

Darwin Initiative Main and Post Project Annual 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)

Submission Deadline: 30th April 2020

Darwin Project Information

Project reference	26-002
Project title	Integrating conservation and health in Papua New Guinea's vulnerable rainforests
Country/ies	Papua New Guinea
Lead organisation	University of Sussex
Partner institution(s)	Binatang Research Center, Madang, PNG
Darwin grant value	£355,353
Start/end dates of project	1.4.19 – 31.3.22
Reporting period (e.g. Apr 2019 – Mar 2020) and number (e.g. Annual Report 1, 2, 3)	Annual report 1: Apr 2019 – Mar 2020
Project Leader name	Dr Alan J A Stewart
Project website/blog/social media	
Report author(s) and date	AJA Stewart, J Middleton, V Novotny, S Sui, F Dem 24 th July 2020

1. Project summary

Papua New Guinea (PNG) includes the world's third largest rainforest, supporting 5% of global biodiversity. However, 24% of PNG forests have been cleared or degraded in 30 years, nearly half caused by commercial logging. Only 4.5% of land is officially protected, and this is largely ineffectual. In PNG, 97% of land is owned by clans as communal property, offering a potential counterweight against logging. However, without alternative development options, many communities are attracted by inducements from extractive industries and opt for logging.

Much of PNG is remote and lacks development resources. It is notably low on health service provision, being ranked 155 of 188 countries by Sustainable Development Goal (SDG) 3's health indicator scores. Medical neglect has left the top causes of health problems unchanged for fifteen years. Life expectancy is low; maternal and infant mortality rates are high.

Sustainable development requires protecting life on land (SDG 15), and supporting good health (SDG 3), but these goals can seem in conflict to PNG forest communities. Logging companies' offers of roads and income can decrease remoteness from health services, making desire for health a driver for forest destruction and erosion of health-related ecosystem services. Conservation success in PNG thus requires synergies be developed with delivery of other SDGs, particularly those pertaining to health.

Our integrated health and conservation project includes (i) a community health intervention tied to conservation, (ii) community and school-based education in the health-related

ecosystem services of intact forests, (iii) creation of two new conservation areas, expansion of an existing one, creation of a no-impact zone within it and two new buffer zones on its borders (Figure 1), (iv) an evidence synthesis of related projects across the tropics, and a multi-site assessment of the effect on biodiversity and public health of conserving compared to logging forests in PNG.

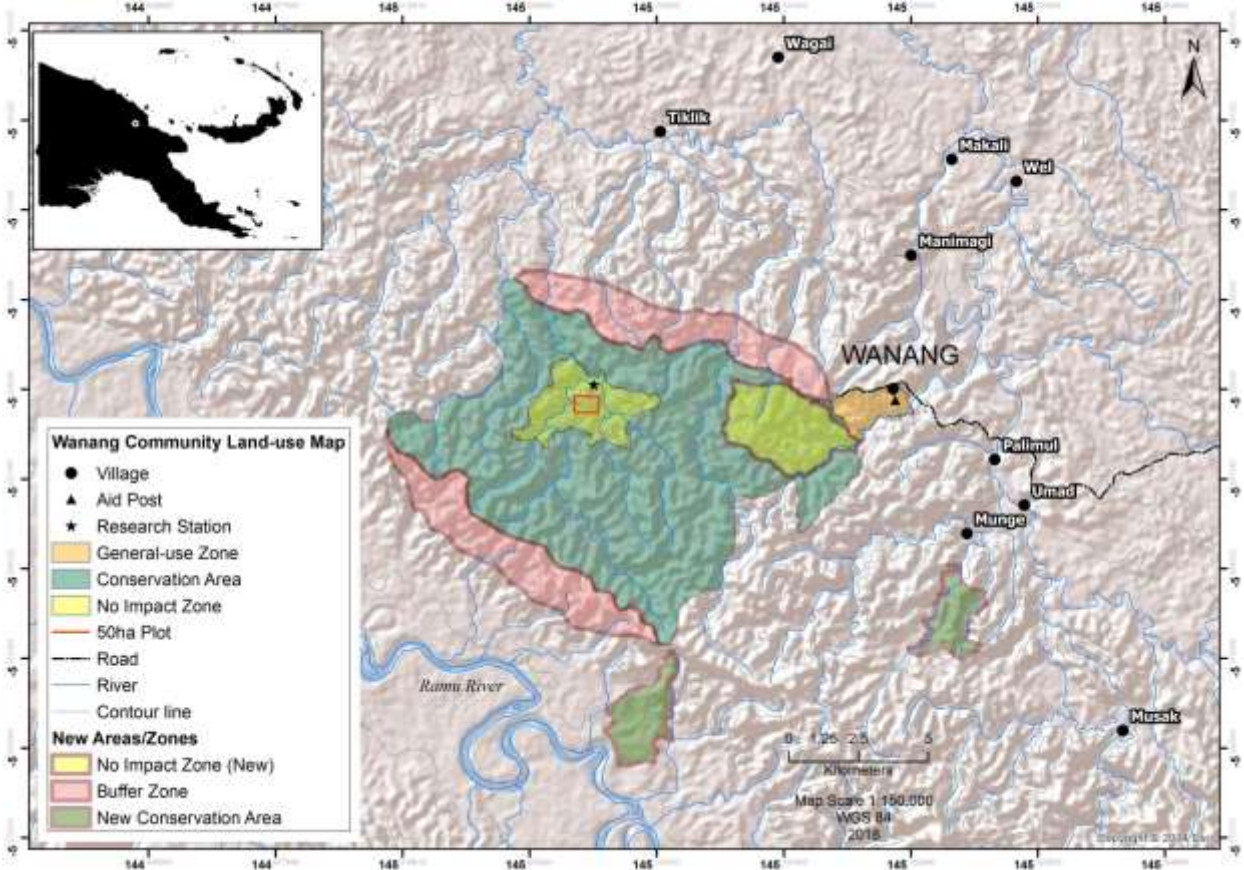


Figure 1: Land-use Map of Wanang Community, as presented in project application, showing existing Wanang Conservation Area (WCA) and new areas/zones planned in project (c.f. Fig. 5 showing newly designated areas).

2. Project partnerships

The project benefits from the long-standing close partnership between the University of Sussex (UoS) as lead institution and the Binatang Research Center (BRC), the principal partner in PNG, based in turn upon the long history of association in research between the two partners (Alan Stewart and Vojtech Novotny), including on six previous Darwin Initiative projects. Alan Stewart is responsible for overall management of the project, including co-ordination of the para-ecologist visits to the UK and report writing. BRC, under the directorship of Prof Novotny, is our principal partner in project management, training and research. It is the leading biological research institution in PNG with a staff of 35 researchers, students and highly skilled research technicians (para-ecologists). Monthly Zoom meetings between UoS and BRC staff are used for planning, decision making and monitoring of the project.

Our previous Darwin projects in PNG have focused on biodiversity survey and conservation, capacity building including training para-ecologists and raising environmental awareness. The current project represents a radical new direction: integration of health service provision into biodiversity conservation. This was at the instigation of Jo Middleton and Jackie Cassell (Brighton & Sussex Medical School) both of whom bring considerable medical experience and expertise and are now critical to the project’s success. The new focus has also prompted a critically important collaboration with the PNG Institute of Medical Research (IMR), the largest concentration of medical research expertise in the country. Our two primary collaborators at IMR are its Director (Dr William Pomat) and Dr Moses Laman, a principal Research Fellow and

Head of the Vector Borne Diseases Unit, who is based in the nearest regional centre of IMR in Madang.

This project would not be possible without our continuing collaboration with those involved in the long-term development of the Wanang Conservation Area (WCA): the nine clan leaders, the WCA project management board and the village residents. The Aid Post was planned at the request of the WCA, who identified health provision as the next step along their path of sustainable development. The excellent relationships that we have with them will be essential for the future success of the project.

We have also developed a new collaboration with the International Institute of Environment and Development (IIED) whom we brought in to provide their expertise in monitoring and evaluation. Dr Emilie Beauchamp provided training in M&E techniques for two para-ecologists during their visit to the UK. She will maintain general oversight of project M&E and has contributed to summarising the M&E in this report.

Our para-ecologist training programme continues to benefit from collaborations with our long-standing partners in the UK. We are continuing collaboration with the Zoology Department at Oxford University (Prof. Owen Lewis and Dr Sofia Gripenberg) who hosted our para-ecologist visitors in 2019. The visitors also benefited from our long-standing collaboration with RBG Kew through being hosted at the Millennium Seed Bank at Wakehurst Place, Sussex, where they were able to see how seeds collected by members of the BRC team were processed and stored and to discuss possible future collaborations. The training programme also benefits from collaboration with the South East Asia Rainforest Research Partnership (Dr Tom Fayle) and the Universiti Malaysia Sabah (Dr Yusah Kalsum), allowing the training of para-ecologists at the Danum Valley and the Maliau Basin Research Stations, and with the Biology Center of the Czech Academy of Sciences (Ceske Budejovice, Czech Republic). These two partnerships allowed us to extend our UK-based training of para-ecologists to additional locations, Malaysia and the Czech Republic, at no additional cost to the project.

3. Project progress

3.1 Progress in carrying out project Activities

Preparation of this annual report has been delayed partly due to the Covid-19 global pandemic, which has affected communications between project team members. Whilst some activities are behind schedule, we are confident that we can catch up within the next reporting period.

We report below only on those activities that were due to progress within the reporting period (please refer to logframe for complete list of activities).

Output 1:

Activities: 1.1 Collect and analyse qualitative and quantitative health and wellbeing data before and after the health intervention. 1.2 Train Wanang community members in immediate trauma care and evacuation procedures. 1.3 Trained Wanang community members respond to trauma and evacuation incidents as required. 1.4 Construct Aid Post, equip it, stock it with medicine, and recruit a nurse. 1.5 Establish and train community health committee. 1.6 Nurse staffed Aid Post receives and treats patients, maintains patient records.

Following ethical approval from both the Brighton & Sussex Medical School and the PNG Institute of Medical Research (IMR), we collected baseline health data from the participating communities in Wanang. We collected the medical history of 130 community members, clinically examined 111, and treated 63 for urgent health conditions. We developed a novel protocol for doing health assessments in this type of remote conditions, which is under second-round review for publication in the *British Medical Journal Open* (evidence: manuscript for *BMJ Open*: Annex 4).

Jo Middleton provided training for 12 Wanang community members (including 3 females) in July 2019 based on an existing Wilderness First Aid syllabus but adapted for the community's needs to include emergency treatment of trauma, forest evacuation of casualties, Rapid

Diagnostic Tests for Malaria and the use of Malaria medication (Figure 2). A trauma kit and supplies were provided for the village so that trained villagers can respond to trauma and evacuation incidents as required.



Figure 2: Supplies being ferried across into WCA (left), for training in malaria testing and trauma care (middle & right).

The Aid Post building has been constructed (Figure 3) and is currently being supplied with suitable equipment and stocked with medicines from local sources. A separate house for the nurse has also been constructed. We have met with the Provincial Health Authority and a District Health Inspector inspected the Aid Post on 21st July 2020. He gave a very favourable report and indicated that official registration of the Aid Post would be given within three weeks. We are in discussion with the Provincial Health Authority regarding support for the operating costs for the post after the Darwin project finishes.

Four candidates were considered for the nurse post and two were interviewed (one male, one female). The person appointed is a state-registered female nurse recruited from IMR and will commence duties in July. The BRC team has met with the Wanang community to explain the project and the new provision of health services, and the community has appointed a 6-person health committee with equal gender representation. Members of this committee have received training in taking minutes as a record of future meetings.



Figure 3: Newly constructed Wanang Aid Post. Upper row: external view (left); consulting/treatment area (right). Lower row: visit by District Health Authority health inspector, 21st July 2020.

Output 2:

Activities: 2.1 Establish new 1,000ha no-impact core conservation area (no hunting, no gardening), map with GPS verified boundaries, and declare in operation by WCA. 2.2 Carry out mammal and bird surveys of new no-impact zone. 2.3 Establish two additional primary forest fragments (c900ha total), map with GPS verified boundaries, and declare in operation by WCA. 2.4 Carry out plant and bird surveys of the two additional primary forest fragments. 2.5 Establish buffer zones of 3,000ha of selectively logged forests with indigenous landowners, map with GPS verified boundaries, and declare in operation by WCA. 2.6 Record and analyse vegetation community composition yearly in the two buffer zones. 2.8 Collect and analyse household survey data on attitudes to conservation in buffer zone communities outside pre-existing WCA boundary and agreements, before and after health intervention.

The total area of forest under protection at Wanang has been enhanced by: (a) the nine local clans in Wanang have all signed forms agreeing to the establishment of a new 1,000 ha no-impact zone (no hunting, no gardening) within the existing Wanang Conservation Area (WCA). The boundary has been mapped using GPS-derived co-ordinates (Figures 4-5). (b) two new primary forest areas of 300ha and 1484ha have been established as conservation areas through agreement with local communities. This represents almost double the 900 ha total that was originally planned. As a result of the increased size of the larger of these two areas its border is now contiguous with the existing WCA (see map), providing further conservation benefit through minimised fragmentation. (c) Discussions have been initiated with owners of selectively logged forests adjacent to the WCA with a view to establishing two new buffer zones of protected forest totalling 3,000 ha. These negotiations, followed by the first biodiversity surveys of the buffer zones, were planned for completion in Year 1 but have been delayed; we expect them to be completed by the time of the next half-annual report. Surveys of the new no-impact zone and the new forest fragments have started and will be finished by late-July; these will provide baselines against which to compare future changes. The National Forest Inventory Protocol is being used as the template for these surveys, from which a standardised protocol for surveys of birds, mammals and plants has been developed (see Annex 5); BRC staff have extensive and long-term experience in conducting such surveys.

We held a co-planning day at Sussex in Sept 2019 to develop the protocol for the household surveys of attitudes to conservation amongst the buffer zone communities. This workshop included three PNG staff (including a member of the Wanang community), a BRC-based anthropologist and our IIED collaborator as the expert in monitoring and evaluation (Figure 6).



Figure 4: Clan leaders show signed form agreeing establishment of no-impact core conservation zone on their land (left); field assistant marking the boundary of the no-impact zone in the Wanang forest (centre left), and landowners Albert Mansa (centre right) and Samuel Japi (right) signing the agreement for the protection of the two new forest fragments.

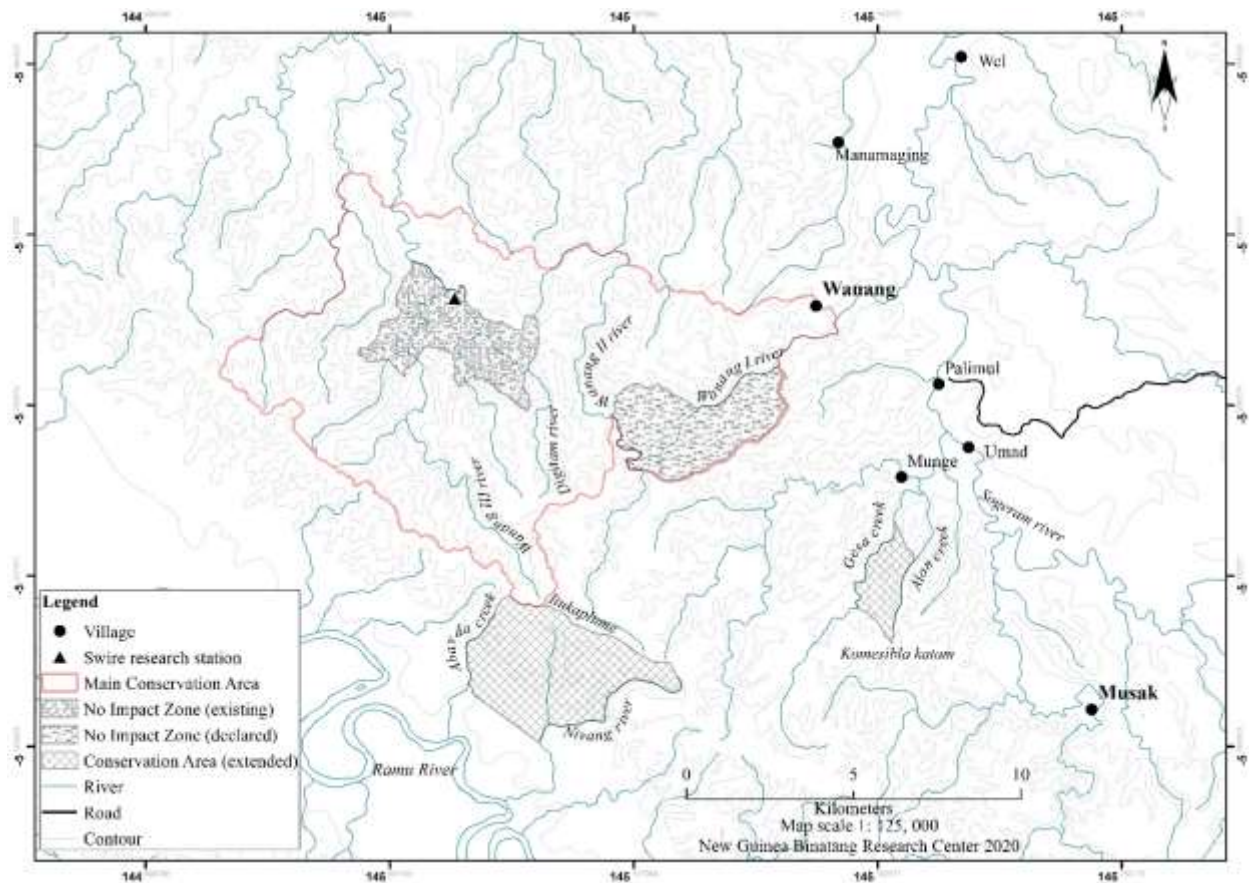


Figure 5: Land-use Map of Wanang Conservation Area (WCA) showing newly agreed No Impact Zone (and existing No Impact Zone) and two new Conservation areas.



Figure 6: Left: Participants in attitudinal survey workshop attended by (from left) Jo Middleton (Sussex), Alan Stewart (Sussex), Jonah Damen (BRC), Kenneth Pomoh (BRC), Emilie Beauchamp (IIED), Alfred Kik (BRC), Martina Konecna (Czech Academy of Sciences); Right: developing a Theory of Change for the project.

Output 3:

Activities: 3.1 Produce curriculum and materials for school and community level educational programmes on health and well-being benefits of forest conservation. 3.2 Provide educational programme in Wanang School (c250 pupils, 35% female), making any necessary improvements to programme following delivery.

The current PNG school curriculum has very limited coverage of the interaction between forest conservation and human health. To address this, we have developed a Forest Conservation and Health education curriculum for introduction into PNG primary schools. We have met with

the teachers at Wanang school and they are supportive. Formal approval is needed from the PNG Education Department to test and run this curriculum, which we expect to be given soon. There has been some delay on this work package as the school system was closed through March and April due to COVID19. However, the curriculum is currently being tested, after which it will be modified as necessary and then run in Wanang school in July, after which we expect to roll it out across schools in other partner communities.

Output 4:

Activities: 4.3 Systematic review of efficacy of integrating health services into tropical forest conservation projects worldwide.

UK staff have accumulated case studies from the published and grey literature that will form the basis of this review and have contacted various NGOs and other organisations who hold relevant information and data. Focused work on constructing the database of evidence and synthesising its contents will begin in the second half of Year 2. We have recruited a new PNG staff member at BRC and registered them on an M.Phil. They will conduct the review as the core of their degree, supervised by Middleton (BSMS & Sussex) and Novotny (BRC).

Output 5:

Activities: 5.1 Train 14 para-ecologists over 3 years in biodiversity survey methods. Total 280 person-days of training. 5.2 Train 25 BRC staff and students in 'Wilderness First Aid - Advanced'. Two courses at BRC HQ and field sites for a total of 25 BRC staff and students (all PNG nationals, 25% female). 5.3 Train 5 BRC & 1 IMR research staff in UK. 1-month intensive training in: biodiversity survey; conservation project evaluation; ecology; microbiology; evidence synthesis and meta-analysis; rapid anthropological assessments; health research. Visits to partner institutions. 5.4 Supervise research projects by 1 MSc student for 2 years and 1 BSc Hons student for 1 year based at the University of PNG.

Para-ecologist staff receive ongoing training at BRC. In addition to training on the job, we have also organized an intensive 3-week training course in July 2019 across tropical and marine habitats for 20 PNG participants that included 5 BRC staff members, 6 postgraduate students, 4 conservation area rangers, and staff members of Insect Trading Agency, Wildlife Conservation Society, Port Moresby Nature Park, Pacific Adventist University and the Forestry Research Institute, thus ensuring nationwide impact of the course. The training included lectures and practicals in ecology, botany and zoology, as well as practical small research projects executed by the trainees, and field trips to local conservation communities and to see primary succession series at Manam Volcano (Fig. 7). The course was evaluated by an anonymous questionnaire completed by the participants and reached a mean 97% satisfaction. They will continue to receive progressive training and evaluation throughout the project. As per our original timetable, the intensive training will be repeated with further intakes of 20 staff in July 2020 and a further 20 in July 2021, together comprising well over 280 person-days.



Figure 7: Training in ecology included ornithology (L), entomology (middle) and botany, including a field trip to see primary succession on an active Manam volcano (R).

12 BRC staff and students completed the Wilderness First Aid course in July 2019 (Fig. 8), receiving certificates from the Emergency Care and Safety Institute of the American Academy

of Orthopaedic Surgeons (see certificate in Annex 6). Unfortunately, it was possible to involve only two females, so it was decided to run only one course in 2019, with a second (15 further participants) scheduled for 2020 enabling a longer run-in time to recruit female participants. It remains a challenge in PNG society, and in research biology in particular, to attract women to partake in such training.



Figure 8: Wilderness First Aid advanced training course for BRC staff and students

Two BRC para-ecologist staff visited Europe in September-October 2019: Jonah Damen (botanist and member of the Wanang village community) and Kenneth Pokam (botanist). They received two weeks intensive training in the UK, visiting Sussex and Oxford universities and other institutions. They also had an additional four weeks training in Malaysia and the Czech Republic, at no additional cost to the DI project. Specific activities included:

- Participation in a 1-day attitudinal survey workshop at Sussex
- One day of training in Monitoring & Evaluation techniques, led by our collaborator Dr Emilie Beauchamp (IIED)
- Visits to local temperate habitats in Sussex and introduction to ecological field techniques
- Visit to the Millennium Seed Bank at Wakehurst Place, Sussex to observe seed curation techniques and discuss mutual research interests with RBG Kew staff
- An introduction to various ecological sampling and experimental techniques with collaborators in the Zoology Department at Oxford University, including visits to significant ecological sites such as Wytham Wood (Fig. 9)
- Two-week visit to Danum Valley, Borneo to work with the 50ha forest dynamics plot team, organised by Dr Tom Fayle, Imperial College London, long-term collaborator with BRC
- Three-week visit to the Czech Academy of Sciences and the Zoology Department at the University of South Bohemia in the Czech Republic, as long-term partners of BRC, facilitated by former DI-sponsored Masters students now studying for PhDs. They visited a number of local study sites including a 25ha CTFS forest dynamics plot and various manipulative field experiments. They also received training in insect and plant identification, taxonomy and eco-physiology
- They gave talks on PNG, BRC, Wanang and their research interests at the Universities of Sussex, Oxford (Fig. 9) and South Bohemia.



Figure 9: Jonah Damen (left) and Kenneth Pokam (right) visiting Wytham Woods, Oxford; Kenneth giving a seminar at Oxford University on PNG and BRC research.

We have decided that the BSc Honours system is no longer suitable for our research projects. Accordingly, we have switched to training M.Phil. students whose research studies take two

years. Three have been enrolled at the PNG University of Technology (UniTech) and have started work on their research projects:

Ben Ruli: *Social and health aspects of logging with conservation communities including a world-wide review*. Ben is working on his literature review for his study topic and assisting with community work in Wanang.

Daniel Okena: *Ecology of mammal communities along an altitudinal gradient (200-3700 m asl) in PNG*. Daniel has completed a 3-month field survey of mammal communities from 200 to 3700m asl. in the Finisterre Mts. (Fig. 10). He is processing the samples and is also working on biodiversity surveys in the WCA.

Gabriel Petuel: *The ecological role of alien species in early successional vegetation along a rainforest altitudinal gradient (100-2500 m asl) in Papua New Guinea*. Gabriel has conducted surveys of alien plant species at several sites (Fig. 10), including WCA. He is presently working on plant identifications and data analysis.



Figure 10: Gabriel Petuel (left) and Daniel Okena (far right) with his team (right) during field work for their MPhil research.

3.2 Progress towards project Outputs

Output 1: Community health and health service provision for Wanang and surrounding communities has been improved, managed by a new community committee with equal gender representation (workstream 1).

With the new Aid Post built and a nurse recruited, provision of a community health service will begin in July. Baseline health data (with no prior history of health service provision in the community) have been previously collected so that we will be able to measure overall improvement in community health at Wanang by project end using clinical assessments (as outlined in the attached protocol to be published in *BMJ Open*) and through quarterly post service health evaluations (based on treatment, vaccination, stock, and staffing records collected by BRC monthly). The new health committee of six community members (three men, three women) has been established and trained in the conduct of meetings, record keeping etc.

Output 2: Wanang conservation Area has been upgraded and expanded with improved attitudes to conservation in new partner communities (workstream 1)

A No-Impact Zone has been established by agreement with clan landowners within the existing WCA, and two new primary forest fragments outside the previously existing WCA (with a total area nearly double that originally proposed) have also been established. Periodic biodiversity surveys following standard protocols will be used to assess the removal of adverse factors (hunting and gardening) in the No-Impact Zone and the protection of extra bird and plant species in the new forest fragments.

Output 3: Knowledge and understanding of the health and well-being benefits of forest conservation amongst school pupils and partner villagers has improved (workstream 2).

This workstream is in its early stages. We have developed an educational programme on the potential positive interaction between forest conservation and community health for introduction into the primary school curriculum.

Output 4: New evidence has been produced on the interlinkages between logging, forest conservation, health, well-being, and livelihoods in PNG, and tropical rainforests globally (work stream 3)

We are building the evidence base for a systematic review of the interlinkages between ecosystem and human health in the context of tropical forests. The fieldwork aspect of this output will be carried out as scheduled in Year 2.

Output 5: Capacity has been expanded, and gender balance improved, in PNG environmental and health research (workstream 4)

BRC has a policy of ongoing training of para-ecologists and students in research. Wilderness first-aid training has been done at BRC (2 females of 12 - this is already a higher proportion than could normally be expected in PNG, but we will be including a greater percentage of females in Y2, see above) and two para-ecologists have been brought to the UK for intensive training (both male, but two of the six we have chosen to bring to the UK during the project are female). Day to day in-country management of the Darwin project is being carried out by BRC Deputy-Director Dr Francesca Dem, who herself was originally trained as part of a previous Sussex-led Darwin project and is now the most senior female biologist in any PNG research organisation.

3.3 Progress towards the project Outcome

The intended project outcome is: *Enhanced human health resulting from health service provision promotes improved knowledge, awareness and positive attitudes towards rainforest conservation and facilitates enhanced biodiversity protection in PNG’s remote and vulnerable village communities.*

The promise of health service provision has already resulted in the community declaration of two new primary forest fragments as protected from logging activities and the allocation of further land within the WCA as a no-impact zone (no hunting, gardening). We expect the declaration of two areas of previously logged forest adjacent to the WCA as buffer zones in the near future. We have engaged with the logging communities in the villages of Palimul, Musak and Well, and met with positive responses. We are now detailing buffer zone agreements that require clarification of customary land boundaries of the clans that want to be involved. We consider that the indicators above remain adequate for measuring our intended outcome and we remain confident that the project will achieve the stated outcome by the end of the project.

3.4 Monitoring of assumptions

Outcome:	Still holds true?	Comments	Source of evidence
The Wanang community continues to cooperate with our approach and remains committed to forest conservation; Health service provision is accepted and used by the community; A sufficient number of survey participants can be recruited; Community expectations of health service provision and health benefits can be managed; Formal approval is obtained from ethics review committees of University of Sussex and PNG Institute of Medical Research.	Yes	The Wanang community remains enthusiastic and keenly awaits the opening of the Aid Post; formal ethics approval has been obtained from UoS and IMR; clan leaders have signed agreements for establishing no-impact zone and new primary forest fragments	Decision letters from ethics committees; signed agreements
Outputs:			
1.1 A sufficient number of trained community members remain resident in the community.	Yes	No changes apparent	
1.2 Suitably qualified nurse can be recruited and retained for aid post; suitable equipment can be sourced and maintained; access to medical supplies can be maintained.	Yes	Nurse recruited. Equipment sourced and ready to transport to Wanang.	Interview record; photos of new aid post
1.3 Wanang community continue to support the principle of the Aid Post and resident nurse.	Yes	Aid Post opening planned and keenly anticipated	

2.1 No hunting / no gardening instruction for new no-impact zone is respected by Wanang community.	Yes	No-impact zone established with clan agreement	Signed agreement
2.2 Protection of isolated forest fragments can be maintained effectively.	Yes	To be monitored	
2.3 Selectively logged forest can be protected effectively from further adverse impact or disturbance.	Yes	To be monitored	
2.4 Village communities in the new buffer zones are prepared to maintain participation in attitudinal surveys.	Yes	Buffer zones not yet established	
3.1-3.3 BRC partner communities, and schools beyond Wanang, are prepared to participate in educational programme.	Yes	Wanang School keen to participate based on initial meetings with teachers	Record of meeting with teachers
3.4 Department of Education remains receptive to idea of national educational package on the health and well-being benefits of forest conservation.	Yes	No meetings yet with DoE during project, but approval given by Provincial Education Authority	Signed approval on letter, 25.6.20 (See Annex 7)
4.1-4.2 Sufficient communities are prepared to, (i) participate in health assessments (clinical examinations, focus groups, key informant's interviews, ethnography), and (ii) allow biodiversity transect counts on their lands.	Yes	Good level of participation in health needs assessment work prior to project start suggest that co-operation will be good	
4.3 Sufficient conservation organisations and other repositories of conservation case studies will co-operate by making internal evaluation documentation available for evidence synthesis.	Yes	Preliminary contacts established and requests for access to documentation agreed	Correspondence
5.1-5.4 A sufficient number of para-ecologists and BRC/IMR staff are interested in developing and broadening their skills base; suitable MSc and BSc Hons candidates can be recruited.	Yes	3 M.Phil. students appointed and started their projects	Names and research project titles (see Section 3.1).

3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation

The planned impact in our original application form was: *Improved health status and support for rainforest protection in Wanang, and improved evidence and debate on the interaction between health and conservation in the tropics, reflected in PNG government policy.* Once operational (from July 2020), the Aid Post will make a direct, visible and quantifiable impact on the health status of the Wanang community. This will represent a tangible contribution to poverty alleviation. Already, a significant area of additional primary forest has been brought into protection and agreements have been made with local clans that hunting and gardening will no longer be allowed in an additional tenth of the existing WCA.

4. Contribution to the Global Goals for Sustainable Development (SDGs)

The project has made a direct contribution in the reporting year to:

SDG 15 (Life on Land): 1,784 ha of primary forest have been brought into conservation protection and clan leaders have agreed to refrain from hunting and gardening in an additional 1,000 ha of currently protected forest within the existing WCA.

SDG 03 (Good Health & Well-Being): Community members have been empowered through training in evacuation, malaria treatment, trauma care and provision of an emergency kit. BRC staff have been trained to carry out evacuations for hospital treatment from Wanang to the nearest road head. An Aid Post has been built at Wanang and is being equipped with medical supplies. A registered nurse has been appointed who will commence work in July 2020.

SDG 04 (Quality Education): A Forest Conservation and Health education curriculum for introduction in PNG primary schools has been written, discussed with schoolteachers in Wanang and will be tested initially at the Wanang primary school and then rolled out in schools in other partner communities across PNG.

Additional indirect contributions have been made to other goals, including SDG 01 (No Poverty) through employment of staff supporting biodiversity research and monitoring and SDG 05 (Gender Equality), see below.

5. Project support to the Conventions, Treaties or Agreements

PNG had committed to doubling its total protected area of land by 2010, a plan not fully achieved since. However, the Conservation & Environment Protection Agency (CEPA), which is the government contact point for the CBD in PNG, includes the WCA in their strategy to achieve this goal, to which the addition of two new primary forest fragments by our project makes a significant contribution. CEPA has worked with BRC since 2011 on the development

of the WCA and regards it as a transferable model for sustainable development and forest conservation in PNG and elsewhere.

6. Project support to poverty alleviation

The project is bringing new income to the population of Wanang village (~200 people) in the form of salaries for assisting in field research, survey and inspection work (such as porters, field assistants), construction of the aid post and conducting social surveys. Furthermore, the expected improvements to community health will contribute significantly to poverty alleviation. Once the buffer zones are in place, these benefits will extend to a further 9 villages surrounding the WCA (c.1800 people).

7. Consideration of gender equality issues

PNG society is generally highly patriarchal with considerable resistance in many traditional communities to the advancement of gender equality. Our contributions to promoting gender equality therefore must be modest and incremental in order to gain community support. We have helped the Wanang community to establish a six-person community health committee with equal gender representation for managing the Aid Post. We have recruited a female nurse from a candidate and interview list containing both genders: something that focus groups had shown was especially important to the Wanang community for promoting reproductive health and safe childbirth.

The training in trauma care and evacuation procedures for the Wanang community achieved the target of 25% female participants amongst the 12 taking the course. Unfortunately, however, only two women amongst the BRC staff and students could be recruited out of 12 participants on the Wilderness First Aid training (target was 25% female); a further course will be run at a later date with the specific objective of encouraging better gender representation. Three M.Phil. students have been recruited: all male. As in previous years, it has proved challenging to encourage suitable female students to apply.

8. Monitoring and evaluation

A Monitoring and Evaluation (M&E) training workshop was held on September 23-25th 2019 at the University of Sussex, with five participants including two members of the team from BRC. The training included basic principles of M&E and laid the ground for developing a Theory of Change (ToC) for the project. This allowed us to unpack and validate the outcomes, indicators and further develop the means of verification in the logframe and to develop the M&E plan as a “living document”.

The project ToC unpacks how the five outputs from the project will lead into short-term and medium-term outcomes and the impact of “Improved health status and rainforest protection in Wanang, and improved evidence and debate on the interaction between health and conservation in the tropics, reflected in PNG government policy”. The five outputs (provision of medical services, upgrade of conservation, improved understanding of health and biodiversity linkages, training, and a systematic review) together will lead to the medium-term outcome of “Improved community health and rainforest conservation in Wanang and surrounding communities as a model for incentivising conservation in PNG’s remote rainforest villages, set against financial inducements of extractive industries”. As such, a core aim of the project is not only to obtain positive outcomes in Wanang, but also across PNG and beyond. Our ToC workshop has further mapped short-term outcomes emerging from the activities, which conjunctly lead to the medium-term outcome and impact. Project activities will work towards building various local capacities and developing a robust evidence base through research and MEL, in order to change attitudes towards conservation as a viable and desirable development route, and towards an appreciation of how conserved biodiversity supports healthier lives.

We have noted the core assumptions and research hypotheses underpinning our project, including:

- Unlogged / high biodiversity areas do correlate with healthier lives
- Provision of health services leads to better lives in Wanang
- Communities' collaboration in the project brings improved well-being
- Evidence presented is adequate and appropriate to be well understood, and in turn to lead to behaviour changes locally.

9. Lessons learnt

One of the few benefits of the Covid-19 pandemic has been the widespread adoption of videoconferencing. Regular monthly Zoom meetings between UoS and BRC have greatly facilitated the planning and ongoing management of the project. The Covid-19 emergency also provided an unplanned test of the sustainability of our local capacity building. Despite six months (so far) of no visits by international researchers, the PNG team has been active with only remote guidance, able to pursue all planned activities on their own, from student research through to biodiversity surveys by BRC staff to community negotiations and health care organization.

10. Actions taken in response to previous reviews (if applicable)

Not applicable as this is the first annual report and no issues were raised in response to our first half-year report in autumn 2019.

11. Other comments on progress not covered elsewhere

The delay in receiving notification that our application had been successful (email letter received 1.4.19) meant that we had to kick-start the project very quickly. We opted to start straight away rather than delay the start as all key personnel were in place and ready to begin. There were considerable delays in setting up the finances, however, due to staff shortages and other disruptions in the University of Sussex Research Finance department, which had knock-on impacts on partners receiving funds and initiating work. Consequently, some activities are currently behind schedule, but they are catching up rapidly and we are confident that we will be back on track within the next six months.

At the time of writing, PNG has had only eleven Covid-19 cases and one death, with strict lockdown imposed on movement across international and provincial borders. It is possible that strict quarantine measures may have prevented a major in-country epidemic so far, although the PNG healthcare system would be ill-equipped to cope if one arose. Hitherto therefore, the impact of Covid-19 on our project has been relatively modest apart from some restrictions to staff travel, a delay in nurse recruitment (now completed), and some delay on the school educational work package due to multi-month school closures. On the other hand, if a significant outbreak were to occur, the consequences for the project could be severe. International visits (by two PNG trainees to the UK and by UK staff to PNG) will be disrupted for the immediate future, but we are hoping these can be rescheduled for later in 2020 or early 2021. On the positive side, thanks to the Darwin project if a country-wide COVID-19 outbreak does reach the Madang region our partner communities will for the first time have some in-community medical support, and will thus not need to travel to the regional hospital for routine care, which would likely guarantee introduction of SARS-Cov-2 into the communities. We will continue to monitor the situation carefully both locally and nationally. We are especially well placed to do this as one of our in-country Co-Is (Dr Moses Laman) has been leading COVID-19 test and trace nationwide.

12. Sustainability and legacy

We have refrained from widespread publicising of the Aid Post locally or nationally until it is fully operational in order not to raise unrealistic expectations or demand. Interest in the project

amongst the community and preparedness to cooperate with its objectives has been shown by the willingness of clan leaders both inside and outside the existing WCA to declare parts of their land for conservation in the form of new protected forest fragments and the new no-impact zone. We are confident that neighbouring communities will also be interested to form buffer zones of previously logged but recovering forest adjacent to the existing WCA boundary.

Sustainability of the WCA depends on promoting it as a flourishing location for international biological (and more recently anthropological) research and simultaneously addressing the developmental needs of the communities, with health care and education being their key concerns. Our project addresses all of these, with the addition of a new dimension in medical research. The positive reception that the introduction of the Aid Post has had at the provincial level means that the PNG government Health Department will recognize it and continue funding it after the Darwin project has finished.

Our philosophy in this and all previous Darwin grants has been that our student and staff training creates a lasting legacy for biodiversity conservation assuming the trainees continue to use their skills and expertise. BRC's past record in this regard is excellent: 31 of 44 para-ecologists continue in research and 6 have gone on to study biology at university level; of 24 Honours and MSc students, 12 remain in research and 9 have continued on to PhD studies. We expect similar success from the present project.

13. Darwin identity

We have acknowledged the contribution of the Darwin Initiative on all publications and publicity materials including press releases (e.g. <http://www.sussex.ac.uk/broadcast/read/48187>). All presentations and talks by students, staff and collaborators at conferences and seminars use the Darwin logo on their slide presentations, as do all training workshops conducted by UK trainers and PNG staff. Our paper in *Sustainability Science* (see Publications and Annex 4), which describes our health and conservation intervention project and its ethical challenges in detail, recognises the Darwin Initiative as its sole funder.

The Darwin Initiative contribution is acknowledged on the websites for the Center for Postgraduate Biology (<http://binatangstudents.weebly.com/partners.html>) and the Binatang Research Center (<http://baloun.entu.cas.cz/png/parataxoweb.htm>) as well as our personal websites (<http://www.sussex.ac.uk/lifesci/stewartlab/research>).

The Darwin Initiative has become well known among biologists and conservationists in PNG as a result of our 20-year history of collaboration between the University of Sussex and the BRC, funded almost entirely and near-continuously by the Darwin Initiative.

14. Safeguarding

We are in the process of developing a safeguarding policy for our project. This will focus in particular on safeguarding measures for BRC staff and others working in (a) the Wanang community, and (b) PNG schools. Key elements of the policy will include:

- a clear statement of what constitutes unacceptable behaviour including, but not confined to, bullying, harassment, exploitation, abuse and discrimination on any grounds
- provision of training and advice for staff on safeguarding issues to ensure that all staff are aware of the policy, what constitutes a breach of that policy and what procedure to follow in the event of a safeguarding incident taking place
- implementation of a mechanism whereby incidents can be reported confidentially, recorded, investigated and dealt with appropriately
- exclusion of any staff or others from working with either children or adults who are unsuited for doing so for any reason
- promotion of a culture of collective responsibility to protect and promote the welfare of children and adults in partner and other communities.

15. Project expenditure

This table will be completed by the University of Sussex's Research Finance department and forwarded to the Darwin secretariat separately.

Table 1: Project expenditure during the reporting period (1 April 2019 – 31 March 2020)

Project spend (indicative) since last annual report	2019/20 Grant (£)	2019/20 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items (see below)				
Monitoring & Evaluation (M&E)				
Others (see below)				
TOTAL				

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2019-2020

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
<p>Impact</p> <p>Improved health status and support for rainforest protection in Wanang, and improved evidence and debate on the interaction between health and conservation in the tropics, reflected in PNG government policy.</p>		<p>No change yet in advance of establishing the Aid Post, but we expect rapid future improvement in health of Wanang community accompanied by greater support for forest protection.</p>	
<p>Outcome Enhanced human health resulting from health service provision promotes improved knowledge, awareness and positive attitudes towards rainforest conservation and facilitates enhanced biodiversity protection in PNG's remote and vulnerable village communities.</p>	<p>0.1 Improved community and individual health status by Y3 end measured against SDG and other health targets, and improved ability to provide first aid and emergency evacuation, in the ten communities (Wanang + 9 others) that have accessed the health post.</p> <p>0.2 Protected areas expanded and enhanced for biodiversity by end of year 3, through: (i) increase of 1,000 ha to the core no-impact zone of the Wanang Conservation Area (WCA); (ii) buffer zones of 3,000 ha bordering WCA of selectively logged forests created by neighbouring communities; (iii) declaration of two new conservation areas, totalling 900ha, thus increasing total protected area by 10%. People in protected area communities show more positive attitudes towards forest conservation by the Y3 end, compared to baseline, as a result of health intervention.</p> <p>0.3 School pupils and village residents have improved understanding and attitudes towards the health and wellbeing benefits of forest</p>	<p>Prospect of future health service provision has already prompted agreements with landowners on establishing extra no-impact zone within existing WCA and two new primary forest fragments increasing total protected area by c.18%.</p>	<ol style="list-style-type: none"> 1. Receive & treat patients in Aid Post 2. Negotiate, declare and survey buffer zones around existing WCA 3. Roll out new curriculum on health and wellbeing benefits of forest protection across network of schools in PNG 4. Gather, collate and synthesise evidence on integrated health and conservation programmes in tropical forest systems 5. Train M.Phil. students and para-ecologists

	<p>conservation in: (i) Wanang school (250 pupils, by Y1 end), (ii) 5 villages in BRC's schools network (750 pupils, by Y2 end), and (iii) BRC's partner communities (5,000 pupils, by Y3 end). 0.4 Improved understanding by project end of the interlinkages between biodiversity and human health, well-being, and livelihoods in PNG rainforests, and the efficacy of combined tropical forest conservation and health projects worldwide (through evidence synthesis). 0.5 Enhanced national capacity for biodiversity and anthropological survey and research, first aid and health research, by Y3 end, through training of BRC and IMR staff, paraecologists, and students.</p>		
<p>Output 1. Community health and health service provision for Wanang and surrounding communities has been improved, managed by a new community committee with equal gender representation (workstream 1)</p>	<p>1.1 By 6 months from project start, 12 WCA community members (25% female) are able to carry out immediate trauma care and evacuation procedures. 1.2 By Y1 end, Aid Post built, suitably equipped, staffed, and operational. 1.3 By Y1 end, new community health committee is able to manage the aid post and has equal gender representation. 1.4 Setting-adapted SDG health and health service indicators (https://sustainabledevelopment.un.org/sdg3) at in-community level have improved compared to baseline data collected in new WCA buffer zones at project start, or in the 2018 Wanang community health needs assessment (carried out in preparation for this application, in part to determine community health service priorities). Specifically: SDG 3.D.1 health worker</p>	<p>Nurse-staffed Aid Post is now in place, ready to treat patients and improve community health over next two years, managed by a newly constituted community committee with equal gender representation (evidence provided in section 3.1 of report).</p>	

	<p>density, by beginning of last quarter of Y1 an increase from baseline of 0:2000 to 1:2000 in the target population; SDG 3.B.1 proportion of the [paediatric] target population covered by all vaccines included in their national programme [measles and three doses of DTP-HepB-Hib pentavalent vaccine], has improved from <10% at baseline [Wanang] to 60% of those children across the target population 1-years old in Y3; SDG 3.1.2 proportion of births attended [in-community] by skilled health personnel has improved from 0% at baseline to 60% in Wanang, and at least 20% in buffer zone communities; SDG 3.3.5 number of people requiring interventions against neglected tropical diseases [specifically in this setting mycoses, scabies, yaws] has decreased 50% by Y3 end. By Y3 end, average self-reported current health status has improved at least 1 point along a 5-point scale. Re SDG 3.3.3 malaria, in-community availability of malaria Rapid Diagnostic Test and treatment has improved from 0% baseline availability to 70% availability to all who seek aid.</p> <p>1.5 Long-term health care plan supported by clinical data, targeting vulnerable groups (women, elderly) for WCA and surrounding communities produced by Y3 end.</p>		
<p>Activity 1.1 Collect and analyse qualitative and quantitative health and wellbeing data before and after the health intervention.</p>		<p>Baseline community health data collected in August 2019 prior to health care intervention (Aid Post) for comparison with data after intervention. Protocol for health assessments in second review round for <i>British Medical Journal Open</i>.</p>	<p>Nurse to collect and analyse qualitative and quantitative health and wellbeing data in standard format.</p>

Activity 1.2, Train Wanang community members in immediate trauma care and evacuation procedures	Completed. 12 Wanang community members (3 female) trained in July 2019 by Jo Middleton. Trauma kit and supplies provided for village.	Monitor ongoing need for refresher training
Activity 1.3 Trained Wanang community members respond to trauma and evacuation incidents as required.	No incidents reported	Nurse to record any incidents in monthly report to BRC
Activity 1.4 Construct Aid Post, equip it, stock it with medicine, and recruit a nurse.	Aid post constructed and equipped with solar power, fridge, medical equipment and medicines. Interviews held to recruit nurse. Female nurse appointed (Michelyn John), due to start work in July 2020. Government health authority has agreed to support Aid Post operating costs after DI project end.	Aid Post / nurse will receive patients
Activity 1.5 Establish and train community health committee.	Mass community meeting held in Aug 2019. Six-person Wanang health committee established (20.4.20), with equal gender representation, and trained in conduct of meetings and minute taking.	Monitor programme of meetings as Aid Post develops patient list
Activity 1.6 Nurse staffed Aid Post receives and treats patients, maintains patient records.	Delayed due to delay in recruitment of nurse and Covid-19, but due to start mid-July.	Ongoing treatment of patients and record keeping.
Output 2. Wanang conservation Area has been upgraded and expanded with improved attitudes to conservation in new partner communities (workstream 1)	2.1 By Y1 end, core no-impact conservation area (no hunting, no gardening) in WCA is 2,000 ha (an expansion in area of 100% from 1,000 ha), as a response to the health intervention. New 1,000ha no-impact zone within WCA shows 25% increase in abundance of previously hunted mammal and bird species by project end. 2.2 By Y1 end, WCA has two additional primary forest fragments (totalling 900ha, ~10% increase) protected from logging, as a response to the health intervention. By project end, the extra 900ha in two forest fragments will provide protection for an additional	WCA has been upgraded by imposition of extra no-impact zone and has been substantially expanded (1784 ha, representing approx. twice area planned) through declaration of two new primary forest fragments (evidence provided in section 3.1 of report)

average of: (i) 34 individual birds/ha (across all species), based on previous WCA surveys showing a density of 1697 birds/50ha; (ii) 11.5 individuals of each of the ten rarest bird species (those with population densities of 1 individual or less per 50ha, based on surveys of the WCA 50ha plot); (iii) 15 tree species recorded across the combined protected areas, based on established plant species accumulation curves for the WCA.

2.3 By Y1 end, an additional 3,000 ha of previously selectively logged forests have been protected from further logging or conversion to agriculture, and form a buffer zone around WCA, as a response to the health intervention. Buffer zones show post-selective-logging recovery of vegetation community by project end, measured as a statistically significant shift along a successional trajectory towards the community composition of primary forest.

2.4 At Y3 end, buffer zone communities (9 villages: c1800 people, c300 households) outside pre-existing WCA boundary show improved positive community attitudes to conservation compared to baseline, as a response to the health intervention. Specifically, by Y3 end scored household attitudes to conservation show improvement in at least 144 of the 300 total households. (Based on expectation that 60% of total households will have sought medical support from the conservation collaboration by Y3 end, and in 80% of such households this results in improved attitudes to conservation).

Activity 2.1 Establish new 1,000ha no-impact core conservation area (no hunting, no gardening), map with GPS verified boundaries, and declare in operation by WCA.	No-impact zone agreed with local communities, formally declared and mapped.	Maintain vigilance that restrictions on hunting and gardening are being respected.
Activity 2.2 Carry out mammal and bird surveys of new no-impact zone.	Surveys lasting 2 weeks due to start mid-July 2020	Complete surveys and analyse data
Activity 2.3 Establish two additional primary forest fragments (c900ha total), map with GPS verified boundaries, and declare in operation by WCA.	Two primary forest fragments agreed with local communities, mapped and formally declared.	Maintain vigilance that fragment boundaries are being respected.
Activity 2.4 Carry out plant and bird surveys of the two additional primary forest fragments.	Surveys lasting 2 weeks due to start mid-July 2020	Complete surveys and analyse data
Activity 2.5 Establish buffer zones of 3,000ha of selectively logged forests with indigenous landowners, map with GPS verified boundaries, and declare in operation by WCA.	Broad target areas for buffer zones selected. Negotiations with landowners due to start July 2020.	Agree, map and formally declare buffer zones.
Activity 2.6 Record and analyse vegetation community composition yearly in the two buffer zones		Survey vegetation and analyse data
Activity 2.7 BRC staff carry out forest inspections every six months of new no-impact conservation area, two additional primary forest fragments, and 3,000ha buffer zone forests.		Carry out inspections after 6 and 12 months
Activity 2.8 Collect and analyse household survey data on attitudes to conservation in buffer zone communities outside pre-existing WCA boundary and agreements, before and after health intervention	Co-planning day held at Sussex in Sept 2019 to develop household survey protocol with 3 PNG staff (including a member of Wanang community), BRC anthropologist & IIED co-I.	Collect and analyse attitudinal data before health intervention (i.e. before Aid Post in operation)
Output 3. Knowledge and understanding of the health and well-being benefits of forest conservation amongst school pupils and partner villagers has improved (workstream 2).	3.1 By Y1 end, c260 pupils (35% female) at Wanang school will have improved knowledge and understanding on the health and well-being benefits of forest conservation, compared to baseline pre- educational programme. 3.2 By Y2 end, c750 pupils in BRC's established network of 5 village schools will have improved knowledge and understanding on the health and well-being benefits of forest conservation, compared to baseline pre- educational programme.	The limited existing coverage of Forest Conservation and Health education in PNG curriculum has been reviewed. Plan established for developing, testing and delivering educational programme for school children and adults on health and well-being benefits of forest conservation.

	<p>3.3. By Y3 end, c5000 people in BRC partner communities across PNG have improved knowledge and understanding of the health and well-being benefits of forest conservation, compared to baseline pre-educational programme.</p> <p>3.4 In Y3, the Department of Education has a pre-trialled educational package on the health and well-being benefits of forest conservation, which can be rolled out to other communities and incorporated into nationally' set school curricula.</p>	
Activity 3.1 Produce curriculum and materials for school and community level educational programmes on health and well-being benefits of forest conservation.	Curriculum drafted and materials prepared for PNG primary schools, discussed with teachers and tested in Wanang primary school.	Collate feedback from testing, modify materials accordingly and finalise curriculum.
Activity 3.2 Provide educational programme in Wanang School (c250 pupils, 35% female), making any necessary improvements to programme following delivery.	Not in period.	Deliver educational programme to pupils in Wanang School. Iteratively receive feedback from teachers and pupils, modify and improve content.
Activity 3.3 Provide educational programme in BRC network of 5 village schools (c750 pupils, not in the new buffer zone), making any final necessary improvements to programme following delivery.	Not in period.	Roll out educational programme to village schools
Activity 3.4 Provide educational programme in BRC partner communities across PNG (c5000 pupils), making any necessary improvements to programme following delivery.	Not in period.	Roll out educational programme to village schools
Activity 3.5 Hold meetings with educational stakeholders, including Department of Education to arrange incorporation of educational package into educational plans nationally.	Not in period.	Initiate meetings with DoE
Activity 3.6 Provide pre-trialled educational packages to PNG Department of Education for further roll-out beyond project, and distribute editable version of package throughout international partners in the Planetary Health Alliance primary/secondary education working group.	Not in period.	Not in period.
Output 4. New evidence has been produced on the interlinkages between logging, forest	4.1 By Y2 end, data collection is complete on the effects of forest status (intact, undergoing logging, or logged)	Collation of case studies on integrating health and conservation in tropical forest communities has started. Planned collection of new data on health, well-being

<p>conservation, health, well-being, and livelihoods in PNG, and tropical rainforests globally (work stream 3)</p>	<p>on community health well-being, and livelihoods in 10 villages (3-4 villages in each land use category) in 100,000 hectare logging concession located near WCA. Data will include: (i) individual level data including demographics, social and occupational history, current health status and interventions, past medical history (including reproductive and child survival), present clinical observations (including Gross Development Index [children]), qualitative and quantitative data on subjective wellbeing, monetary income, (ii) community level data, including top-five (community ascribed) health problems, and livelihood benefits of differing forest status, including food sources and security (such as forest-use for swidden agriculture, hunting and harvesting plants), income, use of non-timber forest products; access to health provision (including the politics of access, transport etc.)</p> <p>4.2 By Y3 end, data collection complete on the biodiversity status of the 10 sites (as 4.1). Data will include: abundance and species diversity of plants, birds, and butterflies recorded along fixed 300m transects.</p> <p>4.3 By Y2 end, an evidence synthesis (in line with Collaboration for Environmental Evidence guidelines; reference #10) has been completed on the impacts of integrating health services into tropical forest conservation projects worldwide (based on our current evidence mapping, expected to be c60 projects).</p>	<p>and livelihoods comparing communities of different forest status (intact; previously logged and recovering; ongoing logging).</p>
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Activity 4.1 Collect and analyse health, well-being, and livelihood data from 10 villages with forests that are either (i) intact, (ii) logged, or (iii) with ongoing logging.	Not in period.	Collect and analyse data from selected villages
Activity 4.2 Collect and analyse biodiversity data from 10 sites also visited for 4.1.	Not in period.	Collect biodiversity data.
Activity 4.3 Systematic review of efficacy of integrating health services into tropical forest conservation projects worldwide.	Collation of potential sources of case studies started, organisations and individuals contacted	Construct database of evidence (likely c.60 projects) and start synthesis.
<p>Output 5. Capacity has been expanded, and gender balance improved, in PNG environmental and health research (workstream 4).</p>	<p>5.1 By Y3 end, 14 PNG nationals (25% female) are able to carry out biodiversity surveys across multiple taxa and environments, to a scientifically sound standard.</p> <p>5.2 By six-months into Y1, 25 BRC staff and students are able to do first aid techniques which may be required in remote fieldwork settings.</p> <p>5.3 By end of first quarter of Y3, 5 BRC & 1 IMR research staff (all PNG nationals, at least one female) have gained knowledge and skills to acceptable standards in biodiversity survey; conservation project evaluation; ecology; microbiology; evidence synthesis and meta-analysis; rapid anthropological assessments; health research.</p> <p>5.4 By end of first quarter of Y3, 2 PNG nationals (recruited on merit, from an expected 1:1 gender balance of application – see section 15 Gender) will be able to do health/environmental research projects at, respectively, masters and undergraduate level.</p>	<p>New M.Phil. students have decided on their research topics and started; two para-ecologists have benefitted from training and experience in UK and selected destinations en route. Redressing gender balance amongst students and trainees remains challenging; expected 1:1 gender balance amongst applicants for training and M.Phil. positions not realised; few female applicants for scientific positions overall; see report Section 7: <i>Gender equality issues</i>.</p>
Activity 5.1 Train 14 para-ecologists over 3 years in biodiversity survey methods. Total 280 person-days of training.	Ongoing training. 2019: 23 days x 20 participants = 460 person days	Ongoing training. 2020: 18 days x 20 participants planned = 360. 2021: 21 days x 20 participants planned = 420

<p>Activity 5.2 Train 25 BRC staff and students in 'Wilderness First Aid - Advanced'. Two courses at BRC HQ and field sites for a total of 25 BRC staff and students (all PNG nationals, 25% female).</p>	<p>12 BRC staff and students trained in July 2019.</p>	<p>15 to be trained in 2020.</p>
<p>Activity 5.3 Train 5 BRC & 1 IMR research staff in UK. 1-month intensive training in: biodiversity survey; conservation project evaluation; ecology; microbiology; evidence synthesis and meta-analysis; rapid anthropological assessments; health research. Visits to partner institutions.</p>	<p>2 BRC para-ecologists visited UK in Sept-Oct 2019 and received training in biodiversity survey, conservation project monitoring & evaluation, rapid anthropological assessments, health research. Visits to RGB Kew Millennium Seed Bank, and collaborators at Oxford University.</p>	<p>1 BRC staff member (social scientist) to visit UK in autumn 2020 for intensive training. 1 staff member of PNG Institute of Medical Research (IMR) to visit UK in early 2021 for advanced training and development of scientific networking opportunities.</p>
<p>Activity 5.4 Supervision of research projects by 1 MSc student for 2 years and 1 BSc Hons student for 1 year based at the University of PNG.</p>	<p>Research supervision model revised as three M.Phil. projects; 3 students appointed, research foci agreed, study initiated.</p>	<p>Continued supervision of 3 M.Phil. research students.</p>

Annex 2: Project’s full current logframe as presented in the application form (unless changes have been agreed)

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Impact: Improved health status and support for rainforest protection in Wanang, and improved evidence and debate on the interaction between health and conservation in the tropics, reflected in PNG government policy. (Max 30 words)</p>			
<p>Outcome: (Max 30 words)</p> <p>Enhanced human health resulting from health service provision promotes improved knowledge, awareness and positive attitudes towards rainforest conservation and facilitates enhanced biodiversity protection in PNG’s remote and vulnerable village communities.</p>	<p>0.1 Improved community and individual health status by Y3 end measured against SDG and other health targets, and improved ability to provide first aid and emergency evacuation, in the ten communities (Wanang + 9 others) that have accessed the health post.</p> <p>0.2 Protected areas expanded and enhanced for biodiversity by end of year 3, through: (i) increase of 1,000 ha to the core no-impact zone of the Wanang Conservation Area (WCA); (ii) buffer zones of 3,000 ha bordering WCA of selectively logged forests created by neighbouring communities; (iii) declaration of two new conservation areas, totalling 900ha, thus increasing total protected area by 10%. People in protected area communities show more positive attitudes towards forest conservation by the Y3 end, compared to baseline, as a result of health intervention.</p> <p>0.3 School pupils and village residents have improved understanding and attitudes towards the health and wellbeing benefits of forest conservation in: (i) Wanang school (250 pupils, by Y1 end), (ii) 5 villages in BRC’s schools network (750 pupils, by Y2 end), and (iii) BRC’s partner communities (5,000 pupils, by Y3 end).</p> <p>0.4 Improved understanding by project end of the interlinkages between biodiversity and human health, well-being, and livelihoods in PNG rainforests, and the efficacy of combined tropical forest conservation and</p>	<p>0.1 Data detailing health services provided compared to previously accessible services; clinical data from returning individuals; focus groups and interviews before and after health service provision (clinical individual primary care assessments, interviews with key respondents)</p> <p>0.2 Written approval by the WCA Conservation Board of enhanced no-impact zone. Conservation agreements with landowners in the villages neighbouring WCA regarding buffer zones and new conservation areas. Results of biodiversity surveys. Household survey data, before and after health service provision, on attitudes towards conservation, disaggregated by social group.</p> <p>0.3 Results of attitudinal surveys and knowledge tests.</p> <p>0.4 Database of case studies on interactions between rainforest integrity and human health. Evidence synthesis.</p> <p>0.5 Records and certificates from skills and knowledge tests and assessments.</p>	<p>0.1-0.4 The Wanang community continues to cooperate with our approach and remains committed to forest conservation; Health service provision is accepted and used by the community; A sufficient number of survey participants can be recruited; Community expectations of health service provision and health benefits can be managed; Formal approval is obtained from ethics review committees of University of Sussex and PNG Institute of Medical Research.</p>

	<p>health projects worldwide (through evidence synthesis).</p> <p>0.5 Enhanced national capacity for biodiversity and anthropological survey and research, first aid and health research, by Y3 end, through training of BRC and IMR staff, paraecologists, and students.</p>		
<p>Outputs:</p> <p>1. Community health and health service provision for Wanang and surrounding communities has been improved, managed by a new community committee with equal gender representation (workstream 1).</p>	<p>1.1 By 6 months from project start, 12 WCA community members (25% female) are able to carry out immediate trauma care and evacuation procedures.</p> <p>1.2 By Y1 end, Aid Post built, suitably equipped, staffed, and operational.</p> <p>1.3 By Y1 end, new community health committee is able to manage the aid post, and has equal gender representation.</p> <p>1.4 Setting-adapted SDG health and health service indicators (https://sustainabledevelopment.un.org/sdg3) at in-community level have improved compared to baseline data collected in new WCA buffer zones at project start, or in the 2018 Wanang community health needs assessment (carried out in preparation for this application, in part to determine community health service priorities). Specifically: SDG 3.D.1 health worker density, by beginning of last quarter of Y1 an increase from baseline of 0:2000 to 1:2000 in the target population; SDG 3.B.1 proportion of the [paediatric] target population covered by all vaccines included in their national programme [measles and three doses of DTP-HepB-Hib pentavalent vaccine], has improved from <10% at baseline [Wanang] to 60% of those children across the target population 1-years old in Y3; SDG 3.1.2 proportion of births attended [in-community] by skilled health personnel has improved from 0% at baseline to 60% in Wanang, and at least 20% in buffer zone communities; SDG 3.3.5 number of people requiring</p>	<p>1.1 Post-training skill assessments; audit of records of trauma/evacuation incidents throughout project</p> <p>1.2 Building plans, builders' invoice, completion certificate, photo; equipment inventories at opening and at 3-month intervals; equipment inventories and staff and aid post activity logs reviewed every two months until project end.</p> <p>1.3 Minutes and membership list (disaggregated by sex) of community health committee.</p> <p>1.4 Analysed individual level clinical data from primary care assessments and interviews before and after health intervention: 120 participants at Wanang July 2018 (63% of population of 189 [all ages]), and expected minimum 360 participants (all ages) across buffer zone communities (20% of population, all ages); patient treatment records; aid post staffing records and inventories.</p> <p>1.1-1.4. Manuscript #1 for submission to peer reviewed journal ('The Lancet Planetary Health'). "Clinical and conservation attitudinal changes following introduction of health services into an expanding community-led conservation project in Papua New Guinea" [note this publication also will report findings as given below in 2.4].</p>	<p>1.1 A sufficient number of trained community members remain resident in the community.</p> <p>1.2 Suitably qualified nurse can be recruited and retained for aid post; suitable equipment can be sourced and maintained; access to medical supplies can be maintained.</p> <p>1.3 Wanang community continue to support the principle of the Aid Post and resident nurse.</p>

	<p>interventions against neglected tropical diseases [specifically in this setting mycoses, scabies, yaws] has decreased 50% by Y3 end. By Y3 end, average self-reported current health status has improved at least 1 point along a 5-point scale. Re SDG 3.3.3 malaria, in-community availability of malaria Rapid Diagnostic Test and treatment has improved from 0% baseline availability to 70% availability to all who seek aid.</p> <p>1.5 Long-term health care plan supported by clinical data, targeting vulnerable groups (women, elderly) for WCA and surrounding communities produced by Y3 end.</p>	<p>1.5 Long-term health care plan for Wanang and buffer zone communities</p>	
<p>2. Wanang conservation Area has been upgraded and expanded, with a resultant increase in biodiversity and improved attitudes to conservation in new partner communities (workstream 1)</p>	<p>2.1 By Y1 end, core no-impact conservation area (no hunting, no gardening) in WCA is 2,000 ha (an expansion in area of 100% from 1,000 ha), as a response to the health intervention. New 1,000ha no-impact zone within WCA shows 25% increase in abundance of previously hunted mammal and bird species by project end.</p> <p>2.2 By Y1 end, WCA has two additional primary forest fragments (totalling 900ha, ~10% increase) protected from logging, as a response to the health intervention. By project end, the extra 900ha in two forest fragments will provide protection for an additional average of: (i) 34 individual birds/ha (across all species), based on previous WCA surveys showing a density of 1697 birds/50ha; (ii) 11.5 individuals of each of the ten rarest bird species (those with population densities of 1 individual or less per 50ha, based on surveys of the WCA 50ha plot); (iii) 15 tree species recorded across the combined protected areas, based on established plant species accumulation curves for the WCA.</p> <p>2.3 By Y1 end, an additional 3,000 ha of previously selectively logged forests have been protected from further logging or</p>	<p>2.1 WCA Conservation Board conservation agreement including map with GPS verified boundaries; reports from forest inspections carried out by BRC staff every six-months during project; mammal and bird data from surveys in new no-impact zone.</p> <p>2.2 Conservation agreement with village landowners of two extra forest fragments, including map with GPS verified boundaries; reports from forest inspections carried out by BRC staff every six-months during project; results of bird and plant surveys.</p> <p>2.3 Conservation agreement with landowners in the villages neighbouring WCA, including map with GPS verified boundaries; reports from forest inspections carried out by BRC staff every six-months during project; results from multivariate analysis of changes in plant community composition in buffer zones since conservation agreement.</p> <p>2.4 Database, with analysis, of data from household surveys on attitudes to conservation (disaggregated by sex and age) in each community, prior to</p>	<p>2.1 No hunting / no gardening instruction for new no-impact zone is respected by Wanang community.</p> <p>2.2 Protection of isolated forest fragments can be maintained effectively.</p> <p>2.3 Selectively logged forest can be protected effectively from further adverse impact or disturbance.</p> <p>2.4 Village communities in the new buffer zones are prepared to maintain participation in attitudinal surveys.</p>

	<p>conversion to agriculture, and form a buffer zone around WCA, as a response to the health intervention. Buffer zones show post-selective-logging recovery of vegetation community by project end, measured as a statistically significant shift along a successional trajectory towards the community composition of primary forest.</p> <p>2.4 At Y3 end, buffer zone communities (9 villages: c1800 people, c300 households) outside pre-existing WCA boundary show improved positive community attitudes to conservation compared to baseline, as a response to the health intervention. Specifically, by Y3 end scored household attitudes to conservation show improvement in at least 144 of the 300 total households. (Based on expectation that 60% of total households will have sought medical support from the conservation collaboration by Y3 end, and in 80% of such households this results in improved attitudes to conservation).</p>	<p>health service provision in Y1, and after in Y3 (all c300 households targeted for recruitment).</p> <p>2.4 Manuscript #1 as detailed in means of verification for 1.1-1.3 above.</p>	
<p>3. Knowledge and understanding of the health and well-being benefits of forest conservation amongst school pupils and partner villagers has improved (workstream 2).</p>	<p>3.1 By Y1 end, c260 pupils (35% female) at Wanang school will have improved knowledge and understanding on the health and well-being benefits of forest conservation, compared to baseline pre-educational programme.</p> <p>3.2 By Y2 end, c750 pupils in BRC's established network of 5 village schools will have improved knowledge and understanding on the health and well-being benefits of forest conservation, compared to baseline pre- educational programme.</p> <p>3.3. By Y3 end, c5000 people in BRC partner communities across PNG have improved knowledge and understanding of the health and well-being benefits of forest conservation, compared to baseline pre-educational programme.</p>	<p>3.1 & 3.2 School records of tests before and after educational programme (disaggregated by sex, age and social group).</p> <p>3.3 Records of assessments before and after educational programme (disaggregated by sex, age and social group).</p> <p>3.4 Copy of pre-trialled educational package; minutes of meetings with education stakeholders, including Department of Education.</p>	<p>3.1-3.3 BRC partner communities, and schools beyond Wanang, are prepared to participate in educational programme.</p> <p>3.4 Department of Education remains receptive to idea of national educational package on the health and well-being benefits of forest conservation.</p>

	<p>3.4 In Y3, the Department of Education has a pre-trialled educational package on the health and well-being benefits of forest conservation, which can be rolled out to other communities and incorporated into nationally set school curricula.</p>		
<p>4. New evidence has been produced on the interlinkages between logging, forest conservation, health, well-being, and livelihoods in PNG, and tropical rainforests globally (work stream 3)</p>	<p>4.1 By Y2 end, data collection is complete on the effects of forest status (intact, undergoing logging, or logged) on community health well-being, and livelihoods in 10 villages (3-4 villages in each land use category) in 100,000 hectare logging concession located near WCA. Data will include: (i) individual level data including demographics, social and occupational history, current health status and interventions, past medical history (including reproductive and child survival), present clinical observations (including Gross Development Index [children]), qualitative and quantitative data on subjective wellbeing, monetary income, (ii) community level data, including top-five (community ascribed) health problems, and livelihood benefits of differing forest status, including food sources and security (such as forest-use for swidden agriculture, hunting and harvesting plants), income, use of non-timber forest products; access to health provision (including the politics of access, transport etc.)</p> <p>4.2 By Y3 end, data collection complete on the biodiversity status of the 10 sites (as 4.1). Data will include: abundance and species diversity of plants, birds, and butterflies recorded along fixed 300m transects.</p> <p>4.3 By Y2 end, an evidence synthesis (in line with Collaboration for Environmental Evidence guidelines; reference #10) has been completed on the impacts of integrating health services into tropical forest conservation projects worldwide (based on</p>	<p>4.1 Database on community health and well-being effects of forest status. 4.2 Database on biodiversity effects of forest status. 4.1-4.2 Manuscript #2 for submission to peer reviewed journal ('The Lancet Planetary Health'): What is the impact of logging on health and biodiversity in Papua New Guinea? 4.3 Database of evidence synthesis of published and grey literature. 4.3 Manuscripts #3 and #4 for submission to peer reviewed journal (both 'Environmental Evidence'). "Efficacy of integrating health services into tropical forest conservation projects worldwide: evidence synthesis protocol. An evidence synthesis of the efficacy of integrating health services into tropical forest conservation projects worldwide."</p>	<p>4.1-4.2 Sufficient communities are prepared to, (i) participate in health assessments (clinical examinations, focus groups, key informant's interviews, ethnography), and (ii) allow biodiversity transect counts on their lands. 4.3 Sufficient conservation organisations and other repositories of conservation case studies will co-operate by making internal evaluation documentation available for evidence synthesis.</p>

	our current evidence mapping, expected to be c60 projects).		
5. Capacity has been expanded, and gender balance improved, in PNG environmental and health research (workstream 4).	<p>5.1 By Y3 end, 14 PNG nationals (25% female) are able to carry out biodiversity surveys across multiple taxa and environments, to a scientifically sound standard.</p> <p>5.2 By six-months into Y1, 25 BRC staff and students are able to do first aid techniques which may be required in remote fieldwork settings.</p> <p>5.3 By end of first quarter of Y3, 5 BRC & 1 IMR research staff (all PNG nationals, at least one female) have gained knowledge and skills to acceptable standards in biodiversity survey; conservation project evaluation; ecology; microbiology; evidence synthesis and meta-analysis; rapid anthropological assessments; health research.</p> <p>5.4 By end of first quarter of Y3, 2 PNG nationals (recruited on merit, from an expected 1:1 gender balance of application – see section 15 Gender) will be able to do health/environmental research projects at, respectively, masters and undergraduate level.</p>	<p>4.1 Participant training logs, periodic learning assessments/tests, and certifications.</p> <p>4.2; 4.3 Training records; skill and knowledge assessments; certification for participants</p> <p>4.4 MSc and BSc Hons theses; graduation certificates</p>	<p>4.1-4.4 A sufficient number of para-ecologists and BRC/IMR staff are interested in developing and broadening their skills base; suitable MSc and BSc Hons candidates can be recruited.</p>

Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)

Output 1. Community health and health service provision for Wanang and surrounding communities has been improved, managed by a new community committee with equal gender representation (workstream 1).

1.1 Collect and analyse qualitative and quantitative health and wellbeing data before and after the health intervention. Baseline data for the community at Wanang has already been collected through a combined clinical and Rapid anthropological Assessment Procedure (RAP) carried out by team members in July 2018 in preparation for stage 2 of this application. Following the same protocol (available on request and due to be submitted in Jan 2019 to 'BMJ Open' for publication), data will be collected in the buffer zone communities at baseline, and towards project end (alongside Wanang). Multidisciplinary teams will do individual clinical assessments (available to all, expectation based on field experience is over 50% will request), structured interviews with key informants (4-6 per community: clan leaders, ward councillors, traditional healers), ethnography, and focus groups (8-12 people in each focus group, 4 groups in each community carried out separately with young females, older females, young males, older males).

1.2 Train Wanang community members in immediate trauma care and evacuation procedures. WCA community members (25% female) receive training over 5 days in immediate trauma care and evacuation procedure (total 60 person-days of training). Training will largely follow standard Wilderness First Aid-Advanced syllabus (as

developed by American Academy of Orthopaedic Surgeons and Wilderness Medical Society), tailored to fit learner requirements and specific needs of community as identified in 2018 health needs assessment (see 1.1 above).

1.3 Trained Wanang community members respond to trauma and evacuation incidents as required. Reports of incidents audited throughout, with appropriate add-on/refresher training provided as required.

1.4 Construct Aid Post, equip it, stock it with medicine, and recruit a nurse. Stock in line with PNG Health Extension Officer base supplies, with the addition of specific medicines and equipment required as identified in the 2018 community health needs assessment (for example: treatments for neglected tropical skin diseases, a bed for supervised births [if expected to be uncomplicated], malaria rapid tests and treatments, sexual and reproductive health supplies).

1.5 Establish and train community health committee. Carry out training adapted from the good practice guide developed by colleagues at London of School of Hygiene and Tropical Medicine who have advised on this aspect, specifically re their projects on community mobilisation to improve the health of mothers and babies.

1.6 Nurse staffed Aid Post receives and treats patients, maintains patient records. Provides range of services including emergency treatment to all who seek it at aid post (irrelevant of community background), and diagnosis, treatment, and referrals for routine and chronic clinical presentations for the target population (2000 people).

1.7 Produce long-term healthcare plan. Developed jointly by community health committee and medical partners, report will provide planning basis of long term care when aid post support is transferred from funded project to local health authority at Y3 end (as already discussed with them).

Output 2. Wanang conservation Area has been upgraded and expanded with improved attitudes to conservation in new partner communities (workstream 1)

2.1 Establish new 1,000ha no-impact core conservation area (no hunting, no gardening), map with GPS verified boundaries, and declare in operation by WCA.

2.2 Carry out mammal and bird surveys of new no-impact zone.

2.3 Establish two additional primary forest fragments (c900ha total), map with GPS verified boundaries, and declare in operation by WCA.

2.4 Carry out plant and bird surveys of the two additional primary forest fragments. Our previous comprehensive bird survey of WCA recorded a density of 1,697 individuals per 50ha across 93 species, ten species of which have densities of one individual/50ha or less (amounting to <200 individuals across the entire 10,000ha area of WCA). The proposed extra 900ha of primary forest would be expected to protect an extra c.30,500 individual birds (across all species) and an average of 11.5 individuals of each of the ten rarest species: Cinnamon Ground dove (*Gallicolumba rufigula*), Long-tailed Honey buzzard (*Henicopernis longicauda*), Streak-headed Mannikin (*Lonchura tristissima*), Rainbow Bee-eater (*Merops ornatus*), Little Pied Cormorant (*Microcarbo melanoleucos*), Papuan Boobook (*Ninox theomacha*), Marbled Frogmouth (*Podargus ocellatus*), Channel-billed Cuckoo (*Scythrops novaehollandiae*), Grey Crow (*Corvus tristis*) and Rufous Monarch (*Symposiachrus rubiensis*). Plant species accumulation curves for the WCA indicate that an extra 900ha would be expected to generate an additional 15 tree species recorded within the combined protected areas.

2.5 Establish buffer zones of 3,000ha of selectively logged forests with indigenous landowners, map with GPS verified boundaries, and declare in operation by WCA.

2.6 Record and analyse vegetation community composition yearly in the two buffer zones (based on species composition of all trees ≥ 5 cm DBH in ten randomly-located permanent 20x20m plots in each buffer zone, repeat sampled in each of 3 years), followed by multivariate analysis of community composition change over the 3 years.

2.7 BRC staff carry out forest inspections every six months of new no-impact conservation area, two additional primary forest fragments, and 3,000ha buffer zone forests.

2.8 Collect and analyse household survey data on attitudes to conservation in buffer zone communities outside pre-existing WCA boundary and agreements, before and after health intervention.

Output 3. Knowledge and understanding of the health and well-being benefits of forest conservation amongst school pupils and partner villagers has improved (workstream 2).

- 3.1 Produce curriculum and materials for school and community level educational programmes on health and well-being benefits of forest conservation.
- 3.2 Provide educational programme in Wanang School (c250 pupils, 35% female), making any necessary improvements to programme following delivery.
- 3.3 Provide educational programme in BRC network of 5 village schools (c750 pupils, not in the new buffer zone), making any final necessary improvements to programme following delivery.
- 3.4 Provide educational programme in BRC partner communities across PNG (c5000 pupils), making any necessary improvements to programme following delivery.
- 3.5 Hold meetings with educational stakeholders, including Department of Education, to arrange incorporation of educational package into educational plans nationally.
- 3.6 Provide pre-trialled educational packages to PNG Department of Education for further roll-out beyond project, and distribute editable version of package throughout international partners in the Planetary Health Alliance primary/secondary education working group.

Output 4. New evidence has been produced on the interlinkages between logging, forest conservation, and human health & well-being in PNG, and tropical rainforests globally (work stream 3)

- 4.1 Collect and analyse health, well-being, and livelihood data from 10 villages with forests that are either (i) intact, (ii) logged, or (iii) with ongoing logging. Collect health related data by carrying out combined clinical and Rapid anthropological Assessments Procedures (RAP, further methodological detail in 1.1 above). Use focus groups, structured interviews, and ethnography to collect qualitative and quantitative data on subjective wellbeing, and livelihood benefits of differing forest status, including food sources and security (such as forest-use for swidden agriculture, hunting and harvesting plants), income, use of non-timber forest products, etc.
- 4.2 Collect and analyse biodiversity data from 10 sites also visited for 4.1. Abundance and species diversity of plants, birds, and butterflies recorded from fixed 300m transects visited at each site four times (twice in wet season, twice in dry).
- 4.3 Carry out systematic review of efficacy of integrating health services into tropical forest conservation projects worldwide. Based on our current evidence mapping exercise, expected to be c60 projects.

Output 5. Capacity has been expanded, and gender balance improved, in PNG environmental and health research (workstream 4)

- 5.1 Train 14 para-ecologists over 3 years in biodiversity survey methods. Total 280 person-days of training. The training includes instruction by PhD level researchers on study design, sampling methods, specimens processing, identification and ecological data analysis and report/manuscript writing for focal plant, insect and vertebrate taxa focused on rainforest ecosystems.
- 5.2 Train 25 BRC staff and students in 'Wilderness First Aid - Advanced'. Two courses at BRC HQ and field sites for a total of 25 BRC staff and students (all PNG nationals, 25% female). These courses will give BRC staff and students working in remote settings the skills and knowledge to help each other in many potential fieldwork emergencies, and evacuate colleagues to outside care. Total 125 person-days of training.
- 5.3 Train 5 BRC & 1 IMR research staff in UK. 1-month intensive training in: biodiversity survey; conservation project evaluation; ecology; microbiology; evidence synthesis and meta-analysis; rapid anthropological assessments; health research. Visits to partner institutions.
- 5.4 Supervise research projects by 1 MSc student for 2 years and 1 BSc Hons student for 1 year based at the University of PNG. The student positions will be advertised nationwide and students selected on merit. They will be resident at BRC to conduct their dissertation research under joint supervision of DI project team and university-based supervisors. The dissertation research will be defined based on the students' strengths and professional interests to contribute to Outputs 2, 3 or 4.

Annex 3: Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Gender of people (if relevant)	Nationality of people (if relevant)	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
2	M.Phil.	3M	PNG					3
3	Wilderness First Aid	9M, 3F	PNG	12				25
5	Ongoing training (M.Phil.)	3M	PNG					3
6A	Ecology / botany / zoology field course	14M, 6F	PNG	20				60
6B	Ecology / botany / zoology field course	14M, 6F	PNG	3				9
11A & 11B	Sustainability Science; BMJ Open			2				6
14B	Planetary Health Alliance conference							1
20	Aid Post building							
21	Community Health Committee	3M, 3F	PNG	1				1
22	Buffer zones (2) permanent vegetation succession plots							6
23	Match funding							

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.	Yes
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.	No
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.	Yes
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.	No
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	No *
Do not include claim forms or other communications with this report.	

* By agreement with LTS Darwin Finance on 13.7.20, the Project Expenditure table will be forwarded by the end of August 2020.