



## 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: 30<sup>th</sup> April 2019**

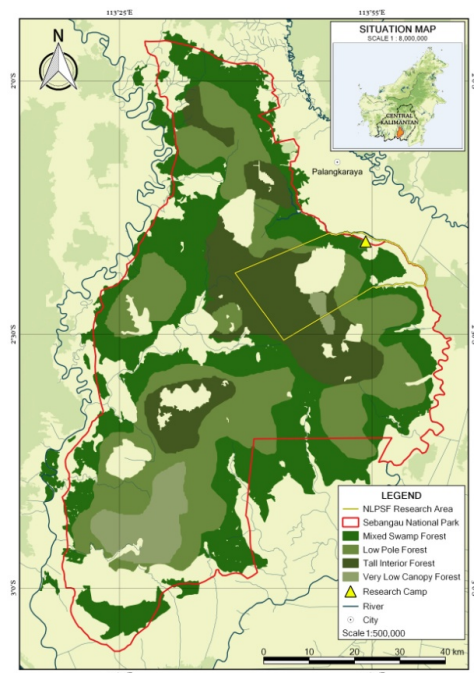
### Darwin Project Information

Project reference	25-001
Project title	Preventing Borneo's peatland fires to protect health, livelihoods and biodiversity.
Host country/ies	Indonesia
Lead organisation	University of Exeter
Partner institution(s)	Borneo Nature Foundation
Darwin grant value	£ 349.329
Start/end dates of project	1 <sup>st</sup> July 2018 – 31 <sup>st</sup> March 2021
Reporting period (e.g., Apr 2018 – Mar 2019) and number (e.g., Annual Report 1, 2, 3)	Jul 2018 – Mar 2019; Annual Report 1
Project Leader name	Dr Frank Van Veen
Project website/blog/Twitter	<a href="#">BNF Website</a> ; <a href="#">BNF Facebook</a> ; <a href="#">BNF Twitter</a>
Report author(s) and date	Bernat Ripoll Capilla, Helen Morrogh-Bernard, Frank van Veen April 2019

## 1. Project rationale

The 600,000 ha Sebangau National Park is the largest lowland rainforest remaining in Borneo, with globally important populations of many endangered species and numerous social and economic functions for local communities. The main threat to this forest is Indonesia's worsening annual peatland fire crisis. In their natural state, peat-swamp forests are permanently waterlogged and fire resistant. Drainage channels dug illegally in the past to remove timber and to develop plantations dry out the peat, leading to annual dry season forest fires which increase during El Niño drought years.

The peatland fire crisis requires major interventions at all levels, from national policy down to local in situ actions. BNF aims to address the root causes of fires in Sebangau including those that are driven by poverty (illegal logging, illegal burning) and those that impact on poverty (local fire-prevention capacity, health impacts), with the long-term aim to develop an integrated, community-based fire-prevention model for this region.



## 2. Project partnerships

Exeter University and BNF have developed over the last 4 years a strong and successful partnership, including scientific collaborations, capacity building activities and developing joint conservation initiatives. All project activities during 2018 have been conducted in close collaboration with the lead institution (Exeter University) and local institutions in Central Kalimantan, Indonesia: the development and the formalisation of these partnerships have been vital for enabling us to support the locally-led research, conservation management and community socialisation activities described in this report.

During 2018 BNF has developed and formed new partnerships with local institutions in Central Kalimantan to achieve the objectives proposed and ensure that the listed outputs will be accomplished. An extended and detailed stakeholder analysis enabled us to identify and define the role and function that each of the stakeholders play into this project. Twenty seven (27) Indonesian stakeholders were identified and mapped, looking at the current and desired level of engagement, their influence, motivation and expectation of change according to the project objectives. During this first year we (together with the key stakeholders) have invested a substantial amount of time and energy into defining its stakeholder participation strategy and working with the relevant groups and institutions that need to be informed, consulted and involved on the different stages of the project implementation. From the 27 stakeholders, we identified 9 that should be established as project partners, with 6 of them being involved on the implementation and monitoring and evaluation stages; these are: Sebangau National Park, CIMTROP-UPR, community fire-fighting teams, Central Kalimantan Disaster Management Agency, local schools and community nurseries/women's groups.

During 2018 we engaged with all the key stakeholders, especially the 13 listed in the *identification, planning and implementation* stages of the stakeholder analysis. Memorandums of understanding and collaboration agreements have been developed by BNF and established with academic/research institutions (University of Palangkaraya, CIMTROP, UPT-KHDTK Tumbang Nusa), community groups (fire-fighting teams, woman's groups, community nurseries, local schools, etc) and governmental agencies, including the Department for Conservation of Natural Resources (BKSDA), Sebangau National Park (BTNS) and the Central Kalimantan Disaster Management Agency (PBPPK).

## 3. Project progress

### 3.1 Progress in carrying out project Activities

**Output 1.** Ex-illegal logging canals blocked and areas burned in the 2015 fires replanted in the Sebangau National Park to re-wet the swamp thus reducing fire risk, prevent further forest losses and reverse fire damage.

*Activity 1.1 Canals surveyed beforehand to identify priority locations for blocking using dams and develop dam building schedule in each target canal.*

Following several coordination meetings with local stakeholders and conservation organisations in order to identify priority areas and align conservation initiatives; BNF surveyed and identified eight large canals which required damming (>1 km long; >2 m wide) in the southern part of the target area. Canal mapping took place during two 10-day expeditions (involving CIMTROP Patrol Team and community members) on the Sebangau River and the remote Bakong River. Each of the eight canals have been mapped and measured, with hydrology baseline data collected and dam construction locations planned.

*Activity 1.2 Seedlings grown in the in-situ Sebangau nursery transplanted into burnt peatland areas of the Sebangau National Park.*

The Reforestation team has been collecting and growing seedlings in the permanent nursery located in the Sebangau research camp; trees grown in the seedling nursery are used to test and trial reforestation techniques for different species under different conditions. During 2018 we have increased the tree stock and developed a new reforestation strategy for the 2015-burned area with the aim to scale up the project using the community nurseries concept. A total of 1,558 trees have been collected/germinated for experimental tests, targeting 4 species (*Shorea balangeran*, *Pittosporum sp.*, *Elaeocarpus acmocarpos* and *Syzygium sp.*) which have high potential for restoration in disturbed areas. During 2018 the team has monitored our experimental and permanent plots. The ongoing experimental design for the organic

polybag (bakul) project revealed promising results in the burned area (survival after 1 year was 97% with the organic polybag, vs 87% with a regular polybag). This pilot project set up in 2016 aimed to bridge the need for innovative techniques to reduce post-planting mortality rates, with the aim of empowering local communities in conservation activities and green economy development.

*Activity 1.3 Establishment of community nurseries in villages adjacent to the National Park, initially established through connections with fire-fighting teams and their families.*

During 2018 the Conservation team established the foundations for the implementation of the community nurseries concept in the 2 target villages (Kereng Bangkirai and Sabaru); holding 10 socialisation/training sessions with a total of 67 attendees, including community members and fire-fighting team representatives and other local stakeholders. These sessions included initial socialisation, presentations about community nurseries and management system, defining the contractual agreements, forming community teams, visiting and preparing lands for seedling nursery construction and presenting training sessions schedule. The community members had a really positive response towards this conservation initiative and so far 5 community nursery groups have been established (2 in Kereng Bangkirai and 3 in Sabaru village), involving a total of 38 families.

The community nurseries concept agreed with the local community members includes an integrated multipurpose permaculture approach, including growing trees for reforestation, planting crops for agricultural purposes and developing fish-ponds in the future to complement community income.

**Output 2.** Improved local fire-fighting capacity for rapid response to peatland fires in Sebangau NP and Palangkaraya district.

*Activity 2.1 New community fire-fighting teams will be created through recruiting team members during socialisation events in the local villages, which will also be used to promote the importance of peat rewetting and revegetation in preventing fire to the community.*

During this first year we started strategic discussions with key stakeholders, community members and governmental agencies in order to identify the priority areas/villages where the fire-fighting teams will be established. It has been agreed with the University of Palangkaraya and the Center for International Cooperation in Sustainable Management of Tropical Peatland (CIMTROP) that a fire-fighting team will be created by enhancing the current CIMTROP Patrol Team (7 members), which is responsible for protecting the northern Sebangau region including the primary Sebangau Research Area. The CIMTROP Patrol and fire-fighting team will grow with 6-8 new members and the fire-fighting coordinator will receive integrated fire-management training and will be fully equipped with fire-fighting equipment.

*Activity 2.2 Fire-fighting team members will be provided with cameras, GPS units, logbook and laptop to facilitate accurate patrolling and fire-fighting records, with the potential for implementing SMART monitoring systems investigated.*

The new CIMTROP Patrol and fire-fighting team has been provided with 3 GPS units and cameras in order to improve their monthly patrol reporting. The fire-fighting equipment needs have been identified, listed, purchased and will be handed to the team during the integrated fire-management training sessions.

*Activity 2.3 A network of fire-fighting teams created at an initial multi-stakeholder workshop, to which all community fire-fighting teams, including those affiliated to this project will be invited to join the network and introduced to each other, recognising these teams as the front-line of the fire-fighting response.*

During the 2018 fire-fighting season, BNF together with the Central Kalimantan Disaster Management Agency (BPBPK) and the local police started an effective coordination and cooperation system with the Community fire-fighting teams established by BNF back in 2017. These coordinated fire-fighting activities, involving different stakeholders, will be strengthened during the fire-fighting multi-stakeholder workshop to be implemented before the arrival of the 2019 dry season.

*Activity 2.4 Fire-fighting teams will conduct regular patrols (min. 15 days/month) in the forest and along waterways to check for fire hotspots and prevent illegal activities, meet with forest users in their homes and coordinate with local authorities as necessary.*

The CIMTROP Patrol Team has been conducting regular patrols on a monthly basis, with an average of 24 patrols a month, following both upstream and downstream routes of Sebangau River. The team registered and reported the illegal activities encountered to the relevant authorities and intervened when needed. Few illegal activities were reported during the past 9 months, as local communities reduce their dependence on forest resources, however, the underlying threat of forest fires remains. Community socialisation activities are especially relevant to overcome these threats, by increasing environmental awareness and the community's engagement into conservation.

The two existing community fire-fighting teams from Kereng and Sabaru villages carried out scheduled patrols within the working areas on a daily basis during the 2018 dry-season. Each fire detected was quickly suppressed thanks to the integrated fire-fighting activities, led by the Central Kalimantan Disaster Management Agency (BPBPK) and supported by the BNF community fire-fighting teams, local police and forestry department.

**Output 3.** Local community adopt more "peat-friendly" farming and fishing practices that avoid peat drainage and use of fire; and families better understand how to mitigate the harmful effects of fire.

*Activity 3.1 Fact-finding research with local fishing and farming groups to identify current practices, including use of fire and peat drainage.*

From December 2018 fish surveys have been completed monthly by local fishermen in the Sebangau River. A total of 3 trap-nights per month, using 10 traps; Total of 120 trap nights, December 2018-March 2019.

A total of 301 fish (average of 11 species per month) have been caught. Complementary environmental data including pH, water turbidity, river depth and water temperature was collected and compared against previous base line data (2014-2015).

*Activity 3.2 Bespoke education sessions conducted in schools, clubs, community forums, and fishing and farmers cooperatives to raise awareness of the impacts of peat drainage and fire use, of potential alternatives and the impacts of behaviour change.*

Our education and outreach activities in the two Sebangau villages and Palangkaraya city during this first year have been a great success. The BNF Education and Outreach teams continued implementing the regular activities with the Children of Sebangau (*Anak Sebangau*) group from Kereng Bangkirai village, and also integrated Environmental Education modules into the curriculum of local schools and provided the opportunity to visit the Sebangau research site to local and international schools.

A series of yearly events led by the Education and Outreach teams contributed towards our goal of raising awareness of the impacts of peat drainage and fire use amongst community members, students and general public. Events we organised during 2018 included (total attendance and location in brackets): International Gibbon day (100 children; Palangkaraya city), the Orangutan day (250 people; Kereng village), Indonesian Primate Day (30 children; Kereng village), International Day of Women in Science (40 students; Secondary school Palangkaraya), Earth Day (74 people; Palangkaraya city), World Wetlands Day (75 University of Palangkaraya students), International Day of Forestry (75 University of Palangkaraya Students), Indigenous Festival (150 people; Palangkaraya).

The Education team also organised 2 youth festivals in order to engage and inspire young generations into conservation: the Sebangau Kids Festival (200 children; Kereng village) and the Borneo Initiatives Youth Camp (50 local and International Secondary school students)

The first year of this project has been a successful and inspiring year for the BNF Education Team; the team expanded, the activities and its direct impacts increased above our targets, and we received a positive response and support from the local schools and community members.

**Output 4.** Foundations established to create a long-term legacy for fire prevention and mitigation in and around the Sebangau National Park.

*Activity 4.1 Multi-stakeholder workshops in years 2 and 3 to discuss and agree on effective and realisable long-term strategies for peatland restoration and fire prevention in the Sebangau National Park.*

Output listed for the 2<sup>nd</sup> and 3<sup>rd</sup> year of this project. BNF is currently developing planning for the multi-stakeholder fire-fighting workshop.

*Activity 4.2 Training of National Park staff through 3 workshops conducted during years 2 and 3.*

Output listed for the 2<sup>nd</sup> and 3<sup>rd</sup> year of this project. During this first year BNF has been working and enhancing the partnership with the Sebangau National Park by implementing an effective coordination and communication system for all research, conservation and outreach initiatives. A new Memorandum of Understanding has been drafted and currently under review.

*Activity 4.3 Coordination with the Sebangau National Park, Environment Agency (DLH), the Disaster Management Agency (BNPB) and Peat Restoration Agency (BRG) to ensure alignment of restoration and fire-fighting activities in the National Park with these agencies' strategies, effective coordination of efforts and data/information sharing.*

During this first year, BNF led more than 30 coordination meetings/events, 2 fire-fighting workshops and 1 large multi-stakeholder conservation workshop. BNF effectively coordinated with Governmental agencies, local universities, NGO's and other key organisations in order to ensure the alignment of the conservation, education and outreach initiatives planned. This included activities coordination and data-sharing meetings with Sebangau National Park, WWF, USAID Lestari, Palangkaraya Disaster Management Agency, Central Kalimantan Environmental Agency, Department for Conservation of Natural Resources (BKSDA), the Central Kalimantan Disaster Management Agency (PBPPK), ICCTF (Indonesia Climate Change Trust Fund), KHDTK Tumbang Nusa, the Disaster and Risk-Reduction Forum, Peat Restoration Agency (BRG), the Ministry of Research and Technology and the Ministry of Environment and Forestry.

### **3.2 Progress towards project Outputs**

**Output 1.** Ex-illegal logging canals blocked and areas burned in the 2015 fires replanted in the Sebangau National Park to re-wet the swamp thus reducing fire risk, prevent further forest losses and reverse fire damage.

*Number of canals closed increased to 24 (baseline 10) and up to 200 new dams built by end yr 3*

During this first year, the hydrology restoration and dam building team have produced a damming and hydrology monitoring strategy design for the next two years. The team has identified a total of 24 critical canals in the northern side of Sebangau National Park. Ten of them (baseline) were dammed before 2018 and seven have been monitored on a monthly basis (ground water-table, water flow and up/downstream water levels). In 2018, before the arrival of the wet season during which time the forest is naturally flooded (making dam-building difficult), 15 new dams were built in two canals and another eight canals have been mapped. In each of these eight canals, 20 dams will be built during the upcoming dry season. No change to indicators.

*1.1 Reduction in water flow-rates and discharge rates (by up to 500%) within canals, and slowing of dry season water-table drawdown (>10 cm in each dammed canal in comparison to pre-dammed state and control studies.*

Baseline hydrology data from BNF's long-running hydrology monitoring indicates a mean water discharge rate along undammed canals of 0.15 m<sup>3</sup>/s and a mean dry season ground water table (GWT) of 40 cm below the surface adjacent to undammed canals. During the first year of hydrology monitoring under this project, the equivalent mean annual values for canals dammed by BNF are a water discharge rate of 0.02 m<sup>3</sup>/s and a GWT of 13.5 cm below the surface. Both values indicate a substantial slowing of water discharge in dammed canals and consequent increase in GWT, resulting in a wetter peat substrate.

Pre-damming data have been collected on seven of the new mapped canals in the Bakong area, including canal size, water body size and water discharge.

After two years of monthly hydrology monitoring as a control canal, the damming process started in Canal Ruslan. Four dams were built in November 2018, although this process was delayed by early seasonal flooding. At this early stage the post-damming values for water discharge rates were 6% slower than in previous years in the same time period 0.06 m<sup>3</sup>/s vs. 0.05 m<sup>3</sup>/s, and GWT was 3 cm higher. However the crucial period for comparing these indicators will be the dry season (June-October) when water drawdown is at its highest and peat re-wetting is most essential.

It is important to note that year-to-year comparisons are also subject to fluctuations in rainfall, and thus inter- and intra-annual fluctuations are expected due to seasonality and the appearance and strength of El Niño/La Niña events, and thus will be taken into account when looking at trends in our monitoring indicators.

### *1.2 50,000 seedlings planted / over 150 ha of previously burnt forest. Average of 80% survival rates for different species / planting conditions identified*

The community nurseries are still in their early stages and the tree stock for replanting are in the process of being grown, ready for large-scale planting in the burned area during in 2019 and 2020. Meanwhile monitoring of our long-term pilot plots has continued in Sebangau, by measuring and recording the condition of the 3,500 young trees planted in 16 reforestation plots sited in the marginal sedge swamp and disturbed forest areas. This monitoring helps us to better understand the possibilities and barriers to long-term recovery of the peat-swamp forest ecosystem, and the level of assistance required. The post planting figures in the 2015 burned area - the targeted reforestation area for this project – show an average survival rate for the four target species of 96%, a highly encouraging demonstration of the effectiveness of implemented reforestation plan. Survival and growth rates for planted trees will be used as a performance indicator. No change to indicators.

### *1.3 Forty (40) families involved in 8 community nurseries. 5 community nurseries operational by end yr 2 and 3 community nurseries established by end yr 3. Twenty (20) women working in Community groups crafting organic-bags/pots to plant seedlings for reforestation purposes.*

By the end of year 1, five community nurseries are operational with 38 families involved, 3 in Sabaru village and 2 in Kereng village. We are very pleased with this achievement which is ahead of our scheduled targets, and very pleased by the community response to this initiative.

A total of 19 women are working in 2 community groups crafting organic bags/pots for reforestation purposes, to date a total of 3,000 organic bags have been produced by these groups. Women's participation and empowerment in conservation initiatives is an integral part for the success of this project.

The number of participants and a post-implementation assessment (including socio-economic, attitude/behaviour and awareness changes) will be used as indicators to quantify the impact of this livelihood project.

## **Output 2.** Improved local fire-fighting capacity for rapid response to peatland fires in Sebangau NP and Palangkaraya district.

### *2.1 Four community fire-fighting teams operational (current baseline = two); up to 20 local people recruited and two training sessions / yr held in peat-fire extinguishing methods and use of equipment.*

Two community fire-fighting teams were fully operational during 2018, with a total of 48 people involved on fire-fighting and patrolling activities. A new, enhanced fire-fighting team will be established before the 2019 dry season by building upon the current CIMTROP Patrol Team structure (currently 7 members); several discussions and meetings have been held with CIMTROP in order to define the nature and structure of this fire-fighting team during which it was agreed that 7 new community members will join the team. At least 2 Integrated Fire Management training sessions will be conducted by the Central Kalimantan Disaster Management Agency in 2019. The fire-fighting equipment has been purchased and will be distributed in the next few months.

During this first year, BNF led two small fire-fighting capacity building workshops, involving community fire-fighting teams and researchers; focusing on drone technology as a complementary tool for fire-fighting and monitoring activities. The first workshop *Developing Local Capacity for Using Heat Sensors on Drones to Detect and Monitor Peat Fires* (17<sup>th</sup> of July 2018) was co-organised by BNF and Liverpool John Moores

University (LJMU) and hosted by the University of Palangkaraya and CIMTROP; the total attendance was 42 people (38 men and 4 women). The second capacity building workshop; *Introduction of fire detection systems* (22<sup>nd</sup> of January 2019) was led by BNF in collaboration with LJMU and hosted by CIMTROP; 22 people attended including senior members of the community fire-fighting teams, governmental officials from relevant agencies (BPBPK, BKSDA, DisHut, etc) and local researchers from the University of Palangkaraya. No change to indicators.

### *Fire-response teams effectively mobilised during each dry season*

To achieve this output, BNF provided financial and technical support for the operational costs to the two existing community fire teams in two sub-districts, Sabaru and Kereng Bangkirai, involving 25 people in each village. The community fire-fighting teams (*Masyarakat Peduli Api : MPA*) carried out scheduled patrols within the working areas on a daily basis, monitoring fire-prone areas, especially vacant land and recently-burned areas. Land patrol activities were carried out by 4 to 5 MPA personnel driving a three-wheel motorbike, carrying portable water pumps, hoses and other necessary equipment; in addition to routine patrols, these teams were immediately informed if a hotspot or fire was detected, in order to take the machinery where it is needed.

The records of number and percentage of known fires (established through direct reports to TSA teams, river patrol, drone and MODIS hotspot monitoring) and the length of time between report receipt and response launch, have been established as performance indicators; although historical baseline data can't be used against this indicator as the community fire-fighting teams were established in 2017, and we also recognise that there is wide variation in length of response time owing to personal team members circumstances. We will use the records of number of known fires as a proxy indicator, by creating a Fire response index: number of fires suppressed by Community members divided by the total number of fires detected/alerts by MODIS during the same time period.

Fire-response index (August-October 2018): 47 fire interventions/30 Fire alerts detected= 1.4 (\*)

(\*) The number of alerts detected is lower than the interventions; this is probably due to small/ localised hotspots not detected by MODIS satellite.

### *2.2 100% of identified fires attended and extinguished in target areas*

During the 2018 dry season, from June to October 2018, a total of 30 fire alerts were detected by MODIS satellites in the designated area of the southern Sebangau sub-district [Data source: imagery from the Land, Atmosphere Near real-time Capability for EOS (LANCE) system operated by NASA's Earth Science Data and Information System (ESDIS)].

Although 2018 had an unusual extended dry season with several fire events in late September and October, only a few fires were detected in the Sebangau region. Most of these fires mainly affected the ex-Mega Rice Project area immediately to the east of Sebangau, where two decades ago in 1996, one million hectares of peatlands were drained for agricultural purposes. The area was abandoned and despite all conservation efforts since, it still represents one of the major drivers for carbon emissions in Indonesia and a major conservation challenge to overcome. Owing to the efforts of the fire-fighting teams the Sebangau peat-swamp forest remained safe, with hotspots in forest and scrubland quickly detected and suppressed thanks to the integrated fire-fighting activities, of the BNF community fire-fighting teams in partnership with the Central Kalimantan Disaster Management Agency, local police and the Central Kalimantan Forestry Department.

During August and September 2018, the community fire-fighting teams worked on 47 fire-interventions (24 in Kereng Bangkirai and 23 in Sabaru village surroundings). 100% of the fires were extinguished with a quantified impact of 131.7 ha of land burned (all of this land had previously cleared/burned so it does not impact on forest loss).

### *2.3 Network of community fire-fighting teams established and coordinating with government agencies in Palangkaraya district and with each other with two multi-stakeholder workshops held in yr 2 and 3*

This output is targeted to be achieved during the 2<sup>nd</sup> and 3<sup>rd</sup> year of this project. BNF and the two existing community fire-fighting teams are already coordinating activities and initiatives with the Disaster Management Agency and the National Park authorities. This effective coordination will lead towards the

establishment of an integrated network of fire-fighting teams in the area. BNF and the Central Kalimantan Disaster Management Agency are planning a multi-stakeholder workshop to be held before the beginning of the 2019 dry season with the objective of enhancing the regional fire-fighting prevention, coordination and response capacity.

**Output 3.** Local community adopt more “peat-friendly” farming and fishing practices that avoid peat drainage and use of fire; and families better understand how to mitigate the harmful effects of fire.

*3.1 240 education modules/sessions held with 20 schools, 3 community forums and special interest groups (fishermen; farmers cooperatives), including three large-scale forums per year with aim to reach 90% of people in these target groups by end yr 3.*

During this first year a total of 72 formal environmental education modules have been held with 8 local schools; each school benefits from 9 environmental education modules (1 session/week for 2 months) and one field trip to Sebangau Forest. On top of the formal modules, the BNF Education team visited a total of 17 schools presenting the Gibbon Goes to School project - a story telling/puppet show created by BNF - reaching a total of 1,396 children.

The Conservation and Community Development teams are currently engaging with local fishermen and farmer’s cooperatives from Kereng Bangkirai and Sabaru villages in order to discuss their conservation concerns, establish their priority needs and later on in 2019 and 2020 implement conservation forums.

*3.2 1,000 people reached with education and awareness activities by end yr 3.*

From April 2018 until March 2019 a total of 1,912 children were reached by the BNF Education team; including formal, non-formal activities and yearly festivals; approximately 57% were girls and 42% boys. 138 teachers and 723 parents participated in the BNF education activities.

*3.3 Number of people demonstrating positive response to these activities (70% increase in knowledge / awareness on environmental issues)*

Since the beginning of 2018 the BNF education team carried out evaluation assessments both pre- and post-teaching in order to quantify the impact of the BNF environmental education programme, including knowledge increase, behaviour and attitude changes towards environmental/conservation practices. These assessments were implemented in each participating school, and 103 children (54 boys and 47 girls; 82% of participating children) completed the impact and behaviour change assessment. Our results show an average of 81.5% increase of knowledge and willingness towards attitude/ behaviour change, as follows:

Forest and wildlife knowledge:	84.9 % post-intervention increase
Understanding of peat-swamp forest:	116.3 % post-intervention increase
Understanding and willingness to mitigate threats:	52.3 % post-intervention increase
Understanding and willingness to work on solutions:	65.9 % post-intervention increase

*3.4 (50% increase in willingness for) adoption of alternative farming and fishing practices, in particular use of non-burning/draining methods, among local community members.*

The BNF conservation team is currently working on a series of questionnaires and practice assessments in order to quantify the impacts of our Community Development work in the 2 targeted villages.

**Output 4.** Foundations established to create a long-term legacy for fire prevention and mitigation in and around the Sebangau National Park.

*4.1 Effective fire-prevention system adopted by National Park managers and stakeholders resulting from 1 multi-stakeholder workshop in yr 2 and follow-up in yr 3.*

Output listed for the 2<sup>nd</sup> and 3<sup>rd</sup> year of the project.



4.2 *Twenty (20) National Park staff receive training in restoration and biodiversity monitoring techniques (70% increase in knowledge) and involved in field activities during 3 training workshops in yr 2 and 3, including field sessions.*

Output listed for the 2<sup>nd</sup> and 3<sup>rd</sup> year of the project; currently discussing with Sebangau National Park the priority needs for the restoration and biodiversity monitoring capacity building initiatives.

4.3 *Three (3) meetings to promote coordination with provincial and national strategies for peatland conservation and fire prevention achieved by end yr 3.*

On February 28<sup>th</sup>, 2019, we organised and hosted a large provincial meeting for peatland conservation and fire prevention, focusing on the Sebangau peat-swamp forest landscape. Titled *Joint efforts to preserve the Sebangau landscape: research, conservation and community empowerment*, the workshop involved 155 people from 71 institutions, including Central Kalimantan governmental agencies, universities, NGOs, community members, private sector and conservation platforms/forums.

The conservation workshop included an introductory presentation and 4 sessions: Ecological Research and Monitoring, Habitat Protection and Restoration, Community Development, and Outreach and Partnerships Development.

### 3.3 Progress towards the project outcome

***The occurrence and intensity of fires in and around Sebangau National Park in Central Kalimantan is significantly reduced, thus benefiting biodiversity conservation and human health***

**Outcome 1:** Number of fires in target area reduced to 25% of baseline value by yr 3, compared to comparable pre-project years

**Progress:** Baseline figures for number of fires in the target area have been established for previous pre-project years. Data source: imagery from the Land, Atmosphere Near real-time Capability for EOS (LANCE) system operated by NASA's Earth Science Data and Information System (ESDIS).

**Adequacy of indicators:** The number of hotspots detected is a reliable and adequate indicator.

**Achievability:** to date we consider that the outcome is achievable. A severe dry season (El Niño event) in the following years will be compared against previous pre-project El Niño years.

**Outcome 2:** Area of peatland burned in target area reduced to 10% of baseline value compared to comparable pre-project years.

**Progress:** The GIS team is currently working on the baseline data for the previous years, using LANDSAT satellite Imagery and a post-processing dBRI (Difference Burned Ratio Index) in order to identify forest loss in the targeted area. Total number of hotspots reduction by 59% in 2018 against baseline data (average from 2012-2017<sup>(\*)</sup>)

(\*) 2015 Niño year excluded

**Adequacy of indicators:** We consider the indicator to be a reliable and adequate.

**Achievability:** we aim to finalise satellite imagery processing and yearly analysis by the end of 2019.

**Outcome 3:** Improving (or at minimum stable) forest condition and populations of key forest fauna, compared to pre-project baselines.

**Progress:** baseline data for indicators that will demonstrate forest condition improvement have been collated, and the first year of monitoring data have been collected, compiled and analysed, including peat water levels (40 locations); tree size and mortality (2.4 ha of long-term forest plots); orangutan population density (line transects of nests); fauna species presence and abundance (24 camera traps).

**Adequacy of indicators:** The current indicators are considered to be reliable in order to verify the forest condition. We will add organic matter litter-fall (kg/ha) as a complementary indicator for forest condition.

**Achievability:** we consider the forest condition improvement achievable.

**Outcome 4:** Reduction in negative health impacts amongst local community members, compared to comparable pre-project years.

**Progress:** pre-project baseline and 2018 monitoring data for the listed indicators have been collected; some of these indicators will require further research as some data-sets are non-complete or will require specific requests (i.e. local medical authority reports). Baseline data established for Air Quality Index (PM10; 2016-2018) and number of acute respiratory infections (2014-2017) based on Palangkaraya annual health reports.

**Adequacy of indicators:** we consider that the indicators are adequate; however absent or incomplete data-sets may compromise the analysis. i.e. PM10 is considered one of the most reliable indicators for the Air Quality Index, but the Palangkaraya meteorological station did not record the PM10 variable between March 2017 and August 2018. We looked at other reliable and complementary indicators for Air Quality Index such as PM 2.5, carbon monoxide (CO), sulphur dioxide (SO<sub>2</sub>), Nitrogen dioxide (NO<sub>2</sub>), etc. but none of them are available in Palangkaraya station. We are currently looking at PM10 meters to record our own datasets as well considering complementary data-sets that could be a proxy for the Air Quality Index, for example, visibility recorded at the airport.

**Achievability:** The reduction of negative health impacts is an outcome mainly determined by the presence of haze resulting from forest fires. We aim to contribute to an improvement in air quality in the targeted area (Sebangau Sub-district) by improving sustainable land-use, reducing forest-fires and increasing public awareness; but of course we have to take into account that haze can travel hundreds of kilometres (generally from south-west to north-east) affecting areas with no forest fires and therefore affecting air quality. The most fire-prone area in Central Kalimantan is the ex-mega rice project, located in the eastern side of the Sebangau Forest. Historically the Palangkaraya District has been hugely affected by recurrent fires burning in this degraded land (Pulang Pisau District); therefore we need to assess the adequacy of this indicator in the case of a severe El Niño event or an unusual amount of haze coming from Pulang Pisau district.

### 3.4 Monitoring of assumptions

#### OUTCOME ASSUMPTIONS

*Assumption 2: Fire hotspots and burn scars can be effectively detected by remote imagery and on-the-ground observations.*

Comments: Burn scars and forest loss quantification (via Land Use and Land cover analysis) is determined by the availability of cloud-free satellite imagery; typically 1 or 2 good cloud-free images available per year.

*Assumption 4: Trends in number of reported cases of medical submissions/treatments for potential haze-related ailments can be reliably linked to haze, numbers of cases are accurately reported by authorities/media and data remain available.*

Comments: Lack of baseline data and accurate records of medical submissions/treatments for the haze effects may compromise this assumption. The hospital records remain available, but these records may not represent the reality. Currently we are looking for alternative or complementary data-sets.

#### OUTPUT 1. ASSUMPTIONS

*Assumption 1: River/canal water levels are appropriate for dam construction.*

Comments: The dam construction and canal blocking is mainly limited to the dry season, when water levels allow manual work. However the materials (wood planks) should be carried upstream during the wet season, when water levels allow the access to the forest. The seasonal nature of peat-swamp forest water-level changes has a large influence on project implementation, budget projections and funds/resources management.

*Assumption 2: Dam construction materials remain available (or suitable alternatives can be found).*

Comments: Certified wood suppliers (via Central Kalimantan Forestry Agency) had a peak of demand during the 2018 wet season, when wood availability and costs slightly fluctuated. BNF anticipated the 2019 dam construction and purchased certified wood during Y1 of the project.

## OUTPUT 2. ASSUMPTIONS

*Assumption 2: Community members promptly and accurately report fires to TSA teams; fires can be effectively detected through a combination of river patrols, drones and MODIS hotspot images.*

Comments: MODIS hotspot images not fully reliable during severe haze events. Currently BNF and Liverpool John Moores University are developing drone heat-sensor technology to support community fire-fighting teams.

*Assumption 3: TSA teams keep accurate records of fires reported and extinguished.*

Comments: Further training on GPS and reporting skills will be required in order to ensure high quality reports. The community members are not always proficient on report writing, data filing or basic software skills.

*Assumption 4: The different community fire fighting teams agree to form a network, collaborate effectively within this network and show initiative to coordinate with local government.*

Comments: Lack of engagement identified in some Kereng Bangkirai community patrol team members. Community member's expectations on monthly incentives should be managed.

## OUTPUT 3. ASSUMPTIONS

*Assumption 2: Education/outreach session participants are willing to participate in pre-/post-session assessments and respond truthfully to these.*

Comments: Before and after questionnaires will be reviewed and enhanced in order to better assess the participants behaviour change; some questions do not provide valuable or quantifiable data.

*Assumption 5: Community members respond truthfully during discussions / questionnaires / for a on the above topics.*

Comments: Some community members expect small financial compensations for information sharing, this practice has been widely implemented by other conservation organisations in Indonesia.

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

The current impact on biodiversity conservation and poverty alleviation can be measured by looking at the activities development and comparing the ongoing monitoring data collection compared against base-line and historical figures.

The base-line data and current trends for primate population's densities and other flagship species (ie. small cats) indicate that the current species conservation efforts in Sebangau forests are in the good direction. The orangutan population remain stable or as an increasing trend (see figure 46. in Annex D.) despite the forest loss due 2015 forest fires, indicating a healthy and viable population. By looking at the orangutan densities analysis in each habitat type, we can identify a potential population compression effect in the Mixed-swamp forest due the forest fires in the Tall interior forest. Despite a successful forest protection from illegal activities, the forest fires remain as an underlying threat; this should be taking into account and be always vigilant during the dry season; combining the effective forest protection with fire fighting preparedness and prevention.

In the same direction the forestry and ecological monitoring data (2.4 ha of permanent plots; trees >20 cm DBH) indicate that Sebangau forest structure is evolving towards a mature habitat, with an increasing trend on historical base-line data (see Figure 44. in Annex 4). The total biomass (t/ha) increased by a 170% in

the last 15 years, proving a successful ecological succession after the ceasing of the timber concession and stoppage of illegal logging activities in the 90's, once the National Park was established.

During this first year of ecological monitoring, 37 species have been recorded with camera traps, including the presence of 2 endangered, 3 critically endangered species and 17 species protected by the Indonesian law; representing these 50% of the species captured (see Figure 47 in Annex 4). BNF is currently working on a detailed analysis on flagship species densities and abundance in order to compare or historical baseline data with the ongoing monitoring. This work represents the first ever comprehensive and long-term surveys of small cats in Central Kalimantan. There is a severe lack of data on these species in non-protected or small forest areas that may also contain viable populations. It is crucial to remember that, while these surveys indicate the continued presence of these cats, the habitat loss, wildlife trade and likely presence of populations in non-protected areas means that more work is needed to understand the impacts of anthropogenic activities on these cats.

The impacts on poverty alleviation evolving from the BNF community development activities have been projected and quantified, including the direct benefits from the community nurseries, canal blocking, community fire-fighting teams, women's groups, support on agriculture development and green job opportunities. To date a total of 50 families (38 community nurseries and 15 dam building team) get direct benefits from BNF integrated reforestation initiatives, with an average of 96 GBP/month of additional income for community members. 60 Community Fire-fighting and patrol team members also get a complementary monthly income by protecting the Sebangau forest and its surroundings, and 25 members of BNF Sebangau research team (coming from Kereng village) got permanent jobs and capacity building opportunities to support their career.

On top of the direct benefits BNF is working on activities that provide an indirect impact on poverty alleviation as implementing conservation and community development initiatives willing to develop on the local economy and reduce the negative impacts of land/forest miss-management; this includes sustainable livelihoods initiatives development, environmental education, preservation of ecosystem services, reduction of carbon emissions, reduction of health impacts, etc.

We are working and identifying the best way to quantify poverty alleviation from the indirect benefits (ie. the estimated amount of carbon retained after effective habitat restoration) in order to have a wider understating of how integrated conservation initiatives could benefit socio-economic development.

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

The main aim of this project is to mitigate the effects of the forest fires and improve human health and increase biodiversity around the Sebangau forest. We plan to do this by implementing several objectives which if successful, will contribute to the SDG goals listed below:

**Goal 3: Good health and well-being** – To be achieved by reducing prevalence of peat forest fires and associated toxic haze, thus improving the ability to manage this health risk and reducing incidence of illnesses and potentially deaths from air pollution. Our main objectives towards these goals are peat rewetting, fire-fighting training, outreach, stakeholder liaison, revegetation and education – Our contribution to date to achieving these goals include the blocking of 2 canals and the mapping of 8 other undammed canals which will be blocked in the coming months. We are bolstering the the patrol and fire-fighting team run by CIMTROP with new members and have provided them with the necessary training and equipment. This team will work in collaboration with the community fire-fighting teams which conducts activities in and around the villages. Meetings between BNF, the Central Kalimantan Disaster Management Agency (BPBPK) and the police have resulted in a fire-fighting multi-stakeholder workshop which is to be held in the next few months, before the dry season arrives. This collaboration is extremely important for an effective and coordinated fire-fighting system to work in the area. Our Community Nursery concept has been set up in 2 villages (Kereng Bangkirai and Sabaru), with 5 nurseries run by members from the local community, fire-fighting teams and local stakeholders. These nurseries will grow and sell trees to BNF for our forest regeneration project. Our education and outreach activities have been very successful and include activities with the local village children on a weekly basis in Kereng Bangkirai, and the development and integration of an Environmental Education module into the local schools curriculum. This is the first of

its kind in this area, and informs students about biodiversity, conservation and fire threats, information which is relevant to the local area they live.

**Goal 5: Gender equality** – To be achieved by adopting and implementing Equal Opportunities, promoting the role of women in leadership positions, considering equal input from female community and cooperative members in work implementation and plan development. Our main contribution toward this is to get women included in our conservation outreach sessions, environmental education, reforestation project and community nurseries, as most work will be concentrated around the villages surrounding the Sebangau National Park. We are very pleased to have 13 women as members of the cooperative women's group making organic polybags (*bakul*), and 2 as members of the community fire-fighting teams (a male dominated activity). We are currently developing the community nurseries composition structure, although most of the initial contacts and meeting included the heads of the family, we hope that women will become important members of this initiative. This is a new initiative with women from all ages, so it is hoped that the numbers will increase as the project gets more established.

**Goal 6: Clean water** – To be achieved by protecting and restoring important water-related ecosystems (peat-swamp forest) to maintain and enhance local water quality. Our main objectives towards this goal were peat rewetting and revegetation; fire prevention; local education and outreach. All these objectives have been initiated - see text from Goal 3.

**Goal 12: Responsible consumption** – To be achieved by the development of more sustainable management of natural resources and by promoting more widespread understanding of sustainable lifestyles and resource use: Our main objectives include education sessions with local schools and cooperative groups, developing peat-friendly alternative fishing and farming plans with local cooperatives and outreach via media and public events. Our contribution to this goal to date primarily comes from our education sessions with the village children (Children of Sebangau Programme), and through our environmental education modules which includes information about waste and methods for recycling. Methods for implementing peat-friendly fishing and farming methods are still being developed with implementation to take place later in the project. The same for our media outreach sessions, which are still in the planning phase.

**Goal 15: Life on land** – To be achieved by enhanced protection and restoration of terrestrial ecosystems (peat-swamp forest), sustainable management, restoration and protecting biodiversity and natural habitats, integrating biodiversity into government planning and enhancing Sebangau National Park (SNP) staff capacity in biodiversity monitoring techniques. Our main objectives include peat rewetting and revegetation, fire-fighting, training, education; outreach and stakeholder/SNP/government liaison. Our contribution towards these goals for peat-rewetting, revegetation, fire-fighting and education are covered in Goal 3. Our contribution towards our stakeholder/SNP/government liaison included over 25 coordination meetings and one large multi-stakeholder workshop which was led by us to coordinate data-sharing between all parties. Parties included in these meetings are listed in Output 4, Section 3.1.

## 5. Project support to the Conventions, Treaties or Agreements

This project supports the CDB's Forest Biodiversity Programme and Targets 1 (conservation and biodiversity) and 2 (sustainable use of its components), by enhancing the protection and condition of the Sebangau forest, through local capacity building and raising local awareness. We have started to develop local and governmental networks during this first year with the multi-stakeholder workshop in February 2019. All relevant local government agencies attended, including the regional Department of Forestry which represents the Indonesian focal point for the CDB. Progress on goals are as follows:

Element 1: Conservation, sustainable use and benefit-sharing

- Goal 1: Applying an ecosystem approach: We have developed a monitoring and evaluation system covering the physical, biological and anthropological aspects of the project. We are in the process of developing guidelines for an Ecosystem Approach (EA) which will incorporate guidance for suitable management practices for the peat-swamp forest ecosystem. Workshops to familiarise policy makers will be held in year 2 and 3.
- Goal 2: Reducing threatening process impacts: We are implementing education and community awareness sessions on fire prevention, effects of haze and fire-fighting. These activities will continue in years 2 and 3.

- Goal 3: Protect and restore forest biodiversity: We are implementing activities towards peat rewetting and reforestation, which will restore biodiversity and ecosystem services in degraded secondary forests. We will promote forest management practices and help facilitate Sebangau NP's part in an effective PA network in year 2 and 3.
- Goal 4: Promoting sustainable forest biodiversity use: We are implementing education sessions and established community nurseries. We will be developing sustainable peat use and fishing methods in years 2 and 3.

#### Element 2: Institutional and socio-economic enabling environment

- Goal 1: Enhancing institutional enabling environment: We will run training workshops and host meetings to help address forest biodiversity-related issues. These will be held in year 2 and 3.
- Goal 2: Addressing socio-economic failures: We are establishing local community nurseries, which will grow trees to supply our reforestation project. We have also started a cooperative group for making organic growing bags. These cooperatives support the local economy by creating employment and opportunities. In years 2 and 3 we will be developing proposals for incorporating peat-friendly fishing methods.
- Goal 3: Increasing public education and awareness: We hold regular education sessions and outreach sessions locally. Our evaluations demonstrate an increased awareness about the forest and its biodiversity and impacts of current land/forest uses (fire).

#### Element 3: Knowledge, assessment and monitoring

- Goal 1: Improving assessment of forest biodiversity: We have set up our M&E process for monitoring forest biodiversity, using key forest species (orang-utans: figures 45 & 46; small cats: figure 47) and tree growth data (figure 44).
- Goal 2: Improving the ability to monitor forest biodiversity: We are collecting data using several methods for our forest biodiversity monitoring.
- Goal 3: Improving understanding of the role of forest biodiversity and ecosystem functioning: We have started the ecosystem restoration project by damming canals and replanting trees. These activities involved the local community. By participating in these activities, we hope this will improve their understanding about the forest and about how the ecosystem functions. We also have regular education sessions and field trips to help increase awareness for children about the forest, and from these sessions we have found a 70% increase in knowledge (F output 3.3 Annex 4), so these activities will continue in year 2 and 3.
- Goal 4: Improving infrastructure for monitoring forest biodiversity. We will start active training sessions in monitoring techniques for National Park staff, local researchers, patrol and fire-fighting teams in year 2 and 3.

## 6. Project support to poverty alleviation

The project is working in order to implement several initiatives to support poverty alleviation. One of these ways is to directly support and develop local community cooperatives/groups, these include the community nurseries, the women's group, fire-fighting teams, dam building teams, research staff and soon we will be working with local fishermen in order to identify ways to enhance their economy. Indirect benefits towards poverty alleviation (See [Section 3.5](#) of the narrative report) also include peat fires prevention in the region, protection of ecosystem services and the reduction of land/forest miss-management impacts. Find below a detailed list of the identified direct and indirect benefits towards poverty alleviation

#### Direct benefits:

- ✓ Community nurseries; complementary financial income via:
  - Tree sells for reforestation purposes (currently looking for other reforestation projects in order to scale up the initiative)
  - Agricultural crops, seedlings and vegetables sells with high value in market
  - Enhancing smallholders cultivated land productivity by integrating permaculture and aquaculture approaches, training and sustainable initiatives
- ✓ Women's groups; complementary financial income selling organic pots to conservation projects and actively participating into historically men-dominated activities (Fire-fighting, patrolling, etc)
- ✓ Long term conservation and green jobs opportunities (Fire-fighting, patrol teams, reforestation, dam building, research, transport, etc.)

- ✓ Connecting research and conservation activities and initiatives to community and small-local economy development

#### Indirect benefits:

- ✓ Preservation of ecosystem services and reduction impact on biodiversity:
  - Forest resources, clean water, flood control and Maintenance of hydrological regimes, climate regulation, etc.
  - Development of cultural services as recreation and tourism, scientific, educational initiatives, etc.
  - Other supporting services towards biodiversity and ecological preservations as carbon storage and sequestration, nutrient cycling, pollination, soil formation, etc
- ✓ Reduction of economy losses due to forest fires and land degradation
- ✓ Reduction of heath impacts due haze and toxic smoke.
- ✓ Reduction of direct economy loss in transportation, education, agriculture, etc

## **7. Project support to gender equality issues**

We are looking at ways to overcome the structural gender issues found within the Indonesia patriarchal culture. This will require long term educational and awareness changes and new generations to overcome this historical unbalance. The BNF education project is working for the integration of gender equality education into their daily activities, by providing alternative ways to understand male-female gender roles, empowering women to pursue professional careers and encourage women to actively participate on decision-making platforms/spaces. It's also important to visualise, empower and promote the importance of female gender in professional context and inspire new generations. A good way to achieve this is by publicly promote and celebrate events as the Science women's day (ie. BNF Indonesian Scientists and conservationists visited local schools and talked about their experiences)

We encourage women to participate into male dominated activities (fire-fighting, patrolling, field work, etc) and providing equal job opportunities to male/female community members. BNF has developed an equal opportunities policy which is fully implemented in this Darwin Initiative Project, and as a result we have been able to recruit 2 women into the male-dominated community fire fighting team. We hope these initiatives will become an example for other women. We have also set up a women's group, which makes organic planting bags (organic pots) and helps the women earn an independent income.

We strongly believe the leading by example and inspiring other people/projects is also as important way to support gender equality; the Indonesian BNF foundation is currently a female led organisation with women on most of the managerial roles and actively leading decision making, scientific projects, attending meetings with stakeholders and representing the organisation as a whole.

## **8. Monitoring and evaluation**

The main outcome for this project is to reduce fires in the area, in order to benefit biodiversity conservation and human health. To monitor and evaluate our activities we have collected baseline data during this first phase of the project and these are presented in this report (Anex 4). Data have been gathered from April 2018-March 2019 for biodiversity and forest monitoring, and from 2015 to 2017 for fire and forest loss monitoring.

For our internal monitoring we hold regular monthly meetings and prepare internal monthly reports.

**0.1. Fire monitoring:** Fire baseline monitoring data was taken from pre-project years after the 2015 forest fires. These data are based on the number of hot spots detected by MODIS for the northern Sebangau forest each year, and they will be compared to MODIS hotspot data in 2019, 2020 and 2021 for our monitoring and evaluation.

**0.2. Forest loss monitoring:** The forest loss from the 2015 forest fires will be calculated from the satellite images (2016, 2017, 2018) for our baseline data, and a burnt ratio index will be produced for the whole of

the Sebangau forest. These calculations will be made yearly (2019, 2012 and 2021) for our monitoring and evaluation assessments.

### **0.3. Forest condition and biodiversity monitoring:**

Forest condition: Baseline data for this is based on tree size, tree mortality and litter-fall, from our already existing phenology plots (2.4 ha), using data from 2017, and re-measuring for comparison. Hydrology is monitored at 40 locations each month and this will continue for the duration of the project. Water discharge rates are calculated from the undammed canals to estimate the amount of water lost from the forest. These baseline figures have been collected before the canals were dammed and after. Selected canals which remain undammed will be monitored on a monthly basis and compared to discharge rates from dammed canals.

Population of key forest species: Baseline data (April 2018-March 2019) on a select number of key forest species has been used. These includes nest surveys for estimating orang-utan (*Pongo pygmaeus wurmbii*) density and number of new nest per month (monthly data collected), and camera trap photos (monthly data collected), used for calculating total numbers seen including key species of the small cats (the clouded leopard (*Neofelis nebulosa*), leopard cat (*Prionailurus bengalensis*), Marbled cat (*Pardofelis marmorata*)) and the Storm's stork (*Ciconia stormi*) per month and per year.

**0.4. Reduction in negative health impact monitoring:** For this we have used a visibility index which gives a good indication for the amount of haze/smoke (baseline data 2016-2018), and air quality data (PM10; Annex 4. Section H.) PM2.5, CO, CO<sub>2</sub>, O<sub>3</sub> and CH<sub>4</sub> data are not continuously available owing to the Palangkaraya Meteorological Station malfunction. For monitoring people's health, we have used the number of reported medical cases, but this figure will not reflect the true number as many people will not always go to the doctor due to the expense. Thus, this method for monitoring may need to be changed and improved, in order to get a more realistic figure of what is really going on.

## **9. Sustainability and legacy**

In February this year we organised a two-day Peat Conservation workshop in the Sebangau, and invited all the relevant government parties, NGOs, collaborators, and stakeholders. The Workshop was very successful with the regional secretary attending and giving a speech on behalf of the provincial Governor. As a result of the conference many media interviews were done and articles written. Since then, there has been much interest from many different parties about what we are doing. So, the profile of the project within Palangkaraya, Central Kalimantan is very good and has a lot of support.

Our planned exit strategy remains the same. This is a long term project for BNF, so many of the activities started in this project will continue, especially with our community engagement activities as behaviour changes will take time. However, it is hoped that the community nurseries and fire-fighting networks can run sustainably with minimum external input, as further training and recruitment can be conducted by existing members ensuring continues knowledge-sharing and improvements.

## **10. Darwin identity**

This project has acknowledged the support of the Darwin Initiative by displaying its logo on our website, and on posters and banners at both workshops and meeting we have attended and organised. As this project is supported by not only the Darwin Initiative but is part of a larger programme, the logo is displayed together with other supporter logos. We have also using links in our BNF News blog posts to the Darwin Initiative website. All our partners and collaborators who we work with in Central Kalimantan acknowledge and understand that this project is supported and funded by the British Government.

Many of the activities which are undertaken as part of this Darwin Initiative project have been blogged and tweeted about, and posts also put on our Facebook site (Annex 4, Section I. Numbers of viewers and followers on our media platforms in Indonesia). Using these media platforms has been a very effective way in getting information about the project out to people all over Indonesia and abroad. Annex 4 Section I, shows the BNF communication impact and number of followers we have from different Social Media platforms. There has also been lots of local interest in the city of Palangkaraya with many news reports being published and TV interviews links to BNF media posts and website stories.



## 11. Project expenditure

**Table 1: Project expenditure during the reporting period (1 April 2018 – 31 March 2019)**

Project spend (indicative) since last annual report	2018/19 Grant (£)	2018/19 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)				
<b>TOTAL</b>				

Staff employed (name and position)	Date work commenced and finished in 2018/19	Proportion of time spent on this work	Cost to Darwin (£)
Helen Morrogh-Bernard – Research Fellow	01/07/18 - 31/03/19	50%	
Frank van Veen – Principal Investigator	01/07/18 - 31/03/19	5%	
Berni Ripoll - Project Management	01/07/18 - 31/03/19	65%	
Juliarta Ottay - Government Liaison	01/07/18 - 31/03/19	100% (of 33% FTE)	
Yunsiska Ermiasi - Conservation Manager	01/07/18 - 31/03/19	100%	
Daniel RK - Community Liaison	01/10/19 - 31/03/19	100%	
Daniel RK - Habitat Restoration Officer	01/07/18 - 30/09/19	100%	
Koesmyadi - Conservation Assistant	01/07/18 - 31/03/19	100%	
Riethma - Education Officer	01/07/18 - 30/09/18	50%	
Dwi Riyan - Education Manager	01/12/18 - 31/03/19	50%	
Risky Angelina - Education Team Leader	01/07/18 - 31/03/19	50%	
Desi Natalia - Communications Officer	01/07/18 - 31/03/19	25%	
Markurius Sera - Drone Operator	01/07/18 - 31/03/19	100%	
Siti Muaquifah - Finance Officer	01/07/18 - 31/03/19	25%	
Idrusman - Hydrology Monitoring Coordinator	01/07/18 - 31/03/19	100%	
Salahudin - Nursery Coordinator	01/07/18 - 31/03/19	100%	
Hendri - Research Team Coordinator	01/07/18 - 31/03/19	100%	
Santiano - Research Team Leader	01/07/18 - 31/03/19	50%	

Breakdown of capital items		
Description	Location	Cost (£)
Two cameras for fire-fighting teams	BNF Office	
Three GPS Garmin 64sc for fire-fighting teams	BNF Office	

Heavy fire-fighting equipment (first set)	BNF Office	
Heavy fire-fighting equipment (second set)	In delivery	
Vehicle for fire-fighting teams: Hilux Double-cabin pickup	BNF Office	
Hydrology data-logging equipment	BNF Office	
Nursery Consumables		
Dam-building materials		

## Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2018-2019

Project summary	Measurable Indicators	Progress and Achievements April 2018 - March 2019	Actions required/planned for next period
<p><b>Impact</b></p> <p>Effective local conservation leadership and management of peat-swamp forests, for the benefit of biodiversity, human health and local economies.</p>			
<p><b>Outcome</b></p> <p>The occurrence and intensity of fires in and around Sebangau National Park in Central Kalimantan is significantly reduced, thus benefiting biodiversity conservation and human health.</p>	<p>0.1 Number of fires in target area reduced to 25% of baseline value by yr 3 , compared to comparable pre-project years</p> <p>0.2 Area of peatland burned in target area reduced to 10% of baseline value compared to comparable pre-project years.</p> <p>0.3 Improving (or at minimum stable) forest condition and populations of key forest fauna, compared to pre-project baselines.</p> <p>0.4 Reduction in negative health impacts amongst local community members, compared to comparable pre-project years.</p>	<p>0.1 Baseline and 2018 forest-fires data has been analysed for the targeted area (Sebangau Sub-district) Progress results: Hotspots reduction by 59% in 2018 against baseline data (average from 2012-2017) (*) 2015 el Niño year excluded</p> <p>0.2 GIS team currently working on the historical and baseline data. Post-processing/ analysis of the dBRI (Difference Burned Ratio Index) in order to identify the forest loss in the targeted area.</p> <p>0.3 Baseline data for indicators that will support the forest condition improvement has been established and first year of data has been collected. Progress results: Forest condition stable or improving based on Forest plots (m<sup>2</sup>/ha) data, Ground Water Tables, Orangutan population trends and key fauna densities.</p> <p>0.4 Pre-project baseline and 2018 monitoring data for the listed indicators has been collected according to its availability. Progress results: Baseline data established for Air Quality Index (PM10; 2016-2018) and Number of acute respiratory infections (2014-2017) based on Palangkaraya annual health reports.</p>	<p>0.1 Continue with the forest-fires data monitoring, narrow the GIS analysis according to Land use and land status.</p> <p>0.2 Finalise the pre-project forest loss GIS analysis as well post-project</p> <p>0.3 Continue with forest condition monitoring (re-measure all the Forestry plots during 2019)</p> <p>0.4 Look for complementary data and other indicators for health impacts (due the current circumstances of lack of / non-available data.</p>

<p><b>Output 1.</b> Ex-illegal logging canals blocked and areas burned in the 2015 fires replanted in the Sebangau National Park to re-wet the swamp thus reducing fire risk, prevent further forest losses and reverse fire damage.</p>	<p>1.1 Number of canals closed increased to 24 (baseline 10) and up to 200 new dams built by end yr 3</p> <p>1.2 Reduction in water flow-rates and discharge rates (by up to 500%) within canals, and slowing of dry season water-table drawdown (&gt;10 cmin each dammed canal in comparison to pre-dammed state and control studies</p> <p>1.3 50,000 seedlings planted / over 150 ha of previously burnt forest. Average of 80% survival rates for different species / planting conditions identified.</p> <p>1.4 Forty (40) families involved in 8 community nurseries. 5 community nurseries operational by end yr 2 and 3 community nurseries established by end yr 3.</p> <p>1.5 Twenty (20) women working in Community groups crafting organic-bags/pots to plant seedlings for reforestation purposes.</p>	<p>1.1 Eight (8) canals have been mapped and 14 new dams have been built in 2 canals.</p> <p>1.2 The 2018 average yearly values for pre-project dammed canals (4) are: water discharge rate 0.02 m<sup>3</sup>/s and GWT -13.5cm. The partially blocked canal (Ruslan) during 2018 had a discharge rate reduction of 6.3% and a water-table increase of 4 cm. Hydrology monitoring will continue during the canal blocking.</p> <p>1.3 No seedlings planted yet, as the first trials using Community Nursery seedlings are expected to occur after the end of the 2019 and 2020 dry season . The pre-project planting monitoring (2018) present average survival rates of 96% for the 4 species planted back in 2017.</p> <p>1.4 A total of 38 families got involved in the development of 5 community nurseries (3 in Sabaru and 2 in Kereng village)</p> <p>1.5 A total of 19 women working in 2 Community groups crafting organic-bags/pots for reforestation purposes, to date a total of 3,000 organic-bags have been produced by these groups.</p>
<p>Activity 1.1 Canals surveyed beforehand to identify priority locations for blocking using dams and develop dam building schedule in each target canal. Dams built on canals in target area by local workforce using sustainable natural materials and a pre-trialled design. Pre-construction socialisation of damming plans with local community to create awareness, allow opportunity for discussion and help ensure community support for damming. Post-construction, dam condition monitored and repaired throughout the year as necessary.</p>	<p>1.1 BNF surveyed and identified 8 new large canals (&gt;1km long; &gt; 2 m wide) found in the southern side of the Sebangau Research Area. Canals have been mapped, measured, hydrology baseline data collected and dam construction locations planned.</p>	<p>1.1 The next phase will include sets of community consultation/socialisation pre-dam construction and building 20 dams/ km in each of the 8 canals (during the dry season), including pre-, during and post-construction hydrology monitoring activities.</p> <p>Further canal mapping will be required during the 2019 wet-season in order to achieve the total figure of 14 canals blocked.</p>
<p>Activity 1.2 Seedlings grown in the <i>in-situ</i> Sebangau nursery transplanted into burnt peatland areas of the Sebangau National Park. Species that have previously shown ability to survive and grow in these conditions, through BNF own research and</p>	<p>1.2 During 2018 the Seedling Nursery team have been increasing the tree stock and developing the reforestation project using the community</p>	<p>1.2 It's expected that the first planting trials and posterior monitoring using the Community</p>

<p>studies elsewhere, will be selected for this purpose. Seedling growth and survival monitored post planting. Additionally the use of drones to disperse seeds in burned and degraded areas will be trialled. Drones will distribute seedlings aerially over larger areas that are difficult to reach on the ground. Sample plots will be established to assess the success of this method.</p>	<p>nurseries concept, targeting 4 species (<i>Shorea balangeran</i>, <i>Pittosporum sp</i>, <i>Elaeocarpus acmocarpus</i> and <i>Syzygium sp</i>).</p>	<p>nursery seedlings will occur at the end of the dry season of 2019 and 2020.</p> <p>Seed dispersal experimental trials will start in 2019 in sample plots in order to assess the success of this method.</p>
<p>Activity 1.3 Establishment of community nurseries in villages adjacent to the National Park, initially established through connections with fire-fighting teams and their families. Community nursery scheme members will be provided with start-up resources and seedlings, trained in seedling growth techniques and will then grow seedlings for replanting burned and degraded areas of the park. Once suitable size is reached (confirmed through spot-checks), BNF will buy seedlings from nursery owners for planting. This is more staff and cost effective, requires no land purchase and offers more economic opportunities to local community members compared to establishing a large, project-owned nursery. Socialisations and training sessions will be conducted, and contracts detailing management and monitoring processes signed before set-up resources are provided. In addition to growing seedlings, families will be encouraged to diversify into additional crops to provide additional benefits.</p>	<p>1.3 A total of 10 socialisation/training sessions with a total of 67 attendees have been implemented, including community members and fire-fighting teams and local stakeholders. So far 5 community nursery groups have been established (2 in Kereng Bangkirai and 3 in Sabaru village), involving a total of 38 families.</p>	<p>1.3 The following activities will include series of technical training for seeds collection, germination and manipulation as well monthly monitoring in order to ensure that targets are met. By the end of 2019 a planting season in the Sebangau burned are will be planned.</p>
<p><b>Output 2.</b></p> <p>Improved local fire-fighting capacity for rapid response to peatland fires in Sebangau NP and Palangkaraya district.</p>	<p>2.1 Four community fire-fighting teams operational (current baseline = two); up to 20 local people recruited and two training sessions / yr held in peat-fire extinguishing methods and use of equipment</p> <p>2.2 Fire-response teams effectively mobilised during each dry season</p>	<p>2.1 A new and enhanced fire-fighting team will be set before the 2019 dry season by using the current CIMTROP Patrol Team structure (currently 7 members). At least 2 Integrated Fire Management training sessions will be conducted by the Central Kalimantan Disaster Management Agency in 2019.</p> <p>During this first year, BNF had the opportunity to lead 2 small fire-fighting capacity building workshops, involving Community Fire fighting teams and researchers; focusing on the Drone technology as a complementary tool for fire-fighting and monitoring activities.</p> <p>2.2. The two Community Fire Fighting teams (25 members each) carried out scheduled patrols within the working areas on a daily basis, monitoring fire-prone areas, especially vacant land and recently-burned areas. Land patrol activities were carried out by 4 to 5 MPA personnel driving a three-wheel motorbike, carrying portable water pumps, hoses and other necessary equipment; in addition to routine patrols, these teams were immediately informed if a hotspot or fire was detected, in order to take the machinery where it is needed.</p> <p>Fire-response index (August-October 2018): 47 fire interventions/30 Fire alerts detected= 1.4 (*)</p> <p>(*)The number of alerts detected is lower than the interventions; this could be due small/localised hotspots not detected by MODIS satellite.</p>

	<p>2.3 100% of identified fires attended and extinguished in target areas</p> <p>2.4 Network of community fire-fighting teams established and coordinating with government agencies in Palangkaraya district and with each other with two multi-stakeholder workshops held in yr 2 and 3</p>	<p>2.3 During August and September 2018, the community fire-fighting teams worked on 47 fire-interventions (24 in Kereng Bangkirai and 23 in Sabaru village surroundings) , 100% of the fires were extinguished with an quantified impact of 131.7 ha of land burned.</p> <p>2.4 Output listed for 2nd and 3rd year of this project.</p>
<p>Activity 2.1 New community fire-fighting teams will be created through recruiting team members during socialisation events in the local villages, which will also be used to promote the importance of peat rewetting and revegetation in preventing fire to the community. Training sessions, led by experienced local fire-fighters, will be held to familiarise new team members and refresh existing team members with equipment, teach fire patrolling and fire-fighting techniques, plus establish management structures, accounting and reporting systems.</p>	<p>2.1 During this first year, BNF started strategic discussions with key stakeholders, community members and governmental agencies in order to identify the priority areas/villages where the fire-fighting teams will be established. It has been agreed with the University of Palangkaraya and the Center for International Cooperation in Sustainable Management of Tropical Peatland (CIMTROP) that a fire-fighting team will be created by enhancing the current CIMTROP Patrol Team (7 members) who is responsible for the Sebangau Research Area protection</p>	<p>2.1 During 2019 the CIMTOP patrol and fire-fighting team will be revitalised , including new 6-8 new members and fire-fighting coordinator, will receive integrated fire-management training and will be fully equipped with fire-fighting equipment.</p> <p>A new fire community fire-fighting team will be established in 2020 in a targeted village.</p>
<p>Activity 2.2 fire-fighting team members will be provided with cameras, GPS units, logbook and laptop to facilitate accurate patrolling and fire-fighting records, with the potential for implementing SMART monitoring systems investigated. Training progress of new team members and team readiness will be monitored during the bi-annual training sessions, and through monthly meetings and reports submitted to BNF. These reports will include records on where fires were detected/recorded and tackled, fire size, number of fire-fighters deployed, length of time to fire extinguished and area burned. During risk periods, fire incidence will also be monitored through drone surveys across target areas and remotely through daily checks of MODIS satellite fire hotspot data.</p>	<p>2.2 The new CIMTROP Patrol and fire-fighting team has been provided with GPS units, cameras and laptop in order to improve their monthly patrol reporting.</p> <p>The fire-fighting equipment needs have been identified, listed, purchased and will be handed to the team during the integrated fire-management training sessions.</p>	<p>2.2 In the next few months the recently purchased fire-fighting equipment will be handed to the CIMTROP Patrol and fire-fighting team. During 2019 sets of SMART monitoring training and Fire integrated Management systems will be provided.</p>
<p>Activity 2.3 A network of fire-fighting teams created at an initial multi-stakeholder workshop, to which all community fire-fighting teams, including those affiliated to this project will be invited to join the network and introduced to each other, recognising these teams as the front-line of the fire-fighting response. Guidelines for methods and training, coordination between groups and with government agencies, access to resources and other issues arising will be developed at this, and follow-up annual workshops. Communication channels, such as a newly created WhatsApp group, and summary email reports will serve to keep teams</p>	<p>2.3 During the 2018 fire-fighting season, BNF together with the Central Kalimantan Disaster Management Agency (BPBPK) and the local police started an effective coordination and cooperation system with the Community fire-fighting teams established by BNF back in 2017.</p>	<p>A fire-fighting multi-stakeholder workshop will be implemented before the arrival of the 2019 dry season.</p>

<p>connected and serve as a platform for sharing alerts, ideas, advances and problems encountered, plus to facilitate coordinated government liaisons and access to financial support.</p>		
<p>Activity 2.4 fire-fighting teams will conduct regular patrols (min. 15 days/month) in the forest and along waterways to check for fire hotspots and prevent illegal activities, meet with forest users in their homes and coordinate with local authorities as necessary. Upon detecting or receiving reports of a fire, a rapid-response team will be quickly mobilized to extinguish the fire, using water bores to obtain water from beneath the peat if necessary and creating fire breaks to protect forest and property.</p>	<p>2.4 The current CIMTROP Patrol Team has been conducting regular patrols on a monthly basis, with an average of 24 patrols a month, following both upstream and downstream routes of Sebangau River. The team registered and reported the illegal activities encountered to the relevant authorities and intervened when needed.</p> <p>The two existing Community Fire Fighting teams from Kereng and Sabaru villages carried out scheduled patrols within the working areas on a daily basis during the 2018 dry-season.</p>	<p>2.4 Regular patrols will continue and will be intensified with the arrival of the 2019 dry season. BNF, the National Park Authorities and CIMTROP will discuss the possibility for the community fire-fighting teams to contribute towards the National Park boundaries patrolling, joining existing teams in the field and enhance the patrolling presence during the dry season.</p>
<p><b>Output 3.</b></p> <p>Local community adopt more “peat-friendly” farming and fishing practices that avoid peat drainage and use of fire; and families better understand how to mitigate the harmful effects of fire.</p>	<p>3.1 240 education modules/sessions held with 20 schools, 3 community forums and special interest groups (fishermen; farmers cooperatives), including three large-scale forums per year with aim to reach 90% of people in these target groups by end yr 3.</p> <p>3.2 1,000 people reached with education and awareness activities by end yr 3.</p> <p>3.3 Number of people demonstrating positive response to these activities (70% increase in knowledge / awareness on environmental issues)</p> <p>3.4 (50% increase in willingness for) adoption of alternative farming and fishing practices, in particular use of non-burning/draining methods, among local community members.</p>	<p>3.1 A total of 72 formal environmental education modules have been held with 8 schools; each school benefits from 9 environmental education modules (1 session/week for 2 months) and one field trip in Sebangau Forest. On top of the formal modules, the BNF Education team visited a total of 17 schools presenting the Gibbon Goes to School project (a story telling/puppet show created by BNF), reaching a total of 1,396 children.</p> <p>3.2 A total of 1,912 children were reached by the BNF Education team; including formal, non-formal activities and yearly festivals; approximately 57% were girls and 42% boys. 138 teachers and 723 parents participated on the BNF environmental activities.</p> <p>3.3 Since March 2018, 103 participants (54 boys and 47 girls) from 4 schools participated in the pre- and-post environmental modules impact and behaviour change assessment (representing 82% of the children that received the Formal activities). Preliminary analysed results show an average of 81.5% increase of knowledge and willingness towards attitude/ behaviour change.</p> <p>3.4 The Conservation team is currently working on a series of questionnaires and practices assessments in order to quantify the impacts of our Community Development work in the 2 targeted villages.</p>

<p>Activity 3.1 Fact-finding research with local fishing and farming groups to identify current practices, including use of fire and peat drainage, and holding workshops and discussion sessions to identify impacts of current activities and potentially suitable alternatives, evaluate willingness for changing practices to more peat-friendly alternatives and identifying resources needed for this and applying for additional funding to secure these resources.</p>	<p>From December 2018 fish surveys have been completed monthly by local fishermen in the Sebangau River. A total of 3 trap-night per month, using 10 traps; Total of 120 trap nights, December 2018-March 2019.</p>	<p>Fish surveys will be implemented in Forest canals pre- and port-damming activities.</p> <p>Series of conservation awareness and sustainable alternatives workshops will be implemented with local fishermen during Y2 and Y3.</p>
<p>Activity 3.2. Bespoke education sessions conducted in schools, clubs, community forums, and fishing and farmers cooperatives to raise awareness of the impacts of peat drainage and fire use, of potential alternatives and the impacts of behaviour change. This will include speakers, use of video and other props, provision of written materials and games for children.</p>	<p>3.2 Environmental education and conservation awareness sessions have been held, including regular activities with the Children of Sebangau group from Kereng Bangkirai village, implementing environmental education modules in the curriculum of local schools, inviting local and international schools to Sebangau research site and running two environmental and conservation awareness festivals in Kereng Bangkirai village.</p> <p>Summary figures for activity 3.2: Formal education sessions in schools (72 formal modules), Gibbon Goes to School project (17 schools), Children of Sebangau community group (161 activities), International Gibbon day (100 children; Palangkaraya city), the Orangutan day (250 people; Kereng village), the Indonesian primate day (30 children; Kereng village), International day of women in science (40 students; Secondary school Palangkaraya), the Earth day (74 people; Palangkaraya city), World wetlands day (75 University of Palangkaraya Students), International day of forestry (75 University of Palangkaraya Students), Indigenous Festival (150 people; Palangkaraya), and 2 youth festivals (250 children).</p>	<p>3.2 Further conservation awareness sessions and workshops will be held targeting farmers and fishing cooperatives in Kereng and Sabaru villages. The Environmental education and conservation awareness events and festivals will be implemented in the same basis as Y1.</p>
<p><b>Output 4.</b> Foundations established to create a long-term legacy for fire prevention and mitigation in and around the Sebangau National Park.</p>	<p>4.1 Effective fire-prevention system adopted by National Park managers and stakeholders resulting from 1 multi-stakeholder workshop in yr 2 and follow-up in yr 3.</p> <p>4.2 Twenty (20) National Park staff receive training in restoration and biodiversity monitoring techniques (70%</p>	<p>4.1 Output listed for the 2<sup>nd</sup> and 3<sup>rd</sup> year of this project. BNF is currently leading the discussions about the multi-stakeholder workshop organisation.</p> <p>4.2 During this first year BNF has been working and enhancing the partnership with the Sebangau National Park by implementing an effective coordination and communication system for all the research, conservation and outreach initiatives. A new Memorandum of Understanding has been drafted and currently under revision.</p>



	<p>increase in knowledge) and involved in field activities during 3 training workshops in yr 2 and 3, including field sessions</p> <p>4.3 Three (3) meetings to promote coordination with provincial and national strategies for peatland conservation and fire prevention achieved by end yr 3.</p>	<p>4.3 BNF led more than 25 coordination meetings/events during this first year, including 2 major fire-fighting workshops and 1 large multi-stakeholder conservation workshop; Governmental agencies and other key stakeholders attended in order to ensure the alignment of the conservation, education and outreach initiatives planned.</p>	
<p>Activity 4.1 Multi-stakeholder workshops in years 2 and 3 to discuss and agree on effective and realisable long-term strategies for peatland restoration and fire prevention in the Sebangau National Park, which will be formalised in summary document/s endorsed by the project proponents and park management. This will include strategies and SOPs for identifying at-risk areas, early fire warning systems, peat rewetting and revegetation, plus fire preparedness (addressing underlying causes of fire, such as fire starting, through awareness, education and community development) and fire-fighting team readiness (equipment, training, management structures, procedures, etc.).</p>	<p>Output listed for the 2<sup>nd</sup> and 3<sup>rd</sup> year of this project. BNF is currently leading the discussions about the multi-stakeholder workshop organisation.</p>		
<p>Activity 4.2 Training of National Park staff through 3 workshops conducted during years 2 and 3. These workshops will include theoretical and technical class-room components, plus field training on peat rewetting (damming strategies, dam construction, hydrological monitoring), revegetation (suitable tree species, replanting and monitoring techniques), plus biodiversity monitoring (including habitat condition and ape populations).</p>	<p>During this first year BNF has been working and enhancing the partnership with the Sebangau National Park by implementing an effective coordination and communication system for all the research, conservation and outreach initiatives.</p>	<p>Training sessions will be implemented during 2<sup>nd</sup> and 3<sup>rd</sup> year of this project. Currently identifying the capacity building needs for the Sebangau National Park staff.</p>	
<p>Activity 4.3 Coordination with the Sebangau National Park, Environment Agency (DLH), the Disaster Management Agency (BNPB) and Peat Restoration Agency (BRG) to ensure alignment of restoration and fire-fighting activities in the National Park with these agencies' strategies, effective coordination of efforts and data/information sharing. This will include employing Indonesian Fire Management and Habitat Restoration Officers within BNF with specific responsibility for coordinating our activities and network management, plus sharing data and information, across local government agencies through regular one-to-one and multi-stakeholder meetings and workshops; distributing and socialising reports, proposals, images and data; and creating a cloud platform to facilitate information sharing.</p>	<p>During this first year, BNF led more than 30 coordination meetings/events, 2 fire-fighting workshops and 1 large multi-stakeholder Conservation workshop.</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: Effective local conservation leadership and management of peat-swamp forests, for the benefit of biodiversity, human health and local economies.</p>			
<p>Outcome: The occurrence and intensity of fires in and around Sebangau National Park in Central Kalimantan is significantly reduced, thus benefiting biodiversity conservation and human health</p>	<p>0.1 Number of fires in target area reduced to 25% of baseline value by yr 3 , compared to comparable pre-project years</p> <p>0.2 Area of peatland burned in target area reduced to 10% of baseline value compared to comparable pre-project years.</p> <p>0.3 Improving (or at minimum stable) forest condition and populations of key forest fauna, compared to pre-project baselines.</p> <p>0.4 Reduction in negative health impacts amongst local community members, compared to comparable pre-project years.</p>	<p>0.1 Spatio-temporal analysis of MODIS hotspot distribution in Sebangau Sub-district; TSA patrol and local community reports. Data compared to previous years with similar El Niño index.</p> <p>0.2 Analysis of annual pre/post-fire season LandSat imagery; on-the-ground monitoring of burned areas. Data compared to previous years with similar El Niño index.</p> <p>0.3 Regular monitoring of peat water levels at 40 locations; tree size and mortality in 2.4 ha of long-term forest plots; orangutan population density through line transects of nests; fauna species presence and abundance through 24 camera traps. Data collected during project compared to pre-project 2017 baseline.</p> <p>0.4 Local air quality monitoring; local medical authority reports; local media reports; reports received by TSA teams from local community members. Data compared to previous years with similar El Niño index.</p>	<p>Fire incidence is directly linked to peat drainage (i.e. peat water levels and water discharge), the effect of which can be distinguished from that of rainfall alone.</p> <p>Fire hotspots and burn scars can be effectively detected by remote imagery and on-the-ground observations.</p> <p>Hydrological, forest structure and biodiversity variables show detectable responses within the project period to proposed changes in conservation management interventions.</p> <p>Trends in number of reported cases of medical submissions/treatments for potential haze-related ailments can be reliably linked to haze, number of cases are accurately reported by authorities/media and data remain available.</p>
<p>Outputs: 1. Ex-illegal logging canals blocked and areas burned in the 2015 fires replanted in the Sebangau National Park to re-wet the swamp thus reducing fire risk, prevent further</p>	<p>1.1 Number of canals closed increased to 24 (baseline 10) and up to 200 new dams built by end yr 3</p> <p>1.2 Reduction in water flow-rates and discharge rates (by up to 500%)</p>	<p>1.1 Hydrology Restoration team reports, including photographic and GPS evidence; field inspections by project leaders.</p> <p>1.2 Monthly measurements of peat water table at 40 locations, plus water</p>	<p>River/canal water levels are appropriate for dam construction.</p> <p>Dam construction materials remain available (or suitable alternatives can be found).</p>

<p>forest losses and reverse fire damage.</p>	<p>within canals, and slowing of dry season water-table drawdown (&gt;10 cmin each dammed canal in comparison to pre-dammed state and control studies</p> <p>1.3 50,000 seedlings planted / over 150 ha of previously burnt forest. Average of 80% survival rates for different species / planting conditions identified.</p> <p>1.4 Forty (40) families involved in 8 community nurseries. 5 community nurseries operational by end yr 2 and 3 community nurseries established by end yr 3.</p> <p>1.5 Twenty (20) women working in Community groups crafting organic-bags/pots to plant seedlings for reforestation purposes.</p>	<p>depth and flow rates in canals at 36 locations (including in dammed and undammed canals) using hand-held and automated data loggers. Comparison of data collected during project period to pre-project years with similar rainfall levels.</p> <p>1.3 Monitoring of number of seedlings of different species planted under different conditions (tagged on planting); subsequent monitoring of tagged seedling survival 1, 6 and 12 months post planting.</p> <p>1.4/1.5 Number of local men and women actively engaged in community nursery programme in nearby villages, established through field inspections.</p>	<p>Local communities and government remain supportive of dam building.</p> <p>Hydrological monitoring locations remain accessible and equipment functional.</p> <p>Replanted seedlings are not killed or damaged by fire or extreme flooding. Seedling tags are not lost.</p> <p>Local community members are willing to engage with community nursery programme.</p>
<p>2. Improved local fire-fighting capacity for rapid response to peatland fires in Sebangau NP and Palangkaraya district.</p>	<p>2.1 Four community fire-fighting teams operational (current baseline = two); up to 20 local people recruited and two training sessions / yr held in peat-fire extinguishing methods and use of equipment</p> <p>2.2 Fire-response teams effectively mobilised during each dry season</p> <p>2.3 100% of identified fires attended and extinguished in target areas</p>	<p>2.1 Records of number of teams created, plus members recruited and retained for each team. Training levels assessed against set criteria at minimum annual intervals.</p> <p>2.2 Records of number and percentage of known fires (established through direct reports to TSA teams, river patrol, drone and MODIS hotspot monitoring) responded to; length of time between report receipt and response launch.</p>	<p>Village residents and authorities support community fire-fighting team establishment, and willing new team members can be found.</p> <p>Community members promptly and accurately report fires to TSA teams; fires can be effectively detected through a combination of river patrols, drones and MODIS hotspot images.</p> <p>TSA teams keep accurate records of fires reported and extinguished.</p>

	<p>2.4 Network of community fire-fighting teams established and coordinating with government agencies in Palangkaraya district and with each other with two multi-stakeholder workshops held in yr 2 and 3</p>	<p>2.3 TSA team records, community reports and field inspections by project leaders.</p> <p>2.4 Establishment and composition of network at annual intervals; continuous assessment of network member contributions based on peer reports and project leader inspections; number of coordination meetings with relevant government agencies and government responses to these.</p>	<p>The different community fire fighting teams agree to form a network, collaborate effectively within this network and show initiative to coordinate with local government.</p> <p>Local government are receptive to coordination with the community fire-fighting network.</p>
<p>3. Local community adopt more “peat-friendly” farming and fishing practices that avoid peat drainage and use of fire; and families better understand how to mitigate the harmful effects of fire.</p>	<p>3.1 240 education modules/sessions held with 20 schools, 3 community forums and special interest groups (fishermen; farmers cooperatives), including three large-scale forums per year with aim to reach 90% of people in these target groups by end yr 3.</p> <p>3.2 1,000 people reached with education and awareness activities by end yr 3.</p> <p>3.3 Number of people demonstrating positive response to these activities (70% increase in knowledge / awareness on environmental issues)</p> <p>3.4 (50% increase in willingness for) adoption of alternative farming and fishing practices, in particular use of</p>	<p>3.1 Education team records of number of sessions held, plus participant numbers and composition. Field inspections by project leaders.</p> <p>3.2 Records from Education team (see 3.1); records from Outreach team on number of people attending events; data on number of website/social media hits.</p> <p>3.3 Pre- and post-session assessments (questionnaires, tasks, games) of education session participant understanding of and position in relation to issues addressed during sessions; informal feedback from session participants and school teachers; and growth in website/social media follower numbers and responses to posts (comments/shares/likes).</p> <p>3.4 Community member responses during informal discussions, formal workshops/fora and to questionnaires in relation to current and intended</p>	<p>Education team keep accurate records of session participant numbers, plus participant and teacher feedback.</p> <p>Education/outreach session participants are willing to participate in pre-/post-session assessments and respond truthfully to these.</p> <p>Trends/responses revealed through analysis of website/social media data accurately reflect those of the wider local community.</p> <p>Community members are receptive to changing farming, fishing and land management practices, and do not perceive/encounter insurmountable resistance from local government to this.</p> <p>Community members respond truthfully during discussions / questionnaires / for a on the above topics.</p>

	non-burning/draining methods, among local community members.	farming, fishing and land management strategies.	
4. Foundations established to create a long-term legacy for fire prevention and mitigation in and around the Sebangau National Park.	<p>4.1 Effective fire-prevention system adopted by National Park managers and stakeholders resulting from 1 multi-stakeholder workshop in yr 2 and follow-up in yr 3.</p> <p>4.2 Twenty (20) National Park staff receive training in restoration and biodiversity monitoring techniques (70% increase in knowledge) and involved in field activities during 3 training workshops in yr 2 and 3, including field sessions</p> <p>4.3 Three (3) meetings to promote coordination with provincial and national strategies for peatland conservation and fire prevention achieved by end yr 3.</p>	<p>4.1 Above recommendations adopted within NP management plan, stakeholder forum established and regularly meeting to ensure coordination and knowledge-share between organisations</p> <p>4.2 Number of training sessions held, number of people involved, pre- and post-training delivery assessment of participant skill levels against set criteria.</p> <p>4.3 Number and composition of coordination meetings and other communications with relevant government departments; responses during these meetings and less formal correspondence; requests for input by government into strategy development; representation of project findings/recommendations within government strategies.</p>	<p>National Park staff and management are receptive to training and willing to implement lessons learned.</p> <p>Stakeholder forum members remain committed to objectives and willing to engage with government</p> <p>Provincial and national government remain committed to peat and biodiversity protection, and are willing to engage with and receive input from project proponents.</p>
<p><b>Activities</b> (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)</p> <p>1.1 Canals surveyed beforehand to identify priority locations for blocking using dams and develop dam building schedule in each target canal. Dams built on canals in target area by local workforce using sustainable natural materials and a pre-trialled design. Pre-construction socialisation of damming plans with local community to create awareness, allow opportunity for discussion and help ensure community support for damming. Post-construction, dam condition monitored and repaired throughout the year as necessary.</p> <p>1.2 Seedlings grown in the <i>in-situ</i> Sebangau nursery transplanted into burnt peatland areas of the Sebangau National Park. Species that have previously shown ability to survive and grow in these conditions, through BNF own research and studies elsewhere, will be selected for this purpose. Seedling growth and survival monitored post planting. Additionally the use of drones to disperse seeds in burned and degraded areas will be trialled. Drones will distribute seedlings aerially over larger areas that are difficult to reach on the ground. Sample plots will be established to assess the success of this method.</p> <p>1.3 Establishment of community nurseries in villages adjacent to the National Park, initially established through connections with fire-fighting teams and their families. Community nursery scheme members will be provided with start-up resources and seedlings, trained in seedling growth techniques and will then grow seedlings for replanting burned and degraded areas of the park. Once suitable size is reached (confirmed through spot-checks), BNF will buy seedlings from nursery owners for planting. This is more staff and cost effective, requires no land purchase and offers more economic opportunities to local community members compared to establishing a large, project-owned nursery. Socialisations and training sessions will be conducted, and contracts detailing</p>			

management and monitoring processes signed before set-up resources are provided. In addition to growing seedlings, families will be encouraged to diversify into additional crops to provide additional benefits

2.1 New community fire-fighting teams will be created through recruiting team members during socialisation events in the local villages, which will also be used to promote the importance of peat rewetting and revegetation in preventing fire to the community. Training sessions, led by experienced local fire-fighters, will be held to familiarise new team members and refresh existing team members with equipment, teach fire patrolling and fire-fighting techniques, plus establish management structures, accounting and reporting systems.

2.2 Fire-fighting team members will be provided with cameras, GPS units, logbook and laptop to facilitate accurate patrolling and fire-fighting records, with the potential for implementing SMART monitoring systems investigated. Training progress of new team members and team readiness will be monitored during the bi-annual training sessions, and through monthly meetings and reports submitted to BNF. These reports will include records on where fires were detected/recorded and tackled, fire size, number of fire-fighters deployed, length of time to fire extinguished and area burned. During risk periods, fire incidence will also be monitored through drone surveys across target areas and remotely through daily checks of MODIS satellite fire hotspot data.

2.3 A network of fire-fighting teams created at an initial multi-stakeholder workshop, to which all community fire-fighting teams, including those affiliated to this project will be invited to join the network and introduced to each other, recognising these teams as the front-line of the fire-fighting response. Guidelines for methods and training, coordination between groups and with government agencies, access to resources and other issues arising will be developed at this, and follow-up annual workshops. Communication channels, such as a newly created WhatsApp group, and summary email reports will serve to keep teams connected and serve as a platform for sharing alerts, ideas, advances and problems encountered, plus to facilitate coordinated government liaisons and access to financial support.

2.4 Fire-fighting teams will conduct regular patrols (min. 15 days/month) in the forest and along waterways to check for fire hotspots and prevent illegal activities, meet with forest users in their homes and coordinate with local authorities as necessary. Upon detecting or receiving reports of a fire, a rapid-response team will be quickly mobilized to extinguish the fire, using water bores to obtain water from beneath the peat if necessary and creating fire breaks to protect forest and property.

3.1 Fact-finding research with local fishing and farming groups to identify current practices, including use of fire and peat drainage, and holding workshops and discussion sessions to identify impacts of current activities and potentially suitable alternatives, evaluate willingness for changing practices to more peat-friendly alternatives and identifying resources needed for this and applying for additional funding to secure these resources.

3.2 Bespoke education sessions conducted in schools, clubs, community forums, and fishing and farmers cooperatives to raise awareness of the impacts of peat drainage and fire use, of potential alternatives and the impacts of behaviour change. This will include speakers, use of video and other props, provision of written materials and games for children.

4.1 Multi-stakeholder workshops in years 2 and 3 to discuss and agree on effective and realisable long-term strategies for peatland restoration and fire prevention in the Sebangau National Park, which will be formalised in summary document/s endorsed by the project proponents and park management. This will include strategies and SOPs for identifying at-risk areas, early fire warning systems, peat rewetting and revegetation, plus fire preparedness (addressing underlying causes of fire, such as fire starting, through awareness, education and community development) and fire-fighting team readiness (equipment, training, management structures, procedures, etc.).

4.2 Training of National Park staff through 3 workshops conducted during years 2 and 3. These workshops will include theoretical and technical class-room components, plus field training on peat rewetting (damming strategies, dam construction, hydrological monitoring), revegetation (suitable tree species, replanting and monitoring techniques), plus biodiversity monitoring (including habitat condition and ape populations).

4.3 Coordination with the Sebangau National Park, Environment Agency (DLH), the Disaster Management Agency (BNPB) and Peat Restoration Agency (BRG) to ensure alignment of restoration and fire-fighting activities in the National Park with these agencies' strategies, effective coordination of efforts and data/information sharing. This will include employing Indonesian Fire Management and Habitat Restoration Officers within BNF with specific responsibility for coordinating our activities and network management, plus sharing data and information, across local government agencies through regular one-to-one and multi-stakeholder meetings and workshops; distributing and socialising reports, proposals, images and data; and creating a cloud platform to facilitate information sharing.

## 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
6A	Family nurseries capacity building and training sessions	All	Indonesia	6 Capacity building sessions				
6A	Women's groups	Female	Indonesia	2 Capacity building sessions				
6A	Community fire-fighting teams training sessions	All	Indonesia	3 Training /conservation workshop sessions				
6A	Education Modules with local schools	All	Indonesia	69 Sessions				
6A	Education Field trips to Sebangau Forest	All	Indonesia and International	12 Trips				
9	RAMSAR Convention for Wetland Protected Areas proposed for Sebangau Forest	n/a	English	1 submitted proposal				
14A	Organised workshops/conferences	All	Indonesia	3 Workshops /conferences				
14B	Workshops attended	All	Indonesia and English	5 Conferences				
20	Physical assets	n/a	Indonesia	1 Car 6 fire-fighting water pumps+hose/nozzle 3 GPS units				
21	Community nurseries and women's groups	All	Indonesia	6 community nurseries and 2 women's groups				
23	Financial measures	n/a	n/a	See financial report				

## Annex 4 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

## Checklist for submission

	Check
<b>Is the report less than 10MB?</b> If so, please email to <a href="mailto:Darwin-Projects@ltsi.co.uk">Darwin-Projects@ltsi.co.uk</a> putting the project number in the Subject line.	
<b>Is your report more than 10MB?</b> If so, please discuss with <a href="mailto:Darwin-Projects@ltsi.co.uk">Darwin-Projects@ltsi.co.uk</a> about the best way to deliver the report, putting the project number in the Subject line.	✓
<b>Have you included means of verification?</b> You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	✓
<b>Do you have hard copies of material you want to submit with the report?</b> 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.	✗
Have you involved your partners in preparation of the report and named the main contributors	✓
Have you completed the Project Expenditure table fully?	✓
Do not include claim forms or other communications with this report.	