

The impacts of COVID-19 on the sustainable management of the forestry sector in Southern Africa

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HIGHLIGHTS

- COVID-19 had an 80% impact on forest management operations.
- Community forests (53%) and nature parks (96%) were the most affected.
- The COVID-19 pandemic had a moderate to severe impact on forest conversion to agriculture land.
- The pandemic resulted in serious levels of illegal logging.
- From the forest production perspective, the impact of COVID-19 on production, supply, demand and price of timber was low.

SUMMARY

The objective of the study was to examine the impact of the COVID-19 pandemic on sustainable forest management in southern Africa. The study employed a targeted approach, also referred to as purposive sampling, to select respondents from the various sectors. The results show that COVID-19 had an 80% impact on forest management operations. The COVID-19 pandemic did not have a significant effect on the conversion of land from forest to other land uses. However, there was severe illegal logging and moderate to severe fires. The COVID-19 pandemic also had a severe impact on the agriculture, environment and ecotourism sectors, with nature reserves completely closed. From the forest production perspective, the impact of COVID-19 on production, supply, demand and the price of timber was generally low due to the commercial nature of the forestry sector in South Africa; the largest economy in SADC being classified as an essential sector.

Keywords: ecotourism, forest products, livelihoods, resource use, sustainable forest management

Les impacts de la Covid 19 sur la gestion durable, dans le secteur de foresterie en Afrique du Sud

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L'objectif de l'étude était d'examiner l'impact de la pandémie de Covid 19 sur la gestion forestière durable dans le sud de l'Afrique. Cette étude a utilisé une approche ciblée, également nommée échantillonnage raisonné, pour sélectionner des interlocuteurs dans plusieurs secteurs. Les résultats indiquent que la Covid 19 a eu un impact de 80% sur les opérations de gestion forestière. Cette pandémie de Covid 19 n'a pas eu d'effet significatif sur la conservation des terres de la forêt vers d'autres utilisations. En revanche, on remarque une coupe de bois illégale sévère, et des feux allant de modérés à importants. La pandémie de Covid 19 a également eu un impact sévère sur les secteurs de l'agriculture, de l'environnement et de l'écotourisme, avec une fermeture totale des réserves naturelles. Du point de vue de la production forestière, l'impact de la Covid 19 sur l'alimentation de la production, de la demande et du prix du bois a été généralement faible, du fait de la nature commerciale du secteur forestier en Afrique du Sud, l'économie la plus importante dans la Communauté de Développement de l'Afrique australe (SADC), étant classifiée comme secteur essentiel.

Las repercusiones de Covid-19 en la gestión sostenible del sector forestal en el sur de África

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El objetivo de este estudio fue examinar el impacto de la pandemia de COVID-19 en la gestión forestal sostenible en el sur de África. El estudio empleó un enfoque dirigido, también denominado muestreo intencional, para seleccionar a los encuestados de los distintos sectores. Los resultados muestran que COVID-19 tuvo un impacto del 80% en las operaciones de gestión forestal. La pandemia de COVID-19 no tuvo un

efecto significativo en la conversión de tierras de bosque a otros usos del suelo. Sin embargo, se produjeron graves talas ilegales e incendios de moderados a graves. La pandemia de COVID-19 también tuvo un grave impacto en los sectores de la agricultura, el medio ambiente y el ecoturismo, debido este último al cierre total de las reservas naturales. Desde el punto de vista de la producción forestal, el impacto de COVID-19 en la producción, la oferta, la demanda y el precio de la madera fue generalmente bajo debido a la naturaleza comercial del sector forestal en Sudáfrica, la mayor economía de la SADC, donde está clasificada como un sector esencial.

INTRODUCTION

The World Health Organization (WHO) declared the COVID-19 outbreak as a global pandemic on the 11th of March 2020. This pandemic has constituted one of the most devastating global crises in recent times, with more than 173 million cases, and over 3.7 million people confirmed dead as of 09 June 2021 (WHO 2021). In Southern Africa, there were over 2.1 million confirmed cases, with about 65 thousand deaths recorded as of 09 June, 2021 (African Union, CDC 2021).

Forests provide economic and livelihood support for many people around the world, especially the rural poor, generating more than 86 million green jobs. The forest sector also provides jobs for around 54.2 million people in the world (ILO 2020). About 31% of the world's population depends on wood-based energy for cooking, with up to 1 billion people utilising wild foods. More than 1.5 billion people, many of whom are women, children and other vulnerable groups, depend on forests for food, nutritional diversity and income (FAO 2018). In Africa, over two-thirds of the population rely on forests for their livelihoods, while fuelwood accounts for about 90% of primary energy source for households (Naazia and Weng 2016).

The African continent received her share of the COVID-19 virus with 47 countries affected, more than 4.9 million cases and over 133 174 deaths recorded as of 09 June 2021. South Africa accounted for more than 50 percent of all confirmed cases (2 858 195) and deaths (84 877) in Africa. Though emphasis is laid on the health impact, the pandemic brings more consequences (including food insecurity, loss of jobs, income and livelihood, and debt crisis) to the African continent. It is projected that the poverty rate in sub-Saharan Africa will increase by 2 percentage points because of the pandemic (Montes *et al.* 2020) due to the fact that it has affected people's livelihood, especially forest-dependent people (e.g. about 100 million people have been added to the list of people in extreme poverty (UNDP 2020)). It is also important to be aware that people living around the forests are economically vulnerable, with 252 million forest and savannah inhabitants having an income of less than USD 1.25 per day. The impact of the pandemic, however, varies from region to region and this paper specifically calls attention to the perceived and known impacts on the forest sector in Southern Africa and the potential responses needed to ease the effect of the crisis.

Considering that most of the countries in the Southern Africa Development Community (SADC) region have extensive rural areas with extreme poverty, forests and forest products play a significant role as a source of livelihood. Forests and forest products contribute to the basic needs (such

as food, nutrition, shelter, fodder, fuel, medicine) of many lives and communities across the southern Africa region. For instance, the Miombo woodlands sustain lives and livelihoods of more than 100 million rural poor and 50 million urban people (Gumbo *et al.* 2018). In terms of economic benefits, forest resources across the SADC region offer various products, livelihood options and ecosystem services. Forests provide timber, which traditionally, is the single most formally traded commodity, both nationally and internationally but other benefits include protection of water catchments and regulation of river flow, carbon sequestration and climate regulation, the production of wild fruits, vegetables and medicines, local construction materials and wood energy. In addition, forests provide habitat to several species of mammals, birds, reptiles, and insects, which support SADC's ever-growing nature-based tourism. These values form the basis to warrant the management and protection of SADC's forests. As such, the impact of COVID-19 obviously has a direct impact on this resource, communities and countries in the region.

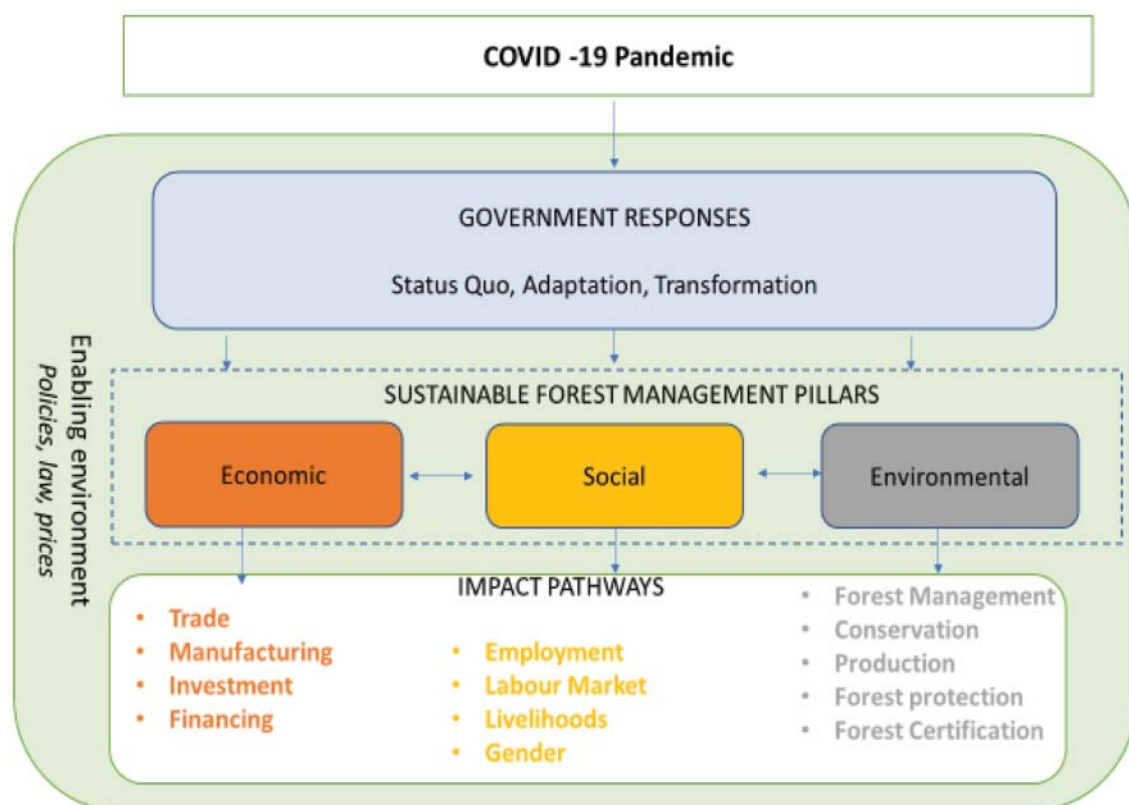
Several studies have been conducted on the forest resource use and dependency in southern Africa (see Ribeiro *et al.* 2020). However, the impacts and implications of the COVID-19 pandemic on sustainable forest management (SFM) are not known. As such, the objective of this study was to determine the impacts and implications of the COVID-19 pandemic on sustainable forest management (SFM) of the forest sector in Eswatini, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe. It is crucial to understand the extent of the impacts caused by the pandemic in order to plan for appropriate responses in the post-COVID-19 era through projects, programmes and policies.

MATERIALS AND METHODOLOGY

The research framework: the link between SFM and the COVID-19 pandemic

The framework (Figure 1) is premised on the impact of the COVID-19 pandemic on sustainable forest management (SFM). The forest resource as highlighted earlier provides ecosystem services to both rural and urban communities and the ecosystem services as presented in the MEA cut across economic, social and environmental focus areas of human well-being (MEA 2005). However, the normal operations and/or processes required to achieve SFM are impacted by the policies, rules and regulations that the local and international communities have put in place in order to tackle the COVID-19 pandemic. The direct impact on countries is on both formal

FIGURE 1 Framework for the link between SFM and the COVID-19 pandemic (source: Attah Alhassan 2020)



and informal trade, forest-based industries, financing and investment in the forestry sector. Socially, the COVID-19 pandemic affects the livelihoods, employment, markets and especially vulnerable groups (women, youth and the old). The response to COVID-19 such as restrictions of movement have affected the environmental integrity of the forest resource vis-a-vis forest management, protection and conservation (Attah 2020).

Study sites

The scope of this study covered Southern Africa, represented by Eswatini, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe (Figure 2).

Data collection and analysis

The study was conducted between October and November 2020 and employed a targeted approach, also referred to as purposive sampling, to select respondents from the various sectors of forestry in the different countries. Due to the pandemic, questionnaires were sent to the respondents as a link for online response through emails and/or the WhatsApp platform. The questionnaire was also sent electronically in MS Word format. Customized questionnaires were sent to key informants from government departments, private sector, NGOs, UN agencies and community respondents. In addition, one-on-one interviews were conducted with some small-scale businesspersons in the forestry sector including for example, timber and non-timber traders (in Malawi

and South Africa). Recognizing the lack of knowledge for technologies for rural communities, the questionnaire was administered face-to-face, while observing COVID-19 rules and regulations. In addition, community focus group discussions were adapted in the communities to have a wider representation and information from respondents. Focus group discussions were conducted with communities (forest dependent communities) in southern Malawi (Machinga and Zomba District) involving 20 different communities (78 females and 64 males) including women's groups and village natural resources management committees. In South Africa, four key informants were interviewed representing four communities (Muhuyu, Damani, Tshipako and Tshiombo) in Vhembe District, Thulamela Municipality in Limpopo province. In Malawi six key informants were drawn from FAO, Save the Children Fund, Department of Land Resources & Conservation, Forestry Department, Leadership for Environment & Development and UNDP.

The following broad research questions guided the interviews and focus group discussions:

- What is the impact of the COVID-19 pandemic on SFM and the forest sector?
- What have been the responses to the forestry sector specifically?
- How have general responses by governments, inter-governmental organisations, non-governmental organisations, civil society organizations and private sector to the pandemic affected SFM and the forestry sector at large?

FIGURE 2 Location of study areas in southern Africa



- What are the mitigation measures for the forest sector's recovery and; how can these measures enhance contribution of forests to inclusive sustainable development?
- What are the emerging opportunities that COVID19 has brought to the fore for the Forestry Sector?

Details of the main sources of data collected for the survey are provided in Table 1. Data were analysed using cross tabulations, simple percentages across the countries and content analysis for focus group discussions. The analyses focussed on the impact of COVID-19 on forest programs and management operations, disturbance on different forest types, changes in the forests and factors contributing to forest

TABLE 1 Detail of the main sources of data collected for the survey in southern Africa

Country Name	Number of respondents across the countries			
	Online Survey	Key Informant	Focus Group Discussions	One-on One Interviews
Malawi	5	6	20	4
South Africa	6	4	0	0
Zimbabwe	6	0	0	0
Zambia	3	0	0	0
ESwatini	5	0	0	0
Namibia	12	0	0	0
Mozambique	3	0	0	0
Total	40	10	20	4

cover change, on other sectors related to the forestry sector, on ecotourism, traditional source of funding, and on the production, supply, demand and price of some forest products in the SADC region.

RESULTS

Impact of COVID-19 on forestry development

The survey results from the region show that COVID-19 had a strong negative impact on forest management operations that contribute to SFM accounting for over 80% of the responses (Table 2). The SFM activities that were assessed in the region include afforestation, reforestation, silvicultural management, fire management, vegetation management (assisted and natural regeneration) and agroforestry. The results show that most activities (66–81%) continued even when restrictions were imposed in all the countries. However, 22% and 30% of reforestation and afforestation activities, respectively had completely stopped (Table 3).

Changes in the forests due to COVID-19 pandemic

The results showed that activities in community forests (54%) and nature parks (58%) were highly affected, and to a lesser extent Government forest reserves across the region (Table 4). Over 50% of respondents indicated that the COVID-19 pandemic did not have a significant effect on the conversion of land to settlement. However, there was severe illegal logging (68%) in most countries except in Mozambique. In addition,

TABLE 2 *Impact of COVID-19 on forest management operations in SADC (values are individual respondents)*

Country Name	Impact of COVID-19 on forest management operations			
	Extremely Positive	Slightly positive	Slightly negative	Extremely negative
Malawi	0	1	2	2
South Africa	1	0	1	4
Zimbabwe	0	0	1	1
Zambia	0	0	0	3
ESwatinini	0	0	0	1
Mozambique	1	0	0	2
Total	2	1	4	13
%	10	5	20	65

over 70% indicated that there were moderate to severe fires in the region (Table 5). Also, over 60% of the respondents indicated that there was moderate to severe land fragmentation and conversion to agricultural land. Table 6 shows the impact of different factors including job losses, migration from urban to rural, policies, and regulations on forest cover change in some SADC countries. The results did not show any single dominant factor contributing to forest cover. However, the lack of strong regulations over forest and loss of jobs accounted for over 65% of the contribution to forest cover change.

Impact of COVID-19 on forest funding and forest related sectors/factors

The impact of COVID-19 was also assessed for other sectors and/or factors linked to forestry including agriculture, land, climate change and the environment. The results show that the

TABLE 3 *Forest programs affected by COVID-19 in the SADC region (values are individual respondents)*

Country	Afforestation (n =27)			Reforestation (n =27)			Silvicultural regimes (n =29)			Fire management (n = 30)			Agroforestry (n = 21)			Vegetation management (n = 26)		
	CS	CR	CP	CS	CR	CP	CS	CR	CP	CS	CR	CP	CS	CR	CP	CS	CR	CP
Malawi	0	3	0	0	2	1	0	3	1	0	3	1	0	2	0	0	4	0
South Africa	2	1	0	2	1	1	2	1	1	2	2	1	1	1	0	1	2	1
Namibia	3	7	1	2	8	1	1	7	3	1	6	4	1	7	1	1	7	2
Zimbabwe	0	3	0	0	2	0	0	3	0	0	2	1	0	1	0	0	1	0
Zambia	0	1	0	0	1	0	0	0	1	0	1	0	0	1	0	0	1	0
ESwatinini	2	1	0	1	2	0	1	2	0	2	1	0	1	2	0	0	2	1
Mozambique	1	2	0	1	2	0	0	3	0	0	3	0	0	3	0	0	2	1
Total	8	18	1	6	18	3	4	19	6	5	18	7	3	17	1	2	19	5
%	30	67	3	22	67	11	14	66	20	17	60	23	14	81	5	8	73	19

CS = Completely stopped; CR = Continued with restrictions; CP = Normal operations

TABLE 4 *COVID-19 Disturbance on different forest types in the SADC region (values are individual respondents)*

Country Name	COVID-19 Disturbance on different forest types											
	Community forests (n=30)			Government forest reserves (n=26)			Nature parks (n=24)			Urban forests (n=22)		
	High	Medium	Low	High	Medium	Low	High	Medium	Low	High	Medium	Low
Malawi	2	2	2	3	0	1	1	1	0	1	1	1
South Africa	3	1	0	1	2	1	3	1	1	0	3	1
Namibia	8	1	1	2	3	2	2	3	0	1	3	1
Zimbabwe	0	1	2	0	1	3	2	0	0	1	1	1
Zambia	0	1	0	1	0	0	2	1	0	0	1	1
ESwatinini	2	0	1	1	1	1	2	1	0	1	0	1
Mozambique	1	1	1	1	2	0	2	2	0	0	1	2
Total	16	7	7	9	9	8	14	9	1	4	10	8
%	54	23	23	35	35	30	58	38	4	18	46	36

TABLE 5 Changes in the forests due to COVID-19 pandemic in the SADC region (values are individual respondents)

Country Name	Changes in the forests due to COVID-19 pandemic in the region (n=33)														
	Conversion to settlement (n=27)			Illegal logging (n=28)			Forest fires (n=29)			Conversion to agricultural land (n=25)			Fragmentation (n=22)		
	S	M	NS	S	M	NS	S	M	NS	S	M	NS	S	M	NS
Malawi	0	1	2	4	0	0	3	2	0	0	3	1	1	1	1
South Africa	1	1	2	3	0	1	2	1	2	1	0	2	1	0	2
Namibia	3	0	6	4	4	1	5	4	1	2	4	4	0	3	4
Zimbabwe	0	2	2	4	0	0	1	1	2	1	1	1	0	1	1
Zambia	1	0	0	1	0	0	1	0	0	0	1	0	1	0	0
ESwatini	2	0	1	3	0	0	0	1	0	0	2	0	0	3	0
Mozambique	0	2	1	0	1	2	0	1	2	0	2	0	0	2	1
Total	7	6	14	19	5	4	12	10	7	4	13	8	3	10	9
%	26	22	52	68	18	14	41	35	14	16	52	32	13	46	41

S = severe, M = moderate, NS = non-significant

TABLE 6 Factors contributing to forest cover change in the SADC region (values are individual respondents)

Country Name	Factors contributing to forest cover change			
	Loss of jobs	Change of government policies	Lack of strong regulations over forests	Migration of people from urban to rural areas
Malawi	2	1	4	0
South Africa	1	0	4	1
Namibia	9	7	8	7
Zimbabwe	0	0	4	0
Zambia	1	1	1	1
ESwatini	3	0	1	1
Mozambique	1	2	0	0
Total	17	11	22	10
%	28	18	37	17

COVID-19 pandemic had a severe impact on the agriculture (57%) and environment sectors (58%) (Table 7). Climate change and land were only moderately affected. For the impact of Covid-19 on ecotourism, 65% of the respondents indicated that game reserves had completely closed (Table 8). However, over 50% had indicated that urban parks and nature sanctuaries had continued with restrictions. In general, most countries in the region continued to get their funding for the forest sector from government (>50%) followed by development agencies (26%) (Table 9).

Impact of COVID-19 on the forestry industry

Over 75% of the respondents indicated that the impact of COVID-19 on the production of timber was low while the production of most value-added products (plywood, poles and structural wood) was strongly affected (>50%). Similar trends were also observed for supply of the products (Table 10). The

majority (73%) of respondents indicated that the demand for timber was low while >50% felt that demand for value added products was high. With respect to pricing of products, over 60% of the respondents felt that it was not affected, while >50% indicated that that price of plywood, poles and structural wood had been highly affected (Table 10).

Community perception of COVID-19 impacts vis-à-vis forestry management

Twenty forest-based community groups operating in southern Malawi presented a generally optimistic picture of the COVID-19 impacts in relation to forest management. Community groups during focus group discussions indicated that access to forest areas was not restricted with respect to forest resource use at the community level to support livelihoods and income generation. They further indicated that even though marketing of forest products has been affected to

TABLE 7 *Impact of COVID-19 on other sectors related/linked to the forestry sector in the SADC region (values are individual respondents)*

Country Name	Impact of COVID-19 on other sectors related/linked to the forestry sector											
	Agriculture (n=30)			Land (n=25)			Climate change (n =27)			Environment (n=31)		
	S	M	NS	S	M	NS	S	M	NS	S	M	NS
Malawi	1	2	0	0	3	0	1	1	1	3	2	0
South Africa	2	3	0	1	2	1	1	2	1	4	2	0
Namibia	8	2	1	0	5	4	3	4	2	6	4	0
Zimbabwe	2	2	0	0	2	2	0	3	1	2	1	0
Zambia	1	0	0	1	0	0	1	0	0	1	0	0
ESwatini	2	1	0	1	0	2	2	1	0	1	2	0
Mozambique	1	2	0	0	2	1	0	3	0	1	2	0
Total	17	12	1	3	14	8	8	14	5	18	13	0
%	57	40	3	12	56	32	30	52	18	58	42	0

S = severe, M = moderate, NS = non-significant

TABLE 8 *Impact of COVID 19 on ecotourism (values are individual respondents)*

Country name	Impact of COVID 19 on ecotourism					
	Game reserves (n =26)		Urban parks (n =20)		Nature sanctuary (n = 20)	
	CS	CR	CS	CR	CS	CR
Malawi	2	1	0	2	0	2
South Africa	4	2	2	1	2	2
Namibia	5	3	5	2	4	3
Zimbabwe	2	0	1	1	1	1
Zambia	0	1	0	1	0	1
ESwatini	2	1	1	2	1	1
Mozambique	2	1	1	1	1	1
Total	17	9	10	10	9	11
%	65	35	50	50	45	55

CS = completely stopped, CR = continued with restrictions

TABLE 9 *Traditional source of funding in the forestry sector in the SADC region (values are individual respondents)*

Country Name	Major source of funding in the forestry sector (n=38)		
	Government	Foreign agencies	Private companies
Malawi	4	1	0
South Africa	3	1	2
Namibia	9	3	0
Zimbabwe	2	2	2
Zambia	0	1	0
ESwatini	2	1	2
Mozambique	0	1	2
Total	20	10	8
%	53	26	21

some extent due to COVID-19 restrictions and low purchasing power, community members were still able to eke a living out of sales of firewood. However, they feared that the current accelerated exploitation of forest resources threatened sustainable forest management which will affect women the most. In fact, women's groups felt that there was need to diversify livelihoods and explore other ways of trading forest products due to COVID-19 restrictions especially if the pandemic is not contained in the short-term. Women, being the most active group in firewood collection and trade are the most affected with COVID-19 restrictions in terms of reduced income generation for household support. Additionally, the women were highly vulnerable to the pandemic due to their social roles (care givers for the sick) in traditional society.

The focus group discussions also indicated that forest-based enterprises are the most affected due to government restrictions related to the COVID-19 pandemic. Forest-based community groups attributed the failure of forest-based enterprises to reduced functions of most players and stakeholders

TABLE 10 *Impact of COVID-19 on the production, Supply, demand and price of some forest products (values are individual respondents)*

Country Name	Impact of COVID-19 on the production, Supply, demand and price of some forest products							
	Timber		Plywood		Poles		Structural wood	
Production	High	Low	High	Low	High	Low	High	Low
Malawi	1	3	1	0	2	0	0	0
South Africa	2	5	2	1	1	2	2	1
Zimbabwe	1	1	1	0	0	1	1	0
Zambia	0	2	0	0	0	0	0	1
ESwatini	0	1	0	1	0	0	0	1
Total	4	12	4	2	3	3	3	3
%	25	75	67	33	50	50	50	50
Supply								
Malawi	3	0	1	0	1	1	0	0
South Africa	1	5	2	1	2	2	2	1
Zimbabwe	2	0	3	0	1	0	1	0
Zambia	0	2	0	0	0	0	0	1
ESwatini	0	1	0	1	0	1	0	1
Total	6	8	6	2	4	4	3	2
%	43	57	75	25	50	50	60	40
Demand								
Malawi	1	3	1	0	2	0	0	0
South Africa	1	5	2	1	2	2	2	1
Zimbabwe	1	1	1	0	0	1	1	0
Zambia	1	1	0	0	0	0	0	1
ESwatini	0	1	0	1	0	1	0	1
Total	4	11	4	2	4	4	3	3
%	27	73	67	33	50	50	50	50
Price								
Malawi	1	3	1	0	1	1	0	0
South Africa	2	4	2	1	3	1	3	1
Zimbabwe	0	1	0	1	0	0	0	1
Zambia	2	0	0	0	0	0	1	0
ESwatini	0	1	0	1	0	1	0	1
Total	5	9	3	3	4	3	4	3
%	36	64	50	50	57	43	57	43

in the forestry sector in respect of COVID-19 government regulations which has generally disrupted forest products supply chains and business.

DISCUSSION

The COVID-19 pandemic has affected SFM functions and units including social, economic and environmental aspects. In the study, 80% of the respondents indicated that it had

affected most activities especially afforestation and reforestation (Table 2). However, in most countries, forestry was declared an essential sector, which allowed for continued activities albeit under strict hygiene observations (Table 3). In terms of the economic aspect, reduced trade activities due to COVID-19 travel restrictions contributed to slower production of some forest related products (Table 10) as well as general investment in the sector by most central governments and private sector. With respect to social aspects, the pandemic has impacted the livelihood of forest dependent communities

through loss of employment (Table 6). The pandemic also affected the environmental aspect of SFM through reduced activities in forest restoration as well as general management of forests in the communities.

With respect to the environment, the results show that forest cover is facing enormous pressure including illegal logging, forest fires and to a lesser extent land fragmentation and agricultural expansion (Table 5). There is a likelihood that these challenges have been exacerbated during the pandemic. For example, a decrease in-ground monitoring could have accelerated illegal timber extraction (Table 5). In addition, it is possible that there has been an increase in the migration of urban settlers to rural areas in order to seek alternative livelihood options or seek refuge from the crisis hotspots of the city. Similarly, the migration from urban to rural areas could potentially increase the spread of COVID-19 to less prepared areas (FAO 2020). Such an exodus could increase the pressure on forest resources, thereby causing a setback in the fight against deforestation and forest degradation. However, from our study this was not apparent accounting for only 17% of a possible contribution to forest cover change.

Additionally, conservation activities and tourism have been severely hampered due to the travel restrictions and closure of conservancies and national parks (Table 4). ILO (2020) reports that the pandemic has intensified pressure on forests in some countries. Due to restrictions and consequentially halting of tourism, many park guides and rangers have lost their jobs, resulting in decreased patrols and conservation thereby leaving forests more open to unlawful activities, such as poaching and illegal logging. In southern Africa, Zimbabwe, for example, relies on the steady flow of income from tourists. The safari industry and conservation projects contributed approximately USD 100 million to the industry, about USD 50 million for rural development and over 200 000 jobs in 2019 and in previous years. However, the tourism sector has been greatly hampered by the crisis. This disruption has affected livelihoods, local earnings and community development. The pandemic has thus put rural communities at risk because they could no longer harvest animals and thus, losing food and income (DW 2020). However, over 50% of the respondent (Table 9) indicated that national governments continued to fund the activities. In addition, there have been some interventions through international financing to address the impact of restrictions to natural resource conservation. In a recent report by the Peace Parks Foundation (12 Nov 2020 <https://www.peaceparks.org/eur-4-million-COVID-19-relief-efforts-in-kaza/>), the German Government provided EUR 4 million to the world's largest trans-frontier conservation area (TFCA), the Kavango Zambezi (KAZA) TFCA, to mitigate the devastating repercussions of COVID-19 in four of the Partner States – Angola, Botswana, Zambia and Zimbabwe. The pandemic threatens to negatively impact on decades of conservation work in KAZA and has placed a strain on thousands of livelihoods in vulnerable communities. Various projects will be enabled, with the main efforts directed at the critical protection of livelihoods, by keeping employment in place at community and conservancy level, as well as

implementing work programmes to strengthen food security and minimise the increase in subsistence poaching. This could be a nature-based solution that can be taken by the region to address the socioeconomic impact of the COVID-19 pandemic.

Economically, the COVID-19 pandemic has caused huge disruptions to supply chains of forest products. Our study showed that while the impact of COVID-19 on the production of timber was low, both the production and supply of most value-added products was highly affected (Table 10). These disruptions have jeopardised the domestic and international markets resulting in limited demand and trading opportunities, reduced production, shrinking trade of forest products and export incomes. The restrictions of movement and physical activities have an adverse effect on trade, industrial and manufacturing activities of forest-based industries and this will certainly risk the livelihood of people.

It has been reported that owing to the pandemic and the measures to contain it, the forestry and logging market is expected to globally decline from \$509.8 billion in 2019 to \$494 billion in 2020 (BRC 2020). According to ILO (2020), the global demand for wood and wood products, including tropical timber, graphic paper and wood furniture, has fallen, thus, forest-related industries have not been able to continue operating at full capacity. These challenges have been intensified by the other sectors which are intricately linked to forests and forestry, such as transportation, forest-based recreation and tourism (see Table 8), and sectors that use wood as a raw material, including construction and automotive manufacturing. Although not identified in this study, other studies have reported that there has been stable or even increased demand for other forest-based products, including packaging materials, wooden pallets and tissue for toilet paper and masks. Demand for forest products (including non-wood forest products) such as essential raw materials for sanitary and hygiene products, ethanol for sanitizer, biomass for heating, household paper product, respiratory paper and parcel packaging has also been rising steadily (FAO 2020).

CONCLUSION AND RECOMMENDATIONS

Livelihoods of forest-dependent people in the Southern Africa region have been hit hard by the COVID-19 pandemic. For instance, in South Africa, the forest sector employs more than 236, 502 people (Clarke 2018), and it is estimated that, with the exception of South Africa, over 90 percent of households in southern Africa use charcoal and the rural community mostly depend on forests for their livelihoods (Dziba et al. 2020). Impacts to the forest industry and people's access to forest resources have affected incomes, livelihoods and forest resources.

This study indicates that COVID-19 has had a significant impact on the forest industry in varying degrees. South Africa, the most industrialized country in SADC, categorized commercial forestry as an essential sector of the economy and therefore allowed it to continue operating, albeit at a reduced scale due to the observance of the COVID-19 hygiene rules and regulations. There was generally a reduced demand and

supply of the forest products both locally and internationally exacerbated by land borders and seaport restrictions/closures.

Socially, most communities felt that they were not impacted significantly at the level of forest resource use for local consumption. In fact, due to reduced monitoring of the forest resource, communities had unfettered access. However, the restrictions to movement and closure of local markets significantly affected their ability to generate income from the trade of forest produce.

Specifically, with respect to sustainable management of natural resources, the restrictions have impacted on forest management operations including silvicultural and forest protection for both natural forests (protected/nature conservancy areas) and the commercial forest industry (especially in South Africa). The livelihood of communities reliant on employment in nature-based programmes and/or projects has been affected due to retrenchment or reduced hours of employment. In the forestry industry, the restrictions have affected production and international trade resulting in reduced export of forest products. In some cases, governments have instituted interventions to respond to the COVID-19 pandemic with some form of economic stimuli but mainly prioritized health (personal protective equipment (PPE)), education and areas of immediate economic impact at the expense of the natural resource. Notwithstanding, other countries such as South Africa categorized the forest industry as an essential service enabling production thereby protecting the industry. The long-term impact of COVID-19 on sustainable management of forest resources will mostly be on reduced management operations as well as possible increase in illegal logging and overexploitation of both timber and non-timber forest products, and land conversion to agriculture.

Countries in the SADC region should seek to promote development of green recovery programmes and/or projects that are nature-based and community-based focusing on youth involvement. Individual countries or the region should identify bilateral and multilateral funding agencies that are amenable to funding green recovery programmes including climate change with nature-based solutions looking forward to the post-COVID-19 era. Evaluation of long-term impacts of the pandemic on the environment should be undertaken especially on the land use cover change and forest species composition and structure, and on wildlife populations. Where interventions have not been implemented in the region, there is a need to explore the introduction of measures to help forest enterprises with special emphasis on supporting the most vulnerable enterprises, including SMEs and those in the informal economy. Such measures could include tax reductions and delayed payments, favourable interest rates, additional credit lines, and direct subsidies for salaries in the forest sector.

Monitoring of the resource is a problem during the pandemic, there is need, therefore, to explore or incentivize community monitoring, in particular using IT and mobile technologies to reduce dependency on physical monitoring by governmental agents. Future interventions should recognize the link to other programmes such as climate change, which have similar impacts on forest resources and therefore warrant similar adaptation and mitigation measures.

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REFERENCES

- Africa Centre for Disease Control; <https://africacdc.org/Covid-19/> Accessed on 4th November 2020.
- ATTAH, A.N. 2020. Initial Assessment of the impact of COVID-19 on sustainable forest Management. Available at: <https://www.un.org/esa/forests/wp-content/uploads/2021/01/Covid-19-SFM-impact-Africa.pdf>.
- BUSINESS RESEARCH COMPANY (BRC). 2020. Forestry and Logging Global Market Report 2020-30: COVID-19 Impact and Recovery. Available at: <https://www.researchandmarkets.com/reports/5022344/forestry-and-logging-global-market-report-2020> Accessed on 30th October 2020.
- CLARKE, J. 2018. Job creation in agriculture, forestry and fisheries in South Africa: An analysis of employment trends, opportunities and constraints in forestry and wood products industries Working Paper 52, Institute for Poverty, Land and Agrarian Studies (PLAAS).
- DEUTSCHE WELLE (DW). 2020. COVID-19 endangers Africa's rural economies as conservation efforts come under strain. Available at: <https://www.dw.com/en/COVID-19-endangers-africas-rural-economies-as-conservation-efforts-come-under-strain/a-53599853> Accessed on 4th November 2020.
- DZIBA, L., RAMOELO, A., RYAN, C., HARRISON, S., PRITCHARD, R., TRIPATHI, H., SITAS, N., SELOMANE, O., ENGELBRECHT, F., PEREIRA, L., KATERERE, Y., CHIRWA, P.W., RIBEIRO, N.S., and GRUNDY, I.M. 2020. Scenarios for Just and Sustainable Futures in the Miombo Woodlands. In: Ribeiro N.S., Katerere Y., Chirwa P.W., Grundy I.M. (eds) *Miombo Woodlands in a Changing Environment: Securing the Resilience and Sustainability of People and Woodlands*. Springer, Cham. https://doi.org/10.1007/978-3-030-50104-4_6
- FOOD AND AGRICULTURE ORGANIZATION (FAO). 2018. *The State of the World's Forests: Forest pathways to sustainable development*. Rome: FAO, 139 pp.
- FOOD AND AGRICULTURE ORGANIZATION (FAO). 2020. The impacts of COVID-19 on the forest sector: How to respond? Rome <https://doi.org/10.4060/ca8844en>.
- GUMBO, D.J., DUMAS-JOHANSEN, M., MUIR, G., BOERSTLER, F., and ZUZHANG, X. 2018. Sustainable management of Miombo woodlands: food security, nutrition and wood energy. FAO.
- International Labour Organization (ILO) Sectoral Brief. 2020. Impact of COVID-19 on the forest sector file:///C:/Users/u04411315/Downloads/wcms_749497.pdf Accessed 18th December 2020.

- MILLENNIUM ECOSYSTEM ASSESSMENT. 2005. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.
- MONTES, J., SILWAL, A., NEWHOUSE, D., CHEN, F., SWINDLE, R. and TIAN, S. 2020. How Much Will Poverty Rise in Sub-Saharan Africa in 2020? Available at: <http://documents1.worldbank.org/curated/en/607011589560173878/pdf/How-Much-Will-Poverty-Rise-in-Sub-Saharan-Africa-in-2020.pdf> Accessed on 29th October 2020.
- NAAZIA, E., and WENG, X. 2016. Why Africa's forests are important – for its people, for China, and the world: An infographic presentation for the China-Africa Forest Governance Learning Platform. *International Institute for Environment and Development*. <http://www.jstor.com/stable/resrep02703>.
- RIBEIRO, N.S., KATERERE Y., CHIRWA, P.W., and GRUNDY, I.M. (eds) 2020. *Miombo Woodlands in a Changing Environment: Securing the Resilience and Sustainability of People and Woodlands*. Springer, Cham. https://doi.org/10.1007/978-3-030-50104-4_1
- World Health Organisation, www.Covid19.who.int/ Accessed on 27th October 2020.