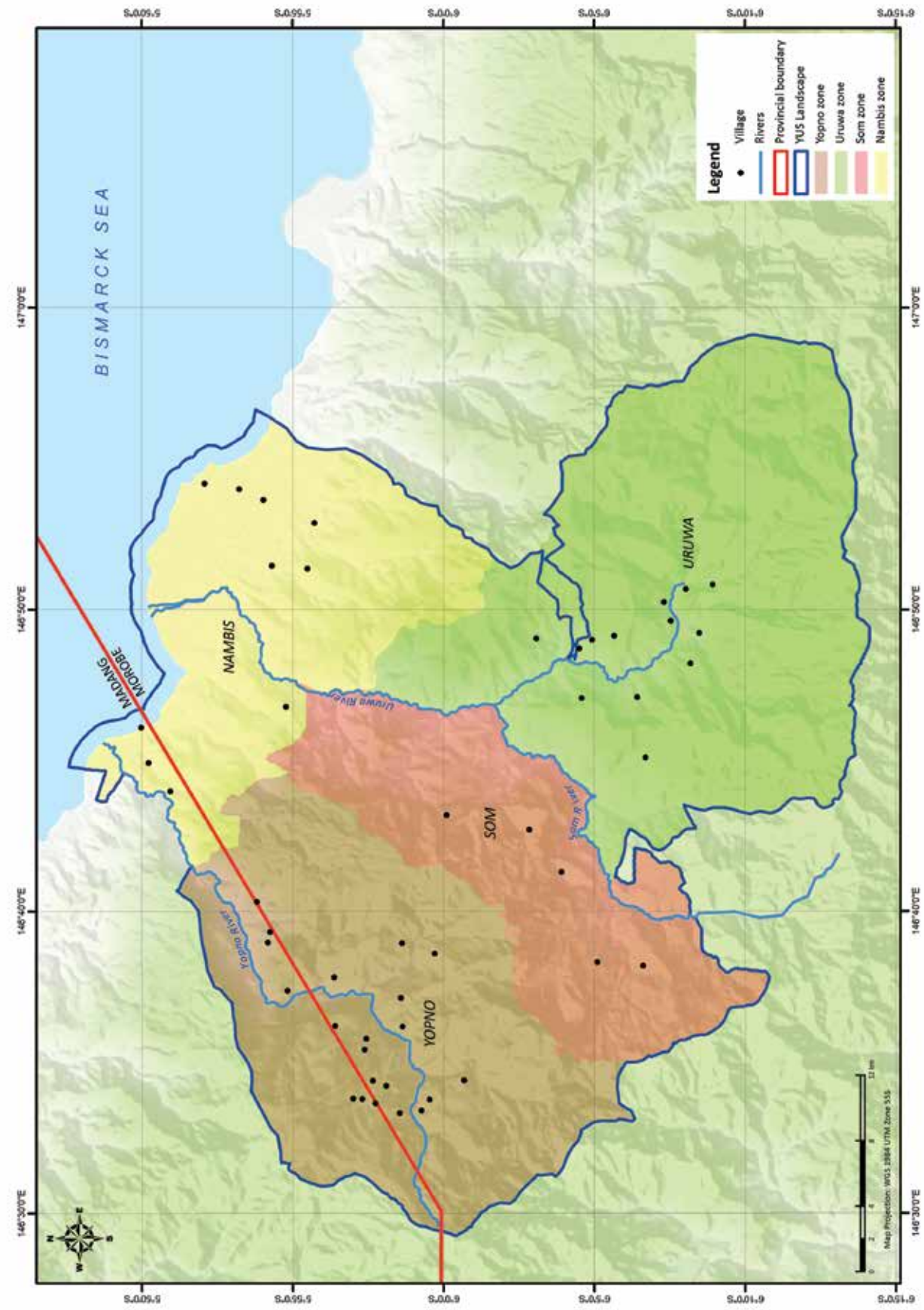
Participating communities are all those that have pledged land for conservation as part of the initiative. This Landscape Plan therefore encompasses the land area of the 51 participating villages across 15 Wards, and is a 158,271ha (1,582km^2) mosaic of human settlements, grasslands, forests, gardens and agricultural areas. For management purposes these are grouped into four zones: Yopno, Uruwa, Som and Nambis (Map 2).


Alpine Grassland , Uruwa Zone. Photo: Mark Ziembicki

Map 1: YUS Landscape scope (mapped ward boundaries represent the outer extent of land owned by the clans residing in the cluster of villages and hamlets within that area. Internal clan boundaries within a village cluster are not detailed here).



Map 2: YUS Landscape management zones.



1.3 Management targets

The management strategies and actions outlined in this Plan encompass both biological and socio-economic targets across the YUS landscape.

- Biological targets are the protection of key ecosystems including: alpine grasslands, montane and lowland rainforests, and marine ecosystems, as well as focal species and their ecology.
- The socio-economic target includes support to civil society, partnerships and governance across the landscape in support of the CA and cultural values on the landscape.

Target 1: Alpine Grassland

Goal 1	Indicators
By 2025, conserve and maintain appropriate area of alpine grasslands across Uruwa and Yopno Zones.	Area in hectares of alpine grasslands protected.

Goal 2	Indicators
By 2025, the alpine grassland areas support viable populations of key indicator species as defined by characteristic structure, density & composition.	Ecosystem integrity measured by indicator species presence, density and range. Viability measured by human use trends and the sustenance of resources for local use.

Target 2: Rainforest (Montane and Lowland)

Goal 1: (Montane Rainforest)	Indicators
By 2025, the population of selected hunted species inside the CA is stable or has increased based on the 2014 baseline.	Area in hectares of montane rainforest within CA.

Goal 2: (Lowland Rainforest)	Indicators
By 2025, the population of selected hunted species outside the CA is stable or has increased based on the 2014 baseline.	Area in hectares of lowland rainforest within CA.

Target 3: Matschie's Tree Kangaroo (and other hunted species)

Goal 1	Indicators
By 2025, the population of selected hunted species inside the CA is stable or has increased based on the 2012 baseline.	Scat counts of target species inside CA.

Goal 2	Indicators
By 2025, the population of selected hunted species outside the CA is stable or has increased based on the 2012 baseline.	Scat counts of target species outside CA. Catch / unit effort.

Goal 3	Indicators
By 2025, the density of selected hunted species is stable or has increased based on the 2016 baseline.	Relative increase in scat counts across all monitoring plots at all transects.

Target 4: Marine Ecosystems

Goal 1	Indicators
By 2016, develop a marine program to conserve marine biodiversity in-line with the YUS Vision.	Marine program developed and incorporated into LP 2.

Target 5: Civil society, partnership and collaboration

Goal 1	Indicators
Multi-stakeholder management institution (CAMC) exists and is fully functional.	Meetings held. Constitution approved. Landscape Plans and YUS CA plans approved by Minister as required.

Goal 2	Indicators
A community-based organisation (YUS CO) exists and is fully functional.	General meetings held twice per year. CO execs present priorities for action at CAMC meetings as required.

Goal 3	Indicators
Facilitation of support to sustainable resource use and management.	Ward Land Use Plans completed. Market integration.

Gogiok Village. Photo: Ashley Brooks

1.4 Legal basis

1.4.1 International obligations

Four key multilateral environmental conventions to which PNG is a signatory that relate specifically to the YUS Landscape are: the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); the Convention on the Protection of Natural Resources and Environment of the South Pacific Region; the Convention on the Conservation of Migratory Species of Wild Animals (CMS); and the Convention on Biological Diversity (CBD).

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

PNG is subject to international controls on trade in specimens of wild animals and plants to ensure their survival. YUS Landscape species covered by CITES controls are listed in Table 1.

Table 1: YUS Landscape species subject to international trade controls under CITES

Latin / scientific name	English name	CITES Appendix [1]
Zaglossus bruijni	Western Long Beaked Echidna	II
Harpyopsis novaeguineae	New Guinea Harpy Eagle	II
Falco cenchroides	Nankeen Kestrel	II
Falco berigora	Brown Falcon	II
Falco severus	The Oriental Hobby	II
Falco peregrinus	The Peregrine Falcon	II
Micropsitta pusio	Buff-Faced Pygmy Parrot	II
Micropsitta bruijnii	Red-Breasted Pygmy Parrot	I
Psittacella brehmii	Brehm's Tiger Parrot	II
Eclectus roratus	Eclectus Parrot	II
Psittrichas fulgidus	Vulturine Parrot	II
Alisterus chloropterus	Papuan King Parrot	II
Rhyticeros plicatus	Blyth's Hornbill	II
Manucodia chalybata	Crinkle-Collared Manucode	II
Ptiloris magnificus	Magnificent Riflebird	II
Drepanornis albertisi	Buff-Tailed Sicklebill	II
Astrapia rothschildi	Huon Astrapia	II
Lophorina superba	Superb Bird of Paradise	II
Parotia wahnesi	Wahne's Parotia	II
Cicinnurus regius	King Bird of Paradise	II
Cicinnurus magnificus	Magnificent Bird of Paradise	II
Paradisaea minor	Lesser Bird of Paradise	II
Paradisaea guilielmi	Emperor Bird of Paradise	II

[1] Appendix I: species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances; Appendix II: species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival.

Source: (Beehler 2012; Birdlife 2012; CITES 2012)

Convention on the Protection of Natural Resources and Environment of the South Pacific Region (PNRESP)

PNG is required under Article 14 to take all appropriate measures to protect and preserve rare or fragile ecosystems and depleted, threatened or endangered flora and fauna as well as their habitat. To this end, PNG must establish protected areas, and prohibit or regulate any activity likely to have adverse effects on the species, ecosystems or biological processes that such areas are designed to protect.

Convention on the Conservation of Migratory Species of Wild Animals (CMS)

PNG is not a signatory to the convention, however the CMS acts a framework convention where subsidiary agreements are developed between species range states to work together to conserve migratory species stocks. PNG is a range state of marine turtles, and is committed to their survival and replenishment through the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (CMS 2012). Under the auspices of the CMS, the MOU is a non-binding agreement that gives shared responsibility for the protection of all marine turtles to MOU Range States (CMS 2012). Due to the presence of marine turtles in the Nambis Zone, the MOU applies. The exact species of turtle will be determined as part of marine biodiversity assessments within the Marine Ecosystem goal.

Dwarf Cassowary chick *(Casuarius bennetti)*. Photo: Ashley Brooks

Convention on Biological Diversity (CBD)

PNG has committed to a raft of ambitious biodiversity targets covering every aspect of conservation from the policy and legislative levels, down to effective site level biodiversity protection. Of the 42 Articles in the CBD, the binding commitments and obligations specific to YUS are:

- Identify and monitor components of biological diversity (Article 7);
- Create a system of protected areas to conserve biological diversity (Article 8);
- Develop mechanisms for the prevention and the introduction of, control or eradication of alien species which threaten ecosystems (Article 8);
- Develop systems for the preservation and maintenance of knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application through appropriate legal, policy and administrative arrangements (Article 8);
- Protect and encourage customary use of biological resources in accordance with traditional and cultural practices (Article 10);
- Develop incentive measures for the sustainable use and management of the country's biological resources (Article 11);
- Promote research and training (Article 12);
- Promote and strengthen public education and training in biological resource management (Article 13);
- Facilitate the exchange of information (Article 17);
- Promote international technical and scientific cooperation (Article 18); and
- Strengthen partnerships to promote access to financial resources (Articles 20 and 21) (Wickham et al. 2010).

1.4.2 National legal context

The landmark environmental policies that contribute to the management and protection of national environmental assets, toward obligations under multilateral agreements include, and specific to YUS, are:

- The International Trade (Fauna and Flora) Act 1979: promotes the sustainable use of fauna and flora and is a framework for national obligations under CITES;
- The Fisheries Management Act 1998: seeks the protection of biodiversity in respect of fisheries;
- The Environment Act 2000: administrative mechanism for environmental impact assessment and evaluation of activities impacting the environment; and
- The Conservation Areas Act 1978 (CA Act, or The Act): The key piece of national legislation relating to the YUS Landscape. The Act is similar to the National Parks Act in that it seeks preservation of environmental and cultural heritage within designated protected areas. However, the CA Act differs in that conservation areas: can be under any form of ownership including customary, government and private; are established to be communally managed by and with consent of landowners; and recognise the inextricable links between people and the landscape (Horwich 2005). The principal purpose of a conservation area is conservation, and as such, any alteration of land use, or development (e.g. commercial logging, mining, road construction etc.) within them is controlled under The Act (CA Act 1978). Thus, conservation areas overall provide protection against unplanned development, foster sustainable use of natural resources while supporting meaningful social, cultural and religious institutions and conserving biodiversity (Horwich 2005).

Som Zone Grasslands. Photo: Ashley Brooks

1.4.3 Local level institutional context

Any approach to identifying, protecting, and managing land in PNG, such as the YUS landscape, for the purposes of conservation and development, must ensure effective consideration of the customary owners and tenure system of the target area. All land across the YUS landscape is legally recognised and collectively owned under customary tenure. Nationally, 97% of land is estimated to be under customary authority, with the remaining 3% divided into public (2.5%) and freehold (0.5%) land[2], 'alienated' from customary tenure during the colonial period.

The various aspects of customary tenure (e.g. issues around inheritance, allocation of usage rights, and dispute settlement, how these are managed) have evolved over thousands of years in a context of localised small-scale trade, remoteness, and subsistence-based livelihoods. A key feature of customary land is collective ownership, where the tribe, clan and extended family are the landowning groups. Such collective ownership is reflected in national laws (i.e. those governing natural resources such as, land, forests, minerals, oil and gas) where resources are collectively owned, rather than by individuals or household units, and decisions are made by consensus and consultative processes (DEC 2010).

Land allocation, usage rights, and traditional resource management (which manifest as conservation agreements and land pledges, land-use planning and zonation, and sustainable resource use in the YUS Landscape context), are intrinsic to local culture, social and economic wellbeing, and community harmony. Such factors have been carefully considered in the Plan and in the processes that preceded it (Annex 3).

The institutional framework within the Organic Law on Provincial and Local-Level Governments 1998 provides a strong basis for communal and locally-based management of the YUS Landscape. The Organic Law is the foundation for a system of bottom-up provincial planning mechanisms that seek to improve the delivery of rural services, increase participation in government at the community and local levels, and decentralise power and responsibility to local level government. Management and planning of the YUS Landscape must therefore work not only in concert with the Organic Law, but seek to enable and support local government processes.

Montane Rainforest, Uruwa Zone. Photo: Mark Ziembicki

1.5 Policy and planning context

1.5.1 National constitution

Strategic actions nationally are governed by the five goals of the PNG Constitution:

1. Integral human development: every person to be dynamically involved in the process of freeing himself or herself from every form of domination or oppression so that each man or woman will have the opportunity to develop as a whole person in relationship with others;
2. Equality and participation: all citizens to have an equal opportunity to participate in, and benefit from, the development of our country;
3. National sovereignty and self-reliance: politically and economically independent, and our economy basically self-reliant;
4. Natural resources and environment: natural resources and environment to be conserved and used for the collective benefit of us all, and be replenished for the benefit of future generations; and
5. Papua New Guinean ways: achieve development primarily through the use of Papua New Guinean forms of social, political and economic organisation (1975).

[2] Public land is owned by the state. Freehold land is owned and controlled by individuals or corporate bodies.

1.5.2 National development plans

Three overarching national planning instruments are the foundation for national development through to 2050, subordinate to the PNG Constitution, these plans are:

- PNG Vision 2050
- PNG Development Strategic Plan (DSP) 2010-2030
- PNG Medium Term Development Plan (MTDP) 2011-2015

PNG Vision 2050

The national vision, launched in November 2009, is: "Papua New Guinea will be a Smart, Wise, Vibrant and Happy Country by 2050" (Wickham *et al.* 2010: 2). The PNG Vision 2050 maps out the country's development initiatives for a 40 year period from 2010 to 2050, and is premised on the mutually reinforcing roles of economic growth, human development and environmental management (Wickham *et al.* 2010). Vision 2050 is built on seven pillars that underpin all national goals:

1. Human Capital Development, Gender, Youth and People Empowerment;
2. Wealth Creation;
3. Institutional Development and Service Delivery;
4. Security and International Relations;
5. Environment Sustainability and Climate Change;
6. Spiritual, Cultural and Community Development; and
7. Strategic Planning, Integration and Control (NSPT 2010b: 3).

PNG Development Strategic Plan (DSP) 2010-2030

The seven strategic focus areas of Vision 2050 are translated into directions for economic policies, public policies and sector interventions across two 20-year DSPs. The DSP contains sector goals, objectives, targets and indicators, and acts as the road map for achieving the long-term results of the Vision (refer to the YUS Landscape Issues Report or the DSP for details).

PNG Medium Term Development Plan 2011-2015

The execution of the DSP is through a series of four, five year MTDPs. The MTDPs contain detailed indicators, deliverables and costings (Wickham *et al.* 2010), and it is these guiding actions that sector specific, provincial, district and LLG plans, and other plans (e.g. public-private partnerships and development partner plans) are required to align with (Table 2).

Wungon Village. Photo: Ashley Brooks

Table 2: PNG national planning framework to 2050

Year / Planning instrument	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	....	2050
Vision			2010-2050																						
DSP										2010-2030														2031-50	
MTDP	2006-2010			2011-2015					2016-2020					2021-2025					2026-2030						
Provincial SDP	2008-2012			#	#	2011-2015			2016-2020					2021-2025					2026-2030						
District SDP	2008-2012			#	#	2011-2015			2016-2020					2021-2025					2026-2030						
LLG SDP	2008-2012			#	#	2011-2015			2016-2020					2021-2025					2026-2030						

Notes: SDP – Strategic Development Plan; # – government re-alignment with PNG Vision 2050.

YUS panoramic. Photo: Ryan Hawk

2 Location and Context

2.1 Papua New Guinea

Occupying the eastern half of the island of New Guinea along with thousands of smaller islands, PNG shares maritime borders with Australia, the Solomon Islands, and Palau, and a land border with Indonesia. As the largest country in the Western Pacific region, with a land area of 452,860km^2 (the next highest being the Solomon Islands with 29,753km^2 of land area) (Wickham et al. 2010), PNG is home to the highest population regionally, at 7.06 million in 2011. The PNG people occupy only around 27% of the land area, and typically live between sea level and 2,800m altitude (Hanson *et al.* 2001). The immense cultural wealth of the country is captured within the estimated 800 languages spoken by over a thousand different tribal groups nationally (Nita 2006).

Papua New Guinea's cultural diversity is matched only by its biological diversity. It is suggested that PNG supports as much as 9% of global terrestrial biodiversity in less than 1% of the land area (Lipsett-Moore et al. 2010). In its Fourth Report to the CBD (DEC 2010), PNG accounted for an estimated 150,000 species of insect, 314 species of freshwater fish, 641 species of amphibian and reptile, 740 species of bird, and 276 species of mammal. Endemism is also high, and is estimated to exceed 30% (DEC 2010). Situated in the centre of the Coral Triangle, PNG's marine biodiversity is also significant and home to around 2,800 species of fish (~10% of global marine estimates) (DEC 2010).

As part of the world's third largest contiguous area of tropical rainforest (forests cover approximately 71% of land area), and habitats from sea level up to cloud forest and alpine grassland, the floral diversity of PNG is very high (Shearman *et al.* 2008). The estimated number of vascular plant species for the island of New Guinea ranges anywhere from 11,000 to as high as 30,000 species (DEC 2010; Thompson 2011).

While such broad estimates of biodiversity are known, it is clear that large gaps in the scientific knowledge remain. The extent of this is reflected by the number of new species being recorded (Thompson 2011). As interest and research in PNG's ecosystems increases, so will the pace of new species records. Some scientists estimate that species of reptiles and amphibians will increase significantly, with numbers of frog species in particular expected to double (DEC 2010). While species number estimates are high and expected to increase with new discoveries, so too are the number of species of conservation concern. The IUCN Red List suggests 36 are critically endangered, 49 endangered, 365 vulnerable, and 288 are near threatened (Vié *et al.* 2009). Furthermore, given the high levels of species endemism in PNG, there is a higher likelihood of species extinctions occurring.

Papua New Guinea's biodiversity is symptomatic of its location at the crossroads of several major bio-geographic provinces (Nita 2006) and its large variations in landform, climate and topography. PNG is tectonically and volcanically active, with a number of large active volcanoes, and extensive high mountain ranges above 3,000m (with the highest peak, Mount Wilhelm at 4,509m) covering much of the country (Hanson et al. 2001). Average annual rainfall varies from extremely high and continuous, with as much as 10,000mm per year in some highlands areas, to relatively low and seasonal, with 1,000 - 1,500mm in coastal areas (Hanson *et al.* 2001; Wickham *et al.* 2010). In some areas such as in Western and Central Provinces, extensive dry seasons exist (DEC 2010). Average temperatures vary mainly with altitude, with tropical temperatures in lowland and island regions, and milder temperatures in the highlands (Hanson *et al.* 2001).

View of YUS Landscape from the Bismarck Sea. Photo: Mark Ziembicki

2.2 Huon Peninsula

The Huon Peninsula is a coastal mountain block jutting out of the PNG mainland at the intersection of Madang and Morobe Provinces (Map 3).

The peninsula is part of a formerly separate island that docked to the PNG mainland during the Late Miocene to Pliocene (between 11 and 5 million years ago) (Shearman and Bryan 2011), and has a turbulent geologic history due to its location at the junction of the Australian and Pacific crustal plates. As the Pacific plate subducts beneath the Australian, the Huon Peninsula rises at one of the fastest rates of geologic uplift globally (at least 0.8-2.1mm/yr) (WHC 2011; Freeman *et al.* 2012). With the majority of uplift occurring in the past one million years, the high peaks of the three principal mountain ranges of the Huon (the Finisterre (to 4,176m), the Sarawaget (to 4,122m), and the Rawlinson are considered geologically 'youthful' (Freeman *et al.* 2012). Both the Finisterre and Sarawaget Ranges consist of massive ridges of limestone dipping steeply to the ocean (WHC 2011). In the area around the coastal village of Sialum, well preserved and expressed limestone ridges occur as a sequence of 'coral terraces'.

Referred to internationally as the "Huon Terraces", these are considered not only spectacular, but have are also a significant testimony to the geo-climatic history of the Pacific region over the last 300,000 years (WHC 2011). The Huon Terraces therefore provide an invaluable resource for understanding Huon landscape evolution, biological history and human occupation of the peninsula overall, and as such have been listed on UNESCO's World Heritage Site – Tentative List[3].

The unique geologic history of the Huon Peninsula has resulted in it being the largest and highest of montane regions outlying the New Guinea Central Ranges (Freeman *et al.* 2012). While the isolation of the montane peninsula promotes evolutionary divergence, the surrounding lowlands, and particularly the Ramu-Markham Basin to the east, act as a geographic barrier that limits colonization by montane taxa from the Central Ranges (Freeman *et al.* 2012). The Huon Peninsula is therefore considered to represent an island biogeographic system with high levels of endemism (Freeman *et al.* 2012).

Remaining relatively intact (Beehler 1993c), the peninsula is afforded its own global ecoregion listing, the Huon Peninsula Montane Rain Forests Ecoregion (number 107 of 200)

Map 3: Huon Peninsula

[3] The World Heritage Tentative List is an inventory of sites which Parties to the World Heritage Convention (in this case PNG) intend to consider for World Heritage nomination in the following years WHC (2011).

(Wikramanayake *et al.* 2001). Nationally the DEC lists the peninsula within the Northern New Guinea Ecoregion, while the marine area around the peninsula falls within the Bismarck Sea Marine Ecoregion of the Coral Triangle (Green and Mous 2008).

The vegetation of the peninsula is mostly tropical wet evergreen forest (from sea level) with a high proportion of tropical montane forest (from 1,000m to 3,000m) and some limestone forest (Wikramanayake *et al.* 2001). Some of the higher peaks contain ecologically fragile cloud forests and high alpine grasslands (Wikramanayake *et al.* 2001). It is considered one of the most botanically rich areas of PNG with an estimated 5,000 species of higher plant, and is only matched by other areas with equivalent altitudinal ranges (Gillieson *et al.* 2011). Plant endemism on the peninsula remains poorly understood, but is also believed to be high (Jensen 2012).

Faunal species richness is considered moderate to high and overall endemism is low to moderate when compared with those of other ecoregions in Indo-Malaysia. However, the Finisterre Range supports more mainland endemic species of warm-blooded vertebrates than any similar-sized area in PNG (Beehler 1993c). Matschie's tree kangaroo *(Dendrolagus matschiei)* is the largest known mammal endemic to the Huon, but the largest body of knowledge for Huon faunal richness comes from extensive avifauna research. Dating back to the late 1920s and continuing through to the Huon Biodiversity Surveys in 2001, 2003 and 2004 (refer Section 2.3 for discussion) extensive surveys and comparative studies conducted on avian species have illustrated historical patterns of speciation and community assemblages for the peninsula (Freeman *et al.* 2012). While PNG's outlying montane regions are relatively species-poor in comparison to the Central Ranges, the avifauna of the Huon is the most diverse (Freeman *et al.* 2012). Species endemism is relatively high with five species endemic to the Huon, one endemic to both the Huon and Adelberts, and 22 endemic subspecies (Refer Annex Table 2).

Som Grasslands. Photo: Ashley Brooks

2.3 YUS Landscape

Located in the north-eastern corner of the Huon Peninsula, the YUS Landscape covers an area of 158,271ha (Table 3), straddles multiple administrative boundaries (Section 1.1), and is home to a culturally diverse population estimated at around 12,000 people, speaking six local languages and dialects in addition to English and Tok Pisin (Map 6). Emerging from the Bismarck Sea, the landscape extends across a narrow coastal plain (2-5km) to foothills, and then rises over a distance of 40 kilometres to altitudes in excess of 4,000 metres in the Sarawaget Range. The landscape also encompasses a forested core zone, gazetted as the "YUS Conservation Area" (totalling 78,729ha). Thus, where "YUS Landscape" is referred to, it encapsulates all the human and environmental elements across the landscape. Whereas, YUS CA is used to refer specifically to the gazetted conservation area, or pledged land parcels (Refer Section 2.4 for discussion).

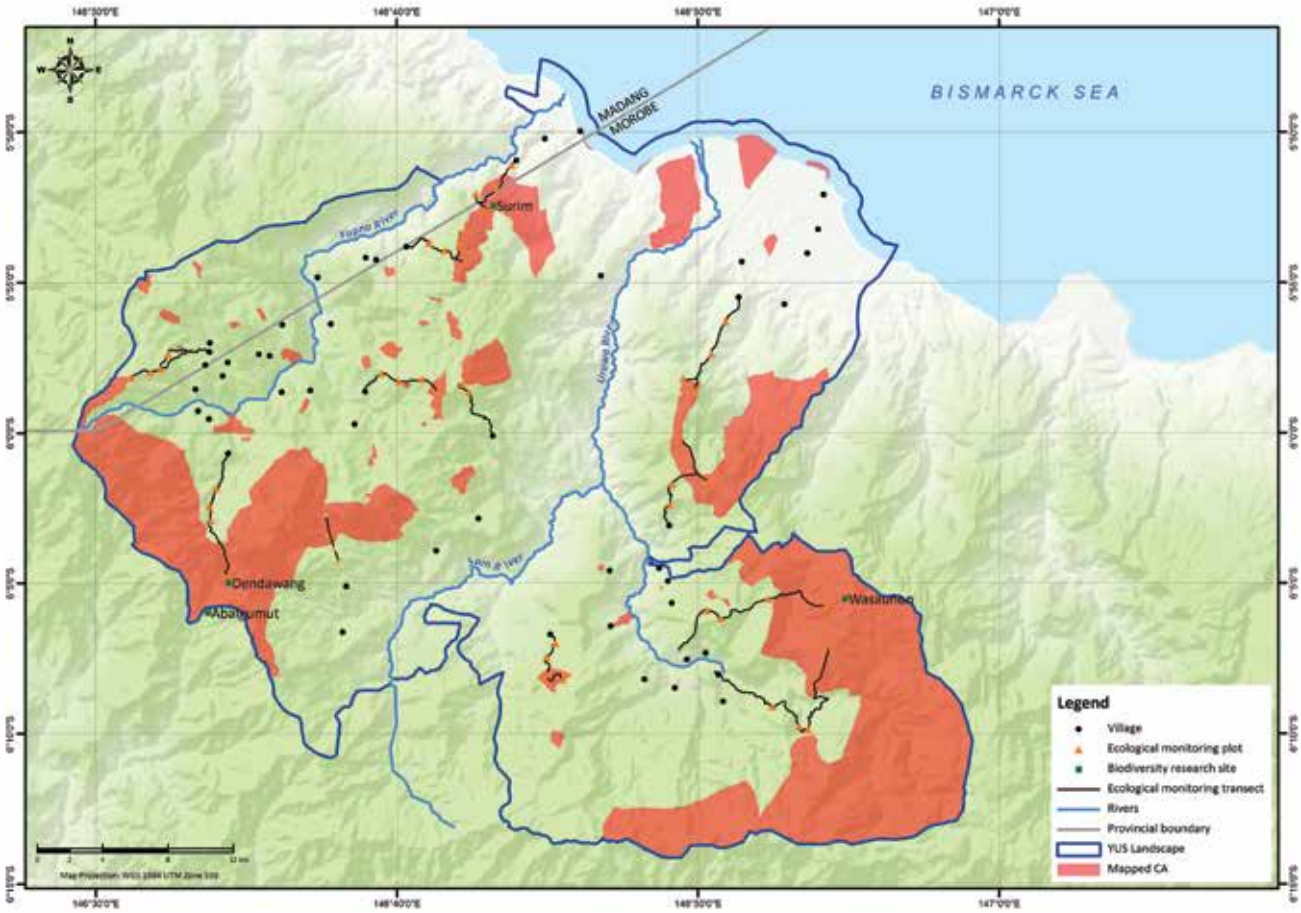
2.3.1 Bio-geographic context and values

The YUS Landscape has significant conservation value. The rugged landscape is characterised by a low human population density (~6.2 people/km^2)[4] and a large unbroken tract of rainforest (both within and outside the CA, from zero to over 4,000m) that occupies 70% of the land area. Although difficult to quantify precisely, permanent human communities occupy around 6% of the landscape, and since no roads currently dissect or enter YUS, the landscape has been afforded some protection from large-scale development and resource extraction that threatens biodiversity nationally (DEC 2010). The YUS Landscape with its intact natural environment, fringed by a small human population, therefore offers a unique opportunity to conserve complete ecological communities for both biodiversity and utilitarian value.

Owing to its uniqueness and ecosystem integrity, the YUS landscape area has twice been identified as a priority for conservation. In the 1993 *PNG Conservation Needs Assessment*, the Finisterre and Sarawaget Ranges were proposed as priority areas for conservation due to their broad elevational ranges, the presence of endemic bird and mammal species, and the extensive *Dacrydium* forests of Sarawaget Range (Beehler 1993a; DEC 2009). A recent conservation analysis (Lipsett-Moore *et al.* 2010) of terrestrial regions of PNG also identified the YUS Landscape area as a conservation priority. Here, modelling was used to determine which areas, if protected, would meet the requirements for: biodiversity conservation; national ecosystem representativeness; the protection of restricted range endemics; and places able to act as species refugia in the event of predicted climate change impacts (Lipsett-Moore *et al.* 2010). Under each modelling scenario, the YUS area met all the requirements to be listed as a conservation priority area.

[4] In comparison: PNG national, 11 people/km^2, PNG highlands, 22 people/km^2 (Ningal *et al* 2008).

Map 4: Ecological monitoring transects, plots and biodiversity survey sites across the YUS Landscape



Flora

The overall forest vegetation for the landscape falls within the Finisterre-Huon Forest classification that encompasses the Huon Peninsula (Gillieson *et al.* 2011). Vegetation field studies were carried out as part of YUS Landscape biodiversity surveys in 2001, 2003 and 2004. Each survey generated significant species data sets across various high elevation sites up to 2,950m:

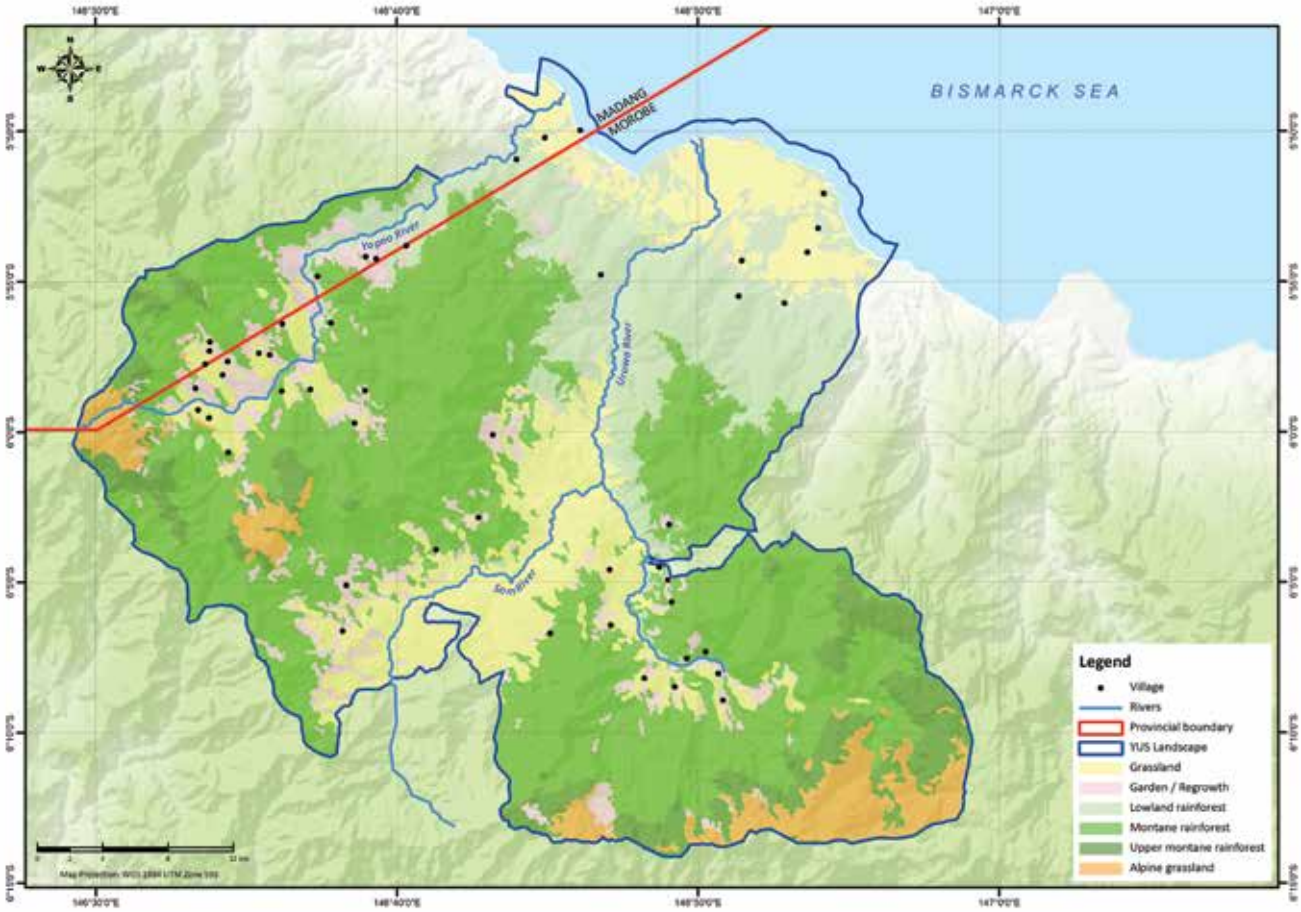
- Dendawang and Abalgamut sites, 2001: > 183 plant species, from 111 genera in 73 families;
- Surim and Tarona sites, 2003: > 119 plants species, from 115 genera in 96 families;
- Wasaunon site, 2004: 156 plant species from 101 genera in 61 families; and
- Dendawang site, 2004: 89 plant species from 67 genera in 43 families (TKCP 2001; TKCP 2003; TKCP 2004).

While much of the data remains to be analysed, it is suggested that many species would be new to science (Jensen 2012).

In 2011, a specific vegetation classification of the YUS Landscape was completed through field assessments and remotely sensed image analysis (Map 5) (Gillieson *et al.* 2011). Along with generating spatial layers for all land cover classes across the landscape, forest vegetation was classified along four broad elevation zones, including lowland, lower montane, upper montane, and alpine) (Gillieson *et al.* 2011). A description and tabulated summary follows (Table 3).


YUS coastline. Photo: Mark Ziembicki

Map 5: YUS Landscape vegetation and land cover



Grasslands and exposed soil

Grasslands across YUS occupy almost a fifth of the landscape area (Table 3) and occur from low elevations over a range of land forms, soils, and climatic conditions (Gillieson *et al.* 2011). YUS grasslands are generally well established and relatively stable, however, they are largely anthropogenic and maintained by burning (Gillieson *et al.* 2011). The largest area of contiguous grassland occurs in the Som Zone, while an additional ribbon of grassland skirts the narrow coastal lowland. Due to the fact that much of the YUS grasslands are burned periodically, spectral properties of burned grass closely relate to bare soil making accurate distinction difficult (Gillieson *et al.* 2011). As such, the land cover class "Burned/Bare Soil" from the vegetation classification study has been grouped with "Grasslands" for the purposes of management. Bare soil includes exposed earth from river bank erosion, bare gardens, burned or senesced grasses and land slips (Gillieson *et al.* 2011).

Gardens / regrowth forest

Generally located proximate to human settlements, this is primarily an anthropogenic land cover class consisting of gardens, plantations, garden regrowth (abandoned gardens) and various stages of regenerating forest (Gillieson *et al.* 2011), and occupies around 7% of YUS. The class includes wind and fire damaged forest, naturally occurring open canopy forest, and dry scrub vegetation communities (Gillieson *et al.* 2011).


Alpine Grassland Uruwa Zone. Photo: Mark Ziembicki

Table 3: YUS Landscape land cover classes and baselines

YUS land cover class	Notes	Area in 2012 (ha)	% area of landscape
Grassland; exposed soil; burned	Mostly anthropogenic, includes some scrub, exposed soil from erosion, bare gardens, burned areas and land slips.	28,535	18%
Gardens / regrowth forest	Mostly anthropogenic; no established canopy; includes gardens; includes wind and fire damaged forest; open canopy forest and dry scrub.	9,885	6%
Lowland rainforest*	0 – 1,000m	26,360	17%
Montane rainforest*	> 1,000m	84,952	54%
Lower montane rainforest	1,000 – 3,000m	73,390	46%
Upper montane rainforest	> 3,000m	11,563	7%
Alpine grassland*	Mean elevation 3,110m	8,540	5%
	TOTAL	**158,271**	

Notes: * – management target vegetation class (Refer Section 1.2).

Lowland rainforest

Occupying around 15% of the YUS Landscape, lowland forests include all the rainforest vegetation of foothills and mountains below 1,000m. Lowland rainforests broadly consist mixed hill forest, Dipterocarp forest, Casuarina forest, Araucaria forest, Themeda grassland, Imperata grassland, Heteropogon grassland, and Eucalypt savannah (Gillieson *et al.* 2011). These mixed lowland rainforests are considered species rich, with lower canopies and emergents, less frequency of large girth trees and buttresses, and less variable height, than in alluvium forest (Gillieson *et al.* 2011). A detailed botanical biodiversity assessment has however yet to be undertaken for this vegetation class in YUS.

Montane rainforest

As a single management target vegetation (Section 1.2), the montane rainforest class, occurring from 1,000m and above, and covering over half of the landscape, consists of lower montane (45% of YUS Landscape) and upper montane (8% of YUS) rainforests. Lower montane rainforests (1,000 to 3,000m) consist of mixed montane, *Castanopsis*, *Nothofagus*, and coniferous forests, with emergents (above 2,400m) including *Podocarpus*, *Dacrycarpus*, *Pauacedrus*, *Phyllocladus*, and *Araucaria* (Gillieson *et al.* 2011). Broadly, the composition of upper montane rainforests (3,000m and above) is suggested to be similar to lower montane rainforests with the addition of *Schefflera* (Gillieson *et al.* 2011), while forest structure differs significantly. Tree densities are greater, trees are generally thin with crooked trunks, and canopy heights decrease and become shrub-like at the highest elevations (Gillieson *et al.* 2011).
In 2004 a detailed study (combining ground truthing and remote sensing), was conducted on forest composition within the elevation range 2,122 to 3,067m at the Wasaonon research site (Map 4) in south-eastern YUS, and may have broader application across the landscape. The study was able to separate the upper montane forest into three distinct classes based on the dominant tree species identified in each plot: D*acrydium nidulum* dominant, *Caldcluvia nymanii* dominant and *Nothofagus starkenborghiorum* dominant (Stabach *et al.* 2009).

Dacrydium nidulum dominant forests (making up almost 40% of the study area) were found on the upper slopes and ridges, up to an elevation of 3,100m, and composed 24 canopy species (Stabach *et al.* 2009). *Caldcluvia nymanii* dominant forest type (26% of study area) composed 35 canopy species. *Nothofagus starkenborghiorum* dominant forests (2.8% of study area) composed six canopy species, and were typically found on or near the ridge crest but at slightly lower elevations than *D. nidulum* forests (Stabach *et al.* 2009).

Alpine grassland

The upper montane zone of YUS consists of discontinuous areas of ridges, peaks and plateaus above 3,000m (rising to over 4,000m), and includes alpine grasslands and herbaceous swamps, occupying 6% of the landscape (Table 3) (Gillieson *et al.* 2011). Alpine grassland structure and composition depends on soil depth, drainage, exposure, and fire history (Gillieson *et al.* 2011). Mid-height tussock grasses predominate on well drained sites, while low grasses (*Deschampsia klossii*, *Poa spp.*, *Festuca spp.*, and *Danthonia spp.*) predominate on poorly drained soils. Species richness does not decrease with altitude in the upper montane grasslands (Gillieson *et al.* 2011).

Fauna

Extensive faunal research and biodiversity surveys have been, and continue to be conducted across the landscape, and regular discoveries of species as yet unrecorded hint that much of the faunal biodiversity and ecology remains poorly understood.

Birds are the best known animal group of the YUS Landscape due to a long history of ornithological surveys on the Huon Peninsula dating back to the late 1920s (Freeman *et al.* 2012). Indeed, avifauna research has been so extensive across YUS that it now constitutes the largest avian dataset for a single research site in PNG (CI 2011; Freeman *et al.* 2012). To date, avian surveys across YUS have documented 268 species from 149 genera, in 51 families (Beehler 2012). Of these, five are endemic to the Huon Peninsula (Annex Table 1), and six are either Near Threatened or Vulnerable to extinction in the wild (Table 4).

Table 4: Species of conservation concern recorded in YUS

Family	Latin / scientific name	English name	IUCN Status‡
Avian fauna			
Casuariidae	*Casuarius bennetti*	Dwarf Cassowary	Near Threatened
Accipitridae	*Harpyopsis novaeguineae*	New Guinea Harpy Eagle	Vulnerable
Scolopacidae	*Scolopax saturata*	Javan Woodcock	Near Threatened
Psittacidae	*Psittrichas fulgidus*	Vulturine Parrot	Vulnerable
Paradisaeidae	*Parotia wahnesi*	Wahne's Parotia#	Vulnerable
Paradisaeidae	*Paradisaea guilielmi*	Emperor Bird of Paradise*	Near Threatened
Mammalian fauna			
Tachyglossidae	*Zaglossus bruijni*	Western Long Beaked Echidna	Critically Endangered
Dasyuridae	*Dasyurus albopunctatus*	New Guinea Quoll	Near Threatened
Macropodidae	*Dendrolagus matschiei*	Matschie's Tree Kangaroo*	Endangered
Macropodidae	*Dorcopsulus vanheurni*	Small Dorcopsis	Near Threatened
Macropodidae	*Thylogale browni*	New Guinea Pademelon	Vulnerable
Muridae	*Paraleptomys rufilatus*	Northern Water Rat	Endangered
Pseudocheiridae	*Pseudochirops corinnae*	Plush-coated Ringtail Possum	Near Threatened

Notes: ‡ – for full description, refer Annex Table 3; * – endemic to Huon Peninsula; # – endemic to both Huon Peninsula and Adelbert Mountain Ranges.

Source: (ISSG 2011; Beehler 2012; Birdlife 2012; Inkster 2012; Ziembicki 2012)

Consistent with the national level context, the knowledge of mammals across YUS lags behind birds, due to difficulties in observing and enumerating them (Beehler 1993b). Despite these challenges, extensive non-avian fauna research has been conducted into the endangered Matschie's tree kangaroo in particular, and generating a significant body of knowledge for a largely unknown taxa. Matschie's tree kangaroos are endemic to the high elevations of the Huon Peninsula between 1,000 and 3,300m (Porolak *et al.* in review). While much of the tree kangaroo's ecology remains poorly understood and the focus of on-going research, much is known from research conducted across the YUS Landscape and of *D. matschiei* in captivity (Annex Table 4). As the only tree kangaroo species on the Huon Peninsula, *D. matschiei* occupies a wider ecological niche than the other nine species in PNG, and populations occur across a range of habitats with different vegetative resources (Betz 2001). Owing to the ongoing threat of hunting in the wild, and decreasing populations in captivity, the Association of Zoos and Aquariums's Tree Kangaroo Species Survival Plan (AZA TK-SSP) was developed in 1991, followed by the AZA'sTK-SSP Master Plan in 1993 to aid in their conservation. An integral part of the species survival plan of *D. matschiei* is the conservation of the species in the wild, and as such is the cornerstone of TKCP, and support to the YUS CA.

Beyond the on-going research into avian fauna and tree kangaroos, biodiversity surveys were conducted across YUS in 2001, 2003 and 2004 (Table 5). While the surveys reaffirmed the biological richness of the YUS Landscape, they also yielded several unrecorded species. The high proportion of un-described species collected indicates the area has high conservation value and that the reptile and amphibian fauna of the Huon Peninsula is inadequately documented (TKCP 2001; TKCP 2003; TKCP 2004). The region might also contain more endemic species than previously predicted (TKCP 2001; TKCP 2003; TKCP 2004).

Painted ringtail possum *(Pseudochirulus forbesi)*. Photo: Mark Ziembicki

Table 5: YUS biodiversity surveys results (2001, 2003, and 2004)

Mammals	44 mammal species, from 33 genera, in 12 families, documented at four survey sites: Dendawang and Abalgamut in 2001; Surim and Tarona in 2003; Six of the species documented during 2001 and 2003 had never been documented for the Huon Peninsula.
Herpetofauna	30 reptile species (nine snakes and 21 lizards) and 26 frog species documented at four survey sites: Dendawang and Abalgamut in 2001; Surim and Tarona in 2003; At least six, possibly seven, frogs documented are unknown to science; Two species of skink documented are un-described taxa.
Moths	Approximately 500 species and 600 species from 2001 and 2003 surveys respectively; The moth faunas of the two surveys are distinct, reflecting the varied habitats found at different altitudes.
Weevils	111 species, in 12 families documented during the 2003 survey (Surim, Tarona, and around the village Ronji); Only three species were collected at more than one locality, indicating high species-richness.

Source: (TKCP 2001; TKCP 2003; TKCP 2004)

2.3.2 Socio-economic context and values

Consideration of the socio-economic context is a key part of YUS Landscape management as the scope encompasses human settlements linked closely with environmental processes. The Plan therefore captures and considers both environmental and human (or socio-economic) elements shaping the landscape.

At the provincial level, socio-economic trends have gone backwards since the 1970s. The provincial government states, "…the general state of physical infrastructure such as roads, bridges, wharves and jetties including health and education infrastructures has deteriorated. Some of which are beyond repairable [sic] state. …the government machinery, systems and processes of delivering goods and services have also become ineffective..." (MPG 2008a: 4).

While the lack of physical infrastructure may constrain delivery of public services to both the Yus and Wasu LLGs, the lack of a Yus Five Year Development Plan means there is no mechanism for higher levels of government to direct and disburse funds to the site. The lack of a five year plan at Yus LLG, means it has only received recurrent budget funds over the last eight years. The result being a lack of significant progress in the development and improvement of basic services across many villages.

Dwarf Cassowary *(Casuarius bennetti)*. Photo: Mark Ziembicki

Education context

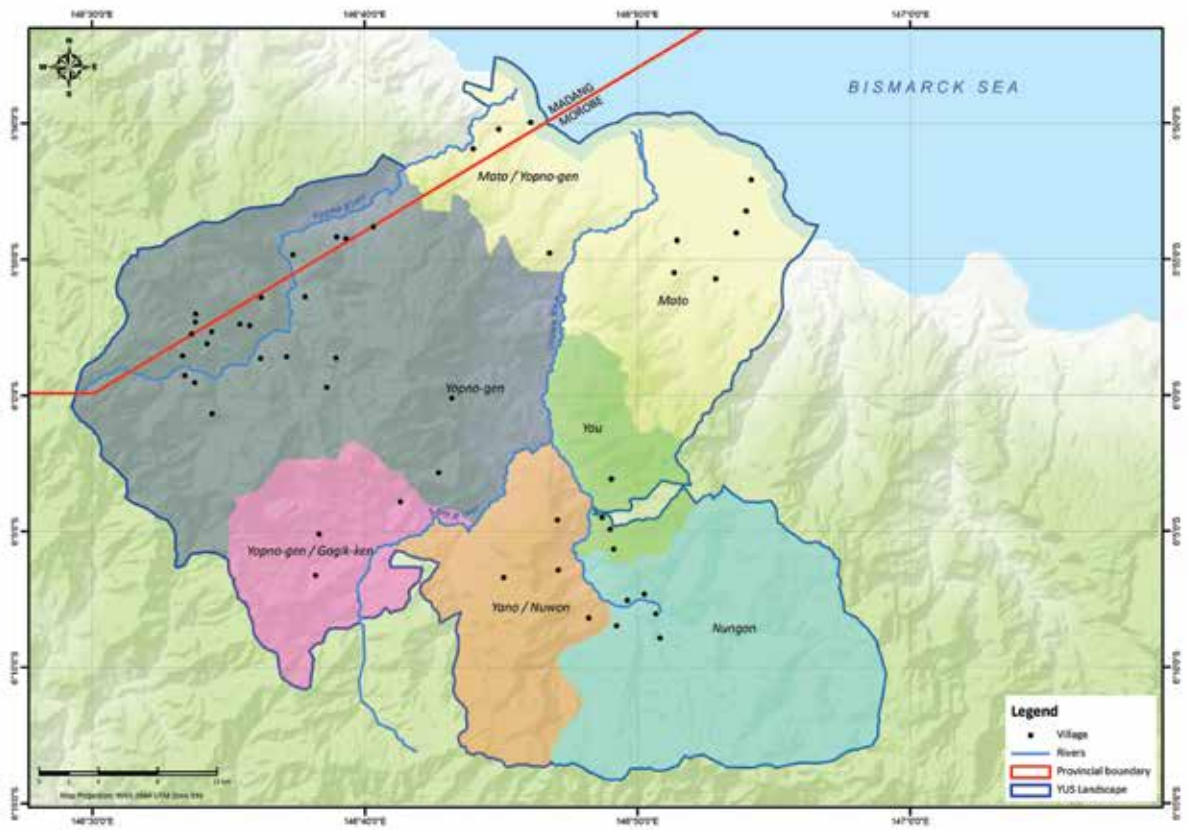
Across Morobe Province is it suggested that progress in the education sector had been made throughout the 1990s and up to 2000 when the census was conducted (MPG 2008a)[5]. The overarching patterns that emerged however were the large gender, and urban-rural imbalances – both of which are magnified beyond primary school-aged people. For rural areas such as YUS, the imbalances in school attendance are attributed to: accessibility, school fees, distance to schools, insufficient boarding facilities, limited support for female education, and lack of parental value in education (MPG 2008a). In 2012 the YUS Landscape had a total of 49 schools: 33 elementary, 12 primary and four community (Map 7) (Samandingke 2012). There are no high schools across the YUS Landscape. For Yus LLG residents, the district high school in Kabwum town is the closest, while for Nambis Zone residents, there is a high school in Wasu town (KDA 2008; Wasu LLG 2008).

The imbalance among national, provincial and village school attendance rates across YUS is not immediately obvious from the census data, with 16 out of 42 villages reaching higher attendance rates than national and provincial levels. On average attendance rates are lowest across the Som and Uruwa Zones when compared with Yopno and Nambis Zones (NSO 2000).

When we consider the proportion of children who stay in school and complete grade 6, it is clear that rates across the YUS Landscape are overall lower than the national and provincial averages with some exceptions. While there is only a small gender disparity at the national and provincial levels, in YUS, five villages have no females that have completed school up to grade 6. In 16 of 37 villages, more females completed grade 6 than males.

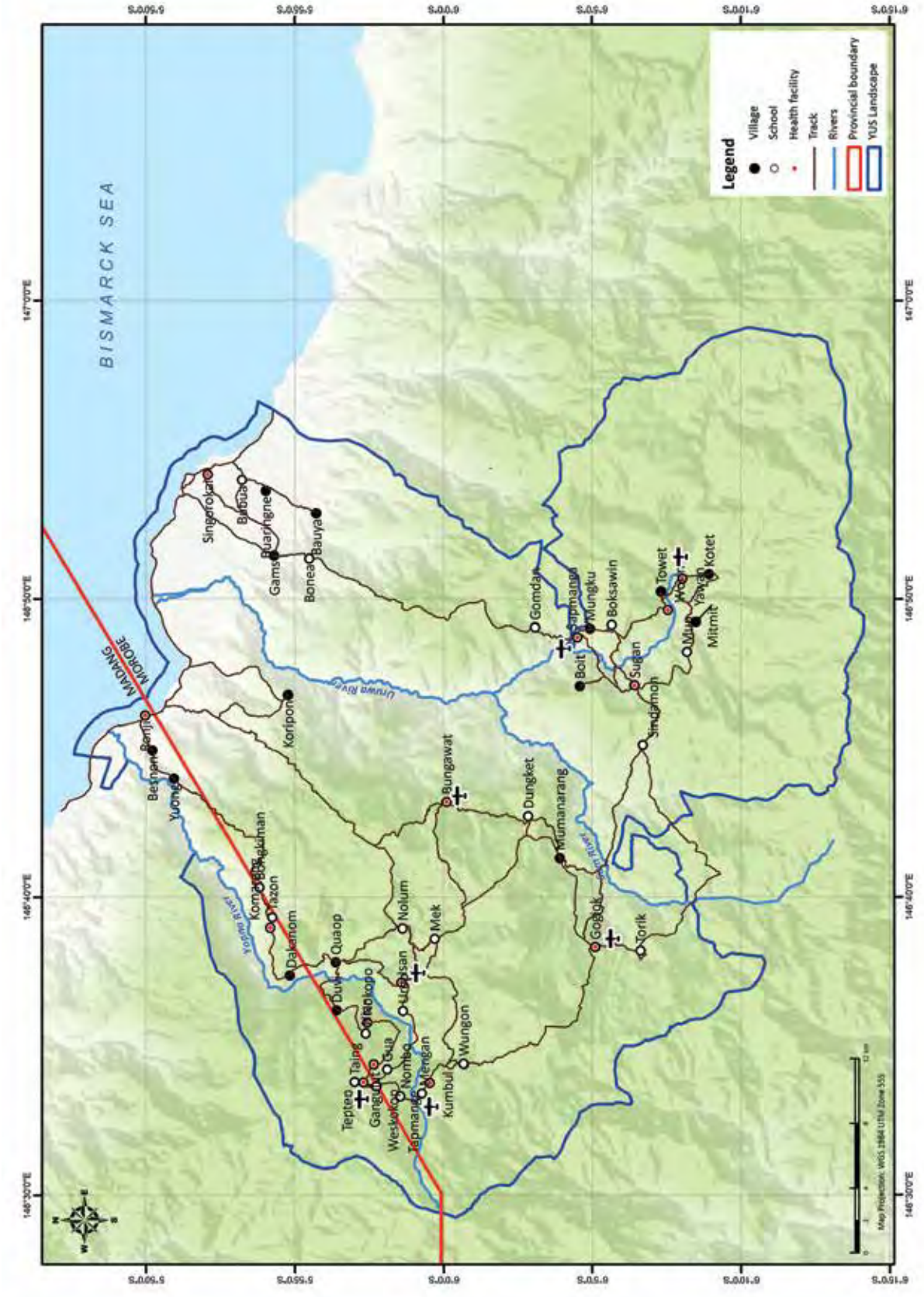
Analysis of school retention and attrition rates beyond grade 6 also highlight education sector challenges for YUS. On average just under nine in 100 (8.9%) children who complete grade 6, continue on to complete grade 10 across YUS (NSO 2000). This is in stark contrast to total national (25.2%) and Morobe Province (24.3%) retention rates, and is primarily attributed to there being no high school within the YUS Landscape, as is also suggested to be due to poor delivery or a lack of quality education (KDA 2008). A significant gender disparity is evident. Across the landscape, only 2% of females that complete grade 6 go on to complete grade 10, but in reality there were only four villages where females completed grade 10. While the retention of males in YUS schools to grade 10 is significantly higher (11.2%) than females, 17 of 37 villages have no one that completed grade 10.

Map 6: Languages and dialects of the YUS Landscape



[5] Many of the statistics used throughout this section are derived from the 2000 census. Although some of the 2000 census data may now be out-dated, it is used here as a baseline as the 2011 census information was not available at the time of writing.

Map 7: Socio economic context of the YUS Landscape



Location and Context

Health context

Progress was made in the health sector nationally in the first two decades following independence, however, progress in some key health indicators worsened since the mid-1990s (NSPT 2010a). A range of interlinked issues have been attributed to the deterioration of the health sector which is suggested to have coincided with the devolution of responsibility for rural health services to local level governments (NSPT 2010a). Overarching issues nationally include:

- Poor access to quality or basic health services and facilities (e.g. aid posts and health centres);
- Inadequate transport infrastructure;
- Closure or limited operation of facilities (due to staff shortages), insufficient medicines, malfunctioning equipment and poor maintenance of buildings (around half of rural health facilities are not operational);
- Lack of emphasis on primary and preventative health practices; and
- Poor management of the sector and failure by provincial governments to adequately resource health services through their annual budgets (NSPT 2010a).

For Morobe, over recent decades the province has experienced an overall decline in health status, in health infrastructure, and in delivery mechanisms (MPG 2008a). A selection of 'outcome' health indicators for the province illustrates its context:

- Infant mortality increased from 62 to 80 deaths per 1,000 live births between 1980 and 2000, while nationally over the same period infant mortality fell from 72 to 64 deaths per 1,000 live births (MPG 2005);
- Child mortality rates of 38 deaths per 1,000 live births compared with the national average of 25 in 2000 (MPG 2005);
- Life expectancy dropped from 53.9 years in 1996, to 51.7 in 2000.

The provincial government suggests that the slow pace of provincial economic development has constrained basic health sector service delivery overall, while at the local level more immediate challenges exist. These include: inaccessibility, illiteracy and ignorance, limited cash income, malnutrition, deteriorating state of health facility, inadequate medical supplies, and limited staffing (MPG 2008a). There is typically one Health Centre or a Sub-Health Center, supported by a network of Aid Posts across each LLG nationally. This is consistent with the distribution of the health facilities across the YUS Landscape in 2005 (Map 7).

Overall, across the YUS Landscape there are a total of 15 Health Centres and Aid Posts (12 within Yus LLG and three in the Nambis Zone) (Map 7) (MPG 2005), though the Kabwum District Administration suggests that in 2007, seven of the Aid Posts in Yus LLG were closed (KDA 2008). This was attributed to a lack of staff/health workers (KDA 2008). Across the YUS Landscape, a combination of the health facilities being closed, and the distance/travelling time to the nearest facility are major constraints (KDA 2008). All the Health Centres and Aid Posts across YUS are scattered across a large area of mountainous terrain and are only accessible by air or by foot. This not only presents a problem for people seeking assistance, but also for Health Centre staff when conducting patrols, immunization clinics, or raising public awareness, and when Aid Posts need resupplying (KDA 2008).

The overarching challenges facing the health sector across YUS into the future will continue to be: access to basic health services; procurement and distribution of health supplies; human resources; funding limitations; and capacity to respond to crises.

Livelihoods context

The primary source of household income across Morobe Province comes from agricultural production (MPG 2008a). However, while it is recognised that the province has "extremely favorable" conditions for improving agricultural and livestock production, it is apparent that there have been declines or stagnation in many areas and average household incomes remain below the rural minimum wage (1,500PGK/year) (MPG 2008a: 8). In Kabwum District, almost all households that produce coffee are doing so as a livelihoods activity, while the production of food crops, livestock, betel nut and poultry are mostly produced for subsistence (Table 6). The Kabwum District administration suggests that it is the "most fortunate of the eight districts in the province" with its abundance of food crops produced all year round, and where food security is not an issue (KDA 2008: 22). In Tewai-Siassi, there is a more even spread of households participating in economic activities, with similar numbers of people producing betel nut, coconut and coffee as cash crops. This is probably due to the district covering a range of climatic zones allowing for a wider variety of products to be grown, as well as easy access to markets due to it being a coastal district.

Table 6: Top five agricultural activities of households across YUS Landscape districts (2010)

Kabwum District	% HH engaged	% HH engaged for cash	Tewai-Siassi District	% HH engaged	% HH engaged for cash
Coffee	93.9	92.1	Food crops	83.5	14.0
Food Crops	89.8	3.8	Betel nut	73.1	27.4
Livestock	74.5	7.0	Coconut	64.7	31.2
Betel nut	35.7	8.9	Livestock	54.9	15.4
Poultry	30.9	3.1	Coffee	43.8	42.8

Notes: HH – households
Source: Adapted from (NRI 2010)

At the provincial level coffee is a major economic activity and in 2002 production peaked at 5,000 tons (MPG 2008a). The high altitude, high rainfall and well drained areas of YUS are highly suited to producing Arabica coffee. Baseline studies conducted by TKCP found that in the Uruwa Zone alone, average annual production was just over 19 tons of coffee a year (TKCP 2010). The Coffee Industry Corporation estimated however that this was only 7% of potential production, and that based on standing trees the coffee producing households across Uruwa could produce as much as 268 tons a year (TKCP 2010). Coffee sales in Uruwa occur through five cooperative groups and/or local buyers who aggregate coffee and transport it as a personal business (TKCP 2010). Coffee is generally transported out by buyers via plane and not on foot due to the extreme distance between Uruwa and the Lae market. Other cash crops widely produced in YUS include cocoa, vanilla and copra, and while cocoa production continues to rise, copra currently remains below 2001 levels (MPG 2008a).

Fruit. Photo: Ryan Hawk

2.3.3 Climate change context and values

The ecosystems of the YUS Landscape are valuable as they serve to both mitigate and help adapt to climate change. The landscape contributes to mitigation by sequestering and storing carbon within natural ecosystems, and to adaptation by providing and maintaining ecosystem services vital for community development and wellbeing, and biodiversity conservation. The greatest enabling factors for YUS to contribute to mitigation and adaptation to climate change are the large intact contiguous tropical ecosystems (Table 3), and the management context: YUS is legally recognised as a nationally gazetted protected area, has management support in perpetuity through an endowment, and has significant governance, management and planning capacity.

YUS and climate change mitigation

YUS serves to both store carbon *and* to continue to capture atmospheric carbon within its extensive forests, grasslands, marine ecosystems, and in below ground biomass. Deforestation and forest degradation (e.g. through agriculture, logging and fires) accounts for nearly 20% of global greenhouse gas emissions, therefore protection of the natural ecosystems of YUS will assist in containing such emissions (Janishevski and Gidda 2010). While YUS currently acts a carbon sink, if the tropical forests become degraded or are cleared, YUS could shift from being a sink to a net carbon source.

Tropical forests are the largest terrestrial carbon stores and active sinks globally (Dudley *et al.* 2010), and YUS is no exception. Recent in-depth studies of carbon stocks across YUS highlighted the significance of the terrestrial ecosystems in storing carbon (Venter M. *et al.* 2012). In one of the most comprehensive studies of its kind in PNG, it was shown that the tropical forests of YUS store more carbon than previously estimated for similar ecosystems in PNG (Venter M. *et al.* 2012). At the landscape scale, it is estimated that over 44 million tons of carbon are stored within above ground, below ground, and in soil organic carbon stocks across YUS (Table 7). If we consider the above ground carbon stocks of the YUS forests alone (111,312ha, and 19.4million tons of stored carbon), were these forests to be lost to fire and clearing over the coming decades, the carbon lost to the atmosphere would be equivalent to 71 million tons of CO_2 (Janishevski and Gidda 2010).

Table 7: YUS Landscape carbon stocks by land cover class (includes Above Ground Carbon, Soil Organic Carbon, and Below Ground Carbon (i.e. carbon stored in root systems)

YUS land cover class	Notes	Area in 2012 (ha)	C density (t/ha)	Stored C (Mt)
Grassland; exposed soil; burned	Mostly anthropogenic, includes some scrub, exposed soil from erosion, bare gardens, burned areas and land slips.	28,535	119	3.4
Gardens / regrowth forest	Mostly anthropogenic; no established canopy; includes gardens; includes wind and fire damaged forest; open canopy forest and dry scrub.	9,885	226	2.2
Lowland rainforest*	0 – 1,000m	26,360	357	9.4
Montane rainforest*	> 1,000m	84,952		28.0
Lower montane rainforest	1,000 – 3,000m	73,390	326	23.9
Upper montane rainforest	> 3,000m	11,563	358	4.1
Alpine grassland*	Mean elevation 3,110m	8,540	182	1.6
	TOTAL	**158,271**		**44.6**
				163.6 (Mt CO_2 equivalent)

Notes: * – management target vegetation class (Refer Section 1.2); C – carbon; t – tons; Mt – million tons
Source: Adapted from (Venter M. *et al.* 2012)

Jackfruit and Galip Nuts, Gams Village. Photo: Michelle Venter

YUS and climate change adaptation

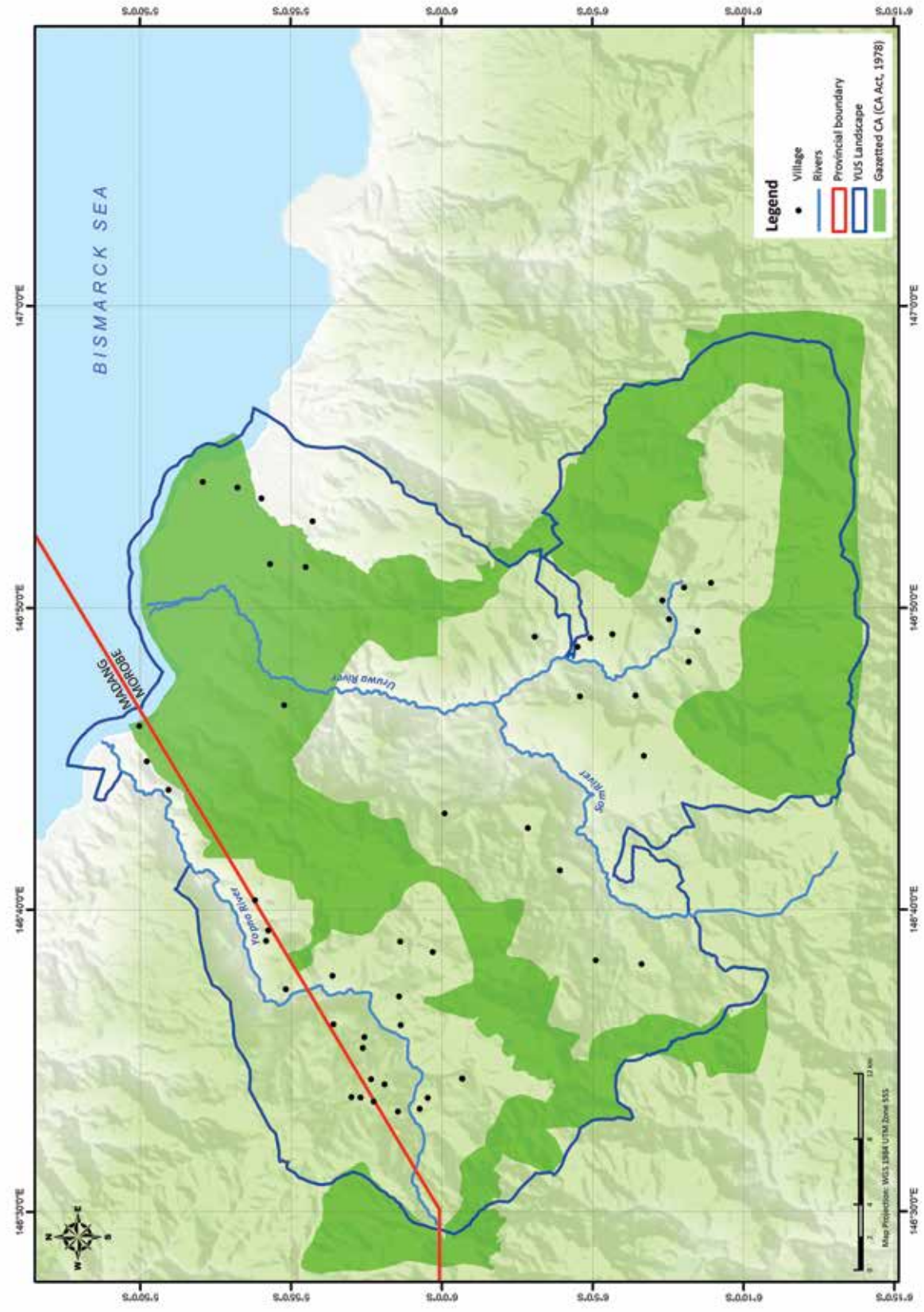
The ecosystems of YUS already provide key services that buffer against natural disasters (cyclones, storm surge, severe storms, and landslides), and supply community needs (e.g. through provision of clean water, wild food, building materials, local medicines, and shelter). Adaptation to climate change is the challenge of maintaining such ecosystem services in the face of long term climatic changes. This can be achieved in YUS by protecting intact ecosystems, restoring degraded areas, maintaining and establishing new corridors between ecosystems, and reducing non-climatic stressors (e.g. invasive species, fire and unsustainable development) on ecosystems.

The communities of YUS are in a good position to adapt to climate due to the extensive, contiguous, representative, and largely intact ecosystems that abound across the landscape. In addition, resource use is almost entirely traditional and small-scale, with no large scale, or industrial development compromising the integrity of ecosystems. In this regard the healthy ecosystems, and therefore the services they provide, have high potential to be resilient in the face of climate change. Due to the low population to forest area of YUS, it also possible to protect portions of intact or fragmented ecosystems against extraction, without compromising communities' ability to develop and prosper.

2.4 YUS Conservation Area

The YUS Conservation Area, established in 2009, is the first conservation area gazetted in PNG (for details of the process of gazetting the YUS CA, refer (Wells *et al.* 2013). The purpose of the YUS CA under The Conservation Areas Act is to preserve the environment and the national cultural inheritance within the area, and to achieve this through conservation of important biological, topographical, geologic, historic, scientific and social resources. Any development or alteration of existing land use is also restricted within the YUS CA under Section 31. Specifically, "...an owner or occupier of land in [the YUS CA] shall not develop or alter or permit the development or alteration of the existing use of that land except: ... in accordance with the terms of the management plan; ... or in accordance with written approval from the Minister". The legislative framework governing the CA therefore provides for example, substantive protection against unauthorised and unmitigated resource extraction, as well as any alteration of land that is not otherwise planned and approved within the present YUS Landscape Plan.

Map 8: Gazetted YUS Conservation Area



Location and Context

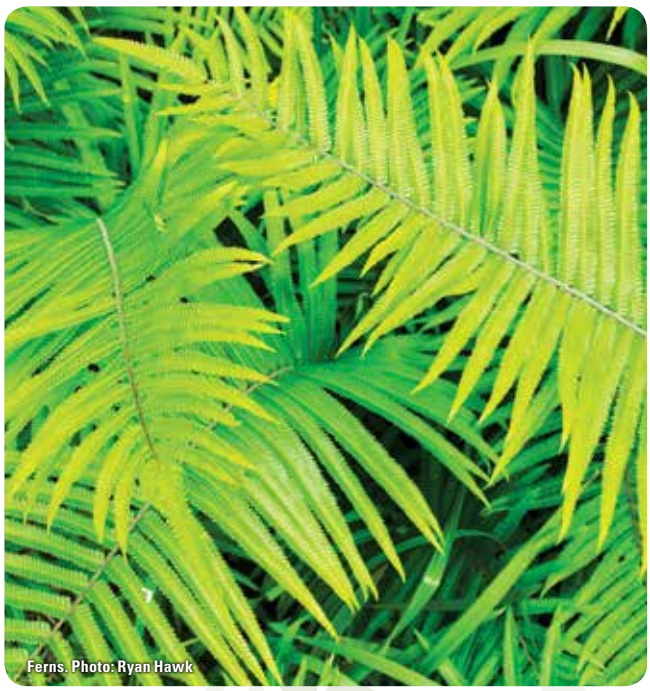
The gazetted YUS CA covers a total area of 78,729ha (787km^2) with an almost contiguous ribbon of tropical lowland and montane forest ecosystems (Map 8). The remaining non-forest area consists of a mosaic of anthropogenic land cover classes, including grasslands, and agricultural gardens, villages and hamlets particularly in the lowland areas of the Nambis Zone. While it is the intention of a conservation area to preserve the environment and culture through the conservation of all relevant resources, and the control of development and alterations to land, it is not the purpose of the YUS CA, the YUS Landscape Plan, or conservation area gazettal to inhibit or restrict access to development opportunities for the people residing within or adjacent to the YUS CA. The gazettal of the YUS CA boundaries as they currently exist, and particularly covering villages and agricultural areas across the Nambis Zone was undertaken as the first step in a longer process. First, in order to bring national and international attention to the YUS landscape for much needed support to communities and the protected area, proposed CA boundaries were drawn up in close consultation with landowners across YUS. Initially, clan members used hand drawn maps and land forms to map the parcels of land they wished to pledge, and from 2004 GPS units were used (Wells *et al*. 2013). It is these boundaries that were gazetted and now constitute the YUS CA (Map 8).

Threats to management targets were identified during a Foundations of Success workshop in 2011. The threats detailed below are only those identified as priority threats to the management targets, while the intermediate and indirect threats identified are not explored. In many instances, a priority threat was identified for the first time during the workshop, had only recently emerged, or had been identified by YUS community members during TKCP workshops across the landscape. In such cases, information, baselines, trends and impacts were not available at the time of writing. This is not a constraint to the Plan, but offers an opportunity for targeted research and follow-up and these are reflected in the Strategies.

The mapping and confirmation of proposed land pledges continues today due to it being a long term process. This is due to combination of: the dynamic nature of customary land; the lack of written records for land boundaries; the use of locally unfamiliar media (i.e. topographic maps, satellite images, and GPS units); long periods in the field spent hiking up and around densely forested mountains; and the need to work and map land with landowners means arrangements need to be made long in advance.

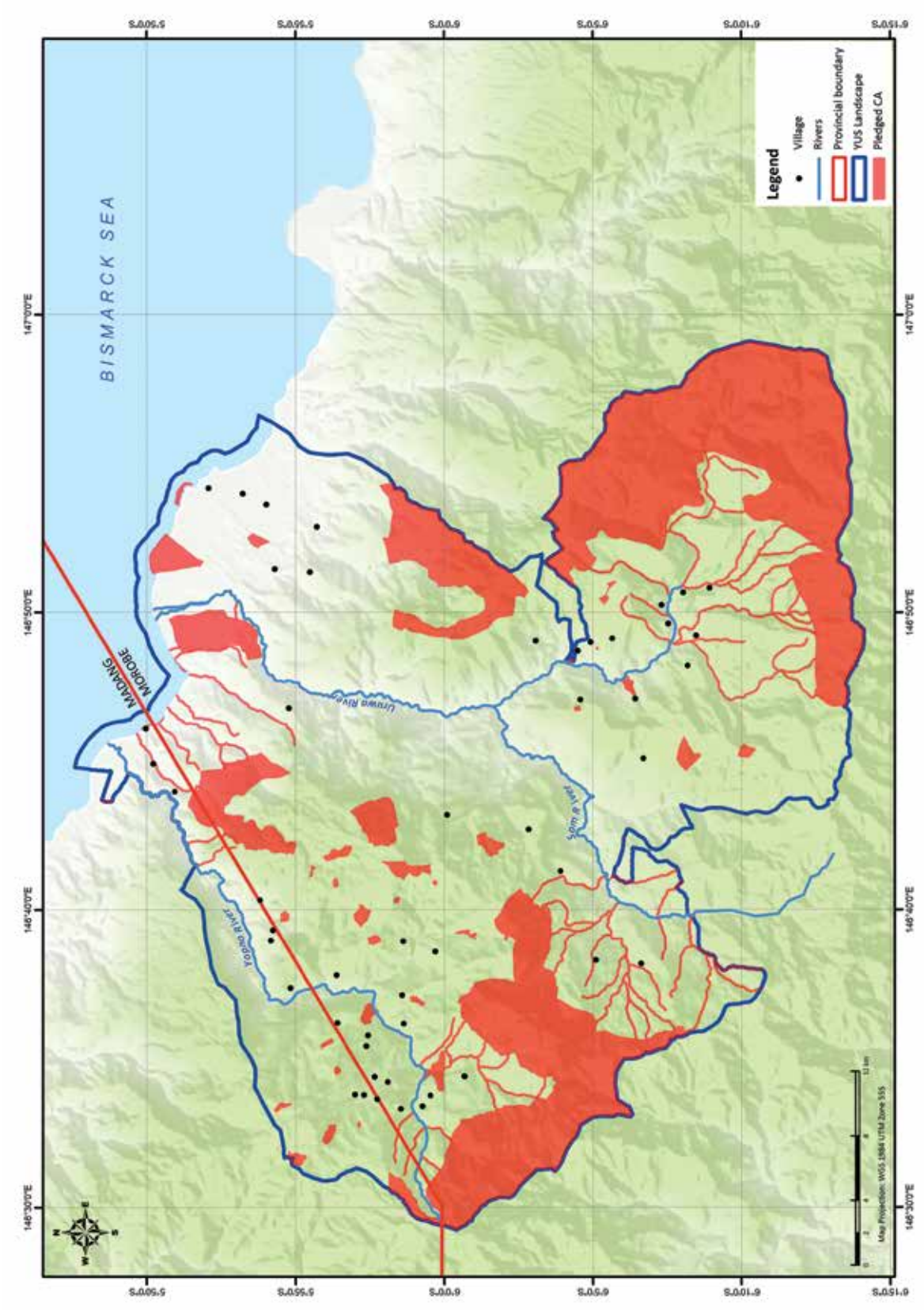
Mapping also often necessitates lengthy dialogue and negotiation between neighbouring clans, and ultimately the mapping of their customary land for the first time. The process and uncertainties around mapping pledged lands, means that the current gazetted YUS CA boundary will invariably augment in shape and size. This is already reflected in the 40,411ha that have been mapped, and confirmed as CA by landowners to date (Map 9). Ultimately, the mapping of pledged lands will be completed and a re-gazettal of the YUS CA will take place. In the lead up to re-gazettal, the areas protected under The Act, and governed by the framework developed by the communities themselves, are the land parcels pledged by landowners and confirmed through mapping. For details regarding the governance of the YUS CA, and processes of pledging land and conflict resolution, refer Annex 1. Detailed discussion and quantification of YUS CA ecosystems and biodiversity is covered within the YUS Landscape discussion above (Section 2.3), and in the lead-up to LP 2, in depth analysis of YUS CA ecosystems will take place as planned herein.

Threats to the achievement of the management targets (Section 1.3) were identified during a Foundations of Success Open Standards for the Practice of Conservation workshop in 2011. The threats detailed below are only those identified as direct threats to the management targets. In many instances, a threat was identified for the first time during the workshop, had only recently emerged, or had been identified by YUS community members during TKCP workshops across the landscape. In such cases, information, baselines, trends and impacts were not available at the time of writing. This is not a constraint to the Plan, but offers an opportunity for targeted research and follow-up and these are reflected in the Strategies.



Ferns. Photo: Ryan Hawk

Map 9: Mapped Conservation Area



3

Threats to Management Targets

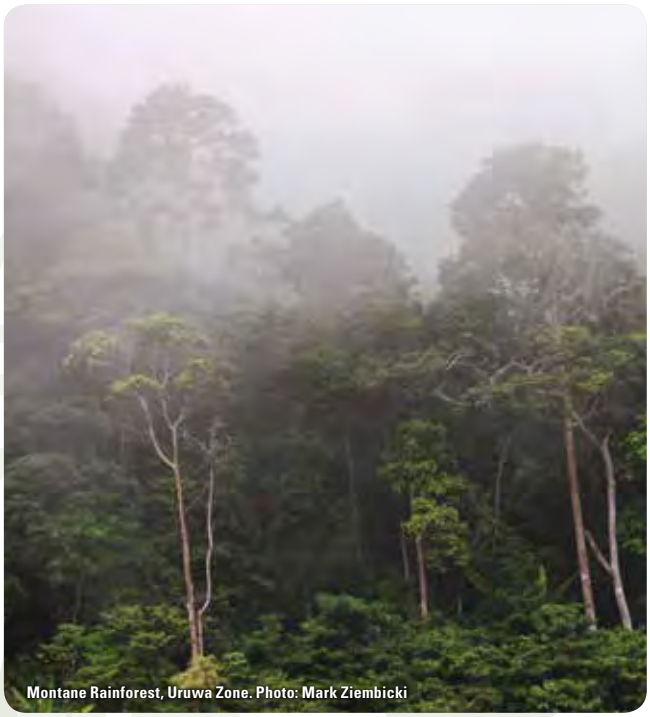
3.1 Direct threats

3.1.1 Small-scale forest clearance

Nationally between 1972 and 2002 small-scale forest clearance for subsistence agriculture (including crops for food, fodder, fibre, and fuel) was the second largest driver of deforestation behind logging (of forests cleared, 45.6% was due to subsistence agriculture, and 48.2% due to logging) (Shearman et al. 2009; Lipsett-Moore *et al.* 2010).

The vast majority of PNG's rural population (87% of national population) depend on smallholder subsistence and semi-subsistence agricultural systems for their livelihoods (MAL 2007; Ningal *et al.* 2008). It is estimated that such production systems result in the clearing of as much as 200,000ha of forest annually nationwide, with around six million hectares of land used in rotational gardening cycles (Wickham *et al.* 2010).

The overarching driver of small-scale forest clearance for subsistence agriculture is population growth. Estimates suggest that under current population growth trends in PNG, all arable land will need to be used to meet the food demands of the population by 2025, and beyond then the population will outstrip the capacity of the land to support subsistence agricultural production (Wickham *et al.* 2010). Across Morobe Province, population change and land use changes from 1975 to 2000 are strongly correlated (Ningal *et al.* 2008). In the absence of new crop introductions and intensification, the current trend of increasing area under cultivation, with associated decrease in forest area, along with population growth is likely to continue (Ningal *et al.* 2008).



Montane Rainforest, Uruwa Zone. Photo: Mark Ziembicki

3.1.2 Subsistence hunting, fishing and egg collection

People depend heavily on PNG's diverse biological resources for subsistence, with some 1,035 different plant species known to be used for various purposes (DEC 2010). Wildlife plays an important part in traditional diets, constituting the primary source of protein and fats in many highland and isolated areas of the country. In coastal regions a wide variety of seafood, including fish, molluscs, and turtles, dominate local diets (DEC 2010). The threat of hunting, like many other threats, may prove to be linked directly to human population size, livelihood opportunities, and the ability of the people of YUS to sufficiently provide for themselves and their families (O'Neil 2011). Current hunting methods are mostly traditional using bows, arrows, traps, and dogs.

It is recognised that the people across the YUS Landscape are subsistence hunters, and all conservation actions take this into account (O'Neil 2011). While the banning of hunting is not a realistic or culturally appropriate management response for the YUS Landscape, the concept of keeping portions of the forest off limits to hunting to serve as refugia for wildlife and as "wildlife banks", is within the traditional belief system of the communities (O'Neil 2011). Historically, clans had areas of the forest where hunting was off limits for spiritual and ecological purposes, which ultimately served the same purpose as protected zones (O'Neil 2011). Past hunting pressure has likely caused local extirpations or low population densities of certain mammals and birds in certain areas of YUS (O'Neil 2011).

3.1.3 Small scale selective harvesting of timber and rainforest products

Small-scale selective harvesting of timber refers here to the practice of harvesting a subset of the trees or other woody vegetation for non-commercial local use within a defined area. In PNG selective harvesting is primarily for high-valued timbers for building, or for fuelwood. This is particularly relevant to the YUS Landscape where, road access for trade in timber does not exist, where on average, 98% of houses across all villages are made from traditional materials (i.e. grass, bamboo, or wood) (NSO 2000), and where there is no access to gas or electricity for cooking purposes (O'Neil 2011). The potential impact of selective harvesting is that it is a precursor to full deforestation. In PNG, a quarter of all forests subject to selective harvesting had been completely cleared between 1972 and 2002 (Shearman *et al.* 2008). Typically, selective harvesting begins with removal of the largest trees and much of the forest biomass. Throughout the process of felling and extraction, many non-target species are killed or damaged (Global Witness 2009). One study in PNG highlighted that nearly half of the trees in a typical selective logging operation are killed, with only 5-6% of the total wood volume extracted as timber (Shearman *et al.* 2008), while another suggested that 70% of remaining trees die within 10 years of a harvesting operation (Cameron and Vigus 1993). The collateral damage of selective harvesting thus

reduces forest integrity, and increases vulnerability to fire, and potentially to complete deforestation (Global Witness 2009). Studies of selectively harvested forests adjacent to grasslands have shown that fires often penetrate well into the primary forest (Johns 1989).

Selective harvesting of forests is a current threat to the lowland forests of the YUS Landscape, and this is recognised by the Wasu LLG government administration. In the Wasu Five Year Development Plan 2008-2012, a core problem identified in the forestry sector is the destruction of the environment by small sawmill operations (Wasu LLG 2008: 17). The seemingly indiscriminate use of portable sawmills is suggested to be a key driver of deforestation (Brooks and Ramachandra 2012).

Harvesting for fuelwood is a further contributing factor to forest damage and potential conversion across YUS. Annual fuelwood use in PNG is estimated at 6.4 million m^3, more than three times the volume of the country's raw log exports (Filer *et al.* 2009). A study in Enga Province found that per capita consumption was 2.25m^3 per annum in rural areas, and 1.9m^3 per annum in urban areas (Carrad 1982, in Filer *et al.* 2009). Local villagers may remove some firewood from trees which die as a result of selective logging operations but, in most rural areas, villagers can get most of the firewood they need in the process of clearing secondary forest or fallow vegetation for new gardens (Carrad 1982, in Filer *et al.* 2009).

3.1.4 Unsustainable marine ecosystem use

Despite the fact that marine ecosystems that fringe the coastal zone of the YUS Landscape are not considered remarkable nationally (DEC 2010), they do play a key environmental and economic role at the local level. Currently, coral reefs in PNG are exploited almost exclusively by small-scale artisanal and subsistence fishers that use a range of techniques (such as spear guns, hook and line, hand spears, kite fishing, gill nets, hand traps, derris root, dynamite, weirs and bamboo traps) to harvest reef and reef-associated fish (Cinner and McClanahan 2006). Despite the overall health of the PNG fishery, local overexploitation has been recorded, particularly in fisheries with access to cash markets (Cinner and McClanahan 2006). Human population density, technological efficiency and market pressure have been cited as probable causes of overfishing, but few studies have directly examined how socio-economic factors may affect the catch in small-scale artisanal fisheries (Cinner and McClanahan 2006).

Anecdotally, coral is harvested in the coastal zone of the YUS Landscape for use in making lime for chewing betel nut. It has also been mentioned however, that it is predominantly shells, not coral, that are ground into lime in the coastal zone.

3.2 Compounding threats

3.2.1 Inappropriate fire regimes

Fire has played a key role in shaping PNG's vegetation patterns over thousands of years of human settlement (Filer *et al.* 2009). Local people have and continue to use fire as a deliberate resource management tool, such as through slash and burn agricultural practices, the maintenance of grassland areas (to maintain grass and wildlife stocks for local use), and as a trigger for the propagation of valued utility species (some pioneer fast growing woody species are sought for fuelwood) (Gillieson *et al.* 2011). Typically, these fire-related processes and outcomes are interlinked through complex cycles of gardening, fallowing, grassland, and succession of secondary forest. In some cases grassland areas may be utilised again as gardens on a 10-15 year cycle (Gillieson *et al.* 2011), and where there is no active suppression of forest regeneration patches of secondary forest will result within 20 or 30 years (Filer *et al.* 2009).

In the case of YUS, it is possible that large areas of grassland are likely anthropogenic and a result of prescribed burning patterns over many years (Gillieson *et al.* 2011). This is described as 'subsistence-related' clearing (Shearman *et al.* 2009), whereby a mosaic of gardens, grassland and secondary forest typically radiate from within and around human settlements, and where frequent burning eventually spreads into adjacent forests, leading to increases in the village 'footprint' (Shearman *et al.* 2009). Where periods of fallow become shortened and burning becomes more frequent, active suppression of forest regeneration occurs, or traditional propagation practices change, the vegetation may undergo a more permanent conversion to grassland.

Beyond deliberative use of fire for resource management purposes, anthropogenic burning can also be unplanned and started spontaneously by itinerant people travelling between villages (Gillison 1969). In such cases, the pattern of burning is irregular in terms of duration, time of year and the extent and configuration of boundaries (Gillison 1969).

The impact of fire across PNG, the Huon Peninsula and YUS, does however go beyond what could reasonably be expected from prescribed and occasional acts by locals as outlined above (Filer *et al.* 2009; Gillieson *et al.* 2011; Shearman and Bryan 2011). In a study of forest conversion and degradation in PNG for the period 1972 – 2002, many areas exhibited features consistent with clearing, or forest conversion to grassland over time, that were significantly distant from human settlements (>10km), had distinct patterns, or were located on the tops of mountain ranges (Shearman *et al.* 2009). The implication being, that since no active clearing, intense farming, or forest suppression takes place in those areas, fire would be the sole factor responsible for such montane forest loss.

The study on deforestation found that between 1972 and 2002, as much as 12.7% of upper montane forest area had been lost nationally, with the Huon Peninsula and Adelbert Range experiencing the third highest proportion of forest cleared of all bio-geographic regions nationally (Shearman and Bryan 2011). In many areas, loss of upper montane forest was clearly associated with fire – either by lightning strike or deliberately lit. The key determinant of the resultant impact of the fires is the climate at the time of the fire. For instance, alpine grasslands are suggested to be relatively flammable and during periods of drought, fires there can readily spread into adjacent forests, and have high potential to cause the death of trees and/or permanent conversion to grassland (Corlett 1987; Shearman *et al.* 2009). Studies have highlighted that in PNG, when there have been severe drought conditions, and extensive forest loss due to fire, these have coincided with global El Niño events (Johns 1989; Filer *et al.* 2009; Gillieson *et al.* 2011; Shearman and Bryan 2011). During the recent El Niño period of 1997-1998, fire is suggested to have been the major factor in the conversion of montane forest to grassland across YUS. The pattern of deforestation and location beyond human settlements, suggests that such conversion of forest was a result of fires started during that drought period.

3.2.2 Invasive species

Across the Pacific region, invasive species represent the second greatest threat to biodiversity and ecosystem services after land-use change (SPREP 2000). Invasive species are non-indigenous species introduced into the environment either intentionally or incidentally as a result of human activities (Center for Ocean Solutions 2009), and their spread is facilitated by such things as trade, road networks and human presence in ecosystems (Lucier *et al.* 2009). Through direct impacts on species or indirectly through alterations of habitats, invasive species are responsible for more species extinctions than any other cause (SPREP 2000). Invasive species can also trigger a cascading set of extinctions and ecosystem instabilities, making them even more vulnerable to succeeding invasions, or disturbances such as climate change (Leadley *et al.* 2010).

Ecosystems across the Pacific region have been wholly changed by the importation of animals such as pigs, cattle, and goats for food, or mongooses for control of other pests such as rats (SPREP 2000). Despite the fact that many introduced species can contribute to ecosystem service functioning and productivity (e.g. food provisioning from pigs, and soil conservation and nutrient cycling with invasive *Lucaena* sp.) (Butler *et al.* 2009), many have had devastating ecological impacts. Cattle, goats and pigs, for example, eat tree seedlings, slowing or even halting the replacement of forest canopies, and reducing native plant diversity (SPREP 2000). Pigs are highly destructive in their search for starch, by eating and uprooting tree seedlings, and breaking open tree-fern trunks (SPREP 2000).

Across the YUS Landscape, evidence of invasive weeds is widespread in many places (particularly in the Yopno Zone), with local people able to point out entire hillsides invaded by unwanted shrub species (Wells 2012). The most widespread introduced invasive across YUS is *Piper aduncum* (Jensen 2012), and most commonly referred to in English as, bamboo piper (Francis 2003), and in the Uruwa Zone of YUS is called "bondo" (Agate 2012). A native to the West Indies and mainland tropical America from Mexico to northern Argentina, bamboo piper is now established across South East Asia, the Pacific, and in PNG, the species is present across, Madang, Sepik, Chimbu and Morobe Provinces (IUCN ISSG 2005).

In PNG, *P. aduncum* is a shrub or small tree up to 7 metres tall, with a 10cm or more stem diameter, and typically occurs in agricultural areas, rainforest areas, and in disturbed forests or forest margins up to 2,000m (Francis 2003; IUCN ISSG 2005). The species is suggested to have a high likelihood of causing significant ecological and economic harm, and management/ control is currently only through physical uprooting or chemical application (IUCN ISSG 2005).

3.2.3 Water pollution

At the Pacific regional level, water pollution from liquid and solid waste is causing river ecosystem degradation, and threatening island habitats. Land-based sources of pollution are a particular threat to coral reefs near the mouths of watersheds, as the high volume of freshwater flow and sediments carried by rivers inhibits coral growth, and creates no-growth zones (Bryant *et al.* 1998; Brooks 2011).

Anecdotal evidence and personal communications from local people to project partners, suggests that land-based pollution through siltation and sedimentation is now of some concern to the lowland communities of the YUS Landscape. While there is no information regarding the extent of run-off from upstream (particularly with reference to the Uruwa and Yopno rivers), historical trends, or the social and environmental impacts of these, a large expanse of suspended silt is obvious at the mouth of the Uruwa River both by the naked eye and satellite imagery. This is not the case for the Yopno which remains clear at its mouth.

Yawan field office. Photo: Zachary Wells

3.2.4 Climate change

While there has yet to be an explicit YUS climate change vulnerability analysis, national and regional studies from Melanesia and the Pacific do provide sufficiently broad predictions on the potential threats from climate change to the landscape and the management targets. For many parts of the Pacific region the effects of climate are already being felt, and these are exacerbated by ongoing non-climatic and human stressors to ecosystems (Hills *et al.* 2011). Predicted climate change also comes with increasing uncertainty the further out the projections go. Thus, as many suggest, it is not that we are heading for a shift to a new climate regime, but toward a context where climate becomes much more variable, and the synergistic effects between climate and non-climate factors become more difficult to predict. In this regard it is impossible to suggest exactly what the threats to the YUS Landscape will be, however with knowledge of the terrain, location, and human context we can predict potential threats to the landscape. These include:

- Rising temperatures: A threat to species with limited climatic thresholds (e.g. those in high elevation and upper montane forests), or restricted range endemics. May also lead to the spatial isolation of some individuals, and migration of lowland flora and fauna upslope;
- Rising rainfall: This will increase run-off into lowland and coastal areas, leading to increased siltation and sedimentation of marine ecosystems. This could decrease suitability for coral and sea grass growth there, and represents a direct threat to threatened marine species and local livelihoods;
- Sea level rise: Could lead to an inward migration of coastal ecosystems (or loss of the system) and communities;
- Rising temperatures along with decreased rainfall: Coupled with fire and forest clearing, this has potential to decrease forest integrity, and increase severity of fire and chances of conversion of forests to grassland; and
- Increased climate variability and severity of storms: This could lead to a change in phenological events, agricultural regimes/ time lines and an increase in uncertainty around food security.

All of these pose significant challenges on their own, but are exacerbated by the compounding effects of each of the threats identified throughout Section 3, which all stand to make the impacts of climate change far greater.

3.2.5 Weak, non-existent or undeveloped governance context

In 1995, the enacting of the Organic Law nationally sought to address issues around the gradual decline in service delivery at the local level (MPG 2008c). While various government and administrative functions were devolved to LLGs, a commensurate transfer of institutional support for planning, monitoring, evaluation, and management did not occur (MPG 2008c). Service delivery across all sectors is now plagued by inefficiencies, financial mismanagement, and government bodies lack the ability to respond appropriately to crises and emerging local needs, while existing planning mechanisms at the ward level are ineffective at capturing local views and passing them up the policy chain and into LLG development plans (MPG 2008a; NSPT 2010a). The fact that the Yus Five Year Development Plan (2008-2012) was non-existent at the time of writing is a case in point. It is evident from discussions with key government representatives in Lae during October 2011, that Yus LLG has not received its Development Budget for the period 2008-2012 due to the fact it does not have a five year plan. Development budgets are typically directed to areas such as agricultural extension, new infrastructure, community services such as boats, solar coffee driers, and provision of adult training. At least three of the 13 Yus LLG wards have Ward development plans, but these were not able to be consolidated into a LLG plan due to the incomplete coverage of ward plans across the LLG, despite the fact that 5-yearly consultative meetings are held to facilitate all ward development plans.

There is, therefore, a disconnect among wards across the landscape in terms of leadership, planning coordination, collaboration and overall governance. This results in the lack of an LLG plan and the lack of disbursement of the Development Budget to the LLG. The risk is therefore that TKCP is seen as the only development service provider, and if/when expectations are not met then achieving management targets becomes difficult if not entirely constrained if programs lose the support of landowners as a result. Part of achieving success at the landscape level is the delivery, by government, of services and the implementation of government priorities. Removing the obstacles to this will be a key challenge, and will allow TKCP to focus on its core programs across the landscape.

3.3 Potential threats

3.3.1 Mining, oil and gas exploration

PNG is rich in gold, copper, silver, nickel, cobalt, petroleum and natural gas (Wickham *et al.* 2010). These have provided the country with significant export earnings and employment over the three decades. The most recent achievements in the mineral and petroleum sector include the signing of a multi-billion dollar deal for a large liquid natural gas project, the development of a new nickel mine, exploration and sampling of deep sea minerals is already showing great potential, and new explorations and expansion in mining of gold and other minerals (Wickham *et al.* 2010). While no mining or petroleum operation is currently underway on the Huon Peninsula or in YUS itself, it is recognised that the community at Dinangat (Yus LLG Ward 4), have chosen to pursue oil exploration and possible development in the future based on the discovery of surface oil. The aspirations of Ward 4 for oil development are in-line with both the Morobe Province and Kabwum District five year development plans (2008-2012), where, Yus LLG is a targeted location for the establishment of an Integrated Landholder Group (ILG) for petroleum development.

It is unclear as to the status of the formation and registration of the ILG, however during 2011, landowners representing Kumalu (Bulolo District), Erap (Nawaeb), Dinangat (Kabwum), and Saimange (Finschhafen) established the Morobe Oil company (Tiamu 2011), which subsequently obtained a Petroleum Prospecting License (PPL) covering the entire Huon Peninsula.

3.3.2 Road construction

The road network in PNG is said to reach the majority of the rural population (Hanson *et al.* 2001), however, a range of factors (including, lack of maintenance, the wastage of funds, constraints around customary land tenure) contribute to its poor overall state in terms of condition and connectivity (NSPT 2010a). Recognition of the state of the national transport network and the constraints this puts on the development of most sectors is expressed within national, provincial and lower levels of government planning documents. Where roads exist they play a vital road in the transport of cash crops (such as fresh vegetables and coffee), fuel, building materials, and imported food (Hanson *et al.* 2001). The transport infrastructure of Morobe Province mirrors that of the national context: the road network is limited due to the remoteness, rugged terrain, budgetary constraints, and a lack of periodic maintenance (MPG 2008a). The provincial government recognises this and suggests that the decline in service delivery and sale of cash crops is attributable to the bad state of transportation infrastructure in the province (MPG 2008a).

The transport infrastructure contexts of the two LLGs across YUS, are similar in their relative status, but have contrasting challenges. For Yus LLG, light airplanes and travel by foot are the only means of transport available. Kabwum District has a network of 82km of road (in various stages of decay), and none of which are inside the Yus LLG (KDA 2008). As indicated in national, provincial, district development plans, the lack of a range of basic utilities across the Yus LLG is symptomatic of the lack of road and transport access to it. National plans, and current five year development plans for Kabwum District, and Wasu LLG, indicate potential road construction in and around the YUS Landscape over the coming years: National Plan – New "missing link" road, Saidor to Wasu to Sialum; Kabwum District Plan – New road, Wantoat to Gogiok; and Wasu LLG Plan – New road, Weluwelu to Ronji (50km).

The construction of an access road into Yus LLG from Wantoat into the Som Zone, and finishing at Gogiok could serve as an important catalyst for the development of basic services and affordable access to markets. In the Nambis Zone of the landscape, the proposed development of 50km of road connecting Weluwelu to Ronji, and the national plan for the missing link road between Saidor (Madang Province) and Wasu town, will open up significant development opportunities for not only the lowland communities, but also offer additional opportunities for highland communities of YUS. The opening up of the coastal area via a nationally planned road will also bring significant pressure to the natural resources, particularly the lowland forest areas of the YUS Landscape. It is expected within the current that this road would not however be a priority until at least the next MTDP 2016-2020.

Land Use Planning workshop, Gogiok Village. Photo: Ashley Brooks

3.3.3 Commercial logging

Commercial logging represented the largest contributing factor to forest loss nationally between 1972 and 2002. It is estimated that over that period, 36% of all accessible, commercially-valuable forests were logged nationally (Global Witness 2009), and a total of 11.2% of forests in Morobe Province logged (Bird *et al.* 2007a). Given that a significant domestic market for timber does not exist in PNG, it is the export market that has driven the demand for PNG timber (Bird *et al.* 2007b). Despite the fact that the PNG government can send signals through the market using regulatory mechanisms, low levels of development in rural areas and the absence of well-developed commercial and employment sectors, means that policies necessarily seek early returns from the development of commercial extractive industries such as logging (Bird *et al.* 2007b; Wickham *et al.* 2010). Commercial forestry now represents the third largest foreign exchange earner after mineral and agricultural exports (Bird *et al.* 2007a).

Accessible forests in PNG are now being depleted at a rate of 1.1–3.4% annually (Thompson 2011), with nearly all of the commercially accessible forests now already under logging concession or are earmarked for future logging (Global Witness 2009). Some estimates predict that at current rates of logging, 83% of commercially accessible forests – i.e. lowland forests – will be depleted by 2021 (Shearman *et al.* 2008; Global Witness 2009). Geographically, logging operations in PNG have taken place in an east to west direction, whereby the most accessible and high volume forests of the islands region were exploited first. When most concession areas in the islands region had been granted, attention shifted westward toward the PNG mainland, and specifically the lowland coastal areas (Bird *et al.* 2007a).

It is credible to suggest that the lowland forest encompassed within the YUS Landscape (Gillieson *et al.* 2011) will be targeted for commercial logging operations at some point. This is a near term threat. The Provincial Forest Plan for Morobe Province 2008-2013 (developed in 2007) lists and maps a proposed timber lease called the, "Timbe Kwama Timber Area" which intersects the YUS Landscape and CA at the lowland Nambis Zone around Singorakai and Ronji (MPG 2008b). The proposed concession covers 52,329ha of "potential forest" area, and has an estimated cut of 16,000cm^3 per annum (MPG 2008b). The key point to make about the Timbe Kwama lease, is that as it is currently listed only as a *proposed* lease, and outside any Forest Management Agreement, as the PNGFA suggests, it can be developed through a range of alternative mechanisms including: small scale sawmilling, integrated projects, and conservation and carbon trading schemes (MPG 2008b). The provision for integrated projects, conservation, and carbon trade schemes, offers potential opportunities for protection of lowland forest of the YUS Landscape dissected by the proposed timber lease.

An obstacle to exploitation of the lowland forests around Ronji and Singorokai may also be lifted if the planned Saidor–Wasu–Sialum Road is constructed. This will significantly improve access to the lowland forests of the YUS Landscape for commercial purposes.

Photo: Ryan Hawk

4 Implementing the Plan

4.1 Aligning with government policies

The YUS Landscape Plan aligns directly with multiple national priorities that contribute to socio-economic development, and importantly the sustainable use and protection of the environment (For details across all Strategies, refer Annex 7). Starting at the highest level of national planning, The PNG Vision 2050, and down through to the current MTDP 2011-2015, the PNG government has committed to a comprehensive and ambitious suite of actions to ensure the protection of the environment (Table 9). PNG also has specific national targets (to 2015) for the global UN Millennium Development Goal #7 (Ensure environmental sustainability) and these (as well as for all eight MDG goals) have been incorporated into the current MTDP.

The national plans guide the formulation of provincial, district, and LLG plans and ultimately the disbursement of funds for the delivery of public services (Annex 8). National government plans are therefore a guide, a mandate, and a potential enabling factor for funding sustainability for the strategies within the Landscape Plan. It is critical therefore that the Landscape Plan aligns with both the sectoral strategies of national plans and with the timing of such instruments (Table 9). The present, foundational YUS Landscape Plan comes midway through a government planning phase and is therefore a three year plan starting 2013 to end 2015. Beyond the present Plan, future Plans will align directly with government five year planning periods, to ensure landscape planning is synchronised with government plans and budgeting at all levels.

Table 9: Coverage of protected areas and biodiversity conservation across national strategies

National guiding strategy	Strategies for, reference to, and focus on conservation and protected areas
CONSTITUTION **Fourth Goal:** Natural resources and environment	• Wise use to be made of our natural resources and the environment in and on the land or seabed, in the sea, under the land, and in the air, in the interests of our development and in trust for future generations; • The conservation and replenishment, for the benefit of ourselves and posterity, of the environment and its sacred, scenic, and historical qualities; and • All necessary steps to be taken to give adequate protection to our valued birds, animals, fish, insects, plants and trees.
VISION 2050 **Pillar #5:** Environmental sustainability and climate change	**1.** Reduce greenhouse emissions by 90% to 1990 levels; **2.** Assist the majority of Papua New Guineans to become resilient to natural and human disasters and environmental changes; **3.** Establish a Sustainable Development Policy in all sectors, especially forestry, agriculture, mining, energy and oceans by 2015; **4.** Develop mitigation, adaptation and resettlement measures in all impacted provinces by 2015; **5.** Conserve biodiversity at the current five to seven per cent of the world's biodiversity; **6.** Establish a total of 20 national reserves, wilderness areas and national parks; **7.** Establish at least one million hectares of marine protected areas; **8.** Conserve and preserve cultural diversity; **9.** Provide 100% power generation from renewable energy sources; **10.** Provide 100% of weather and natural disaster monitoring systems in all provinces; **11.** Integrate environmental sustainability and climate change studies in primary, secondary and national high school curricula; and **12.** Establish an Institute of Environmental Sustainability and Climate Change.
DSP 2010-2030 **Goal 5:** Promote a sustainable environment	*[Note: Specific strategies are not listed within the DSP, however they are detailed in the MTDP. Listed here is a summary from the text on page 118 of the DSP only]* • The development of economic incentives to deter pollution, and the formulation of a pollution market to reduce pollution; • The strengthening of customary practices for enhancing and preserving the environment; • Improvement of the legislative framework, together with monitoring and evaluation mechanisms to protect the environment; • Re-align PNG's national environmental programs with international commitments; • Empowerment and strengthening of agencies responsible for environmental and geophysical issues to ensure their pro-activity in mitigation; • Establishment of a database for environmental accounting; and • Increase awareness and encourage actions to protect the environment.

National guiding strategy	Strategies for, reference to, and focus on conservation and protected areas
MTDP 2011-2015 **Goal 5.6:** Promote a sustainable environment	Sector strategies: **1.** Institutional capacity strengthening for environmental sustainability management; **2.** Environmental protection and standards; **3.** Institutionalise implementation and management of the Global Environment Conventions to meet PNG's commitments; **4.** Creation of systems of protected areas management at all levels and forest and biodiversity conservation; **5.** Land and water resource management; and **6.** Environmental data and information management for planning and dissemination.
MDG to 2015 **MDG Goal 7:** Ensure environmental sustainability	Relevant PNG Targets for environmental sustainability: - Target 12: Implement the principles of sustainable development through sector specific programs by 2010, and no later than 2015; and - Target 13: By 2020, increase commercial use of land and natural resources through improvements in environmentally friendly technologies and methods of production.

Source: (1975; DNPM 2010; NSPT 2010b; NSPT 2010a)

Table 10: PNG national planning framework to 2050

Year / Planning instrument	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	...	2050
Vision			2010-2050																						
DSP										2010-2030														2031-50	
MTDP	2006-2010			2011-2015					2016-2020					2021-2025					2026-2030						
Morobe SDP	2008-2012			#	#	2011-2015			2016-2020					2021-2025					2026-2030						
District SDP	2008-2012			#	#	2011-2015			2016-2020					2021-2025					2026-2030						
LLG SDP	2008-2012			#	#	2011-2015			2016-2020					2021-2025					2026-2030						
YUS Landscape Plan				*	*	LP 1: 2013-15			LP 2: 2016-2020				*	LP 3: 2021-2025				*	LP 4: 2026-203				*	LP 5:31-35	
YUS Annual Work Plan					*																				

Notes: SDP: Strategic Development Plan; # – National planning re-alignment with PNG Vision 2050; * – Planning and completion of subsequent YUS Landscape Plan.

Poles to build school teacher house, Yopno Zone. Photo: Michelle Venter

Footbridge. Photo: Zachary Wells

4.2 Management and oversight of the YUS Landscape

The overall planning, management, oversight and reporting of activities across the YUS Landscape falls to a range of community and technical organisations, and elected representative bodies. Each organisation directly related to YUS Landscape management has specific roles, responsibilities and mandates, and these are outlined here. For details regarding the roles and responsibilities of other key representatives in general, refer Annex 8.

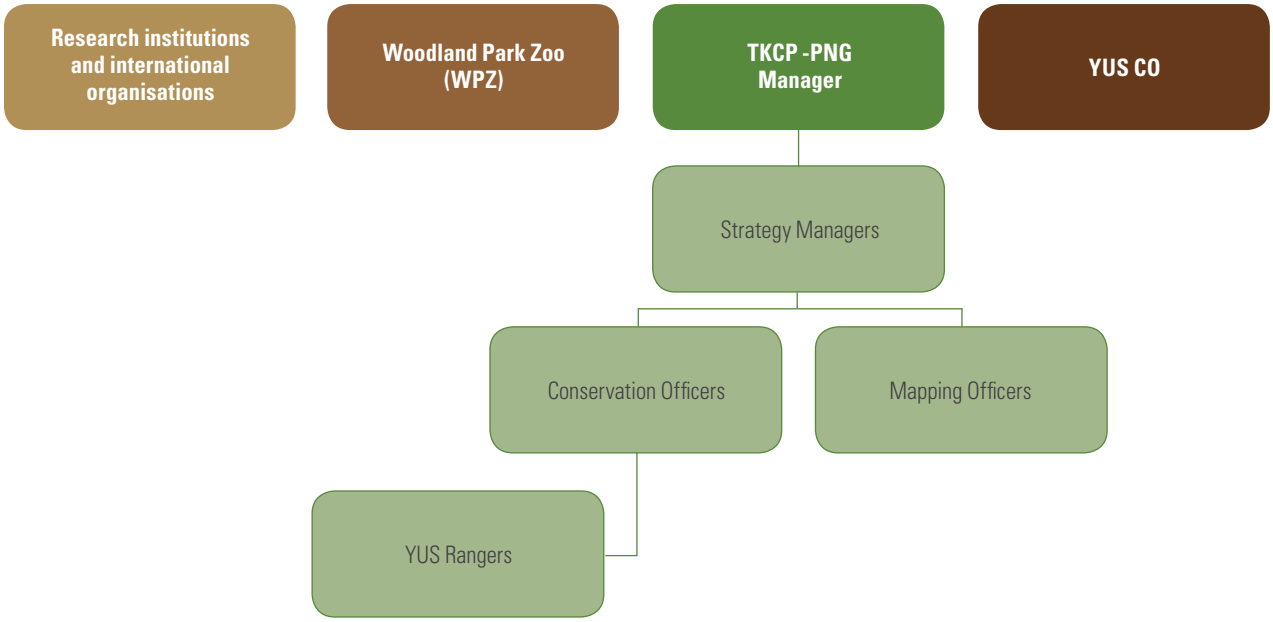
4.2.1 Tree Kangaroo Conservation Program – PNG (TKCP-PNG)

The day-to-day management of activities, implementation of the YUS Landscape Plan, and fulfilment of obligations under The Act for the YUS CA, are the responsibility of TKCP-PNG. TKCP-PNG comprises a Program Manager, Strategy Managers based in Lae, and a team of staff based within YUS (Figure 1). A locally recruited Conservation Officer is based in each of the four YUS Landscape Zones, while two local Mapping Officers are also YUS-based, and roam where required. The YUS Rangers report directly to, and are locally managed by the Conservation Officers in their zone.

Each of the TKCP-PNG Strategy Managers manages all programs, activities, staff and finances of their respective strategy, as well as assist in the development of work plans for their staff. The Program Manager works closely with WPZ, and is tasked with ensuring that all strategies and programs are being implemented as scheduled within Annual Plans, and ensures that strategies are contributing to Goals and long term management Targets. The Program Manager also facilitates, coordinates, and maintains direct collaboration with international research institutions and organisations, to ensure their work is in-line with YUS Landscape goals. Technical and financial support to TKCP-PNG is provided by WPZ on a regular and ongoing basis through a YUS Conservation Endowment and collaborative fundraising.

Overall strategic guidance of TKCP-PNG comes from the 5-yearly Landscape Plans, while annually the organisation is guided by an Annual Plan. TKCP-PNG is also locally advised by the landowner representative body, the YUS CO. During the current institutional building stage of the YUS CO, TKCP-PNG is providing direct capacity building support in a range of areas to the YUS CO: leadership development, agricultural extension, health training, strategy building, research skills, financial management, environmental education, grant writing, and business management. These are all in response to needs identified through workshops held throughout the year. In this regard, TKCP-PNG acts a 'facility': managing ongoing programs, responding to local community needs, and conducting research to fill information gaps where required.

Figure 1: Organisational structure of TKCP-PNG



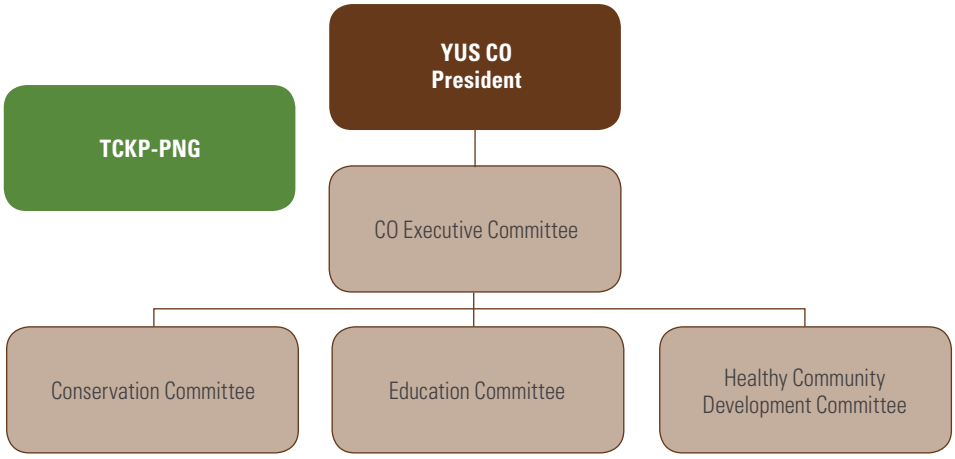
4.2.2 YUS Conservation Organisation (YUS CO)

The YUS CO serves as an advisory board to TKCP-PNG, and is also represented on the YUS CAMC for longer term strategy. The context of customary land tenure across the landscape necessitated the establishment of this representative body for landowner groups. It serves to provide communities with opportunities to advise on and participate in the programs across the landscape, and to develop and/or leverage technical and financial support for livelihoods development within their communities. The YUS CO is comprised of 48 landowner representatives and is registered under PNG law as an incorporated organisation. When a clan pledges land to the YUS CA, that clan is given the right to nominate a representative to the YUS CO. The goals of the YUS CO are to implement and guide TKCP-PNG in the following:

- To provide long-term management for the YUS CA;
- To build local capacity to address needs in conservation, education, healthcare, and community development;
- To promote environmental awareness and conservation of natural resources and wildlife for present and future generations;
- To network with partners such as NGOs, churches and governments to establish an effective YUS CA and to provide basic services and infrastructure to the community;
- To promote and facilitate research into the biological diversity of the YUS landscape for the benefit of the landowners, PNG and the world; and
- To promote and encourage equal participation by all clan members and genders in all activities related to achieving the objectives of the YUS CO in the YUS Landscape.

The YUS CO is led by an elected president, and a leadership group within the executive committee (Figure 2). The executive committee includes a chair, secretary, and women's representatives from each of the sub-committees, a public officer, auditor, and ex-officio advisors (TKCP-PNG staff). Below this committee are three sectoral sub-committees representing priorities in areas including enforcement, healthcare projects, community development and livelihoods. Each of the sub-committees collaborates closely with TKCP-PNG staff to guide and oversee activities in their area, and support the development of future activities through recommending priorities and development of the YUS CO Strategic Plan. The YUS CO Conservation Committee also works closely with TKCP-PNG to facilitate new land pledges and supports the work of the YUS Rangers.

Figure 2: Organisational structure of the YUS CO



4.2.3 YUS Conservation Area Management Committee (CAMC)

The YUS Conservation Area Management Committee (CAMC) was established as part of the Conservation Areas Act upon gazettal of the CA. The nine member management committee reflects the interests of the CA landowners, and the authorities that govern the area, through representation from the following organisations:

1. Three Executive Members, YUS CO.
2. District Administrator, Kabwum District or their nominee.
3. Program Advisor, Division of Mining, Natural Resources & Environment, Morobe Provincial Administration or their nominee.
4. Head, Terrestrial Environment Programs, PNG DEC or their nominee.
5. President, Yus LLG.
6. President, Wasu LLG.
7. Program Manager/Country Director, TKCP or their nominee.

The CAMC has the purpose of long term strategic planning. The CAMC serves both the Minister DEC for all national and international requirements, while concurrently serving the YUS landowners with strategic guidance, and organisational and policy support to protect and sustainably use resources.

Thus, the CAMC acts across all vertical and horizontal levels of government relating to the landscape. The CAMC meets twice a year to collate reports and data, and to discuss and respond to any development or alteration of land use that may have/be arising across YUS. Any development applications or actions that could be in breach of either the Landscape Plan or The Act are referred to the Minister DEC. During the fourth year of a five-year Landscape Plan, the CAMC also contributes to the formulation of the new Landscape Plan, and submits that to the Minister DEC for approval.

4.2.4 Woodland Park Zoo (WPZ)

The Woodland Park Zoo (WPZ) provides technical oversight and long term managerial and financial support to TKCP-PNG from Seattle, USA. WPZ also holds in trust and manages the YUS Conservation Endowment fund to meet some of the "core" costs for YUS Landscape Management. These core costs include TKCP staff in Lae and office running costs. WPZ along with the endowment provide substantive and vital support for YUS and TKCP-PNG, and is ultimately a key cog in the long term sustainability of the initiative. Within WPZ, a dedicated TKCP Department is housed within the Field Conservation Division of the zoo. The TKCP Department is the conduit and linkage among donors, research institutions and organisations for support to TKCP-PNG.

Land Use Planning. Photo: Ashley Brooks

Kiso and Timmy Sowang measuring montane rainforest trees for carbon study in Uruwa Zone. Photo: Michelle Venter

Strategy 1: YUS Conservation Area Management

Strategy 1: YUS Conservation Area Management

The eight programs that make up this Strategy, constitute the YUS CA Management Plan, and fulfil all obligations under the Act. The programs align with and add value to a range of local and national plans and international obligations (Annex 7).

- **S11: YUS Rangers**
- **S12: Enforcement**
- **S13: Ecosystem resilience and biodiversity conservation**
- **S14: Ecological monitoring and hunting**
- **S15: Signage, mapping and CA awareness**
- **S16: Fire management**
- **S17: Invasive species management**
- **S18: Reporting**

S11. YUS Rangers

The program is the backbone of YUS CA management and planning. The YUS Rangers program was inaugurated at Sapmanga Village in March 2012. The ecological monitoring, hunting surveys, and enforcement activities are carried out by YUS Rangers. The information they gather also underpins ecosystem conservation, signage and awareness raising, fire and invasive species management, and contributes to the ability of the CAMC to strategically plan, and respond to challenges across the landscape.

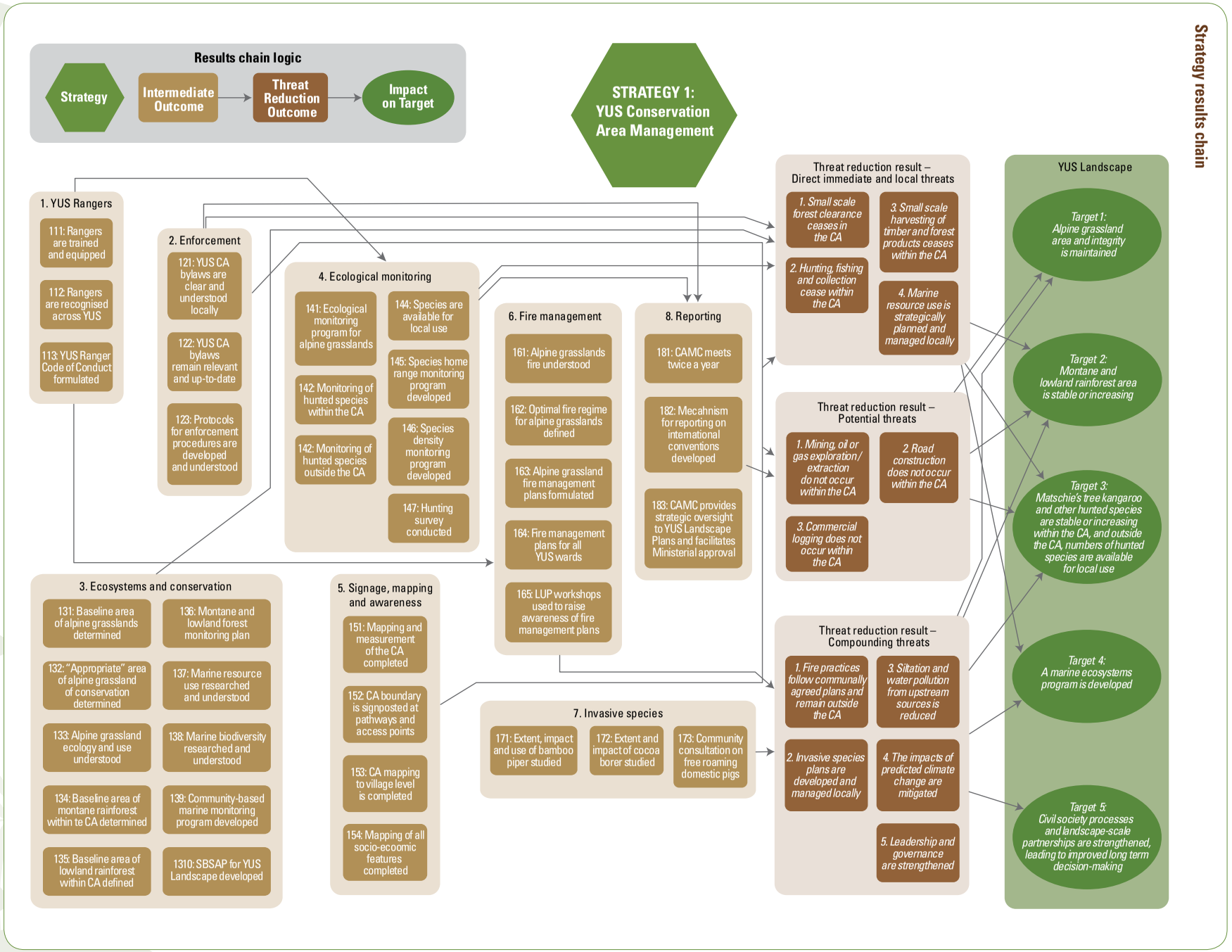
Through the CAMC, the rangers work ultimately contributes to recommendations to the Minister, DEC, as well as PNG's reporting on international environmental conventions.

In the year leading up to inauguration, James Cook University (JCU) designed an ecological monitoring program including a series of monitoring transects to be located across YUS (Map 4). Village leaders and landowners, where monitoring transects were to be located, then selected local candidates to be rangers for that region. The candidates were then trained by JCU in the establishment of monitoring plots, sampling and in supervision of additional workers. Candidates were typically trained at all transects across their respective region. At the end of the training period, 12 of the candidates were recruited and initiated as YUS Rangers in March 2012.

The overarching strength of the ranger program is that the rangers are nominated and selected locally, and they are also YUS landowners that generally patrol within and around their own land. Importantly this means that the rangers have the full support of their communities, and they are comprehensively aware of their landscape and the challenges present.

The initial cadre of 12 YUS Rangers will increase in size commensurate with need across the landscape. Thus as the ecological monitoring program expands to include additional ecosystems (e.g. marine, alpine, and lowland), and additional monitoring plots are established, new rangers will need to be recruited. The ranger program therefore offers a significant source of income into local communities.

Land Use Planning, Besnon Hamlet. Photo: Ashley Brooks


Strategy results chain
Results chain logic
Strategy
Intermediate Outcome
Threat Reduction Outcome
Impact on Target
STRATEGY 1: YUS Conservation Area Management
1. YUS Rangers
111: Rangers are trained and equipped
112: Rangers are recognised across YUS
113: YUS Ranger Code of Conduct formulated
2. Enforcement
121: YUS CA bylaws are clear and understood locally
122: YUS CA bylaws remain relevant and up-to-date
123: Protocols for enforcement procedures are developed and understood
4. Ecological monitoring
141: Ecological monitoring program for alpine grasslands
142: Monitoring of hunted species within the CA
142: Monitoring of hunted species outside the CA
144: Species are available for local use
145: Species home range monitoring program developed
146: Species density monitoring program developed
147: Hunting survey conducted
6. Fire management
161: Alpine grasslands fire understood
162: Optimal fire regime for alpine grasslands defined
163: Alpine grassland fire management plans formulated
164: Fire management plans for all YUS wards
165: LUP workshops used to raise awareness of fire management plans
8. Reporting
181: CAMC meets twice a year
182: Mecahnism for reporting on international conventions developed
183: CAMC provides strategic oversight to YUS Landscape Plans and facilitates Ministerial approval
3. Ecosystems and conservation
131: Baseline area of alpine grasslands determined
132: "Appropriate" area of alpine grassland of conservation determined
133: Alpine grassland ecology and use understood
134: Baseline area of montane rainforest within te CA determined
135: Baseline area of lowland rainforest within CA defined
136: Montane and lowland forest monitoring plan
137: Marine resource use researched and understood
138: Marine biodiversity researched and understood
139: Community-based marine monitoring program developed
1310: SBSAP for YUS Landscape developed
5. Signage, mapping and awareness
151: Mapping and measurement of the CA completed
152: CA boundary is signposted at pathways and access points
153: CA mapping to village level is completed
154: Mapping of all socio-ecoomic features completed
7. Invasive species
171: Extent, impact and use of bamboo piper studied
172: Extent and impact of cocoa borer studied
173: Community consultation on free roaming domestic pigs
Threat reduction result – Direct immediate and local threats
1. Small scale forest clearance ceases in the CA
2. Hunting, fishing and collection cease within the CA
3. Small scale harvesting of timber and forest products ceases within the CA
4. Marine resource use is strategically planned and managed locally
Threat reduction result – Potential threats
1. Mining, oil or gas exploration / extraction do not occur within the CA
2. Road construction does not occur within the CA
3. Commercial logging does not occur within the CA
Threat reduction result – Compounding threats
1. Fire practices follow communally agreed plans and remain outside the CA
2. Invasive species plans are developed and managed locally
3. Siltation and water pollution from upstream sources is reduced
4. The impacts of predicted climate change are mitigated
5. Leadership and governance are strengthened
YUS Landscape
Target 1: Alpine grassland area and integrity is maintained
Target 2: Montane and lowland rainforest area is stable or increasing
Target 3: Matschie's tree kangaroo and other hunted species are stable or increasing within the CA, and outside the CA, numbers of hunted species are available for local use
Target 4: A marine ecosystems program is developed
Target 5: Civil society processes and landscape-scale partnerships are strengthened, leading to improved long term decision-making

Strategy 1: YUS Conservation Area Management

In the initial stages of LP 1, the rangers are well equipped to carry out the ecological monitoring and hunting surveys started in 2012, and refine the reporting mechanisms with TKCP-PNG. The other programs will require some development leading in to LP 2. These include in particular in the areas of ecosystem conservation and management, and fire and invasive species management, where program objectives for LP 1 are principally about filling information gaps in order to develop long term objectives in LP 2.

Due to the incipient nature of the ecological monitoring, LP 1 will focus on testing and refinement of the ecological monitoring program, while leaving explicit focus on law enforcement by rangers to begin in LP 2. The period of LP 1 must therefore include training for rangers in managing and responding to people and CA violations, as well as the formulation of a ranger Code of Conduct to guide professionalism and integrity of rangers in their work.

Code	Objective 1	Activities	Indicators
S111	Ongoing, through to 2016, rangers are fully trained, equipped and compensated for their work.	Rangers are paid, and trained as required. Additional rangers are recruited as required or reflecting need across the landscape.	Ranger reports. Rangers continue to conduct their patrols and all reporting requirements. Ranger requests / concerns are resolved.

Code	Objective 2	Activities	Indicators
S112	By 2015, rangers are recognised across YUS and are supported by all levels of government.	Ranger uniforms. Ranger logo designed. Ranger ID cards. Gazettal of bylaws.	YUS Rangers program is cited in LLG and District 5 year plans.

Code	Objective 3	Activities	Indicators
S113	By 2016, rangers are conducting their duties professionally.	Ranger training in dealing with people. YUS Ranger Code of Conduct developed with rangers and community leaders.	Training conducted. Complaints against rangers.

S12. Enforcement

The overarching purpose of the enforcement program is to ensure that there is compliance with the bylaws developed to govern the YUS CA. The YUS Rangers are principally mandated with enforcement of the bylaws. The program is therefore strongly linked to ranger patrols, and the ecological monitoring program. Key challenges in the first three years of implementation will revolve around clear delineation of the CA and awareness of local landowners to both CA boundaries and the rules and restrictions that apply. As such, the program will seek in the first three years (LP 1) to focus on raising awareness of CA governance overall, and encourage positive engagement with communities. Throughout the program, rangers' data and feedback from community workshops and consultations will be used to draft and pilot an enforcement framework. This will involve consideration for verification of bylaw violations; process of appeal; collection and payment of fines; and referral to and representation at village or higher level courts (following customary procedures). The framework will also include a code of conduct for rangers. Beyond the first three years (LP 2), the enforcement program will begin in earnest.

Nambis Zone. Photo: Mark Ziembicki

Code	Objective 1	Activities	Indicators
S121	By 2016, YUS CA bylaws are clear and understood locally.	By 2015, the majority of pledged YUS CA areas across the landscape are mapped (via GPS). Production of clear maps of the CA for use at the village and ward level. Production of copies, and distribution of YUS CA bylaws. Rangers conduct regular community workshops to raise awareness of the YUS CA bylaws and recent events.	YUS CA data are collected and stored in mapping software. YUS CA maps produced. Re-gazettal of the CA. Leaflets/brochures of the CA bylaws produced and distributed. Ranger community meetings held. # infractions.

Code	Objective 2	Activities	Indicators
S122	By 2016, YUS CA bylaws are relevant and up to date.	Evaluate bylaw applicability and add / amend where required (e.g. addition of marine bylaws; rules around signage).	Evaluation conducted. Amendments made. Bylaws re-gazetted.

Code	Objective 3	Activities	Indicators
S123	By 2016, YUS rangers in partnership with TKCP officers and communities have developed a protocol for enforcement of bylaws.	By 2014, rangers have substantive event book data and community consultations such that draft protocol can be formulated for discussion. Local piloting of protocol and mechanisms for enforcement and reporting. Formalise protocol within LP 2.	Collection of ranger patrol data. TKCP and ranger workshop. Community workshop reports. Protocol is formulated and agreed by communities. Protocol is in LP 2.

S13. Ecosystem resilience and biodiversity conservation

The natural ecosystems of YUS are the foundation for life and opportunity for all the communities across the landscape. The diverse ecosystems provide immense direct benefits in goods and services, and have sustained generations of families. The unique island biogeographic context of the region has also meant that the ecosystems exhibit high levels species endemism. While the current context at the landscape level is favourable: a low population density (~6.2 people/km^2), and an almost completely unbroken, unoccupied tract of primary rainforest covering 1,113km^2, history and evidence suggests these ecosystems, and all they support, are at risk. The primary threats to the ecosystems highlight their local and economic value: small-scale clearance for agriculture, subsistence hunting and marine ecosystem use, selective harvesting of timber, and commercial logging. And as ecosystem resilience gradually decreases due to these actions, they become increasingly vulnerable to secondary threats such as fire, invasive species, and climate change. Potential for significant impacts and ecosystem loss are further exacerbated by rapid population growth, and weak or lack of sustainable resource management locally.

The Landscape Plan recognises the dual socio-economic and ecological values of the ecosystems across YUS, and the work required sustaining these values in perpetuity. This is fundamentally reflected in the Vision and the five management Targets to 2025. Recognition of the ecosystem values comes from over 16 years of scientific research, and direct and ongoing community collaboration.

The purpose of the Ecosystem Resilience and Conservation Program is to ensure that both ecological values and human needs are sustained. However it is recognised that much of the biodiversity and ecology of species and ecosystems across YUS remains poorly understood. The focus in LP 1 is filling information gaps on biodiversity and ecosystem processes for the target ecosystems: alpine grassland, rainforest, and marine. LP 1 thus sets the foundation for a strategic program in LP 2 and beyond that ensures resilience and connectivity of ecosystems, while allowing for sustainable use.

For alpine grasslands and rainforests, the key challenge is defining the baseline area of the ecosystems. This is due to the fact that existing satellite imagery and mapping data are at coarse scales, making ecotones difficult to identify. This is particularly the case where a forest is immediately adjacent to grassland, or proximate to a village/livelihood area. In such cases, the forest is often used in some way by local people (e.g. shade grown coffee, forest garden mosaics), and such forests are impossible to distinguish on remotely sensed imagery. A further compounding factor is that many of the ecosystems to be pledged for conservation, have not yet been mapped. This process will be complete by end 2015 concurrent with the Land-Use Planning and Management Program.

Strategy 1: YUS Conservation Area Management

Alpine grasslands: anecdotal evidence suggests that the four alpine grassland areas, two in Yopno, and two in Uruwa (Map 5) have both cultural and ecological significance. While some discussion continues around whether the alpine grassland areas are natural or anthropogenic, it is evident that they are a distinct vegetation community to the grassland areas at lower altitudes. Culturally the areas are burnt periodically and wildlife hunted. Biologically they contain potentially rare conifer and grassland ecosystems, and tree kangaroos, among other mammals, are thought to forage across them. Key objectives in LP 1 are to measure the area, determine the cultural significance and traditional use of fire, ecological characteristics and importance, and ultimately to determine the appropriate area needed within the CA to sustain both socio-economic and ecological requirements.

Alpine Grasslands near Uli Monji Mountain. Photo: Ashley Brooks

Rainforests (montane and lowland): multiple studies in forest composition, habitat requirements of species, human use of forests, and in climate related areas, have been conducted across YUS. The vastness and diversity of the forest estate across YUS has meant that much remains unknown around species composition, resilience and succession following disturbance, vulnerability to climate change, invasive species and fire, and ecological relationships with fauna. While, many of these questions are covered in ongoing research and in Strategy 2 (Research), the priorities for LP 1 are to define the baseline area of montane and lowland forests within the CA, and to develop a monitoring plan for forests and land cover across the landscape. LP 1 is thus the first step toward being able to identify where change is occurring, where key threats are, and where to direct management responses to protect critical habitat and ecosystems into and beyond LP 2.

Montane Rainforest. Photo: Ryan Hawk

Marine ecosystems: anecdotally there are significant ecosystems and species in existence in the coastal area of YUS Landscape. These significant ecosystems are also linked directly with local livelihoods/subsistence. There is also recognition that actions in the terrestrial area of YUS will have an impact on the marine ecosystems and vice versa (For example an increase in terrestrial CA area may lead to an increase in marine resource use). Hence the need to implement programs to respond to threats to both biological and socio-economic values of the marine area. LP 1 therefore seeks to fill information gaps about the importance of marine ecosystems for subsistence and livelihoods locally, as well as to understand the marine ecosystems present (through mapping reefs, sea grasses and turtle nesting sites, biodiversity surveys, and identification of threats).

As LP 1 fills information gaps on biodiversity locally, it also offers an opportune foundation for the formulation of a Subnational Biodiversity Strategy and Action Plan (SBSAP). SBSAPs generally contribute to National Biodiversity Strategies and Actions Plans (NBSAP), which are the principal instrument for implementing the CBD nationally.

Overall NBSAPs outline strategies for mainstreaming biodiversity conservation into planning processes across all sectors. PNG completed a summary version of its NBSAP in 2007, however a complete NBSAP has never been formally released. Increasingly, where an NBSAP does not exist, SBSAPs are developed at state, provincial, local and city levels globally. The YUS Landscape is therefore well placed to develop the country's first SBSAP, and each of the programs within Strategy 1 offer significant potential for success and replication nationally. The final objective of the Ecosystem Resilience Program is therefore to use the information collected to facilitate and develop an SBSAP for the YUS Landscape and LLGs of Yus and Wasu.

Code	Objective 1	Activities	Indicators
S131	By 2015, establish baseline area of the four alpine grasslands.	• Develop methodology for calculating and monitoring area of grassland in Ha. • Develop methodology for monitoring change to area of alpine grassland.	• Methodology developed. • Baseline calculated.

Code	Objective 2	Activities	Indicators
S132	By 2015, define "appropriate" area of alpine grassland for conservation.	• Engage a researcher to study alpine grassland use. • Assess alpine grassland based on consideration of: ecological, cultural, livelihood, and intrinsic values.	• Research report. • Area in Ha calculated. • Research reports.

Code	Objective 3	Activities	Indicators
S133	By 2015, gain understanding of alpine grassland ecology (structure, density, composition) and use.	• Engage a researcher to study alpine grassland ecology. • Define indicator species for monitoring change. • Identify species of conservation concern. • Assess linkages with livelihoods and alpine grass usage.	• Alpine grassland study report.

Code	Objective 4	Activities	Indicators
S134	By 2015, define baseline area of montane rainforest within the Conservation Area.	• Use remote sensing and ARCGIS to determine area of montane forest within CA (pledged land). • Facilitate accurate mapping and measurement of pledged lands during and between LUP workshops at the ward level. • Amend and update baseline area as required.	• Ha of forest within pledged lands/CA. • Areas pledged are mapped and area calculated. • Changes made to baseline target every 5 years.

Code	Objective 5	Activities	Indicators
S135	By 2015, define baseline area of lowland rainforest within the Conservation Area.	• Use remote sensing and ARCGIS to determine area of lowland forest within CA (pledged land). • Facilitate accurate mapping and measurement of pledged lands during and between LUP workshops at the ward level. • Amend and update baseline area as required.	• Ha of forest within pledged lands/CA. • Areas pledged are mapped and area calculated. • Changes made to baseline target every 5 years.

Code	Objective 6	Activities	Indicators
S136	By 2016, develop a montane and lowland forest and land cover area monitoring plan.	• Pilot the forest area and land cover monitoring plan in Wards that have completed their LUP.	• Forest and land cover area monitoring plan developed using remotely sensed imagery and analysis. • Monitoring of forest area and land cover for Wards that have completed their LUP. • Any follow-up steps taken to respond to significant changes should be incorporated into the monitoring plan.

Code	Objective 7	Activities	Indicators
S137	By 2014, understand marine resource use.	• Socio-economic, consumption and use survey of marine resources.	• What is used/caught • Use intensity • Consumption patterns • Methods for catching • Any cash income • Effort used • Importance

Code	Objective 8	Activities	Indicators
S138	By 2015, understand marine biodiversity.	• By 2014, marine survey completed. • Marine ecosystems and turtle nesting sites mapped.	• Biodiversity survey. • Threat assessment. • Maps of ecosystems and habitat and nesting sites.

Code	Objective 9	Activities	Indicators
S139	By 2015, formulate and pilot a community-based marine monitoring program.	Identify and train a local person to be a marine ranger. Gain community support for protected marine ecosystems and zones. Raise awareness of protected marine ecosystems and zones through signage.	Monitoring program. Indicator species identified. Beach signage in place and locally maintained. Buoys in place and locally maintained. Numbers of indicator species.

Code	Objective 10	Activities	Indicators
S1310	By 2016, develop an SBSAP for the YUS Landscape.	By 2016, the SBSAP is developed concurrent with formulation of Strategy 1 within LP 2.	SBSAP completed and submitted to PNG CBD focal point. YUS SBSAP listed / available on CBD website.

S14. Ecological monitoring and hunting

The Ecological Monitoring and Hunting program includes two linked initiatives conducted by YUS Rangers: monitoring of hunted species; and ongoing surveying of hunters. Ecological monitoring focuses on three general taxa (macropod, possum/cuscus and cassowary) comprising several species (Table 11).

Table 11: Ecological monitoring target species

Taxa	Latin / scientific name	English name
Macropods	*Dendrolagus matschiei*	Huon, Matschie's Tree Kangaroo
	Dorcopsulus vanheurni	Small Dorcopsis
	Thylogale browni	New Guinea Pademelon
Possums / cuscus	*Phalanger carmelitae*	Mountain Cuscus
	Phalanger gymnotis	Ground Cuscus
	Pseudochirulus forbesi	Painted Ringtail Possum
	Dactylopsila palpator	Long-fingered Triok
	Dactylopsila trivirgata	Striped Possum
	Spilocuscus maculatus	Spotted Cuscus
	Pseudochirops corinnae	Plush-coated Ringtail Possum
Cassowary	*Casuarius bennetti*	Dwarf Cassowary

Monitoring design is based on 12 transects distributed across the landscape (Map 4), ranging in elevation from 400m to 3,200m. Each transect consists of four plots stratified at increasing distance from a village (considered a cline in decreasing hunting intensity). The two furthest plots are at the same functional distance from the village, with one being inside the CA and the other outside. The sampling method for the focal taxa is based on scat counts as a proxy of relative abundance.

The strength of the method is that it can be employed without specialised training and equipment, and may be used to survey several taxa at one time. In addition, the technique also allows for the opportunistic detection of several other non-target species, and others that are difficult to detect or are rare across YUS. The methodology is predicated on the assumption that a cessation of hunting in the CA will lead to an increase in scat counts inside monitoring plots there. Increasing numbers and range of species inside the CA, gives an indication of the effectiveness of the CA, while stable or increasing numbers of species outside the CA may indicate that harvesting/hunting intensity is sustainable, or populations are recovering and moving outside the CA to forage and closer to villages.

The overall purpose of the Ecological Monitoring and Hunting program is to monitor the effectiveness of the CA overall, assess contribution to the achievement of management targets, and ultimately to ensure viable populations of hunted species are maintained across the landscape.

The focus of ecological monitoring in LP 1 involves determining confident population baseline estimates, establishing new plots and transects in additional ecosystems, and expanding the monitoring to include density data and new taxa as required. Concurrent with the ecological monitoring is the hunting survey. As part of this, selected hunters across YUS will record all their personal hunting activity. The objective of the hunting survey is to gain a comprehensive understanding of hunting intensity, what is hunted, and when, where, why and how. The information will be used to model greatest hunting pressure and threats across YUS, to triangulate and help interpret ecological monitoring data, and to gain an understanding of the sustainability of harvest and eliminating the need for people to return to the CA to hunt to meet basic needs.

Code	Objective 1	Activities	Indicators
S141	By 2016, formulate and begin implementation of ecological monitoring program for the four alpine grassland areas.	• Develop and pilot alpine grassland monitoring program for both ecology and spatial change. • Incorporate grassland monitoring into rangers' work plans as required.	• Plots established. • Transects established. • Monitoring protocol developed. • Monitoring incorporated into ranger work as required. • Monitoring incorporated into GIS work as required. • Rangers work plans reflect new responsibilities for grassland monitoring.

Code	Objective 2	Activities	Indicators
S142	By 2016, establish a viable ecological monitoring program for hunted species inside the CA.	• By 2016, increase accuracy of monitoring by increasing number of transects to 24. • By 2016, evaluate methodology and refine and / or add target taxa as required. • By 2016, establish confident baseline population numbers and update Goal accordingly.	• Number of transects. • 4 plots per transect (#1 closest to a village, #2 away from a village, #3 and #4 furthest from a village, with #3 in-line with #2 and outside CA, and #4 inside CA).

Code	Objective 3	Activities	Indicators
S143	By 2016, establish a viable ecological monitoring program for hunted species outside the CA.	• By 2016, increase accuracy of monitoring by increasing number of transects to 24. • By 2016, evaluate methodology and refine and / or add target taxa as required. • By 2016, establish confident baseline population numbers and update Goal accordingly.	• Number of transects. • 4 plots per transect (#1 closest to a village, #2 away from a village, #3 and #4 furthest from a village, with #3 in-line with #2 and outside CA, and #4 inside CA).

Code	Objective 4	Activities	Indicators
S144	Ensure that sustainable numbers of target taxa exist for local use.	• Conduct ongoing hunting survey in selected villages. • By 2015, determine key hunting pressures and ecosystems across YUS. • By 2016, establish estimates for the sustainable hunting of target species.	• Surveys conducted. • Number of animals hunted. • Distance travelled. • Time spent in field / hunting. • Location of hunting site. • Modelling of hunting threats across YUS.

Code	Objective 5	Activities	Indicators
S145	Establish a viable species density monitoring program.	• By 2016, use existing ecological monitoring transects and plots to develop density data for selected hunted species. • By 2016, establish a confident baseline of species density.	• Density monitoring incorporated into ecological monitoring program.

Code	Objective 6	Activities	Indicators
S146	Complete a comprehensive hunting survey.	• By 2015, complete analysis of ongoing hunting survey conducted by rangers. • By 2016, model hunting pressure and threats across YUS.	• Analysis of ranger record books completed. • Spatial model of hunting threats produced.

Strategy 1: YUS Conservation Area Management

S15. Signage, mapping and CA awareness

The Signage and Mapping program sets out to complete the mapping and delineating of the CA that began in 2004. It then uses the mapping to build awareness and recognition of CA boundaries through site-specific signage. Without accurate mapping it is impossible for locals and rangers to determine where the CA is, and therefore where and how to respond to bylaws and violations, or monitor species and ecosystems.

Due to the fact most people in YUS travel by foot, there is a widely used system of tracks between villages, to gardens, and other frequently accessed areas. As such there are a finite number of access points into and through the CA, and it is at these locations that CA signage will be erected. In some existing *tambu* areas, signs have already been erected to announce that the site is locally protected. YUS CA signboards are therefore in line with existing systems of delineating protected areas.

Code	Objective 1	Activities	Indicators
S151	By 2015, complete the mapping and measurement of the CA.	Use LUPs as a principal forum for getting and mapping new pledges. Facilitate pledging of corridors between CAs to ensure connectivity. Areas pledged are mapped and area calculated. Amend and update baseline area as required.	Pledges of new land. Forest and land cover area monitoring plan developed using remotely sensed imagery and analysis.

Code	Objective 2	Activities	Indicators
S152	By 2015, YUS CA boundary is signposted – at pathways, access points, and high use or critical areas (e.g. turtle nesting site).	By 2015, map all existing locations of access to and pathways into the CA across the landscape. By 2015, design and commission production of YUS CA signboards. By 2015, YUS CA signboards are erected.	Number of access points to YUS CA. Signboards designed and contract for production in place. Signboards in place.

Code	Objective 3	Activities	Indicators
S153	By 2015, complete the mapping of all village land boundaries.	Use LUPs as a principal forum for mapping village lands. Ensure inclusion of ward and LLG maps in LLG five year plans (2016-2020).	Villages across all wards are mapped. Complete YUS Landscape Map down to the village area level is included in LP 2. Yus and Wasu LLG 5 year plans (2016-2020) include completed ward level maps, as provided by TKCP.

Code	Objective 4	Activities	Indicators
S154	By 2015, complete mapping of socio-economic features across YUS.	Use LUPs as a principal forum for mapping features. Use existing information to map features.	All socio-economic features are up to date and data is stored in ARCGIS software.

S16. Fire management

Fire is an historical constant across the YUS Landscape, and represents a significant management challenge. Not only due it being an essential part of ecological processes, subsistence agricultural practices and in the daily lives of people across the landscape, but also due to the challenges of preventing and mitigating such a force across a large area, with minimal resources and substantial physical limitations. What is known is: that fire has played a major part in defining the YUS Landscape; that montane trees and forests are susceptible to death and conversion to grassland where fires occur in drought periods (During the El Niño period of 1997-1998, fire is suggested to have been the major factor in the partial of montane rainforest to grassland across YUS. While evidence from the field suggests many areas affected show signs of recovery, the scale of the impact highlights the vulnerability of forests to fire during dry periods); that montane forests can have slow rates of recovery following significant disturbance; and that the area of Som Zone grassland has possibly already undergone conversion to grassland, with the natural regeneration of secondary forest being suppressed (e.g. through fire).

Successful management of fire across YUS may greatly depend on education and outreach efforts around existing fire practices in and around the YUS CA and target forest types. There may also need to be comprehensive research into the minimal area of grassland required per household (to sustain sources of protein (i.e. wallabies), fibre and building materials) so as to make prudent management decisions relating to agro-forestry, reforestation, and ultimately the reduction in unnecessary burning of grassland that is a risk to forest edge, and forests overall.

The purpose of the Fire Management Program is to gain a fuller understanding of the context of fire practices across the landscape in order to develop a landscape level response that allows for fire without compromising the integrity of ecosystems, and to adequately develop an education and outreach program. Three key outcomes are planned in LP 1: understanding of alpine grassland fire history and ecology; facilitation of fire management plans at the ward level; and the integration of fire management into awareness raising initiatives.

Using findings from the Ecosystem Resilience Program (that looks at the linkages between the use of alpine grasslands and their unique ecology), the Fire Management Program will seek to understand historical burning patterns across the alpine ecosystems in order to determine optimal fire regimes there. The second key initiative is to facilitate ward level fire management plans. The key forum to facilitate these is the land-use planning workshops, where information on the importance of fire, and where and when existing burns take place will constitute the plan. This information will then be used by rangers and community leaders to raise awareness locally.

Code	Objective 1	Activities	Indicators
S161	By 2015, gain understanding of fire (frequency, extent, location) across each alpine grassland area.	• Conduct surveys with communities who own alpine grasslands to determine historical fire practices. • Use historical remote sensing imagery, as well as site-based surveying to determine historical fire practices.	• Survey report.

Code	Objective 2	Activities	Indicators
S162	By 2015, define the optimal fire regime for each alpine grassland area.	• Conduct surveys with communities who own alpine grasslands.	• Timing and location of fires noted and mapped.

Code	Objective 3	Activities	Indicators
S163	By 2016, formulate and begin implementing alpine grassland fire management plans as informed by grassland studies as required.	• Get official approval through the CAMC for the use of fire for managing the grasslands as required. • Facilitate changes to affected Ward LUPs (Ward 1, 5, 12, 13) as required. • Facilitate and complete any changes required to TKCP Constitution, and gazetted area of the YUS CA as required. • Conduct testing of grassland (area, ecology, and use) and fire monitoring in the 6 months leading up to LP 2. • Incorporate alpine grassland fire management regimes into Goals of LP 2.	• Legislative Council gazettal allowing fire. • Area of grassland. • Ecological monitoring reports. • Human use reports. • Number of fires. • Extent of fires. • Frequency of fire. • Cause of fire.

Code	Objective 4	Activities	Indicators
S164	By 2015, facilitate the development of fire management plans for 100% of YUS wards.	• Use LUP workshops as the key forum to facilitate the fire management plans. • Map all areas designated for prescribed burning.	• Fire management plan exists on all LUP posters. • Prescribed burning areas and timing of burning are mapped and noted on LUP posters.

Code	Objective 5	Activities	Indicators
S165	By 2015, use ward level fire management plans and LUP maps as a source of information for raising awareness of agreed fire practices.	• Information and maps is made available to rangers and community leaders to disseminate locally.	• Number of unplanned fires.

S17. Invasive species management

The two most widely recognised invasive species across YUS are pigs and the South American plant, bamboo piper *(Piper aduncum)*. While pigs (domestic and wild) are inextricably linked to households and culture across most of YUS, they are also recognised as having significant negative impact to gardens and forests. Bamboo piper on the other hand is a more recent introduction that has not cemented such a position within local communities, and seems predominantly used as fast burning firewood. The invasive shrub thrives in agricultural or disturbed forest margins and is known to cause significant ecological harm. Evidence of invasive weeds is widespread across YUS, with local people able to point out entire hillsides invaded by unwanted shrubs. Cocoa borer is an additional invasive species in the Nambis Zone which has potential to curtail development of a cocoa extension program there.

The lack of national frameworks to manage and contain invasive species in PNG means that any management actions taken in YUS will be a national first in a protected area, and contribute to a model for national biosecurity planning and management.

The purpose of the Invasive Species Management program in LP 1 is threefold: to gain an understanding of the extent of, impacts and uses of bamboo piper in order to develop a management response; to understand the extent and potential impact of cocoa borer in the Nambis Zone; and to assess community attitudes to management of free roaming domestic pigs.

The current state of bamboo piper across YUS is largely unknown, and community consultation and mapping is required to fill this information gap, and to develop a feasible management response in LP 2. Free roaming domestic pigs are locally recognised to cause significant damage in and around villages, and in many villages gardens are fenced and pigs are now being penned in to prevent their impact. Continuing this existing community-based action, LP 1 will seek to gauge communities' willingness across the landscape to adopt such a program overall. The key forum to facilitate discussion and potential management responses to bamboo piper, cocoa borer and pigs is the land-use planning workshops.

Code	Objective 1	Activities	Indicators
S171	By 2016, conduct community consultation on the extent, impact, and use of bamboo piper.	• Use the LUP workshops as the key forum to facilitate discussion and identify and map areas of bamboo piper and highest impact. • Select wards for piloting of bamboo piper management program in LP 2. • Bamboo piper management plan developed for LP 2.	• Map of bamboo piper extent produced. • Pilot wards volunteer to participate in management plan. • Bamboo piper management plan.

Code	Objective 2	Activities	Indicators
S172	By 2016, conduct community consultation on the extent and impact of cocoa borer.	• Use the LUP workshops as the key forum to facilitate discussion and identify locations of infestation and impact. • Cocoa borer management plan developed for LP 2.	• Nambis Zone wards volunteer to participate in management plan. • Cocoa borer management plan.

Code	Objective 3	Activities	Indicators
S173	By 2016, conduct community consultation on potential for control of free roaming pigs across all YUS villages.	• Use the LUP workshops as the key forum to facilitate discussion on controlling free roaming pigs.	• Number of villages controlling domestic pigs.

Torik Village Land Use Planning. Photo: Ashley Brooks

S18. Reporting

One of the key obstacles to effective protected area management in PNG is the gap between what is occurring on the ground and the decision-makers at higher levels of government. As long as this gap and the lack of reporting exist, government planners at the provincial and national levels are unable to formulate budgets that reflect the needs on the ground, nor are they able to monitor outcomes and report on national targets and international obligations. A process for integrating protected area outcomes into higher level sectoral plans and policies currently does not exist. The onus is therefore on the managers of YUS CA, as the first CA in the country, to develop this process. The architecture is already in place through the YUS Rangers, the CAMC and the Minister DEC. The rangers collect data and the CAMC reports to the Minister.

The purpose of the Reporting Program is to develop and enhance the *linkages* among these three bodies, whilst fulfilling the basic reporting requirements of the Act. Building these linkages will come from three key outcomes: first the ongoing support to the functioning of the CAMC, and ensuring that data collected by rangers and presented to the CAMC can be used to inform YUS Landscape strategies and for annual submissions to the Minister DEC; second, that a national mechanism for reporting on international obligations is piloted at YUS and facilitated by the CAMC; and third that the CAMC continues to provide the strategic oversight to annual and 5-yearly landscape planning, and ensures Ministerial approval as required.

Code	Objective 1	Activities	Indicators
S181	The CAMC has an approved constitution and meets twice a year.	• CAMC receives, considers and acts on requests or challenges from YUS as required. • Data from rangers are periodically collected, collated, synthesized and analysed by TKCP, and presented to CAMC. • CAMC submits annual reports to the Minister DEC.	• Meetings held. • Constitution approved. • Ranger reports received and presented to the CAMC. • Reports to the Minister. • Landscape Plans and YUS CA plans approved by Minister as required. • Reports to YUS stakeholders. • Reports to Minister. • LP 2 is approved by the Minister.

Code	Objective 2	Activities	Indicators
S182	By 2014, a mechanism for reporting on international environmental obligations is developed and piloted.	• Guidelines sought from national CBD, CITES, CMS representatives in Port Moresby. • By 2014, working with YUS Rangers and TKCP, CAMC defines guidelines / requirements for field-based data collection. • By 2014, CAMC develops and pilots a model mechanism for reporting on international environmental obligations – from the CA to the Minister DEC.	• Guidelines established. • Monitoring and reporting protocol developed. • Initial report submitted to the Minister DEC.

Code	Objective 3	Activities	Indicators
S183	CAMC provides strategic oversight to 5-yearly YUS Landscape Plans and facilitates Ministerial approval.	• By 3rd quarter 2015, LP 2 is submitted to the CAMC for strategic oversight and submission to Minister DEC.	• Landscape Plans approved by Minister DEC.

2

Strategy 2: Research to inform resource and landscape management

Strategy 2: Research to inform resource and landscape management

The Research Strategy consists of seven programs that cover the full gamut of research fields that feed into and inform the direction of many YUS Landscape programs into the future. Much of the research is a continuation of the work conducted over many years across the YUS Landscape, and will continue to foster existing and new institutional partnerships to ensure scientific rigour and local relevance. The information gained across each of the programs also contributes to multiple government plans and international obligations (Annex 7).

S21: Research collaboration

S22: Hunted species

S23: Ecosystems

S24: Marine and aquatic systems

S25: Social / anthropology

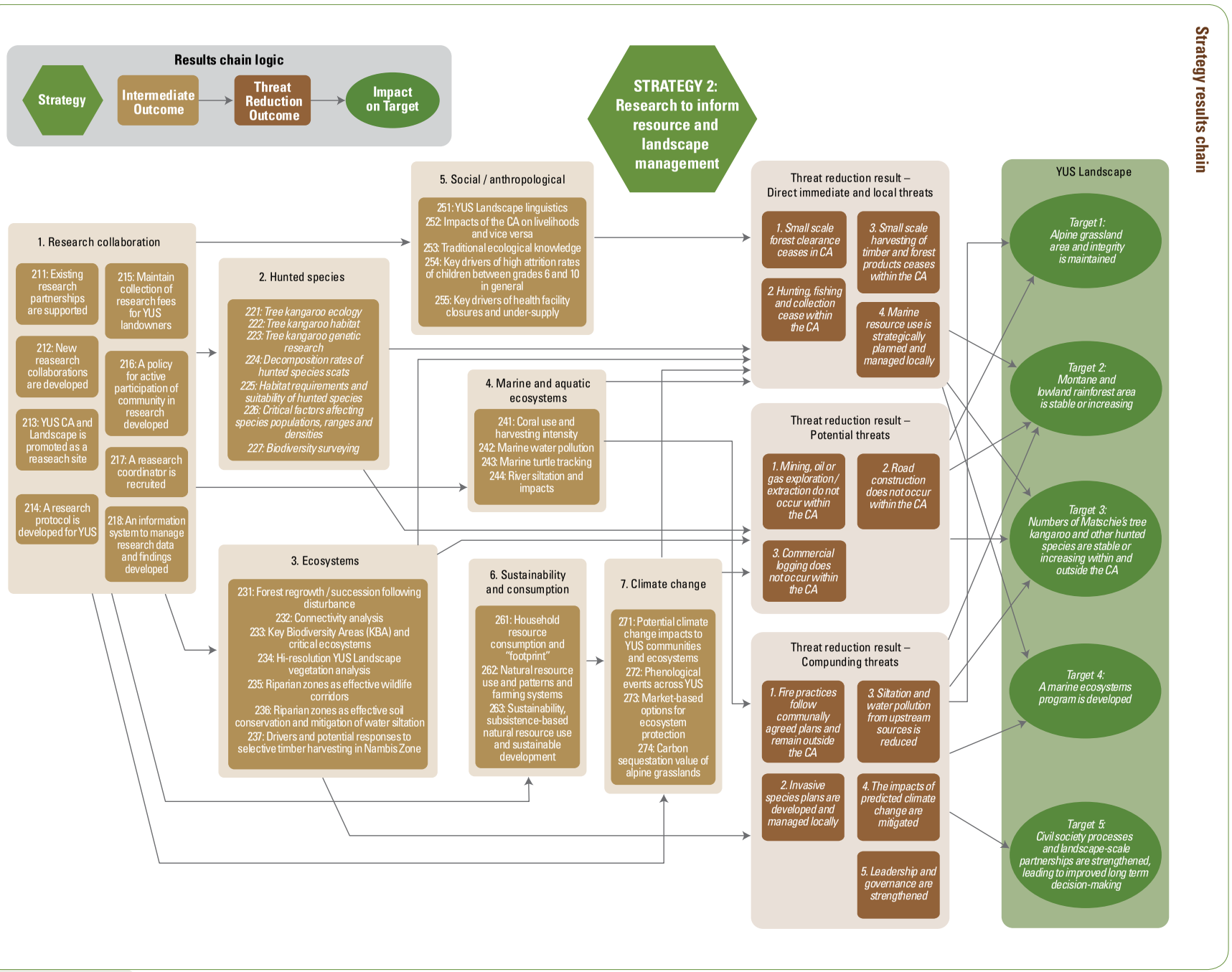
S26: Sustainability

S27: Climate change

In programs 2 – 7 the activities are not listed as they are broadly the same for each program: develop the research project; engage an individual or institution (in-house or external) to conduct the study; then ensure that completed research findings are stored in a database and can be applied to ongoing/ future YUS Landscape strategies and programs.

The list of research fields is not exhaustive and the Strategy will continue to allow for and facilitate new research fields outside this basic framework as required. Many of the research fields listed are not mutually exclusive of other Programs and Strategies, and all will contribute specific programs in Strategies 1, 3 and 4. However, if any proposed research field does not proceed, it will not compromise the ability of an existing Program to function. Where a research field is a fundamental part of the achievement of a specific Program, then that research is already listed as an objective within that Program.

Ronji. Photo: Mark Ziembicki


Strategy results chain
Results chain logic
Strategy
Intermediate Outcome
Threat Reduction Outcome
Impact on Target
STRATEGY 2: Research to inform resource and landscape management
1. Research collaboration
211: Existing research partnerships are supported
212: New reasearch collaborations are developed
213: YUS CA and Landscape is promoted as a reaseach site
214: A research protocol is developed for YUS
215: Maintain collection of research fees for YUS landowners
216: A policy for active participation of community in research developed
217: A reasearch coordinator is recruited
218: An information system to manage research data and findings developed
2. Hunted species
221: Tree kangaroo ecology
222: Tree kangaroo habitat
223: Tree kangaroo genetic research
224: Decomposition rates of hunted species scats
225: Habitat requirements and suitability of hunted species
226: Critical factors affecting species populations, ranges and densities
227: Biodiversity surveying
3. Ecosystems
231: Forest regrowth / succession following disturbance
232: Connectivity analysis
233: Key Biodiversity Areas (KBA) and critical ecosystems
234: Hi-resolution YUS Landscape vegetation analysis
235: Riparian zones as effective wildlife corridors
236: Riparian zones as effective soil conservation and mitigation of water siltation
237: Drivers and potential responses to selective timber harvesting in Nambis Zone
4. Marine and aquatic ecosystems
241: Coral use and harvesting intensity
242: Marine water pollution
243: Marine turtle tracking
244: River siltation and impacts
5. Social / anthropological
251: YUS Landscape linguistics
252: Impacts of the CA on livelihoods and vice versa
253: Traditional ecological knowledge
254: Key drivers of high attrition rates of children between grades 6 and 10 in general
255: Key drivers of health facility closures and under-supply
6. Sustainability and consumption
261: Household resource consumption and "footprint"
262: Natural resource use and patterns and farming systems
263: Sustainability, subsistence-based natural resource use and sustainable development
7. Climate change
271: Potential climate change impacts to YUS communities and ecosystems
272: Phenological events across YUS
273: Market-based options for ecosystem protection
274: Carbon sequestation value of alpine grasslands
Threat reduction result – Direct immediate and local threats
1. Small scale forest clearance ceases in CA
2. Hunting, fishing and collection cease within the CA
3. Small scale harvesting of timber and forest products ceases within the CA
4. Marine resource use is strategically planned and managed locally
Threat reduction result – Potential threats
1. Mining, oil or gas exploration / extraction do not occur within the CA
2. Road construction does not occur within the CA
3. Commercial logging does not occur within the CA
Threat reduction result – Compunding threats
1. Fire practices follow communally agreed plans and remain outside the CA
2. Invasive species plans are developed and managed locally
3. Siltation and water pollution from upstream sources is reduced
4. The impacts of predicted climate change are mitigated
5. Leadership and governance are strengthened
YUS Landscape
Target 1: Alpine grassland area and integrity is maintained
Target 2: Montane and lowland rainforest area is stable or increasing
Target 3: Numbers of Matschie's tree kangaroo and other hunted species are stable or increasing within and outside the CA
Target 4: A marine ecosystems program is developed
Target 5: Civil society processes and landscape-scale partnerships are strengthened, leading to improved long term decision-making

Strategy 2: Research to inform resource and landscape management

S21. Research collaboration

The cornerstone of research across YUS is the maintenance of effective institutional collaborations for research. This can only occur through two interlinked actions: maintaining existing partnerships and fostering new ones; and maintaining YUS community support for research overall.

In responding to the need for partnerships, the Research Collaboration Program in LP 1 aims to: continue to raise the profile of the YUS CA and Landscape as a site for research for national and international scientists; complete and develop the network of research stations and facilities across YUS; and to strengthen existing partnerships through joint submission of research grant proposals.

The Research Collaboration Program also aims to maintain community support for research through: the formulation of research protocols for outside researchers; the continuation of research fees for landowners; the promotion of local community members to participate in research efforts; and the development of an information/data management system that allows for community access and ownership.

A key objective in LP 1 is the recruitment of a devoted research coordinator at TKCP to oversee the Research Program.

Code	Objective 1	Activities	Indicators
S211	On an ongoing basis, continue to support existing research collaborations.	Continue to exchange information. Identify potential sources of grant funding. Develop strategy to apply for grant funding and follow-up. Joint development of research grants and funding proposals.	Continuation of existing partnerships. Grants submitted.

Code	Objective 2	Activities	Indicators
S212	On an ongoing basis, support new research partnerships.	Identify potential institutions and scientists for YUS-based research collaboration. Actively seek collaboration with identified / interested agencies.	Approaches by new institutions / scientists.

Code	Objective 3	Activities	Indicators
S213	On an ongoing basis, promote YUS CA and Landscape as a research site.	Develop promotional material for dissemination to relevant networks. Develop and facilitate a dissemination workshop in partnership with OCCD and DEC on climate research across YUS. Identify relevant networks to promote YUS landscape to researches. Actively seek collaboration with identified / interested agencies. Organise data (bioclimatic, species list, geology, sociology etc.) of sites within YUS to promote outside research interest.	Conference presentations. Funding sourced and dissemination workshop completed. Information disseminated to relevant networks. Approaches / interest by scientists. New research planned, field studies implemented, papers published. Data organised.

Code	Objective 4	Activities	Indicators
S214	By 2014, develop research protocol for external researchers in YUS.	Work with existing partners and YUS communities to formulate policies and guidelines for researchers.	Protocol developed.

Code	Objective 5	Activities	Indicators
S215	On an ongoing basis, maintain and manage the research fee for landowners initiative.	Ensure researchers pay fees to landowners and the YUS CA. Refine program as required to ensure effective implementation and transfer of fees.	Fees paid and accounted for.

Code	Objective 6	Activities	Indicators
S216	By 2015, formulate a policy to promote the participation of community members in research.	Training provided to community. Awareness raising of research across YUS. Develop a policy to ensure community collaboration on research projects.	Training provided. Policy developed. Community participation.

Code	Objective 7	Activities	Indicators
S217	By 2014, recruit a research coordinator.	Secure funding. Advertise and recruit suitable candidate.	Research coordinator recruited.

Code	Objective 8	Activities	Indicators
S218	By 2015, develop an information system to manage research data and findings.	Research coordinator develops database and system allowing for YUS CO access and dissemination to communities.	Data management system developed.

S22. Hunted species

Code	Research field 1	Indicative timing	Program linkages	
S221	Tree kangaroo ecology.	Ongoing	YUS Rangers Ecosystem Resilience Reporting	Enforcement Ecological monitoring

Code	Research field 2	Indicative timing	Program linkages	
S222	Tree kangaroo habitat.	Ongoing	YUS Rangers Ecosystem Resilience Reporting	Enforcement Ecological monitoring

Code	Research field 3	Indicative timing	Program linkages	
S223	Tree kangaroo genetic research.	Ongoing	YUS Rangers Ecosystem Resilience Reporting	Enforcement Ecological monitoring

Code	Research field 4	Indicative timing	Program linkages	
S224	Decomposition rates of hunted species scats.	Ongoing	YUS Rangers	Ecological monitoring

Code	Research field 5	Indicative timing	Program linkages	
S225	Habitat requirements and suitability of hunted species.	Ongoing	YUS Rangers Ecological monitoring	Ecosystem resilience

Code	Research field 6	Indicative timing	Program linkages	
S226	Critical factors affecting species populations, ranges and densities.	Ongoing	YUS Rangers Ecological monitoring	Ecosystem resilience

Code	Research field 7	Indicative timing	Program linkages	
S227	Biodiversity surveying.	Ongoing	YUS Rangers Ecological monitoring	Ecosystem resilience Reporting

S23. Terrestrial Ecosystems

Code	Research field 1	Indicative timing	Program linkages
S231	Forest regrowth / succession following disturbance (rates of change, identification of ecotones, climax communities, and primary vs. secondary forests).	Ongoing	Ecosystem resilience Signage, mapping and awareness Land Use Planning Sustainable resource use

Code	Research field 2	Indicative timing	Program linkages
S232	Connectivity analysis.	By 2016	Ecosystem resilience Ecological monitoring

Code	Research field 3	Indicative timing	Program linkages
S233	Identification of Key Biodiversity Areas (KBA) and critical ecosystems / habitats.	By 2016	YUS Rangers Ecosystem resilience Ecological monitoring Signage, mapping and awareness.

Code	Research field 4	Indicative timing	Program linkages
S234	Expand the Stabach et al (2009) vegetation analysis to the YUS Landscape scale (using hi-resolution remote sensing data and ground truthing).	By 2015	Ecosystem resilience Signage, mapping and awareness Fire management Invasive species management Land Use Planning Sustainable Resource Use

Code	Research field 5	Indicative timing	Program linkages
S235	Riparian zones as effective wildlife corridors.	By 2016	Ecological monitoring Ecosystem resilience Land Use Planning Sustainable Resource Use

Code	Research field 6	Indicative timing	Program linkages
S236	Riparian zones as effective soil conservation and mitigation of water siltation.	By 2016	Ecological monitoring Ecosystem resilience Land Use Planning Sustainable Resource Use

Code	Research field 7	Indicative timing	Program linkages
S237	Drivers and potential responses to selective timber harvesting in the Nambis Zone.	By 2016	Ecosystem resilience Land Use Planning Sustainable Resource Use

S24. Marine and aquatic ecosystems

Code	Research field 1	Indicative timing	Program linkages
S241	Coral use and harvesting intensity.	By 2015	Ecosystem resilience Sustainable resource use

Code	Research field 2	Indicative timing	Program linkages
S242	Marine water pollution.	By 2015	Ecosystem resilience Land use planning

Code	Research field 3	Indicative timing	Program linkages
S243	Marine turtle tracking.	By 2016	YUS Rangers Enforcement Ecosystem resilience Ecological monitoring

Code	Research field 4	Indicative timing	Program linkages
S244	River siltation.	By 2016	Ecosystem resilience Land use planning

S25. Social / anthropological

Code	Research field 1	Indicative timing	Program linkages
S251	YUS Landscape linguistics.	Ongoing	Ecological monitoring Responding to community needs

Code	Research field 2	Indicative timing	Program linkages
S252	Impacts of the CA on livelihoods and vice versa.	Ongoing	YUS Rangers Ecosystem resilience Sustainable resource use Community development Building capacity of leaders Responding to community needs

Code	Research field 3	Indicative timing	Program linkages
S253	Traditional ecological knowledge.	Ongoing	

Code	Research field 4	Indicative timing	Program linkages
S254	Key drivers of high attrition rates of children between grades 6 and 10 in general, and the even higher levels of attrition of females.	Ongoing	Responding to community needs.

Code	Research field 5	Indicative timing	Program linkages
S255	Key drivers of health facility closures and undersupply of resources.	Ongoing	Responding to community needs.

Strategy 2: Research to inform resource and landscape management

S26. Sustainability and consumption

Code	Research field 1	Indicative timing	Program linkages
S261	Household resource consumption and "footprint".	By 2015	

Code	Research field 2	Indicative timing	Program linkages
S262	Natural resource use patterns and farming systems.	By 2015	

Code	Research field 3	Indicative timing	Program linkages
S263	Understanding sustainability, subsistence based natural resource use and sustainable development.	By 2016	Ecosystem resilience Ecological monitoring Land Use Planning Sustainable resource use

S27. Climate change

Code	Research field 1	Indicative timing	Program linkages
S271	Potential climate change impacts to YUS communities and ecosystems.	By 2016	All

Code	Research field 2	Indicative timing	Program linkages
S272	Phenological events across YUS.	By 2016	

Code	Research field 3	Indicative timing	Program linkages
S273	Exploration of climate / carbon market-based options for ecosystem protection.	By 2015	Ecosystem resilience

Code	Research field 4	Indicative timing	Program linkages
S274	Looking at carbon sequestration value of alpine grasslands and grasslands.	By 2015	Ecosystem resilience; Environmental services

Wungon Village. Photo: Ashley Brooks

Tapmange Village. Photo: Mark Ziembicki

3

Strategy 3: Sustainable resource use and environmental services

Strategy 3: Sustainable resource use and environmental services

The Strategy consists of two inextricably linked programs focussing on community-based long term planning for resource use, and enhancing the ability of ecosystems to continue to provide services. Both programs align directly with national and local plans to balance rural development and environmental protection, and provide a substantive contribution to balancing sustainable development with biodiversity conservation within the CBD and MDG frameworks (Annex 7).

S31: Land-use planning

S32: Environmental services

S31. Land-use planning, management and sustainable resource use

The vast majority of threats to management targets across YUS are small-scale, long term incremental changes to ecosystems driven by subsistence requirements of communities (the acute threats usually posed by commercial operations are only a potential at this point, or are entirely unpredictable as in the case of drought and bushfires associated with El Niño events). The Land-use Planning Program responds to these incremental and compounding threats by facilitating land-use plans (LUP) for every ward across the YUS Landscape. The program continues the LUPs piloted in 5 wards in 2011/12 (Annex 4). Experience from the LUP pilot phase showed that the LUP process is vital in facilitating community consensus over resource use through bringing neighboring clans together to agree on how to improve the use of existing land, which forests to use and which forests to protect and declare off limits. The LUPs were also valuable in promoting ecosystem connectivity across the landscape. Here, landowners from neighboring villages and wards were able to clearly identify adjoining forests for protection and collaboratively agree to protect them. And finally the LUPs enable alignment with, or support to ward development plans (in some cases the Ward LUP is adopted and becomes the ward development plan), and are therefore integrated into local planning mechanisms.

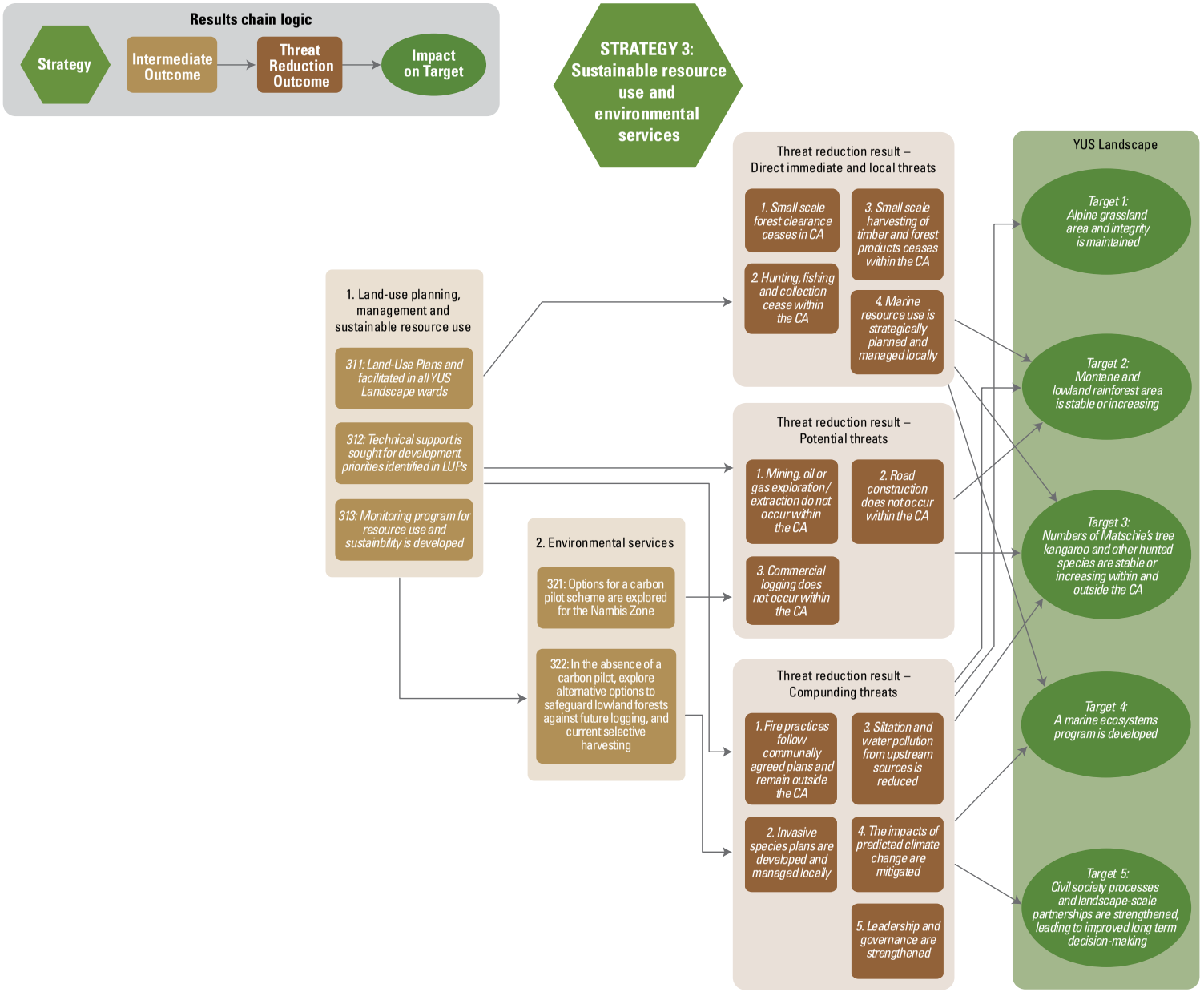
Land use planning is also recognised by the PNG government as a national priority, but has yet to be mainstreamed. It is also an essential component of the country's customary land tenure system. With around 97% of land in PNG collectively owned by clan groups, in most cases it is impossible for people to buy and sell property, and move to more productive areas and settle. In the words of the PNG Government, land is held by clans for eternity. It is an absolute imperative therefore, that communities use their clan lands sustainably and collectively plan resource use for the long term.

In LP 1, the program will seek to complete LUPs for the remaining wards across the YUS Landscape. The LUPs will then form a significant basis for strategic support to communities in LP 2. This is particularly important in relation to the "potential" threats (logging, roads and mining) to YUS. The program in LP 1, will not set out to prevent potential developments, but will ensure that through the LUP process, communities can integrate potential future developments into their ward LUPs, with a view to maximising any opportunities presented, and mitigating any potential negative impacts.

As each ward LUP is completed, the program then seeks to provide support to areas identified as priority needs by communities. This can be considered an indirect substitution for land pledged for conservation as part of the program. The program responds to communities' commitment by supporting actions in the livelihoods zone that improve productivity of that area, thereby keeping pressure off the CA. In most cases the specific priorities will not be known until each ward completes their LUP. In this regard the program remains open to respond to community needs as they emerge. In LP 1, the program supports small scale agroforestry through nursery development in selected wards.

Finally LP 1 will seek to develop a monitoring program for the LUPs overall. Monitoring of LUPs and resource use is vital in tracking and determining if the right balance of use and protection is in place, and if principals of sustainability are in place.

Yopno Zone. Photo: Zachary Wells


Results chain logic
Strategy
Intermediate Outcome
Threat Reduction Outcome
Impact on Target
STRATEGY 3: Sustainable resource use and environmental services
1. Land-use planning, management and sustainable resource use
311: Land-Use Plans and facilitated in all YUS Landscape wards
312: Technical support is sought for development priorities identified in LUPs
313: Monitoring program for resource use and sustainbility is developed
2. Environmental services
321: Options for a carbon pilot scheme are explored for the Nambis Zone
322: In the absence of a carbon pilot, explore alternative options to safeguard lowland forests against future logging, and current selective harvesting
Threat reduction result – Direct immediate and local threats
1. Small scale forest clearance ceases in CA
2. Hunting, fishing and collection cease within the CA
3. Small scale harvesting of timber and forest products ceases within the CA
4. Marine resource use is strategically planned and managed locally
Threat reduction result – Potential threats
1. Mining, oil or gas exploration/ extraction do not occur within the CA
2. Road construction does not occur within the CA
3. Commercial logging does not occur within the CA
Threat reduction result – Compunding threats
1. Fire practices follow communally agreed plans and remain outside the CA
2. Invasive species plans are developed and managed locally
3. Siltation and water pollution from upstream sources is reduced
4. The impacts of predicted climate change are mitigated
5. Leadership and governance are strengthened
YUS Landscape
Target 1: Alpine grassland area and integrity is maintained
Target 2: Montane and lowland rainforest area is stable or increasing
Target 3: Numbers of Matschie's tree kangaroo and other hunted species are stable or increasing within and outside the CA
Target 4: A marine ecosystems program is developed
Target 5: Civil society processes and landscape-scale partnerships are strengthened, leading to improved long term decision-making

Strategy 3: Sustainable resource use and environmental services

Code	Research field 1	Indicative timing	Program linkages
S311	By 2016, facilitate Land-use Plans (LUP) across all Yus LLG and three Wasu LLG Wards.	By 2015, conduct a series of 3 workshops in each target Ward (Yus LLG 8 wards, Wasu LLG 2 wards) to complete Land Use Plans. By 2016, conduct a review of all LUPs with landowners and revise or modify LUP as required for LP 2. By 2016, Yus and Wasu LLG managers and presidents incorporate ward LUPs into their LLG development plans.	LUPs for each ward. Workshops held. LUP maps completed. Ward LUPs incorporated into LLG development plans.

Code	Research field 2	Indicative timing	Program linkages
S312	On an ongoing basis, seek technical support as required to respond to development priorities identified in ward level LUPs.	By 2015, develop pilot nurseries for agroforestry in partnership with the YUS CO.	Nurseries established. Technical and financial support received (as is currently happening with coffee and cocoa). Trainings conducted.

Code	Research field 3	Indicative timing	Program linkages
S313	By 2015, monitoring program for resource use and sustainability at village, ward, zone and landscape level is being used by completed LUP wards.	Use MDG 7 indicators to guide sustainability questions. Use JCU socio-economic report to guide community perceptions and impacts of the CA on communities. Incorporate monitoring program into LUP workshop agendas. Wards with completed LUPs have baselines and monitoring is underway. Ensure that any lessons are incorporated into new or subsequent ward LUPs as they arise. Reporting of YUS CA outcomes on MDG 7 to UNDP in Port Moresby.	LUP monitoring in use. Reports to UN MDG.

S32. Environmental services

The YUS Landscape is well placed to play a key role nationally in linking its massive carbon stores with community benefit – or enhancing access to benefits of environmental services. This can be done either through exploring market-based mechanisms to protect the forests (such as accessing carbon markets internationally) as an alternative livelihood in the Nambis Zone, the development of a national model for climate change adaptation, or by simply showcasing how a landscape protected area is able to balance use with protection, while maintaining and enhancing ecosystem service provision.

Throughout LP 1, the Environmental Services Program will focus on assessing the potential for a carbon pilot for the lowland forests of YUS. Such a pilot does not exist in PNG, and given the strong governance and management in place for the YUS Landscape, as well as pending ecosystem monitoring methods, the site is well placed to develop PNG's first carbon pilot initiative. The lowland forests of YUS are already under pressure from selective timber harvesting using walkabout sawmills. In addition, there is also a proposed logging lease covering part of the forests of the Nambis Zone. The proposed lease offers the ideal opportunity for a carbon pilot to be developed to offer incentives to maintain and protect the ecosystems versus clearing them. In the long term, if such an approach is made possible, it is expected to offer a relatively low cost mechanism for climate change mitigation, while offering opportunities for sustainable community development, co-benefits in terms of employment, income generation, and biodiversity and watershed conservation.

Code	Research field 1	Indicative timing	Program linkages
S321	By 2015 explore options for development of a carbon pilot for the Nambis Zone.	Assess feasibility and funding options for the pilot. Liaise with communities, OCCD and DEC to determine merit of a carbon pilot.	Meetings held with relevant stakeholders. Pilot project started.

Code	Research field 2	Indicative timing	Program linkages
S322	By 2016, in the absence of a carbon pilot, explore alternative options to safeguard lowland forests against future logging, and current selective harvesting.	Assess feasibility and funding options sought for lowland forest protection.	Actions integrated into LP2.

Tapmange Village. Photo: Mark Ziembicki

4

Strategy 4: Community services, livelihoods and healthy families

Strategy 4: Community services, livelihoods and healthy families

The programs that make up this Strategy are aimed at building the capacity of local leaders, supporting livelihoods and market integration, and supporting the YUS CO to facilitate the government support and services to which the landscape is entitled. The Strategy also allows the Landscape Plan provision to maintain the positive linkages with communities through responding to needs if / when they arise. The programs support key national development plans and are in line with government expectations of NGOs (Annex 7).

S41: Developing leadership

S42: Economic livelihoods – quality and markets

S43: Responding to local needs

S41. Developing leadership

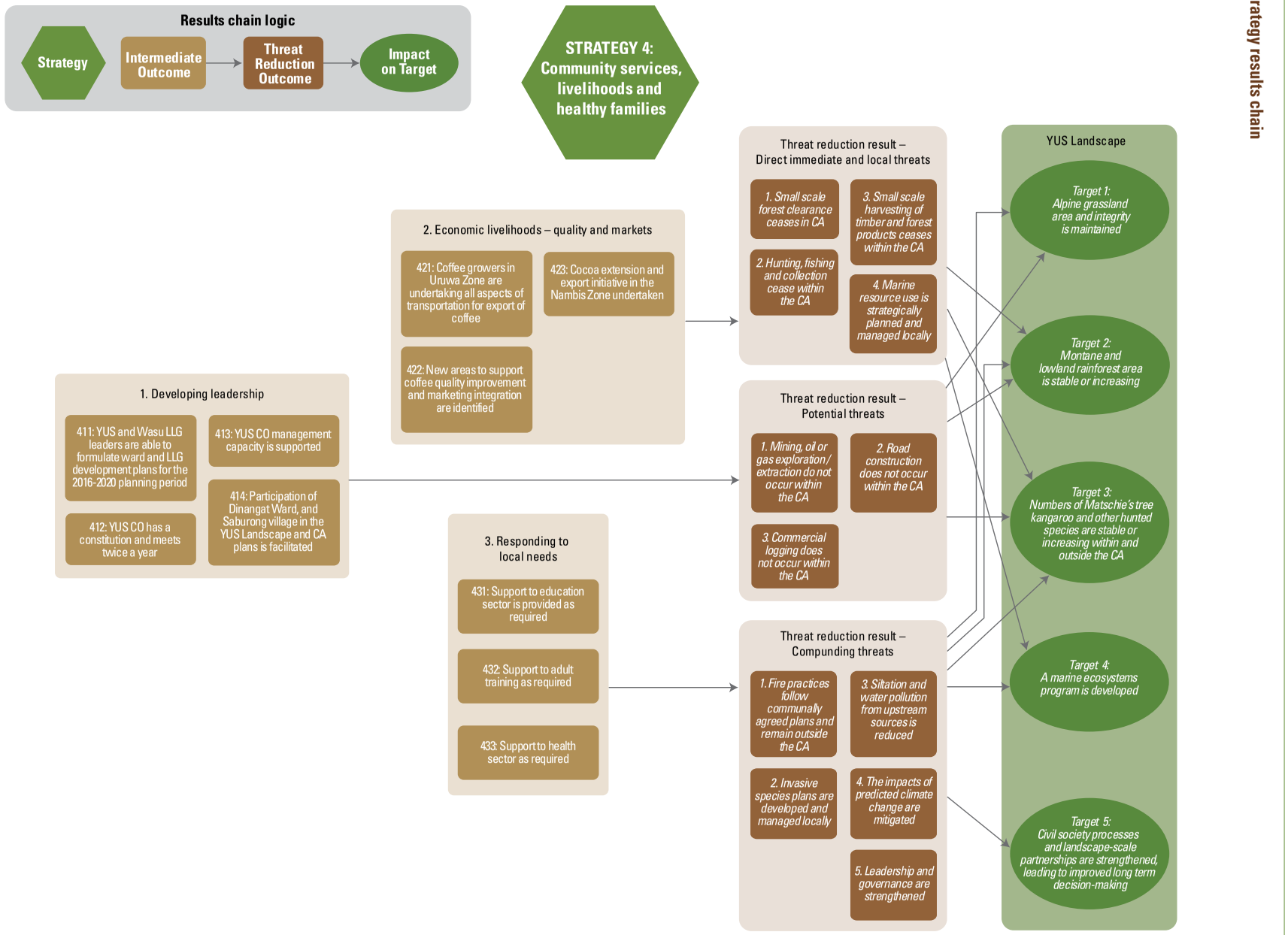
The cadre of local leaders across the YUS Landscape are strong, committed, professional, and highly respected individuals from a suite of organisations and with differing responsibilities. Across YUS these include: congregation, church and parish leaders; elected ward counsellors; ward magistrates and peace officers; ward health and agricultural extension officers; teachers; women's representatives; and the two LLG Managers and respective LLG presidents. Invariably however, the mandate for their services only reaches the outer boundary of their given jurisdiction, and little if any planning and collaboration for sustainable development occurred across these boundaries prior to the work of TKCP at the landscape level. Indeed the collaboration between the YUS communities and TKCP brought about the establishment of the YUS CO and the CAMC – both of which are nested institutions that transcend multiple administrative boundaries. While they offer a direct conduit for YUS people to higher levels of government that was not previously there, the ability of local leaders to maximise the opportunities presented by these links, needs to be developed.

Across the Yus LLG, as few as three wards currently have five-year ward development plans. The result being that the LLG Manager is unable to complete its five-year LLG development plan for submission to the next level of government – the district. As a consequence the district government is unable to distribute the allocated development budget to the area, due to the lack of the LLG plan, and few government services can be delivered, maintained or upgraded across Yus LLG. In the absence of significant and ongoing government support to Yus LLG, TKCP is left to fill gaps in areas that have government budgets already earmarked for them.

The purpose of the Developing Leadership Program in LP 1 is to strengthen local leaders' ability to advocate for and receive government support for services and community development. This will be achieved through direct training for ward and LLG planning, and continued support to the YUS CO. As a landscape level organisation, the YUS CO is uniquely placed as a forum for ward and village leaders to share lessons, identify common concerns, and seek solutions for challenges that occur at scales beyond individual mandates. The strength of the YUS CO lies in its proximity to the people, and the peoples' membership and participation in its activities, and its ability to provide timely and cost-effective solutions to local social and economic problems. Challenges lie in its institutional capacity, leadership, and governance. LP 1 will seek to build the YUS CO's strengths, and develop a foundation whereby in LP 2, the YUS CO has significant recognition by, and develops partnerships with government, is able to develop mechanisms for improved information flow from government through to villages, and ultimately makes significant contribution to the YUS Landscape.

The program also seeks in LP 1 to use local leadership and the YUS CO to gain the participation of Dinangat Ward (Yus Ward 4) and Saburong Village (within Yus Ward 2).

Bridge. Photo: Ryan Hawk


Results chain logic
Strategy
Intermediate Outcome
Threat Reduction Outcome
Impact on Target
STRATEGY 4: Community services, livelihoods and healthy families
1. Developing leadership
411: YUS and Wasu LLG leaders are able to formulate ward and LLG development plans for the 2016-2020 planning period
412: YUS CO has a constitution and meets twice a year
413: YUS CO management capacity is supported
414: Participation of Dinangat Ward, and Saburong village in the YUS Landscape and CA plans is facilitated
2. Economic livelihoods – quality and markets
421: Coffee growers in Uruwa Zone are undertaking all aspects of transportation for export of coffee
422: New areas to support coffee quality improvement and marketing integration are identified
423: Cocoa extension and export initiative in the Nambis Zone undertaken
3. Responding to local needs
431: Support to education sector is provided as required
432: Support to adult training as required
433: Support to health sector as required
Threat reduction result – Direct immediate and local threats
1. Small scale forest clearance ceases in CA
2. Hunting, fishing and collection cease within the CA
3. Small scale harvesting of timber and forest products ceases within the CA
4. Marine resource use is strategically planned and managed locally
Threat reduction result – Potential threats
1. Mining, oil or gas exploration/ extraction do not occur within the CA
2. Road construction does not occur within the CA
3. Commercial logging does not occur within the CA
Threat reduction result – Compunding threats
1. Fire practices follow communally agreed plans and remain outside the CA
2. Invasive species plans are developed and managed locally
3. Siltation and water pollution from upstream sources is reduced
4. The impacts of predicted climate change are mitigated
5. Leadership and governance are strengthened
YUS Landscape
Target 1: Alpine grassland area and integrity is maintained
Target 2: Montane and lowland rainforest area is stable or increasing
Target 3: Numbers of Matschie's tree kangaroo and other hunted species are stable or increasing within and outside the CA
Target 4: A marine ecosystems program is developed
Target 5: Civil society processes and landscape-scale partnerships are strengthened, leading to improved long term decision-making

Strategy 4: Community services, livelihoods and healthy families

Code	Objective 1	Activities	Indicators
S411	By 2016, participating Yus and Wasu LLG leaders are able to formulate ward and LLG development plans for the 2016-2020 planning period.	• Training of ward counsellors in planning, facilitating community discussion, and formulation of ward plans. • Identification of scholarships for tertiary study or vocational training as required. • By 2016, Yus LLG and Wasu LLG both have 5 year development plans (2016-2020).	• Ward plans for Yus LLG are completed and submitted to LLG manager. • Ward plans for three Wasu wards are completed and submitted to the LLG manager. • Five year development plans for LLGs.

Code	Objective 2	Activities	Indicators
S412	The YUS CO has an approved constitution, and annual strategic plan and meets periodically.	• YUS CO submits application to WPZ for Endowment funding of strategic activities in line with the Landscape Plan.	• Annual applications submitted to WPZ. • Funding received and activities implemented.

Code	Objective 3	Activities	Indicators
S413	YUS CO management capacity is supported.	• Ongoing, capacity building and training opportunities to YUS CO leaders. • YUS CO linked into any grant opportunities that arise to support priority projects within the CO strategic plan.	• Training conducted. • Grants sought and secured.

Code	Objective 4	Activities	Indicators
S414	Facilitate participation of Dinangat Ward, and Saburong village in the YUS Landscape and CA plans.	• By 2016, significant actions have been put in place to garner the participation of Dinangat and Saburong.	• Dinangat and Saburong landowners pledge land / or seek collaboration with TKCP.

S42. Economic livelihoods – quality and markets

The overarching activities of the program seek to build local small-holder capacity to improve product quality and assist in market integration. This continues on from the successful piloting of coffee extension and facilitation of market linkages by TKCP. The success of removing obstacles to the development of coffee, market integration, and handover of management to local producers has proved to be an effective model, and the same approach will be used with additional cash crops across YUS. The development of infrastructure is beyond the remit of the Plan, however where any physical market linkages (e.g. roads) are planned, small-holders will be made aware of market opportunities when they arise.

Supporting livelihoods serves to enhance the productivity of already cleared land, and thereby mitigates the need to clear existing forests for agriculture. Improving household incomes, also serves to diversify income streams, and open up new opportunities for investment in production of alternate sources of protein without compromising wildlife numbers or cultural traditions.

In LP 1, the Program will continue to support coffee, and begin promoting the export of a sustainably produced and high quality cocoa from the Nambis Zone using environmentally friendly production techniques.

Land Use Planning workshop, Yawan Village. Photo: Ashley Brooks

Code	Objective 1	Activities	Indicators
S421	By 2016, coffee small-holders in Uruwa Zone are undertaking all aspects of transportation for export of coffee to Caffé Vita or other buyers.	• Continue support to Uruwa coffee collectives, and phase out transport / flight subsidy.	• Uruwa coffee growers are managing the production and transport of their coffee independently.

Code	Objective 2	Activities	Indicators
S422	By 2016, identify new areas to support coffee quality improvement and market integration.	• Use LUPs, YUS CO and ongoing community consultations to identify where local needs are. • Identification of new markets and buyers for YUS coffee.	• Extension training in new areas by CIC. • New buyers identified.

Code	Objective 3	Activities	Indicators
S423	By 2016, complete the cocoa extension and export initiative in the Nambis Zone.	• By 2014, baseline data collected. • Technical capacity building exercises aimed at improving cocoa quality by PNGCB. • Ongoing and by 2015, periodic quality assessments against national standards. • By 2015, evaluation of market opportunities including direct trade and certification schemes.	• Data collection for 100% of existing cocoa cooperatives. • Training of at least 200 individuals. • 90% samples attain highest grade appropriate for smallholder production. • Report ranking opportunities for income generation through cocoa.

S43. Responding to community and government needs in line with targets

The Landscape Plan provides a structured and long term plan for resource allocation and CA management, and while it covers the full gamut of landscape protected area needs from the field to the policy level, it must also be responsive to unplanned requests or unforseen needs. The Responding to Community and Government Program is designed in this vein. In LP 1, the program continues the work of TKCP in the education and health sectors where basic services are lacking.

Support in these areas is then phased out, or become more strategic in LP 2 when a Yus LLG plan has been established, and basic services are funded by government. The program also provides the mechanism within the Landscape Plan to respond to donor or government requests to implement new activities in areas that may not be explicitly planned for, and would contribute to the management targets.

Code	Objective 1	Activities	Indicators
S431	Support to education outcomes.	• By 2015, current scholarships program is evaluated.	• Evaluation conducted. • Future actions incorporated into LP2.

Code	Objective 2	Activities	Indicators
S432	Support to adult education and training.	• Training in response to key priorities identified during LUP workshops.	• Trainings conducted.

Code	Objective 3	Activities	Indicators
S433	Support to community health outcomes.	• By 2014, current health projects are evaluated and proposals for new projects and ongoing collaboration with provincial health department to remove obstacles for health services in YUS are explored.	• Evaluation conducted. • Future actions incorporated into LP2.

5

Strategy 5: Implementation and management

Strategy 5: Implementation and management

The three programs that make up the Strategy are the basis and guide for the effective, transparent, adaptive and professional implementation of all the actions within the YUS Landscape Plan. While the programs are divided into discrete processes of management, they are inextricably linked. It is vital for effective implementation of actions across the landscape that TKCP staff have the right skills to fulfill their roles, that they conduct their work professionally, and that they facilitate regular consultation with stakeholders to encourage participation and knowledge sharing. TKCP staff are therefore facilitators who ensure that the linkages among planning, research, monitoring, and community consultations are maintained and that any resultant program action reflects community desires and supports YUS Landscape values. The programs in this Strategy therefore seek to build management capacity to achieve these outcomes, and are also in-line with government priorities (Annex 7).

S51: Stakeholder linkages and an effective workforce

S52: Monitoring and assessing effectiveness

S53: Financing

As a landscape protected area, the YUS Landscape is inherently community-driven. It is vital therefore that program activities continue to reflect community aspirations, are supported by communities, and key management decisions are based on community dialogue and information gathered. TKCP is therefore a body of qualified personnel who facilitate and direct financial and technical support to the landscape based on the best available information. Many stakeholders are linked through the YUS CO, the CAMC, institutional partnerships for research, and organisational support from WPZ. The Stakeholder Linkages Program is designed to ensure that the institutional structures and processes by which TKCP staff communicate with and respond to stakeholders are maintained, and are enhanced through a culture of learning, information gathering, professionalism of the workforce, and ongoing organisational operation.

S51: Stakeholder linkages and an effective workforce

Code	Objective 1	Guide	Indicators
S511	Key management decisions are made based on best available information and stakeholder involvement.	• Key management decisions are based on reliable, relevant and long-term information gathered from a range of sources. • Staff are encouraged to use programmatic workshops in YUS to gather community views, and respond to queries or concerns that may arise. • Staff continue to work with government bodies to access and consider policies and plans to support decision making. • Staff use periods of provincial, district, LLG and ward planning to gather information to guide their programs. • Community have access to programmatic information, meeting minutes, and reports.	• Professional development plans are in place. • CO and CAMC leads are defined and CO/CAMC activities are built into annual work plans. • Funding for CO and CAMC activities is in place. • TKCP staff support pre-planning of CO/CAMC and TKCP planning meetings. • CAMC meeting attendance is at least 75% of regular committee members and ex-officios. • Relevant national, provincial, district and LLG plans are sought within an appropriate time-frame as related to public release. • All official CO and CAMC meetings end with a Q and A session, minutes kept by TKCP and CO/CAMC secretariat. • Meeting minutes are delivered to all participants (CAMC and CO) in-situ (at meetings). • Minutes/reports are updated quarterly at all field office resource centres.

Code	Objective 2	Guide	Indicators
S512	A culture of learning and stakeholder engagement is supported to inform decision making.	• Provide organisational support to encourage innovative ideas for YUS programs. • Staff are encouraged to identify systems and processes that could be adapted or incorporated to improve their programs. • Management is flexible and adaptive and continues to be culturally appropriate.	• Strategy leads have annual monitoring and evaluation requirements for their programs. • Quarterly and 6-monthly reviews of individual staff work plans. • Presence of new systems or methods developed by staff to improve their programs. • Guidance is sought from leadership or relevant stakeholder body before new steps are implemented. • Annual reviews address staff concerns with management.

Code	Objective 3	Guide	Indicators
S513	TKCP staff have the skills necessary to fulfil their responsibilities.	• A system of core competencies are developed for each position. • Staff are actively engaged to participate in training opportunities and an annual training program is developed. • Staff are supported in ways to improve engagement with communities. • Organisational support is provided for staff to attend relevant meetings, conferences, field work and workshops which increase their contact with external organisations and other programs to exchange information and develop skills.	• Annual training plans developed. • Mentoring programs developed as required. • Staff trained in areas relevant to their programs (e.g. in facilitation, community capacity building, project design, communication and conflict resolution). • # of staff presentations, attendance and contribution to external forums and programs.

Code	Objective 4	Guide	Indicators
S514	TKCP has a functioning office and resources to support staff and programs.	• A safe and professional working environment is in place to support staff reaching their full potential and achievement of landscape targets.	• All office functions are sustained. • TKCP Lae account is financially solvent at all times. • All invoices / bills are scrutinised and paid on time. • Annual financial reports on overhead / costs / sustainability are developed.

Land Use Planning Village, Yawan. Photo: Ashley Brooks

Strategy 5: Implementation and management

S52. Monitoring and assessing effectiveness

The Monitoring Program provides the key feedback loop to understanding if objectives in the Landscape Plan are being met once implementation is under way. The purposes of this program are: to identify whether the plan is being implemented effectively and steps are being made toward achieving objectives; to learn from observation of the impacts of management at the site level; and to adapt the management actions and programs as required. There are two overarching components of the Monitoring Program. First, activity monitoring is used to review and monitor ongoing actions and determine if they are on track. Second the monitoring of ecological and socio-economic indicators is used to determine if all activities and programs are contributing to the achievement of management goals and targets in the long term.

A simplified activity monitoring framework is shown below highlighting when each result area of the Landscape Plan is monitored. The 5-yearly evaluations of goals and strategies should begin in the six months prior to the implementation of the subsequent Landscape Plan (Figure 3). These evaluations should be used to determine if objectives have been achieved and if programs and strategies overall are being implemented. Findings are then used to guide programming and allocation of resources in the subsequent Landscape Plan.

Table 1: YUS monitoring framework

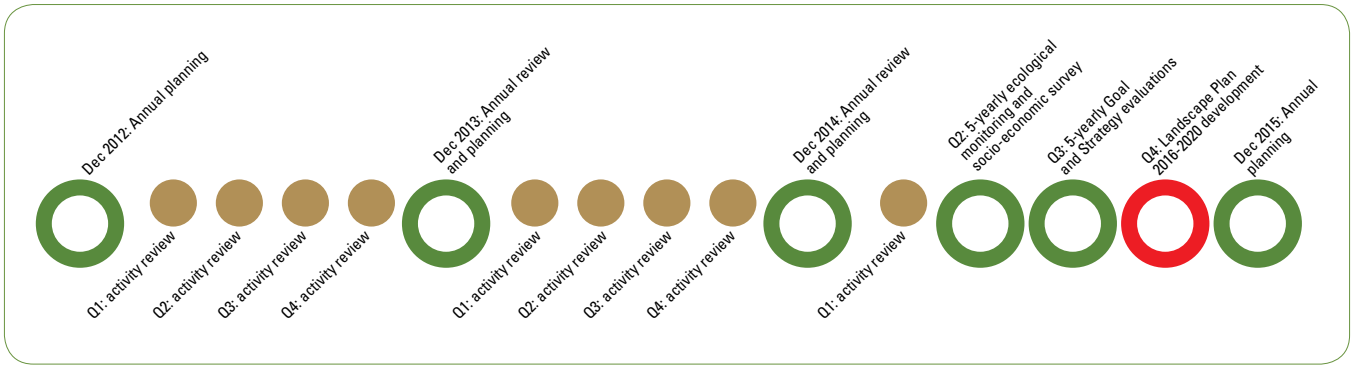
Landscape result area	Type of monitoring	Comments
Target	• Ecological monitoring. • Socio-economic monitoring.	• 5-yearly ecological monitoring. • 5-yearly socio-economic surveying.
Goal	• 5-yearly evaluation.	• Evaluation is the first step in planning for the subsequent Landscape Plan.
Strategy	• 5-yearly evaluation.	• Evaluation is the first step in planning for the subsequent Landscape Plan.
Program	• Annual review.	• Annual review in December.
Objective	• Ongoing review.	• Review is at quarterly meetings.
Activity	• Quarterly monitoring and review.	• Developed during annual planning in December. • Monitoring is ongoing. • Review is at quarterly meetings.

Tapmange Village. Photo: Mark Ziembicki

Each year TKCP strategy leads are given monitoring and evaluation (M&E) programs for their respective strategies. M&E programs are taken directly from the current Landscape Plan. Ongoing reviews of objectives should be used to reflect on the objective statements, their timing and feasibility, and how the activities could be more suitably planned and implemented to meet annual goals. Annual appraisal and planning in December should be used as the key forum to reflect on all programs for the year, and to lay the foundation for work in the subsequent year. Annual reviews could necessitate the change or adaptation of activities, or re-wording of objective statements, but goals and targets should remain unchanged until the time period identified in them has ended.

The success of the YUS Landscape will be measured and verified against the long-term environmental and social targets and goals on a 5-yearly basis. The 5-yearly evaluations will be used to assess a range of issues including: how well has the Landscape Plan responded to threats to targets, and whether management interventions are minimising threats, or protecting and enhancing YUS Landscape values. In many instances the answers to these questions will come from and be verified by the ecological and socio-economic monitoring initiatives, which should be completed with enough lead time for consideration and incorporation in the subsequent Landscape Plan (Figure 3).

Figure 3: Indicative monitoring timeline 2013 – 2015



The ecological and socio-economic monitoring framework is shown in Table 13. In many cases the specific monitoring initiative is to be developed (noted as TBD in Table 13) during LP 1 and these are already listed as Objectives within the relevant Programs.


Montane Rainforest. Photo: Ryan Hawk

S53. Financing

Financial sustainability is an overarching aim for YUS Landscape management. Significant steps have been taken to this end through the establishment of the non-sinking YUS Conservation Endowment, managed by WPZ, and which at the time of writing stands at USD 2 million. Following the procedures outlined in WPZ's Operations Manual, 4% of the interest earned by the endowment is to be disbursed annually by WPZ in accordance with TKCP-PNG annual plans and budget formulated in December of each year, and is designed to provide partial funding for core landscape programs in perpetuity. The allocation of endowment funds is therefore closely linked to clear outcomes in TKCP-PNG annual plans, and the long term targets of the YUS Landscape Plan. Strategies are also necessary to continue to attract additional funding streams for the rest of the core programs, non-core programs, operational costs, and where there is a need to adapt to changing circumstances. WPZ and TKCP-PNG will continue to submit funding proposals to donors in this regard, and TKCP-PNG staff will be trained in fund raising.


Tree coring. Photo: Mireia Torello Raventos

Table 13: Ecological and socio-economic monitoring framework

Ecological indicator	Verifiable indicator	Monitoring frequency	Monitoring method	Resources required	Responsibility	Comment
Alpine grassland area and change over time.	Hectares. Rates of change. Boundary mapping.	5-yearly	Remote sensing and rangers.	Satellite imagery.	GIS coordinator, rangers.	TBD by 2015 (Objective S131).
Alpine grassland ecology	Indicator species.	Annual and 5-yearly	Rangers.	Record books. GPS.	Rangers.	TBD by 2015 (Objective S133).
Montane and lowland forest and land cover area.	Hectares. Rates of change. Boundary mapping.	5-yearly	Remote sensing and rangers.	Satellite imagery.	GIS coordinator, rangers.	TBD by 2016 (Objective S136).
Marine ecosystems.	Indicator species. Hectares protected.	Annual and 5-yearly	Community-based and marine rangers.	Record books. GPS.	Rangers.	TBD by 2015 (Objective S139).
Hunted species inside the CA.	Standing scat counts.	Selected plots surveyed each year on a rotational basis over 4 years. Then all plots surveyed in the 5th year of the planning cycle.	Rangers and community / landholder representatives.	Record books. GPS.	Rangers.	Objective S142.
Hunted species outside the CA.	Standing scat counts.	" "	Rangers and community / landholder representatives.	Record books. GPS.	Rangers.	Objective S143.
Hunted species density.	Scat production and decomposition rates. Genetic analysis.	" "	" "	Record books. GPS. Genetic analysis.	Rangers.	TBD by 2016 (Objective S146).

Socio-economic indicator	Verifiable indicator	Monitoring frequency	Monitoring method	Resources required	Responsibility	Comment
Sustainable numbers of target taxa exist for local use.	Number of animals hunted. Distance travelled. Time spent in field/hunting. Location of hunting site.	5-yearly	Rangers.	Record books. GPS.	Rangers. JCU PhD study.	TBD by 2016 (Objective S1.4.4)
Resource use and sustainability at village, ward, zone and landscape levels.	Resource use, availability and trends. Effort vs. benefit. Distance travelled. Time spent in field/hunting. Forest area cleared. Forest area regrown.	5-yearly	Household survey and remote sensing.	Satellite imagery. GPS.	LUP facilitators.	TBD by 2015 (Objective S313).
Impact of CA on livelihoods and access to resources.	Resource use, availability and trends. Effort vs. benefit. Distance travelled. Time spent in field/hunting. Cash income trends. Export income. Gardening output/yield.	5-yearly	Household survey.		LUP facilitators.	TBD by 2015 (Objective S313).
Attitudes toward the CA.	Perceptions.	5-yearly	Household survey.		LUP facilitators.	TBD by 2014 (Objective S313).

Notes: TBD: To be developed.

YUS coastline. Photo: Zachary Wells

Annex 1
Governance of the YUS Conservation Area

Governance of the YUS Landscape is underpinned by the voluntary pledging of land for conservation by landowners, with an enforcement framework (including bi-laws, penalties and conflict resolution processes) developed by the landowners themselves, and enacted as law under the CA Act.

Process of pledging land

Land is pledged through one of two processes: i) Participating landowners make contact with TKCP with notification of the intention to pledge land for conservation. A TKCP mapping officer then makes arrangements with the landowners to map the proposed land parcel using GPS; or ii) Land is pledged by landowners during land-use planning workshops. In both cases landowners accompany the mapping officer to mark out pledged land boundaries, and finally clan owners complete and sign a pledge form. Pledge forms for both forested and degraded / grassland areas exist and are shown here in tok pisin:

Pledge form for forest / non-degraded land

Graun Tambu igo long YUS Konsevesen Eria

Dispela pepa em i soim olsem ol clan na ol lan grup representitif i wanbel long tambuim graun igo insait long YUS Konsevesen Eria, YUS Lokol Levol Gavaman, Kabwum Distrik, Morobe Provins, na PNG.

Mipela, _____Klen i wanbel long tambuim graun na putim igo insait long YUS Konsevesen Eria.

Nem bilong dispela hap graun we mipela tambuim igo insait long YUS Konsevesen Eria em i _____ (raitim wanpela graun nem tasol. Sapos yu laik tambuim narapela graun yu mas pulumapim narapela fom) na em i stap klostu long _____ ples, Wod _____, YUS Lokol Levol Gavaman. Olgeta papa bilong dispela hap graun i wanbel long tambuim na putim igo long YUS Konsevesen Eria.

Mipela wanbel olsem ol opisa bilong Tri Kengeru Konsevesen Program o husait ol I makim, i ken wok wantaim mi o lan grup istap antap long makim banis bilong tambu graun antap.

Mipela kilia olsem em ino wok bilong Tri Kengeru Konsevesen Program long stretim tok bilong graun. Sainim bilong dispela pepa ino soim olsem mipela i givim dispel graun igo long Tri Kengeru Konsevesen Program o gavman. Tri Kengeru Konsevesen Program bai makim tasol hap we papa graun i tambuim long em.

Mipela wanbel olsem olgeta toktok antap i stret na i tru. Aninit em nem bilong ol clan lidas wantaim ol lain husait i wanbel long makim graun bilong ol igo long Konsevesen.

1. Nem _____ Sain _____ Deit _____

2. Nem _____ Sain _____ Deit _____

3. Nem _____ Sain _____ Deit _____

4. Nem _____ Sain _____ Deit _____

5. Nem _____ Sain _____ Deit _____

Pledge form for degraded land / grassland

Tambu Kunai igo long YUS Konsevesen Eria

Dispela pepa em i soim olsem ol clan na ol lan grup representitif i wanbel long tambuim wanpela hap kunai na putim igo insait long YUS Konsevesen Eria, YUS Lokol Levol Gavaman, Kabwum Distrik, Morobe Provins, na PNG.

Mipela, _____ Klen i wanbel long tambuim kunai gras na putim igo insait long YUS Konsevesen Eria long kamapim niupela bus.

Nem bilong dispela hap kunai we mipela tambuim igo insait long YUS Konsevesen Eria em i _____ (raitim wanpela nem tasol. Sapos yu laik tambuim narapela hap kunai yu mas pulumapim narapela fom) na em i stap klostu long _____ ples, Wod _____, YUS Lokol Levol Gavaman. Olgeta papa bilong dispela hap kunai i wanbel long tambuim na putim igo long YUS Konsevesen Eria. Dispela wanbel i soim olsem mipela ino inap kukim kunai gras. Bai mipela lusim istap olsem inap bus i kamap bek.

Mipela wanbel olsem ol opisa bilong Tri Kengeru Konsevesen Program o husait ol I makim, i ken wok wantaim mipela ol lan grup istap antap long halivim makim banis bilong tambu kunai antap.

Mipela kilia olsem em ino wok bilong Tri Kengeru Konsevesen Program long stretim tok bilong graun. Sainim bilong dispela pepa ino soim olsem mipela i givim dispela kunai igo long Tri Kengeru Konsevesen Program o gavman. Tri Kengeru Konsevesen Program bai makim tasol hap we papa graun i tambuim long em.

Mipela wanbel olsem olgeta toktok antap i stret na i tru. Aninit em nem bilong ol clan lidas wantaim ol lain husait i wanbel long makim kunai bilong ol igo long Konsevesen.

1. Nem _____ Sain _____ Deit _____

2. Nem _____ Sain _____ Deit _____

3. Nem _____ Sain _____ Deit _____

4. Nem _____ Sain _____ Deit _____

5. Nem _____ Sain _____ Deit _____

YUS CA enforcement framework

Rules

In consultation with YUS landowners, the following Rules have been developed and endorsed by the YUS CAMC, apply to all areas within the boundaries of the YUS CA:

Rule 1: We must look after all of the resources in the YUS CA.

Rule 2: We must look after all of the different kinds of flora and fauna in the YUS CA.

Rule 3: We must respect traditional beliefs and sacred sites.

Rule 4: Relevant stakeholders must give permission before any services or development takes place in YUS CA (Stakeholders can mean community, Government, DEC, TKCP, etc.)

Rule 5: We must look after all of the different kinds of non-living/abiotic resources.

Rule 6: We must increase/extend/connect the YUS CA.

Penalties, fines and fees

YUS CA is subject to the content of the Conservation Areas Act. For regulations on land-use changes within the Conservation Area refer to the Act, Section 35.

(1) A person who develops or alters or permits the development or alteration of the existing use of land in a conservation area except:

(a) in accordance with the terms of the management plan for that conservation area; or (b) in accordance with written approval from the Minister under Section 34(1), is guilty of an offense.

Penalty: A fine not exceeding K40,000.
Default penalty: A fine not exceeding K4,000.

(2) A person who develops or alters or permits the development or alteration of the existing use of land in an area in respect of which a notice of recommendation has been given under Section 12(1), except in accordance with written approval from the Minister under Section 34(1), is guilty of an offense.

Penalty: A fine not exceeding K40,000.
Default penalty: A fine not exceeding K4,000.

(3) It shall not be a defense to an action for an offense under this section that the development or alteration to the existing use of land did not adversely affect the environment.

In accordance with Section 28 the YUS Conservation Area Management Committee, in consultation with local landowners, has developed/approved the following site-specific Rules and fines.

These penalties, fines and fees apply unless an exception is specifically prescribed in the current YUS Landscape Strategic Management Plan.

1. It is illegal to light forest fires within the Conservation Area (does not include fires for cooking). Fine = K200.
2. It is illegal for anyone to hunt or fish within the Conservation Area
   a. If species with special status. Fine = K100.
   b. If tree kangaroo. Fine = K500.
   c. If species without special status. Fine = K50.
   d. If pig. Fine = K30.
   e. If dog. Fine = K100.
3. It is illegal for anyone to release a pig or dog within the Conservation Area
   a. If pig. Fine = K30.
   b. If dog. Fine = K50.
4. It is illegal for anyone to make a garden within the Conservation Area. Fine = K150.
5. It is illegal for anyone to pollute any water body or soil inside the Conservation Area. Fine = K10.
6. It is illegal to cut any trees or destroy any plants within the Conservation Area. Fine = K50.
7. It is illegal for anyone to go into a sacred site without permission within the Conservation Area. Fine = There is no associated fine.

All penalties, fines and fees are imposed by relevant YUS Conservation Area Management Committee Members and are payable to the Committee. YUS CAMC will determine to direct this revenue to the appropriate destination within the parameters of its constitution.

YUS Rangers

The CAMC in consultation with local landowners has developed and recommended to the Minister the appointment of group of conservation area rangers for the purpose of ensuring compliance with the Act. The CAMC will maintain the current register of YUS CA rangers.

For a description of the powers of a conservation area ranger please refer to Section 29 of the Act. The fine imposed for the obstruction of a ranger is in accordance with Section 40 of the Act and is as follows:

A person who – (a) hinders or obstructs a ranger; or (b) refuses or fails to comply with any reasonable request of a ranger, in the exercise of his powers or functions under this Act is guilty of an offense. Penalty: A fine not exceeding K50.

Conflict resolution

During landowner workshops in 2008 the following process for conflict resolution was drafted for enforcing the laws of the YUS CA, these follow existing systems in place for law enforcement across YUS.

Once a law is violated and recorded by community members or YUS Rangers, the perpetrator has access to a series of administrative bodies. If the problem is resolved a fine or penalty (e.g. community service, or compensation to victims) is meted out and the issue is not escalated to a higher level. If there is a dispute or appeal, the issue is escalated to a higher administrative body for consideration and resolution.

First level: Conservation committees. One committee in each ward for local enforcement – not appropriate or feasible to get all ward representatives together to resolve each infraction. This is most appropriate because the committee members know most about the individual rule breaker, the rules and regulations of the YUS CA.

Second level: Hevi ("problem") committee. This may include the church committee or members of the church committee. These committees act as a mediation step prior to escalation to the village court.

Third level: Village court. It fits within the jurisdiction of the Conservation and Hevi committees that also operate at the ward level rather than the village or regional level.

Fourth: District court or higher.

Gogiok Village. Photo: Ashley Brooks

Som Zone Grasslands. Photo: Ashley Brooks

Annex 2
YUS Landscape Plan development process

Annex Table 1: Process for development, synthesis and production of the Landscape Plan

Planning stage	Timing	Actions and outcomes
Inception	1996	Huon Peninsula Tree Kangaroo Conservation Program begins across selected sites within Yus LLG. Initial research of species distribution, habitat and conservation potential and challenges.
	1996	Community support for tree kangaroo protection; landowners begin pledging parcels of land for conservation.
Surveying, and pre-planning	1996	Expansion of TKCP into a broader capacity building and community-based conservation initiative.
	2001	Biodiversity surveys conducted at Dendawang and Abalgamut sites research sites (> 183 plant species, from 111 genera in 73 families identified).
	2003	Biodiversity surveys at Surim and Tarona research sites (> 119 plants species, from 115 genera in 96 families identified).
	2004	Biodiversity surveys and forest composition conducted at Wasaunon (156 plant species from 101 genera in 61 families identified) and Dendawang (89 plant species from 67 genera in 43 families identified) research sites.
	2004	Foothill and montane avifauna research conducted.
	2005	Workshops held across Yus LLG to develop a Resource Management Plan for Yopno, Uruwa and Som Zones. Outcome was an agreed plan by communities for resource mapping and identification, and priorities for ongoing research and survey work.
	2004	2nd foothill and montane avifauna research conducted.
	2007	Community workshops held to garner support for the establishment of the YUS CA. During these workshops, Nambis Zone villages request their participation in the YUS CA and landscape level initiative. The Nambis Zone becomes the 4th YUS Landscape Zone. TKCP begins surveying Nambis resources, building relationships, and facilitating participatory needs assessments in coastal villages.
	2008	Financial support provided for support for the development of the YUS Landscape Plan by the German Government within the framework of the International Climate Initiative of the Federal Ministry for Environment Nature Conservation and Nuclear Safety (BMU) through KfW in partnership with Conservation International.
	2008	Workshop held in Isan Village to develop the governance mechanism for the YUS CA. A draft set of Rules, Goals, and penalties are agreed.
	2008	First step in YUS CA establishment with formal endorsement by Yus LLG, Kabwum District, and Morobe Provincial governments.
YUS CA Gazettal	January 2009	Formal approval of the YUS CA by the PNG National Government. Establishment and launch of the YUS CA celebrated in Teptep Village in April 2009.
Surveying, pre-planning	2010–2012	A series of research studies conducted to feed into The Plan: YUS Socio-economic study YUS Agroforestry study YUS Wood use survey YUS Above ground carbon research YUS Soil organic carbon research YUS Tree density and carbon analysis YUS Ecological monitoring research YUS Vegetation and land cover analysis YUS Drivers of deforestation and REDD+ feasibility study Bird surveys YUS Rapid Assessment beetle survey (700m – 2,500m) YUS Bat surveys (500m – 2,400m) YUS Skink distribution survey Uruwa Zone, linguistics research YUS Tree Kangaroo home range research (since 2004) YUS Distributional survey of avifauna PNG national, sectoral, provincial, district and LLG policy analyses International Multilateral Environmental Agreements policy analysis

Planning stage	Timing	Actions and outcomes
Community consultation, goal setting and planning	2010	Management planning workshop held in Bungawat Village to finalise the Rules, Goals and Penalties for the YUS CA to be gazetted as the YUS CA Bylaws.
	2010	Formal establishment of the YUS CO.
	2011	Foundations of Success workshop held in Cairns to identify key threats to YUS Landscape values, targets, and goal setting.
	2011	First CAMC meeting held in Yawan Village, and discussion of landscape targets and goals. Introduction to the landscape plan overall framework for discussion and CAMC and community feedback.
	2011	Government dialogue, policy analysis and alignment of agreed YUS Landscape strategies.
	2011	Discussion of YUS Landscape targets, goals, and government policies with YUS CO members, in Ronji Village.
	2011	Incorporation of YUS Landscape targets and goals into LUP workshops.
	2011–2012	A series of 12 Land Use Planning workshops across four villages. Designation of permissible activities within the activities guide. Village land-use plans for each pilot village developed.
	2012	Facilitation of feedback and further update of the landscape plan by the CAMC during meetings in May and Oct 2012.
Synthesis, release and public release	2013	Gazettal of YUS CA Bylaws that were agreed to in Bungawat Village.
	March 2013	Production and public release of the YUS Landscape Plan 2012-2015.

Alpine Grassland Uruwa Zone. Photo: Mark Ziembicki

Annex 3
History and background of programs across the YUS Landscape

Emergence of a conservation program

The Tree Kangaroo Conservation Program based at Woodland Park Zoo in Seattle USA, was started in 1996 by Program Director Dr. Lisa Dabek. WPZ is the lead agency globally charged with the conservation and protection of the endangered, Huon endemic, Matschie's tree kangaroo, and led the formulation of the Species Survival Plan. At the zoo itself, three Matschie's tree kangaroos provide invaluable public awareness benefit for Papua New Guinea across North America. In addition the individuals offer valuable genetic and reproductive biology insights – vital for endangered species preservation. It is in this context that WPZ instigated the tree kangaroo conservation program on the Huon Peninsula, in order to seek the protection of the species in its natural habitat. The project initially commenced as a study to determine the conservation status of the Matschie's tree kangaroo and soon expanded into a broader ecosystem-wide, community-based conservation initiative.

The site for the program – the Yus LLG area, Kabwum District, Morobe Province – was chosen for two key reasons. First, Matschie's tree kangaroo is endemic to the Huon Peninsula, and globally endangered. And, second, the 1991 PNG Conservation Needs Assessment (Beehler 1993c) considered the area of the Yus LLG straddling the Sarawaget Mountain Range, and adjacent to the Finisterre Mountain range to be a "scientific unknown" and in need of scientific and conservation attention (Wells *et al.* 2013).

TKCP researchers first entered the YUS area in 1996 to undertake conservation research on the endangered Matschie's tree kangaroo. No long term biological research on the Matschie's tree kangaroo had been conducted previously. This initial work helped to determine basic population estimates as well as collect information on the key threats to tree kangaroos such as hunting and forest clearing (Wells *et al.* 2013).

The decision to create a formal, internationally recognised protected area developed early on through discussions between local landowners and conservation biologists. Initially one clan in the Yopno Zone of Yus, set aside forest for conservation and research, and then this clan helped educate other landowners and garner support for further pledges. Informal community meetings were held with landowners, local leaders and TKCP staff in surrounding villages in Yopno, and then in Som and Uruwa Zones to discuss the decline of tree kangaroo populations and the desire by the hunters to create a sustainable resource for subsistence hunting. The concept of setting aside a portion of one's hunting land for a protected (or tambu) area was described as a "wildlife bank".

The protected area would serve as a refuge for tree kangaroos and other wildlife to breed, and when the young disperse the hunters can harvest them as a sustainable resource. Through these discussions it became clear that there had been a similar practice of culturally-based tambu areas in the past, although this practice had been abandoned after the clans were missionised. One of the motivating factors for the protected area was creating a sustainable hunting system. TKCP staff also shared information about tree kangaroo reproduction (e.g. only one offspring every one to two years, slow to reproduce) to emphasise the vulnerability of tree kangaroos as a hunting source and the need to manage harvesting (Wells *et al.* 2013).

Addressing community needs

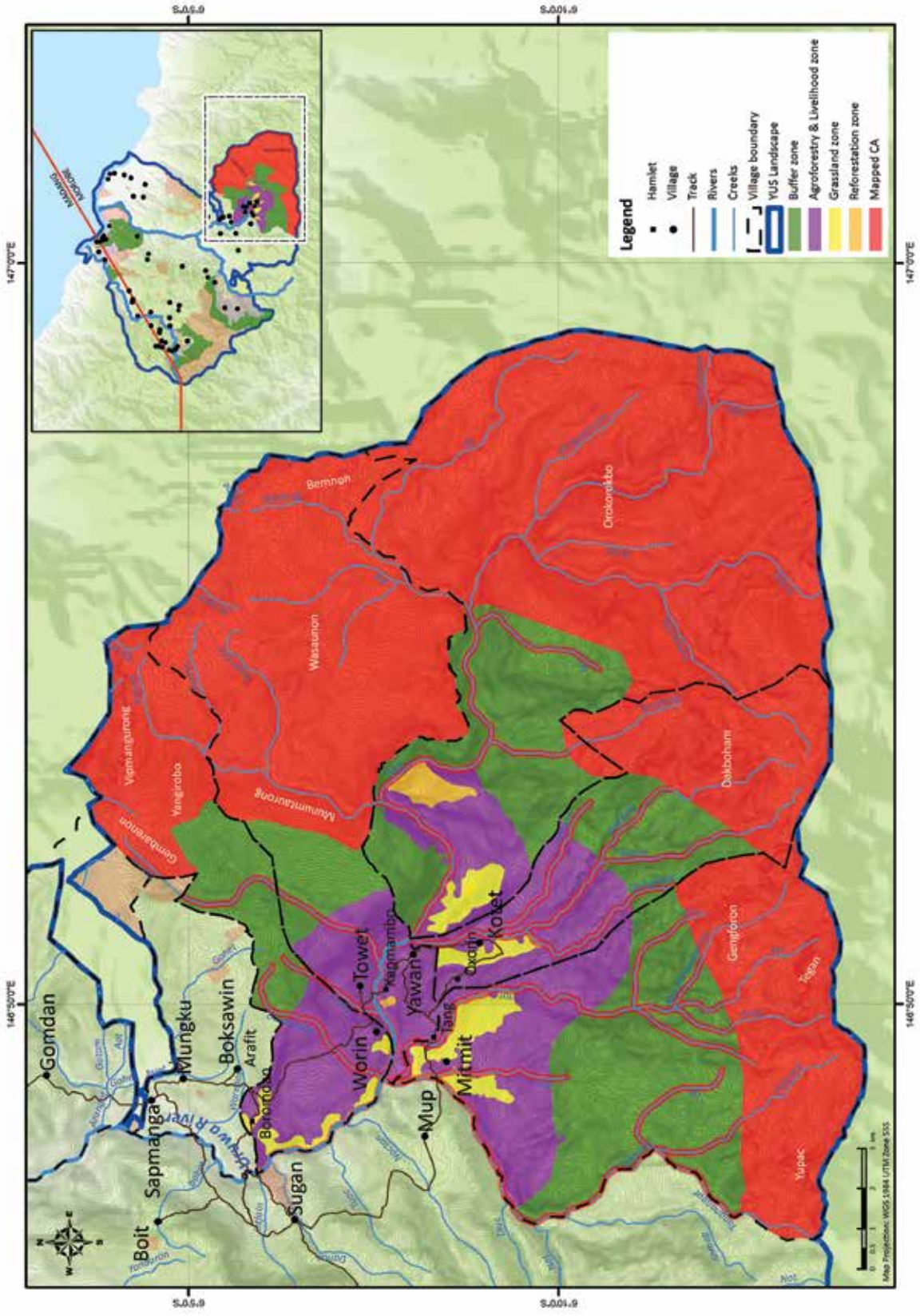
TKCP fostered community-based conservation through responding to both environmental and community needs. The principal services that the YUS communities were concerned about were education and health. Given the small size of TKCP in the early years, researchers took guidance from Yus leaders as well as the Member of Parliament from the District at the time who came from the Yus LLG and focused first on education services. Many schools in the villages were closed due to a lack of teachers. A TKCP sponsored community education project then started in 1998 providing teacher training scholarships for YUS students and teacher training workshops for current teachers. The scholarships are provided on a co-funding the basis where TKCP and the Yus LLG each contribute 44.5% of the fees, and the parents provide the remaining 11%. This approach benefitted entire villages and communities which helped with gaining support for conservation efforts. Additionally capacity training for local research assistants became another benefit of TKCP's presence across YUS. The community approach was to address LLG-level services that were not being met by the government. The goal has been to initially fill gaps and then strengthen the direct link between Yus LLG and provincial government agencies. An NGO should not replace government services, but in the case of remote areas there is a need to facilitate linkages between higher levels of government and the LLG (Wells *et al.* 2013).

In 2005 TKCP started a community health project in collaboration with the provincial government and the YUS community. The focus was on supporting training workshops for midwives (a need identified by the community and the Provincial Health Department) and supporting an immunisation project by establishing solar refrigerators in aid posts and health centres. Responding to local priorities through supporting health and education development has helped build trust and long term relationships across the YUS Landscape.

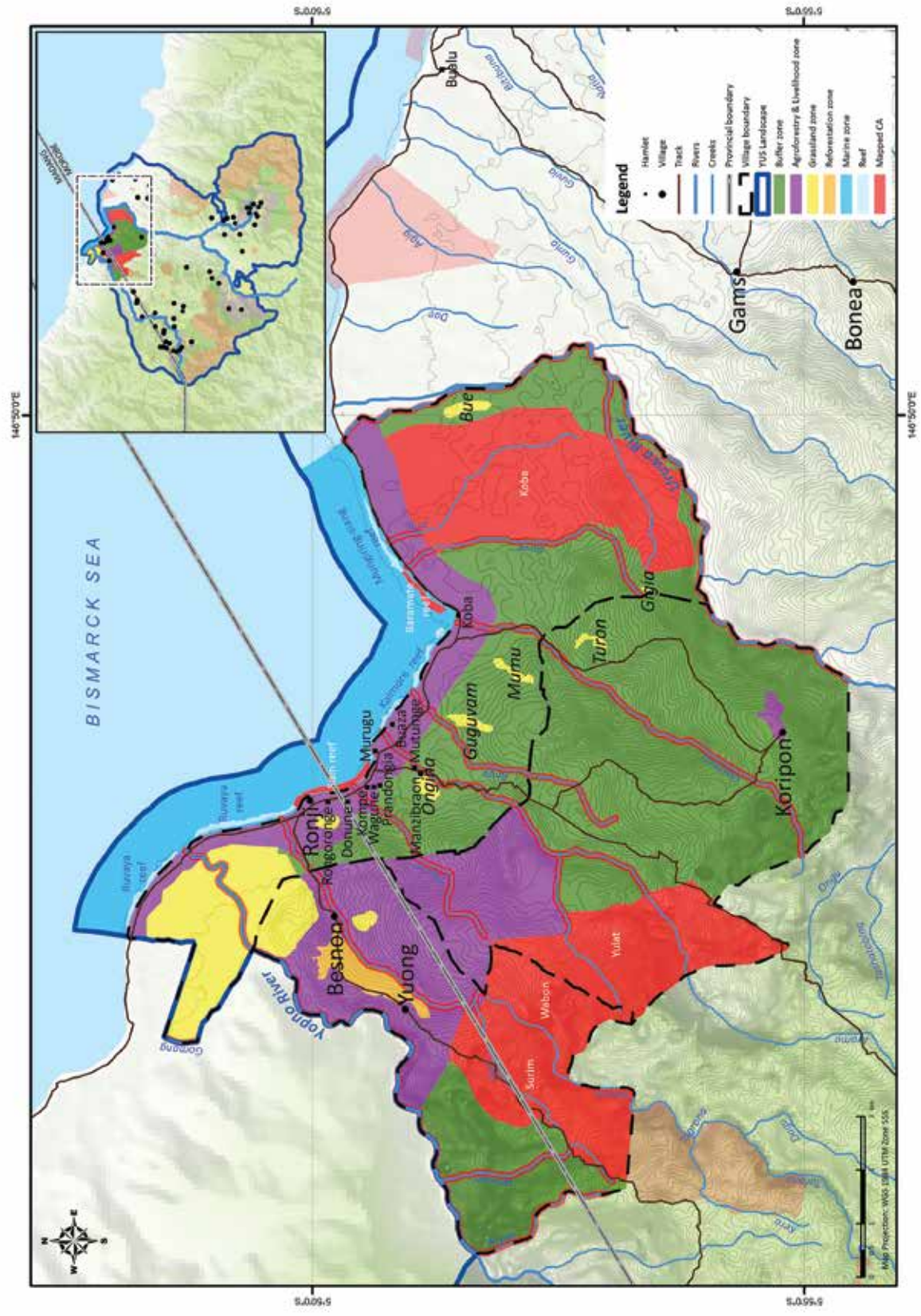
Annex 4
Land Use Planning maps

Five pilot ward land use plans were completed in 2012. The land use maps for each ward are provided here.

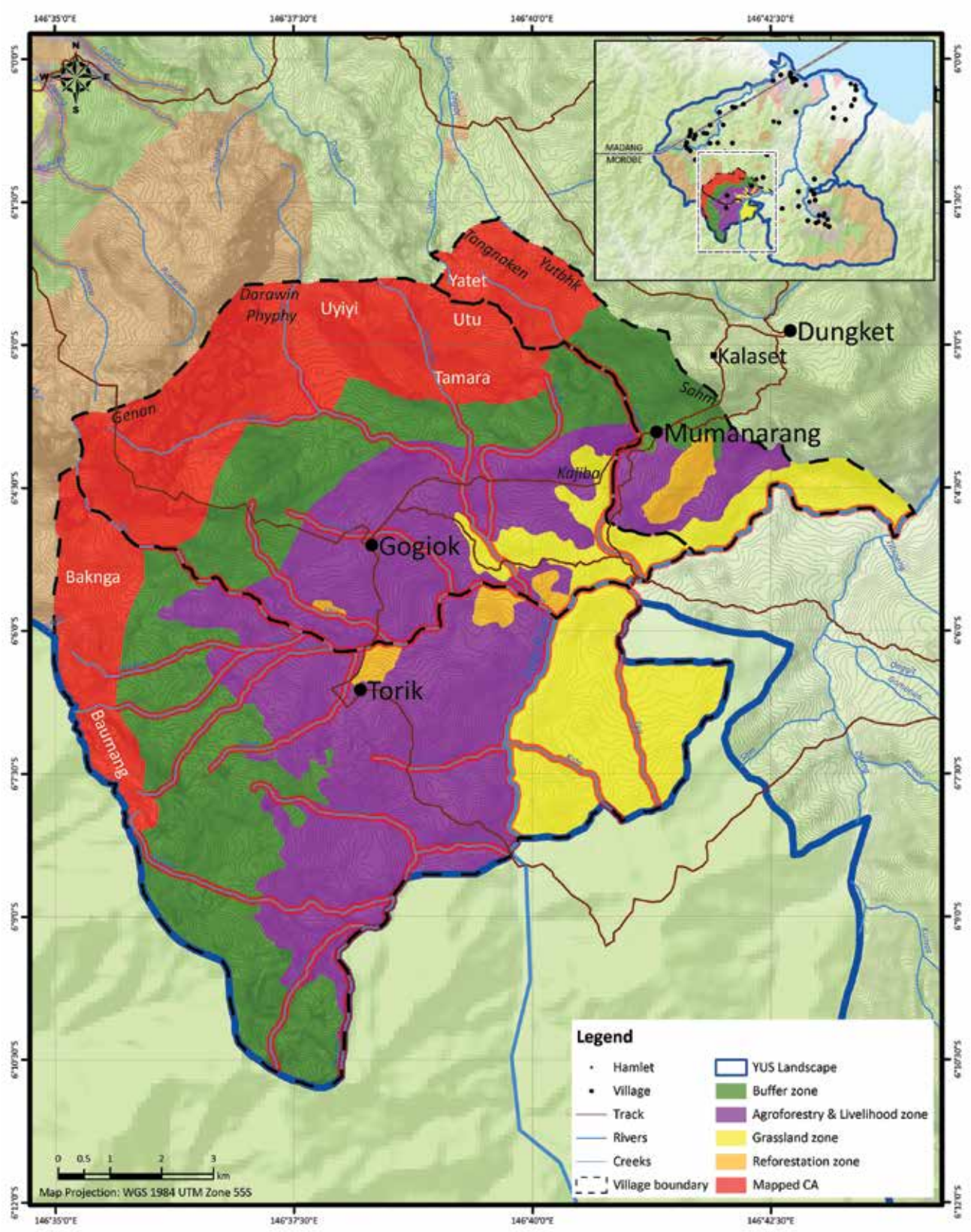
Map 10: Yawan – Ward Land Use Plan



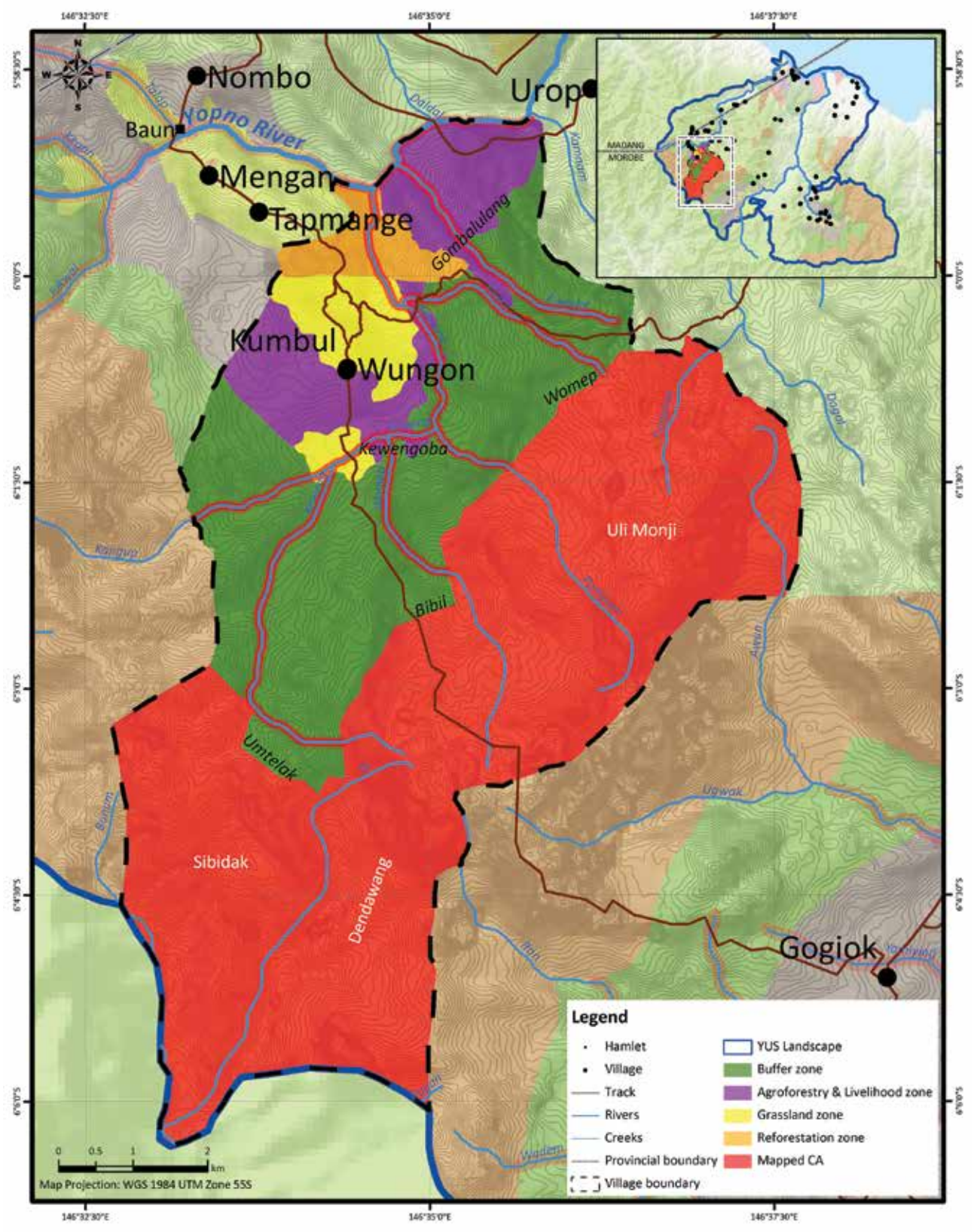
Map 11: Ronji – Ward Land Use Plan



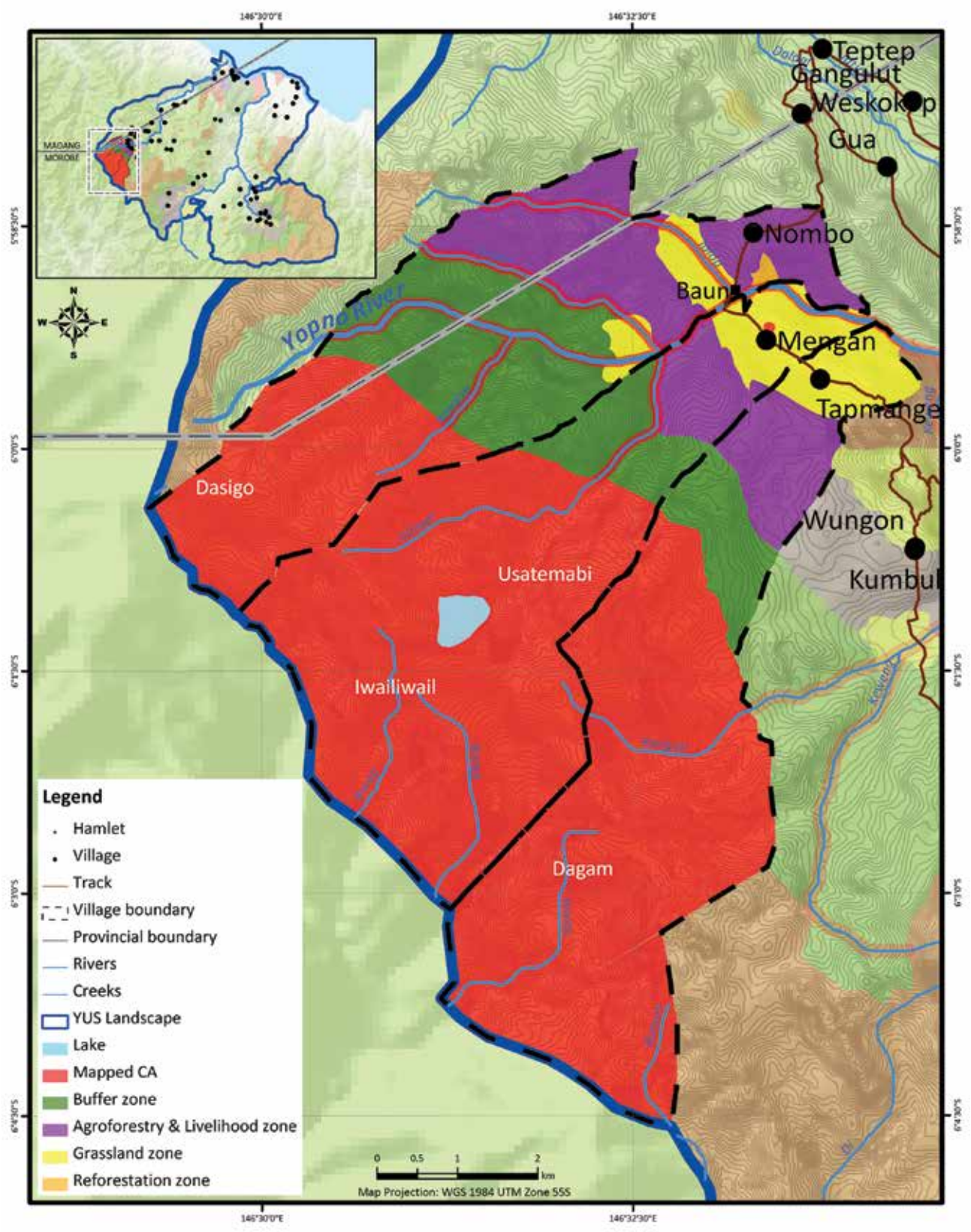
Map 12: Gogiok – Ward Land Use Plan



Map 13: Kumbul – Ward Land Use Plan



Map 14: Mengan – Ward Land Use Plan



Annex 5
Ecosystems, flora and fauna of conservation significance

Annex Table 2: Species endemic to the Huon Peninsula

Family	Latin /scientific name	English name
Endemic to Huon Peninsula		
Macropodidae	*Dendrolagus matschiei*	Huon, Matschie's Tree Kangaroo
Meliphagidae	*Melidectes foersteri*	Huon Melidectes
Meliphagidae	*Melipotes ater*	Spangled Honeyeater
Paradisaeidae	*Astrapia rothschildi*	Huon Astrapia
Paradisaeidae	*Paradisaea guilielmi*	Emperor Bird of Paradise
Ptilonorhynchidae	*Amblyornis macgregoriae*	Huon Bowerbird
Endemic to Huon and Adelbert Mountain Ranges		
Paradisaeidae	*Parotia wahnesi*	Wahne's Parotia
Sub-species endemic to Huon Peninsula		
Psittacidae	*Charmosyna papou wahnesi*	Papuan Lorikeet
Psittacidae	*Psittacella brehmii harterti*	Brehm's Tiger-Parrot
Psittacidae	*Psittacella madaraszi huonensis*	Madarasz's Tiger-Parrot
Alcedinidae	*Syma megarhyncha sellamontis*	Mountain Kingfisher
Turdidae	*Turdus poliocephalus keysseri*	Island Thrush
Orthonychidae	*Ptilorrhoa castanonota par*	Chestnut-backed Jewel-Babbler
Eopsaltriidae	*Machaerirhynchus nigripectus harterti*	Black-Breasted Boatbill
Eopsaltriidae	*Peneothello sigillatus saruwagedi*	White-Winged Robin
Pachycephalidae	*Aleadryas rufinucha lochmia*	Rufous-Naped Whistler
Pachycephalidae	*Colluricincla megarhyncha madaraszi*	Little Shrike-Thrush
Pachycephalidae	*Pitohui nigrescens harterti*	Black Pitohui
Dicaeidae	*Melanocharis striativentris chrysocome*	Streaked Berrypecker
Dicaeidae	*Paramythia montium brevicauda*	Crested Berrypecker
Dicaeidae	*Toxorhamphus poliopterus septentrionalis*	Slaty-Chinned Longbill
Zosteropidae	*Zosterops atrifrons gregaria*	Black-fronted White-Eye
Zosteropidae	*Zosterops novaeguineae oreophila*	New Guinea White-Eye
Meliphagidae	*Timeliopsis fulvigula fuscicapilla*	Olive Straightbill
Meliphagidae	*Melidectes ochromelas lucifer*	Cinnamon-Browed Melidectes
Meliphagidae	*Melidectes torquatus cahni*	Ornate Melidectes
Ptilonorhynchidae	*Ailuroedus melanotis astigmaticus*	Spotted Catbird
Paradisaeidae	*Drepanornis albertisi geisleri*	Buff-Tailed Sicklebill
Paradisaeidae	*Lophorina superb latipennis*	Superb Bird of Paradise

Source: (ISSG 2011; Beehler 2012; Birdlife 2012)

Annex Table 3: Status of fauna of conservation concern across YUS

Latin / scientific name	English name	IUCN Status
Casuarius bennetti	Dwarf Cassowary	Near Threatened
Does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for, or is likely to qualify for a threatened category in the near future.		
Harpyopsis novaeguineae	New Guinea Harpy Eagle	VUC2a(ii)
Considered to be facing a high risk of extinction in the wild (VU), as best available evidence indicates that: - Population size is estimated to number fewer than 10,000 mature individuals (C) - There is continuing decline, observed, projected, or inferred, in numbers of mature individuals (2) - All mature individuals are in one subpopulation (a(ii))		
Scolopax saturata	Javan Woodcock	Near Threatened
Does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for, or is likely to qualify for a threatened category in the near future.		
Psittrichas fulgidus	Vulturine Parrot	VUA2bcd+3bcd+4bcd

Considered to be facing a high risk of extinction in the wild (VU), as best available evidence indicates that:
- There has been an observed, estimated, inferred or projected population reduction of ≥ 30% over the last 10 years or three generations, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible (A2,3 and 4), based on any of the following:
  - an index of abundance appropriate to the taxon (b)
  - a decline in area of occupancy, extent of occurrence and/or quality of habitat (c)
  - actual or potential levels of exploitation (d)		

Parotia wahnesi	Wahne's Parotia#	VUC2a(i)
Considered to be facing a high risk of extinction in the wild (VU), as best available evidence indicates that: - Population size is estimated to number fewer than 10,000 mature individuals (C) - There is a continuing decline in numbers of mature individuals (2) - No subpopulations contain more than 1,000 mature individuals (a(i))		
Paradisaea guilielmi	Emperor Bird of Paradise*	Near Threatened
Does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for, or is likely to qualify for a threatened category in the near future.		
Zaglossus bruijni	Western Long-Beaked Echidna	CRA2acd

Considered to be facing an extremely high risk of extinction in the wild (CR), as best available evidence indicates that:
- There has been an observed, estimated, inferred or suspected population reduction of ≥ 80% over the last 10 years or three generations, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible (A2), based on any of the following:
  - direct observation (a)
  - a decline in area of occupancy, extent of occurrence and/or quality of habitat (c)
  - actual or potential levels of exploitation (d)		

Dasyurus albopunctatus	New Guinea Quoll	Near Threatened
Does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for, or is likely to qualify for a threatened category in the near future.		
Dendrolagus matschiei	Matschie's Tree Kangaroo*	ENC2a(ii)
Considered to be facing a very high risk of extinction in the wild (EN), as best available evidence indicates that: - Population size is estimated to number fewer than 2,500 mature individuals (C) - There is a continuing decline in numbers of mature individuals (2) - At least 95% of mature individuals are in one subpopulation (a(ii))		

Latin / scientific name	English name	IUCN Status
Dorcopsulus vanheurni	Small Dorcopsis	Near Threatened
Does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for, or is likely to qualify for a threatened category in the near future.		
Thylogale browni	Brown's Pademelon, New Guinea Pademelon	VUA2d
Considered to be facing a high risk of extinction in the wild (VU), as best available evidence indicates that: • There has been an observed, estimated, inferred or suspected population reduction of ≥ 30% over the last 10 years or three generations, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible (A2), based on: ◦ actual or potential levels of exploitation (d)		
Paraleptomys rufilatus	Northern Water Rat	ENB1ab(iii,v)

Considered to be facing a very high risk of extinction in the wild (EN), as best available evidence indicates that:
• Geographic range (extent of occurrence) is estimated to be less than 5,000km2
• Population is severely fragmented or known to exist at no more than five locations (a)
• Continuing decline, observed, inferred or projected (b), in the following:
  ◦ area, extent and/or quality of habitat (iii)
  ◦ number of mature individuals (v)		

Notes: * – endemic to Huon Peninsula; # – endemic to both Huon Peninsula and Adelbert Mountain Ranges

Source: (ISSG 2011; Beehler 2012; Birdlife 2012; Inkster 2012; Ziembicki 2012)

Annex Table 4: Matschie's Tree Kangaroo *(Dendrolagus Matschiei)* research

Principal authors / researchers	Research field
McNab, B.K. (McNab 1988)	• energy conservation
Burns, D.L. (Burns *et al.* 1994)	• treatment of mycobacterial cobacterial infections
Dabek, L. (Dabek 1994)	• reproductive biology and behaviour
Dabek, L. (Dabek & Betz 1998)	• species conservation
Iwaniuk, A.N. *et al* (Iwaniuk *et al.* 1998)	• manual dexterity and limb movement
Montali, R.J. *et al* (Montali *et al.* 1998)	• immunosuppressive disorders and mycobacterial infections
Betz, W. (Betz 2001)	• food plants
Betz, W. (Betz 2001)	• population density estimation
Betz, W. (Betz 2001)	• conservation status and cultural history
Stabach, J.A. (Stabach 2005), Pugh, J.A. (Pugh 2003)	• habitat identification using remote sensing
Ross, T. & Dabek, L. (Ross & Dabek 2006), Ancrenaz, M., Dabek, L., & O'Neil, S. (Ancrenaz *et al.* 2007)	• conservation and community participation
Porolak, G. (Porolak 2008)	• range size and habitat
North, L.A. & Harder, J.D (North & Harder 2008)	• reproductive biology
Stabach, J.A., Dabek, L., Jensen, R., & Wang, Y. Q. (Stabach *et al.* 2009)	• dominant forest type for conservation
McGreevy, T.J.Jr., Dabek, L., *et al.* (McGreevy et al. 2009; McGreevy *et al.* 2010b; McGreevy *et al.* 2010a)	• population genetics
Travis, E.K. (Travis *et al.* 2012)	• health assessment
Porolak, G. (Porolak *et al.* in review)	• distribution and home range
Porolak, G. (2012, current Doctoral research)	• hunting pressures

Annex 6
Zoning

Conservation Area

The purpose of the Conservation Area is to protect and conserve the natural ecosystems and wildlife there. This includes both forest and reef. These areas are therefore off limits to any kind of hunting, clearing, and gardening, or any kind of activity that might destroy or reduce the health and size of the ecosystems. Where the conservation area is made up of natural forest or alpine grassland, then this area should remain the same over time. Where the conservation area is made up of other vegetation types, then this area should grow back to forest and wildlife habitat over time.

Reforestation Zone

The purpose of the Reforestation Zone is the designation of land for the explicit purpose of planting and growing trees for use. The timber and wood grown in these areas provides an alternative source of wood for construction and fuel, and reduces the need for people to cut and clear forest areas within the Conservation Area and the Forest for Use Zone. As community populations grow the size of the reforestation zones may increase as well, or new areas designated within current livelihoods and grassland areas.

Forest for Use Zone

The zone acts as a buffer between the CA and the village and livelihoods areas. The purpose of this zone is to reduce the exposure of the edges of the CA to damaging human impacts from fire, forest clearing, invasive species, and animal hunting and trapping. While many activities including hunting, clearing, cutting timber, and collecting forest products are allowed within this zone, the area of the zone should not decrease as trees will be planted with each one cut. Wildlife numbers and range should also not decrease as the CA as the wildlife bank, serves to replenish those stocks. Forest for Use area should also not decrease due to village expansion, as any new developments should take place in the Village and Livelihoods Zones.

Livelihoods and Agroforestry Zone

The purpose of the Livelihoods and Agroforestry Zone is to provide space for current and the expansion of gardening, animal husbandry, or any other livelihoods or processing activities. Many of the permitted small-scale activities (such as collecting forest products, cutting wood, hunting and trapping) are similar to the Forest for Use Zone, however this zone is typically already cleared or disturbed and with a minority of forest area. Any growth or intensification of livelihoods should occur in this zone, and any incremental encroachment into the Forest for Use Zone avoided.

Grassland Zone

The purpose of the Grassland Zone is to provide a sustainable source of kunai and pit pit and land for burning and hunting (of, for example wild pigs) for local collection and use. Importantly all activities, except for village-based services and construction, are allowed in the Grassland Zone. The actual size of the area of grassland zone may decrease over time as reforestation plots are established for local use, or new livelihoods plots (e.g. coffee) are established. Any decrease in grassland area will however have to ensure remaining area of grassland is sufficient for local use.

Village Zone

The Village Zone is principally the place for houses, stores, schools, churches, and airstrips and any other village service or construction. The key activities not permitted in this zone are lighting kunai and setting traps.

Marine Zone

The Marine Zone is the open water outside of reefs. All activities are permitted in this Zone. The purpose of this Zone is to ensure that local communities have access to marine resources, passage and transport.

Reef Zone

The Reef Zone is the area of reefs along the YUS Landscape scope. These reefs are used to sustain local needs and sustenance, and are a place where people can fish and collect marine resources. These are sensitive ecosystems and therefore no large ships or boats can pass over this zone.

Annex 7
Aligning with and building on existing policies and plans

Annex Table 5: Alignment of Strategies and Programs with PNG's international environmental obligations

International convention / agreement	PNRESP	CITES	CBD	CBD Article 8: POWPA	CMS	MDG #7
YUS Landscape Strategy and Programs	**Article**	**Appendix**	**Article**	**Activity**	**Appendix**	**Target**
Strategy 1: YUS CA management	**14***	**I & II**	**6*, 7*, 8*, 13, 18, 20, 21**	**1.1.1**	**I & II**	**12**
S1.1: YUS Rangers	14	I & II	8*, 13		I & II	12
S1.2: Enforcement	14	I & II	8*, 13		I & II	12
S1.3: Ecosystem resilience	14	I & II	8*	1.1.5	I & II	12
S1.4: Ecological monitoring	14*	I & II	7*, 13, 14*, 18		I & II	12
S1.5: Signage, mapping and awareness		I & II	8, 13		I & II	
S1.6: Fire management						
S1.7: Invasive species			8			
S1.8: Reporting	14	I & II	8*, 17, 26	1.1.4, 2.1.2, 4.1.2, 4.2.1	I & II	12
Strategy 2: Research to inform resource and landscape management			**12, 14, 17, 18, 20, 21**			
S2.1: Research collaboration			12, 17, 18			
S2.2: Hunted species		I & II	7*, 10	1.1.5	I & II	
S2.3: Ecosystems		I & II	7	1.1.5	I & II	
S2.4: Marine and aquatic systems		I & II	7	1.1.5	I & II	
S2.5: Social / anthropology			8	1.2.1		12
S2.6: Sustainability			8, 10, 14	1.2.1, 3.1.2		12
S2.7: Climate change						
Strategy 3: Sustainable resource use and livelihoods			**8, 10, 11**	**3.1.2**		**12, 13**
S3.1: Land-use planning			8, 10, 11, 20, 21	1.2.1, 3.1.6		12*, 13
S3.2: Environmental services						
Strategy 4: Community services and healthy families			**20*, 21***			
S4.1: Developing leadership			12, 13*, 17, 20, 21	3.1.1		
S4.2: Livelihoods – quality and markets			8, 11	3.1.6		13
S4.3: Responding to local needs						

Notes: CBD – Convention on Biological Diversity; CITES – Convention on International Trade in Endangered Species; CMS – Convention on the Conservation of Migratory Species of Wild Animals; MDG #7 – Ensure Environmental Sustainability; A Strategy or Program is considered to align or contribute to an international obligation where: it meets the basic guideline/requirement of the specific article/action, and/or represents a component of a national requirement. Where an article/action is emphasised with "*", the expected outcomes of the Strategy or Program will: exceed the basic guideline/requirement of the article/action; or is a pilot/has no precedent in PNG, and could serve as a model for national replication.

Annex Table 6: Alignment of Strategies and Programs with applicable PNG Medium Term Development Plan (2011-2015) Goals and Deliverables

National Goal	Goal 3.3	Goal 3.4	Goal 3.6	Goal 3.7	Goal 3.14	Goal 4.1	Goal 4.2	Goal 4.3	Goal 5.6	Goal 5.7	Goal 5.9	Goal 6.2	Goal 6.3
	Health	School Education	Adult Education	Research	Rural Development	Agriculture	Fisheries	Forestry	Environment	Climate Change	Governance	Partnerships	Alignment
YUS Landscape Strategy and Programs	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**
Strategy 1: YUS CA management								**3**	**3.1, 4.1, 4.4**	**1.2**		**6.2.3, 6.2.5**	
S1.1: YUS Rangers			2.1					3	1.6, 4.1, 4.4,				*
S1.2: Enforcement								3	1.6, 4.1, 4.4				*
S1.3: Ecosystem resilience								3	1.6, 4.1, 4.4				*
S1.4: Ecological monitoring			2.1					3	1.6, 4.1, 4.4				*
S1.5: Signage, mapping and awareness								3	1.6, 4.1, 4.4, 4.5				*
S1.6: Fire management									1.3				*
S1.7: Invasive species						4.4							*
S1.8: Reporting				8	8			3	1.6, 3.1, 4.1, 4.4	4.4	1.2, 1.3	6.2.5	*
Strategy 2: Research to inform resource and landscape management				**8**								**6.2.5**	*
S2.1: Research collaboration				2									*
S2.2: Hunted species				2					4.1				*
S2.3: Ecosystems				2					4.1				*
S2.4: Marine and aquatic systems				2			4		1.6, 4.1				*
S2.5: Social / anthropology				2	8				4.4,				*
S2.6: Sustainability				2	8			6, 8	1.3, 4.4				*
S2.7: Climate change				2				9	4.5	4.4			*

National Goal	Goal 3.3 Health	Goal 3.4 School Education	Goal 3.6 Adult Education	Goal 3.7 Research	Goal 3.14 Rural Development	Goal 4.1 Agriculture	Goal 4.2 Fisheries	Goal 4.3 Forestry	Goal 5.6 Environment	Goal 5.7 Climate Change	Goal 5.9 Governance	Goal 6.2 Partnerships	Goal 6.3 Alignment
YUS Landscape Strategy and Programs	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**	**Dev. #**
Strategy 3: Sustainable resource use and livelihoods					**8**			**8**	**1.2, 1.3, 1.6, 2.1, 4.5, 5.7**				*
S3.1: Land-use planning				8	8			6.8	1.2, 1.3, 1.6, 2.1, 4.5, 5.7				*
S3.2: Environmental services													
Strategy 4: Community Services and Healthy Families					**8**							**6.2.5**	*
S4.1: Developing leadership			2.1		1				3.1, 4.5	4.4	1.2, 1.3	6.2.4, 6.2.5	*
S4.2: Livelihoods – quality and markets			2.1		3, 5	4.1, 4.2, 4.6, 7.2	4		4.5				*
S4.3: Responding to local needs	1.2, 1.3, 2.1, 4.1, 5.1, 5.2	1.5, 2.5, 2.6, 4	2.1		8								*

Notes: Dev. = Deliverable; * – Where noted, this highlights that due to programs aligning with at least one national goal, the program is therefore also contributing to Goal 6.3: Alignment. A Strategy or Program is considered to align or contribute to a national Goal where: it meets the basic guideline/requirement of the specific article/action, and/or represents a component of a wider national requirement, for which the province could report on.

Annex 8
Planning processes, and the role of government representatives and administrators related to the YUS Landscape

Planning processes

Broadly, planning in PNG follows a three-step process. First the highest levels of government set the national agenda (as is currently done through The Vision 2050 and in accord with any international obligations), and passes down to provincial governments the architecture, or the policy framework, for national development goals, as well as the indicators to be used to measure achievement. From here, provincial governments adapt the national framework to their contexts and similarly pass their strategic direction and long term targets down to the district, LLG and ward level administrations.

The second stage of the process begins at the ward level where every five years the ward counsellors, along with LLG managers, come together at a consultative meeting to develop specific priorities and actions that align with and contribute to provincial and national policy frameworks to achieve national development goals. Ward development plans are synthesised into a five year LLG development plan, while LLG plans within a given district are synthesized into a five year district development plan. District plans are in turn synthesised into provincial plans and so on. The completion of a five year development plan ensures that a given administrative unit receives their proposed allocation from the national development budget.

The third and final stage of planning is the synthesis of all provincial plans – complete with priorities and actions specific to each locality – into national plans, and the allocation of budgets.

Roles and responsibilities of representatives and regional administrators

The roles of the key representatives present on the CAMC or linked to the CAMC are summarised in the table below.

Annex Table 7: Government functions with potential implications for the YUS Landscape

The Department of Conservation and Environment (DEC)	• Minister DEC has power to approve or disapprove a YUS Landscape Plan; • Minister DEC has power of approval or veto to all major forestry development projects. The Minister is a foundational member of the National Forest Board. With regard to timber extraction, no actual development will take place until the Minister DEC has approved an environment plan; • DEC Secretary is the focal point for the 'Rio Conventions'; and • DEC Secretary is Chair of the MDG 7 Technical Committee. Secretary DEC supports coordination with other government agencies relevant to MDG 7 guides DEC, the implementing agency. As the implementing agency, DEC has primary responsibility in managing organisational, policy and technical assessments to inform the MDG 7 implementation strategy.
Provincial Government and Administrators	• Provincial Administrator (PA) has responsibility for the effective implementation of provincial five year development plans; • PA is supported by Deputy Provincial Administrators, who are in turn supported by Program Advisors who coordinate implementation of development objectives in each district and LLG; • Joint Provincial Planning and Budget Priority Committee (JPP&BPC) overseas and coordinates all provincial budgeting processes; and • Regarding forestry, provinces may make laws on: Land and land development including provincial titles and leases; Forestry and agro-forestry; Renewable and non-renewable natural resources; and Parks, reserves, gardens, scenic and scientific centres.
Provincial Department of Mining, Natural Resources and Environment	• Advocacy for local communities with regards to extractive and natural resource-based industries; and • Assessment of and approval of exploration and prospecting leases.
District Government / Administrators	• District program coordinators are directly responsible for the implementation of provincial development objectives through district projects and activities; • District Administrator monitors implementation of provincial plans at the district and LLG level, and reports directly to the Deputy Provincial Administrator – District Affairs; and • At the district level a Joint District Planning and Budget Priority Committee (JDP&BPC) exists in all nine districts of Morobe Province. This committee oversees and coordinates the planning and budgetary process for all districts and LLGs to ensure funding and implementation are in line with the district and LLG development plans and priorities.
Local Level Government	• LLG are responsible for community development. • The LLG Manager plays the key role in overseeing the implementation of five year plans, data collection and reporting to the District Administrator. • LLG Managers have Project Officers assigned to work closely with Ward Counsellors; • Regarding forestry, LLGs have power to make laws on: Dispute settlement; Local environment; Domestic animals, flora and fauna; Protection of traditional sacred sites; and the imposition of fines for breaches of any of its laws; and • LLGs have implicit veto under the Forestry Act when it comes to the acquisition and allocation of resources, where they have not been consulted of the province's intentions to enter into an FMA.

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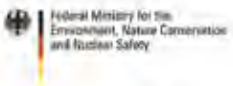
Tapmange. Photo: Mark Ziembicki


WOODLAND
PARK ZOO


TREE
KANGAROO
CONSERVATION
PROGRAM


YUS
CONSERVATION ORGANIZATION


CONSERVATION
INTERNATIONAL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