

Darwin Initiative Main and Post Project Annual Report

To be completed with reference to the "Writing a Darwin Report" guidance: (<http://www.darwininitiative.org.uk/resources-for-projects/reporting-forms>).

It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes

Submission Deadline: 30th April 2020

Extended submission deadline: 15th May 2020

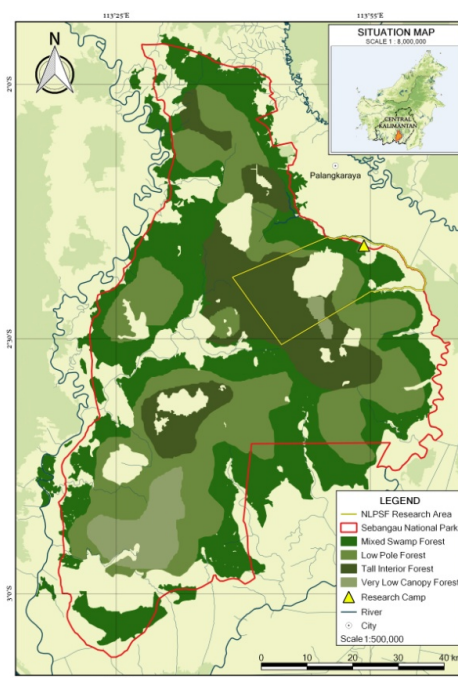
Darwin Project Information

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 st July 2018 – 31 st March 2021
Reporting period (e.g., Apr 2018 – Mar 2019) and number (e.g., Annual Report 1, 2, 3)	April 2019 – March 2020; Annual Report 2
Project Leader name	Frank Van Veen
Project website/blog/Twitter	BNF Website ; BNF Facebook ; BNF Twitter
Report author(s) and date	Bernat Ripoll Capilla, Helen Morrogh-Bernard, Pau Brugués Sintes and Frank van Veen - April 2020

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

During 2019-2020 the University of Exeter and BNF continued developing and strengthening our partnership; this strong and successful collaboration included the expansion of our research and conservation initiatives, identifying new opportunities and collaborating on key research areas. After five years of this successful partnership in Indonesian Borneo, capacity building initiatives for young students and our close research collaborations have expanded and strengthened. All of the Darwin project initiatives have been conducted in close collaboration with many local institutions from Central Kalimantan; at the end of this second year the formalisation of these partnerships is a reality and enabled us to successfully implement many locally-led conservation initiatives, including and involving more than 25 stakeholders in this work, including governmental agencies, universities, community groups, NGOs and local networks.

This has become the most successful year ever for BNF in terms of local partnership development and collaborations, which have empowered BNF and raised their capacity to achieve the objectives proposed and ensure that milestones will be met. The two most important structural stakeholders for this project, CIMTROP-UPR, and the Sebangau National Park, respectively formalised extended and new MoU's and collaborative agreements with BNF during 2019. The Sebangau National Park-BNF partnership (sitting under the Ministry of Forestry and Environment) has agreed a five year workplan ensuring long-term sustainability for several of the ongoing projects. The partnership development, effective collaboration and field-work coordination was particularly relevant during the 2019 fire-fighting season, with the establishment of foundations for a coordinated fire-fighting network, incorporating five community fire-fighting teams, two government agencies (Sebangau National Park and the Central Kalimantan Disaster Management Agency) and academic/research institutions; all working together in the northern Sebangau landscape to prevent peatland fires. BNF also established two new important academic partnerships with two highly-regarded Indonesian universities with biodiversity and tropical conservation research groups, the National University (UNAS) and Gadjah Mada University (UGM). This forms a total of five MoUs between BNF and academic institutions, adding to the existing partnerships with Pakangkaraya University (UPR), Muhammadiyah Palangkaraya University (UMP) and the Christian University of Palangkaraya (UKRIP). Furthermore, with University of Exeter as lead of a UK/Indonesian consortium, we have obtained a multi-million pound Global Challenges Research Fund grant to for work that will complement and build on this Darwin project and that will ensure that the lessons learned from our project will be applied on a wider geographical scale over the coming years.

The partnerships and collaborations established in the first year of the project, with Kereng Bangkerai and Sabaru community stakeholders, included two MPA (Community fire-fighting teams), five community seedling nurseries, two women's groups, one hydrology restoration team, and four public schools. These partnerships continued effectively, enabling BNF to meet the project milestones for 2019-2020. Other key stakeholders, including the Central Kalimantan Education Agency, the Department for Conservation of Natural Resources (BKSDA), the Kahayan River Watershed Management Agency (BAPEDAS) and the village administrations of Kereng Bangkerai and Sabaru, played an important role in this project, supporting BNF to successfully implement activities.

After two years of this project and being half-way through the implementation phase, BNF has completed a stakeholders and partnerships assessment, reviewing the initial stakeholders' matrix and expectation of change against the baseline analysis (Section D. Figure 3). The current engagement and participation assessment from most of the stakeholders is satisfactory and reached initial expectations: out of 27 stakeholders, 11 remain committed, 8 supportive and 8 neutral. In terms of the expectation of change against the baseline situation, 56% improved their participation/engagement, 41% remained the same and 4% were resistant. In terms of stakeholders' participation for each of the project phases we quantified average figures (from 1 to 5, being 1 the lowest participation and 5 the highest) as it follows: identification 4.1, planning 3.8, implementation 3.7, and monitoring and evaluation 3.6. The full assessment table for the participation-roles identified for each stakeholder can be found in Section D. Figure 4.

We would like to finalise this partnership development section with a special mention for Pak Yusurum Jagau (Director of UPT LLG CIMTROP - University of Palangkaraya) who passed away in March 2020 after a long illness. He was a good friend of BNF and the current leader of the most important stakeholder for this project and BNF's long-term partners. Dr. Jagau was a prominent academic figure at the University of Palangka Raya (UPR), and a dedicated researcher and environmentalist. During the

past two years, BNF worked together with him on many projects in the fields of research, habitat protection and restoration of tropical peat-swamp forest, and he will be sorely missed.

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.

To date the habitat restoration team have identified, mapped and gained agreements to block 12 of the 14 canals targeted for this project, representing good progress towards this output achievement. After holding a series of socialisation events and meetings with fishermen and other relevant stakeholders from local communities, we formed agreements to block seven of eight identified additional canals along the Bakung River during 2019-2020. Although this location is within the Sebangau National Park boundaries, the canal-blocking activities are still a sensitive topic for some community members. Fishermen families from Kereng Bangkirai village historically claimed ownership over the canals, which were them to access the Sebangau forest areas to obtain natural resources. To avoid further community conflicts and integrate the community perspective into conservation practices, BNF held a series of informal discussions with key community members during 2019, reaching specific agreements about the priority canals that will be blocked.

The access to canals in Bakung river area is limited from March to June due to river water level fluctuations, and therefore the yearly schedule for dam building has to be well planned in advance.

The summary of canals mapped, the current condition, the 2020 work-schedule, and the monitoring plan have been internally agreed and listed in Figure 17.

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

In 2019 a large new seedling storage nursery was built in the Sebangau reforestation area; this nursery stores the seedling stock before being planted in the burned area, for acclimatisation purposes. Stress due to transportation and changes of environmental conditions are some of the most important aspects to control during the pre-planting. The seedlings spend a few weeks in the new nursery, allowing a gradual adaptation to their new environment. The main objective of this step is to reduce post-planting mortality rates.

A total 3,294 seedlings from 6 targeted species (*Shorea balangeran*, *Dyera lowii*, *Pittosporum sp.*, *Elaeocarpus acmocarpus*, *Syzygium sp.* and *Mesua sp.*) were collected and grown in the *in-situ* Sebangau nursery during 2019; an additional 22,372 seedlings from three of the targeted species were been donated by the Watershed Management Agency (BPDAS) reaching a total of 25,666 seedlings managed by the Sebangau *in-situ* nursery. These were all planted between December 2019 and January 2020.

In 2019 the habitat restoration team monitored the experimental reforestation plots in the burned and degraded areas, obtaining preliminary results after four years of planting. We will use the results to assess and modify the reforestation strategy.

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.

The five community nurseries previously established during the first year of the Darwin project, have continued to be improved by consolidating the management structure and undertaking training on seedling maintenance skills and knowledge. The community nurseries became 100% functional in 2019, with 21,134 seedlings growing for more than a year, out of these, 19,520 seedlings are assessed as big enough to be planted in the burnt area in 2020-21. These seedlings have been brought to the community nurseries and are currently stored in the *in situ* nursery located in the burned area.

During 2019 the BNF conservation team increased capacity building and training efforts. The nursery maintenance and the reforestation expert's team have carried out regular visits/checks every two weeks, providing advice and solutions to the problems encountered. Five training/workshop sessions were held in 2019, where participants learned about specific topics such as nursery management, growing techniques, peat-swamp forest ecology, forest navigation/compass use, seedlings handling and transportation and reforestation plots preparation. Many coordination meetings were held between BNF staff and the community nurseries members to coordinate upcoming activities, align schedules and evaluate the activities implementation. (Figure 20 lists the activities implemented during the past year)

After two years of the project development the habitat restoration team assessed the community nurseries project, assessing (both qualitatively and quantitatively) their performance, commitment and sustainability. To date four of the five seedling nurseries are performing well or very good. The BNF assessment is formed of a number of variables including seedling stock available, group stability, cooperation and commitment towards objectives, attendance at events/meetings, engagement with the project and long-term sustainability; in a scale from 1 to 10, being 1 the lowest performance and 10 highest performance (see Figure 21 in Annex 4.) Three out of five community nurseries reached the targeted amount of seedlings that they committed to; representing a total of 30%, 28% and 27% of the 19,520 seedlings bought. The two remaining community nurseries contributed with 10% and 5% of the seedling stock. Despite the difference in performance and commitment, the five community nurseries have retained all of their members after the second year for this project, involving a total of 38 families from Kereng and Sabaru villages.

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 2019 BNF focused on training, operational capacity improvement and effective coordination for the community fire-fighting teams established in year 1. In 2020-21 we aim to add two new fire-fighting teams in two more villages, and enlarge the scale of the community nursery programme, thus developing income streams for more community members, encouraging participation and leadership by women.

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.

Due to the extended and prolonged dry season experienced during 2019, BNF provided fire-fighting equipment to the three existing fire-fighting teams, ensuring that (i) the teams have all the essential equipment to tackle fires, (ii) they had better and more effective communication, and (iii) their fire-fighting strategy would improve with the use of new technologies.

After holding a meeting with the BNF-supported fire-fighting teams, we identified their needs for the upcoming dry season. Equipment purchased by BNF was distributed in August to the three fire-fighting teams. It was essential for the teams to be able to function at 100% of their capabilities. The use of drone technology allowed the teams to be less exposed to the fires, develop new strategies and be more efficient and safe when tackling fires.

The 5-days workshop *SMART: Patrol techniques and reporting* were co-organised by BNF, CIMTROP and IUCN in November 2019. It was attended by 27 people, including firefighters, members from relevant NGOs and governmental representatives. Since January 2020, both MPAs and CIMTROP Patrol and Fire-fighting teams started a pilot project to implement SMART monitoring in their patrols and reports.

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 2019, BNF supported four fire-fighting and patrol teams operating in the northern Sebangau area. These teams are self-managed but were mobilised and extinguished fires in 2019 under a coordinated network system via BNF. These fire-fighting activities involving different stakeholders were strengthened during a series of multi-stakeholder fire-fighting workshops implemented before and during the 2019 dry season.

Team members participated in eight fire-fighting training and capacity building workshops during the preparedness phase, led by BNF and other local stakeholders including UPT CIMTROP at the University of Palangka Raya, the Disaster Information Management Centre and Central Kalimantan Disaster Management Agency. A total of 247 people attended these multi-stakeholder training and capacity building sessions, with 108 fire-fighting team members involved. Key training and capacity building topics included:

- Fire-fighting collaborative strategies and internal coordination (Focus Discussion Groups)
- Integrated Fire-fighting Strategies - International Workshop (ACIAR - Australian Centre for International Agricultural Research)
- Developing automated detection of peat fires with thermal infrared sensors (BNF, UPT CIMTROP and Liverpool John Moores University)
- SMART training: Patrol techniques and reporting using SMART Software (BNF, UPT CIMTROP, IAR and YABI)
- Fire fighting - field techniques training (Disaster Information Management Centre)

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.

There was a drought and thus elevated fire-risk in 2019 in the Sebangau region, therefore the CIMTROP Patrol and Fire-fighting Team increased the number of monthly patrols to an average of 38 patrols per month, following both upstream and downstream routes of Sebangau River in teams of two. The team registered and reported illegal activities encountered to the relevant authorities and intervened when needed. Since February 2020, following on from the CIMTROP Patrol and Fire-fighting team revitalisation and operational improvement objective, five new members joined the team (a current team composed of 12 permanent members), this team expansion has increased the operational capabilities and currently they patrol the Sebangau river almost on a daily basis.

The two existing community fire-fighting teams from Kereng and Sabaru villages carried out an average of 18 patrols each month during the 2019 dry-season. Each fire they detected was quickly suppressed thanks to their exceptional efforts, hard-work and bravery, working in good coordination with the Central Kalimantan Disaster Management Agency (BPBPK) and supported by the BNF research team staff, local police and forestry department.

From August to September, the two community fire-fighting teams developed joint coordinated patrolling activities with UPT-CIMTROP, BPBPK, Sebangau National Park, POLRI (Indonesia National Police) and BHABINKAMTIBMAS (Community Security and Order Agency)

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.

Fisheries research

From December 2018 fish monitoring started again (since the 2015 baseline surveys), with fish surveys completed monthly in the Sebangau River. A total of 3 trap nights per month for each of 10 traps have been surveyed. To date (March 2020), this is a total of 16 months of data for the Sebangau River, or 390 trap nights. During this period, we have trapped and measured 3,069 fish from 21 different species. These data are then compared to the baseline data collected in 2015 as part of Thornton’s PhD research.

The catch data have been converted to catch-per-unit-effort (CPUE). This calculates the number of fish trapped per number of trap nights which allows us to compare the catches when the number of traps used or length of surveys varies. We identified an expected increase in CPUE during the approach to the dry season between May and July 2019, however the big increase in fish catches which was recorded during this fishing season in 2015 did not happen in 2019. There was an 87% decrease in the CPUE during the ‘peak’ fishing season from 2015 to 2019.

Fish populations and impacts of canal blocking to local fishermen

To explore the impact of peatland dams on fish populations, surveys have been started in Sungai Bakung (the target area for canal-blocking in 2020). These will look at the before-and-after damming impacts on fish catches as well as seasonal changes in two control canals. Surveys consist of 36 traps set in 5 canals and one river, surveyed on 3 days per month. To date, we have trapped and measured 799 fish. Dams will be built in the canals in the coming year and we will be able to assess the impacts of canal-blocking on local fisheries.

Perceptions of current practices and fire

In April 2019, 20 gender-balanced semi-structured interviews were conducted in Kereng Bangkirai and Taruna Jaya villages. Interviews discussed changes in fish populations, income sources in the village, the number of people depending on fishing as the main source of income and the impacts and experiences surrounding fire and fire use in the areas. The following are preliminary results from Kereng Bangkirai.

Fisheries perceptions:

- Most participants reported a decrease in fish populations. The more recent interviews indicate that these population decreases are continuing. The reasons for the decreases in fish populations haven’t changed since the 2016 interviews.
- There is an increased intensity of fishing using sometimes harmful fishing methods, fires can have negative impacts on the fish populations, and there is still a perception that dams have a negative impact on the fish populations.
- While in 2016 the main harmful methods of fishing included poison and electricity, this was not the case in 2019. In 2019 interviews, a large trap called *rambat* was frequently discussed as a cause of fish population decreases. It has been reported that one fisherman can own up to 100 of these traps.
- Comparing the percentage of people who work as fishers as the main job in Kereng Bangkirai, this has increased slightly, from 35% in 2016 to 40% in 2019.
- Notably, the interviews in 2019 indicate a shift in livelihoods is currently ongoing. While in the past (as reported in the 2016 interviews), people turned from logging to fishing (once logging and illegal logging was stopped in the Sebangau Forest), now people seem to be turning from fishing to the tourism industry or to swift houses.

Perceptions of fire and fire use:

- All participants said that the government has become stricter with enforcing the ban against fire use, but also that fires have decreased in number.
- Furthermore, there are now two Community Fire-fighting teams which were reportedly effective at fighting fires when they do happen. One participant reported that the fires in 2015 were

particularly bad because local people were using fires to protest WWF and CIMTROP, with reasons being that they were angry at the rules of limited forest access/use. When asked what the solution to this situation was, the participant reported that it has already been solved, through the hiring of local people in jobs such as the Community Fire-fighting teams.

- When asked about perceptions of the fire ban, several participants were generally supportive of the rules, but others felt that the ban was too strict, and they would like to use fire in certain activities.

Further analyses of the interview results are ongoing. These will be compared with the 2016 baseline interviews to provide a temporal view of the changes and challenges faced by fishing communities in the Sebangau area.

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.

During 2019 the BNF education and outreach team implemented weekly education sessions and quarterly awareness events in the two Sebangau villages and Palangkaraya city. Some of these specific events had in common the topics of peat mismanagement, strategies for fire mitigation and carbon emissions reduction.

The education teams have continued their regular weekly activities with the “Children of Sebangau” (*Anak Sebangau*) group. A new group for teenagers called *Sebangau Rangers* has been created in Kereng Bangkirai village for older children, aiming to empower and raise awareness amongst young people, creating ambassadors of the Sebangau forest and inspiring new generations to care about environmental issues.

The education team also integrated environmental education modules into the curriculum of local schools, aiming to re-connect young generations with nature and providing opportunities to visit the Sebangau research site to local and international schools. A series of monthly events contributed towards our goal of raising awareness of the impacts of peat drainage and fire use amongst community members, students and the general public, including:

- International Gibbon day: This event was held by BNF in collaboration with the Education Department of Central Kalimantan. Ten schools got involved and made their booth to promote zero-waste concept and recycling initiatives. 170 Senior High Students and 25 teachers from Palangkaraya city participated in this event.
- Orangutan Day. Due to the smoke-haze situation we cancelled the public event and instead, in collaboration with Kalaweit Radio, we organised a talk-show about orangutan conservation, environmental issues such as fires and peat-drainage, and the contributions we can all do to mitigate the impacts. The Head of Sebangau National Park and the Natural Resources Conservation Agency (BKSDA) for Central Kalimantan contributed as speakers for this outreach event.
- Indonesian Primate Day. We celebrated Indonesian Primate Day by making a pack of fun learning sessions for community children from Kereng Bangkirai and Sabaru villages. BNF primate scientists talked and engaged children in a Q&A session. 22 children attended the event.

BNF also organised two big youth festivals to engage and inspire young generations into conservation:

- Sebangau Kids Festival; this event was held in Kereng Bangkirai; the main gateway to the Sebangau Forest and a village that has now become an attractive local tourist destination. 591 people attended the event.
- Borneo Initiatives Youth Camp; In collaboration with Bina Cita Utama (BCU) School, BNF hosted the second Borneo Initiatives Youth Camp, involving 8 international and local secondary schools. During the 3-day youth camp, 70 participants gained new knowledge and experience through presentations, hands-on learning, cultural experiences, group discussions and trips to visit local conservation and educational projects.

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.

In 2019-20 BNF co-hosted and implemented a series of small conservation workshops to discuss Sebangau forest conservation strategies and threats mitigation with key stakeholders, including integrated fire management, SMART reporting and forest protection strategies and reforestation coordination and workplans. The main local partners involved during this discussion groups were: Sebangau National Park, CIMTROP, community fire-fighting teams and the community seedling nurseries representatives.

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

During this second year and after many coordination meetings with governmental agencies, BNF formalised our partnership with the Sebangau National Park, signing an MoU in August 2019 and agreeing to the next five years' work-plan. Due to the severe dry season and the extended fire-fighting season (from June to October) we had to postpone the training and capacity building workshops planned for the Sebangau National Park staff. It has been agreed to run the workshops in 2020-21.

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 second year, BNF has led more than 25 coordination meetings/events, three fire-fighting multi-stakeholder workshops, one habitat restoration workshop and a specific and targeted habitat restoration socialisation event for governmental agencies, held in collaboration with CIMTROP.

BNF coordinated and reported all the activities implemented with key Governmental agencies including the Sebangau National Park, Environment Department (DLH), the Disaster Management Agency (BNPB) and recently in 2020 with the Peat Restoration Agency (BRG).

Other stakeholders including universities, NGOs and other organisations also received benefits from BNF's public socialisation events and workshops, ensuring that our conservation, education and outreach initiatives are well known and synergies and potential collaborations are identified. Amongst others, these include CIMTROP, University of Palangkaraya, ICCTF (Indonesia Climate Change Trust Fund), KHDTK Tumbang Nusa, IAR (International Animal Rescue), Community fire-fighting teams, Community seedling nurseries and Community Security and Order Agency (BHABINKAMTIBMAS).

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.

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

During this second year, six canals were blocked (namely Bahkan, Jumri, Alui, Marji, Palilis, Canal X) with a total of 81 new double-wall dams built by the hydrology restoration team. This adds to the two canals blocked in 2018 (Ruslan & Adun) and the 14 dams built. At the end of year two we have blocked a total of 8 out of 14 canals and 95 double-wall dams have been built. This represents 57% of the canals targeted for this output and 47.5% of the dams planned. The hydrology restoration team at the end of year two has set hydrology monitoring data collection in six canals (four long-term and two short-term monitoring).

In April 2020, a new expedition will be implemented in the Bakung River area with the objective to survey and to finalise the mapping for the remaining canals; which will be included in the dam-building activities for the third year of this project.

1.2 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.

During 2019 the Habitat restoration team continued implementing monthly hydrology monitoring in 6 canals (See Figure 8 in Annex 4), including water discharge, groundwater tables (GWT) and water-body and canal physical variables.

For this second year of hydrology monitoring, the mean annual values for canals dammed by BNF are a water discharge rate of 0.029 m³/s and a GWT of 23.5 cm below the surface; thus continuing to indicate a permanent slowing of water discharge in dammed canals compared with baseline data (0.15 m³/s and GWT of 40 cm below the surface).

Overall the water-flow rates have reduced by 67% in the two largest dammed canals (Canal Ruslan and Alui) after two years of hydrology monitoring for this project. This is remarkable as 2019 had an unusually humid wet-season, with high monthly average rainfall figures compared to previous years. The water-discharge trend for one of the most critical canals (Ruslan) blocked at the end of year one indicates that water discharge reduced and annual fluctuations stabilised significantly, reaching the lowest figures for the last 4 years (0.044 m³/s), representing a water discharge rate reduction of 45%. The same trend occurred in two other large canals in the northern Sebangau landscape, with historical base-line data and monthly monitoring figures for these two canals (pre- and post-dam building) presented in Figures 12 and 13 of Annex 4.

The 40 groundwater-table (GWT) monitoring stations indicate a substantial rising of water tables across the landscape (compared against base-line data). Average and historical GWT for 2015 (-40.7 cm), 2016 (2.4 cm), 2017 (0.25 cm), 2018 (-6.7 cm) and 2019 (-13.3 cm) are presented in a monthly basis in Figure 15 of Annex 4. Despite this generalised decrease across the landscape, the figures for the groundwater tables set near blocked canals increased substantially in 2019 compared with the pre-dam building periods. GWT Pre-dam building in 2017 (-31 cm) compared with post-dam building 2018 and 2019 (-14 and -16 cm respectively) as presented in Figure 15 of Annex 4.

(*) NOTE: The 500% reduction in water discharge rates (as pointed by the reviewed in the first year annual report review) is a percentage reduction, intended to mean five times slower or reducing the water discharge amount to 20% of the baseline value.

1.3 50,000 seedlings planted / over 150 ha of previously burnt forest. Average of 80% survival rates for different species / planting conditions identified

During December 2019 and January 2020, the BNF reforestation team and 18 members of the community seedling nurseries undertook planting of 25,666 seedlings over an area of 50ha in the burnt area (See the reforestation Map in Figure 25 of Annex 4). It took 20 days to complete the planting, or a total of 372 man-days.

After developing the Community Nurseries concept and the series of training sessions in year 1, the community nurseries collected and grew as agreed the targeted seedlings species; and by the end of year 2 reached a total stock of 21,134 seedlings, ready to be planted in the second quarter of 2020. (See in Figure 24 of Annex 4; the total amount of seedlings provided by each community nursery)

The planted seedling condition and survival rates monitoring will begin in May 2020.

The long-term monitoring of BNF's long-term pilot-planting in the forest edge and the burned area has also continued, measuring and recording tree condition and growth for the >3,500 seedlings planted here. As part of this study we are testing the most suitable species and the best techniques to be used to increase survival rates. Promising and interesting results include average survival rates of 80% for four of the key species currently used and a substantial increase of survival rates when using organic pots in the burned area (28% increase in first-year survival.)

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. Twenty (20) women working in Community groups crafting organic-bags/pots to plant seedlings for reforestation purposes.

At the end of year 2, the five community nurseries established in year 1 are 100% operational, with a total of 38 people involved. During 2019, the community members have gained experience in nursery managerial and planting skills; whilst collecting and growing thousands of seedlings for the Darwin reforestation project. 18 people have been fully involved in the whole reforestation process, taking part in the seedlings transportation, building the new nursery in the burnt area, preparing the reforestation transects and planting the seedlings.

The 3,000 organic pots crafted by the women's groups in 2018 have already been used for the 2019 planting season; a new agreement and an order of 5,000 pots have been made which will be used for the 2020-21 planting season. The two women's groups remain stable in membership, with a total of 19 women participating.

The conservation team is currently working on a community nursery participant's post-implementation assessment (including socio-economic, attitude/behaviour and awareness changes) which will be used as indicators to quantify the impact of this livelihood project and its potential scale-up.

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.

During 2019 a total of 4 independent fire-fighting teams received support from BNF: two community teams, CIMTROP and Sebangau National Park teams, with a total of 105 fire-fighters involved in patrolling and fire interventions.

Our main target for year 2 was to enhance the existing CIMTROP Patrol team to become a fully operational Patrol and Fire-fighting team. Following meetings and agreements reached during the first year, the CIMTROP Patrol team increased its operational and coordination capacity with a total of 22 volunteers joining the 7 permanent members of the team. After the dry season, the CIMTROP Patrol team started internal discussions about their organisational structure and how to integrate new permanent members. In February 2020, 5 new staff joined the current CIMTROP Patrol and Fire-fighting team, making a total of 12 permanent staff members.

During this second year, BNF led four small fire-fighting capacity building workshops. The first workshop *Preparedness for 2019 forest and land-fires in Sebangau* (28th May 2019) was co-organised by BNF and CIMTROP and hosted by the Community Fire-fighting Team Sabaru (24 people attended). The second capacity building workshop; *Forest navigation and GPS training* (10th July 2019) was led by BNF in collaboration with CIMTROP and took place in the Sebangau Forest research site (32 people attended). The third workshop *Developing automated detection of peat fires with thermal infrared sensors* (16th September 2019) was co-organised by BNF, Liverpool John Moores University (LJMU) and hosted by CIMTROP (19 people attended, including 8 members of government agencies). The fourth workshop *SMART: Patrol techniques and reporting* (11th-15th November 2019) was organised as a 5-day event to get the fire-fighting teams and other relevant stakeholders instructed in SMART software; it was co-organised by BNF and IUCN and hosted by CIMTROP (27 people attended, including members of fire-fighting teams, relevant stakeholders and the government)

2.2 Fire-response teams effectively mobilised during each dry season

The fire-fighting response activities in the northern Sebangau forest were conducted by all four fire-fighting teams and more than 126 people, including fire-fighters, community members and BNF field assistants were involved. Fire-fighting activities took place daily during the dry season, which involved patrolling, re-wetting, installing bores and extinguishing fires. There was an extended El Nino-associated dry season in 2019 which saw severe fires burning out of control across all of Central Kalimantan's peatland areas, and a severe smoke-haze. The fires, haze, and subsequent peat- and forest-loss were all the worst since 2015.

The CIMTROP Patrol and Fire-fighting increased the number of monthly patrolling activities (doubling their capacity from June to September by reaching 40 patrols/month), improved their coordination for fire-fighting interventions with the new community fire-fighting teams, and led the construction of 25 permanent deep-wells along the Sebangau forest-edge to anticipate potential new fires in the area.

During the 2019 fire crisis BNF provided financial, operational and technical support to the fire-fighting teams. A total of 285 patrolling and fire-fighting activities were recorded between July and October 2019 by the fire-fighting teams, with a total of 182 team-days spent fighting fires and 24 major fires identified and extinguished by the teams. The main activities involved patrolling the river and the forest (via canals), suppressing fires, re-wetting fire-prone areas and installing deep-wells in the forest edge to support the fire teams. BNF and community support teams were responsible for operational support as logistics and transportation. All the teams worked together and were effectively mobilised in a daily basis by a coordination centre established by the Disaster Management Agency in collaboration with BNF and CIMTROP. Land and river patrol activities were carried out by 4 to 5 firefighters driving either a three-wheel motorbike or a boat, carrying portable water pumps, hoses and other necessary equipment. All teams were equipped with walkie-talkies, so any team could give a rapid alert if a hotspot was detected and the nearby teams could quickly be coordinated and mobilised to the area with the necessary equipment.

The 2019 Fire-response index for 2019 has been calculated as follows (number of fire-fighting interventions by community members divided by the total number of fires detected/alerts by MODIS during the same period (within Sebangau Sub-district administrative boundaries)

Fire-response index (July-September 2019): $154 \text{ fire interventions} / 622 \text{ Fire alerts detected} = 0.24$

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

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

(**) To standardise the fire-response index it's important to determine the area of influence where fire fighting teams operate; we used the Sebangau Sub-district for preliminary analysis, but the boundaries exceed the area of interest/influence, going beyond the Kahayan River. We are considering the area of influence to be a 2 km buffer following 30 km of Sebangau River.

2.3 100% of identified fires attended and extinguished in target areas

From July to November 2019 Indonesia experienced a severe dry season with 16,465 hotspots detected by MODIS satellites in Central Kalimantan. Although the dry season and ENSO (El Niño Southern Oscillation) event was not as long and severe as in 2015, this was the worst fire season since that year within Indonesia and particularly in Kalimantan (See Annex 4, Figure 34, for the total number of historical hotspots identified in Indonesia). 298 hotspots were detected within the boundary of the Sebangau National Park, 85% of those during August and September 2019; when the fire-fighting teams worked untiringly to prevent fires spreading from grasslands into the rainforest.

A total of 395 fire-related interventions were made in 2019, with 24 major fires identified and tackled by the fire-fighting teams along the northern boundary of the Sebangau Forest. All the major fires occurred in the forest sedge and thanks to the quick response all fires were extinguished before reaching the forested areas. Considering that 2019 has been the worst fire-season since 2015, we are proud to report that 100% of the fires were extinguished before they reached the forest and therefore no forest loss has been identified in the target area. The Difference Normalised Burn Ratio (imagery source: Landsat 8) has been used to identify the burned areas in the northern Sebangau landscape (Figure 45 of Annex 4)

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

In 2019 BNF started the effective coordination of the fire fighting teams and their activities with the Disaster Management Agency and the National Park. The two existing community fire-fighting teams, CIMTROP Patrol team and community groups started operating as a network of fire-fighting units at the beginning of the fire-fighting season and despite the many challenges found, the teams cooperated as they have never done before, implementing joint patrols, holding coordination meetings and sharing resources and data when needed. This represented a huge challenge as the emergency and the many fire hotspots identified each day were a priority. We will build on these initiatives to lead towards the

establishment of an integrated network of fire-fighting teams in the northern Sebangau area, operating independently but coordinated under the same network.

We are preparing a series of strategic workshops in 2020-21 to identify the structure and managerial resources for this network, including SOPs, funding mechanisms, operational support and its sustainability.

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 the second year a total of 53 formal environmental education modules were held with 7 local schools, reaching a total of 144 children; each school benefits from environmental education modules and one field trip to Sebangau Forest. On top of the formal modules, the BNF Education team visited a total of 12 schools presenting the Gibbon Goes to School project - a storytelling/puppet show created by BNF - reaching a total of 547 children.

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

During the second year a total of 1,109 children were reached by the BNF Education and outreach team; including formal, non-formal activities and yearly festivals; 50.8% were girls and 49.2% boys. 82 teachers and 542 parents also participated in BNF education activities.

The environmental education and awareness events participation exceeded our expectations, the community members and the general public participation went beyond our predictions and targets have been reached at the end of this second year.

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

Since the beginning of 2018 and during 2019, 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. During the reporting period we compiled a total of 166 (83 pre- and 83 post- modules implementation) questionnaires from four schools, to complete the impact and behaviour change assessment. Our results and preliminary finding after 2 years are summarised below:

Average of 42% increase (after modules implementation) of knowledge and willingness towards attitude/behaviour change

Forest and wildlife knowledge:	34% post-intervention increase
Understanding of peat-swamp forest:	52% post-intervention increase
Understanding and willingness to mitigate threats:	37% post-intervention increase
Understanding and willingness to work on solutions:	49% post-intervention increase

After 2 years we also analysed the participants understanding of the key conservation initiatives and the specific understanding of solutions; interestingly Forest Protection (40% answers), Habitat Restoration (31%) and Fire-Fighting (13%) were the best-known initiatives before implementing the education sessions, but just a few others were mentioned. The post-session analysis indicates that participants not only gained understanding about the conservation initiatives and solutions but also increased the number of answers, diversifying and expanding solutions, including waste management, forest management, wildlife management, wildlife protection, pollution mitigation, research and outreach.

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 fishing, permaculture and aquaculture training sessions to be implemented in 2020-21, including questionnaires and practice assessments 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.

During 2019 BNF facilitated several coordination meetings, capacity building workshops and evaluations that contributed towards this output achievement. BNF conceptualised and began implementing an integrated fire-fighting management system through which we aim to address the problems and issues caused by man-made fires within the context of the natural environment and socio-economic systems. This involves implementing a suite of interventions focusing on reducing both short-term fire impacts and long-term fire risk, both of which are essential for protecting the area's habitat and threatened apes. This follows the annual seasonal cycle, with four main work areas included within our integrated approach: fire prevention, preparedness, response and recovery.

For the first time, in 2019 several fire-fighting teams worked together to anticipate and tackle forest fires in the Sebangau forest. The conservation team is currently discussing with the Sebangau National Park officers the best way to implement long-term fire-prevention and integrated management systems that integrate all the stakeholders operating in the landscape.

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 2nd and 3rd year of the project. During this second year BNF formalised our partnership with the Sebangau National Park, signing an MoU and agreeing the next five years' work-plan. We had to postpone the training and capacity building workshops planned for the Sebangau National Park staff to the third year of this project. We are currently planning and discussing with the Sebangau National Park staff the priority needs for the restoration and biodiversity monitoring capacity building workshops.

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

At the beginning of 2019, during the first year of this project, BNF hosted a large provincial meeting for peatland conservation and fire prevention, focusing on the Sebangau peat-swamp forest landscape. This workshop involved 71 institutions, including Central Kalimantan governmental agencies, universities, NGOs, community members, private sector and conservation platforms/forums. During 2019 BNF worked on effective coordination with key government agencies and realised important new partnerships evolving from large workshop; including with BRG (Peat Restoration Agency), the Watershed Management Agency (BAPPEDAS) and the Disaster and Fire-fighting Management Agency (BPBPK)

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 the number of fires in the target area have been established for pre-project years. 2019 data has been compiled and analysed.

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 as it correlates with burned area size, but it's important to take into account that one fire can include many hotspots.

Achievability: we consider 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 compiled the baseline data for the previous years, 2018 and 2019 using LANDSAT 8 satellite Imagery and a post-processing dBRI (Difference Burned Ratio Index) identifying forest loss in the northern Sebangau landscape. We aim to expand the analysis to the whole Sebangau landscape and contrast results obtained with similar and comparable areas with no previous interventions.

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

Achievability: We aim to finalise satellite imagery processing before the end of the project period.

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 demonstrate forest condition improvement have been collated, and the first and second years of monitoring data have been collected, compiled and analysed, including monthly monitoring of peat water levels (40 locations); yearly tree size increase and mortality rates assessment (2.4 ha of long-term forest plots); orangutan population density estimates (line transects of nests); monthly monitoring of fauna species presence and abundance (24 camera traps).

Adequacy of indicators: The current indicators are considered to be reliable 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, 2018 and 2019 monitoring data for the listed indicators have been collected, extended and processed. Air Quality Index (PM₁₀; 2005-2019), visibility index (2005-2019) and number hotspots (MODIS, 2014-2019), number of acute respiratory infections (2014-2019) datasets have been analysed.

Adequacy of indicators: we consider that the indicators are adequate; however absent or incomplete data-sets may compromise the analysis. PM₁₀ is considered the most reliable indicators for the Air Quality Index but dataset can be incomplete or not fully reliable; we are looking at other reliable and complementary proxy indicators proxy for the Air Quality Index, for example, visibility records 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. Haze can travel hundreds of kilometres affecting areas with no forest fires and therefore affecting air quality. We are currently assessing the adequacy of this indicator for the northern Sebangau landscape. 2019 has been a moderate El Niño year with many recurrent fires in the Pulang Pisau district (ex-Mega Rice Project area) and an increase of PM₁₀ particles was observed (a negative indicator of air quality)

3.4 Monitoring of assumptions

Assumption 1: 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.

Comments: 2019 was a moderate El Niño year and overall groundwater-tables in the northern Sebangau landscape followed similar patterns to the severe El Niño year of 2015 (Annex 4; Figure 14). Despite this, groundwater levels near to blocked canals remained higher than pre-blocking figures, therefore peat drainage was reduced, thereby reducing the fire risk.

Fire incidence was also lower in 2019, which could be linked to peat drainage, but is also attributable to the efforts of the fire-fighting teams in preventing the fires reaching the dry peat.

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

Comments: Fire hotspots (MODIS and VIIRS) data are available and reliable when identifying burned area locations, but the number of hotspots does not correlate with the number of peat-fires as MODIS hotspots obtain in many recurrent hotspots for one fire, whilst the detection ability of both VIIRS and MODIS is reduced in thick haze conditions. Paradoxically therefore, when fires are at their peak, haze is thickest and hotspot detection is lowest. We are attempting to resolve this issue by combining other data-sources

For analysing burn scars we have been able to obtain good satellite cloud-free imagery for each 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 accurate records of medical submissions/treatments for the haze effects may compromise this assumption. The yearly hospital records remain available (Figure 17 of Annex 4), but the accuracy of these records is unclear. We remain hopeful that the overall trend is indicative of the general health of the population.

OUTPUT 1. ASSUMPTIONS

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

Comments: The seasonal nature of peat-swamp forest water-level fluctuations has a large influence on activities and timing implementation, and therefore a substantial amount of planning and anticipation is needed. Although all canals are suitable for dam construction, community perceptions and historical canal claims are being taken into account.

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

Comments: Dam construction materials have remained available.

Assumption 3: Local communities and government remain supportive of dam building.

Comments: Considering the bad reputation and issues faced by some conservation organisations operating in the area, we are positive with the current community engagement, support and participation.

We strongly believe that reciprocity is a key aspect to consider when implementing conservation initiatives, having a community-led approach and providing and developing green jobs facilitated the accomplishment of this output assumption.

Assumption 4: Replanted seedlings are not killed or damaged by fire or extreme flooding. Seedling tags are not lost.

Comments: BNF experience and evidence-based knowledge (reforestation pilot tests, intensive monitoring and yearly assessments) allowed a gradual scale-up for the reforestation project at the same time we ensure quality control at the time of implementing activities.

OUTPUT 2. ASSUMPTIONS

Assumption 1: Village residents and authorities support community fire-fighting team establishment, and willing new team members can be found.

Comments: Yes, assumption has held true.

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: Yes, assumption has held true. Community awareness and a good network of fire-fighters patrolling on a daily basis in the fire-prone areas are the most successful methods to identify fire-columns and tackle fires before they turn too large.

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

Comments: Yes, the TSA teams kept accurate records. During 2019 BNF provided training on GPS, reporting skills and SMART patrols reporting, this will ensure high-quality reports. Some community patrol team members are not always proficient in report writing, data filing or basic software skills however.

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: Yes, the teams collaborated well together. The challenging 2019 fire season increased effective collaboration amongst teams and its members and coordination with government agencies. These are good indicators for the successful implementation of a sustainable integrated fire-fighting network.

OUTPUT 3. ASSUMPTIONS

Assumption 1: Education team keep accurate records of session participant numbers, plus participant and teacher feedback.

Comments: Yes, assumption has held true.

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

Comments: Yes, the participants were willing to join the assessments. Questionnaires pre- and post-session have been effective tools to assess the participant's knowledge, understanding and willingness towards behavioural change (See Figures 53 and 54 of Annex 4), although some questions and variables did not provide valuable data. The Education team will consider re-phrasing some of the questions.

Assumption 3: Trends/responses revealed through analysis of website/social media data accurately reflect those of the wider local community.

Comments: Yes, website and social data supports the increasing interest on peatlands threats and conservation initiatives.

Assumption 4: Community members are receptive to changing farming, fishing and land management practices, and do not perceive/encounter insurmountable resistance from local government to this.

Comments: The "community" concept is heterogeneous and therefore is subjected to many meta-perceptions and conflicts of interests; we truly believe that time and long-term presence increase community trust and reduce resistance to behavioural change, but some of the current land management methods historically used (i.e. land burning and intensive fishing) are driven by financial optimisation and economic benefits maximisation, and therefore are harder to tackle.

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

Comments: Yes, participants responded truthfully. Some community members expect small financial compensations for information sharing; this practice has been widely implemented by other conservation organisations in Indonesia. BNF is reluctant to implement these practices but working on reciprocity approaches and trust.

OUTPUT 4. ASSUMPTIONS

Assumption 1: National Park staff and management are receptive to training and willing to implement lessons learned.

Comments: Yes, the National Park staff and management are enthusiastic to collaborate. In 2019 we signed an MoU with the Sebangau National Park and developed a detailed and holistic work-plan for the next five years. By doing this we have become an important and relevant implementation partner in the Sebangau landscape.

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

The base-line data and current trends after two years of monitoring populations of primates and other flagship species (i.e. wild cats) indicate that current species conservation efforts in Sebangau are having a positive impact. The orangutan population continues to show an increasing trend with an average of 2.30 ind/km² in mixed-swamp Sebangau forest for 2019 (see Figure 6. of Annex D.) indicating a healthy and viable population.

Forestry and ecological monitoring data (2.4 ha of permanent plots; trees >20 cm DBH) indicate that Sebangau forest structure is continuing to recover post-logging (since 2003); with an increasing trend on historical base-line data (see Figure 76 in Annex 4). The total biomass (t/ha) increased year after year (monitoring carried out every two years) 439 (2015), 477 (2017), 557 (2019) demonstrating continuing sustained forest growth. We included new baseline data and survey results for litter-fall traps (16 x 1 m² traps, data collected monthly along two transects) as a proxy for forest productivity. This showed an increase in 2019, which is most likely largely or entirely due to increased leaf fall during the fire season, rather than necessarily indicating increased forest productivity. Data from a non/low-fire year will be needed to assess trends in forest productivity.

During this second year of ecological monitoring, 29 species have been recorded on camera traps, including 1 Critically Endangered, 3 Endangered, 1 Vulnerable and 3 Near Threatened species. 15 of the 29 species captured are protected under Indonesian law (see Figure 70 in Annex 4). In May 2019, 20 existing camera traps were moved into the forest canopy at sites selected for the presence of primate feeding trees or trees with characteristics common to gibbon and/or red leaf monkey sleeping trees. While this may have negatively impacted the total species recorded in this reporting period, particularly the small cats, data collected from canopy cameras to date is providing essential information on primate behaviour which is difficult to record from the ground, as well as broadening our scope to capture predominantly arboreal species. Neither the flat-headed nor marbled cat was captured on camera traps in year two. While surveys in our Sebangau research grid in previous years have confirmed the continuing presence of these cats, the paucity of data makes an assessment of population trends very challenging. During this reporting period, two species of bird were recorded for the first time on our camera traps, the common hill myna and the great slaty woodpecker, which is classified Vulnerable on the IUCN Red List and protected under Indonesian law. Such findings after almost 12 years of camera trapping in Sebangau provide further evidence of the importance of long-term monitoring across all habitat types in the forest.

The impacts on poverty alleviation evolving from the BNF community development activities have been compiled and quantified for the second year for this project, including direct benefits from the community nurseries, canal blocking, community fire-fighting teams, women's groups and green job opportunities. During the second year approximately 78 people (38 community nurseries, 8 dam-building teams, 19 women and 18 people supporting the replanting activities) received direct benefits from BNF integrated reforestation initiatives, with an average of 670,080 Rp (representing 25% of the minimum wage in Central Kalimantan) of additional income for community members. About 50 community fire-fighting and patrol team members also receive a complimentary monthly income by protecting and fighting fires in the Sebangau forest and its surroundings; additionally, during the 2019 severe dry season, BNF provided fire-fighting related jobs to an additional 50 people (porters, boat drivers, cooks, logistics support and community volunteers). We estimate that approximately 150 people and their families received direct conservation-related job benefits during the second year of this project.

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 the prevalence of peat forest fires and associated toxic haze, thus improving the ability to manage this health risk and reducing the 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 environmental education.

Our contribution to date to achieving these goals includes the blocking of seven of the eight canals mapped in year one, reducing water discharge rates and increasing groundwater levels and therefore reducing peat subsidence, oxidation and erosion, and associated carbon emissions. Some community members were worried that if all canals get blocked, fish stocks will decrease.

BNF has provided the necessary capacity building tools (training and equipment donations) to three fire fighting teams to support the fire -suppression. During the 2019 forest fires, over 150 people joined these teams to fight the fires; working together non-stop for three months. Thanks to their commitment, extraordinary efforts and dedication all fires were extinguished and none of them reached the Sebangau forest, reporting 0ha of forest loss in such a difficult year. All these efforts resulted in fewer forest-fires in the Sebangau landscape, less smoke, fewer carbon emissions and consequently less pollution which has a positive impact on people's health and wellbeing.

BNF Community Seedling Nursery concept was established in 2018 in two of the most important villages found in the northern Sebangau landscape (Kereng Bangkirai and Sabaru). Five nurseries are currently managed by community members, who have received training in seed collection, germination, seedling management and planting, with a total of 21,134 seedlings already grown and bought for replanting. Re-vegetation mitigates against future fire risk.

The enhanced and expanded education and outreach programmes, with a weekly presence in the villages, continue to be of great success (See education impacts evidence). The project has also integrated Environmental Education modules into the local schools curriculum. This is the first of its kind in this area, and will ensure a long-term legacy of biodiversity conservation, environmental threats and fire awareness.

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 the 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.

In year 2 we have maintained the number of cooperative women's groups who make organic polybags (19 women). The community fire-fighting teams are male-dominated, but despite this, two women are active members of the community fire-fighting teams, the first to do so, and contribute towards breaking gender-barriers and altering pre-conceptions. These women initiatives are new, and now we have almost reached our pre-project target of 20 women recruited, we aim to increase these numbers even further. The community outreach and education sessions present even participation from each gender.

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 the 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 for children and young adults, and our environmental education modules in local schools, which includes activities and resources about waste management, methods for recycling and responsible consumption.

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 staff capacity in biodiversity monitoring techniques. Our main objectives include peat rewetting and revegetation, fire-fighting, forest protection patrols, training, education; outreach, biodiversity monitoring and stakeholder/SNP/government liaison. Our contribution towards these goals for peat-rewetting, revegetation, fire-fighting, forest protection patrols and education are covered in Goal 3. Our contribution in 2019 towards our stakeholder/SNP/government liaison included a series of coordination meetings,

bringing together key conservation and community development stakeholders, and capacity development workshops on integrated fire management and land protection. Biodiversity monitoring has continued at our core site and SOP's and training materials prepared to support SNP training objectives in year 3.

5. Project support to the Conventions, Treaties or Agreements

This project supports the CBD'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 our first year with the first multi-stakeholder workshop in February 2019. Since then we hosted many coordination meetings/workshops including the following key topics: integrated fire management, habitat restoration, community empowerment, SMART patrolling and reporting, environmental education and landscape management.

These workshops have included local government agencies and the regional Department of Forestry which represents the Indonesian focal point for the CBD. Progress on our goals for year 2 is 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 with the Sebangau National Park agency for an Ecosystem Approach (EA) which will incorporate guidance and capacity building sessions for effective management of the peat-swamp forest ecosystem.
- Goal 2: Reducing threatening process impacts: During 2019-20 we continued implementing education and community awareness sessions and media campaigns on fire prevention, effects of haze and fire-fighting along 2019. These activities will continue and be expanded to reach more people in year 3.
- Goal 3: Protect and restore forest biodiversity: During 2019-20 we continued implementing activities towards peat rewetting and reforestation, which will restore biodiversity and ecosystem services in degraded secondary forests. We aligned this goal with the Sebangau National Park work-plan, extending the work period beyond the life-time of this grant until 2023.
- Goal 4: Promoting sustainable forest biodiversity use: Currently implementing education sessions and established community nurseries. We intend to commence initiatives in sustainable peat use/management, aquaculture and fishing methods in year 3.

Element 2: Institutional and socio-economic enabling environment

- Goal 1: Enhancing institutional enabling environment: We have organised and run training workshops, and hosted multi-stakeholder meetings to help address forest biodiversity-related issues. These will continue and be expanded in year 3.
- Goal 2: Addressing socio-economic failures: During third year of this project, we will develop and implement a series of community-led peat-friendly practices to support this goal. The socio-economic development activities are described in the poverty alleviation section of this report.
- Goal 3: Increasing public education and awareness: We continued and expanded BNF regular education sessions and outreach sessions locally. Our outreach and social media assessments demonstrate an increased interest in the forest and its biodiversity, and impacts of current land/forest use (fire). See the increase in BNF website traffic and twitter impressions during the dry season and fire-fighting activities of 2019 (Figure 78, Annex I).

Element 3: Knowledge, assessment and monitoring

- Goal 1: Improving assessment of forest biodiversity: We continued the process of monitoring forest biodiversity, using key forest species (orang-utans: Figures 68 & 69; small cats: Figure 71) and tree growth data (Figure 66).
- Goal 2: Improving the ability to monitor forest biodiversity: We continued collecting data using several methods for our forest biodiversity monitoring. We aim to expand some of this monitoring to new and remote areas within the Sebangau National Park in 2020-21.
- Goal 3: Improving understanding of the role of forest biodiversity and ecosystem functioning: In 2019-20 continued implementing series of wildlife and forestry monitoring surveys, including key species and ecological indicators in order to better understand the Sebangau ecosystem. We also implemented a thematic workshop for community members on the topics of nursery management

and techniques for peat swamp forest restoration. We also held 35 regular education sessions and 11 field trips to help increase awareness for children about the forest, and from these sessions we recorded a 70% increase in knowledge (Output 3.3 Annex 4), and these activities will continue in year 3.

- Goal 4: Improving infrastructure for monitoring forest biodiversity. We are currently building 2 km of new boardwalks into the forest to improve the researcher's access for monitoring purposes. The Sebangau programme field research staff have been fully trained in research monitoring techniques which will continue our staff development programme in year 3. Training sessions in-field monitoring techniques for National Park staff are planned to get started this year.

6. Project support to poverty alleviation

Continuing from year 1, the project is working to implement several initiatives to support poverty alleviation, including community nurseries, the women's group, fire-fighting teams, dam building teams and research staff. 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 mis-management impacts. Find below a detailed list of the direct and indirect benefits towards poverty alleviation implemented during 2019-20:

Direct benefits:

- ✓ Community nurseries; complimentary financial income via:
 - Tree sales for reforestation purposes
 - Enhancing smallholders cultivated land productivity (training and sustainable initiatives planning)
- ✓ Long term conservation and green jobs opportunities development (fire-fighting, patrol teams, reforestation, dam building, research, transport, etc.)

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 such as recreation and tourism, scientific, educational initiatives, etc.
 - Other supporting services towards biodiversity and ecological preservations such as carbon storage and sequestration, nutrient cycling, pollination, soil formation, etc.
- ✓ Reduction of economic losses due to forest fires and land degradation
- ✓ Reduction of health impacts due to haze and toxic smoke.

7. Project support to gender equality issues

BNF has looked at ways to overcome the structural gender issues found within the Indonesia patriarchal culture, which does require long term educational and awareness changes and new generations to overcome this historical unbalance.

The main activities and initiatives implemented in 2019-20 that supported gender equality included:

- The education project included gender-equality education within their activities, by providing alternative ways to understand male-female roles. BNF have provided female role-models to empower women to pursue professional careers, for example the BNF primate scientist joined the children's education groups on several occasions, attended the radio talk-show on the International Orangutan Day and was part of the panel on the International Gibbon Day education event.
- BNF female staff actively led capacity-building workshops, facilitated discussion groups, attended talk-shows, presented in scientific conferences, etc.
- Promoting women's groups such as the organic polybag initiative.
- Encouraged community women to participate in male-dominated activities (fire-fighting, patrolling, fieldwork, etc).
- Providing equal job opportunities for male/female community members.

- Leading by example; the Indonesian BNF foundation has women in leadership roles throughout (6 of 9 managers or coordinators), actively participating in decision making, leading scientific projects and representing the organisation externally.

8. Monitoring and evaluation

The main outcome for this project is to reduce fires in the area, to benefit biodiversity conservation and human health. During year 2 of the project we continued monitoring the indicators identified, the impacts of our activities and worked on a series of continuous evaluations/assessments.

INDICATORS:

0.1. Fire monitoring: the verification variables remain as initially listed, based on the yearly figures for the number of fire interventions, number of patrols, burned areas size and hotspots detected by MODIS for the northern Sebangau forest. We are currently defining the area of influence for the fire fighting teams to evaluate the quality of activities implemented.

0.2. Forest loss monitoring: Satellite imagery (2016-2023), burnt ratio index, SMART patrol reports and complementary and existing datasets, including the Ministry of Forestry GIS-Geoportal and Forest loss/gain rasters from Global Forest Change, will be used as verification variables.

0.3. Forest condition and biodiversity monitoring: Verification variables listed are considered adequate and reliable, including tree size, tree mortality, litter-fall, hydrology variables (GWT, water discharge, pH, temperature, water-levels, etc) and monitoring of these will continue as planned for the duration of the project. Presence/absence and/or population size of key forest species are suitable indicators (including monthly nest surveys and camera trap photos).

0.4. Reduction in negative health impact monitoring: For this we have compiled and processed data for the indicators listed, but the difficulty to get realistic and valid figures for the targeted project area. We consider the air quality data (PM10; Annex 4. Section H.) a good indicator but the sensors detect haze coming from the South-eastern landscape (Ex-Mega rice project - Blok C) which does not fully represent the current project area. PM2.5, CO, CO₂, O₃ and CH₄ data are not continuously available owing to the Palangkaraya Meteorological Station malfunction, so we will not be able to use these parameters as indicators. We continue relying on yearly health reports from Sebangau sub-district to monitor people's health, we have used the number of reported medical cases with respiratory diseases, but this figure may not reflect the true number as many people will not always go to the doctor due to the expense, although trends in hospitalisations should still be a useful indicator. Health impact monitoring methods will be revised along 2020, identifying the strengths of current datasets and identifying complementary indicators from external parties as the Health Agency and Meteorology Climatology and Geophysics Agency from Central Kalimantan

EVALUATION:

During 2019-20 we have completed a series of assessments and half-term project evaluations that will be used to compare against base-line data at the end of this project and to demonstrate the project success. The most relevant preliminary evaluations we have run during year 2 are as follows:

- Current stakeholder's participation, engagement and expectation of change compared against the initial stakeholder analysis (Figures 3 and 4 in Annex D)
- Pre- and post-dam building hydrology impact assessments (Figures 11,12 and 13 in Annex D)
- 2017-2019 fire-fighting activities evaluation workshop (Data pending analysis)
- Fisheries and sustainable practices information received via structured interviews and compared with comparable surveys implemented in the same community in 2014 (See report section: Output 3 Activity 3.1.)
- Behaviour change and environmental awareness assessments carried out pre- and post-education modules (Figure 53 and 54 of Annex D)
- Quantification of green-job opportunities and contributions provided towards local economic development (Figure 21 of Annex D)
- Reforestation methods evaluation, survival rates tree species used for reforestation (Figure 28 of Annex D)

- Community seedling nurseries performance, commitment and sustainability assessments after year 2 (Figure 34 of Annex D)
- BNF social media monitoring and evaluation since the project start (Figure 78 in Annex I)

9. Sustainability and legacy

After two years, we are confident that the profile of the project and its reputation within Palangkaraya and Central Kalimantan is very good and has a lot of support, specifically within the Kereng Bangkirai and Sabaru villages, the centre of our community initiatives.

Since the start of the project BNF has undergone substantial structural development as organisation, this is thanks to its conservation holistic-approach integrating several disciplines to mitigate current threats in the area. This combined with the permanent and proactive presence in the Central Kalimantan conservation networks and platforms helped BNF to gain and build trust from the key stakeholders working in the landscape. The development of strategic partnerships and collaborations will ensure a sustainable exit strategy. This remains unchanged from the start of the project, for which we are planning a series of capacity building initiatives and workshops to be implemented in the final year of this project, ensuring that the legacy of the Darwin project remains after it is completed.

10. Darwin identity

We continually acknowledge the support of the Darwin Initiative by displaying the logo on our website, on posters and banners at workshops and meetings that 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 as appropriate.

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 (Figure 76 of Section I. Numbers of viewers and followers on our media platforms in Indonesia along 2019). Annex 4 Section I, shows the BNF communication impact and number of followers we have from different Social Media platforms.

During 2019 BNF work has been featured and acknowledged in many news reports, TV interview links, and local newspapers. (Figure 77 of Section I)

11. Project expenditure

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

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

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

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
<p>Impact</p> <p>Effective local conservation leadership and management of peat-swamp forests, for the benefit of biodiversity, human health and local economies.</p>			
<p>Outcome</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>0.1 Baseline figures for number of fires in the target area have been established for previous pre-project years. 2019 hotspots and burned areas data-sets have been compiled, processed and analysed. Number of fires and burned areas in target area continue reducing as a trend compared with base-line data despite the severity of 2019 fire-season.</p> <p>0.2 The GIS team compiled the baseline data for the previous years. 2018 and 2019 burn area analysis has been processed using LANDSAT 8 satellite Imagery and a post-processing dBRI (Difference Burned Ratio Index) identifying forest loss in the Northern Sebangau Landscape. We aim to expand the analysis to the whole Sebangau landscape and contrast the results obtained with similar and comparable areas with no previous interventions. 100% of the fires were extinguished before they reached the forest and therefore no forest loss has been identified in the target area</p> <p>0.3 Baseline data that will demonstrate forest condition improvement have been collated, and the first and second years of monitoring data have been compiled and analysed. Forest condition stable or improving based on Forest plots (m2/ha) data, Ground Water Tables,</p>	<p>0.1 Continue the forest-fires data compilation, monitoring and GIS analysis. When possible to expand the analysis to the whole Sebangau landscape in order to support BTNS fire-fighting strategy.</p> <p>0.2 Continue with the satellite imagery processing for 2020 and finalise GIS analysis for the whole length of the project.</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>Orangutan population trends and key fauna densities.</p> <p>0.4 Pre-project baselines and 2018 and 2019 monitoring data for the listed indicators have been collected, extended and processed. Air Quality Index (PM10; 2005-2019), visibility index (2005-2019), number hotspots (MODIS, 2014-2019) and number of acute respiratory infections (2014-2019). 2019 Air Quality Index datasets compiled and analysed, including some complementary indicators as visibility records that can be used as proxy variables.</p>	<p>0.3 Continue forest condition monitoring, finalise forest condition analysis for key fauna and forestry variables.</p> <p>0.4 Continue compiling current health-impacts variables and datasets and other complementary indicators as visibility and Health Agency records.</p>
<p>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.</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 (>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</p>	<p>1.1 During this second year, six canals have been blocked with a total of 81 new double-wall dams built. 8 out of 14 canals blocked and 95 double-wall dams have been built. In April 2020, a new expedition will be implemented in the Bakung River area with the objective to survey and to finalise the mapping for the remaining canals.</p> <p>1.2 During this second year, the mean annual values for canals blocked by BNF are: (i) a water discharge rate of 0.029 m³/s and (ii) a GWT of 23.5 cm below the surface; representing a permanent slowing of water discharge. For this second year of hydrology monitoring, the mean annual values for canals dammed by BNF are a water discharge rate of 0.029 m³/s and a GWT of 23.5 cm below the surface; thus continuing to indicate a permanent slowing of water discharge in dammed canals compared with baseline data (0.15 m³/s and GWT of 40 cm below the surface). Overall the water-flow rates have reduced by 67% in the two largest dammed and monitored canals</p> <p>The 40 groundwater-table (GWT) monitoring stations indicate a substantial rising of water tables. Despite this generalised decrease across the landscape, the figures for the groundwater tables set near blocked canals increased substantially in 2019. 2017 (-31 cm) 2018 (-14 cm) and 2019 (-16 cm).</p> <p>1.3 During December 2019 and January 2020, the BNF reforestation team and 18 members of the community seedling nurseries undertook planting of 25,666 seedlings over an area of 50ha in the burnt area. By the end year 2 reached a total stock of 21,134 seedlings, ready to be planted in the second quarter of 2020.</p>	

	<p>conditions identified.</p> <p>1.4 Fourty (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>The planted seedling condition and survival rates monitoring will begin in May 2020.</p> <p>1.4 Five community nurseries established in year 1 are 100% operational, with a total of 38 people involved. 18 people have been fully involved in the whole reforestation process. The conservation team is currently working on a community nursery participant's post-implementation assessment.</p> <p>1.5 The 3,000 organic pots crafted by the women's groups in 2018 have already been used for the 2019 planting season; a new agreement and an order of 5,000 pots have been made which will be used for the 2020-21 planting season. The two women's groups remain stable in membership, with a total of 19 women participating.</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 Identified, mapped and gained agreements to block 12 of the 14 canals targeted. We formed agreements to block seven of eight identified additional canals along the Bakung River during 2019-2020.</p>	<p>1.1 Implement the 2020 work-schedule, and the monitoring plan internally agreed and listed</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 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>1.2 In 2019 a large new seedling storage nursery was built. A total 3,294 seedlings from 6 targeted species were collected and grown in the in-situ Sebangau nursery. an additional 22,372 seedlings from three of the targeted species were been donated by the Watershed Management Agency (BPDAS) reaching a total of 25,666 seedlings managed by the Sebangau in-situ nursery</p>	<p>1.2 Seedling collection to continue in the Sebangau in-situ nursery. Seedlings monitoring to begin in May 2020 Perform seed dispersal trials to assess the 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</p>	<p>1.3 The community nurseries became 100% functional in 2019, with 21,134 seedlings growing for more than a year, out of these, 19,520 seedlings are assessed as big enough to be planted in the burnt area in 2020-21.</p> <p>Five training/workshop sessions have been implemented along 2019 and regular coordination meetings have been held between BNF staff and community nurseries members to</p>	<p>1.3 To increase the number of families involved in the community nurseries project and establish new nurseries</p> <p>The already existing nurseries will receive training on permaculture and aquaculture techniques to support livelihoods development.</p>	

<p>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>coordinate upcoming activities, align schedules and evaluate the activities implementation.</p>	<p>(*) Activities can be subjected to potential changes or alterations (ie. attendance limitations) due to governmental regulations on COVID-19 situation in Central Kalimantan</p>
<p>Output 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>2.4 Network of community fire-fighting teams</p>	<p>2.1 During 2019 a total of 4 independent fire-fighting teams received support from BNF: two community teams, CIMTROP and Sebangau National Park teams, with a total of 105 fire-fighters involved in patrolling and fire interventions. CIMTROP Patrol team increased its operational and coordination capacity with a total of 22 volunteers joining the 7 permanent members of the team.</p> <p>During this second year, BNF led four small fire-fighting capacity building workshops</p> <p>2.2. The fire-fighting response activities in the northern Sebangau forest were conducted by all four fire-fighting teams and more than 126 people, including fire-fighters, community members and BNF field assistants were involved.</p> <p>The CIMTROP Patrol and Fire-fighting increased the number of monthly patrolling activities, improved their coordination for fire-fighting interventions with the new community fire-fighting teams, and led the construction of 25 permanent deep-wells.</p> <p>During the 2019 fire crisis BNF provided financial, operational and technical support to the fire-fighting teams.</p> <p>2.3 A total of 395 fire-related interventions were made in 2019, with 24 major fires identified and tackled by the fire-fighting teams along the northern boundary of the Sebangau Forest 100% of the fires were extinguished before they reached the forest and therefore no forest loss has been identified in the target area.</p> <p>2.4 In 2019 BNF started the effective coordination of the fire fighting teams and their activities with the Disaster Management Agency and the National Park. The two existing community fire-fighting teams, CIMTROP Patrol team and community groups started operating as a network of fire-fighting units.</p> <p>We are preparing a series of strategic workshops in 2020-21 to identify the structure and managerial resources for this network, including SOPs, funding mechanisms, operational support and its sustainability</p>

	<p>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>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 2019 BNF focused on training, operational capacity improvement and effective coordination for the community fire-fighting teams established in year 1. We aim to add two new fire-fighting teams in two more villages, and enlarge the scale of the community nursery programme, thus developing income streams for more community members, encouraging participation and leadership by women.</p>	<p>2.1 Two new community fire-fighting teams will be established in 2020 in targeted villages.</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 BNF provided fire-fighting equipment to the three existing fire-fighting teams, ensuring that (i) the teams have all the essential equipment to tackle fires, (ii) they had better and more effective communication, and (iii) their fire-fighting strategy would improve with the use of new technologies. The 5-days workshop SMART: Patrol techniques and reporting were co-organised by BNF, CIMTROP and IUCN in November 2019. Since January 2020, both MPAs and CIMTROP Patrol and Fire-fighting teams started a pilot project to implement SMART monitoring in their patrols and reports.</p>	<p>2.2 To purchase complementary equipment as requested by the teams, preparedness activities and assessment of SMART patrols monitoring system.</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 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>2.3 During 2019, BNF supported four fire-fighting and patrol teams operating in the northern Sebangau area. These teams are self-managed but were mobilised and extinguished fires in 2019 under a coordinated network system via BNF. Team members participated in eight fire-fighting training and capacity building workshops during the preparedness phase, led by BNF and other local stakeholders including UPT CIMTROP at the University of Palangka Raya, the Disaster Information Management Centre and Central</p>	<p>2.3 An integrated fire-fighting multi-stakeholder workshop will be implemented along 2020, focusing on the protocols and procedures adopted for the fire-fighting network.</p> <p>(*) Activities can be subjected to potential</p>

	Kalimantan Disaster Management Agency	changes or alterations (ie. attendance limitations) due to governmental regulations on COVID-19 situation in Central Kalimantan
<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 During 2019 the CIMTROP Patrol and Fire-fighting Team increased the amount of patrols to an average of 38 patrols per month.</p> <p>The two community fire-fighting teams carried out an average of 18 patrols each month during the 2019 dry-season. They worked under the integrated fire-fighting activities, led by the Central Kalimantan Disaster Management Agency (BPBPK)</p>	<p>2.4 Regular patrols integrated with the SMART reporting will continue and will be intensified with the arrival of the 2020 dry season.</p>
<p>Output 3.</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</p>	<p>3.1 During the second year a total of 53 formal environmental education modules were held with 7 local schools, reaching a total of 144 children; each school benefits from environmental education modules and one field trip to Sebangau Forest. On top of the formal modules, the BNF Education team visited a total of 12 schools presenting the Gibbon Goes to School project - a storytelling/puppet show created by BNF - reaching a total of 547 children.</p> <p>3.2 A total of 1,109 children were reached by the BNF Education and outreach team; including formal, non-formal activities and yearly festivals; 50.8% were girls and 49.2% boys. 82 teachers and 542 parents also participated in BNF education activities.</p> <p>3.3 During the reporting period we compiled a total of 166 (83 pre- and 83 post- modules implementation) questionnaires from four schools, to complete the impact and behaviour change assessment. Average of 42% increase (after modules implementation) of knowledge and willingness towards attitude/ behaviour change</p> <p>We also analysed the participants understanding of the key conservation initiatives and the specific understanding of solutions; Forest Protection (40% answers), Habitat Restoration (31%) and Fire-Fighting (13%) were the best-known initiatives before implementing the education sessions, but just a few others were mentioned</p> <p>3.4 The BNF conservation team is currently working on a series of fishing, permaculture and aquaculture training sessions to be implemented in 2020-21, including questionnaires and practice assessments to quantify the impacts of our Community Development work in the 2 targeted villages.</p>

	of alternative farming and fishing practices, in particular use of non-burning/drainage methods, among local community members.		
<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>3.1 <u>Fisheries research</u>: To date (March 2020), this is a total of 16 months of data for the Sebangau River, or 390 trap nights. During this period, we have trapped and measured 3,069 fish from 21 different species.</p> <p><u>Fish populations and impacts of canal blocking to local fishermen</u>: Surveys consist of 36 traps set in 5 canals and one river, surveyed on 3 days per month. To date, we have trapped and measured 799 fish. Dams will be built in the canals in the coming year and we will be able to assess the impacts of canal-blocking on local fisheries</p> <p><u>Perceptions of current practices and fire</u>: In April 2019, 20 gender-balanced semi-structured interviews were conducted in two villages.</p>	<p>3.1 Fish surveys will continue and implemented in Forest canals pre- and post-damming activities.</p> <p>Further analyses of structured interview results are ongoing, and will be compared with the 2016 baseline interviews to provide a temporal view of the changes and challenges faced by fishing communities in the Sebangau area.</p> <p>Series of conservation awareness and sustainable alternatives workshops will be implemented with local fishermen during Y3.</p> <p>(*) Activities can be subjected to potential changes or alterations (ie. attendance limitations) due to governmental regulations on COVID-19 situation in Central Kalimantan</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 BNF education and outreach team implemented weekly education sessions and quarterly awareness events in the two Sebangau villages and Palangkaraya city. The education teams have continued their regular weekly activities with the “Children of Sebangau” (Anak Sebangau) group. A new group for teenagers called Sebangau Rangers has been created in Kereng Bangkirai village. The education team also integrated environmental education modules into the curriculum of local schools.</p> <p>A series of monthly events and two big youth festivals contributed towards our goal of raising awareness of the impacts of peat drainage and</p>	<p>3.2 Further conservation awareness sessions and workshops will be held targeting farmers and fishing cooperatives in Kereng and Sabaru villages.</p> <p>Environmental education and conservation awareness events and festivals will be implemented as in Y1 and Y2.</p>

		fire use amongst community members.	(*) Activities can be subjected to potential changes or alterations (ie. attendance limitations) due to governmental regulations on COVID-19 situation in Central Kalimantan
<p>Output 4. 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% 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 During 2019 BNF facilitated several coordination meetings, capacity building workshops and evaluations that contributed towards this output achievement. BNF conceptualised and began implementing an integrated fire-fighting management system through which we aim to address the problems and issues caused by man-made fires within the context of the natural environment and socio-economic systems. The conservation team is currently discussing with the Sebangau National Park officers the best way to implement long-term fire-prevention and integrated management systems that integrate all the stakeholders operating in the landscape.</p> <p>4.2 Output listed for the 2nd and 3rd year of the project. During this second year BNF formalised our partnership with the Sebangau National Park, signing an MoU and agreeing the next five years' work-plan. We had to postpone the training and capacity building workshops planned for the Sebangau National Park staff to the third year of this project. We are currently planning and discussing with the Sebangau National Park staff the priority needs for the restoration and biodiversity monitoring capacity building workshops</p> <p>4.3. During 2019 BNF worked on effective coordination with key government agencies and realised important new partnerships evolving from large workshop; including with BRG (Peat Restoration Agency), the Watershed Management Agency (BAPPEDAS) and the Disaster and Fire-fighting Management Agency (BPBPK)</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>4.1 In 2019-20 BNF co-hosted and implemented a series of small conservation workshops to discuss Sebangau forest conservation strategies and threats mitigation with key stakeholders, including integrated fire management, SMART reporting and forest protection strategies and reforestation coordination and workplans.</p>	<p>4.1 To implement at least one multi-stakeholder workshop to discuss peat-restoration strategies with BRG and BTNS.</p> <p>Develop together with BTNS a peat-restoration and integrated fire-management concept document</p> <p>(*) Activities can be subjected to potential changes or alterations (ie. attendance limitations) due to governmental regulations on COVID-19 situation in Central Kalimantan</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,</p>		<p>4.2 Due to the severe dry season and the extended fire-fighting season (from June to October) we had to postpone the training and</p>	<p>4.2 Organise and implement the three theoretical and technical capacity building workshops for the Sebangau National Park staff</p>

<p>replanting and monitoring techniques), plus biodiversity monitoring (including habitat condition and ape populations).</p>	<p>capacity building workshops planned for the Sebangau National Park staff. It has been agreed to run the workshops in 2020-21.</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>4.3 During this second year, BNF has led more than 25 coordination meetings/events, three fire-fighting multi-stakeholder workshops, one habitat restoration workshop and a specific and targeted habitat restoration socialisation event for governmental agencies, held in collaboration with CIMTROP.</p> <p>BNF coordinated and reported all the activities implemented with key Governmental agencies including the Sebangau National Park, Environment Department (DLH), the Disaster Management Agency (BNPB) and recently in 2020 with the Peat Restoration Agency (BRG).</p>	<p>4.3 Continue the effective Coordination with BTNS, BNPB) and BRG. Identify and align long-term strategies for restoration and fire-fighting activities in the Sebangau landscape.</p> <p>Continue BNF's public socialisation events and workshops, ensuring that our conservation, education and outreach initiatives are well known, including synergies and strategic partnerships with collaborations.</p> <p>(*) Activities can be subjected to potential changes or alterations (ie. attendance limitations) due to governmental regulations on COVID-19 situation in Central Kalimantan</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
Impact: Effective local conservation leadership and management of peat-swamp forests, for the benefit of biodiversity, human health and local economies.			
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>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>
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 forest losses and reverse fire	<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</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>damage.</p>	<p>within canals, and slowing of dry season water-table drawdown (>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>water 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>2.3 TSA team records, community reports and field inspections by</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>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 non-burning/draining methods, among local community members.</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 farming, fishing and land management strategies.</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>

<p>4. 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% 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>
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Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)

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.

1.2 Seedlings grown in the *in-situ* 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.

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

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	4 Capacity building sessions		10	
6A	Women's groups	Female	Indonesia	2 Capacity building sessions	N/A		2	
6A	Community fire-fighting teams training sessions	All	Indonesia	3 Training /conservation workshop sessions	4 Training /conservation workshop sessions		7	
6A	Education Modules with local schools	All	Indonesia	69 Sessions	53 Sessions		122	
6A	Education Field trips to Sebangau Forest	All	Indonesia and International	12 Trips	11 Trips		23	
9	RAMSAR Convention for Wetland Protected Areas proposed for Sebangau Forest	n/a	English	1 submitted proposal	N/A		1	
14A	Organised workshops/conferences	All	Indonesia	3 Workshops /conferences	4 fire-fighting capacity building workshops 2 Community nurseries training sessions 2 youth festivals		12	
14B	Workshops attended	All	Indonesia and English	5 Conferences	TBC			
20	Physical assets	n/a	Indonesia	1 Car 6 fire-fighting water pumps + hose/nozzle 3 GPS units	17 fire-fighting water pumps + 18 nozzles + 67 hose + 10 wakie talkies + 1 generator + 1 Drone		1 car, 23 water pumps, 24 nozzles, 67 hose, 1 generator, 3 GPS and 1	

							Drone	
21	Community nurseries and women's groups	All	Indonesia	6 community nurseries and 2 women's groups	N/A		6 community nurseries and 2 women's groups	
23	Financial measures	n/a	n/a	See financial report	See financial report			

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

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	✓
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	✓
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	✗
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.	