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| Danish organisation | Orangutang Fonden / Save the Orangutan Foundation (StO) |
| Title of the intervention | Increased community preparedness to ENSO-induced impacts on human- and environmental health. |
| Partner name(s) | Borneo Orangutan Survival Foundation (BOSF-Mawas programme) |
| Amount applied for | 999.812 DKK |
| Country(ies) | Indonesia |
| Period (# of months) | 13 |

**1. Objective and relevance (the world around us)**

**Main purpose and challenges that will be addressed**

This intervention aims at increasing the preparedness of indigenous communities in Central Kalimantan, Indonesian Borneo, for extreme El Niño and La Niña events, and to mitigate the impacts of peat swamp forest fires on environmental and human health. As a direct result of climate change, extended periods of flooding and widespread peat swamp forest fires, including the severe air pollution that follows, are recurring issues in the area. This poses a serious risk to local livelihoods, human health, and crucial ecosystem services, and contributes significantly to global warming. Over the last decades, the peatlands of Central Kalimantan Province have undergone substantial change as millions of Ha of peat swamp forests have been logged, drained, and converted into oil palm plantations, mining concessions and agricultural land[[1]](#footnote-1). The risk of flooding and forest fires is further increased by the climatic phenomenon ENSO (The El Niño-Southern Oscillation), which in Indonesia causes severe and extended periods of drought in case of El Niño episodes, and high-intensity and prolonged rainfall, in case of La Niña episodes. The ENSO episodes happen in cycles on an average every three to eight years, and especially within the last half century, climate change has contributed to more frequent and extreme ENSO episodes. While the communities have strong traditional knowledge about their natural surroundings, they lack access to knowledge of the fast-changing environmental and climatic conditions, how this impacts their health and livelihoods, and most of all, how they mitigate, and adapt, to these challenges. The proposed intervention will respond to these issues by:

1. Increasing community awareness of the impacts of environmental degradation on human and environmental health as well as the link between the two.
2. Engaging the communities in environmental restoration and protection to mitigate future impacts from climate change.
3. Decreasing local health-related impacts of ENSO-induced disasters through the preparation of a Local Strategic Preparedness and Response Plan (LSPRP).

Educational outreach and community engagement are seen to be cost-effective risk mitigation strategies in high-risk areas with low resources. With a multi-stakeholder approach, this intervention will furthermore involve the health sector, relevant environmental agencies, and the educational system. Finally, the project includes an advocacy component in order to lobby health authorities for increased resources at the local health centers in order to be better prepared for severe drought, fire, haze, and floods.

**Context**

Project location

The project will be implemented in the remote forest area of Mawas, located in the districts of Kapuas and South Barito in Central Kalimantan Province, Indonesian Borneo. The Mawas area is the size of the Danish island, Funen, consisting of 309,000 hectares of peat swamp forest and is populated by a total of 62 communities with 29,000 families/145,000 people, from the heavily marginalized indigenous population, the Dayaks. In the 1990’s, approx. 4,600 km of drainage and irrigation canals were dug in the peat as preparation for rice fields for the governmental ‘Ex-Mega Rice Project’, leaving the area extremely susceptible to the impacts of the recurring ENSO episodes. The project left one million Ha of peatland highly degraded, deforested, and in terminal decay due to the ongoing drainage from the canals, resulting in recurrent flooding and forest fires, with negative impacts on the local communities’ health, natural resources, and socioeconomic stability. Moreover, the area is only accessible via small waterways, and the lack of infrastructure and remote location of the communities thereby further poses challenges to the population in terms of lack of access to health services, among others.

The environmental conditions of Mawas

Peatlands consist of partially decomposed matter derived mainly from accumulated plant material under year-round water-logged conditions. By storing the carbon that the plants have absorbed from the atmosphere, peatlands function as highly effective carbon sinks, storing 30 percent of the earth’s soil carbon, which exceeds the carbon stored in all other vegetation types, although they cover as little as three percent of the world’s surface area. Emissions from drained peat, which covers only 0.4 percent of the global land surface, make up for more than five percent of the global anthropogenic CO2 emissions, a number that increases dramatically when they burn. While intact peatlands are highly effective in regulating soil hydrology, degraded and drained peat is during rainy season, highly flood-prone, and during droughts, extremely susceptible to forest fires which are particularly difficult to extinguish and control as they can burn and smolder up to 50 cm underground*.* For this reason, the protection of peatlands has great potential in the mitigation and adaptation to the effects of climate change. Intact peatlands also provide numerous other ecosystem services such as supporting biodiversity, preventing erosion, and supporting the livelihoods of local communities and indigenous people by providing options for forestry, agriculture, fishery and collection of Non-Timber Forest Products (NTFPs). Moreover, peatlands recycle and purify water, trap toxins and heavy metals and store these away from human interaction, as well as serve as critical barriers against dangerous zoonotic diseases.

Flood- and fire-related impacts on local communities in Mawas

The target communities suffer from high levels of poverty linked to resource degradation, low agricultural productivity, and marginalization. These challenges are further exacerbated when they are hit by natural disasters such as floods, forest fires, and severe air pollution, jeopardizing the socio-economic security of the communities. The reoccurring fires furthermore bring along serious risks to human health to an extent, where working or attending school becomes impossible and hospital bills make it even more difficult to put food on the table. During the severe El Niño events of 1997-1998 and again in 2015-2016, wildfires in Indonesia resulted in major regional haze. The smoke from burned wood and vegetation contains tiny particles that can lodge deep into the lungs and pass into the bloodstream and other organs. During 2015-2016, the haze was estimated to have caused more than 100,000 premature deaths in Indonesia[[2]](#footnote-2), Malaysia, and Singapore. In Indonesia alone, about half a million people contracted acute respiratory infections and respiratory distress due to smoke poisoning[[3]](#footnote-3). The target communities in and around Mawas are located right in the middle of one of the most high-risk areas and are thus among the most vulnerable groups. Air and smoke-contaminated soil and food is moreover particularly bad for pre- and postnatal health. Studies found, that exposure to the haze from the 1997-1998 El Niño event, lead to more than 15,600 child, infant, and fetal deaths and caused significantly slower growth rates among the exposed surviving children[[4]](#footnote-4). Also, the floods have intensified, with the latest disaster happening in January 2021, which in the neighboring province, South Kalimantan, affected a minimum of 210,140 people and displaced 39,000 people with 24,379 houses inundated, according to JBA Risk Management. The 2021 South Kalimantan Floods were the first major flood event in the region in the past 50 years. The exact numbers from the target province, Central Kalimantan, are unknown however likely to be similar. With these disasters happening more frequently and becoming more severe, there is an urgent need for increased preparedness among the local communities in Mawas.

**Stable or fragile context**

The intervention takes place in Indonesia and although the context in many ways is considered stable, there are also areas in which the context is more fragile. For instance, the space for CSOs and NGOs has been restricted - especially over recent years. They need a formal license for working in Indonesia, and recently some organizations had these revoked (e.g. WWF). Especially forest protection is considered a sensitive issue, which the government requires full management and oversight, why the partners need to be very careful when addressing and reporting illegal logging and forest fires. Many local NGOs (and StO partners), have been interrogated when reporting illegal logging to the police, and many cases have resulted in threats from the police. This situation has worsened, as the national Ministry of Environment and Forestry (MoEF) sent out a letter, stating that any forest protection efforts are under their management and that NGOs are required to report directly to them. This limits their opportunities to act as watchdogs and report on illegal logging to the public, without the high risk of losing their working license.

**Strengthening of civil society organizing, active citizenship, and volunteering, etc.**

As mentioned above, the target communities are affected negatively in several ways by the continuing degradation of the peatlands and its impacts on both human and environmental health. During extreme ENSO episodes, the communities’ natural resources are damaged and crucial ecosystem services are compromised. The community members are among others, reliant on agricultural land, clean water, basic infrastructure, and NTFPs for their survival, all of which tend to get further degraded, destroyed, or become unavailable during events of natural disasters which then further worsens the already widespread poverty in the area. The community members are furthermore reliant on their health to carry out work and generate incomes, why health implications such as haze-induced respiratory illnesses, easily can push individuals and households into extreme poverty, further reducing their limited coping mechanisms. While forest fires and floods are reoccurring in the area, the overall awareness of their causes and long-term impacts are not well understood in the communities. Their education level is generally limited, and health- and environmental education is basically non-existent. This intervention therefore firstly aims at increasing the communities’ awareness and knowledge of the causes of environmental degradation, the importance of environmental protection, and its impacts on human health, with a particular focus on severe drought, fire, haze, and floods, through health- and environmental education, targeting school kids and young, as well as community adults. It is the aim to create an early appreciation for the natural environment along with an increased sense of ownership of their own lives and their natural surroundings, as well as an understanding of their connection to the environment. The community members will furthermore be facilitated in organizing and participating in community-led forest patrols and blocking of the canals, enabling them to act as stewards of the environment by taking an active role in minimizing the impacts of climate change and natural disasters in the future. Lastly, the community members will be involved in participatory assessments of the communities’ capacities and vulnerabilities to severe drought, fire, haze, and floods, leading to the preparation of an LSPRP and increased access to health services in the events of natural disasters caused by severe El Niño and La Niña episodes. Through all of the above-mentioned strategies, the communities will become more resilient to future ENSO-events as well as become better prepared to advocate for increased support for climate change mitigation in the future.

**Climate- and environmental conditions that the intervention responds to**

The target communities are located in an area, extremely vulnerable to the effects of climate change and they already struggle to cope with the existing challenges of poverty and climate shocks. However, the further effects of sudden extreme weather events and climate change-induced natural disasters could push many beyond their ability to cope or in worst cases survive. By increasing the knowledge and awareness of these issues in the communities, the risk of forest fires started by human activity will be mitigated, and the incentive among the community members to actively engage in protecting their remaining natural resources, will be increased. However, environmental degradation and poverty go hand in hand. The communities rarely have economic insurance to cover health care bills when climate change-induced disease-outbreaks occur, as well as lost property, and damaged crops related to floods and forest fires. Thus, a vicious cycle is established, where flooding and forest fires cause the local community members to sell their land to large concessions and/or to turn to illegal activities such as logging or mining, which only leads to further environmental degradation and makes the area even more prone to floods and forest fires. Therefore, this initiative moreover aims at increasing the preparedness of the communities to droughts, fires, haze and floods by supporting the communities in assessing their capacities and vulnerabilities, implementing Early Warning – Early Action (EWEA) systems and preparing Local Strategic Preparedness and Response Plans (LSPRP).

**2.** **The partnership**

Save the Orangutan Foundation (StO)

StO works for the survival of the orangutan and its natural habitat, as well as sustainable development for the local population. Strategically this is based on a rights-based approach to community development supporting the rights and livelihoods of marginalized and vulnerable indigenous people and other forest-dependent communities. The work involves cooperation with local partners in Borneo through which the organization has more than 15 years of experience working with community development and rights-based work. This has among others involved different interventions for supporting capacity building in indigenous people’s rights and acknowledgment, sustainable livelihood strategies focusing on providing added value, increased output, and better market linkages and profit, as well as community-based forest protection and eco-restoration efforts including capacity building and organization of community patrols for anti-logging and fire prevention. These experiences have provided valuable experiences for the proposed intervention. The work of StO has built up knowledge and professional practical skills, both on-the-ground level and within partner cooperation and the organization is qualified within a broad range of disciplines, including natural resources management, international development, communication, project cycle- and financial management and monitoring.

Borneo Orangutan Survival Foundation (BOSF)

BOSF is the local partner organization and one of the largest non-profit organizations in Indonesia, established in 1991. Their work is dedicated to the conservation of the Bornean orangutan, habitat conservation, and community empowerment, working in cooperation with local communities and international partner organizations. The organization consists of a headquarters on Java and four programs on Kalimantan. The proposed project will be implemented by the program, BOSF-Mawas, which has worked with community development and community engagement in forest protection activities since its establishment in 2003. With almost 20 years of presence in the area, BOSF-Mawas has great knowledge of the working area and their huge capacity within community development and forest management will contribute to highly professional implementation. They have so far successfully engaged several hundred community members in the protection of the forest and their livelihood resources and have great experience in building community capacity for forest monitoring and fire prevention. BOSF-Mawas have moreover built valuable and positive relations with the environmental agencies as well as the health authorities on subdistrict, district, and provincial levels, also involved in this intervention.

**Previous cooperation between the partners**

StO and BOSF have worked together since 2003, and in 2007, BOSF-Mawas and StO started working together on community development, among others, with support from CISU. This has built up a strong partnership with many years of cooperation experiences that are extremely useful for the proposed project. The partnership projects have among others involved capacity building of the BOSF-Mawas program and staff in project management tools, and know-how for development work, and the partners have moreover developed a joint strategy for community development based on the experiences and lessons learned from their joint projects in Mawas, the target area of the proposed intervention. Together, StO and BOSF have successfully supported 18 communities in the training, organization, and equipment of forest monitoring patrolling teams which are successfully continuing the patrolling of the areas, detecting, extinguishing, and stopping an impressive amount of forest fires and illegal logging instances. In other ongoing interventions, the partners are working on developing a forest monitoring app that will enable better systematizing and collection of data, that can be used to identify priority areas and advocate the authorities to improve their engagement in the protection work as well as carrying out capacity building of the BOSF staff in the use of satellite data for monitoring changes in the forest cover. Awareness-raising of environmental issues is moreover an integrated part of many of the previous and current projects by the partners. In another initiative, also funded by CISU, in the northern part of East Kalimantan, however implemented by the program, BOSF-RHO, the partners have gained valuable experience with environmental and health-related education in elementary schools and junior high schools as well as with coordinating with health authorities on different administrative levels, both in relation to advocacy for increased support at the local level and in relation to the formulation and dissemination of a local One Health Action Plan. Moreover, StO is simultaneously implementing a similar intervention in Sebangau National Park, also located in Central Kalimantan, with the local NGO, Borneo Nature Foundation (BNF), which is also focusing on environmental- and health education of local communities and natural resource protection in relation to forest fires and haze. All of the above-mentioned experiences have played an important role in the development of the proposed intervention and will positively contribute to the implementation of the project activities.

**Contributions, roles and responsibilities of the partners and other actors**

Responsibilities of the partners

StO will be responsible for the overall project- and financial management, as well as reporting to CISU on the achievement of results and expenses. StO is responsible for facilitating an online start-up meeting with representatives from BOSF-Mawas to discuss and prepare the work plan and implementation, and will receive and review quarterly narrative and financial reports from BOSF-Mawas, covering the progress of the implementation of activities planned to support the achievement of the objectives of the project. These reports will form the basis for the quarterly online progress meetings with the partners facilitating discussions and feedback on progress and possible challenges, as well as adjustments to the work plan if needed. Throughout the project, StO will moreover play an active role in the implementation of certain project activities by providing technical input to the planning of the simulation drills in the communities, the Vulnerability and Capacity Assessments and to the development of the simple EWEA systems. Moreover, StO will be involved in preparing monitoring and reporting protocols for the patrolling teams. At the end of the project, the partners will carry out a final review and discuss lessons learned to enable the best learning from the experiences and results, and ensure that learning can be used in other project areas and provide significant spill-over effects, as usually seen in the partner projects. The local implementing partner of the intervention is BOSF-Mawas of which the Program Manager will be responsible for the overall local management of the project, while the daily implementation will be carried out by the project coordinator, the community development team, the local teachers, and the local health care personnel. This includes conducting baseline studies, local capacity building through training sessions and meetings with community members, as well as technical assistance in the field. The BOS Foundation headquarters will be responsible for supporting the implementation and local monitoring and reporting.

Other involved actors

While the partners are responsible for the planning and implementation of the project activities, the overall success of the intervention relies on the target communities' motivation and participation in the project activities. The community members thereby hold the overall responsibility for the final impacts derived from the intervention. With a multi-stakeholder approach, this intervention furthermore involves a wide range of schools, health units, authorities, and agencies on different administrative levels. Several of the activities within the proposed intervention will be initiated and/or implemented through cross-sectorial meetings, workshops, and focus group discussions involving several of the below actors as well as the community members. The specific contributions, roles and responsibilities of the involved actors are as follows:

Local school teachers:The local teachers will play a significant role in the development of educational material and teaching of human- and environmental health subjects in two elementary schools, two junior high schools, and one senior high school as well as the planning and execution of school field trips to a degraded area in Mawas. The local teachers will moreover participate in a two-day capacity-building session by a local consultant and representatives from DLH, the Education Agency, and the Health Agency of South Barito. At the end of the project, the teachers will assist in the planning and execution of an event where the involved school students will present their knowledge and learnings to other students of the schools and thereby hopefully making more students aware of and interested in environmental- and human health related issues.

Environmental authorities and agencies:The involved environmental authorities and agencies include the Protection Forest Management Unit of Kapuas Regency (KPHL), the Natural Resources Conservation Agency (BKSDA), the Environmental Agency of Kapuas Regency (DLH), and the Regional Disaster Mitigation Agency (BPBD). Representatives from these institutions will participate in the development of educational material and the execution of the human- and environmental health education and simulation drills of haze and flood events with the community members. The KPHL, DLH, and the BPBD will moreover be involved in identification of specific needs for natural resource management and -protection in and around the communities, and in the training of the community fire-fighting teams. The DLH will moreover participate in the identification of former and current haze-induced health problems in the communities, and together with the BPBD provide input for the participatory Capacity and Vulnerability Assessment of the communities as well as participate in the development a simple EWEA systems and an LSPRP for the communities. The physical meetings between villages and duty-bearers through the above-mentioned activities will ease future coordination by creating an awareness of the conditions and specific challenges in the villages amongst the institutions, as well as an overall insight into the institutions and political decision-making processes amongst the community members. Altogether, this will positively affect the villages’ potential for engaging in advocacy processes in the future.

Local health units and the Health Agency of South Barito:The local health units involve the Posyandus and the Puskesmas. The first is a local integrated health center, managed by local people that have received short health education. The main focus of a Posyandu is to provide routine health checks (typically for infants, pregnant women, and elders), provide counseling, and distribute vitamins. The Puskesmas is the Public Health Center with educated doctors which is only found at the Subdistrict level, Dusun Hilir. Personnel from these local health units will be involved in the preparation of educational material for the school students and the community members as well as in the capacity building of the local teachers and execution of education- and outreach activities regarding human health and first aid in the communities. They will moreover be involved in the identification of former (and current) haze-induced problems in the communities and in making an inventory of the local health clinics in the communities in order to identify areas of improvement. Lastly, they will participate in the preparation of a simple EWEA system and an LSPRP for the communities. The Health Agency of South Barito District (Dinas Kasehatan) is the agency responsible for supervising the puskesmas in the sub-districts as well as all planning, policy development and budgeting related to all health aspects in the entire district of South Barito. In this project the agency will help integrate project activities with government activities, provide input to the educational material, as well as provide data from the local health units in the sub-districts and villages.

Village leaders:The Village leaders for both villages include the Village Head, the Village Secretary, the Head of the BPD (Village Representative Body), the Village Customary Head (mantir), and the Community Leader. These leaders will participate in the planning of human- and environmental health education for the school students and the community members, the vulnerability and capacity assessments of the communities, the identification of former and current health impacts from haze and floods, the development of simple EWEA systems, and the preparation and dissemination of an LSPRP. By involving the village leaders in all decision making, all community meetings and -workshops throughout the project, the partners and the project will sustain and gain the local leaders’ trust, necessary for firstly implementing the project, and later, sustain the achieved progress and changes in the villages.

Customary institutions:The Damang (the Customary head of the Dusun Hilir Subdistrict) and the Dayak Council of the sub district will be involved in the preparation of learning materials for the human- and environmental health education for the communities and in the development of an EWEA system and LSPRP, by providing input on local wisdom and customs.

**The interventions contribution to developing the relationship and collaboration between the partners**

As mentioned, the partners have almost 20 years of experience working together, and 15 years of experience in the Mawas area. Working directly with the schools is however a new strategic component for BOSF-Mawas, however, inspired by the previously mentioned recent intervention by StO and BOSF-RHO, focusing solely on human- and environmental health. With help from the BOSF-HQ, learning and experiences from that intervention will feed into the planning and implementation of the proposed intervention. The intervention will thereby strengthen the partners’ collaboration with each other and between BOSF programs and their capacity to work strategically with education on the link between human- and environmental health, both through the experiences and learnings from the implementation in the communities, and advocacy work through coordination with the relevant health- and environmental authorities on different administrative levels. In another ongoing intervention, the partners are moreover preparing a reporting and data collection system to be used by the community patrolling groups as well as an improved system for monitoring, evaluation, and learnings. These systems will be tested and used in the proposed intervention, in order to reach better monitoring and evaluation of the long-term impacts, outcomes, and learnings of their work, with impacts beyond the scope of individual projects.

**​​The intervention’s contribution to strengthening the partners’ relations to other actors.**

This intervention involves a range of authorities on all administrative levels, including environmental agencies, disaster agencies and health care units. Assisted by BOSF, representatives from the communities will conduct meetings with these agencies and authorities as well as participate in Vulnerability and Capacity Assessments and preparation of a simple EWEA system and an LSPRP and thereby build ties and improve awareness about the local conditions and challenges in order to better advocate for increased resources at the local levels for environmental protection and health care. As a new strategy for the Mawas team, ties will be formed with five elementary-, junior high- and senior high schools in the Mawas area during the making and teaching of human- and environmental health education material, which is hoped to become the first step in including more education of these highly relevant real-life issues, in the school curriculums in the future. The target communities and the local partner will thus gain strengthened relationships with a long range of actors, highly relevant and necessary for the ongoing processes of protecting the human- and environmental health in the Mawas area.

**3.** **Target groups, objectives, and expected results**

**Composition of target groups**

The project targets two indigenous Dayak communities living in Mawas, namely Mengkatip Village and Dusung Simpang Telo Village in Dusun Hilir Sub district in South Barito District. Mengkatip is the largest village by population in the subdistrict, located 132 km from the capital of Kapuas Regency. It has its own elementary schools, junior high schools, and senior high schools as well as a public health center (Puskesmas) with two educated doctors. Mengkatip furthermore has a public market, public electricity, clean water, and cell phone signal. Dusung Simpang Telo, on the other hand, is a small village of only 60 households, located 73 kilometers from the capital of Kapuas, which can only be reached by boat. The village has no clean water, no cell phone signal, and public electricity and its health care options are limited to a midwife and two nurses, only found in the neighboring village, Batampang, where also the children and young attend school. However, no senior high school is available in Batampang Village. The target communities mainly consist of indigenous Dayak people who have embraced both Islam and Christianity, but still maintain and preserve the old Dayak traditions and rituals, from the animistic folk religion Kaharingan, professed by many Dayaks in Kalimantan, which is strongly connected to nature. Their main source of income is agriculture, which further emphasizes their dependence on their natural resources. See the below table for further details.

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| **Village** | **Population** | **Households** | **Ethnicity** | **Primary religion** |
| **Men** | **Women** | **Total** |
| Mengkatip | 2024 | 1873 | 3897 | 1055 | Dayak | Islam, Christian,  |
| Dusung Simpang Telo | 180 | 120 | 300 | 60 | Dayak Bakumpai | Islam |

Source:Official sub district statistical data for Timpah and Dusun Hilir Subdistricts (2019)

A total of 4244 people will thereby benefit from the implementation of the project (secondary target

group), while a minimum of 244 are expected to take an active part in project activities (primary target group), including:

* Students from two elementary schools, two junior high schools, and one senior high school, i.e., 20 from each school (100).
* Community members involved in environmental education and awareness-raising activities (60).
* Community members involved in forest monitoring and canal blocking (50).
* Teachers from five local schools (10).
* The Health Clinic (Puskesmas) of Mengkatip Village (2).
* The Natural Resources Conservation Agency (BKSDA) (2).
* The Protected Forest Management Unit of South Barito (KPHL) (2).
* The Regional Disaster Mitigation Agency of Kapuas (BPBD) (2).
* The Environmental Agency of Kapuas (DLH) (1).
* The Education Agency (2).
* The Local health care units (Posyandus) from Mengkatip and Batampang Village (2).
* The Health Agency of South Barito (1).
* The Customary Institutions on the sub district level (2).
* Village leaders (10).

**How the target communities will participate and benefit from the intervention**

First of all, the target groups will gain increased knowledge of the causes and prevention of forest fires, haze and floods and how to mitigate the impacts of these. In combination with the establishment of simple Early Warning – Early Action (EWEA) systems, assessment and mapping of the communities’ vulnerabilities and capacities, and the preparation and dissemination of an LSPRP, the community will thereby become better prepared for severe drought, fire, haze, and floods as well as become better able to advocate for increased support from the involved authorities, due to the experiences and connections formed throughout this intervention. They will become able to implement safety precautions for high-risk community members, and with first-aid courses and increased coordination with local and upper-level health agencies, the community members will seek and achieve improved medical attention when symptoms from severe air pollution do occur. The proposed intervention will moreover create a foundation for community members to actively engage in forest monitoring for the prevention of forest fires, directly increasing their resilience to droughts during extreme El Niño events. As a new thing in Mawas, this intervention furthermore involves the young generations. From a previous intervention, carried out by StO and BOSF-RHO, it became clear that the young generations are highly open to new information and the introduction to new practices and that they value and care for their local environment and personal health when given the right tools and information. Thus, this intervention aims at promoting the children and young people as ‘agents of change’ by aligning the education implemented in the schools with the education and information disseminated in the villages, as well as encouraging the oldest students to take an active part in the forest patrols. It is the hope that increased knowledge, awareness, and understanding of issues related to environmental and human health among the young generations will empower and motivate them to join in community decision-making in relation to sustainable development, now and in the future, with benefits for many generations ahead.

**Target group involvement in the intervention development and partners’ legitimacy to act as champions of their cause**

Long term commitment in Mawas has built up legitimacy and trust between StO, BOSF-Mawas and the local communities in the area. Mengkatip Village has been involved in the partners’ project ‘SOS Borneo’ since 2015, which is an ongoing reforestation project. While the partners are new to working with Dusun Simpang Telo, the neighboring Village, Batampang (of which the schools are involved in this intervention), have been a target community of BOSF Mawas and the partners in previous projects. The previous interventions in Batampang focused on capacity-building for economic development and sustainable livelihoods, as well as environmental protection and restoration involving establishment of community forest monitoring patrols and canal blocking. This intervention is thereby based on experiences and learnings from these previous interventions in the target communities and surrounding villages, which establishes trust from the very beginning. The objectives and activities of this project builds upon these former experiences and direct wishes of the community members, of which has been expressed and gathered during evaluations of the previous projects. The BOSF staff themselves have furthermore often been present in the villages and therefore have an updated understanding of the needs and wishes of the community members as well as of the challenges and opportunities within the different communities.

**The strategy of the intervention**

The project aims at increasing the preparedness to severe ENSO events and mitigating the impacts of droughts, fires, haze and floods on environmental and human health for two indigenous communities in Central Kalimantan, Indonesian Borneo. The intervention is based on three strategic elements focused on the pillars of the Development Triangle, each of which are continually reinforcing each other. The partners will provide the target communities with strategic deliveries and services in the shape of education and equipment that will lead to increased awareness, knowledge, and preparedness for ENSO-induced fire, haze and floods. The intervention is moreover focused on the pillar of good organizational capacity by supporting the target group's own organization and their ability to carry out environmental rehabilitation and protection efforts and engage in sustainable livelihoods. Moreover, new shared M&E systems will be tested throughout the intervention, which will contribute to the development of the partner organization by improving the procedures and processes concerned with data gathering, participatory methods for obtaining feedback from the communities, monitoring and evaluation of the projects as well as developing new projects in the future. In order to bring about lasting change in the communities, this intervention furthermore focuses on advocating the relevant health-, environmental- and disaster management authorities on different administrative levels for increased human- and environmental health education in the schools and increased support for health care and environmental protection at the local level through meetings with the relevant institutions, agencies and authorities and community representatives and village leaders, and thereby including the voice of the target areas. The project will start up in December 2022 and run over a period of 13 months. Altogether, the activities aim to contribute to the prevention of avoidable forest fires as well as the mitigation of impacts from both floods and forest fires, on human and environmental health.

1. Increased community knowledge and awareness

The general awareness in the communities of the causes and impacts of environmental degradation as well as its link with human health, is low, why this intervention firstly aims at increasing the knowledge and awareness of these issues, through education and outreach activities for both children, young, and adult community members. This is seen as a preventative measure, as reaching the community members both from an early age, will change their attitude towards hazardous practices (e.g. slash-and-burn techniques, burning garbage, etc.) as the causes of both intentional and accidental fires in the dry seasons, but also their understanding of the importance of environmental protection and restoration as a more long-term method to mitigate the risk of floods and forest fires and their impacts on human health. Together with an external consultant and the school teachers, BOSF, the relevant health authorities, environmental agencies, and the Disaster Management Agency will develop educational material about these issues. This material will be taught to 40 elementary students and 40 junior high school students in Mengkatip and Batampang Village (i.e., the neighboring village to Dusung Simpang Telo Village), and 20 senior high school students in Mengkatip Village, twice a month from April 2023, up until the end of the year. With the aim of creating young first-movers, who in the long run will be able to inspire others, the students will be selected from a criterion of motivation, and the subjects range from nature appreciation for the youngest to more high-level anatomy classes, first aid courses, and topics within restoration techniques, for the oldest, among others. These students will moreover participate in a field trip to a highly degraded and restored site, where the students get to plant jelutong (rubber) trees at the restoration site. All of these activities will culminate in an event where they will disseminate their learnings to other students of their schools in order to reach a broader representation of the young generations. The subjects will be taken on by the schools as extracurricular, with the potential to hopefully become an integrated part of the school curriculum in the future. Moreover, 60 community members, also selected from a criterion of motivation, will participate in environmental and health-related education and outreach initiatives, including first-aid education and simulation drills of natural hazards and disasters, to better understand the harmful effects of environmental degradation on human health. This will be carried out as community meetings, once by the environmental agencies (i.e., BKSDA, KPHL, and DLH) and once by health staff and BPBD, including the local Puskesmas and the Health Agency of South Barito District. Lastly, the community members from each target community, will participate in a field trip to degraded and restored sites, in line with the field trip arranged for the school students. Not only are the educational activities seen as a measure to prevent hazardous practices, but also as a way to create incentives among the older community members (i.e., senior high school students and adults) to actively participate in the protection of their natural resources, hence becoming part of the mitigation efforts as well.

2. Improved forest protection through hydrological rehabilitation and community-led forest patrolling

While some actions can be taken to ensure that avoidable ignitions are decreased, the forest fires in Kalimantan are recurring and often a result of industrial activity and long periods of drought, due to the El Niño phenomena. Therefore, this intervention seeks to build the communities’ capacity to protect their natural resources by rehabilitating the hydrology of the drained peat to decrease the fire risk as well as supporting the communities in organizing in patrolling teams with the aim to control and extinguish the fires before they spread and become uncontrollable. Four small canals (tatas) in Dusun Simpang Telo and six tatas in Mengkatip, will be blocked with an average of three dams per canal, by community members who will receive training and assistance in the construction and maintenance of the dams by BOSF-Mawas. As the canal owners often utilize their canals for transportation of goods and products of which make up their livelihoods, they will furthermore receive support and training in alternative livelihoods, in order to ensure long term existence and maintenance of the dams. The importance of canal blocking will moreover be disseminated to the communities as part of the environmental education activities, in order to ensure communal support for the canal blocking. Mengkatip Village already has a patrolling team but with this intervention, the team will be to expand its routes, thus covering a bigger risk area. In Dusung Simpang Telo Village, community members will be assisted in establishing a patrolling team, and equipped with fire-fighting, health, and safety equipment (i.e., GPS, first aid kits, fire clothing, water pumps, hoses, boots, materials for deep well drilling, etc.). They will moreover be trained in peat-fire extinguishing methods, how to drill deep wells at strategic locations along their patrolling routes and how to establish traditional fishponds (*bejes*), both of which will ensure their water supply for extinguishing fires during droughts. These training sessions will also include the village leaders and village governments in order to ensure their support for the patrolling teams. The bejes furthermore serve as firebreaks and benefit the target communities economically by naturally trapping fish from overflowing rivers in the area, during the rainy season. Throughout the intervention, community patrolling teams in both villages will have engaged in the protection of the risk areas around their villages throughout an entire dry season, with an increased effort in case of an El Niño event. This approach will help mitigate the effects of El Niño events on both human and environmental health.

3. Increased preparedness for severe haze and flooding events

The health implications caused by peat swamp forest fires in Indonesia, affect large parts of Southeast Asia, however, this is not well understood among the communities most vulnerable to the problem. Access to adequate health care in the communities is limited and limited reporting and coordination between health authorities at different administrative levels means that the knowledge of the local health impacts is low. In order to get an overview of the current situation and areas of improvement, BOSF-Mawas will map the relevant health authorities on the different administrative levels and the local health care staff, village leaders, and community members (with input from BPBD) will through meetings and FGDs assess the vulnerability and capacity of the communities, as well as identify former and current haze-induced problems. Moreover, the local health care staff will make an inventory of the local health clinics. These activities will together form the basis of the preparation of an LSPRP and the establishment of simple EWEA systems with assigned anticipatory actions, in case of severe drought, fire, haze, and floods. This involves meetings with public health agencies on the village, subdistrict, and district levels, DLH, and BPBD, to inform about the status in the villages and advocate for increased support.With input from the relevant agencies (i.e., BPBD, DLH, and the Health Agency of South Barito District), motivated community members, assisted by BOSF-Mawas, will prepare the LSPRP and present and discuss this with the villagers at community meetings, followed by the placement of awareness-raising material in the villages. The LSPRP will include elements such as practical guidelines for high-risk community members (i.e., pregnant women, infants, children, and elders, plus people with pre-existing heart- and lung diseases), recommendations for additional health checks among community members in risks groups, including guidelines on where to go in case of symptoms, information about the provision of basic protection aids such as N95 face masks, and guidelines on school attendance during severe haze events. Thus, the LSPRP will directly contribute to the preparedness of the communities and the mitigation of health impacts from the haze.

**Objectives, activities, expected results, and indicators of the intervention**

The project will be implemented over a period of 13 months and aims at contributing to the overall development objective: *Increased preparedness for extreme ENSO episodes and mitigation of the impacts of droughts, forest fires, haze, and floods on environmental and human health for local communities in Central Kalimantan, Borneo.*

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| **Immediate objective 1:** *The target communities have gained increased awareness and knowledge of the causes of environmental degradation, the importance of environmental protection, and its impacts on human health, with a particular focus on forest fires and severe haze events.***Indicators:**1. Teachers from five different schools have developed and are teaching educational material in environmental degradation and forest fires and the harmful effects on human health.
2. A minimum of 145 community members (students and adults) are reporting to have gained increased knowledge and understanding of the causes of environmental degradation and the harmful effects of forest fires in particular on human health.
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| **Output 1.1.** The harmful effects on human and environmental health, caused by environmental degradation and forest fires in particular, are taught regularly to a minimum of 100 students, from one elementary school and one junior high school in both Mengkatip and Dusung Simpang Telo Village and one senior high school in Mengkatip Village (five schools/min. 20 students per school).  | **Activity 1.1.1.**: Preparation of educational material by local teachers and a local consultant, with input from representatives from the Education Agency, the Health Agency of South Barito, KPHL, BPBD, DLH, and the Puskesmas of Mengkatip Village.**Activity 1.1.2.**: Capacity building of local teachers, including preparation of education plan by BOSF and a local consultant with input from representatives from DLH, the Education Agency, and the Health Agency of South Barito.**Activity 1.1.3:** Environmental and health education in schools twice a month from April 2023 for 8 months, including first-aid courses, resulting in an event where the involved students disseminate their learnings to other students of the schools.**Activity 1.1.4:** Field trip to a degraded and restored area in Rantau Upak, for a minimum of 100 students, arranged by BOSF-Mawas and the teachers. |
| **Output 1.2**. A minimum of 60 community members from the target villages have participated in environmental and health-related education and outreach initiatives to better understand the harmful effects on human health caused by environmental degradation and forest fires in particular. | **Activity 1.2.1:** Meetings w. BOSF-Mawas, village leaders, local teachers, relevant environmental agencies (i.e., BKSDA/KPHL/DLH), the Health Agency of South Barito District, and the local Puskemas to discuss and prepare environmental and human health education for the communities.**Activity 1.2.2:** Environmental and health educational activities in the villages (twice per village), including simulation drills of natural hazards and first-aid education, involving village governments, and community members, conducted by BOSF-Mawas, BKSDA/KPHL/DLH/BPBD, the local Puskesmas, and the Health Agency of South Barito District, assisted by StO.**Activity 1.2.3:** Community field trips with a minimum of 60 participants to a degraded and restored area in Rantau Upak. |
| ***Immediate objective 2.*** *The target communities are restoring and protecting high-risk areas*  *surrounding the villages against seasonal forest fires in order to reduce their environmental and human health impacts.* **Indicators:**1. The patrolling teams have gained the skills and knowledge to carry out patrols and extinguish fires and the target communities are effectively increasing their forest protection efforts.
2. 100% of the identified forest fires in and around the target areas, have been attended and extinguished.
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| **Output 2.1.** Local fire-fighting capacity for rapid response to peat swamp forest fires in and around Mawas has increased, with operating patrolling teams in both communities. | **Activity 2.1.1:** Community meetings for identification of specific needs for natural resource protection in and around the communities, facilitated by BOSF and relevant authorities (e.g., BPBD/KPHL/DLH).**Activity 2.1.2:** Community patrolling teams in both villages have been organized, assisted and equipped for patrolling operations.**Activity 2.1.3:** Training of community patrolling teams in peat-fire extinguishing methods, use of equipment, and deep well drilling.**Activity 2.1.4:** Deep well drilling in high-risk areas by community groups.**Activity 2.1.5:** Establishment of five traditional fish ponds in each of the villages for provision of water during dry season and fish stock.**Activity 2.1.6:** Community patrolling teams in both communities are effectively mobilized during the dry season with an increased effort during droughts and in particular in the event of an El Nino episode, assisted by BOSF and StO. |
| **Output 2.2.** Community members are actively engaging in protecting drained peatland from forest fires by rehabilitating the hydrology of the peat in the areas of the target villages.  | **Activity 2.2.1:** Community meetings for identification of canals to be blocked and development of agreement with canal owners incl. need assessment for alternative livelihoods.**Activity 2.2.2:** Environmental survey of relevant canals.**Activity 2.2.3:** Training of 20 community members and canal owners in canal blocking methods.**Activity 2.2.4:** Procurement of materials for dam constructions and blocking of 10 small canals (tatas) with 3 dams/canal. **Activity 2.2.5:** Participatory planning of and training in alternative livelihood activities for canal owners. **Activity 2.2.6:** Monitoring and technical assistance in canal blocking and alternative livelihoods. |
| **Immediate objective 3:***The target communities have gained increased preparedness for severe drought, fires, haze and floods with the goal of mitigating the impacts on human health, and are more capable of advocating relevant duty-bearers for increased resources.* **Indicators:**1. Increased coordination with health authorities has led to improved resources at local health centers.
2. A minimum of 50% of the community members in the target villages, are reporting to have gained increased awareness of how to respond to, and mitigate the impacts of droughts, fires, haze and floods on human health.
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| **Output 3.1**: The communities’ vulnerability and capacity in the events of severe droughts, fires, haze, and floods, have been assessed and areas of improvement have been identified in coordination with relevant health authorities. | **Activity 3.1.1:** BOSF-Mawas have mapped the relevant health authorities on the different administrative levels. **Activity 3.1.2:** BOSF-Mawas has identified former (and current) haze-induced problems in the communities and made an inventory of the local health clinics (Pusyandu) in the communities through meetings and FGDs with communities, village leaders, and local health staff.**Activity 3.1.3:** Participatory assessment of community vulnerability and capacity during severe flood and haze events, with input from BPBD, facilitated by BOSF-Mawas with inputs from StO. |
| **Output 3.2:** By the end of the project period, a Local Strategic Preparedness and Response Plan (LSPRP) for severe droughts, fires, haze and floods has been developed and disseminated to the community members.  | **Activity 3.2.1:** Coordinating meetings with public health agencies on the village, subdistrict, and district levels, DLH, and BPBD to inform about the status in the villages and advocate for increased support.**Activity 3.2.2:** Participatory preparation of a simple EWEA system and an LSPRP with input from BPBD, DLH, and the Health Agency of South Barito District, prepared by BOSF-Mawas and StO.**Activity 3.2.3** Implementation of simple EWEA systems and dissemination of the LSPRP to community members through community meetings and awareness-raising material. |
|  **4. In pursuit of more than one immediate objective** |
| **Output 4.1:** The partners and community members are prepared for project start-up. | **Activity 4.1.1:** Online start-up meeting between StO and BOSF-Mawas to discuss implementation, detailed work plan, and baseline.**Activity 4.1.2:** Detailed implementation has been planned with the communities, and introductory meetings have been carried out with local agencies. **Activity 4.1.3:** Baseline study through meetings and FGDs of awareness and knowledge among community members and students by BOSF-Mawas. |
| **Output 4.2.** Ongoing monitoring and evaluation of progress, challenges, and impacts have ensured continuous learning and enabled adjustments if needed. | **Activity 4.2.1:** Technical assistance to community members and monitoring of activities in the field by BOSF-Mawas.**Activity 4.2.2:** Online partner status meetings for discussions of progress, challenges, budgets, etc.  |
| **Output 4.3.** The partners have evaluated the impact of the intervention and learnings have fed into future strategies.   | **Activity 4.3.1:** Knowledge exchange between communities and result study of gained awareness and knowledge among community members and students, post implementation, by BOSF Mawas. **Activity 4.3.2:** Final review by StO and BOSF (HQ and Mawas programme), involving a project visit and discussions with the partners and target groups on lessons learned.  |

**Contributions to establishing sustainable and lasting improvements for poor, marginalised and vulnerable target groups and strengthening the partners’ capacities after the intervention period.**

The intervention has a strong focus on building local capacity for preventing and responding to different immediate and long-term issues that are affecting the health and livelihoods of the target communities. The focus on education and training sessions are expected to provide the target groups with better understanding and capacity to address the risks to their health and livelihoods caused by environmental degradation, and by targeting the younger generations as well, this is expected to benefit the communities for generations ahead. It is the hope that the human- and environmental health education activities in the schools, which in this intervention will be taken on as extracurricular, will prove successful and function as a pilot for a later inclusion of this in the official school curriculums. The organization of community patrolling teams and coordination with local schools, village governments, health units, and governmental agencies, moreover aims at providing a stronger foundation for the communities to continue the efforts after the end of the intervention. This also involves the canal owners, who with training in alternative livelihood strategies, will be supported in establishing environmentally- and economically sustainable livelihood practices such as fish farming, honey farming or vegetable farming. The community members will moreover take part in the Capacity and Vulnerability Assessments to haze, fires and floods as well as in the identification of health impacts in the communities connected to severe ENSO episodes. This will happen at multi-stakeholder holder meetings with relevant government agencies and other stakeholders where the community members can voice their concerns and provide inputs for the development of the simple EWEA system and LSPRP, based on their improved awareness and understanding of what is required to mitigate the impacts of environmental degradation and the risks to their health and livelihoods. With the development of an EWEA system and an LSPRP the communities will be able to anticipate the risks and act timely when hazards in the shape of drought, fire, haze and floods are approaching the communities. The community members will know how to respond, who to protect and where to go, when symptoms occur, which can protect the most vulnerable in the communities, and in the most severe cases, prevent cases of serious illness and death. This intervention furthermore focuses on involving village leaders and governments in all training and decision making throughout the intervention in order to create a foundation for local governmental support for the project activities and for these to be proceeded after the end of this intervention. Throughout the intervention the communities will thus gain strengthened capacity and position, both to take active part in addressing causes and impacts affecting their lives, as well as a strengthened position to voice their concerns and advocate duty-bearers for improved efforts and support. Altogether this will ensure that the target group is not left in a situation of dependency as it enables them to maintain positive changes and results, also after the end of the project period. The intervention will moreover increase the experiences of the partners and improve their capacity to collaborate on projects regarding these issues in Mawas and other areas affected by the ENSO-episodes in the future.

**Possible risks that can hinder or delay fulfilment of the objectives and their possible solutions.**

High motivation, but low active participation level by community members

Community members, especially the poorest, are often hesitant to engage in new activities as this involves time away from what is known to be able to sustain their livelihoods (even if this is at a minimum). Locals therefore might show interest in new initiatives, but prioritize their time on current ones to minimize the risk of losing important livelihood sources. The project therefore has a strong focus on awareness-raising and education as well as inclusion of the community members in participatory processes of the assessment of their capacities and vulnerabilities to drought, fires, haze and floods as well as the identification of current and previous impacts from these events in the communities. By involving the most motivated community members, and facilitating meetings between these and the relevant health, education, environment and disaster management authorities, the communities are given a voice in the development of systems and plans that will affect how they will and can act to these weather events in the future. This will moreover create a sense of ownership to the project and the results in terms of the EWEA system and an LSPRP. Risk mitigation therefore also involves clear information on the strategy and activities of the project, and planning of community activities together with the participants and local leaders and governments well in advance.

Resistance against blocking drainage canals

Many drainage canals are used by locals for river transportation, fishing and in some cases also transporting illegal timber out of the forest. Blocking of these has in some areas therefore been met with resistance in the past, due to locals considering it a hazard to their existing activities and use of the canals. However, the negative impacts of the canals are becoming more and more apparent for the communities, why the efforts to mitigate these through canal blocking are of general interest for the local communities. While there is a general positive attitude towards environmental restoration, and specifically canal blocking, in the area, the proposed intervention involves education and awareness raising initiatives in order to fully assure the communities’ understanding of the importance of the need for blocking canals in order to re-wet the area for the communities’ health and livelihoods, as well as meetings to ensure support for this from community members. Furthermore, the canal owners will receive capacity building in alternative sustainable livelihoods such as honey or poultry farming or fish damming, in order to assure the livelihoods of the directly affected households.

Sensitivity around forests and fires and general shrinking space for NGOs in Indonesia

As mentioned earlier, forest protection and peatland fires has become a sensitive issue in Indonesia especially over the recent years, probably due to an increasing global focus on climate change. This is causing increasing restrictions on NGOs and their initiatives to address the issues. This can make up a risk for the local partner and the implementation of the activities, in particular the forest monitoring and fire prevention efforts. It has been emphasized by the authorities that they are the ones managing the forest areas, and any examples in the press or other ways that can highlight their shortcomings can therefore be considered a threat to the government. This is a dilemma as government agencies often lack the necessary resources to address the issues that they are responsible for, and therefore need help from CSOs and NGOs. To mitigate this risk, it is of high importance that the relevant government authorities are involved in the different parts of the intervention and in large part can take ownership of the results. The proposed intervention will therefore involve meetings with relevant authorities right from the beginning to inform about the intervention objectives and work plan, regular information and reporting on activities and results, as well as stakeholder meetings involving different government agencies to ensure that all actors feel involved which will furthermore improve the foundation for advocacy for a stronger engagement by the duty-bearers.

The Pandemic

The COVID-19 crisis and its related restrictions on travels and social gatherings, etc. have affected the work of the partners heavily since 2020. While restrictions in Indonesia have lightened significantly during the last 6 months, it is unknown whether the pandemic will have a come-back during the project implementation period. However, the partners have gained valuable experience in how to adjust and adapt to the changing context while complying to restrictions and mitigating the spread of COVID-19 and at the same time enabling the continuation of interventions with a minimum delay in the project implementation. If the COVID-19 cases in Indonesia are to rise and bring along increased restrictions during the project implementation period, the partners will make use of these experiences.

Loss of key personnel

The sudden loss of key personnel can result in a loss of knowledge and capacity, which can affect the implementation of the project. Therefore, intensive ongoing knowledge sharing among staff and partners in order to ensure that documentation on progress etc. is available to others is an important part of this, and all other interventions between the partners. This specifically involves the testing of the new Partner M&E system and framework for systematization of knowledge and learning, which will be developed as part of another CISU funded partner project in the fall of 2022.

**Systematizing experiences along the way and at the end of the intervention**

The proposed intervention builds on an established monitoring and reporting system, including documentation of baselines and lessons learned. The partners are moreover collaborating on an improved shared M&E system for data gathering and processing, which will be utilized throughout this intervention. Through community meetings and training sessions, status, progress, and experiences will be gathered by the BOSF-Mawas project staff who will conduct regular internal meetings for discussing project progress, status and challenges, budget, expenses, and lessons learned. These discussions will also form the basis for quarterly reports that BOSF-Mawas will prepare for StO. At StO, the Head of Programs and the Project Officer are responsible for gathering and systematizing experiences. Project updates will be given at regular meetings with the partners, along with a discussion of how to make use of the experiences in other projects and in communication work. At the end of the intervention, StO and BOSF will evaluate the project and discuss lessons learned in Indonesia.

**4. Project-related information work in Denmark**

Information work will be carried out in Denmark, with the aim to contribute to increased awareness and understanding of how climate change-induced drought, fire, haze, and flooding events are impacting the natural environment and the public health, and challenging the livelihoods of the communities in Kalimantan, Indonesian Borneo, as well as how it is possible to support and contribute to positive changes for these vulnerable and marginalized people for them to build resilience for the future. The main target groups for the information work include the existing donor base of StO consisting of nearly 9000 individual donors and private sector companies, as well as newsletter readers and followers on social media. The means of communication to be used includes articles on the website, in newsletters in the printed annual result report, and on social media (Facebook, Instagram, LinkedIn). StO will moreover seek to publish articles and press releases in newspapers and online media, to spread information to the general public and contribute to a better understanding of the impacts of climate change, environmental degradation, and ENSO episodes in general.

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3. BBC News. 16 September 2019. [↑](#footnote-ref-3)
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