Initial Assessment of the Impact of COVID-19 on Sustainable Forest Management

Asia-Pacific States

A case study on Thailand and Nepal

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In order to have a broad overview of the impacts of COVID-19 on forests, forest sector, and forest dependent people, and to assess the potential of forests to diminish the adverse impacts of the pandemic, the United Nations Forum on Forests (UNFF), at its fifteenth session, requested the UNFF Secretariat, in consultation with other members of the Collaborative Partnership on Forests (CPF) and with input from members of the Forum, to compile an initial assessment of the impact of the COVID-19 pandemic on: (i) sustainable forest management (SFM), (ii) the forest sector, forest-dependent people, indigenous peoples and local communities, (iii) forest financing and international cooperation, and to present this assessment to the Forum at its sixteenth session in April 2021. To initiate this assessment and collect information, the UNFF Secretariat commissioned five assessments to be conducted on a regional basis.

Executive Summary

Coronavirus disease 2019 (COVID-19 or SARS-CoV-2) is a global pandemic that has caused enormous effects on human lives and the global economy. The on-going health crisis has led to common restrictions across countries such as a complete and/or a partial lockdown and restricted mobility. These control measures, while useful in preventing COVID-19 spread, have severely disrupted global supply chains, strained fiscal capacity and safety nets, increased unemployment, loss of income, food insecurity, and increased poverty rates. In particular, the economic sectors related to tourism and hospitality, agriculture, remittance, and industry have been the most affected. However, there is limited information and evidence of COVID-19 impacts on the forestry sector. This study investigated the impacts of COVID-19 on the forestry sector in the Asia-Pacific, with focus on Thailand and Nepal, through analyzing impacts on i) sustainable forest management (SFM); ii) the forestry sector, forest-dependent people, indigenous peoples, and local communities; and iii) forest industry and trade.

Given the time constraint for preparation of a comprehensive study on the entire Asia-Pacific region which includes a large number of countries, as well as difficulty in getting inputs and responses by UNFF national focal points to the queries of consultants, two countries from the Asia-Pacific region, Thailand, and Nepal, were used as case studies to understand and analyze the impacts of COVID-19 on the forestry sector. These countries offer a mix of geographical spread within Asia, with each having a different experience in terms of COVID-19 spread and containment. Data was collected through secondary sources and supplemented with key expert interviews in the country.

The results indicate that COVID-19 has created impacts in the forestry sector. The disruptions caused through partial and total lockdowns have impacted the forestry sector operations and management targets. While some incidents of illegal logging and poaching are reported, they have yet to severely threaten the forest condition and wildlife species. However, forestry sector operations in terms of plantations, forestation, and reforestation have slowed down.

Forest sector industry and trade also were impacted mainly due to the halts in the transport sector; these abruptions, in turn, affected the timely supply of raw materials or lengthened the process adding the extra cost of production. The low supply of raw materials hindered fuller operations, decreasing the scale of production and sales. This has further impacted the loss of jobs, with industries now downsizing their labor force by 60 percent. Forest-based tourism, particularly in areas of the watershed and protected areas were also negatively affected. Communities who were involved in the harvesting of high-value non-timber forest products also lost their main source of income.

As other sources of livelihood are cut short during these difficult times, forest communities were found to use forest-based resources as a safety net. Forest communities in both countries resorted to forests for basic provisions such as food, fodder, and grass. Some used forest-based resources to

support alternative livelihood options such as livestock rearing, milk selling, and forest-based tourism.

These results suggest that there is space for using the forestry sector in supporting subsistence livelihoods of forest-dependent communities, whilst also contributing to revive the economy through commercial production models of management. Land use planning of forests based on site characteristics to cater to different types of products and services offers a plausible option. However, to do so, the forestry sector needs to harmonize legal and regulatory barriers that currently appear as constraints.

Report Outline

1. Background and objective of the regional study

Coronavirus disease 2019 (COVID-19 or SARS-CoV-2) is a global pandemic that has caused enormous effects on human lives and the global economy. The virus has a global spread infecting more than 75 million people and resulting in over 1.6 million deaths by 22nd December 2020 (WHO, 2020). The on-going health crisis has led to common restrictions across countries such as a complete and/or a partial lockdown and restricted mobility. These control measures, while useful in preventing COVID-19 spread, have severely disrupted global supply chains, strained fiscal capacity and safety nets, increased unemployment, loss of income, food insecurity, and increased poverty rates (ADB, 2020;Lancet, 2020; Sumner and others, 2020). In particular, the economic sectors related to tourism and hospitality, agriculture, remittance, and industry have been the most affected. While the spread of the virus has been sporadic across the globe, reports indicate that mostly the poor, informal workers, ethnic minorities[i], and women (World Bank, 2020; Douglas, 2020; ILO 2020) have suffered disproportionately from COVID-19 and/or its social impacts. These groups are more impacted in countries with weak health and social protection systems.

The importance of the forestry sector to provide for several goods and services to meet societal needs, whilst keeping forests sustainable for future generations, has long been emphasized. Forests are recognized as providing several ecosystem services and functions that contribute to a broad range of vital products and services including food, livelihood, green space, cultural connection, watershed functions, biodiversity, air, and overall well-being. FAO (2020a) estimates that of the 1.2 billion people worldwide who live in extreme poverty, with about 90 percent rely on forest resources for at least some part of their livelihood. In the Asia-Pacific region, several hundred million people earn much of their subsistence and/or incomes from non-industrial forest products through the collection, marketing, or other simple processing activities such as handicrafts, furniture making, or food-processing. Forests also serve as an important energy source for cooking and charcoal production in many countries, including Sri Lanka and Nepal.

The role of forests, however, extends much beyond generating products and raw materials such as food, fresh water, medicine, wild meat, and wood, to providing other critical functions important to human and environmental wellbeing and related economic sectors. Forests also provide several critical ecosystem services, such as controlling soil-erosion, helping in soil formation, nutrient cycling, flood control and prevention, water purification, carbon sequestration, coastal protection, pollination, and air purification. Forests also offer cultural space, identity, and connections through collective, recreational, and spiritual functions within rural communities, indigenous people, and urban populations; these dynamics have been illustrated by the Sacred Groves of India, and through very conservative management practices of many cultural minorities in Yunnan or the Philippines, Dyaks in Borneo, and many peoples throughout Melanesia. Considering the goods and services that forests provide to societies, the role of the forestry sector is closely interwoven with wider sectors of the economy such as agriculture and food security, water and energy, and health and social protection. The importance of the forestry sector is underpinned across national development plans to global and regional commitments ranging from the Paris Climate Agreement to the 2030 Agenda on Sustainable Development Goals.

There is, thus, an urgent need to obtain a better understanding of how COVID-19 has impacted the forestry sector and what roles and contributions the forestry sector can play in associated recovery measures in a post-COVID context. To fulfil this need,through resolution of the fifteenth session of the United Nations Forum on Forests (UNFF15), Members of the Forum requested the UNFF Secretariat to compile an initial assessment of the impacts of COVID-19 on forest and forest sector. To collect relevant information, the UNFF Secretariat commissioned preparation of several background papers and case studies in each of the five UN regions, namely, Africa, Asia-Pacific, Eastern Europe, Latin American and Caribbean, and Western Europe and Others Group. In accordance with the resolution adopted by UNFF15, the focus is to assess the impacts of the COVID-19 pandemic on i) sustainable forest management (SFM); ii) the livelihoods of forest-dependent people, indigenous peoples, and local communities; and iii) forest industry and trade with its resulting implications for forestry to play a major role in planning, financing and international cooperation in recovery measures. The results coming from various assessments and case studies in different regions will be discussed during the UNFF Expert Group Meeting (EGM) in January 2021. The main outcome of the discussions during the EGM, including the key findings and suggestions on the way forward, -will be presented to the Forum at its sixteenth session in April 2021.

2. The Asian-Pacific Region: context and review of early impacts of COVID-19

Prior to the COVID-19 situation

The Asia-Pacific region is crucially important for the management of global forest resources. There are extensive spiritual and cultural associations between people and forests in this region and an extensive history of forest use and development. The region underwent an increase in forest cover by 17.6 million ha between 1990 and 2015, with the area of planted forests (mostly monocultures) almost doubling in the region from 69 million to 126 million ha between 1990 and 2015 (FAO, 2020). Most forest landscape changes in the Asia-Pacific region in recent decades can be attributed to policies of cumulative effects of conservation and sustainable forest management efforts placed in the region, and an increase in large-scale expansion of commodity plantations like rubber and oil palm, infrastructure development, and mining. The region has over half the world's population (55%) and countries with the fastest-growing population, and surging economies. This has placed an increased demand on forest resources in the region and elsewhere.

The Asia-Pacific region, led by China and India, is the fastest-growing economies of the world regions, and it now commands more than 40 percent of global gross domestic product (FAO, 2020a). The region is also considered a major producer, consumer, and exporter of wood products. Industrial roundwood production has grown, yet demand is rising faster, which has increased dependence on imports. Some countries, especially China, India, Indonesia, and Japan, have had significant impacts on regional and global trends in wood trade and consumption. The traditional use of wood as a source of domestic energy has been declining rapidly, as incomes rise and people

move to cities, leading to the increased use of electricity and liquefied petroleum gas (LPG). The use of industrial roundwood (for sawnwood, paper and paperboard, and wood-based panels) is growing to cater to the increased demand for housing, furniture, and exports. Health-and-beauty products derived from non-wood forest products are proliferating, driven by developments in processing technologies and demand for "natural" products. New wood-based products – such as biomaterials and biochemicals – are entering the market, and technological innovations are enabling added recycling and processing opportunities maximizing efficiency and production. In some countries, the migration of young people, particularly men, away from rural settings means that older people and women are increasingly responsible for forest and landscape management.

COVID exposure, impacts, and response mechanisms in the region:

The spread of COVID-19 across the Asia-Pacific region remains uneven. Some countries - notably Thailand and Vietnam– were able to contain the spread more effectively than others. While there is variation across the countries, the COVID-spread overall appears to be on the rise in Asian 'mega' cities that are densely populated. Developing Asia has about 70,000 new cases daily, more than two-thirds of them in South Asia and almost all of the rest evenly divided between Central and Southeast Asia. East Asia has the virus largely under control, with just over 500 new cases daily, while the Pacific has so far avoided large outbreaks.

The COVID-19 pandemic has caused massive shocks to Asian economies causing contraction of economic growth. Recent economic reports (World Bank 2020c) suggest improvements in the recovery of economies across Asia with a forecast of contraction by 0.4%, less than the 0.7% contraction envisaged in the Asian Development Outlook 2020 Update in September. Economic growth in South Asia will contract by 6.1% this year, upgraded from a 6.8% contraction forecasted in September. Economic contraction in Southeast Asia has been revised from 3.8% to 4.4%. Central Asia is still projected to contract by 2.1% this year, and the Pacific economies by 6.1% as global tourism continues to languish. The notable exception is East Asia, where the growth forecast is upgraded from 1.3% to 1.6%.

Estimates also indicate the loss of 81 million jobs in Asia-Pacific due to the contraction of labor markets, with an increase in the regional unemployment rate to 5.7 percent in 2020 (ILO, 2020a). Income inequality is increasing further during the COVID-19 pandemic because job losses have been concentrated among informal and low-income workers, especially in manufacturing, accommodation, and food service activities with high risks to female workers losing their jobs (IMF, 2020).

Governments across the Asia-Pacific have adopted shutdown measures and have earmarked stimulus support to revive industrial output, consumption, employment, and tourism. Many Asian governments have implemented significant fiscal policy measures to mitigate the pandemic's effects on the most vulnerable, with the impact depending on the initial coverage of safety nets, fiscal space, and degree of informality and digitalization. Yet, the challenge that remains ahead is

balancing competing priorities for economic recovery and long-term environmental protection measures.

Early impacts of COVID-19 on the forestry sector

Several press articles and opinion pieces have reported on potential and emerging challenges (and some benefits) as a result of COVID-19 lockdowns. These have included, but are not limited to, the reduction of independent on-the-ground monitoring activities of forest resources that might increase tenure conflicts and land grabbing (FAO 2020b); and more rapid land encroachment by agribusinesses who take advantage of preoccupied governments and decreased public scrutiny (Chandran, 2020; Cotuala 2020). Illegal logging of wood and extraction of other forest products were observed across the Prey Lang Wildlife Refuge in Cambodia and some protected areas of Nepal (Nachemson, 2020). Most of these incidents took place in the early months (one to four months) after the lockdown measures were implemented. Some reports indicated more widespread forest fires due to limited fire prevention efforts or higher forest use in Thailand (Cheema, 2020), while others indicated a decrease in the number of forest-fire incidents, particularly in community-managed forests in Nepal (Paudel, 2020). The pandemic has also affected the forestry sector especially in terms of timber and NTFP production and sale, with multiplier effects on the local livelihoods and forest-based enterprises (FAO 2020b). Across community-managed forests in the region, communities have turned to forest resources as safety nets for supplementing their food supplies (FAO and RECOFTC 2020). There have also been reports of rural populations and indigenous communities in Asia, who are turning to forests for food, medicines, fuel, and shelter, and to isolate themselves from the risk of COVID-19 infection. Millions of unemployed daily wage laborers have returned to their rural villages, putting a strain on their local ecologies. This movement is also perceived to create immediate strains on forests, rivers, and other natural resources to collect food and other necessities. While some reports suggest links between forest degradation and zoonotic diseases, the statistical evidence to prove this connection is currently weak and thus requires further testing.[1]

Some positive benefits of COVID-19 were also recorded. According to anecdotal testimonies, the shuttered factories, empty streets, and "bluing" of perennially smoggy skies over many cities have provided welcome relief from routinely crowded, polluted Asian urban environments. Measures such as limited transport mobility are linked with reduced outdoor pollution (Zambrano-Monserrate and others 2020) and the reduction in the concentration of major air pollutants.[2] Other unanticipated benefits include cleaner coastlines, reduced crowds in ecotourism sites, and sights of long-unseen wildlife across Asia's jungles and seashores. Even endangered leatherback turtles have

[1] Some recent studies indicate that an estimated 60 percent of all infectious diseases in humans and 75 percent of all emerging infectious diseases are of zoonotic origin caused by viruses, bacteria, parasites, and fungi transmitted between humans and animals, but the causes confirming this hypothesis are yet to be statistically verified. Existing statistical evidence to confirm this theory is weak and requires further testing. Another critique relating to this theory is the assumption of visualizing forestry or natural landscapes as pristine spaces, which is assumed to exist without direct interaction with human settlements. Many refute the concepts of pristine landscapes and refer to the need of unpacking communities' intricate relationship with forest and environmental landscapes (Lachapalle, 2004).

[2] https://www.scidev.net/asia-pacific/environment/news/asian-covid-19- lockdowns-clear-the-air-of-pollutants.html (accessed 8/28/2020 at 9:44 pm)

reclaimed Phuket (Thailand) beaches to lay eggs, while a live leatherback was reportedly seen on a Phuket beach (Ocharoenchai, 2020).

However, these reports are mostly anecdotal and remain too limited to draw conclusive patterns. While some infractions on forest regulations are noted, it does not reveal much on how severe these infractions have been to affect sustainable forest management practices. A key empirical gap remains about data on how forestry institutions and communities engaged with forest resources are (re)organizing due to COVID-19. Data is also limited about the patterns of whether and how rural, forest-dependant, indigenous communities, returnee migrants, and women have used forest products and services as a safety net to cope with the adverse impacts of COVID-19. While the forest trade on timber and associated wood products has been closely observed (WRI, 2020), data on trades of non-timber forest products or forest-based tourism are not evident. These missing data are important to broadly assess the impacts of COVID-19 on the forestry sector, and its use in the recovery measures.

3. Methodology

3.1.Conceptual framework

This study utilizes a conceptual framework (Figure 1) to understand whether and how the disruptions linked to COVID-19 have impacted the forestry sector in three areas: sustainable forest management, livelihood, and forest industry and trade.

The conceptual framework situates the forestry sector as a system with unique characteristics and functions that strive to meet environmental, economical, and social demands relevant to national, regional, and global goals (1). COVID-19 has emerged as a new challenge causing disruptions in the existing functioning of this system (2). Some changes are taking place in terms of i) ecological condition of forest and management practices that can affect sustainable forest management; (ii) local communities' reliance on forests and forest products as a safety net to meet food and space needs that in turn, support their livelihoods (iii) contraction of economies and markets, with changes in supply chains of forest-based industries. The effects can be both positive and negative (3). These positive and negative effects subsequently become the basis to account for the overall impacts of the pandemic and to propose the role/contribution of the forestry sector in the measures of recovery (4).

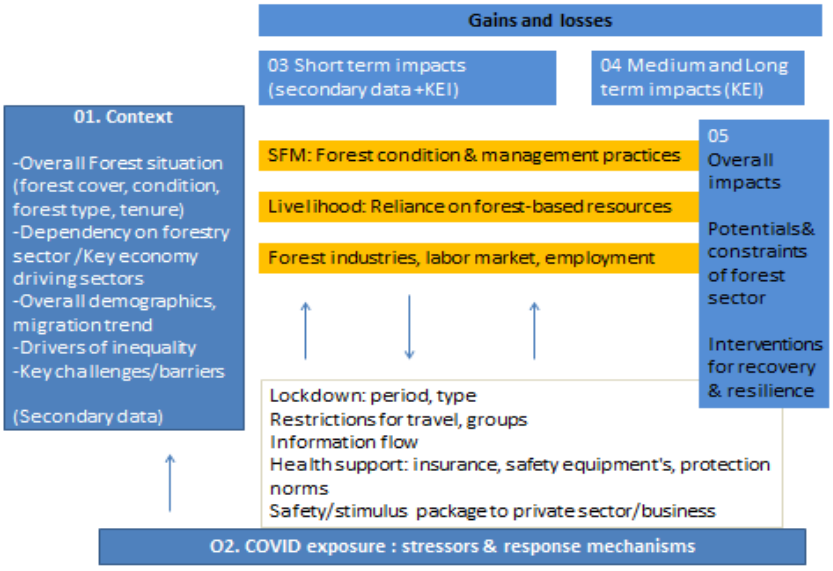


Figure 1: Conceptual framework for assessment

3.2.Key topics and variables

Within this research context, sustainable forest management is understood as "forest condition and management practices that are useful to preserve, manage and use the forest resource and its products and services". This definition was kept to avoid multiple interpretations of the term "sustainable forest management." For this research, the term "sustainable forest management" indicates practices that ensure the preservation, management, and utilization of the forest resource stock and regeneration against potential threats such as illegal logging, wildfires, pest infestations, storms and other impacts of climate change. In short, these are denoted as forest conditions and management practices. Thus, to assess the effects of COVID-19 on sustainable forest management, the study looks at (i) incidents of infractions such as illegal harvesting, poaching before and after COVID-19 and the perceived severity (scale and impacts) of these infractions; (ii) disruptions in continuing silvicultural practices and afforestation activities usually conducted to maintain the forest condition; and (iii) management and organizational level changes (capacity, programs, budgets) taking place within key forestry institutions as a result of COVID-19.

The term "livelihood" within this research is understood as the reliance of local communities, including indigenous people, women, and smallholders who are dependent on forest resources for their subsistence needs. Subsistence needs refer to meeting the minimum or basic needs and do not include activities or resources that lead to commercial gains. COVID-19's impact on livelihood is assessed through: (i) changes of use of forest-based products and services to meet the local communities' daily consumption; and (ii) selling and usage of forest-based products and services to support other livelihood options.

The impacts of COVID-19 on forest-based industries and trade are assessed in three sub-sectors namely: (i) timber (ii) non-timber forest products and (iii) forest-based tourism. The impacts are

assessed in terms of changes in the supply chain, which include: the volume of production and sale, market demand, labor size and scale, and the most impacted group across the supply chain.

3.3.Research approach: Case study

The study employs a case study approach to understand and analyze the impacts of COVID-19 on the forestry sector. The case study approach is an established research approach to draw an in-depth, multi-faceted understanding of a complex issue in its natural context. Given the continued spread of COVID-19 in the region and its unfolding impacts, the case study approach offers a useful perspective to understand the broader impacts of COVID-19 on the forestry sector, explain causal links, and identify opportunities and gaps for prospective recovery measures.

Two countries from the Asia-Pacific region, Thailand and Nepal, are purposely selected. These two countries offer a mix of geographical spread within Asia with the representation of South and Southeast Asia, with each having a different experience in terms of COVID-19 spread and containment. Both of these countries' tourism sectors have been hit severely by lockdowns related to COVID-19, which has, in turn, disrupted their national economies. In Thailand, forest policy is majorly run through the state's paradigm of forest protection and management and the legal basis for Community Forestry is limited. In Nepal, through the enactment of the Community forestry program in the early 1990s, large-scale devolution of the use, management, and governance of land and forest is done through collective groups of forest communities. Despite the countries' differences in economies and forest management modalities, the forestry sector is a part of national and global commitments in both countries.

This study does not intend to use these two cases as a strict comparison against the controlled variables. Rather, the aim is to distil insights from these two cases to better understand the impacts of COVID-19 on the forestry sector, which may offer some guidance to other Asia-Pacific countries.

3.4.Methods for data collection and analysis

In each country, both primary and secondary data were collected. Secondary data were collected through available information in development reports, journal articles, grey literature, news articles, webinars, and social media posts in both English and local language. Data from secondary information is assessed to understand emerging issues, trends, and recovery responses within the forestry sector in the post-COVID situation. Data collected through secondary information were distilled to identify major trends and opportunities. In short, they indicated "what changed" within the forestry sector due to COVID-19. Based on these data, some of the variables have been customized and adapted for country-level analysis. In Nepal, for example, questions on reverse migrations have been added. In Thailand, direct associations between COVID-19 and forestry were difficult to locate (except in trade) since forestry is not the major economic source of livelihood. Thus, the Thailand study focuses on understanding the impacts of COVID-19 on upland communities in a northern province that engage in agroforestry-based livelihoods. The Thailand study also does not focus on NTFP industries.

A total of 35 key informant interviews (KII) were conducted with experts across the two countries to better understand the reasons behind the key trends that were observed through the desk review (Annex 1 and 2). A checklist was used to guide interviews (Annex 3)Discussions were also held with experts to understand the severity of these trends and their likely implications in the forestry sector, as well as to identify potential measures for recovery of the sector. UNFF Focal points across the Asia-Pacific were informed about the study through email. Responses to the research questions were provided by the UNFF focal points from Thailand, Nepal, and Samoa. Most of the key expert interviews were conducted through phone or Zoom and in local languages. Some KII was recorded as a written response in situations when key experts opted to write-in instead of a direct interview. In Nepal, most of the interviews took place by phone or Zoom due to travel restrictions. In Thailand, where traveling was possible, field visits took place at two forest-based tourism sites – Mon Jam and Mae Kum Pong located in Chiang Mai province, northern Thailand– to assess the impacts of COVID-19 on forest communities.

Data obtained from these two countries were analyzed for common and distinct patterns and to identify the impacts of COVID-19 on the forestry sector. These assessments were subsequently consolidated to offer some suggestions for the region.

4. Results from Case study 1 - Nepal

4.1.Country context

Nepal is a landlocked country between India and China. The high Himalayas mark the border with China while Nepal shares its plains towards the South with India. Nepal falls in the category of the world's poorest countries, ranking 147th out of 189, with a Human Development Index (HDI) score of 0.579.[3] Despite certain economic progress, the per capita income of Nepal falls behind other South Asian nations with only USD 1071.[4] Agriculture has remained a dominant economic sector in the country, though its overall contribution to the Gross Domestic Product (GDP) has been gradually declining over the years. For instance, the agriculture sector contributed about 38 percent of the GDP in 1999, but it gradually declined to 36 percent in 2009 and 26.9 percent in 2018/19 (ADB, 2019; MoF, 2020). The combined contribution of agriculture and forestry sectors to GDP is estimated to be 27.1 percent in the fiscal year 2019/2020 (MoF, 2019). Likewise, the contribution from the industry sector[5] to the GDP too had gradually decreased in the past two decades. Its contribution was 23 percent in 1999 which gradually declined to 16 percent and 14.2 percent in 2009 and 2018 respectively. However, the contribution of the service sector[6] was progressive in that sense where the contribution to the GDP during the years 1999, 2009, and 2018 was 39 percent, 48 percent, and 57.6 percent respectively (ADB, 2019). More than half of the country's farms are small, about less than 0.5 hectares (ha) with average holdings of 0.7 ha, and fragmented. Nearly 4.6 million people (16% of the total population) are still food-insecure, with 20 percent of households (HHs) being mildly food-insecure, 22 percent moderately food-insecure, and 10 percent severely food-insecure (MoH and others, 2017).

A majority of Nepal's labor force—62 percent or 4.4 million people—works in the informal sector and 59 percent of enterprise laborers are engaged in micro-enterprises (CBS, 2018). Poverty is estimated to have decreased in recent years. The population living below the absolute poverty line is estimated to be 18.7 percent, which can be attributed to high economic growth, increasing investment in physical and social infrastructure, and most importantly, the influx of remittance (MoF, 2019). The migration of people from rural to urban areas in search of employment opportunities has resulted in the population rise in urban areas. The recent statistics show that the urban population is estimated to have reached 59.9 percent of the total country's population (MoF, 2019).

Following the promulgation of the Constitution of Nepal 2015, the country entered into a federal governance system with three tiers of government: federal, provincial, and local. Further, due to the absence of a locally elected government for over 18 years, there was a huge gap in the local

[3] http://hdr.undp.org/en/countries/profiles/NPL (accessed 24 November 2020)
[4] https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=NP (accessed 24 November 2020)
[5] Industry sector, also known as manufacturing sector, includes manufacturing, construction, electricity, gas among others.
[6] Service sector includes hotels, restaurants, transportation, communication, wholesale and retail, health among others.

governance in the country. However, with the new Constitution in place, the local governments elected in 2017 have been exercising executive, legislative, and judicial powers (ADB, 2020).

4.2.COVID situation, management measures, and impacts on the economy

The first case of COVID-19 infection was recorded on 23 January 2020 in a person returning from Wuhan, China (GoN, 2020). Testing was not aggressive while any sample that had to undergo Corona Virus screening had to be sent outside of the country. With rising cases elsewhere, Nepal formally closed down all the schools on 19 March 2020 (Panthee and others, 2020). The government appeared to be committed to controlling the spread, but despite that, a second case was detected on 23 March 2020 in a person who returned from Europe.

Nepal observed a rapid rise in the number of detected cases following the introduction of the testing kits. Cases have been reported across all seven provinces. Initially, the spread was well contained with the number of infections below 100, until 11 May 2020 when a sudden spike of 185 infections was recorded. Nepal saw its first COVID-19 related death on 16 May 2020 (MoHP, 2020). However, as the lockdown prolonged, and eventually affected the overall economy, the government lifted the lockdown. As a result, the total number of infections rose across different geographies with a total count of 253,772 as of 20 December 2020 (ibid). Many Nepalese migrants returned after losing their jobs in Far Western Nepal and were identified as infected with the coronavirus. Of the total cases, large proportions (165,594) were men. Most of the infected individuals are in the age group of 21-40 years of age. The mortality rate is 0.7 percent with 1,778 deaths and the recovery rate is at 96 percent (GoN, 2020).

With the fear of a rapid rise in the number of cases, the government decided to close all its borders including international flights, and declared a nationwide lockdown until 14 June 2020 (Panthee and others, 2020). Social distancing in public places, mandatory use of face masks, sanitizers, and hand wash in public places were set up across public and private institutions. Even with these facilities in place, the COVID-19 cases could not be contained due to diverse factors. Many migrants within and outside of Nepal returned. Migrants returning from India, due to the porous border, averted quarantines. The facilities where return migrants were kept for isolation were not adequately set up with poor cooking, bathing, toilet, and sanitary facilities. Additionally, there was some social stigma against people who tested positive, and thus people without serious symptoms tried to avoid COVID-19 tests.[7] Many people opted to stay at home isolations and avoid tests; as a result, the number of cases went down gradually.

Response measures

The Government of Nepal started conducting regular screening among people returning from foreign countries. Moreover, contact tracing was made mandatory for all the positive cases aiming to cut off the chain of further transmission. A team was formed under the leadership of the secretary of the office of Prime Minister and Council of Ministers to monitor the condition of the disease and find out the measures in advance to minimize the spread of the virus. Also, a high-level

[7] https://thehimalayantimes.com/nepal/social-stigma-more-painful-than-coronavirus/

committee was formed under the leadership of the Prime Minister to take precautionary measures against the possible uncontrolled spread of COVID-19 (Sapkota and others, 2020). Likewise, the Federal government established "The Coronavirus Prevention, Control, and Treatment Fund (CPCTF)", which received donations from various national/international organizations and individuals. The fund also received donations from Nepal Oil Corporation, Nepal Telecom, offices under the Ministry of Finance, Nepal Stock Exchange, different commercial banks, corporations, and individuals (Khatri, 2020).

Apart from adopting measures to stop the transmission of COVID-19, the Government of Nepal made preparations and carried out extensive dissemination of information, education, and communication materials on social distancing, handwashing, proper use of masks and hand sanitizers, mass awareness campaigns via television, radio, social media, and pamphlets. Moreover, the government also launched a mobile application (Hamro Swasthya), and a web portal (covid19.mohp.gov.np) to disseminate information regarding the COVID-19 impact in the country (Sharma and others, 2020). Further, testing and tracing of the infected people, and preparation of health sector emergency response plans were carried out by the government including strategies for effective quarantine management, case investigation, contact tracing, community-level screening and testing, and strengthening laboratory capacities, etc. (Sharma and others, 2020).

Despite these efforts, the capacity of the government and the existing health system has not been able to cover the treatment of patients in large numbers. The treatment is also costly. There was frustration growing among the Nepalese people regarding the perceived incompetence of the Government in addressing the crisis.[8] Some non-governmental initiatives led by the non-governmental sector remained effective in providing some respite. For instance, the Federation of Community Forestry User Groups, Nepal (FECOFUN), a collective membership-based network of 22415 community forest user groups was effective to provide relief measures to the poorest and vulnerable households through the mobilization of their social, financial, and human resources. The financial contribution of over 250 CFUGs in addressing the COVID-19 impact was 170,000 USD [9][1] in addition to 10 million USD support to the relief fund created at the local level (Gentle et al. 2020). Furthermore, over 1400 CFUGs offered their buildings for quarantine centers during the crisis. Likewise, other international and humanitarian organizations such as CARITAS Nepal, and the World Food Programme have been supporting affected areas in the eastern and western parts of Nepal.

Impacts on the economy

There was a decline in the remittance inflow from NRs 879.3 billion (approx. USD 7 billion) in the fiscal year 2018/19 to NRs 592.4 billion (approx. USD 5 billion) in the fiscal year 2019/20 (MoF, 2020). Estimates show that three in every five employees in both formal and informal micro, small, and medium enterprises (MSMEs) in Nepal have lost their jobs as a result of the COVID-19 pandemic (UNDP, 2020). According to a recent survey (WFP 2020), the COVID-19 pandemic has

[8] *The Diplomat 2020*

[9] USD 70184 cash was provided to support the local government's relief fund and USD 99058 cash was invested for food and non-food items during the COVID-19 pandemic (Gentle and others, 2020).

affected the livelihoods at the HH level, with one out of ten HHs reporting the loss of livelihood and three out of ten HHs accounted for a reduction in income.

4.3.Forestry context and impacts of COVID-19 in the forestry sector

Forests in Nepal occupy a total of 5.96 million ha, accounting for 40.36 percent of the total area of the country. Other Wooded Land (OWL) covers 0.65 million ha (4.38 percent). Forest and OWL together represent 44.74 percent of the total area of the country. Out of the total area of Forest, 82.68 percent (4.93 million ha) lie outside the Protected Areas while the rest 17.32 percent (1.03 million ha) lie within. The core area and buffer zone comprise 0.79 and 0.24 million ha of the Forest, respectively. In terms of geographical distribution, 37.80 percent lie in the middle Mountains, 32.25 percent in high Mountains and high Himal, 23.04 percent in Churia, and 6.90 percent in Terai. In the case of OWL, Terai, Churia, Middle Mountains, and High Mountains and High Himal physiographic regions share 1.47 percent, 3.50 percent, 9.61 percent, and 85.42 percent, respectively (DFRS, 2015).

Forests in Nepal are broadly categorized as Government forest and private forest in terms of ownership. However, there are different management modalities for the Government forests in Nepal. These include community forests (2,312,545 ha), buffer zone community forests (138,184.1 ha), leasehold forests (45,043 ha), collaborative forest management (75,665 ha), protected forests (190,809 ha), and religious forest (2,054 ha)[10]. In two decades, the total area of forest land in Nepal increased from 39.6 percent to 44.74 percent (DFRS, 2015). With an increase in the total area of forested land, Nepal's forestry sector has huge potential for the commercial management of forest resources from sustainable logging and harvesting of products, mainly in community managed forests, in addition to creating jobs and income. This is illustrated in the Government policies and strategies wherein it aims to provide livelihood opportunities through sustainable management of forest. The Forest Sector Strategy 2016-2025 (GoN, 2016) envisions a sustainably managed forest, inclusive of livelihood opportunities.

Nepal is a signatory to several climate change and biodiversity related conventions. In particular, Nepal is signatory to the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Paris agreement. Nepal initiated a series of REDD+ (Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries) readiness activities with support from the Forest Carbon Partnership Facility (FCPF) of the World Bank and UN-REDD supported studies and capacity building activities. Likewise, Nepal is also a signatory to the Convention on Biological Diversity (CBD), and as a party, the country has committed to ensure conservation and sustainable use of biodiversity through its integration into sectoral plans and policies (MoFSC, 2014).

[10] Adapted from the presentation by Hari Prasad Pandey, 2020, Forests coverage under different management modalities in Nepal.

The agriculture and forestry sectors account for 27.1 percent of the GDP. While the exact contribution of each sector is lacking, recent estimates (MoF, 2020) indicate that the contribution of the forestry sector alone was dismally low accounting for less than 1 percent of the total revenue generated in Nepal in the Year 2019. There are two reasons for this observed trend. First, forest management in Nepal has largely been placed at the farm-forest interface with immediate links to the agriculture sector. Forest-based products including food are considered significant particularly in terms of supplying crucial micronutrients among forest-dependent people, with limited access to arable private lands (Ojha and others, 2009; Vinceti and others, 2013). Forests used to be an important part of household energy sources (Malla, 2000) with almost 70 percent dependence on firewood, which is now increasingly reduced due to widespread use of other fuel sources- such as Liquified Petroleum Gases (LPG) and Kerosene. People are also dependent on forests for products such as grass, and fodder that support livestock-based livelihoods in the rural parts of Nepal (Paudel and Ojha, 2013; Ojha and others 2009; Pandit and others, 2009; Karki and others 2018).

Second, forest management in Nepal has remained largely conservative in terms of utilizing its forest-rich resources. Studies indicate that there is an enormous potential for income generation and employment through timber and NTFPs (Paudel and others, 2014; Banjade 2012). Paudel and others (2014) showed that timber from community forests alone can generate an income of approximately Nepalese Rupees (NRs) 27 billion (USD 220.98 million) and 21,710 jobs annually. The same study also estimated the growing stock of key marketable timber species in the community forest to be 67.37 million m^3 while the annual allowable harvest (AAH) of nine timber species was estimated at 32,932.49 m^3. Likewise, Subedi and others (2014) highlighted the potential of NTFP in creating jobs wherein an estimated 189,000 people are employed in the sector. Despite the potential, in 2015 alone, timber amounting to about 0.83 million m^3 and worth NRs 88 billion was imported from various countries including Malaysia, Indonesia, Burma, Vietnam, New Zealand, Denmark, Africa, and Australia. In the same year, around 1 million m^3 of timber was wasted or went unused in the forests of Nepal (GoN, 2017). This was primarily due to the strict regulations wherein the user groups are only allowed to harvest poor quality and dead trees (Baral and Vacik, 2018). Likewise, the import of timber has gradually increased from 13,920 tons in 2009 to 83,210 tons in 2016 (MoCS, 2018). The protected areas on the other hand have also attracted a good number of tourists in the past. The number of tourists visiting protected areas and engaging in eco-tourism related activities increased from 172,290 in 2003 to 706,148 in 2019 (DNPWC, 2019).[11]

The importance of the forestry sector in generating jobs and income has been emphasized in the development plans of the Government of Nepal (NPC, 2018; NPC, 2007; NPC, 2003). For instance, the Fifteenth Five Year plan 2075/76- 2080/81BS (2018/2019-2023/2024 AD) aims to utilize agriculture and forestry sectors to generate income and employment and increase its value from 81135 Crore to 104,736 Crore at the end of the period (NPC, 2018). Similarly, the Three Year Interim Plan (2007/08 – 2009/10) aims to create rural employment and income generating opportunities through the forestry sector, especially for the systemically marginalized communities

[11] http://www.dnpwc.gov.np/media/files/DNPWC_Annual_Report_2075.76.pdf

such as Dalits, local communities, Indigenous people, and other disadvantageous/marginalized groups (NPC, 2007).

Community-based forest management has largely played a contributing role in addressing poverty reduction in rural areas. Comparing the changes in forest cover and poverty levels during the period 2000-2012 in Nepal, Oldekop and others (2018) show that community-based approaches to the management of natural resources are believed to have benefits both in terms of improved natural resource conditions and reduced poverty. The authors show that community forests have contributed to reductions in poverty as well as deforestation across Nepal, and handing over the forests to local communities does create a win-win situation. It is estimated that nearly 4 million HHs in Nepal still depend on traditional biomass energy, including fuelwood, for cooking (CBS, 2011). Most of these resources come from community managed forests and private land, while a small portion is fulfilled from government forests. Apart from meeting the daily needs of the rural population, community forestry has been acclaimed for its inclusive policy and practices. Community forest in Nepal has also included several inclusive policies and mechanisms to secure the participation of women, Indigenous people, Dalits, and other marginalized people. Gender equality and social inclusion agenda gradually entered into the community forestry policy and practice domains since the 1990s with three interrelated elements including representation of women in the local level community forestry institutions; women-only institutions, promoting women's leadership and voice (Ojha and others, 2009). Initiatives have been taken at both the national policy and local level. Policy level initiatives include the Ministry of Forest and Soil Conservation's Gender and Social Inclusion Strategy (MoFSC, 2007), Community Forestry Guideline 2015 (MoFSC, 2015), Federation of Community Forestry Users Nepal's (FECOFUN) constitutional mandate of 50 percent women in all decision making bodies. Other inclusive initiatives include: keeping the names of both the male and female in the community forest user group (CFUG) members list as HH heads (FAO, 2003). Likewise, there is an increasing number of women-led CFUGs where they have performed better in terms of accountability, forest management, and transparency. There are over 1000 such women-led CFUGs in Nepal (Jhaveri, 2013). The Constitution of Nepal has provisions related to the inclusion of women (at least 2 in each ward) in the Village Assembly, and one-third out of the total members elected in the Federal Parliament are required to be women (GoN, 2015).

4.3.1. Impacts of COVID-19 on sustainable forest management

Incidences of increased extraction of resources

The lockdown and subsequent restrictions in mobility led to a reduction in or the halt of monitoring and management practices of forests. Forest patrolling was completely halted in community

managed forests, which led to illegal logging. To curb the possible spikes of illegal logging, the Government placed a ban on harvesting, which affected annual harvesting targets of timber.

The illegal collection of firewood from forests was not recorded since most of the households use an alternative energy source, the LPGs with the supply of LPGs being maintained even during the lockdown. [12] This may change during the wedding season during December and January, wherein the demand for firewood and timber is high, especially among the Tharus, an Indigenous community in the Southern part of Nepal. The imposed ban on harvesting without feasible alternatives may lead to infractions of illegal harvesting.

Box 1: Illegal logging cases in Kailai during COVID-19 pandemic

In Kailali district alone, about 2070 cft illegal timber was confiscated from seven different places during the lockdown period. Similarly, 25 legal cases have been lodged on various illegal actions in the district – illegal collection and transportation of forest products (23), forest encroachment (1), illegal hunting (1). Likewise, unattended timber logs were retrieved from Udasipur sub-divisional forest office (419.55 cft) and Musiriya sub divisional forest office (206.91) in Kailali.

Source: Personal communication with Mr Chandra Bhandari, Officer, Kailali Divisional Forest Office (5 December 2020)

Poaching and illegal hunting were rife during the lockdown period across Nepal due to the absence of monitoring measures from government agencies. Many such incidents were reported during the lockdown. For instance, in Tanahu, there used to be merely 4 or 5 illegal hunting cases in general, but it was reported that the number of cases almost doubled during the lockdown period.[13]

Restrictions in community groups mobilization and halt in the renewal of operational plans: The CFUG operational plans (or management plans) are the legal documents of forest user groups. Hence, without a valid plan, any activity conducted inside the forest is deemed illegal. As the CFUGs could not hold their general assemblies, the renewal of their operational plans came to a complete halt. This in turn affected harvesting and other related activities in the forest. Mr. Prem Shrestha, Chairperson of Kalopani CFUG, expressed his concerns as:

> *"Renewal of the operational plan has been affected as a result of the lockdown. The renewal has been overdue by 9 months. Because of this, some activities like harvesting have been stopped*."

A similar situation was found across the Bahunidevi community forest of Sarlahi district in Terai. The general assembly of the community forest user groups that used to be organized periodically was also affected due to the pandemic. The chairperson of Bahunidevi community forest, Ms. Rama Paudel expressed her concerns in that line:

> *"In the initial days of COVID-19 and due to subsequent lockdowns, forest management was severely affected. Especially, the CFUG members could not go for forest guarding. Likewise, we could not have our General Assembly, which before COVID-19 used to take place once in every six months."*

[12] Personal communication with Mr. Jian Karki, Assistant Forest Officer at Kailai.

[13] Personal communication with Shambhu Charmakar, Food and Agriculture Organization based in Nepal.

The location of community forests and their distance to city centers are key determining factors of communities' mobilization during the pandemic. Community forest groups that are located close to city centers were more affected due to strict lockdown measures and a high level of vigilance by security personnel. These groups could not organize their annual general assembly, without which they could not comply with the legal precedent of approval for the successive year's work plan. Even when the general assembly was held, the community group could not renew their plans since the government forest offices were closed or stopped their service to avoid the spread of COVID-19. This has created delays in the official approval of the operational plans due to which many silvicultural operations, such as weeding, cleaning, and forest fire control, could not take place as planned and if further continued, can hamper forest growth.

However, community forest groups that are situated at considerable distances from city centers were less affected. These groups used social distancing measures, held general assemblies, and continued their operations. The chairperson of Kalopani community forest, which is situated at a larger distance from the main market center of Banepa in Kavrepalanchowk opined:

> *"Our village is far from the main market center. So we were not much affected by the lockdown. Mobility of the people within the village was not affected. We held our meetings regularly while maintaining social distancing.*
>
> *However, during the initial days of COVID-19 and subsequent lockdowns, there were some issues with regard to forest management. The CFUG members could not go for regular forest guarding. Likewise, we could not hold our General Assembly too, which otherwise (before COVID-19) used to take place once every six months.*

Even those community forest groups, who had all the required preparatory work ready for the renewal of their operational plans, could not conduct their general assemblies due to the lingering ban on harvesting. This not only impacted the timber production and harvesting but also disrupted the forest management activities in the community forests.

Cancellation of regular forest management activities such as silviculture operations:

The Government of Nepal has implemented scientific forest management in 30 collaborative forests, 285 community forests, and seven government block forests (Poudyal and others, 2019). Over 600 forest management plans for community-based forests, with an area of 90,000 ha, are being implemented with a focus on commercialization based on silvicultural principles (MoFE, 2019). Besides, the CFUGs conduct forest management activities including cleaning, thinning, pruning periodically. All of these activities were halted following the imposition of lockdown in March. Table (1) suggests changes in the key activities usually monitored within the forestry sector (Pandey and others, 2020). The data indicates that there is an improvement in seedlings distribution for enrichment planting, and the quality of air has also improved. It is likely that most of the seedling distribution and plantation activities were conducted by adopting social distancing

measures in several community forestry areas with support from the forest offices. However, other activities such as timber harvesting, plantation, and revenue collection have decreased.

Table 1: Changes in forest management indicators

Indicators /unit	Fiscal Year[14] 2019-2020 (2075/76 B.S.)	Fiscal Year 2020- 2021 (2076/77 B.S.)	Observed change
Timber harvesting (cu. ft. in millions)	194	143.21	Decrease
Revenue collection (Rs, in millions)	31100	17500	Decrease
Nursery management and seedlings distribution (millions)	**205**	**234.22**	Increase
Plantation (hac.)	4100	2900	Decrease
Air pollution index (PM 2.5)	**53**	**39.65**	Improve

(Source: Pandey and others, 2020)

Reduced scope of institutional budgets and capacity building activities:

The government's budgets and capacity-building activities were impacted negatively. Usually, budgets are allocated for sustainable forest management related training and capacity building activities every year. But, a ban on public gatherings and prolonged lockdown measures across the country resulted in cancellations of such activities. The cancellations of capacity building on silvicultural operations to communities also affect their ability in carrying out such activities in their forest. Moving beyond communities and national boundaries, it has also constrained trans-boundary cooperation for joint exchange and training on wildlife management and monitoring, across the Terai Arc Landscape Program (TAL).[15] The physical space which previously provided an open avenue to discuss problematic aspects through more open dialogues of both nations is currently halted.

4.3.2. Impacts of COIVD-19 on livelihoods

Local communities in rural Nepal mostly depend on forests for fuelwood, grass, fodder, NTFPs, and in few cases on wild foods for their subsistence. Communities' usage of fodder has increased during the lockdown, due to an increase in livestock rearing. Some community members also extracted firewood, but not as a fuel for cooking. They used firewood in alcohol production, an alternative livelihood option to support their reduced incomes. They also used timber for repairing and maintaining their houses and livestock

[14] Fiscal year in Nepal can roughly be categorized as a period of a year starting from 16 July.

[15] Personal communication with Mr. Jisan Karki, Assistant Forest Officer at Division Forest Office, Kailali.

sheds. However, due to bans on travel and transport, the buyers who would normally buy community products (baskets, *Nigalo* products) produced through materials from community forests could not travel to purchase those items, which led to a loss of income. Most of the weaving and local products were done by women. Additionally, some community forest user groups faced constraints to mobilize their CFUGs fund due to a lack of renewal of operational plans.

Collection of products from forests to meet subsistence needs

Local communities used forests to collect fodder and grass and the amount they collected increased significantly during the lockdown period. This can primarily be attributed to the influx of reverse migration to rural areas, and their inclinations to livestock rearing (cow, buffaloes, goats). They also started cultivating previously under-utilized, barren agricultural land. This has led to an increased demand for fodder and grass from forests. For instance, it was observed that the demand for fodder had almost tripled in the village of Chaubas of Kavre, wherein, those collecting 10 bhari[16] per month normally have now started collecting 30 bhari per month following the lockdown.

Likewise, fuelwood collection was on the rise throughout the lockdown period. This pattern was primarily among HHs involved in alcohol making. Those who lost their jobs opted for alcohol sale as an alternative livelihood option and as a result, their dependency on the forest increased. In Bahunidevi community forest, out of the 250 HHs, 150 rely on fuelwood for energy. Before the COVID-19 situation, they used to collect 120-145 bhari of fuelwood, but now the amount has almost doubled to around 200-250 bhari every month.

In a similar case, timber demand was high during the lockdown. With returnee migrants getting back to their villages, repairing and reconstruction of old houses and sheds was on the rise. The timber logs that were already harvested and were ready for sale were used for those purposes. Phagarkhola community forest of Chaubas was a good illustration of this trend wherein the demand for timber among returnee migrants was high. Ms. Sushila Kunwar, Chairperson of Phagarkhola community forest recounted the scenario in her village:

> *"Timber demand has been high since people have started to renovate their houses. Before the pandemic, the total volume harvested was 300-400 cft but during the lockdown, it was 400-500 cft. Likewise, individual houses used to collect 20-25 bhari fuelwood per month. But following the pandemic, the amount has gone up to 50-60 bhari per month.*

Impacts on local livelihood sources due to COVID

The travel restrictions have also led to cut down of income sources of women and Tharu (one of the Indigenous groups of Nepal) communities who used to earn money through producing baskets and leaf plates using grass and other materials from the forests. These groups use weaving and make baskets as part of their traditional and cultural practice. Ms. Rama Paudel, Chair of Bahunidevi community forest opined:

[16] Bhari is a local term indicating the weight/quantity of forest products, where 1 bhari is equivalent to 25-30 kgs.

"Corona had a direct impact on certain groups, especially those involved in making and selling baskets, leaf plates, and Nanglo. Not only the collection and its making, but the buyers of these products (mainly from the Indian side) too could not travel due to the lockdown. As a result, these groups lost the income they used to earn through the selling of these products."

The impact of COVID-19 pandemic was also observed on the livelihoods of forest-dependent people, particularly those that rely on livestock rearing and selling of milk and milk products. The Kalopani community forests in Kavre used to cultivate fodder species- Khasru (*Quercus sp*) to provide for more than 50% of the dietary need of buffaloes and cows for milk production in the Bethan Chowk region. Out of the total 278 households of this community forestry, the majority of them (225) sell milk and milk products (khuwa- milk curd). Together, the community used to generate 4000-5000 liters of milk, every day and earn a household average of Nepalese Rupees (NRs) 5000 per month (USD 50/month), contributing to 25% of the HH income. Due to COVID-19, transportation was curbed and daily collection and sale of milk declined by 25%, leading to a subsequent reduction in monthly income by half (NRs 2500-3000 per month).

Constraints to use the CFUG funds due to lack of renewal of operational plans

Generally, Community Forestry User Groups convene general assembly with their user members to discuss, decide, and plan for their further actions. One of the key decisions is around utilizing CFUG funds on several activities including forest management, targeting services to women, poor and marginalized groups, and capacity building of overall community group members. Due to lock-down, many CFUGs could not conduct the general assembly and/or get the approval of their operational plans from the state forest agencies, which affected their possibility to use CFUG funds they could have otherwise mobilized for immediate reliefs, especially to poor members.

4.3.3. Impacts of COVID-19 on forest industry and trade

The COVID-19 pandemic is having a significant impact on forest-based enterprises in terms of production, trade, employment, and other attributes of the supply chain. This involves timber, non-timber, and eco-tourism related services from the forest. It is estimated that small, medium and large-scale enterprises were affected due to the pandemic in various ways. The pandemic is expected to have both short and long-term impacts on the forest-based industry (figure 3).

Low production as a result of a decline in the supply of raw materials, restrictions in transportation, layoffs of workforce during the lockdown period, and financial constraints were some of the identified impacts of the pandemic in the industry sector in Nepal.

<u>Impacts on timber industries</u>

Limited amount of raw material for production despite the market demands

During the initial weeks of the COVID-19 pandemic and subsequent lockdowns in the country, all actors across the supply chain were hit by the pandemic. In the following months, there was ample demand for finished products in the market but the production could not meet it. In some cases, it was reported that the raw materials could not be transported to the production houses despite the

harvested products were available at the source. It is believed that the assembling industries, for example, those importing parts and assembling them, were not much affected even during the lockdown. However, those that relied on raw materials for production were severely affected. Evergreen Bamboo, a small-scale company that manufactures wood and bamboo-based products to make plywood, faced a shortage of raw material due to restricted transport. Before COVID, it used to get an annual average of 11326.73m^3 (400,000 cft) of wood consisting of timber logs and veneer from the Terai region. After the onset of COVID, the supply is reduced to less than half[17] due to limited transportation.

Low supply of raw materials also affected the furniture industry. 'Bira Furniture', a large-scale furniture manufacturer company, faced challenges to meet market demand for furniture as the supply of raw materials was reduced. Before the pandemic, it used to acquire about 1132 m^3 (40,000 cft) of timber logs, both from within and outside of Nepal. But following the pandemic, the supply decreased significantly to 141.5-198.2 m^3(5000-7000 cft.) Also, there was a price hike in wood logs. A popular wood - Sal (*Shorea robusta*) was purchased for USD 50 per cft (roughly NRs 5000) before COVID, which now sells at USD 60 per cft (NRs 6000) and is expected to increase more.[18]

The low supply of raw materials led to low production resulting in an immediate reduction in the yearly turnover (net sales figure) of the companies. For instance, the Evergreen Bamboo used to make about USD 1.27 million (a rough equivalent of NRs 15 Crores) annually. But this year, the total sales dropped to almost one-fifth accounting to USD 255–340 thousand (a rough equivalent of 3-4 Nepali Crores) only.

Such changes have notably impacted employment across the sector. Compared to the pre-COVID situation, the companies have now retained only about 30-37% of their employees. The Evergreen Bamboo company had 90 employees in the management and production team, which has now been reduced to just 30. Bira Furniture had 400 employees earlier, but now they have retained just 150.

While some small-scale industries are on the brink of closure, others are struggling to retain their employees hoping that the situation will return to normalcy soon. The recent economic survey of Nepal has already estimated a 46% decline in timber production and a 600% decline in royalties generated by the forestry sector in the fiscal year 2019/20 in comparison to 2018/19 (MoF 2020). With plummeting income, low supply of raw materials, and increasing prices of raw materials, the timber industry is expected to face hardships for a foreseeable period even in the post-COVID-19 scenario.

Impacts in the forest-based tourism industry

Nepal has been offering various ecotourism activities including homestays, and trekking, among others. Of these, eco-tourism in and near Protected Areas used to be a popular activity for tourists. Protected areas generated annual revenue of USD 3.81 million (NRs 440 million) in the fiscal year 2018/19 through eco-tourism (DNPWC 2019). Eco-tourism was a source of employment to many,

[17] Personal communication with Mr Damber Dev Aryal, Proprietor of Evergreen Bamboo enterprise, Nepal.

[18] Personal communication with Mr. Kapil Adhikari, former chair of the Federation of Forest-based Industry and Trade (FENFIT), Nepal.

including tour operators, trekking guides, porters, and hoteliers. The tourism sector plummeted due to the closure of all borders and international flights which led to zero influx of tourists. The impact is negative as the tourism sector (operators, hotels, and teahouses) has no business, and people who were previously employed- such as trekking guides, porters, and hotel staff, etc. lost their jobs. Ecotourism businesses including homestays operating in and around the protected areas are severely affected.[19] Tour operators are under financial stress while many are seeking alternative business. It is also likely that the revenue of Protected Areas will be drastically less, which in turn will reduce the scope of wildlife conservation, investment in local eco-tourism, and other community development activities. The reduced incentives could risk increased theft/poaching of valuable wildlife for illegal trade.

Impacts on the non-timber forest products industry

Commercial harvesting and sale of high-value non-timber forest products are highly valued for the scale of employment and income it creates for local communities. A study estimates that the NTFP sector alone employs nearly 189,000 people across Nepal (Subedi and others, 2014). It is speculated that 30 to 65 percent of the total export amount is directly received by the harvesters who have limited livelihood diversification opportunities. No other commodity has this much monetary contribution to the rural inhabitants, which also highlights the importance of NTFPs to alleviate rural poverty.[20]

Specific species such as Yarshagumba (Himalayan Viagra- *Cordyceps sinensis*), Morel mushroom, and wild garlic (*Fertelleria chirossa)* are important sources of livelihood for local people in the Himalayan region. These species are harvested from forests by the local communities and sold to earn income. COVID-19 lockdown period coincided with the seasonal harvesting season of these non-timber forest products, which affected the timely collection of these seasonal commodities, thereby affecting the livelihood of local communities and other actors across the entire supply chain. For example, in Patasari rural municipality of Jumla, a high mountain district of Nepal, an average collection of 100kgs of Yarshagumba was possible during the peak harvesting season of March to May. However, in 2020, due to COVID-19, there was no collection. Likewise, during the harvesting season of October to November, some 6000-7000 kgs of Wild garlic used to be collected from the forests in high mountainous regions previously, which has now plummeted to zero due to COVID-19. The amount of Morel Mushroom collected in Jumla district has declined by 95 percent this year. Previously, they used to collect around 4000-5000 kgs in a single season, but now they could collect only 200-250 kgs. The market value of these species is high: Morel Mushroom sells at NRs 20,000-25,000 per Kilo. With less collection and sale, the livelihood of local communities (1116 households) who used to harvest these species were the ones who were most impacted due to this change. This is because these high-value NTFPs were their only source of livelihood.[21]

Table 2: Before and after collection of high value NTFPs and loss of income

[19] Personal communication with Binod Basnyat of the National Trust for Nature Conservation, Nepal.

[20] Personal communication with Dipesh Pyakurel, Nepal.

[21] Personal communication with Mr. Nabin Joshi, NTFP expert at ANSAB who shared these estimates from 4 CFUGs located at Patasari rural municipality of Jumla district in Nepal.

Type of species	Before	After	% of decline	Price per kilo	Loss of income	Loss of income per household[22]
Yarshagumba	100kg per season	0	100%	NRs 25,000	NRs. 2,500,000	5605
Wild Garlic	6000-7000 kg per season	0	100%	NRs 30,000-35,000	Nrs. 210,000,000	268886.04
Morel Mushrooms	4000-5000kg per season	200-250kgs per season	95%	NRs 20000-25000	NRs.76,000,000	97311
Source: Key expert interviews (November 2020)						

5. Results from Case Study 2 - Thailand

5.1.Country context

In 2020, Thailand had a population of approximately 68 million people, of which 33 million are men and 34 million are women. Almost 12 million, or 17 percent of the entire Thai population, are elderly (age over 60) people. In terms of ethnicity, around 75 percent of the population belongs to ethnic Tai groups, 14 percent are ethnic Chinese, 3 percent of Malay, and a variety of minority groups are commonly found in the mountainous areas of the country also referred to as the 'Hill Tribes'.[23] The hill tribes include the Karen, Hmong, Lahu, IU Mien (Yoa), Lisu, Akha, Lua (Lawa), H'tin (Kachin), Khamu, and Mlabri. In 2006, the total population of Hill Tribes was approximately 1.2 million, with the Karen making up the largest group. The Hill Tribes exist in fifteen provinces in the northern and western parts of Thailand. They use and manage forests based on their beliefs, and have done so for hundreds of years, though their management regimes vary from region to region.[24] Their communities are often the poorest and most vulnerable community sector in Thailand since they often lack full citizenship rights, with their land lying in state-claimed zones (whether national parks, wildlife sanctuaries, or other protected areas) (Manassrisuksi, Korn and Weerawat Sangkrajang, 2011; Ingalls and others, 2018).

[22] Of the total 1116 households, around 40% (446 households) were engaged in collecting Yarshagumna, and 70% (781) of the household were engaged in collecting wild garlic and morel mushrooms. A household is a family unit with an average of five people.

[23] World Population Review, 2018.

[24] Inter-Mountain Peoples' Education and Culture in Thailand Association (IMPECT) and Forest Peoples Programme, Indigenous Knowledge, Customary Use of natural Resources and Sustainable Biodiversity Management: Case Study of Hmong and Karen Communities in Thailand (IMPECT, 2006) 8, 15; Lasimbang, Jannie and Chingya Luithui, 'Natural Resource Management Country Studies: Thailand' (UNDP: Regional Indigenous Peoples' Programme, UNDP, November 2006),1; Mark S. Flaherty and Vesta R. Filipchuk, 'Forest management in northern Thailand: a rural Thai perspective' (1993) 24(3) Geoforum 263,265; Minna Hares, 'Forest Conflict in Thailand: Northern Minorities in Focus' (2009) 43(3) Environmental Management 381, 383.

Thailand, in general, is an agriculture-dependent country that is transitioning to an industry-based economy. Over the last four decades, the country has made remarkable progress in social and economic development, moving from a low-income to an upper-income country in less than a generation with the main sources of tourism and agricultural sector (World Bank, 2019). Over the past decades, Thailand's economy and labor market have been shifting from rural and agricultural dominance to an orientation towards urban manufacturing and service industry over the last few decades. The service sector now contributes to over 50 percent of the total GDP. In contrast, the contribution of the agricultural sector dropped below 10 percent after 1990.[25] Nevertheless, a large proportion of the labor force (56 percent of the total population) is involved in the agricultural sector.[26]

Forests are an essential ecosystem and key economic sector in Thailand. Forest products accounted for 118 billion baht (3.9 billion USD) in exports—or about 1.2 percent of all exported goods and services in 2018. This does not include either the value of domestic consumption of forest products or the ecosystem services forests provide. After a substantial decline in forest cover from the 1960s through the 1980s, Thailand has stabilized and even reversed this trend in recent years, although some governance challenges and conflicts persist (Open Development Thailand, 2020).

There were 19.0 million self-employed workers in Thailand in 2019 compared to 18.7 million wage and salaried workers. Thus, the majority of workers were self-employed, although the share has declined significantly over time.

5.2.COVID situation, management measures, and impacts on the economy

COVID-19 outbreak and first wave:
The first COVID case in Thailand was detected on 13 January 2020, and it is known to be the first confirmed case outside of China. Since then, the number of COVID-19 patients gradually increased and reached its peak in late March 2020 with more than a hundred cases reported daily with the local transmission (World Health Organization, 2020). Initially, COVID-19 infection rates were relatively low and the spread has been slow. From late March, when the majority of cases registered were locally transmitted, the government ramped up its measures to contain the virus spread. On 25 March 2020, the Prime Minister announced an emergency decree to control the pandemic.

The management measures affected transportation and citizens' movement in Thai society. People were asked to stay at home and refrain from moving across the areas. Traveling across provinces and the country boundary was prohibited. Subsequently, all schools, universities, malls, markets,

[25] Bank of Thailand. Macro-economic Index. Ministry of Finance, Bangkok. Available online: http://www2.bot.or.th/statistics/ReportPage.aspx?reportID=409 (accessed on 15 December, 2019).
[26] National Statistical Office. Population and Society. Prime Minister Office, Bangkok, 2017. Available online: http://web.nso.go.th/en/stat_theme_socpop.htm (in Trisurat et al 2019). (In Thai)

dine-in restaurants, salons, spas, gyms, massage parlors, theme parks, sports venues, conference halls, cinemas, and theatres were closed. Supermarkets, fresh food markets, and restaurants offering takeaway food were exempted from the order. Local schools, already on their summer breaks, were ordered to postpone the return of students from May to July (International Labor Organization, 2020). For the following six months, there were zero local transmissions, and Thailand was held as a success story for the way it handled the pandemic.

The second wave period:

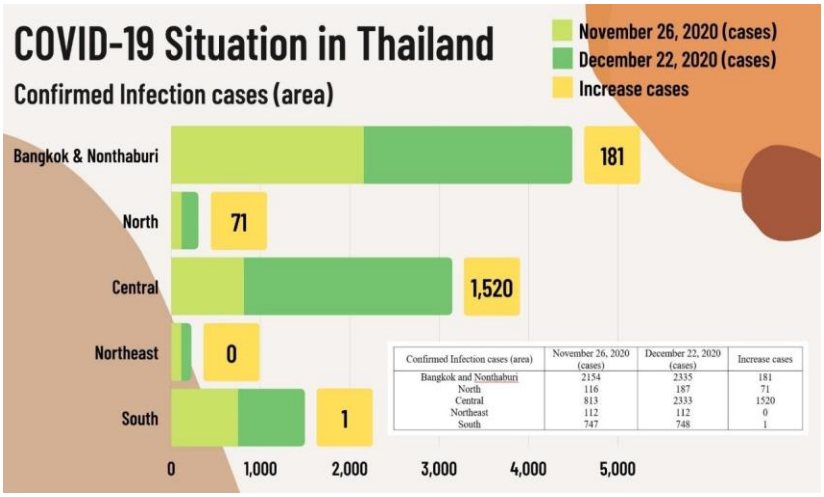
On November 26, a new case of local transmission was recorded when a 29-year-old Thai woman who had spent time in Myanmar illegally entered Mae Sai district in Chiang Rai through natural channels, thereby avoiding inspection at the cross-border checkpoints. After going shopping and visiting a bar and a cinema in the province, she later tested positive for COVID-19. On Friday, 11 December 2020, media outlets reported 17 new cases stemming from her: five in Chiang Mai, thirty-seven in Chiang Rai, three in Bangkok, one each in Phayao, Phichit, Ratchaburi, and Sing Buri, making a total of 49 new transmissions.[27]

The resurgence of the virus in November 2020 has impacted the country's economic recovery, particularly in the tourism sector in the northern part of Thailand. Fearing the cancellations would lead to a panic, authorities in the Chiang Mai province promptly rolled out a campaign in the tourism sector to allay fears among visitors. As a gesture of reassurance, the campaign pledged to offer 100,000 baht to anyone who contracted the virus in Chiang Mai; also, it offered one million baht to relatives of those who died from the disease (Bangkok Post, 7 Dec 2020).

As of November 11, 2020, the total number of infected cases in Thailand was recorded at 3,847 cases, out of which 102 were in treatment, 3,685 have been cured and 60 have died. The number of patients was found in 69 provinces, the majority of whom were located in Bangkok, followed by the South, the East, the Northeast, the North, the West, and the Central, respectively.

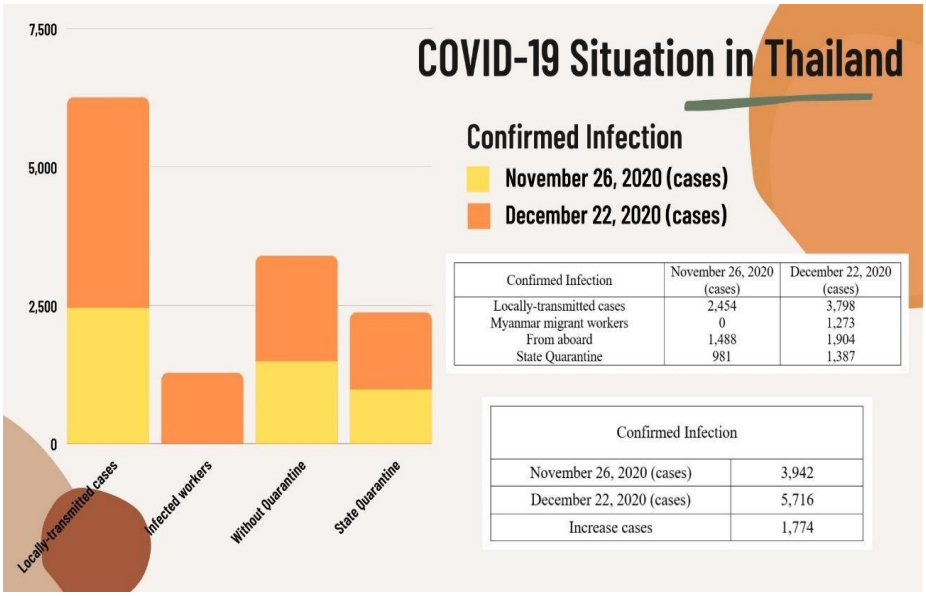
New cases of COVID cases in December 2020 were observed in a shrimp market in Samut Sakhon province, where migrant workers, mostly from Myanmar, Cambodia, and Lao PDR, have been living and working. Since then, there has been a rapid increase in local transmission, leading to 1,774 new cases. The statistical data comparing the COVID-19 infected areas in Thailand in November with those in December 2020 (Figure 2) reveal that the most infected areas were located in the central part of Thailand. Figure 3 shows a rapid increase in local transmission cases in Thailand from November to December 2020.

[27] Bangkok Post, 6 Dec 2020



Confirmed Infection cases (area)	November 26, 2020 (cases)	December 22, 2020 (cases)	Increase cases
Bangkok and Nonthaburi	2154	2335	181
North	116	187	71
Central	813	2333	1520
Northeast	112	112	0
South	747	748	1

Figure 2: Comparing the COVID-19 infected areas in Thailand in November and December 2020



Confirmed Infection	November 26, 2020 (cases)	December 22, 2020 (cases)
Locally-transmitted cases	2,454	3,798
Myanmar migrant workers	0	1,273
From aboard	1,488	1,904
State Quarantine	981	1,387

Confirmed Infection	
November 26, 2020 (cases)	3,942
December 22, 2020 (cases)	5,716
Increase cases	1,774

Figure 3 Comparing of the confirmed COVID-19 infection cases in Thailand in November and December 2020

Impacts on the economy

The impact of the COVID-19 pandemic on the economy in Thailand is likely to be severe through both direct (generated by domestic lockdown) and indirect (supply and demand shocks in supply chains, including tourism) channels. There were already signals of the disruptions in the employment sector in the first quarter of 2020 in Thailand which are expected to deepen and broaden over the subsequent months. In the meantime, the Gross Domestic Product (GDP) of Thailand has dramatically decreased, from the first quarter at 2.8 percent in 2019, to negative 12.2 percent in the last quarter of 2020.[28]

[28] Office of the National Economic and Social Development Council, 2020

On the one hand, Thailand's labor force has been impacted, as observed in the proportion rate, which is estimated at 67.0 percent, with a low unemployment rate of 0.7 percent. Total employment was 37.6 million, with 45.6 percent of women were engaged in the workforce in 2019. The rate of unemployed youth (15-24 years) who are "not in education, employment and training (also called as NEET)" amounted to 1.4 million, which corresponds to a NEET rate of 14.9 percent).[29] Two-thirds of the NEET population were women, most of whom were married.

Response measures:

Timely updates

Information on the COVID-19 situation has been reported daily by the Centre for COVID-19 Situation Administration (CCSA). The Department of Disease Control (DDC), Ministry of Public Health of Thailand (MOPH) has worked with other related authorities to provide an updated summary on the spread, mitigating measures, and mortality rates linked with COVID-19 in Thailand and across the globe.

Social distancing

Social distancing practices have been suggested as one of the key policy measures; these practices encourage residents to avoid crowds and to stay at home to reduce the risks of infection. All persons are mandated to wear masks when in public spaces. Contact tracing is conducted through mixed methods- with people registering their names in paper or with digital technologies with barcodes recording entry and exit to public offices or in commercial malls. Sanitizing products such as alcohol and thermometers used to scan body temperatures are also issued at various outlets.

Packages for economic stimulus and social protection

Thailand announced important mechanisms for economic stimulus and social protection. It announced four Royal decrees and 1 decree approved by His Majesty the King and signed by the Prime Minister Gen, Prayut Chan-o-cha, mandating 1.9 Trillion Baht and other measures to mitigate the impact of the coronavirus on the economy.[30] These include :(i) the Executive Decree authorizes the Ministry of Finance to proceed with loans, in the amount of not over 1 Trillion Baht; (ii) the Executive Decree provides financial assistance to entrepreneurs, no more than 500,000 Million Baht; (iii) the Executive Decree on Maintaining Financial System Stabilization and Economic Security in 2020 by stipulating that in the term of funds, the amount does not exceed 400,000 Million Baht; (iv) the Executive Decree on Electronic Meetings; and (v) the Decree on the number of deposits received general coverage 2020.

For the economic stimulus and social protection, two packages were provided during the months from April to June 2020 to support businesses and individuals coping with the loss of income. A

[29] International Labour Organization, 2020

[30] http://www.jfcct.org/wp-content/uploads/sites/1871/2020/06/Govt-Support-Measures-for-Economy-and-Society-15-June-2020.pdf?nocdn

third package was launched to cover the period from May to July 2020. It aimed to provide comprehensive and continued assistance for all people in the country. These measures included a range of social protection measures including cash transfers for unemployed informal workers, tax breaks, loans with subsidized interests, and others as noted below:

- Loans of 10,000 – 50,000 THB, with low interest, channeled through the Government Saving Bank (GSB). The grace period of repayment is up to 6 months.
  - Personal Emergency Loan of 10,000 THB per individual (no collateral) with a fixed interest rate of 0.10 percent per month, up to two and a half years.
  - Additional Special Personal Emergency Loan of 50,000 THB per individual (with collateral) with a fixed interest rate of 0.35 percent per month, up to three years.
- Soft loans of 3 percent interest rate for three years available for entrepreneurs registered with the SSO.
- Financial assistance of 5,000 THB per month for three months to the 3 million temporary- and self-employed workers. The coverage of this measure later extends to 9 million people.
- Reduction of withholding tax from 3 to 1 percent from April to September 2020.
- SMEs can use expenses incurred by salary payments from April to July 2020, for workers who are members of the Social Security Office (SSO) and receive a monthly salary of 15,000 THB, to claim tax deductions of up to three times.

To reduce the risk of COVID-19 exposure, the government issued a period of lockdown phase; provided regulations and guidelines for all government agencies to be able to resolve the emergency quickly and prevent more serious events. Efforts focused on the individual tracking of COVID-19 infections, which included a risk assessment of the spread.

Several measures were enacted to stimulate domestic tourism. For example, a campaign, entitled "We travel together - travel, share happiness," was promoted that featured reduced accommodation rates in hotels. Additionally, the government implemented the co-payment program under which registered individuals would pay only half the retail price of their purchases, with the government subsidizing the rest. Under the scheme, the government would pay fifty percent of the price of food, drink, and general goods purchases up to 150 THB per person per day, with the total subsidy capped at 3,000 baht per person for the duration of the program. This scheme was aimed to incentivize people to shop and travel across the country, and in turn, to support tourism and stimulate the overall economy.

5.3.Forestry context and impacts of COVID-19 in the forestry sector

Forest area covers 31.68 percent or 16,397,451.63 ha of the total country area.[31] A recent assessment spanning the period from 2000 to 2016 revealed that forest cover in Thailand stabilized at 31-33 percent, largely due to economic transformation and strict law enforcement. [32] However, variations in rates of deforestation within the country were observed. A decreased deforestation

[31] The Royal Forest Department (Thailand), 2019.

[32] Royal Forest Department [RFD]. Forestry Statistics Year 2016; Ministry of Natural Resources and Environment: Bangkok, Thailand, 2016. (In Thai)

rate (8.1 percent) was observed in northern Thailand during 2000-2016, and the highest rate of deforestation as 16 percent was reported in Nan province followed by Chiang Mai province (12 percent) in northern Thailand. In contrast, the remaining forest cover in central and southern Thailand stabilized during this period.[33] Of the total forest cover, 41% is comprised of primary forest, 34.7 percent of naturally regenerated forests, and 24.3 percent of planted forests (Ingalls and others, 2018). The national target is to increase the forest area to 40% of the total land area. Thailand's forests are one key natural resource to the country's economy, environment, and the everyday livelihoods of its rural population. Some studies indicate that one in six people in Thailand depends on natural forests for their livelihoods (Bhmibhamon, 2005) and 480,426 households lived in forest areas (RFD, 2007).[34]

In terms of ownership, forests in Thailand are broadly categorized as state-owned lands and privately owned lands. The National Forest Policy 2019 classifies forests into two main types of landuse management modalities: 1) conservation forest and 2) economic and community forests. The Thai government aims to achieve 40 percent forest cover in the country regulated through 25 percent conservation forest area and 15 percent of economic forest area. The policy aims were set in the early 1970s but the initial targets of 25:15 were switched from economic to conservation forests after a logging ban introduced in 1989 put a halt on logging, and conservation activities got precedence.

Forest resources in Thailand are managed by the Ministry of Natural Resources and Environment (MNRE), which is responsible for the implementation of forest conservation activities including establishing conservation areas, restoring degraded forests, initiating research on forest resources and development programs, and promoting community participation in forest conservation and local communities' livelihoods. Under the administration of MNRE, four agencies have direct responsibilities for forest management including The Royal Forest Department (RFD), especially through *the Division of the Community Forest Management*, which is directly responsible for forest practices in forest areas classified as general forest and reserved forest. Much of this land contains rural villages and agricultural areas; an estimated 10 million people live in the forest reserves. The RFD is responsible for forest plantation, community forests, and management of forest reserve areas. *T*he Department of National Parks, Wildlife, and Plant Conservation (DNWPC) is directly responsible for forest practices within the reserved national parks and wildlife sanctuaries. The DNWPC implements the *Wildlife Conservation and Protection Act* and the *National Park Act.* The Department of Marine and Coastal Resources (DMC) implements the Act on the Promotion of Marine and coastal resources management which focuses on conservation and rehabilitation of coastal flora and fauna including mangrove forests. The Forest Industry Organisation (FIO) is responsible for commercial forest plantations, reforestation, and silviculture, conducting forest industry research, and raising public awareness of the importance of forest conservation.

[33] Ibid: Royal Forest Department [RFD]. Forestry Statistics Year 2016; Ministry of Natural Resources and Environment: Bangkok, Thailand, 2016. (In Thai)

[34] Thailand Office of Natural Resources and Environmental Policy and Planning (ONEP), 'Thailand's National Parties Self-Assessment: United Nation Convention to Combat Desertification' (ONEP and UNDP, 2010) 32.

Within the state-owned lands, different types of land tenure arrangements guide access, management, use, and sale of forest products under different types of forests. Usually, degraded forests and arable lands have been allocated to local communities for sustaining their livelihoods with rights. One example in which land titles have been provided for state-owned lands are those under the agricultural land reform program, the so-called *Sor-Por-Kor*; these lands were determined to be depleted forests that had been withdrawn from the national reserved forest area. Thus, the *Sor-Por-Kor* includes permitted lands where forest trees of both natural growing and man-made planting can be cut down without requiring permission from the government agency.[35]

Another land tenure arrangement *Kor-Tor-Chor* is practised with communities located in the national reserved forest boundaries. Under this scheme, communities are granted some areas to make a living. This program suggests joint land use surveys with the locals and officials to avoid land boundary conflicts, recognize traditional dwellers, and promote trust and collaboration of the local communities in forest management. However, a major contention with the KTC program is that this program is initiated to allocate degraded forest land to landless farmers who already occupied those lands without acknowledging the history of land settlements of local communities, mostly ethnic minorities within and across forest reserves and protected areas. It allocates collective/communal land plots and promotes collective farming, which is said to be against the local individually held farming practices. Any farming decision has to be discussed and approved through a collective decision-making process which adds to a complicated process with a long time frame. The *Kor-Tor-Chor Regulation Handbook* mentions maintaining a minimum of 20% tree cover across the arable land, but some areas that fall under Watershed classification[36] (1A and 1B) are to be completely preserved without any agricultural activities. The program deal lasts only 30 years which also raises questions on tenure security. The overall land ownership is retained with the State, implying that people with the *Kor-Tor-Chor* program need to ask for permission from the government agencies to cut down naturally grown and artificially planted trees on the lands.

One of the most challenging aspects of the Kor-Tor-Chor program is that the government does not give ownership rights to the framers of the community over the collective plots of land, but instead provides them with 30-year leases, with a lease fee.[37] The leasing mechanisms tend to contradict long-standing farmer/community claims to have owned the lands[38] before the forest reserves were

[35] MNRE issued a notice for lifting previously held bans of restricted species in November 2020 which allows for a legal passage for harvesting of these species, including timber. However, the details on how this will be implemented is yet to be advised by the Ministry.

[36] These classes include WCS 5-(Lowland farming: gentle slopes or flat areas needed for paddy fields or other agricultural uses, with few restrictions); WCS 4 (Upland farming: areas with gentle sloping land suitable for row crops, fruit trees and grazing, with moderate need of soil conservation measures; WCS 3 (Fruit tree plantations: uplands with steep slopes and less erosive land forms. May be used for commercial forests, grazing, fruit trees or certain agricultural crops, with soil conservation measures); WCS 2 (Commercial forest: for protection and/or commercial forest, with mining and logging allowed within legal boundaries, usually at high elevations with steep to very steep slopes. May be used for grazing or crop production, with soil conservation measures); and WCS 1 (Protected or conservation forest and headwater sources. This class is divided into two subclasses: (i) WSC1A: Watershed protection forest: protected forest areas, including the headwaters of rivers, usually at high elevations and on very steep slope should remain as permanent forest cover. (ii) WSC1B: Disturbed WSC1: areas with similar physical and environmental features to class 1A, but with portions cleared for agriculture, which requires special soil conservation measures. Where possible, these areas should be replanted as forest or maintained as permanent agroforestry.)

[37] Communities have to pay a rental fee of 25 Baht (less than US$1) per rai (equal to 1600m$^{2)}$

[38] https://thailand.opendevelopmentmekong.net/topics/forests-and-forestry/

declared. To join the KTC program, communities need to accept that the lands they are being given are not owned by them but by the state (Wittayapak and Baird, 2018). The distribution of *Kor-Tor-Chor* has not been even among the villagers and many do not have land rights to use land and forest resources. A recent study by Sapkota and others(2018) indicates that up to 50 percent of households in the villages located within the Ing watershed were reported to be landless and only 7 percent possess land titles (in the same villages). The study suggests that the lack of legality of the land has been a major source of power inequality between local people and state agencies. It is also a key constraint for local farmers and communities to diversify their livelihoods and access financial assistance (loans) and many of the state benefits (e.g. subsidies) that primarily use (individual) land ownership certificates as a basis for such transactions to take place. Such tenure insecurity has profound implications for the livelihood and security of an estimated 10 million people that live in the forest reserves[7]. It also puts farmers and communities into situations where they prefer to grow fast-growing crops (such as upslope maize cultivation that can lead to soil erosion and polluting of water) as opposed to trees planting over which they have limited security to engage and get benefits from. Another implication is that youth are not interested in farming and forestry.

The ambiguities around land and tenure arrangements, conflicting claims over land rights, and limited scope for community-led land and forest management have been a point of discord between state agencies and local communities. Such provisions have been said to affect the rights and livelihoods of forest-dependent communities, particularly of poor, rural farmers, and ethnic minorities, including the Hill tribes that have claimed to traditionally lived within the forest spaces for as long as 80 to 100 years with de facto rights. With the establishment of National Parks and Forest reserves in these areas in the early 1980s, which included all the residential and cultivated areas, their de facto rights to access to these areas and the land-use practices were severely affected. The total upland[39] area of Thailand is 10.75 million ha, covering 20 provinces (Wathinee and others, 2019).

For example, in the north of Thailand, watershed conservation objectives were prioritized. Watershed areas in the northern mountainous regions are Thailand's only source of headwaters, and these need to be preserved against deforestation and forest degradation, agricultural expansion, soil erosion, and unregulated grazing. Hill tribes have long been regarded as a threat to natural resource management and are often blamed for destroying watershed forests due to their constant mobility, shifting or swidden agriculture, extensive opium cultivation, and debates on this issue have been ongoing for the past 40 years (Colchester 1999). Early policy measures were directed for them to abandon migratory livelihood practices, and to switch from slash and burn to permanent cultivation. Land allocations were made and royal projects supported them with alternative agriculture practices (such as orchards farming). Different land allocations were made to the communities through the Royal project and through land allocation titles (Lakanavichian, 2007) such as ''No Sor 3[40] through the Land Department, which came into conflict with the regulations

[39] Uplands are denotes as mountainous lands up to 500 meters above sea level.

[40] It is a land title with a lesser security than an irrevocable title deed because it can be revoked if the land has not being used within the first ten years) in national forest reserves.

mandated through national forest reserves. Such ambiguities have led to situations where agriculture/orchard framing has been destroyed, previously granted land allocations withdrawn, and revoked. These strict regulations with a key focus on watershed protection and conservation required a reshuffle: communities needed to be re-allocated to a new place and/or needed to alter their landuse/agriculture practices at the expense of their traditional farming practices.[41] In cases where forest-dependent villagers have to move out of their villages demarcated for conservation purposes, their livelihoods were jeopardized. In cases where communities were allowed to stay in, their options for agricultural landuse practices became rather limited within the scope of other environmental goals (Lakanavichian, 2007).

For example, lands classified as a watershed category of Class 1 (both 1A and 1B) are to be treated as prioritized conservation forests, should be maintained as permanent forestry or agroforestry cover, and no humans are allowed to reside in these areas. Any sort of agricultural activity was officially deemed illegal (Neef and others, 2006). Also, the boundaries of a watershed (i.e. the sub-catchment of the watershed areas) and National Park were expanded at times, claiming additional part of the surrounding village's agricultural land and forbidding any sort of agricultural activities that further jeopardized the communities' livelihoods. In some areas, villagers were arrested on the charges of encroachment (Leepreecha, 2001).[42] There are records of the arrest of 1,519 individuals encroaching a forest area of 864.86 ha.[43] In some cases, this was resolved through common agreement, in other conflicts were observed. Several relocation landuse programs have been tried with limited satisfactory results as the key issue of tenure insecurity and limited engagement of the community in forest planning and implementation remains debated between state forest agencies and local communities over the years (Phantasen, 1995; Poffenberger, Soriaga and Walpole, 2005). Managing the rights and relationships of forest communities and the state authorities to meet diverse needs is the key conflict and the need. Recent amendments have been targeted to secure

[41] There are different perspectives on shifting cultivation and its impacts on deforestation and degradation of forests. While many policy documents identify shifting cultivation as a key driver of deforestation and degradation, emerging evidence from research and community of practice implies that if the area is not extended and the rotation cycle not reduced, shifting cultivation does not add to deforestation. Some also contend that shifting cultivation often has been used to put the blame on local communities, which can contribute to deforestation. (https://www.files.ethz.ch/isn/28630/api047.pdf)

[42] An example from Mae Sa Mai is provided by Leepreecha 2001 in Neem et al 2006. Mae Sa Mai is one of the largest Hmong Settlements in northern Thailand, with a total population of 1765 inhabitants. Local government officials did not pay much attention to them until the year 1969 when the King paid a visit to Mae Sa Mai. He granted Thai citizenship to all villagers who made a commitment to stay permanently in their present location. Intervention from the Royal Forest Department (RFD) in Mae Sa Mai began in 1977 with the planting of 480 ha of pine and eucalyptus trees. The establishment of the Suthep-Pui National Park in 1981, which included all the residential and cultivated areas in Mae Sa Mai, dramatically changed the lives of its inhabitants. The same year, the King paid another visit to the village and - at the request of the villagers - allocated an area of about 400 ha to them for agriculture. In addition, he established a Royal Project Station for the demonstration and introduction of cash crops. While the Intervention of the King provided the villagers of Mae Sa Mai with a certain level of tenure security, land Claims by the Royal Forest Department (RFD) for reforestation purposes remained a permanent threat. Peach orchards in the upper part of the catchment were destroyed by RFD staff in 1982 and some villagers were arrested for encroaching on the head watersheds. In 1986, the area of Mae Sa Mai was classified as «watershed conservation area class AI», meaning that agricultural activities were officially declared illegal according to two cabinet resolutions dated May 1985 and October 1986.

[43] Royal Forest Department, 2019

tenure rights, promote community forests, [44] and promote tree planting[45] in privately owned lands. [46] The long-awaited Community Forestry Act endorsed in 2019 gives hope to formalizing communities' rights in areas located outside protected forest areas. Yet, some questions linger on the mode of engagement with communities that are located inside the protected forest areas.

Recent attempts are focused in preparing "One Map Project" that aims to develop one unified database and map to avoid conflicting landuse boundaries.[47] Other efforts include joint land surveys with forest agencies and communities under the Kor-Tor-Chor Program and engagement of local communities in forest jobs such as in forest patrolling and monitoring.

5.3.1. Impacts of COVID-19 on sustainable forest management

Lockdown and curfew measures have been ordered by the government to contain COVID-19 spread, which also lead a new normal way of life with restricted mobility and social distancing. Statistical records (GISTDA Forest Monitoring System, 2021) indicate a much lesser number of illegal incidents occurring in conservation forests in 2020 when compared with 2019 data[48]. All types of illegal activities in protected areas such as illegal plantation, illegal encroachment, illegal wildlife hunting, and illegal NTFP gathering were reduced in 2020 when compared with 2019 data. The number of forest fires has also decreased (Figure 4). There was almost a tenfold reduction in the number of arrests made this year for illegal logging cases. Forest patrols and forest land uses tracking systems in natural forest areas designated for conservation purposes have been the main task of the DNP officers. The lack of full mobility and control measures have led to some changes in the operation of forest activities, for instance, some activities were delayed, as reported by forest officers and foresters

[44] At present there is only one law clearly cover the community forest, it is the Community Act 2019, whereas, other laws such as the National Reserved Forest Act (the latest version 2016), the National Park Act (the latest version 2019), or any other related laws indirectly mention community forest. These laws widely address the issue of forestland tenure, tax and fiscal management and establishment and operating forest enterprise for sustaining livelihoods and generating income.

[45] For instance, A recent amendment of the Forest Plantation Act, B.E. 2535 (1992), amended in B.E. 2558 (2015) recommends a list of 58 tree species (Annex 4)for commercial plantation (Forest Plantation Act, 2015). This Act is aimed to increase economic forest area cover by encouraging private landholders to plant trees in their lands, meet forestation targets, and promote additional sources of income generation by growing trees on farms.

[46] https://www.recoftc.org/publications/0000380?p=browse

[47] https://www.bangkokpost.com/thailand/general/1806969/thamanat-outlines-need-for-one-map-in-senate

[48] GISTDA Forest Monitoring System. (2021). Statistics of Illegal logging and forest resources in 2019 and 2020. Retrieved January 5, 2021, from https://gfms.gistda.or.th/stat.

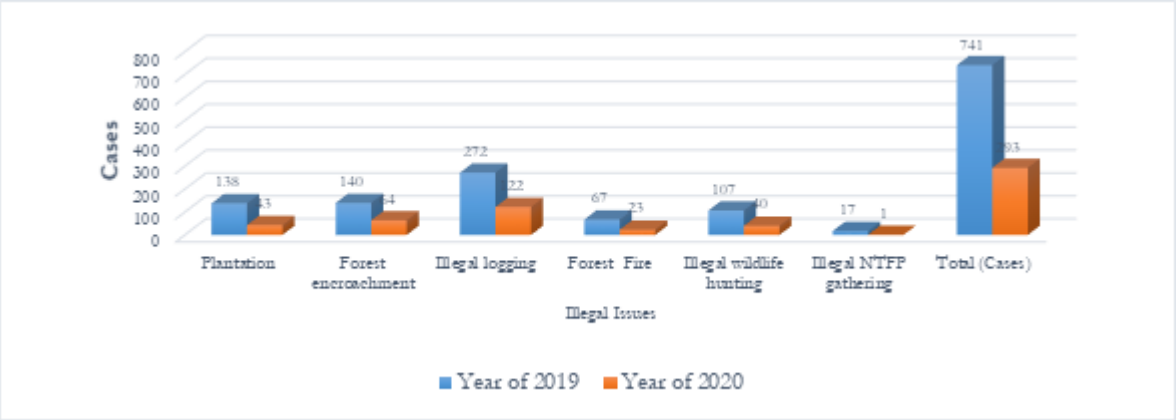


Figure 4: Comparison of Illegal Logging and Forest Resource Utilization within conservation areas in 2019 and 2020

In the economic forest and community forest schemes, a recent progress report (Oct 19 – June 20) of RFD has indicated obstacles and limitations to continue collaborative engagement with local communities due to lockdown and control measures. To mitigate this, several incentive programs were adopted- such as that of engaging local communities in forest patrolling and employing them in reforestation activities. A joint demarcation of land boundaries is also slowed down within the (Kor-Tor-Chor) program (Royal Forest Department, 2020). Lack of face-to-face communication among stakeholders was also mentioned as limitations of collaborative working among villagers and forest rangers.

The statistical records indicated an increase in forest fire burnt areas in 2020 when compared with 2019 data in eight provinces located in northern Thailand (Figure 5).[49] This increase is linked with the lockdown restriction. Due to restrictions on local gathering, communities from nearby communities could not convene together to conduct prescribed burning (a form of fire control mechanism) in many hotspots, which could have led to an increase in forest fire this year.

[49] Geo-Informatics and Space Technology Development Agency (Public Organization). (2020). Summary report of forest fires and haze from satellite data for the year 2020. Retrieved from http://fire.gistda.or.th/fire_report/Fire_2020.pdf

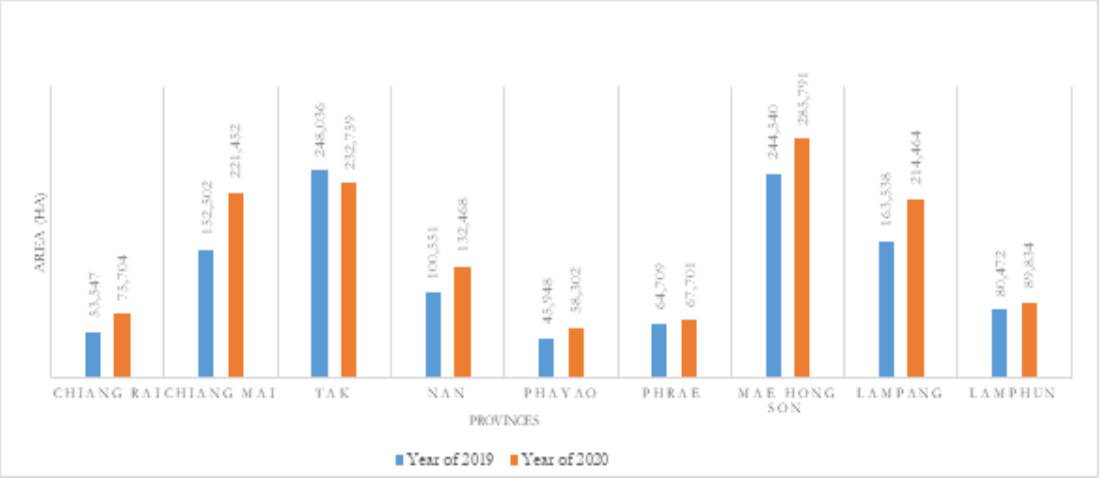


Figure 5: Comparison of Accumulative Forest Fire-Burnt Areas of Nine Provinces in Northern Thailand

The Ministry of Natural Resources and Environment (MNRE) has announced (in which month/year?) a remedial measure with a worth of 445 million baht for providing support to forest sector laborers who had lost their jobs due to the pandemic. Informal laborers from local communities living nearby forested lands and informal laborers working as part-time officers under the authority of Royal Forest Department (RFD), Department of National Park, Wildlife and Plant Conservation (DNP), Department of Marine and Coastal Resources (DMCR), and General Affairs Division Office of the Permanent secretary Natural Resources and Environment of MNRE have been offered jobs. A total of 16,488 vacancies were created with a three-month contract with a salary of 9,000 baht per month, effective from July to September 2020. The projects of One Person – One Tambon working in collaborative natural resources and environment restoration implemented by the General Affairs Division Office of the Permanent secretary Natural Resources and Environment of MNRE have offered 7,255 vacancies. RFD has offered 5,058 vacancies for hiring Kor-Tor-Chor assistant officers who work on surveys and assertion monitoring of forest reserves-land boundaries and land tenures. DNP has offered 3,500 vacancies to employ temporary forest ranger assistants for water resources and food for wildlife restoration schemes. DMCR has offered 675 vacancies to employ workers of mangrove forest surveys. This scheme has been extended from October to December 2020 and expanded to employ about 10,000 temporary employees assigning them on tasks of forest firebreak establishment, reforestation, and other data field survey and monitoring (Ministry of Natural Resources and Environment, 2020).

5.3.2. Impacts of COVID-19 on livelihoods

The impacts on livelihoods are assessed through two forest-based tourism sites located in Nong Hoi Mai and Mae Kum Pong, which are regarded as nature-based tourism destinations; both sites are located in Chiang Mai Province. The two sites represent upland communities who live in or near the forest reserve areas in the North of Thailand; they are dependent on agriculture and forest resources and are from the province that has been most affected due to COVID-19.

Nong Hoi Mai village at Mon Jam District, Chiang Mai

The Mon Jam site was previously a forest reserve but was in degraded condition due to deforestation and was allocated as communities for agricultural farming[50]. Since the expansion of agricultural lands was not allowed to conserve the watershed functions, this area has been developed alternatively as a tourism site. Tourists visit Mon Jam to experience the landscapes, cold weather, observe the hill tribe traditional farming, and shop for handicraft products and non-wood forest products. One of the villages, Nong Hoi Mai, which is located in Mon Jam, has been used as an agricultural and nature-based tourist destination. Nong Hoi Mai's villagers who are mostly Hmong ethnic minorities currently manage small farms effectively to serve the dual purpose of tourism and forest conservation.

Before the spreading of COVID-19, tourism operations and accommodations at the Mon Jam site were fully booked all year-round. In particular, the Hmong cultivated agricultural products in those farmlands such as kale, sweet gourd, bell peppers, strawberries, cape gooseberries, sweet potatoes, and avocados were in high demand and sold out completely. A variety of non-wood forest products including Pak-Hwan Pa (*Melientha suavis* Pierre), bamboo shoots, and mushrooms were collected at the community forest, aimed at household consumption and sale purposes. Bamboo shoots cost 20 baht per kilogram whereas mushrooms cost 15-20 baht per pile of about 150 to 200 gram. The mushrooms are seasonal and grow intensively during the rainy season (the end of May to the mid of October). Tourism was the major share of income (about 80%) for these communities' income.

Due to the lockdown, the Mon Jam area was forced to close for three months from the end of February until the end of May 2020. The closure has stopped their income from tourism and affected their livelihoods. The Mon Jam tourism enterprise has to carry fixed costs of operations including wages of full-time employees, water, and electricity costs. This required reduction in salaries, and some cases, with estimates of at least 30 percent of employees lost their jobs to lower the cost of the operations.

The government provided a remedy measure of cash transfer of 5,000 baht to the head of households for three months. This support, though small, was useful to sustain their household's living at that time. However, as cash transfers took place through e-banking, the compensation program benefitted households with the capacity to access the internet and use technology for e-banking.

After strict lockdown, the government announced swift measles to promote domestic travel and tourism with social distancing measures. The Mon Jam destination began to offer tourism operations and accommodations again in early June. It was found that the number of tourists in the early days had decreased considerably compared to the figures from last year. However, the number of tourists picked up momentum and increased during October- December 2020. It was observed that more tourists, mainly domestic, visited the site compared to the previous

[50] Based on key informant interviews at the site.

year/period. It has again declined after the second wave of COVID-19 in the Northern Province of Thailand.

Mae Kam Pong village at Mae On District, Chiang Mai

The second site, Mae Kam Pong Village, is a nature-tourism destination surrounded by old forests and water streams flowing through the village. It is located in Mae On District in Chiang Mai Province. Most of the population in this village are ethnic minorities known as "Khon Muang". They earn their livelihood through on-site tourism. Their tourism services include over-night homestays, restaurants, and massage services to tourists. In the past, the communities of the Mae Kam Pong village were less dependent on gathering forest products and utilization since the forest areas were protected and managed for conserving water sources. They used to derive their livelihoods from tea cultivation and collection. Later, they have been relying on forest-based tourism operations.

During the lockdown period, the tourism operations were halted for 3 months (March to May 2020) causing a loss of substantial income. Fortunately, most villagers could collect bamboo worms and mulberry leaves for their consumption. Some villagers who have coffee and tea farms, collected and sold these products to village cooperatives to maintain household income. After the government announced supporting measures to promote tourism, the influx of tourists has increased. It was found that more tourists were reserving accommodation compared to last year.

Overall, the number of tourists visiting nature-based tourism sites had decreased by 66 percent with numbers plunging from 20,819,396 tourists in 2019 to 13,910,037 tourists in 2020. This was recorded on October 12, 2020, by the national park office (Ministry of Natural Resources and Environment, 2020), so there could be a likely increase after the domestic tourism picked up from October to December 2020.

5.3.3. Impacts on COVID-19 on forest industry and trade

Timber and wood based industry

The effects of COVID-19 on Thailand's forest industry sector can be categorized into three levels: international trade, domestic trade, and local enterprise level. Thailand was doing import-export of these main forest products: timber, lumber, plywood, and veneer among other processed wood products. Key sources of imports were China, Malaysia, New Zealand, Myanmar, and Vietnam. Statistics from the Foreign Trade Department indicate that in the first 10 months of 2018, imports of wood and wood products totaled 14.9 billion baht [51]. The export value of wood and wood products for the same period totaled 80.5 billion baht[52]. Most exports were of processed wood, fibreboard, and plywood, bound for key markets in China, South Korea, and Japan. Thailand was

[51] https://www.bangkokpost.com/business/1604970/wood-export-rules-revisited
[52] https://www.bangkokpost.com/business/1604970/wood-export-rules-revisited

also one of the second largest[53] suppliers of lumber (13.5% of total lumber supplies) to China (Liu et al; 2020[54]).

The statistical secondary data derived from Thai Customs suggest changes in the import-export of these forest products: timber, lumber, plywood, and veneer among other processed wood products. Thai Customs' statistics[55] (2020) indicate that the **import valu**e of wood and wood products totaled 11,053.0 million baht in 2020, a **decrease fro**m 12,278.9 million baht in 2019 (for the same period or not?). The import value of timber was slightly increased from a total of 106.0 million baht in 2019 to 119.6 million baht in 2020. The import value of plywood and veneer products was increased from a total of 4,944.2 million baht in 2019 to 5,365.0 million baht in 2020. The import value of lumber and other wood products was less. The import value of lumber was decreased from a total of 5,513.4 million baht in 2019 to 4,099.0 million baht in 2020. The import value of other wood products was decreased from a total of 1,715.3 million baht in 2019 to 1,469.4 million baht in 2020.

Thailand has contained an annual average export value of more than 56,514.3 million baht from the export of timber and timber products from 2016 to 2019 (January.-September)[56]. Compared to the same period, in 2020, the total e**xport value was at 51,721.4 million baht**, with a decrease of more than 4 million baht[57]. The data from Thai Customs of 2019, revealed that Thailand has exported timber worth 34,466.79 million baht in 2020 (January to September)(Thai Customs, 2019).

The domestic trade on forest products, especially home decoration furniture, seems to have increased after the lockdown measure when compared with the previous rate in 2019. This increase was confirmed by key informant interviews who opined that since people were at home for two months during the lockdown period, they were using their time to decorate their homes and furniture.

Organizational operations of Forest Industry Organization (FIO)

The Forest Industry Organization (FIO) is the main forest-based industry organization that has been solely operating commercial forest plantations as a state enterprise. The spread of the COVID-19 epidemic severely affected the organization's structure and operation. FIO manages a commercially valuable tree species *Tectona grandis* ("Teak" in English, Thai name - "Sak")

In the year 2019, the FIO had produced approximately 3,000 cubic meters of Teak stock, whereas, in 2020, only 2,000 cubic meters of the wood product can be produced. Due to COVID-19, the

[53] The other suppliers are Russia (48.3% of total imports), Thailand(13.5%), Canada (9.6%) and the United States (7.8%) are largest lumber suppliers in 2018

[54] Fei Liu , Kent Wheiler , Indroneil Ganguly and Mingxing Hu, 2020. Sustainable Timber Trade: A Study on Discrepancies in Chinese Logs and Lumber Trade Statistics.*Forests*, 11, 205; doi:10.3390/f11020205.

[55] The Customs Department. (2020). Statistical report. Retrieved from http://www.customs.go.th/statistic_report.php?ini_content=statistics_report.

[56] Department of Foreign Trade as international trading records. The Customs Department. (2020). Statistical report. Retrieved from http://www.customs.go.th/statistic_report.php?ini_content=statistics_report.

[57] source: Department of Foreign Trade as international trading records

production decreased to about 1,000-1,500 cubic meters with an average of 1,200 cubic meters. This decrease occurred as a result of the lockdown, which led to a long process to transport teak wood products across provinces and also reduced orders from customers.

This decrease was also due to the economic system disruption, and the business of making teak furniture not being streamlined, such that retail operators have been restrained in production. The amount of product ordered during that time was reduced; this decline in demand has affected the corporation's revenue, which has slumped by more than 30 percent when compared to sales in the previous year. This decline was a result of the forestry activities in the FIO's forest plantation, including production processes, which could not be carried out normally. The organization needed to prioritize the reduction of non-essential and non-urgent activities, to ensure the necessary processes and reduce fixed costs.

The majority of impacted workers from this change were the part-time employees who had been hired as informal workers. This impact was due to the organization's reduction of its operational activities. Informal workers were mainly farmers living nearby the boundary of the teak plantation. In comparison, the permanent hired workers of the organization were less affected because of their stabilized salaries; however, the proportion of their bonus payments was reduced accordingly.

6. Summary of Findings and Discussion

The two case studies in the previous section revealed several impacts observed in the forestry sector after the COVID-19. Some of the impacts such as reduced on-site monitoring, reduced harvesting of NTFPs, and the closure of forest-based tourism sites were found to be directly linked to the travel bans imposed in the lockdown period that coincided with the harvesting seasons. Some other impacts (such as loss of jobs, and impacts on livelihoods), although linked to COVID, were triggered due to the systemic interplay of forest sector policies and social protection mechanisms. This section identifies some common and unique trends that were observed across the two cases and discuss their relevance to the forestry sector while also exploring the potential role the forestry sector can play in the recovery measures.

6.1. Impacts of COVID-19 in sustainable forest management

Several incidents of illegal logging or wildlife poaching were reported across Asia after COVID-19 (Fair, 2020[58]). The results from the two countries show mixed results. Contrary to the regional trend, fewer incidents of forest-fire have been observed in community forests of Nepal and across the National Parks of Thailand which can be linked to low mobility of people (in Thailand) and the presence of community-level monitoring systems (in Nepal). However, in cases where communities could not be mobilized to do fire management activities such as across forest reserves in Thailand, more forest fire incidents were observed. The scope and magnitude of these infractions alone,

[58] Fair, John. 2020. COVID lockdown precipitates deforestation across Asia and South America. 3 July 2020. https://news.mongabay.com/2020/07/covid-19-lockdown-precipitates-deforestation-across-asia-and-south-america/

across the two countries, remain too low to negatively risk forest cover. Some infractions of illegal logging and extraction of resources (fodder, grass) were observed in Nepal, which was because of the increased reliance of local communities on forests to meet their basic needs.

However, some other changes were observed, in terms of silviculture operations and organizational management practices, with implications for sustainable forest management. For example, the lockdown and social distancing measures posed severe challenges to conduct regular functions such as securing governmental approvals and performing regular silvicultural operations in forests. In Nepal, particularly in urban and peri-urban areas, the communities could not be gathered at one place to convene the General Assembly of the community forest user groups, which hindered the renewal of their future annual operational plans and functions. Further, no other alternative mechanism to resolve the situation was adopted. As a result, communities were not able to implement silviculture operations. They were also not able to extract timber to meet their domestic needs and/or to sell it in the market. Because of the lapse of almost a year's time with COVID-19, communities were forced to reschedule their plans and prepare to get approval again for the same from forest agencies. This costs additional time and money, thereby further delaying the operations. Hence, a prolonged continuation of this situation will lead to a lack of regular silvicultural operations that can compromise forest productivity. It is also likely that communities will start extracting resources to meet their needs albeit the approved operational plans are not in place. But they do run the risk of being treated as doing illegal extractions. If unresolved with remedial measures, this scenario could likely increase conflicts between communities and state forest agencies.

A few notable changes were observed as well in terms of differences in forestry sectors' annual targets of plantation areas, overall revenue collection from the forestry sector, and reduced number of organizational capacity building activities. If the current scenario prevails, these activities could hamper the regular functioning of the forestry sector, and may likely slow down the pace of achieving its forest-based targets for national and international goals.

6.2.Impacts of COVID-19 on livelihoods

During these difficult times, when the availability of other sources of livelihood is relatively limited, forest communities were found to use forest-based resources as a safety net. In both Thailand and Nepal, forest communities had resorted to forests for basic provisions of food, fodder, grass, and timber to meet their daily needs. Communities in upland Thailand used forests for mulberry leaves, bamboo shoots, bamboo worms, mushrooms, and Pak-Hwan Pa (*Melientha Suavis Pierre*) for household consumption. In Nepal, the reliance of local communities on forests was primarily for fodder and grass to provide for their livestock. They also used timber to repair their houses and livestock sheds. In both cases, forest communities also used forest-based resources to support their livelihood. In Nepal, the returning migrants were found to be engaged more in agricultural and livestock related activities, thereby increasing their dependence on forests, especially following the pandemic crisis. Local communities were found to use fodder and grass for pursuing or intensifying alternative livelihood options such as agroforestry planting, livestock rearing, and milk selling. In Thailand, they relied on domestic forest-based eco-tourism. These cases indicate that forests do act

as safety nets during shocks, through the provision of resources, help them cope, and reduce/avoid risks of further marginality. The risks to communities' livelihoods would have been more adverse if communities could not access forests as safety nets. Even when the income from forest products does not account for a considerable share of a household's total income, the cases show that forest and forest-based products are critical resources in filling cash flow gaps.

The ability of local communities to use forests as safety nets depended upon the scope of tenure security. In both countries, communities had access to forests, thanks to some tenure provisions to access and utilize the forest products. In Nepal, communities drew their resources from Community Forests through which they have secured legal rights to access, use, manage, and sell the forest products including timber. In Thailand, communities can access forest reserves to access products for household consumption and meet their subsistence needs. A recent study by FAO/RECOFTC study (2020) also confirms that community forestry- where tenure security is vested on communities- increased the resilience of more than 3 million rural people across the lower Mekong region to the social and economic shocks of the pandemic[59]. However, the exercise of these rights is made challenging due to ambiguous, overlapping policies. The harvesting(logging of timber) ban in Nepal put a complete halt on any forms of timber harvesting which was previously allowed, creating tensions between state forest agencies and community forest user groups. This ban has also restrained the possibility of generating income for community forest user groups, which could have been otherwise used to provide economic support to communities. In Thailand, the long-standing tenure ambiguities have created mistrust and conflicts in terms of land and forest use that are yet to be resolved. The lack of clarity of these policy provisions acts as a threat to tenure security and constrains optimal utilization of forests to meet local communities' needs. These findings are similar to other studies across Asia which indicate clear tenure security as a key factor for sustainable management of natural resources (Dahal et al 2011[60]; Robinson et al 2014[61]).

While forests helped to absorb shocks, communities needed more economic support to deal with the loss of jobs or reduced income. The Thai government's relief package of direct cash transfers was more or less helpful for people to continue with their lives. In Nepal, community forest user groups mobilized their forest funds to provide economic relief packages. Community forest user groups have a system of identifying users based on economic and social stratification, which is useful to identify the most vulnerable groups. It also has a locally managed community forest fund which is regularly mobilized to provide support to the most vulnerable groups, upkeep sustainable forest management practices. This system and network have been tapped by local government agencies to channel relief services to the poorest and impacted people, including the poor, marginalized, single women families, and disabled in the communities (Gentle, 2020).

[59] https://www.recoftc.org/news/new-research-shows-community-forests-help-people-cope-covid-19

[60] Dahal et al 2011. Forest tenure in Asia: Status and Trends. http://dlc.dlib.indiana.edu/dlc/handle/10535/7719

[61] Robinson et al 2014.
https://www.sciencedirect.com/science/article/pii/S0959378013000976?casa_token=Vni0I-e-VMcAAAAA:5SZMyqkGwpJek10RoFkltmk5ITlhBwffkg2iu9YksRv7NqSiDLKrrNPgkfnrualSxfemwGLfWQ

6.3.Impacts of COVID-19 on forest industry and trade

Forest sector industry and trade also were negatively impacted by COVID and its impacts are distributed across the supply chain. In the case of timber industries, the domestic market demand for furniture increased, as people used their lockdown time for repairs or in furnishing their homes. However, transportation remains restricted in Nepal, leading to a low supply of raw materials, which in turn, shrank the production volume, sales, and income. This has further created a loss of jobs, with industries now downsizing their labor force by 60 percent in Nepal. In Thailand, the production of teak wood products shrank because, due to the lockdown, it took a much longer process to transport, which in turn, led to reduced orders from customers. The revenue is slumped by more than 30 percent and many informal laborers - mostly farmers living near the boundaries of the teak plantation - were laid off. While the permanent staff was retained, their proportion of bonuses were reduced. In Nepal, forest-based entrepreneurs are reported to be in financial stress due to weak returns, lack of stimulus plans from the government, and non-cooperation from the banks. In Thailand, the government provided several stimulus programs to support businesses and workers, including financial measures aimed towards farmers, informal workers, and SMEs. There is not a specific mention of the forestry industry sector in the stimulus support, although businesses, farmers, and informal workers associated with the forestry sector may be eligible. SMEs in the bill encompass "tour and travel agencies, spas, transport businesses, hotels, motels, restaurants[62], through which local communities engaged in tourism were benefited. The provision of support was confirmed by both the upland communities, and it was regarded as useful to meet urgent household needs.

In Nepal, the market demand for wood products increased, but the production was constrained due to the low supply of raw materials caused due to transportation difficulties and the logging ban. In Thailand, some changes were observed in the net export and import value of wood-based products. These results are similar to the regional trends of impacts based on the April 2020 assessment (ITTO, 2020). This report shows that the overall demand for wood and wood-based products has plummeted. Vietnam expected a reduction of wood product exports by 80 percent as buyers asked for delayed shipment of orders, and timber companies reported losses of around US$1.06 million during the first quarter of this year. In Malaysia, for example, due to the closure of government administration offices, it was impossible to acquire legal timber harvest and log export permits. India recorded a contraction in wood exports by 35 percent, the sharpest decline in at least two decades (ibid.). Thousands of workers lost their jobs. Some governments provided support, while others have not. The major concern is if there will be a recovery in demand for tropical timber. Accurate estimates and impacts will become apparent when more countries publish trade data.

In addition to timber, other forest-based industries are also impacted. For instance, communities who were involved in the harvesting of high-value non-timber forest products in the high-lands of Nepal also lost their main source of income, severely impacting their livelihoods. Likewise, the

[62]https://thailand.um.dk/~/media/thailand/jobopslag/engelsk.pdf?la=da#:~:text=The%20tax%20relief%20is%20in,tax%2C%20VAT%20and%20stamp%20duty.&text=The%20Thai%20government%20issued%20its%20third%20COVID%2D19%20stimulus%20package,liquidity%20in%20the%20financial%20sector (Accessed 28 December, 2020).

producers at the community level who used to sell local handicraft items and high-value NTFPs, lost their income as the travel restrictions limited the mobility of middlemen or tourists to come to their sites to buy these products.

Negative impacts of COVID-19 were also evident in forest-based tourism, particularly in protected areas of Nepal and the uplands in Thailand. Not only did the market plummet, but jobs were lost and tourism operators struggled to maintain their running costs; the likely implications on wildlife conservation and local development are adverse. On the other hand, the tourism promotion packages introduced by Thailand were found effective in promoting domestic tourism, but also pose risks for infection.

6.4.Role of the forestry sector in post-COVID recovery measures

The cases indicate the multifaceted role and usefulness of forests as safety nets to secure livelihoods of forest-dependent communities as well as to promote the economy. The sector is directly related to the production of various food, wood, and high value non-timber forest products, as well as forest-based tourism with capacities of creating mass employment opportunities. It provides an immediate safety net for local communities in times of shocks. The COVID-19 experience across these two cases and also globally has highlighted the role of forests in sustainable development. And there are attempts made across global, regional, and national levels to explore how the forestry sector can play an important role in the post-crisis recovery measures.

Yet, the forestry sector remains underutilized. The economic contribution of the forestry sector across many countries in Asia remains dismally low. Valuing and preparing the forestry sector to meet the fuller potential of forestry is the way forward. This requires tackling some of the key constraints the sector faces. The sector faces **policy barriers** to allow the optimal utilization of forest products and services. Logging ban, conflicting policies, closure of government offices to obtain official permits, and approvals in both the cases have impeded the growth and productivity which otherwise could have been useful in post-recovery measures. Studies estimate that there is a potential to generate an income of approximately USD 220.98 million (NRs. 27 billion) and 21,710 jobs annually through the harvesting of matured timber from Community Forestry in Nepal (Paudel and others, 2014; Banjade, 2012). The conflicting provisions in the recent amendments of the Forest Act of Thailand create further confusion on how land-use systems in the upland will be regulated, causing questions around tenure security. Building tenure security of local communities through community management and creating an enabling policy environment are key.

Another challenge is the **limited scope** of forest operations on either conservation or timber. This limited scope has overlooked the roles and reliance of local communities on other important forest resources including food, grass, fodder, fuelwood, and high-value non-timber forest products. While the focus was on timber or strict conservation, opportunities from other high-value non-timber forest products that could have boosted the local and national economy are lost. As shown in the Nepal case, generally local communities are engaged in NTFPs. In the wake of COVID-19, there is an opportunity for fresh debate in optimally utilizing forests using forest science and land-use planning in ways that offer safety nets, conserves resources, and generates economic returns.

The unprecedented magnitude of COVID-19 also indicated that there are **limits to the forestry sector's organizational planning, capacity, and response mechanisms to deal with shocks**. While there were observations of forestry actors from the national to community level switching to digital spaces as alternate modes of learning or initiated working from home for specific periods, the planning/approval process (such as of CFUG operational plan) was halted, and the procedural mechanism for timber harvesting and transportation permits were proved difficult. No alternative mechanisms such as rethinking ways to reduce the procedural approvals through online technology or entrusting local communities to take decisions on approvals were adopted. Learning from COVID-19, the forestry sector needs to integrate disaster and risk mitigation approaches in its planning, policies, and response mechanisms.

Low level of social protection mechanisms is another key challenge to help forest-dependent communities and forest industries in times of crisis. This is particularly true for the forestry sector, where large numbers of workers are informally engaged and employed. While estimates are made for economic contractions, it is important to identify that the economic costs of conservation on forest-dependent communities and informal workers are not adequately acknowledged and accounted for in policy measures. This situation makes them vulnerable to shocks. Given the evidence of social protection and inclusive measures to minimize shocks and save jobs and incomes, embedding social protection mechanisms that promote more people-oriented, inclusive approaches within forest sector policies becomes crucial to boost resilience.

Moving forward, a recovery plan should aim to focus on removing these key constraints in the forest sector, which necessitates a long-term vision and planning process. Some immediate roles and action point to tackle the adverse impacts of COVID are provided below:

- **Create a task force and mobilize resources for the recovery**

Initial efforts of COVID-19 recovery were directed to address imminent issues of health, food, and employment. As such, across countries, there is little evidence and analysis to determine the scope and magnitude of the COVID-19 impacts in the forestry sector. It was also indicated from the responses from the UNFF focal points that such data is not yet available/publicly shared in the country across the region. It would be thus useful to create a dedicated task force within the countries to assess and monitor the impacts of COVID-19 across the forestry sector, and take adaptive measures to support the recovery measures.

The task force can assess the magnitude of sectoral impacts, take note of timely developments, and make adaptive strategies. The task force can identify efficient and timely short, medium, and long term strategies to minimize the impacts of the COVID-19 pandemic and similar future crises in the forestry sector. Some examples are already seen in the region. For instance, in Thailand, close monitoring, adaptive planning, and management is considered useful to minimize the spread of the coronavirus, provide social protections, and to recover the battered economy. Likewise, in Indonesia, the Forestry Ministry adjusted its budget to create a support fund to tackle the disruptive impacts and to ensure the sustainability of the forest, the survival of forestry enterprises, and forest conservation activities.

- **Provide cash incentives for local people for reforestation and monitoring**

Local people who are engaged in planting, managing, and sustaining forests need to be recognized and financially incentivized for their engagement in reforestation and afforestation activities. Communities bear the economic costs of conservation but they receive minimal economic returns from it. At times of crisis like COVID-19, the forestry sector should identify ways through which local communities can be financially rewarded. Launch of reforestation and afforestation programs to hire short-term employment for rural people, especially those who lost jobs in one option. Thailand has temporarily employed people for plantation and on-site monitoring jobs. Similar efforts are seen in other countries like India and Pakistan (UN 2020). Promoting and incentivizing community-based monitoring is another. There is ample evidence that community engagement has significantly contributed to restraining illegal activities even at harsh times. Such schemes can provide economic respites to people and households struggling with the loss of jobs and income, while also promoting the ecological restoration of degraded lands.

- **Use forest resources and underutilized lands to generate income and employment**

In times of crippling economies, forest resources can be sustainably used to generate income and employment. Most of the forest resources - timber and high value non-timber forest products are "low-hanging fruit" that can be tapped using sustainable harvesting methods. The underutilized fallow or degraded lands can be utilized by promoting the plantation of non-wood timber products (cardamom, tea, coffee, fruits, herbs, etc.) using agroforestry techniques. Multi-purpose trees suitable for different climates can be planted to meet different needs.

- **Provide stimulus and social protection measures to revive the forest-based industry and support adversely impacted actors**

Given the importance of the forest-based industry to create jobs and employment, it would be useful for the forestry sector to facilitate the relaxation of financial constraints (e.g. bank loans, interests, etc.), as well as increase financial access for smallholders and other local producers.

- **Integrate approaches to mitigate disasters and shocks in forest planning, policies and practice**

Learning from COVID-19, the forestry sector needs to integrate disaster and risk mitigation approaches in its planning, policies, and practice.

- **Develop and implement national forest financing strategies**

National Forest Financing Strategies (NFFS) should be adopted and integrated as an integral part of the national COVID-19 recovery plans and as part of appropriate national frameworks, including integrated national financing frameworks. Mobilizing existing and potential bilateral and multilateral financing in the forestry sector would be critical for the revival of the sector. For example, the Forest Investment Program (FIP) can play a significant role in creating opportunities by tailoring investment in creating green jobs and employment through forest-based enterprise, and sustainable forest management. Partnerships with other agencies and businesses are equally

important for investment, skill-oriented training, use of technology for efficiency and productivity, as well as to link sustainable forest management efforts with other development sectors[63].

- **Collaboration with other sectors**

Given that forests are a source of a range of ecosystem products and services to society and other economic sectors (especially agriculture, industry, tourism), there is a need for coordinated multi-sectoral efforts and investments with a coordinated focus on land use planning and management. Also, as the COVID crisis- a major health issue- indicated that the restrictions on transportation and closure of borders due to COVID-19 have affected the lives of forest-dependent people and the management of forest resources. Thus, the transportation and logistics sector seem to be important non-forestry sectors with close links to the forest-based industry and tourism. Also, the sector of technology and online applications has remained crucial to promote capacities and to link products to markets.

7. Conclusion

As the entire globe is struggling to fight the COVID-19 crisis, attempts have been made to address the imminent health crisis through prioritizing measures to curb the spread and minimize mortality. Efforts are also taken to minimize the negative effects on the economy. Concepts of build back better and green COVID-19 recovery are circulating across policy and development circles at global, regional, and national levels. Forests have been considered one of the most critical ecosystems to materialize the pathways to green recovery.

This study provides empirical insights into the impacts of COVID-19 in the forestry sector. There are notable negative impacts of COVID-19 in sustainable forest management, livelihoods of forest-based communities, especially the poor, forest-dependent, indigenous groups, informal workers, and on the forest industry and trade. Yet, the sector offers an opportunity to deal with those adverse impacts. The study concludes that forests are safety nets and serve multiple functions from supporting livelihoods of local communities to regulating the environment, to providing raw materials to forest industry and trade. However, forests remain underutilized due to policy constraints and excessive focus on conservation. There is a potential for the forestry sector to utilize its full potential for recovery measures. However, to make it happen, there is a need for a fresh debate in optimally utilizing forests with forest science and land-use planning in ways that offer safety nets, conserve resources, and generate economy. In addition, it is equally important to foster an enabling policy environment by tackling conflicting policy provisions, embedding social protection mechanisms, and strengthening the tenure security of stakeholders, particularly of local communities. Likewise, targeted investment and financing measures are needed to promote forest enterprise and trade.

[63] Email communication with Mr. Prakash Lamsal, Joint Secretary at the Ministry of Forest and Environment, and UNFF focal point.

The results from this study include examples of different types of impacts, but it doesn't express the fuller magnitude of those impacts at the country level. Future studies can be directed to fulfill this knowledge gap. Also, the findings need to be interpreted within the context of certain methodological limitations: the empirical data are derived from two case studies (Nepal and Thailand) and relate to the observed changes in the forestry sector with certain relational context (different rates of COVID spread and containments, scale of economy and dependency on forest resources). Thus, while some case study results may be similar in countries across Asia, the context of research production needs to be taken into account when inferring comparable conclusions for the entire region.

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9. Annexes

Annex 1: List of experts interviewees in Nepal

SN	Name	Affiliation	Theme for discussion
1.	Mr. Kapil Adhikari	Ex-Chair, Federation of Forest-based Industry and Trade, Nepal (FENFIT)	Impact of COVID-19 in timber trade, impact on employment
2.	Mr. Prakash Lamsal	Government	Overall impact of COVID-19 in forestry sector – forest management, livelihood, and trade
3.	Mr. Jisan Karki	Assistant Forest Officer, Kailali	Impact of COVID-19 in forest management, access of local communities to forest, role of DFOs in safeguarding communities access to resources
4.	Mr. Chandra Bhandari	Assistant Forest Officer, Kailali	Illegal logging and poaching during the pandemic situation
5.	Dr Nabin Joshi	Asia Network for Sustainable Agriculture and Bio-resources (ANSAB)	Impact of COVID-19 on NTFP trade, supply, processing, and marketing, impact on employment
6.	Mr. Shambhu Charmakar	Food and Agriculture Organization (FAO) Nepal	How COVID-19 has impacted forestry sector, FAO's support to Nepal in coping with the impact
7.	Mr. Suresh Shreshta	Director, Bira furniture industries	Impact of COVID19 on forest-based enterprise (furniture), resource supply, marketing, impact on employment
8.	Mr. Damodar Aryal	Proprietor, Evergreen Bamboo Pvt. Ltd	Forest-based enterprise, impact of COVID-19 in the supply chain, impact on employment
9.	Dr. Jiban Poudel	Tribhuvan University, Nepal	Migration and forestry nexus, reverse migration trend and opportunities and challenges in forestry sector
10.	Ms. Rama Paudel	Chairperson, Bahunidevi community forest user groups, Sarlahi	Impact at the community level, livelihood of forest dependent communities, gender specific issues
11.	Ms. Sushila Kunwar	Chair, Fagarkhola CFUG, Chaubas, Kavre	Impact on the livelihood of CFUGs, how COVID-19 has affected the daily subsistence of communities, how are women in specific affected, coping strategies
12.	Ms. Arishma Shrestha	GESI mainstreaming coordinator, People in Need	Gender specific issues and COVID-19
13.	Mr. Prem Shrestha	Chair, Kalapani CFUG, Kavre	Impact on the livelihood of CFUGs, how COVID-19 has affected the daily subsistence of communities, coping strategies
14.	Mr. Binod Basnyat	National Trust for Nature Conservation	Impact on tourism, general scenario and trend
15.	Ms. Sylvia Rai	Coordinator, CARITAS Nepal	Migration in the COVID-19 scenario, opportunities and challenges

Annex 2: List of interviewees in Thailand

SN	Key experts	Location	Occupation/social groups
	Theme: **Livelihood options in Community Forest Management**		
1.	Nong Hoi Villager	Mon Jam Nong Hoi Village, Mea Ram Sub-district, Mae Rim District, Chiang Mai Province	Hmung ethnics, NWFP selling
2.	Nong Hoi Villager		Hmung ethnics, NWFP selling
3.	Nong Hoi Villager		Hmung ethnics, NWFP selling vegetation and NWFP selling
4.	Nong Hoi Villager		Hmung NWFP selling
5.	Head of the Hong Hoi village	Hong Hoi's Head of the village	
	Theme: Livelihood options in Nature-based Tourism		
6.	Mon I-din resort owner	Mon Jam Mea Ram Sub-district, Mae Rim District, Chiang Mai Province	Forest-based tourism entrepreneur at Mea Kum Pong village
7.	The owner of Ban Mon Homestay		
8.	Mea Kum Pong villager/Indigenous entrepreneur	Mae Kum Pong, Mae On sub-district, ChiangMai Province	
9.	The owner of Suda Homestay		
10.	The officer of Lung Pood and Pa Penf Homestay		
11.	The officer of Lung Pood and Pa Penf Homestay		
12.	Mea Kum Pong] tourist guide		Mea Kum Pong villager/ Local guide
13.	The owner of Lung Nuoad Homestay		Mea Kum Pong villager/Indigenous entrepreneur
14.	Head of Mea Kum Pong Village	Mae Kum Pong village headman	Head of Mea Kum Pong Village
	Theme: Forest Industry and Trade		
15.	Head of Mae Jam Forest Plantation	Chiang Mai Province	

16.	Head of Mae Um Long Forest Plantation	Chiang Mai Province	
17.	Head of Evaluation and Plan management office at Chiang Mai Province	Chiang Mai Province	
SFM: Forest condition & Management			
18.	Royal forest Department officer, Chiang Mai provincial office (Mon Jam and nearby sites)	Center office at Mea Rim District, Chiang Mai Province	The Administrative Division for solving land use conflicts at Mae Rim Forest reserved Area Forest Resource Management Office No.1 (Chiang Mai), Royal Forest Department
19.	Director of Forestry Certification Division	Bangkok	Forest Economics Bureau, Royal Forest Department
20.	Dr. Preecha Ongprasert, Bangkok	Chief of International Special Program Section, International Forestry Cooperation Division, Planning and Information Technology Bureau, RFD	Forestry Foreign Affairs Office, Royal Forest Departmen

Annex 3: Checklist for the Key Expert Interviews

Overall COVID-19 situation in the country

What was the scale of the impact of COVID-19 in the region/area?

Which type of impact was most severe in your context?

What was the response mechanism adopted to address the adverse impact?

Effects of COVID-19 in forest conditions and management of forest

What type(s) of impacts was visible in terms of sustainable management of forest in Nepal?

Which product was mostly harvested during the pandemic?

Compared to the situation before, how has the forest conditions changed following the COVID-19 pandemic? Has there been any negative or positive change in the forest?

Has there been any pressure on forest conditions as a result of reverse migration?

What type of illegal activities was observed during the pandemic and how did it affect the forest conditions?

What do you think will happen to the forest if the current situation continues?

What are your three major suggestions in order of the priority to sustainably manage the forest cover and practices in the context of COVID-19?

Effects of COVID-19 on forest livelihood

How has COVID-19 affected the livelihoods of the local communities reliant on forest products?

How has the situation changed as compared to before and after COVID-19 pandemic?

How has forest supported in the livelihoods of the people during the crisis?

Which products were mostly harvested during the pandemic that actually supported the livelihood of the people?

Was there any shift in the consumption pattern of the people during the crisis?

In what way(s) has the forest supported the returnee migrants in securing their livelihood?

Has women participation and representation changed following the pandemic?

What will happen to the forest-based communities and their livelihoods if the situation continues to exist?

What are your three major suggestions in priority to use forestry to support forest-based communities and their livelihoods?

Effects of COVID-19 on forest-based industries and trade (timber, NTFPs, ecotourism)

How has COVID-19 impacted the forest-based industry in Nepal?

What aspect of the supply chain has been hardly hit and who are the most affected groups?

How has the pandemic affected the trade of forest-based products?

What type of disruptions existed in the labour force during the crisis?

Have there been any disruptions in the finances?

Have there been changes in the consumer patterns?

What will happen to the forest-based industry if the current situation continues? Has there been any support from the government?

What are your three major suggestions in the order or priority to use forest-based industry in recovery measures in the context of COVID-19?

Annex 4: The lists of fifty eight tree species promoting for commercial forest plantation in Thailand

List	Family	Scientific Name
1	Anacardiaceae	*Mangifera spp.*
2	Apocynaceae	*Alstonia scholaris* (L.) R. Br.
3	Apocynaceae	*Cerbera* odollam Gaertn.
4	Bignoniaceae	*Milligtonia horentis* Linn.f.
5	Bignoniaceae	*Dolichandrone serrulata* (Wall. ex DC.) Seem.
6	Bignoniaceae	*Tabebuia argentea* Britt.
7	Bixaceae	*Cochlospermum religiosum* (L.) Alston.
8	Calophyllaceae	*Mesua nervosa* Planch. & Triana

9	Combretaceae	*Terminalia corticosa* Pierre ex Laness.
10	Dipterocarpaceae	*Cotylelobium lanceolatum* Craib.
11	Dipterocarpaceae	*Shorea henryana* Pierre.
12	Dipterocarpaceae	*Shorea obtusa* Wall. ex Blume
13	Dipterocarpaceae	*Shorea siamensis* Miq.
14	Dipterocarpaceae	*Shorea roxburghii* G. Don
15	Dipterocarpaceae	*Hopea odorata* Roxb.
16	Dipterocarpaceae	*Hopea ferrea* Laness.
17	Dipterocarpaceae	*Neobalanocarpus heimii* (King) Ashton
18	Dipterocarpaceae	*Dipterocarpus alatus* Roxb.
19	Dipterocarpaceae	*Dipterocarpus spp.*
20	Fabaceae	*Dalbergia cochinchinensis* Pierre.
21	Fabaceae	*Dalbergia oliveri* Prain
22	Fabaceae	*Dalbergia parviflora* Roxb.
23	Fabaceae	*Dalbergia cultrata* Graham ex Benth.
24	Fabaceae	*Millettia leucantha* Kurz.
25	Fabaceae	*Pterocarpus macrocarpus* Kurz.
26	Fabaceae	*Pterocarpus indicus* Willd.
27	Fabaceae	*Afzelia xylocarpa* (Kurz.) Craib
28	Fabaceae	*Sindora siamensis* Teijsm. & Miq
29	Fabaceae	*Peltophorum pterocarpum* (DC.) K.Heyne
30	Fabaceae	*Albizia lebbeck* (L.) Benth.
31	Fabaceae	*Cassia bakeriana* Craib
32	Fabaceae	*Cassia fistula* Linn.
33	Fabaceae	*Samanea saman* (Jacq.) Merr.
34	Fabaceae	*Intsia palembanica* Miq.
35	Fabaceae	*Caesalpinia sappan* L.
36	Fabaceae	*Tamarindus indica* L.
37	Gentianaceae	*Fagraea fragrans* Roxb.
38	Lamiaceae	*Tectona grandis* Linn.f
39	Lauraceae	*Litsea grandis* Hook.f.
40	Lauraceae	*Cinnamomum porrectum* Kosterm
41	Lythraceae	*Lagerstroemia floribunda* Jack
42	Lythraceae	*Lagerstroemia tomentosa* C. Presl
43	Lythraceae	*Lagerstroemia speciosa* (L.) Pers.
44	Magnoliaceae	*Magnolia spp.*
45	Malvaceae	*Microcos tomentosa* Sm.
46	Malvaceae	*Durio* spp.
47	Meliaceae	*Azadirachta indica* A.Juss.
48	Meliaceae	*Azadirachta excelsa* (Jack) Jacobs.
49	Meliaceae	*Chukrasia velutina* Wight &Arn.
50	Meliaceae	*Toona ciliata* M. Roem.
51	Mimosaceae	*Xylia xylocarpa* (Roxb.) Taub.
52	Moraceae	*Artocarpus lakoocha* Roxb
53	Myrtaceae	*Syzygium* sp.
54	Phyllanthaceae	*Phyllanthus emblica* Linn.

55	Poaceae	*Bambusa* sp
56	Rosaceae	*Prunus cerasoides* D.Don.
57	Rubiaceae	*Anthocephalus chinensis* (Lamk.) A. Rich. ex Walp.
58	Thymelaeaceae	*Aquilaria crassna* Pierre ex Lec.