

Name of Protected Area: Crater Mountain Wildlife Management Area

Part 1: Basic information about the protected area

Table 1. Protected area information

Name, organisation and contact details for person(s) conducting the assessment <i>Person 1: Name, Organisation, Address, Email, Phone</i>	Beside Thomas, Conservation and Environment Protection Authority, P.O. Box 6601, Boroko, National Capital District, bensidethomas@gmail.com, +675 301 4500.
<i>Person 2: Name, Organisation, Address, Email, Phone</i>	Bernard Suruman, Conservation and Environment Protection Authority, P.O. Box 6601, Boroko, National Capital District, bsuruman@dec.gov.pg, +675 301 4500.
Today's Date	5/10/2016
Name (or names) of protected area	Crater Mountain Wildlife Management Area
Size of protected area (ha)	270,000
PNG Code or number	
World Database of Protected Areas site code (these codes can be found on www.unep-wcmc.org/wdpa/)	76321
What level or kind of protected area is it? (National Park, Wildlife Management Area, Sanctuary, Reserve, Locally Managed Marine Area etc)	Wildlife Management Area
IUCN Category	Nil
International protected area? e.g. World Heritage or Ramsar?	Nil
Country	Papua New Guinea
Province/s	Eastern Highlands, Simbu and Gulf
District/s	Lufa (Eastern Highlands), Karamui (Simbu), Baimuru (Gulf)
Local level governments	Unavi, Karamui, Baimuru
Ward/s	Unavi LLG; Wards 1, 2, 6 & 7. Karamui LLG; Ward 27; Baimuru LLG; Wards 21, 22 & 23.
Nearest big town	Goroka
Location of protected area (brief description)	The WMA spans three provinces and consists of several pinnacles rising to around 3400m. The WMA is named after Cater Mountain, which is a volcano with a relict caldera, fumaroles and hot springs. The land slopes away from the peaks in the south and west through lowland hill forest to the Purari River.
Map references	Karamui sheet 7884 and Crater sheet 7984.
When was the protected area gazetted or formally established?	25/11/1993 (CEPA files indicate 14/10/1993 under the Fauna Control Act).
Reference for gazettal or Memorandum of Understanding (MoU)	Gazette No. 85
Who owns the protected area? please enter Government Private Community/ customary	Customary Landowners, including 22 clans from two ethno-linguistic groups (Pawaia and Gimi).

landowners, private, Other (name) and include Clan name(s)	
Number of households living in the protected area	Approx. 1300
Population size within the protected area	Approx. 8000
Who manages the protected area?(e.g. please enter government, customary landowners [add clan names] management committee [how many and what gender])	Several clans manage the WMA in partnership with the Research and Conservation Foundation (RCF). The current Management Committee members are: Avit Wako of <i>Faya Clan</i> -Heroana Village; Joseph Nene of <i>Fulekele Clan</i> -Heroana Village; Graham Gusili of <i>Kayumo Clan</i> -Heroana Village; Sauta Yasina of <i>Fadu Clan</i> -Ubaigubi Village; Seviava Lubu of <i>Hakowe Clan</i> -Ubaigubi Village; Haidabo Wai of <i>Yanabisa Clan</i> -Ubaigubi Village; Orilai Faido of <i>Wi'l Clan</i> -Haia Village; Luke Tobobolu of <i>Jale Clan</i> -Haia Village; Joe Moih of <i>Du Clan</i> -Haia Village; James Midi of <i>Joe Clan</i> -Haia Village; Hule Owai of <i>Jene Clan</i> -Haia Village; Pili Timai of <i>Waria Clan-Haia Clan</i> ; Yongbe of <i>Peu Clan</i> -Haia Village; Faki Asewaribi of <i>Yaneve Clan</i> -Agotu Village; Uya of <i>Lioni Clan</i> -Maimufu Village; Kamiagi of <i>Kuseli Clan</i> -Maimufu Village; Fobora of <i>Kaigua Clan</i> -Maiva Village. (The inclusion of Yaneva Clan and Kaigua Clan needs to be clarified as officially they have not been considered a part of the WMA since the mid-1990s and their land holdings need to be reviewed in relation to the WMA's boundaries). The members of the Management Committee do not function as a cohesive unit due to the size and remoteness of the WMA. Each community has their own Management Committee (e.g. from Ubaigubi, Herowana, Maimafu, Haia etc) and the names of the people on these committees need to be submitted to CEPA for gazettal. There used to be bi-annual meetings of the Crater Mountain WMA Committee but this ceased more than 15 years ago due to funding restrictions, a decline in airline services and an increase in the cost of air travel.
Total number of staff (this means anyone working on the protected area in paid jobs – whether NGOs, community, rangers or customary landowners	2 officers within RCF. Depending on the availability of funds the number of paid staff can increase to six or eight.
<i>Temporary paid workers</i>	4-6
<i>Permanent paid workers</i>	2
Annual budget (US\$) – excluding staff salary costs	K150,000 per year (from a donor agency).
Operational (recurrent) funds	0
Project or special funds	0 (However, the Soderstrom Foundation [a private family fund]based in the USA assisted with funds five to six years ago [e.g. support for a local student from Maimafu Village to receive teacher-training for three years at Balob Teachers College in Lae and then to return to serve as a teacher in the Primary School in his village. This approach is an antidote for acute teacher-shortages in remote schools throughout PNG]. There was also some funding support which was donated from a private family fund to support a local student to be trained as a teacher at Goroka Teacher's college).
Reason for park establishment	To protect the bird of paradise population (from the harvest of feathers as the bird is hunted and used in traditional singings) and to protect tribal land from neighbouring clans/tribes land claims.
What are the main values for which the area is designated (Fill this out after data sheet 2)	Bird of paradise conservation; protecting three species of tree kangaroos e.g. Good Fellows Tree Kangaroo, <i>Dendrolagus goodfellowi</i> and Dorias Tree Kangaroo, <i>D. dorianus</i> respectively ("ire/ama") from over-hunting; protecting land, rivers and streams; protecting biodiversity.
List the primary protected area management objectives (add lines if needed after the	To protect bird of paradise populations against over-hunting (plumage used in traditional sing-sing regalia such as head-dresses).

most important objectives): <i>Management objective 1</i>	
<i>Management objective 2</i>	To protect tribal land against the possession/claim from neighbouring clans.
<i>Management objective 3</i>	To provide a venue/site for tourists and researchers in order to generate some monetary benefits to the remote communities.
Number of people involved in answering the assessment questions	5
Name/organisation/contact details of people participating the assessment (<i>Please do not insert return/enter or dot points</i>)	<i>Robert Bino</i> , NRM Program Manager, Research Conservation Foundation (RCF), P.O. Box 1261, Goroka, Eastern Highlands Province; <i>Avit Wako</i> , Herowana Village, Lufa District, P.O. Box 1261, Goroka, Eastern Highlands Province; <i>Steven Aise</i> , Mengino Village, Karamui District, P.O. Box 1261, Goroka, Eastern Highlands Province; <i>Miso Helikope</i> and <i>Rodney Soho</i> , Haia Village, Baimuru District, P.O. Box 1261, Goroka, Eastern Highlands Province.
Customary landowners/other community; CEPA, Other national government agency; Provincial govt; local level govt; Protected area staff (anyone working on the protected area in paid jobs; NGO; Donors; External experts; Others	Customary landowners and Research Conservation Foundation (RCF).
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?

No statement recorded (see information in Table 2).

Table 2. Key values of the protected area

No.	Key values	Brief description	Note if endangered species or ecosystem (IUCN)
1	Bird of paradise	The key species include raggiana, king, blue and superb.	Protected under PNG laws and UCN Red List
2	Mineral spring/pond	Provides salt used in cooking. A large array of birds and forest animals frequent these mineralised springs to eat the salt and thus these areas are a potential site for bird (or animal) watching pending landowner approval and consent to enter these areas.	
3	"Ugami" tree	This tree is used as building and fencing material. The seed from the tree is consumed by animals and individuals in the community and is also used in traditional bride price.	
4	"Fu/mirake" tree	This is a common building material (post/stump), but the supply is running low.	
5	Cassowary	There are two species of cassowary (southern and northern; and dwarf) and they are used for bride price and other traditional uses. They are one of the most sought after species. Chicks are collected and kept in enclosures to use as a 'currency' in trade and ceremonies. Large adults are killed for consumptions and eggs are collected.	Southern and northern cassowary – vulnerable; dwarf cassowary – near threatened.
6	Tree kangaroo (3 species)	This includes the <i>Dendrolagus goodfellowi</i> and <i>Dendrolagus dorianus</i> . Conservation of the species is important as the population is decreasing.	<i>Dendrolagus goodfellowi</i> , <i>Dendrolagus</i>

			<i>dorianus</i> (IUCN Red list)
7	Traditional medicine	Preservation of herbs/tree species is important for medicinal purposes. Other herbs are used in handicrafts.	
8	Streams/rivers	Crater Mountain protects the head waters of many rivers flowing into the Gulf of Papua.	
9	Stone fish (miuha/kimi)	This is a very good source of protein for the community.	Stone fish (miuha/kimi) - endangered
10	Biodiversity	There are many unknown species that researchers have yet to discover e.g. the recent discovery of the largest moth (Hercules moth). Mack and Wright (1996) recorded 25 pigeon and 27 parrot species in the WMA. Opiang (2009) also conducted research on long-beaked echidnas <i>Zaglossus bartoni</i> , which historically have been widespread.	

Table 3. Checklist of values/benefits

Not important 0; Important 1; Very important 2; Don't know DK

How important is the protected area for each of the listed values/benefits?	Score (0,1,2, DK)	Comment
1. Biodiversity – the presence of many different kinds of plants, animals and ecosystems	2	A rich biodiversity with several rare and threatened species. The biodiversity supports the daily livelihood of the customary landowners, including traditional medicines, food and building materials.
2. Presence of rare, threatened, or endangered species (plants and animals)	1	Some rare species are used in traditional ceremonies such as 'singsings' and they are important.
3. Ecosystems (e.g. wetlands, grasslands, coral reefs etc) that are rare because they have been cleared or destroyed in other areas	2	There are thought to be many restricted range or rare species. The WMA includes primary forest or alpine shrub and a small area of grassland on the high peaks.
4. Protecting clean, fresh water	2	The availability of fresh clean water in the forest supports the communities in the conservation area.
5. Sustaining important species in big enough numbers that they are able to survive here	2	The communities in the WMA recognize the importance of maintaining a good size population of larger animals, which they can depend on to supplement their daily meals.
6. Providing a source of employment for local communities now	2	The establishment of the WMA allows partners to train local people and this provides an income generating opportunity for the locals.
7. Providing resources for local subsistence (food, building materials, medicines etc.)	2	Due to the remoteness of these communities this conservation area is all the customary landowners have and they depend on it to meet their daily needs.
8. Providing community development opportunities through sustainable resource use	2	There is a water supply and the provision of water tanks to the communities in this WMA allows them to harness their resources for everyone in the community.
9. Religious or spiritual significance (e.g. tambu places)	2	There are tambu sites and masalai areas. Their presence allows the landowners to observe and also provides an avenue for tourism. The tourists will pay more to visit the tambu sites with the consent of the locals.
10. Plant species of high social, cultural, or economic importance	2	There are many different plant species with social and economic importance such as sandal wood.
11. Animal species of high social, cultural, or economic importance	2	Bird of paradise species are valued and used for different types of traditional dances. Cassowaries are also traditionally significant in both Kimi and Pawaia cultures (two ethno-linguistic groups who control landholdings in the CMWMA) in terms of bride-price currency.
12. Attractive scenery	2	There are a few lookouts with views to four provinces. There are waterfalls, many rivers and large tracts of

		forest and associated wildlife. There are bat caves and stone houses.
13. Tourism now	2	Considered very important as a source of income but at the moment access to the site is limited and is a challenge. Scientific tourism (or scientific research) used to thrive in the Crater Mountain WMA and brought in significant levels of monetary benefits (cash) to customary landholders of the protected area. Many landowners in the WMA still want researchers back working on their land.
14. Potential value for tourism in the future	2	There is potential for tourism into the future but the current trend with the lack of regular flights presents a major challenge. For example, there is potential for scientific research/tourism to be revived and re-developed into a niche due to the existing social infrastructure (or capital), (i.e. providing a market-based approach to conservation in the context of an ICDP).
15. Educational and/or scientific value	2	Research information has assisted the landowners in becoming aware especially of breeding seasons and this helps the community to limit hunting during the breeding season. The presence of the Research Conservation Foundation highlights the research and educational values of the WMA.
16. Maintaining culture and tradition on customary land and passing this on to future generations	2	The community depends on this WMA to support them during cultural events/singsings.

Part 3: What are the threats to the protected area?

Table 4: Threats to the protected area

- H** High significance 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
- M** Medium threats are having some negative impact – they are damaging values but not so badly
- L** Low threats are present but not seriously damaging values
- 0** 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

Threat type	Score (H,M,L,0)	Notes
1.1 Housing and settlement	L	The WMA has a huge forested area and the impacts from settlement are not a major concern.
1.1a Population increase in the protected area community	L	This is possibly a threat at the clan level, but it is not a threat for the whole WMA.
1.2 Commercial and industrial areas	0	
1.3 Tourism and recreation infrastructure	L	The lodges and facilities are sparsely distributed and most are run down by now.
2.1 Customary land owner and community gardens and small crops	L	Most of the community gardens are cultivated within the vicinity of the settlements. There is a huge track of untouched forest surrounding these community gardens.
2.1a Drug cultivation	M	Some drugs are cultivated for household use and this impacts mainly on the young people and there are subsequent threats to visitors and researchers.
2.1b Commercial plantations	L	There are no commercial plantations but the landowners have small gardens that cater for each household and these include organic coffee and vanilla farms. Access to these sites to support the communities is a major problem and needs to be addresses so it can support community livelihoods over a long period of time. Air freight costs are high in relation to export of coffee and other products and this limits the income generation within the communities.
2.2 Wood and pulp plantations	0	
2.3 Livestock farming and grazing	0	

Threat type	Score (H,M,L,0)	Notes
2.4 Marine and freshwater aquaculture	0	
3.1 Oil and gas drilling	H	There is a lot of interest from various companies to explore and mine the area. There was some exploration for natural gas near the Purari River bank.
3.2 Mining and quarrying	H	Currently there is a small scale gold mine in the area at the head waters of Wara Nimi. There is a mine (subterranean operation) currently located within the official boundaries of the Crater Mt WMA - the Nevera site is described as a High Grade Zone by the operator, Gold Anomaly (PNG) Ltd, a subsidiary of Crater Gold Mine Ltd (Australian-based). There are at least three other properties (including exploration licences), with promising potential, yet to be further assessed and developed, that are located within the official boundaries of the WMA. The environmental permit (or 'licence to operate') was 'knowingly' accorded to the operator by DEC/CEPA with the full knowledge that this is an officially gazetted protected area. This decision by DEC/CEPA further questions its (or the agency's) role/position as the 'game warden' (keeper of conservation in PNG, mandated by the state) and at the same time as a 'rent-seeker' (seeking to build the financial autonomy of this state agency/institution). This obviously results in a 'conflict-of-interest' situation. Mining exploration companies have established structures and these have been left to deteriorate over time. There is also thought to be a proposed mining operation on the boundary of the WMA and this has raised concerns about the limited benefits that this will bring to the communities.
3.3 Energy generation	L	The proposed Karamui hydro-electricity plant has been moved out of the WMA boundary.
4.1 Roads and railroads (include road-killed animals)	0	
4.2 Utility and service lines (e.g. electricity cables, telephone lines)	0	
4.3 Shipping lanes	0	
4.4 Flight paths	L	
5.1 Hunting, killing and collecting terrestrial animals (including killing of animals as a result of human/wildlife conflict)	L	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.
5.2 Gathering terrestrial plants or plant products (non-timber)	L	
5.3a Logging and wood harvesting for local/customary use	L	The selection of trees for construction purposes is done within the vicinity of the human settlements and the main impacts are in those locations. There is significant selection pressure on the targeted species of tree(s). Locals have informally told RCF project staff that the targeted species of tree(s) are getting scarce in forests within close proximity to villages/human settlements and as a result people have to venture further into the forest in search of trees.
5.3b Logging and wood harvesting – commercial logging	L	Towards Crater Mountain the threat is low but there are logging operations to the south of Crater Mountain on the flat plain next to the Purari River.
5.4a Fishing, killing and harvesting aquatic resources for local/customary use	L	Fishing takes place within the vicinity of the villages within the WMA.
5.4b Fishing, killing and harvesting aquatic resources for commercial use	0	
6.1 Recreational activities and tourism	L	The tourists are aware of the rules about the use of the forest. However, a Management Plan is needed to mitigate the impacts of tourism on the environment.
6.2 War, civil unrest and military exercises	0	

Threat type	Score (H,M,L,0)	Notes
6.3 Research, education and other work-related activities in protected areas	L	There were two cases of researchers abusing the rules within the WMA and they were dealt with by the communities.
6.4 Activities of protected area managers (e.g. construction or vehicle use)	0	
6.5 Deliberate vandalism, destructive activities or threats to protected area staff and visitors	L	
7.1 Fire and fire suppression (including arson)	L	The cold climate reduces the risk of fire most of the time. However, a significant portion of Crater Mt WMA's forests in the north-eastern sections of the WMA, especially near the villages of Mengino, Maimafu, Ubaigubi, etc. were destroyed by rampant bush-fires during the 1997 El-Nino. Out-of-control fires outside the WMA slowly worked their way into the boundaries of the WMA and this remains a threat to the forests of the WMA.
7.2 Dams, hydrological modification and water management/use	0	
7.3a Increased fragmentation within protected area	0	
7.3b Isolation from other natural habitat (e.g. deforestation)	0	
7.3c Other 'edge effects' on park values	L	
7.3d Loss of keystone species (e.g. top predators, pollinators etc.)	M	The changing hunting methods are a major threat to the wildlife populations, especially the cassowaries. Field research by Dr Andrew Mack demonstrated that <i>Casuarius bennetti</i> (Dwarf/Mountain Cassowary) is an important seed dispersal agent, playing a key role in the distribution/composition of certain plant species (those trees bearing large-sized fruits/seeds) within the WMA. Populations of <i>C. bennetti</i> are located in the higher altitude areas of CMWMA. The larger Southern Cassowary (<i>Casuarius casuarius</i>) is the second species of cassowary found within the CMWMA and tend to occur towards the southern end of the CMWMA.
8.1 Pest plants	H	On the Purari side, there is an intrusion of the piper species and it is spreading into the forest. This is being spread by flying foxes and cuscus.
8.1a Pest animals	H	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.
8.1b Diseases such as fungus or viruses that make native plants or animals sick	L	
8.2 Introduced genetic material (e.g. genetically modified organisms)	0	
9.1 Household sewage and urban waste water	0	
9.1a Sewage and waste water from protected area facilities	0	
9.2 Industrial, mining and military effluents	L	Mining exploration companies have established structures in the WMA and these have been left to deteriorate over time. Locals near Maimafu have complained of dead fish, other aquatic organisms, etc. and are blaming mining-related effluents (chemical and siltation) discharged directly into the Nevera River (without any proper treatment and due-diligence on the part of the operator) from the mine operated by Gold Anomaly. The Nevera River flows past a major hamlet (village house-line), considered as a sub-village of Maimafu, and then flows into Wara Hei, a main river of Maimafu where local people also fish (especially near its confluence with the Tua River [Wara Waghi], officially considered as the headwater of the Purari

Threat type	Score (H,M,L,0)	Notes
		River). 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.
9.3 Agricultural and forestry effluents (e.g. excess fertilizers or pesticides)	0	
9.4 Garbage and solid waste	0	
9.5 Air-borne pollutants	0	
9.6 Excess energy (e.g. heat pollution, lights etc.)	0	
10.1 Volcanoes	0	
10.2 Earthquakes/Tsunamis	0	
10.3 Avalanches/Landslides	L	Mining exploration teams have caused landslides.
10.4 Erosion and siltation/ deposition (e.g. shoreline or riverbed changes)	H	Erosion occurs during the wet season and affects communities along the Purari River in Baimuru Local Level Government area. Some years ago it came to RCF's attention that locals in Pawaia were cutting down trees 'conveniently-located' along the banks of the Purari River and were floating logs down river to sell at a sawmill at Baimuru station. Thus players (operators) like that, who operate businesses in proximity to a protected area must be encouraged (or coerced) to comply with environmental standards (e.g. FSC).
11.1 Habitat shifting and alteration	L	
11.2 Droughts	L	
11.3 Temperature extremes	L	
11.4 Storms and flooding	L	Flooding occurs towards the southern end of the WMA within the vicinity of the Purari River, Baimuru Local Level Government.
11.5 Coral bleaching	0	
11.6 Intrusion by saltwater into gardens etc.	0	
11.7 Sea level rise	0	
Other (please explain)		
12.1 Loss of cultural links, traditional knowledge and/or management practices	H	The exposure to modern technology and foreign culture through mobile phones has led to the loss of some traditional practices and language, and the lack of respect for elders is becoming common
12.2 Natural deterioration of important cultural site values	H	The introduced species such as piper species in these sites is a problem.
12.3 Destruction of cultural heritage buildings, gardens, sites etc.	L	
Other (please explain)		

Table 5. Worst threats and ways forward

Threat No.	Threat (Most significant first)	Threat number or name (copy no. from Table 4)	Nature of the threat, impact and how to reduce the impact.
1	Oil and gas drilling	3.1	There is interest being shown in mining within the area and this can have impacts on the environment. We need to provide more economic opportunities to sustain the communities by providing alternative livelihood options. This must be accompanied by the provision of training to support the income base of each household.
2	Mining	3.2	There is interest being shown in mining within the area and this can have impacts on the environment. We need to provide more economic opportunities to sustain the communities by providing alternative livelihood options. This must be accompanied by the provision of training to support the income base of each household.
3	Pest plants and animals	8.1, 8.1a	The main impacts are from piper species and the introduction of tilapia and carp into the waterways. It is hard to reduce the impacts of these pest species unless there are appropriate interventions from the government or partners and engagement

			with the customary landowners. There needs to be a harmonisation of government policies in PNG especially within the context of managing protected areas. Whilst there is an issue of food security being addressed by DAL (i.e. introducing foreign fish species into local ecosystems) measures must be put in place to ensure that such interventions by the state do not conflict with its other policies – i.e. to protect the country’s rich biological diversity.
4	Erosion and siltation/ deposition	10.4	This impacts mainly on the Purari River and these natural threats are difficult for the customary landowners to manage.
5	Natural deterioration of important cultural site values and loss of culture	12.1, 12.2	Natural threats are difficult for the customary landowners to manage.
6	Drug/marijuana	2.1a	The availability and influence of marijuana on the young children in the society is a major threat especially to visiting tourists and researchers. There should be more police presence in the area to educate and avoid such situations. It is difficult to maintain public servants like teachers and health workers in remote areas in PNG. Thus the possibility of placing police officers in CMWMA communities is impractical. Instead the focus should be on building the capacity of local or community-based institutions to enforce laws and ensure social order in these communities.

Part 4: What is the management like in the protected area?

Table 6. Management effectiveness scores, comments, next steps

Issue	Score (0,1,2,3, NA)	Comment	Next steps
1a. Legal status	3	Declared and gazetted under the Fauna (Protection and Control) Act 1966.	Para-legal training for WMA Committee members is needed to strengthen and enforce the laws.
1b. Legal status			
2a. Protected area regulations	2	There are no formal regulations. However, there are traditional rules e.g. prohibition on hunting in clan based conservation areas.	Develop and gazette rules, fees and fines for the WMA. There is a need to educate the communities about the laws and penalties.
2b. Protected area regulations			
3. Law enforcement	1	There are major deficiencies in capacity and resources to undertake effective law enforcement. This occurs by traditional practices with the support of the clan leaders.	There is a need for assistance from partners familiar with conservation laws to help the community strengthen their current understanding. Para-legal training is needed for members of the WMA Committee to help strengthen and enforce the laws. The best practical option is to build the capacity of existing locally-based institutions within these communities (e.g. management committees and village courts) to enforce the conservation laws enacted by the communities themselves. The people must not depend on an external solution to the problem as this will not work due to many factors - the solution lies from within.

Issue	Score (0,1,2,3, NA)	Comment	Next steps
4. Protected area objectives	2	There are objectives (unwritten) but assistance is needed to reinforce these and identify them in a formal Management Plan.	Develop a Management Plan for the WMA which includes agreed objectives.
5. Protected area design	3	The WMA is large (270 000 ha) and its size is sufficient to achieve the objectives. It has upland and lowland areas to facilitate wildlife movement. However, the lowland areas are under greater development pressure.	
6. Protected area boundaries	2	There are incomplete boundaries that separate the communities from their resources. Land use planning is undertaken in the Karamui area, however, two tribes have yet to undertake land use planning for their area. Land disputes are a threat to some areas within the WMA. Not all landowners are supportive of being in the WMA.	Map the customary boundaries and develop a land use plan for the entire area and map cultural boundaries for all the tribes.
7. Management plan	0	There is no formal Management Plan in place. However, there are landuse plans in several communities that identify hunting and gardening areas and areas for conservation.	Develop a Management Plan for the WMA in consultation with the customary landowners. The Management Plan must also harmonise with the NRM, landuse and resource management plans of the different tiers of government - i.e. local/ district/ provincial. Re-establish the Management Committee, provide funding and resources to enable the committee to meet regularly and to enforce the relevant regulations.
7a. Planning process	0	There is no Management Plan and thus customary landowners have no influence.	
7b. Planning process	0	There is no Management Plan and thus there is no plan review process.	
7c. Planning process	0	There is no Management Plan and hence no monitoring that can influence it.	
8. Regular work plan	0	There is no work plan as this hinges on having a Management Plan	Develop a Management Plan and related work plan.
9. Resource inventory	2	There is some knowledge and traditional practices within the various clans on how resources are managed.	Resource information should be collated and made available to the Management Committee.
10. Protection systems	1	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.	Develop an effective protection system for the WMA. The current legislation (i.e. Fauna [Protection and Control] Act) under which the CMWMA was gazetted is regarded as 'WEAK' in the sense that it cannot protect the WMA against other competing interests e.g. resource extraction schemes such as logging and mining. Re-gazette the WMA under the new protected area legislation.

Issue	Score (0,1,2,3, NA)	Comment	Next steps
11. Research and monitoring	2	Some parts/areas within the WMA are well researched but there is no monitoring (e.g. of the impact of hunting).	Taxonomy training should be provided by research teams and organisations that come to the WMA.
12. Resource management	2	There is no formal resource management in place although traditional practices are in place.	Draft a formal resource management plan that takes into consideration traditional knowledge.
13a. Staff numbers	2	People are employed by the Research Conservation Foundation to coordinate activities from their head office in Goroka.	Seek the support to employ full-time ground staff within the WMA. The legislation already provides for Management Committee members (who are also customary landowners) to act as rangers and enforce conservation laws within the context of 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.
13b. Other people working on the protected area	3	Many customary landowners work in the WMA, e.g. there are about 22 members of the Management Committee in Herowana LLG, Lufa District and 22 (20 males and 2 females) in Karamui/Baimuru.	There is a need for management training for the members of the Management Committee.
14. Training and skills	2	There is local knowledge in relation to biodiversity, but there needs to be specific skills transferred to the communities.	Specific training on resource management, species identification and livelihood skills are needed in this area.
15. Current budget	1	Some funding is secured by RCF for this project. One of the biggest challenges of operating the CMWMA, is its isolation and accessibility to markets. Freight and logistics is quite expensive in PNG and the CMWMA for that matter. Coffee farmers in the CMWMA for instance are not getting the financial returns for their effort/investment into coffee production which used to generate a significant portion of house-hold income in the coffee-growing regions of the CMWMA which may prove to be no longer viable with the ever-rising cost of (air) freight.	Explore a range of income generating activities for the WMA.
16. Security of budget	0		
17. Management of budget	2	There is a management system in place for various projects undertaken by RCF.	
18. Equipment	2	There is some equipment to help manage the WMA.	
19. Maintenance of equipment	1	Maintenance of equipment is ad hoc and dependent on the funding available.	
20. Education and awareness	1	This is done when funding is available.	Implement long-term education and awareness raising programs, especially through the schools.

Issue	Score (0,1,2,3, NA)	Comment	Next steps
21. Planning for land use or marine activities	1	Adjacent land use planning does not take into account the needs of the WMA, but currently this is not harming the area.	Establish more effective working relationships with adjacent stakeholders.
22. State and commercial neighbours	1	There is little cooperation between the Management Committee and outside land users.	There needs to be some understanding reached between parties who have interest in this area.
23. Indigenous people/ Customary landowners	2	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.	
24a. Impact on communities	1	There is trust between the community and outside NGOs and governments, but there is no funding for management.	
24b. Impact on communities	1	There are some programs to improve the landowners' welfare.	
24c. Impact on communities	1	The customary landowners support the WMA. There is a strong desire by the community to protect their environment.	Provide support to the community to enable their conservation efforts to continue.
25. Economic benefit	2	There used to be a flow of economic benefit when tourists visited the site but that has dropped now as there are few flights into the area. Third-level airline operators still operate flights into CMWMA airstrips. However, the issue is with affordability. The airfare has risen so high such that it is now beyond the reach of locals. There are in-frequent flights into the CMWMA and people tend to charter a plane if they want to secure flights and this is more expensive. There is the belief that if the community engages in conservation then they should receive some assistance or benefits.	Investigate the re-establishment of cheaper flights into the area and the development of ecotourism opportunities and other income generating activities.
26. Monitoring and evaluation	1	There is some irregular monitoring.	Establish effective monitoring processes to obtain information to enhance management.
27. Visitor facilities	1	Facilities are now rundown due to the lack of tourist coming into the area.	
28. Commercial tourism operators	1	There is communication but access is a major challenge.	Develop appropriate tourism options (refer above).
29. Fees	2	There is a fee structure in place and entry fees were charged when tourists came to the area. However, there have been no recent tourists.	Clarify the financial management arrangements for the WMA.
30. Condition of values	2	Most of the important biodiversity values remain intact.	
30a. Condition of values	0	The assessment of values is not based on research or monitoring data.	
30b. Condition of values	1	There are some programs in place to minimise the threatening processes.	
30c. Condition of values	0	There are no routine management activities.	

Part 5: Condition and trends of the protected area values

Table 7. Values, condition and trend

Key value (from Table 2)	Condition Score (VG, G, F, P, DK)	Trend Score (I, S, D, DK)	Information source and justification for Assessment and HOW the condition can be IMPROVED
Bird of paradise	VG	I	The birds have been observed and sighted near the airstrip, and other public areas.
Mineral spring/pond	VG	S	The condition has been observed to be the same as what it used to be many years back and overflows at times.
"Ugami" tree	VG	S	This tree reproduces many seeds and it is believed that there is sufficient growth in the WMA.
"Fu/mirake" tree	F	D	Since it is a hard wood, the growth rate is so slow and with the population increase there is increasing pressure on this particular species, which is used as a building material.
Cassowary (2 species)	G	D	The demand for cassowary for many traditional uses places pressure on this species and the improved and modern hunting methods has led to decreases in the population.
Tree kangaroo(3 species)	F	D	Hunting methods and population pressure on this species is a major concern.
Traditional medicine	VG	S	There is little impact on traditional medicines.
Streams/rivers	VG	S	There is a potential threat from activities upstream, especially medium scale mining activities that impact on water quality in the western end of Crater Mountain.
Stone fish/(miuha/kimi)	P	D	The introduction of invasive tilapia and carp is threatening this native species.
Biodiversity	VG	S	Remoteness has helped to protect the biodiversity of the WMA.

Table 8. Recommendations and ways forward

1.	2.	3.
Strong legislation needs to be in place to prevent other competing demands on the land and resources within the WMA. This strong legislation will provide greater certainty and reduce confusion about future alternative land uses.	Strengthen the income generating activities within the WMA (as previously experienced). These activities must be distributed equitably amongst all participating landowning clans and be supported by training in livelihood and income-generating opportunities. Capacity-building and training is needed in the WMA to enable the customary landowners to take charge of their own destiny. This will reignite the interest of the customary landowners. If the landowners are happy and contented then they will not look to alternative (competing) interests that may damage the WMA's values.	Re-establish regular (e.g. annual) meetings within the WMA to increase the participation and involvement of the customary landowners in the management of the WMA.

Table 9. Strengths and challenges (facilitator/recorder synthesis)

	Strengths	Challenges
1	Remoteness has in the past helped to protect the diverse values of the WMA.	Identifying a range of income generating activities in the face of limited tourist visitation (due to changes in flight schedules) and support from government.
2	There is strong interest in retaining the WMA and introducing more effective management planning and enforcement.	Maintaining community interest in conservation in the face of potential mining, oil and gas development. It is time for the state in PNG to take ownership and stronger control over these kinds of issues. The state must undertake over-arching processes such as Strategic Environmental Assessments (SEA) and harmonise its policies. Thus in areas that the state has established protected areas, it must not allow other

		competing interests to intrude/encroach and cause confusion to landowners and visa-versa.
3	There are good links with the Research Conservation Foundation, which provides support to the WMA.	Reducing the impact of invasive pest species (tilapia and carp) that have been introduced into the waterways as part of government policy and which are threatening to eliminate a range of native fish species.
4	The WMA has a large size and this enhances management effectiveness.	Obtaining support to develop and implement an effective Management Plan that has the support of the customary landowners.

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