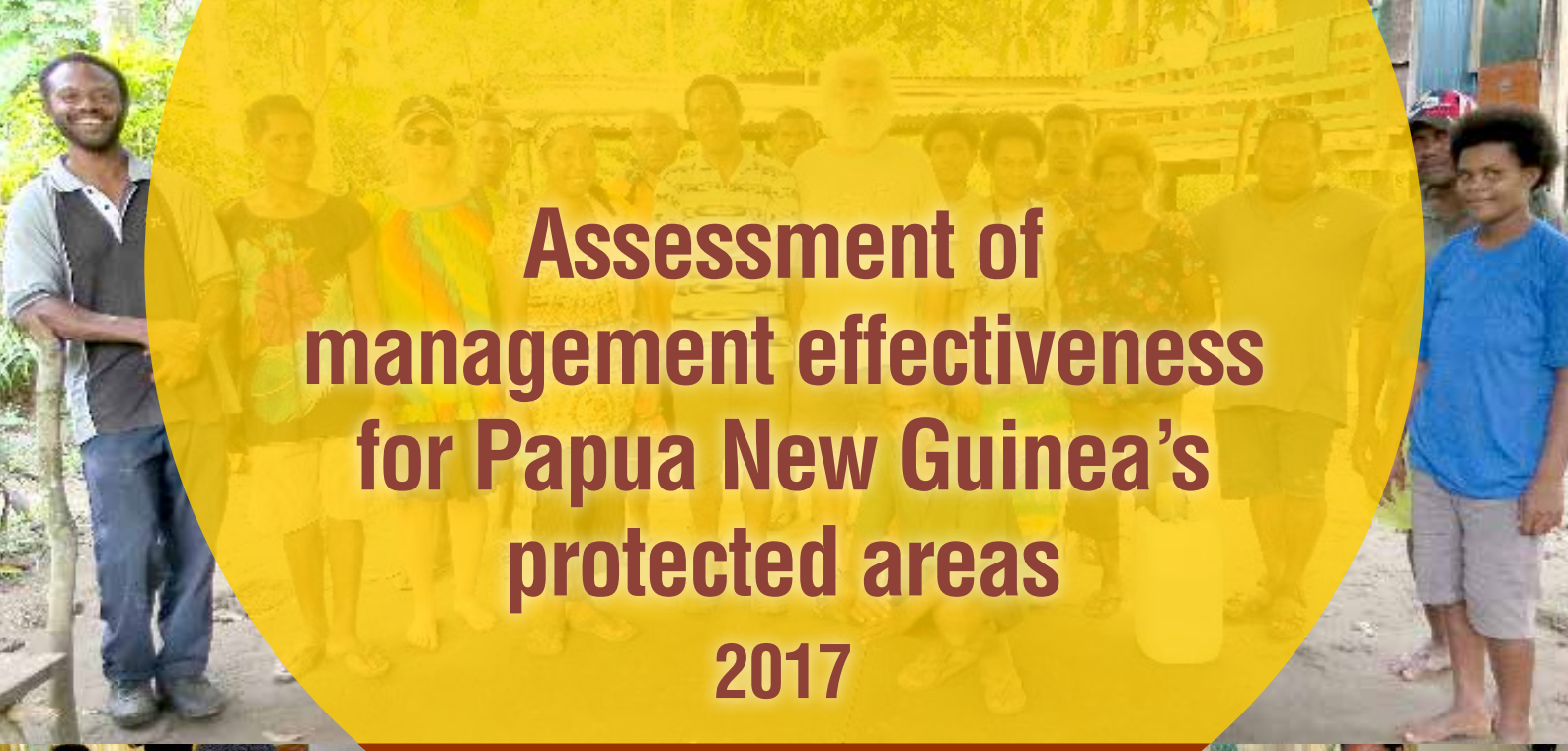

Assessment of management effectiveness for Papua New Guinea's protected areas

2017

FINAL REPORT

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UNDP

SPREP
PROE

ASSESSMENT OF MANAGEMENT EFFECTIVENESS FOR PAPUA NEW GUINEA'S PROTECTED AREAS 2017

This is the final report prepared by the Secretariat of the Pacific Regional Environment Programme (SPREP) for submission to the United Nations Development Programme (UNDP) and the Papua New Guinea Conservation and Environment Protection Authority (CEPA) in relation to the 2016–17 assessment of the management effectiveness of Papua New Guinea's protected areas. All the 57 gazetted protected areas in PNG are covered in this report, along with one proposed protected area that is in the process of gazettal.

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Fiona Leverington, Ann Peterson and Gregory Peterson conducted this project through Protected Area Solutions Pty Ltd under contract to SPREP.

In addition, Fiona is an Adjunct Senior Fellow and Ann is an Honorary Associate Professor with The University of Queensland, School of Earth and Environmental Sciences: we both appreciate the University's continuing support.

DISCLAIMER

This report has been prepared in cooperation with CEPA but is an independent evaluation, and the views do not necessarily reflect official CEPA policy or SPREP policy. There is no obligation for CEPA to accept or implement any recommendations contained in this report.

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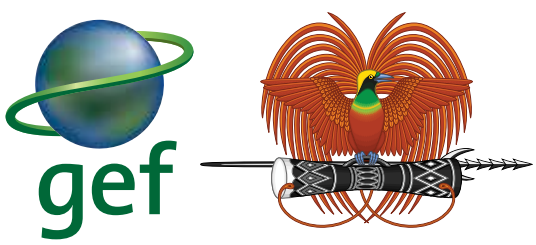

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List of terms and abbreviations

CA	Conservation Area
CBD	Convention on Biological Diversity
CEPA	Conservation and Environment Protection Authority
CI	Conservation International
DEC	Department of Environment and Conservation (*Now CEPA*)
GEF	Global Environment Facility
IUCN	International Union for Conservation of Nature
LMMA	Locally Managed Marine Area
METT	Management Effectiveness Tracking Tool
NEC	National Executive Council
NGO	Non-Governmental Organization(s)
NP	National Park
PAME	Protected Area Management Effectiveness Evaluation
PAS	Pacific Alliance for Sustainability
PNG	Papua New Guinea
POWPA	Program of Work on Protected Areas (program of the CBD)
RAPPAM	Rapid Assessment and Prioritisation of Protected Areas Management
UNDP	United Nations Development Programme
SPREP	Secretariat of the Pacific Regional Environment Programme
TNC	The Nature Conservancy
WMA	Wildlife Management Area
WWF	World Wide Fund for Nature
WCS	Wildlife Conservation Society
WS	Wildlife Sanctuary

EXECUTIVE SUMMARY

In 2016–2017 the Government of Papua New Guinea (PNG), through its Conservation and Environmental Protection Authority (CEPA) and with the support of the United Nations Development Program (UNDP), organised for an evaluation of its protected areas, as part of the process to improve management effectiveness. The scope of work for this project included:

- Conduct a literature review of protected areas in PNG and methodologies used to evaluate protected areas;
- Design and test an evaluation tool to be employed in PNG;
- Undertake field work to assess PNG's formally gazetted protected areas; and
- Analyse the data and compile reports (i.e. overall report and assessment data for each protected area).

PNG's protected area system

Customary landowners, custodians of up to 97% of land in PNG, recognise many areas of land and sea as "*tambu*" – areas of special spiritual significance. As the PNG Policy on Protected Areas states, "Over thousands of years, communities all over PNG have been conserving nature for cultural and spiritual reasons, while pursuing traditional livelihoods in these landscapes and seascapes" (Independent State of Papua New Guinea 2014, p. 7).

The earliest formal protected area was McAdam National Park, which was reserved by the former PNG colonial administration in 1962 and gazetted in 1970 (CEPA 2016). Around the time of Independence, there was a promising start in developing a protected area system based on customary land ownership and management, through declaring WMAs. These protected areas are declared over customary land and waters, with the agreement of customary landowners and usually on their initiative. Declaration of these protected areas across terrestrial and marine environments was innovative on an international scale.

By 2000 PNG had 45 protected areas with a total area of over 1.5 million ha.

This increased to 57 protected areas covering 1.7 million ha by 2009 (Figure A-1). Formally gazetted protected areas have not increased since that time. However, several significant areas are awaiting gazettal.

While protected areas were established on paper, their management has remained patchy and problematic. A significant evaluation of management effectiveness carried out in 2006 made some important recommendations to strengthen the protected area system and to halt the deterioration of values being experienced at that time (Chatterton *et al.* 2006). Most recommendations of the 2006 RAPPAM study have not been implemented, and since then several protected areas have been cleared fully or partially, and have lost many of their values. However, one key recommendation was a PNG Policy on Protected Areas, which was finalised and endorsed by the PNG Government in 2014 (Independent State of Papua New Guinea 2014).

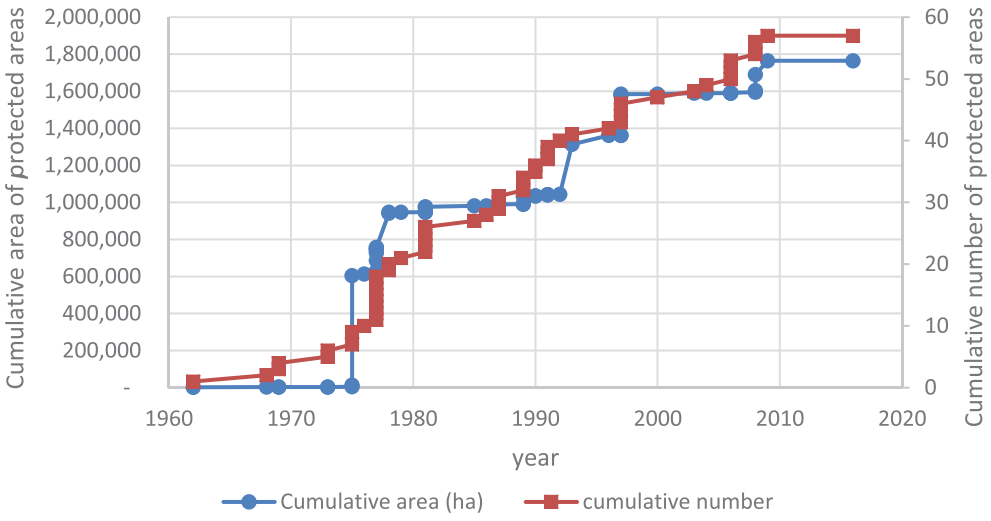


Figure A-1: Growth of protected area system in PNG

Source: Compiled from the CEPA database on protected areas (Conservation and Environment Protection Authority 2017)

CEPA is currently finalising new protected area legislation, and will then review all protected areas and re-allocate them into the new protected area classes, based on consistent criteria.

PNG Protected Area Timeline

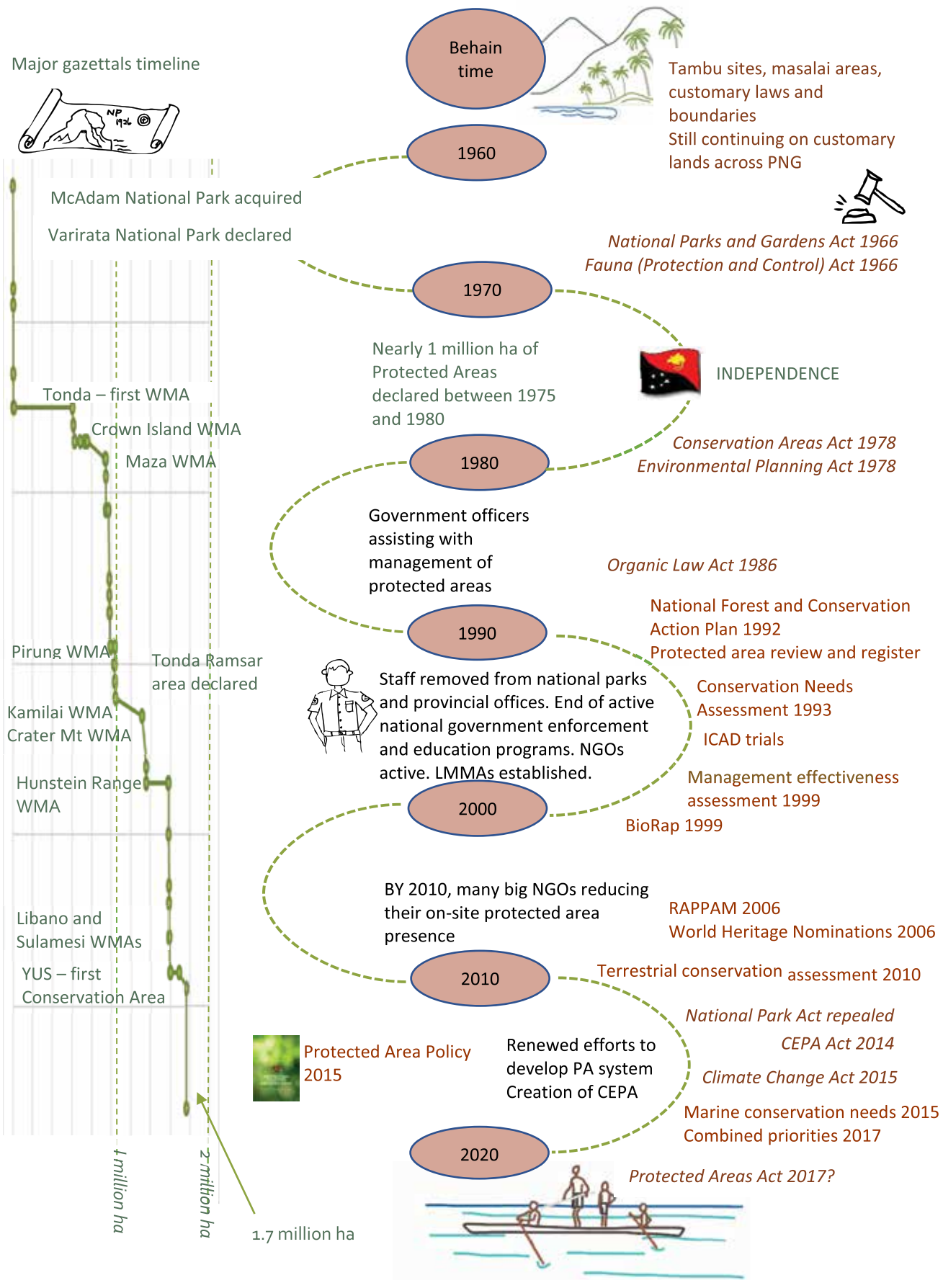


Figure A-2: PNG Protected Area Timeline

Reserve planning – the process of systematically identifying the highest priorities for protected areas – has been carried out in PNG for more than 40 years. In 2015–17, a project entitled "Review and Integration of the Terrestrial and Marine Program of Works on Protected Areas" used reserve planning software to analyse priorities and propose ways to integrate conservation planning across landscapes and seascapes (Adams *et al.* 2016). In spite of the many attempts to identify priority areas, to date, none of the reserve plans have been implemented.

A timeline of PNG's protected areas is shown in Figure A-2.

Assessing management effectiveness

A modified Management Effectiveness Tracking Tool was applied to examine the management effectiveness of PNG's protected areas. Key changes to develop the 'PNG-METT' included:

- ensuring the appropriateness of the questionnaire and the workshops in the PNG context;
- adding questions about protected area benefits and values, and the condition and trend in these values over time; and
- recording participants' views about how the situation on their protected areas could be improved (e.g. in relation to the values, threats and various management effectiveness themes).

The PNG- METT was implement through a series of workshops, which were a very important opportunity to build and repair relationships between customary landowners, CEPA and other parties.

Protected area values and benefits

METHOD: There were three parts to gaining an understanding of the values and benefits of each protected area from the perspective of the customary landowners and other workshop participants: (1) the participants were asked to respond, in pictures and words, to the question 'What do you like and what is important about your protected area?'; (2) key values for each protected area were identified; and (3) the participants scored the importance of a checklist of 16 types of protected area benefits ('not important' (0), 'important' (1) or 'very important' (2).

Overall, respondents for most of the protected areas had a very strong appreciation of the benefits of their protected areas, with attractive scenery, traditions and customs, potential future tourism, fresh water, and biodiversity scoring the highest across the country (Figure A-3).

93% of the protected areas nominated natural values

88% of protected areas listed socioeconomic values (livelihood and commercial)

71% listed cultural values

- With a few exceptions, *most protected areas are highly valued* by their customary landowners as places where nature and culture are relatively intact. Participants are enthusiastic about the values and benefits of their protected areas. However, customary landowners for a few protected areas have little idea of why the protected area exists or what it means.
- People still perceive a *close relationship between nature, culture and livelihoods*. Animals and plants are respected for their own value, but more often as important resources for food, medicines, building material and cultural practices. People are usually aware of the need for sustainability in their use.
- The *lack of detailed knowledge* about the landscape, plants and animals is striking in many protected areas.
- As well as biodiversity, *natural areas are prized for clean fresh water, attractive scenery, clean air and protection of tambu places*.
- In developing and managing protected areas in PNG, *the 'healthy parks, healthy people'* concept could be useful in building on people's current understanding of how closely they are linked to the natural world.
- There are sometimes *differences in opinion* within landowner groups, as some people value the protected areas while others (especially those living away from their villages) are concerned at the lack of tangible cash benefits.
- Many customary landowners stated their willingness and interest to learn more about their protected areas, and showed a high level of interest in information that has been given to them in the past

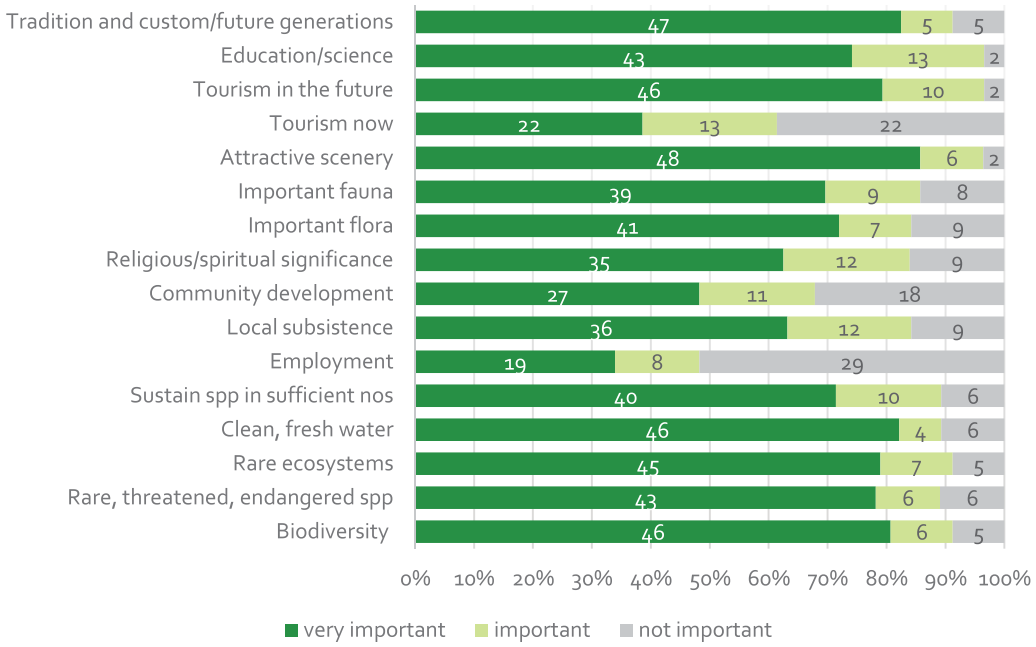


Figure A-3: Participants' perceptions of the level of importance of the benefits provided by protected areas in PNG

Management effectiveness scores

METHOD: We assessed 58 protected areas. Most METT questions have a choice of four answers, reflecting the progress towards an ideal situation. For each question the four-point scale represents progress from no management, through very minimal or early management to basic and then sound management.

The total METT scores for each protected area were calculated by adding all the scores, giving some indication of overall progress in achieving effective management. These total scores were then considered as a percentage of the total possible score and rated as follows: 'very good', with a result of more than 66%; 'good progress, with some concern' (50–66%); some progress, high concern' (33–49%); and 'little or no progress' (<33%).

Overall progress in PNG's protected area system is very limited (Figure A-4). Only four protected areas are rated as achieving very good progress. A further three protected areas are rated as having good progress, although with some concerns. The remainder of the protected areas are struggling to deliver even basic management. Fourteen protected areas (24% of the total) are showing some progress, although there are major concerns with management. The remaining 37 protected areas (64%) score less than 33% of the possible score, which indicates that management is quite inadequate or has not yet been established[1].

It should be noted that a low management effectiveness score does not indicate that the situation is hopeless or that the protected area does not have high remaining values. Some of the poorest scoring protected areas have rated the condition of their values as 'good', but urgent action is needed to prevent future deterioration.

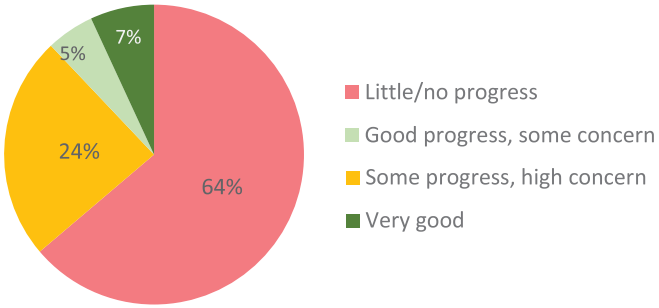


Figure A-4: Overall progress in management effectiveness for protected areas in PNG
(Percentage of protected areas achieving each total management effectiveness rating)

[1] The classification of total scores according to Leverington F.; Costa K.; Pavese H.; Lisle A. & Hockings M. (2010a) A Global Analysis of Protected Area Management Effectiveness. *Environmental Management* 46, 685–98. 10.1007/s00267–010–9564–5.

Results were analysed and are discussed in this report according to eleven major management themes. Design and establishment was by far the strongest theme, with resource management the weakest (Table A-1).

Table A-1: Mean METT scores across 58 protected areas, according to the management theme

RANK	THEME	MEAN SCORE (% OF HIGHEST POSSIBLE SCORE)
1	Design and establishment	76%
2	Condition of protected area values	60%
3	Economic benefits to local communities	33%
4	Legislation, control and enforcement	32%
5	Budget, infrastructure and equipment	31%
6	Human resources	29%
7	Relationships education and awareness	24%
8	Information, inventory and research	22%
9	Planning and objectives	18%
10	Tourism and recreation	15%
11	Resource management	12%

Participants' suggestions

For each of the METT questions, we recorded 'next steps': the participant's views about what could be done to improve their score in the future. Thinking about the future and discussing options for the future is critical step if management effectiveness evaluation is to have positive results. We compiled comments for each question across all the protected areas, and identified common themes and actions as well as some of the most salient comments. At the end of the workshops participants were asked to identify three things that would make their protected area better in the future. These three key recommendations were analysed across all the protected areas (FigureA-5).

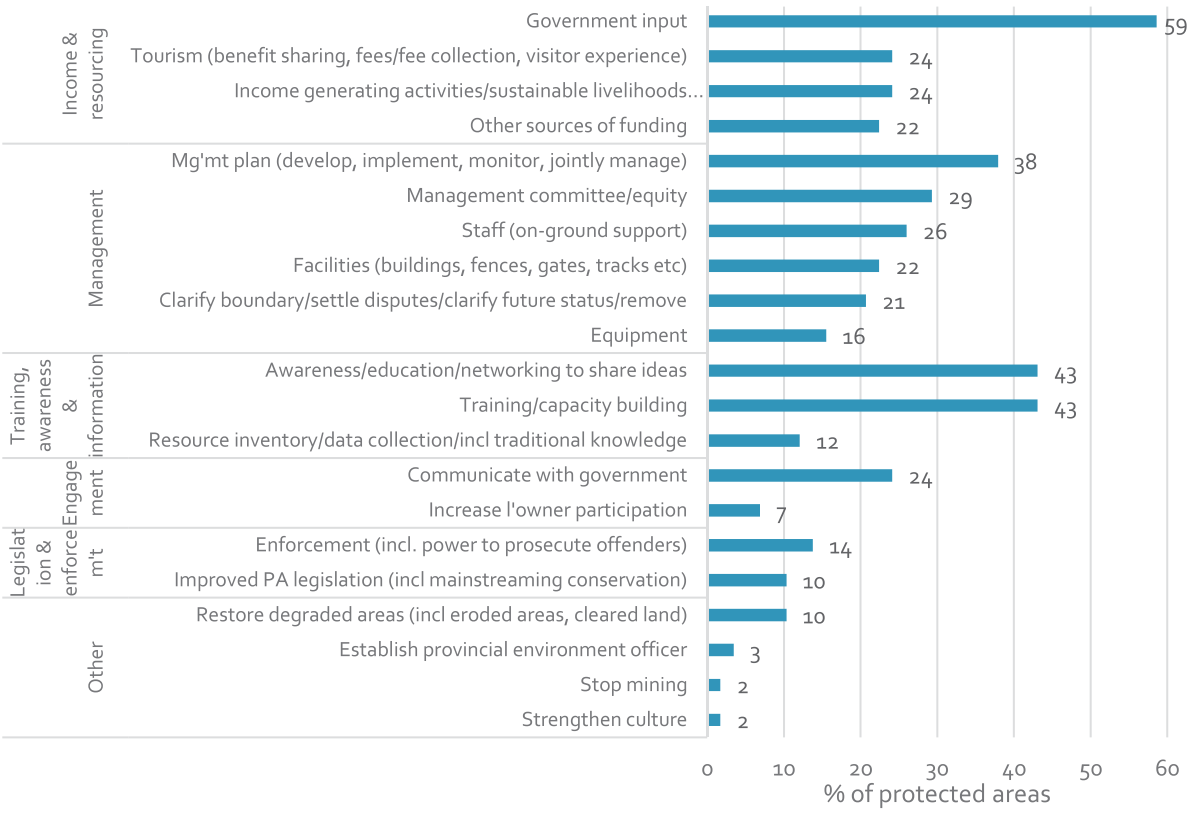


Figure A-5: Summary of the workshop participants' three key recommendations from each protected area

Many of the participants' recommendations are based on the need for a greater involvement of government. While most of the customary landowners were keen to be involved and to remain as primary stewards of the protected areas, they recognised that this could not be done without assistance – financial, logistical and technical. Generally, they were seeking assurance that future management would involve true and sustained partnerships, where they were not expected to bear all the responsibility for management.

Threat analysis

METHOD: The threat analysis in the PNG-METT is based on the IUCN standard threat classification (Salafsky et al. 2008), adapted for protected areas and for PNG's context. The classification uses two levels of threat to enable analysis at local, national and international levels. We asked respondents to:

- rate the significance of each threat on the list as High, Medium, Low or Not applicable
- describe the nature of the threat
- nominate ways to reduce the impact of the threat, and
- identify the three worst threats affecting their protected area.

A threat is defined as something that causes damage or potential damage to the values of the protected area. Many protected areas in PNG include villages and gardens, and the landowners undertake some hunting and/or fishing. These activities are not always defined as threats, as they may not threaten the protected area values if the population is stable and sustainable practices are applied.

The most frequently reported level 1 (general) threats were climate change and severe weather, followed closely by biological resource use and invasive species (Figure A-6). The most commonly identified Level 2 (specific) threats were sea level rise, temperature extremes, pest animals, loss of cultural links and population increase.

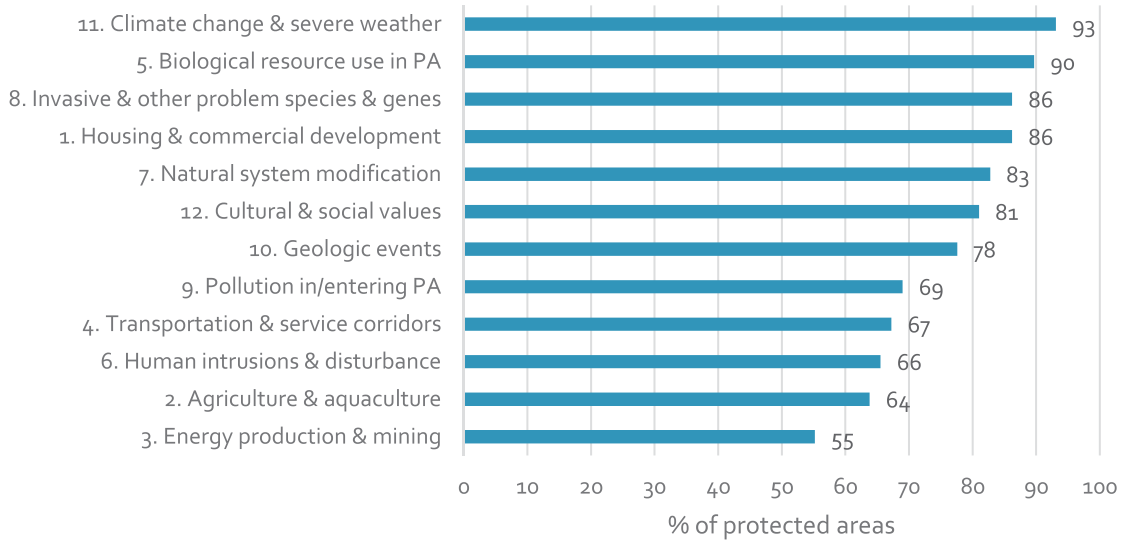


Figure A-6: Percent of protected areas that experience each level 1 (general) threat

Respondents were also asked to nominate the 'top three' worst threats for their protected area. These were population increase in the protected area community; housing and settlement; and various aspects of climate change. Hunting, pest animals, fire and loss of culture are also frequently mentioned as among the worst threats.

93% of protected areas experience **climate change**. Specific threats and impacts currently being experienced include temperature extremes, prolonged droughts, increasingly severe storms and flooding, shifts in habitat and changes in seasonal patterns which affect food security and long-term sustainability. Coastal and marine protected areas are also significantly affected by sea level rise and there is reporting of extensive coral bleaching.

90% of protected areas were concerned about **biological resource use**, in particular hunting/collecting terrestrial animals and fishing/harvesting aquatic resources.

86% of protected areas recognise **invasive species** as a threat. **Pest plants and animals** impact on wildlife and ecosystems. The introduction of non-native fish into waterways is seen as a serious threat in areas where this has occurred.

86% of protected areas consider **housing and development** as a threat to the protected areas. Associated with this is **population increase**, which puts pressure on housing as well as on land for settlement and gardens. This frequently results in **clearing of forests for housing and firewood, pressures on wildlife for food, and declines in water quality**. Natural population increase is exacerbated by the **settlement of 'outsiders'** both within and adjacent to many protected areas and this is followed by subsequent increased extraction of the protected area's resources. Many protected areas are incapable of addressing the issue of illegal settlers and have sought assistance from government, which frequently has not been forthcoming.

This assessment reflected the reality that in PNG nature and culture are closely linked. Most workshop participants were very concerned that their communities are experiencing a **loss of their culture, traditions and language**, and this is seen to be intertwined with biodiversity loss. The loss of names for many species of plants and animals, and the loss of traditions relating to hunting, fishing and gathering, are of concern.

In the 20% of protected area where **pollution from existing or past mining operations** occurs, this appears to be a threat of extreme severity, affecting both the environment and human health.

Customary landowners have **limited capacity** to effectively address many of the identified threats. This problem is magnified by lack of equipment, funding and relevant skills (e.g. in monitoring) and an ongoing failure of all levels of government and NGOs to effectively engage with many protected areas to address threatening processes.

Lack of effective enforcement, due to the absence of funding, equipment or on-ground ranger presence results in increasing impacts for some threats such as resources extraction (e.g. terrestrial and aquatic fauna and flora, expansion of gardens and settlements into sensitive environmental areas and failure to address invasive species). This is particularly problematic as landowners from many protected areas reported increased illegal harvesting as a result of growing populations and illegal entry into and settlement within their protected areas.

The problem of **outsiders extracting resources** with no traditional limits or other enforcement has contributed to the 'tragedy of the commons' (Hardin 1968; Ostrom 1990) in some areas, where nobody takes responsibility for sustainable resource use so the attitude becomes 'grab it before someone else does'. This is not the usual attitude of PNG landowners, where the customary landowners are very aware of their custodianship.

State of the protected areas

METHODS: For each protected area, workshop participants defined the most important values, including natural, cultural, socio-economic and historic. Later in the workshop, participants rated the current condition and trend for each value. For each value, the estimated condition was rated as:

- **Very good** (3): Desirable status. Little additional intervention is required unless new threats arise. (May require continuing interventions that are already occurring);
- **Good** (2): Within the range of acceptable variation, but some addition intervention is needed if this is to be maintained;
- **Fair** (1): condition is outside the range of acceptable variation; but could be restored over time; or
- **Poor** (0): Condition is outside the range of acceptable variation and restoration is very difficult.

Trend was estimated as stable, improving or declining. The ratings are summarised in tables in each protected area summary. Condition and trend information was then 'rolled up' for each protected area to derive an overall condition score.

In terms of the overall condition of PNG's protected areas:

71% of protected areas estimated their values to be in good to very good condition. However, when area is taken into account, only **45%** of the protected area system falls into these categories.

53% experience decline in some important values.

Discussion

Positive features to build on

Most customary landowners remain interested in conserving their land and seas. People are closely connected to their traditional lands, and there is a close intertwining of culture and nature. Communities appreciate the range of benefits provided by protected areas and are concerned about the risk of losing them.

There is a strong desire by customary landowners to protect and continue their languages (Tok Ples) culture and traditions, including respect for *tambu* (sacred) and *masalai* (spirit) places, and to pass on their culture and respect to future generations. They are aware of the important role that the natural environment plays in this culture.

Landowners stated their current support for their protected area in more than three-quarters of the protected area assessments. There is a high level of interest and support for the potential revitalisation of almost all of the protected areas assessed.

Landowners are open and enthusiastic about exploring a range of sustainable livelihood options. Given the option, most would prefer to be able to live and work on or close to their traditional lands and seas, provided they can do so with a reasonable quality of life.

CEPA has developed an ambitious and comprehensive Protected Area Policy which has been endorsed by the National Executive Council, and has also prepared the new Protected Areas Bill. The national policy context from the Constitution down provides support and endorsement for approaches to conservation that are strongly oriented towards involvement and ownership by customary landowners. International goals, policies and agreements also strongly support both conservation and the rights of Indigenous people (CBD COP 10 2010; United Nations Permanent Forum on Indigenous Issues 2006) and can be adapted to be appropriate to the cultural and legal framework of PNG.

There is a very high potential for financial and logistical support for the PNG protected area system from the international community, once there are secure options for effective investment. This potential support ranges from large international organisations to community ranger groups in Australia and the Pacific.

The natural values of most of the protected areas assessed are generally in good to very good condition. However, there are many serious threats to the values and there has been extensive loss of natural vegetation and species. While many values on existing and potential protected areas are deteriorating, there is still great potential for conservation if action is taken soon. PNG retains an extraordinary level biodiversity on an international scale, and efforts in conservation can yield very rewarding results.

Many protected areas have potential for tourism, which can generate income for communities to complement their subsistence lifestyles. Many customary landowners see this potential for ecotourism and are keen to put in their own effort if some training and support is provided.

Strengths in management effectiveness

While management effectiveness scores overall are very weak, some strengths can be built on. It is important to realise that revitalisation of the protected area system would not be ‘starting from scratch’.

All but one of the protected areas in this study have been formally gazetted, and protected area boundaries are mostly mapped and known by the customary landowners, though their precise location is not always known on the ground. In many cases there are either active management committees or inactive committees that could be reconstituted. In almost all cases there remain at least some customary landowners with an understanding of the values of the protected area, and a real interest in reviving and strengthening management.

Landowners also have quite a sophisticated level of understanding and support for concepts of spatial and management planning. While current law enforcement is weak in most areas, the customary landowners are very aware of the problems, especially in relation to uncontrolled incursions including settlement by outsiders. There is a high degree of interest in re-establishing a rule of law in the protected areas and they would be very appreciative of efforts in this regard.

Key weaknesses and challenges

Overall the key weakness of the existing protected area system is the absence of any protected area management agency or organisation, resulting in almost total breakdown of the rule of law in most of the protected areas. There is an organisational challenge involved in establishing a workable management system throughout the country. The lack of any 'inputs' – that is, paid protected area staff, equipment, support and infrastructure is a weakness underlying all aspects of protected area management effectiveness, including planning, law enforcement and patrolling, community awareness and education, resource management activities and visitor management. The challenge is to provide these inputs in a practical and *sustainable* way, to meet the greatest needs of the protected area. Customary landowners almost universally requested greater involvement from CEPA itself, while others mentioned the roles of provincial or local level government.

Most of the threats relating to land clearing, overhunting, overfishing and other serious resource loss on the protected areas appear to be from small-scale use: that is from illegal settlement and unsustainable resource extraction by individuals and small groups. This is largely blamed on 'outsiders', including immigrants (some displaced people from far field) who have settled within protected areas and are not subject to customary laws and traditions. Customary landowners find it very difficult to enforce any laws, even to stop people from clearing and settling within protected areas, and reported no support in this regard from any level of government, even where such help has been requested.

Environmental laws do not always protect the values of protected areas and there are instances of mining exploration, commercial plantations, logging and road construction within protected areas. It is anticipated that strengthened legislation will reduce these pressures under the new Protected Areas Bill.

Governments have not provided sufficient basic services such as education, health and access to many of the customary landowners interviewed, and this increases their reliance on a range of resource uses including logging, mining and agriculture. Lack of basic services also places pressure on protected areas from both local landowners and outsiders seeking basic livelihoods. Increasing populations have placed additional strain on both natural resources and community infrastructure.

Opportunities and recommendations

Future management is clearly a shared responsibility with governments, communities, civil society and industry all playing important roles. The recommendations here do not apply to governments only, and it is important that discussions are held to allocate responsibilities.

Strengthening effective management of protected areas in PNG will require a concerted and long-term effort with shared responsibility. In the past, shared responsibility and devolution have often meant that *nobody* picked up the tasks and costs of protected area management. Improvement in management will only be seen if *all parties* are willing to work together and real leadership emerges.

Five key areas of effort are recommended relating to the establishment of protected areas as clear enforced entities; clear allocation of governance and management responsibilities, including an on-ground ranger presence; development of management plans and activities; increased awareness and education; and consideration of community needs and interests. These five areas of effort should be undertaken concurrently and in an integrated manner – for example management committees and a ranger workforce will be needed to establish a clear rule of law; and education must be complemented by effective law enforcement. It is assumed that there will be full involvement of customary landowners in all decision-making and management actions.

A basic need underlying most of these recommendations is a sustainable, adequate and well-managed system of financial support to all protected areas, which could be derived from a variety of sources. Development of this system of financial support should be a focus of CEPA and UNDP. It is also critical that there is support from all sectors of government and civil society, including through laws and policies that respect the integrity of protected areas and provide complementary services and law enforcement.

Establish protected areas as clear, respected and legally enforced entities

- Include existing protected areas in the new and expanded protected area network unless there is strong opposition from customary landowners (for areas under customary landowners) and/or all natural and cultural values have been seriously degraded. Support and enthusiasm from local people is an important factor to consider in planning the protected area network.
- Determine the future designations or types of the existing protected areas, in full consultation with the management committees, customary landowners, local and provincial governments, and other stakeholders. A guide to selecting the most appropriate protected area has been produced by CEPA as part of this project.

- Consider the expansion of some protected areas to include key values and viable areas of habitat, especially where landholders have requested that boundaries be extended. Any expansion would need to be in consultation with all stakeholders. Existing protected areas may become part of future larger protected areas of high natural and cultural significance, or may be connected with other natural areas.
- Clarify boundaries and communicate them to all parties. Participatory community mapping is an excellent process to develop shared understanding. Lack of knowledge about boundaries and rules is one of the driving forces behind the small-scale incursions into some of the protected areas. Boundaries of marine protected areas also need to be marked through anchored buoys and notices.
- Provide large-scale printed maps to landholders and governments, and erect signage across the protected area system to mark boundaries.
- Ensure integrated and complementary law and policy making among national government departments and across all levels of government and non-government sectors, to achieve protected area management outcomes.
- Mainstream environment and conservation including protected area management into provincial, district and local level plans in accordance with the Vision 2050, MTDP and StaRS to ensure respect for protected areas and resourcing for these areas.
- Communicate the laws relating to protected areas to all PNG agencies, and provide training where appropriate to local government workers, magistrates, police, fisheries and border patrol officers, army and other enforcement officers.
- Regularly monitor breaches of protected area boundaries (especially land clearing) through on-ground monitoring (requiring ranger patrols) backed up by spatial analysis, and follow up any infringements as a matter of priority. While law enforcement may be an unpopular activity, it is an essential process to overcome the 'tragedy of the commons'.
- Improve capacity for effective law enforcement in a holistic plan from regulation review, to patrols and enforcement, to legal proceedings. A range of approaches to law enforcement are needed, as problems range from minor and local issues, such as hunting and fishing outside agreed limits, to major incursions by large companies or settlers from outside the community.
- Support compassionate resettlement of people illegally living on protected areas (i.e. without permission of customary landowners), after discussions with customary landowners. Preventing new illegal settlements is also important: in times of scarcity, any unused land or water can be seen as open access unless clear rules and sanctions are portrayed.

Establish clear management roles and an effective on-ground ranger presence

- Where necessary, undertake studies and mediation to determine the customary landholders and rightsholders to ensure that appropriate people are involved in protected area management.
- Establish or re-establish management committees for relevant protected areas, ensuring representation of all groups involved, including women.
- Encourage management committees (along with rangers) to develop protected area by-laws and to enforce the by-laws, if necessary by taking offenders to court. Ensure the committees are supported to be active and efficient.
- Develop an effective ranger program across all protected areas, backed by small teams of conservation officers in provinces or regions. *Finding an effective mechanism to employ field staff is critical and urgent, and should be one of the highest priorities in re-invigorating the protected area system*.
- Strengthen the national, provincial and local government capacity to manage protected areas with the appointment of conservation officers who would support and assist management committees and field rangers.
- Build capacity for field management through good supervision, training, information exchange, mentoring, visiting other protected areas, and other activities.
- Build leadership capacity among customary landowners to reduce the dependence on external organisations, and establish long-term and reliable champions and leaders in protected area communities.
- Obtain and maintain essential funds and equipment for the field and support staff to function effectively. As well as field staff, support staff will also need to access transport, computers, mapping and office space and equipment. Asset and financial management skills and systems will be needed.

Establish management plans and activities

- Develop and regularly update management plans to ensure that values are protected and threats to the protected areas are identified and addressed.
- Integrate traditional knowledge with science to develop strong but relevant plans, based on local adoption and adaptive management, and management based on good information. Encourage appropriate and useful research and monitoring programs, but ensure that scientists return information to the customary landowners and protected area managers, in relevant and useful formats.
- Develop regional threat abatement plans where necessary, to ensure integrated management of relevant threats such as invasive species, water pollution nor illegal settlement at appropriate landscape scales.
- Effectively engage and plan with all relevant stakeholders to avoid or minimise the impact of threatening processes. This will include all levels of government, researchers/institutions, customary landowners, NGOs and stakeholders in the areas contributing to the particular threat (e.g. plantations, forestry, mining, infrastructure and industry).
- Develop local climate adaptation strategies e.g. relocation and resettlement strategies for areas impacted by sea level rise, coastal erosion and long term drought.

Raise awareness and encourage education

Many customary landowners in the workshops discussed the need to increase programs of awareness-raising and environmental and cultural education, both for their own communities (especially for children and young people) and for people from outside.

- Include environmental and cultural education as part of the curriculum from primary to tertiary levels.
- Support local people in raising awareness about protected areas. Many customary landowners also stressed the importance of more continuing awareness-raising activities with a range of people: starting with their own people and surrounding communities, and moving on to stakeholders including commercial interests and local level government.
- Build relationships and cooperative work programs between customary landowners, civil society (including academia and NGOs) and governments.

Consider community needs and issues

In PNG, it is impossible to consider how to reinvigorate the protected area system without also considering the needs of the customary landowners and other community members. However, many of the activities recommended in this section are beyond the scope of protected area managers alone. It should be noted that the approach of integrating conservation with community development has been implemented in many parts of the world over the last 30 years and has had very mixed success, including some temporary successes and longer-term failures in PNG (West and Kale 2015). Priorities are to:

- Support law enforcement and compassionate resettlement of illegal settlers in and adjacent to protected areas.
- Develop appropriate incentives such as education and health projects, and sustainable development activities in conjunction with customary landholders but *only* after careful planning and with firm agreements about conservation benefits and long-term support.
- Support development of sustainable tourism, including small-scale village based enterprises, where customary landowners are keen to encourage tourists.
- Develop negotiated and agreed benefit sharing arrangements between customary landowners and a range of stakeholders (e.g. hotels, tourism operators, research institutions, extractive industries).

"If we do not protect rare, threatened and endangered species now, they will not be there for the children. They will only be heard about in our legends.

We want dugongs for their ceremonial meat and we want this to continue for future generations. There has been a serious decline in dugong numbers. When I was small I could stand on the beach and watch my father or brother harpoon a dugong – now there is nothing out there. It is only through luck that you will find them. People are blocking their channels with nets. Improvement depends on law enforcement and implementation of the Dugong and Turtle Plan."

(Management committee, Maza WMA)

Conclusions

The level of management effectiveness across most of PNG's protected areas is very low, and there has been no systemic improvement in on-ground delivery since the RAPPAM management effectiveness study of 2006 (Chatterton *et al.* 2006). Several large NGOs have withdrawn specific on-ground protected area programs since that time, and this study indicates that only a handful of protected areas are now receiving support from any outside agencies.

Across the country, customary landowners are again pleading for assistance and support to look after their protected areas, and to develop meaningful employment and livelihood options based on stewardship and a close relationship with their lands and seas. Given the very high values and high levels of threats to these protected areas, we urge the national government and the international community to urgently find ways to deliver this support before the situation deteriorates further. The existing protected areas are a good starting point for a comprehensive, adequate, representative and relevant network to which the PNG government has committed (Independent State of Papua New Guinea 2014).

In spite of many threats and impacts, most protected areas still contain many of their original values in good to very good condition, and most customary landowners are supportive of the protected area model over any other form of land/ sea use. Hope remains, and there are models of effective interventions on the ground. However, clearly defined and enforced protected areas must be backed up by active management committees and a reliable ranger workforce, and establishing this must be the responsibility of all levels of government with CEPA playing the key role. Civil society, international organisations and industry can all make vital contributions, but above all else the assessment emphasises the need, and the communities' desires, for strong and consistent government support.

PART ONE
BACKGROUND

CHAPTER 1 Introduction

1.1 Project background

In 2016–2017 the Government of Papua New Guinea, through its Conservation and Environmental Protection Authority (CEPA) and with the support of the United Nations Development Program (UNDP), organised for an evaluation of PNG's protected areas, as part of the process to improve their management effectiveness.

PNG's Policy on Protected Areas commits to regular evaluation of management effectiveness, and to taking remedial action to improve effectiveness over time.

"Management effectiveness of Protected Areas will be regularly evaluated on a national basis, and improvements will be put into place based on assessment results. Where Protected Area effectiveness or wildlife populations and health are shown to be declining or at risk, causes will be investigated and corrective measures rapidly implemented." (*Independent State of Papua New Guinea 2014, p. 50*)

The Protected Area Policy identifies five pillars that support the nation's vision for protected areas, and the assessment of protected area management effectiveness is a component of the third pillar – effective and adaptive management (Figure 1).

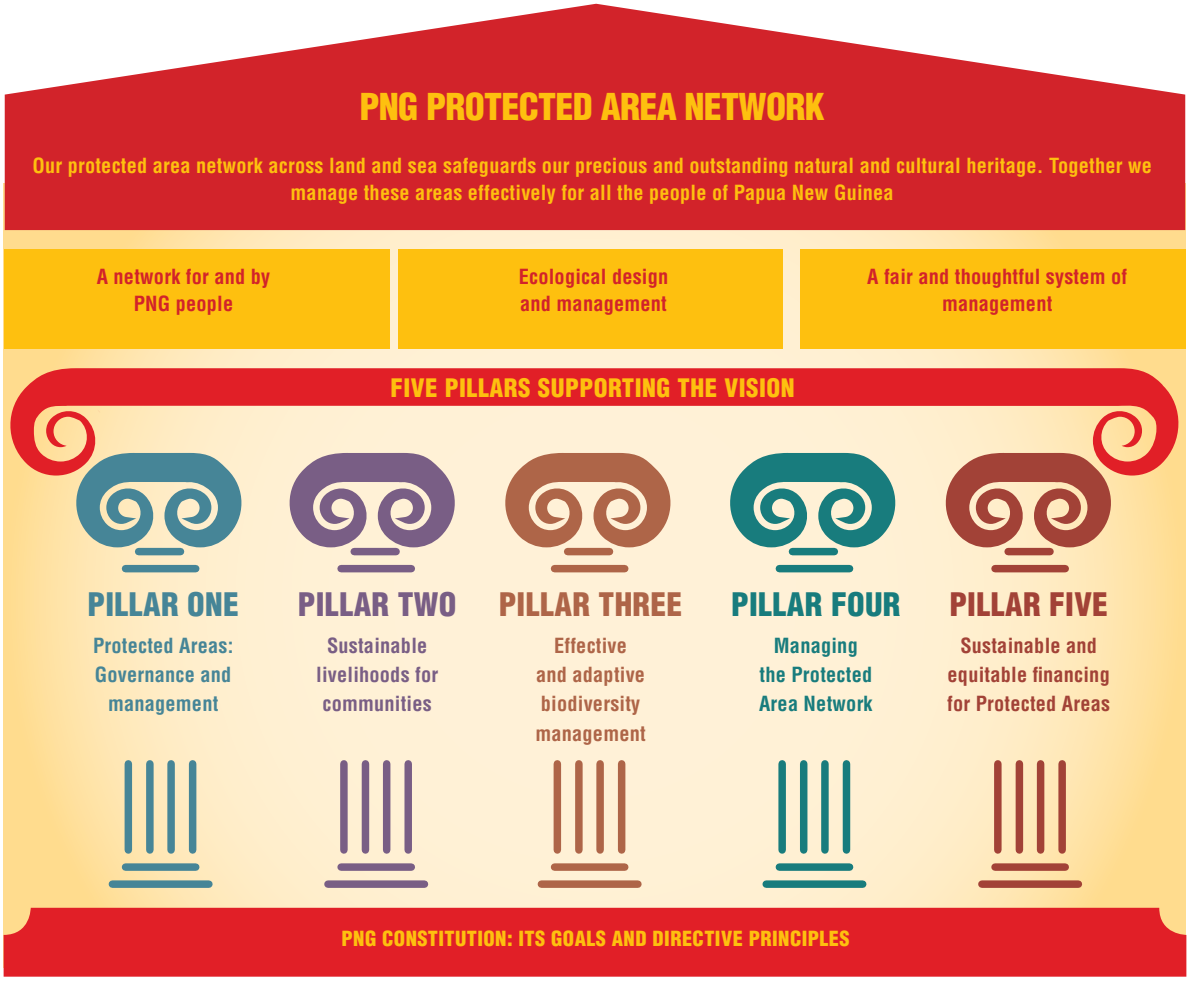


Figure 1. Five pillars of the PNG Policy on Protected Areas

The PNG Protected Area Management Effectiveness project is part of a larger initiative, the Global Environment Facility – Pacific Alliance for Sustainability (GEF -PAS) funded project known as "Community-based Forest and Coastal Conservation and Resource Management in PNG" (GEF 2011), which has CEPA and UNDP as implementing partners. The Secretariat of the Pacific Regional Environment Programme (SPREP) was engaged to undertake a project titled "Review and Update of the Status of Current Protected Areas in PNG".

PNG Protected Area Timeline

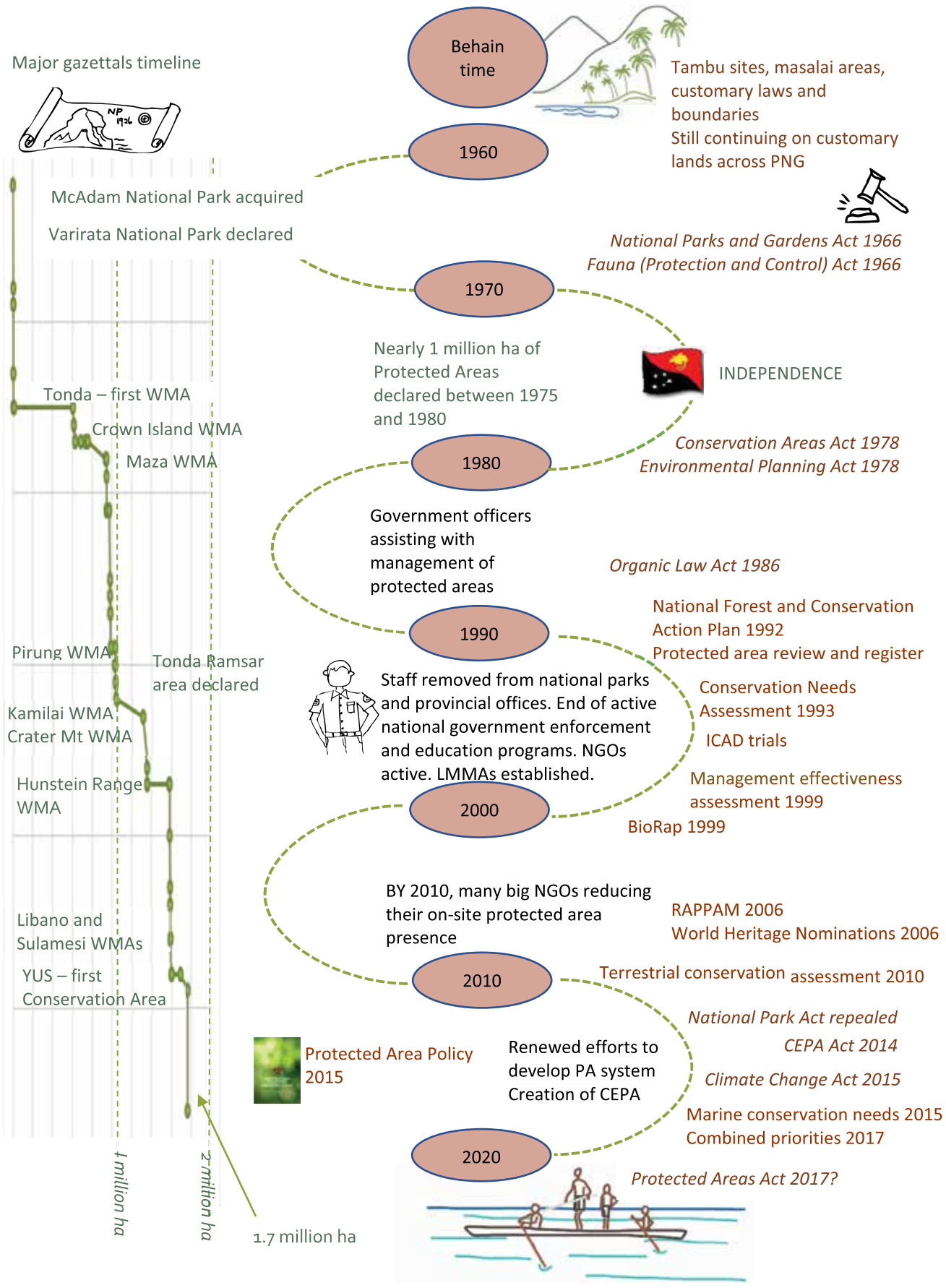


FIGURE 2: PNG Protected Area Timeline

The main scope of work for this project included:

- Conduct a literature review of protected areas in PNG and methodologies used to evaluate protected areas;
- Design and test an evaluation tool to be employed in PNG;
- Undertake field work to assess PNG's formally gazetted protected areas; and
- Analyse the data and compile reports (i.e. overall report and assessment data for each protected area).

The following sections provide a brief overview of the history of PNG's protected area system (1.2), including a summary schematic of the historical development (Figure 2) and key principles of protected area management effectiveness (1.3).

1.2 Creation and progress of PNG's protected area system

1.2.1 Before Independence

> Most protected areas are community based where traditional beliefs and customs have been extremely effective in protecting tracts of forests, mountains, caves, wetlands, lakes, rivers, and animals/wildlife. These culturally significant sites were part of an overall traditional protected area system whose functions are similar to contemporary protected area approach. Thus, any intervention to establish protected areas must adhere to the traditional socio-cultural surroundings (Kigl 2014, p. 65).

Customary landowners, custodians of up to 97% of land in PNG, recognise many areas of land and sea as "*tambu*" – areas of special spiritual significance. Tambu areas can be permanent or periodic, with cycles of resource closure (Whitmore *et al.* 2016). As the PNG Policy on Protected Areas states, "Over thousands of years, communities all over PNG have been conserving nature for cultural and spiritual reasons, while pursuing traditional livelihoods in these landscapes and seascapes" (Independent State of Papua New Guinea 2014, p. 7). In addition, conservation in the broadest sense – wise and sustainable use of natural resources – was practiced throughout the country (Hunnam 2003). Traditional rules governed fishing and hunting practices, where trees could be felled, fallow periods and other types of habitat protection (Kwapena 1997). People believe that their land is held in trust for future generations – this has been the basis for responsible management and has also discouraged over-exploitation of wildlife (Eaton 1985). However, as population rapidly increased along with other development pressures, it became obvious that traditional practices alone would not be adequate to avert the loss of important natural places and species (Kwapena 1997).

Customary land ownership brings both benefits and challenges to conservation: protected areas cannot be established and sustained without the full and continuing support of landowners, and must compete with other development options which can deliver more immediate and obvious economic benefits (McCallum and Sekhran 1996). The paradigm of protected areas as being 'set aside' and managed in isolation from local communities was clearly not applicable in PNG, and has been superseded in conservation thinking across the world (Phillips 2003).

A few protected areas were established in PNG before Independence. The earliest formal protected area was McAdam National Park near Bulolu (Morobe Province), which was reserved by the former PNG colonial administration in 1962 and gazetted in 1970 (CEPA 2016). The area was reserved "to protect a representative area of forest rapidly being lost to mining, settlements and forestry operations; in particular, it was intended that good examples of the Klinkii and Hoop Pines be protected" (Papua New Guinea Department of Environment and Conservation and World Wildlife Fund 2006). The area near Port Moresby which became Varirata National Park was dedicated as a national park in 1963 and re-gazetted in 1969. Baiyer River Sanctuary near Mt Hagen (Western Highlands Province) was reserved in 1968 "to provide for the development of a zoological garden and to protect an area of riverine, high altitude forest" (Papua New Guinea Department of Environment and Conservation and World Wildlife Fund 2006). Declaration of these early protected areas as government-owned reserves necessitated the purchase of the lands from the customary landowners, but there were conflicts over the process and rights to use the areas, and these difficulties severely constrained the growth of the protected area system at that time (Melick *et al.* 2012). The concept of permanently transferring land ownership was a concept quite foreign to the customary landowners, who were more familiar with temporary loans of land. The colonial administration found it difficult to negotiate the "maze of rights and relationships to identify the actual landowners" (Eaton 1985, chap 9, p.1).

Legislation enabling early protected areas included the *National Parks and Gardens Act 1966*, and the *Fauna (Protection and Control) Act 1966*, which provided for establishment of wildlife sanctuaries, wildlife management areas (WMAs) and species protection areas.

1.2.2 The 1970s

In 1974, an Office of Environment and Conservation was established. After Independence in 1975, the new nation made a commitment in the Constitution to environmental stewardship, with the fourth goal stating that "Papua New Guinea's natural resources and environment (are) to be conserved and used for the collective benefit of us all, and be replenished for the benefit of future generations"

Around the time of Independence, there was a promising start in developing a protected area system based on customary land ownership and management, through declaring WMAs. These protected areas are declared over customary land and waters, with the agreement of customary landowners and usually on their initiative, through often with support and advice from government and / or NGOs). Sustainable resource use can take place under special regulations for each area, and management committees are also gazetted. It was hoped that the concept of WMAs would be more workable and acceptable in the PNG context than national parks, and they were popular with landholders, partly because they could help formalise their land ownership and resource rights (Eaton 1991). Establishment of WMAs was deliberately made a relatively straightforward procedure, but did require a boundary to be defined, a management committee to be appointed and a set of rules to be established.

The first of these was the Tonda WMA, established by the PNG Department of Environment and Conservation (DEC) in 1975 in partnership with local communities and NGOs. This protected area – still the largest in PNG at over half a million hectares – aimed to conserve savanna, protect wildlife species from overhunting and attract sustainable development, and was to be managed by customary landowners (Chatterton no date; Eaton 1991). A further 14 protected areas were declared between 1975 and 1979, showing "a level of cooperative achievement by landowners and government officers not close to being matched subsequently" (Hunnam 2003, p. 2). These included a number of quite large WMAs that comprised islands and the surrounding waters and reefs, including Maza WMA in the Torres Straits and Ranba, Crown Island and Bagiai WMAs. This declaration of protected areas across terrestrial and marine environments was innovative on an international scale, and very important for protection of threatened wildlife including dugongs and turtles.

Tonda Wildlife Management Area – the first WMA in PNG. Photo: WWF

While protected areas were being established on paper, their management remained patchy and problematic. The national parks established under the colonial administration were plagued with land tenure issues (Eaton 1985). However, many people interviewed in this project now recall the early days of national parks as a time when resources, facilities and staff were available and there was some effective on-site management.

From Independence to the 1980s, a number of significant WMAs were being established, and also were being managed reasonably well. WMA committees were established along with local rules for the protection, propagation, encouragement, management, control, harvesting and destruction of fauna. In some important WMAs, rules also provided for hunting and fishing fees to be levied. The role of the national Department was to facilitate this mechanism, by facilitating bank accounts for the management committee, and administering the funds back to the committee for management purposes. However, it is unclear whether this obligation was ever undertaken (Hunnam pers comm 2017).

However, WMAs have no legal protection from exploitation, including large-scale logging, clearing and mining (Beehler and Kirkman 2013b; Melick *et al.* 2012). In recognition that the *Fauna (Protection and Control) Act 1966* was inadequate to prevent logging, mining and plantations in WMAs, new legislation, the *Conservation Areas Act 1978*, was developed. Conservation areas gazetted under this Act remain as customary land tenure and are managed by a committee that can set rules and fees, but the Environment Minister must approve any development activities within the protected area. This was a useful addition to the protected area options in PNG, but it would be more than 30 years before the first Conservation Area was declared.

1.2.3 1980–2010

During the 1980s,the focus on resource exploitation increased and there was less political support for conservation initiatives (Hunnam 2003). Progress slowed in declaration of protected areas, though nine were declared in that decade. There were management staff on some of the protected areas, a new *National Park Act 1982* superseded the old legislation, and the Conservation and Environment Department was set up.

Barriers to effective implementation of the protected area system recognised by the early 1990s included: the lack of staff and resources to manage existing areas and to process the long list of proposals; landuse conflicts; incentives for landholders to choose cash development options for their lands over conservation; lack of environmental education and awareness; and lack of training (Seri 1992).

The 1990s saw a renewed and widespread interest in biodiversity conservation in PNG, with the production of numerous reports and many trials of different community-based conservation innovations. The interest was primarily to counter the massive increases in industrial logging; and there was an emphasis on devising and facilitating alternative (low impact) forms of income to customary landowners. In 1992 the DEC developed the National Forest and Conservation Action Plan, which set much of the agenda through the 1990s. The Action Plan aimed to improve forestry management and establish a representative protected area system, with objectives including: the development of an expanded system of conservation areas; strengthening the planning, management and evaluation capabilities of groups involved in conservation and management; and communication and advocacy to foster support for the conservation area system. Part of the Action Plan was the establishment of the PNG Biodiversity Conservation and Resource Management Program in 1993, with funding from the Global Environment Facility (GEF). The objectives of this program were not achieved, partly due to political and institutional difficulties (Chatterton *et al.* 2006).

During this period, there was extensive work and cooperation between the government of PNG and the larger international NGOs (including the Wildlife Conservation Society, Conservation International, The Nature Conservancy [TNC], World Wildlife Fund [WWF], The Foundation for Peoples of the South Pacific and Greenpeace), which had significant presence and worked with landholders to establish community-based protected areas. While each NGO had discrete projects, they often had similar approaches focussed on bottom-up management and Integrated Conservation and Development Projects (ICADs). There were 'a dozen' large projects funded to US$1million each, as well as some 50 smaller grant projects (Hunnam 2003). The Biodiversity Program ICAD projects aimed "to test the hypothesis that by demonstrating to local communities that development and conservation are not mutually exclusive goals, and by assisting them to achieve their development aspirations sustainably, a long-term framework for stable conservation can be built" (McCallum and Sekhran 1996, p. 11).

Support from NGOs was critical in the establishment of protected areas and in a range of other projects to develop and strengthen management capacity. Excellent work was contributed by a range of people, and cooperative partnerships achieved rapid growth of protected areas; trained many scientists and local community members; trialled ecotourism and other income-generating activities; and established support and infrastructure in a number of remote centres and regional towns.

However, some people question the role of the large NGOs, and of the protected area models and commitments they promoted, and note that the partnerships have been marred by disillusionment (Kigl 2014). It has been alleged that local communities were persuaded into agreements with promises of better livelihoods, which failed to materialise, sometimes with disastrous consequences (Melick *et al.* 2012; West and Kale 2015). It is also alleged that these organisations were more concerned with the creation of new protected areas on paper than with actually achieving conservation goals (with 'claiming' rather than 'creating' conservation initiatives), and that they failed to support the management and enforcement of the new protected areas (Benson 2007; 2012). These outcomes were reportedly related to the need for large NGOs to follow international trends and respond to donor priorities, rather than being responsive to local needs and local communities (Benson 2012; West and Kale 2015). NGOs have caused further problems when they have suddenly ceased projects, closed local offices or even withdrawn completely from PNG when international priorities changed. Guidelines for working in conservation in PNG, developed at a workshop in 2011, point out the many challenges and pitfalls faced by the NGOs, including the risk of contributing to a 'cargo cult' mentality (Beehler and Kirkman 2013b).

> "…Lessons from YUS and other similar efforts include the following:
>
> 1. much planning and analysis should precede commitment to a site for work;
> 2. expect to invest more than a decade in the effort;
> 3. the need to build a trusting and respectful relationship with landowners is essential;
> 4. necessity of incorporating community needs with conservation goals;
> 5. need to build relationships with all levels of PNG government as project stakeholders;
> 6. need to plan for long-term sustainable financing" (Beehler and Kirkman 2013a, p.11).

In the 1990s, 20 new protected areas were established, including three national parks and some large and significant WMAs such as Lake Kutubu. In addition, two WMAs (Tonda and Lake Kutubu) were declared as Wetlands of International Significance (Ramsar sites). In the marine zone, locally managed marine areas (LMMAs) were an additional initiative, building on customary laws and trialling no-take areas. With the support of NGOs and international funding, 86 LMMAs were recorded by 2009 (Govan 2009).

From the mid-1990s onwards, the ability of the government to manage protected areas, and to oversee conservation initiatives generally, declined in line with other government services. In particular, the withdrawal of staff from many protected areas, including national parks during the 1990s resulted in a lessening of respect for the areas and created problems which are still continuing. By 2009, it was "generally accepted that conservation policy in Papua New Guinea has not worked for over two decades …Unfortunately, most responsibility for conservation on the ground seems to have been passed to provincial and local-level governments, who have neither the capacity nor funds to do very much. Much of the work in conservation is now done by NGOs working with local communities" (Mowbray and Duguman 2009, p. 179). Several major reports, including the Protected Areas Review carried out by a joint WWF-DEC team, recommended that existing and proposed WMAs be used as the starting point for a protected area strengthening program, but instead the emphasis was placed on establishing new projects (Hunnam 2003).

The *Mama Graun* Trust Fund was registered in 2000 and has supported initiatives in a few protected areas through attracting and managing donor funds for conservation.

In July 2002, another cooperative project began to boost protected area management and conservation planning in PNG, through activities including creation of databases and GIS maps, reviewing forest loss, and assisting in the protection of new areas.

A significant evaluation of management effectiveness was carried out in 2006 (Section 1.3.1) and made some important recommendations to strengthen the protected area system and to halt the deterioration of values being experienced at that time (Chatterton *et al.* 2006).

The gazettal of YUS Conservation Area in 2009 was the first of this new type of protected area, which is managed in conjunction with the surrounding 'YUS landscape'. NGOs and international funding have been critical in establishing YUS CA, but it is now managed by a PNG-based NGO focussing its efforts solely on YUS. The management plan notes that the NGO engagement "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" (Tree Kangaroo Conservation Program 2012, p. 8).

By 2000 PNG had 45 protected areas with a total area of over 1.5 million ha. This increased to 57 protected areas covering 1.7 million ha by 2009, but has not increased since that time (Figure 3, Figure 4). However, a number of significant areas are awaiting gazettal when the new Protected Areas Bill is finalised.

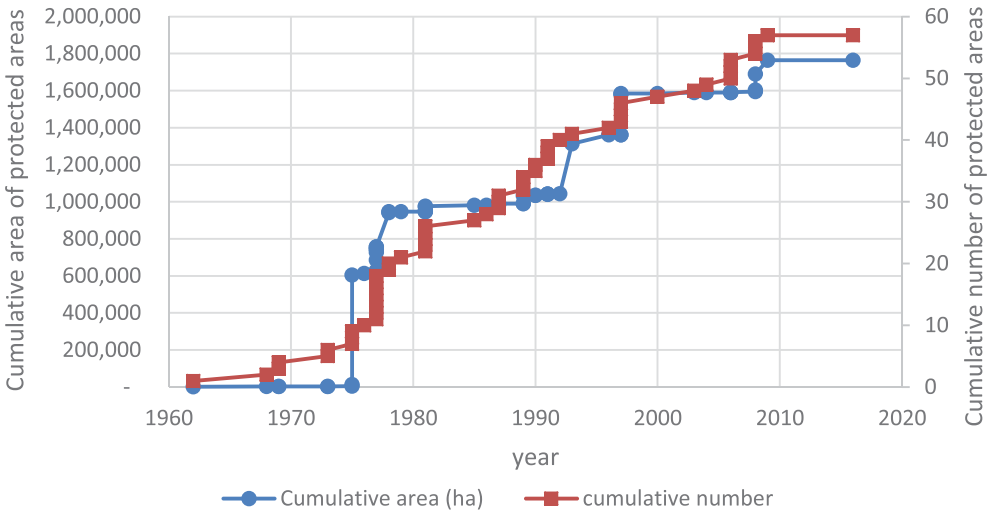


FIGURE 3: Growth of the protected area system in PNG

Source: Compiled from the CEPA database on protected areas (Conservation and Environment Protection Authority 2017)

1.2.4 The current decade

Many of the recommendations of the 2006 RAPPAM study (Chatterton *et al.* 2006) have not been implemented, and since that time several protected areas have been cleared fully or partially, and have lost many of their values.

However, one key recommendation was to develop a PNG Policy on Protected Areas, which was finalised and endorsed by the PNG Government in 2014 (Independent State of Papua New Guinea 2014). The Policy sets the framework for renewal and strengthening of the protected area system. Its vision for the PNG Protected Area Network is:

"Our protected area network across land and sea safeguards our precious and outstanding natural and cultural heritage. Together we manage these areas effectively for all the people of Papua New Guinea" (*Independent State of Papua New Guinea 2014, ,p. 14*).

CEPA is currently finalising new protected area legislation, and the intention is to review all protected areas and re-allocate them into the new protected area classes, based on consistent criteria.

This decade, a number of other important initiatives are being planned and implemented that will create a more positive enabling environment for protected areas in PNG. Initiatives at the international level which are actively supported by PNG include:

- the Convention on Biological Diversity's (CBD) Strategic Plan for Biodiversity (known as the Aichi targets) (CBD COP 10 2010)
- the Paris Agreement on Climate Change, which builds on the United Nations Framework Convention on Climate Change
- the UN Sustainable Development Goals (United Nations 2015), and
- the Coral Triangle Initiative (Coral Triangle Initiative on Coral Reefs Fisheries and Food Security 2016; Coral Triangle Initiative on Coral Reefs Fisheries and Food Security (CTI-CFF) 2013).

Recent PNG legislation and policy includes:

- *Conservation and Environment Protection Authority Act 2014*
- *Fisheries Management Amendment Act 2015*, which seeks to promote long term conservation, management and sustainable use of the marine living resources of PNG for the people of PNG, and
- National Strategy for Responsible Sustainable Development (StaRS) (2014), which calls for a "paradigm shift" towards a green economy and recognises the need to protect the assets that are the basis of the country's wealth and future development.

It has been estimated that between 1972 and 2002, 15% of PNG's tropical forests were cleared and 8.8% degraded through logging (Shearman and Bryan 2011). Lowland forests suffered most loss over that period and were most at risk. Over this period 2.2% of rainforest within protected areas were degraded by logging, and a further 6.7% cleared, mostly as a result of subsistence activities. This figure of 8.9% of protected area rainforest lost or degraded was lower than the national average, where 24% had been lost over this period. However, in some protected areas the change was dramatic, with six WMAs reportedly losing more than 50% of their cover and four losing 99% (Shearman et al. 2009). Between 2002 and 2014, a further 4.1% of PNG's forests were cleared or logged (Bryan et al. 2015), but no published data about the impacts on protected areas over this period is available.

1.2.5 Reserve planning for PNG

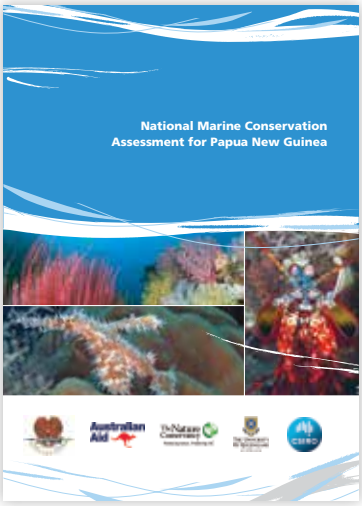
Reserve planning – the process of systematically identifying the highest priorities for protected areas – has been carried out in PNG for more than 40 years, often in conjunction with initiatives discussed in the previous sections. The need to increase protected area coverage on land and sea has been reinforced by international and national commitments, including the CBD Aichi Targets (CBD COP 10 2010), the Coral Triangle Initiative (Coral Triangle Initiative on Coral Reefs Fisheries and Food Security 2016; Coral Triangle Initiative on Coral Reefs Fisheries and Food Security (CTI-CFF) 2013) and the PNG Protected Area Policy (Independent State of Papua New Guinea 2014). Targets have been set for protected areas on land and sea. Major reserve planning projects are outlined below.

In 1973, scientists conducted an assessment of the plant communities of both PNG and Australia, with the aim of helping to develop representative reserve systems (Specht *et al.* 1974). A few years later, Diamond (1976, cited by Seri 1992) recommended 22 large reserves and gave their indicative sizes, based mainly on his ecological studies of birds across PNG. One of the important points he made was the need for connectivity between lowland and highland areas. Other biologists who made recommendations for reserve systems included Flannery (1990), based

on zoogeographic provinces and Schodde (1973), based on bird and ecological studies. These reserve systems were reviewed by Seri (1992) as part of the Action Plan for Australasian marsupials and monotremes, and he considered them highly suitable for conserving mammal fauna.

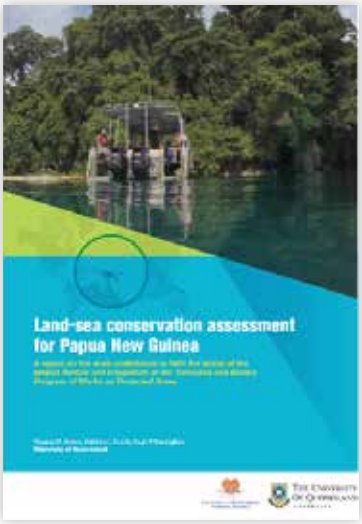
As part of a study across the South Pacific, Dahl (1980) reviewed the broad ecosystems of PNG and reserve proposals to that time. The PNG Conservation Needs Assessment was a major initiative conducted in 1992–93 by a consortium of international experts and PNG scientists. Data and maps were developed, identifying areas of known biodiversity importance and areas which required further investigation. The reports covered marine and coastal areas, wetlands and terrestrial areas. Expert reviews were also prepared for the biodiversity of regions and for the conservation status of many wildlife groups, with contributions from a wide range of stakeholders (Hunnam 2003). This planning considered more than a narrow range of biological features and information, maps and an informative two-volume report were produced (Alcorn 1993; Beehler 1993).

In 1997–1999, a process known as Bio-Rap was applied in PNG using data and systematic reserve planning to identify key biodiversity areas. There was an attempt to minimise conflict with the forestry industry and to provide an ongoing evaluation framework for balancing biodiversity conservation and other land use needs with the capacity to include new information and changing circumstances in the future. A number of reports and papers were produced from this study along with priority maps (Faith *et al.* 2001a; Faith *et al.* 2001b).



As part of the CBD Protected Areas Program of Work, a thorough assessment of the terrestrial biodiversity conservation needs for PNG was completed in 2010, with a high level of involvement of protected area staff (Lipsett-Moore *et al.* 2010). The assessment used modern conservation tools to assess the current gaps in representation and to develop options for a comprehensive system which would be resilient to climate change (Game *et al.* 2011). It recognised that in PNG, establishing a protected area network requires consideration of not only biodiversity, but also of the customary landowners and the ecosystem services upon which people depend (Lipsett-Moore *et al.* 2010).

PNG is a partner country in the Coral Triangle Initiative, which produced action plans and targets for marine protected areas, reflected in the PNG Marine Program on Coral Reefs, Fisheries and Food Security (Government of Papua New Guinea 2010). The National Marine Conservation Assessment carried out in 2013–2015 aimed to identify the current status and progress towards achieving goals under the CBD and the Coral Triangle Initiative. The study identified gaps in the marine protected area system and priority areas for expanding PNG's MPA network to achieve stated goals under the CBD and CTI (Government of Papua New Guinea 2015).



In 2015–17, a project entitled "Review and Integration of the Terrestrial and Marine Program of Works on Protected Areas" used reserve planning software to analyse priorities and propose ways to integrate conservation planning across landscapes and seascapes (Adams *et al.* 2016). The project aimed to identify a reserve system that would meet national and international commitments, while most efficiently conserving the range of ecosystem types and species and also addressing connectivity between land and sea. As a result of input from experts, areas to be incorporated in the analysis include the most important sites for biodiversity identified in the earlier studies. This recognises the value of combining computer-based planning with expert knowledge and community input.

In spite of the many attempts to identify priority areas, to date, none of the reserve plans have been implemented.

1.2.6 Protected area statistics 2017

The 2017 information and spatial data held by CEPA (Conservation and Environment Protection Authority 2017) includes 57 protected areas declared under national legislation (Table 1), though some of these do not have complete boundary information. CEPA also recognises 16 non-gazetted areas managed as Locally Managed Marine Areas (LMMAs), but the actual number of LMMAs is very unclear. A number of other areas are managed as significant protected areas but are not yet gazetted (for example, Torricelli Mountain Range Proposed Conservation Area and Wanang Proposed Conservation Area).

The World Database on Protected Areas (WDPA) includes 50 national protected areas, two Wetlands of International Significance (Ramsar sites), and one Word Heritage Site in PNG. In some cases, areas recorded for the protected areas on the WDPA are different from the national data. A list of all known PNG protected areas is included in Attachment One.

TABLE 1: Gazetted protected areas in PNG, recognised LMMAs, and current and proposed international designations

Source: compiled from CEPA database 2017, our research, and WDPA

Protected area type	No.	Total Area (ha)	Note
Conservation Area	1	75,000	
District Park	1	12	
Historical Reserve	1	71	
Memorial Park	3	167	
National Park	5	8,241	
Natural Reserve	2	272	
Provincial Park	1	77	
Protected Area	3	2,576	Three protected areas of unknown designation
Reserves	1	29	
Sanctuary	2	1,211	
Scenic Reserve	1	13	
Wildlife Management Area	33	1,622,621	
Wildlife Sanctuary	3	74,735	
Total gazetted protected areas	57	1,784,954	
Locally Managed Marine Area	16	2,101	Not gazetted under national legislation (not included in total)
Wetland of International Significance (Ramsar)	2	590,000	Not included in total area above as they overlap with national protected areas
World Heritage Site	1		Kuk Early Agricultural Site
Proposed World Heritage Sites	7		Included on UNESCO tentative list

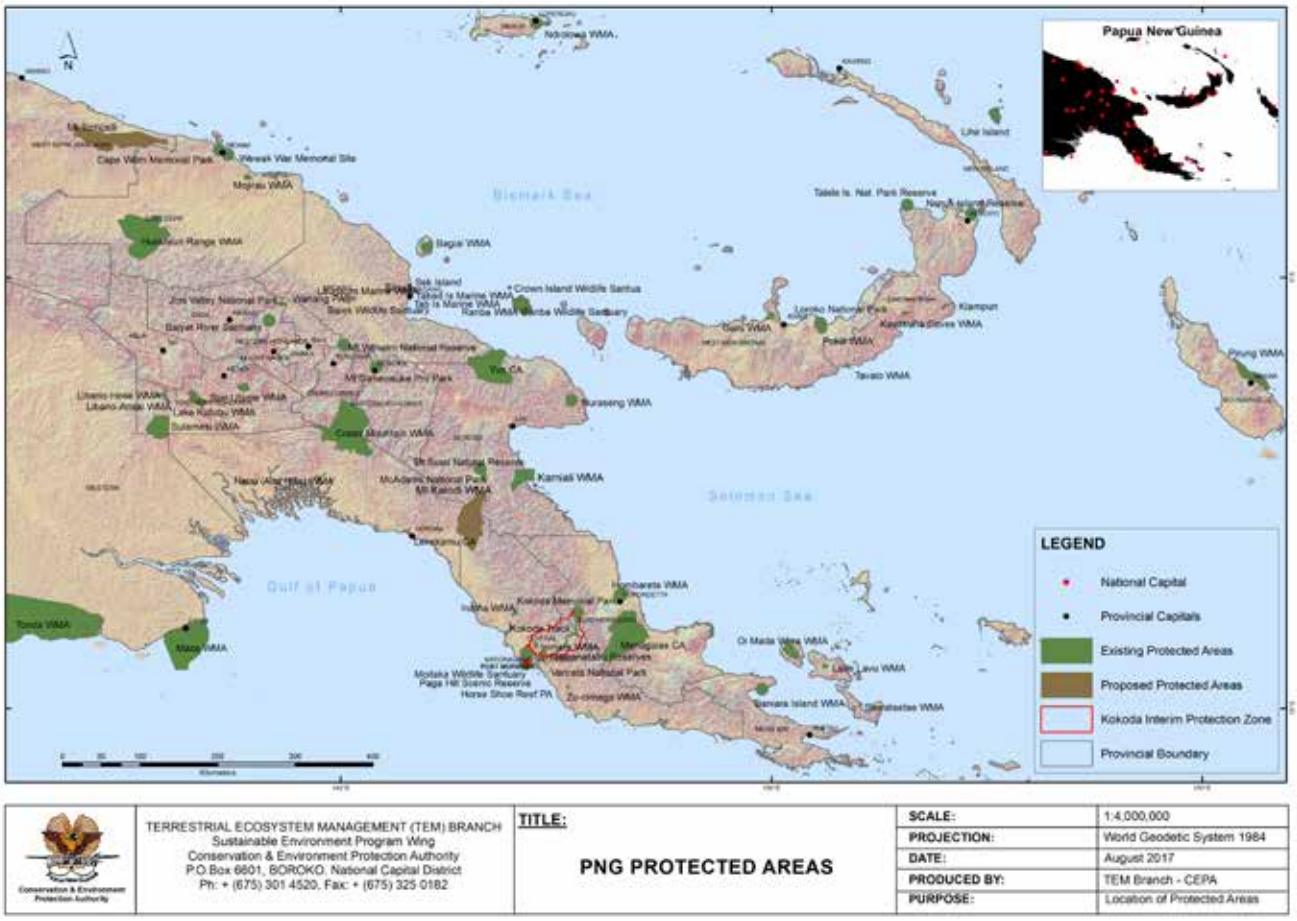


FIGURE 4: Protected areas of PNG
Source: CEPA 2017

Lake Kutubu is a WMA and a Ramsar site, and is part of the Kikori River Basin WHA nomination. Photo: Fiona Leverington

Seven properties have been on the World Heritage Tentative list since 2006. The properties are waiting for the Government of PNG to proceed with their nominations in conjunction with stakeholders, especially the customary landowners. In the Policy on Protected Areas, there is a commitment to proceed with the nominations, but a lot of work is required to progress them. The site descriptions are on the World Heritage (UNESCO) website (UNESCO 2017).

TABLE 2: World Heritage Sites tentative list for PNG

Site name	Location
Upper Sepik River Basin	East and West Sepik Provinces
Trans-Fly Complex (grasslands and savannahs)	Western Province
Kikori River Basin / Great Papuan Plateau	Gulf, Western and Southern Highlands Provinces
Kokoda Track and Owen Stanley Ranges	Central and Oro Provinces
Milne Bay Seascape (Pacific Jewels of Marine Biodiversity) Samarai Island	Milne Bay Province
Huon Terraces – Stairway to the Past	Morobe Province
The sublime Karst of Papua New Guinea	New Britain Province, Western Highlands Province, Southern Highlands-Enga-Sepik border

A review was carried out in 2015 to investigate the tentative sites (Hitchcock and Gabriel 2015). The review found that:

- No progress has been made on any of the nominations.
- Two of the sites, the Trans-Fly complex and the Huon Terraces, were judged as being relatively straightforward to prepare, while the other five will require complex negotiations with customary landowners.
- Most of the sites still retain most of the values present in 2006, and in some cases additional values have been recognised or are now better understood.
- The range and magnitude of threats to the sites on this list are higher, and the areas are in urgent need of protection.
- The seven sites appear to represent the most important major landscapes with potential for recognition of Outstanding Universal Values, and thus nomination for World Heritage listing for natural values.
- Extensions to boundaries, and addition of smaller more specific sites for natural Outstanding Universal Values might be considered.
- Several other sites have potential for listing for Outstanding Universal Values for cultural values.

The review concludes: “It is apparent that the only way that known heritage values will be maintained for the foreseeable future will be through a well-resourced pro-active program of protection. Much of that can be achieved with the assistance of non-government organizations and local government but of critical importance is leadership at the national Government level” (Hitchcock and Gabriel 2015, p. 5).

1.3 Protected area management effectiveness

Effective management of protected areas has been recognised widely as an essential component of conservation strategies (Pressey *et al.* 2015; Watson *et al.* 2014). To move towards more effective management, practitioners need to be able to answer the following questions about protected areas:

- What is the current state of individual protected areas and of the system as a whole?
- Are protected areas achieving the outcomes for which they have been declared and managed?
- Are their key values improving, stable or declining?
- What are the current and future threats?
- Are management resources adequate and how should they be improved?
- Are processes of management appropriate, effective and efficient?
- What steps could be taken to improve management and to ensure values are better protected?

Protected area management effectiveness evaluation (PAME) has been developed to find answers to these questions and many others. The expansion of protected area management effectiveness evaluations is in keeping with the general rise in evaluation and performance assessments within governments and other public bodies across the world. In the environmental sector, donors, governments and other bodies increasingly require management bodies to show evidence that their money is well spent (Keene and Pullin 2011; Saterson *et al.* 2004). The importance of evaluation in effective management and project cycles has been recognised in many fields of endeavour, including health and international development as well as conservation. Protected area management involves biophysical, cultural, socio-economic and managerial factors as well as numerous stakeholders, so monitoring and evaluation must draw on tools from a wide range of disciplines. Approaches such as participatory rural appraisal and project cycle management have offered many useful ideas.

Generally PAME is conducted for one or more of four purposes (Leverington *et al.* 2010b) to:

- enable and support an adaptive approach to management of protected areas;
- assist in effective resource allocation between and within sites;
- promote accountability and transparency by reporting on the effectiveness of management to interested stakeholders and the public; and/or
- help involve the community, build constituency and promote protected area values.

Target 11 of the CBD Strategic Plan, also known as the Aichi Target 11, specifically mentions management effectiveness when it calls for:

"at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas to be conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas" (*CBD COP 10 2010*).

The Program of Work on Protected Areas has requested countries to evaluate this effectiveness, with a target of 60% of areas to be evaluated by 2020. By 2015, over 9000 protected areas across the world had been assessed, some of them multiple times (Coad *et al.* 2015). In the 2016 meeting of the CBD Conference of Parties, a recommendation also urged countries:

"To endeavour to undertake more systematic assessments of management effectiveness and biodiversity outcomes of protected areas, and where possible, other effective area-based conservation measures, to improve the management effectiveness by addressing the gaps, and to provide, on a voluntary basis, information on the results to the Global Database on Protected Areas Management Effectiveness" (*CBD COP 13 2016*).

IUCN's World Commission on Protected Areas (WCPA), a group of volunteer experts in protected area management, has led the development of materials relating to PAME since the 1990s and has published Guidelines for Management Effectiveness Evaluation as part of its best practice series (Hockings *et al.* 2000; Hockings *et al.* 2006). These Guidelines include a Framework of PAME which has been used widely as the basis for many methodologies and assessments across the world. The Framework is based on the belief that to be truly useful in improving management, assessments need to examine all the parts of a management cycle: not only the outcomes, but also the context, planning, inputs, processes and outputs (Figure 5).

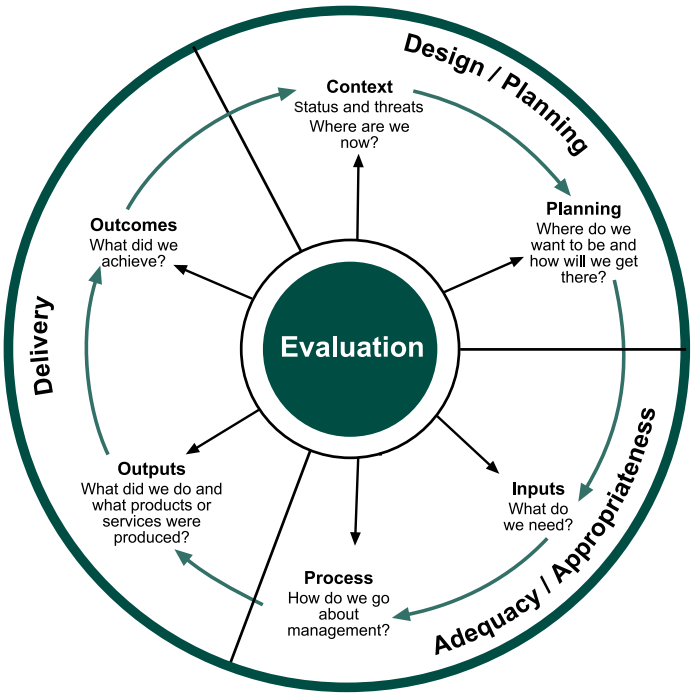


FIGURE 5: IUCN Framework for assessing management effectiveness of protected area

Source: (Hockings *et al.* 2006)

As PAME has developed over the last three decades, many different methodologies have been devised, most of which have been based on this Framework. Most are self-assessment scorecards which measure progress against specific management standards, such as the existence of management plans and the adequacy of resourcing. The most widely used methodologies are: (i) the *management effectiveness tracking tool* (METT) (Stolton *et al.* 2007) which has been completed 4046 times for 2045 protected areas; (ii) the *New South Wales State of Our Parks* (SOP) methodology (Growcock *et al.* 2009), completed 3552 times for 859 protected areas; and (iii) the *Rapid Assessments and Prioritization of Protected Area Management* (RAPPAM) (Ervin 2002), completed 2276 times for 1930 protected areas (Coad *et al.* 2015).

1.3.1 Previous assessments of management effectiveness in PNG

In the early 1990s, WWF and DEC conducted a review of the protected area system of PNG. This review resulted in a preliminary register of PNG protected areas and in the unimplemented design for a protected area strengthening program (Chatterton *et al.* 2006). In 1999, a study using expert-completed questionnaires found that there was no management or minimal management in most PNG protected areas (IUCN 1999). The report does not indicate how many protected areas were included in the study. Some indicators were published for five protected areas (Table 3) and overall assessments appear to be for the entire protected area system, which was about 1.5 million ha at that time (Figure 6).

TABLE 3: Individual protected area assessments in PNG, 1999

PAPUA NEW GUINEA											
NAME	SIZE (HA)	MANAGEMENT BODY	MANAGEMENT STATUS	DEGREE OF THREAT	LEGAL INSTITUTION	MANAGEMENT PLAN	FUNDING	STAFFING	LOCAL INVOLVEMENT	MAIN THREATS	STATUS OF WILDLIFE
Kamiali	47,000	Customary tenure	Serious gaps	Facing serious threat	Yes	Acceptable	Low	Average	Some	Hunting, settlement + low level logging, mining, tourism	Fairly intact
Garu	8,700	Government	Mi nimal	Some degradation	Yes	Minimal	None	Poor	Co-managed	Hunting + low level logging, mining, encroachment & tourism	Fairly intact
Variarata	1,063	Government	Minimal	Facing serious threat	Yes	Minimal	Low	Poor	Some	Tourism + low level logg ing, mining, hunting & encroachment	Intact
Lakekamu Basin (proposed)	250,000	NGO	Serious gaps	Facing serious threat	No	Acceptable	Enough	Poor	Some	Hunting + low level logging, mining, encroachment & tourism	Intact
Crater Mountain	270,000	?	Serious gaps	Facing serious threat	Yes	Acceptable	Enough	Average	Co-managed	Low level logging, mining, hunting, encroachment & tourism	Intact

Source: IUCN (IUCN p. 44)

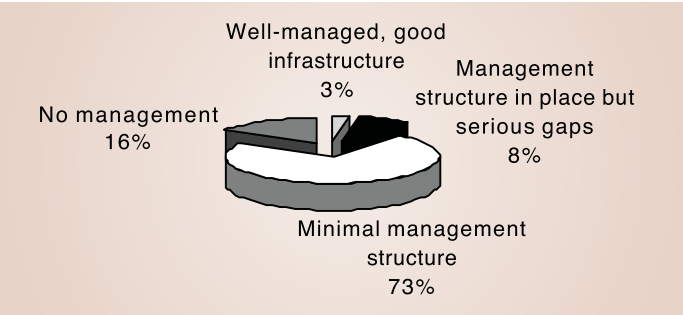


FIGURE 6: Management status of protected areas in PNG, 1999

Source: IUCN (1999, p. 23)

Between 2002 and 2006, a partnership of NGOs and DEC conducted a major project including a management effectiveness evaluation of PNG's protected areas. The RAPPAM survey methodology (Ervin 2003) was used, with modifications to suit PNG. Key activities included:

- "An assessment of whether protected areas are successfully achieving their conservation goals and are supported by landholding communities;
- Identification of threats and pressures to individual protected areas and across the system as a whole;
- Consideration of how effectively protected areas contribute to the livelihoods and aspirations of communities;
- Updating the protected area Register of the status and management of selected protected areas;

- Review of the strengths and weaknesses of government and NGO support to protected areas, and how best to apply the resources and skills of government and NGOs to strengthen the protected area system;
- An assessment of approaches and tools that are effective in helping communities to manage their natural resources;
- Exploration of mechanisms to reduce conflict between protected areas and other land uses; and
- Recommendations and next steps to improve protected area policy and practice and for improving on-the-ground management in individual protected areas" (Chatterton et al. 2006, 8–9).

The detailed report from this assessment was complemented by data sheets produced for most of the protected areas. Collated information was supplied to the PNG protected area registry. These form a useful baseline for later protected area assessments, with the qualitative information a valuable addition to the quantitative scores.

The methodology and findings of the RAPPAM assessment are not included here in detail, as the report is freely available. Key points include:

- Many protected areas had not been visited by a government officer or NGO for over a decade, and some communities were not aware of the existence of the protected area.
- Most significant pressures were of local origin, while future threats included larger-scale developments (Table 4). Hunting and gardening were low-level, but pervasive pressures, and only became serious due to increased population and increased technology (such as guns allowing more intensive hunting pressure). Conversion to agriculture and plantations (oil palm), logging, mining and commercial overfishing were all considered serious future threats to protected areas, with logging a threat to over a quarter of protected areas.

TABLE 4: Most significant pressures and threats assessed in 2006

Rank	Pressure (Current)	Threat (Future)
1	Gardening	Logging
2	Hunting	Invasive species
3	Conversion for agriculture	Hunting
4	Subsistence harvesting	Mining
5	Commercial over fishing	Conversion for agriculture

Source: (Chatterton *et al.* 2006)

- Management of most protected areas was minimal, with 22 of the 45 assessed protected areas scoring less than 33% of the possible score, and the remainder scoring between 33% and 67% (Figure 7).
- There was a very high level of concern that many of the protected areas were vulnerable to losing the values for which they had been declared. The state-owned protected areas were considered to be most at risk.
- RAPPAM reports usually include a comparison of the reported protected area significance with the level of threat, to estimate those protected areas in greatest need of urgent attention. This is called conservation priority. In PNG, most of the protected areas scoring high on the significance criteria had a relatively low degree of threat compared to the less significant protected areas. The exceptions were Tonda, Maza and Laugum WMAs, which were considered to be of especially high priority for intervention.
- The system-wide assessment which is built into RAPPAM revealed very poor scores for the policy and insitutional environment. A particular point was the lack of a clear policy on protected areas, and the progressive weakening and under-resourcing of the government's protected area management capacity. It was noted that NGOs were attempting to compensate for some of the absence of government activity.

The main recommendations identified by the report authors (Chatterton *et al.* 2006, p. 32) were to:

- create a national parastatal institution that will be charged with overseeing the formal protected area system in conjunction with DEC (based on an example from Madagascar)
- ensure there is representation between all stakeholders (government agencies, conservation organisations, industry and landowners) in relation to the establishment of protected areas

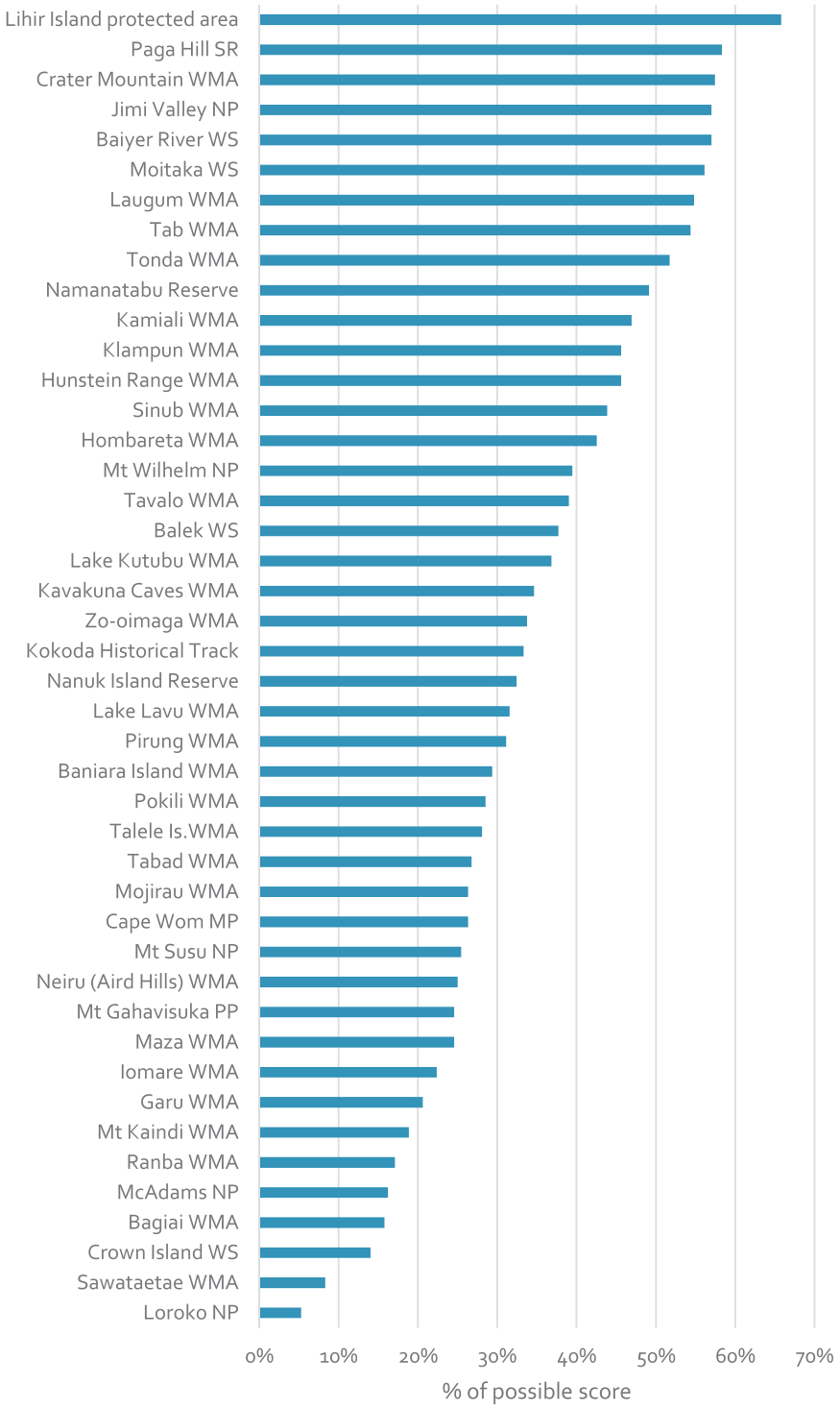


FIGURE 7: Mean RAPPAM management scores for PNG's protected areas

Source: reworked from RAPPAM datasheet, 2006.

- amend and streamline protected area legislation and policies that are applicable to all stakeholders
- create an avenue for the capacity building and training of communities in sustainable eco–business within protected areas
- ensure there are adequate communication, education and awareness programs within all communities, and
- ensure that all threats and pressures within and around protected areas are addressed amicably among all stakeholders.

The comprehensive report and data from this assessment (Chatterton *et al.* 2006), as well as unpublished information about the field methodology, provided valuable information for the 2016–17 assessment of the management effectiveness of PNG's protected areas.

A more local assessment was undertaken of LMMAs in Kimbe Bay (Wise *et al.* 2016), where a very successful cooperative program had established these community-based reserves. The assessment aimed to:

- identify the perspectives of local communities on the effectiveness and status of LMMAs
- assess the LMMAs in terms of their compatibility with local livelihoods and cultural practices, and whether they include all relevant stakeholders and cross-scale threats, and
- identify possible interventions that would contribute to improving LMMA effectiveness and sustainability.

The study concluded that the LMMAs had delivered benefits, including livelihood benefits, but that by 2013 they were no longer managed and that enthusiasm for the scheme had waned rapidly after TNC left the area. There was no tourism income, no fees or fines were being collected, and illegal harvesting had increased. Many reefs were damaged or bleached (Wise *et al.* 2016). Conclusions were that the international community were benefiting from the LMMAs, but that for participants, the costs were seen to outweigh the benefits. Communities would not fine each other for breaches of the rules, and higher-level intervention and support were needed (Wise *et al.* 2016).

1.4 Conclusions: What have we learnt from the past?

The huge volume of work summarised in this chapter on reserve selection, management initiatives and management effectiveness studies includes many astute observations and conclusions about conservation, and specifically protected area management in PNG. Reading the many reports from the early 1990s, it is striking that many lessons documented 20–25 years ago are still applicable, and that most of the challenges remain the same – but with a higher level of urgency. Some of the key points we gleaned from this review of PNG's protected area history include:

- **Protected area management in PNG has a long way to go**. In spite of much good intention and many plans and policies, it is not clear that much progress has been made on the ground in the management of PNG's protected areas or in the establishment of a representative and resilient network. The need for permanent rangers and protected area management presence on the ground is a recurring theme in project reports and evaluations.
- **Protected area management is a never-ending process, not a project with an end date**. On reading the reports, it is tempting to think that almost any conservation approach might have been more effective than the process that has eventuated over the last forty years – that is, constant change, an emphasis on trials rather than long-term commitments, and short-term project cycles rather than long-term adaptive management.
- **Community traditions and dynamics, and an understanding of customary landholders and resource rights, must be the basis of the PNG protected area system**. There are both opportunities and challenges in working with customary land ownership models, and an understanding of where power rests and how it changes is essential. Though community-based management is an excellent starting point for protected areas, there are very few cases where communities working alone can achieve long-term management success. Long-term support and external players are essential.
- **A successful protected area system must harness long-term cooperation** from all levels of government, civil society (including NGOs, private enterprise, educational and religious organisations). However, the efforts need to be coordinated and the **Government of PNG needs to take a clear lead**.
- **Factors out of the immediate circle of influence need to be considered.** Even the best efforts may not succeed if external factors or internal community dynamics are unfavourable.
- **Integrated planning and management with other sectors is vital** to ensure conservation efforts are not undermined by conflicting policies.
- **Much valuable information has been lost or is not easily available**, so better attention needs to be paid to data and document storage and dissemination.

Crater Mountain at the time of the RAPPAM assessment. Photo: WWF

CHAPTER 2 Assessment methodology

The project team of CEPA and the consultants was tasked with evaluating the management effectiveness of as many of PNG's protected areas as could practically be assessed. The focus of this project was to be evaluation at protected area level, differing somewhat from the previous RAPPAM study which included assessment of policy and capacity at the national level. Challenges faced by the team included the remote and inaccessible nature of many of the protected areas, and the lack of knowledge about their current management, including contact details of customary landowners and other key stakeholders.

This chapter outlines the steps taken to develop and apply the management effectiveness evaluation methodology in the field, and to source and analyse additional information about PNG's protected areas.

2.1 What we did

The key steps we took in this project were:

- Search all available published and unpublished literature for any information about PNG's protected areas;
- Develop an appropriate and effective methodology, which needs to be simple, practical and relevant to the PNG context;
- Implement the method in the field, with reliable and valid data collection techniques including accurate note-taking;
- Review spatial data to give an additional estimation of condition of protected areas; and
- Analyse the information, compile a useful report and communicate the results.

The next, most critical step will be to apply the findings to improve management.

2.2 Key findings

- It is very challenging to gain a detailed picture of every protected area in PNG, due to the lack of information and the logistical challenges. Further work, including field inspections, is needed to better understand the values, threats and conditions of each area.
- The methods described in this chapter have enabled us to present a valuable summary of PNG's existing protected area network, and have greatly increased the amount of readily available information.
- The Management Effectiveness Tracking Tool (METT), adapted for use in PNG, has proven to be a simple and effective basis for evaluation. The addition of more detailed information about values and their condition was very important in this project. Further improvements to the questionnaire could be considered to make it clearer to customary landowners.
- The workshop process has been successful, but could be further improved with better advance preparation especially in ensuring attendance of a representative group of people. The enthusiastic cooperation of the customary landowners, CEPA staff and other parties has been critical.
- While the questionnaire ratings give an overall quantitative estimation of the state of management, it is the comments and additional information that assists in planning for the future. Recording this information in detail is challenging but very important.

2.3 Principles for PAME

The first step in developing the methodology was to consider principles guiding how management effectiveness evaluations should be conducted (Box 1). General principles for developing and applying PAME were developed as part of the IUCN-WCPA Framework (Hockings *et al.* 2006) and have been added to and refined since then incorporating many people's experiences across the world (Hockings *et al.* 2015).

Box 1: Management effectiveness should be:

i. Part of an effective management cycle: linked to defined values, objectives and policies and part of strategic planning, park planning and business and financial cycles;

ii. Practical to implement within available resources, giving a good balance between measuring, reporting and managing;

iii. Useful and relevant in improving protected area management; yielding explanations and showing patterns; and in improving communication, relationships and awareness;

iv. Logical and systematic: working in a logical and accepted framework with balanced approach;

v. Based on good indicators, which are holistic, balanced, and useful;

vi. Accurate: providing true, objective, consistent and up-to-date information;

vii. Cooperative and participatory: with good communication, teamwork and participation of protected area managers and stakeholders throughout all stages of the project wherever possible; and

viii. Focussed on positive and timely communication and application of results.

2.4 Designing the questionnaire

To develop an appropriate methodology for PNG, we needed to apply these best-practice principles while considering the special features of PNG's protected area system, especially the role of customary landowners. A draft methodology was devised and shared with staff of CEPA, UNDP and some civil society representatives at a workshop in Port Moresby in April 2016. The methodology was then trialled and adjusted in the field before being finalised. An evaluation of the methodology against the eight principles is presented in Section 0.

As PNG remains in the initial stages of developing an effective protected area system, this PAME assessment will deliver baseline information. PNG then has an excellent opportunity to undertake regular PAME studies to show the changes and hopefully improvements in protected area management over time. This 2016–2017 iteration of PAME is undertaken with external funding and with the assistance of consultants. However, in the future it needs to be practical and economic for CEPA to apply.

The previous (2006) study undertaken in PNG used the RAPPAM methodology and it would have been useful to use the same method. However, there were also arguments for using the Management Effectiveness Tracking Tool (METT) as the basis for the assessment. The METT is now the most widely applied tool across the world (Coad *et al.* 2015), and is required by the Global Environment Facility (GEF) for all the projects and activities they support. As GEF is a substantial donor in PNG, using METT will save a lot of resources in the future. It is also relatively simple to apply and analyse. Both RAPPAM and METT can meet most of the PAME principles listed above, but on balance it was decided that adopting and adjusting the METT is the most efficient and effective approach for PNG now and in the future.

Key changes to the METT included: ensuring the appropriateness of the questionnaire and the workshops in the PNG context; adding questions about protected area benefits and values, and the condition and trend in these values over time; and recording participants' views about how the situation on their protected areas could be improved (e.g. in relation to the values, threats and various management effectiveness themes).

Changes to make the methodology appropriate to PNG

Most protected areas in PNG are owned and managed by the customary landowners, and in these protected areas there are no government employees – the more traditional model of 'park staff'. This is a very significant difference between PNG's protected areas and the more standard protected areas addressed by the METT.

Implications for the PAME methodology and its implementation are:

- *Many of the standard questions needed amendment* to be applicable to the PNG situation. In some cases, we provided an option for respondents to choose between the traditional METT question (for the few government–owned protected areas) and a new modified version (for community areas). The facilitator helps the workshop participants decide which of the question alternatives is most appropriate for each protected area.
- Most of the people providing information to complete the questionnaire do not work for CEPA or other agencies but are customary landowners and members of the management committees, where these exist. This means additional challenges for workshop organisation. Community participants must be supported financially at least with travel costs; assessments must be held in locations that people can reach in a reasonable time; and workshops must be conducted in a culturally appropriate manner. For example, people must be given sufficient time to feel comfortable with the facilitators and each other, and must be given appropriate invitation or encouragement to speak.

Informal follow-up discussions, where possible, help better understand the protected area situation. Photo: Ann Peterson

Addition of information about values

A recognised weakness of the standard METT questionnaire is the lack of information gathered about protected area values and outcomes. If the METT complements other information or assessments this is not such a problem, but given the serious paucity of even basic information about most of the protected areas in PNG, it was essential to boost the data collected about these aspects.

For this reason, we added a section where participants were asked to nominate the primary values of their protected area, after discussion with the workshop group and using words or pictures to describe them. This is similar to questions asked in the METT modified for use by the Ramsar Secretariat (the R-METT). Participants are encouraged to contribute their own ideas and discuss values important to them, rather than working from a standard checklist. In addition, we added a benefits checklist based on that used in RAPPAM, to help the participants to consider all the possible benefits provided by the protected area.

To evaluate the current condition and trend of the protected area values, we added a section on protected area outcomes. Participants are asked to use the key values that they listed in the first part of the workshop. The condition of these is then rated as poor to very good, using the condition criteria developed by The Nature Conservancy and the Conservation Measures Partnership (Parrish, 2003). The trend is then described as improving, stable or deteriorating. Information sources and explanations are recorded for all the ratings provided.

Collation of participants' recommendations

Workshop participants are in the best position to understand what strategies might be practical in improving the management of their protected area. Their recommendations are thus recorded in the workshops to ensure their viewpoints complement more general recommendations from the evaluators.

The whole PNG-METT questionnaire is included in Attachment Two.

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2.5 Process

While it was important to develop a sound and relevant questionnaire, we were also aware that the *process* of assessment is vital for future improvements of the protected area. Workshops bringing people together to focus on management and its successes and shortcomings have benefits well beyond the completion of an evaluation (Hockings *et al.* 2015).

As well as being vital to collect information, the PAME workshops represent a very important opportunity to build and repair relationships between customary landowners, CEPA and other parties. Key benefits of the process are providing people with the incentive and mechanism to define the importance of their protected areas, and beginning the conversations about how management might be improved.

The facilitation process aims to be inclusive and to make participants feel comfortable to express their opinions honestly. A minimum of one day is need to allow the facilitators to work through the questionnaire in logical steps (Attachment Two). Key points in relation to the workshop processes include the following:

- *Essential preparation* for the workshops includes organisation of equipment and handouts, securing a suitable venue, providing notification and support for participants, and planning the program of workshop activities. This preparation can be challenging in the PNG situation, but the time and effort taken by participants to attend meetings must be respected by providing them with a good process.
- *Good facilitation is essential to enhance data reliability and validity.* The facilitator needs to provide a welcoming environment and encourage the participation of all, particularly women and younger people thus ensuring that dominant voices are not the only voices heard. Achieving consensus is a key task given that most questions require a final score (e.g. from 0–3). Skilled facilitation is important in situations where disparate opinions are held.
- *Speakers of both English and Tok-Pisin* must be available in the workshops, and the language of the questionnaire needs to be simple enough for people with limited literacy. An interesting finding was that taking *reading glasses* to the workshops is advantageous, as many people otherwise can't read the questionnaires.
- *Good note-takers* are a critical part of the facilitation team, as lack of attention to note-taking can result in inadequate information to compile meaningful reports and inform future management directions.
- Care needs to be taken to *avoid creating unrealistic expectations.*
- *Completing all questions in sufficient detail is essential*. It is critical that the 'comments and next steps' section of the questionnaire and that the data on the first page (recording participant and protected area details) are completed fully. These aspects are often missing in completed METT forms, and their absence is a great impediment to the usefulness of the assessment results (Stolton *et al* in press).
- *Return all recorded data to the participants for checking to enhance data reliability*. Follow-up acknowledgement, with a copy of the workshop assessment for checking is basic good practice and shows respect. Participants are encouraged to disseminate the data sheets among their communities to enhance data reliability. Some communities held extensive community-wide consultation following the formal workshop meeting.

Customary landowners from four different protected areas and CEPA staff inspect management issues. Photo: Ann Peterson

2.6 Evaluation of the methodology

The methodology was trialled in the field and adapted accordingly to form the final PNG-METT questionnaire (Attachment Two). In Table 5, we estimate how well this methodology measures up against the PAME principles.

TABLE 5: Estimation of the PNG-METT against eight PAME principles

Principles	Progress in the PNG PAME
Part of an effective management cycle: linked to defined values, objectives and policies and part of strategic planning, park planning and business and financial cycles.	An effective management cycle has not been established in most PNG protected areas. This is the second PAME assessment in PNG after a 10 year break, and the findings of the first assessment were not incorporated into management. However, as there is a high level of commitment now within the PNG Government and CEPA to improved management, this methodology can be a part of effective management in the future.
Practical to implement within available resources, giving a good balance between measuring, reporting and managing	The methodology is relatively simple and practical to implement. It requires a minimum of a one-day workshop with two facilitators – one to lead discussions and the other to take detailed notes. CEPA staff are being trained to lead the process in the future. Support for travel is the primary cost. Field visits into the protected area to better evaluate condition and trend would be desirable, where possible.
Useful and relevant in improving protected area management; yielding explanations and showing patterns; and in improving communication, relationships and awareness	The PNG-METT as applied in the field leads to a good basic understanding of the values and status of management of the protected area and provides a good basis for moving forward and improving management. The process is important in re-establishing cooperative working relationships among partners including management committees and CEPA.
Logical and systematic: working in a logical and accepted framework with balanced approach	The methodology is based on the IUCN-WCPA Framework and the METT, both of which are well established and logical.
Based on good indicators, which are holistic, balanced, and useful	Indicators include all the elements of the management cycle as well as the primary themes of management. Additional questions relating to values and outcomes improve the balance of the original METT. Increased emphasis on cultural aspects is also included in the facilitation.
Accurate: providing true, objective, consistent and up-to-date information	The workshop process aims to ensure that information is as accurate and objective as possible. While the information is qualitative and much of it is subjective, it is the best that can be compiled within a modest budget. It is desirable to complement this with field visits and other information sources where possible.
Cooperative and participatory: with good communication, teamwork and participation of protected area managers and stakeholders throughout all stages of the project wherever possible	The workshops process is critical to develop cooperative and participatory relationships.
Focussed on positive and timely communication and application of results	Participants can take away their completed assessments and their written or drawn vision for their protected area, to give them immediate feedback on their results, and they are sent the edited METT forms and four-page summaries as soon as possible. Results from individual protected areas are made available to CEPA after each workshop, and the overall report can be compiled soon afterwards.

Overall, the PAME assessments using the PNG-METT are a valuable step in establishing effective management in PNG protected areas. However, the methodology will only prove useful if the information obtained is used to develop workable future policies, resources, procedures and actions on the ground.

2.7 Limitations of approach

The limitations of rapid assessment methodologies are recognised, as this is a subjective recording of people's opinions and ratings, and the exercise involved very few site visits. In PNG it can take up to a week per protected area for even a quick site visit, and in this case the logistics were not possible. In time, it would be desirable to include in-depth field checking of each protected area, and this will need to be done as part of the revitalisation and decision-making processes.

Participant Levi from Loroko National Park with his visual representation of key protected area values. Photo: Ann Peterson

For some protected areas, it is not clear that all the key people attended the METT workshops, and it is possible that the participants did not represent the diversity of community views. Despite attempts to invite them, few women attended the workshops, and their input was thus limited.

However, we believe that information about most aspects of management effectiveness were answered consistently and accurately, and facilitators worked hard to elicit back-up statements and to probe the ratings given. Estimations of the protected area condition, especially the status of animal species, were given with the least confidence. Participants frequently referred to the lack of monitoring and research, and expressed a great desire for more accurate information about wildlife in their area.

2.8 Spatial analysis

To complement the questionnaire-based assessments in the estimation of current condition of the protected areas, some spatial analysis was carried out. This work aimed:

- to determine the recent (2013) extent of natural cover versus other land-uses for terrestrial protected areas and to compare this cover with the statistics for 1996, and
- to estimate the change in forest cover between 2000 and 2014 in the protected areas.

Here we briefly outline the methods and data sources used in the analysis. Results are presented in Section 7.4. Protected area spatial information was provided by CEPA and was the best available data in August 2016. The land cover analysis used spatial information compiled by researchers at the University of Queensland (Adams *et al.* 2017). Their data was based on the Papua New Guinean Forestry Inventory Management System (FIMS) mapping circa 1996 (Box 2).

TABLE 6: Landuse / landcover classes used in the GIS analysis

Landuse classes	
Bare	Riverine
Forest	Swamp forest
Forest – Large Crown	Swamp
Forest – Medium Crown	Mangrove
Forest – Small Crown	Lakes and larger rivers
Forest – Very Small Crown	Land use intensity classes 0–4 (low to very high)
Forest – Open	Timber Plantation
Woodland	Mining
Savanna	Oil palm
Scrub	Cultivated land
Grasslands	Urban
Land use 0–4	Volcanic successions

Box 2: Landuse landover (LULC) data

A LULC classification for 2013 was derived by updating the Papua New Guinean Forestry Inventory Management System from 1996. The Forest Information Management System (FIMs) mapping provides the best available vegetation data for PNG. FIMs was based on the interpretation of SKAIPIKSA air photography taken in 1973–75 (Hammermaster and Saunders 1995). The 1:100,000 classification includes a total of 59 vegetation types including: 36 Forests, 6 Woodland, 3 Savanna, 3 Scrub, 11 Grasslands, 1 Mangrove and 4 Non Vegetation Types

Source: Adams et al. (2016)

Our analysis compared the 1996 and 2013 land cover data overlain with the 2016 protected area layer. The study also incorporated contemporary landcover change mapped from Landsat imagery, data from the Roundtable on Sustainable Oil Palm (RSPO) and Global Forest Change data 2000 – 2014 (Hansen *et al.* 2013) with data downloaded from their website.

Using this analysis, the following maps and tables were generated:

- landuse breakdown for current and proposed protected areas in 1996 and 2013
- landuse change within current PNG protected areas, between 1996 and 2013, and
- 2000 – 2014 forest loss for current and proposed protected areas, using the Global Forest Loss data (example in Figure 8).

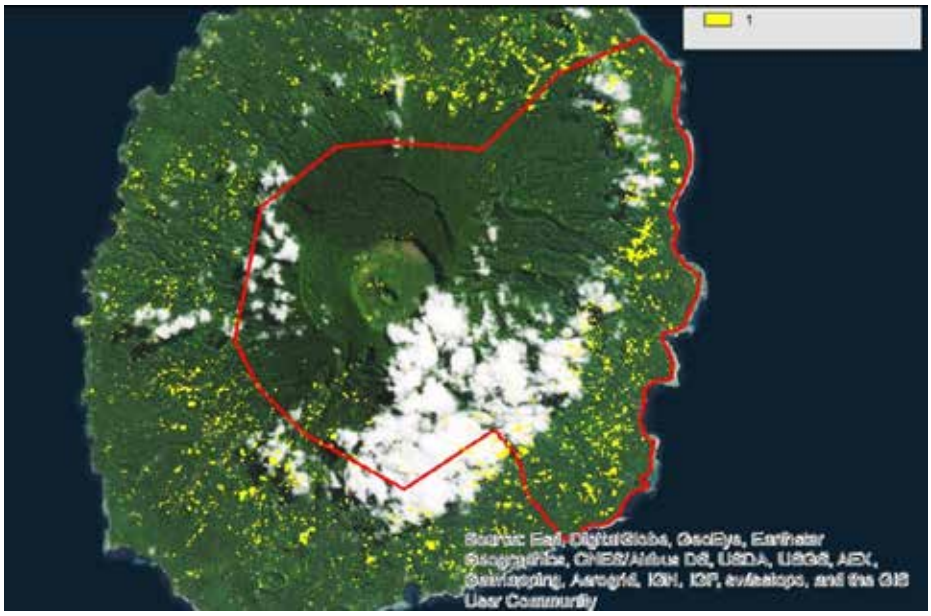

FIGURE 8: Forest loss on Karkar Island between 2000 and 2009

Source: forest loss data derive from Hansen et al. 2014

While the analysis provided some useful information, there were serious limitations:

- There is missing data in the spatial layer for some protected areas. For some protected areas, only point data was available, and these protected areas have been excluded from the analysis. Unfortunately, the lack of spatial accuracy meant that the overall figures calculated for PNG's protected areas have not been included in this report. However, the GIS system is set up to re-calculate data when the information is available.
- For the land use cover analysis, interpretation of bare ground and grassland, appears to vary between the 1996 and 2013 data sets. Without ground truthing it is difficult to confirm whether bare areas have been cleared or are naturally bare – for example, steep rocky ground. For this reason, caution needs to be exercised in using the data.

2.9 Conclusions

This project has built upon past initiatives in PNG, to develop a current picture of the status of its protected area system.

Many protected areas are remote with very difficult access, and over time contact with customary landowners and other managers of the areas has been lost. For most protected areas, there is little current information about the status of the environment and wildlife, and many have no spatial data or even clearly delineated boundaries. For these reasons, it is challenging to gain a detailed picture of every protected area.

While the information presented in this report is largely qualitative, relying on inputs from workshops, we believe that people have answered the questionnaire to the best of their abilities. The workshops included internal cross-checking questions and any inconsistent and unclear answers were followed up with further questions

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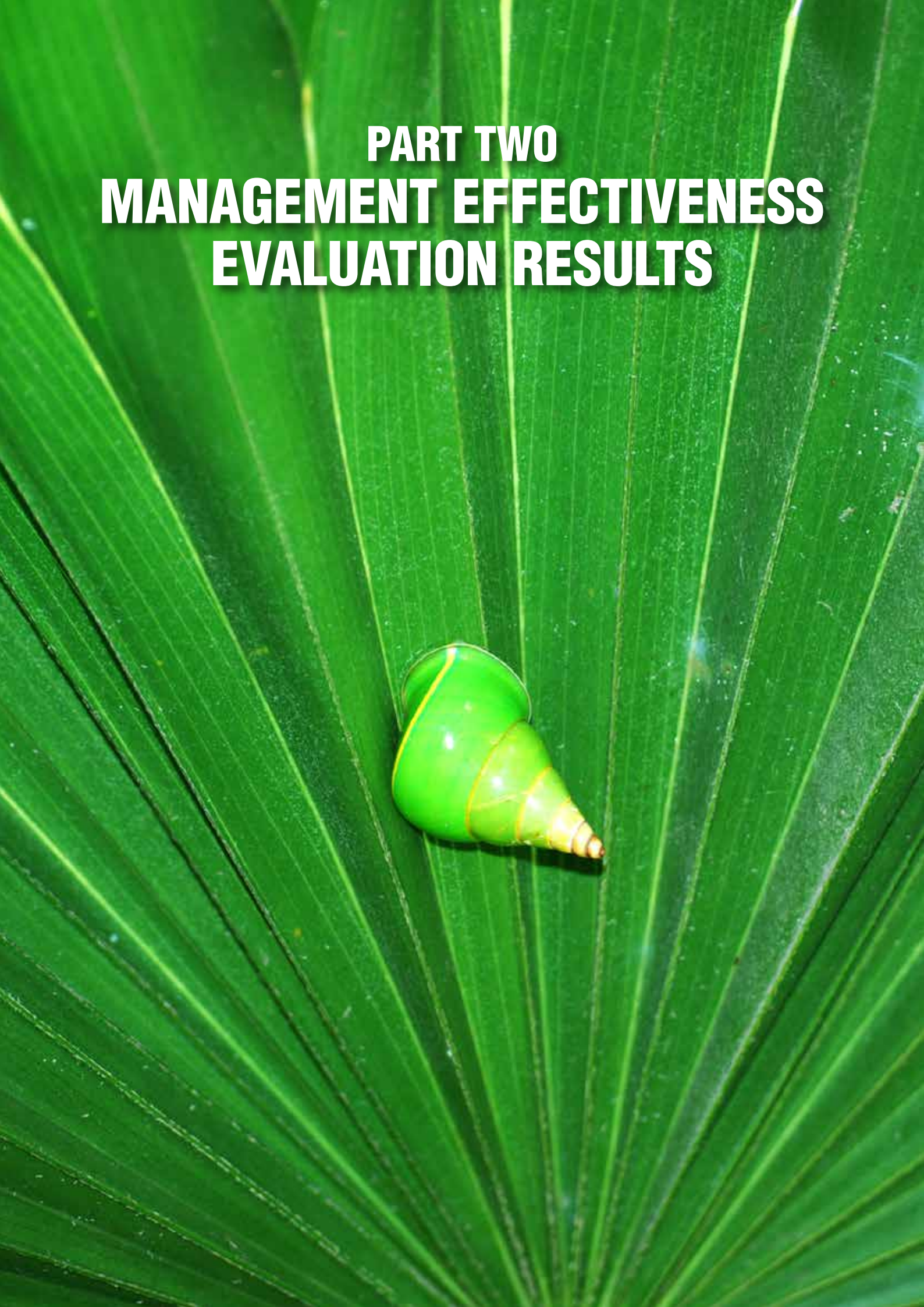
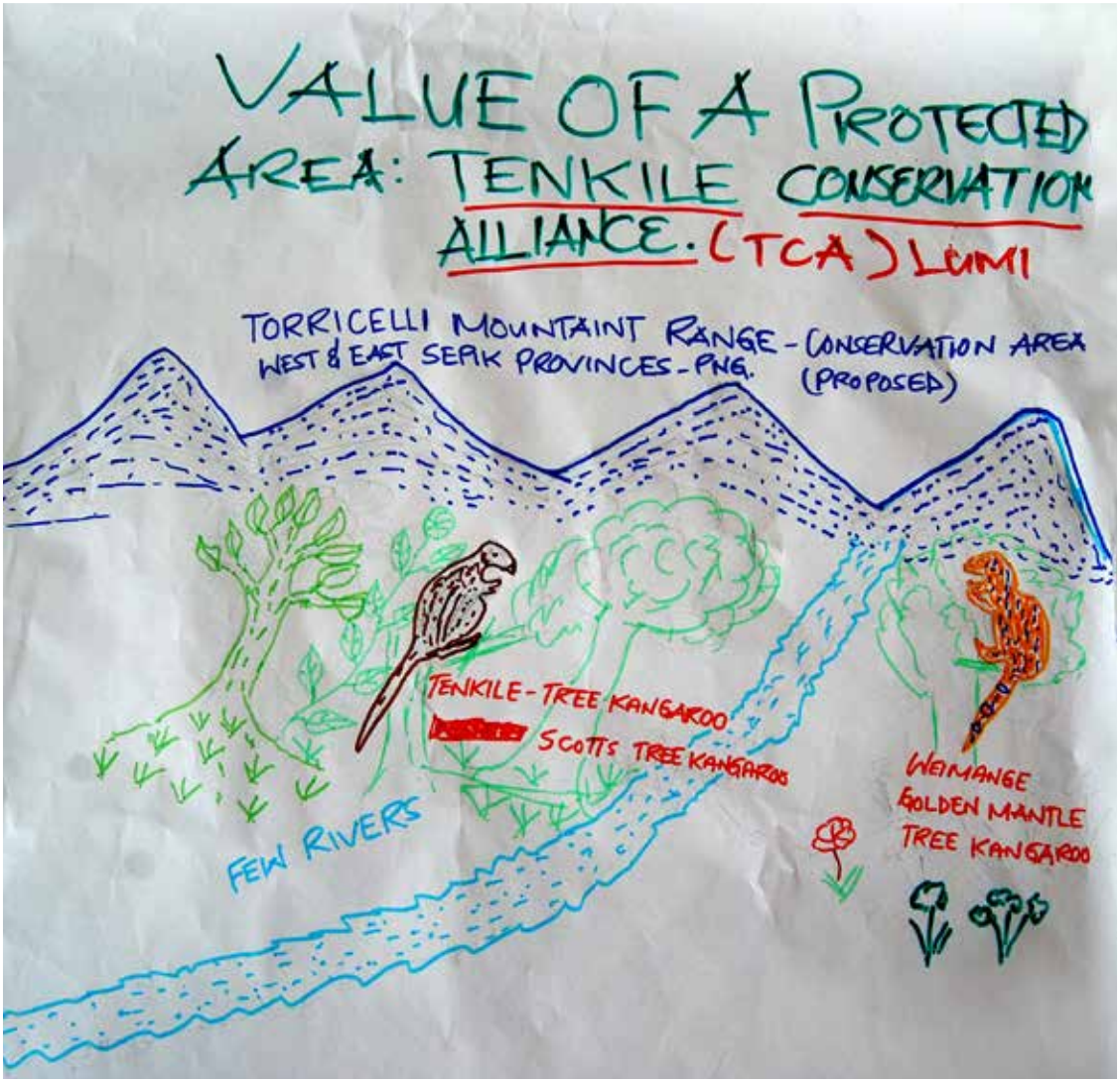


PART TWO
MANAGEMENT EFFECTIVENESS EVALUATION RESULTS


VALUE OF A PROTECTED AREA: TENKILE CONSERVATION ALLIANCE. (TCA) LUMI
TORRICELLI MOUNTAINT RANGE - CONSERVATION AREA (PROPOSED)
WEST & EAST SEPIK PROVINCES - PNG.
TENKILE - TREE KANGAROO
SCOTTS TREE KANGAROO
WEIMANGE GOLDEN MANTLE TREE KANGAROO
FEW RIVERS

CHAPTER 3
Values and benefits of PNG's protected areas

In this chapter, we present the results of the first part of the METT assessments for 58 protected areas. See Attachment Two for the METT questionnaire.

3.1 What we did

There were three parts to gaining an understanding of the values and benefits of each protected area from the perspective of the customary landowners and other workshop participants.

The first step in the workshop process (Section 3.3) was to ask participants to respond, in pictures and words, to the question, 'Why is the protected area important?' or 'What do you like about your protected area?' The participants' statements often included the reasons why people thought that their protected area was gazetted. Facilitators provided minimal input into this session to ensure that ideas were not influenced. The values statements and graphic representation for each protected area can be found in the summaries (Attachment Three).

In the second step (Section 3.4), participants worked with the facilitators to identify and describe four to eight key values for each protected area (refer METT questionnaire, Table 2). This expanded on the values' statements, but went into more depth and identified values that later would be considered in terms of their current condition and trend.

In the third step (Section 3.5), participants were provided with a checklist and asked to nominate whether the 16 listed types of protected area benefits were 'not important' (0), 'important' (1) or 'very important' (2). A 'don't know' option was also provided. Comments were recorded for each benefit. This information reinforced the ideas generated in the values discussion, but allowed participants more time to think about all the benefits generated, and also collected negative responses.

Estimations of the current condition and trend of the identified values were made at the end of the workshop – see Section 7.1 for details about this process.

3.2 Key findings

- For most protected areas, *participants are enthusiastic about the values and benefits of their protected areas*. Customary landowners appreciate the role of protected areas as places where nature and culture are relatively intact. However, customary landowners for a few protected areas have little idea of why the protected area exists or what it means.
- People still perceive a *close relationship between nature, culture and livelihoods*. Animals and plants are respected for their own value, but more often as important resources for food, medicines, building material and cultural practices. There is no real separation between values for biodiversity, culture and human well-being.
- As well as biodiversity, *natural areas are prized for clean fresh water, attractive scenery, clean air and protection of tambu places*. People are usually aware of the need for sustainability in resource use.
- Many customary landowners stated their willingness and interest to learn more about their protected areas, and showed a high level of interest in information that has been given to them in the past.
- The *lack of detailed knowledge* about the landscape, plants and animals is striking in many protected areas, and customary landowners would appreciate simple aids such printed maps of their areas, and posters of their plants and animals.
- There are sometimes *differences in opinion* within landowner groups, as some value the protected areas while others (especially those living away from their villages) are concerned at the lack of tangible cash benefits.

3.3 Why is the protected area important?

Many of the values statements show a high level of community commitment and support for the protected area. Some examples include the following:

"My father came up with the idea of a Sanctuary and he convinced the members of the community. Logging companies were interested in the area, but we recognized the importance of the area for wildlife. We didn't want to have logging. We would have lost everything. We wanted to keep it protected for our children.

In the Sanctuary we have kwila trees, butterfly, herbal plants and national iconic species such as the bird of paradise and crocodile. There are python, scorpion and other unique species. There are no cassowaries (muruk) any more as they have been hunted. So we must protect what is left. It is important to have this place so that children can come here and learn about the environment. There is healing water in the sulphur springs. People come here to be in the water as it helps with many illnesses (e.g. malaria, leprosy and other sicknesses). There are fish, prawns and eels in the water. There is also a mountain with caves and tunnels." (*Balek WS*)

"Sinub WMA [in Madang Lagoon] is a marine protected area that includes a small island and the surrounding marine reefs (to about 200m from the shore). The island sits about 2m above the sea level. We protect the area mainly for the fish. There are many different species (e.g. surgeon, long Tom) and also sharks, dolphin, turtles, crayfish, black and white sea snakes and beche de mer. We did this because the number of fish was declining.

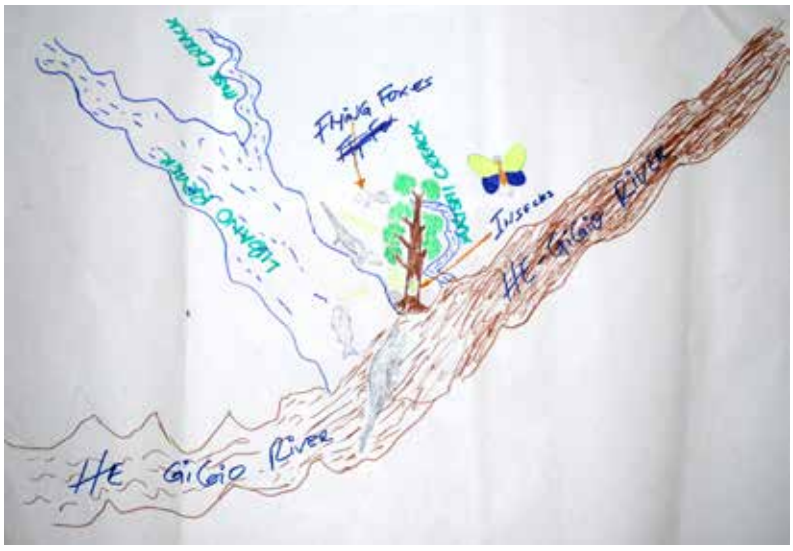
We have two healing stones (made of coral rock) on the reef – they are legendary stones. The people usually wash around the rocks and they can heal their sores or any other sickness. We have planted some seagrass (*from CSIRO, Australia*).

On the land there are gardens in the middle of the island. It has some trees (Kalapulim, coconut and mango) and birds (megapodes and blue and while kingfisher). The reefs help to prevent island erosion from the sea waves. There are some white sand beaches and a wreck on the northern side. The ship was sunk in the 1980s to provide diving opportunities for tourists, but there are no boat moorings. Sinub is connected to Laugum and Tabad and this expands the area given protection." (*Sinub WMA*)

"The WMA is our 'mama graun' (mother earth). It has forest, kumuls (bird of paradise), tree kangaroos, cassowaries, pigs, lizards, wallabies and fresh water species such as fish, eels, turtles, and prawns. There is diverse biodiversity and several rare and threatened species. It has mountains, with caves and waterfalls. In the forest the soil is pushed up into mounds (gunategi) by insects. We form an association with mama graun. Our survival depends on this and we need to protect this land, the forest and the animals. We also want to extend the WMA so there is no more destruction of the forest." (*Mojirau WMA*)

"In 1995 the World Wildlife Fund explained to us that logging would 'bagarap' the forest. The whole village went into an agreement, that logging could take place but not within the area to be dedicated as a WMA.

We like many things about the WMA. The rivers are important. The Hose River is very fresh and it cures some sicknesses. The He-Gigio River is brown, a different colour, but this is natural, and it has straight running water. The Libano and other rivers are blue. These rivers are very beautiful and there are some waterfalls. The fish are important. There are common ones and some special ones for eating (for taste). ... The butterflies are in the forest and when they are flying around they look colourful and good. When the crocodiles are sleeping on the beach, the butterflies try to sit on them. We also have many caves and there are flying foxes in the caves and in the trees (these are the special ones – they are bigger and the meat is very tasty). We also have frogs, megapodes and beetles." (*Libano-Hose WMA*)



The rivers and wildlife of Libano-Hose WMA, on the slopes of Mt Bosavi, as drawn by the workshop participants.

Other responses demonstrated anger and disillusionment with the protected area process to date:

> "A decision was made by customary landowners to give the land to the government to keep it safe for future generations. Large areas of customary land were degraded through logging and mining. However, it is unclear whether a resource use agreement was made between the National Forest Service and the landowners.
>
> The area has biological significance because it contains a small remnant of araucaria pine forest that also contains red cedar. There are several fauna species (e.g. bird of paradise, cassowary and small mammals), but the small size of the reserve limits its effectiveness. It has special spiritual places that are important to the landowners. It is an area of scenic value, overlooking the Bulolo Valley…
>
> Customary landowners believe that the state has done nothing to protect and manage the area and the customary landowners want to reclaim their ownership." (*Mt Susu NR*).

3.4 Key values

A total of 290 values were listed for the 58 protected areas. The nominated values were used in the later part of the workshop as the basis for evaluating the current status of the protected area (see 6.5). Where additional information about values was available from other sources, this was added either at the workshop or later. Information about key values was also complemented by a more detailed discussion of benefits from the protected area (Section 3.5).

We analysed participants' statements about the key protected area values and made a tally of the number of times each type of value was cited. We found that:

93% of the protected areas nominated natural values

88% listed socio-economic values (livelihood and commercial)

71% listed cultural values

10% had historic values.

However, there are very close links between 'natural', cultural' and 'livelihood' values. Just over half the values nominated by participants covered at least two of these value classes – for example animal species were listed and then their cultural and/or socioeconomic importance was discussed. This is not surprising: it reflects the very close connection and interdependence that PNG people still have with their natural environment. This was often stated, for example:

> "Protecting customs, legends and history: There are many important spiritual sites within the area and people are closely connected with their environment. It is a part of them. (*Mojirau WMA*)
>
> "Traditional culture: The establishment of the protected area was also about linking protection of the natural world with protection of our cultural values. We have spiritual places where people are not permitted to hunt or use the resources. These areas are important for wildlife ('ples masalai'). The conservation area helps to protect and maintain our stories and legends. If a logging company comes in we won't have any of this left, so we protect our land, as it is our culture and customs. There is also strong leadership in the community and high levels of awareness of the benefits of conservation." (*Torricelli proposed CA*)

People most often value biodiversity for its contribution to their livelihood: as a vital source for food (including protein), building materials and medicines. Plants and animals are also used for many customs and traditions. Participants discussed various animals, as well as plants and ecosystems (including forests and reefs). The animals include both native and non-native species (e.g. pigs, dogs, chickens). In some cases plants or animals also provide income to enhance living standards.

Forests of Pokili. Photo: Ann Peterson

"Forest: There are many species of trees. About 40 species of tree are used to build one house. There are birds (e.g. waterfowl and the Hauok [cockatoo]). With increasing population, this puts a lot of pressure on the forest. The forest is also important for medicinal plants, building canoes, providing for sing sings (dance and music ceremonies) and also habitat for wildlife." (*Mojirau WMA*)

"Fish: The WMA is important for fish spawning and traditional rules regulate the take of the mullet, e.g. not all fish are harvested – you just catch enough for yourself and use traditional methods. The fish are not for sale, but if there is excess it is distributed to others.

Forest: The forest is important for timber, medicinal plants and habitat for plants and animals – when we have bush we have animals and medicine. Forest brings unpolluted air." (*Ndrolowa WMA*)

Traditional fishing methods are used in Kimbe Bay to feed families and supplement incomes. Photo: Ann Peterson

"Animals: Birds of paradise, wallabies, cuscus, parrots (green and red), white cockatoo. The animals are used for traditional ceremonies, but the people want to look after the animals. We hunt wallaby, pigs, cuscus, bird of paradise, prawns and small river fish." (*Zo-oimaga WMA*)

"Wild animals (cuscus, tree kangaroo and wallaby): These animals are used for bride price, in traditional attire and the meat is an important source of protein and is also used for compensation and marriage." (*Siwi Utame WMA*)

"Crayfish: There is an abundance of crayfish all year round. They provide a major income for coastal communities. Crayfish are sold commercially by local people and there are also licensed exporters. Turtles: Turtles provide meat for ceremonial purposes and we want to continue this tradition for future generations." (*Maza WMA*)

In many cases, people also showed a knowledge of and pride in wildlife for its own sake. People from Madang Lagoon, where researchers had been active, are proud of the marine biodiversity, including unique fish species. The Mt Kaindi WMA workshop specifically mentioned the importance of the protected area as a refuge for wildlife.

"Biodiversity: It is a safe haven for plant and animal species in an environment that has been largely altered outside the boundaries of the WMA (e.g. by mining and gardens). It is thought to provide habitat for several birds (Wattled brush turkeys, lorikeets and fruit doves), small mammals and bats. It also provides a landscape function as it is in close proximity to other protected areas." (*Mt Kaindi WMA*)

"Tree kangaroo: All species are critically endangered. There has been a hunting moratorium (MOU) in place since 2003 and numbers have increased from 100 to over 300. Some are returning to areas where they have not been seen in a long time. All 50 villages have tree kangaroos on their land." (*Torricelli proposed CA*)

"Wetlands: The wetlands are internationally recognized as a Ramsar site. The wetlands contain grassland, savanna woodlands and monsoon forest with a diversity of wildlife, mainly endemic birds and mammals." (*Tonda WMA*)

"Animals: … There is no hunting in the WMA as we want the environment to come back to its previous state. We hunt some species outside the WMA, including kapul, bandicoot, cuscus, wildfowl and wild pig." (*Nuserang WMA*)

Water was nominated as a key value in 58% of protected areas: in most cases it is valued for the provision of drinking water and for use in cooking and gardens, as well as for its importance in supporting fish and other food sources. For example, the Kokoda IPZ protects the catchments of the Brown, Naoro and Goldie Rivers. These are important to provide secure water and the provision of hydro-electric power for the region.

The cultural and spiritual values of protected areas relate to the presence of spiritual/sacred sites and *masalai* sites and the importance in keeping culture alive, including the passing on of traditional skills such as hunting, fishing, house building as well as rituals, dances, songs, stories and dress.

"Culture: Presence of a healing stone on the reef, which heals a range of sicknesses. Preserving our traditional culture relating to fish harvesting (e.g. use of traps, spears and nets) is important." (*Sinub WMA*)

Cultural and traditional values in Lake Kutubu WMA include longhouses, which remain in use. Photo: Ann Peterson

"Culture: We have cultural sites – large flat rock (Panuluan stone) on northern side of the island. It is very unique. Pregnant women sit on the stones and this will produce a tall child." (*Tabad WMA*)

"Cultural values: There are special animals that are protected – e.g. eagle, kite (associated with initiations) – important bird in the wetlands; tribal groups have local totems (e.g. eagles, plants/trees). Tonda is regarded as part of the family." (*Tonda WMA*)

"Mountains: The forested mountains are a special place not only for significant biodiversity, but for visual amenity and a sense of peace and tranquility." (*Sulamesi WMA*)

Tourism, recreation and scenic values were nominated by 30% of protected areas, and in part this is related to special features such as caves, tunnels, hot springs, crater lakes, and coastal areas with beaches and diving sites. Participants are keen to maximise their financial return from recognised tourist destinations.

"We need to protect the landscape (especially around the cave) to ensure that tourists come and pay their entry fee to the community. Good opportunity for tourism; intact environment; excellent for adventure tourism. Investment into developing tourist facilities, introducing a permit system and fee system for visitors, and information and marketing of the WMA values." (*Kavakuna Caves WMA*)

The historic sites of Wewak War Memorial Site, Kokoda Memorial and IPZ, Paga Hill Scenic Reserve and Cape Wom Memorial Park feature tourism as a key value along with military history.

Scientific and educational uses were not cited frequently as key values (12% of protected areas).

"Tertiary institutions (such as University of Papua New Guinea, University of Technology and the University of Goroka), primary and elementary schools and NGOs use the park for educational studies and research. Several biodiversity inventories have been undertaken during training exercises." (*Mt Gahavisuka*).

The state and trend of values are discussed in Section 4.4.11 and 0.

3.5 Benefits checklist

Overall, respondents for most of the protected areas had a very strong appreciation of the benefits of their protected areas, with attractive scenery, traditions and customs, potential future tourism, fresh water, and biodiversity scoring the highest across the country (Figure 9).

Some benefits that were rarely nominated as key values (such as value for education and science) gained more frequent positive comments when the checklist was completed (i.e. Table 3 in the METT questionnaire).

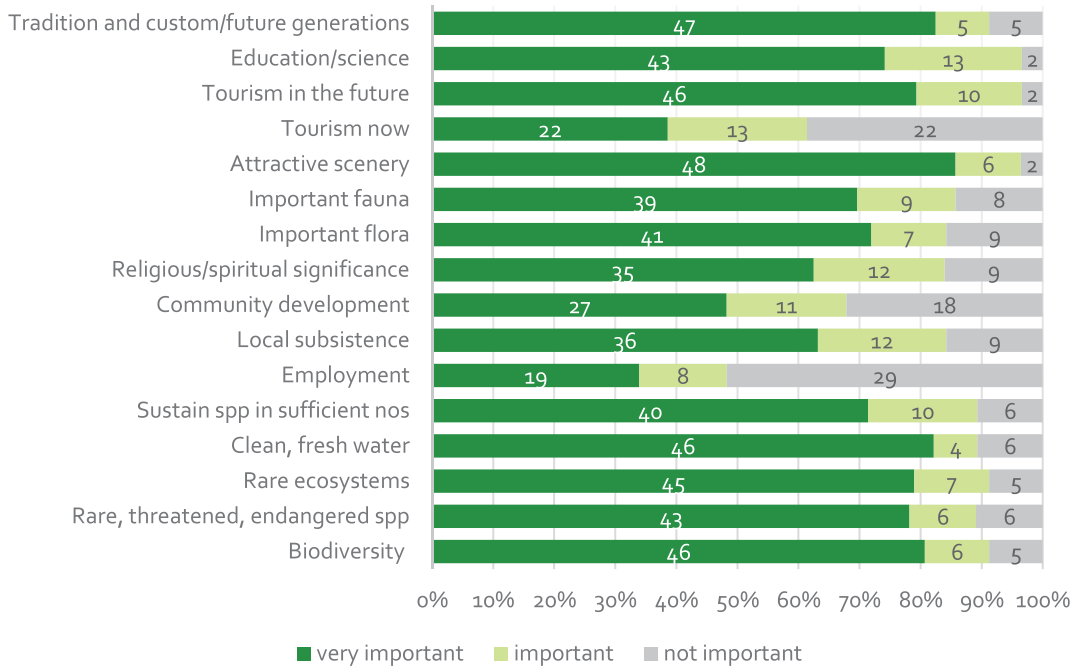


FIGURE 9: Perceptions of benefits provided by PNG's protected areas

Percentage of protected areas where participants rate each benefit a very important, important or not important

All of the listed benefits, except for employment and current tourism, were rated as very important for more than half the protected areas. In addition, many people think their protected areas could be important for both employment opportunities and tourism in the future, and are disappointed that these benefits are not being delivered at present. It is clear from the comments that even small amounts of funding and employment are appreciated.

> "When the WMA was first gazetted, the people were lead to believe that the WMA would provide employment, but there is still no employment." (*Tab Island WMA*)

> "There is no paid employment currently, but at certain times small funds have come into the community to undertake activities. The WMA operates within the community's capacity. However, there are long-term plans to seek financial support to create employment opportunities for the community and this will strengthen and motivate people to become more concrete in their environment protection conviction and to take more ownership and responsibility in leading a self-reliant and sustainable livelihood." (*Klampun WMA*)

Comments about the benefits also reinforced the close links between people and nature.

> "The area provides fish, timber, clean water and medicinal plants. 95% of the peoples' livelihoods depends on the resources extracted from the WMA." (*Neiru WMA*)

To see the overall perception of how much the protected areas were seen to benefit communities, total scores for each protected area were calculated across the 16 possible benefit types, and then expressed as a proportion of the maximum possible score. The importance of the benefits for each protected area was then classed as 'very high' (75% of the total score), high (50–75%), medium (24–50%) and low (<25%). The results of this analysis (Figure 10) indicate that most protected area participants believed that their protected area provides a high or very high level of benefits. Only nine protected areas rated the importance as medium or low, and of these three are small military history sites with low biodiversity significance.

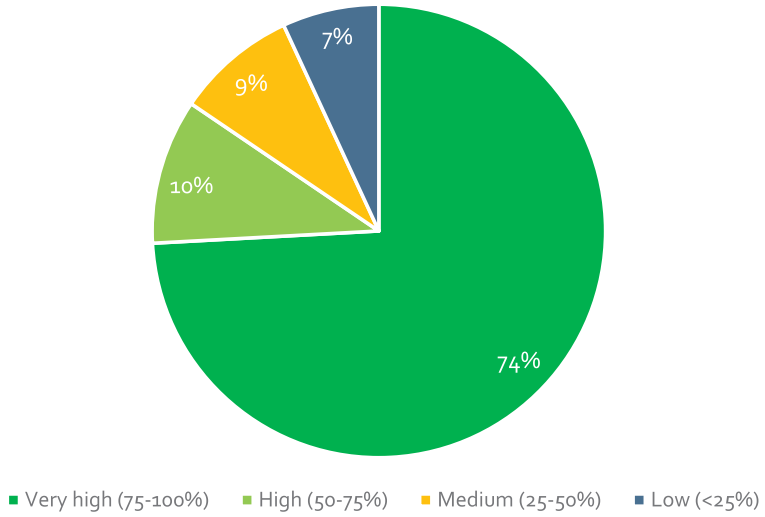


FIGURE 10: Overall benefits importance ratings for PNG protected areas

(Percentage of 58 assessed protected areas achieving each rating)

3.6 Conclusions

Detailed discussions about the values and benefits of the protected areas were very worthwhile, and most participants seemed to enjoy and learn from the exercise, by sharing information with each other and the facilitators. It is important for recorders in future workshops to collect all possible information about the values of the protected areas to enable the landowners and CEPA to make informed decisions about their future.

It would also be advantageous if more information about known values could be conveyed to customary landowners – many people mentioned that they would like to know more and to combine their traditional knowledge with scientific information about the plants and animals. Field trips where scientists are specifically tasked with building joint understanding about the protected areas would be very useful.

The very close relationships between people and the environment in most protected areas could be the basis for a continuing philosophy and practice of protected area stewardship and management. T*he 'healthy parks, healthy people'* concept (http://www.hphpcentral.com/) could be useful in building on people's current understanding of how closely they are linked to the natural world.

CHAPTER 4 Management effectiveness evaluation

4.1 What we did

We assessed 58 protected areas – 57 from the CEPA list of gazetted areas plus Torricelli Mountain Range proposed CA. In addition, nine non-gazetted areas, including LMMAs and other proposed protected areas, were assessed. While the profiles and METT data sheets for these non-gazetted areas are available, they are not included in any statistics or analysis in this chapter. The development of the methodology for this assessment is presented in Chapter Two, and the PNG METT questionnaire is included in Attachment Two, Table 6.

For analysis and discussion, the 30 questions have been grouped into eleven major themes of management:

1. design and establishment
2. planning and objectives
3. budget, infrastructure and equipment
4. human resources
5. legislation, control and enforcement
6. information, inventory, and research
7. resource management
8. relationships, education and awareness
9. tourism and recreation
10. economic benefits to local communities
11. condition of values

In addition, the results have been analysed according to the elements of management (Section 1.3):

- context and planning
- inputs
- process, and
- outputs and outcomes.

Most METT questions have a choice of four answers, reflecting the progress towards an ideal situation. The specific meaning of the scores (0 to 4) for each question is outlined in the METT questionnaire (Attachment Two, Table 6), but for each question the four-point scale represents progress from no management, through very minimal or early management to basic and then sound management.

The total METT scores for each protected area have been calculated by adding all the scores, giving some indication of overall progress in achieving effective management.

These total scores are then considered as a percentage of the total possible score and rated as follows:

- 'very good', with a result of more than 66%
- 'good progress, with some concern' (50–66%)
- 'some progress, high concern' (33–49%)
- 'little or no progress' (<33%).

For each question, we recorded comments to explain why the rating was given, and a selection of these comments is included in this chapter. We also recorded participants' recommendations for future improvement: these recommendations are discussed in Chapter 5.

We also translated the scores from this assessment into the 'common reporting format' used in the Global Study of management effectiveness (Leverington *et al.* 2010a) and reported in the World Database on Protected Areas, which allows us to compare this results with other methodologies. We then used this information to compare current management effectiveness scores with the RAPPAM scores from 2006.

4.2 Key findings

Overall progress in PNG's protected area system is very limited (Figure 11). Only four protected areas (YUS CA, Torricelli Mountain Range proposed CA, Kokoda Track/IPZ and Kokoda Memorial) are rated as achieving very good progress. This is equivalent to 7% of the protected area system.

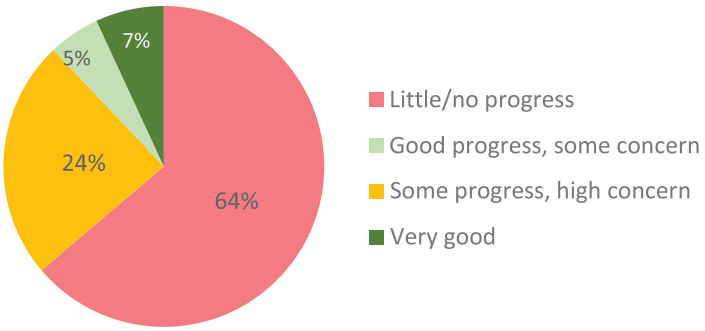


FIGURE 11: Overall progress in management effectiveness for protected areas in PNG

(Percentage of 58 assessed protected areas achieving each rating)

Factors of success seen in these best managed protected areas include:

Strong governance, management planning and leadership, such as:

- management plans that are current and regularly reviewed
- on-ground rangers or staff to manage the area and effective work plans in place
- strong leadership
- good administrative arrangements (e.g. Kokoda Track Initiative, YUS Conservation Organisation and Torricelli Conservation Alliance) and/or representative management committees in place
- restricted resource use in some areas
- long-term support (e.g. NGOs or governments, both national and international).

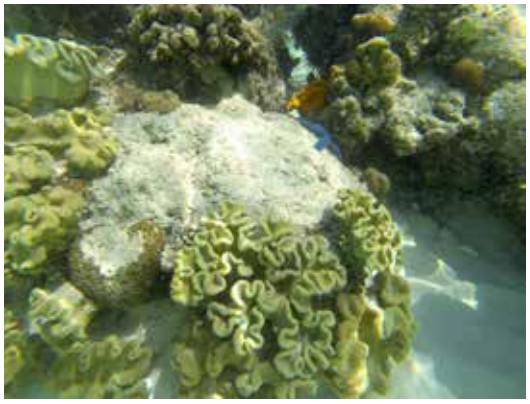
Reasonable resources and funding, with:

- secure and ample funding
- a range of income generating activities which are often linked to conservation
- effective benefit-sharing arrangements
- a diverse range of community development projects

Good information and communication, including:

- good information/inventories of resources and values
- high level cooperation of customary landowners who benefit from the protected area
- education, research and monitoring are undertaken and inform planning and management

A further three protected areas (Klampun, Sulamesi and Crater Mountain WMAs) are rated as having good progress, although with some concerns.The remainder of the protected areas are struggling to deliver even basic management. Fourteen protected areas (24% of the total) are showing some progress, although there are major concerns with management, while 37 protected areas (64%) score less than 33% of the possible score, which indicates that management is quite inadequate or has not yet been established .



Reefs remain in good condition in parts of Madang Lagoon, and landowners are still keen to restore their protected areas. Photo: Ann Peterson

It should be noted that a low management effectiveness score does not indicate that the situation is hopeless or that the protected area does not have high remaining values. As the METT questionnaire includes only one question on the status of values, the total score does not reflect the actual state of the protected area – rather it reflects the current management situation. Some of the poorest scoring protected areas have rated the condition of their values as 'good', but urgent action is needed to prevent future deterioration.

4.3 Results for each protected area

Management effectiveness scores for each protected area are shown in Figure 12. Raw scores are shown on the left axis, totalled from the ratings (zero to three) given for each question. The shading represents the elements of management (Section 4.1). Note that the number of questions answered varied, as some questions were not applicable to all protected areas – for example, questions relating to commercial tourism, management of finance, and maintenance of equipment and infrastructure. For this reason, the total score shown on the left axis may be out of 99 (if all questions are answered) or out of a lower possible score (96, 93, 90 or in one case 87).

On the right axis, the score for each protected area is shown as a percentage of the total possible *for that protected area* – that is, the score has been adjusted to compensate for questions that were excluded.

The gap between the four best-resourced protected areas and all others is noticeable. Some elements of management vary more than others: there is more variation in the input and process scores. Some of the protected areas which rate lowest have zero or very low scores for inputs (money, staff and equipment) and low scores for processes (activities on the ground), while they still score reasonably well for planning.

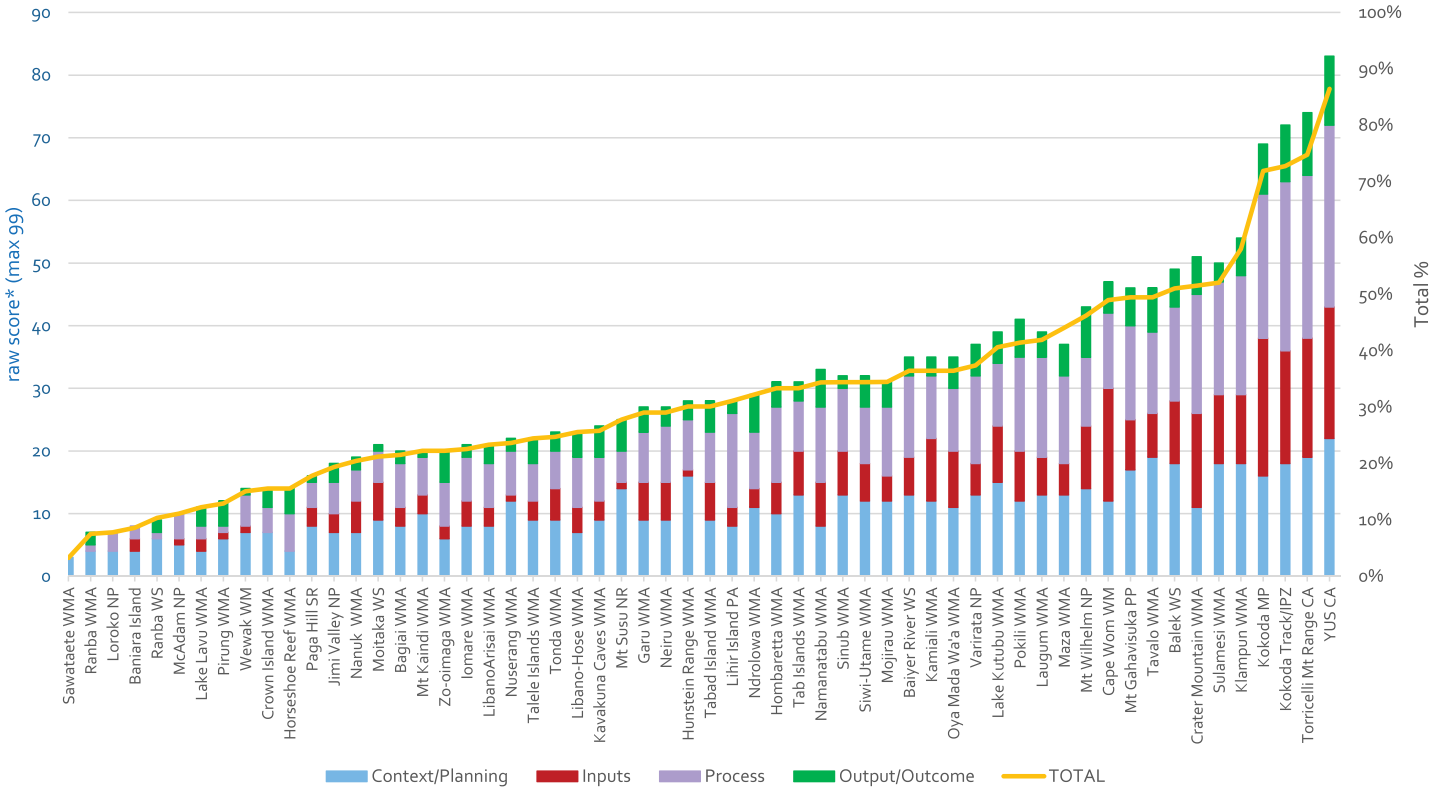


FIGURE 12: Total METT scores (% of possible) for each protected area and raw scores for each element

Note: Percentage scores are from the total possible excluding the questions rated as not applicable

4.4 Results according to management themes

Results were also analysed according to the eleven major management themes introduced in Section 4.1. Design and establishment was the strongest theme, with resource management the weakest (Table 7).

TABLE 7: Mean METT scores across 58 protected areas, according to management theme

Rank	Theme	Mean score (% of highest possible score)
1	Design and establishment	76%
2	Condition of protected area values	60%
3	Economic benefits to local communities	33%
4	Legislation, control and enforcement	32%
5	Budget, infrastructure and equipment	31%
6	Human resources	29%
7	Relationships education and awareness	24%
8	Information, inventory and research	22%
9	Planning and objectives	18%
10	Tourism and recreation	15%
11	Resource management	12%

Sections 4.4.1 to 4.4.11 discuss the results of each of these themes in turn. *Note that all graphs, unless stated otherwise, are based on results from 58 protected areas.*

4.4.1 Design and establishment

Three questions assess basic factors in the protected area's design and establishment.

Q.1: Does the protected area have legal status (or in the case of private reserves is covered by a covenant or similar? (Planning)

Q.5: Is the protected area the right size and shape to protect species and habitats of key conservation concern? (Planning)

Q.6: Is the boundary known and demarcated, and is it respected? (Planning)

Design elements in most protected areas are rated as positive (Figure 13), in keeping with management patterns seen all over the world (Leverington *et al.* 2010a). Almost all protected areas included in this analysis have been **formally gazetted** (Q.1a), with Torricelli Mountain Range proposed CA and the Kokoda Track/Interim Protection Zone expected to become protected areas in the near future (CEPA pers. comm, December 2016).

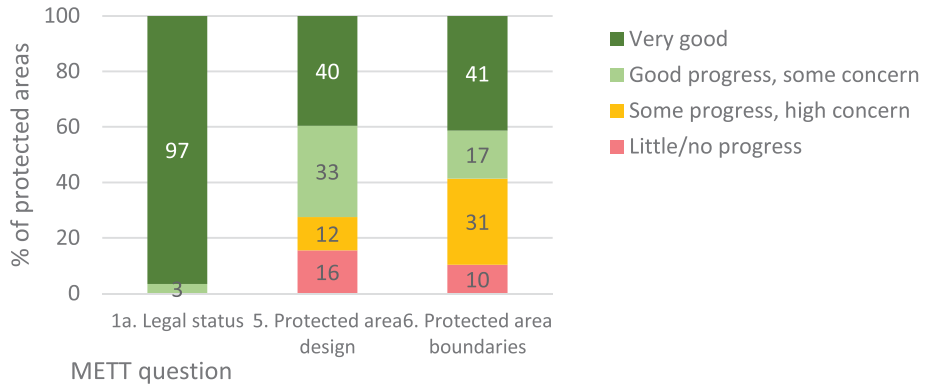


FIGURE 13: Ratings for gazettal, design and boundary demarcation

Marine protected area boundaries can be difficult to identify

The **design** of the protected area (Q.5) – its size, shape and configuration – can have a significant impact on how easy it is to manage the protected area. For example, protected areas with a high boundary to area ratio, or those crossed by main roads, can be much more vulnerable to impacts from outside. In very small protected areas it can be difficult to maintain biodiversity.

In 73% of the protected areas, participants reported either that the design of the protected area is positive or that it does not impede management. However, over a quarter (28%) reported problems such as the protected area is too small (e.g. Jimi Valley NP, Mt Susu and Horseshoe Reef WMAs and most marine WMAs); does not include some of the key values (e.g. Maza and Lake Lavu WMAs); is surrounded by incompatible development that isolates the protected area (e.g. Hombareta WMA); or does not include catchments or surroundings linked to the key features:

> "The park was established as a government station and the boundaries have no relationship to the protection of environmental values." (*Loroko NP*)

Boundaries in 58% of protected areas (Q.6) are known and respected by the customary landowners and others in the area.

> "The boundary is not surveyed, but is based on natural traditional land marks." (*Garu WMA*)

> "There are natural markings (on trees) and these are known by the community, although not always respected by outsiders." (*Balek WS*)

However, in some places confusion over boundaries causes significant issues:

> "CEPA may know the boundaries, but they are not marked on the ground and are not respected by the community. There are illegal settlers within the park." (*McAdam NP*)

> "The protected area boundary is mapped, but … people are generally unaware of the existence of the protected area and its boundaries." (*Oya Mada Wa'a WMA*)

In most protected areas with marine components, customary landowners are aware of the boundaries, but people from the surrounding communities may not know these boundaries and this frequently results in poaching of their marine resources. Many respondents indicated that they would like their boundaries mapped and confirmed with their communities. Lack of respect for boundaries by both customary landowners and others is often attributed to a failure to effectively manage and enforce the rules.

> "The people know the boundary, but they choose to live within the park, because there is no presence of the State and they [the State] are not having a major impact." (*Loroko NP*)

Q.7: Is there a management plan and is it being implemented? (Planning)

SUPPLEMENTARY QUESTIONS

Q.7a: Rights-holders (i.e. customary landowners) and key stakeholders have input into the management plan and can influence it (yes or no) (Planning)

Q.7b: People review and update the plan regularly (yes or no) (Planning)

Q.7c: Monitoring, research (including traditional knowledge) and evaluation put information into the planning (yes or no) (Planning)

Q.4: Is the protected area managed with agreed objectives? (Planning)

Q.8: Is there a regular work plan and is it being implemented? (Planning)

4.4.2 Planning and objectives

Three questions focused on planning and three supplementary questions focused on stakeholder input, plan review and monitoring.

Almost half (45%) of the protected areas have a **management plan** or one that is being prepared (Q.7) (Figure 14). However, most of the plans were prepared some time ago with the assistance of NGOs during specific projects. These plans were very useful but are out of date and have not been reviewed. In some cases, customary landowners have old printed plans, while in other cases no copies are available.

The supplementary questions (Q.7a,b,c) about management plans all scored very weakly, reflecting that most plans are out of date and have not incorporated the latest information, and that there is no program to review management plans.

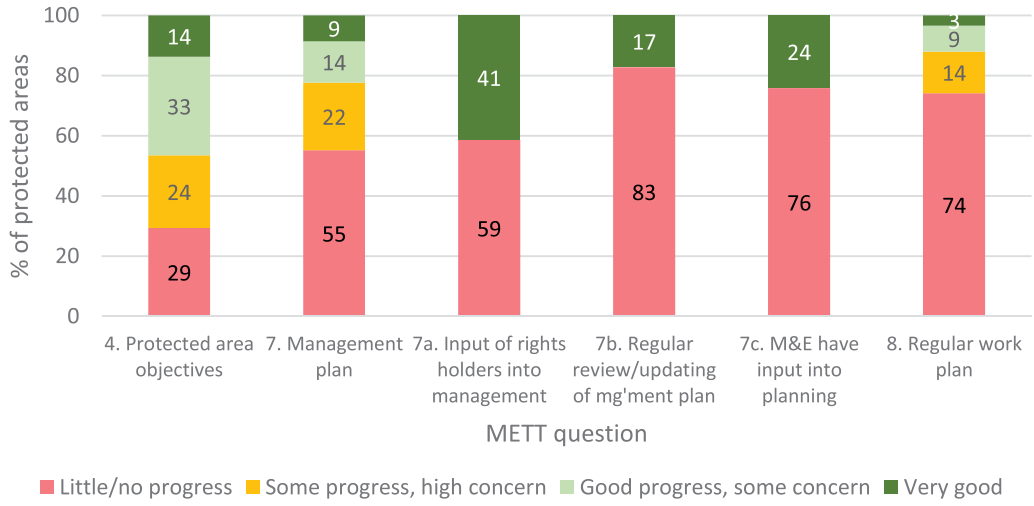


FIGURE 14: Ratings for planning and the existence of clear objectives

(Note: questions 7a, 7b and 7c are rated on a yes/no scale, where pink is no, and green is yes)

> "The management plan was written in about 1973 (i.e. before gazettal in 1977). Lack of funding restricts implementation of the plan." (*Balek WS*)
>
> "Management plans for Madang Lagoon WMA were supported and produced by Wetlands International in 2006 in close consultation with the local communities, and include marine zones including no-take zones." (*Laugum WMA*)

In one case, the main issue reported was a disagreement with the plan's content:

> "There is a management plan but there is a dispute. The plan was written by the Provincial Government and the people do not agree with it. Implementation is limited due to lack of funding and lack of clarity on landowner roles and responsibilities." (*Talele Islands WMA*)
>
> In Kavakuna Caves WMA "mediation is required to address the customary landownership conflict and subsequently establish a Management Committee, which can develop a management plan that encourages full input of the relevant customary landowners."

71% of the protected areas have **clear management objectives** to some extent (Q.4), so there is some basis for effective decision-making, even if there is no official management plan. However, only 14% are managed fully according to the management objectives. In 29% of protected areas, no firm objectives have been agreed for the protected area.

> In McAdam NP people are aware of the original objectives, but "the absence of CEPA staff has meant that no one knows what the objectives are. They are not enforced".
> In Talele Islands WMA, respondents said, "Objectives were established by the government without community consultation and agreement. There are some in the community who dispute the protected area."

Management Plan for Mt Gahavisuka PP, one of the most recent and comprehensive plans to be produced in PNG

Customary landowners maintain tracks, bridges and other facilities in Balek WS

The lack of **work plans** (Q.8) in almost three-quarters of the protected areas reflects the lack of any active management. Two protected areas reported that a regular work plan exists and many activities are implemented:

> "Every week, the community implements actions from the work plan, both inside and outside the protected area. Immediate needs and arising issues are addressed to ensure that immediate needs are met and pressing issues are solved. This is done on a daily basis." (*Klampun WMA*)

> "There is community involvement on Monday and Wednesday – the community work for one day each week on cleaning and improving the site. This has happened since the start of the Sanctuary. They are not paid to do this." (*Balek WS*)

4.4.3 Budget, infrastructure and equipment

Five questions assessed the availability and management of basic resources including money and equipment. *Input* questions are presented here with closely related *process* questions.

Q.15: Is the current budget sufficient? (Input)

Q.16: Is the budget secure? (Input)

Q.17: Is the budget managed to meet critical management needs? (Process)

Q.18: Is equipment sufficient for management needs? (Input)

Q.19: Is equipment adequately maintained? (Process)

Most protected areas do not have a budget or infrastructure and equipment (Figure 15). Participants confirmed that the absence of even the most basic resources severely limits their ability to manage their protected area.

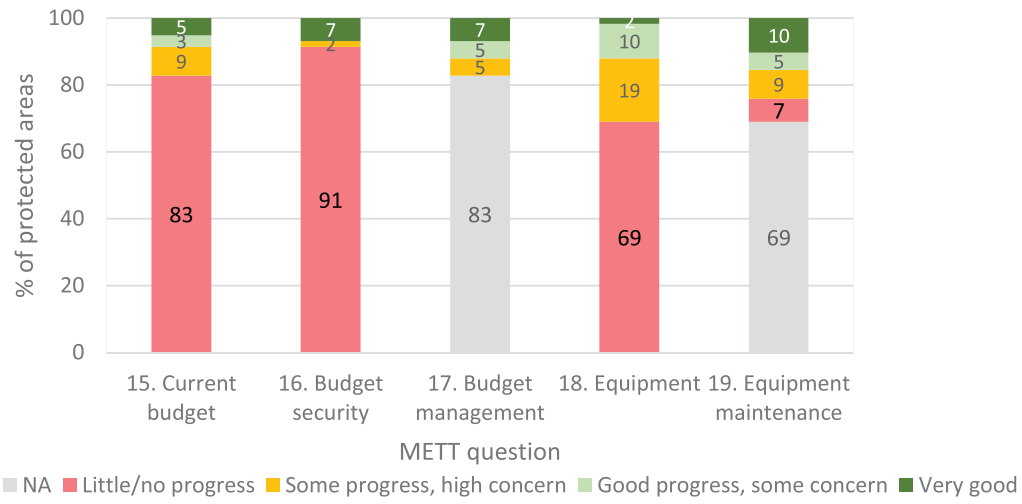


FIGURE 15: Ratings for budget, infrastructure and equipment

(Note: Where there is no budget or equipment, the question about their management is not applicable)

Sustainable financing (Q.15, 16) is absent from almost all protected areas assessed, with 83% reporting that there is no annual budget to manage the protected area. Most protected areas (91%) have no budget security into the future (Q16):

> "Lack of funding is an important constraint on achieving effective management outcomes." (*Mojirau WMA*)

> "There is a lack of government funding to provide basic services and ongoing maintenance of the WMA. There is the potential for customary landowners to be bribed or corrupted by outside business interests." (*Tavolo WMA*)

However, money is raised in various ways to assist with management. For example, in Tonda WMA there is no ongoing budget, but the small amount of money raised from tourism enables the committee to meet. In Lake Kutubu WMA there is no budget, but there is some fundraising within the community to help the committee with communication and transport. However, alternative income-generating activities to provide funds for protected area management are difficult to implement in many areas due to remoteness, lack of infrastructure and high costs of transport:

> "One of the biggest challenges of operating the Crater Mountain WMA is its isolation and accessibility to markets. Freight and logistics is quite expensive… Coffee farmers … are not getting the financial returns for their effort/ investment into coffee production … [and this] may prove to be no longer viable with the ever-rising cost of (air) freight." (*Crater Mountain WMA*)

About 12% of protected areas have some funding, although this remains a serious constraint to management (e.g. Moitaka WS, Crater Mountain, Klampun and Pokili WMAs and Varirata NP) (Q15). Landowners in some protected areas encourage self-reliance in funding, believing that waiting for government assistance would result in no management outcomes.

Cape Wom WMS is maintained by the community, with some funding provided by the Australian Government

The Resource Centre in Lake Kutubu WMA, developed with funding provided by Oil Search © Ann Peterson

"Many things can be done without funding, but additional funds would complement current actions … the community members contribute money or fundraise … for certain activities ..." (*Klampun WMA*)

In Pokili WMA, the local NGO, Mahonia Na Dari, is working with the local level government and district governments to identify possible funding sources for Pokili's proposed projects and is negotiating with these levels of government to incorporate the needs of the WMA into their future budgets. This positive approach is bringing some good results to this WMA. Recently, project funding has become available to three protected areas. In 2016, project funding of K500,000 was provided to assist Baiyer River WS and Jimi Valley and Mt Wilhelm NPs. This money is primarily for infrastructure (e.g. resource centre, fencing and facilities).

Three protected areas have a 'sufficient' budget: Cape Wom and Kokoda MPs and YUS CA and in these cases funding is provided by external sources.

In Cape Wom the budget is provided by the Australian War Graves Commission. The customary landowners are paid a wage to look after the reserve and their management needs are provided for. The Kokoda Memorial Park's budget also is funded by the Australian Government and is secure into the future. In YUS, the YUS Conservation Endowment Fund is used to support management activities and community development. USD2.5million is held by the Woodland Park Zoo and YUS CA receives about USD90,000 per annum for management activities.

Protected areas with an 'acceptable' budget include Kokoda Track HR/IPZ and Torricelli Mountain Range proposed CA.

The Kokoda Track HR receives annual funding from both the Australian Government and PNG Government to maintain the Kokoda Track and provide benefits to the local landowners. Income is also received from the trekkers and the licences paid by the trekking companies. Torricelli Mountain Range proposed CA has a budget over five years which is sufficient to meet their current needs. This funding is provided through UNDP.

Budget management (Q. 17) was not applicable in most protected areas as there was no budget to manage. However, in those with some funds, budget management did rate as good to very good:

"Community contributions and money raised through fundraising are reported back to the whole community. The activity plans determine how much money is to be spent, and it is then presented to community for approval and implementation. A financial report is provided to the community whenever money is spent." (*Klampun WMA*)

One significant limitation in budget management is that many protected areas do not have bank accounts into which money can be deposited and transactions made.

The lack of adequate **equipment and infrastructure** (Q.18) was raised consistently as a major issue, and 88% of protected areas have no or very minimal equipment.

Exceptions include Cape Wom WMS where there is equipment such as lawn mowers and brush-cutters to maintain the war graves. At Pokili WMA the community has purchased bicycles to enable the 'bush rangers' to quickly access their WMA and enforce the agreed rules. Lake Kutubu WMA has a purpose-built resource centre and powered boat funded by Oil Search.

Even where community members are prepared to work on the protected area on a volunteer basis they often cannot get to the area or move around within it. Transport, especially boats in marine environments, and basic equipment, even a pick and shovel, wheelbarrow or chainsaw, are needed at most protected areas. Kamiali WMA had visitor facilities in the past, including a guesthouse, but these have not been maintained (due to lack of funding) and have fallen into disrepair. This situation is common at many protected areas.

"The guesthouse and related equipment is run down and there is little equipment for managing the park. There is no dinghy and only a little diving equipment (compressor etc.) and a small solar panel (insufficient to run a computer)." (*Kamiali WMA*)

Q.13a: Are there enough people employed to manage the protected area? (Input)

Q.13b: Are there enough people (community or customary landowners) helping to manage the protected area? (Input)

Q.14: Are staff / other people capable and trained to manage the protected area? (Process)

Maintenance of equipment (Q. 19) was not applicable to most protected areas as they have no equipment to maintain. About 11% of protected areas indicated that equipment and facilities are well maintained.

4.4.4 Human resources

While money and equipment are vital, even more important is the presence of people to safeguard and manage the protected areas. We modified the usual METT questionnaire to reflect the fact that people working on the protected areas are rarely formal staff from any agency or organisation. Three questions were posed.

In addition, Table 1 in the METT questionnaire records *who manages the protected area.*

Human resources and capacities are very limited in most protected areas (Figure 16): 81% of protected areas have no **paid staff** (Q. 13a). The lack of reliable, available workers on protected areas is one of the primary impediments to success across the protected area system.

> "The last park ranger left about 1982 or 1983 and there has been no on-site CEPA presence since. The integrity of the park was respected by all the local people up until about 2000. It was after that date, when CEPA withdrew, that illegal settlers began to move in with impunity." (*McAdam NP*)

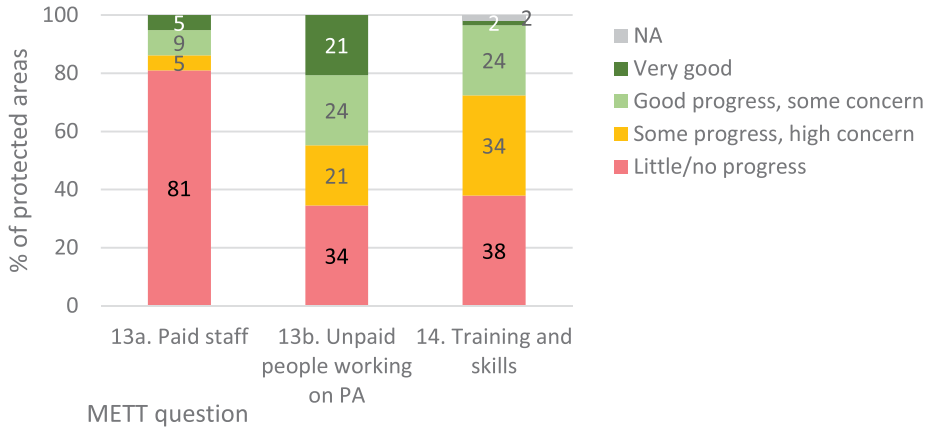


FIGURE 16: Ratings for human resource related questions

Paid staff are thought to be sufficient to manage the protected area at only three sites: Cape Wom WMS and Kokoda MP (funded by the Australian Government) and Iomare WMA (the 10 members of the Management Committee are paid with some funds provided by the PNG Government). Paid staff are also present at: Crater Mountain WMA (people are employed in Goroka by the Research Conservation Foundation to coordinate activities on the protected area); Kokoda Track HR; Moitaka WS (two staff performing maintenance duties); YUS CA; and Torricelli proposed CA. However, the comment was frequently made that we would 'do better if there were more staff'.

> The Kokoda Track Authority has limited staffing and a small revenue source to pay the KTA rangers. The KTA staff manage the daily operations of the authority e.g. liaising with Kokoda communities, tour operators, government agencies and media, providing on-track management, and they collect and distribute a proportion of the trekking fees to Kokoda Track communities. Through the Kokoda Initiative, the Australian Government provides funding for a selection of KTA staff positions to assist the PNG government to effectively manage the Track.

> In YUS CA, the Tree Kangaroo Conservation Program has six full-time staff and six part-time staff based in Lae, 14 terrestrial rangers, two part-time marine rangers and the Assistant Director, and two full-time staff at Woodland Park Zoo in the USA. The rangers are nominated and selected locally and are YUS landowners who patrol within and around their own land. The rangers have the full support of their communities and receive relevant training (*TKCP 2012*).

Kokoda Initiative signage, raising awareness of the program and the benefits provided to the community © Ann Peterson

Customary landowners maintain a small historical museum at Blamey's Garden, Namanatabu WMA and undertake work at the site © Ann Peterson

Other protected areas with paid staff, but for which the staff are insufficient for 'critical management activities' include Varirata NP, Baiyer River WS and Hombareta WMA.

In about one third of protected areas (Q13b) no people (i.e. not even customary landowners) are working on the protected area. In some cases this is because the protected area is a long way from where the customary landowners live and there are reported to be few impacts on the area.

However, in most of the country the voluntary workforce is a vital component of management. Work is carried out by **customary landowners**, with 45% of protected areas recording good to very good progress in this regard. Several indicated that where work is undertaken it is primarily by the members of the management committee, with few other landowners participating (e.g. Kamiali WMA).

> "The 'Bush Rangers' work on the ground to check the megapode harvest... In addition, temporary paid workers from Mahonia Na Dari assist with advice on the protected area management." (*Pokili WMA*)

> "Community or clan landowners are involved [in management]. It is compulsory for individual members of all the 13 clans in the WMA to participate cooperatively with each other to ensure WMA work is fulfilled for the collective benefit of all. People meet and talk about issues and come to a common consensus about solutions, timeframes and implementation." (*Klampun WMA*)

> "Activities are for community development not just conservation; such as women's sewing group, guesthouse, small sawmill to sustainably harvest timber in the WMA. We have funding from nine donors." (*Tavolo WMA*)

> "People help because incentives are being distributed – they are active helpers to manage the conservation area." (*Torricelli Mountain Range CA*)

> "Six men work on the island; three women do the raking/cleaning. Rubbish is buried on the island. Work takes place about every two weeks." (*Nanuk WMA*)

Training and skills (Q.14) are low or non-existent in almost three-quarters (72%) of the protected areas, with only Kokoda MP reporting an acceptable level of training and skills development. Where training has occurred, most was undertaken in the past by NGOs and research organisations and is not a continuing process. For example, researchers have trained local people to undertake coral reef transects and turtle research. Training is believed to be important to help raise awareness of the benefits and values of protected areas:

> "People are not fully supportive [of the WMA] because they don't really understand the importance of conservation. The expectation of financial gain is high compared to community social responsibility toward resource stewardship. Some individuals have selfish motives." (*Pokili WMA*)

The existence and function of **protected area management committees** are critical for protected area management. In just over half of the protected areas, management committees are active to some degree, including two with provincial government involvement in management.

> "There is an active management committee with the capacity to implement and enforce traditional laws. This is a significant factor in the effectiveness of this protected area." (*Tavolo WMA*)

However, almost half of the protected areas, including most of the national parks, have no formal management structure. Some management committees are defunct as members have died and have not been replaced, or are now very old. Generally, women are not well represented on the management committees, with most dominated by men. Torricelli Mountain Range proposed CA is an exception: there are 50 villages in the Alliance, each with two representatives on the committee, and half of these are women.

The work of the customary landowners is evident in Nanuk WMA, which has clean beaches and clear water
© Ann Peterson

4.4.5 Legislation, control and enforcement

Four questions assessed whether the 'rule of law' applies on the protected area, either through formal government or community-based mechanisms. Planning for land use and marine activities is included under this heading, as incursions of mining, logging, plantations and settlers into protected areas has been of concern.

Q.2b: Are regulations or traditional laws and agreements in place for controlling land or marine use and activities? (Planning)

Q.3: Can people (e.g. staff or customary landowners) enforce protected area rules well enough? (Inputs)

Q.10: Are systems in place to control access/resource use in the protected area? (Process)

Q.21: Does land or water planning recognise and protect the protected area? (Planning)

National legislation is in place for almost all the protected areas assessed, but the level of control, enforcement, protection systems and compatible planning is low (Figure 17). In relation to **regulations, traditional laws or agreements** (Q.2), 94% of protected areas have some rules in place for controlling activities within the protected area, with only three protected areas (Baniara, Sawataetae and Ranba WMAs) reporting the absence of any agreements or rules. The rules cited by respondents relate to controls on tree clearing, and fishing and hunting, including zoning plans which regulate the take of resources.

In YUS CA a comprehensive Landscape Plan has been agreed to by the customary landowners. Clans that pledge parcels of land to be included in the conservation area agree to designate certain areas as off-limits to hunting (tambu) and these areas have become "'wildlife banks' where species can reproduce and thrive and eventually repopulate areas where hunting is allowed". The next step in YUS CA is to conserve the marine environment and local communities have "pledged to discontinue destructive fishing practices and place signage to identify sensitive reefs and turtle nesting sites".

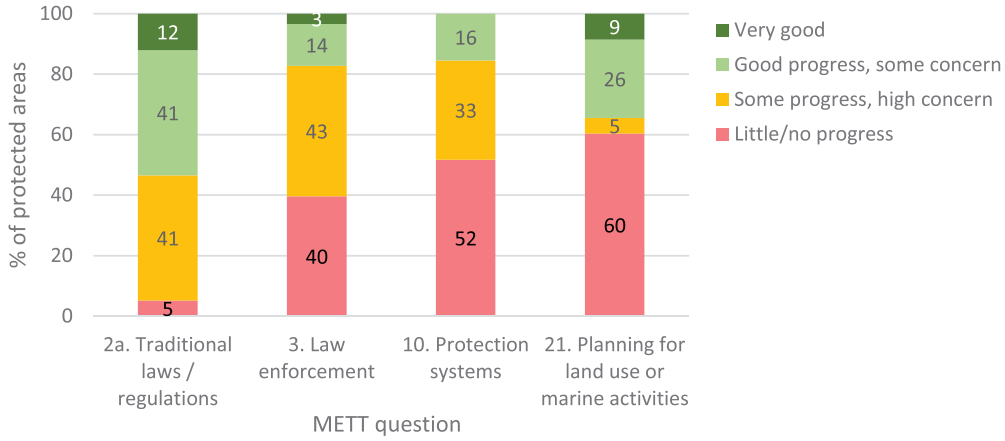


FIGURE 17: Ratings for law enforcement and control of activities

Lake Kutubu WMA does not have an official management plan, but there are rules on the take of wildlife, such that people other than customary landowners are not permitted to take, kill or harm any plant or animal, including aquatic plants and animals. Entry into culturally significant sites, such as burial sites, is also controlled.

Traditional rules are also in place in Mojirau WMA and these regulate hunting of all animals and the collection of megapode eggs and timber by the customary landowners. However, these are thought to be insufficient laws to protect the WMA, especially from external threats such as illegal logging, as the approval for logging which takes place in the WMA is said to be as a result of "our weak national laws".

Access to burial sites on the shores of Lake Kutubu WMA is controlled by the customary landowners © Ann Peterson

In Lake Lavu,"There are different tribes who own different parts of the land. We try to get people to go to their own land and they fish there. They don't trespass to other people's land. These are unwritten rules that ensure access to the WMA's resources. Firearms are prohibited and also the taking of crocodile eggs. Neighbouring villages are given rights, by the Iamalele chieftains, to use the lake, based on inter-marriage relationships." (*Lake Lavu WMA*)

In some cases not all people agree with the rules:

"The Management Committee was formed by only one clan (Taulu) and representation from other clans is missing. Some rules exist in relation to cutting forest or taking forest products (to build houses). The new regulations are not legal or agreed to by everyone." (*Kavakuna Caves WMA*)

"Not all the rules are gazetted. There are traditional rules that are not written down. The main issue is that at the time of gazettal, not all the landowners were involved and some did not like the rules or agree with them. Tonda is a big area and the main problems are with the landowners who don't agree with the WMA rules." (*Tonda WMA*)

The Kokoda Track/IPZ has a complex set of regulations administered by three separate pieces of legislation, which focus on:

"the Track itself and the regulation of the tourism/trekking industry (porters, guides, guest house accommodation); the military heritage, which is regulated by the National Museum; and the environmental values which are regulated under environmental legislation."

In terms of **law enforcement capacity** (Q.3) (i.e. those empowered to work in the protected area), most protected areas (83%) have either no effective human resources or major deficiencies. Only two protected areas reported very good progress in relation to law enforcement (Torricelli Mountain Range proposed CA and Mt Wilhelm NP).

Torricelli's success relates to effective funding and training of on-ground staff across all the villages within the Alliance and respondents indicate that the community has the capacity to implement and enforce laws effectively.

YUS CA has 14 terrestrial and two marine rangers to assist with enforcement. The rangers are landowners who are nominated and selected locally and they patrol within and around their own land. Enforcement is both through the courts and local sanctions: "Landowner capacity is quite high in terms of law enforcement. There are rangers on the ground and they collect evidence if there are breaches of the regulations. There are by-laws that identify the required rules and outcomes and rangers collect evidence of actions contrary to the by-laws and these are reported to the local Courts. However, while the by-laws may be understood locally, the court officials often fail to punish the offenders. There is also some customary law enforcement. A major deterrent in YUS is that if people break the by-laws they are not able to participate in selling coffee for one year and have to pay a fine. If people are prohibited from receiving economic gain this leads to higher compliance with the required conservation regulations." (*YUS CA*)

Perhaps the main concern in most protected areas is the inability to prevent illegal entry and access to resources by outsiders – both people from outside the customary landowner groups, who have settled illegally within the protected area, and those who enter the protected area to illegally exploit resources.

In Varirata NP, there is an entry gate and signage, but the poachers enter illegally, despite the presence of a ranger at the park.

In Mt Kaindi WMA, despite rules which "… originally imposed a prohibition on lighting fires, cutting trees, killing fauna, developing new gardens, building new houses and mining for gold ... most of these rules are not adhered to due to the illegal settlers who garden, hunt and remove timber".

The entry to Varirata NP, where signage and a gate do not prevent illegal entry. © Ann Peterson

Many protected area managers struggle to prevent the illegal entry of commercial enterprises.

In Mojirau WMA, "... the customary landowners are able to look after their own land, but it is difficult to prevent the logging companies from impacting on our WMA".

Customary landowners are very concerned about their inability to enforce laws and about the absence of government-led enforcement systems.

Workshop participants identified several causes of the failure to effectively enforce the laws:

- Management is weak or absent:
  - *absence of Management Committees and Management Plans* and the subsequent lack of clear rules and structures to enforce the rules; and many years of neglect, which have reduced the awareness of the communities about why their areas were originally established as protected areas (e.g. Bagiai WMA).
  - *little or no on-ground ranger presence* to enforce the rules. The situation in Ranba WMA was common, in that regulations are in place, for example, to prohibit hunting, but due to the "lack of surveillance or monitoring it is difficult to know if this rule is adhered to". McAdam NP states, "CEPA is responsible for the park and it has the capacity to enforce the laws, but has not had a presence in the park for many years".
  - *outsiders*, who do not recognise the right of the protected area to enforce its laws and who can retaliate if penalties are imposed (e.g. Laugum WMA).
  - *boundary issues*, including disputes over the boundaries and the areal extent of the protected area (e.g. Sawataetae WMA).
  - *lack of funding and limited equipment* (e.g. boats, cars and bicycles) to enable rangers and others to access all parts of the protected area to enable effective enforcement.
- Enforcement and penalties are inadequate:
  - *inability of managers to prosecute members of their own clan* (e.g. in Laugum WMA, the respondents said, "the Management Committee are members of the same community and it is difficult for community members to enforce the law with their own people".
  - *lack of effective regulatory/enforcement powers.*

  For example, the Kokoda Track Authority has a system of rangers to manage the Kokoda Track. However, they have no powers under legislation – "If some of the porters do not comply with the regulations (e.g. hunting, collecting) the rangers have limited effective enforcement powers". Along the Kokoda Track the removal of military heritage is a major problem as the trekkers and scrap metal dealers collect and sell a range of souvenir items. Control and enforcement of this trade is currently difficult.
  - *limited penalties*, which do not deter illegal actions.

  In Sinub WMA the respondents said, "… the fines were quite low and this is not a deterrent".
  - *break down in the village court system* and lack of respect for this system, and an inability to access court systems due to the long distances and associated cost.

  In Kamiali WMA respondents said, "there is little respect for the village court … and as a result people are harvesting coral and taking fish … Offenders must go to the village court, but this is a long way away and there are insufficient funds to do this."

Protection systems (Q.10) refer to mechanisms to stop or manage people from outside the protected area entering and taking or using the area's resources. This can include permits and other forms of permission, physical barriers, and patrols. There is overlap between this question and the earlier discussion about law enforcement (Q.3). Respondents express frustration about the inability to prevent incursions. No protected areas indicate that these systems are wholly effective. Where protection systems may have been in place at the time of gazettal, the general consensus is that they have lost their effectiveness.

Even national parks and other protected areas owned by the state have been unable to implement effective protection systems.

Varirata NP had fencing and gates across major access points and ranger staff at the entry points, but this ceased, largely due to lack of funding.

Fences in Moitaka WS have been breached and fallen into disrepair.

Tourists also illegally enter some protected areas and customary landowners are unable to receive any benefit from this entry (e.g. Kavakuna Caves, Horseshoe Reef and other WMAs in Madang Lagoon).

The main protection systems are based on the customary landowners who informally manage their area and who are often referred to as the 'eyes and ears' of the protected area. However, many, including Sinub WMA, reported that it is "only by chance that we find people who should not be in the WMA".

> "There are no formal protection systems in place. The awareness through the various language groups enables the communities to be the eyes and ears for each tribe." (*Crater Mountain WMA*)

> "The community knows what is going on in their WMA e.g. the people hear if dynamite is being used and they are watching what is happening." (*Laugum WMA*)

Several protected areas have permit systems.

> In Kokoda Track HR, the trekkers are required to obtain permits and trekking companies must be licensed to operate along the Track and there is certification of these companies to ensure that minimum standards are adhered to and Track safety is enhanced. While there may be some illegal trekking operators, who may not get the appropriate approvals, the role of the KTA rangers is to walk the Track to ensure compliance. However, they reportedly have no powers to enforce penalties. Mt Wilhelm has a system of trekking permits for tourists who climb the mountain, and this is managed by the local communities. There are some issues with these permits.

Protection systems are believed to be ineffective due to:

- *lack of resources/money, equipment and capacity*. Lack of funding significantly limits the development and training of an effective ranger workforce to enforce the rules of the protected area. Without equipment (e.g. boats and cars) it is difficult to access distant parts of protected areas.

  > Kavakuna Caves WMA reported that inland parts of the WMA "… are unknown and uncontrolled due to lack of motivation and camping equipment."

- *remoteness* – customary landowners are frequently unable to access remote locations within the protected area.
- *inability to patrol protected areas* (especially marine protected areas) at night and this is a time when many illegal activities, such as fishing and hunting are undertaken.
- *break down of customary traditions:*

  > "Some of these elements of control within the community are breaking down, e.g. fear of witchcraft and retribution … where previously there may have been controls on cutting trees, today people are less concerned about retribution/ punishment if they break traditional rules. These changes are producing negative impacts on the environment." (*Oya Mada Wa'a WMA*)

The lack of effective protection systems has resulted in alienation of some important protected areas. This includes the establishment of plantations, timber harvesting and illegal settlement and uncontrolled hunting and gathering of resources.

> "The customary landowners are aware of intruders and of any illegal resource use and are largely effective in protecting the values of the WMA. However, the links between the government and the people are not effective e.g. in preventing logging of our lands." (*Mojirau WMA*)

Appropriate planning for surrounding land/marine areas (Q.21) is important at all levels of governance to ensure that landuse activities will not impact adversely on the protected area. However, respondents from 65% of the protected areas indicate that the adjacent land use planning does not consider the protected area. Key concerns relate to government agencies that make decisions to the detriment of the protected areas. This can include transport routes (roads and shipping lanes), airports, wharves and power plants that are located within or near the protected areas.

> Lake Lavu WMA states that "nobody in the outside planning area knows about the WMA or considers it in their planning."

> In Pirung the respondents state, "our land has been taken and used for mining purposes".

> In Mojirau WMA "planning decisions have enabled the logging company to construct a logging road within the WMA and this has had significant impacts on the WMA".

> Ndrolowa WMA cites a situation where one member of their clan had given permission for the Provincial Government "to develop a correctional centre in the middle of the WMA…. This is also the habitat of a threatened species, the superb pitta".

Industrial and port development in Madang Lagoon: nearby WMAs report that the Pacific Marine Industrial Zone in Madang Lagoon was developed with limited input from the customary landowners of the protected areas within the lagoon © Ann Peterson

In Laugum WMA: "Outside developments threaten the WMA and land use planning has not taken the conservation needs into account. There are pressures from industrial development and settlement especially on the mainland."

Lack of planning has been responsible for inappropriate industrial and tourism development, forestry and plantation (including oil palm) operations, transport routes, and expanded settlement and populations that have caused harm including:

- *loss of resources*: clearing of forests, damage to ecosystems and loss of wildlife
- isolation and fragmentation of habitat (e.g. as a result of a planned highway passing through Balek WS, or expansion of oil palm plantations isolating Hombareta WMA)
- *declines in water quality* (e.g. industrial development in Madang Lagoon)
- *fire* escapes into the protected area, resulting in damage and alteration to ecosystems, especially in mountainous environments (e.g. change from forest to grasslands)
- *illegal take of resources*, including vegetation, fauna, water and minerals (Bagiai WMA indicated that tuna cannery boats entered the area to take fish)
- *introduction of pest species* (e.g. tilapia have been introduced by government agencies into many rivers in the Southern Highlands and other areas and this is resulting in the loss of native species).

"Outsiders often think that protected areas have no important values and they want plantations (coconut, cocoa), mines and other land uses. Agriculture and Fisheries Departments want to do some land use change (e.g. tilapia farms) and they don't consider the impact on the Sanctuary." (*Balek WS*)

"Planning decisions have resulted in the destruction of many of the site's values." (*Paga Hill SR*)

The historic values of Paga Hill SR in Port Moresby have been lost as a result of development on the site and in surrounding areas © Ann Peterson

In contrast, a few protected areas indicate a higher level of engagement with outside land uses.

"Land use planning does understand the values of the WMA and tries to avoid impact on the WMA. A limestone mining tenement exists around the WMA, but consultation is occurring through CEPA to protect the WMA values." (*Kavakuna Caves WMA*)

Mt Susu WMA and Mt Gahavisuka PP have buffers that help to better protect their areas:

"Mt Susu WMA … is surrounded by commercial plantations and is a seedbank for *Araucaria*. There is a buffer of forest around the protected area although it is an 'island' of natural areas in a sea of plantation." (*Mt Susu WMA*)

"[there is] a buffering forest between communities and the park." (*Mt Gahavisuka PP*)

Lack of consultation is cited frequently as the main cause of the failure to integrate land uses within and around protected areas.

In Tab Islands WMA the "local people as resource owners are left out of consultations in relation to big development projects".

In YUS CA the respondents comment that remoteness "makes contact with the District office difficult and expensive" and hence "engagement in plan making and subsequent decisions relating to development that may affect the CA are problematic".

However, in Klampun WMA the community has a landuse plan and its leaders are often invited to share their landuse planning experiences with communities who do not have a plan and are experiencing negative impacts from inappropriate development and it is believed that this consultation "builds understanding, respect and support systems with other communities, who then respect our WMA".

4.4.6 Information, inventory and research

Four questions were asked relating to the knowledge of protected area values, both past and continuing; and the monitoring and assessment of management effectiveness.

Q.9: Do you have enough information to manage the area? (Input)

Q.11: Is there a programme of management-oriented survey and research work? (Process)

Q.26: Are management activities monitored, evaluated and acted on? (Process)

SUPPLEMENTARY QUESTION

Q.30a: The assessment of the condition of values is based on research and/or monitoring (yes/no response) (Outcome)

Though few protected areas have sufficient relevant information, research, monitoring and evaluation (Figure 18), this was not raised by participants as a major constraint to management, compared to the lack of staff and equipment or the inability to enforce laws.

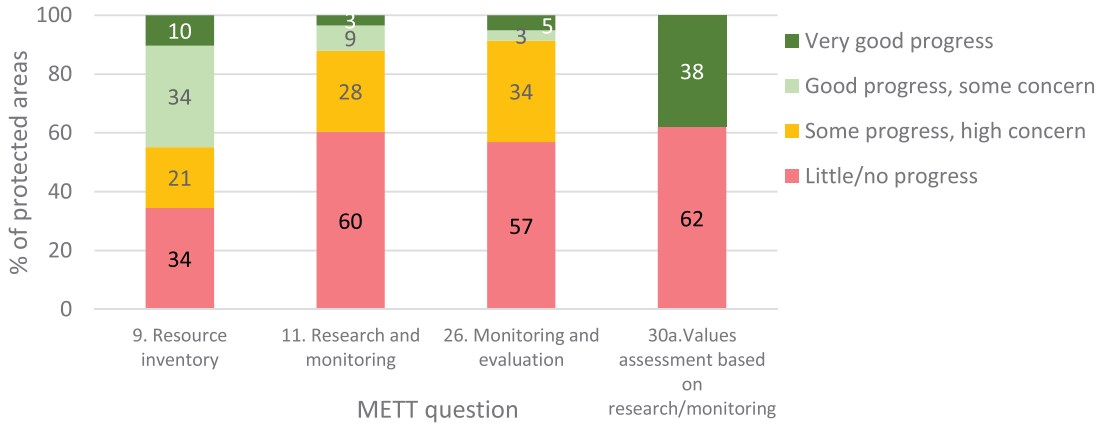


Figure 18 Ratings for information, research and monitoring

(Note: Q.30a uses a yes/no scale: red is no and green is yes)

Availability of relevant and useful information for management (resource inventory) (Q.9) was scored by 44% of the protected areas as either good or very good. For land and sea management, people mostly rely on their traditional and customary knowledge rather than information provided by western science, or government or NGO extension officers. However, there is very little or no written Information about tradition or how the ancestors did things, and there was great concern expressed that this knowledge is being lost rapidly.

Klampun WMA noted the importance of traditional knowledge in planning, but laments that there has been no recent resource inventory: "Traditional knowledge is well known. The people are well informed about the physical, social and spiritual values of the natural environment where they live, grow, multiply and die. The community has developed a WMA value map which guided them in the development of their land use map. There has been no recent formal resource inventory."

In our observation, many participants have intimate knowledge about different places and the landscape, but less about the wildlife. Most knowledge has strong utilitarian purposes. *Plestok* words were given in the workshops for some species, but not for most of them, mirroring the earlier comments that loss of language also results in loss of knowledge about the environment. Lack of maps and hard copy information is mentioned often as a constraint. Some people note that researchers visit and take away information but do not return it to the community. It was interesting to observe that where scientists had worked with customary landowners in the past, such as in the Madang Lagoon, information about both science and management had been communicated and retained very well over a long period. For example, the more senior customary landowners are very committed to no-take areas and to revegetation of mangroves, and mentioned that their forefathers had not been aware that these actions would assist in a good fish catch over time.

No **research or monitoring** (Q.11) is occurring in 60% of protected areas and 57% have no evaluation programs (Q.26) that inform planning. A number of participants feel that this is linked to the absence of a management plan. Several areas had more extensive research programs in the past but these have been abandoned. A few positive comments were recorded:

> "There is research and broad monitoring of many species e.g. butterfly, birds, frogs, trees and the information is directed towards management in some regards. There is considerable survey work, both scientific and traditional (know fruiting times etc.)". There is some issue with researchers not contributing financially to the communities." (*Oya Mada Wa'a WMA*)

> "Reflection is undertaken regularly by the local community as a normal practice (e.g. after daily work evaluation of weaknesses and strengths is undertaken in story form) and we review and identify the lessons learnt so that improvements can be made." (*Klampun WMA*)

Several protected areas have more comprehensive research outcomes as a result of collaborations with external providers:

YUS CA has a focus on ecological research directed towards the Huon tree kangaroo. Woodland Park Zoo has been sponsoring long-term research into tree kangaroo ecology and has mapped the area with YUS landowners to identify critical habitat areas for preservation. Several studies of tree kangaroos have been undertaken, including home range, distribution, food plants and a hunting survey. A database of known species has been created as well as socio-economic data and mapping information on YUS, and the testing of field methods for long-term tracking of indicator species such as tree kangaroos. It has a community based ecological monitoring program which includes 12 transects across the landscape and an elevational transect.

Torricelli CA has funding provided by UNDP and has conducted a population census (2005–2015) as well as research on tree kangaroos. This information is used to inform management. They have developed partnerships with several Australian universities and have used camera traps since 2011 to identify the species diversity in the area, were purchased through crowd source funding.

Varirata NP has some active research and monitoring as part of the Jica project (including cameras to capture fauna and visitor movement).

Kokoda Track/IPZ, which has secure funding from the Australian and PNG Governments has undertaken research on biodiversity, archaeological and cultural values, and oral histories and social mapping has also been completed.

4.4.7 Resource management

Q.12: Is active resource management being undertaken? (Process)

SUPPLEMENTARY QUESTIONS

Q.30b: Specific management programmes are being implemented to address threats to the protected area (yes/no response) (Outcome)

Q.30c: Activities to maintain key biodiversity, ecological and cultural values are a routine part of park management (yes/no response) (Outcome)

Three questions were asked about resource management, including two supplementary questions focussing on the achievement of outcomes.

Resource management, which refers to a deliberate decision to check and maintain the resources of the protected area, scored very poorly in this assessment (Figure 19). The question primarily refers to management of critical habitats, species or cultural values. Fewer than half of the protected areas reported any **resource management activities** (Q.12), only 17% undertake **threat abatement activities** (Q.30b) and 19% **conduct routine maintenance of values** (Q.30c).

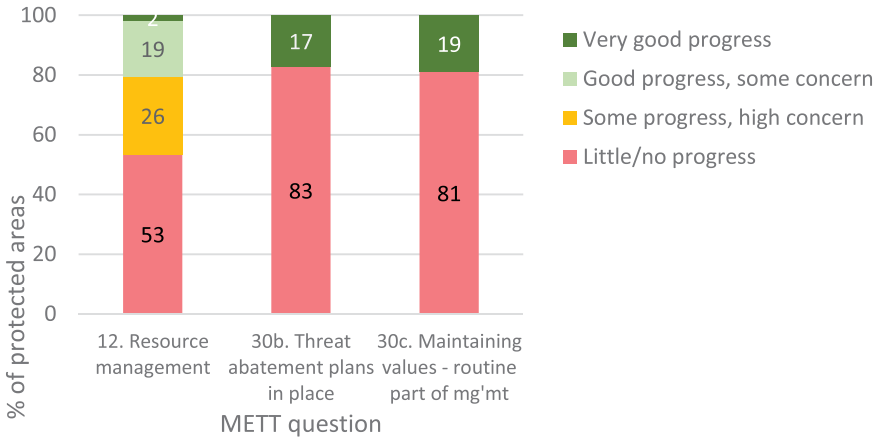


FIGURE 19: Ratings for resource management

(Note: 30b and 30c use a yes/o scale: red is no and green is yes)

An interesting comment from participants from Oya Mada Wa'a WMA was that there is a "pervasive view that there are plenty of resources and this is resulting in the 'tragedy of the commons'". In addition, many respondents reflected on the absence of rangers and management plans as the reasons for lack of resource management activities

"There is no maintenance of key park values due to the absence of park management personnel … This was practiced when park rangers were employed and when the Board of Trustees was in operation, but it is no longer undertaken today." (*Mt Gahavisuka PP*)

Planned active management approaches reported by respondents include no-take zones and a revegetation program for mangroves in Laugum WMA.

In Balek WS the "paths and sulphur springs are maintained, and there is some weed control".

In Pokili WMA "rangers monitor and safeguard the megapodes".

Klampun WMA has a landuse plan and "every week activities are undertaken as part of community wide activities… [and] implementation [of the landuse plan] ensures by-laws protecting Masalai places … traditional sites [and] buffer zones are respected".

Many protected areas have no formal resource management plans and activities, but respondents highlight the importance of traditional resource plans.

Sulphur springs at Balek WS are well maintained by the customary landowners © Ann Peterson

In Kamiali WMA, "people continue to use their traditional practices both on land and sea".

In Nanuk WMA the "customary landowners are engaged in visiting and managing various".

However, some respondents stress that there is no need for active management as their protected areas are remote.

"The community lives a long way from the WMA [and] there is little need for on-ground active management" (*Kavakuna Caves WMA*).

YUS CA is the only protected area to record a very good score for resource management: "A list of specific birds, trees, plants and other animals has been prepared. The traditional owners, rangers and others walk through the landscape with a list of priority species and identify the location of animals and their signs and this information is used to assist with management, including the location of corridors. Open monitoring occurs every month while the closed ecological monitoring along transects occurs at least on a five-yearly basis. Land-use planning workshops and activities collect information from landowners on a ward-level. Landowners identify priority species (both animal and plant) and resources and indicate if there are plenty, few, or no evidence in the various land-use zones".

4.4.8 Relationships, education and awareness

Six questions were asked about the important 'human relationship and communication' components of management. Responses to these questions showed some progress for most of the protected areas (Figure 20), despite relatively poor communication and engagement with state and commercial neighbours, and limited education and welfare programs.

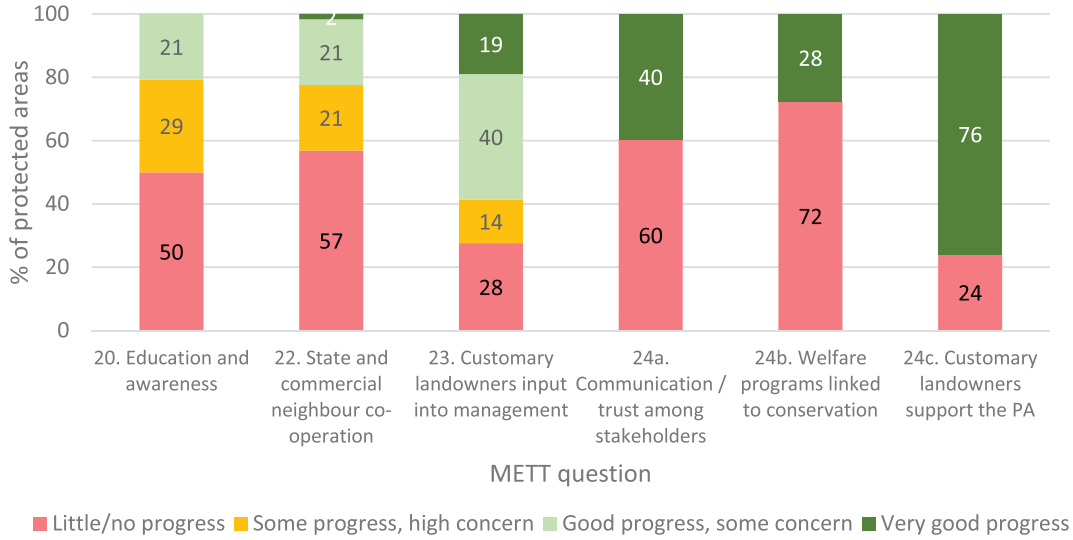


FIGURE 20: Ratings related to communication, community awareness and benefits

(Note: Q.24 a, b, c are on a yes/no scale – no is red and yes is green)

Half of the protected areas have **no program of community awareness or education** (Q.20), and no protected areas indicated that their education and awareness program is appropriate and fully implemented. In many cases, it was pointed out that education programs were implemented in the past, and the participants were disappointed that these had ceased:

"In the first 10 years there was an education program, but now there is nothing. It has all been lost due to lack of funding. There was Canadian then Norwegian funding and then it stopped (for eco-forestry projects)." (*Kamiali WS*)

"No programs are in place. In the past, we worked with the primary school and it was very successful." (*Tab Island WMA*)

Current education/awareness programs in protected areas are a mixture of mainly community-generated activities with some supported by outside organisations:

Kavakuna Caves WMA, since 2006, has had some awareness programs sponsored by the Provincial Government and Conservation International, in relation to World Heritage Area listing and the training of trainers to conduct awareness programs.

Mojirau WMA's aim is to stop illegal logging. Eco Forestry, through the REDD+ program undertakes some conservation training and assists with land use plans.

© Ann Peterson

Klampun WMA's Implementation Plan has an education plan for the village that is based on the community's priority needs. However, the respondents also commented that "… many stakeholders conduct educational awareness at the wrong time, wrong place and with the wrong people".

Lake Kutubu WMA provides posters to schools; places signboards at entry points to the WMA; engages in World Environment Day; and has an annual environmental showcase at their resource centre, where "all the people from within the WMA will come to visit the centre" to learn about the WMA and its values.

Laugum WMA raises awareness through the use of a notice board that "provides reminders to everyone in the community, including visitors, about the WMA rules".

Balek WS provides information to students about the Sanctuary and how to manage the environment, but this occurs only about once each year.

Kokoda Track, through the Kokoda Initiative (supported by the Australian and PNG Governments) provides interpretive plaques along the Track and trekking companies provide information to their trekkers about the historic, cultural and natural values of the site.

YUS CA identifies education as a foundation of the Tree Kangaroo Conservation Program. The education program in local schools (from kindergarten to Year 8) uses local teachers and educators from various zoos who raise conservation awareness and the programs include conservation oriented curricula for village schools. There is a junior ranger program and "we developed the curriculum for this program in 2016 – the aim is to increase environmental knowledge and awareness, preserve traditional knowledge and create future environmental leaders". Rangers also receive training and use this information to inform customary landowners. In the past YUS landowners have travelled to other WMAs to network and learn key lessons that may be relevant to YUS (*Wells et al. 2013*).

There has been a lack of continuity and uniformity in the delivery of education and awareness programs within protected areas. Frequently women and children are not involved (Oya Mada Wa'a WMA). There could be better engagement with educational institutions (e.g. universities) to assist with raising awareness. The most commonly cited reasons for a lack of education and awareness programs relate to very limited funding and resources (Baiyer River WS).

Responses to the question about relationships with state and commercial neighbours (Q.22) were very negative, with 78% of protected areas having either no contact or very limited contact and no cooperation. Respondents in Madang Lagoon mentioned conflicts or court cases with commercial neighbours:

"There was some discussion between the cannery and the community over waste disposal (it kills the shellfish in the mangroves and other fish), but there was little consideration of the impacts of these industries on our WMA." (*Sinub WMA*)

"There is little consultation with State and commercial interests e.g. the Pacific Marine Industrial Zone [a major development planned for the Madang Lagoon] did not contact our WMA. We held a meeting and protested against the project to the provincial government. However, the PMIZ project plan has been agreed to anyway." (*Tab Island WMA*)

"There is little cooperation. Major industrial neighbours have been taken to court previously." (*Tabad WMA*)

Mojirau WMA reported that there are ongoing discussions with the logging company that "illegally entered our WMA" and that the WMA is waiting for decision from the latest court case and appeal (2012).

In Crater Mountain WMA mining is currently taking place within the WMA, despite the objections of the customary landowners. Hombareta WMA reported that the adjacent oil palm industry did not consult members of the committee in relation to the development of the plantation that now surrounds the WMA and that this has impacted "on the water as a result of discharge of effluent."

Only Laugum WMA indicated regular contact between the WMA and neighbouring official or corporate land users and substantial cooperation on management. The WMA is in contact with officers from the local level government and there have been discussions about "various developments proposed in the region with the community".

Other positive stories came from:

Kokoda Track/IPZ : "There is close contact with CEPA, PNG Power and oil palm companies and other resource sector agencies within government"

Maza WMA, where there is cooperation and consultation between Maza and international neighbours to negotiate the "management and take of marine species" (Maza villages are part of the Torres Strait Treaty communities)

Klampun WMA: "The conservation approach of the WMA has been heavily criticized as non-economic, providing no benefits or infrastructure, a waste of time, and has been said to "fool people". The WMA has coped with these criticisms and built working relationship with our commercial neighbours, e.g. selling fresh food, vegetables, fish, pork etc. to the logging camps. We have regular contact with the commercial companies (logging and oil palm), and assisting them, by liaising with other communities, has built respect, which means that the companies respect the protected area, and the other communities have become interested in establishing protected areas."

Very few protected areas indicated effective communication with the national government (including CEPA).

The supplementary question relating to **communication and trust** (Q.24a) also rates very poorly: only 40% of protected areas agree that there is some communication and trust between customary landowners, other stakeholders and protected area managers (e.g. CEPA). Most participants commented that they never see CEPA and that there is a "lack of transparency in management decision making" (Kamiali WMA). Poor communication is also a result of lack of formal management structures within many of the protected areas. Management committees have collapsed, planning documents, if they existed at all, have not been reviewed and people may have limited knowledge of conservation and protected area issues. The lack of environmental officers at the Provincial Government level is also identified as a reason for the lack of communication between protected areas and CEPA – "the absence of a provincial officer means that information is not relayed to CEPA" (Sinub WMA).

In contrast, most customary landowners agreed that they have **input into management decisions** (Q.23) on their protected areas, with 61% agreeing that they have direct input into some or most decisions.

"There are 10 landowning clans and three clans with user rights on the land. Environmental protection is not an introduced idea. It is a traditional conviction that has been passed down from generation to generation. All the above clans agree and made commitments to walk their ancestral pathway in caring, respecting and living in harmony with nature." (*Klampun WMA*)

In Tavolo WMA the people identified the issues with the management committee members and the committee meets quarterly to resolve these issues. However, management committees are not always representative and tend to be dominated by men. In addition, it is not always clear who has a voice: land ownership is not always clear, and in some cases there are user rights as well as customary ownership of resources. Issues of remoteness can limit the landowners' ability to meet and make decisions.

For example, in Crater Mountain WMA the customary landowners contribute to decision making and some meetings are conducted, "but due to the remoteness of the area, the meetings recently have not been frequent".

Ranba WS reported that the customary landowners have no input into planning and management "as all relevant structures have disintegrated".

Frequently in state owned protected areas (e.g. national parks) the customary landowners reported that they are not involved in decision making "as the national government makes all the decisions" (Jimi Valley NP).

However, in Mt Wilhelm NP the "customary landowners are the de facto on-ground managers in the absence of CEPA or Provincial staff" and hence have input into decision making.

Programs to improve community/customary landowners' welfare (Q.24b) were reported in less than one third (28%) of protected areas, and not all of these programs directly relate to the protected area or conservation agreements.

In Garu WMA, some activities are taking place with the assistance of NGOs.

Kavakuna Caves WMA has community programs provided through the local level government and these promote the "healthy island concept (community planning), agriculture and business development". Maza WMA has a ranger program and this is "bringing changes to the welfare of the people e.g. fresh water and better maintenance of infrastructure".

Kokoda Track/IPZ and YUS CA are outstanding examples of conservation actions improving community welfare (refer METT for details).

Funding arrangements for the *Kokoda Track* have resulted in several programs that have delivered a range of benefits including: (1) Education – increase in the number of registered schools, teachers, and primary and elementary school enrolments; training of teachers; construction of classrooms in over 12 villages; supply of curriculum materials and stationery; (2) Health services – new and renovated health centres and aid posts; equipment and supplies; waiting houses for pregnant women; greater access to vaccines/medicines; provision of clean water; training of village health volunteers and health workers; establishing HIV counselling and testing centre; and regular health patrols; and (3) Other activities – training programs for women's leadership, food preparation, small scale business, toilet construction; and provision of community water supply and toilets.

In YUS CA, Conservation International (Global Conservation Fund) provided over USD$1 million to support work with communities and landholders and Woodland Park Zoo has helped to establish a Conservation Trust that will provide long-term financing for YUSCA projects. The approach has been to provide services that have not been delivered by the various levels of government. The program aims to fill the gaps and strengthen the links between YUS CA and all levels of government, particularly the Provincial Government. Recent projects include village birth attendant training, family planning, child care, health, hygiene and nutrition and sponsoring health patrols by doctors and dentists.

Over 70% of protected areas reported that there are no welfare programs, or that past programs have been discontinued.

In Oya Mada Wa'a "there is little development and it is not linked to conservation. People are left to their own devices".

In Baiyer River WS "for the last twenty years nothing has happened in the Sanctuary".

One of the most positive findings of this assessment is that over three-quarters (76%) of the protected areas' customary landowners **support the protected area** (Q.24c).

In Crater Mountain WMA "there is a strong desire by the community to protect their environment".

In Laugum WMA "the landowners support the WMA because they can see benefits from it".

Customary landowners in Varirata NP "want to keep the national park and they support it".

Similarly at Mt Wilhelm NP the customary landowners support the national park "as it is their only means to generate funds to support their livelihood".

Others are fighting to keep their protected areas in the face of threats from a range of developments.

In Lake Lavu WMA the customary landowners "want the WMA to be extended. We don't want commercial logging or mining or large agricultural development".

There are reservations in some places about this support, and in some cases feelings among the landowners is divided.

Most people in Tonda WMA support the WMA, "but there are some landowners who have never supported the WMA and there is land use conflict".

In Garu WMA there are some who support and some who do not support the WMA "because of misunderstandings about the value of the WMA".

In McAdam NP the customary landowners want the protected area to continue, but they also want "to have some input into management".

In Horseshoe Reef WMA "some of the fishers have mixed feelings about protecting the reef. If people protect the reef they are concerned about not having access to the reef".

In Libano-Arisai WMA 70% in the community do not support the WMA as "they don't see any benefits coming from the WMA". There is some suggestion that outsiders who do not live in the community "give false information and can make decisions that are against the wishes of those who live in the community".

Similarly in Libano-Hose WMA "about 70% of the community does not support the WMA. These are mostly people

who live outside the area. The village people who live near the area are generally supportive of the WMA, while others would like to have some economic benefits from their land".

In Zo-oimaga WMA, due to lack of engagement with government and conservation agencies over many years the respondents said, "we are unsure of who supports the WMA".

Only in a few instances is there general opposition to the current protected area status.

In Loroko NP the customary landowners "want the land returned" to them.

In Wewak WM, according to the local government, customary landowners do not support the protected area. There was a 99-year lease and the landholders want their land returned, as they are not benefiting from the lease. The customary landowners are seeking payment by the Japanese government for the use of their land.

4.4.9 Tourism and recreation

Three questions asked about visitor facilities, tourist operators and entry fees.

Q.27: Are visitor facilities adequate? (Process)

Q.28: Do commercial tour operators contribute to protected area management? (Process)

Q.29: If fees (i.e, entry fees or fines) are applied, do they help protected area management? (Process)

The protected area 'benefits checklist' (Section 3.5) indicates that few protected area communities are benefiting from tourism, although most identified potential for future tourism. This lack of progress was confirmed by the assessment questions about tourism, where responses are generally very negative (Figure 21).

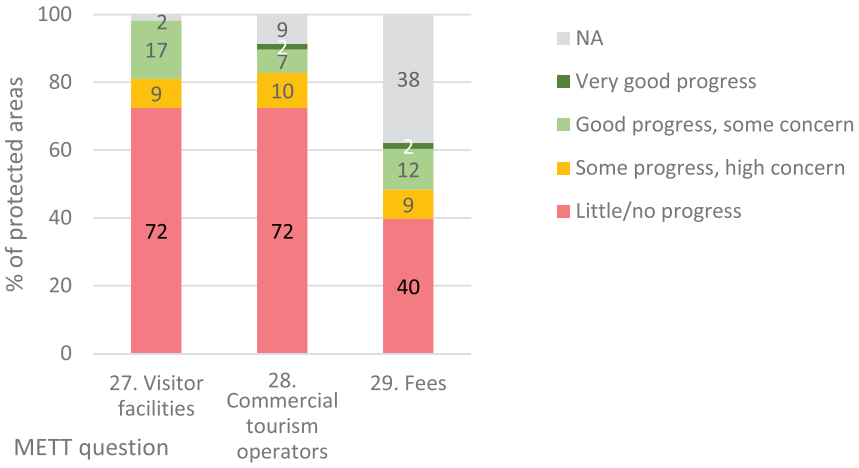


FIGURE 21: Ratings related to tourism and recreation

Visitor facilities and services (Q.27) are absent in almost three-quarters (72%) of the protected areas surveyed. It should be noted that some protected areas reported no visitors (e.g. Maza and Zo-oimaga WMAs) and some are not seeking to promote tourism (e.g. Torricelli Mountain Range proposed CA and YUS CAs).

In another 9% of protected areas, the existing facilities are poor, inappropriate or run down.

Crater Mountain WMA indicated that this is due to the lack of tourists coming into the area, as well

Day visitor facilities at Varirata National Park, close to Port Moresby. © Ann Peterson

as lack of maintenance, resulting in a cycle of fewer tourists, lower income and less motivation to maintain facilities.

In Kavakuna Caves, the WMA has no visitation in spite of its attractions, due to disputes among landowners.

Even though purpose built tourist facilities may not be available, some communities accommodate visitors in their homes (Klampun WMA).

Other protected areas have very basic visitor facilities.

In Varirata NP, there are basic visitor facilities (e.g. picnic shelter, BBQ plates, lookouts, walking tracks, signage, camping sites, pit toilets, mowed picnic areas) and these currently are being refurbished.

The main facilities at Mt Wilhelm NP include "the track itself and huts … [although] the huts are not cared for and are in very poor condition [and] there is conflict between two landowner groups who own the huts".

Lake Kutubu has a resource centre that is available to visitors and it displays posters with information about several important species.

Tonda WMA has a lodge for tourists, who are mainly engaged in fishing tours.

There is little or no contact with **commercial tour operators** (Q.28) in 72% of protected areas.

Only the Kokoda Track/IPZ reported good communication with commercial tour operators, who provide opportunities for visitors to walk the Kokoda Track. About 57 trekking companies from Australia and PNG operate across the Kokoda Track (*Kelly et al. 2016*), although there are perhaps about 100 trekking companies in existence. There is a licensing system and associated code of conduct for tour operators (there is no accreditation system) and the KTA's role includes the regulation of the trekking operators. However, some people challenge the effectiveness of this regulation.

Some protected areas are visited by cruise ships. In Cape Wom when big cruise ships are in port, local villagers perform dances and sell traditional items. Similar benefits are received in areas close to Alotau, Rabaul, Madang and Port Moresby. In Kamiali WMA cruise boats bring in tourists who pay PGK30 per person (once per year and only about 30 people), but this money is said to be insufficient to protect the area.

A frequent comment from respondents was that commercial operators use the protected areas but contribute little to their upkeep or support for communities. For example, dive boats work through hotels in Madang Lagoon and these may not pay any fees or support the local communities.

Related to this is the issue of **fees paid** for access to the protected areas by individuals, tour operators, film crews and researchers (Q.29). Fee structures exist in theory and some fee schedules were included in the original protected area gazettal notices. Despite this, 38% of protected areas reported that fees do not apply in their protected area. Often this is due to lack of capacity and a lack of clarity about the fees and processes.

Baiyer River WS reported "previously fees were collected, but currently nothing is done".

In Crown Island WMA there is no system for collecting fees.

In Ndrolowa WMA tourists visit the area for scuba diving and "workers from the Asylum Centre use their kayaks in the WMA. These people make no contribution to the WMA".

Mt Gahavisuka PP is typical of many parks where some ad hoc payments are made to the local community for helping the tour operators. However, due to a lack of rangers, no fees are generally applied.

About a quarter (23%) of protected areas reported that some fees are collected. Only Mt Wilhelm NP indicated that these fees make a substantial contribution of the community.

In the Kokoda Track, fees are charged by the Kokoda Track Authority, and a substantial portion of the fees support community development activities.

In Balek WS the tour operators collect fees and pay the community (PGK10 per person). This money supports important community programs.

Visitors from the cruise ship anchored at Alotau inspect an historic site near the port under the guidance of a local community guide. Tourists also visit nearby protected areas. © Ann Peterson

In some protected areas, participants reported that fees make no contribution to the protected area.

> In Varirata NP fees apply but are "not systematically collected. Fee receipts are not monitored. Fees go to the government, but they are not returned to assist with management, or there is no record for this".

> In Namanatabu WMA a PGK20 entry fee is charged by CEPA, but this must be paid in Port Moresby: no fees are collected on site because there are no facilities.

> Day visitors, both independent and on guided tours to protected areas in Madang Lagoon do not always pay an entry fee to the customary landowners and this limits funds for management.

4.4.10 Economic benefits to local communities

Q.25: Is the protected area providing economic benefits to local communities/ customary landowners e.g. income/employment? (Outcome)

A measure of the social outcomes related to the existence of the protected area is the extent to which the protected area provides economic benefits to local communities/customary landowners. In this section only one question was asked.

While only two protected areas reported a very good flow of benefits, just over half (51%) reported some benefits (Figure 22).

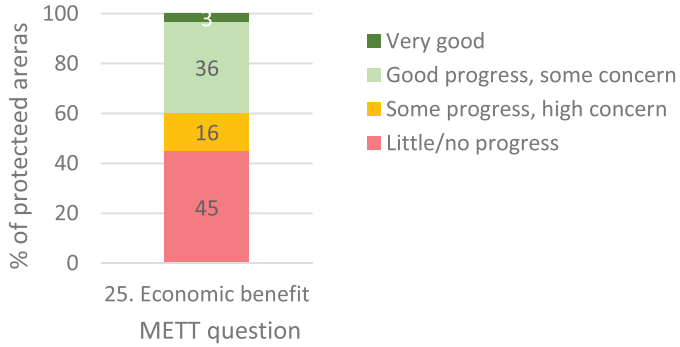


FIGURE 22: Perception of economic benefits

Typical of many protected areas, is the statement made by Crater Mountain WMA:

> "There is the belief that if the community engages in conservation then they should receive some assistance or benefits".

Frequently the benefits are returned to individuals in the community rather than the proceeds being spent on programs that may improve overall benefits for the community.

Very few protected areas provide **employment opportunities**. It is often the management committee members who undertake work and may be paid a small amount for this.

> In Iomare WMA it is reported that "only 10 people [the management committee] benefit from the protected area".

Some customary landowners may be employed as rangers to undertake on-ground management. Some tourism operators and researchers employ locals as porters and guides.

Tourists being shown the hot springs of Pokili WMA by the 'bush rangers. © Ann Peterson

Tourists to Tabad Island WMA in Madang Lagoon seldom pay to visit the islands or snorkel or dive on the coral reefs. © Ann Peterson

Hunting and collecting of resources is an important source of income for many protected areas and in general the income flows to individuals.

> In Lake Lavu WMA the people benefit from the sale of tilapia and crocodile skins – "There is no crocodile farming, but rather crocodiles are taken from the wild, and skinned using traditional methods. The meat is eaten by the customary landowners".
>
> In Pokili WMA a key objective for the establishment of the protected area was to protect megapodes, and the people have established a "calendar for harvesting" of megapode eggs, which provide an important income source to the community.
>
> Crown Island WMA provides "very minor benefits to individuals from the sale of fish and trochus shells". The main products sold by landowners include fish, shellfish and meat, garden food and eggs (megapode and turtles.

Tourist activity is limited in most protected areas and the resultant economic benefits tend to be reported as potential future tourism benefits. In Balek WS about three tourists per month visit the site and they pay about PGK10 each. This low visitation and economic benefit is typical of many protected areas. Protected areas may receive some income from bird watchers (e.g. Garu WMA and Varirata NP), trekkers (Kokoda Track, Mt Wilhelm NP and Oya Mada Wa'a WMA), and visitors to hot springs, caves, volcanoes, reefs and other landscape features. (*Please refer to Section 6.3.10 where tourism activities and related issues are outlined*). Declining infrastructure and changes to transport can affect tourism income:

> "There used to be a flow of economic benefit when tourists visited the site but that has dropped now as there are no flights into the area." (*Crater Mountain WMA*)

Several respondents indicated that they have tried to approach tourism operators and accommodation providers to negotiate benefit sharing arrangements in relation to tourists visiting and undertaking activities in their protected area, but this generally has not resulted in sustainable outcomes.

> "Customary landowners have approached hotels which offer diving to get a payment for entering their area, but this has been refused." (Nanuk WMA)

Perhaps the most successful tourism venture, which brings substantial returns to the community, is the Kokoda Track (refer section 1.10 and METT data sheet).

> The Kokoda Track Authority regulates the trekking industry, provides permits for trekkers and issues Commercial Operations Licences for any enterprise operating along the Track. The fees paid are used for KTA administration and authority operating costs (50%); payments to the 13 villages along the Track to undertake track maintenance (25%); and cash payments to local communities for a variety of purposes (Kelly et al. 2016). Benefits are also received by the locals who are engaged as porters and guides by the trekking companies and from the sale of products and artefacts to the trekkers. The trekking companies pay for accommodation in village guest houses, employ local guides and porters, purchase local food, equipment, transport and pay for various ceremonies (singsings). Trekkers and trekking companies also support a range of activities and programs e.g. school scholarships and improvements in water supplies. Carlsen (2012) estimated about PGK4–5 million is directly received/invested into the communities along the Track each year.

Royalties are paid in some protected areas.

In Tonda WMA this is comes from hunting and fishing by visitors, although this is "very small".

In Lake Kutubu WMA, the principal landowners should receive a royalty payment from the use of the land in Moro by Oil Search. "We, the lake people are supposed to get 10% of the royalties and the Fasu get 90%. This is to cover for the pipeline, refinery and facilities. They should pay us about PGK4000–5000 quarterly (but we have not been paid for 13 years, nor have Fasu). Treasury and Finance have the money and this has not been released to us. The WMA is owned by the landowners and we need to secure some funds from the royalties." (Lake Kutubu WMA)

Alternative income generating projects have been encouraged in some areas.

In Tavolo WMA, the wildlife management committee "has actively sought funding for a range of projects (e.g. 184 families provided with roofing iron [PGK100,000], an Aid Post, started Grade 3 and 4 schooling in 2016, housing for teachers, sewing machine group, guest house, community hall etc.)". The purpose of this funding is to provide basic services and "reduce the temptation to invite destructive land use, such as logging and plantations into their WMA".

YUS CA has also generated direct benefits to the community, "even though compensation is not paid for pledging land for conservation". The project seeks to harness opportunities to promote local development and improve livelihoods: "The YUS Conservation Coffee and Cocoa Cooperative provides a long-term commitment of support to the customary landowners and provides for local employment. The growers receive a guaranteed premium price for coffee beans, a price that is significantly more than they would receive from selling coffee in local markets…The coffee project enhances habitat and wildlife conservation while providing local farmers a source of income that can be invested in other areas (e.g. education, health etc.). TKCP is trying to replicate this with cacao farmers in the coastal areas. Cacao has been sold to a chocolate company based in Port Moresby and TKCP is working with the PNG Cocoa Board and chocolatiers to improve the quality and flavour of the cacao." (YUS CA)

4.4.11 Condition of protected area values

Q.30: What is the condition of the important values of the protected area? (Outcome)

Perhaps the most important measure of management effectiveness is whether the protected area's values are being conserved. A more detailed assessment of the condition of values is discussed in Chapter 7.

Responses to this question indicate that in spite of poor resourcing and processes, the state of values in most protected areas is good to very good (Figure 23). However, in most cases this assessment is not based on recent research or monitoring.

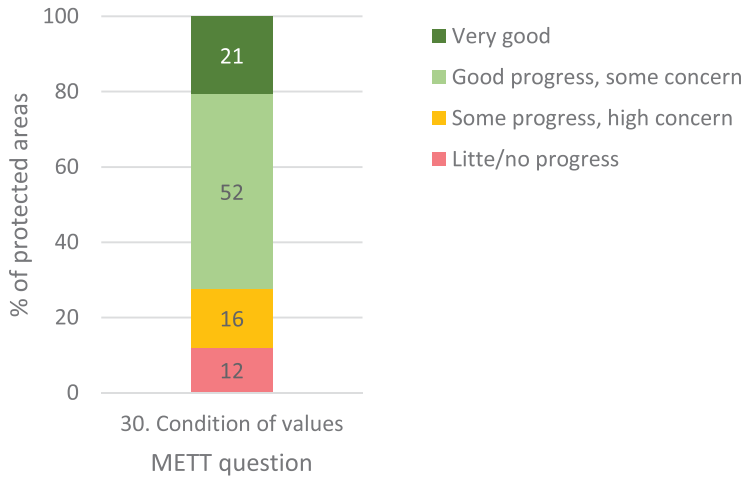


FIGURE 23: Rating for the condition of protected area values

21% of protected areas reported that biodiversity, ecological or cultural values are very good – that is, predominately intact: YUS CA, Kavakuna, Klampun, Libano-Hose, Sulamesi, Talele and Mt Susu WMAs, Mt Gahavisuka PP, Jimi Valley and Mt Wilhelm NPs and Kokoda Memorial site.

© Fiona Leverington

> "The general condition of the values remains intact with minor disturbances along the tracks and lookouts." (Mt Gahavisuka PP)
>
> "The community believes that the condition of the values in the WMA are intact and undisturbed." (Klampun WMA)
>
> In YUS CA this outcome is believed to be due to the landscape approach which underpins management – the plan "aims to protect species and habitats within tambu areas, provide for connectivity across YUS and include landscapes along an elevational gradient from the coast to the interior high mountains."

Just over half (52%) reported that some biodiversity, ecological and cultural values are being partially degraded, but the most important values have not been significantly impacted.

> "The environment and overall ecology have not been significantly impacted. Some of biodiversity is partially degraded, e.g. wallaby, but there is a lot of endemism and for these species, there is only partial degradation." (Oya Mada Wa'a WMA)
>
> "The natural values in general remain intact, despite illegal logging in part of the WMA. Wildlife are returning to the WMA due to land use changes elsewhere." (Mojirau WMA)

Remoteness and isolation are thought to be major factors in helping to conserve the natural values in many protected areas.

In 16% of protected areas *some* biodiversity, ecological or cultural values are being *severely degraded*. This included Hunstein, Lake Lavu, Mt Kaindi and Tab Islands WMAs, Moitaka WS and Wewak WM site. Settlers from outside pose major threats to the values in Mt Kaindi and Tab Islands WMAs and Moitaka WS. In many protected areas the introduction of tilapia and carp has decimated native fish populations.

> In Lake Lavu WMA "freshwater fish have been lost from the lake, overtaken by tilapia and water quality is in decline". This threatens the entire ecosystem of the lake and also the livelihoods of the people.
>
> In Lake Kutubu WMA "there are significant threats to the WMA, particularly the fish [as a result of the introduction of tilapia] and the water and swamp forests" and in Libano-Arisai "the overall condition is relatively good. The main problem lies with the introduction of tilapia into the waterways".

A further 12% of protected areas reported that *many* biodiversity, ecological or cultural values are being *severely degraded*. These are Loroko and McAdam NPs, Iomare, Sawataetae and Tonda WMAs and Paga Hill SR. In Loroko there is an absence of management and fire has "entered mainly from the south and now people have begun to garden in these areas" destroying the natural values of the national park. Tonda WMA is threatened by the impacts of mining and illegal entry causing changes in entire ecosystems, and these threats are not being managed. Paga Hill SR has been destroyed by construction activities.

There is generally a high degree of concern about cultural values, especially the loss of traditions and knowledge.

> "Much traditional knowledge is lost. The sunbird makes a noise when the big eagle is up in the tree – the children do not understand this anymore. If they destroy the places where the swallows nest when they fly up from Australia, then where will they go?" (Bagiai WMA)

Pokili WMA reports that the condition of their protected area's values remains high, with vegetation communities in generally good condition. © Ann Peterson

4.5 Conclusions: are protected areas improving?

This chapter has provided the results of the Management Effectiveness Evaluation (i.e. from Table 6 in the METT assessment). Overall results indicate that most protected areas are very under-resourced and are not managed effectively, but there are some exceptions, and many customary landowners are making great efforts to maintain their areas in good condition.

When the results of this PNG-METT study are compared to the RAPPAM study of 2006, using both original data and data which has been translated into a common reporting format for comparison purposes (see Section 4.1), the means for the protected area network show little change over the last ten years (Table 8).

TABLE 8: Comparison of scores for two PNG protected area management effectiveness studies

	RAPPAM 2006–2006	METT 2016–17
Number of protected areas assessed	44	58
Overall mean (original methodologies)	35%	31%
Overall mean (translated to common reporting format to allow comparison)	33%	33%
Mean of 43 protected areas assessed in both studies (translated to common reporting format)	33%	31%

Of the 43 protected areas assessed in both studies, half of the management effectiveness scores have increased and half have decreased over this time (Figure 24). A few protected areas that were doing reasonably well in 2006 have declined very significantly for a variety of reasons (e.g. Lihir Island Protected Area and Tonda WMA). Big declines are evident in the management of some of the state-owned protected areas (such as Paga Hill SR, Jimi Valley NP and Baiyer River WS).

However, management in other protected areas has improved substantially, either because of external funding and assistance (e.g. Kokoda Track HR) or because of the dedication and energy of customary landowners (e.g. Balek WS and Pokili WMA). More detailed stories of some of these protected areas are presented in Chapter 8.

The most important aspect of the assessment is discerning how the situation can be improved in the future. The next chapter details recommendations provided by the workshop participants.

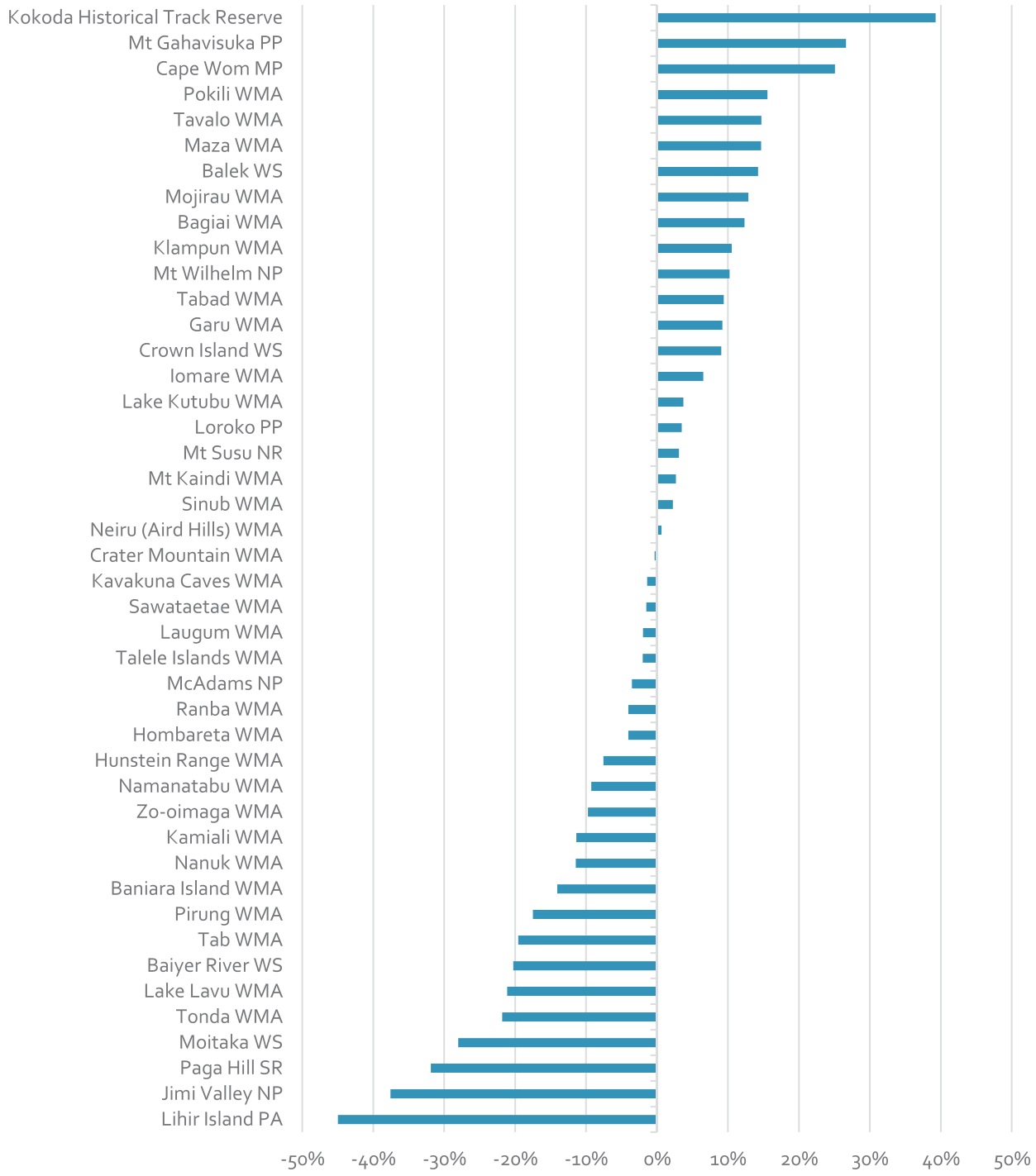


FIGURE 24: Changes in management effectiveness scores 1996–2017

(Using common reporting format scores – note changes are in raw percentage points)

CHAPTER 5 Participants' recommendations

5.1 What we did

For each of the METT questions, we recorded 'next steps': the participants' views about what could be done to improve their score in the future. Thinking about the future and discussing options for the future is a critical step if management effectiveness evaluation is to have positive results. We compiled comments for each question across all the protected areas, and identified common themes and actions as well as some of the most salient comments.

At the very end of the workshops. We asked participants the following question: "As the final task, I would like you to think about all the values, threats and issues that have been raised and to list three things that would help you to make your protected area better in the future". These three key recommendations were analysed across all the protected areas.

5.2 Key Findings

The three key recommendations from each protected area were tallied (Figure 25). These included proposals to:

- **Increase the input of all levels of government** in relation to funding and resourcing, while also encouraging other non-government sources and local income generating activities, including tourism;
- **Implement management actions**, including the development of management plans, establishing management committees, creating, training and appropriately resourcing an on-ground ranger workforce, clarifying boundaries and providing basic facilities and equipment;
- **Develop the skills and capacity** of the protected area managers (including committees, rangers and administrators) and develop and implement relevant awareness raising and education programs that build support for the protected area;
- **Improve communication** among all relevant stakeholders including the customary landowners of the protected areas and all levels of government and non-government organisations; and
- **Improve protected area legislation** and improve enforcement capacity.

More detailed recommendations in relation to each theme of management are discussed below.

5.3 Design and establishment

CLARIFY BOUNDARIES

Many respondents suggested a need to clarify and mark the boundaries of the protected area:

> "The boundary needs to be established with GPS coordinates and marked on the ground using traditional markers. The landowners need to be taken around the boundary so that we can show them the traditional marks e.g. creeks, important trees, and we can describe this and they will know the boundary." (*Lake Lavu WMA*)

Many protected areas were declared a long time ago and the new generation of landowners are not always familiar with boundaries or the reasons for their location. Boundary clarification is particularly important in protected areas with marine environments (e.g. Crown Island and Bagiai WMAs).

Signage at Lake Kutubu WMA helps to raise awareness of the WMA's boundaries © Ann Peterson

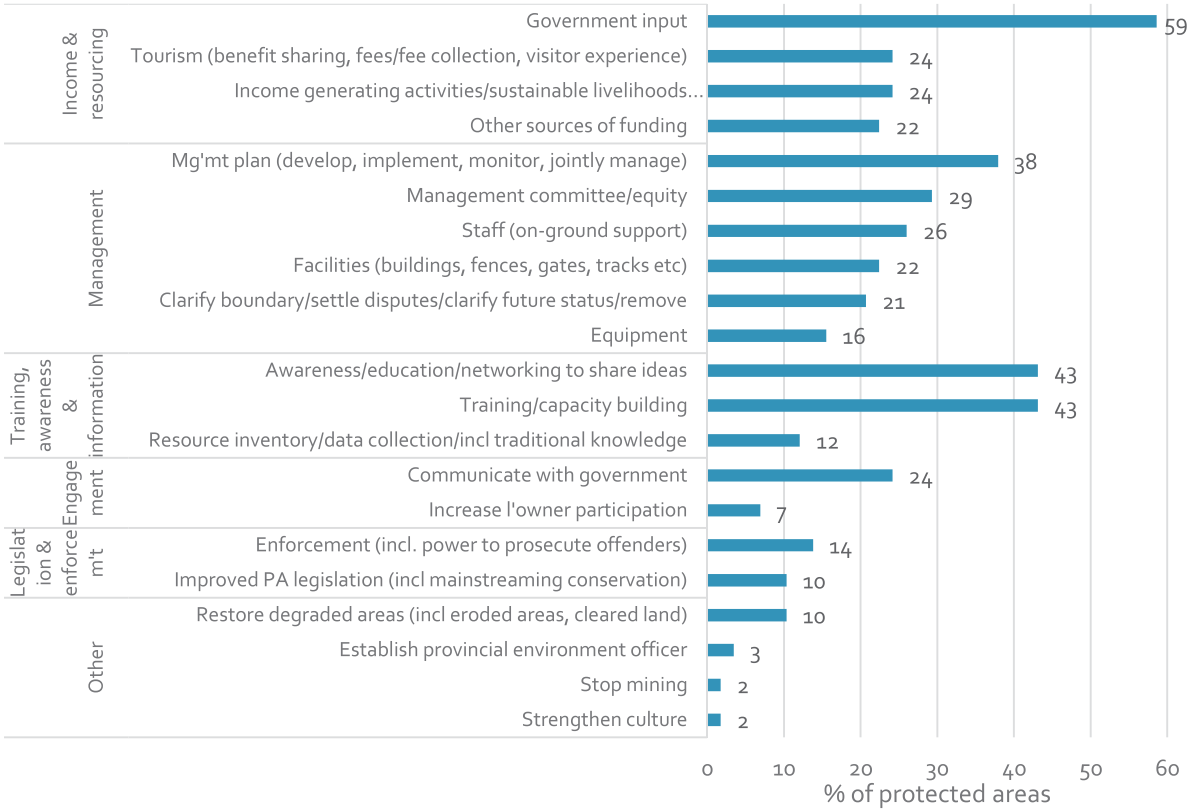


FIGURE 25: Summary of three key recommendations from each protected area

COMPLETE ACCURATE MAPS, PROVIDE HARD COPIES TO LANDOWNERS AND USE SIGNAGE TO RAISE AWARENESS

Respondents indicated that maps of some protected areas are incorrect. These maps should be revised to better reflect gazettal notices. Hard copies of maps would be appreciated by landowners and this would form an important basis for raising awareness among communities both within and outside the protected area. In Lake Kutubu WMA, the Management Committee is placing billboards at critical points on their boundary to limit the entry of illegal settlers. YUS CA also recommends the use of signage to improve boundary recognition.

UNDERTAKE PARTICIPATORY MAPPING

In some cases, the boundary is disputed by landowners, and hence participatory mapping and legal changes may be needed (e.g. Lihir Island and Crater Mountain WMAs).

> "Map the customary boundaries and develop a land use plan for the entire area and map cultural boundaries for all the tribes." (*Crater Mountain WMA*)

AMALGAMATE, OR ENLARGE OR REDUCE THE SIZE OF, PROTECTED AREAS

The participants from Ranba WS and Ranba WMA (on Long Island) and Crown Island called for boundary clarification as well as possible amalgamation of the wildlife sanctuary and wildlife management area and the inclusion of Crown Island under one protected area category:

> "There should be discussion between CEPA and the Provincial Government on the boundaries and the design of the WMA. The people are supportive of the WMA continuing but want the boundaries clarified." (*Ranba WMA*)

Some respondents felt that their protected area should be enlarged to include more areas of high importance.

> Horseshoe Reef WMA would like to explore the possibility of expansion into marine areas within Bootless Bay.

> Hombareta WMA, which provides important habitat for the Queen Alexandra birdwing butterfly would like to explore boundary extension to improve the conservation outcomes for the endangered butterfly.

Habitat of the Alexandra birdwing butterfly, Ornithoptera alexandrae is protected in Hombareta WMA and extension of the boundaries may assist in achieving improved management outcomes. Photo Rothschild 1907

Maza WMA would like to expand to include more key habitat for dugongs and turtles.

Other participants supporting protected area expansion included people from Garu, Kamiali, Kavakuna Caves, Klampun, Mojirau, Namanatabu, Nanuk and Talele Islands WMAs, Mt Gahavisuka PP and Mt Wilhelm NP, where expansion is seen as a way to improve connectivity.

In Sawataetae WMA the respondents indicate that "poor siting and design of the WMA have resulted in the exclusion of important habitat and thus the future value as a WMA is questionable, unless its boundaries are redesigned, and in particular include coastal and marine environments".

In Pokili WMA the respondents said, "We would like to expand the WMA into Commodor Bay, but this needs further discussion with the communities. This will help to protect the reefs, mangroves, kina shells and sago".

In Lake Lavu WMA "The protected area was set up around the lake and does not include other important areas and habitats, e.g. there is a river that comes from the mountains and it feeds into the lake; there is a big 100m waterfall that drops into a pool and this is where the freshwater eels spawn and move into the lake. The coast where the river flows out into the sea is also important. If the boundaries of the WMA were reviewed and realigned it could have greater value, as many important areas are in the lowland areas."

In contrast, Zo-oimaga WMA indicated that a reduction in the size of their WMA would enable the landowners to better manage hunting and other resource extraction.

CLARIFY THE STATUS OF THE PROTECTED AREA AND UPDATE UNDER PROPOSED NEW LEGISLATION

The current status of some protected areas, especially McAdam and Loroko NPs, Lihir Island PA and Wewak WMS, was questioned by the customary landowners and needs to be collaboratively reviewed by the relevant stakeholders. A clear decision on the future status should be made under the new national Protected Area Policy. Similarly, the existing protected areas will need to be re-assessed according to the criteria for the proposed new categories of protected areas, as outlined in the forthcoming Protected Area legislation. Many of the existing categories of protected area will not remain under the new legislation (e.g. Wildlife Management Area) and their future status must be clarified in consultation with the customary landowners.

CLARIFY PROTECTED AREA BENEFITS AND INCREASE SUPPORT

Several respondents questioned whether their protected areas would continue to have support from their customary landowners in the face of limited benefits or support over a long period of time:

"If there are no benefits we cannot continue to maintain the excitement of the commitment to the WMA. There has been no action in 23 years, so it is difficult to continue." (*Libano-Hose WMA*)

Respondents from some protected areas were ambivalent about the design of their protected areas, with their future decisions on size and shape to be based on the benefits:

"We would like to expand the boundaries if there are any benefits, but we will reduce the size if there are benefits from mining and oil/gas development." (*Libano-Arisai WMA*)

5.4 Planning and objectives

Recommendations focused on first developing a management plan for the protected area and then ensuring funding for agreed work plans.

DEVELOP MANAGEMENT PLANS, ESTABLISH AGREED OBJECTIVES AND REVIEW REGULARLY

Landowners want to develop management plans, or where they already exist, to revise and update them. They repeatedly stressed the need for collaborative approaches that involve all relevant people, including clan groups and all levels of government and NGOs to ensure harmony and agreement with the identification of the plan's vision, objectives, actions and outcomes.

For a number of protected areas, landowners stated that the first step in this process is to re-establish the management committee so they can lead the plan's development:

"We need a management plan with clearly identified rules and enforcement strategies [and we] need to re-establish the management committee to progress this planning." (*Oya Mada Wa'a WMA*)

Boundaries need to be agreed to and clarified and the plan content should be based on relevant scientific information, the results of any monitoring or research and also the extensive knowledge of the customary landowners:

> "… incorporate more extensive ecosystem planning approaches into the traditional management approach." (*Ndrolowa WMA*)

Joint management plans were raised as a possible way forward. In Madang Lagoon, all of the protected areas indicated the need for Lagoon-wide cooperation among all the stakeholders and that the Madang Lagoon Association may be a suitable mechanism for achieving greater efficiencies through collaborative planning and management and sharing of resources, rangers and equipment. Similarly, respondents from Jimi Valley NP indicate a preference for consolidated planning and management with Baiyer River WS "because they have the same objectives, districts, wards and culture and traditional relations and they are only 16 km apart".

Plans need regular review and updating, based on the results of monitoring, research and evaluation:

> "Regularly revise the management plan to ensure that it meets the needs of the community and is effective in protecting the values of the WMA." (*Mojirau WMA*)

DEVELOP WORK PLANS AND SEEK APPROPRIATE FUNDING

Many participants felt that once a management plan is developed, an effectively funded and resourced work plan is essential to achieve on-ground outcomes. The absence of work plans in many protected areas, reflects the lack of management structures and resources and equipment to implement actions.

5.5 Budget, infrastructure and equipment

IDENTIFY GOVERNMENT FUNDING SOURCES

Most participants felt that financial support from the government is essential to revitalise protected area management:

> "Funding is essential if the first steps towards more integrated planning and management are to be achieved." (*Ranba WS*).

National, provincial and local level governments were all identified as potential sources of funding, as well as accessing money from the District Improvement Program:

> "Provincial and local level governments should be involved and provide funding (e.g. from strategic improvement funds)." (*Garu WMA*)

> In Lake Lavu WMA the respondents believed that a small investment of money by government would encourage the community "to make more money to help the WMA".

IDENTIFY COMMUNITY SOURCES OF FUNDING

The need for at least some level of self-sufficiency and fundraising was recognised by most groups, and many people requested training and assistance to help them find sustainable income sources:

> "Identify more opportunities to raise funds or access other funds. We need funding to add value or complement community self-help initiatives that aim to address needs, minimize issues and enhance self-reliance and sustainable livelihoods." (*Klampun WMA*)

Expanded tourism ventures were identified by most protected areas as a mechanism to generate income. However, this may require substantial improvement in transport and communication services. Some protected areas suggested investment into commercial ventures including coffee and cocoa production.

IDENTIFY OTHER SOURCES OF FUNDING

Some of the most successful protected areas in PNG are those that receive external funding (e.g. YUS CA and Torricelli Mountain Range proposed CA, Kokoda Track HR and Cape Wom MP). Many respondents indicated that assistance in seeking funding from external sources is important.

> For example, Pokili WMA, which is surrounded by oil palm development, stated:"[We] need to submit and write proposals to donor agencies e.g. New Britain Palm Oil Ltd (e.g. need to consider how some of this money from the

NBPOL Trust Fund or other sources can be injected into the WMAs). NBPOL are a major business in this region and they should be contributing to the province and in particular the WMAs"

"CEPA needs to provide guidance and advice on linkages and networking in relation to funding opportunities with potential donors." (*Kamiali WMA*)

Most protected areas indicated a need to improve their capacity and skills in applying for funding.

TRAIN FOR BUDGET MANAGEMENT

Establishing bank accounts and providing basic training in financial and budget management is essential in almost all protected areas.

IDENTIFY AND PROVIDE NECESSARY EQUIPMENT AND FACILITIES

A long list of required equipment and facilities was proposed for most protected areas, including basic field equipment, tools to assist with monitoring and data collection, office and computers, and visitor facilities:

"Office space for the committee or a resource centre, computer and office equipment, GPS for survey work and boundary demarcation, and a solar light (for the equipment)." (*Pokili WMA*)

Most urgent is the need for transport (better roads and air transport, as well as bikes, vehicles or boats) so that customary landowners can access and patrol the protected areas. The lack of transport is a major constraint on landowners being able to look after their land and seas.

"The problem is transport – the roads are bad … To improve the outcomes for the community a better road would make it easier for tourists to enter the WMA. A car for transporting tourists to the site and for the proposed guesthouse. Establishment of an office, with equipment for the Management Committee." (*Kavakuna Caves WMA*)

Others sought electricity, generators or solar power to enable the use of computers, phones and irrigation systems (*Balek WS*).

5.6 Human resources

ESTABLISH AND TRAIN A RANGER WORKFORCE

Representatives from almost all protected areas felt strongly that a permanent, paid ranger presence is essential, and that people need to be trained and supported in these roles. The roles and responsibilities of the ranger workforce need to be discussed and agreed. In those places where community members are carrying out these roles now, people thought that at least some of them should be paid and formally recognised.

"… there is a great need to employ full time staff to manage the people's WMA and ensure the people's environmental conviction is defended, protected and materialized." (*Klampun WMA*)

"Seek support to employ full-time ground staff within the WMA … My long experience with management committee members and a community-based enforcement structure is that these people want to be paid or accorded some recognition by the state." (*Crater Mountain WMA*)

Several protected areas raised the idea of a networked ranger workforce, where staff can engage in exchanges and visits to other protected areas to share their experiences and learnings.

Pokili WMA stated the need for "exchange of ideas and site visits to other areas".

ENCOURAGE SELF-HELP AND A VOLUNTEER WORKFORCE

Overall, the requests for staff and support were quite modest, and most protected areas recognised the importance of voluntary work by the community.

"People are willing to provide their support, but some form of payment is needed. Perhaps two paid workers would be sufficient." (*Baiyer River WS*)

"There should be some special projects to support the Wildlife Management Area's activities and this must include other members of the community so they can appreciate the area and its values." (*Iomare WMA*)

IDENTIFY AND FUND SUITABLE TRAINING PROGRAMS

There were many requests for training of customary landowners, management committees and future ranger staff,

with a quite sophisticated understanding of the types of skills needed to manage the protected areas. Recognised training needs included:

- relevant laws and law enforcement
- preparation of management plans (including land use plans)
- techniques for monitoring and research, including species identification and better understanding of wildlife
- developing and marketing tourism activities
- community education (about protected areas' values and their importance)
- writing funding proposals and reports
- administration and financial management, including information technology skills
- raising awareness and appreciation of the protected areas' values
- leadership

Statements made by respondents included:

> "Need better understanding of science and how to manage people who come to exploit the area. Need awareness training in relation to enforcement and monitoring and how to manage visitors/scientists" (*Mada Wa'a WMA*)
>
> "Customary landowner's skills in understanding the area and its people are high, but training could be appreciated. Scientific knowledge could be improved – e.g. understanding food chains, understanding laws … maybe some mediation." (*Bagiai WMA*).
>
> "Need to train the rangers, raise awareness in the community, improve governance [including] capacity building of the committee in financing, marketing, leadership; also need IT training and para-legal training (to help enforcement officers)." (*Pokili WMA*)
>
> "Training is needed in relation to: conservation training (basics of conservation, ranger training to enable people to explain what is happening in the environment); ecotourism training (hiking, trekking, birdwatching, safety); hospitality training and food provision for the proposed tourist facility; administration skills; IT; finance, budgeting." (*Mojirau WMA*)
>
> "…. consider training in first aid, emergency procedures, radio communications and map reading and consider the development of a peer mentoring program. Consider the introduction of a porter accreditation scheme to provide basic training and qualifications for porters" (*Kokoda Track/IPZ*)

5.7 Legislation, enforcement and control

All the recommendations about regulations and improved implementation of laws would require an increase in funding. They included:

Review legislation

- Review and update existing protected area rules and regulations (taking into account the proposed new national protected area legislation);
- Review penalty provisions to ensure that they deter illegal actions;
- Consider recognition of protected area rules in local level government by-laws to enhance enforcement capability;
- Review the village court processes and related rules and penalties;
- Clarify protected area boundaries to reduce conflict and land disputes; and
- Enhance links between protected areas and their provincial and local level governments to facilitate the enforcement of protected area rules under the relevant laws

Provide access to a **provincial environment officer** who can "address a range of issues that are relevant to the protected areas" (Balek WS).

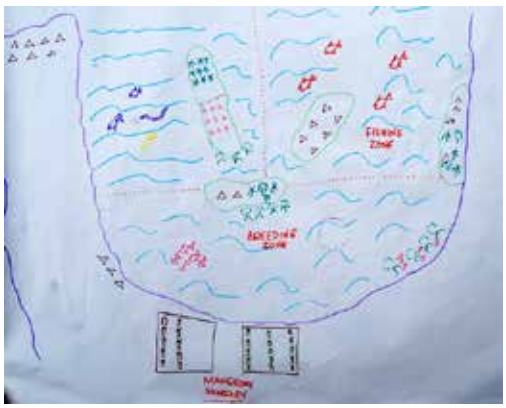
Increase the on-ground ranger presence and facilities for rangers, and **provide necessary equipment** (such as transport for patrols).

Provide effective training, awareness raising and capacity building for:

- rangers e.g. policy, legislation and law enforcement

- village court officers and magistrates e.g. in environmental law
- members of management committees e.g. para-legal training
- surrounding communities e.g. raise awareness of the relevant rules and boundaries and where necessary erect signboards, fence important areas, have a presence in the WMA
- tourists and trekkers (e.g. greater awareness by the trekkers and also the trekking companies of the required rules to increase compliance (e.g. relating to souvenir hunting).

Consider establishing and certifying a 'Tourism Police' (e.g. at Kokoda Track to enhance compliance).



The depiction of Laugum WMA indicates a good understanding of the marine environment, but customary landowners need assistance to manage the area and enforce their zoning plans.

To improve planning outcomes and reduce the impacts from incompatible landuses occurring within and adjacent to protected areas, suggestions include:

Establish more effective working relationships and better communication between protected areas and their surrounding land users and all levels of government. For example, Tabad WMA suggests that the government should inform and engage the landowners about the potential impacts of development and seek their input.

Enhance co-operation among government agencies to ensure policy integration and little or no adverse impacts of policies on protected areas.

Consider protected areas in all planning decisions that may impact on this network:

> "The planning system must look to see if there is a WMA before any decisions are made concerning development near the WMA i.e. check with the Environment Department. If the decision makers don't know then development will occur that will damage the WMA. We need proper consultation with the community before development is approved and undertaken." (*Lake Lavu WMA*)

5.8 Information, inventory and research

Respondents stressed the need for integration of traditional and scientific knowledge and research and monitoring strategies centred on collation and storage of information, identifying long-term collaborative partnerships, training of local people to undertake data gathering and obtaining necessary equipment.

Landowners felt that their knowledge base or inventory of their resources can be improved by:

Using and passing on traditional knowledge, especially to younger generations, and in Klampun WMA this will require "research into local knowledge, which is based on the traditional, natural physical, social and spiritual contexts of life."

Learn more from the scientific community and integrating scientific data with traditional knowledge:

> "Basic research and data are important to form a basis for future management and to highlight the key values and importance of the area to the customary landowners, who should be involved in all decisions concerning future research on Long Island" (*Ranba WMA*)

Participants discussed the need to undertake improved research and monitoring, as often the available information is out of date and very incomplete. Key 'ways forward' included:

Collate, store and improve access to existing information. People appreciate the chance to learn from visiting scientists and expressed frustration that some researchers "get their papers and PhDs and leave us with nothing". Storage of information is important, with Mt Gahavisuka PP suggesting the development of online/web-based storage of data that is "accessible to all partners and stakeholders, including visitors…" as well as purpose built resource centres. Jimi Valley NP stressed the need "for knowledgeable people … to translate and simplify the existing information so it is more accessible to people in the village. The people need to know why they are protecting certain things".

Undertake regular monitoring and evaluation to inform planning.

Laugum WMA stated, "regular monitoring would give more data about fish numbers and breeding etc. Information is important for management."

Identify collaborative long-term partnerships to undertake necessary research (e.g. with government, universities and NGOs).

Obtain relevant equipment to undertake research and monitoring.

Tab Islands WMA stated that "the community has the skills (e.g. certified divers and monitoring skills) to continue the transect-monitoring program, but there is no equipment."

Train local rangers and community members, including children to undertake research and information/data gathering.

"Children should be involved in the monitoring plan and noting the plants and animals in the WMA. This is also part of imparting traditional skills and values to the next generation". (*Garu WMA*)

5.9 Resource management

There is generally a lack of understanding among landholders as to the kinds of activities included in resource management. The key recommendations focused on management planning and coordination, a ranger workforce and training.

Resource management suggestions included:

Management planning

- *Revise or develop new management plans*.

  In Ranba WMA this is important to identify "key actions to ensure effective resource management (e.g. land use plan with identified zones and targets)".

- *Co-operate with other protected areas*: e.g. share information, equipment and management activities. Most protected areas in Madang Lagoon call for collaborative engagement with the Madang Lagoon Association to "establish a coordinated resource management program" (*Tab Islands WMA*).

- *Identify data needs* – management planning and resource management rely on relevant data to prioritise the actions that are needed within the protected area.

- *Coordinate threat abatement planning* e.g. control of tilapia in waterways.

Establish an effective workforce or on-ground rangers and volunteers to implement resource management actions. The most urgent need for many is the control of illegal activities such as resource extraction.

Train staff and community to develop the necessary resource management skills, including integration of scientific and traditional knowledge.

5.10 Relationships and awareness

Key suggestions for each component in this theme focussed on improving education and awareness (targeted information and engaging diverse groups of providers), improving relationships with government and commercial interests and providing innovative community welfare programs linked to conservation. Funding remains the central to each of these recommendations:

EDUCATION AND AWARENESS

The need for awareness-raising and education activities was endorsed enthusiastically, and suggestions included developing *information targeted to the needs of specific stakeholders* to ensure that they better understand and respect traditional values and the environment. Participants thought they needed to:

- *Identify the key stakeholder groups*, including customary landowners; management committee members and on-ground staff/rangers; other community members, including illegal settlers and those who illegally extract resources; students; women; courts/magistrates; government members at all levels; tourist operators and hotels; tourists; mining companies and other resource developers.

  YUS CA identified women as a key stakeholder group and stressed the need for gender inclusion – "as a result

of intermarriage the new people need information on conservation relevant to YUS. There needs to be greater engagement of women in the conservation process. We need to complete the gender program, which aims to train staff to have a more gender inclusive approach".

- *Develop specific information products* for each of the priority stakeholder groups. Some examples identified by respondents included materials aimed at *students and youth,* which may require a review or updating of current educational curricula and development of specific products.

  YUS CA said, "We need to develop the primary curriculum in 2017 and related training to implement the junior ranger program".

  Kavakuna Caves WMA reported that they need "help with writing a booklet about the WMA and using it in the school to help inform the younger generation".

  Oya Mada Wa'a WMA believes educational tools are needed. For example, in order to manage the wallaby population "it would be useful to create a cartoon book about the wallaby and what knowledge of it exists, how to manage it etc. It could be a self-guided exercise book ... People need to visualise. The material should be distributed through schools and be in sufficient quantities to enable it to be taken home. Perhaps a video could be developed with 'a call to action' focus".

  Respondents also emphasised the need to blend traditional knowledge and science all educational material. *For community members,* it was suggested that awareness activities could include dissemination of appropriate information by rangers, messages portrayed through through dance and ceremonies, construction of notice boards and regular meetings. *For tourists and visitors* it may include online information, brochures and interpretive signage.

- Identify the most appropriate *medium to deliver the information*. Each stakeholder group may prefer to receive information in a particular way.

  Ndrolowa WMA advocated generating information in digital form to attract visitors (and this could generate income). They also suggested the use of "radio, T shirts and posters".

  Hombareta WMA stressed the need to utilise social media to raise awareness.

- *Engage diverse groups in the delivery of information and support*. Suggestions included the need for *community elders* to be more engaged, especially with young people; include *youth groups and churches* (Garu WMA).

  Libano-Arisai WMA "would like to pay for transport for two men and one woman from Wasana to have international exposure to strengthen environmental scientific education".

Education and awareness raising were seen as important to improve landowners' understanding of the value of their protected area and thus increase their level of support. Participants commented that all levels of government, particularly provincial and local level government, should be involved in education/awareness programs and support.

RELATIONSHIPS WITH STATE AND COMMERCIAL NEIGHBOURS

People had many suggestions about improving relationships with government and industry and felt that the various levels of government need to make more effort to communicate with the landholders. In some places landowners wish to have a higher level of involvement in decision-making.

"There needs to be regular meetings and better dialogue with both government and commercial enterprises." (*Laugum WMA*)

"Consultation between stakeholders is needed. The WMA Committee must be able to present their Management Plan to these organisations." (*Garu WMA*)

"Customary landowners need some input into decisions within the WMA. Their rights need to take precedence over how the WMA is managed. We must involve and consult the customary landowners so that we have no problems, and then they will help us to protect the area." (*Lake Lavu WMA*)

"We would like to establish contact with hotels and other tourist operators to regulate their activities and impacts on the protected area and to encourage people to act sustainably. There should be a benefit-sharing arrangement to provide a return to the customary landowners." (*Nanuk WMA*)

The need for more contact, communication and cooperation from CEPA, provincial governments and local level governments was raised repeatedly at all workshops.

"Misunderstandings have occurred as a result of lack of communication – low literacy rates among landowners make this worse" (*Garu WMA*)

"We are requesting that CEPA respond positively to landowners' requests." (*Namanatabu WMA*)

"Need improved engagement with CEPA i.e. communication, networking and visitation" (*Torricelli Mountain Range CA*)

COMMUNITY WELFARE PROGRAMS

Almost all protected areas are seeking some benefit from their protected area to raise the living standards and welfare of their community. Kokoda Track/IPZ, YUS CA and Torricelli Mountain Range proposed CA provide examples of positive programs that can deliver these benefits. Central to all of these is some form of secure long-term funding, either from governments or NGOs.

"We should go to NGOs to seek assistance, because the community is doing what they can to protect the WMA." (*Lake Lavu WMA*)

5.11 Tourism and recreation

Most protected areas identified tourism potential as a major benefit that could bring income, employment and facilities to their area, and were keen to point out the attractions in their areas. Marine parks could provide opportunities for diving and snorkelling in reef ecosystems. Mountainous areas provide trekking opportunities and opportunities to scale volcanoes and explore cave systems. Many places could provide for biodiversity experiences, particularly bird watching and nature based tourism, and cultural tourism to learn and experience the diverse cultures and history of PNG's people. Many participants also commented that fees within a set structure could be a good source of income for the community and could increase landowners' appreciation for the protected area. However, some protected areas do not envisage or want increased visitor numbers.

"There is no desire to expand on the visitation levels that are currently experienced." (*Torricelli Mountain Range proposed CA*)

Key recommendations included:

MANAGEMENT PLANNING

Management plans were requested by respondents to enable tourism developments to provide sustainable benefits to landholders. Garu WMA believed that the management plan "should consider how to manage tourism, including commercial tourism and benefit sharing arrangements".

VISITOR FACILITIES

The visitor facilities in the protected area should be prioritised once the management plan is completed. Some suggestions include: "… walking tracks [and] rest huts in the wilderness" (Kamiali WMA); "small guesthouses" (Mojirau WMA); "new signs and simple structures" (Mt Kaindi WMA); toilets (Namanatabu WMA); and resource/information centre (e.g. Ndrolowa and Horseshoe Reef WMAs). It was also pointed out that maintenance of the facilities is important to ensure that they continue to provide benefits to the community.

INFRASTRUCTURE SUPPORT

Many protected areas are remote and a failure to improve roads, ports, air transport and communication will make it very difficult for many protected areas to expand their tourism ventures.

At Mt Wilhelm NP, the Kegesuglo airstrip will be re-developed in 2017 and this should improve "accessibility to both local and international tourists".

In Crater Mountain WMA changes in flight schedules and the increased cost of flights has significantly impacted on visitation and without support and integrated planning many remote locations will be unable to take advantage of their tourism potential. This WMA suggests the need to "investigate the re-establishment of flights into the area and the development of ecotourism opportunities and other income generating activities".

IMPROVE SURVEILLANCE

This is needed to protect upgraded equipment and facilities within the protected areas. For example, in Mt Wilhelm NP when sections of the track were improved with rope and wire, the material was taken. Several respondents also suggested the need for security for visitors. (e.g. Nanuk WMA and Varirata NP).

Longhouse traditions are practiced in Yo'obo village, Lake Kutubu WMA and access to such sites would be of high interest to tourists and generate income for the customary landowners. Photo: Ann Peterson

Walking tracks through Varirata National Park provide access for bushwalkers and birdwatchers. Photo: Ann Peterson

EXPAND TOURISM OFFERINGS, PACKAGING AND AWARENESS RAISING

To encourage a more diverse range of tourists, who spend a longer time in the protected areas, there must be improvements in the range of activities offered to tourists.

Tonda WMA indicated "we need to create more activities for the tourists (not only hunting and fishing)".

Klampun WMA indicated the "need to promote tourism activities and products".

Kamiali WMA suggested that, "we need to organise a festival that may bring in more ships at one time".

Kokoda Track/IPZ highlights the need for product diversification and for all tourism operators to offer a high-quality product and experience. Although the main activity is trekking, there is potential for a much more diverse range of products to attract tourists, including shorter treks, day visitation focusing on other activities such as boating and fishing, bird watching and cultural tourism, and also widening the tourism experience to nearby areas. Improved marketing and infrastructure development are also required.

Communities can also improve their guest facilities and services provided to trekkers. Certification is required to ensure that all operators work in a culturally and socially responsible way. Specifically in this protected area it is suggested that the National Museum, in consultation with tour operators, needs to develop protocols for managing the area, including the development of an accreditation scheme for tour operators.

In general, an expansion in tourism products will require improved engagement with tourism operators, hotels and tourism promotion authorities, as well as dissemination of information about the protected areas to encourage visitation.

IMPROVE BENEFIT SHARING ARRANGEMENTS

The need for cooperation and benefit sharing with tourism operators and other agencies is stressed.

Horseshoe Reef WMA stated, "we would like tourists to pay to use our reef … [and] we need a benefit sharing arrangement". This requires a review the fee structure; creation of financial arrangements (e.g. bank accounts) to enable transactions; and identification of a suitable process for collection of fees.

In relation to researchers, Torricelli Mountain Range proposed CA suggested that researchers entering the area should make an upfront payment (e.g. PGK500) and that the community should "have an equitable share of the research fees".

Maza WMA suggested that "commercial fishing fees could be directed to the protected area"

In Baiyer River WMA the "landowners want to form their own touring operators" to ensure that benefits are directed towards their own community.

5.12 Economic benefits

An important message from many protected areas is the need to increase benefits in order to maintain support for conservation:

> "No economic benefits have been derived from the WMA, so other uses are looking more attractive… We need to see some benefits derived from the WMA to maintain support for the WMA". (Libano-Hose WMA)

Most suggestions about economic benefits focused on potential tourism, with landowners thinking further about how to ensure increased visitors and benefit sharing.

> Mt Gahavisuka PP suggested a tourism future based on the need to "create products and establish markets and have a business plan".
>
> "The community needs to initiate projects that give more economic power to the people to minimize their dependence on natural resources e.g. promoting tourism through building eco-tourism facilities." (Klampun WMA)
>
> Iomare WMA highlights the importance of providing "opportunities for the people to be involved so that the people can create ownership and appreciate the benefits the protected area provides".
>
> In Kokoda Track the respondents believe that the villagers should be encouraged to cater fully for the food requirements of the trekkers to earn more income i.e. including locally produced fruit, vegetables, as well as beverages and souvenirs and to expand their accommodation and cultural offerings.

Suggested future community businesses focused on resource extraction include aquaculture, small scale timber milling, plantations (e.g. coffee, cocoa) and expanded fishing ventures. There was also the suggestion that if money is received from protected areas (e.g. national parks), through collection of entry fees, then this money should be re-invested in the protected area.

5.13 Condition of values

Many of the suggestions in relation to improving the protected areas' values have been raised in previous sections. The main ideas included the need to:

- Reassess and inventory values
- Review management actions and develop or revise management plans
- Identify funding to implement programs to improve the values
- Monitor the values
- Continue to address the loss of cultural and traditional values and language
- Increase awareness training to "keep the values intact" (*Mt Gahavisuka PP*).

5.14 Conclusions

Participants showed great willingness to consider how their conditions and that of the protected areas could be improved, though their understanding of the options open to them varied form limited to sophisticated. It is clear that many of the recommendations are based on the need for a greater involvement of government. While most of the customary landowners were keen to be involved and to remain as primary stewards of the protected areas, they recognised that this could not be done without assistance – financial, logistical and technical. Generally, they were seeking assurance that future management would involve true and sustained partnerships, where they were not expected to bear all the responsibility for management.

The next chapter details the results of the assessment of threats to the protected areas and the key recommendations for improved management of these threats.

Landowners discussing recommendations and future options. Photo: Ann Peterson

CHAPTER 6 Threats to PNG's protected areas

6.1 What we did

The threat analysis in the PNG-METT is based on the IUCN standard threat classification (Salafsky *et al.* 2008), adapted for protected areas and for PNG's context. The classification uses two levels of threat (Table 9, next page) to enable analysis at local, national and international levels. We refer to these as level 1 or general threats (e.g. "1. housing and commercial development within a protected area") and level 2 or specific threats (e.g. "1.1 housing and settlement"). The numbering of the level 2 threats also indicates the corresponding level 1 threat: for example 11.7 (sea level rise) and 11.3 (temperature extremes) are sub-categories of Category 11: climate change and severe weather.

We asked respondents to:

- rate the significance of each threat on the list as High, Medium, Low or Not applicable
- describe the nature of the threat
- nominate ways to reduce the impact of the threat, and
- identify the three worst threats affecting their protected area.

A threat is defined as something that causes damage or potential damage to the values of the protected area. Many protected areas in PNG include villages and gardens, and the landowners undertake some hunting and/or fishing. These activities are not necessarily defined as threats, as they may not threaten the protected area values if the population is stable and sustainable practices are applied. However, they become threats if they are illegal or unsustainable, or when they damage any of the values.

6.2 Key findings: most common and severe threats

The most frequently reported level 1 (general) threats were climate change and severe weather, followed closely by biological resource use and invasive species (Figure 26).

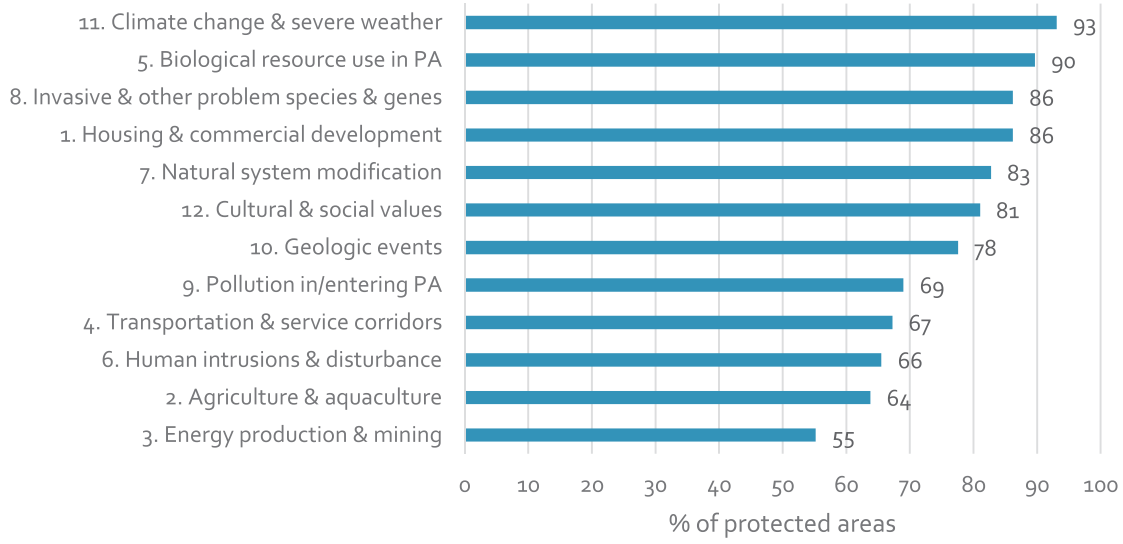


FIGURE 26: Proportion of PNG's protected areas reporting each level 1 (general) threat

The most commonly identified Level 2 (specific) threats were sea level rise, temperature extremes, pest animals, loss of cultural links and population increase (Figure 27).

Respondents were then asked to nominate the 'top three' worst threats for their protected area. The most frequently nominated worst threats were population increase in the protected area community, and housing and settlement. These were followed by various aspects of climate change, including aspects of direct concern to livelihoods such as storms, flooding, temperature extremes, drought, habitat shifting and alteration and sea level rise. Hunting, pest animals, fire and loss of culture are also frequently mentioned as among the worst threats.

TABLE 9: List of general and specific threats used in the assessments

HOUSING AND COMMERCIAL DEVELOPMENT WITHIN A PROTECTED AREA *(THREATS FROM HUMAN SETTLEMENTS OR OTHER NON-AGRICULTURAL LAND USES)*

Housing and settlement

1.1a Population increase in the protected area community

Commercial and industrial areas

1.3 Tourism and recreation infrastructure (e.g. structures)

2. Agriculture and aquaculture within a protected area (*Threats to the protected area from all kinds of farming and grazing, including plantations, forestry and fish-farming)*

2.1 Customary land owner and community gardens and small crops

2.1a Drug cultivation

2.1b Commercial plantations

2.2 Wood and pulp plantations

2.3 Livestock farming and grazing

2.4 Marine and freshwater aquaculture

3. Energy production and mining within a protected area (*Threats from production of non-biological resources)*

3.1 Oil and gas drilling

3.2 Mining and quarrying

3.3 Energy generation

4. Transportation and service corridors within a protected area (*Threats from long narrow transport corridors and the vehicles that use them*)

4.1 Roads and railroads (include road-killed animals)

4.2 Utility and service lines (e.g. electricity cables, telephone lines)

4.3 Shipping lanes

4.4 Flight paths

5. Biological resource use and harm within a protected area (*Threats from use of "wild" biological resources including both deliberate and unintentional harvesting effects; also persecution or control of specific species (note this includes hunting and killing of animals)*

5.1 Hunting, killing, collecting terrestrial animals (including killing of animals due to human/wildlife conflict)

5.2 Gathering terrestrial plants or plant products (non-timber)

5.3a Logging and wood harvesting for local/customary use

5.3b Logging and wood harvesting – commercial logging

5.4a Fishing, killing and harvesting aquatic resources for local/customary use

5.4b Fishing, killing and harvesting aquatic resources for commercial use

6. Human intrusions and disturbance within a protected area *(Threats from human activities that alter, destroy or disturb habitats and species associated with non-consumptive uses of biological resources)*

6.1 Recreational activities and tourism

6.2 War, civil unrest and military exercises

6.3 Research, education and other work-related activities in protected areas

6.4 Activities of the protected area Management Committee (e.g. construction or vehicle use)

6.5 Deliberate vandalism, destructive activities or threats to protected area staff and visitors

7. Changes to natural systems *(Threats from other actions that convert or degrade habitat or change the way the ecosystem functions)*

7.1 Fire and fire suppression (including arson)

7.2 Dams, hydrological modification and water management/use

7.3a Increased fragmentation within protected area

7.3b Isolation from other natural habitat (e.g. deforestation)

7.3c Other 'edge effects' on park values

7.3d Loss of keystone species (e.g. top predators, pollinators etc.)

8. Invasive and other problematic species and genes *(Threats from non-native and native plants, animals, pathogens/microbes or genetic materials that have or are predicted to have harmful effects on biodiversity following introduction, spread and/or increase)*

8.1 Pest plants

8.1a Pest animals

8.1b Diseases such as fungus or viruses that make native plants or animals sick

8.2 Introduced genetic material (e.g. genetically modified organisms)

9. Pollution entering or generated within protected area *(Threats from pollution and/or excess materials or energy from specific or general sources)*

9.1 Household sewage and urban waste water

9.1a Sewage and waste water from protected area facilities

9.2 Industrial, mining and military effluents

9.3 Agricultural and forestry effluents (e.g. excess fertilizers or pesticides)

9.4 Garbage and solid waste

9.5 Air-borne pollutants

9.6 Excess energy (e.g. heat pollution, lights etc.)

10. Geological events *(Geological events may be part of natural disturbance regimes in many ecosystems. However, they can be a threat if a species or habitat is damaged and has lost its resilience and is vulnerable to disturbance. Management capacity to respond to some of these changes may be limited)*

10.1 Volcanoes

10.2 Earthquakes / Tsunamis

10.3 Avalanches / Landslides

10.4 Erosion and siltation / deposition (e.g. shoreline or riverbed changes)

11. Climate change and severe weather *(Threats from long-term climatic changes which may be linked to global warming and other severe climate or weather events outside the natural range of variation)*

11.1 Habitat shifting and alteration

11.2 Droughts

11.3 Temperature extremes

11.4 Storms and flooding

11.5 Coral bleaching

11.6 Intrusion by saltwater

11.7 Sea level rise

Other climate change related (please explain)

12. Specific cultural and social threats

12.1 Loss of cultural links, traditional knowledge and/or management practices

12.2 Natural deterioration of important cultural site values

12.3 Destruction of cultural heritage buildings, gardens, sites etc.

The discussion of threats in this chapter is presented in order of the most commonly nominated level 1 (general) threats (i.e. according to Figure 26). Some threats such as sea level rise, coral bleaching and saltwater intrusion are relevant only to protected areas with marine components. Twenty-five protected areas (43%) include both coastal and/or marine areas.

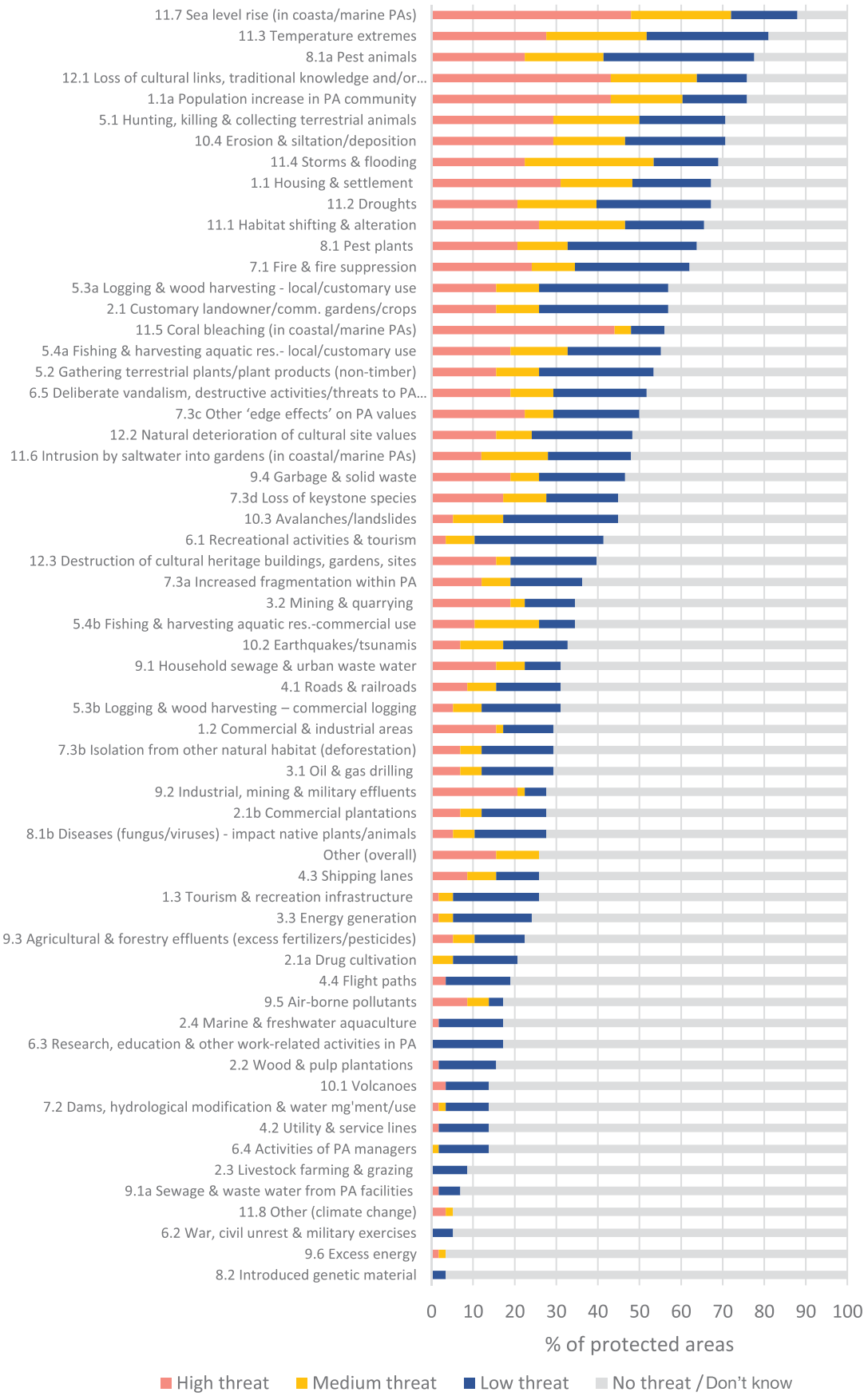


FIGURE 27: Perceived occurrence of 'Level 2' (specific) threats in protected areas in PNG

(n=58; except sea level rise, coral bleaching and saltwater intrusion, where n=25)

6.3 Community perspectives on threats

This section presents in more detail the respondents' scores and comments in relation to the threats experienced within their protected area. All graphs indicate the proportion of protected areas reporting threats at the four levels of severity.

6.3.1 Climate change and severe weather

93% of protected areas experience climate change.

56% consider at least one aspect of climate change as a serious threat.

A comment from Torricelli Mountain Range proposed CA is typical of many protected areas: "Everyone knows that climate change is happening – there are no sceptics in the community". In Pirung WMA, "people are talking about climate change – they are seeing it".

The most frequently reported level 2 threats in this category were temperature extremes, storms and flooding, drought, and sea level rise (Figure 28).

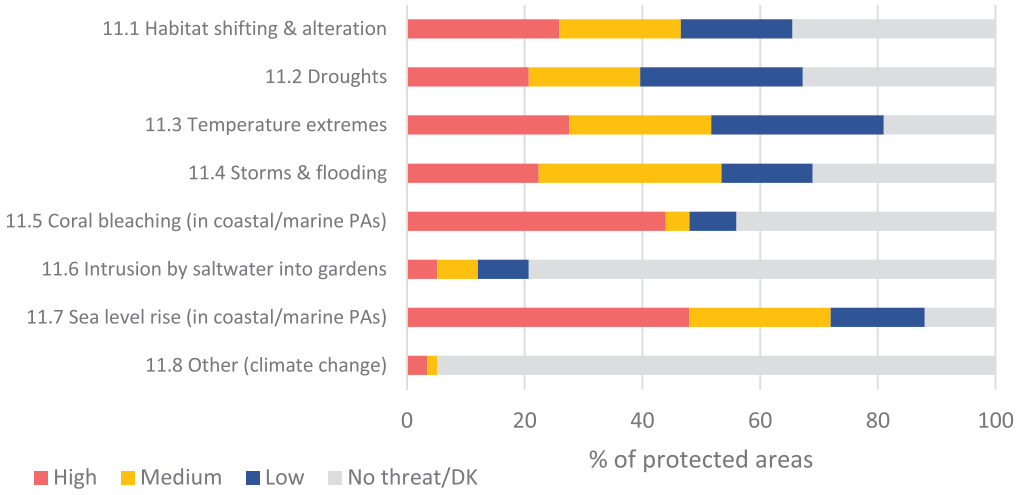


FIGURE 28: Level of threat to protected areas from climate change

(Note: n=58; except for coral bleaching and sea level rise, where n=25)

TEMPERATURE EXTREMES

Frequently cited changes were more hot days and a change in the seasons. Iomare WMA respondents noted the link between climate change and vegetation clearing, stating that "when there was more vegetation, temperature extremes were not felt". Respondents identified that changes in temperature extremes affect the following:

- *Planting regimes*: this threatens food security within many communities

  "This [i.e. temperature extremes] has made it more difficult to predict when to plant crops… Now there is confusion about the seasons. Before, food grew well, but now some crops fail. Also the dry season has changed and we no longer know when it will begin." (Torricelli proposed CA)

  "The coconuts and sago die and also many other plants. This is affecting the whole area. People are starting to question and say 'What next". The coconuts are not going into flower." (Tonda WMA)

- *Distribution of species with climatic thresholds*

  "The days are hotter and the nights are cooler. Before there was ice on the mountain, but this no longer occurs. Rising temperatures are a threat to species with limited climatic thresholds, including those in high elevation and upper montane forests, or restricted range endemics. This may lead to the spatial isolation of some individuals (e.g. on mountain tops) and migration of lowland species upslope. Changes in temperature can also affect planting regimes and ultimately livelihoods." (YUS CA)

- *Distribution of leeches and malaria-transmitting mosquitoes* and pest species such as the borer which attacks kaukau (sweet potato) – these are more common with higher temperatures.

- *Greater incidence of fires* causing loss of vegetation and changes in vegetation types
- *Changes to coastal and lake water temperatures* with impacts on ecosystems.

STORMS AND FLOODING

Respondents cited a greater frequency of storms with higher winds (e.g. "the number of storms is thought to have decreased, but their intensity is greater" [Tabad WMA], and a higher incidence of cyclones, and greater variability:

"There is no pattern to the storms and rain." [Sinub WMA]

"The timing of the wind and rains according to the traditional calendar have changed." [Maza WMA]

"… Before there were seasons, but now everything is out of season. Storms and flooding can come at any time – unexpectedly." [Tonda WMA]

The impacts of storms and flooding cited by respondents included:

- *Wind damage* e.g. loss of trees, damage to buildings.

  In Bagiai WMA "The wind is stronger and it breaks off the mango flowers and we lose the mango crop".

- *Loss of habitat, often due to river erosion as a result of flooding*.

  In Tonda WMA the floods "can remove riparian vegetation which is the roosting site for birds, which then have to find new habitat".

- *Flash flooding as a result of altered rainfall patterns*.

  In Lake Kutubu WMA this can "affect the swamp areas where feeding grounds for wildlife are disturbed".

- *Increased erosion and sedimentation.*

  In Oya Mada Wa'a WMA "water is a big erosive power in this mountain environment"

  In Sawataetae WMA "cyclones caused big damage to the shoreline".

- *Coral reef damage and loss of seagrass*, including from the impacts of increases in sedimentation

  "Storms are destroying the reefs [in Tab Islands WMA] as the waves are much stronger".

- *Changes to water supplies*

- *Changes in lake water temperature.*

  Lake Lavu WMA respondents noted that "because of constant flooding and storms the temperature and the level of the lake is changing. Recently we had nearly a one year drought and the water went dangerously low and this was followed by three months of heavy rain".

- *Loss of crops, especially those planted on river banks.* This can threaten livelihoods.

  In Tonda WMA, "in recent times, people have tried to plant the food gardens and the floods came down. They did this three times, but their crops were destroyed".

DROUGHTS

Droughts are reported to be more frequent with the dry season coming earlier each year (Balek WS).

In YUS CA "the elders talk about a more stable climate … there are more frequent and longer dry periods in the coastal areas".

Reported impacts of drought included:

- *Reduced water availability*.

  In Lake Lavu WMA droughts have impacted severely on the lake environment, including reduced water and threats to the lake's fauna and flora.

  In Crown Island WMA, "drought has a big effect on the water catchment as we rely on well water for our drinking supply."

- *Increased incidence of fire and related impacts on vegetation*, including conversion of forest to grassland.

  In Oya Mada Wa'a WMA, "droughts cause big local changes especially because of fires, which impact on the mountain vegetation and related habitats".

- *Changes in the pattern of vegetation, habitats and species presence*.

  Lake Kutubu WMA noted the loss of fish as a result of the 2015 drought.

  Libano-Hose and Libano-Arisai WMAs both indicated an increase in insect populations.

  In Mt Susu WMA "some species such as mosses and lichens no longer grow here due to drying out of the area".

Owners of some protected areas indicate that they are taking action to reduce the impact of droughts.

In Klampun WMA landowners are engaged in "tree planting, no gardening along rivers and creeks and not using fire to remove vegetation".

HABITAT SHIFTING AND ALTERATION

Issues associated with this threat included:

- *Habitat and ecosystem changes*, including loss of dunes and related beachfront ecosystems in coastal areas subject to sea level rise, larger waves and erosion and subsequent loss of vines which protect the hermit crabs (Pirung WMA); movement of some birds to higher elevations (YUS CA); changes to reef ecosystems and related species; loss of turtle nesting habitat, and loss of seagrass.

  In Nuserang WMA "the structure of the forest is changing – some plants are now found in new areas".

  In Mt Wilhelm PP "… there is less ice than there used to be [and] it is expected that there will be changes in the vegetation".

- *Loss of wildlife*, especially due to loss of habitat.

  In Garu WMA, "habitat has been changed – there used to be fish in a certain area and now they are gone".

  In Lake Lavu WMA, "the cranes used to be abundant. Now there are only a few. The forest is disappearing".

  In Lake Kutubu WMA "some birds are found here that were not common in the past e.g. pelicans. There has been a change in the flight paths of some animals. There are also red ants that were not here before".

SEA LEVEL RISE

The key impacts of sea level rise identified by respondents were:

- *Erosion of coastal areas and inland penetration of sea water,* including disappearance of low lying islands and sand banks.

  In Maza WMA "the king tides go straight through the villages. We have a very flat beach profile and big tides".

- *Loss of settlements requiring resettlement of people in affected areas.*

  In Tonda WMA, "the villages on the coast now flood on the high tides".

  In YUS CA there "is a big change in sea level in the community areas. This may lead to increased coastal erosion and an inward migration of coastal ecosystems and also communities".

- *Loss of nesting sites for turtles and megapodes*
- *Loss of trochus shells*
- *Loss of cultural sites*.

The coastal road to Pokili WMA has been eroded and the coastline has retreated many metres, threatening houses and infrastructure © Ann Peterson

CORAL BLEACHING

Coral bleaching events are often associated with lower tides and higher temperatures. Respondents from Nanuk WMA indicate that the last bleaching event in their area was in about 2010 and it affected about 40% of the reef. In Sinub WMA "most of the reef is bleached". In general, the extent and level of impact of coral bleaching is not monitored in the protected areas. Impacts of coral bleaching identified by respondents included:

- *Loss of corals*.

  In Garu WMA, "a lot of the corals have died".

  In Tabad WMA, "about 60% of the reef has been affected by coral bleaching. In the 1980s the reef was very colourful, but now it is mainly white".

  In Horseshoe Reef WMA up to 30% of the reef is reported to be bleached.
- *Increase in algal growth*
- *Loss of fish species*

INTRUSION BY SALTWATER:

The key impacts are:

- *Habitat alteration*, including loss of turtle nesting sites

  "Saltwater is intruding into the wetlands. It is going into new areas and the saltwater fish are following them. Saltwater now comes six to seven kilometres upstream (in the past it was only two to three kilometres upstream)... The native fish are almost gone (no prawns) and the birds that eat them are gone – this is due to the change in fresh to saltwater and the change in colour of the water. Villages are inundated with salt water." (Tonda WMA)
- *Loss of gardens due to salty water*
- *Loss of drinking water from wells*

  In Horseshoe Reef WMA, "saltwater has entered the village and now the water in the wells is brackish".

OTHER CLIMATE CHANGE EFFECTS

Respondents were given the opportunity to identify any other climate change threat. The most commonly identified threat was the change in seasonal patterns.

"Seasonality, fruiting and harvesting seasons have changed. The seasons are now unpredictable and as a result the community is struggling to manage these changes and to develop a new 'seasonal calendar' to promote a continuing subsistence way of life." (Klampun WMA)

"The traditional calendar for planting and hunting has been affected." (Tavolo WMA).

"There is a possible underestimating of the impact of La Nina on flowering and fruiting for the species that are dependent on these plants. Long rainfall events are having an impact. Seasonality is changing and there is a sense of catastrophe among the community i.e. all the usual signs are not working. We are on the cusp of major changes as a result of climate change." (Oya Mada Wa'a WMA)

6.3.2 Biological resource use and harm within a protected area

90% of protected areas were concerned about this threat. The most commonly identified level 2 threats were hunting/collecting terrestrial animals and fishing/harvesting aquatic resources (Figure 29).

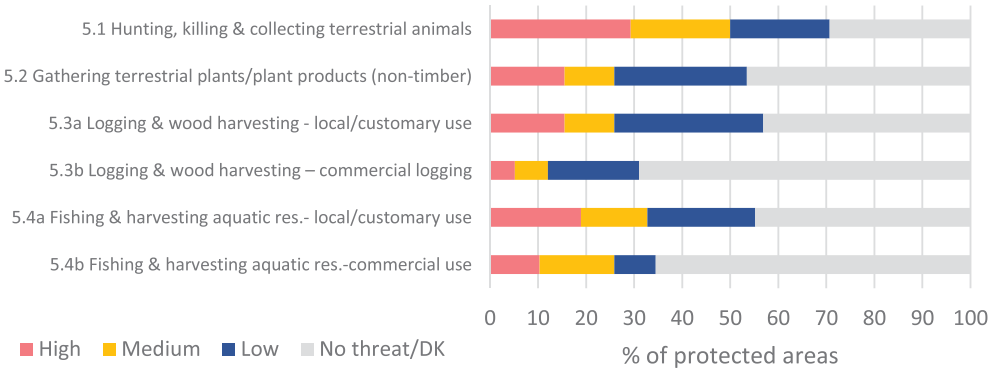


FIGURE 29: Level of threat caused by biological resource use and harm in protected areas

HUNTING, KILLING AND COLLECTING TERRESTRIAL ANIMALS

In general, "people depend on biological resources for subsistence [and] wildlife is important for protein and fat in highland and remote areas" (YUS CA). A wide range of species is hunted, primarily for subsistence purposes, including cuscus, tree kangaroo, cassowary and other birds (native chickens, pigeons), wallaby, bats and reptiles (e.g. snakes and lizards). Eggs are, for ceremonial purposes such as singsings, initiations, marriage, church openings and school closures. This includes birds of paradise, wallaby and turtles. For example collected from megapodes and turtles. Many species are also hunted, or their parts (e.g. feathers) collected.

In Oya Mada Wa'a WMA, wallabies are hunted primarily for ceremonial purposes.

Most participants indicated that there are traditional rules relating to hunting, in terms of where hunting takes place, at what time and in what manner and when traditional rules are working, the threat from hunting is minimal.

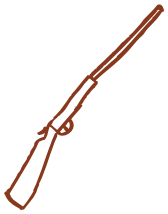
In Klampun WMA "hunting takes place, but is governed by traditional rules and the impact is low. There are allocated places for hunting and restrictions on the number that can be killed".

In Mojirau WMA hunting takes place only at certain times and for specific purposes (e.g. ceremonies).

The landowners of Mt Gahavisuka PP indicated that they have a buffer zone adjacent to the park and it is in the buffer that hunting is permitted, thus reducing the pressure to take animals from the protected area.

"Although hunting is a threat, there are some rules that prohibit hunting in certain areas and at different seasons. Also harvesting is restricted due to the conservation measures and traditional practices." (Crater Mountain WMA)

A change in *hunting technology* is a key reason for the increased impact of hunting.



In Iomare WMA the use of guns has allowed hunters to kill more animals than using bows and arrows.

The increasing human population is noted to result in greater hunting pressure and this is a threat to wildlife (Neiru WMA).

In Tonda WMA, wildlife is poached and sold to merchants in Indonesia.

Where megapodes or turtles are found, the over-harvesting of their eggs is a frequently reported threat.

In Garu WMA, there is over-harvesting of megapode eggs and some are killed.

In Nanuk WMA people collect turtle and megapode eggs and kill the animals.

Many respondents identified '*outsiders' and 'illegal settlers'* or '*vandals'* as the main source of the threat. In some areas such as Tavolo WMA, the protected area contains the only remaining vegetation within the wider area, making it a target for hunting, especially by outsiders.

In Bagiai WMA, "there is always some poaching by outsiders".

Similarly, in Balek WS "outsiders enter the Sanctuary and take wildlife".

In McAdam NP "illegal settlers have no regard for sustainable harvest of wildlife. Many species are targeted (e.g. squirrels, bandicoots, birds), resulting in a loss of wildlife".

In Mt Kaindi WMA "squatters constantly encroach inside the protected area and illegally hunt animals".

In Nanuk WMA "hunting and collecting is mainly done by visitors to the island. People from mining vessels often stay overnight and are known to kill the local pigeons".

Lake Kutubu WMA respondents noted the high impact of hunting, especially of birds by people travelling along the roads.

Traditional costumes are made from a range of biological materials. Cultural ceremonies are important for passing on traditions © Ann Peterson

Lack of effective management (e.g. plans and rangers) and enforcement are key factors reported in the threat of over-hunting.

> In Loroko NP, people have begun to enter the national park and hunt animals, as well as take timber and other resources, and
>
> In Nuserang WMA, because there is no patrolling, people enter the WMA and hunt a range of wildlife.
>
> In Baiyer River WS, lack of fencing reduces enforcement capacity and control hunting.

The *main impacts of hunting* were reported to be a reduction in species numbers and elimination of some species from the protected area.

> Few animals remain in Loroko NP as "they have been depleted by hunting – there are only a few pigs for hunting and some birds and cassowaries".

A *shift in the location of species* is also observed in some areas.

> In Oya Mada Wa'a WMA the "Dorcopsis wallabies are moving upslope and there has been a decrease in the breeding population".

There is almost no monitoring of species abundance or distribution and hence it is difficult to determine the precise impact of hunting on PNG's wildlife. However, as reported by the participants in this assessment, the impact is considered to be high, with the loss and/or reduction in several species from within protected areas.

In Torricelli Mountain Range proposed CA, alternative food sources are being developed to reduce pressure on the Conservation Area's wildlife:

> "We are trying to control hunting and educate the population (through family planning) to reduce the impact on animal resources and we have areas were hunting is not permitted. Several farming projects have been implemented to provide alternative sources of protein (e.g. rabbits, chicken, pig and fish) and thus reduce the need to hunt native animals. This is accompanied by appropriate training and assistance."

FISHING, KILLING AND HARVESTING AQUATIC RESOURCES FOR LOCAL/CUSTOMARY USE

A wide diversity of species is taken, including fish, prawns, octopus, beche de mer, shellfish (clams, trochus and cowrie), turtles, crocodiles and coral for lime. Most coastal/marine protected areas reported a decline in many species. The threat is both from the customary landowners and 'outsiders' illegally taking the resource.

> In Laugum WMA, "outsiders enter the WMA at night and steal fish".
>
> In Maza WMA the "influx of people from the Fly River, where villages have been destroyed by Ok Tedi" is resulting in poaching of their aquatic resources.

A common view was that expressed by Klampun WMA, where "gathering takes place on an 'enough is enough' basis and the customary landowners do not believe this is causing any threats". Similarly, the landowners from Crown Island WMA state that there is a belief that there will always be an abundance. However, they also conclude that this belief in abundance may result in the loss of their marine resources in the future.

Fish frequently provide the main *protein source* for the community and there is concern that increasing human populations will place greater pressure on fish and shell species.

> In Tabad WMA, "due to population increase in the area (Madang Lagoon), many people come from the mainland to take resources from the WMA".

Traditional fishing is undertaken in Kimbe Bay © Ann Peterson

As there is little or no monitoring of aquatic species it is difficult to know the impact of local subsistence use.

Some WMA's have *traditional rules* to manage their fisheries.

In Klampun WMA, torch diving and fishing nets are limited and controlled under the by-laws of the WMA.

However, for many protected areas these rules have lapsed. Many reported the use of *harmful fishing methods*, including poison rope, a vine that is used to kill fish, but also kills many other species, including coral. In Horseshoe Reef WMA both the customary landowners and other communities take fish and use harmful methods including dynamite, small nets and night fishing [and] this has resulted in the decline of several species. However, it is frequently noted that without effective enforcement, it is difficult to control the take of aquatic resources, both by their own people and outsiders.

"People enter the WMA at night – to night dive. If we had rangers we could control this, but there are no people to enforce the laws. There is spear fishing and netting that take place illegally." (Sinub WMA)

"We find it difficult to punish the offenders, although there were processes in place after gazettal when one of the NGOs was funding some level of enforcement. The laws and penalties are set by the Local Level Government at the ward level (through the Organic Law). The village courts also set limits on the amount of penalties that can be applied (i.e. maximum of K1000). It would be beneficial if the fines collected were sufficiently high to act as a deterrent and if the fines collected were equitably distributed to the WMA to assist them with management." (Tabad WMA)

Pest species (Section 6.3.3) are present in several terrestrial waterways and this has caused the loss of native species. However, in Lake Lavu the tilapia are an important source of food for the people.

"Other communities on the coast have lost their fish and now depend on tilapia from our lake. … the community want to ensure a plentiful supply of tilapia to bring in an income." (Lake Lavu WMA)

FISHING, KILLING AND HARVESTING AQUATIC RESOURCES FOR COMMERCIAL USE

Klampun WMA's community has taken a firm stand against commercial fishing within its waters. However, many communities reported the sale of aquatic resources to supplement their subsistence livelihoods. Species traded include fish, sea cucumber, trochus shells, turtles and prawns.

Maza WMA reported that "turtles are taken to Port Moresby for sale".

In Neiru WMA "people are harvesting a lot of fish now for the Asian market (local people sell to the traders). They use big nets and collect a lot of fish".

In Tonda WMA "outsiders from Indonesia take our fish – they come in with large nets that take a diverse array of species".

The workshop participants from Madang Lagoon believe that the commercial fishing in surrounding waters may be having an impact on fish stocks within the WMA:"There are impacts from both local fishing and the use of big nets from the tuna company, with boats coming close to the island." (Tab Island WMA)

There were also reports of illegal commercial taking of fish (such as by the tuna cannery near Bagiai WMA).

Kamiali WMA experiences the destruction of their reefs by outsiders who take coral material for sale for lime production, and this has a very significant impact on the reef and associated marine life.

LOGGING AND WOOD HARVESTING FOR LOCAL AND CUSTOMARY USE

'Outsiders' were identified as the main cause of logging and wood harvesting.

In Tavolo the WMA is used by neighbouring communities, who take logs from the forest.

In Pokili WMA the settlers from Lavege village are said to have a walk-about saw mill within the WMA.

The main use of timber is for houses, firewood, garden fencing, canoes and carvings. In many protected areas this extraction occurs close to the existing villages and with increasing populations, this threat is viewed as problematic into the future. The impacts identified are loss of vegetation, specific timbers, and habitat for a range of species and erosion and sedimentation.

To counter this threat, Klampun WMA reduced the occurrence of logging through its housing scheme initiative: "Selected mature trees located in the cash crop and gardening zones are harvested to build community houses ... The aim is to reduce the continuous harvesting of forest regrowth in the cash crop and gardening zones (which is resulting in the transition to grassland). The community housing scheme means that the committee allocates set trees of the right size to be harvested."

Collecting palm fronds from Tabad Island. © Ann Peterson

GATHERING TERRESTRIAL PLANTS OR PLANT PRODUCTS (NON-TIMBER)

Again, the main cause was reported to be 'outsiders' and squatters, although customary landowners are also involved. The main impact is unsustainable use of limited resources, including thatching, grasses, palms and canes for houses, pandanus for flooring, kunai grass for ceremonial costumes, trees/branches for firewood, eaglewood , medicinal plants, galip nut, breadfruit and mango, orchids and bamboo.

> In Hombareta, "the WMA is the only place that has cane and people enter the WMA to harvest cane and this destroys Queen Alexandra birdwing butterfly habitat and vines".
>
> In Lake Kutubu WMA orchids are said to be shipped out by planes, without the approval of the landowners.

COMMERCIAL LOGGING

The main impacts occur when logging operations are adjacent to protected areas or within their upstream catchments. Keeping commercial logging out of WMAs is a key objective for many protected areas:

> "Logging represents an ongoing challenge to achieving long-term conservation outcomes, especially when there is political pressure which favours logging." (Torricelli Mountain Range CA)

Commercial logging is a high threat in McAdam NP and Mojirau WMA, where logs have been taken along an illegal logging road and the customary landowners are seeking compensation from the logging company responsible. Illegal settlers and outsiders are a key cause of the take of timber for commercial purposes. In Loroko NP there is a walk-about sawmill which extracts timber for sale.

6.3.3 Invasive and other problematic species and genes

86% of the protected areas recognised invasive species as a threat (Figure 26). The main level 2 threats are pest animals and pest plants (Figure 30).

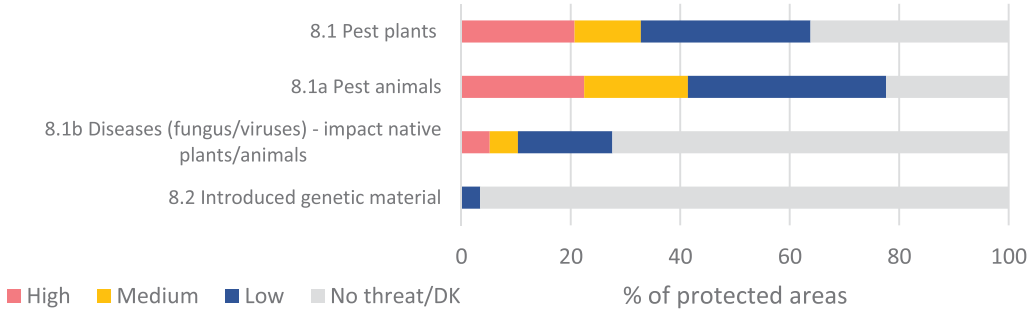


FIGURE 30: Level of threat caused by invasive and other problematic species and genes

PEST ANIMALS

Pest animals were identified by 78% of protected areas as a threat, but pest animals did not rank highly when respondents were asked to identify their 'top three' threats. Some of the pest animals identified include tilapia, carp, cane toads, giant Japanese/African snails, willy wagtail (feed on butterfly caterpillars), rusa deer (pull bark off trees), stinger bees, wild pigs and wild dogs (kill snakes).

Tilapia, carp and other non-native fish species are a serious threat in PNG (Smith *et al.* 2016) and have noticeable impacts in a number of protected areas (e.g. Lake Kutubu, Libano-Arisai, Libano-Hose, Neiru and Lake Lavu WMAs). They have caused the decline and sometimes elimination of native fish species.

In Libano-Arisai the respondents reported "we are catching plenty of tilapia and not so many native fish".

Many reported that the introduction of these fish species was undertaken by government agencies aiming to increase protein sources within communities:

"The introduction of tilapia and carp through the Whagi River is a major concern. This has been done through the Department of Primary Industry and Department of Agriculture and Livestock under the food security program." (Crater Mountain WMA)

Respondents from Hunstein WMA identified the pacu (pirhana type fish) as a major threat, particularly to the seagrass in the lake.

In Tonda WMA "there is grazing pressure from the rusa deer which enter the wetlands… and this can result in seed dispersal and overgrowth of Melaleuca". In this same WMA "anabass (climbing perch) fish have killed the snakes [and] many species of snakes have disappeared".

Pigs are not often thought of as a threat due to their importance within PNG communities for food and in ceremonies. However, they are a threat in some protected areas. Wild dogs are a threat in some protected areas, with their main reported impact being the take of megapode eggs and killing of young animals such as wallabies. Cats were mentioned as a threat in three protected areas, but in general were not viewed as a threat to native wildlife, but rather as a benefit as they eat rats. In marine protected areas, crown of thorns is a key threat.

In Laugum WMA crown of thorns starfish is present on the reef and causing destruction of the reefs.

With a lack of research and monitoring on these introduced species, it is difficult to determine their impacts.

Klampun WMA noted, "there is an urgent need to study and ascertain the facts on how pest animals affect the biodiversity of the WMA".

There are few resources, little to no assistance and no coordinated approach to help eliminate or minimise the impact of many pest species.

PEST PLANTS

Plant invasions are the result of the escape of garden plants, introductions as a result of logging and plantation cropping, forest clearing, forest fires and seed dispersal by birds. Pest plants are found most commonly near settlements and along roads. Often, participants could not name the pest plant in English and used descriptive terms. The main pest plants identified include:

- *Piper adancum*, which participants indicated is spread by flying foxes and cuscus. This species can invade, dominate and cover plants, especially in regenerating forest and fallow areas, and is likely to have a high impact on both agricultural production and biodiversity (Hartemink 2010). However, villagers have found a number of uses for it including as a source of firewood (Hartemink 2010; Siges *et al.* 2005). For example, in Kamiali WMA piper tree is used as a medicinal plant – people cut the tree and the roots fertilise the soil.
- giant sensitive plant *Mimosa pigra,* sensitive plant *Mimosa pudica* and nila grass *Miimosa diplotricha* all invade roadsides and cleared or fallow areas
- water lilies (Lake Lavu WMA) – they are "covering the lake and sometimes the landowners cannot get access for fishing. If the water level is low the water lilies can rot and cause a health problem".
- others such as garden plants, *Glarisida*, a legume plant used on cocoa plantations, a strangling vine with purple flowers, water hyacinth, bamboo, elephant grass and cow grass, mustard plant, bakuk rope [poison rope], Taka Diwai, algae growing on reefs, and 'Independence vine', which in YUS CA "covers the vegetation. People are trying to remove it by pulling it out and then putting it on a raft to dry out. It is believed to be a significant threat."

Piper species occur along many roads in Lake Kutubu WMA © Ann Peterson

DISEASES

In Pokili WMA, there are sick banana and mango trees and cocoa plants (Kokopo borer).

In McAdam NP there is a fungus in the soil, and in Sawataetae WMA breadfruit has a fungal disease.

Pathogenic diseases have been reported in Lake Kutubu WMA and are affecting fish stocks. Smith *et al*. (2015) indicate that tilapia may be the vectors in the spread of epizootic ulcerative syndrome in the lake.

Similar problems are identified by Libano-Hose and Libano-Arisai WMAs, where a fish disease was reported in the main stream.

6.3.4 Housing and commercial development within a protected area

86% of protected areas recognised housing and development as a threat to the protected areas (Figure 26). In the PNG METT assessment, the Level 2 threat of 'population increase within the protected area' was added to the threat list, as most protected areas have customary landowners living within or close to the protected area, and this is the most serious level 2 threat in this group (Figure 31). Population increase is recognised widely as a major problem in PNG, where the average annual population increase from 2010 to 2015 was 2.1% (United Nations Development Programme 2017).

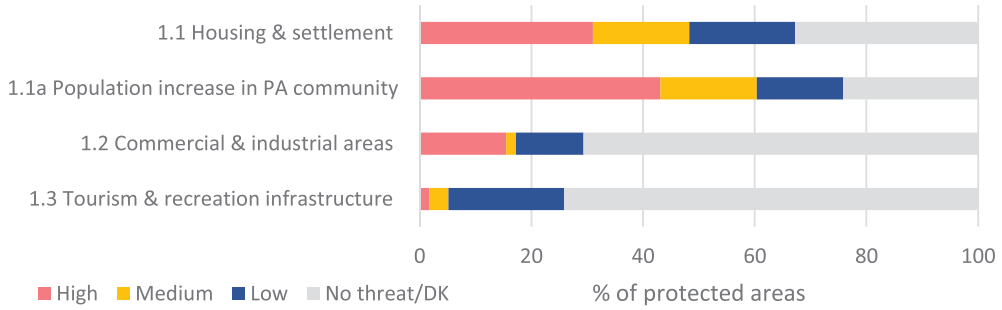


FIGURE 31: Level of threat caused by housing and commercial development within protected areas

POPULATION INCREASE, HOUSING AND SETTLEMENT

Population increase and the related expansion of settlements are occurring in most protected areas. An increase in settlement in regions surrounding the protected areas was also identified as a significant threat.

"(There is)…more settlement on the mainland and more people (from other clans) and they break the laws of the WMA e.g. illegal fishing, diving, netting and causing damage to the WMA. We have no rangers in place to stop this illegal entry. This mainly happens at night." (*Sinub WMA*)

Key issues raised as a result of expanding populations were the increased need for resources for subsistence purposes, including timber to build houses and for firewood, removal of other plant products primarily for food and medicines, the expansion of gardens for both subsistence and cash cropping, and greater hunting and fishing pressure. The consequences of population increase are more serious in small protected areas.

"Most people have from four to 10 children and the increasing numbers are a threat to the marine resources. For example there is overfishing. …This [housing and settlement] is a high threat because population is increasing and as a result the bush needs to be cleared for new houses." (*Laugum WMA*)

"Population increase places greater pressure on the WMA's resources (e.g. more land for gardens, timber to build houses and land for more settlements) and this creates social disorder and unrest. Building materials for housing purposes are harvested from secondary regrowth forest (e.g. small trees re-growing in the gardening zone) and are in high demand and this is turning the secondary forest into grassland. With the present population boom, this harvesting of regrowth is becoming a very serious threat to the cash cropping and gardening zones and to the regeneration of forest." (*Klampun WMA*).

Illegal settlers in protected areas can cause habitat clearing, Lake Kutubu WMA © Ann Peterson

Settlers on Mazzaz Island within Tab WMA, Madang Lagoon, impact on the island's vegetation and marine resources © Ann Peterson

Illegal settlement was identified in a number of protected areas as a significant issue:

Lake Kutubu WMA – the development of oil and gas reserves has resulted in an "influx of people looking for jobs [and] these people are setting up illegal squatter settlements".

Lihir Island PA – outsiders are seeking work in the mine and encroach on protected areas.

McAdam NP – "illegal settlers are constructing permanent structures" (in this case the illegal settlers were attracted to the area to mine for gold and other metals).

Moitaka WS (within Port Moresby) – settlers are migrating to the WS and "many people trespass and have gardens in the Sanctuary. There are several conflicts between retaining the biodiversity and alternative developments".

Garu WMA – "settlers from nearby villages now are trying to settle in the buffer zone. This is based on traditional stories that their ancestors used to hunt and gather food in this area".

Pokili WMA – settlers have created Lavege Village within the WMA and do not always respect the traditional customs of the landowners. "People came in from elsewhere and settled there. They have houses in the WMA – make gardens, cut trees and have greater access to harvesting of megapode eggs and they do not harvest on harvesting days."

Loroko NP – experiencing the cumulative and increasing impacts of illegal settlement. "People have begun to return to the park. There are now five families living in the protected area and they have cut forest for gardens and houses, and fire has destroyed part of the forest. Now other people are using chain saws to cut the forest to build houses. Now there is a saw mill".

Tonda WMA reported: "In the time of our fathers people lived in a village, but now people are moving out of the villages to create their own settlements throughout the WMA (i.e. bush camps) and this is a problem especially with the expansion of gardens and hunting. This also creates disputes over land ownership. The government is not assisting us in solving these problems. Poachers (West Papuans and Indonesians) are also coming in. There are refugees who live here and they take our resources and sell them in Indonesia. River fishing occurs right on the border – they come in with big nets and catch the large female fish. This will impact on our tourism income, as this is the area where the main tourist lodge is located and where tourists come to do game fishing. The Saratoga fish have been taken out of the area. This poaching causes a lot of disputes in the communities. The poachers also hunt rusa deer and some populations have been lost in the border areas. They also go in with dogs to hunt. The construction of houses also causes destruction of the forest and the expansion of gardens into the forest results in loss of forest".

Several small islands in Madang Lagoon, e.g. on Tab Islands WMA, migrants have settled on the islands of Mazzaz and Paeowai and this is increasing the pressure on the marine and island resources (e.g. cutting trees).

Some WMAs recognise the threats and are beginning to implement programs to reverse these trends.

> "Because of the population increase, the 13 clans are engaged in awareness raising about the implications of population growth and its future consequences. Now the people are more responsible and there is better resource use planning and management to avoid future problems." (*Klampun WMA*)

> "The 'Meri stap' group and church groups try to educate young people. Traditional practices of birth control are not common, although we still have the 'boy house'. People are beginning to see the impact of population on the use of resources and the expense associated with having many children. So people are starting to think about reducing population." (*Sinub WMA*)

> "We need to secure funding to maintain family planning and control the growth rate of the population." (*Torricelli Mountain Range proposed CA*)

Some protected areas indicated that there are no programs on family planning and that the church had destroyed the traditional methods of family planning.

COMMERCIAL AND INDUSTRIAL AREAS

The main developments include hydro-electric power plants and associated industrial areas. Local markets are seen as a threat, often resulting in increased rubbish and waste disposal.

TOURISM AND RECREATIONAL INFRASTRUCTURE

In general, tourism and recreation infrastructure has deteriorated over time due to lack of management and resources and there are currently few tourists visiting PNG's protected areas.

> In Baiyer River WS tourism facilities have fallen into disrepair and in Crater Mountain WMA, the lodges and facilities are sparsely distributed and most are run down.

> Along the Kokoda Track, expanded tourism facilities (e.g. guest houses) may place pressure on resource extraction along the Track.

> However, in Zo-oimaga WMA tourism infrastructure is seen as an opportunity – "we hope we have this threat in the future".

6.3.5 Changes to natural systems

83% of protected areas reported changes to natural systems. The main level 2 threats include fire, edge effects and loss of keystone species (Figure 32).

FIRE AND FIRE SUPPRESSION

The main causes of fire are related to natural events such as lightning and drought (often associated with El Nino events); fire escapes, particularly from gardens; and deliberate use of fire to clear an area for gardens, to improve ease of access within the landscape, to facilitate hunting, and as a result of vandalism.

> In Varirata NP fires has become "a habit in the dry season, as the people like to see the fire and the smoke".

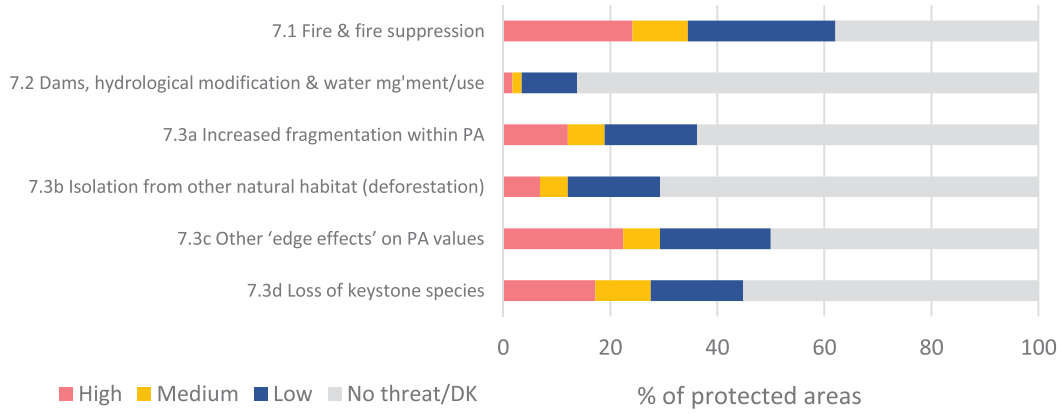


FIGURE 32: Level of threat caused by changes to natural systems within protected areas

Fires are also reported to often enter the protected area from external areas. The key impacts identified are:

- Habitat alteration, including changes in species composition.

  Fire changes the forest type and can cause the loss of pine species, e.g. Mt Kaindi WMA and Jimi Valley NP.

  In Tonda WMA fire is a threat to the wetlands. Here it is said that poachers: "…light fires and these escape into wetlands. Fire has resulted in loss of crocodile nests and affected other species. This has destroyed the vegetation e.g. it has destroyed the floating grass mats where people would go to obtain fresh water and seafood)." (Tonda WMA)

  "There is a problem with fire. Fire is used to hunt wallaby, but sometimes the fire escapes and enters the WMA. This threatens the wildlife and can change the forest into grassland. Fires are more common in the dry season from July." (Zo-oimaga WMA)

  There was also a report of increased habitat fragmentation and loss of wildlife, e.g. Balek WS commented that wallabies have no place to hide in a fire.

  Mt Wilhelm NP reported that a fire in 1997 that burned the vegetation and it took a long time to recover.

- Conversion of fire-damaged areas into gardens

  Loroko NP and Ranba WMA reported that the fires are often followed by regular burning and clearing for gardens, and this subsequently result in grassland ecosystems on the hills.

  Fire prevention methods are limited and there are few resources to implement fire prevention strategies.

  For example, in Balek WS, "the landowners carry buckets of water into the forest to try and stop the fire".

EDGE EFFECTS

Edge effects include incompatible developments on the edges of protected areas such, as gardens, settlement, plantations, mining and industrial development.

In Lake Kutubu WMA "mining has resulted in chemicals entering the lake".

In Pirung WMA "there are impacts from mine waste and the wharf facilities".

In Hunstein WMA "… mining from Frieda mine can affect the water flowing into the lake".

Tonda WMA borders Indonesia and this is the point of entry of poachers and refugees. There is also agriculture along this boundary and "it uses a lot of fertilisers and pesticides and this may affect the fish in our wetland".

In Garu WMA, "palm oil seeds have brought in rats and they are now breeding in the area. There is also pollution from fertilisers".

Ballast water from ships is seen as an edge effect in Madang Lagoon (e.g. Tab Islands WMA).

LOSS OF KEYSTONE SPECIES

The main reported causes of the loss of keystone species are hunting, and in particular more modern methods of hunting such as guns; loss of habitat; population increase; rising demand for traditional costumes for ceremonies; and introduced species (such as tilapia and piper tree).

"The changing hunting methods are a major threat to the wildlife populations, especially the cassowaries." (Crater Mountain WMA)

"In the olden days – from the 1960s there were big fish coming into the village. Now this is all gone. The dugongs are gone. The sharks and crocodiles are gone." (Horseshoe Reef WMA)

Keystone species that have been lost include cassowary (Balek, Crater Mountain, Garu, Nuserang and Zo-oimaga WMAs), agile wallaby (Balek WS), crocodile (Hunstein, Horseshoe Reef and Tonda WMAs), birds of paradise (Iomare WMA), native fresh water trout (Lake Lavu WMA), corals (Laugum WMA), fish species, eels and mud crabs (Laugum WMA), birds such as doves and parrots (Moitaka WS) and the guria pigeon (Balek WS), long beaked echidna (Varirata NP) and orchids (Varirata NP). In all instances, the respondents indicate that it was difficult to know the status of species as there has been no recent research or monitoring within protected areas.

The guria pigeon has been lost from Balek WS © Ann Peterson

INCREASED FRAGMENTATION WITHIN THE PROTECTED AREA

This has resulted from the expansion of subsistence gardens within the protected area, rising populations (pressure for new housing and gardens) and roads, primarily as a result of logging and plantation expansion.

ISOLATION FROM NATURAL HABITAT

Protected areas experiencing isolation from other natural areas are in the main surrounded by cleared areas, settlements and gardens, and plantations.

> "The Sanctuary is surrounded by urban and industrial development and roads and is a small patch of semi-natural bushland in an urban environment" (Moitaka WS);
>
> "The WMA is isolated because of company activities on logging and oil palm surrounding the protected area." (Tavolo WMA)

DAMS, HYDROLOGICAL MODIFICATION AND WATER MANAGEMENT USE

This threat relates primarily to the potential construction of hydro-electric plants within nearby catchments.

6.3.6 Loss of cultural and social values

81% of protected areas recognised cultural links and sites as a threat, with the most common level 2 threat being loss of cultural links and traditional knowledge (Figure 33). Customary landowners have close connections with their land and sea environments. Their traditions, culture and language are passed from one generation to the next.

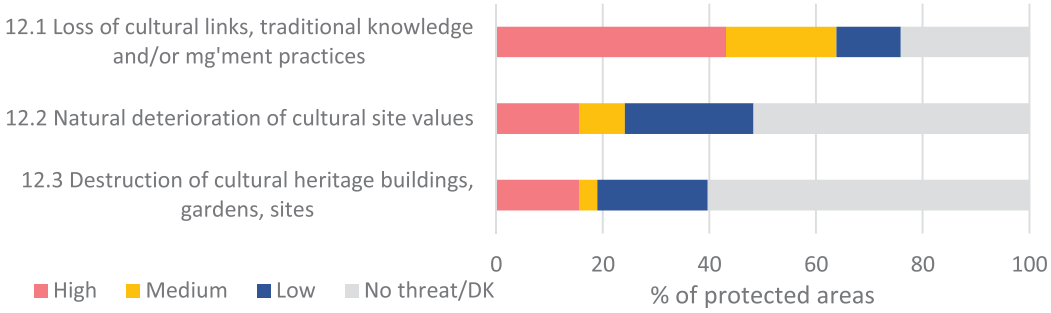


FIGURE 33: Level of threat relating to loss of culture within protected areas

LOSS OF CULTURE

This threat included the loss of language, understanding of the environment, traditional skills, ceremonies and practices, and lack of respect for elders. Along with population increase, this was the most commonly rated level 2 threat.

- the *loss of Tok Place* (local language) is regretted by many landowners, with these languages being replaced or blended with Tok Pisin and sometimes English. This loss of language is due partly to marriage to outsiders, with the parents of such marriages tending to speak Tok Pisin in the home, rather than the local language.

  In Laugum WMA people spoke of "a loss of knowledge of the names of fish, corals and other species ... Tok Pisin is not good enough to communicate these values".

  In Horseshoe Reef WMA there has been some loss in Tok Place in relation to the marine species.

- *loss of understanding of the natural world* is exemplified in Garu WMA by a "fading observance of the values of natural resources … and lack of cooperation by village people".

- *loss of cultural practices* related to accessing and harvesting resources.

  In Pokili WMA there are traditional rules that prohibit the use of spades and metal plates for collecting megapode eggs. However, this tradition is being lost and "…now people harvest anytime – the old practices are gone. Money is driving the change away from traditional practices".

  In Varirata NP there is a loss of hunting skills and the skills required to build traditional tree houses.

  Horseshoe Reef WMA reported "we have lost many of our traditions including our fishing methods, especially the taboo times for fishing … and [there is] some decline in customary sports of canoe racing".

In Tonda WMA cultural practices and ceremonies associated with the yam season are dying out and this, as well as the loss of other traditions "makes us sad".

- *loss of cultural dress and singsings* (traditional festivals) and a decreasing interest shown by young people in maintaining traditional ways.

  Interestingly, in Jimi Valley NP the lack of tourism is implicated in the "decline in training and practice in traditional dances and songs and dressing up traditionally. The tourists used to provide an incentive for regular practice of our dances and other customs".

  In Torricelli Mountain Range proposed CA, "traditional communication using the garamut (drum) is disappearing and traditional skills (from our ancestors) have been lost".

  In Bagiai WMA "the traditional barter system is disappearing. This was important for creating relationships".

- *lack of respect for taboo places*

  In Varirata NP "there is a taboo site near the lake. Visitors now go to this site and they are not supposed to. The site is thus devalued".

- *lack of respect for elders*, as well as a *failure to pass on traditional knowledge*.

  In Lake Lavu WMA "there is a legend about the lake, which relates to creation and our origin. For us in this generation we have no idea about this".

The children are the future and it is vital that traditions and culture are passed on to future generations © Ann Peterson

- *lack of effective engagement of the elders,* such as in Hunstein WMA where "children are not being taught traditional dances, songs and stories by the elders". Some respondents believe that when traditional management is not strong, the cultural values start to decline (Ndrolowa WMA). However, in contrast in Kamiali WMA, "the elders and parents are teaching their children, but the children are affected by western culture". Several protected areas blamed western influences and technology such as mobile phones and the internet.

  However in Lihir Island PA respondents indicate that "social change has come as a result of mining [and] many traditional cultural practices are not practiced or written down and with the passing of older generations, the culture is being lost".

  "Our education system and the churches that do not support many traditional practices. There is the influence of drugs and alcohol that take away the traditional customs of young people…. The development process is not working." (Mojirau WMA)

  "This is occurring as a result of formal education (children going to school and spending less time learning their traditions and skills) and Christianisation. There is a loss of social capital." (Oya Mada Wa'a WMA)

Several respondents did indicate some positive cultural outcomes.

In Zo-oimaga WMA it is reported that cultural practices about "sharing and giving, bride price, how to garden …. are still strong. Tok Place is strong".

In YUS CA: "Our culture remains strong. Talks about our culture have been introduced into the elementary school – people come into the school and talk about the old ways and practices. Some of the information from the research undertaken in YUS is brought back into the schools to raise awareness. We promote our culture. Language remains strong. Culture and the surrounding environment is important. The new generation can learn their culture because the environment is conserved. It is very important to have YUS CA to protect our culture".

DETERIORATION OF CULTURAL SITES IS A PROBLEM IN AREAS AFFECTED BY:

- sea level rise and erosion in coastal areas e.g. loss of gravesites and cemetery and sacred sites. Maza WMA reported their traditional burial grounds are now covered by sea
- vegetation clearing and subsequent erosion and landslides
- pest species
- drought and a greater incidence of fires
- increasing population numbers including migration from other areas, combined with less respect for special cultural sites (Neiru WMA).

In McAdam NP "illegal settlers show no regard for the spiritual places of the customary landowners.

In Tab Islands WMA, "new settlers are destroying some of our cultural sites".

- lack of maintenance, e.g. in Namanatabu NR "the historic relics are unprotected in the open air [and] many are rusting away".

THE DESTRUCTION OF CULTURAL HERITAGE BUILDINGS, GARDENS AND SITES

Respondents from Paga Hill SR described the destruction of important WWII relics e.g. bunkers, gun emplacements and tunnels.

In Lake Kutubu WMA "cultural sites have been affected by mining activities, including the buildings, roads and pipelines".

Neiru WMA reported "an increasing collapse in recognising the importance of our heritage".

6.3.7 Geological events

78% of protected areas considered geological events as a threat. PNG is subject to earthquakes and tsunamis, and due to the extremely steep topography in its mountainous regions, erosion and siltation are also serious issues. The main level 2 threat is erosion and siltation (Figure 34).

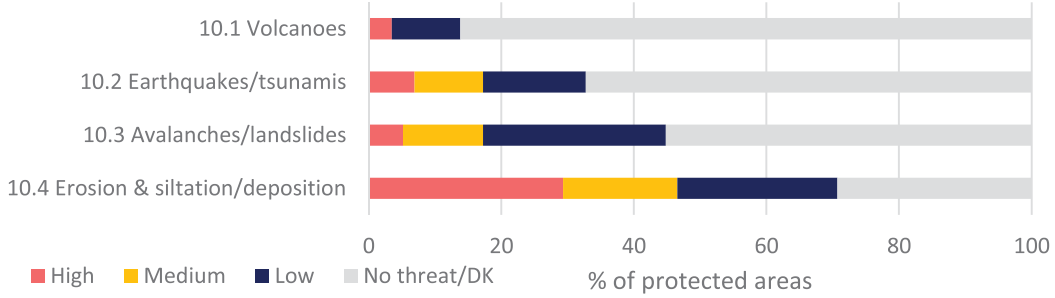


FIGURE 34: Level of threat caused by geologic events within protected areas

EROSION AND SILTATION

Some of the causes were related to clearing of vegetation for gardening, settlement, logging, plantation crops and mining.

"High levels of erosion are experienced … the threat is the effects spread from the neighbouring logging and palm oil development communities. Sediment is entering from the Setway River … and impacts on waterways and marine resources." (Klampun WMA)

"There is siltation from the rivers and some islands are disappearing. The main cause is from logging on the mainland." (Laugum WMA)

There is also loss of vegetation following fire. The impacts are high after heavy rains, when there is often higher levels of erosion.

The main identified impacts of erosion and siltation include:

- *Shoreline retreat and loss of coastal vegetation*

  "The island is subject to ongoing erosion. About 20m of the island has been lost on the eastern side. This is due to changing currents and higher sea levels as a result of climate change. The currents are changing and cause the movement of the sand. We have noticed a change in the currents and the wind direction – coming more from the southeast/northeast but this varies according to the season. A small 'haus win' (outdoor area) has been lost due to erosion." (Tabad WMA)

- *River bank retreat and loss of riparian vegetation*.

  In Libano-Arisai WMA there is serious erosion on the rivers and this has impacted on sago production, even "reducing the size of the sago plant itself".

- *Increased sediment load* in major rivers and deposition in coastal areas.

YUS CA reported "there is river erosion (e.g. from the Uruwa and Yopno Rivers), resulting in impacts on the estuary (i.e. changes in its location). There are high levels of silt suspended in the Uruwa River at its mouth. This is a concern to the lowland communities of YUS landscape".

- *Decline in coastal mangroves and seagrass beds* (covered by sediment) –

  Maza WMA indicated the "erosion is very high from the Fly River and this causes serious sedimentation of the rivers and also the inshore coral reefs, where the sediment covers the reefs and seagrass".

- *Decline in water quality* and drinking water
- *Loss of inshore coastal reefs* –

  Horseshoe Reef WMA reported "there is silt coming from the rivers and this affects the coral".

- *Loss of marine species*

6.3.8 Pollution entering or generated within a protected area

69% of protected areas reported pollution of the environment as a threat. The main Level 2 threat is from garbage and solid waste disposal, and household sewage and urban waste water (Figure 35).

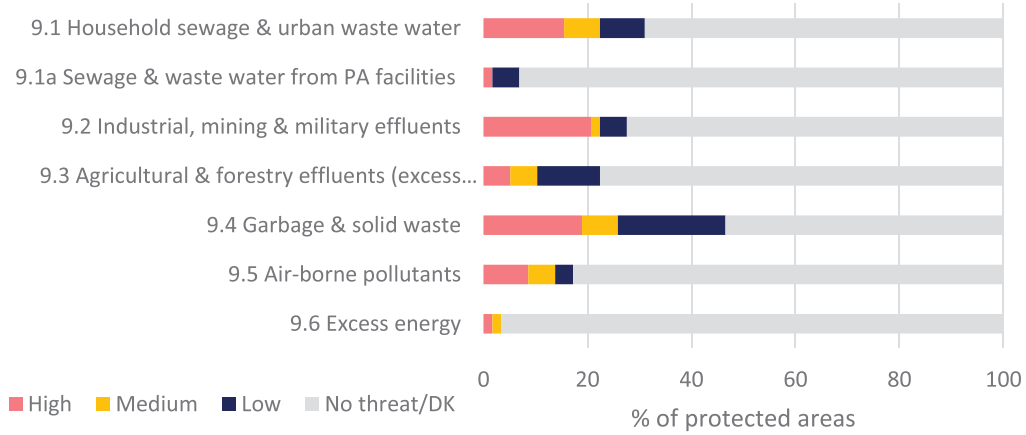


FIGURE 35: Level of threat from pollution entering or generated within a protected area

GARBAGE AND SOLID WASTE

Causes of this threat include outsiders dumping waste within protected areas; waste dumped along roadsides; disposal of garbage in waterways, forested areas and marine areas; recreational activities; and marine vessels dumping waste.

In Laugum WMA near Madang, "there is plastic all over the mangroves and other waste material. This impacts particularly on the turtles and there are many dead turtles".

In Moitaka WS, "people trespass or take a short cut through the Sanctuary and this causes littering and other problems".

Where protected areas are close to towns or settlements, the impact was thought to be greatest close to the settlements.

"People living in town dump their waste in the drains in the Sanctuary and some fish are disappearing. People travelling along the road also dump their waste. Factories dump building material, cement and other toxic material into the river."(*Balek WS, which is a short drive from Madang*)

"The garbage comes from the city and villages as there are no formal disposal places. There is no waste management in the villages (currently people burn and bury the waste, but most ends up in the water)." (*Horseshoe Reef WMA, which is close to Port Moresby*).

Impacts of rubbish include a decline in water quality within rivers and coastal areas, increased prevalence of disease, loss of habitat, loss of species (e.g. turtles and birds) and bushfire (fire escapes from burning rubbish). Communities did not indicate that effective waste disposal practices are in place. In general, awareness-raising is needed to improve understanding of the impacts of garbage and solid waste, and incentive strategies to enhance community outcomes.

Horseshoe Reef WMA would like to partner with businesses and government to develop a Waste Management Plan to improve water quality in the Port Moresby area and raise awareness of environmental values.

Over-water toilets in Madang lagoon contribute to poor water quality © Ann Peterson

HOUSEHOLD SEWAGE AND URBAN WASTE WATER

Lack of water quality testing means that most do not know the severity of this threat. One of the main causes is over-water toilets in marine areas, with impacts on water quality, reef health and human health (Crown Island WMA), and in Garu WMA "people are using the river as the toilet and this has a serious impact on water quality and health". Urban waste water is a threat in most protected areas that are located near to large settlements.

MINING AND INDUSTRIAL EFFLUENTS

These were identified as a threat by almost all protected areas that are close to these operations, and where they do occur this is a serious issue.

> In Crater Mountain WMA, where mining takes place within the WMA, the mining structures have been left to deteriorate over time: "… Locals near Maimafu have complained of dead fish, other aquatic organisms … and are blaming mining-related effluents … discharged directly into the Nevera River, without any proper treatment and due-diligence on the part of the operator ... The Nevera River flows past a major hamlet … and then flows into Wara Hei, … where local people also fish ... In a stakeholder meeting in Goroka in 2014/15 the operator assured stakeholders that the discharge of effluents from its mining operations would be negligible." (*Crater Mountain WMA*)
>
> Customary landowners in Hunstein WMA reported the impacts of a local mine, including tailings dams, road construction, runoff, loss of forest, damage to sago and other crops.
>
> In Pirung WMA the respondents reported several "legacy issues" in relation to a former mine, stating that "there is no active mining, but chemicals from the Panguna mine still enter the WMA". They also reported that the wharf where the copper was loaded is a source of pollution and that there is "an old power plant which is full of chemicals that have been dumped on the ground and also scrap metal ... There is a smell in this area and it is suspected that there are deformities as well as cancers, miscarriages that have resulted from this".
>
> Most protected areas in the Madang Lagoon indicated the negative impacts from the nickel refinery and the tuna cannery, reporting fish kills, algal blooms and declines in water quality, e.g. Tab Islands WMA claimed that the tuna cannery effluent is killing the reefs. Further industrial expansion is viewed as a serious threat to the lagoon and its protected areas.
>
> Mt Kaindi WMA raised the issue of potential heavy metal poisoning as a result of gold mining and that this is a problem for the river system and the people who use the water in the creeks.
>
> Deep sea tailings placement in Lihir Island PA involves the discharge of about 100,000 ML of tailings slurry, contaminated with cyanide and other toxicants, into the sea each year and it contains about 2.5 Mt of sediment (Judd 2015, . Sediments and toxic metals have accumulated in rivers and the near-shore environment, frequently poisoning and degrading food supplies for local people {Judd, 2015 #4571)frequently poisoning and degrading food supplies for local people {Judd`, 2015 `#4571</Suffix><DisplayText>(Judd 2015, . Sediments and toxic metals have accumulated in rivers and the near-shore environment, frequently poisoning and degrading food supplies for local people {Judd, 2015 #4571. At Lihir the effects are detectable up to 20km east of the discharge point and to at least 2000m water depth and the outfall is considered responsible for greatly reduced abundances and changes in higher taxon composition of the sediment fauna, impact on bottom dwelling fauna and macrofaunal (*Hughes et al. 2015*).

The impact of mining effluent from Ok Tedi mine was also reported as very high in Maza and Tonda WMAs:

> "The effluent is causing health issues … The effluent includes arsenic, cadmium and other heavy metals. It is in sediments and the fish and affects human health …There are concentrations of toxins in fish that are believed to result from 200 drums that fell into the Fly River – many people are now getting sick. All young people in the 14 villages have severe problems in their joints – they think it is witchcraft." (*Maza WMA*)

"Ok Tedi mine has effluent that enters the WMA. This causes health complications (e.g. birth defects and deformities and skin growths). There is a gas that comes up through the river (it bubbles) – it smells and kills prawns – we don't know what it is. There needs to be a water management plan in place to minimise the impacts." (*Tonda WMA*)

Tonda WMA respondents reported in relation to this effluent that the "people call this the genocide of our people".

AGRICULTURAL AND FORESTRY EFFLUENTS

These come from plantations (oil palm, coffee, cocoa) and forestry operations. The main impacts are the input of chemicals into rivers and coastal environments, with subsequent impacts on fauna, flora and human health.

6.3.9 Transportation and service corridors within protected areas

67% of protected areas reported a threat from transport corridors – mostly roads and shipping lanes (Figure 36).

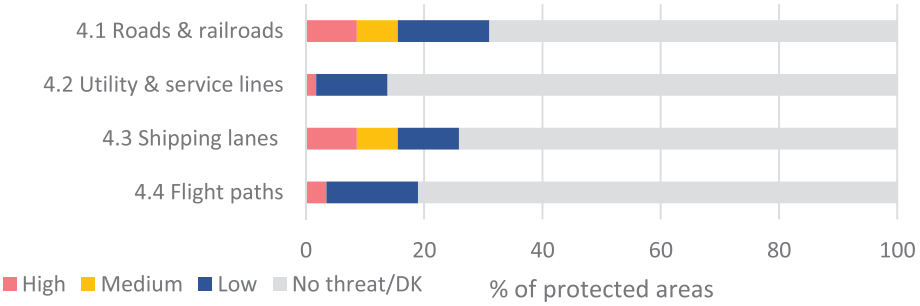


FIGURE 36: Level of threat caused by transportation and service corridors

Roads

Reported impacts from roads were mainly the loss of vegetation, loss of wildlife, erosion and sedimentation of waterways and introduction of invasive species.

However, Lake Kutubu WMA also reported that "the roads bring in rascals and these people cut timber and take wildlife" and also add that trucks have crashed and lost their loads (that can include oil and petrol) and that these have washed into the creeks and lake.

YUS CA indicated that proposed future roads pose a potential threat to their protected area.

SHIPPING LANES

These were seen as an issue in Madang Lagoon and Kimbe Bay. The respondents indicated that shipping lanes can pass within their WMAs and that the proposed industrial expansion within Madang Lagoon will cause a significant increase in shipping and potential future negative impacts such as damage to reefs, disposal of bilge, oil/grease and boat strikes on marine species.

Neiru WMA reported that about 10 to 20 ships per month pass through the WMA waters in the Kikori delta and that they release diesel and oil, and damage and erode the river banks as a result of the boat wash.

Horseshoe Reef WMA reported that six ships have run aground in nearby areas and that there is potential for ships to cause damage to the reef.

FLIGHT PATHS

These were considered a threat in almost 20% of protected areas, with concerns about the chemicals carried by helicopters that fly over protected areas.

Increased shipping has potential to impact on protected area values in Madang Lagoon. © Ann Peterson

Kokoda Track/IPZ raised the issue of noise impacts from helicopters that fly over their area.

Numerous aircraft from nearby mining operations overfly Lake Kutubu WMA. The respondents reported the issue of noise from aeroplanes and helicopters as well as "noticeable and visible signs of emissions from the aircraft [that] are intruding into special areas within the WMA where they should not be (e.g. cultural places and tambu areas) and this violates the privacy of the people and does not show respect for their traditional customs".

UTILITY AND SERVICES LINES

The main issue reported was the lack of consultation with landowners concerning the location of these towers and lines.

6.3.10 Human intrusions and disturbance within a protected area

66% of protected areas were concerned about human intrusions – mostly relating to vandalism and destructive activities (Figure 37).

DELIBERATE VANDALISM, DESTRUCTIVE ACTIVITIES OR THREATS TO PROTECTED AREA STAFF AND VISITORS INCLUDED:

- hunting and fishing, including the use of destructive methods (e.g. poison rope, dynamite)
- lighting fires/arson
- graffiti
- damage to structures, including fences, signs, memorials and buildings/facilities

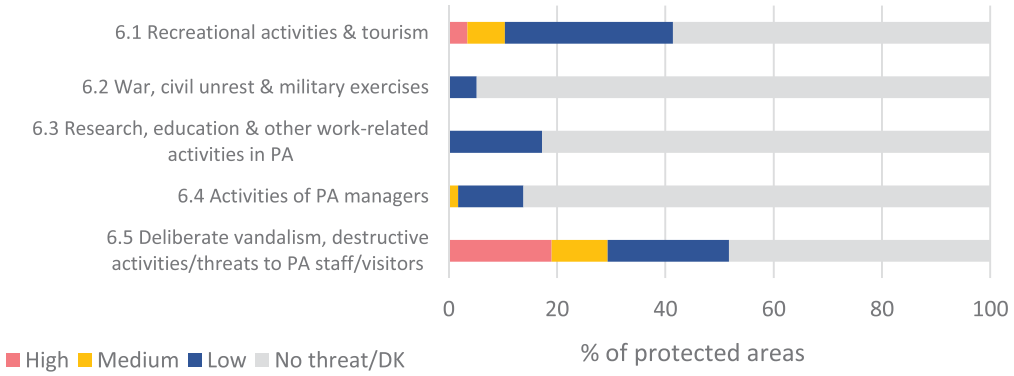


FIGURE 37: Level of threat from human intrusions and disturbance

- removal of historic artefacts/plaques.

  For example, in the Kokoda Track/IPZ, "historic artefacts from the Kokoda campaign are being removed by souvenir hunters and dealers. The monuments along the Track may be damaged …"

- garbage and littering.

  In Laugum WMA, the community's mangrove nursery was destroyed by vandals and this forced the closure of the mangrove rehabilitation project. The vandalism was in retaliation relating to the punishment of person who had been convicted of taking marine resources from the WMA. Illegal settlers are also viewed as a source of several of the destructive activities.

  In Paga Hill SR it was reported that the site has been destroyed as a result of earthworks for the construction of commercial buildings.

RECREATIONAL ACTIVITIES AND TOURISM

These were identified as a threat by 41% 0f protected areas. There is a relatively low impact as few tourists visit PNG's protected areas. Problems include tourists taking resources (e.g. stones, plants and cutting trees), entering without permission or guidance, causing damage (e.g. from boats anchoring on reefs), reef walking and diving which may damage reefs, leaving rubbish and making fires.

"People from the mainland frequent the WMA and cause destruction of the habitat by walking on the reef, collecting from the reef, and causing damage from boats. This occurs every weekend – perhaps 30–50 people each day on the weekend." (*Tabad WMA*)

One of the main tourist drawcards in PNG is the Kokoda Track, which attracts 3000 to 4000 trekkers each year. This causes some damage to the track, especially during rain events. However, the Kokoda Track Authority has been established to help manage and maintain the track and works collaboratively with the customary landowners.

The remaining threats in this category are of lower significance.

RESEARCH, EDUCATION AND OTHER WORK-RELATED ACTIVITIES

These were considered to be a low-level threat, with the impact dependent on the number of people engaged in research and education activities. The main concern is the failure of researchers to inform the community of the results of their research and the best ways to integrate this into improved management approaches.

6.3.11 Agriculture and aquaculture with a protected area

66% of protected areas reported some form of threat from agriculture and aquaculture, with main threats coming from customary landowners, community gardens and small crops (Figure 38).

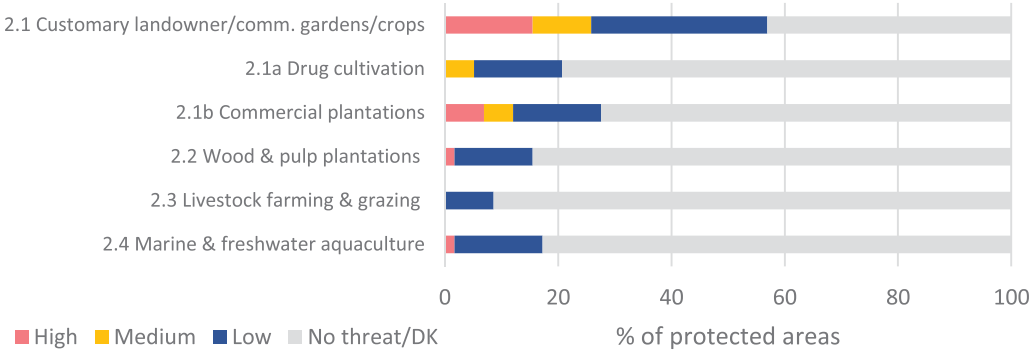


FIGURE 38: Level of threat from agriculture and aquaculture in protected areas

CUSTOMARY LANDOWNER AND COMMUNITY GARDENS AND SMALL CROPS

These were thought to be of concern due to the growing population which requires additional land for cropping. The threat is most severe where the area of land is limited.

For example, in Crown Island, "There is limited area for expansion of gardens, which currently exist on the fringes of the island. Further gardening may result in the loss of the coastal fringe vegetation."

In Loroko NP "the families have small gardens, and due to the small size of the protected area the impact is relatively high".

The threat is exacerbated by the expansion of illegal settlements within and near existing protected areas. In McAdam NP, "illegal settlers are expanding their gardens in the national park, where the forest has been cleared or burned to create gardens on all sides of the park".

In Moitaka WS illegal settlers cut and burn trees and develop gardens.

In Mt Kaindi WMA, settlers are establishing coffee gardens and some vanilla within the WMA.

In Pokili the WMA has lost about three kilometres of land as a result of gardening by the illegal settlers. Reported impacts include loss of habitat (mainly forest and related flora), loss of fauna, erosion and increased sediment, introduction of invasive species, and fragmentation of the protected area.

Garden expansion on the shores of Lake Kutubu, because of population growth, results in the loss of native vegetation © Ann Peterson

COMMERCIAL PLANTATIONS

These are expanding (e.g. copra, cocoa and coffee). Some protected areas have commercial plantations within their bounds (e.g. Bagiai and Mt Kaindi WMAs and McAdam NP) and others are entirely surrounded by them (e.g. Hombareta WMA). Within the YUS CA's 'Landscape Area' (i.e. outside the protected area) coffee, cacao, betel nut and copra are grown to support the customary landowners in their conservation efforts.

6.3.12 Energy production and mining within a protected area

55% of protected areas experienced some level of threat from energy production and mining within the protected area, with mining and quarrying of most concern (Figure 39). This is in addition the the threat from pollution discussed in Section 6.3.8.

At Lihir Island PA, a Special Mining Lease was granted after the gazettal of the protected area and the respondents reported that this has caused loss of vegetation, backfilling of the land and stockpiles.

In Crater Mountain, mining is undertaken within the WMA and there are several mining exploration permits over lands within the WMA: "these have been granted despite the area being gazetted as a WMA".

McAdam NP has illegal mining undertaken by the illegal settlers in the protected area (along the Bulolo River).

Mt Kaindi WMA has small scale gold mining within and around their WMA.

Lake Kutubu WMA reported that there is diamond prospecting inside the WMA and "they bring helicopters in and clear areas of forest and they do not consult with us".

Sawataetae WMA has an adjacent mine that impacts on the WMA.

Protected areas within Madang Lagoon are concerned about the possibility of expanded deep sea mining and feared the potential increased disposal of tailings would impact on their WMAs.

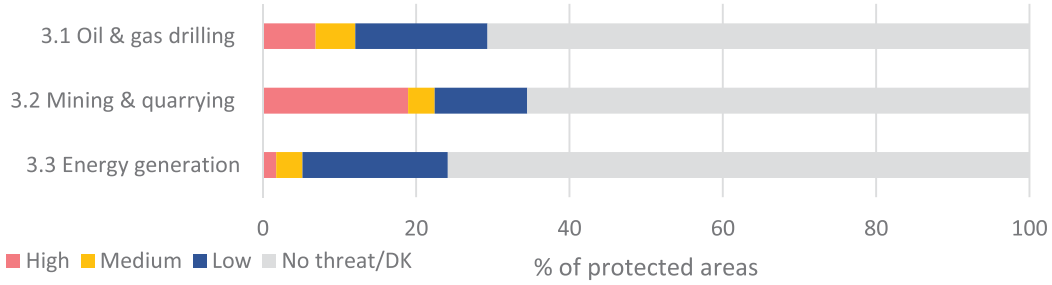


FIGURE 39: Level of threat from energy production and mining in the protected area

A further 10 protected areas indicated that there is high level interest in mining and/or oil and gas development in their areas, but the respondents were not well informed of future mining developments and found it difficult to assess their future levels of threat. Some protected areas, such as Libano-Arisai, support the possibility of mining and oil and gas development on their WMA "to provide income for the community – the community needs income to develop services (e.g. roads, clinics, schools)".

Several protected areas indicated that hydro-electric plants are planned or expanding, with potential impacts on water quality and quantity, and scenic amenity.

Iomare WMA reported that fresh water prawns, fish, turtles and eels are affected due to the low water levels.

The expansion of geothermal energy plants is an unknown threat for many protected areas.

6.3.13 Other threats

The protected area representatives were given the opportunity to identify any other threats. This question enabled the respondents to think critically about their protected area and to identify 'other' threats of importance. Many of the threats identified through this process relate to 'root causes' rather than the immediate threats included in the IUCN classification, and to management weaknesses.

Participants' concerns included:

A. MANAGEMENT AND GOVERNANCE

- lack of government support, consultation and finance (Kavakuna Caves, Talele and Tonda WMAs, Loroko NP and Wewak WMS)
- lack of governance, including an effective Management Plan and management (Balek and Moitaka WS, Mt Susu and Nuserang WMAs, and Kokoda MS) and failure to communicate and work together (Kokoda Track/IPZ)
- failure to gazette new Management Committees (Mt Kaindi WMA)
- lack of agreement by customary landowners on the presence of the protected area (Zo-oimaga WMA)
- politics (Baiyer River WS) and others speaking on behalf of the community (Ndrolowa WMA).

B. ECONOMIC

- lack of income generating activities and development (Kamiali WMA)
- conflict over benefit sharing arrangements (Kavakuna Caves WMA)
- development pressure (Klampun WMA)

C. SOCIAL

- social problems, often experienced by youth (e.g. alcohol, drugs) (Hunstein and Sawataetae WMAs), and the loss of women's matrilineal rights (Klampun WMA)
- lack of awareness and understanding of environmental issues and threats (Horseshoe Reef WMA)

6.4 Limitations of the threat assessment

The PNG_METT assessment adopted the standard categories of threats that are used internationally (Salafsky *et al.* 2008) and modified the wording to incorporate additional threats that better reflected the broad circumstances within PNG. The use of this standard threat framework enables global comparisons of the threats.

The threat analysis presented here presents a wealth of information about conditions on the ground and water in PNG's protected areas. It reflects the opinions and experiences of the workshop participants, and this has the advantage of being a current and wide-ranging survey of what they are experiencing. However, there is some variation in the extent to which this would coincide with an objective scientific analysis of the threats in each protected area.

We do not know the impact of hunting and fishing, due to the lack of monitoring of species and ecosystems. Respondents may underestimate these as threating processes. In addition, customary landowners may not consider subsistence livelihood practices (such as gardening, resource harvesting and forest clearing for settlement) as threats because of their importance in sustaining whole communities.

Participants may not recognise some threats, such the introduction of tilapia, carp and other non-native species into lakes, waterways and aquaculture systems. These species are often seen as a plentiful source of protein, which also provides additional income through sale of these species at local markets. There was lack of awareness of their potential harm to ecosystems. Hence there may be under-reporting of some threats, particularly pest animals, in some protected areas.

6.5 Discussion and Conclusions

A number of other studies have looked at the threats to biodiversity in PNG. These have concluded primary threats are:

- Habitat loss and over-exploitation of species, followed by invasive species (Kingsford *et al.* 2009).
- Population increase and the resultant impact on sustainable agriculture and landuse intensity; commercial logging; climate change and its impacts on both forest and marine life; hunting; destructive fishing; pollution; extractive industry; invasive species; development access and illegal exports (Department of Environment and Conservation 2014).
- In the marine environment, population growth (especially in coastal areas); development activities (in coastal and upstream areas) and related impacts including increased runoff and habitat fragmentation and degradation; overexploitation of resources, particularly fisheries resources; pollution, especially related to runoff from inland mining activities and poor land management practices, and debris and sewage; and impacts of climate change, including potential disruption of oceanographic processes, changes in species distribution, changes in water temperature and salinity, and sea level rise (Government of Papua New Guinea 2015).

- In protected areas in 2005–2006, gardening, hunting, conversion for agriculture, subsistence harvesting and commercial over fishing (Chatterton *et al.* 2006).

This assessment confirmed all the threats listed above, but also reflected the reality that in PNG nature and culture are closely linked. Most workshop participants were very concerned that their communities are experiencing **a loss of their culture, traditions and language**, and this is seen to be intertwined with biodiversity loss. Cultural decline is a result of increasing adoption of western culture and language, a decline in respect for elders, an increased engagement with formal education systems, the influence of Christian churches and movement of people from protected areas to larger towns and settlements. Internationally, the loss of culture and particularly of local languages has been linked to the loss of biodiversity (Maffi 2005). In PNG protected areas, the loss of names for many species of plants and animals, and the loss of traditions relating to hunting, fishing and gathering are of concern.

Orchids are among the natural plants and animals prized by collectors and increasingly at threat in PNG's protected areas. Photo: Fiona Leverington

It is interesting to see the extent to which **climate change** was universally acknowledged by workshop participants as a serious and present threat. Specific threats and impacts currently being experienced include temperature extremes, prolonged droughts, increasingly severe storms and flooding, shifts in habitat and changes in seasonal patterns which affect food security and long-term sustainability. Coastal and marine protected areas are also significantly affected by sea level rise and there is reporting of extensive coral bleaching. There is no monitoring of these changes in most of the protected areas assessed.

Population increase is seen to be a major threat to many natural systems, primarily due to the reliance of the customary landowners on their landscape to sustain them. Increasing population places pressure on land for settlement and gardens and this frequently results in **clearing of forests for housing and firewood, pressures on wildlife for food, and declines in water quality**. Natural population increase is exacerbated by the settlement of 'outsiders' both within and adjacent to many protected areas and this is followed by subsequent increased extraction of the protected area's resources. Many protected areas are incapable of addressing the issue of illegal settlers and have sought assistance from government, which frequently has not been forthcoming.

Hunting, fishing and gathering of forest and marine resources is a complex subject in PNG. 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 PNG most hunting has been for consumption by local people (known as wild meat harvest), rather than 'bush meat' hunting for sale in markets (Mack and West 2005). In coastal regions a wide variety of seafood, including fish, molluscs, and turtles, dominate local diets (DEC 2010). Studies in PNG have shown that even where populations are low, fishing does impact the numbers and diversity of some fish groups, especially larger species such as sharks and groupers (Drew *et al.* 2015). On land, populations of mammals including cuscus, wallabies, echidna and tree kangaroos are likely to be reduced through hunting pressure, while bandicoots and ringtails may be able to provide for sustainable hunting (Cuthbert 2010). In this assessment, participants from most protected areas recognised that hunting and fishing have an impact, and many were concerned about the increase in hunting, especially due to the loss of traditional controls and incursions by outsiders. Over half the protected areas identified a loss of keystone species as a threat, although less than one third of protected areas identify hunting of terrestrial animals as a major threat.

There are also perceived pressures from the increasing occurrence of **pest species** which impact on wildlife and ecosystems. The introduction of non-native fish into waterways is seen as a serious threat in areas where this has occurred. Lack of monitoring of biodiversity makes it difficult to know the extent of biodiversity loss.

Where **pollution from existing or past mining operations** occurs, this appears to be a threat of extreme severity, affecting both the environment and human health. This threat needs to be addressed as a matter of urgency, with the international community and large companies taking responsibility. Customary landowners of Tonda NP and Maza WMA told particularly chilling stories of crippling damage to their people and their lands and seas.

This threat assessment also shows the synergies among different threats, where an increase in one threat can accentuate the impact of another threat. The problem of **outsiders extracting resources** with no traditional limits or other enforcement has contributed to the 'tragedy of the commons' (Hardin 1968; Ostrom 1990) in some areas, where nobody takes responsibility for sustainable resource use so the attitude becomes 'grab it before someone else does'.

This is not usual in PNG, where the customary landowners are very conscious of stewardship of land and sea, but occurs where land has been alienated and where traditional rules have been eroded.

Customary landowners have limited capacity to effectively address many of the identified threats. This problem is magnified by lack of equipment, funding and relevant skills (e.g. in monitoring) and an ongoing failure of all levels of government and NGOs to effectively engage with many protected areas to address threatening processes.

Lack of effective enforcement, due to the absence of funding, equipment or on-ground ranger presence results in increasing impacts for some threats such as resources extraction (e.g. terrestrial and aquatic fauna and flora, expansion of gardens and settlements into sensitive environmental areas and failure to address invasive species). This is particularly problematic as landowners from many protected areas reported increased illegal harvesting as a result of growing populations and illegal entry into and settlement within their protected areas.

Roads in PNG's more remote areas bring many benefits to inhabitants, but also give easier access to illegal settlement and increased threats such as uncontrolled hunting.

CHAPTER 7 Condition and trend of PNG's protected areas

7.1 What we did

For each protected area, workshop participants defined the most important values, including natural, cultural, socio-economic and historic (see Section 3.4). Between four to seven values were recorded in as much detail as possible.

Later in the workshop, after extensive discussions about the area and its management, participants rated the current *condition* and *trend* for each value, using the methodology defined in the Conservation Action Planning process (Braun 2005; Parrish *et al.* 2003) and used in the Open Standards for Conservation (Conservation Measures Partnership 2013). For each value, the estimated condition was rated as:

- Very good (3): Desirable status. Little additional intervention is required unless new threats arise. (May require continuing interventions that are already occurring).
- Good (2): Within the range of acceptable variation, but some addition intervention is needed if this is to be maintained.
- Fair (1): Condition is outside the range of acceptable variation, but can be restored in time.
- Poor (0): Condition is outside the range of acceptable variation and restoration is very difficult.

The trend in condition was estimated as stable, improving or declining.

The condition and trend ratings are presented in tables in each protected area summary (Attachment 3), as shown in the example of Mojirau WMA (Table 10).

TABLE 10: Condition and trend summary, Mojirau WMA

Value	Condition	Trend	Description
Sustainable livelihoods	Good	↔	People depend on WMA resources for the subsistence needs (aquatic, terrestrial animals provide protein)
Protecting customs, legends and history	Fair	↓	Important spiritual sites and people are closely connected with their land/environment
Forest (plants & animals)	Very good	↔	Extensive forest; birds (waterfowl and Hauok); provide building material, medicies and support ceremonial purposes; pressure from population increase
River and water	Very good	↔	Important for drinking water, transportation, food and small scale gold mining; some sedimentation
Grassland	Very good	↔	Covers about 30% of the WMA and is important for habitat and hunting.

Justifications for the ratings were also recorded: for example customary landowners for Mojirau WMA wrote:

> "Landowners reside outside the WMA and most of their subsistence needs are met outside the WMA, although resources are extracted for house building, medicinal and ceremonial purposes. The main pressure is population increase and the loss of surrounding landscapes. The current condition is stable." (*Mojirau WMA*)

Condition ratings for each protected area were then 'rolled up' to derive an overall condition score. This roll-up considered the average score for all values, as well as the number of values with different ratings (i.e. the proportion of values rated very good). Additional intermediate categories (good- very good; fair-good; poor-fair) were added to the overall condition rating, to better reflect cases where there was significant variation among the different value ratings. For example, the overall condition rating for Mojirau WMA is good to very good.

The overall trend of the values was also estimated, with intermediate classes for mixed trends; for example, stable-declining means that some values are stable while others are declining. The overall trend for Mojirau WMA is rated stable in spite of one value group declining.

7.2 Key findings

A total of 275 values were defined, and of these 71% were estimated to be in good to very good condition.

50% of values were considered to be stable, with 19% declining in condition. In 53% of protected areas, at least some important values are declining.

71% of protected areas overall estimated the values to be in good to very good condition. However, when area is taken into account, only 45% of the protected area system falls into these categories.

7.3 Condition and trend

The roll-up of participants' condition and trend estimations for the values identified in each protected area are shown in Table 11, along with the responses to the PNG-METT values (Q30). On the basis of these estimates, 71% of the protected areas currently have values in in good or very good condition overall (Figure 40). This means participants consider that the most important values of these protected areas are intact or can be restored within reasonable time and effort. However, when area is taken into account, only 45% of the total reserved area is in good or very good condition, with 55% poor, fair and fair-good. Two of the largest and most significant wildlife management areas, Tonda and Maza, are rated as only in fair condition, and declining, due to multiple threats and lack of law enforcement capacity.

TABLE 11: Condition and trend estimates for the values identified in PNG's protected areas

(Note Q. 30 is rated on a zero to three scale, where '3' is Very good; '2' is Good; '1' is Fair and '0' is Poor)

Protected area	Gaz year	Area ha	Condition	Trend	Q.30
Bagiai WMA	1977	13,760	Good	Declining	2
Baiyer River WS	1968	741	Good-very good	Stable-declining	2
Balek WS	1977	470	Good-very good	Declining	2
Baniara Island	1975	200	Poor	Stable	0
Cape Wom WM	1973	165	Good	Stable	2
Crater Mountain WMA	1993	270,000	Good	Stable-declining	2
Crown Island WMA	1977	58,969	Good-very good	Stable	2
Garu WMA	1976	8,700	Good	Stable	2
Hombaretta WMA	1997	130	Fair-good	Stable-declining	2
Horseshoe Reef WMA	1981	396	Fair	Declining	2
Hunstein Range WMA	1997	220,000	Fair-good	Stable	1
Iomare WMA	1987	3,828	Poor	Declining	0
Jimi Valley NP	1991	4,180	Very good	Declining	3
Kamiali WMA	1996	47,413	Good	Stable	2
Kavakuna Caves WMA	1997	3,220	Very good	Stable-improving	3
Klampun WMA	2003	5,200	Good-very good	Stable-declining	3
Kokoda MP	1981	small	Good	Stable-improving	3
Kokoda Track/IPZ	not yet	?	Good-very good	Stable-improving	2
Lake Kutubu WMA	1981	23,497	Fair-good	Declining	1
Lake Lavu WMA	1992	2,640	Good	Declining	1
Laugum WMA	2003	73	Good-very good	Declining	2
Libano-Arisai WMA	2008	3,964	Good-very good	Stable-declining	2

Protected area	Gaz year	Area ha	Condition	Trend	Q.30
Libano-Hose WMA	2008	4.830	Very good	Stable	3
Lihir Island PA	1991	1,980	Fair	Declining	1
Loroko NP	1991	100	Poor	Declining	0
Maza WMA	1978	184,230	Fair	Declining	1
McAdam NP	1962	2,081	Fair	Declining	0
Moitaka WS	1989	42	Fair-good	Declining	1
Mojirau WMA	1978	5,079	Good-very good	Stable	2
Mt Gahavisuka PP	1989	77	Very good	Stable	3
Mt Kaindi WMA	1990	1,502	Good-very good	Stable	1
Mt Susu NR	unknown	260	Good-very good	Stable	3
Mt Wilhelm NP	1990	817	Good-very good	Stable	3
Namanatabu WMA	1979	29	Good	Stable	2
Nanuk WMA	1973	12	Good	Stable	2
Ndrolowa WMA	1985	5,850	Good	Stable	2
Neiru WMA	1987	3,984	Good-very good	Stable-declining	2
Nuserang WMA	1986	22	Good-very good	Stable-declining	2
Oya Mada Wa'a WMA	1981	22,840	Very good	Stable-declining	2
Paga Hill SR	1987	13	Poor	Declining	0
Pirung WMA	1989	43,200	Fair-good	Stable-declining	2
Pokili WMA	1975	9,840	Good-very good	Stable-declining	2
Ranba WMA	1977	41,922	Good	Stable-declining	2
Ranba WS	1977	15,724	Very good	Stable	2
Sawataete WMA	1977	700	Good-very good	Stable-improving	0
Sinub WMA	2003	12	Fair-good	Stable-declining	2
Siwi Utame	1977	12,540	Very good	Stable-declining	2
Sulamesi WMA	2009	86,451	Very good	Stable	3
Tab Islands WMA	2006	984	Fair-good	Stable-declining	1
Tabad Island WMA	2003	16	Good	Stable	2
Talele Islands WMA	1977	12	Very good	unknown	2
Tavalo WMA	unknown	2,400	Good	Stable-declining	3
Tonda WMA	1975	590,000	Fair	Declining	0
Torricelli Mt Range CA	Not yet	185,000	Good-very good	Stable-improving	3
Varirata NP	1969	1,063	Good	Stable	2
Wewak War Memorial	1969	1	Fair	Declining	1
YUS CA	2009	75,000	Good-very good	Improving	3
Zo-oimaga WMA	1981	1,510	Good	Stable-improving	2

FIGURE 40: Overall values condition ratings for PNG's protected areas (n=58)

(Percentage of 58 assessed protected areas achieving each rating)

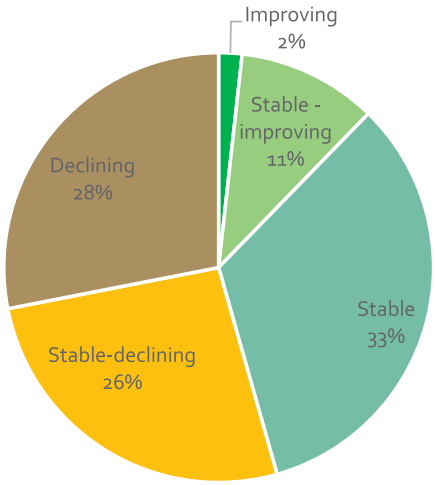


FIGURE 41: Overall trend ratings for PNG's protected areas

We looked at whether the condition ratings above matched well with the results of the PNG-METT question 30 (a quick estimation of current overall condition) and found a correlation is 0 .76, which is highly significant (p<.001). With a couple of anomalies, this means that participants' answers to question 30 were well in line with responses to more probing assessment of their nominated values.

Trend data shows that 54% of the protected areas have rolled-up values ratings of declining or mixed stable and declining (Figure 41). The decline in these values can be largely attributed to the threats to the protected areas, discussed in Chapter 6.

When the condition and trend data is combined (for the 235 values that have complete information), 63% of the nominated values are either in good or very good condition, and are stable or improving (Table 12).

TABLE 12: Combined condition and trend ratings for 245 individual values

Condition and trend	Proportion of values
very good and improving	7%
very good and stable	32%
very good but declining	4%
good and improving	4%
good and stable	19%
good but declining	8%
fair and improving	2%
fair and stable	3%
fair and declining	12%
poor but improving	1%
poor and stable	1%
poor and declining	6%

7.4 GIS analysis

For a brief explanation of the methodology used for this analysis, see Section 2.8. Changes in land use cover (1996–2013) and forest loss (2000–2014) were calculated for each protected area and totalled across the whole protected area network. Unfortunately, spatial boundary data was inaccurate for many protected areas, so the national analysis was considered unreliable and has not been included in this report. It is hoped this can be published when better information is available. However, a few interesting examples are discussed in this section, to illustrate how the spatial analyses can be used.

The following figures contain three maps. The bottom right map indicates location. The upper left is the landcover mapping from 1996 (Papua New Guinean Forestry Inventory Management System). The upper right indicates in yellow any clearing observed between 2002 and 2014 in the available forest clearing data (Hansen *et al.* 2013).

7.4.1 Protected area values with little change

Examples of protected areas reported to be in very good condition include Klampun WMA and Kavakuna Caves WMA (see Table 11). Spatial imagery for both of these parks reveals little change in land use or forest cover since 2000.

These represent very different protected area scenarios: Kavakuna Caves WMA is remote and people live a long way from the protected area, while Klampun WMA is surrounded by development and the management committee is well organised in trying to prevent development within their protected area. In Klampun (Figure 42), there has been some recent clearing, but this is concentrated in the coastal fringes where there was intensive land use in 1996. The areas mapped as forested in 1996 still appear to be intact.

Kavakuna Caves WMA was forested in 1996 and remains almost entirely intact according the spatial imagery (Figure 43).

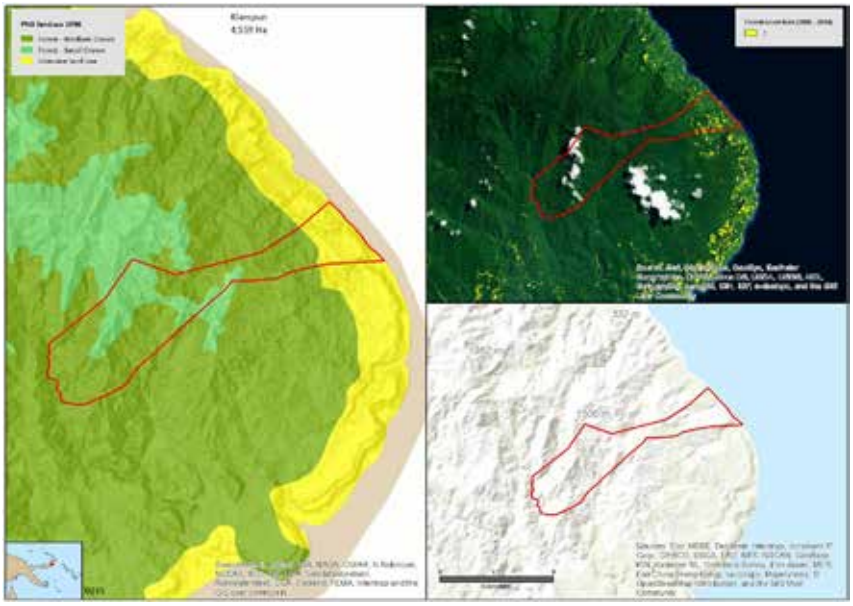


FIGURE 42: Klampun WMA showing 1996 land use and clearing from 2002–2014

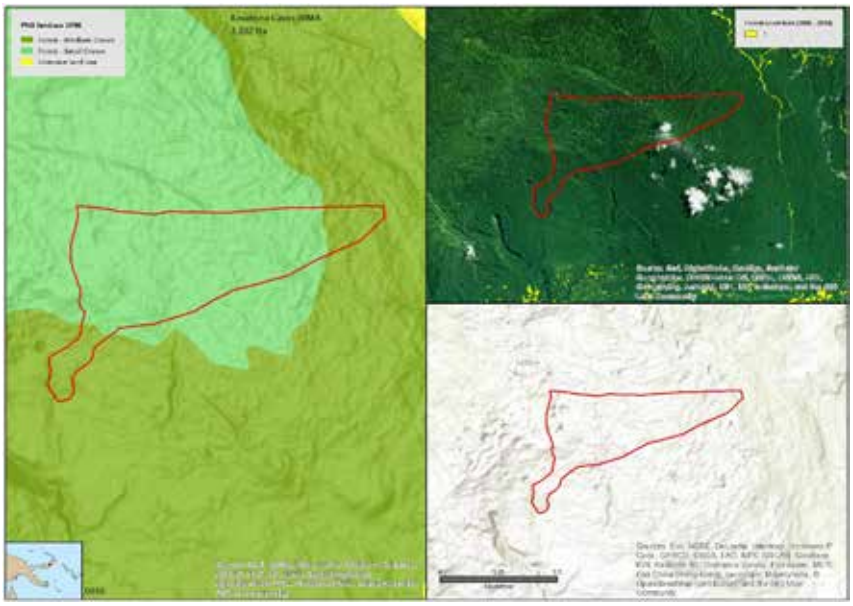


FIGURE 43: Kavakuna Caves WMA showing 1996 land use and clearing from 2002–2014

7.4.2 Protected areas with forest and biodiversity loss

Two contrasting protected areas that have experienced decline in values are discussed in this section: Tonda WMA and Iomare WMA. Tonda WMA has experienced considerable loss of natural vegetation since 2004 – the greatest loss of any protected area in PNG. Land cover data shows a decline in natural vegetation, from 99.8% in 1996 to 87% in 2013 (Table 13). This loss was confirmed by landowners who attended the METT workshop, and who rated Tonda's natural condition as only fair and declining, with significant impacts from fire, climate change and illegal settlement.

TABLE 13: Estimated change in landcover in Tonda WMA from 1996 to 2013

Landcover category	Area (ha)		change (%)
	1996	2013	
Forest	28,822	27,183	6
Grassland	101,766	70,594	31
Intensive land use	1,316	146	May now be included in 'bare'
Bare		78,091	(not in 1996 assessment)
Lakes and larger rivers	2,759	2,759	0
Mangrove	10,858	8,237	24
Savanna	144,441	130,150	10
Scrub	133,539	123,132	8
Swamp	76,467	67,541	12
Woodland	103,730	95,868	8

According to the deforestation data (Hansen *et al.* 2013), about 5000ha of natural forest has been cleared or lost since 2004, representing 0.8% of the WMA (Figure 44). This is particularly unfortunate given the large size and high value of Tonda, which is also a Wetland of International Significance.

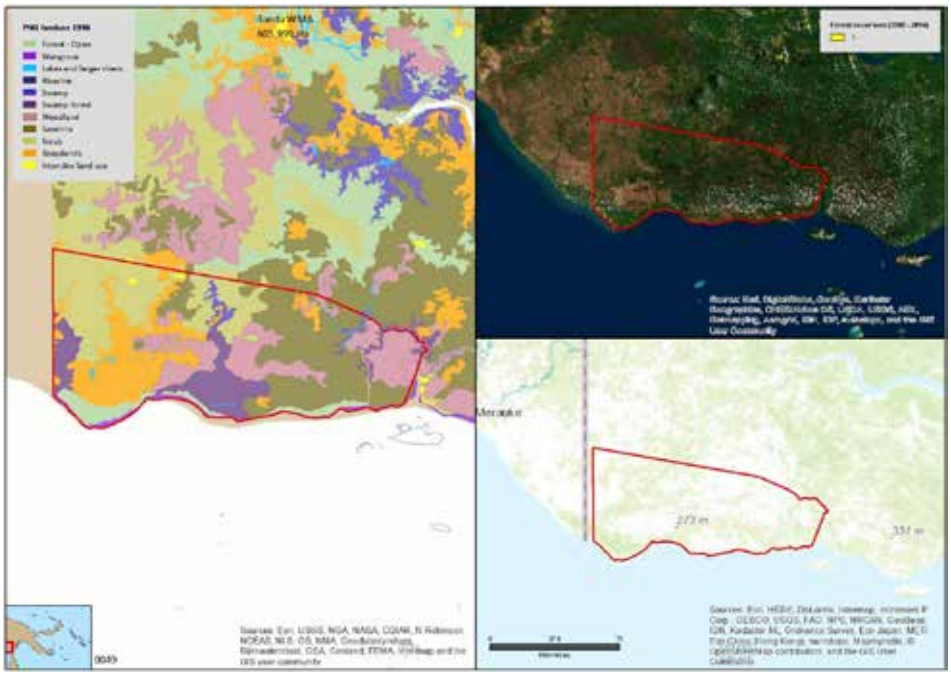


FIGURE 44: Tonda WMA showing 1996 land use and clearing from 2002–2014

Remote sensing data gives us a very valuable tool, but condition of protected area values cannot be measured through estimation of forest cover and changes in land use alone. A decline in condition can also include loss of species – a forest can appear intact in spatial imagery while in reality biodiversity is depauperate and the forest is 'half-empty' (Redford and Feinsinger 2003) or worse.

For example, the values of Iomare WMA were rated by workshop participants as in poor condition, though less than 1% of its forest cover has been lost since 2000, and the landuse analysis estimates a loss of only 143 ha since 1996. The customary landowners report that they have conflicts with surrounding settlers, who are migrating into customary land and depleting their resources. In addition, a quarrying company has caused serious impact on the land and water. The Iomare area previously had animals such as deer, birds of paradise, fresh water eels and prawns; timbers including rosewood, pine and kwila; and clean water for people to utilize. The currently reported poor condition might therefore relate partly to very recent (post-2014) forest clearing, which is not yet evident in remote sensing data (Figure 45), but also is due to depletion of plant and animal resources within the remaining forest.

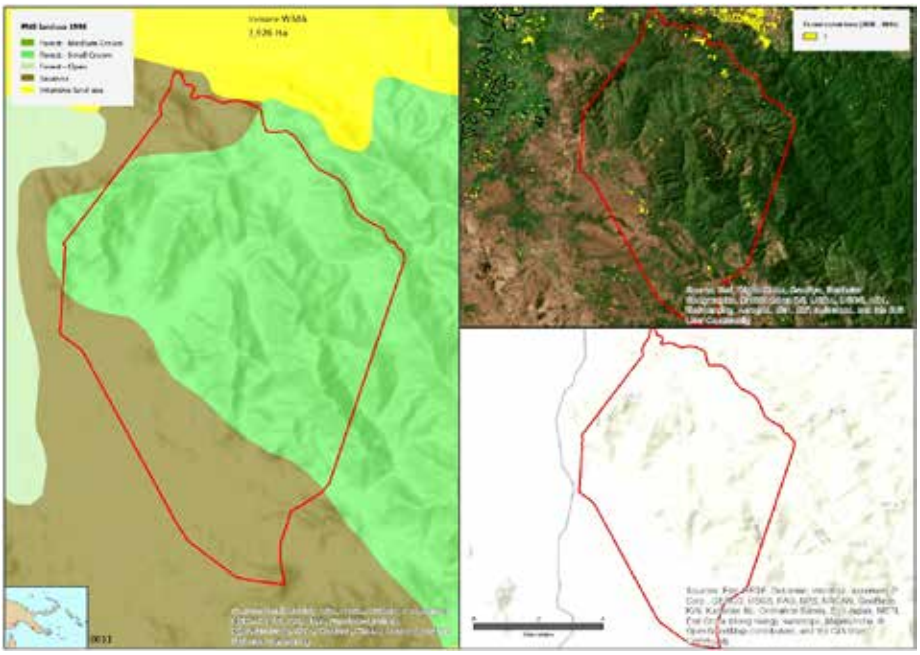


FIGURE 45: Iomare WMA showing 1996 land use and clearing from 2002–2014

7.5 Conclusions about condition and trend

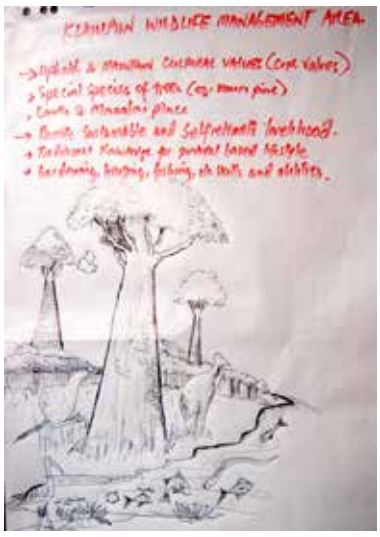
There has been little consistently gathered information about the values or condition of the protected areas in PNG, and this lack of knowledge continues to make decision-making very difficult. There is a great need for more detailed surveys, including site visits, to give a better understanding of what is happening on the ground. However, the combination of participant information and spatial analysis leads us to conclude that the situation is far from hopeless.

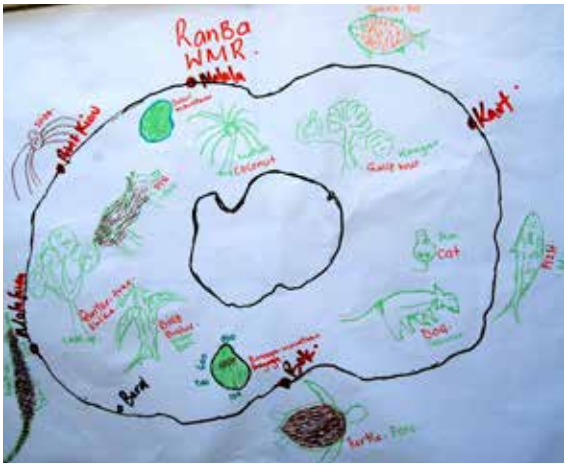
On one hand, there has been loss and degradation of natural vegetation (forests, savannahs, woodlands, scrub, swamps and mangroves) in almost every protected area, and in some cases this loss is very widespread and significant. Most of this loss appears to be from small-scale settlements and clearings dotted throughout the protected areas, which means that we can expect further undetected damage on the ground to many species of plants and animals through hunting, collection and disturbance of undergrowth.

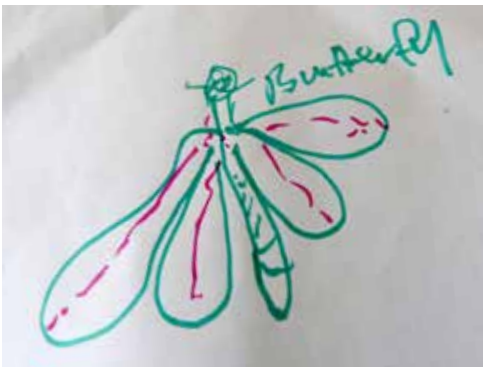
On the other hand, with a few exceptions, the protected areas still retain many of their ecological values. Most of the incursions are on a small scale and could be halted and eventually reversed if strong management including enforcement is put in place.

The decline in values relating to cultural knowledge and traditions is of great concern to customary landowners, but in most cases strong traditions and knowledge of *Tock Pales* still exist. Again, strong actions now can ensure survival of cultural heritage.

PART THREE
REFLECTING ON THE PAST LOOKING TO THE FUTURE







Photos: © Ann Peterson

CHAPTER 8 Stories from the protected areas

In this chapter, we present ten stories about the protected areas that we evaluated. Each covers a different theme. The stories include a brief background, a short summary of the issue or program that is highlighted and they conclude with some of the key learnings for strategies to improve protected area management outcomes. The ten stories are:

1. **Bushrangers** – Pokili Wildlife Management Area: Making inroads with limited funding and resources
2. **Champions for conservation** – Tavolo Wildlife Management Area: Strong leadership builds support for conservation
3. **Conservation Alliance** – Torricelli proposed Conservation Area: Community benefits – building support for conservation
4. **Secure funding** – Kokoda Track Historic Reserve: Secure funding supports long-term sound management
5. **Integrated and collaborative management** – Madang Lagoon: Is integrated management an opportunity lost in Laugum, Sinub, Tab and Tabad WMAs?
6. **Ridge to reef** – Kamiali Wildlife Management Area: Good design and an integrated landscape approach
7. **An holistic approach** – YUS Conservation Area: Supported by sustainable production and long-term funding
8. **International collaboration** – Maza Wildlife Management Area: Provides support for marine protected areas
9. **Ecotourism** – Mt Wilhelm National Park: A basis for sustainable outcomes
10. **Onground management** – Loroko National Park: Failure to manage and enforce rules leads to biodiversity loss




Photos: © Ann Peterson

8.1 Bush rangers – Pokili Wildlife Management Area

Making inroads with limited funding and resources

Background

Pokili WMA (9840 ha), West New Britain Province, was established in 1975 by the customary landowners to protect part of the land from oil palm development, which had engulfed large tracts of land in WNBP; and to conserve megapode habitat and sacred sites, including hot springs.

The Bush Ranger program

Aids on-ground management outcomes: Ten volunteer bush rangers, consisting of six men and four women patrol the WMA to ensure compliance with the agreed rules (e.g. specified days and methods for harvesting megapode eggs and controls on vegetation removal and hunting). They have a visible uniform, which helps to raise their profile within the community and it is proudly worn by the rangers.

Work with limited resources: Close liaison with local NGOs, Mama Graun and Mahonia Na Dari resulted in the provision of funding to develop a draft Management Plan and purchase four mountain bikes, which are used by the rangers to quickly access the more remote areas of the WMA. Other resources are very limited.

Governance structures are transparent: The WMA Committee of 21 men and nine women facilitate management and awareness raising and help to support the bush rangers.

Key learnings

- On-ground rangers are necessary to enforce agreed rules and raise awareness among the customary landowners and surrounding communities.
- Basic equipment such as bicycles can facilitate improved management outcomes.
- Community support, engagement and awareness are necessary to underpin the ranger program.
- Links with local NGOs can provide assistance with funding, planning and training.
- Voluntary programs can work in the short-term, but long-term funding to support the payment of rangers will enhance sustainability.
- Capacity building and training are essential components of an effective ranger workforce.

Left: Uniformed Pokili Bush Rangers working in Pokili WMA. Right: Pokili Bush Rangers monitor the harvesting of megapode eggs within the WMA to ensure compliance with the prescribed harvest times and methods. © Ann Peterson

8.2 Champions for conservation– Tavolo Wildlife Management Area

Strong leadership builds support for conservation

Background

Following the destruction of forests in West New Britain Province for timber and oil palm development, the customary landowners of Tavolo WMA (2400ha) agreed that it was essential to protect their land and resources. The WMA was established in 1997 to protect the environment for current and future generations; and to promote sustainable livelihoods. The WMA retains the only remaining forest within the area and is largely isolated from other natural areas.

> "He organises and mobilizes his community members so that they remain informed and connected to the outside world at all times through education and participation… He is committed to ensure that the future of his children is secured through conservation of natural resources and sustainable and culturally-relevant development" (Mogina 2010)

Aspects of leadership

Strong WMA Chair: Leadership under WMA Chair, Peter Kikele has resulted in substantial community and environmental gains.

Agreed governance structures in place: A hard-working and well-respected chief and Management Committee are in place. The members are unpaid, but have the capacity to implement and enforce laws effectively. Decision-making includes the customary landowners. The Committee actively promotes the importance of the WMA to the community and liaises with governments and NGOs to receive assistance and support.

Several community projects have been implemented: construction of a community resource centre and guest houses; roofing iron to 184 families; an Aid Post; provision of schooling for grades 3 and 4; housing for teachers; equipment for the sewing group; a sawmill; and women's projects. These projects provide basic services and help to *"reduce the temptation to invite destructive land uses such as logging and plantations"* (Workshop participant) into the WMA. Donations and funding have been received from nine donor organisations including the Global Environment Facility, Seacology, Forcet, Mama Graun Conservation Trust, the European Union and local level government.

Raising awareness and support for conservation: Peter instructs community members in forest management as part of the Tavolo Eco-Forestry Program and the community actively supports the WMA and are aware of the benefits that have been derived from their conservation efforts. *"We are happy and proud that we have initiated this project"* (Workshop participant) as almost everything the people use comes from the forest and the marine environment.

Key learnings

- Strong and committed leadership can ensure conservation gains as well as community development and improved sustainability.
- Strong partnerships (e.g. from government, NGOs or other external providers) are necessary to invest in community development that is aligned to conservation outcomes.
- On-going awareness raising and training are important to ensure long-term sustainable management and support for conservation. Collaboratively agreed plans are needed to underpin conservation and management actions.

> "It is uncommon to find a community that is so supportive of conservation and collectively maintains focus through activities that ensure that their local environment is protected whilst at the same time promoting sustainable development" (Mogina 2010).

WMA Chair, Peter Kikele ://asopa.typepad.com/.a/6a00d83454f2ec69e20191048c3c55970c-popup

8.3 Conservation Alliance – Torricelli Proposed Conservation Area

Community benefits – building support for conservation

Background

The TCA "uses the tree kangaroos as flagship species for achieving broad forest conservation outcomes" (TCA 2017)

The Torricelli Conservation Alliance (TCA), established in 2001, has assisted 50 villages in entering conservation agreements with three Local Level Governments. Three zones have been identified: a hunting zone; conservation zone; and commercial/subsistence livelihoods zone. The extensive area (185,000ha) supports several endemic and endangered species including the tenkile or Scott's tree kangaroo and the Weimang or golden-mantled tree kangaroo.

Bases of the program

Strong leadership and good governance: The TCA plays a pivotal role in assisting the villagers in their organisation, administration, project/skills development and in achieving conservation outcomes. There is also growing leadership capability within the villages. The Management Committee consists of 50 male and 50 female elected representatives.

Moratorium on hunting: Agreements are negotiated (every two years) with landowners who commit to protect endangered species and other environmental values. In return, the landowners receive a range of benefits.

Supported by external funding: Funding from UNDP has enabled the ongoing provision of a range of development projects and training/education programs, which are tied to various conservation outcomes. Funding also enables the payment of staff, including rangers (e.g. 30 permanent and 160 temporary paid staff), who manage the CA and work with customary landowners.

Community development projects

Diverse projects have been funded to address health and hygiene, family planning, poverty, housing, water supply, education and training, and sustainable livelihoods. These underpin the landowners' conservation efforts. For example, water tanks which have been installed are a daily reminder to the landowners of the benefits to be provided through agreeing to restrict hunting in certain areas of the CA.

Large in scale: To date about 50 villages and > 12,000 people have become part of the Tenkile Conservation Alliance covering an area of about 185,000 ha.

Working relationships with local level government: The Alliance works with the local level government to develop the conservation agreements.

Key learnings

- High profile species (e.g. tree kangaroo) can provide a basis for raising funding to support conservation.
- Sound governance structures are necessary to ensure effective management of funds that support conservation.
- Linking conservation efforts to community development helps to raise support for conservation, but must be sustainable into the future.

See also: Tenkile Conservation Alliance 2017. About TCA. Available at: http://www.tenkile.com/about.html

Left: Tenkile Tree Kangaroo
© Tenkile Conservation Alliance

Right: Improving water supply and sanitation
© Tenkile Conservation Alliance

8.4 Secure funding – Kokoda Track Historic reserve

Secure funding supports long-term sound management

Background

The Track Reserve (71ha), 96 km in length and 20 metres wide, crosses the Owen Stanley Ranges. Although the Track was long used as a means of communication by Papua New Guineans, it is the Track's historical importance during the Kokoda Campaign (July – November 1942) that has facilitated its protection. The Track was used to move soldiers and supplies and was crucial in turning back the Japanese advance on Port Moresby. The Track attracts about 4,000 trekkers each year.

Bases of the program

Kokoda Initiative brings secure, long-term funding: KI is a joint venture with funding provided by the Australian Government (AUD 5 million per annum) and contributions from the PNG Government. Income is also received from the licences paid by trekking companies and tour operators (about PGK 100,000 per annum) and trekking fees (PGK 350 per trekker, raising PGK 1.2 million per annum). These payments acknowledge that the land is owned by individuals and communities. This money helps to manage the track, improve the livelihoods of local customary landowners, and supports the payment of track rangers and various community development projects. Several NGOs also support community development projects in the area.

Kokoda Track Authority: KTA is a special purpose authority that provides oversight of activities undertaken on the track and a strong basis for leadership and management. It manages the track and the trekking industry and supports the two local level governments through which the track passes.

Community development projects: Diverse projects have been undertaken with the funds available and this has enhanced the livelihoods and welfare of the customary landowners, who are strong supporters of the Kokoda Track. Landowners also work as porters and guides and provide accommodation and other services to the trekkers.

Community development programs have included: education – schools, teachers, vocational training centre; health services – renovation of centres, aid posts, medicines, training of health workers; and other projects related to women's leadership, provision of community water supply and toilets, business support and a community mentor program.

Key learnings

- Secure and ample funding, combined with accountable management are essential to ensure continued visitation and support by landowners.
- Paid and trained rangers assist in providing an outstanding tourism experience and in assisting landholders.
- A diversified tourist product will generate expanded tourism and provide greater benefits to a wider group of landowners.
- Tourism accreditation and a Code of Practice are essential to provide a sound foundation for management and an outstanding experience for visitors.
- Some operators state there is a need for greater oversight and enforcement of permits.

Left: Owers' Corner – the Kokoda Memorial Arch represents the six states of the Australian Commonwealth and the connection between the people of PNG and Australia © Ann Peterson

Right: Track maintenance has improved several creek crossings © Kokoda Track Authority

8.5 Marine protected area management – Madang Lagoon

Is integrated management an opportunity lost in Laugum, Sinub, Tab and Tabad WMAs?

Background

> "Through the Madang Lagoon Association we are connected with other WMAs in the Lagoon and we share ideas and work together" (Tabad WMA).

Madang Lagoon has over 800 reef species: about 57% of reef species in PNG and 14% globally (Jenkins 2002). The marine areas are in relatively good condition. Four small WMAs have been gazetted in the Lagoon, with limited resources to implement management actions. The Madang Lagoon Management Association assisted with management, but recently it has had little funding or support to continue its work and this has been a significant impediment to an integrated approach to addressing environmental threats.

Bases of the program

Madang Lagoon Management Association: In the past, the Association has assisted with lagoon-wide planning and helping WMAs to manage their resources, undertake research and monitoring, and develop alternative income generating activities. The Association is a critical element in future planning for the lagoon and its WMAs.

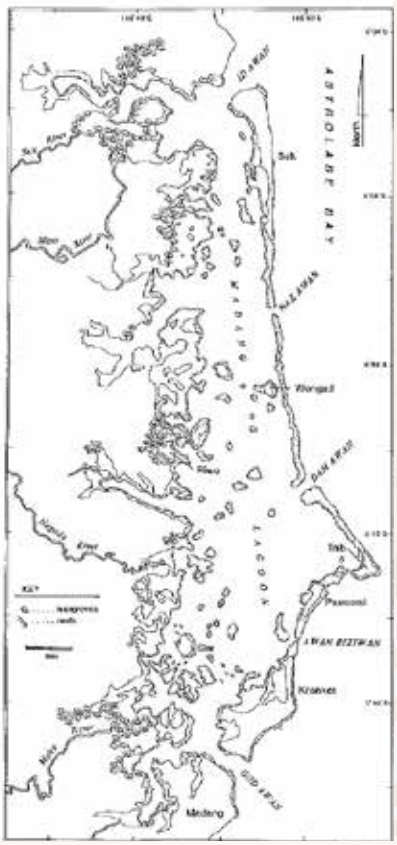
Resource and information sharing: Marine environments are typically difficult and expensive to manage. Sharing of resources, both physical and human, can facilitate improved outcomes.

Seascape or eco-regional approach to conservation: A lagoon-wide management plan can facilitate more integrated management and a greater ability to address a range of threatening processes being experienced within the lagoon. Cross-sectoral engagement is important in this developing region.

Key learnings

Collaborative approaches to planning and management can help to: spread management costs; increase benefits for conservation and for landowners; share resources; expand areas under protection; improve community skills through shared training; improve communication and engagement; raise awareness within the wider community; and develop income generating activities such as ecotourism.

- Integrated government support is necessary to ensure effective regional planning for the Lagoon.
- NGOs can assist communities to develop management plans and undertake collaborative research and monitoring activities.



Madang Lagoon. Source: (Jebb and Lowry 1995, p. 3))

Tabad WMA, Madang Lagoon
© Ann Peterson

8.6 Ridge to reef – Kamiali Wildlife Management Area

Good design and an integrated landscape approach

Background

Kamiali WMA located on the Huon Coast, contains both terrestrial (29,285 ha) and marine (18,128 ha) components, extending from the forested catchment divide to about 12 km offshore into the Solomon Sea. It ranges in height from 2,012m above mean sea level to 1,080m below sea level.

Design elements

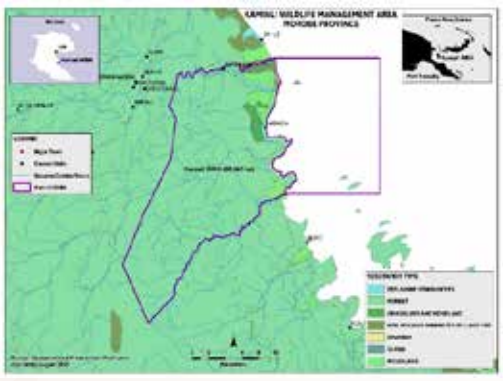
Holistic, catchment based planning: The WMA contains diverse terrestrial and marine ecosystems. Biomes include open sea, coral reef, mangrove, beach, sago swamp, riparian areas, tropical forest and cloud forest. It provides habitat for many rare and threatened species. The area is an important nesting site for the endangered leatherback turtle.

Supports sustainable livelihoods: The 1500 people who live within the WMA obtain their resources sustainably from the WMA. Diverse forest and marine species are extracted, usually according to traditional rules.

Supported by external agencies and funding: Leading researchers and NGOs highlighted the importance of the area for a diverse range of species (e.g. leatherback turtles) and supported the landowners in establishing the WMA. Funding and support have now tapered off and the community is seeking assistance.

Key learnings

- Integrated terrestrial and marine protected areas provide opportunities for improved water quality outcomes (in-stream and marine) and conservation of terrestrial and marine ecosystems.
- Integrated governance arrangements are needed, especially between all levels of government and NGOs.
- Long-term support (e.g. from government and NGOs) is necessary to help maintain facilities, equipment, improve landowners' wellbeing, skills and support for conservation.
- Appropriate income generating projects are necessary to ensure the community has the capacity to sustainably finance conservation actions when donor agencies depart.



Location of Kamiali Wildlife Management Area

Ridge to reef conservation approach used in Kamiali WMA © https://png-bpbm.smugmug.co

© Ann Peterson

8.7 An integrated approach – YUS Conservation Area

Supported by sustainable production and long-term funding

Background

YUS is PNG's first Conservation Area (CA) under the *Conservation Areas Act 1978* and is located on the north east corner of the Huon Peninsula. It is named after the Yopno, Uruwa and Som Rivers that flow through the CA. The forested core zone or tambu area is gazetted as the YUS CA, which is within the wider 'YUS Landscape'.

Main components

Integrated landscape-based planning: The YUS CA Landscape (blue line on map) (150,000ha) extends from coral reefs on the northern coast bordering the Bismarck Sea to the peaks of the western Saruwaged and Finisterre Mountain Ranges (4,100m). It contains diverse ecosystems, and provides habitat for many rare and threatened species. Within the YUS Landscape is the gazetted CA (striped zone on map) (78,729ha). Since gazettal, additional areas of land and reef have been pledged for conservation (areas shaded red and dark green on map). The YUS Landscape Plan (Tree Kangaroo Conservation Program 2012) integrates management of the gazetted area with the wider landscape or livelihood zone, where most people live, garden and hunt.

Flagship species raises support for conservation: The CA design focuses on protecting the endangered endemic Huon tree kangaroo, *Dendrolagus matschiei* and developing connecting landscape corridors and buffers, especially along riparian areas. The tree kangaroo is a symbol for the project and helps to raise awareness and support for conservation, especially from international supporters (Tree Kangaroo Conservation Program 2017a).

Supported by external agencies and funding: The YUS Conservation Endowment fund provides annual funding to support management, community development and training/education. Support is provided by Woodland Park Zoo (USA) and Conservation International. The budget (US$90,000 pa) is secure and effectively managed.

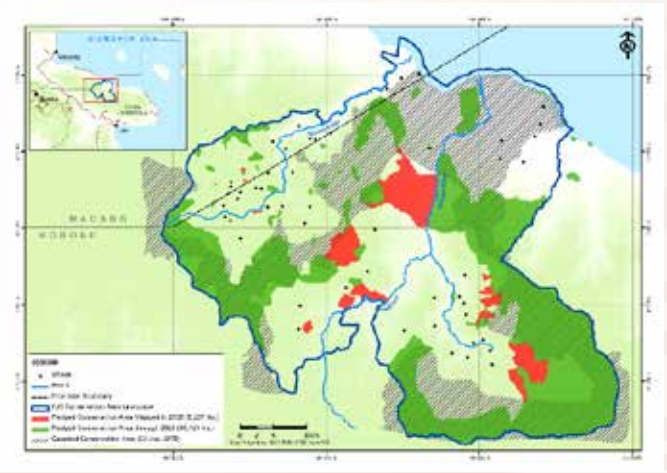
Conservation linked to production and community development: Landowners pledge land to the CA and in return are trained to grow quality coffee and cocoa for export with a premium price. Community projects are supported with a focus on healthcare, education and awareness raising.

Strong, inclusive and effective leadership: The Tree Kangaroo Conservation Program has an Assistant Director and 12 staff based in Lee, 16 rangers and 2 international members. The Management Committee is supported by the YUS Conservation Organisation (three representatives selected from 14 wards and including at least one female).

Active on-ground management/protection systems: Paid rangers are employed to enforce regulations and landowners volunteer to improve management outcomes. These on-ground rangers are backed up by technical support staff.

Key learnings

- Integrating the planning and management of the protected area with its surrounding landscape can improve conservation outcomes.
- Integrated and inclusive governance arrangements are needed between all levels of government and NGOs.
- Long-term support (e.g. from internal and international providers) is necessary to provide conservation and community outcomes.
- Supported income generating projects linked to conservation outcomes can incentivise support for establishing and managing protected areas (Beehler and Kirkman 2013b).



8.8 International collaboration: Maza Wildlife Management Area

International support for traditional management practices and management planning

Background

Maza WMA (184,230ha) consists mainly of marine areas in the Torres Strait and adjoins the coast to the west of the Fly River estuary. It is less than 12km from the Australian Sabai Island. The WMA includes two islands: Daru, which is heavily populated, and Bobo/Bristow. The WMA has important areas of seagrass, coral reefs and mangroves. Part of the WMA lies within the Torres Strait Protection Zone. The Torres Strait supports the world's largest dugong population.

Main components

International cooperation in management: 14 villages in Maza WMA are included in the Torres Strait Treaty and cooperate in planning and on-ground work with Australian authorities and communities. Through this treaty and as part of the Torres Strait Protection Zone, the WMA has access to resources and support from the Australian Government. The draft Moro Momoro Gamo Management Plan (Treaty Village Communities South Fly District)aims to reduce pressure on marine resources by supporting livelihoods which generate a steady income and protein supplies, in exchange for dugong/turtle and environmental stewardship .

Institutional support: There is good organisation and support from the WMA Management Committee, local level government, and other institutions. CEPA has also provided assistance in the past. However, this is negatively impacted by a lack of funding to implement plans and on-ground actions.

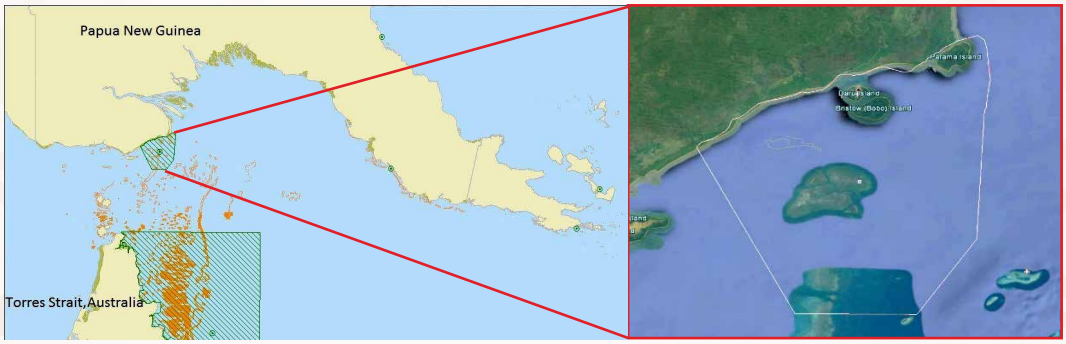
Traditional rules support conservation: The customary landowners have extensive rules relating to the harvest of marine species, including dugong, turtles and fish species and there is a strong culture and high level of commitment by the resource owners to long-term sustainable use of marine species and their habitats.

Diverse pressures on the marine environment: About 20,000 people live within the WMA and rely on its marine resources for their subsistence e.g. fish, crayfish, turtles, dugong and *beche de mer*. Many people are migrating to the area to escape the pollution entering the Fly River and this is resulting in over-fishing and harmful fishing practices. Turtles and other species are sold commercially in Daru and Port Moresby. Effluent entering the WMA contains heavy metals which are affecting human and fish health.

Community rangers help the community: Rangers have been trained through the Treaty Villages Resilience Program, although to date this has concentrated on building and maintaining community facilities (e.g. water supply).

Key learnings

- Networks of interlinked marine protected areas can help to conserve marine species and ecosystems.
- Integrated and inclusive governance arrangements are needed between all levels of government and NGOs and international partners.
- Strong customs and traditions are important to ensure the sustainable use of marine resources.
- Long-term support and funding (e.g. from internal and international providers) are necessary to enable effective on-ground management actions.
- Community rangers are essential to monitor and enforce agreed rules within large marine protected areas. However, they need appropriate training and equipment.



Location of Maza WMA within Torres Strait

8.9 Ecotourism At Mt Wilhelm National Park

Potential for sustainable benefits – for the park, tourists and the community

Background

The national park (71,364 ha) contains the highest mountain in PNG (Mt. Wilhelm, or Enduwa Kombuglu, 4,509m), has high biological conservation value (e.g. extensive alpine and sub-alpine vegetation), and diverse landscapes including glacial lakes. While the park has suffered as a result of poor funding and resourcing, commercial tour/trekking operators have stepped in and maintained an ecotourism presence on the mountain.

Ecotourism issues

Highest mountain providing a major trekking experience: As PNG's highest mountain Mt Wilhelm NP attracts international trekkers who aim to climb the highest mountains in the countries they visit. It is considered a test of endurance by trekkers. It has attractive scenery and offers a very special experience to visitors (e.g. walking in snow and cloud forest, viewing orchids and cycad forests). It remains in very good condition, largely due to its remoteness.

"The park was at some point ceded to the provincial administration to manage and since 1994 there has been little active management or recognition of the area as a protected area" (PNG Tourism Promotions Authority 2017)

Limited tourism organisation, facilities and services and minimal on-ground ranger engagement: There are tracks leading to the summit and these are partly managed by the customary landowners as the on-ground ranger service was discontinued in the 1990s. Since this time tourism and research facilities have fallen into disrepair. A recent injection of funds (PGK500,000) will be used to develop a resource centre, including an office for national park rangers, and this will improve the visitor experience.

The park "is not managed formally by any organisation for tourism… although local villager members provide … accommodation" and act as porters. (PNG Tourism Promotions Authority 2017)

Key learnings

- Long-term and secure funding is needed to ensure the park maintains its values and continues to attract tourists.
- A trained and well-supported on-ground ranger presence is essential to maintain the tourist facilities, including the track, ensure visitor safety and implement management actions.
- Improved regional infrastructure (e.g. airstrips and roads) are essential to attract visitors and provide a cost-effective tourist offering.
- Licensed tour operators and a Code of Practice are necessary to provide some funding to maintain the facilities and improve the visitor experience.

The customary landowners, whose lands were alienated in the process of becoming a national park, must be involved in future determinations concerning the park, e.g. planning, benefit sharing and community development.

Reference: (Papua New Guinea Tourism Promotions Authority 2017)

Trekkers ascending Mt Wilhelm © PNG Trekking

Aerial view of Mt Wilhelm National Park

8.10 Absence of management: Loroko National park

Failure to manage and enforce rules leads to biodiversity loss

"Few animals remain. They have been depleted by hunting. There are only a few pigs … and some birds…The walkabout sawmill is illegally extracting timber" (*Workshop participant 2016*)

"There were no particular values for which the park was designated, other than it was land owned by the state" (Workshop participant 2016)

Background

The land on which Loroko National Park (100 ha) in West New Britain Province stands was a government agricultural station in the colonial area. The former Department of Primary Industries undertook wildlife extension work (e.g. mainly related to crocodiles). After Independence, the station closed and the site became a national park in 1991. The customary landowners (from the Ababe and Boualali clans) indicated that they were not consulted in this process and were removed from the site.

Management issues

"The government has failed to manage the area" (Workshop participant 2016)

Lack of management and resources

The transferral of the land to the State for protection did not result in the provision of money or other resources (staff, equipment or facilities) to assist with management and the park does not have the support of the customary landowners or local community.

"…in the past the people knew the traditional boundaries and customs, but now other people enter and have less respect for the values … The local community has no respect for the land, so they take resources and enter the park (e.g. for timber, hunting and gardening)". (Workshop participant 2016)

Boundaries have little relationship to enhancing effective management

As the boundaries reflect the needs of the former agricultural station, there is little relationship to requirements for effective environmental conservation.

Loss of values

The failure to manage and enforce rules has resulted in the loss of the park's biodiversity values due to resource extraction by both the former customary landowners and other 'outsiders'.

Key learnings

- The transferral of former colonial government lands to a type of protected area (e.g. national park, sanctuary, nature reserve etc) was often based on the lands being in State ownership at the time, rather than their high value for conservation. This may not provide a sound basis for a comprehensive, adequate, representative and resilient national protected area network.
- The exclusion of customary landowners from decision making concerning the status of their area and its ongoing management limits the protected area outcomes.
- In many cases, the status of these sites is unclear and future decision making should include the former customary landowners, many of whom want their lands returned to them.

Workshop participants' perceptions of Loroko National Park's values
© Ann Peterson

CHAPTER 9 Discussion: What is working and what is not

This chapter overviews the findings of the PNG-METT assessment and identifies the main positive features of protected area management in PNG, and its key challenges and weaknesses.

9.1 Positive features to build on

Positive ratings and comments repeatedly observed in the assessments related to four main themes: positive community attitudes and receptiveness; the policy framework; values remaining in protected areas; and some strengths in management effectiveness. While current management effectiveness is weak and there are many issues to be resolved, the topics discussed below provide a strong basis from which to create a vibrant, sustainable and well-managed protected area system in the future.

Landowners in more than three-quarters of PNG's protected areas supported the protected area and conveyed an open and positive attitude to revitalisation of the protected area system.

9.1.1 Community attitudes and receptiveness

Most customary **landowners remain interested** in conserving their land and seas. People are closely connected to their traditional lands, and there is a close intertwining of culture and nature. Often customary landowners see the main value of nature as providing resources for livelihoods – food, building and medicinal plants, and fresh clean water.

Communities appreciate the range of benefits provided by protected areas (Section 3.5) and are concerned about the risk of losing them.

There is a strong desire by customary landowners to protect and continue their **languages (Tok Ples) culture and traditions**, including respect for *tambu* (sacred) and *masalai* (spirit) places, and to pass on their culture and respect to future generations. They are aware of the important role that the natural environment plays in this culture. Internationally, biodiversity and language diversity often coincide, (Gorenflo *et al.* 2012) and loss of languages has been closely linked to biodiversity loss (Maffi 2005).

Landowners stated their current support in more than three-quarters of the protected area assessments. There is a high level of interest and support for the potential revitalisation of almost all the protected areas. Despite many years of neglect and broken promises from both government and civil society with respect to their protected areas, customary landowners generally were prepared to start again and conveyed their open attitude to CEPA staff and the assessors.

Landowners are open and enthusiastic about exploring a range of sustainable livelihood options. Given the option, most would prefer to be able to live and work on or close to their traditional lands and seas, provided they can do so with a reasonable quality of life.

Landowners of Libano-Hose WMA discuss the values of their area. Communities such as this are cautiously positive about protected areas, but need to see some benefits if their support is to continue. Photo: © Ann Peterson

9.1.2 Policy framework

CEPA has developed an ambitious and comprehensive **Protected Area Policy** which has been endorsed by the NEC, and has also prepared the new Protected Areas Bill. This will provide the foundation for establishing new protected areas and for transitioning and revitalising existing protected areas. The **national policy context** from the Constitution down provides support and endorsement for approaches to conservation that are strongly oriented towards involvement and ownership by customary landowners. **International goals, policies and agreements** also strongly support both conservation and the rights of Indigenous people (CBD COP 10 2010; United Nations Permanent Forum on Indigenous Issues 2006) and can be adapted to be appropriate to PNG's cultural and legal framework.

There is a very high potential for **financial and logistical support** for the PNG protected area system from the international community, once there are secure options for effective investment. This potential support ranges from large international organisations to community ranger groups in Australia and the Pacific.

9.1.3 Retention of values in protected areas

The natural values of most of the protected areas assessed are in **good to very good condition**. However, there are many serious threats to the values and there has been extensive loss of natural vegetation and species in some protected areas. While many values on existing and potential protected areas are deteriorating, there is still great potential for conservation if action is taken soon. PNG retains an extraordinary level biodiversity on an international scale, and efforts in conservation can yield very rewarding results.

Many protected areas have **potential for tourism**, which can generate income for communities to complement their subsistence lifestyles. Many customary landowners see this potential for ecotourism and are keen to put in their own effort if some training and support is provided.

9.1.4 Strengths in management effectiveness

While management effectiveness scores overall are very weak, some strengths can be built on. It is important to realise that revitalisation of the protected area system would not be 'starting from scratch'.

All but two of the protected areas in this study have been **formally gazetted**, and protected area **boundaries** are mostly mapped and known by the customary landowners, though their precise location is not always known on the ground and in many cases mapping needs to be corrected.

In about half the protected areas, there are either active **management committees** or inactive committees that could be reconstituted. In most cases there remain at least some customary landowners with an **understanding of the values** of the protected area, and a real interest in reviving and strengthening management. Their view is that such revival would be positive for livelihoods and for the strengthening and retention of cultural links. (There are a few exceptions where customary landowners would like their protected areas to be degazetted.)

Landowners also have quite a sophisticated level of understanding and support for concepts of **spatial and management planning**, and are very keen to engage in process where the community and other parties work out logical and positive ways forward for conserving the protected area while allowing for sustainable use. There were repeated references to the need for such planning as part of future initiatives. While there is a lack of formal management plans and objectives, many protected areas have traditional rules that guide management.

While current law enforcement is weak in most areas, the customary landowners are very aware of the problems, especially in relation to uncontrolled incursions including settlement by outsiders. There is a **high degree of interest in re-establishing a rule of law** in the protected areas and they would be very appreciative of efforts in this regard.

9.2 Key weaknesses and challenges

This section provides an overview of the key weaknesses that need to be overcome, and the challenges facing government, customary landowners and other partners in their efforts to establish a viable and well-managed protected area system. This information relates to management challenges, and should be considered in conjunction with the threats to the protected areas (Chapter 6).

9.2.1 Lack of agency presence, the rule of law and community sanctions

> To date the land in most instances has been enough to satisfy a sustainable rotation of subsistence agriculture and hunting pressure. However, now with increasing populations, the resources are not so abundant and capable of supplying the needs of the community. In the past there have been processes in place to protect environmental resources (e.g. where to garden and when; bans on hunting some animals; seasonal bans on animals; not eating totem animal etc– based on traditional law). Now some people just say I will put my garden where I like.
>
> Not many communities know or consider the issue of stress on resources or understand the concept of limits or carrying capacities in relation to the island they live on. (Oya Mada Waá WMA)

Overall the key weakness of the existing protected area system is the **absence of any protected area management agency or organisation**, resulting in almost total breakdown of the rule of law in most of the protected areas. This absence of a 'parks service' at any level of government has been partly compensated for in some places through the activities of management committees and NGOs, but some of the larger international NGOs no longer have programs specifically giving support to local protected area endeavours. There is an organisational challenge involved in establishing a workable management system throughout the country.

The lack of any 'inputs' – that is, paid protected area staff, equipment, support and infrastructure is a weakness underlying all aspects of protected area management effectiveness, including planning, law enforcement and patrolling, community awareness and education, resource management activities and visitor management. The challenge is to provide these inputs in a practical and *sustainable* way, to meet the greatest needs of the protected area.

Customary landowners almost universally requested greater involvement from CEPA itself, while others mentioned the roles of provincial or local level government. There were frequent references to the 'good old days' when the government had staff and management presence on some protected areas. Since this presence has been withdrawn, the resultant gap has led to chaos, conflict and the serious loss of protected area values, to the extent that some protected areas are now not viable.

Most of the threats relating to land clearing, overhunting, overfishing and other serious resource loss appear to be from **small-scale use: that is from illegal settlement and unsustainable resource extraction** by individuals and small groups. This is largely blamed on 'outsiders', including immigrants (some displaced people from far field) who have settled within protected areas and are not subject to customary laws and traditions. Classic 'tragedy of the commons' scenarios have then developed, as local people cannot see sense in practicing good resource management when others from outside clear land, fish without limits, and hunt endangered species. Re-establishing clear ownership and control by customary landowners, with support from partners and legislative backing, poses an important challenge, as the attitude has developed in some areas that protected areas belong to no-one and are available to everyone.

Customary landowners find it very difficult to enforce any laws, even to stop people from clearing and settling within protected areas, and they reported no support in this regard from any level of government, even where such help has been requested. Communities are lacking training, equipment and infrastructure for law enforcement, and often cannot access or patrol the protected areas in a practical and regular way. While some local courts make serious efforts to uphold the law, in other cases courts do not deal well with protected area infringements. The allocated punishment is not always an adequate deterrent. An added challenge is that when people are apprehended there is a serious risk that they will retaliate and cause further harm to the protected area or to the customary landowners.

9.2.2 Incursions from large-scale development

Environmental laws do not always protect the values of protected areas and there are instances of mining exploration, commercial plantations, logging and road construction within protected areas. It is anticipated that strengthened legislation will reduce these pressures under the new Protected Areas Bill, but there will be many challenges in implementing the new legislation.

Many communities are struggling to protect their protected areas from impacts due to past or present industries on adjacent lands or within their larger catchment areas.

9.2.3 Context of population increase poverty, resource depletion and lack of government services

Governments have not provided basic services such as roads, education, and health to many of the customary landowners interviewed, and this increases their reliance on a range of resource uses including logging, mining and agriculture. Lack of basic services also places pressure on protected areas from both local landowners and outsiders seeking basic livelihoods. While meeting this challenge is beyond the scope of the protected area system, poverty and the lack of community education and facilities makes establishment of good management much more complex. Increasing populations have placed additional strain on both natural resources and community infrastructure.

9.2.4 Community training and understanding

Though customary landowners have a high level of appreciation for the environment, this is usually a utilitarian view that values biodiversity for its production values (e.g. food security, building materials) and provision of clean water, good soil and clean air. The **level of understanding about wildlife and ecology is not high** in many areas, as traditional knowledge is being lost and little scientific knowledge has been gained. Participants in the workshops stated their needs for training, and also were concerned about the lack of understanding of the value of protected areas in their wider communities and among younger people.

9.2.5 External threats: climate change, invasive species and natural disasters

Even with the most effective possible management, protected areas need to cope with many external threats including climate change and invasive species. N**atural disasters including volcanic eruptions, earthquakes and tsunamis are always possible in PNG**, while floods and droughts may be exacerbated by climate change.

Participants in the assessment process were **extremely concerned about climate change**. Building resilience in the communities and the protected areas will remain a very considerable challenge for management.

9.3 Conclusions

The strengths and weaknesses of protected area management in PNG, and the challenges facing managers, have not changed dramatically since previous assessments were conducted in the 1990s and mid-2000s. In some cases, there has been improvement, due to the efforts of communities and support from external groups, but in many protected areas the situation has become more serious with the withdrawal of previous support. Protected area policies and planning at national level have made considerable advances, but the situation of most protected areas on land and sea remains very poor, with few resources and little on-ground management.

In 1992, the “matters inhibiting effective implementation of protected areas in PNG” were summarised as:

- “A lack of staff and inadequate funds make effective implementation of conservation areas, and monitoring and management of conservation areas, very difficult…;
- The possibility of cash income from development of resources in individual or group-owned land makes landowners reluctant to set aside portions or all of their land for conservation purposes…; and
- A lack of effective environmental education or awareness campaigns, and a lack of technical training of government and community groups” (Seri 1992, p. 16).

These matters remain serious problems, but this study has shown that the positive features of committed customary landowners and biological and cultural values mean the protected areas have potential to be part of an outstanding network in the future.

CHAPTER 10 Opportunities and recommendations

10.1 What we did

In this chapter, we present recommendations synthesised from suggestions by customary landowners and other workshop participants (Chapter 5) and from our analysis of the of the assessment results. This chapter is not intended to be a prescription for all activities or policies needed for PNG protected areas to flourish – this more comprehensive work is being undertaken as part of CEPA's implementation of the Protected Area Policy.

Future management is clearly a shared responsibility with governments, communities, civil society and industry all playing important roles. Thus the recommendations here do not apply to governments only, and it is important that discussions are held to allocate responsibilities.

10.2 Key findings

Strengthening effective management of protected areas in PNG will require a concerted and long-term effort with shared responsibility. In the past, shared responsibility and devolution have often meant that *nobody* picked up the tasks and costs of protected area management. Improvement in management will only be seen if *all parties* are willing to work together and real leadership emerges.

Five key areas of effort are recommended (Figure 46), relating to the establishment of protected areas as clear enforced entities; clear allocation of governance and management responsibilities, including an on-ground ranger presence; development of management plans and activities; increased awareness and education; and consideration of community needs and interests.

These five areas of effort should be undertaken concurrently and in an integrated manner – for example management committees and a ranger workforce will be needed to establish a clear rule of law; and education must be complemented by effective law enforcement. It is assumed that there will be full involvement of customary landowners in all decision-making and management actions discussed in this chapter.

A basic need underlying most of these recommendations is a **sustainable, adequate and well-managed system of financial support** to all protected areas, which could be derived from a variety of sources. Development of this system of financial support is a focus of CEPA and UNDP, and will not be discussed in this report.

It is also critical that there is **support from all sectors of government and civil society,** including through laws and policies that respect the integrity of protected areas and provide complementary services and law enforcement.

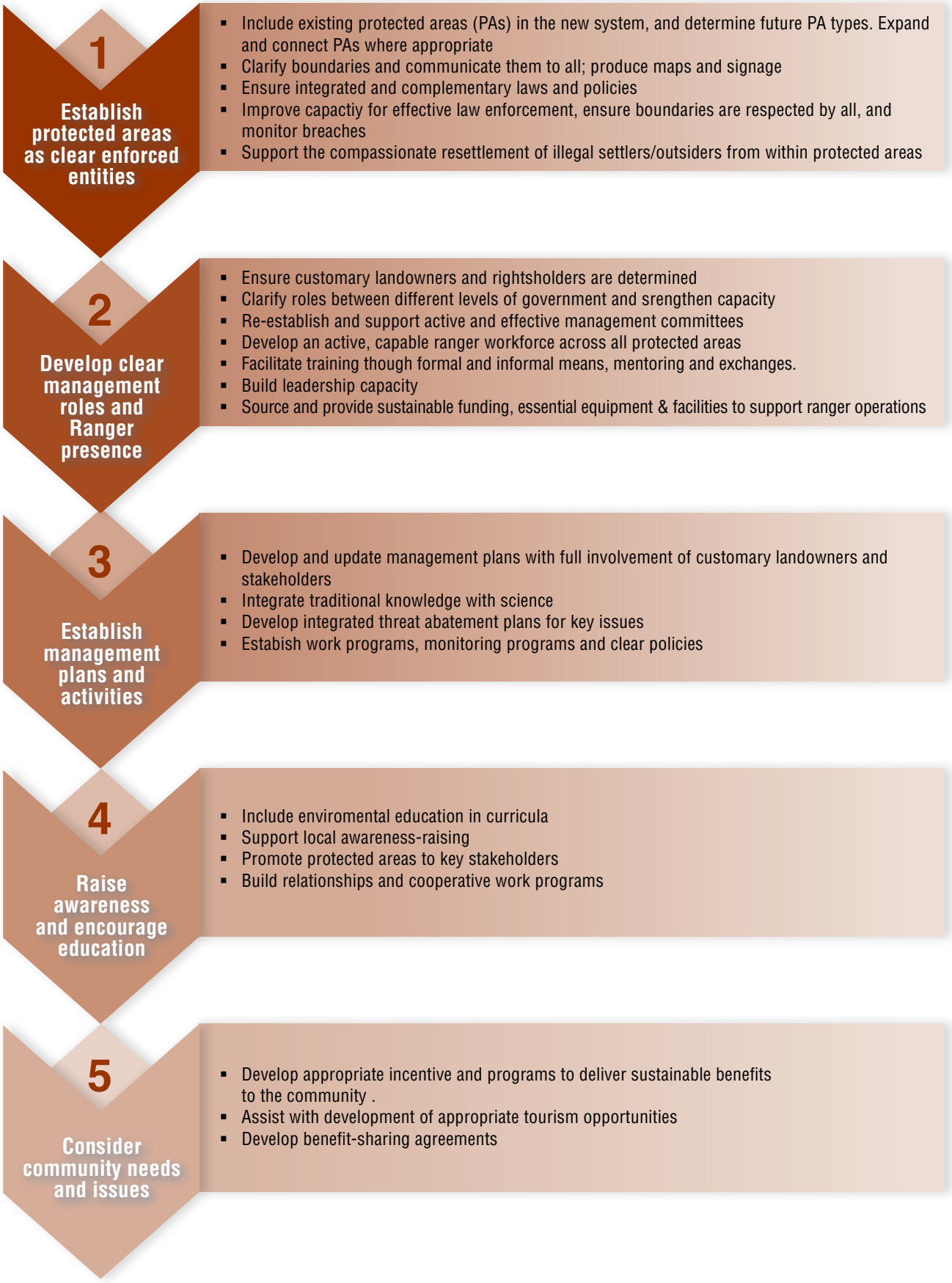


FIGURE 46: Recommendations for an effective protected area system in PNG

10.3 Establish protected areas as clear, legally enforced entities

Recommendations and justifications

- **Include existing protected areas in the new and expanded protected area network**, except where there are good reasons to exclude them (see below). Some protected areas are of outstanding and unique landscape and biodiversity values, and have been identified as high priorities in conservation planning studies (Adams *et al.* 2017). Others may not rate as highly in reserve prioritisation processes, but are important to customary landowners and deliver a range of benefits for connectivity, catchment protection, biodiversity conservation and sustainable landscape and seascape management. A precautionary approach should be adopted: the lack of current knowledge about the biodiversity of an area should not result in it being degazetted.

  We recommend that existing protected areas be included in the revised system, unless there is strong opposition from customary landowners (for areas under customary landowners) and/or all natural and cultural values have been seriously degraded. Support and enthusiasm from local people is an important factor to consider in planning the protected area network. As one conservation scientist observes:

  "…we have seen 20 years of prioritizing different regions of the country for some hypothetical future conservation that would be, one day, miraculously delivered to its biodiversity hotspots. There have been many failed conservation projects in the PNG history, all due to inadequate popular, political or financial support for conservation and ensuing conflicts about the use of land (*West 2006, Mack 2014, Novotny 2009, 2010*). There are hardly any conservation projects that have failed because they lacked adequate biodiversity information and were therefore erroneously protecting a species poor forest. This experience tells us that **conservation areas should be located primarily where conservation enjoys strong support from the landowners**." (*Novotny and Toko 2015, p. 83*)

- **Determine the future designations or types of the existing protected areas**, in full consultation with the management committees, customary landowners, local and provincial governments, and other stakeholders. A guide to selecting the most appropriate protected area has been produced by CEPA as part of this project.
- **Consider the expansion of some protected areas** to include key values and viable areas of habitat, especially where landholders have requested this. Any expansion would need to be in consultation with all stakeholders. Protected areas where customary landowners have requested expansion are listed in. **Existing protected areas may become part of future larger protected areas** of high natural and cultural significance, or may be connected with other natural areas.
- **Clarify boundaries and communicate them to all parties.** Participatory community mapping is an excellent process to develop shared understanding. Lack of knowledge about boundaries and rules is one of the driving forces behind the small-scale incursions into some of the protected areas. Boundaries of marine protected areas also need to be marked through anchored buoys and notices.
- **Provide large-scale printed maps** to landholders and governments, and **erect signage** across the protected area system to mark boundaries. This signage may include local-style signs that may engage people more effectively (Figure 47) as well as more formal government-style signs (Figure 48) though these would also need to be in Tok Pisin.
- **Ensure integrated and complementary law and policy making** among national government departments and across all levels of government and non-government sectors, to achieve protected area management outcomes. Existing and potential threats to protected areas including climate change, population growth, invasive species, and development impacts must be addressed in a more integrated way. Sharing of spatial data and an understanding of

FIGURE 47: Boundary sign – YUS Conservation Area
Source: Tree Kangaroo Conservation Program (2017b)

FIGURE 48: Example of formal boundary sign
Source: Queensland Parks and Wildlife Service (2015, p. 5–6)

boundary issues is a good start. Other agencies will need to follow provisions of the management plans as well as the protected area legislation.

- **Mainstream environment and conservation including protected area management** into provincial, district and local level plans in accordance with the Vision 2050, MTDP and StaRS to ensure respect for protected areas and resourcing for these areas.
- **Communicate the laws relating to protected areas to all PNG agencies**, and provide training where appropriate to local government workers, magistrates, police, fisheries and border patrol officers, army and other enforcement officers.
- **Regularly monitor breaches of protected area boundaries** (especially land clearing) through on-ground monitoring (requiring ranger patrols) backed by spatial analysis, and **follow up any infringements as a matter of priority**. Other government departments could play a role in surveillance. While law enforcement may be an unpopular activity, it is an essential process to overcome the 'tragedy of the commons'. If incursions into the protected area are seen to go unpunished, it gives the impression to the community that people who do the wrong thing are rewarded, while the law-abiders lose their customary land.
- **Improve capacity for effective law enforcement** in a holistic plan from regulation review, to patrols and enforcement, to legal proceedings. A range of approaches to law enforcement are needed, as problems range from minor and local issues, such as hunting and fishing outside agreed limits, to major incursions by large companies or settlers from outside the community. Many suggestions for increasing capacity were made by participants (Section 5.7) including paralegal training to assist communities to enforce their own by-laws. In some cases, enforcement assistance from outside the community is essential to avoid situations where community members find it difficult to sanction their family members or elders.
- **Support compassionate resettlement** of people illegally living on protected areas (i.e. without permission of customary landowners), after discussions with customary landowners. Preventing new illegal settlements is also important: in times of scarcity, any unused land or water can be seen as open access unless clear rules and sanctions are portrayed.

10.4 Establish clear management roles and an effective on-ground ranger presence

- Where necessary, undertake studies and mediation to **determine the customary landholders and rightsholders** to ensure that appropriate people are involved in protected area management.
- **Establish or re-establish management committees** for relevant protected areas, ensuring representation of all groups involved, including women. Negotiate terms of reference for the committees and ensure there is a motivated and capable group of people involved. Provide opportunities for information exchange and cross-learning among committees. Where appropriate (e.g. Madang Lagoon), help landholder groups form larger organisations to cooperatively secure equipment, staff and training.
- **Encourage management committees (along with rangers) to develop protected area by-laws** and to enforce the by-laws, if necessary by taking offenders to court. Ensure the committees are supported to be active and efficient.
- **Develop an effective ranger program a**cross all protected areas, backed by small teams of conservation officers in provinces or regions. *Finding an effective mechanism to employ field staff is critical and urgent, and should be one of the highest priorities in re-invigorating the protected area system*.

The focus of increased staffing for protected areas firstly needs to be in the field, to fill long-term and serious gaps in on-ground patrolling and law enforcement capacity. These rangers may be full-time or part-time, but the appointments should be long-term and sustained. A model used in YUS CA, where rangers spend one week per month patrolling and monitoring (Tree Kangaroo Conservation Program 2016), may be a good example, as this allows more community members to be employed and allows them to continue traditional activities as landowners.

Another useful model is the Australian Indigenous Rangers program. A strength of this program is that rangers are drawn from the communities and are employed by local organisations, but may be funded directly from different levels of government or a range of other sources. While maintaining a local community identity, they share a common pride in their Indigenous Ranger image. This program has delivered numerous social and economic outcomes as well as environmental benefits (van Bueren *et al.* 2015).

Rangers need to be appointed as a designated officer under the Protected Area Bill, given an identity card, and trained to uphold the laws and manage the areas.

Both male and female rangers should be employed, and a fair selection process used to avoid the community elite being appointed to all positions.

- **Strengthen the national, provincial and local government capacity to manage protected areas** with the appointment of conservation officers who would support and assist management committees and field rangers. These people would have expertise in fields such as planning, education and monitoring, and would have a direct role in field support rather than high-level policy. Some roles may need to be shared across several provinces on a regional basis as it may not be possible to establish this capacity across all provinces, especially in the early stages of implementation. District Development Authorities may also be able to assist if environmental conservation was added into their mandates, as they have good presence at local level.
- **Build capacity for field management** through good supervision, training, information exchange, mentoring, visiting other protected areas, and other activities. National Ranger Associations from the region and the International Ranger Federation could provide practical peer support.

  Training needs suggested during assessments include:

  - financial management (for WMA Committee members)
  - leadership (roles and responsibilities of WMA Committee members), management and organisation
  - monitoring and basic research
  - evaluation and reporting
  - maintenance of equipment
  - office skills including computer/IT skills
  - horticultural skills
  - human resource management
  - report writing
- **Build leadership capacity** among customary landowners to reduce the dependence on external organisations, and establish long-term and reliable champions and leaders in protected area communities.
- **Obtain and maintain essential funds and equipment for the field and support staff to function effectively.** As well as field staff, support staff will also need to access transport, computers, mapping and office space and equipment. Asset and financial management skills and systems will be needed.

10.5 Establish management plans and activities

- **Develop and regularly update management plans** to ensure that values are protected and threats to the protected areas are identified and addressed. Management plans will usually need to include land use plans and related zoning strategies that incorporate seasonal closures, no-take zones and harvest limits. They should also address effective monitoring and evaluation and underlying research. Ensure plans include visual representations and community visions. Management planning approaches suited to the PNG context include the Open Standards for Conservation (Conservation Measures Partnership 2013) and management planning for Indigenous Protected Areas in Australia (Hill *et al.* 2011).
- **Integrate traditional knowledge with science** to develop strong but relevant plans, based on local adoption and adaptive management, and management based on good information. Encourage appropriate and useful research and monitoring programs, but ensure that scientists return information to the customary landowners and protected area managers, in relevant and useful formats.
- **Develop regional threat abatement plans** where necessary, to ensure integrated management of relevant threats such as invasive species, water pollution and illegal settlement at appropriate landscape scales. Improve information on threatening processes through research and monitoring, and improve data storage and sharing among relevant stakeholders.
- **Effectively engage and plan with all relevant stakeholders to avoid or minimise the impact of threatening processes.** This will include all levels of government, researchers/institutions, customary landowners, NGOs and stakeholders in the areas contributing to the particular threat (e.g. plantations, forestry, mining, infrastructure, industry etc). This may also include catchment wide or regional consideration of threatening processes and relevant stakeholders. There needs to be a long-term commitment to planning and plan review, and integration by all stakeholders to effect a shift from project planning to a more sustainable form of long-term planning.

- **Develop local climate adaptation strategies** e.g. relocation and resettlement strategies for areas impacted by sea level rise, coastal erosion and long-term drought. Many communities are already moving in the face of rising sea levels. Better understanding of the predicted impacts of climate change will help communities in the future to better address and adapt to these predicted changes.

10.6 Raise awareness and encourage education

Many customary landowners in the workshops discussed the need to increase programs of awareness-raising and environmental and cultural education, both for their own communities (especially for children and young people) and for people from outside. In the past, some programs were conducted by government staff and by NGOs, but little is being done now. Landowners stressed that they would be happy to participate in these programs, but many requested support. In addition, they would like regular contact and a closer relationship with protected area staff from CEPA.

- **Include environmental and cultural education** as part of the curriculum from primary to tertiary levels. In many cases, landholders are keen to be involved in talking to school children and especially showing them their lands and seas and passing on cultural knowledge and language. Family planning should be part of the education program.
- **Support local people in raising awareness about protected areas.** Many customary landowners also stressed the importance of more continuing awareness-raising activities with a range of people: starting with their own people and surrounding communities, and moving on to stakeholders including commercial interests and local level government. Key topics would be the protected area values, and the need for sustainability in their livelihood activities.
- **Build relationships and cooperative work programs** between customary landowners, civil society (including academia and NGOs) and governments. Establish good protocols to ensure that all parties can develop trust and understanding, and avoid situations where international bodies develop programs and expectations, then suddenly leave the area.

10.7 Consider community needs and issues

'Field conservation in Papua New Guinea can succeed only if it addresses key needs and concerns of local stakeholders at the same time that it carries out the intended conservation intervention. This means that the conservation action must be well-nested within a series of processes that are relevant to the local political, legal, cultural, and social landscape.' (*cited by Beehler and Kirkman 2013a, p. 12*)

In PNG, it is impossible to consider how to reinvigorate the protected area system without also considering the needs of the customary landowners and other community members. However, many of the activities recommended in this section are beyond the scope of protected area managers alone. They can be implemented through appropriate government agencies, private industry and civil society in close cooperation with customary landowners. It should be noted that the approach of integrating conservation with community development has been implemented in many parts of the world over the last 30 years and has had very mixed success, including some temporary successes and longer-term failures in PNG (West and Kale 2015). Priorities are to:

- **Support law enforcement and compassionate resettlement** of illegal settlers in and adjacent to protected areas (see Section 10.3).
- **Develop appropriate incentives such as education and health projects, and sustainable development activities** in conjunction with customary landholders but *only* after careful planning and with firm agreements about conservation benefits and long-term support. The pitfalls of integrated conservation and development projects (ICDPs), including withdrawal of sponsoring NGOs, need to be carefully considered. For example, employment and agricultural programs aimed at reducing pressure on protected areas can attract more settlers to the target area and worsen the problem; and development of roads and additional facilities can increase rather than decrease impacts. ICDPs are only likely to be effective if they combine economic opportunities with stronger law enforcement, education and management presence. They should never assume that once local people have achieved a basic level of income, then threats to the protected area will magically cease. The risks of creating unrealistic expectations of economic gains through conservation projects are considerable, and excellent planning and long-term commitment are essential.
- **Support development of sustainable tourism**, including small-scale village based enterprises, where customary landowners are keen to encourage tourists. Most of PNG's protected areas have high potential for ecotourism and cultural tourism, and customary landowners are seeking support to develop this potential in a way that returns benefits to local communities. A critical factor is to ensure personal security of visitors within protected areas.

Integrated work needs to be done to provide visitors with prior information, safe access, transport, accommodation and food supply. Tourism planning needs to ensure a diversity of experiences and tourism 'products'.

- **Develop negotiated and agreed benefit sharing arrangements** between customary landowners and a range of stakeholders (e.g. hotels, tourism operators, research institutions, extractive industries). This will ensure benefits and income return to landowners. This will assist with funding improved management, monitoring and enforcement activities within the protected areas. Benefit sharing agreements need to be legally binding and recognise the property rights of the customary landowners.

10.8 Conclusions

The level of resourcing and management effectiveness across most of PNG's protected area network is very low. This study indicates that only a handful of protected areas are now receiving support from any level of government or from outside agencies. Observers have commented that the model of devolution of protected area management to provincial and local government has failed (Mowbray and Duguman 2009), resulting in clearing and degradation of some protected areas (Shearman and Bryan 2011).

Across the country, customary landowners are again pleading for assistance and support to look after their protected areas, and to develop meaningful employment and livelihood options based on stewardship and a close relationship with their lands and seas. Given the very high values and high levels of threats to these protected areas, we urge the national government and the international community to urgently find ways to deliver this support before the situation deteriorates further. The existing protected areas are a good starting point for a comprehensive, adequate, representative and relevant network, to which the PNG government has committed (Independent State of Papua New Guinea 2014). While there is a great need to grow the protected area network and include representation, we believe it would be counter-productive to discard the good-will and commitment of the many landowners and other managers who have participated in this assessment and who have stated their willingness to be part of a protected area revitalisation.

In spite of many threats and impacts, most protected areas still contain many of their original values in good to very good condition, and most customary landowners are supportive of the protected area model over any other form of land/ sea use. Hope remains, and there are models of effective interventions on the ground. However, **clearly defined and enforced protected areas must be backed by active management committees and a reliable ranger workforce,** and establishing this must be the responsibility of all levels of government with CEPA playing the key role. Civil society, international organisations and industry can all make vital contributions, but above all else the assessment emphasises the need, and the communities' desires, for strong and consistent government support.

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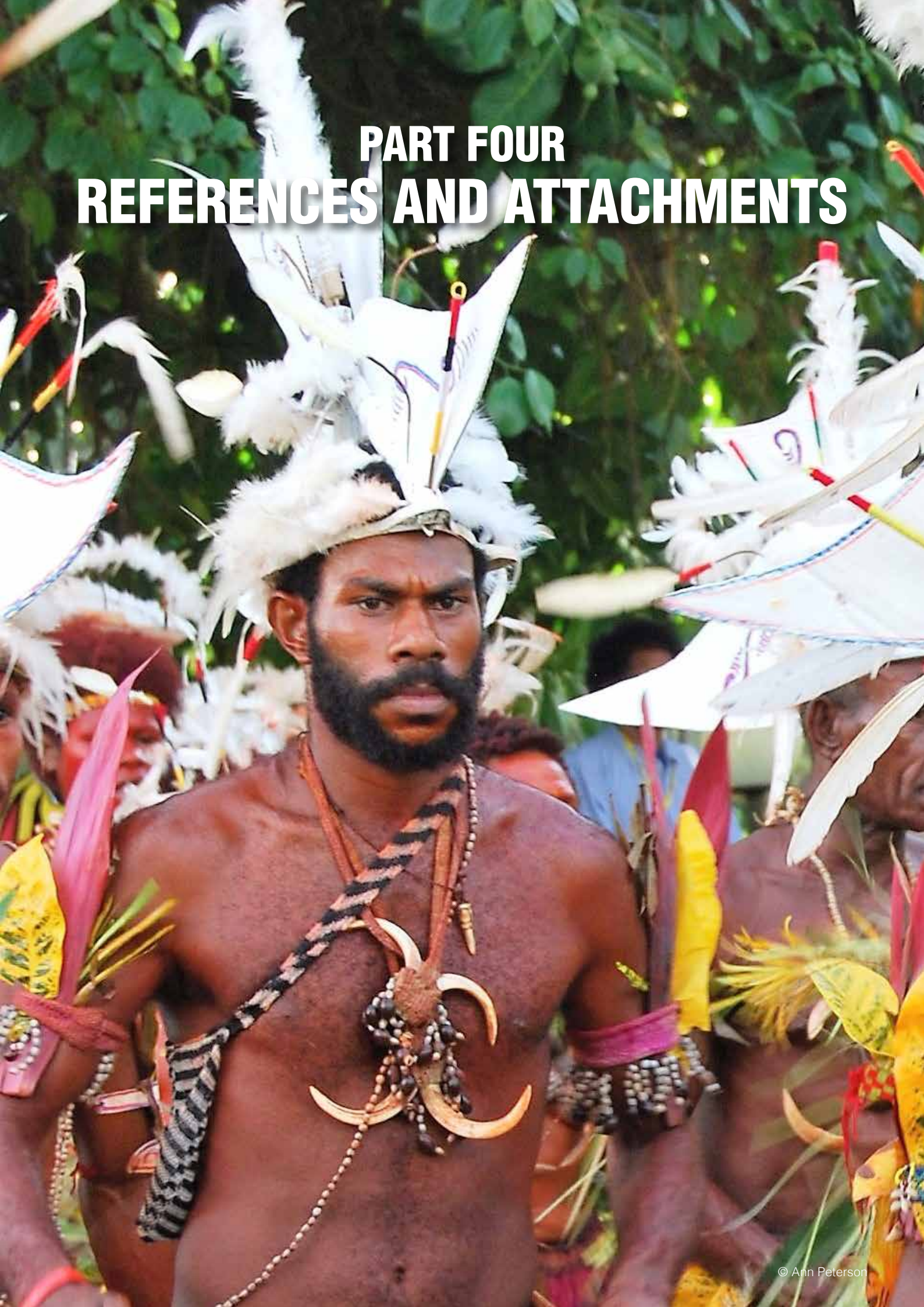
PART FOUR
REFERENCES AND ATTACHMENTS



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ATTACHMENT 1: List of PNG protected areas

The process of compiling a definitive list of current protected areas is still being finalised. The list as currently compiled (Table 14) includes some uncertainties in areas and boundaries. Non-gazetted LMMAs are included in the WDPA but are not included on this list.

TABLE 14: Gazetted protected areas of PNG

Source: compiled from CEPA data (Conservation and Environment Protection Authority 2017)and the WDPA (UNEP-WCMC 2016)

	Name	Type	WDPA code	Gazettal	Area (Ha)	Notes
1	Bagiai Wildlife Management Area	WMA	4205	1977	13,760	Gazettal notice includes extensive marine area
2	Baiyer River Sanctuary	WS	3146	1968	741	
3	Balek Wildlife Sanctuary	WS	4204	1977	470	
4	Baniara Island		4201	1975	200	Protected area type unknown
5	Cape Wom Memorial Park	MP	3145	1973	165	
6	Crater Mountain Wildlife Management Area	WMA	15789	1993	270,000	
7	Crown Island Wildlife Sanctuary	WS	106683	1977	58,969	
8	Garu Wildlife Management Area	WMA	4122	1976	8,700	
9	Hombareta Wildlife Management Area	WMA	316895	1997	130	
10	Horseshoe Reef			1981	396	Protected area type unknown
11	Hunstein Range Wildlife Management Area	WMA	377712	1997	220,000	
12	Iomare Wildlife Management Area	WMA	15782	1987	3,828	
13	Jimi (Ruti) Valley National Park	NP	15797	1991	4,180	
14	Kamiali Wildlife Management Area	WMA	220242	1996	47,413	
15	Kavakuna Caves Wildlife Management Area	WMA	377717	1997	3,220	
16	Klampun Wildlife Management Area	WMA	377713	2003	5,200	
17	Kokoda Memorial Park	MP	377714	1981		
18	Kokoda Historical (Track) Reserve	Historical Reserve	377710		71	Not gazetted though on list of gazetted PAs
19	Lake Kutubu Wildlife Management Area	WMA	61533	1992	23,497	
20	Lake Lavu Wildlife Management Area	WMA	9718	1981	4,924	
21	Laugum Marine Wildlife Management Area	WMA	316932	2003	73	
22	Libano-Arisai Wildlife Management Area	WMA		2008	3,964	
23	Libano-Hose Wildlife Management Area	WMA		2008	4,830	
24	Lihir Island	unknown	15894	1991	1,980	Protected area type unknown
25	Loroko National Park	NP	61530	1991	100	
26	Maza Wildlife Management Area	WMA	4202	1978	184,230	
27	McAdam National Park	NP	838	1962	2,081	
28	Moitaka Wildlife Sanctuary	WS	17823	1989	42	

	Name	Type	WDPA code	Gazettal	Area (Ha)	Notes
29	Mojirau Wildlife Management Area	WMA	9720	1978	5,079	
30	Mt Gahavisuka Provincial Park	PP	9714	1989	77	
31	Mt Kaindi Wildlife Management Area	WMA	316937	1990	1,502	
32	Mt Susu Natural Reserve	NR	4197		260	
33	Mt Wilhelm National Park	NP	71364	1990	817	
34	Namanatabu Nature Reserve	NR	4199	1979	29	
35	Nanuk Island District Park	DP		1973	12	
36	Ndrolowa Wildlife Management Area	WMA	15781	1985	5,850	
37	Neiru (Aird Hills) Wildlife Management Area	WMA	15783	1987	3,984	
38	Nusareng Wildlife Management Area	WMA	377715	1986	22	
39	Oya Mada Wa'a Wildlife Management Area	WMA	15787	1981	22,840	
40	Paga Hill Scenic Reserve	SR	19716	1987	13	
41	Pirung Wildlife Management Area	WMA	15788	1989	43,200	
42	Pokili Wildlife Management Area	WMA	4123	1975	9,840	
43	Ranba Wildlife Management Area	WMA	4203	1977	41,922	Mapped boundaries disputed by CLOs. Gazettal notice includes extensive marine area
44	Ranba Wildlife Sanctuary	WS	12888	1977	15,724	
45	Sawataetae Wildlife Management Area	WMA	9719	1977	700	
46	Sinub Island Marine Wildlife Management Area	WMA	220246	2003	12	
47	Siwi-Utame Wildlife Management Area	WMA	9721	1977	12,540	
48	Sulamesi Wildlife Management Area	WMA		2009	86,451	
49	Tab Island Marine Wildlife Management Area	WMA	316933	2006	984	
50	Tabad Island Marine Wildlife Management Area	WMA		2003	16	
51	Talele Islands Natural Reserve	NR	20057	1977	12	
52	Tavalo Wildlife Management Area	WMA	377716	0	2,400	
53	Tonda Wildlife Management Area	WMA	4200	1975	590,000	
54	Varirata National Park	NP	839	1969	1,063	
55	Wewak War Memorial Site	MP	377711	1969	1	
56	Zo-oimaga Wildlife Management Area	WMA	9717	1981	1,510	
57	YUA Conservation Area	CA		2009	75,000	
77	Torricelli Mountains Proposed Conservation Area	Proposed CA	316938		185,000	
	Tonda Ramsar Site	Ramsar Site	68136	1993		Overlaps with Tonda WMA
	Lake Kutubu Ramsar Site	Ramsar Site	166883	1998		Overlaps with Lake Kutuba WMA

ATTACHMENT 2: The PNG-METT questionnaire

Part 1: Basic information about the protected area

TABLE 1: Protected Area Information

Name, organisation and contact details for person(s) responsible for completing this form – Person 1: *Name, Organisation, Address, Email, Phone*	
Person 2: *Name, Organisation, Address, Email, Phone*	
Today's Date	
Name (or names) of protected area	
Size of protected area (ha)	
PNG Code or number	
World Database of Protected Areas site code (these codes can be found on www.unep-wcmc.org/wdpa/)	
Protected Area Designation: What kind of protected area is it? (National Park, Wildlife Management Area, Sanctuary, Reserve, Locally Managed Marine Area)	
IUCN Category	
International protected area? e.g. World Heritage or Ramsar	
Country	Papua New Guinea
Province/s	
District/s	
Local level governments	
Ward/s	
Nearest big town	
Location of protected area (brief description)	
Map references	
When was the protected area declared or gazetted?	
Reference for gazettal or Memorandum of Understanding (MoU)	
Who owns the protected area? Please tick (If a Customary landowner, please indicate the relevant Clans).	Government Community / Customary landowners Private Other (name)
How many households live within the protected area?	
What is the population size within the protected area (please indicate, if known)	
Who manages the protected area? **(e.g. government, customary landowners [which clans], management committee [number & gender])**	
Total number of staff (this means anyone working on the protected area in paid jobs –whether NGOs, community, rangers or customary landowners	

Temporary paid workers	
Permanent paid workers	
Annual budget (US$) – excluding staff salary costs	
Operational (recurrent) funds	
Project or special funds	
Why was the protected area established?	
What are the main values for which the area is designated (Fill this out after Part 2 of the METT is completed)	
List the primary protected area management objectives (Fill this out after Part 4 is completed): **Manage***ment Objective 1*	
Management objective 2	
Management objective 3 **(Please add other objectives/lines if needed)**	
Total number of people involved in completing or answering the questions in this assessment	
Including organisation: **(please tick)**	Customary landowners and other community members CEPA staff Other national government agency staff Provincial government Local level government Protected area staff (anyone working on the protected area in paid jobs) Non-government organisation Donors External experts Others
Please note if assessment was carried out in association with a particular project, on behalf of an organisation or donor.	SPREP through the PNG Protected Area Assessment Project, which is a component of the GEF Community-based Forest and Coastal Conservation and Resource Management Project in PNG

Part 2: What makes this protected area special and important?

What are the key values of your protected area?

TABLE 2: Protected Area Key Values

No.	Key values (e.g. only known breeding area for the PNG Heron)	Brief description (e.g. large freshwater wetland areas immediately above high tide provide nesting sites and food for rearing chicks. Island location means no interference from feral animals or from vehicles).	Note if endangered species or ecosystem (IUCN)
1			
2.			
3.			
4.			
5.			
6.			

Checklist of benefits

TABLE 3: Checklist of benefits

How important is the protected area for each of the listed values or benefits NOW? Tick one box for each	Very important	Important	Not important	Don't know	Comment
Biodiversity – the presence of many different kinds of plants, animals and ecosystems					
Presence of rare, threatened, or endangered species (plants and animals)					
Presence of ecosystems (e.g. wetlands, grasslands, coral reefs etc) that are rare because they have been cleared or destroyed in other areas					
Protecting clean, fresh water					
Sustaining important species in big enough numbers so that they are able to survive here					
Providing a source of employment for local communities now					
Providing resources for local subsistence (food, building materials, medicines etc.)					
Providing community development opportunities through sustainable resource use					
Religious or spiritual significance (e.g. tambu places)					
Plant species of high social, cultural, or economic importance					
Animal species of high social, cultural, or economic importance					
Attractive scenery					
Tourism now					
Potential value for tourism in the future					
Educational and/or scientific value					
Maintaining culture and tradition on customary land and passing this on to future generations					

Part 3: What are the threats to the protected area?

How to rate the threats

- **HIGH** significant threats are *seriously degrading values*. This means they are badly damaging some value – it might be a kind of animal or plant, or your traditional gardens
- **MEDIUM** threats are having *some negative impact* – they are damaging values but not so badly
- **LOW** threats are *present but not seriously damaging values*
- **N/A** where the *threat is not present* in the protected area *or where something is happening but is not threatening the values at all*

TABLE 4: Protected Area Threats

High	Medium	Low	N/A	Threat type
1. Housing and commercial development within a protected area Threats from human settlements or other non-agricultural land uses.				
				1.3 Housing and settlement
				1.1a Population increase in the protected area community
				1.4 Commercial and industrial areas
				1.5 Tourism and recreation infrastructure (e.g. structures)
2. Agriculture and aquaculture within a protected area Threats to the protected area from all kinds of farming and grazing, including plantations, forestry and fish-farming.				
				2.1 Customary land owner & community gardens & small crops
				2.1a Drug cultivation
				2.1b Commercial plantations
				2.2 Wood and pulp plantations
				2.3 Livestock farming and grazing
				2.4 Marine and freshwater aquaculture
3. Energy production and mining within a protected area Threats from production of non-biological resources.				
				3.1 Oil and gas drilling
				3.2 Mining and quarrying
				3.3 Energy generation
4. Transportation and service corridors within a protected area Threats from long narrow transport corridors and the vehicles that use them				
				4.1 Roads and railroads (include road-killed animals)
				4.2 Utility and service lines (e.g. electricity cables, telephone lines)
				4.3 Shipping lanes
				4.4 Flight paths

High	Medium	Low	N/A	Threat type
5. Biological resource use and harm within a protected area Threats from use of "wild" biological resources including both deliberate and unintentional harvesting effects; also persecution or control of specific species (note this includes hunting and killing of animals).				
				5.1 Hunting, killing and collecting terrestrial animals (including killing of animals as a result of human/wildlife conflict)
				5.2 Gathering terrestrial plants or plant products (non-timber)
				5.3a Logging and wood harvesting for local/customary use
				5.3b Logging and wood harvesting – commercial logging
				5.4a Fishing, killing and harvesting aquatic resources for local/customary use
				5.4b Fishing, killing and harvesting aquatic resources for commercial use
6. Human intrusions and disturbance within a protected area Threats from human activities that alter, destroy or disturb habitats and species associated with non-consumptive uses of biological resources.				
				6.1 Recreational activities and tourism
				6.2 War, civil unrest and military exercises
				6.3 Research, education and other work-related activities in protected areas
				6.4 Activities of protected area Management Committee/ managers (e.g. construction or vehicle use)
				6.5 Deliberate vandalism, destructive activities or threats to protected area staff and visitors
7. Changes to natural systems Threats from other actions that convert or degrade habitat or change the way the ecosystem functions				
				7.1 Fire and fire suppression (including arson)
				7.2 Dams, hydrological modification and water management/use
				7.3a Increased fragmentation within protected area
				7.3b Isolation from other natural habitat (e.g. deforestation)
				7.3c Other 'edge effects' on park values
				7.3d Loss of keystone species (e.g. top predators, pollinators etc.)
8. Invasive and other problematic species and genes Threats from non-native and native plants, animals, pathogens/microbes or genetic materials that have or are predicted to have harmful effects on biodiversity following introduction, spread and/or increase.				
				8.1 Pest plants
				8.1a Pest animals
				8.1b Diseases such as fungus or viruses that make native plants or animals sick
				8.2 Introduced genetic material (e.g. genetically modified organisms)
9. Pollution entering or generated within protected area Threats from pollution and/or excess materials or energy from specific or general sources.				
				9.1 Household sewage and urban waste water
				9.1a Sewage and waste water from protected area facilities
				9.2 Industrial, mining and military effluents
				9.3 Agricultural and forestry effluents (e.g. excess fertilizers or pesticides)
				9.4 Garbage and solid waste
				9.5 Air-borne pollutants
				9.6 Excess energy (e.g. heat pollution, lights etc.)

High	Medium	Low	N/A	Threat type
10. Geological events Geological events may be part of natural disturbance regimes in many ecosystems. However, they can be a threat if a species or habitat is damaged and has lost its resilience and is vulnerable to disturbance. Management capacity to respond to some of these changes may be limited.				
				10.1 Volcanoes
				10.2 Earthquakes / Tsunamis
				10.3 Avalanches / Landslides
				10.4 Erosion and siltation / deposition (e.g. shoreline or riverbed changes)
11. Climate change and severe weather Threats from long-term climatic changes which may be linked to global warming and other severe climate or weather events outside the natural range of variation.				
				11.1 Habitat shifting and alteration
				11.2 Droughts
				11.3 Temperature extremes
				11.4 Storms and flooding
				11.5 Coral bleaching
				11.6 Intrusion by saltwater
				11.7 Sea level rise
				Other (please explain)
12. Specific cultural and social threats				
				12.1 Loss of cultural links, traditional knowledge and/or management practices
				12.2 Natural deterioration of important cultural site values
				12.3 Destruction of cultural heritage buildings, gardens, sites etc.
				Other (please explain)

What are the worst threats?

Now that you have finished the threat list, please tell us which three (3) threats are the worst in your protected area. You may include threats that are not included in the list above. Start with the most significant threat.

TABLE 5: Threat ranking

Threat (most significant first)	Threat number or name (copy from Table 4)	Please explain the nature of the threat and what impact is it causing and how to reduce the impacts of the threat.
1		
2		
3		

Part 4: Management effectiveness

TABLE 6: Management Effectiveness

Issue	Criteria
1a. Legal status *For formal protected areas* Does the protected area have legal status (or in the case of private reserves is covered by a covenant or similar)?	The protected area is ***not gazett***ed by national, regional or local government
	There is ***agreement*** that the protected area should be gazetted/covenanted ***but the process has not begun yet***
	The protected area is ***in the process of being gazetted***/covenanted but the process is still incomplete
	The protected area has been ***formally gazetted***/covenanted by national, regional or local government
1b. Legal status *For community agreements* Does the protected area have legal status (or in the case of private reserves is covered by a covenant or similar)?	The protected area has ***no formal community agreement***
	The customary landowners have ***begun the discussions*** about creating the protected area
	The protected area is ***in the process of being agreed*** to by the customary landowners, but the process is still incomplete
	The protected area has been ***formally agreed*** to by the customary landowners
2a. Protected area regulations *For formal protected areas* Are traditional laws or agreements in place to control land or marine use and activities?	There are ***no regulations or traditional laws*** or agreements for controlling land and marine use and activities in the protected area
	Some regulations for controlling land use and activities in the protected area exist but there are ***major weaknesses***
	Regulations for controlling land use and activities in the protected area ***exist but there are some weaknesses or gaps***
	Regulations for controlling inappropriate land use and activities in the protected area ***exist and provide an excellent basis for management***
2b. Protected area regulations *For community agreements* Are traditional laws or agreements in place to control land or marine use and activities?	There are ***no traditional laws or agreements*** for controlling land or marine use and activities in the protected area
	Some traditional laws or agreements for controlling land or marine use and activities in the protected area exist ***but there are major weaknesses***
	Traditional laws or agreements for controlling land use and marine activities in the protected area ***exist but there are some weaknesses or gaps***
	Traditional laws or agreements for controlling land use and activities in the protected area ***exist and provide an excellent basis for management***
3. Law enforcement Can people (eg. staff or customary landowners) enforce protected area rules well enough?	There is ***no effective human capacity/resources to enforce*** protected area legislation and regulations OR community agreements
	There are ***major deficiencies*** in human capacity/resources to enforce protected area legislation and regulations OR community agreements (e.g. lack of skills, no patrol budget, lack of institutional support)
	There is ***acceptable human capacity/resources*** to enforce PA legislation and regulations OR community agreements ***but some deficiencies remain***
	There is ***excellent human capacity/resources*** to enforce protected area legislation and regulations OR community agreements
4. Protected area objectives Is the protected area managed with agreed objectives?	***No firm objectives*** have been agreed for the protected area
	The protected area has ***agreed objectives, but is not managed according to these objectives***
	The protected area has ***agreed objectives, but is only partly managed according to these objectives***
	The protected area ***has agreed objectives and is managed to meet these objectives***

Issue	Criteria
5. Protected area design Is the protected area the right size and shape to protect species and habitats of key conservation concern?	The protected area is ***too small or the boundaries are not a good shape***, so it is really ***hard to manage*** and achieve the vision
	The protected area is too small or the boundaries are not a good shape, but ***we are working to make it better***, such as by building links (e.g. agreements with adjacent land owners for wildlife corridors)
	The protected area size and boundaries ***do not prevent us from achieving objectives, but could be better***
	Protected area size and the boundaries ***helps us achieve the*** objectives
6. Protected area boundaries Is the boundary known and demarcated?	The boundary of the protected area is ***not known by the Management Committee/ managers***
	The boundary of the protected area is ***known*** by the ***Management Committee/ managers but is not understood and respected by everyone in the area***
	The boundary of the protected area is ***known and is respected*** by everyone in the area ***but is not marked on a map or recorded by GIS***
	The boundary of the protected area is ***known and respected*** and also ***formally recorded by GIS or on a map***
7. Management plan Is there a management plan and is it being implemented?	There is ***no management plan*** for the protected area
	A management plan is ***being prepared or has been prepared but is not being implemented***
	A management plan ***exists but it is only being partially implemented*** because of funding constraints or other problems
	A management plan ***exists and is being implemented***
7a. Planning process	Rights-holders (i.e. customary landowners) and key stakeholders have input into the management plan and can influence it
7b. Planning process	People review and update the plan regularly
7c. Planning process	Monitoring, research (including traditional knowledge) and evaluation put information into the planning
8. Regular work plan Is there a regular work plan and is it being implemented?	***No regular work plan exists***
	A regular work plan ***exists but few of the activities are implemented***
	A regular work plan ***exists and many activities are implemented***
	A regular work plan ***exists and all activities are implemented***
9. Resource inventory Do you have enough information to manage the area	There is ***little or no information*** available about the protected area to help manage it well
	There is ***not enough information*** about the protected area to help manage it well
	Information about the protected area is ***sufficient for most key areas*** of planning and decision making
	Information on the protected area ***is sufficient to support all areas of planning and decision making***
10. Protection systems Are systems in place to control access/ resource use in the protected area?	Protection systems (patrols, permits etc.) ***do not exist or are not effective*** in controlling access/ resource use
	Protection systems are only ***partially effective*** in controlling access/resource use
	Protection systems are ***moderately effective*** in controlling access/resource use
	Protection systems are ***largely or wholly effective*** in controlling access/ resource use

Issue	Criteria
11. Research and monitoring Is there a programme of management-orientated survey and research work?	There is ***no*** survey, inventory or research work taking place in the protected area
	There is a ***small amount*** of survey, inventory and research work but it is not directed towards the needs of protected area management
	There is ***considerable*** survey, inventory and research work but it is not directed towards the needs of protected area management
	There is a ***comprehensive, integrated programme*** of survey, inventory and research work, which is relevant to management needs
12. Resource management Is active resource management being undertaken?	Active resource management is ***not being undertaken***
	Very few of the requirements for active management of critical habitats, species and cultural values are being implemented
	Many of the requirements for active management of critical habitats, species and cultural values are being implemented ***but some key issues are not being addressed***
	Requirements for active management of critical habitats, species and cultural values are ***being substantially or fully implemented***
13a.Staff numbers Are there enough people employed to manage the protected area?	There are ***no staff/people*** paid to work on the protected area
	There are ***not enough staff/people*** for critical management activities
	We ***would do better if there were more staff/people*** working in the protected area
	There are ***enough staff/people*** to manage the protected area
13b.Other people working on the protected area Are there enough people (community or customary landowners) helping to	There are ***no*** community members or customary landowners working to manage the protected area
	There are ***not enough*** people to do critical management activities
	We would ***do better if there were more people*** working in the protected area
	There are ***enough people*** working to manage the protected area
14. Training and skills Are staff / other people capable and trained to manage the protected area?	People who work/undertake activities on the protected area ***do not have the skills*** they need to manage the protected area
	Training and skills are l***ow*** relative to the needs of the protected area
	Training and skills are ***okay***, but could be improved to better manage the protected area
	Training and skills to manage the protected area are ***very good***
15. Current budget Is the current budget sufficient?	There is ***no*** money from any source to manage the protected area
	There is ***not enough*** money and this is a serious constraint to the capacity to manage
	The available budget is ***acceptable*** but could be further improved so there could be better management
	The available budget is ***sufficien***t & meets the full management needs of the protected area
16. Security of budget Is the budget secure?	There is ***no*** secure budget for the protected area and management is wholly reliant on money that varies from one year to the next
	There is ***very little*** secure budget for management
	There is a ***reasonably secure*** core budget for regular operation of the protected area
	There is a ***secure*** budget for the protected area and its management needs

Issue	Criteria
17. Management of budget Is the budget managed to meet critical management needs?	Budget management is ***very poor*** and significantly undermines effectiveness
	Budget management is ***poor and constrains effectiveness***
	Budget management is ***adequate but could be improved***
	Budget management is ***excellent*** and meets management needs
18. Equipment Is equipment sufficient for management needs?	There are ***little or no*** equipment and facilities for management needs
	There are ***some*** equipment and facilities ***but these are inadequate*** for most management needs
	There are equipment and facilities, but still ***some gaps*** that constrain management
	There are ***adequate*** equipment and facilities
19. Maintenance of equipment Is equipment adequately maintained?	There is ***little or no*** maintenance of equipment and facilities
	There is ***some ad hoc*** (occasional) maintenance of equipment and facilities
	There is ***basic*** maintenance of equipment and facilities
	Equipment and facilities are ***well maintained***
20. Education and awareness Is there a planned education programme about the protected area?	There is ***no*** education and awareness programme
	There is a ***limited*** education and awareness programme (i.e. not regular)
	There is an education and awareness programme but it only ***partly meets needs and could be improved***
	There is an ***appropriate and fully implemented*** education and awareness programme
21. Planning for land use or marine activities Does land or water planning recognise and protect the protected area?	Adjacent/outside land use planning does not take into account the needs of the protected area and ***activities/policies harm the area***
	Adjacent/outside land use planning does not take into account the long-term needs of the protected area, but ***activities do not harm the area***
	Adjacent/outside land use planning ***partly*** takes into account the long-term needs of the protected area
	Adjacent/outside land use planning ***fully*** takes into account the long term needs of the protected area
22. State and commercial neighbours Is there co-operation with adjacent land users?	There is ***no contact*** between the Management Committee/managers and neighbouring official or corporate land users
	There is contact between the Mg'mt Committee/managers and neighbouring official or corporate land users but ***little or no cooperation*** on management
	There is contact between the Mg'mt Committee/managers and neighbouring official or corporate land users, but only ***some co-operation*** on management
	There is regular contact between the Mg'mt Comm'te/managers & neighbouring official/ corporate land users, & ***substantial co-operation*** on management
23. Indigenous people/ Customary landowners Do customary landowners, who reside or regularly use the protected area, have input into management decisions?	Customary landowners have ***no input*** into decisions relating to the management of the protected area
	Customary landowners have ***some input*** into discussions relating to management but no direct role in management
	Customary landowners ***directly contribute to some relevant decisions*** relating to management but their involvement could be improved
	Customary landowners ***directly participate in all relevant decisions*** relating to management, e.g. co-management
24a.Impact on communities/ customary landowners	There is ***open communication and trust*** between customary landowners (all clans), other stakeholders (e.g. NGOs) and protected area managers (e.g. CEPA, LLG)

Issue	Criteria
24b.Impact on communities/ customary landowners	Programmes to improve customary landowners' ***welfare***, while conserving protected area resources, are being implemented
24c.Impact on communities/ customary landowners	Customary landowners ***actively support*** the protected area
25. Economic benefit Is the protected area providing economic benefits to local communities/customary landowners, e.g. income/ employment?	The protected area ***does not deliver any*** economic benefits to local communities
	Potential economic benefits are recognised and plans to realise these are being developed
	There is ***some flow*** of economic benefits to local communities
	There is a ***major flow*** of economic benefits to local communities from activities associated with the protected area
26. Monitoring and evaluation Are management activities monitored, evaluated and acted on?	There is ***no*** monitoring and evaluation in the protected area
	There is ***some unplanned and irregular*** monitoring and evaluation, but no overall strategy and/ or no regular collection of results
	There is an ***agreed and implemented*** monitoring and evaluation system but results do not feed back into management
	A ***good*** monitoring and evaluation system exists, is well implemented and ***used in adaptive management***
27. Visitor facilities Are visitor facilities adequate?	There are ***no*** visitor facilities and services despite an identified need
	Visitor facilities and services are ***inappropriate*** for current levels of visitation
	Visitor facilities and services are ***adequate*** for current levels of visitation ***but could be improved***
	Visitor facilities and services are ***excellent*** for current levels of visitation
28. Commercial tourism operators Do commercial tour operators contribute to protected area management?	There is ***little or no contact*** between the Management Committee/managers and tourism operators using the protected area
	There is contact between the Management Committee/managers and tourism operators but this is ***largely confined to administrative or regulatory matters***
	There is ***limited co-operation*** between the Management Committee/managers and tourism operators to enhance visitor experiences and maintain protected area values
	There is ***good co-operation*** between the Management Committee/managers and tourism operators to enhance visitor experiences, and maintain protected area values
29. Fees If fees (i.e. entry fees or fines) are applied, do they help protected area management?	Although fees are theoretically ***applied, they are not collected***
	Fees are ***collected, but make no contribution*** to the protected area or its surroundings
	Fees are ***collected, and make some contribution*** to the protected area and its surroundings
	Fees are ***collected and make a substantial contribution*** to the protected area and its surroundings
30. Condition of values What is the condition of the important values of the protected area?	***Many*** important biodiversity, ecological or cultural values are being ***severely degraded***
	Some biodiversity, ecological or cultural values are being ***severely degraded***
	Some biodiversity, ecological and cultural values are being partially degraded but the most important values have ***not been significantly impacted***
	Biodiversity, ecological and cultural values are ***predominantly intact***
30a: Condition of values	The assessment of the condition of values is ***based on research and/or monitoring***
30b: Condition of values	***Specific management programmes are being implemented*** to address threats to the protected area
30c: Condition of values	***Activities to maintain key biodiversity***, ecological and cultural values ***are a routine part of park management***

Part 5: Condition and trend of protected area values

Key values for the protected area should be copied from Table 2 on p.9.

Please consider the current state of the protected area values you have identified and rate them using the scale below:

Very good: there is no problem; it is doing well

Good: things are okay although there are minor problems; the value could recover with a bit of help and time

Fair: there are some serious problems affecting the value, and it will need quite a lot of work and time to recover

Poor: the value is really suffering, and it will not recover, at least without a really major effort and intervention.

Don't know: we have no information or knowledge about the value and cannot assess the condition or trend.

Now please consider the trend (or change over time) in relation to each protected area value. Please use the rating scale below:

I Improving: Getting better / recovering

S Stable: Staying about the same

D Deteriorating: Getting worse

TABLE 7: Condition and trend of protected area values

Key value (from Table 2)	Condition					Trend			
	Very good	Good	Fair	Poor	Don't know	I ↑	S ↔	D ↓	Don't know

Part 6: Recommendations or ways forward

As the final task, I would like you to think about all the values, threats and issues that have been raised and to list three things that would help you to make your protected area better in the future.

1.

2.

3.

Thank you for your participation in this national protected area management assessment process. We value the time and knowledge that you have contributed to this important task.

ATTACHMENT 3: Protected area summaries

Assessment summaries have been completed for each protected area.

These can be downloaded from the **SPREP Protected Area Portal** http://pipap.sprep.org/, along with an explanation sheet.

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