Department for Environment Food & Rural Affairs

DARWIN INITIATIVE

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DARWIN INITIATIVE: FINAL REPORT

*To be completed with reference to the "Writing a Darwin Report" guidance: (http://www.darwininitiative.org.uk/resources-for-projects/reporting-forms). It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)*

**Darwin Project Information**

| | |
|---|---|
| Project reference | 23-020 |
| Project title | Sustaining biodiversity, livelihoods and culture in PNG's montane forests |
| Host country(ies) | Papua New Guinea |
| Lead organisation | Wildlife Conservation Society (WCS) |
| Partner institution(s) | Oxfam International, Individual Reform & Restoration Movement, KGWan Eco-Habitat, Miruma community (WAMU5) |
| Darwin grant value | £299,959 |
| Start/end dates of project | 1 April 2016 – 30 March 2019 |
| Project leader's name | Ambroise Brenier |
| Project website/blog/Twitter | @WCSMelanesiaSci<br>www.wcspng.org |
| Report author(s) and date | Thomas Mutton (WCS), Ambroise Brenier (WCS), Markis Pesco (WCS), John Lamaris (WCS), Tory Kuria (WCS), Azalea Anota (WCS), Toppy Sundu (IRRM), Steven Yadime (KGWan), Johannes Pakatul (NARI), Rodney Aku (NARI)<br><br>31 July 2019 |

# PROJECT RATIONALE

The Bismarck Mountains, running east-west along the spine of Papua New Guinea (PNG), contain the nation's highest peak, Mt Wilhelm, and some of the country's most spectacular landscapes, home to many famed endemic species, including cassowaries, birds of paradise and tree kangaroos, all integral to PNG's biological and cultural diversity. Unfortunately, these forests are under severe threat from a human population set to double in the next 25 years. Local communities, the traditional forest landowners, are almost totally dependent on natural resources for their subsistence and for livelihood opportunities and are driving forest loss through small-scale but widespread clearance for vegetable gardens (for local subsistence and sale) and timber (for building materials and firewood). Further threats to the ecological integrity of forests are

hunting and over-exploitation of birds and mammals for food and for cultural use (e.g. feathers and fur in traditional outfits) and the loss of traditional ecological knowledge about these species and about the uses of forest products for food, medicine and timber. An additional threat is the widespread planting of non-native pines and eucalypts for timber and climate change, which appears likely to drive species extinctions in the Bismarck Mountains (Pacifici, M., Visconti, P. and Rondinini, C. (2018). “A framework for the identification of hotspots of climate change risk for mammals.” Global Change Biology 24(4): 1626-1636).

This project aimed to significantly reduce deforestation in the Bismarck Mountains, strengthen and diversify local livelihoods, and conserve PNG’s cultural and biological diversity through four main strategies: improving agricultural practices to strengthen community livelihoods through the establishment of cash and drought resilience crops and by increasing yield to lessening the need for the clearing of primary forest for garden plantations; implementing sustainable forestry and silviculture to provide reserve high-protein and drought tolerant crops and to reduce deforestation through the provision of alternative timber resources; reducing hunting pressure on threatened species though the re-establishment of tambu sites and community education; and retaining and passing on traditional ecological knowledge to the next generation through the recording of local language wildlife names and the development of a supplementary school program. The project has been delivered at three communities that contain a total population of 10,016 (2011 census) people, who still largely follow a subsistence lifestyle.

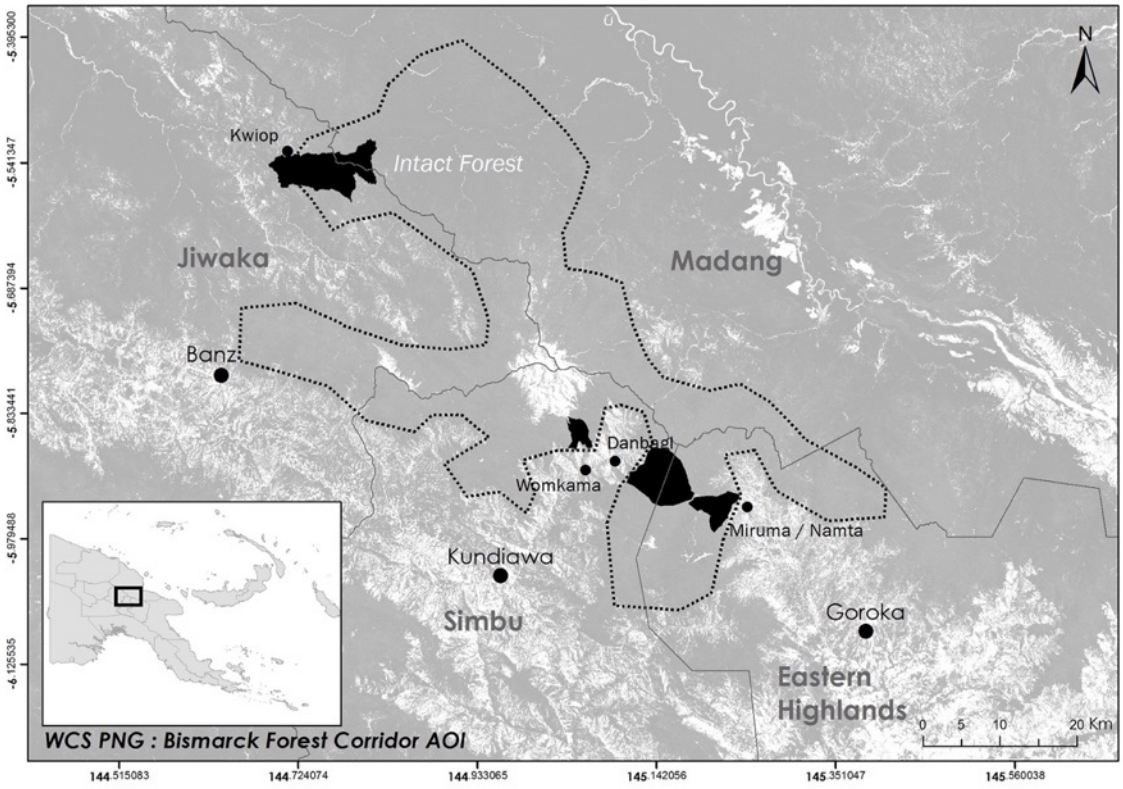


**Figure 1.** Map of the three Darwin Initiative project sites and Kwiop, a community which was supported from 2018 which co-funding from the Australian government

# PROJECT PARTNERSHIPS

Memoranda of understanding (MoU) were signed in Year 1 with three community-based organisations (CBOs): IRRM and KGWan Eco-habitat in Gembogl District, Chimbu Province, and the Miruma (Namta) community in Daulo District, Eastern Highlands Province. WCS partnered with IRRM and KGWan as Oxfam had a pre-exist relationship with these CBOs and approached WCS with the CBOs seeking support for conservation and livelihoods activities. WCS partnered with the Miruma (Namta) community on the request of the Eastern Highlands Provincial Government which had identified the community as custodians of one of the highest value conservation areas in the province.

The established CBOs of IRRM and KGWan Eco-habitat were supported since Year 1 through sub-grant awards to contribute to the implementation of Darwin initiative activities. The Miruma community was supported via direct funding of community activities through the Operating Cost budget line in WCS's overall budget. Miruma was initially excluded due to concerns about their ability to manage funds as they had not established a CBO. However, in March 2018, the Miruma community formed a CBO named WAMU5 and appointed a leadership team. WCS assisted WAMU5 in formally registering their CBO with the PNG Investment Promotion Authority and provided training in financial management and governance to the CBO. In March 2018 WCS signed an amendment to the MoU with the Mirimua (Namta) community recognising WAMU5 as the recipient of the community's subgrant. The CBOs provided financial and narrative reports to WCS on a six-monthly basis which WCS then used to compile WCS reports to the Darwin Initiative.

WCS' relationship with the three CBOs developed well over the course of the project, with each of the CBOs providing strong support during WCS field trips and overseeing community nurseries and agricultural plots. A collaborative partnership emerged, with regular meetings and consultation between the CBOs and WCS and with guidance provided to WAMU5 by the more established KGWan and IRRM. With support from the European Union, WCS has committed to continuing to support these three CBOs over the next four years to build-upon the successes developed over the course of the Darwin Initiative.

In Year 1, additional MoU were signed with Oxfam International to co-ordinate and collaborate on agricultural activities and with Man on Earth Ltd to utilise a Goroka nursery to trial native timber propagation methods. Also in Year 1, WCS signed and awarded sub-grants to the National Agricultural Research Institute (NARI), to undertake agricultural training and drought resistant plant propagation with the participating communities; and Oxfam International, to evaluate agricultural resilience in Gembogl in response to the 2015-2016 drought to inform our agricultural initiatives.

In the final year of the project a fourth community in the Bismarck Forest Corridor (Kwiop) and their CBO (Kaukam Landowners Foundation) were supported through co-funding from the Australian Government to assist in realising the communities desire to establish a conservation area. WCS is currently supporting their CBO to become formally registered. With funding from the European union WCS will provide greater support for livelihood and conservation activities to this community in coming years.

WCS will continue collaborating with all Darwin Initiative partners. As mentioned WCS will continue to support the four CBOs (KGWan, IRRM, WAMU5 and Kaukam Landowners Foundation). WCS will also continue to collaborate with Oxfam International to co-ordinate our

livelihoods and land use planning activities in Danbagl and Womkama. WCS has also contracted NARI to undertake an analysis of options to increase protein consumption through community-based micro-livestocks programs in the four communities and continue to use Man on Earth Ltd nursery to develop propagation protocols.

# PROJECT ACHIEVEMENTS

## OUTPUTS

**Output 1.** The introduction and uptake of improved gardening practices in three communities and an increase in the duration and life of garden areas

*1.1 Number of new gardening techniques that are taken up by male and female community members in the project area by March 2018 and by March 2019*

**Achieved:** Initial assessments by WCS and NARI showed knowledge of agronomic practices for commercial vegetable production, management of soil fertility, water resources and fertilizer application and methods to guard against pest and disease were low at each site and that there was a desire within the communities for more knowledge. Collectively NARI, WCS and Oxfam introduced a number of new gardening techniques over the course of the project. Training was provided on all crops introduced by the project (see Output 2.2 for a list of the crop varieties introduced). NARI also provided training on how to increase crop yield, garden lifespan and soil moisture conservation through mounding, hedge row planting (with locally common *Tithonia diversifolia* and *Causarina oligodo* which was grow in the community nurseries). Training was also provided on multiple mulching techniques, the use of fertilizers (plant-derived and chemical), fallow periods and crop rotation using nitrogen fixing plants.

Training was also provided on how to appropriately and effectively use pesticides and fertilisers for the crops NARI distributed and how to make a natural pesticide from the locally abundant weed *Tephrosia vogelii*. NARI also provides training on appropriate food processing techniques for sweet potato and cassava, on how to making preserves and on seed storage for subsistence use and marketing. This included instructions on sorting and grading seeds, the important of air ventilation during storage and proper methods to pack the crops. Participants were asked to share their experiences of seed damage and the trainers discussed how to counter these issues.

In total 1034 people (540 male, 494 female) attended training sessions run by NARI and WCS. Crop perception surveys of 167 people across the three communities at the end of the project reported 40.7% of people were using new gardening methods introduced by the project (detailed below). See Annex 7: Compendium Report for further details on all methods.

*1.2 At least 300 households using new gardening techniques by March 2018*

**Achieved:** Community Facilitators were trained in each community to undertake a survey to assess whether the new agricultural methods introduced by NARI and WCS (with follow-up training by the CBOs) were been used in community gardens. The Community Facilitators were instructed to randomly sample people in different regions of their communities until a minimum of 25 men and 25 women had been sampled. In total 167 people were surveyed from across the three communities in January and February 2019. Of those surveyed 40.7% (68 people) said they had used at least one method taught by NARI and WCS in their own garden. A much higher rate of take up with recorded in Danbagl (50%) and Miruma (60.4%) than Womkama (19%), were

community tensions stopped WCS and our other project partners from visiting the community for a number of months in 2018 and thus restricted the number of training session NARI was able to undertake in this community .In Miruma and Womkama the most commonly used methods introduced by the project were new planting methods, particularly for carrot and sweet potato. In Danbagl crop rotation techniques to increase soil fertility was reported as the most commonly used new gardening technique. See Annex 7: Compendium Report, section on Agriculture for further details.

This shows the success of our approach, which was able to amplify the training by NARI and WCS through funding CBO community agricultural workers to do follow-up training and by requesting attendance from across the community at each training session and stressing that those in attendance should pass one what they learn to their neighbours and extended family. As between 3,000 and 5,000 people live in each community, the random sampling design of the survey strongly suggestions that more than 300 households are using new agricultural techniques which will increase the duration of their garden areas. This survey was not undertaken before March 2018 as internal delays meant NARI was not able to begin providing training on new garden techniques until 2018.

*1.3 Introduction of new techniques to a minimum of 150 households to ensure the duration of active garden areas will increase by project end*

**Achieved:** Of the many agriculture methods on which training was provided, two in particular will ensure active gardens lifespan increases: crop rotation and composting. In total 27.6% of those surveyed (46 people – see Output 1.2 for further details on the survey) said they had implement new crop rotation or composting methods following training by NARI and WCS. Given that each community consists of between 3,000 and 5,000 thousand people the random sampling design of the survey strongly suggestions that more than 150 households are using new agricultural techniques which will increase the duration of their garden areas by project end.

**Output 2.** Introduction of new market crops for income generation, and introduction of pest and drought resistant varieties for subsistence use within all three communities

*2.1. A 50% increase in the number of marketable crops in gardens in project areas by March 2019.*

**Achieved:** Through WCS' and NARI's baseline surveys at the start of the project it was determined that Miruma did not have a commercial crop and Danbagl and Womkama have one (bulb onions). In partnership with NARI and Oxfam, we introduced three varieties of blight resistant, drought tolerant potatoes to the three sites. Two varieties (E24 and Kumudi) of introduced potato grew well and have now been distributed broadly throughout the communities. However, the E2 variety was observed to have high infection rates by potato blight and was therefore not distributed. The establishment of potato in the communities represents a >50% increase in the number of marketable crops at these sites (see Annex 7: Compendium Report for more details).

*2.2 At least 2 new pest and/or drought resistant crop varieties introduced by March 2018*

**Achieved:** NARI introduced the following crops to the three project sites: drought tolerant, pathogen tested and early-maturing sweet potato (twelve varieties); drought tolerant, low cyanide cassava (four varieties); African yam; and drought tolerant, late blight resistant potato (three varieties – WCS and Oxfam also separately introduced one of these varieties (E2) in 2017-2018). To improve nutrition and income an upland rice variety, carrot and wheat were also introduced to the communities. On-farm field demonstrations about how to grow each crop were carried out at the community multiplication plots during each NARI visit and by the CBO agricultural workers.

Report from NARI and the CBOs showed that all crops grew well except the E2 potato variety showed high damage from blight and cassava did not thrive at Danbagl and Womkama where the altitudinal conditions appear not to be ideal for this crop. These crops were not distributed in the communities (see Annex 7: Compendium Report for further details).

**Output 3.** Nursery practices for native tree species tested and established in two communities and active planting of areas with native species by the project end

*3.1 Successful propagation of at least four native tree species in nurseries by March 2018*

**Achieved:** WCS successfully propagated 9 timber and 3 tree crop species by project end (see Annex 7: Compendium Report for further details):

- *Causarina oligodon* (fuel wood, nitrogen fixer, to be used as nurse crop for hardwoods species in woodlots, it is also locally an important timber tree for local construction purposes).
- *Fagraea beteriana* (durable hardwood timber tree)
- *Fagraea salticola* (durable hardwood timber tree)
- *Castanopsis acuminatissima* (general purpose timber, food source (seeds), has commensal edible fungi)
- *Pandanus julianetti* (reserve food crop for under story planting)
- *Ficus copiosa* (reserve food crop for under story planting) -
- *Ficus damaropsis* (reserve food crop for under story planting)
- *Dacrycarpus cinctus* (montane pine, softwood timber tree species)
- *Nothofagus grandis* (durable hardwood timber tree)
- *Papuacedrus papuana syn. Libocedrus papuana* (montane pine, cultural significant and soft wood timber tree species)
- *Podocarpus archboldii* (Vulnerable montane softwood timber tree*)*
- *Dacrydium nidilum* (Montane pine, softwood timber tree species).

Note: propagation protocols were also developed for two *Araucaria* species, however the PNG Forest Authority later released protocols for these species so we have not included them in the above this.

*3.2 Planting of native tree species in place of exotic species incorporated into land use plans by March 2018 with community nursery output exceeding 3,000 weather hardened native seedlings per community per year by project end*

**Achieved:** 30,128 weather hardened native seedlings were successfully raised in the community nurseries and WCS' Goroka nursery over the course of the project. 13,443 seedlings were raised in the three community nurseries in the final year of the project, averaging 4,481 seedlings

produced per community. Across the three communities a total of 262 ha has been incorporated into community land use plans as regions dedicated to reforestation, community woodlot and tree crop plantation 8 (see Annex 7: Compendium Report for further details on the plantation areas). At close 22,043 seedlings had been outplanted. The remaining seedlings will be planted in 2019 with support from the European Union.

**Output 4.** Sustainable use of existing forest stands within remaining areas of native forests and planted areas of exotic trees

*Activity 4.1: Through the land-use planning process the planting of invasive species in intact forest areas is banned in at least 1 community*

**Achieved:** As part of the detailed land-use planning process which occurred in their community, the Danbagl community committed to banning the planting of invasive species, primarily *Eucalyptus* and *Pinus* in their large intact forest area (4,264 ha). See Annex 7: Compendium Report for further details.

*Activity 4.2 Secure more than 500 hectares under sustainable forestry practices as compared to baseline by March 2019*

**Achieved:** At the start of the project no project community had agreed to implement sustainable forestry practices. Through a community-based natural resource and land-use planning process, the Danbagl community committed to only undertake sustainable forestry in their intact forest area (4,264 ha). All forestry in this area must follow Forest Stewardship Council's international guidelines for Papua New Guinea (2010) for commercial operations. Harvesting for subsistence use is allowed and clear-fell logging has been completely banned. This commitment aligns with KGWan Eco Habitats goal of promoting ecologically sustainable development within their community.

With funding from the European Union WCS is now working in Womkama, Miruma and Kwiop to implement similar sustainable forestry rules and to establish community rules enforced by the local village courts to ensure wildlife hunting is reduced to sustainable levels.

**Output 5.** Capturing and passing on traditional ecological knowledge on forests and threatened species

*5.1 Quantitative survey on knowledge and attitudes of men, women and children in project and control areas at the project start and end*

**Achieved:** Surveys covering traditional ecological knowledge and perception of environmental values were undertaken at the start and end of the project at Danbagl and Womkama. A baseline survey was also conducted at Miruma at project start. Unfortunately, a death of a leader from Miruma during out visit meant a project end survey could not be undertaken at this site as planned. See Table 1 for the number of people surveyed in each community. In total 195 people (Table 1), includingl 24 children (14-18 years old) were collectively surveyed across the three sites in the baseline and endline surveys.

**Table 1.** Baseline and endline reported occasional use of forest, disaggregated by gender.

| Community | Baseline | | Endline | |
|---|---|---|---|---|
| | Men | Women | Men | Women |
| Danbagl | 36 | 13 | 17 | 27 |
| Womkama | 28 | 15 | 35 | 24 |
| Miruma | 38 | 26 | - | - |

Forest use, bilas ownership, concern over the effects of deforestation and knowledge of local language (*Tok Ples)* wildlfie names were assessed. No significant change was recorded in any category surveyed except worry over the effects of deforestation. In the initial survey nearly two thirds of respondents reported a very high or high level of concern over the consequences of deforestation (63%), however a substantial minority of the community (37%) showed little or no concern about deforestation (Figure 2). However, after education awareness in the community fully 98% of respondents reported having big concerns about deforestation by project end (Figure 3 - for further information Annex 7: Compendium Report, Traditional ecological knowledge section).

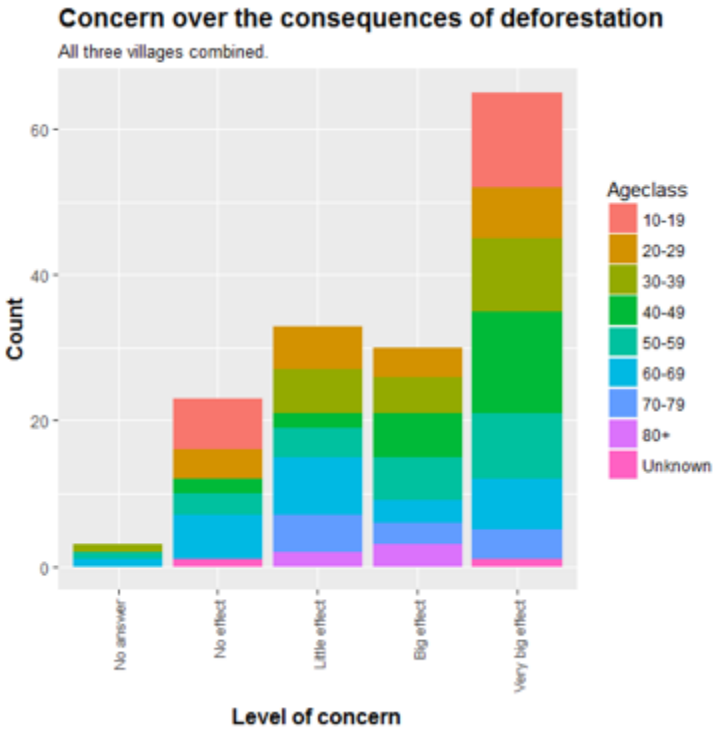


**Figure 2.** Concerns over the consequences of deforestation by age class – baseline survey

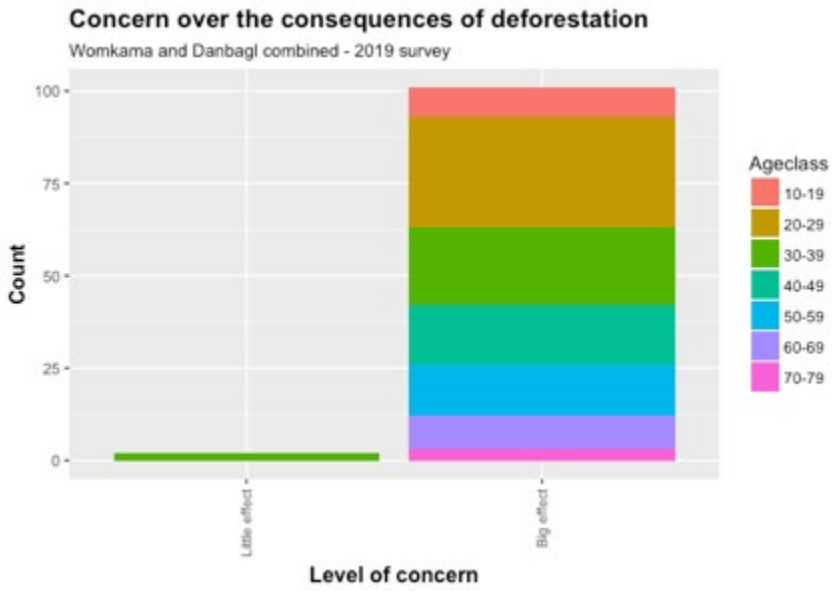


**Figure 3.** Concerns over the consequences of deforestation by age class – project end survey. Note the survey questions were simplified in the project end survey (no, little or big concern) as the WCS team believed translating the original 5 options into Tok Pisin had been confusing for the community members surveyed.

*5.2 Copies of supplementary education materials capturing local ecological knowledge delivered to 3 primary schools in the project area by September 2017 with teacher guides*

**Achieved:** Copies of the supplementary education materials (a supplementary school syllabus with associated posters and a teachers' guide) were delivered to a primary school in each of the three project areas (Nugi, 2017).

Nugi,G (2017) Understanding your environment: a supplementary resource for teachers in communities along the Bismarck Forest Corridor. Wildlife Conservation Society, Papua New Guinea Program. Goroka, PNG. ISBN: 978-0-9943203-5-3

*5.3 Increase in number of school children that learn about their local culture and traditional ecological knowledge by March 2019*

**Achieved** Supplementary education materials (school syllabus, teachers' guide and 7 different posters which related to the syllabus) were developed and delivered to the 3 upper primary schools in the project area. Former PNG teacher and WCS Community Engagement Officer John Par Kagl taught a lesson from the supplementary school syllabus in the primary schools in each of the three communities in both 2018 and 2019 (except Namta 2019). In total he taught 221 (109 female and 112 male) students. The school teachers also reported using the school syllabus. During field trips to the community the Community Engagement Officer would also hold quizzes in the night at the community centre on the local names of plants and animals in the communities (many hundreds of people attended, however given the casual nature of the events attendance was not recorded).

*5.4 Documentation of tok ples names and traditional knowledge of culturally and ecologically important fauna and flora gathered from female and male community members by March 2018*

**Achieved:** WCS has documented 135 fauna and flora *tok ples* names over the course of the project. During field visits the WCS team gave presentations with games involving trying to guess the right *tok ples* name for different species and a number of the names were used to construct the supplementary school syllabus.

**Output 6.** Minimizing impacts on hunted species by preserving local costumes and reviving traditional *tambu* (no hunting) areas.

*6.1 Uptake of improved preservation methods for fur and feathers in traditional costumes (termed* bilas *in tok pisin) by 3 active cultural troupes (at least 75 dancers) by March 2019*

**Achieved:** 1,595 bilas protection kits were given out to bilas owners over the course of the project, including 785 kits to bilas owners in the project areas and 810 kits distributed during the Mt. Hagen and Goroka shows in 2016 and 2017. We did not distribute bilas kits in 2018 but have secured funding from the European Union to continue this work in 2019-2020.

*6.2 Increase in area or number of tambu sites created or re-established in the project area by March 2019*

**Achieved:** WCS surveyed our project communities with regard to traditional practices including *tambu* areas. There was been no indication that *tambu* prohibitions are being used as a resource management technique in this region of PNG in a manner similar to the time limited hunting restrictions used on Manus Island (see Whitmore et al., 2016). However, a modern *tambu* (meaning prohibition) area was established over the entirety of the Danbagl community's primary forest areas where commercial logging and the planting of invasive trees has now been banned. Furthermore, through the land use planning process at this site seven sacred sites were identified as traditional *tambu* areas. Elders of the Danbag community was eager to ensure that these sites were captured in the land use plan as they feared future generations may otherwise forget them and that many current community members were not aware of all sites. Around each sacred site people are not meant to enter unless given permission by the land-owner and hunting and harvesting of trees is prohibited.

As part of the land use planning process the following information was recorded on the seven *tambu* areas:

1. Gigl Amugl Waigua – "Gigl" means spirit, "Amugl" is pandanus, and "Waigua" means roam or inhabited. It is believed that this place is inhabited by wild spirits which roam the area in search of white pandanus to consume.
2. Old Japanese War Cave – A cave which was built by the Japanese army during the 2nd world war. The Danbagln community believes this site of war should be respected and may inhabited with the spirits of those who died at war.
3. Masalai Ples – "Masalai" is spirits and "ples" is site/place. These are sacred sites or places believed to have be inhabited by spirits. There are certain customs and traditional practices to be followed before entering the site. Normally access is fully restricted to any outsiders. A guide or local land owner of the area can enter and knows what to do when going in to the area.

4. Usi Bokau – A masalai ples (see above).
5. Tainunu Dai Man – “Tainunu” is the name of the place and “die man” means dead body or dead people. There is a waterfall at this site. It is seen as a sacred site because it is believed a clan’s ancestor died there due to unknown reasons.
6. Doropera – An ancestry burial site sacred to the community.

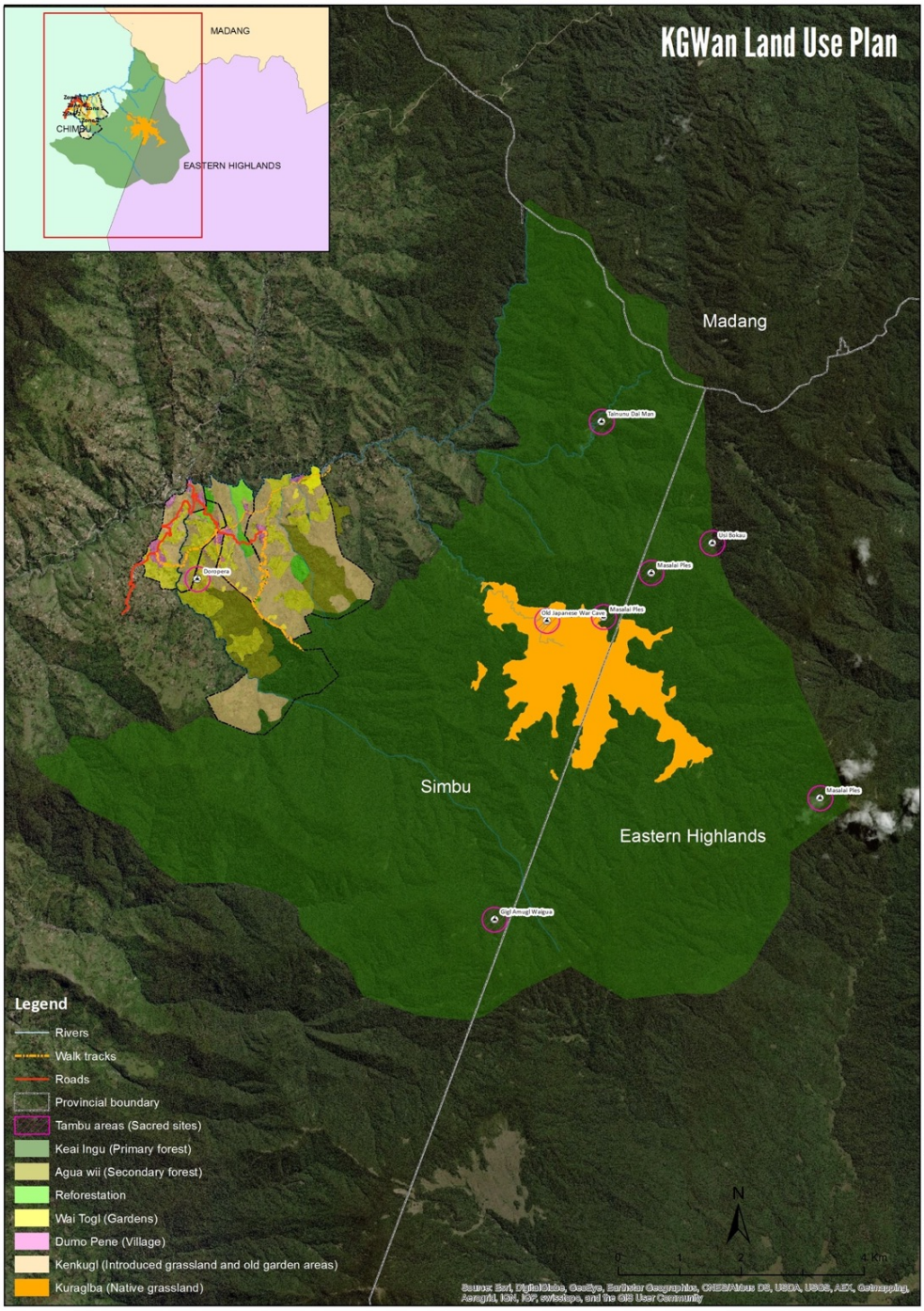


**Figure 5.** Danbagl participatory-designed Land Use Plan map. Land use rules for all zones listed in the map legend were decided upon by the Danbagl community (see Annex 7 for further details). The land use plan was produced by WCS GIS Officer Jacob Kimagl, KGWan and the Danbagl community.

With co-funding from the Australian government, a similar ban to that implemented in Dangabl has also been achieved in Kwiop. We are now working with the Kwiop community to establish legal (conservation deed) protection of this area. As previously mentioned, with support from the European Union Sustainable Wildlife Management we have now begun a process of working with the community to identify over-hunted species and to facilitate the establishment of hunting exclusion zones in the three communities.

Whitmore, N; Lamaris, J; Takendu, W; Charles, D; Chuwek, T; Mohe, B; Kanau, L; and Pe-eu, S. 2016. The context and potential sustainability of traditional terrestrial periodic tambu areas: insights from Manus Island, Papua New Guinea. Pacific Conservation Biology. 22:151-158.

*6.3 Participatory threshold surveys for key biodiversity indicator species (tree kangaroos, forest wallabies, echidna and cassowaries) by September 2016 and end surveys by March 2019, and established monitoring procedures for birds of paradise by November 2016*

**Achieved:** Monitoring and threshold surveyed were completed at Danbagl, Womkama and Miruma in 2017 and 2018. The methods include: 1) 5 minutes point counts incorporating a distance variable detection methodology (enumerating all calling or sighted birds); 2) camera trap monitoring for cursorial and arboreal species (both mammals and birds) using 10 cameras set along a 5km transect line; 3) mist netting for birds; 4) village consumption threshold surveys and 5) hunter interceptions (incidental recordings of hunter capture observed during the field work periods).

A total of 3587 fauna sighting was recorded over the project, with 79 and 22 individual bird and mammal species, respectively, recorded. Two Endangered species were recorded, the Endangered Papuan harpy eagle (*Harpyposis novaeguinea*) and Endangered Goodfellow's tree kangaroo (*Dendrolagus goodfellowi*). The Vulnerable New Guinea pademelon (*Thylogale stigmatica*) and two the Near Threatened mammal species were also recorded (see Annex 7: Compendium Report, Wildlife monitoring section for further details).

The 5 minutes point count methods proved very successful for monitoring birds of paradise, with a total of 216 recordings of two species of bird of paradise, the Princess Stephanie's astrapia (*Astrapia stephaniae*) and the Brown Sicklebill (*Epimachus meyeri*) made over the course of the project. This method involves walking a line transect for one hour and taking point counts which incorporates a distance variable detection methodology to enumerate all calling or sited birds at 5-minute intervals. The method also recorded the Endangered Papuan Harpy eagle (*Harpyposis novaeguinea*) and many other bird species. Indeed, across the two surveys a similar and high number of individual bird sightings were recorded using this method (baseline: 1,756 bird sightings; endline: 1,831 bird sightings).

Evidence of hunting of the Endangered Goodfellow's tree kangaroo (*Dendrolagus goodfellowi)* was recorded at each site. At Danbagl two individuals of the species were caught by intercepted hunters, at Miruma two Goodfellow's tree kangaroos were recorded in household diets (see threshold survey results below) and at Womkama one hunter reported killing seven Goodfellow's tree kangaroos between January-March 2017 and 3 were recording in the 2018 household monitoring of this site. Overexplotiation for hunting is believed to have driven this species to extinction throughout much of its former range (Leary et al, 2017).

However, no echidna or cassowary species were recorded during the project. In discussion with the communities they report that these animals are in low abundance or locally extinct due to overhunting and deforestation. With funding from the European Union, we are now working to

expand the methods developed in the Darwin Initiative to survey for longer periods and to establish hunting exclusion zones to protect these animals.

As noted in our previous annual report we did not undertaken the survey protocol in 2016 as originally planned as trial monitoring suggested trap success was much lower during the wet season. Instead we undertook monitoring in the dry season of 2017 and 2018.

Leary, T., Seri, L., Wright, D., Hamilton, S., Helgen, K., Singadan, R., Menzies, J., Allison, A., James, R., Dickman, C., Aplin, K., Flannery, T., Martin, R. & Salas, L. 2016. *Dendrolagus goodfellowi*. The IUCN Red List of Threatened Species 2016: e.T6429A21957524. http://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T6429A21957524.en.

## OUTCOME

**Outcome 1:** Area under new replanting at project end equals or exceeds the area affected by 3 years of annual forest loss (averaged across 2001-2014) within the project footprint indicators of mammal and bird abundance show stability or improvement.

**Achieved:** Baseline rates of forest loss were calculated in Program R using information from the Global Forest Change database. Total forest loss between 2001 and 2014 in the project area was calculated as 40.6 ha, which averages 8.7 ha over 3 years (2.9 ha a year). Over the course of the project a total of 262 ha has been designated in community land-use plans for replanting. Of this 42 ha has so far been replanted with 30,128 weather hardened trees grown in the four community nurseries and WCS' Goroka nursery. This exceeds the total forest loss between 2001-2014 in the three sites. Evidence collected suggests out-planting mortality rates were less than 10% in the first year (for further details see Annex 7: Compendium Report, silviculture and community nurseries sections). Wildlife monitoring suggest mammal and bird abundance show stability or improvement. Survey results show nearly all community members appear to be concerned about the impacts of deforestation at project end. Furthermore, following awareness by WCS at least two hunters who specialised in hunting the Endangered Goodfellow's tree kangaroo have reported to WCS that they have stopped hunting the species due to learning about its Endangered status. No evidence of species declines was recorded, although the short project length made this difficult to definitively establish. However, WCS has secured an additional 5 years of funding for this program through the European Union Sustainable Wildlife Management Programme to continue reforesting the 262 ha designated for reforestation in the community land-use plans and to work with the communities to bring hunting and timber harvesting to sustainable rates. This work has begun in the Kwiop community which has allocated 4,200 ha of intact primary forest as a conservation area. With the support of the WCS, they are currently working towards signing a conservation deed, which will provide legal protection for this area. Within the conservation area, the community has committed to ban broad-scale clearing of primary forest. The community has also started instituted bans, such as the use of dogs for hunting and the hunting of species at risk of extinction. Kwiop villagers are reporting that these rules have already led to an increase in the number of animals regularly seen around the village.

**Outcome 2:** Increased food security and climate resilience through doubling in variety of crops in gardens (in comparison to baseline) for 1000 households in the project area by March 2019.

**Partial achievement:** In total 22 new varieties of crops, including climate resilient and drought tolerant varieties, were distributed broadly throughout the community. Baselines surveys found the average farmer to grow between 6-9 subsistence crop varieties and 0 (Miruma/Namta) or 1 (Danbagl, Womkama) cash crop. All crop varieties were multiplied in community multiplication plots by the CBOs and distributed to representatives from different clan/zone within each community. In total 351 clan/zone representatives received the crops. They then distributed the crops throughout their clan/zone or multiplied them for later distribution. This suggests that approximately 1000 households would have increased or doubled the variety of crops in their garden by project end.

**Outcome 3:** Diversified livelihood opportunities for households in 3 communities, disaggregated by gender, by March 2019

**Achieved:** WCS has developed and taught propagation methods for 10 highland timber and 3 tree crop species in the 3 communities. These trees were planted in communal areas and will consequently benefit a great number of households (total population >10,000). As the tree crops grown are drought resistant they should particularly support the communities if a drought were to again occur. New commercial, drought and pest tolerant crops have been introduced and broadly distributed throughout the communities. Training to improve harvest, garden lifespan, and the pest and drought resistance of agricultural crops were provided. In total 1034 people (540 male, 494 female) people attending training sessions by WCS and NARI. These sessions were supplemented by additional outreach by the CBOs. Additionally, 217 of the 351 representatives who received the multiplied crop varieties on behalf of their clan/zone were women. In Womkama it was decided to directly distribute some of the tree crops propagated in the community nursery to 407 households. Furthermore over 30,000 tree timber and tree crops were grown and community nurseries with training community foresters were established in each community. These trees will provide income through the sale of timber and/or tree crop fruit in the future. Additionally, the CBOs are currently in discussion with WCS about the option of using a subsection of their nurseries to produce plants for sale in local markets. The CBOs also report that following training and awareness raising by the project a number of community members have set up their own personally nurseries in the communities.

**Outcome 4:** Increased awareness, including among youth, of importance of forests and local biodiversity to local people and cultures, measured through quantitative surveys at the project start and end in communities within the project

**Achieved:** Traditional ecological knowledge has been quantified at three villages for adults and children. This information was used to develop the supplementary school curricula which WCS is now assisting schools in the local area in teaching. A total of 221 students were taught by from this syllabus by WCS with further teaching occurring when WCS was absent (by the school teachers). During each visit the WCS team members hosted awareness raising sessions in the night for the local communities (attendance was not recorded). There is evidence that this was effective, as nearly all community members surveyed (98%) reported high concern about deforestation at project end, whereas less than two thirds (63%) did so at the project start.

## IMPACT: ACHIEVEMENT OF POSITIVE IMPACT ON BIODIVERSITY AND POVERTY ALLEVIATION

In our application the following impact was outlined: The restoration and sustainable management of montane forests within the Bismarck Mountains to strengthen livelihoods, protect biological and cultural diversity, and act as a model for forest conservation in PNG.

The restoration and sustainable management of montane forest was achieved through the successful development of native timber and tree crop propagation methods, the establishment of well-functioning community nurseries in each of the project communities and the designation of 262 ha for reforestation. The development of a detailed land use plan for the Danbagl community which bans unsustainable forestry practices and the planting of invasive species and growing of gardens in their intact primary forest area (4,260 ha) will ensure sustainable management of the montane forest at this site. With co-funding from the Australian government, a similar process has been supported in the Kwiop community (~4,200 primary forest area).

Livelihoods were strengthened though the silviculture program, which provided a source of drought-resistant food, timber and firewood, and through the agricultural work, which led to a total of 22 pest, drought and/or cash crops varieties grown and distributed in each of the communities. In the future, the harvesting of timber species that have been planted should boost incomes throughout the tree communities through the direct sale of these trees or their use instead of purchases timber for house construction.

Biodiversity values were also protected through the silviculture program which will provide additional habit for native species and will lessen deforestation pressures. Regular community and school presentations by WCS led to an increased awareness of risks to biodiversity with anecdotal reports of a decrease in hunting of the Endangered Goodfellow's tree kangaroo and evidence of nearly all community members being concerned about the effects of reforestation by project end. Cultural diversity was protected through the distribution of ornament protection kits, the development and teaching of a traditional ecological knowledge supplementary school syllabus and the recording of local language (*tok ples*) names for biodiversity. Additionally, the work undertaken in this project have served as a model which will be further scaled and replicated under new secured funding from the European Union's Sustainable Wildlife Management Program (5 years from 2018) and the USAID's PNG Biodiversity funding (5 years from 2019).

# CONTRIBUTION TO DARWIN INITIATIVE PROGRAMME OBJECTIVES

## CONTRIBUTION TO GLOBAL GOALS FOR SUSTAINABLE DEVELOPMENT (SDGS)

**Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture**

The project worked towards achieving food security through the propagation and distribution of food bearing tree crops (*Castonopsis acuminatissima, Pandanus julianetti* and *Ficus copiosa*) which we have identified as important reserve food crops during times of drought. Twenty-two drought and pest resistant crop varieties were introduced. We further enhanced local farmer's knowledge of practices to improve yields through training to: improve soil moisture conservation

and soil fertility management for staple crops; grow a greater diversity of drought tolerant crops species and varieties; and manage pests and disease.

**Goal 12: Ensure sustainable consumption and production patterns**

The project propagated and distributed 30,128 weather hardened native seedlings which will form the foundation of the development of sustainable forestry to meet the immediate timber needs of villagers, and ultimately lessen the impact of degradation on the surrounding primary forest. 1,595 bilas protection kits were distributed to lessen unsustainable hunting pressures. Sustainable forestry rules were implemented for the entirety of Dangabl's primary forest area (4,260 ha), and, with co-funding from the Australian government, Kwiop's primary forest area (~4,200 ha).

**Goal 13: Take urgent action to combat climate change and its impacts**

The project has pioneered the propagation and husbandry of native montane tropical timber species with a total of approximately 30,000 trees raised. The growth of the seedlings distributed so far into mature trees will sequester carbon, thereby beginning to offset the communities' carbon footprint. Furthermore, a drought in 2015 resulted in widespread starvation. By promoting the husbandry of edible tree crops, which we have identified as one of the most important food reserve in times of drought, and through distributing new drought and pest resistant crop varieties, we have strengthened the adaptive capacity of the community to climate-related hazards, especially drought.

**Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss**

The development of community nurseries and the timber species husbandry methods by WCS should form the foundation for reducing the rate of forest degradation, deforestation and biodiversity loss into the future. The planting of tree species on 42 ha of cleared, mountainous riverine areas has diminished the risk of catastrophic landslides and water pollution at the partnering villages. The skills to manage these nurseries have been developed in each community, with low mortality rates and successful out-planting observed in each community without oversight by WCS. Additionally, the community nurseries have reportedly inspired other community members to construct their own small backyard nurseries, a practice which was not traditionally undertaken in the Highlands. One community has banned unsustainable forestry practices in their entire primary forest area (Danbagl – 4,260 ha). With co-funding WCS has supported the development of a similar ban in Kwiop.

## PROJECT SUPPORT TO THE CONVENTIONS OR TREATIES (CBD, CITES, NAGOYA PROTOCOL, ITPGRFA)

The objectives of the project are directly relevant to the Convention on Biological Diversity (CBD)'s 2011-2020 Strategic Plan, most notably Goal A (Address the underlying causes of biodiversity loss); Goal B (Reduce the direct pressure on biodiversity and promote sustainable use); and Goal C (To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity). The project also supports three of the CBD's seven thematic

programmes of work for Agricultural Biodiversity; Forest Biodiversity and Mountain Biodiversity.

The project directly contributed to a number of Achi Targets including Target 1 (By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably), through increasing awareness on biodiversity values and steps that can be taken to conserve and sustainably use biodiversity in the Bismarck Forest Corridor for the approximately 10,000 residents of Danbagl, Womkama and Miruma communities. Achi Target 5 (By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.) was also addressed by the reduction of degradation and fragmentation of forest through a replantation and community nursery program in each site. Out-planting of approximately 30,000 seedlings (42 ha) was greater than forest loss in the sites between 2002-2014. Unsustainable logging was also completely banned in Danbagl's primary forest area (4,260 ha) and, with co-funding in Kwiop's primary forest area (4,200 ha). Target 9 (By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment) was also addressed through the banning of the planting of invasive species in the intact forest areas of Danbagl and Kwiop. Target 12 (By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained) was also addressed through community awareness campaigns which led to hunters of the Endangered Goodfellow's tree kangaroo deciding to cease hunting this species so that it will persist for future generations. Target 14 (By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable) was addressed through the reforestation initiatives which reduced landslide risk and soil erosion into community water sources in each of the communities. The development of propagation protocols for locally important timber and tree crop species and community nurseries strengthens the livelihoods of the indigenous, poor, women and vulnerable inhabitants of the communities (>10,000 people).

## PROJECT SUPPORT TO POVERTY ALLEVIATION

Poverty alleviation was directly addressed through the introduction of drought and pest resistant crops, permaculture methods, and diversification of marketable crops. Poverty has indirectly been alleviated through strengthening pre-existing community-based organisations in Gembogl (IRRM & KGWan Eco-habitat), and helping establish the community based organisation in Miruma (WAMU5). The CBOs in Gembogl have significantly alleviated poverty through working with NGOs (CARE, Oxfam) and with government departments. The establishment of WAMU5 should lead to higher incomes and more secure livelihoods in Miruma through the advocacy this CBO will provide for its community, for instance the CBO has already formed a partnership with the PNG Fresh Produce Authority who will help them improve agricultural productivity. There is clear evidence that gender inequality undermines economic growth, human development and poverty reduction (Woezel, 2015; UN Women, 2015). Therefore, through promoting, advocating for, and delivering gender inclusive training and activities WCS is helping to alleviate poverty in our partner communities.

The long-term effects of the silviculture program, agricultural training and new cash crops varieties distributed should significantly increase household incomes and provide food security. The reforestation and community woodlot projects will provide a sustainable resource of important timber and tree crop species and also decrease erosion pollution of water sources and the high landslide risk which could cause the loss of life and the destruction of important garden areas. The beneficiaries of the projects are the communities of Womkama, Danbagl, and Miruma and their community-based organisations (IRRM, KGWan Eco-Habitat and WAMU5). These communities have a total population of 10,016 (2011 census). WCS and our collaborating partner NARI specifically provided agricultural traiing to enhance livelihoods to 1034 people (540 male, 494 female).

UN Women. 2015. The Effect of Gender Equality Programming on Humanitarian Outcomes. New York: Institute of Development Studies and UN Women.

Woezel, Jonathan. 2015. The power of parity: How advancing women's equality can add $12 trillion to global growth. McKinsey Global Institute Shanghai

## GENDER EQUALITY

WCS worked to achieve gender parity within the communities with respect to all training and participatory activities. While this project did not have any gender specific activities, gender inclusiveness is a cross-cutting principle within all our project activities. Each WCS activity is expected to integrate the perspectives of women and include female representation. Indeed, at the end of the Darwin project we established a Gender Officer (Azalea Anota) on our program staff, who is now supported under the EU Sustainable Wildlife Management programme to work directly towards addressing gender inequality in the three communities. In the traditionally male dominated highlands we were able to achieve relatively high female representation across all agricultural trainings (47.8%), while women comprised 77% of the community clan/zone representatives who received the distributed crops. Moreover, WCS supported women representatives within each CBO leadership structure, and led by example with female project and CBO staff leading activities in each community.

## PROGRAMME INDICATORS

- DID THE PROJECT LEAD TO GREATER REPRESENTATION OF LOCAL POOR PEOPLE IN MANAGEMENT STRUCTURES OF BIODIVERSITY?

Yes, the project strengthened local aptitude for biodiversity management in each of the communities we worked in through partnering with the established IRRM and KGWan CBOs on their first biodiversity focused program and through assisting Miruma in the establishment of their CBO (WAMU5). Moreover, the development of strong community nursery programs in each community has led local people to identify areas of importance for replanting, which will enhance biodiversity through habitat restoration. In total, 262 ha were designated by the communities for reforestation. In Danbagl, community natural resource planning processes were followed to ban unsustainable forestry and the planting of introduced trees or extension of gardening into their primary forest area.

- WERE ANY MANAGEMENT PLANS FOR BIODIVERSITY DEVELOPED AND WERE THESE FORMALLY ACCEPTED?

Yes, a management plan which bans unsustainable logging, the planting of invasive trees and the extension of gardening into Danbagl's large primary forest area was developed. In each community, management plans for riverine reforestation and community woodlots were established. The plans were formally accepted by the communities and their CBOs. Through funding from the European Union, we are now working to extend the scope of these community plans to include restrictions on hunting and to have them including in local government land use plans.

- WERE THEY PARTICIPATORY IN NATURE OR WERE THEY 'TOP-DOWN'? HOW WELL REPRESENTED ARE THE LOCAL POOR INCLUDING WOMEN, IN ANY PROPOSED MANAGEMENT STRUCTURES?

In KGWan, a management plan which bans unsustainable logging was developed through a meeting with the leadership of the 10 sub-CBOs. Each sub-CBO has at least one woman on their leadership team. All land for reforestation and riverine protection  out-planting (262 ha) was designated by the communities through participatory community meetings, largely undertaken independently by community members themselves. This shows that the communities have taken ownership of the community nursery and reforestation program.

- How did the project positively influence household (HH) income and how many HHs saw an increase?

The project positive influenced household income by training to improve crop yield and garden life for 1034 individuals, distribution of ornament protection kits (which reduce to need to buy replacement parts) to 1,595 individuals. Furthermore over 30,000 trees were out-planted for community timber and tree crops. When fully grown these trees will have a market value of many millions of Papua New Guinea kina. This should positively influence the household income of all houses (as the community members will be able to sell the timber and/or won't need to buy timber for house construction. Blight and drought resistant potato, a local cash crop, was established at each site and distributed to all 23 clans which constitute the three communities, as were 19 other varieties of crops. Nearly all >10,000 members of the 3 communities should therefore experience positive influences on their household income from this project.

- HOW MUCH DID THEIR HH INCOME INCREASE (E.G. X% ABOVE BASELINE, X% ABOVE NATIONAL AVERAGE)? HOW WAS THIS MEASURED?

The growing of approximately 30,000 trees for planting in the three communities over the course of the program will boost many household incomes through the provision of timber and firewood over the next 10-15 years which can be sold and will lower the communities need to purchase timber and firewood. This should wildly benefit the 10,000 plus members of the 3 communities. The agricultural program established new cash crops (potato, rice, wheat, carrot) which should positive affect community incomes, as should the increase in drought and pest tolerant crop varieties. Moreover, in Womkama 407 households were directly given tree crops to plant in their personal gardens and at least 1034 people attending trainings on ways to improve garden life and crop yield. Given the slow rate of tree growth and that marketable crops had not been sold in local markets by the end of the project we were not able to directly measure an increase in household income.

## TRANSFER OF KNOWLEDGE

The most lasting knowledge transfer of the program is likely to be to the 3 communities and their CBOs. Strong evidence of improved knowledge of conservation risks (98% of community members are now concerned about deforestation, up from 63% at project start) and implementation of new gardening techniques (40.7% of community members report using new techniques at project end) and crops was seen in all communities. Over 1,000 people attending WCS and NARI agricultural training sessions. Additionally, WCS observed substantial progress in the 3 CBOs ability to write narrative and financial reports. Indeed, two of the communities have independently applied for funding to extend the community nursery program in their communities and one CBO (IRRM) established a relationship with an international researcher on the basis of their monitoring training during this project.

WCS briefed the Simbu and Eastern Highlands Provincial Governments on the project and presented the interim result of the program to the Conservation and Environment Development Authority in Port Moresby. Moreover, results were shared with regional conservation stakeholder (Research Conservation Foundation, Tenkile tree kangaroo conservation, Oxfam PNG and the Tree Kangaroo Conservation Project) during collaborative meetings where we recently successfully applied for USAID funding which will, in part, build-upon and extend the successes of the community nursery and reforestation work to other communities in PNG.

The CBO leader of KGWAN (Steven Yandim) and IRRM (Toppy Sundu) attended a two-day Livelihoods and Food Security workshop at the Pacific Gardens Hotel in Goroka in April 2018 where they presented on their Darwin Project livelihood and food security work with WCS, Oxfam and NARI. Representatives from a number of national and provincial organisations were in attendance, including from the National Department of Agriculture and livestock, FAO PNG, United Nation's World Food Program, European Union delegation in PNG, PNG Women in Agriculture, CARE PNG, NARI, Fresh Produce Development Authority and the Eastern Highlands Provincial government were in attendance.

In 2017, WCS ran training workshops on project management and small grant proposal writing over two days with seven participants from IRRM and KGWan (two female, five male). The training focused on teaching project design and management using a 5-step approach to the Deming cycle (a quality controlled management cycle): "Plan-Train-Do-Check-Act". Further, WCS trained 31 community facilitators (12 female, 19 male) at all three communities. Community facilitators are community members trained in village communication, conducting surveys, and conservation messaging for the purpose of facilitating the effectiveness of the Darwin Initiative project.

WCS Forest Ecologist received support from the United States Forest Service (USFS) to attend their 2019 International Seminar on Forest Landscape Restoration from March 31-April 17, 2019 in Oregan, USA and the USFS hosted a 3 day nursery training program in 2018 for all community nursery assistants and the 3 CBO leaders.

## SUSTAINABILITY AND LEGACY

Over the course of the project, WCS has worked hard to enshrine the Darwin Project activities within the work of the CBOs. Strong progress was made as the CBOs developed the ability to manage the community nurseries and decide on the most valuable places for out-planting, and co-ordinate out-planting. Indeed, two of the CBOs (IRRM and KGWan) are now working toestablish parallel nursery programs where they sell native trees (primarily *Casuarina*) for a small profit to CBO community members. The communities are also continuing to manage their community gardens and the distribution of crops introduced by the project. Moreover, we are particular happy at the progress of the Miruma community in establishing their CBO (WAMU5). This new CBO did well in implementing a subgrant from this project to manage two community nurseries and a community agricultural multiplication plot. They have also begun to establish their own separate work in assisting their community in increasing income through the growing of coffee, preserving traditional cultural ceremonies and through a partnership with the PNG Food Development Authority.

We have recently successfully secured funding for our work in the Bismarck Mountains from the European Union (US$2.5 million), administered through the Food and Agricultural Organisation of the United Nations (FAO) through their Sustainable Wildlife Management Program, and from the USAID PNG Biodiversity Program (US$2 million). This will allow us to continue and build-up the activities supported by the Darwin Initiative for an additional five years in the three project communities and an additional four communities in the Bismarck Forest Corridor. Through the EU FAO project, we will work with partner communities to determine which species are currently overhunted and work with the communities to reduce hunting to sustainable levels while providing alternative protein sources. Wildlife monitoring conducted as part of the Darwin Initiative work will provide essential information in determining sustainable harvest rates. It is hoped that the success of this EU project, that builds on the legacy of the Darwin Initiative work in at our sites in PNG, will provide a model to be rolled out across Melanesia.

## LESSONS LEARNED

Although quite time-consuming, we found real value in assisting the communities in establishing and/or strengthening their CBOs and would recommend others doing similar projects in the PNG Highlands help support or establish CBOs. Once well-established, these organisations become a medium for the community to decide on a variety of governance issues including natural resource management. They also provide an avenue for female leaders to assert their views, which can otherwise be limited in traditional community decision-making processes. CBO deliberations allow for feedback on project activities to be more easily provided (as a community member who may be hesitant to directly bring a grievance to WCS can instead discuss it with their CBO who can than raise it on their behalf with WCS). Registered CBOs also create a vehicle for communities to receive small grants from other sources.

We learned an important lesson about Community Facilitators (CFs) over the course of this project. WCS envisioned the role of CFs to assist our team when present in the community and explain project activities when we were absent. While this was a useful relationship for us, we observed that the CFs, who were paid by WCS, altered village power dynamics and often failed to integrate well with the CBOs. For this reason, we are now ended the CFs positions and are instead requesting that the CBOs organise all field assistance themselves for WCS teams. Many

of the CFs we originally hired will continue to support WCS activates, but will now do so under the direct supervision of the CBO leadership.

One key lesson we learnt is that the communities see real value in establishing tree propagation and planting programs as the lack of useable timber and high cost of buying timber (and firewood) is keenly felt in communities throughout the Highlands. We were happy to establish this as such programs are not common in the PNG Highlands and the communities did not traditionally propagate plants. Our Traditional Ecological Knowledge program was also very well received. This is because community members broadly perceive that younger generations are rapidly losing traditional ecological knowledge. Parents proud to be able to help teach their children such knowledge through the education posters and school syllabus WCS produced.

## MONITORING AND EVALUATION

There were not any external evaluations of the work and none have been planned. The CBOs provided informal evaluations of the work during our regular meetings with them which were useful and helped improve the project work. We therefore plan to (under EU and USAID funding) establish bi-annual meetings with the leadership groups of each CBO so that we can discuss project activities and look at ways of improving them or deciding upon new activities which better address our shared goals.

The M&E system was helpful, we in particular would like to thank Darwin for allowing the flexibility to adjust indicators during the project after it was assessed that the some original indicators were not feasible to measure.

## ACTIONS TAKEN IN RESPONSE TO ANNUAL REPORT REVIEWS

We discussed the relevant sections of each review with our partner organisations. Comment on feedback received during the last review of our annual reports is given below.

*Details of new/unplanned partnership with US Forest Service?*

WCS PNG partnered with the US Forest Service (USFS) who are providing technical support to our silviculture program. This partnership was formed after the USFS inquired about the community nursery program (supported by the Darwin Initiative) and undertook a site visit in late 2017. They led a training workshop with the community foresters from the three communities where we work with in the Highlands and provided advice on land use planning. The USFS plans to come back later in the year to lead an intensive workshop in silviculture training. They recently sponsored WCS Forest Botanist Tory Kuria to attend a 3-week workshop on community reforestation in the United States.

*Please provide details of survival/mortality rates of planted seedlings (P1, P2, etc.), both on your data, and results elsewhere in PNG/similar environmental conditions.*

Mortality rates were generally low in the WCS and community nurseries (see Annex 7: Compendium Report, Silvlciture section for mortality rates). Mortality for outplanted seedlings in was monitored in five sites. The average mortality rate across these sites was 6.0% and varied from a low of 2.5% to a high of 10.6%. As WCS developed novel propagation protocols for these species there is not equivalent results from the region to compare these results to.

*What are planned/intended supply/value chains and markets for new crops?*

The communities use readily available private motor vehicles to transport the crops they grow to market. They already do this for a relatively large amount of bulb onion at Womkama and Danbagl. They generally sell there produce directly at markets in Goroka, Mt Hagen or Lae (2nd biggest city in PNG).

*Are the households/families the project has engaged with/trained re gardening poor or the poorest?*

Yes, NARI's initial assessment suggestions nearly all households in the region have very low monetary incomes. All members of the communities are Indigenous Papua New Guineans.

## DARWIN IDENTITY

The Darwin Initiative logo has been used on all documents related to this project. It is on the 7 school posters and the school syllabus WCS designed and distributed. The Darwin Initiative funding is recognised as the major funder of our Bismarck Forest Corridor programme, along with the co-funder The Christensen Fund. Our social media account (Twitter: @WCSMelanesiaSci) actively posted about the project. We have presented and discussed the project with government official at all levels, including a member of the British High Commision in Port Moresby, staff and the Managing Director of the Conservation and Environment Protection Authority (the national government environment department) and high placed government officials in the two provinces in which we work. Additionally, WCS's Botanist and Conservation Technician presented their work on the Darwin project at the Society for Conservation Biology Oceania conference in Wellington, New Zealand, in July 2018, during which the Darwin Initiative was acknowledged for their generous funding.

# FINANCE AND ADMINISTRATION

## PROJECT EXPENDITURES

| Project spend (indicative) since last annual report | 2018/19 Grant (£) | 2018/19 Total actual Darwin Costs (£) | Variance % | Comments (please explain significant variances) |
|---|---|---|---|---|
| Staff costs (see below) | | | 0% | |
| Consultancy costs | | | 8% | |
| Overhead Costs | | | 3% | |
| Travel and subsistence | | | -3% | |
| Operating Costs | | | 4% | |
| Capital items (see below) | | | 0% | |
| Monitoring & Evaluation (M&E) | | | 2% | |
| Others (see below) | | | -9% | |
| **TOTAL** | | | **0%** | |

| Staff employed (Name and position) | Cost (£) |
|---|---|
| Ambroise Brenier, Country Director | |
| Thomas Mutton, Terrestrial Conservation Advisor | |
| John Kuange, Community Engagement leader | |
| John Par Kagl, Community Engagement officer | |
| Marygrace Wanamp, Operation Manager | |
| Jacob Kimagl, GIS Officer | |
| Jeffrey Binifa, Agricultural Officer | |
| Tory Kuria, Forestry Officer | |
| John Lamaris, Science officer | |
| Leah Baina, Account Officer | |
| John Ole, Driver | |

| | |
|---|---|
| Tobby Sundu, Head of IRRM (CBO) | |
| Steven Yandime, Head of KGWan (CBO) | |
| Peter Siune, Head of Miruma (CBO) | |
| **TOTAL** | |

| **Capital items – description** | **Capital items – cost (£)** |
|---|---|
| Transportation cost for nursery work<br><br>Labor cost for nursery work<br><br>Sand, polytubes, polybags, Spray, fertilizer and seed for nursery work | |
| **TOTAL** | |

| **Other items – description** | **Other items – cost (£)** |
|---|---|
| | |
| **TOTAL** | |

## ADDITIONAL FUNDS OR IN-KIND CONTRIBUTIONS SECURED

| Source of funding for project lifetime | Total (£) |
|---|---|
| WCS Unrestricted Funds (April 2016 to March 2019) | |
| European Union SWM programme | |
| | |
| | |
| | |
| **TOTAL** | |

| Source of funding for additional work after project lifetime | Total ($) |
|---|---|
| European Union SWM programme (2018-2022) | |
| USAID PNG Biodiversity program (2019-2023) | |
| | |
| | |
| | |
| **TOTAL** | |

## VALUE FOR MONEY

Despite having an estimated 8% of global biodiversity housed on less than 1% of the world's land mass and experiencing rapid population growth, there are few biodiversity initiatives in PNG. The need for such work is particularly urgent in the Bismarck Forest Corridor (BFC), which has a relatively high density and rapidly growing population which is largely directly dependent on exploiting the natural environment to support their livelihoods. However, no model of sustainable conservation-minded development has been established in the BFC. This is particular concerning as the area has been identified as one of the top six hotspots for climate change driven extinction of mammals in the future (Pacifici et al., 2018).

There is therefore a strong need to build models of conservation which can be broadly replicated in PNG and Melanesia. This project has succeeded in doing that, both through enabling WCS to leverage funds to continue and expand our work to new locations and through partnership with the majority of significant conservation organisations in the country. Lessons learnt from this project being directly applied to the large, multi-partner USAID and EU projects in which we are

now involved. Through the agriculture and community nursery programs the project directly contributed to the livelihoods of the over 10,000 inhabitants of the 3 communities.

Pacifici, M., Visconti, P. and Rondinini, C. (2018). “A framework for the identification of hotspots of climate change risk for mammals.” Global Change Biology 24(4): 1626-1636.

# Annex 1 Project's original (or most recently approved) logframe, including indicators, means of verification and assumptions.

| Project summary | Measurable Indicators | Means of verification | Important Assumptions |
|---|---|---|---|
| **Impact:**<br>(Max 30 words) The restoration and sustainable management of montane forests within the Bismarck Mountains to strengthen livelihoods, protect biological and cultural diversity, and act as a model for forest conservation in PNG. | | | |
| **Outcome:**<br>(Max 30 words) Reduced rates of deforestation in the Bismarck Range through improved agricultural and forestry practices that diversify and strengthen livelihoods and conserve PNG's cultural and biological diversity. | 0.1 Area under new replanting at project end equals or exceeds the area affected by 3 years of annual forest loss (averaged across 2001-2014) within the project footprint indicators of mammal and bird abundance show stability or improvement<br><br>0.2 Increased food security and climate resilience through doubling in variety of crops in gardens (in comparison to baseline) for 1000 households in the project area by March 2019<br><br>0.3. Diversified livelihood opportunities for households in 3 | 0.1 Area under replanting. Indices of mammal and bird abundance<br><br>0.2 WCS and community reports on agriculture and forestry work, showing diversified crops, drought and pest tolerant crops, and native species in use in gardens<br><br>0.3 Socio-economic studies at the project start and end, including sales/income records, indicate increased use and importance of diversified crops and timber products for households | Large scale changes outside the control of the project (such as major droughts and forest fires or political and social unrest) do not impact the project area |

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| | communities, disaggregated by gender, by March 2019<br><br>0.4 Increased awareness including among youth, of importance of forests and local biodiversity to local people and cultures, measured through quantitative surveys at the project start and end in communities within the project area and control areas | 0.4 Records of number of school children who have been taught with the project's curricula (disaggregated by gender), and published report on results of quantitative survey | |
| Outputs:<br>1. The introduction and uptake of improved gardening practices in three communities and an increase in the duration and life of garden areas | 1.1 Number of new gardening techniques that are taken up by male and female community members in the project area by March 2018 and by March 2019<br><br>1.2 At least 300 households using new gardening techniques by March 2018<br><br>1.3 Introduction of new techniques to a minimum of 150 households to ensure the duration of active garden areas will increase by project end | 1.1 WCS and community reports detailing successful introduction of new techniques<br><br>1.2 Community reports on garden numbers and gardeners, disaggregated by gender<br><br>1.3 Baseline report on current garden life and reports showing the establishment of new techniques | Extreme weather events do not occur during the project period |

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| 2. Introduction of new market crops for income generation, and introduction of pest and drought resistant varieties for subsistence use within all three communities | 2.1. A 50% increase in the number of marketable crops in gardens in project areas by March 2019<br><br>2.2 At least 2 new pest and/or drought resistant crop varieties introduced by March 2018 | 2.1 WCS and community reports detailing the number of new crops against baseline information<br><br>2.2 WCS and NARI reports on the planting and use of new pest/drought resistant varieties | Extreme weather events do not occur during the project period |
| 3. Nursery practices for native tree species tested and established in two communities and active planting of areas with native species by the project end | 3.1 Successful propagation of at least four native tree species in nurseries by March 2018<br><br>3.2 Planting of native tree species in place of exotic species incorporated into land use plans by March 2018 with community nursery output exceeding 3,000 weather hardened native seedlings per community per year by project end | 3.1 Propagation records from nursery programme<br><br>3.2 (a) Land use plans incorporate planting areas for native species<br>3.2 (b) Maps/photos of areas planted with native species | No major forest fires in the area during the project period |
| 4. Sustainable use of existing forest stands within remaining areas of native forests and planted areas of exotic trees | 4.1 Through the land-use planning process the planting of invasive species in intact forest areas is banned in at least 1 community | 4.1 (a) Signed agreement showing that the planting of invasive species in intact forest areas have been banned in at least one community. | Market opportunities continue for using native tree species |

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| | 4.2 More than 500 hectares under sustainable forestry practices as compared to baseline by March 2019 | 4.1 (b) Community land use plans and forestry plans<br><br>4.1 (c) Area of forest clearance from satellite imagery<br><br>4.2 Community land use plans and forestry plans; WCS and community reports on forestry work | |
| 5. Capturing and passing on traditional ecological knowledge on forests and threatened species | 5.1 Quantitative survey on knowledge and attitudes of men, women and children in project and control areas at the project start and end<br><br>5.2 Copies of supplementary education materials capturing local ecological knowledge delivered to 3 primary schools in the project area by September 2017 with teacher guides<br><br>5.3 Increase in number of school children that learn about their local culture and traditional ecological knowledge by March 2019 | 5.1 Published results of quantitative survey<br><br>5.2 Copies of supplementary education materials<br><br>5.3 Records of number of children taught (disaggregated by gender) at three primary schools in the project area | Approval from provincial education divisions for use of developed curriculum materials and willingness from community members to participate in surveys |

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| | 5.4 Documentation of *tok peles* names and traditional knowledge of culturally and ecologically important fauna and flora gathered from female and male community members by March 2018 | 5.4 Reports detailing *tok peles* and scientific names for >100 species and reporting traditional uses for fauna and flora including gender specific uses | |
| 6. Minimizing impacts on hunted species by preserving local costumes and reviving traditional *tambu* (no hunting) areas. | 6.1 Uptake of improved preservation methods for fur and feathers in traditional costumes (termed *bilas* in *tok pisin*) by 3 active cultural troupes (at least 75 dancers) by March 2019<br><br>6.2 Increase in area or number of *tambu* sites created or re-established in the project area by March 2019<br><br>6.3 Participatory threshold surveys for key biodiversity indicator species (tree kangaroos, forest wallabies, echidna and cassowaries) by September 2016 and end surveys by March 2019, and established monitoring procedures for birds of paradise by November 2016 | 6.1 Reports on number of *bilas* protection kits distributed to male and female performers and in use by cultural groups<br><br>6.2 Copies of resource management plans and maps of *tambu* sites<br><br>6.3 Project reports on hunted species that are brought in by community members (“threshold surveys”) and reports and results from forest bird surveys | Changing use of *bilas* products (e.g. development of markets for these materials) do not impact the project area<br><br>Community members are willing to participate in threshold surveys |

**Activities**

1.1 Increase the number of new gardening techniques that are taken up by communities in the project area

1.2 Ensure activities are established in >300 households using new gardening techniques by March 2018

1.3 Introduce new techniques to a minimum of 150 households to ensure the duration of active garden areas will increase by project end

2.1 Work with Oxfam and local partners to promote a 50% increase in the number of marketable crops in gardens

2.2 With the support of NARI introduce least 2 new pest and/or drought tolerant crop varieties

3.1 Develop propagation methods for at least four native tree species in nurseries

3.2 Planting of native tree species in place of exotic species incorporated into land use plans by March 2018 with community nursery output exceeding 3,000 weather hardened native seedlings per community per year by project end

4.1 Through the land-use planning process work with the communities to ban the planting of invasive species in intact forest areas

4.2 Ensure more than 500 hectares under sustainable forestry practices as compared to baseline by March 2019

5.1 Produce school curricula capturing local ecological knowledge in 3 primary schools in the project area by September 2017

5.2 Copies of supplementary education materials capturing local ecological knowledge delivered to 3 primary schools in the project area by September 2017 with teacher guides

6.1 Promote the uptake of improved preservation methods for fur and feathers in traditional costumes (termed *bilas* in *tok pisin*)

6.2 Work to increase the area or number of *tambu* sites created or re-established in the project area by March 2019, or other compatible traditional management methods

6.3 Conduct baseline and end threshold surveys for key biodiversity indicator species, and establish monitoring procedures for birds of paradise

# Annex 2 Report of progress and achievements against final project logframe for the life of the project

| Project summary | Measurable Indicators | Progress and Achievements |
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| **Impact**:<br><br>The restoration and sustainable management of montane forests within the Bismarck Mountains to strengthen livelihoods, protect biological and cultural diversity, and act as a model for forest conservation in PNG. | | The restoration and sustainable management of montane forest was achieved through the successful development of native timber and tree crop propagation methods, the establishment of well-functioning community nurseries in each of the project communities and the designation of 262 ha for reforestation. The development of a detailed land use plan for the Danbagl community which bans unsustainable forestry practices and the planting of invasive species and growing of gardens in their intact primary forest area (4,260 ha) will ensure sustainable management of the montane forest at this site. With co-funding from the Australian government, a similar process has been supported in the Kwiop community (~4,200 primary forest area).<br><br>Livelihoods were strengthened though the silviculture program, which provided a source of drought-resistant food, timber and firewood, and through the agricultural work, which led to a total of 22 pest, drought and/or cash crops varieties grown and distributed in each of the communities. Once fully grown the timber species that have been planted will boost incomes throughout the three communities through the direct sale of these trees or their use instead of purchases timber for house construction.<br><br>Biodiversity values were also protected through the silviculture program which will provide additional habit for native species and will lessen deforestation pressures. Regular community and school presentations by WCS led to an increased awareness of risks to biodiversity with anecdotal reports of a decrease in hunting of the Endangered Goodfellow's tree kangaroo and evidence of nearly all community members being concerned about the effects of reforestation by project end. Cultural diversity was protected through the distribution of ornament protection kits, the development and teaching of a traditional ecological knowledge |

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| | | supplementary school syllabus and the recording of local language (*tok ples*) names for biodiversity. Additionally, the work undertaken in this project have served as a model which will be further scaled and replicated under new secured funding from the European Union's Sustainable Wildlife Management Program (5 years from 2018) and the USAID's PNG Biodiversity funding (5 years from 2019). |
| **Outcome** Reduced rates of deforestation in the Bismarck Range through improved agricultural and forestry practices that diversify and strengthen livelihoods and conserve PNG's cultural and biological diversity. | 0.1 Area under new replanting at project end equals or exceeds the area affected by 3 years of annual forest loss (averaged across 2001-2014) within the project footprint indicators of mammal and bird abundance show stability or improvement<br><br>0.2 Increased food security and climate resilience through doubling in variety of crops in gardens (in comparison to baseline) for 1000 households in the project area by March 2019<br><br>0.3. Diversified livelihood opportunities for households in 3 communities, disaggregated by gender, by March 2019 | **Outcome 0.1:** Baseline rates of forest loss were calculated in Program R using information from the Global Forest Change database. Total forest loss between 2001 and 2014 in the project area was calculated as 40.6 ha, which averages 8.7 ha over 3 years (2.9 ha a year). Over the course of the project a total of 262 ha has been designated in community land-use plans for replanting. Of this 42 ha has so far been replanted with 30,128 weather hardened trees grown in the four community nurseries and WCS' Goroka nursery. This exceeds the total forest loss between 2001-2014 in the three sites. Evidence collected suggests out-planting mortality rates were less than 10% in the first year (for further details see Annex 7: Compendium Report, silviculture and community nurseries sections). Wildlife monitoring suggest mammal and bird abundance show stability or improvement. Survey results show nearly all community members appear to be concerned about the impacts of deforestation at project end. Furthermore, following awareness by WCS at least two hunters who specialised in hunting the Endangered Goodfellow's tree kangaroo have reported to WCS that they have stopped hunting the species due to learning about its Endangered status. No evidence of species declines was recorded, although the short project length made this difficult to definitively establish. However, WCS has secured an additional 5 years of funding for this program through the European Union Sustainable Wildlife Management Programme to continue reforesting the 262 ha designated for reforestation in the community land-use plans and to work with the communities to bring hunting and timber harvesting to sustainable rates. This work has begun in the Kwiop community which has allocated 4,200 ha of intact primary forest as a conservation area. With the support of the WCS, |

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| | 0.4 Increased awareness including among youth, of importance of forests and local biodiversity to local people and cultures, measured through quantitative surveys at the project start and end in communities within the project area and control areas | they are currently working towards signing a conservation deed, which will provide legal protection for this area. Within the conservation area, the community has committed to ban broad-scale clearing of primary forest. The community has also started instituted bans, such as the use of dogs for hunting and the hunting of species at risk of extinction. Kwiop villagers are reporting that these rules have already led to an increase in the number of animals regularly seen around the village.<br><br>**Outcome 0.2:** In total 22 new varieties of crops, including climate resilient and drought tolerant varieties, were distributed broadly throughout the community. Baselines surveys found the average farmer to grow between 6-9 subsistence crop varieties and 0 (Miruma/Namta) or 1 (Danbagl, Womkama) cash crop. All crop varieties were multiplied in community multiplication plots by the CBOs and distributed to representatives from different clan/zone within each community. In total 351 clan/zone representatives received the crops. They then distributed the crops throughout their clan/zone or multiplied them for later distribution. This suggests that approximately 1000 households would have increased or doubled the variety of crops in their garden by project end.<br><br>**Outcome 0.3**: WCS has developed and taught propagation methods for 10 highland timber and 3 tree crop species in the 3 communities. These trees were planted in communal areas and will consequently benefit a great number of households (total population >10,000). As the tree crops grown are drought resistant they should particularly support the communities if a drought were to again occur. New commercial, drought and pest tolerant crops have been introduced and broadly distributed throughout the communities. Training to improve harvest, garden lifespan, and the pest and drought resistance of agricultural crops were provided. In total 1034 people (540 male, 494 female) people attending training sessions by WCS and NARI. These sessions were supplemented by additional outreach by the CBOs. Additionally, 217 of the 351 representatives who received the multiplied crop varieties on behalf of their clan/zone were women. In Womkama it was decided to directly distribute the some of the tree crops |

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| | | propagated in the community nursery to 407 households. Furthermore over 30,000 tree timber and tree crops were grown and community nurseries with training community foresters were established in each community. These trees will provide income through the sale of timber and/or tree crop fruit in the future. Additionally, the CBOs are currently in discussion with WCS about the option of using a subsection of their nurseries to produce plants for sale in local markets. The CBOs also report that following training and awareness raising by the project a number of community members have set up their own personally nurseries in the communities.<br><br>**Outcome 0.4**: Traditional ecological knowledge has been quantified at three villages for adults and children. This information was used to develop the supplementary school curricula which WCS is now assisting schools in the local area in teaching. A total of 221 students were taught by from this syllabus by WCS with further teaching occurring when WCS was absent (by the school teachers). During each visit the WCS team members hosted awareness raising sessions in the night for the local communities (attendance was not recorded). There is evidence that this was effective, as nearly all community members surveyed (98%) reported high concern about deforestation at project end, whereas less than two thirds (63%) did so at the project start. |
| Outputs 1. The introduction and uptake of improved gardening practices in three communities and an increase in the duration and life of garden areas | 1.1 Number of new gardening techniques that are taken up by male and female community members in the project area by March 2018 and by March 2019<br><br>1.2 At least 300 households using new gardening techniques by March 2018 | **1.1:** Initial assessments by WCS and NARI showed knowledge of agro practices for commercial vegetable production, management of soil fertility, resources and fertilizer application and methods to guard against pest and d were low at each site and that there was a desire within the communities fo knowledge. Collectively NARI, WCS and Oxfam introduced a number o gardening techniques over the course of the project. Training was provided crops introduced by the project (see Output 2.2 for a list of the crop va introduced). NARI also provided training on how to increase crop yield, g lifespan and soil moisture conservation through mounding, hedge row plantin locally common *Tithonia diversifolia* and *Causarina oligodo* which was grow community nurseries). Training was also provided on multiple mulching techn |

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| | | the use of fertilizers (plant-derived and chemical), fallow periods and crop r using nitrogen fixing plants. |
| | 1.3 Introduction of new techniques to a minimum of 150 households to ensure the duration of active garden areas will increase by project end | Training was also provided on how to appropriately and effectively use pes and fertilisers for the crops NARI distributed and how to make a natural pe from the locally abundant weed *Tephrosia vogelii*. NARI also provides train appropriate food processing techniques for sweet potato and cassava, on h making preserves and on seed storage for subsistence use and marketing included instructions on sorting and grading seeds, the important of air ven during storage and proper methods to pack the crops. Participants were as share their experiences of seed damage and the trainers discussed how to c these issues.<br><br>In total 1034 people (540 male, 494 female) attended training sessions run by NARI and WCS. Crop perception surveys of 167 people across the three communities at the end of the project reported 40.7% of people were using new gardening methods introduced by the project (detailed below). See Annex 7: Compendium Report for further details on all methods.<br><br>**1.2:** Community Facilitators were trained in each community to undertake a survey to assess whether the new agricultural methods introduced by NARI and WCS (with follow-up training by the CBOs) were been used in community gardens. The Community Facilitators were instructed to randomly sample people in different regions of their communities until a minimum of 25 men and 25 women had been sampled. In total 167 people were surveyed from across the three communities in January and February 2019. Of those surveyed 40.7% (68 people) said they had used at least one method taught by NARI and WCS in their own garden. A much higher rate of take up with recorded in Danbagl (50%) and Miruma (60.4%) than Womkama (19%), were community tensions stopped WCS and our other project partners from visiting the community for a number of months in 2018 and thus restricted the number of training session NARI was able to undertake in this community .In Miruma and Womkama the most commonly used methods introduced by the project were new planting methods, particularly for carrot and sweet potato. In |

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| | | Danbagl crop rotation techniques to increase soil fertility was reported as the most commonly used new gardening technique. See Annex 7: Compendium Report, section on Agriculture for further details.<br><br>This shows the success of our approach, which was able to amplify the training by NARI and WCS through funding CBO community agricultural workers to do follow-up training and by requesting attendance from across the community at each training session and stressing that those in attendance should pass one what they learn to their neighbours and extended family. As between 3,000 and 5,000 people live in each community, the random sampling design of the survey strongly suggestions that more than 300 households are using new agricultural techniques which will increase the duration of their garden areas. This survey was not undertaken before March 2018 as internal delays meant NARI was not able to begin providing training on new garden techniques until 2018.<br><br>**1.3:** Of the many agriculture methods on which training was provided, two in particular will ensure active gardens lifespan increases: crop rotation and composting. In total 27.6% of those surveyed (46 people – see Output 1.2 for further details on the survey) said they had implement new crop rotation or composting methods following training by NARI and WCS. Given that each community consists of between 3,000 and 5,000 thousand people the random sampling design of the survey strongly suggestions that more than 150 households are using new agricultural techniques which will increase the duration of their garden areas by project end. |
| Activity 1.1 Increase the number of new gardening techniques that are taken up by communities in the project area | | See Output 1.1 |
| Activity 1.2. 2 Ensure activities are established in >300 households using new gardening techniques by March 2018 | | See Output 1.2 |
| Activity 1.3 Introduce new techniques to a minimum of 150 households to ensure the duration of active garden areas will increase by project end | | See Output 1.3 |

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| Output 2. Introduction of new market crops for income generation, and introduction of pest and drought resistant varieties for subsistence use within all three communities | 2.1. A 50% increase in the number of marketable crops in gardens in project areas by March 2019<br><br>2.2 At least 2 new pest and/or drought resistant crop varieties introduced by March 2018 | **2.1:** Through WCS' and NARI's baseline surveys at the start of the project it was determined that Miruma did not have a commercial crop and Danbagl and Womkama have one (bulb onions). In partnership with NARI and Oxfam, we introduced three varieties of blight resistant, drought tolerant potatoes to the three sites. Two varieties (E24 and Kumudi) of introduced potato grew well and have now been distributed broadly throughout the communities. However, the E2 variety was observed to have high infection rates by potato blight and was therefore not distributed. The establishment of potato in the communities represents a >50% increase in the number of marketable crops at these sites (see Annex 7: Compendium Report for more details).<br><br>**2.2:** NARI introduced the following crops to the three project sites: drought tolerant, pathogen tested and early-maturing sweet potato (twelve varieties); drought tolerant, low cyanide cassava (four varieties); African yam; and drought tolerant, late blight resistant potato (three varieties – WCS and Oxfam also separately introduced one of these varieties (E2) in 2017-2018). To improve nutrition and income an upland rice variety, carrot and wheat were also introduced to the communities. On-farm field demonstrations about how to grow each crop were carried out at the community multiplication plots during each NARI visit and by the CBO agricultural workers.<br><br>Report from NARI and the CBOs showed that all crops grew well except the E2 potato variety showed high damage from blight and cassava did not thrive at Danbagl and Womkama where the altitudinal conditions appear not to be ideal for this crop. These crops were not distributed in the communities (see Annex 7: Compendium Report for further details). |
| Activity 2.1 Work with Oxfam and local partners to promote a 50% increase in the number of marketable crops in gardens | | See Output 2.1 |
| Activity 2.2 With the support of NARI introduce least 2 new pest and/or drought tolerant crop varieties | | See Output 2.2 |

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| Output 3. Nursery practices for native tree species tested and established in two communities and active planting of areas with native species by the project end | 3.1 Successful propagation of at least four native tree species in nurseries by March 2018<br><br>3.2 Planting of native tree species in place of exotic species incorporated into land use plans by March 2018 with community nursery output exceeding 3,000 weather hardened native seedlings per community per year by project end | **3.1:** WCS successfully propagated 9 timber and 3 tree crop species by project end (see Annex 7: Compendium Report for further details):<br>• *Causarina oligodon* (fuel wood, nitrogen fixer, to be used as nurse crop for hardwoods species in woodlots, it is also locally an important timber tree for local construction purposes).<br>• *Fagraea beteriana* (durable hardwood timber tree)<br>• *Fagraea salticola* (durable hardwood timber tree)<br>• *Castanopsis acuminatissima* (general purpose timber, food source (seeds), has commensal edible fungi)<br>• *Pandanus julianetti* (reserve food crop for under story planting)<br>• *Ficus copiosa* (reserve food crop for under story planting) -<br>• *Ficus damaropsis* (reserve food crop for under story planting)<br>• *Dacrycarpus cinctus* (montane pine, softwood timber tree species)<br>• *Nothofagus grandis* (durable hardwood timber tree)<br>• *Papuacedrus papuana syn. Libocedrus papuana* (montane pine, cultural significant and soft wood timber tree species)<br>• *Podocarpus archboldii* (Vulnerable montane softwood timber tree)<br>• *Dacrydium nidilum* (Montane pine, softwood timber tree species).<br>**3.2:** 30,128 weather hardened native seedlings were successfully raised in the community nurseries and WCS' Goroka nursery over the course of the project. 13,443 seedlings were raised in the three community nurseries in the final year of the project, averaging 4,481 seedlings produced per community. Across the three communities a total of 262 ha has been incorporated into community land use plans as regions dedicated to reforestation, community woodlot and tree crop plantation 8 (see Annex 7: Compendium Report for further details on the plantation areas). At close 22,043 seedlings had been outplanted. The remaining seedlings will be planted in 2019 with support from the European Union. |

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| Activity 3.1 Develop propagation methods for at least four native tree species in nurseries | | See Output 3.1 |
| Activity 3.2 Planting of native tree species in place of exotic species incorporated into land use plans by March 2018 with community nursery output exceeding 3,000 weather hardened native seedlings per community per year by project end | | See Output 3.2 |
| Output 4. Sustainable use of existing forest stands within remaining areas of native forests and planted areas of exotic trees | 4.1 Through the land-use planning process the planting of invasive species in intact forest areas is banned in at least 1 community<br><br>4.2 More than 500 hectares under sustainable forestry practices as compared to baseline by March 2019 | **4.1:** As part of the detailed land-use planning process which occurred in their community, the Danbagl community committed to banning the planting of invasive species, primarily *Eucalyptus* and *Pinus* in their large intact forest area (4,264 ha). See Annex 7: Compendium Report for further details.<br><br>**4.2** At the start of the project no project community had agreed to implement sustainable forestry practices. Through a community-based natural resource and land-use planning process, the Danbagl community committed to only undertake sustainable forestry in their intact forest area (4,264 ha). All forestry in this area must follow Forest Stewardship Council's international guidelines for Papua New Guinea (2010) for commercial operations. Harvesting for subsistence use is allowed and clear-fell logging has been completely banned. This commitment aligns with KGWan Eco Habitats goal of promoting ecologically sustainable development within their community.<br><br>With funding from the European Union WCS is now working in Womkama, Miruma and Kwiop to implement similar sustainable forestry rules and to establish community rules enforced by the local village courts to ensure wildlife hunting is reduced to sustainable levels. |
| Activity 4.1 Through the land-use planning process work with the communities to ban the planting of invasive species in intact forest areas | | See Output 4.1 |
| Activity 4.2 Ensure more than 500 hectares under sustainable forestry practices as compared to baseline by March 2019 | | See Output 4.2 |
| | | **5.1:** Surveys covering traditional ecological knowledge and perception of environmental values were undertaken at the start and end of the project at |

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| Output 5. Capturing and passing on traditional ecological knowledge on forests and threatened species | 5.1 Quantitative survey on knowledge and attitudes of men, women and children in project and control areas at the project start and end<br><br>5.2 Copies of supplementary education materials capturing local ecological knowledge delivered to 3 primary schools in the project area by September 2017 with teacher guides<br><br>5.3 Increase in number of school children that learn about their local culture and traditional ecological knowledge by March 2019<br><br>5.4 Documentation of *tok peles* names and traditional knowledge of culturally and ecologically important fauna and flora gathered from female and male community members by March 2018 | Danbagl and Womkama. A baseline survey was also conducted at Miruma at project start. Unfortunately, a death of a leader from Miruma during out visit meant a project end survey could not be undertaken at this site as planned. In total 195 people, including 24 children (14-18 years old) were collectively surveyed across the three sites in the baseline and endline surveys.<br><br>Forest use, bilas ownership, concern over the effects of deforestation and knowledge of local language (*Tok Ples)* wildlfie names were assessed. No significant change was recorded in any category surveyed except worry over the effects of deforestation. In the initial survey nearly two thirds of respondents reported a very high or high level of concern over the consequences of deforestation (63%), however a substantial minority of the community (37%) showed little or no concern about deforestation (Figure 2). However, after education awareness in the community fully 98% of respondents reported having big concerns about deforestation by project end (Figure 3 - for further information Annex 7: Compendium Report, Traditional ecological knowledge section).<br><br>**5.2:** Copies of the supplementary education materials (a supplementary school syllabus with associated posters and a teachers' guide) were delivered to a primary school in each of the three project areas (Nugi, 2017).<br><br>**5.3:** Supplementary education materials (school syllabus, teachers' guide and 7 different posters which related to the syllabus) were developed and delivered to the 3 upper primary schools in the project area. Former PNG teacher and WCS Community Engagement Officer John Par Kagl taught a lesson from the supplementary school syllabus in the primary schools in each of the three communities in both 2018 and 2019 (except Namta 2019). In total he taught 221 (109 female and 112 male) students. The school teachers also reported using the school syllabus. During field trips to the community the Community Engagement Officer would also hold quizzes in the night at the community centre on the local names of plants and animals in the |

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| | | communities (many hundreds of people attended, however given the casual nature of the events attendance was not recorded).<br><br>**5.4** WCS has documented 135 fauna and flora *tok ples* names over the course of the project. During field visits the WCS team gave presentations with games involving trying to guess the right *tok ples* name for different species and a number of the names were used to construct the supplementary school syllabus. |
| 5.1 Produce school curricula capturing local ecological knowledge in 3 primary schools in the project area by September 2017 | | See Output 5.1 |
| 5.2 Copies of supplementary education materials capturing local ecological knowledge delivered to 3 primary schools in the project area by September 2017 with teacher guides | | See Output 5.2 |
| 6. Minimizing impacts on hunted species by preserving local costumes and reviving traditional *tambu* (no hunting) areas. | 6.1 Uptake of improved preservation methods for fur and feathers in traditional costumes (termed *bilas* in *tok pisin*) by 3 active cultural troupes (at least 75 dancers) by March 2019<br><br>6.2 Increase in area or number of *tambu* sites created or re-established in the project area by March 2019<br><br>6.3 Participatory threshold surveys for key biodiversity indicator species (tree kangaroos, forest wallabies, echidna and cassowaries) by September 2016 and end surveys by | **6.1:** 1,595 bilas protection kits were given out to bilas owners over the course of the project, including 785 kits to bilas owners in the project areas and 810 kits distributed during the Mt. Hagen and Goroka shows in 2016 and 2017. We did not distribute bilas kits in 2018 but have secured funding from the European Union to continue this work in 2019-2020.<br><br>**6.2:** WCS surveyed our project communities with regard to traditional practices including *tambu* areas. There was been no indication that *tambu* prohibitions are being used as a resource management technique in this region of PNG in a manner similar to the time limited hunting restrictions used on Manus Island (see Whitmore et al., 2016). However, a modern *tambu* (meaning prohibition) area was established over the entirety of the Danbagl community's primary forest areas where commercial logging and the planting of invasive trees has now been banned. Furthermore, through the land use planning process at this site seven sacred sites were identified as traditional *tambu* areas. Elders of the Danbag community was eager to ensure that these sites were captured in the land use plan as they feared future generations may otherwise forget them and that many current community |

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| | March 2019, and established monitoring procedures for birds of paradise by November 2016 | members were not aware of all sites. Around each sacred site people are not meant to enter unless given permission by the land-owner and hunting and harvesting of trees is prohibited.<br><br>As previously mentioned, with support from the European Union Sustainable Wildlife Management we have now begun a process of working with the community to identify over-hunted species and to facilitate the establishment of hunting exclusion zones in the three communities. With co-funding from the Australian government, a similar ban to that implemented in Dangabl has also been achieved in Kwiop. We are now working with the Kwiop community to establish legal (conservation deed) protection of this area.<br><br>**6.3:** Monitoring and threshold surveyed were completed at Danbagl, Womkama and Miruma in 2017 and 2018. The methods include: 1) 5 minutes point counts incorporating a distance variable detection methodology (enumerating all calling or sighted birds); 2) camera trap monitoring for cursorial and arboreal species (both mammals and birds) using 10 cameras set along a 5km transect line; 3) mist netting for birds; 4) village consumption threshold surveys and 5) hunter interceptions (incidental recordings of hunter capture observed during the field work periods).<br><br>A total of 3587 fauna sighting was recorded over the project, with 79 and 22 individual bird and mammal species, respectively, recorded. Two Endangered species were recorded, the Endangered Papuan harpy eagle (*Harpyposis novaeguinea*) and Endangered Goodfellow's tree kangaroo (*Dendrolagus goodfellowi*). The Vulnerable New Guinea pademelon (*Thylogale stigmatica*) and two the Near Threatened mammal species were also recorded (see Annex 7: Compendium Report, Wildlife monitoring section for further details).<br><br>The 5 minutes point count methods proved very successful for monitoring birds of paradise, with a total of 216 recordings of two species of bird of paradise, the Princess Stephanie's astrapia (*Astrapia stephaniae*) and the |

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| | | Brown Sicklebill (*Epimachus meyeri*) made over the course of the project. This method involves walking a line transect for one hour and taking point counts which incorporates a distance variable detection methodology to enumerate all calling or sited birds at 5-minute intervals. The method also recorded the Endangered Papuan Harpy eagle (*Harpyposis novaeguinea*) and many other bird species. Indeed, across the two surveys a similar and high number of individual bird sightings were recorded using this method (baseline: 1,756 bird sightings; endline: 1,831 bird sightings).<br><br>Evidence of hunting of the Endangered Goodfellow's tree kangaroo (*Dendrolagus goodfellowi)* was recorded at each site. At Danbagl two individuals of the species were caught by intercepted hunters, at Miruma two Goodfellow's tree kangaroos were recorded in household diets (see threshold survey results below) and at Womkama one hunter reported killing seven Goodfellow's tree kangaroos between January-March 2017 and 3 were recording in the 2018 household monitoring of this site.Overexplotiation for hunting is believed to have driven this species toextinction throughout much of its former range (Leary et al, 2017).<br><br>However, no echidna or cassowary species were recorded during the project. In discussion with the communities they report that these animals are in low abundance or locally extinct due to overhunting and deforestation. With funding from the European Union, we are now working to expand the methods developed in the Darwin Initiative to survey for longer periods and to establish hunting exclusion zones to protect these animals. |
| Activity 6.1 Promote the uptake of improved preservation methods for fur and feathers in traditional costumes (termed *bilas* in *tok pisin*) | | See Output 6.1 |
| Activity 6.2 Work to increase the area or number of *tambu* sites created or re-established in the project area by March 2019, or other compatible traditional management methods | | See Output 6.2 |
| Activity 6.3 Conduct baseline and end threshold surveys for key biodiversity indicator species, and establish monitoring procedures for birds of paradise | | See Output 6.3 |

# Annex 3 Standard Measures

| Code | Description | Total | Nationality | Gender | Title or Focus | Language | Comments |
|---|---|---|---|---|---|---|---|
| **Training Measures** | | | | | | | |
| 1a | Number of people to submit PhD thesis | | | | | | |
| 1b | Number of PhD qualifications obtained | | | | | | |
| 2 | Number of Masters qualifications obtained | | | | | | |
| 3 | Number of other qualifications obtained | | | | | | |
| 4a | Number of undergraduate students receiving training | | | | | | |
| 4b | Number of training weeks provided to undergraduate students | | | | | | |
| 4c | Number of postgraduate students receiving training (not 1-3 above) | | | | | | |
| 4d | Number of training weeks for postgraduate students | | | | | | |
| 5 | Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification (e.g., not categories 1-4 above) | 6 | PNG | Male and female | Community Foresters | Tok Pisin | 6 community foresters were trained over the course of the project by WCS Botanist |
| 6a | Number of people receiving other forms of short-term education/training (e.g., not categories 1-5 above) | In excess of 1000 | PNG | Male and female | Wildlife monitoring assistants. | Tok Pisin | Received training from WCS Wildlife |

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| | | | | | (~60 – mostly male); attendees of NARI, WCS and Oxfam agricultural training (over 1000 men and women) | | Biologist, NARI, WC Agricultural Officer and Oxfam International |
| 6b | Number of training weeks not leading to formal qualification | 2 weeks per community per year wildlife monitoring training and 3 weeks per community per year community nursery training and approximately 10 weeks in agricultural training in each community over the course of the project | See above | | | | |
| 7 | Number of types of training materials produced for use by host country(s) (describe training materials) | Supplementary traditional | | | | | |

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|---|---|---|---|---|---|---|---|
| | | ecological knowledge syllabus and associated posters | | | | | |

| Research Measures | | Total | Nationality | Gender | Title | Language | Comments/ Weblink if available |
|---|---|---|---|---|---|---|---|
| 9 | Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (ies) | 0 | | | | | Participatory process? |
| 10 | Number of formal documents produced to assist work related to species identification, classification and recording. | 0 | | | | | |
| 11a | Number of papers published or accepted for publication in peer reviewed journals | 0 | | | | | |
| 11b | Number of papers published or accepted for publication elsewhere | 0 | | | | | |
| 12a | Number of computer-based databases established (containing species/generic information) and handed over to host country | 0 | | | | | |
| 12b | Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country | 0 | | | | | |
| 13a | Number of species reference collections established and handed over to host country(s) | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13b | Number of species reference collections enhanced and handed over to host country(s) | 0 | | | | | |

| Dissemination Measures | | Total | Nationality | Gender | Theme | Language | Comments |
|---|---|---|---|---|---|---|---|
| 14a | Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work | 0 | | | | | |
| 14b | Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated. | 2 | PNG | Male - WCS Wildlife Ecologist and WCS Forest Botanist | Wildlife monitoring in the Bismarck Range and community forestry in PNG Highlands | English<br>Presentation titles:<br>Shopping in the Highlands Supermarket: Wildlife abundance in the Bismarck Forest Corridor, Papua New Guinea<br>And Reducing montane forest degradation through community replanting for subsistence use in Papua New Guinea | Conference: Oceania meeting of the Society for Conservation Biology<br>The poster presented by the Forest Botanist is shown in the Annex 7: Silviculture section |

| Physical Measures | | Total | Comments |
|---|---|---|---|
| 20 | Estimated value (£s) of physical assets handed over to host country(s) | 0 | |
| 21 | Number of permanent educational, training, research facilities or organisation established | 2 | Community nurseries |
| 22 | Number of permanent field plots established | 0 | |

| Financial Measures | | Total | Nationality | Gender | Theme | Language | Comments |
|---|---|---|---|---|---|---|---|
| 23 | Value of additional resources raised from other sources (e.g., in addition to Darwin funding) for project work | US$2.4million | | | | | EU Sustainable Wildlife management program (2018-2022) |

# Annex 4 Aichi Targets

| | Aichi Target | Tick if applicable to your project |
|---|---|---|
| 1 | People are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably. | X |
| 2 | Biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems. | |
| 3 | Incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions. | |
| 4 | Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits. | |
| 5 | The rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced. | X |
| 6 | All fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits. | |
| 7 | Areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity. | X |
| 8 | Pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity. | |
| 9 | Invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment. | X |
| 10 | The multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning. | |
| 11 | At least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and | |

| | | |
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| | other effective area-based conservation measures, and integrated into the wider landscapes and seascapes. | |
| 12 | The extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained. | |
| 13 | The genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity. | |
| 14 | Ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable. | X |
| 15 | Ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification. | X |
| 16 | The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation. | |
| 17 | Each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan. | |
| 18 | The traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels. | |
| 19 | Knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied. | |
| 20 | The mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties. | |

# Annex 5 Publications

| Type * (e.g. journals, manual, CDs) | Detail (title, author, year) | Nationality of lead author | Nationality of institution of lead author | Gender of lead author | Publishers (name, city) | Available from (e.g. web link, contact address etc) |
|---|---|---|---|---|---|---|
| Supplementary school syllable | Nugi,G (2017) Understanding your environment: a supplementary resource for teachers in communities along the Bismarck Forest Corridor. Wildlife Conservation Society, Papua New Guinea Program. Goroka, PNG. ISBN: 978-0-9943203-5-3 | PNG | WCS PNG | Female | Self- published | WCS PNG |
| | | | | | | |
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# Annex 6 Darwin Contacts

| | |
|---|---|
| **Ref No** | 3082 |
| **Project Title** | Sustaining biodiversity, livelihoods and culture in PNG's montane forests |
| | |
| **Project Leader Details** | |
| Name | Dr Ambroise Brenier |
| Role within Darwin Project | Ambroise oversaw and co-ordinated the project |
| Address | |
| Phone | |
| Skype | |
| Email | |
| **Partner 1** | |
| Name | Charlotte Kakebeeke |
| Organisation | Oxfam International |
| Role within Darwin Project | Program manager for Oxfam PNG |
| Address | |
| Fax/Skype | |
| Email | |
| **Partner 2 etc.** | |
| Name | Dr Ramakrishna Akkinapally |
| Organisation | National Agricultural Research Organisation |
| Role within Darwin Project | Agricultural training and crop distribution |
| Address | |
| Fax/Skype | |
| Email | |
| **Partner 3** | |
| Name | Steven \Yandime |
| Organisation | KGWan Eco-habitat |
| Role within Darwin Project | KGWan managed the community nursery and agricultural multiplication plot in their community and provided community training |

| | |
|---|---|
| Address | |
| Fax/Skype | |
| Email | |
| **Partner 3** | |
| Name | Lukas Monda |
| Organisation | WAMU5 |
| Role within Darwin Project | WAMU5 managed the community nursery and agricultural multiplication plot in their community and provided community training |
| Address | |
| Fax/Skype | |
| Email | |
| **Partner 3** | |
| Name | Toppy Sundu |
| Organisation | Individual Reform and Restoration Movement (IRRM) |
| Role within Darwin Project | IRRM managed the community nursery and agricultural multiplication plot in their community and provided community training |
| Address | |
| Fax/Skype | |
| Email | |

## CHECKLIST FOR SUBMISSION

| | Check |
|---|---|
| **Is the report less than 10MB?** If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line. | |
| **Is your report more than 10MB?** If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line. | x |
| **Have you included means of verification?** You need not submit every project document, but the main outputs and a selection of the others would strengthen the report. | x |
| **Do you have hard copies of material you want to submit with the report?** If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic. | x |
| Have you involved your partners in preparation of the report and named the main contributors | x |
| Have you completed the Project Expenditure table fully? | x |
| Do not include claim forms or other communications with this report. | |