COMPLETION REPORT

ITTO PP-A/56-340-1

CAPACITY BUILDING on Forest and Land Fire Management in Indonesia

Host Government: Indonesia

Executing Agency:
Directorate of Forest and Land Fire Management
Directorate General of Climate Change
Ministry of Environment and Forestry

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ITTO FIRE PROJECT PROFILE

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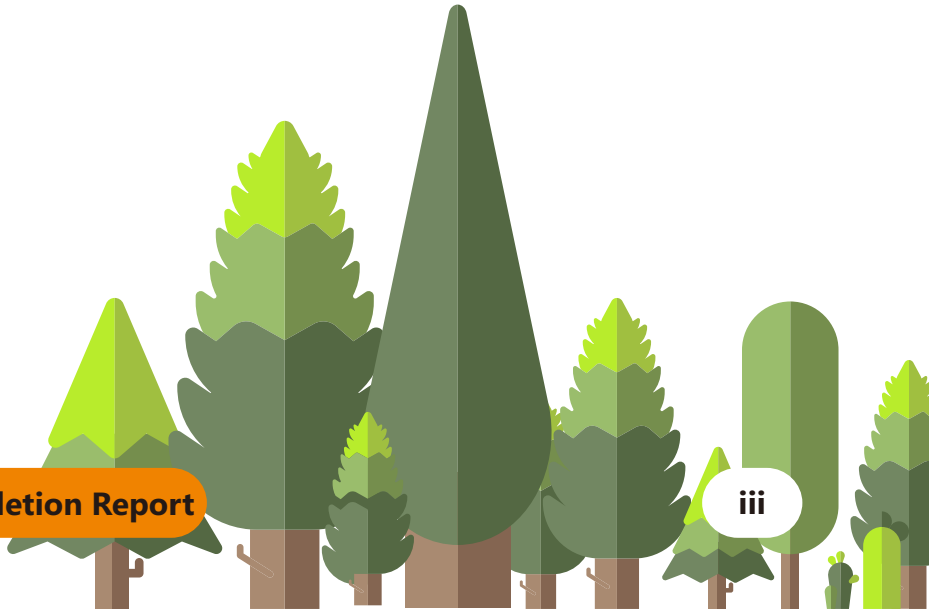
Project Coordinator of ITTO PP-A/56-340-1



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BBSDLP	:	*Balai Besar Penelitian dan Pengembangan Sumber Daya Lahan Pertanian* (Indonesian Center for Agricultural Land Resources Research and Development)
BIG	:	*Badan Informasi Geospasial* (Geospatial Information Agency)
BMKG	:	*Badan Meteorologi, Klimatologi, dan Geofisika* (Meteorological, Climatological and Geophysical Agency)
BNPB	:	*Badan Nasional Penanggulangan Bencana* (National Agency for Disaster Countermeasure)
BPPT	:	*Badan Pengkajian dan Penerapan Teknologi* (Agency for the Assessment and Application of Technology)
BRGM	:	*Badan Restorasi Gambut dan Mangrove* (Mangrove dan Peat Restoration Agency)
BRIN	:	*Badan Riset dan Inovasi Nasional* (National Research and Innovation Agency)
CATIE	:	Center for Research and Training in Tropical Agriculture Directorate
Directorate FLFM	:	Directorate of Forest and Land Fire Management
FCP	:	Program of Community Development on Fires Control in Peat Land Area
FDRS	:	Fire Danger Rating System
FFPMP	:	Forest Fire Prevention and Management Project
FGD	:	Focus Group Discussion
GIS	:	Geographic Information System
IIRR	:	International Institute for Rural Reconstruction
ITTO	:	International Tropical Timber Organization
JICA	:	Japan International Cooperation Agency
LAPAN	:	The National Institute of Aeronautics and Spaces
MA	:	*Manggala Agni* (Forest and Land Fire Brigade of MoEF)
MPA	:	*Masyarakat Peduli Api* (Fire Care Community)
MODIS	:	Moderate Resolution Imaging Spectroradiometer
MoEF	:	Ministry of Environment and Forestry
NOAA	:	National Oceanic and Atmospheric Administration
NGO	:	Non-Government Organization
PLTB	:	*Pembukaan Lahan Tanpa Bakar* (Land preparation without burning)
PM	:	Atmospheric Particulate Matter
PSC	:	Project Steering Committee
Renstra	:	*Rencana Strategis* (Strategic Plan)
Renja	:	*Rencana Kerja* (Work Plan)
RPJMN	:	*Rencana Pembangunan Jangka Menengah Nasional* (National Mid-term Development Plan)
RFMRC-SEA	:	Regional Fire Management Resource Center-South East Asia
SMART	:	System Monitoring and Reporting Technology
UNFCCC	:	United Nation Framework Convention on Climate Change

EXECUTIVE SUMMARY

Fires in Indonesia occur almost every year, especially during the dry season. Many researchers stated that almost 99% of forest and land fires in Indonesia are caused by human activities. According to various studies and experiences, forest and land fires in Indonesia have negative impacts on health, ecosystems, economy, transportation, politics, etc.; caused loss to forest cover and natural wildlife habitats, and damaged to forest and land including peatland ecosystems. The key problems identified by stakeholders can be outlined as: i) negative impacts on health, ecosystems, economy, transportation, politics, etc.; ii) loss to forest cover and natural wildlife habitats; iii) damage to forest and land including peatland ecosystems; and iv) insufficient comprehensive policies and operational regulations on forest and land fire prevention.

The project was formulated to address the key problems that had been identified and further designed the development and specific objective that should be achieved. The development objective is to support the capacity building for the implementation of an integrated forest fire prevention program and to reduce the effects of fires on forest cover, natural wildlife habitats, and livelihood; while the specific objective was to improve prevention of forest and land fire through strengthening management and technical capacity of stakeholders in three targeted provinces and nationwide.

Regarding the implementation strategy, the defined project objectives were translated into three outputs that must be achieved, they were:

i. Best agricultural practices applied by Fire Care Community (*Masyarakat Peduli Api*)/Local communities

ii. Management capacity to address forest and land fires problems strengthened, and

iii. Cooperation among local institutions, private sector and communities in forest and land fire prevention strengthened

For the 18-month period, the project had completed all its planned activities and even delivered several unplanned activities. The completed planned activities were in line with achieving the targeted outputs. The project introduced and improved the program on alternative integrated land preparation without burning for the community/*Masyarakat Peduli Api* as one of the answers to the national policy on burning prohibition, through land preparation without burning for cropping, farming and local livelihood development. The land preparation without burning practice was conducted by utilizing biomass wastes from land preparation. The project also improved capacity of *Manggala Agni* through the training program on technical skills which most of the substances were novel knowledge for *Manggala Agni*. To ensure sustainability of the project benefits, planned follow up actions are: 1) strengthening synergy and collaboration of involved stakeholders; 2) continuing implementation of

activities by Directorate of Forest and Land Fire Management, Fire Regional Agency, and *Manggala Agni* under their respective tasks and responsibilities in the implementation of forest and land fire control in the field; and 3) encouraging more active community participation in fire prevention.

The important lessons learned from the project include:

- To execute the colossal work on fire management, synergy and collaboration are indispensable between stakeholders including the government, fire brigades, private sector, MPA, universities, NGOs and international communities.
- Local communities and farmers are in need of applicable alternative technologies and approaches for utilizing lands and augmenting income in light of the government policy on land burning prohibition.
- Participation of local communities and farmers in prevention of forest and land fires should be continuously encouraged, assisted and accompanied by the government and stakeholders.
- The Fire Brigades (*Manggala Agni*) should be periodically trained to maintain and improve their capacity in fire management.
- There is a need to consistently revitalize the equipment and facilities for controlling forest and land fires to ensure adequacy of performance in terms of quantity and quality.

1 PROJECT IDENTIFICATION

Indonesia national policies related to forest and land fires put priority on the reduction of burnt areas in fire prone provinces focusing on prevention activities. Formulation of this project conforms to the Indonesia national policy and existing regulations as stated in the National Mid-term Development Plan 2020-2024 (RPJMN).

1.1. Context

1.1.1. Project Location

a. South Sumatra Province

South Sumatra Province is located on the southeast of Sumatera Island with Palembang as it's capital. It lies south of the equator at 2°45”S and 103°50'E and bordered with several other provinces, i.e Jambi in the North, Lampung in the South and Bengkulu in the West while in the East the Bangka Strait separates the province with the Bangka Belitung Islands Province.

b. Central Kalimantan Province

Central Kalimantan Province is located on the island of Borneo with Palangkaraya as its capital. This province is the third largest Indonesian province with an area of 153,564.5 km^2, about 1.5 times the size of the Java Island. It is bordered by West Kalimantan and East Kalimantan provinces in the north, by the Java Sea in the south, by South Kalimantan and East Kalimantan provinces in the east and by West Kalimantan province in the west. The coordinates of the province are 2°13'S and 113°55'E.

c. South Kalimantan Province

South Kalimantan Province is located on the island of Borneo, located in 2°30'S and 115°30E. South Kalimantan has a total area of 37,377.53 km² and is divided into four regions, namely Kotabaru, Banjar, Tabalong, and Banjarmasin city. Geographically, South Kalimantan is in the southeastern part of the island of Borneo, has a low-lying area in the west and east coast and a plateau formed by the Meratus Mountains in the middle. South Kalimantan consists of two main geographic features, namely the lowlands and the highlands. This province is bordered by the Makassar Straits in the east, Central Kalimantan in the west and north, the Java Sea in the south and east Kalimantan in the north. The province also includes the island of Laut located off the eastern coast of Kalimantan.

1.1.2. Social, Cultural, Economic and Environmental Aspects

a. South Sumatra Province

The population of South Sumatra Province is estimated at around 8,497,196 in 2019. The province is inhabited by many different ethnic groups with the Malays being the largest one. Most people speak Palembang Malay which is mutually unintelligible to both Indonesian and standard Malay. Other ethnic groups include the Javanese, Sundanese, Minangkabau and Chinese. Most are concentrated in urban areas. The culture of the province is largely influenced by Malay culture. South Sumatra's cultural wealth includes traditional houses, traditional clothing, various types of dances as well as typical foods from the area. The cultural wealth of South Sumatra is not only popular within the South Sumatra region itself, but also beyond the border.

There are five sectors that support economic growth of South Sumatra, namely the processing industry, mining, agriculture, construction, and retail. South Sumatra's economic growth is also supported by tourism. The area of this province consists of swamps, peatland and mineral soil and

the vegetation is dominated by lowland vegetation, palmate plants, mangrove, rubber, oil palm, and agriculture plantations, especially coffee, tea and vegetables. Mount Dempo is the highest point in this province. This region has a tropical monsoon climate. Throughout the year the province is only affected by two seasons, namely the rainy season and the dry season. The air temperature varies from 24.7 to 32.9^{0} C with air humidity levels ranging from 82% to 88%. The rainy season falls from October to April and December is the month with the most rainfall while the dry season usually occurs in June to September.

b. Central Kalimantan Province

There are three major Dayak tribes in Central Kalimantan: the Ngaju, Ot Danum and Dusun Ma'Anyan Ot Siang. The three major tribes extend into several branches of prominent Dayak tribes in Central Kalimantan such as Lawangan, Taboyan, Dusun Siang, Boyan, Bantian, Dohoi and Kadori. Besides the indigenous Dayak tribes, there are also ethnic groups from other areas of Indonesia, including Javanese, Madurese, Batak, Toraja, Ambonese, Bugis, Makassar, Papuan, Minang and Banjarese, Balinese and also Chinese. The center of the province is covered with tropical forest, which produces rattan, resin and valuable timber such as Ulin and Meranti. The southern lowlands are dominated by peatland swamps that intersect with many rivers. Sebangau National Park located in this province is a protected peatland area internationally acknowledged as sanctuary for the endangered Orangutan. The province's climate is wet weather equatorial zone with an eight-month rainy season, and 4 months of dry season. Rainfall or precipitation is 2,776 - 3,393 mm per year with an average of 145 rainy days annually. The population of Central Kalimantan Province is around 2,649,803 in 2019.

c. South Kalimantan Province

The population of South Kalimantan was recorded at just over 3.6 million people in 2010 and at nearly 4.0 million in 2015. The latest official estimate in 2017 is 4.1 million. South Kalimantan is the traditional homeland of the Banjar people. Other ethnic groups also inhabit the province, such as several group of the Dayaks and Javanese. The area of forest in South Kalimantan is 1,659,003 hectares, including: protected forests, natural forests, permanent production forests, limited production forests, conversion forests and mangrove forests. South Kalimantan Province is known as "the land of a thousand rivers", due to its large number of rivers. From these rivers, one of the well-known is the Barito River, commonly used as floating markets for buying and selling goods. This region has a tropical monsoon climate, similar to most other Indonesian provinces. The main product of agriculture in this province is rice, corn, cassava and sweet potatoes. Fruits consist of oranges, papaya, bananas, durian, rambutan and many other local species. Palm oil is also a common product of South Kalimantan.

1.1.3. Relevance

a. National Policies

Indonesia national policies related to forest and land fires put priority on the reduction of burnt areas in fire prone provinces focusing on prevention activities. The formulation of this project conforms to the Indonesian national policy and existing regulations which are stated in the National Mid-term Development Plan 2020-2024 (RPJMN). This project also supports the implementation of the following policies:

1. President Instruction No. 3 /2020 concerning Strengthening Control on Forest and Land Fire
2. Environment and Forestry Ministerial Regulation No. P.32/MenLHK/Setjen/Kum.1/3/ 2016 on Forest and Land Fires Control.
3. MoEF Executive Decision No. P8/MENLHK/SETJEN/KUM.1/3/2018 concerning Procedures for Field Checking Hotspots and / or Forest and Land Fire Information.
4. MoEF Executive Decision No. P.9/MENLHK/SETJEN/KUM.1/3/2018 concerning Technical Criteria for Forest and Land Fires Preparedness and Emergency.

Figure 1. Project locations

b. ITTO priorities (ITTO Strategic Action Plan)

Strengthening the forest fire governance in the priority areas will be ensured through the capacity-building component for community organizations and authorities, as well as through the development of stakeholder coordination mechanisms in the field of forest management in problematic areas (consistent with Strategic Priority 1). Furthermore, the project seeks to reduce the degradation of tropical forests by improving their conservation so as to maintain the provisions of environmental services and promote sustainable forest management, which in turn will contribute to national and, in particular, local economies (Strategic Priorities 3, 4 and 2).

c. ITTO Guidelines on Fire Management in Tropical Forest

By aiming to reduce the occurrence/frequency of forest and land fires especially in the dry season, this project is consistent with ITTO objectives and priorities as well as the relevant national policies. This project complies with principle 1, principle 16 and principle 24 of the ITTO Guidelines on Fire

Strengthening the forest fire governance in the priority areas will be ensured through the capacity-building component for community organizations and authorities, as well as through the development of stakeholder coordination mechanisms in the field of forest management in problematic areas

Management in Tropical Forest as highlighted below:

(i) Principle 1 Policy Development, Recommended Action 1

- Identify local communities, concession holders, timber companies, contractors, conservation non-governmental organizations (NGOs), women's groups, and other voluntary organizations to assess their interest and capacity to forge partnerships with government authorities in fire management programs. Where necessary, assistance will be provided by government authorities in the development of such organizations.
- A national fire policy forming an integral part of the national land use policy, and assuring sustainable forest management, should be formulated and accepted by all relevant parties, including government, local communities, and the private sector.
- Establish, and effectively staff and fund, a decentralized national agency, or strengthen an existing institution responsible for the establishment and implementation of an effective fire policy.
- Enact and/or revise national and local laws and regulations regarding the proper use of fire to ensure the effective implementation of fire management policies.
- Create a system of incentives and sanctions, which will encourage responsible use of fire at all levels, including timber felling and sawmilling.

(ii) Principle 16,

- Promote improved agricultural and agrosilvopastoral systems as alternatives to shifting cultivation.
- Establish model demonstration areas for specific farming and agrosilvopastoral practices combining them with other components of a fire management system (e.g. integrating farming and grazing activities to modify fuel loads or fuel break systems).
- Develop suitable incentive programs to reward communities and individuals which use

Establish model demonstration areas for specific farming and agrosilvopastoral practices combining them with other components of a fire management system (e.g. integrating farming and grazing activities to modify fuel loads or fuel break systems).

appropriate land-use practices, resulting in reduced fire damage. In the case of individuals, it is often effective to make formal recognition in the presence of peers, that the individual has done something special. Develop and promote an environmental awareness program on the relation between social, economic, and environmental benefits derived from forests, and the negative impacts associated with wildfires.

- Establish a program to investigate the causes of wildfires, and the underlying reasons. This should form the basis for formulating a wildfire prevention, education, and extension program.
- Develop and implement programs following the principles of regenerative agriculture to promote nutrient cycling so that biomass is utilized to enhance soil fertility. These programs should consider promoting and disseminating sustainable agricultural practices by organizations such as the IIRR (International Institute for Rural Reconstruction), CATIE (Center for Research and Training in Tropical Agriculture), and grassroots level NGOs.
- Demonstrate a variety of land treatment and soil preparation practices, which apply viable and inexpensive soil and water conservation techniques, consider establishing demonstration plots where fire is not utilized as a tool in site preparation or land clearing.

(iii) Principle 24, Recomended Action 24

- Concession holders, timber companies, and contractors should provide support to local communities; and encouraging their active participation in forest fire prevention programs.
- Some forest-based activities of local communities involve the use of fire. Such activities should be regulated through measures, which reduce the risk of wildfire by these activities. Conflicts and misunderstanding between local communities and forest concession workers must be avoided through regular dialogues, and respect for local tradition and wisdom. Concession holders, timber companies, and contractors must always consider the welfare and well-being of local communities.

- Assist communities in their efforts to enhance respect for traditional values and customs, which have historically preserved natural resources.
- During periods of extreme fire danger, access to forests for recreational pursuits should be strictly controlled. Camping should be restricted to certain sites where facilities such as stoves should be provided. Elsewhere, the use of fires for cooking should be prohibited.
- Patrols should be undertaken in areas frequented by people to ensure compliance with rules and regulations in force. Such patrols should be more intensive during periods of high fire risks or during holiday seasons.

This project is expected to contribute to addressing specific national socio-economic and natural problems related to fires in natural and planted tropical forests in Indonesia in accordance with the ITTO Guidelines on Fire Management in Tropical Forest.

1.2. Origin and the problem addressed

1.2.1. Origin

In recent years, forest fires have risen in global attention as an environmental and economic issue. Fires are considered a threat to sustainable development because of their direct effects on ecosystems, contribution to carbon emissions and impact on biodiversity. Fires in peat areas generate smoke haze that causes negative impact on health, daily activities, transportation, education and regional cooperation. According to the research study published in the Atmospheric Chemistry and Physics journal, conducted field measurements during the 2015 El Niño in Central Kalimantan, showed that the smoke haze from peat fires contained 90 gases that are harmful for health and contribute to greenhouse gas emissions since the smoke haze contains carbon dioxide, carbon monoxide and methane (Stockwell, 2016). Another study that has been conducted in Central Kalimantan and published in Springer shows that the average increase in the annual mean PM 2.5 concentration due to peatland fires in Central Kalimantan was 26 $\mu g/m^3$, which is more than twice the recommended value of the World Health Organization Air Quality Guidelines. The increase of PM 2.5 leads to increased occurrence of a range of air pollution related diseases and premature mortality. The number of premature mortality cases can be estimated at 648 cases per year (26 mortality cases per 100,000 population) among others due to chronic respiratory, cardiovascular and lung cancer (Hein, 2019).

Fires in Indonesia occur almost every year especially in the dry season. Many researchers stated that forest and land fires in Indonesia are almost 99% caused by human activities. Local communities in Indonesia are familiar with the use of fire in traditional livelihood activities, such as land and post-harvest vegetation clearing, agriculture preparation, hunting, camping, etc. Use of fire in farmland preparation has been conducted since a long time ago in almost every part of the world, not only in Indonesia but also in other countries which practice traditional agriculture since using fire in farm or agricultural preparation is fast, easy and cheap. Historically, local communities with its local wisdom have played a significant role in the management of fire in many years. Nevertheless, changes in land use patterns, social conflict, and economic growth often change these patterns and practices of using fires.

Sahardjo (2003) stated that in shifting cultivation, fire has been used since thousands of years ago because it is easy, quick, and cheap, and farmers think that the soil can get nutrients from the ashes. According to Sadjati (2012), farmers using fire in farmland preparation assumed that the soil would become more fertile after being burnt, but disregard the hazard that occurred from uncontrolled burning. While few of the burning activities are ecologically sound and useful, many of them were harmful and damaging to the environment. People often have the opinion that by burning the land, it can fertilize the soil. However, researchers suggest that excessive and uncontrolled land fires actually result in infertile soil (poor nutrient) and can cause loss of soil organisms that may have important roles in soil fertility.

Massive forest and land fires occurred in Indonesia in 1982/1983, 1997/1998, 2006, 2009, 2014, 2015 and 2019 with varying scales and intensities. Fires during 1997/1998 especially in Sumatera and Kalimantan burnt an area of around 11.7 million ha, while in the fire season in 2015 burnt area is estimated to be 2.1-2.6 million ha (Albar, 2016). The last fire season in 2019 estimated burnt area at about 1.6 million ha. In 1993, ITTO supported a project “Establishment of a Demonstration Plot for Rehabilitation of Forest Affected by Fire in East Kalimantan”. In addition, JICA has consistently supported the Ministry of Forestry (MoF) on forest fire prevention, among others, Forest Fire Prevention and Management Project (FFPMP) in 1996-2006 and “Program of Community Development of Fires Control in Peat Land Area (FCP)” in 2013.

For more than two decades, previous actions to combat the fires focused on suppression activities. However, the 2015's fire, transboundary haze pollution occurrences and Indonesia's commitment to climate changes issues on COP-21 UNFCCC that was held in Paris on 2015 encouraged Indonesia to change approaches into focusing on prevention activities.

For more than two decades, previous actions to combat the fires focusing on suppression activities. However, since the 2015's fire, transboundary haze pollution occurrences and Indonesia's commitment to climate changes issues on COP-21 UNFCCC that was held in Paris on 2015 encouraged Indonesia to shift the focus on prevention activities. The President of Republic of Indonesia held coordination meeting and have been giving presidential directives since 2016 until 2019 which proves Indonesia's strong commitment in addressing forest and land fire. In general, the Presidential Directives consist of mechanisms to strengthen prevention, field operation, law compliance and enforcement. Prevention activities that have been conducted are as follows: integrated prevention patrol, routine patrol, early detection and early warning system, peatland management, campaign and socialization, establishment of *Masyarakat Peduli Api*, biomass utilization "Zero Burning Policy" (*Pembukaan Lahan Tanpa Bakar*), and community assistance program. The prevention activities are focused on increasing awareness and participation of communities at village level and integrated prevention patrol to prevent forest and land fires. Currently, mainstreaming forest and land fire prevention in Indonesia is the key agenda to tackle the forest and land fire problem. Prevention activities could contribute in reducing hotspots and forest and land fires occurrences, increasing public awareness in preventing forest and land fires and improving community welfare.

In order to strengthen prevention activities, the MoEF established the Forest and Land Fire Brigades called *Manggala Agni* since 2002 in 12 fire prone provinces in 34 Local Fire Station (Daops *Manggala Agni*) with consists of 1,875 personnel. The insufficient number of *Manggala Agni* encourages MoEF and other Institutions to establish *Masyarakat Peduli Api* on a voluntary basis. Currently, there are 704 groups of MPA with 10,569 members in 28 provinces. *Manggala Agni* has trained the members of MPA with basic knowledge on forest and land fire control. The members of MPA are expected to be the "agent of change" in their community regarding forest and land fire prevention.

In terms of prevention, the MoEF launched several programs which among them is integrated prevention patrols since 2016, although they still need improvement to achieve the effectiveness and efficiency of integrated patrol programs. This program targets 8 fire prone provinces, namely: North Sumatera, Riau, Jambi, South Sumatera, West Kalimantan, Central Kalimantan, East Kalimantan, and South Kalimantan. A team of integrated prevention patrol consists of *Manggala*

Agni, MPA, Police, Army, Forest Rangers and representatives of local governments. Besides the new program called integrated prevention patrol, MoEF also conducts routine patrols outside the integrated prevention patrol areas. Both patrols aim to prevent, monitor, and conduct early suppression of forest and land fires.

According to the burnt area calculation using Landsat 8 imagery, the data showed that the largest burnt area in 2019 was located in South Sumatera Province (328,457 ha), followed by Central Kalimantan with a total burnt area of 303,881 ha while burnt area in South Kalimantan Province was recorded at around 136,428 ha. These three provinces also have large areas of peatland that are very prone to fire in the dry season. The area of peatlands in three provinces from the widest to the smallest in sequence is Central Kalimantan with around 2,659,000 ha, South Sumatera with around 1,262,000 ha and South Kalimantan with around 106,000 ha. These data indicate that it is important to increase prevention activities in those areas.

This project has supported the Government of Indonesia to conduct prevention activities. The project has involved *Manggala Agni* and *Masyarakat Peduli Api* as the main key actors in forest and land fire control and prevention at site level (village level) through training and integrated prevention patrol in 3 fire prone provinces. Last, the project has also supported government officials to strengthen their capability to conduct effective and efficient forest and land fire management to address forest and land fire issue.

1.2.2. Problem

In Indonesia, forest fires occur almost every year especially in dry season. Many researchers stated that almost 99% of forest and land fires in Indonesia are caused by human activities. Local communities in Indonesia are familiar with the use of fires in traditional livelihood activities, such as land and post-harvest vegetation clearing, agriculture preparation, hunting, camping, etc. Use of fires in farmland preparation has long been practiced in almost every part of the world, not only in Indonesia but also in other countries which practices traditional agriculture since the use of fires in farm or agricultural preparation is quick, easy and cheap. Historically, local communities with their local wisdom have played a significant role in the management of fires for many years. However, changes in land use patterns, social conflicts, and economic growth often change these fire use patterns and practices.

Fire prevention is a key activity stated in MoEF Planning Document (Renstra and Renja 2020-2024) and in line with President Directives Number 3 year 2020. Insufficient budget allocation for carrying out the activity has prevented achievement of fire prevention targets. In light of the importance of tackling the issues, the project will improve technology/system and development of technique and guidelines such as SMART (System Monitoring and Reporting Technology), an application tool that can be utilized for managing an integrated real time report by *Manggala Agni* in the field and works as preventive measures in protecting the forest from fire and haze in target location.

Based on Indonesia regulations, the coordination mechanism in forest fire prevention shall be conducted at various levels, namely: central, provincial, district/city, as well as at the site level. At central level, several ministries and national agencies have established coordination mechanisms which include, among others, the MoEF; Ministry of Agrarian Affairs; Spatial Planning/National Land Agency; Ministry of Health; National Institute of Aeronautics and Spaces (LAPAN); Meteorological, Climatological and Geophysical Agency (BMKG); and Geospatial Information Agency (BIG). At the operational level (provincial and below), there is room for improvement, including coordination among actors i.e. these are all important efforts towards a common goal. However more needs to be done at the operational level despite increased cooperation among local governments, law enforcement units, communities and the private sector.

Several studies and experiences reveal that forest and land fires in Indonesia have negative impacts to health, ecosystems, economy, transportations, politics, etc.; caused loss to forest cover and natural wildlife habitats and damaged forests and lands including peatland ecosystems. The key problem that causes repeated-occurrences of forest and land fire identified by the stakeholder meeting were:

1) Negative impact to health, ecosystems, economy, transportations, politic, etc.
2) Loss of forest cover and natural wildlife habitats
3) Damage to forest and land including peatland ecosystems
4) Insufficient comprehensive policies and operative regulations on forest and land fire prevention

Following the stakeholder consultations, three main causes of the key problems had been identified: i) Poor agricultural practices employed by communities; ii) Limited management capacity of institutions to address forest and land fires problems; and iii) Lack of cooperation/actions among stakeholders in forest and land fire prevention.

2 PROJECT OBJECTIVES AND IMPLEMENTATION STRATEGY

2.1. Project Objectives

The project objectives that must be achieved consistent with the problems addressed were defined as follows:

Development objective : support the capacity building for the implementation of integrated forest and land fire prevention program and reduce the effects of the fires on the forest cover, natural wildlife habitats and livelihood

Specific objective : improve prevention of forest and land fire through strengthening management and technical capacity of stakeholders at three targeted provinces of South Sumatra, Central Kalimantan and South Kalimantan, and national level

2.2. Project implementation strategy

Defined project objectives were translated into three outputs that must be achieved, specifically:

1) Best agricultural practices applied by Fire Care Community (MPA)/Local communities
2) Management capacity to address forest and land fires problems strengthened
3) Cooperation among local institutions, private sector and communities for forest and land fire prevention strengthened

We express our deep gratitude to ITTO for providing cooperation support on forest and land fire management in Indonesia through this project. We hope the project could provide significant influences and impacts on forest and fire management in Indonesia

Ir. Laksmi Dhewanthi, MA, IPU
(Director General of Climate Change, MoEF)

Figure 2. Statement of Director General of Climate Change

Under the translated individual outputs, 12 main activities had been identified and implemented during the project period to deliver those outputs. These activities were implemented through developing guidelines, delivering trainings/courses, improving technology, organizing workshops/Focus Group Discussions/Meeting, as well as providing fire safety equipment, in the following fashion:

Output 1

The project developed guidelines for alternative agricultural practices related to land preparation without burning for communities. In addition, the project carried out several capacity building on grass root level through implementing training programs for local communities especially *Masyarakat Peduli Api* members in 8 locations in the three targeted provinces, followed by developing demonstration plots for zero burning practices in the same locations.

Output 2

The project developed guidelines on forest and land fire control for fire brigades. The project carried out training programs on forest and land fire control for *Manggala Agni*, organized training/workshops on fire-spatial approaches, as well as conducted socialization and training on utilizing SMART Patrol Information System in three targeted provinces. The SMART Patrol Information System is an application technology for managing an integrated real-time reporting and monitoring of fire prevention patrols delivered by *Manggala Agni*. Moreover, through collaboration between *Manggala Agni* and *Masyarakat Peduli Api*, SMART patrols were conducted as a preventive measure against forest fires and haze in the targeted locations. The project also provided fire equipment to support the implementation of forest and land fire control.

A training programme is very much needed for Fire Care Community/MPA, since there are numerous Fire Care Community groups that have been established in Indonesia where they lack knowledge on Land Preparation without Burning.

Output 3

This output was delivered through the development of synergy and collaboration among stakeholders which is important to enhance information sharing and take rapid-fire suppression actions. Dialogues on synergy and collaboration were also effectively carried out to support actions on land preparation without burning (*Pembukaan Lahan Tanpa Bakar*/PLTB) which involved communities, private sector, regional government, and village government. The project organized sub-regional webinar series for the prevention and management of forest and land fires in Southeast Asia which presented international experts/practitioners on forest fire issues. The project also disseminated the outcomes of the project in various forms of project promotional materials such as leaflets, videos, and reports using different available platforms, including social media. In addition, the project also organized competitions on the project activities issues for other ways of dissemination.

2.3. Assumptions and risk

Several assumptions had been made and defined to ensure a successful project implementation to achieve project objectives which comprised:

1) The stakeholders support the whole project's activities,
2) The central government maintain forest fire prevention as its national priority programme,
3) All stakeholders firmly commit to actively participate in actions to handle forest and land fire in the country.

Moreover, some of the risks that could obstruct the achievement of project outputs and the objectives had also been identified including:

1) Stakeholders do not fully support in addressing forest and land fire problems in Indonesia.
2) Forest and land fire prevention are not maintained as a national priority program.
3) All stakeholders do not commit to handle forest and land fire problems.

In order to mitigate or reduce these above risks, the project carried out activities in intensive coordination and cooperation with all stakeholders referred to the Minister of Environment and Forestry Regulation No P.32/2016 on Forest and Land Fires Control which aims to increase stakeholders' participation in forest and land fire control including prevention, suppression, and post-fire activities. Furthermore, related stakeholders at local, district, provincial, national, or even regional levels were invited and involved in the meetings, training, or events that could increase their awareness and participation in addressing forest and land fire issues. The regional office and project personnel delivered continuous and direct contact and coordination with the local communities and representatives of related stakeholders to build networking and conduct intensive communication as well as participation in project events.

3 PROJECT PERFORMANCE

3.1. Planned versus realized project performance

3.1.1. Specific Objective

The specific objective defined that must to be achieved through the implementation of planned activities was to improve prevention of forest and land fire through strengthening management and technical capacity of stakeholders at three targeted provinces of South Sumatra, Central Kalimantan and South Kalimantan, and national level. During the project implementation, defined specific objective was fully relevant thus no amendments had been made.

3.1.2. Outputs and related Activities

Table 1. Planned and realized outputs and related activities

Objective/Outputs/ Activities	Planned	Realized	Status/Remarks
DEVELOPMENT OBJECTIVE Support the capacity building for the implementation of integrated forest fire prevention program and reduce the effects of fires on forest cover, natural wildlife habitat s and livelihood			
SPECIFIC OBJECTIVE To improve prevention of forest and land fire through strengthening management and technical capacity of stakeholders at thre e targeted provinces and national level			
OUTPUT 1 Best agricultural practices applied by Fire Care Community (MPA)/Local communities			
1.1. To d evelop/improve training materials on sustainable agricultural and silvicultural management techniques as well as development zero burning practices	One package of Development/improvement on sustainable agricultural and silvicultural management techniques as well as development of zero burning practices area available	Module: Development of Zero Burning Practices (Land Preparation Without Burning) for the Community	Completed • Engaged experts/ researchers from MoEF/BRIN (Saptadi Darmawan, Kushartati Budiningsih, Irfan Malik Setiabudi)
1.2. To i mplement training for local community especially Fire Care Community (*Masyarakat Peduli Api*) members	Eight training program mes for local communities especially Fire Care Community *(Masyarakat Peduli Api)* members in 3 provinces namely South Sumatra, Central Kalimantan and South Kalimantan conducted.	8 (eight) training of zero burning practices: • 4 in South Sumatra • 2 in Central Kalimantan • 2 in South Kalimantan	Completed • Emphasizing on agricultural aspects
		3 (three) additional community economic empowerment training: • 2 in South Sumatra • 1 in Central Kalimantan	Completed • Emphasizing on economic aspects
1.3. To e stablish demonstration plots of zero burning practices	Demonstration plots of zero burning practices in 8 locations established	8 (eight) demonstration plots: • 4 in South Sumatra • 2 in Central Kalimantan • 2 in South Kalimantan	Completed • Emphasizing on agricultural aspects
		3 (three) additional fish ponds farming: • 2 in South Sumatra • 1 in Central Kalimantan	Completed • Emphasizing on economic aspects

Objective/Outputs / Activities	Planned	Realized	Status/Remarks
OUTPUT 2 Management capacity to address forest and land fires problems strengthened			
2.1. To provide training for forest and land fire control for Forest and Land Brigade (*Manggala Agni*) at province and district level	Four training programmes on forest and land fire control conducted for Forest and Land Fire Brigade (*Manggala Agni*) in 3 provinces namely South Sumatra, Central Kalimantan a nd South Kalimantan	11 (eleven) technical training of fire management : • 4 in South Sumatra • 4 in Central Kalimantan • 3 in South Kalimantan	Completed
		3 (three) technical training of Basic fire management for new members of *Manggala Agni*: • 1 in South Sumatra • 1 in Central Kalimantan • 1 in South Kalimantan	Completed
		3 (three) technical training of fire mechanics	Completed
2.2. To support officials on forest fire damage estimation using GIS and remote sensing application	Series of training for officials on GIS modeling carried out and proven remote sensing technology developed	• 2 (two) S ocialization and technical training of burnt -area estimation in South Sumatra and Central Kalimantan • 2 (two) S ocialization and technical training of fire -hazard map production in South Sumatra and Central Kalimantan	Completed
2.3. To develop technology/ system of SMART integrated patrol - reporting application	One set technology/ system of SMART integrated patrol reporting application developed and installed in 3 target provinces	• *System Monitoring and Reporting Technology for Fire Prevention Patrol (SMART Patrol Informat ion System)* in android mobile & web -based • Manual of parameter measurement • User manual video	Completed • Cooperation with Mathematics and Natural Science Faculty, IPB University • Coordinator development team: Prof. Imas S. Sitanggang
2.4. To improve Standard Operational Procedure on Forest and Land Fire Control	One Standard Operational Procedure on Forest and Land Fire Control developed	Handbook : Procedure for Forest and Land Fire Brigade	Completed • Engaged experts/ researchers from MoEF/BRIN (Kushartati Budiningsih, Irfan Malik Setiabudi)
2.5. To support building capacity of Forest and Fire Brigade (*Manggala Agni*) to control land and forest fire by providing safety equipment	Personal protective clothing properties and safety equipment of *Manggala Agni* in target location available	• 1,110 Safety Coats • 580 Safety Shoes • 16 portable water pumps • 8 motorcycles • 7 GPS • 58 Handy Talkies • 90 portable oxygen tubes	Completed

Objective/Outputs / Activities	Planned	Realized	Status/Remarks
OUTPUT 3 Forest and land fire prevention action increased			
3.1. To improve and strengthen the institutional coordination of the Task Force for Control on Forest and Land Fire Management at the national and provincial/district level	MOU among stakeholders (task force) to exchange information, conduct policy dialogues, strengthen cooperation implemented	Organized 3 (three) institutional synergy strengthening and collaboration at the Central level and Regional Level (South Sumatra and Central Kalimantan)	Completed
3.2. To hold dialogues on forest and land fire management/ action with private sectors and other local institutions	Two dialogue series to support Land Preparation without Burning *(Pembukaan Lahan Tanpa Bakar/ PLTB)* with private sector and local institutions implemented	Organized 2 (two) stakeholders dialogues one in South Sumatra and one in Central Kalimantan	Completed
3.3. To organize a sub -regional workshop for prevention and management of forest and land fires in Southeast Asia with an emphasis to Indonesia	A sub -regional workshop for prevention and management of forest and land fires in Southeast Asia with an emphasis to Indonesia conducted	Co-organized 7 (seven) monthly sub-regional webinar series collaborated with IPB University.	Completed • Cooperation with Environment and Forestry Faculty, IPB University • Coordinator: Prof. Bambang Hero Saharjo
		Continue organized 5 (five) international fire webinars hosted by MoEF.	Completed
3.4. To develop dissemination of the outcomes of the project and asses of its replication in other area	Dissemination of the outcomes of the project developed in various forms such as leaflets, film and report/social media	Disseminate the project implementation in various platforms (official website, mass media, online media, visual media/TV) and participation in exhibitions/events The project also provided 5 fire leaflets , 5 project videos , as well as organized poster and video competition.	Completed

3.2. Project schedule

The Project officially commenced on 28 January 2021 planned initially for twelve months, but some intense preparatory works and arrangements had been carried out since early January 2021 involving project key-personnel. Since duration of the project was truly short but involved large number of activities to implement during the Covid-19 pandemic situation; an extension in time for implementation was inevitable. A six-month extension in time had been approved by the ITTO without additional funding that the project completion date has now changed to 30 June 2022; with the extension, it was expected that all planned project activities would be fully implemented to deliver the outputs and achieve the specific objective including final project reporting both in terms of technical and financial aspects.

Table 2. The planned and completion activities

Outputs, Activities, and Sub-activities		Schedule		Monthly Schedule					
		Planned	Completion	2021				2022	
				1-3	4-6	7-9	10-12	1-3	4-6
Output 1. Best agricultural practices applied by Fire Care Community (MPA)/Local communities									
1.1	Development/improvement of training materials on sustainable agricultural and silvicultural management techniques as well as development zero burning practices	Jan – Jun 21	Mar 21 – Mar 22						
1.2	Implement of training for local community especially Fire Care Community (*Masyarakat Peduli Api*) members	Apr – Oct 21	Oct 21 – Jan 22						
	Training of community economic empowerment (additional)	Mar – May 22	Mar – May 22						
1.3	Establish demonstration plots of zero burning practices	Apr – Dec 21	Oct 21 – Mar 22						
	Fish-pond farming (additional)	Mar – May 22	Mar – May 22						
Output 2. Management capacity to address forest and land fires problems strengthened									
2.1	To provide training for forest and land fire control for Forest and Land Brigade (*Manggala Agni*) at province and district level	Apr – Dec 21	May – Jun 21						
	Technical training of forest and land fire control (additional)	Jul 21 – Jun 22	Jul 21 – Jun 22						
	Technical training of basic fire management (additional)	Jan 22	Jan 22						
	Technical training of fire mechanics (additional)	Jun 22	Jun 22						
2.2	To support officials on forest fire damage estimation using GIS and remote sensing application	Jan – Dec 21	Nov 21						
2.3	To develop technology/system of SMART integrated patrol-reporting application	Jan – Dec 21	May 21 – May 22						
2.4	To improve Standard Operational Procedure on Forest and Land Fire Control	Jan – Dec 21	Mar 21 – Mar 22						
2.5	To support building capacity of Forest and Land Fire Brigade (*Manggala Agni*) to control land and forest fire by providing safety equipment	Jan – Dec 21	May 21 – Jun 22						
Output 3. Forest and Land fire prevention action increased									
3.1	To improve and strengthen the institutional coordination of the Task Force for Control on Forest and Land Fire Management at the national and provincial/district level	Jan – Dec 21	Ags 21 – Mar 22						
3.2	To hold dialogues on forest and land fire management/ action with private sectors and other local institutions	Apr – Dec 21	Nov 21 – Apr 22						
3.3	Organize a sub-regional workshop for prevention and management of forest and land fires in Southeast Asia with an emphasis to Indonesia	Apr - Dec 21	Jun 21 – Jan 22						
	Continue organize international fire webinar series (additional)	Apr – Jun 22	Apr – Jun 22						
3.4	Develop dissemination of the outcomes of the project and asses of its replication in other area	Jan – Dec 21	Jan 21 – Jun 22						
Reporting		Jan – Dec 21	Jan 21 – Jun 22						

Note: Initial planning

Implementation and completion

3.3. Project budget and applied inputs

3.3.1. Project personnel

In the 18-month project implementation, the project was supported by Project Management Unit, which consisted of:

- Project Coordinator : Irfan Malik Setiabudi, S.Hut., M.Sc.
- Project Secretary : - Nuri Nursjahbani, S.Hut., M.Si. (Jan – June 2022)
  - Tuningsih, S.Hut. (July – Dec 2021)
- Project Finance : Tian Partiani, S.Hut.
- Regional Coordinator
  - South Sumatera : Didik Suprijono, S.Hut.
  - Central Kalimantan : Fahmi Nurjaman, S.Hut.
  - South Kalimantan : Dody Ronald H, S.Hut., M.Sc.
- Regional Assistant
  - South Sumatera : Tri Prayogi, S.Hut.
  - Central Kalimantan : Avon
  - South Kalimantan : Riris A. Nababan, S.Hut.

The key-project personnel (Project Coordinator, Project Secretary, and Project Finance) were assigned by the Executing Agency and ITTO Secretariat based on the NOL approval, while the Regional Coordinator and Regional Assistant were assigned by the Agency of Climate Change and Forest and Land Fire Management in Region Sumatra and Kalimantan as one of their in-kind contributions to the project.

3.3.2. Project expenditures

Amount of the project budget was US$ 1,131,663,16 comprising US$ 1,105,263.16 of ITTO funds, sourced from Japanese Government's Emergency Fund, and US$ 26,400 of Government of Indonesia's contribution through the Executing Agency. Out of the total ITTO funds, an amount of US$ 163,421.00 was retained by ITTO, under the Agreement, that the amount of ITTO funds actually managed by the Executing Agency was only US$ 941,842.16, which had been fully received through four installments during the project duration.

As of the closing date of the project on 30 June 2022, total expenditures of the project amounted to US$ 943,898.80 consisting of US$ 917,498.80 of ITTO funds and US$ 26,400 of GOI fund. The GOI contribution was not only in cash but also in-kind contribution in the forms of personnel, supported infrastructures and equipment, coordination and networks. There was unspent funds in the amount of US$ 24,375.81, including US$ 32.45 of bank interest as "other revenue", and the amount that had been transferred back to ITTO Secretariat at 30 June 2022 through Bank Mandiri, a state-custodian bank.

The financial audit for the fiscal year 2021 was carried out by Mazars Financial Advisory Services appointed by ITTO Secretariat, from January to April 2022. The financial audit report was directly submitted by Mazars FAS to ITTO Secretariat.

Table 3. The project budget expenditures (as of 30 June 2022)

Component		Amount		Expenditures to-date			Unspent
		Original	Modified	Accrued	Expended	Total	
		(A)	(B)	(C)	(D)	(E)	(F)
10	Project Personnel	127,700.00	138,470.00	-	136,431.05	136,431.05	2,038.95
20	Sub-Contract	130,000.00	130,000.00	-	130,000.00	130,000.00	-
30	Duty Travel	122,500.00	128,371.33	-	122,939.98	122,939.98	5,431.35
40	Capital Items	321,600.00	295,849.96	-	295,651.88	295,651.88	198.08
50	Consumable Items	101,700.00	90,350.00	-	83,543.32	83,543.32	6,806.68
60	Miscellaneous	138,342.16	158,800.87	-	148,932.57	148,932.57	9,868.31
70	**Total managed by EA**	**941,842.16**	**941,842.16**	-	**917,498.80**	**917,498.80**	**24,343.36**
80	National Management Cost	26,400.00	26,400.00	-	26,400.00	26.400,00	-
90	ITTO Monitoring, Evaluation and Administration	153,421.00	153,421.00	-	-	-	-
66	Financial Audit	10,000.00	10,000.00	-	-	-	-
TOTAL		**1,131,663.16**	**1,131,663.16**	-	**943,898.80**	**943,898.80**	

4 PROJECT OUTCOME AND INVOLVEMENT OF THE TARGET BENEFICIARIES

4.1. Achievement of the specific objective

During the project development process, the project proponent hypothesized that defined specific objective will be achieved if all three outputs are fully delivered through the full implementation of planned activities under each of the outputs. This concept was clearly depicted in the Solution Tree as contained in the project document. Hence, it is necessary to first assess the extent to which defined outputs had been achieved prior to assessing achievement of the specific objective. Assessment of defined outputs is shown in Table 4 by matching pre-defined indicators of the outputs with results of the activities implemented under individual outputs:

Table 4. Achievement indicators of output vs results of realized activities

Output/Activities	Measurable indicators	Results of realized activities
Output 1 Best agricultural practices applied by Fire Care Community (MPA)/Local communities.	• One package of development/ improvement on sustainable agricultural and silvicultural management techniques as well as development of zero burning practices area available • Eight training programmes for local communities especially Fire Care Community *(Masyarakat Peduli Api)* members in 3 provinces namely South Sumatera, Central Kalimantan and South Kalimantan conducted • Demonstration plots of zero burning practices in 8 locations established	• Module: Development of Zero Burning Practices (Land Preparation Without Burning) for the Community • Organized trainings: 8 zero burning practices and 3 additional community economic empowerment for local communities especially *Masyarakat Peduli Api* • Developing demonstration plots: 8 demplots and 3 additional fish ponds farmings
Conclusion: it is clear that pre-defined indicators of Output 1 had been fully satisfied; it is reasonable to conclude that the output had been fully delivered		
Output 2 Management capacity to address forest and land fires problems strengthened.	• Four training programmes on forest and land fire control conducted for Forest and Land Fire Brigade (*Manggala Agni*) in 3 provinces namely South Sumatera, Central Kalimantan and South Kalimantan • Series of training for officials on GIS modeling carried out and proven remote sensing technology developed • One set technology/system of SMART integrated patrol reporting application developed and installed in 3 target provinces • One Standard Operational Procedure on Forest and Land Fire Control developed • Personal protective clothing properties and safety equipment of *Manggala Agni* in target location available	• Organized technical training: 11 fire management, 3 basic fire management, and 3 fire mechanics • Organized training: 2 burnt-area estimation and 2 fire-hazard map production • Developed SMART Patrol Information System has been applied in Sumatra and Kalimantan • Handbook: Procedure for Forest and Land Fire Brigade • Procured 7 items of safety equipment that had been distributed to *Manggala Agni*
Conclusion: It is obvious that the pre-defined indicators of Output 2 had been fully met, implying that the output had been successfully completed		
Output 3 Forest and land fire prevention action increased	• MOU among stakeholders (task force) to exchange information, conduct policy dialogues, strengthen cooperation implemented • Two dialogue series to support Land Preparation without Burning *(Pembukaan Lahan Tanpa Bakar/ PLTB)* with private sector and local institutions implemented • A sub-regional workshop for prevention and management of forest and land fires in Southeast Asia with an emphasis to Indonesia conducted • Dissemination of the outcomes of the project developed in various forms such as leaflets, film and report/social media	• Organized 3 (three) strengthening institutional synergy and collaboration • Organized 2 (two) stakeholders dialogues on supporting PLTB that involved private sectors, regional government, village government, and communities • Co-organized 7 monthly sub-regional webinar series, and continued 5 international webinar series • Dissemination in various platforms (official website, mass media, online media, visual media/TV), participation in exhibitions/events, and provided 5 fire leaflets, 5 project videos, as well as organized poster and video competition.
Conclusion: The pre-defined indicators of Output 3 had been clearly satisfied thus it is reasonable to conclude that the output had been fully delivered		

The matching of pre-defined indicators of the outputs with the results of the activities implemented under the outputs as shown in Table 4 clearly indicated that all three outputs had been fully delivered by the project. If so, consistent with the hypothesis made by the project proponent, it is reasonable to conclude that the specific objective must have been fully achieved. To support this conclusion or otherwise, it is necessary to match pre-defined indicators of the specific objective with results of the relevant project activities as shown in Table 5.

Table 5. Achievement indicators of the specific objective vs results of realized activities

Specific Objective	Measurable indicators	Results of realized activities
To improve prevention of forest and land fire through strengthening management and technical capacity of stakeholders at three targeted provinces and national level	1. Community in 8 villages in 3 provinces apply best practice agriculture (land preparation without burning).	1. Local community/*Masyarakat Peduli Api* in 8 villages were trained with zero burning practices and have developed demonstration plots for zero burning practices. Among that 3 communities/villages of them had also been trained with community economic empowerment and have developed fish ponds farming
	2. Capacity of Forest and Land Fire Brigade *(Manggala Agni)* & officials in 3 provinces improved.	2. Capacity of *Manggala Agni* is improved through organized technical training comprising of 11 fire management, 3 basics fire management, as well as 3 fire mechanics training. *Manggala Agni* was also provided by SMART Patrol Information System and 7 items of fire equipment. Specifically for regional officials, their capacity is improved through participation in the burnt-area estimation and fire-hazard map production training, involvement in zero burning practices training and demplots development, as well as participation in the fire webinar series.
	3. Proven technology on reporting and detection of forest fires and forest burnt area to support Monitoring System available	3. The SMART Patrol Information System is completely developed and applied by *Manggala Agni*. *Manggala Agni* and other regional officials were also also received training in the burnt-area estimation and fire-hazard map production with proven and standardized methodology delivered by competent-official agencies (National Institute of Aeronautics and Space of Indonesia/LAPAN-BRIN; Geospatial Information Agency/BIG; MoEF)
	4. Personal protective clothing properties and safety equipment of *Manggala Agni* in target location available	4. Procured 7 items of safety equipment that had been distributed to *Manggala Agni* in 3 provinces. They are comprises 1,110 Safety Coats, 580 Safety Shoes, 16 portable water pumps, 8 motorcycles, 7 GPS, 58 Handy Talkies, and 90 portable oxygen tubes

Specific Objective	Measurable indicators	Results of realized activities
	5. Main stakeholder awareness in three provinces on forest fire prevention improved	5. Raising stakeholders awareness was conducted through involvement of stakeholders in 3 (three) institutional synergy strengthening and collaboration as well as 2 (two) stakeholders dialogues on supporting zero burning practices (PLTB). Stakeholders were also invited and/or involved in the training of zero burning practices and developing demonstration plots, as well as participation in the fire webinar series In addition, stakeholders were also involved in the training of burnt-area estimation and fire-hazard map production
Conclusion: all pre-defined indicators of the specific objective had been fully met by results of the relevant activities. The specific objective, therefore, has been fully achieved.		

The matching of indicators of achievement with results of the activities implemented as shown in Table 5 clearly indicated that all four pre-defined indicators had been fully satisfied by results of the activities implemented thus the specific objective has been achieved. This conclusion supports the previous conclusions based on output delivery that the project has fully achieved the specific objective.

"We are greatly helped because we can learn more about the technical aspects of Land Preparation without Burning Program and how it works in the field"

Rico Andri Pratama
(*Masyarakat Peduli Api*, OKI – South Sumatra)

Figure 3. Testimony of *Masyarakat Peduli Api*

4.2. Existing situation at project completion vs pre-project situation

4.2.1. The tangible outputs of the project

The tangible outputs of the project which did not exist before the project or improved after the project implementation are described below:

Output 1

- Improved module for developing alternative technology for zero burning practices entitled "Development Zero Burning Practices (Land Preparation without Burning) for the Community".
- Improved 8 technical trainings on land preparation without burning for the local communities/Fire Care Community/farmers through the utilization of biomass wastes which was followed by 3 technical trainings of community economic empowerment.
- Developing 8 demonstration plots of zero burning practices as practical learning for the local communities/Fire Care Community/farmers, further integrated with 3 fish-pond farmings for community economic empowerment.

Output 2

- Improved organizing technical trainings for *Manggala Agni* comprising: 11 fire management, 3 basic fire management, and 3 fire mechanics.
- Improved organizing socialization and training for *Manggala Agni* and Regional officials consisting of: 2 events of burnt-area estimation and 2 events of fire-prone map production.
- Developing the System Monitoring and Reporting Technology for Fire Prevention Patrol (SMART Patrol Information System) which has been applied in regional Sumatra and Kalimantan.
- Improved guidance for fire brigade entitled "Procedure for Forest and Land Fire Brigade".
- Improving or revitalizing fire safety clothes and fire equipment consist of 1,110 safety coats, 580 safety shoes, 16 portable fire water pumps, 8 motorcycles, 7 GPS, 58 Handy talkies, and 90 portable oxygen tubes. In particular motorcycles, the project procured 7 underbone-motorcycles which addressed gender issue to support the female *Manggala Agni* in delivering fire prevention, especially through socialization and campaigns. The 7 underbone-motorcycles were the pioneer type for *Manggala Agni* which usually provided with trail motorcycle.

Output 3

- Improved strengthening synergy and collaboration among stakeholders in fire management actions which was followed by the declaration of mutual understanding and commitment.
- Organizing stakeholder dialogues to support the development of integrated land preparation without burning by the community, and also followed with the declaration of mutual understanding and commitment.
- Improving organizing 12 sub-regional/international webinar series on fire management

4.2.2. Sectoral policies and programs

The project introduced and improved the program on alternative land preparation without burning for the community as one of the answers to the national policy on burning prohibition. The program was carried out through an integrated land preparation without burning which consists of 2 activities, namely: land preparation without burning for the agriculture aspect and empowerment for the economic aspect. The land preparation without burning practice was conducted by utilizing the biomass wastes from land preparation.

Furthermore, the program organized stakeholder dialogues involving district governments, private sector, villages, communities, and universities. Those dialogues resulted and endorsed the declaration of mutual understanding and commitment, one of which was to support community participation in fire prevention and encourage their economic empowerment through an integrated land preparation without burning. The project also produced a campaign video related to the program entitled “Development of Land Preparation without Burning Practices, encouraging community participation in forest and land fire prevention”.

In addition, the implementation of occupational health and safety training and accommodation of gender mainstreaming in project delivery becomes a prerequisite for Directorate of Forest and Land Fire Management to access another fire prevention project from Green Climate Fund.

4.2.3. The physical environment

Through the project implementation, 8 demonstration plots of land preparation without burning with an area ranging from 1,000 – 2,600 m2, as well as 3 (three) fish pond farmings have been constructed.

4.3. Involvement of the project beneficiaries

As initially intended to, implementation of the project activities has brought direct benefit to stakeholders, namely *Masyarakat Peduli Api*/local communities/farmers, *Manggala Agni*, and regional officials. In fact, some *Masyarakat Peduli Api* and *Manggala Agni* are local communities/residents, many of them are also farmers. Their detailed participation and the benefit received are summarized on Table 6.

Table 6. Beneficiaries: participation and benefit/further task

No	Beneficiaries	Participation	Benefit / Further task
1	• Fire Care Community (*Masyarakat Peduli Api*) • Local communities • Farmers	• In training o n zero burning practice and community economiy empowerment • Development of zero burning demplots and fish pond farming	Benefit • Alternative technology regarding burning prohibition policy • Knowledge and skills on zero burning practice and community economic empowerment • Set of agricultural tools, pumps, bio-decomposers, fish feeds, fish feed manufacturing machine, liquid smoke - charcoal manufacturing machine Further task • Continue to manage zero burning demplots and fish pond farming • Commit to disseminate alternative technology of zero burning practice to other communities
2	Forest and Land Fire Brigade (*Manggala Agni*)	• In trainings/ workshops • In the development of zero burning demplots and fish pond farming • In development of SMART Patrol Information System • In fire webinar series	Benefit • Alternative technolog ies that support burning prohibition policy • Knowledge and skills on zero burning practice and community economic empowerment • Improved capacity on fire management and other substances • Assisted fire patrol by applied SMART Patrol Information System • Set of fire equipment (7 items) • Shared knowledge of fire management from other institutions/countries Further task • Continue to accompany community on managing zero burning demplots and fish pond farming • Commit to disseminate alternative technology of zero burning practice to other communities • Apply improved knowledge on fire management as well as disseminate to others • Utilize SMART Patrol Information System • Utilize and maintenance fire equipment

3	Regional officials	• In training of zero burning practice and community economic empowerment • In trainings of burnt -area estimation and fire -hazard map production • In FGD of strengthening synergy and collaboration, as well as supporting zero -burning practice • In fire webinar series	Benefit • Alternative technology regarding burning prohibition policy • Knowledge and skills on zero burning practice and community economic empowerment • Knowledge and skills on burnt -area estimation and fire -hazard map production • Improvement of network and strengthen synergy and collaboration among fire-stakeholders, as well as supporting zero burning practice • Shared knowledge of fire management from other institutions/countries Further task • Continue to accompany community on managing zero burning demplots and fish pond farming • Commit to disseminate alternative technology of zero burning practice to other communities • Apply improved knowledge burnt -area estimation and fire -hazard map production, as well as disseminate to others
4	Private sector	• In training of zero burning practice as invitees • In FGD of strengthening synergy and collaboration, as well as supporting zero -burning practice • In fire webinar series	Benefit • Alternative technology regarding burning prohibition policy • Knowledge and skills on zero burning practice and community economic empowerment • Improvement of network and strengthen synergy and collaboration among fire -stakeholders, as well as supporting zero burning practice • Shared knowledge of fire management from other institutions/countries Further task • Commit to support and accompany community on developing zero burning demplots • Commit to disseminate alternative technology of zero burning practice to other communities • Commit to support the implementation of fire management

4.4. Project sustainability

The project had completed all planned activities and even realized several unplanned activities. The completed planned activities imply and are in line with achieving the targeted outputs. Regarding the project completion by end of June 2022, a package of exit strategies had been identified in view of sustaining and enhancing the benefits that have been achieved; the strategies are outline below:

1) Application of best agricultural practices by Fire Care Community (MPA)/Local communities

Detailed exit strategy is as follows:

- Continue assisting the communities on the implementation of integrated land preparation without burning, both technically and financially.
- Strengthen stakeholder collaboration and increase their contribution to supporting communities on the implementation of integrated land preparation without burning
- Replicate the implementation of integrated land preparation without burning to wider communities by MoEF or in collaboration with stakeholders.
- Disseminate the program on integrated land preparation without burning and its benefits to wider stakeholders and communities.
- Develop the rural business model from the existing demplots that has been initiated by ITTO with support from other donors/partners.

2) Management capacity to address forest and land fires problems strengthened

The exit strategy comprises:

- Continue to carry out technical training in fire management for *Manggala Agni* and the other stakeholders/government to maintain and improve their capacity
- Continue to carry out training on burnt-area calculation and fire-hazard map production for all fire brigades/*Manggala Agni* and the other stakeholders/government
- Utilize SMART Patrol Information System on monitoring and reporting fire prevention patrols, and reach more extensive users
- Apply and disseminate Procedure for Forest and Land Fire Brigade as a guide for all fire brigades/*Manggala Agni* and the other stakeholders in conducting their tasks and responsibilities on fire management
- Utilize and maintain the existing fire equipment in good condition to support *Manggala Agni*
- Revitalize fire equipment to support *Manggala Agni* in conducting their tasks and responsibilities
- Allocate national budget and develop cooperation with other partners to support the management capacity activities.

3) Cooperation among local institution, private sector and communities for forest and land fire prevention strengthened

The exit strategy comprises:

- Strengthen synergy and collaboration in fire management with all stakeholders i.e. Government, private sectors, and communities at various levels in Central, Regional, and site-level
- Continue to encourage stakeholders to support community participation in fire prevention, and replicate it to wider communities
- Continue to encourage stakeholders to support economic empowerment for the communities
- Continue to disseminate fire prevention campaigns to reach more stakeholders and communities
- Encourage and increase private sector participation through corporate social responsibility programs or incentive/disincentive programs.

5 ASSESSMENT AND ANALYSIS

Since forest and fire management is a huge-complex work, it requires synergy and collaboration of all stakeholders with their own tasks and responsibilities.

5.1. Project rationale and identification process

Fires in Indonesia occur almost every year, especially during the dry season. Many researchers stated that forest and land fires in Indonesia are nearly 99% caused by human activities. Local communities in Indonesia are familiar with the use of fire for traditional livelihood activities, such as land and post-harvest vegetation clearing, agriculture preparation, hunting, camping, etc. Historically, local communities with their local wisdom have played significant role in the management of fire for many years.

The key problems identified as caused by forest and land fires are:

- Negative impacts on health, ecosystems, economy, transportation, politics, etc.
- Loss of forest cover and natural wildlife habitats,
- Damage to forest and land including peatland ecosystems, and
- Insufficient comprehensive policies and operational regulations on forest and land fire prevention

By aiming to reduce the occurrence and frequency of forest and land fires, especially during the dry season, formulation of the project has conformed to the Indonesian national policies and the new existing regulations which stated in the National Mid-term Development Plan 2020-2024 (RPJMN), as well as to ITTO objectives and priorities notably the ITTO Strategic Action Plan 2013-2018 and ITTO Guidelines on Fire Management in Tropical Forest.

Since forest and fire management is a huge-complex work, it requires synergy and collaboration of all stakeholders with their own tasks and responsibilities. The project formulation also properly identified and defined the project beneficiaries comprising primarily local communities/farmers/*Masyarakat Peduli Api* and *Manggala Agni* as well as appropriately mapped

and defined involved stakeholders in the project implementation including Central Government, Local Government, Police, Army, private sectors as well as village governments and communities itself.

5.2. The problem addressed, project objectives, and implementation strategy

The project was formulated to address the key problem that had been identified as caused by three main forces, namely 1) poor agricultural practices carried out by local communities; 2) limited management capacity of institutions to address forest and land fire problems; and 3) limited actions in the prevention of forest and land fire.

Elaborating on those main causes of fire problems, the project further designed the specific and development objectives that should be achieved. The specific objective was to improve prevention of forest and land fire through strengthening management and technical capacity of stakeholders at three targeted provinces and national level; while the development objective was to support the capacity building for the implementation of an integrated forest fire prevention program and reduce the effects of fires on forest cover, natural wildlife habitats, and livelihood.

Regarding the implementation strategy, defined key problem would be addressed through full delivery of three outputs, namely:

i) Best agricultural practices applied by Fire Care Community (MPA)/Local communities

ii) Management capacity to address forest and land fires problems strengthened

iii) Cooperation among local institution, private sector and communities for forest and land fire prevention strengthened

Furthermore, under defined individual outputs, a total of 12 main activities had been identified and

implemented during the project duration to deliver the outputs. These activities were implemented by developing guidelines, delivering trainings/courses, improving technology, organizing workshops/Focus Group Discussions/Meeting, providing fire safety equipment, etc.

5.3. Critical differences between planned and actual implementation

Implementing the project during Covid-19 pandemic, under a short duration but plenty of activities and outputs, the biggest challenge was time management and coordination with involved stakeholders to carry out the project activities. In the process, intense communication and coordination among the Executing Agency, Agency of CCFLFM in Sumatra and Kalimantan, Local Fire Stations and Project Management Unit, including strong commitment and full support of the stakeholders, were the important element of the successful project implementation. Prior to initiation of project activities, the project elaborated and confirmed the planned activities with the Executing Agency, Agency of CCFLFM in Sumatra and Kalimantan, Local Fire Stations. Regarding project period, the ITTO had also approved a 6-month extension aimed for completing all planned activities, delivering defined outputs and achieving defined specific objective.

In general, all planned activities had been fully implemented in accordance with the original project design but some deviations had also occurred in the form of upward, surplus achievement under particular activities as highlighted below:

Activity 1.2 The project completed 8 technical training of zero burning practices for the community as specified in the project document. Since the technical training emphasized on the agricultural aspect, the project noticed that the community also requires training on economic empowerment. Addressing that concern, the project organized 3 additional technical trainings for community economic empowerment. Both training, agricultural and economic aspects, were further specified as integrated land preparation without burning practices.

Activity 1.3 The project established 8 demonstration plots of zero burning practices by the community as specified in the project document. In connection with Activity 1.2, since the demonstration plots emphasized on the agricultural aspect, the project also assisted 3 fish pond farmings to improve communities' income. Both activities, agricultural and economic aspects, were further specified as integrated land preparation without burning practices.

Activity 2.1 The project provided 4 technical trainings on fire management for *Manggala Agni* as initially targeted. However, considering the importance of the subject, the project continued to deliver 7 additional fire management trainings to reach all the Local Fire Stations in three provinces. Furthermore, the project also carried out 3 basic fire management trainings for the new members of *Manggala Agni*, as well as 3 fire mechanics trainings specifically for all Sub-Local Fire Stations in those provinces.

Activity 2.3 The project completed the development of System Monitoring and Reporting Technology for Fire Prevention Patrol (SMART Patrol Information System) in collaboration with Mathematics and Natural Science Faculty (FMIPA) IPB University with the lead coordinator Prof. Imas S. Sitanggang. The SMART Patrol Information System was also equipped with User manual video and Manual for parameter measurement. Since the system development was fully completed, the activity held further organized two events, namely: 1) Launching of SMART Patrol Information System in person by President IPB University (Prof. Arif Satria), Director General of Climate Change (Ir. Laksmi Dhewanthi, MA, IPU), and ITTO Representative (Dr. Hwan-Ok MA); 2) National Seminar on Forest and Land Fire Prevention: Policy, Social Approach, Technological Innovation.

Activity 2.5 The project provided set of safety clothes and fire equipment to support *Manggala Agni* in implementing fire control. For the planned 5 (five) items of safety equipment procured as stated in the project document, however with larger quantity compared to the initial target. The items comprised safety coats, safety shoes, portable fire water pumps, motorcycles, and Global Positioning System.

Amendment of procured safety equipment occurred for remote sensing and satellite phone. Considering the proposal by *Manggala Agni*, instead of purchasing remote sensing and satellite phone, the project amended to procure items like handy talkies, portable oxygen tubes, and additional fire water pumps which were more important for the operation of *Manggala Agni*.

Table 7. Initial and realized of fire equipment procurement

NO	ITEM	INITIAL	REALIZED
1	Safety Coats	480	1,110
2	Safety Shoes	480	580
3	Water pumps	4	16
4	Motorcycles	3	8
5	GPS	6	7
6	Handy Talkies	-	58
7	Portable Oxygen Tubes	-	90

Activity 3.3 Originally, the activity would be organized by physically organizing sub-regional workshop involving fire experts/academies/practitioners from Indonesia and Southeast Asia. However, considering the Covid19 pandemic regarding travel restrictions and gathering people, alternatively, the activity was carried out by organizing 7 monthly online-webinar series on fire management. That amendment did not reduce the activity's goal to exchange experience on good practices of prevention and management of forest and land fires as well as strengthen fire networks. Considering the importance of the fire webinars, the project continued to organize 5 more fire webinars hosted by MoEF which are beyond the initial target of the project.

5.4. Adequacy of project inputs

Here, the project inputs refer to time, personnel, and budget. Since the project comprised plenty of planned activities and achieved outputs, in addition executed during the Covid19 pandemic, the initial 12-months period of the project was insufficient to carry out all the activities and achieve the outputs. In the process, the ITTO approved an extension in time for 6 months until 30 June 2022. Field activities, especially technical training of fire mechanics for *Manggala Agni* in three provinces, were conducted in mid-June 2022. Until the closing time, the project completely delivered all planned activities and the beyond, as well as achieved the outputs and objectives as targeted. However, that additional time did not address yet project completion issues regarding final evaluation and reporting. Project reporting was carried out after the project closing date, while project evaluation was only organized once at the central level, without conducting field monitoring and evaluation.

In terms of project personnel, again, considering the number of activities to implement, the 2 initial personnel (Project Coordinator and Project Treasurer) obviously did not meet the requirement. Since July 2021, the ITTO approved to engage one additional personnel for Project Secretary without additional funding but only through internal reallocation of budget. That additional engagement was proved able to smooth the project implementation. Based on the experience of the project implementation, for this kind of project which consists of many activities to implement in three

different provinces, the project should have been supported by additional personnel for field coordinators as well as other personnel for dissemination, documentation, and spatial analysis.

Regarding the funding, the allocated budget was sufficient to finance the entire project activities. In fact, the budget can support more activities beyond the planned ones as specified in the project document. The total budget sourced from ITTO was completely transferred to the Executing Agency in four fund installments. As of the project closing date, out of the total US$ 941,842.16 of ITTO funds, there was an unspent fund in the amount of US$ 24,375.81, including US$ 32.45 bank interest, that had been transferred back to the ITTO Secretariat/Donor on 30 June 2022.

5.5. External influences

Several assumptions and risks that had been previously defined to ensure a successful project implementation and completion was relevant throughout the project duration are specified below:

- Forest and fire prevention is still on the national priority program. On February 22nd, 2021, President Joko Widodo delivered several instructions on forest and fire management, among others prioritizing fire prevention and finding permanent solutions for the communities related to land preparation without burning. The President's instructions were conveyed in the National Coordination Meeting which was attended by the Ministers, Head of National Army, Head of National Police, Head of Province/District governments, Head of National Agency for Disaster Countermeasure, and soon. The President's directions are also strongly relevant to the project objectives and activities, particularly in the fire prevention program and encouraging community participation through land preparation without burning practices.

The main stakeholders fully supported the entire project implementation. Local communities, including farmers and *Masyarakat Peduli Api* also contributed and were actively involved in the implementation of integrated land preparation without burning

- The main stakeholders fully supported the entire project implementation. Directorate General of Climate Change, Directorate of Forest and Land Fire Management, Agency of Climate Change and Forest and Land Fire Management in Regional Sumatra/Kalimantan, Local Fire Stations as well as *Manggala Agni* strongly supported and committed to preparing and implementing the entire activities, as well as conducting coordination and building networks with related stakeholders in the central, regional, and site levels. Local communities, including farmers and *Masyarakat Peduli Api* also contributed and were actively involved in the implementation of integrated land preparation without burning practices. Regional/district governments as well as Army, Police, and Sub-district/village governments endorsed and appreciated the implementation of the project, especially regarding application of the fire prevention programs and promotion of community participation.
- As previously mentioned, stakeholders have supported and committed to participating in forest and fire management. To be more specific, all of the stakeholders committed and further endorsed the declaration of mutual understanding on and commitment to: i) supporting forest and land fire control, ii) strengthening synergy and collaboration among stakeholders, and iii) encouraging community participation in fire prevention and community economic empowerment.

Beyond it all, since the project was implemented during the Covid19 pandemic, any activities should be organized under strict health protocol. This condition strongly influenced the project implementation as regards movement of personnel and gathering of stakeholders and participants, while many project activities were technical training that involved gathering of participants in the same venue which did not take place if performed virtually. Furthermore, when the Covid-19 pandemic got worse and resulted in an increasing trend to emergency phase, the government enforced stricter protocols that practically prohibited face-to-face encounters. During such an emergency period, the project delayed almost all the planned training/courses.

5.6. Project beneficiaries

The project was deliberately designed to provide benefits for the primary beneficiaries and other stakeholders, as follows:

- Local communities, including farmers and *Masyarakat Peduli Api*, admitted and understood alternative technology for preparing (agricultural) land in connection to national policy on burning prohibition. They received knowledge and skills on land preparation without burning practices through the utilization of biomass wastes, as well as income generation through aquaculture practices. On the utilization of biomass wastes, the communities were trained on how to transform biomass wastes into liquid smoke, charcoals, and composts. The charcoal and compost have been used for planting media, increasing pH value in peatland, fertilizer, and also improving soil structures. The liquid smoke has been applied for fertilizer and pest repellent. They also directly practiced developing zero burning practices and fish pond farming. Those activities are further called integrated land preparation without burning practices.

The community also received a set of agricultural tools, pumps, bio-decomposers, fish pellet, fish pellet manufacturing machines, and liquid smoke-charcoal manufacturing machines. The communities have committed to continue managing zero burning demonstration plots and fish pond farming, as well as disseminating alternative technology of zero burning practice to other communities.

- Forest and Land Fire Brigade (*Manggala Agni*) received knowledge and skills in fire management practices, animal evacuation, occupational and health safety, basic fire control, and fire mechanics. Besides the fire management substance, most of *Manggala Agni* commented that the training materials were novel knowledge which had not been obtained in the previous training. *Manggala Agni* also received knowledge and skills in burnt-area estimation and fire-hazard map production. They had understood alternative technology for preparing (agricultural) land through zero burning practice and economic empowerment, as well as shared experiences on fire management in the other institutions/countries from the webinar series.
- To support their tasks on fire control, *Manggala Agni* has been equipped with SMART Patrol Information System and also provided with a set of fire equipment including safety coats, safety shoes, motorcycles, portable fire water pumps, Global Positioning System, handy talkies, and portable oxygen tubes.

"Now when we carry out fire patrols utilizing the SMART Patrol application, it's more convenient since we don't need to carry as much equipment, such as stasionery. And also with the support of equipment like safety fire clothes and vehicles, it really supports the implementation of our tasks in the field"

Mia Janiarti
(*Manggala Agni* – South Kalimantan)

Figure 4. Testimony of *Manggala Agni* (South Kalimantan)

- For further implementation, *Manggala Agni* commits to continue accompanying communities in managing zero burning demonstration plots and fish pond farming, as well as disseminating alternative technology of zero burning practice to other communities. They have utilized and will maintain SMART Patrol Information System and fire equipment, have applied and will improve knowledge and skills on fire management, and even disseminate to other parties.
- The Regional/District officials also admitted and recognized alternative technology for preparing (agricultural) land through zero burning practice and economic empowerment, as well as received knowledge and skills in burnt-area estimation and fire-hazard map production. They also endorsed the declaration of mutual understanding on and commitment to: i) supporting forest and land fire control, ii) strengthening synergy and collaboration among stakeholders, and iii) encouraging community participation in fire prevention and community economic empowerment.

The entire primary beneficiaries received and appreciated many benefits from the project implementation both in terms of knowledge and skills, and materials; subsequently, they are expected to disseminate their knowledge and skills in order to contribute to the national program on fire prevention.

5.7. Project sustainability

The project had completed all its planned activities and even delivered several unplanned outcomes. The completed planned activities successfully delivered defined outputs of the project. As has been described in section 4.4, it is important to ensure sustainability of the project benefits that have been achieved. Synergy and collaboration of the stakeholders, including their resources contribution and support, become the key elements for continuing the project benefits in the frame of forest and fire management. That synergy and collaboration can implement fire management more effectively and efficiently in the field considering the enormous needed resources, and limited owned resources by each institution. The synergy and collaboration have also been utilized to support community participation in fire prevention through zero burning practices and community economic empowerment.

Directorate of Forest and Land Fire Management, including the Agency of CCFLM in regional Sumatra/Kalimantan and Local Fire Stations with their *Manggala Agni*, have a crucial role in continuing the initiated activities and delivered benefits from the project. The Regional Agency, Local Fire Stations, and *Manggala Agni* have also steadily assisted and accompanied the communities in implementing integrated land preparation without burning practices. They have applied and will improve knowledge and skills from delivered training; they have utilized and will maintain the SMART Patrol Information System and safety equipment, in their daily activities on fire control.

Last but not least, the communities should participate more actively in fire prevention initiative, continue to manage and scale up the demonstration plots of integrated land preparation without burning, apply the knowledge and skills on integrated land preparation without burning practices; they also are expected to disseminate the alternative technology for preparing (agricultural) land in connection with national policy on burning prohibition to other and wider communities.

5.8. The institutions involved in project implementation

As previously mentioned and explained, the project implementation was supported by several stakeholders at different levels: national, regional, and site levels. Since the activities were implemented mostly in the field (village), the most involved stakeholders also were originating from the regional and site levels. The various institutions involved, along with their roles and responsibilities, in the project implementation are shown in Table 8.

Table 8. The institutions involved in the project implementation at different levels

No	Institution	Role & Responsibility
I	**National level**	
1	DG of Climate Change, MoEF	• Chair of the PSC • Provided directions; carried out supervision and evaluation of activities and objectives
2	Secretary of DG CC, MoEF	• Member of the PSC • Provided directions; carried out preparation, supervision and evaluation of the project in the administrative and financial aspects
3	Directorate of FLFM, MoEF	• Executing Agency, member of the PSC • Provided directions; carried out preparation, implementation, supervision and evaluation of activities and objectives in the technical, administrative, and financial aspects
4	International Cooperation Bureau, MoEF	• Member of the PSC • Provided directions; carried out preparation, supervision and evaluation of the project in the cooperation aspect
5	Planning Bureau, MoEF	• Carried out preparation, supervision and evaluation of the project in the administrative aspects
6	Public Relation Bureau, MoEF	• Carried out preparation and implementation of fire webinar series
7	Directorate of Inventory and Monitoring of Forest Resources, MoEF	• Co-organized and facilitated socialization and training on burnt-area estimation and fire-prone map production
8	Directorate of Green House Gas Inventory and Monitoring Report and Verification, MoEF	• Co-organized and facilitated socialization and training on burnt-area estimation
9	Research, Development and Innovation Agency, MoEF	• Expert/researcher on Developing Modules: Development of Zero Burning Practices for the Community; and Procedure for Forest and Land Fire Brigade • Facilitators/experts on training and demonstration plots of land preparation without burning practices
10	National Institute of Aeronautics and Space of Indonesia (LAPAN-BRIN)	• Co-organized and facilitated socialization and training on burnt-area estimation
11	Geospatial Information Agency (BIG)	• Facilitator in socialization and training on fire-prone map production
12	IPB University, Mathematics and Natural Science Faculty	• Development of SMART Patrol Information System • Co-organized Launching the System and National Seminar on Fire Prevention
13	IPB University, Forestry and Environment Faculty	• Co-organized 7 webinar series on fire management
14	Ministerial and Agency of Central Government (BNPB, LAPAN-BRIN,	• Key-stakeholder in strengthening synergy and cooperation for coordination and consolidation of data and information to support fire management

No	Institution	Role & Responsibility
II	**Regional/District level**	
1	Agency of Climate Change and Forest and Land Fire in Regional Sumatera	• Member of the PSC • Provided directions; prepared, implemented, supervised and evaluated activities and objectives in technical, administrative, and financial matters • Key-stakeholders and declarators of strengthening synergy and cooperation, and supporters of zero burning practices for community
2	Regional Disaster Management Agency	• Involved in integrated land preparation without burning • Key-stakeholder and declarator in strengthening synergy and cooperation, and in supporting zero burning practices for community • Participants in socialization and training of burnt-area estimation and fire-prone map production
3	Agencies in Regional/District government (Forestry, Environment, Agriculture, Fisheries, Industry, Small-medium business, Health, Manpower Agency)	• Involved in integrated land preparation without burning • Key-stakeholders and declarators in strengthening synergy and cooperation and in supporting zero burning practices for community • In particular, Agriculture and Fisheries Agency as facilitators in training of land preparation without burning and community economic empowerment • In particular, Health and Manpower Agency as facilitators of fire management, especially occupational and safety health aspect
4	Forest Management Unit	• Involved in integrated land preparation without burning • Participants in socialization and training on burnt-area estimation and fire-prone map production • Key-stakeholder and declarator in strengthening synergy and cooperation, and in supporting zero burning practices for community
5	Army	• Facilitator in training on fire management, especially occupational and safety health aspect • Facilitator in training on basic fire management • Participant in socialization and training on burnt-area estimation and fire-prone map production • Key-stakeholder and declarator in strengthening synergy and cooperation, and in supporting zero burning practices for community
6	Police	• Participant in socialization and training on burnt-area estimation and fire-prone map production • Key-stakeholder and declarator in strengthening synergy and cooperation, and supporting zero burning practices for community

No	Institution	Role & Responsibility
7	Meteorology, Climatology, and Geophysical Agency (BMKG)	• Participant in socialization and training on burnt-area estimation and fire-prone map production
8	Natural conservation unit, MoEF	• Facilitator in training on fire management, especially animal evacuation aspect
9	Provincial technical units of MoEF	• Participant in socialization and training on burnt-area estimation and fire-prone map production
10	University	• Facilitator and declarator in strengthening synergy and cooperation and in supporting zero burning practices for community
11	Private sector	• Involved in integrated land preparation without burning • Key-stakeholder and declarator in strengthening synergy and cooperation and in supporting zero burning practices for community
III	**Site/village level**	
1	Local Fire Stations, including *Manggala Agni*	• Participant and community facilitator in training on land preparation without burning and community economic empowerment • Participant in trainings on fire management, basic fire management, fire mechanics, burnt-area estimation, fire-prone map production, utilization of SMART Patrol Information System
2	Local community/Fire Care Community/farmers	• Participant in training of land preparation without burning and community economic empowerment • Executor of land preparation without burning and community economic empowerment
3	Sub-district/village government	• Participant and community facilitator in training on land preparation without burning and community economic empowerment
4	Army	• Participant and community facilitator in training on land preparation without burning and community economic empowerment
5	Police	• Participant and community facilitator in training on land preparation without burning and community economic empowerment
6	Agriculture/Fisheries extensions	• Participant and community facilitator in training on land preparation without burning and community economic empowerment

"Cooperation and collaboration among stakeholders (BPBD, *Manggala Agni*, Unit Services, and companies) should be strengthened in order to control forest and land fires, as we are currently doing"

Alpian, M.Si
(Head of BPBD – Banyuasin, South Sumatra)

6 LESSONS LEARNED

The project was well formulated and prepared to improve fire prevention through strengthening the management and technical capacity of stakeholders.

6.1. Project Identification and Design

1. The project was well formulated and prepared to improve fire prevention through strengthening the management and technical capacity of stakeholders.
2. The project involved many activities that must be coordinated and implemented during the Covid-19 pandemic, the project period should not be packaged for a short duration, initially 12 months, but at least for 36-48 months duration.
3. The project implementation should have been supported by adequate key-project personnel (Project Management Unit) both in the administrative main office and field operations.
4. In terms of improving quality of deliverables, the project should provide a preparatory phase that consists of pre-study, coordination, meetings, and field visits to elaborate on effective operational plan for implementation.

6.2. Project Implementation

1. In terms of smoothing the project implementation, good communication and understanding are truly needed among the Executing Agency, Project Management Unit, Agencies of FLFM, and Local Fire Stations in the field. It also demands cooperation, commitment, and support from those parties in the implementation of the entire project activities.
2. The huge-complex works of fire management require synergy and collaboration from all stakeholders including Government, *Manggala Agni*, private sectors, communities/*Masyarakat Peduli Api*, universities, NGOs, and even international agencies.
3. Considering the national policy on burning prohibition; communities and farmers require alternative technologies, approaches, and practices to meet that prohibition policy and accomplish their farming tasks.
4. Community participation in fire prevention should be encouraged, assisted, and accompanied continuously by Government and other stakeholders.
5. Community economic empowerment is required to increase income of local communities and as an incentive to participate in fire prevention program.
6. Fire brigades (*Manggala Agni*) should be trained periodically to maintain and improve their capacities in fire management.
7. Fire equipment should be revitalized over time to meet needed of quality and of quantity.
8. In terms of project completion, the project should provide sufficient working time and supporting inputs to carry out the technical final evaluation and reporting as well as administrative-financial closing of the project.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusions

1) The project was well formulated with strong adherence to the ITTO Manual for project formulation: origin of the project was clear, the key problem addressed was relevant, and deeply analyzed involving stakeholders to reveal the cause and effect relationship which had been used as the basis for constructing the project design.
2) Regarding the national policy on burning prohibition, communities should be provided with alternative approaches to zero burning practices, improved their economic empowerment and encouraged to actively participation in fire prevention.
3) Fire brigades (*Manggala Agni*), officials and other stakeholders should continuously improve their management and technical capacity through periodic participation in various training.
4) Fire equipment of *Manggala Agni* and other stakeholders should be provided and continuously revitalized in terms of quantity and quality in order to adequately support the implementation of fire management.
5) Synergy and collaboration in the implementation of fire management among the main stakeholders should be continuously strengthened to increase their contributions.
6) Good communication and understanding among Executing Agency, Project Management Unit, Agencies of FLFM, and Local Fire Stations in the field were the critical points of successful project implementation to achieve the specific objective, in addition to the cooperation, commitment, and support from those parties involved in the implementation of the project.

"The ITTO forest fire project is strong evidence that continuous capacity building of local government and local community is essential for the prevention of forest fires"

Dr. Hwan-Ok MA
(Senior Projects Manager – ITTO)

Figure 3. Statement of Senior Projects Manager - ITTO

7.2. Recommendations

1) Since human activities have become the main driving force in forest and land fires in Indonesia, involvement of communities is strongly needed in fire prevention and management in the field. For that concern, community participation should be encouraged, assisted, and accompanied continuously by the Government and other stakeholders.
2) The needs for technical training regarding fire management and working safety aspect for Manggala Agni and other stakeholders are very important to maintain and improve their capacities in implementing fire management, the training should be carried out periodically and reach all fire brigades/*Manggala Agni* since fire management operation is a high-risk activity.
3) The fire equipment utilized by *Manggala Agni* should be revitalized over time to provide sufficient fire equipment in terms of quantity and quality.
4) Since fire management is a huge work that requires enormous resources, its implementation must be carried out with synergy and collaboration from all stakeholders.
5) The fire budget allocation at the National and Regional Governments can be increased either by digging potency of funding from donors and other sources or carrying out synergy and collaboration among stakeholders to optimize use of available resources.
6) Implementing similar projects and activities in the other provinces that are historically prone to fire incidents is strongly advisable.

Responsible for the report,

Irfan Malik Setiabudi
Project Coordinator

Date: July 2022

ANNEX 1. Project Financial Statement

PROJECT FINANCIAL STATEMENT (IN US Dollars)

Project No. PP A/56-340-1 — Period ending on: June 30, 2022

Project Title: Capacity Building on Forest and Land Fire Management in Indonesia

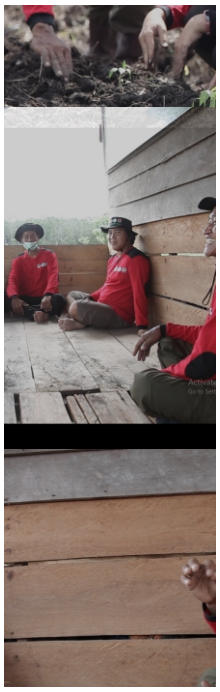
		Component	Original Amount	2nd Modified Budget Amount	Expenditures To-date			Available Fund
					Accrued	Expended	Total	
				(A)	(B)	(C)	(D) {B + C}	(E) {A - D}
1		Expenditures by executing agency:						
	10	Project Personnel						
		11 Project Coordinator	27.000,00	50.000,00		50.000,00	50.000,00	-
		12 Project Treasurer	18.000,00	33.000,00		33.000,00	33.000,00	-
		13 Expert	8.000,00	8.000,00		8.000,00	8.000,00	-
		14 Facilitator	74.700,00	47.470,00		45.431,05	45.431,05	2.038,95
		19 Component Total	**127.700,00**	**138.470,00**	-	**136.431,05**	**136.431,05**	**2.038,95**
	20	Sub-Contract						
		21 Sub Contract A (Advance Monitoring System)	80.000,00	80.000,00		80.000,0	80.000,00	-
		22 Sub contract B (Regional Workhop South East ASIA)	50.000,00	50.000,00		50.000,0	50.000,00	-
		29 Component Total	**130.000,00**	**130.000,00**	-	**130.000,00**	**130.000,00**	-
	30	Duty Travel						
		31 Daily Subsistence Allowance						
		31.1. DSA International	6.000,00	12.000,00		12.000,0	12.000,00	-
		31.2. DSA	74.800,00	68.000,00		64.466,04	64.466,04	3.533,96
		32 Air Ticket				-	-	-
		32.1. Air ticket International	3.000,00	6.471,33		6.453,90	6.453,90	17,43
		32.2. Air ticket domestic	27.900,00	26.800,00		25.648,50	25.648,50	1.151,50
		33 Local transport	10.800,00	15.100,00		14.371,54	14.371,54	728,46
		39 Component Total	**122.500,00**	**128.371,33**	-	**122.939,98**	**122.939,98**	**5.431,35**
	40	Capital Items						
		41 Laptop, PC (Printer)	5.000,00	4.971,01		4.971,01	4.971,01	-
		42 FireFighter Coat	120.000,00	118.928,80		118.928,80	118.928,80	-
		44 Motorcycle	14.100,00	11.966,55		11.966,55	11.966,55	-
		45 Vehicle	33.000,00	23.720,69		23.720,69	23.720,69	-
		46 waterpump	32.000,00	49.777,75		49.777,75	49.777,75	-
		47 GPS	3.600,00	3.136,68		3.136,68	3.136,68	-
		48 Remote Sensing	14.300,00	-		-	-	-
		49 Sattelite Phone	39.600,00	-		-	-	-
		56 Safety Shoes	60.000,00	55.072,13		55.072,13	55.072,13	-
		43,1 Handy Talkie, Batery		19.503,27		19.503,27	19.503,27	-
		43,2 Portable Oxygen, Fire Masker		8.773,07		8.575,00	8.575,00	198,08
		49 Component Total	**321.600,00**	**295.849,96**	-	**295.651,88**	**295.651,88**	**198,08**
	50	Consumable Items						
		51 Office supplies	11.700,00	13.700,00		11.510,78	11.510,78	2.189,22
		52 Training Equipment	27.000,00	30.000,00		27.585,16	27.585,16	2.414,83
		53 Develop training material	49.000,00	31.250,00		31.242,85	31.242,85	7,15
		54 Produce leaflet	14.000,00	15.400,00		13.204,53	13.204,53	2.195,48
		55 Office Space	-			-		
		59 Component Total	**101.700,00**	**90.350,00**	-	**83.543,32**	**83.543,32**	**6.806,68**
	60	Miscellaneous						
		61 Training/ cources	40.000,00	48.600,00		48.589,8	48.589,84	10,16
		62 Miscelaneous	5.250,00	5.000,89		3.984,55	3.984,55	1.016,34
		63 Workshop/ FGD	84.000,00	90.000,00		84.506,30	84.506,30	5.493,70
		64 Publication	1.092,16	4.199,99		4.167,06	4.167,06	32,94
		65 PSC/PTC Meeting	4.000,00	6.000,00		4.697,38	4.697,38	1.302,62
		66 Financial Audit				-	-	-
		67 Meeting	4.000,00	5.000,00		2.987,44	2.987,44	2.012,56
		69 Component Total	**138.342,16**	**158.800,88**	-	**148.932,57**	**148.932,57**	**9.868,31**
	70	**Total managed by EA**	**941.842,16**	**941.842,16**	-	**917.498,80**	**917.498,80**	**24.343,36**
	80	National Management Cost	26.400,00	26.400,00		26.400,0	26.400,00	-
		89 Component Total	**26.400,00**	**26.400,00**	-	**26.400,00**	**26.400,00**	-
		Financial Audit	**10.000,00**	**10.000,00**				
	90	ITTO Monitoring, Evaluation and Administration						
		91 ITTO monitoring & review	25.000,00	25.000,00				
		92 ITTO final evaluation	10.000,00	10.000,00				
		93 ITTO Programme support	118.421,00	118.421,00				
	100	**Total Project Monitoring and Administration**	**153.421,00**	**153.421,00**	-	-	-	-
		GRAND TOTAL	**1.131.663,16**	**1.131.663,16**	-			

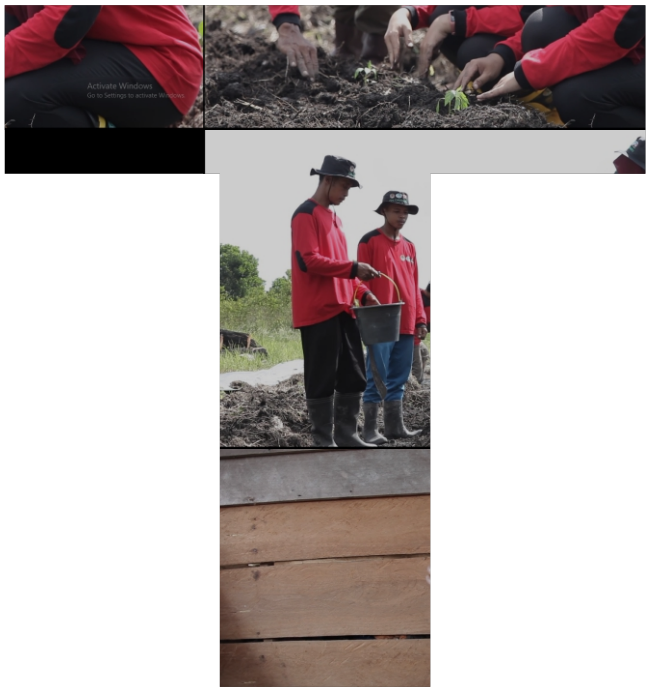
PROJECT CASH FLOW STATEMENT

Project No. PP A/56-340-1 **Period ending on: June 30, 2022**

Project Title: Capacity Building on Forest and Land Fire Management in Indonesia

		Component	Reference	Amount	
				($)	RP
A		**Funds received from ITTO:**			
	1	First Installment	28 January 2021	500.000,00	7.059.500.000,00
	2	Second Installment	10 November 2021	200.000,00	2.846.601.000,00
	3	Third Installment	23 February 2022	141.842,16	2.032.456.310,64
	4	Fourth Installment	27 May 2022	100.000,00	1.449.500.000,00
	5	Fifth Installment		-	-
		Gain/Loss Exchange rate		-	112.408.322,44
		Other Revenue		32,45	454.726,60
		Total Funds received:		**941.874,61**	**13.500.920.359,68**
B		**Expenditures by executing agency:**			
	10	**Project Personnel**			
		11 Project Coordinator		50.000,00	720.636.513,11
		12 Project Treasurer		33.000,00	475.688.000,00
		13 Expert		8.000,00	114.560.000,00
		14 Facilitator		45.431,05	652.008.750,00
		19 Component Total		**136.431,05**	**1.962.893.263,11**
	20	**Sub-Contract**			
		21 Sub Contract A (Advance Monitoring System)		80.000,00	1.139.842.000,00
		22 Sub contract B (Regional Workhop South East ASIA)		50.000,00	717.975.000,00
		29 Component Total		**130.000,00**	**1.857.817.000,00**
	30	**Duty Travel**			
		31 Daily Subsistence Allowance			
		31.1. DSA International		12.000,00	172.104.000,00
		31.2. DSA		64.466,04	922.238.642,00
		32 Air Ticket		-	-
		32.1. Air ticket International		6.453,90	92.561.859,00
		32.2. Air ticket domestic		25.648,50	366.599.246,00
		33 Local transport		14.371,54	205.272.858,00
		39 Component Total		**122.939,98**	**1.758.776.605,00**
	40	**Capital Items**			
		41 Laptop, PC (Printer)		4.971,01	68.600.000,00
		42 FireFighter Coat		118.928,80	1.706.553.292,80
		43 Motorcycle		11.966,55	171.083.643,00
		44 Vehicle		23.720,69	337.308.175,00
		45 waterpump		49.777,75	711.316.556,00
		46 GPS		3.136,68	45.105.452,00
		47 Remote Sensing		-	-
		48 Sattelite Phone		-	-
		56 Safety Shoes		55.072,13	784.757.500,00
		43,1 Handy Talkie, Batery		19.503,27	279.715.904,00
		43,2 Portable Oxygen, Fire Masker		8.575,00	123.700.000,00
		49 Component Total		**295.651,88**	**4.228.140.522,80**
	50	**Consumable Items**			
		51 Office supplies		11.510,78	164.330.000,00
		52 Training Equipment		27.585,16	393.964.200,00
		53 Develop training material		31.242,85	449.553.170,00
		54 Produce leaflet		13.204,53	190.030.500,00
		55 Office Space		-	-
		59 Component Total		**83.543,32**	**1.197.877.870,00**
	60	**Miscellaneous**			
		61 Training / cources		48.589,84	694.906.700,00
		62 Miscelaneous		3.984,55	57.147.221,89
		63 Workshop / FGD		84.506,30	1.211.008.250,00
		64 Publication		4.167,06	60.480.000,00
		65 PSC/PTC Meeting		4.697,38	67.898.300,00
		66 Financial Audit		-	-
		67 Meeting		2.987,44	42.042.600,00
		69 Component Total		**148.932,57**	**2.133.483.071,89**
	70	**Total Expenditures To-date:**		**917.498,80**	**13.138.988.332,80**
	80	**National Management Cost**			
		89 Component Total			
	90	**ITTO Monitoring, Evaluation and Administration**			
		91 ITTO monitoring & review			
		92 ITTO final evaluation			
		93 ITTO Programme support			
	100	**Total Project Monitoring and Administration**			
		Remaining balance of funds (A-B)		**24.375,81**	**361.932.026,88**





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