FRANKFURT ZOOLOGICAL SOCIETY

COVID-19 IMPACTS ON CONSERVATION PROJECTS AND PROTECTED AREAS

An insight into the impacts of the COVID-19 pandemic experienced by Frankfurt Zoological Society projects and supported protected areas between March 2020 and September 2020

MAKING CONSERVATION COUNT

About the report

This report is based on an online survey conducted in September 2020 with conservation practitioners from the Frankfurt Zoological Society (FZS) and partner organizations on the perceived impacts of COVID-19 on biodiversity conservation. The survey is part of a broader study led by FZS to understand the impacts of the pandemic on protected areas.

Author note

The interpretation of the results and conclusions presented in this report must account for the study's limitations. First, readers must acknowledge that the study is based on reports from conservation practitioners and managers. Although these stakeholders are believed to be well-acquainted with the broad and multiple impacts of COVID-19 on projects and protected areas (PAs), they provide only a specific perspective. The views of other important stakeholders, such as donors or local communities, are not captured in this study. Moreover, the reliance on reports, respondent's perceptions, and estimations are sensitive to inaccuracies and biases that are difficult to identify. However, at this early stage and given the current situation, reports are among the best data to gather a broad and quick overview of current pandemic impacts. Second, the representativeness and generalizability of this study's results and conclusions are constrained by the inherent biases of the study sample – which is restricted to the Frankfurt Zoological Society projects and some of the PAs where these operate. Still, this study is unique in providing an in-depth and comprehensive insight into what happened from the outbreak of the COVID-19 pandemic until the end of September 2020 across multiple regions worldwide. Finally, it is important to acknowledge that the events are still unfolding and the impacts reported here provide only a snapshot, and they are rapidly changing. Despite this uncertainty, there is a considerable need for identifying patterns and learning lessons that can be used to inform management in the short and medium-term.

All respondents to this survey were granted anonymity. However, their answers are occasionally quoted to illustrate frequently reported or interesting impacts and facts.To contextualize and facilitate interpretation of these quotes, we provide information on the geographic area of the project or PA for which the respondent completed the survey.

Acknowledgements

We thank the respondents from FZS projects and partner organizations who, during the challenging times of COVID-19, found the time to respond to the questionnaire on which this report is based.

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Front cover picture:

Staff from the Frankfurt Zoological Society in Perú during the yearly Giant Otter Monitoring in November 2020, after COVID-19 restrictions were slightly eased in the country

Contents

SUMMARY

The COVID-19 pandemic is a major human catastrophe with cascading impacts that extend beyond public health. This report summarizes the results of a survey conducted by the Frankfurt Zoological Society (FZS) in September 2020 to gather insights on the observed impacts of COVID-19 across most of the projects implemented by the organization and a sample of protected areas (PAs) where FZS works (i.e., "supported PAs"). Data were collected for 23 FZS project areas and 29 PAs supported by FZS, spanning 17 countries and four continents.

Although the overall impacts of COVID-19 have emerged as generally negative for FZS projects and especially for PAs, other problems remain a greater challenge in some countries (e.g., internal conflicts in Colombia or Belarus). According to the results of this survey, the pandemic has affected all dimensions of FZS projects and PAs – from funding to threats.

At the time this study was conducted, the pandemic had not resulted in funding losses for FZS projects. However, several PAs where FZS works had suffered from reductions in state funding and tourism revenues. Fortunately, private and public donors largely maintained their support to FZS projects and PAs. Still, some donors warned of a potential reduction or withdrawal of their support depending on the pandemic's development. The higher resilience of FZS finances and the increased financial support to PA partners are likely to have mitigated some of the negative impacts of COVID-19 on PA finances. In fact, many FZS projects had to reshuffle their budgets, and some made use of contingency budgets and emergency funding to increase their support to partners and PAs. Financial adjustments were made to accommodate delays in project implementation and a sudden but urgent need to address new activities related to the pandemic (e.g., public health measures, health assistance to partners).

Fortunately, the reductions in PA budgets had had limited cascading effects on human resources, and the employment of permanent staff had been relatively secured in almost all PAs. However, some reported that temporary staff had been laid-off and staff income had been reduced. Still, the most common impacts of COVID-19 on human resources of both FZS projects and PAs were related to (i) struggles working remotely/in home-office and (ii) negative impacts on staff morale.

The restrictions implemented to contain the pandemic challenged and limited the implementation of conservation activities. On average, 70-80% of the planned and regular activities could be implemented over the first six months of the pandemic. However, some of the PAs' and projects' activities suffered delays and were suspended, at least temporarily. Regionally, operations were most negatively affected in South America due to the strict and long-lasting COVID-19 restrictions. But even there, respondents reported that activities were slowly re-starting as restrictions were eased. In PAs, the restrictions had caused a widespread reduction and cancellation of both training activities and regular engagement/support with local communities. Nevertheless, some PAs and FZS projects reportedly provided emergency assistance to local communities affected by the pandemic (e.g., food and health support). Despite this additional support, nearly half of the practitioners that participated in our survey believed that COVID-19 had caused an overall reduction in the benefits that local communities used to get from conservation. This, coupled with the economic hardship triggered by COVID-19 and, occasionally, migration from urban to rural areas, was believed to be causing an increase in threats and illegal activities in and around PAs.

Across African PAs, there were reports of increased illegal use of natural resources, mostly bushmeat hunting, but no reports of increased hunting of commercially highly-valued species such as elephants and rhinos. Threats like drug-trafficking and gold mining increased in many South American PAs, presumably because of local economic hardship and reduced or lack of patrols. PAs in Central and Eastern Europe that had experienced an increase in domestic tourism during the pandemic also reported an increase in threats and disturbances caused by visitors. In contrast, such threats were considerably reduced elsewhere, as tourism had considerably or entirely decreased.

Regular patrols (i.e., ground or boat patrols) were reported to remain unchanged in 41% of the PAs, but they were reduced or stopped altogether in a third of the sites. Meanwhile, in about one fifth of the PAs globally, patrolling was reported to intensify in response to an anticipated or observed increase in illegal activities and threats. Regionally, patrols were relatively least disrupted in Europe and Africa and worst affected in South America.

Despite all the above, respondents also recognized that several opportunities and lessons had emerged from the pandemic. For example, partnerships between FZS and government authorities/PA staff were reported as mostly unaffected or even improved. Improved partnerships were attributed to the rapid response by FZS in supporting heavily affected partners. A few FZS projects and PAs also benefited from strengthened partnerships with local communities.

Many respondents reported on the opportunity to draw lessons from the challenges experienced throughout the first months of the pandemic. For instance, many learned about the importance of collaboration, strong partnerships, and regular communication with stakeholders, donors, and local communities. Out of the necessity to communicate and meet virtually with partners and colleagues, FZS staff could recognize some of the benefits of virtual meetings – including saving time and reducing expenses. However, the pandemic also evidenced an urgent need to strengthen the capacity of FZS projects and PAs for remote communication and implementation. On a more general level, PAs and FZS projects admitted a lack of preparedness to deal with the pandemic and recognized the importance of planning for other unforeseen crises and shocks. COVID-19 also revealed the vulnerabilities of current conservation financing models, and many respondents recognized the need to build more resilient funding streams for both PAs and FZS projects.

Respondents were uncertain but concerned about the potential short-term impacts of COVID-19 on the multiple dimensions of FZS projects and PAs. One of the main concerns was the anticipation of further funding cuts resulting from global and national economic downturns and a shift in donor priorities away from conservation. Respondents were also worried about further increases in threats and pressures to PAs resulting from the pandemic. Finally, there were concerns about further delays or difficulties in implementing activities and operations if COVID-19 restrictions continued or intensified.

Summary figure – Regional average impacts of COVID-19 on FZS's projects and supported protected areas

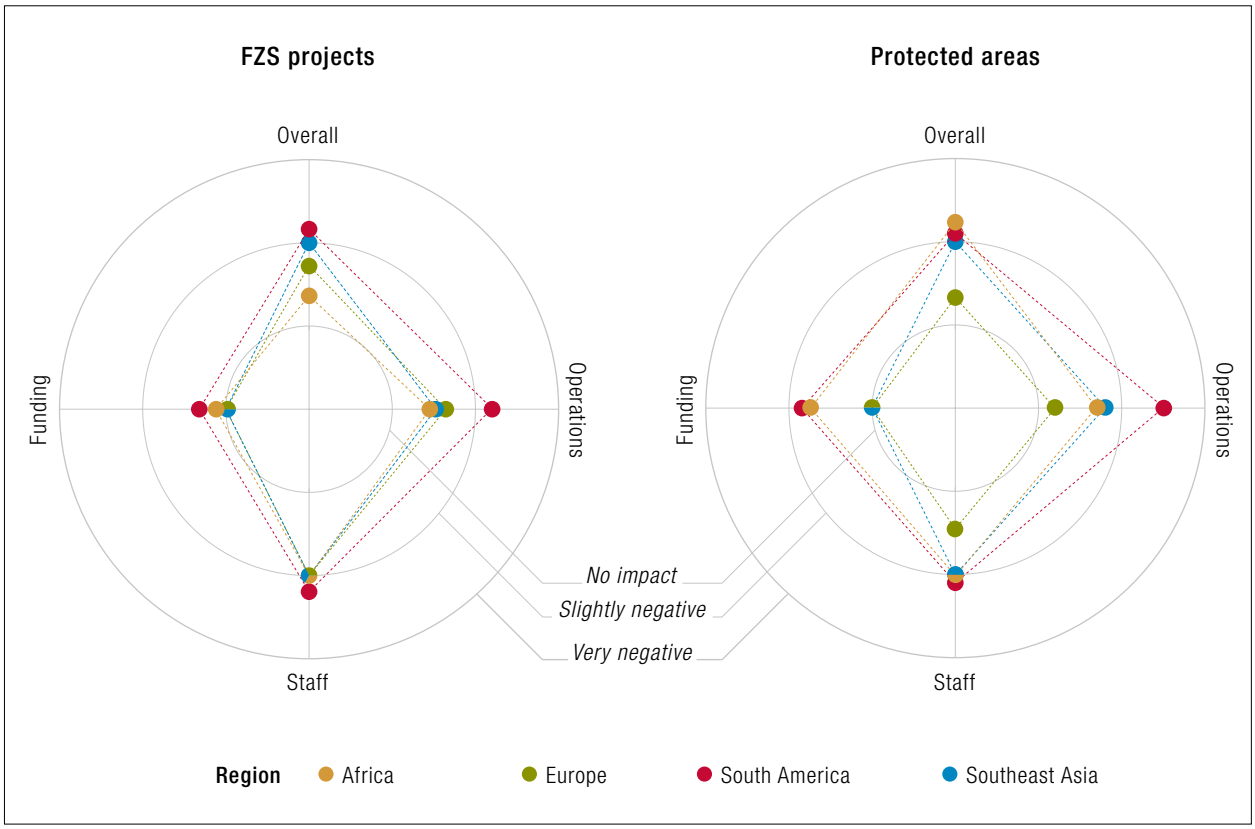


FIG. A1 *Radar chart showing the average reported impacts of COVID-19 on the Frankfurt Zoological Society's (FZS) projects and protected areas (PAs) where these operate. The average reported impacts are provided for three dimensions including funding, staff, and implementation of activities (operations). Outer values represent more negative impacts; central points indicate "no impact". Sample sizes: FZS projects: Europe n=7, Africa n=6, South America n=6, Southeast Asia n=2; PAs: Europe n=9, Africa n=8, South America n=10, Southeast Asia n=2.*

1. INTRODUCTION

1.1. STUDY AREAS

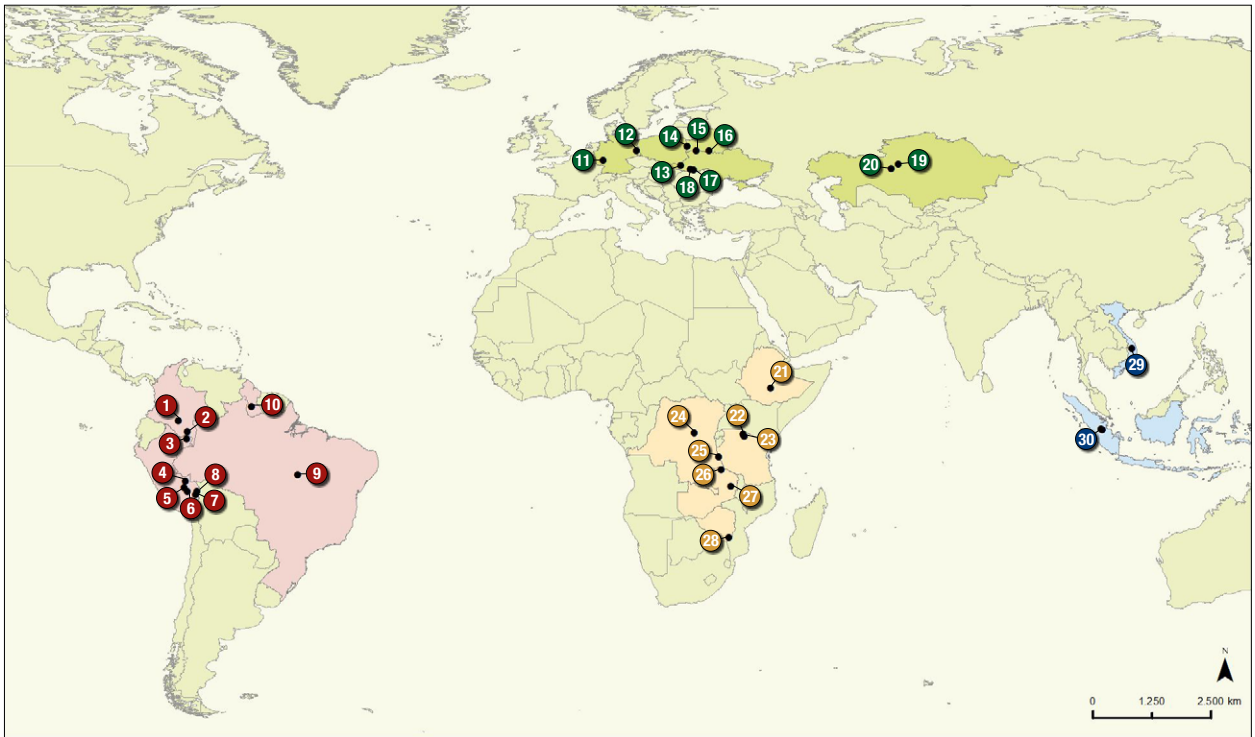
The Frankfurt Zoological Society (FZS) coordinates 29 projects that support over 60 protected areas (PAs) across 18 countries and four continents. The support provided from FZS projects to these PAs ranges from indirect technical and financial support to formal co-management.

From the early start of the COVID-19 pandemic, FZS realized the potential impact it could have on conservation and PAs and initiated a comprehensive study to monitor and understand these impacts. The study ultimately aims to draw lessons and inform conservation strategies and PA management.

As part of this study, in September 2020, FZS launched an online survey to gather insights on the observed and expected impacts of COVID-19 on most of its projects and a sample of PAs and sites where it operates (hereafter referred to as "supported PAs"). The survey was completed by FZS staff responsible for managing and coordinating projects, PA managers, and other conservation practitioners. In total, data were collected for 23 of the projects run by FZS and for 29 PAs supported by FZS located across 17 countries and four continents (Map 1, Table 1).

This report collates the information gathered via this survey to provide a comprehensive overview of the early impacts of the COVID-19 pandemic across four regions: Europe (including Central, Eastern Europe, and Kazakhstan), Sub-Saharan Africa (including East and Southern Africa, as well as the Democratic Republic of Congo; and hereafter referred to as "Africa"), South America, and Southeast Asia (namely Vietnam and Indonesia).

Location of protected areas included in this study



1 Chiribiquete NP
2 Cahuinari NP
3 Yaguas NP
4 Alto Purus NP
5 Manu NP
6 Amarakaeri CR
7 Bahuaja-Sonene NP
8 Tambopata National Reserve
9 Cantao State Park
10 Kanuku Mountains PA
11 Wispertaunus PA
12 Lieberose Private WA
13 Bieszczady NP
14 Bialowieza
15 Pripyat-Stokid NP
16 Pripyatsky NP
17 Hutsulshchyna NP
18 Carpathian NNP
19 Altyn Dala State NR
20 Irgyz-Turgay-Zhylyansyk State NR
21 Bale Mountains NP
22 Ikona WMA
23 Serengeti NP
24 Lomami NP
25 Mahale Mountains NP
26 Nsumbu NP
27 North Luangwa NP
28 Gonarezhou NP
29 Kon Ka Kinh NP
30 Bukit Tiga Puluh, ERC FMU 16

Map 1. World map showing the location of the protected areas (PAs) included in the study. The full name of the PAs can be found in Table 1.

Frankfurt Zoological Society's (FZS) projects and supported protected areas included in this study.

TABLE 1. Frankfurt Zoological Society's (FZS) projects and protected areas where those projects operate that are included in this study. (*) Europe also includes Kazakhstan, according to FZS internal structure. NA: Information of impacts at the project/PA level not included in this study.

	Country	Program / Project	National Park / Protected Area
Europe*	Ukraine	Protection of old-growth forests in the Ukrainian Carpathians	Carpathian National Nature Park
			Hutsulshchyna National Park
	Belarus & Ukraine	Polesia	Pripyat-Stokhid National Nature Park
			Prypiatsky National Park
	Poland, Slovakia, and to a lesser extent Ukraine	Wolf Mountains	Bieszczady National Park
	Poland and Belarus	Preservation of the Bialowieza-/ Bielaviežskaja-Pušča forest	NA
	Germany	Wispertaunus	Wispertaunus Protected Area
	Germany	Wilderness in Brandenburg	Lieberose Private Wilderness Area
	Kazakhstan	Protection of the Saiga antelope and steppes	Altyn Dala State Nature Reserve
			Irgyz-Turgay-Zhylyansyk State Nature Reserve
Africa	Tanzania	Serengeti Conservation Project	Serengeti National Park
	Tanzania	Serengeti Ecosystem Management	Ikona Wildlife Management Area
	Tanzania	Mahale Conservation Project	Mahale Mountains National Park
	Ethiopia	Bale Mountains Conservation project	Bale Mountains National Park
	Zambia	North Luangwa Conservation Program	North Luangwa National Park
	Zambia	Nsumbu Tanganyika Conservation Project	Nsumbu National Park
	Zimbabwe	Gonarezhou Conservation Trust	Gonarezhou National Park
	Democratic Republic of Congo	Protection of Lomami National Park	Lomami National Park
South America	Peru	Manu Landscape Conservation Program	Manu National Park
			Amarakaeri Comunal Reserve
	Peru	Bahuaja Sonene – Tambopata Landscape Conservation Program	Bahuaja-Sonene National Park
			Tambopata National Reserve
	Peru	Yaguas Landscape Conservation Program	Yaguas National Park
	Peru	Alto Purus Landscape Conservation Program	Alto Purus National Park
	Colombia	Conservation of Chiribiquete National Park and its greater landscape	Chiribiquete National Park
			Cahuinarí National Park
	Guyana	Management of Kanuku Mountains Protected Area	Kanuku Mountains Protected Area
	Brazil	NA	Cantao State Park
Southeast Asia	Indonesia	Bukit Tiga Puluh Landscape Conservation Program	Ecosystem Restoration Concession/Forest Management Unit 16 area/Bukit Tiga Puluh National Park
	Vietnam	Forest Protection in the Highlands of Central Vietnam	Kon Ka Kinh National Park

1.2. COVID-19 SITUATION IN THE STUDIED COUNTRIES

By the end of September 2020, COVID-19 had affected all of the countries where FZS operates included in this study. However, there had been remarkable differences across and within regions regarding the intensity and duration of the first wave of the pandemic and the measures implemented to contain it (Fig. 1). Most notably, South American countries had been, by far, the hardest hit by the pandemic and had experienced long-lasting stringent public health restrictions (e.g., lockdowns). Across the countries included in the FZS Europe Program, the impact of COVID-19 and government response were rather diverse. Except for Belarus, which had the least stringent public health restrictions in the Europe region, all countries imposed severe international travel restrictions. Countries included in the FZS Africa Program had relatively lower numbers of reported COVID-19 cases and deaths (both in absolute and relative terms) than countries of other regions. There, Tanzania had the lowest number of reported cases and deaths and the least stringent restrictions (the country stopped reporting COVID-19 cases in May 2020).

Respondents of this survey perceived that limitations and bans on international and domestic travel were the most disruptive COVID-19 restrictions. In South America, lockdowns were often reported as very disrupting for FZS projects and for PAs.

Both FZS projects and PAs implemented several protocols and measures to minimize the spread of SARS-CoV-2 among staff and stakeholders. These measures were based on World Health Organization and national recommendations. They included but were not restricted to the use of masks and protective gear, implementation of rapid COVID-19 tests and quarantine protocols, awareness-raising on disease prevention, physical distancing and use of open-air spaces, home-office and reduction of personnel numbers in offices and meetings, new and extended rotation schedules, restrictions on staff travel and movement, and restricted contact with local communities.

COVID-19 context in study countries

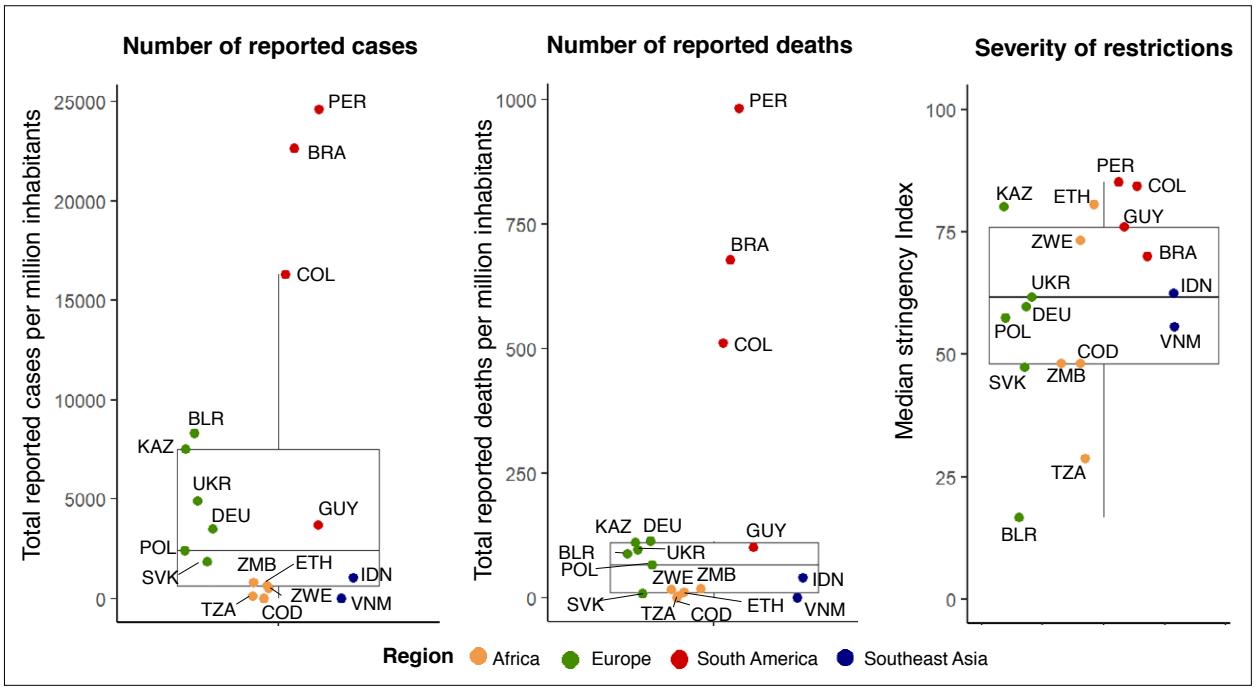


FIG 1. Total reported COVID-19 cases and deaths and average stringency of government containment response by 30th September 2020 in the countries (dots) and regions (colors) included in this study. The central hinge of box plots corresponds to the median, and the lower and upper hinges correspond to the first and third quartiles (25th and 75th percentiles). The whiskers correspond to the largest and smallest value no further than 1.5 IQR from the hinge. No variable is plotted along the X-axis. Data retrieved from: Our World in Data. Stringency Index retrieved from: Oxford's Government Response Tracker.

2. REPORTED COVID-19 IMPACTS

2.1. OVERALL IMPACT OF COVID-19 ON CONSERVATION EFFORTS

The COVID-19 pandemic has had an unprecedented impact on our societies, with implications that extend beyond public health. Biodiversity conservation efforts and PAs have also been affected by the direct and indirect impacts of the COVID-19 pandemic, with concerns on the medium and longer-term impacts widely voiced across the press [e.g. 1, 2] and scientific literature [e.g. 3, 4, 5, 6, 7] The reported and feared impacts of COVID-19 affect all aspects of PAs, from budgets to wildlife and local communities.

This rapid assessment of the impacts of COVID-19 on FZS projects and PAs revealed that both had been hit in various ways by the pandemic and the governmental restrictions implemented nationally and internationally. Although some trends emerged, there was high heterogeneity in the impacts, which can be explained by factors that include the extent of the public health crisis in the respective country but also pre-existing factors and characteristics of the project/PA.

FZS Projects

The vast majority of FZS projects (83%) reported an overall negative impact from COVID-19. Interestingly, however, a few projects in Europe and Africa reported that the impact of COVID-19 had been either negligible, neutral, or even positive (as was the case for two of the FZS projects operating in Tanzania). The perception of an overall positive impact was justified by a strengthened relationship with partners and the reception of additional funding.

The impacts of COVID-19 on project operations (e.g., meetings, environmental education, community activities) were often reported to be the worst consequence of the pandemic so far (Fig. 2). Restrictions on domestic and international travel, challenges in international cooperation, and impacts on staff were also among the most commonly perceived negative impacts of the pandemic by the time the survey was conducted. Interestingly, at least on a global level, impacts on project finances did not emerge as a frequently perceived "most negative impact" of the pandemic on FZS projects.

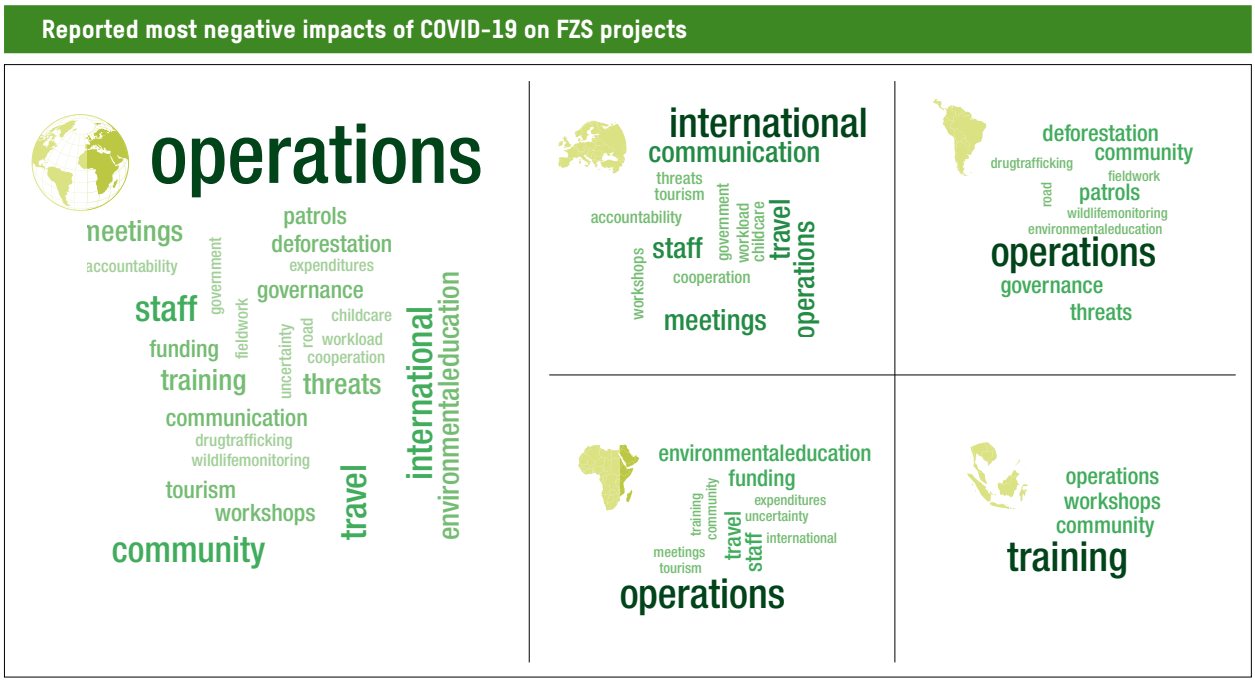


FIG. 2. Word clouds showing the COVID-19 impacts perceived to have been the most negative for Frankfurt Zoological Society's projects. The results are provided both for the total sample (largest word cloud to the left) and by regions (smaller word clouds to the right, indicated by the corresponding region's silhouette). Darker colors and larger sizes indicate more frequently reported impacts. Sample sizes: Global n=23, Europe n=7, Africa n=6, South America n=6, Southeast Asia n=2.

Supported Protected Areas

All things considered, the impact of COVID-19 on the vast majority of PAs (79%) was reported to be negative, including nearly a fifth reporting very negative impacts. Respondents considered that the most negative impacts of COVID-19 on PAs were an exacerbation of PA threats (n=12), reductions on PA funding streams (n=9), the collapse of tourism (n=7), and the cancellation and reduction of several PA operations (n=9, Fig. 3).

Eight out of every ten PAs reported an overall negative impact of COVID-19

Overall positive impacts were reported only in two European PAs – in the Ukrainian Polesia and Poland, where national tourism and tourism income had increased as a result of the pandemic.

Reported most negative impact of COVID-19 on protected areas

FIG. 3. Word clouds showing the COVID-19 impacts perceived to have been the most negative for protected areas included in the study. The results are provided both for the total sample (largest word cloud to the left) and by regions (smaller word clouds to the right, indicated by the corresponding region's silhouette). Darker colors and larger sizes indicate more frequently reported impacts. Sample sizes: Global n=29, Europe n=9, Africa n=8, South America n=10, Southeast Asia n=2.

2.2. COMMUNICATIONS AND PARTNERSHIPS OF FZS PROJECTS

The vast majority of FZS projects (87%) reported that COVID-19 had negatively impacted their governmental partners. Partners in African and South American countries were reportedly most negatively impacted. The only African project reporting no significant impact of COVID-19 on its government partner was the FZS project in Democratic Republic of Congo – the only FZS project currently implemented in Central Africa.

Communications between FZS staff, government authorities, and PA staff were reported to be negatively impacted in most FZS projects. However, partnerships were mostly unaffected or even improved as a result of the COVID-19 pandemic – especially across Europe and Africa (Fig. 4). Improved partnerships resulted from the rapid response by FZS to support heavily affected partners (Fig. 4).

"Communications in our project were mainly affected with indigenous communities due to their remoteness, lack of means of communication and transportation."
(respondent – FZS project, South America)

Partnerships between FZS and PA staff and government agencies were relatively unaffected (especially across Europe and Africa) and occasionally even strengthened thanks to the provision of rapid emergency support.

The vast majority of respondents reported that communications between FZS projects and local and indigenous communities had been weaker than before the pandemic (Fig. 4). Partnerships with local and indigenous communities were also perceived to be negatively impacted in half of the projects, primarily because of the heavily impaired communication with them (Fig. 4). Weakened partnerships with local communities were more frequently reported across FZS projects in South America, probably because of the remoteness of both the project areas and the local and indigenous communities therein (Fig. 4). Moreover, many indigenous communities in South America explicitly requested not to be contacted to avoid being infected with the disease. Only a few projects in Africa and South America reported that partnerships with communities had been improved, which was attributed to the provision of additional emergency support and the maintenance of jobs and salaries for local employees (Fig. 4).

Reported COVID-19 impact on FZS's communications and partnerships

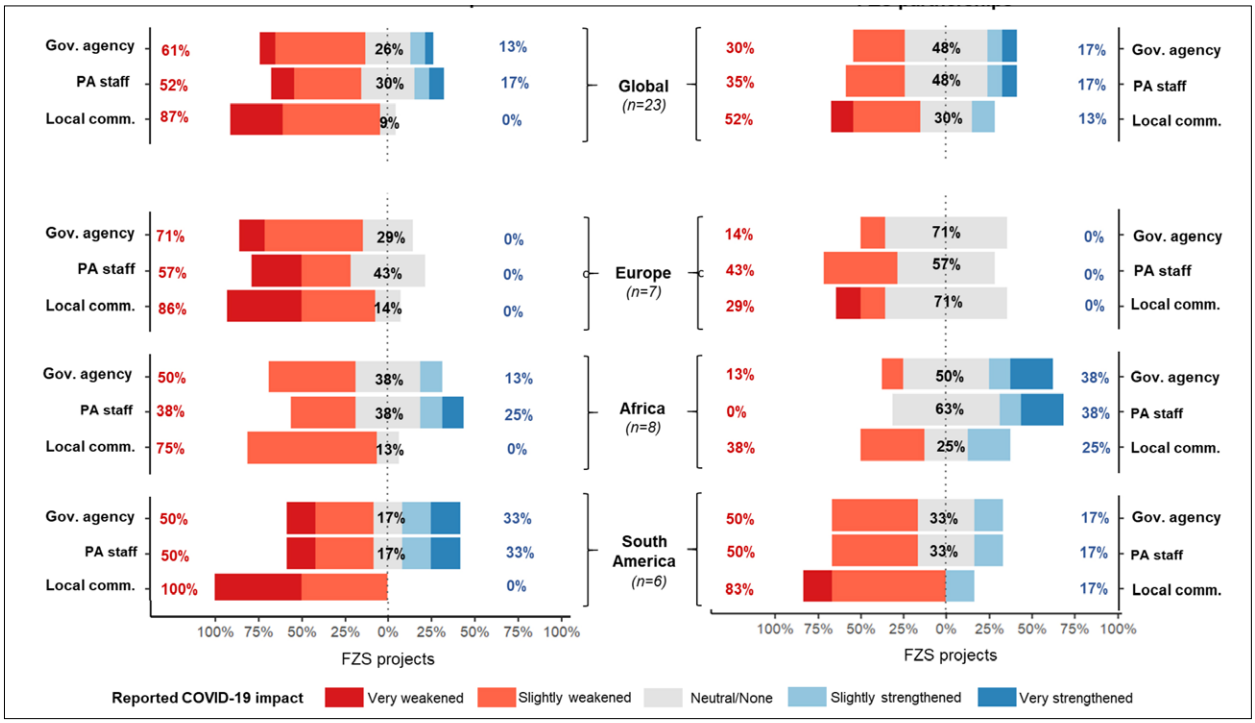


FIG. 4. Reported COVID-19 impacts on communications and partnerships between Frankfurt Zoological Society's (FZS) projects and key partners: environmental or conservation national agencies and ministries (gov. agency), staff and authorities from individual protected areas (PA staff), partner NGOs, and local and indigenous communities (Local comm.). Results are provided both for the total sample and by regions. Percentages are calculated based on the grouping of negative, neutral, and positive reported impacts, but the color code allows for further differentiation on impact levels. n: sample size.

2.3. CONSERVATION FINANCES

FZS Projects

A large number of FZS projects (61%) had to reshuffle their project budgets due to the COVID-19 pandemic, particularly those of the Africa and South America programs. Some projects also made use of contingency budgets. These changes were made to accommodate delays in the implementation of planned activities as well as the need to implement new activities in response to COVID-19. FZS (via its core funds), private donors, and public donors (to a lesser extent) allowed a reasonable degree of flexibility in this regard.

Respondents reported that some donors had warned of the possibility to reduce or withdraw support if their own finances ended up affected by the COVID-19 crisis. As reported by one of the FZS projects in East Africa, some donors also considered withdrawing their commitments as they "questioned whether project operations could continue under COVID-19 restrictions and whether staff would need to be laid off."

On a more positive note, some FZS projects reported that they had secured additional third-party funds as a result of COVID-19 and had supported fundraising activities for their partners to cover funding gaps resulting from the pandemic.

Supported Protected Areas

"Our largest donor warned that if there is a downturn in the stock market, it could result in a major change in their ability to provide funds."
(respondent – FZS project in Africa)

The impacts of COVID-19 on PA finances were generally perceived to be negative, particularly in the Global South. The greatest changes in funding adequacy triggered by COVID-19 were reported across South America (with an average reduction of 20% in PA budgets) and Africa (although here, PA finances have been very heterogeneously affected).

By the end of September 2020, cuts in national government budgets associated with the pandemic were reported in about half of the PAs (Fig. 5). Additionally, a few respondents highlighted that some governments had already announced further upcoming budget cuts. Funding gained via entry fees and tourism operations was reported to have decreased in 11 PAs (Fig. 5), including all Southern and East African PAs that participated in the study. The relevance of these losses depended on the extent to which PAs relied on this funding stream. Thus, the impact was most acute in Wildlife Management Areas around the Serengeti National Park (e.g., Ikona Wildlife Management Area), which were almost entirely dependent on tourism revenue, and reported a 100% loss of this funding stream. In contrast, two PAs in Eastern Europe reported increases in tourism revenues as a result of COVID-19, although others in the same country and region reported decreases too.

Other funding streams, such as international public and private donors, were generally reported to have remained unchanged (Fig. 5). A few sites reported an increase in FZS core funds to PAs as emergency funds to cover gaps left by other financial cuts (Fig. 5).

About half of the respondents were somewhat worried, and nearly 40% were very or extremely worried about the impacts that COVID-19 could have on PA finances in the following months. These concerns were most acute in African PAs. Concerns arose from the likely reductions in government funding and international donations – both private and public – due to the anticipated economic recession and shift of priorities away from conservation. PAs highly dependent on tourism income were also worried that this funding stream would be slow to recover.

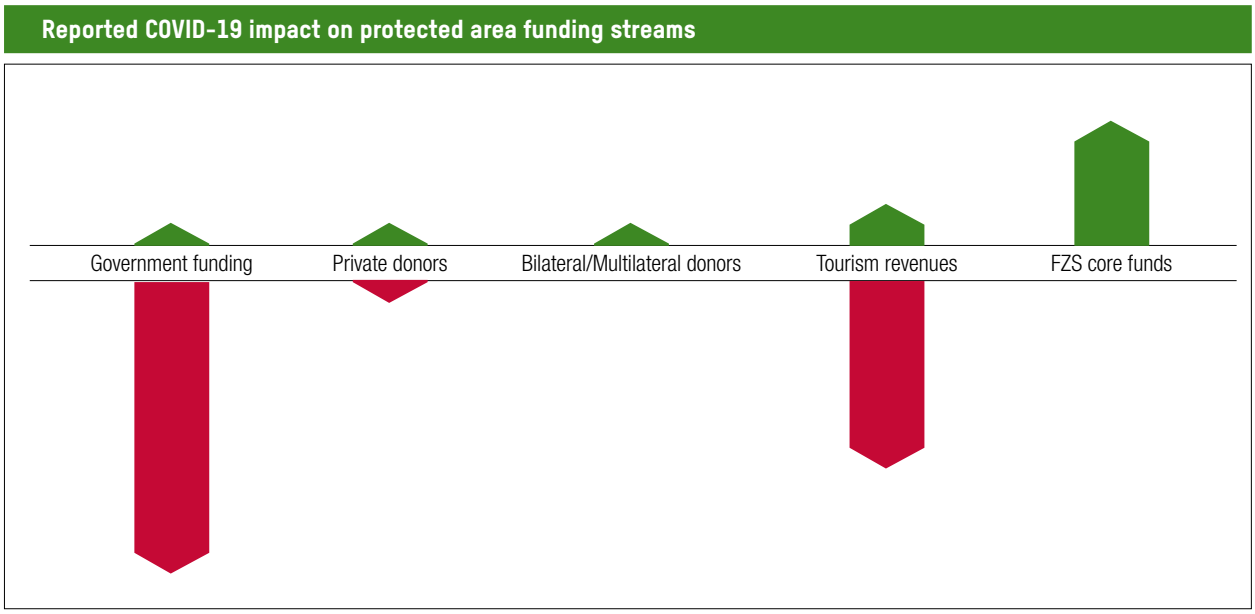


FIG. 5. Frequency of reported increases (green) and decreases (red) in funding streams of protected areas resulting from COVID-19. Arrows are proportional to the number of protected areas reporting the change.

2.4. HUMAN RESOURCES

FZS Projects

Overall, 61% of FZS projects reported negative impacts of COVID-19 on their human resources. Negative impacts were more frequently reported across South American projects due to the more stringent and long-lasting public health restrictions.

The most common challenges experienced by staff across FZS projects included struggles working remotely/in home-office (74%), negative impacts on project staff morale (57%), changes in deployment (52%), and working longer shifts (35%).

Supported Protected Areas

The reported impact of COVID-19 on staff was negative in 66% of the PAs. Negative impacts were less frequently reported in Europe than in the other regions. On average, South American and African PAs reported having suffered more impacts per PA than those in other regions.

All temporary staff previously working in Cantao State Park, in Brazil, has been permanently dismissed. Mahale Mountains National Park, in Tanzania, reported an end to almost all temporary contracts because of a lack of money to pay salaries.

Globally, the most commonly reported impacts on PA staff included struggles to complete work remotely and negative effects on morale. In addition, the staff of some PAs also suffered from changes in deployment, staff sent on paid leave, staff working longer hours, and some experienced income reductions. There were also cases, especially across South America, of COVID-19 infections among staff. Although permanent staff positions had been relatively secure in almost all PAs, dismissals of temporary and casual staff were relatively common (in at least 8 of the PAs included in this survey).

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2.5. CONSERVATION OPERATIONS

FZS Projects

On average, FZS projects were only able to implement 70% of their planned activities. However, the impacts of COVID-19 on project implementation were highly heterogeneous. Operations were most negatively impacted across South American projects due to stringent and long-lasting restrictions. On average, they could only implement 45% of their planned activities.

Project activities reportedly being worst impacted included operations and initiatives that usually took place on-site in the PAs (i.e., fieldwork) as well as activities that involved more than one country. However, at the time of the survey, some activities had already started to reactivate or were about to do so. Activities with local communities and environmental education were the project activities most negatively affected by COVID-19 (according to 61% of respondents).

"Many of our partners had stopped implementing for a while, but are starting up again. FZS never stopped."
(respondent – FZS project in Africa)

Only half of the projects were able to report activities that had benefited from COVID-19. Among those, cooperation and coordination with partners (mostly PA and government authorities) and communications (via the intensification of virtual calls, regular meetings, and catch-ups) emerged as the most commonly benefited activities.

Operations were most negatively impacted across South American projects due to strict and lengthy restrictions.

COVID-19 also triggered the implementation of new activities. These included the support of COVID-19 awareness campaigns with local communities and the provision of health support. FZS projects also supported local communities with food supplies and accessing markets. Moreover, some projects had started to work on building capacity for virtual communications and remote work with and within the project sites, after COVID-19 had evidenced severe weaknesses in this regard.

Supported Protected Areas

On average, PAs were able to implement 80% of their planned activities. However, the impacts of COVID-19 on project implementation were highly heterogeneous, ranging from PAs that were able to implement all of the programmed activities to sites that were unable to execute any operations (Fig. 6). The impacts of COVID-19 on implementation varied regionally. Thus, South American PAs were the most affected and were able to implement, on average, only 40% of their planned operations, mostly due to the stringent and long-lasting public health restrictions. In contrast, European PAs could, on average, implement 90% of their operations. Operations in African PAs were usually only slightly affected, with the exception of Tanzanian sites. There, over half of the regular operations could not be implemented mainly as a result of reduced funding.

Reported COVID-19 impact on protected area operations

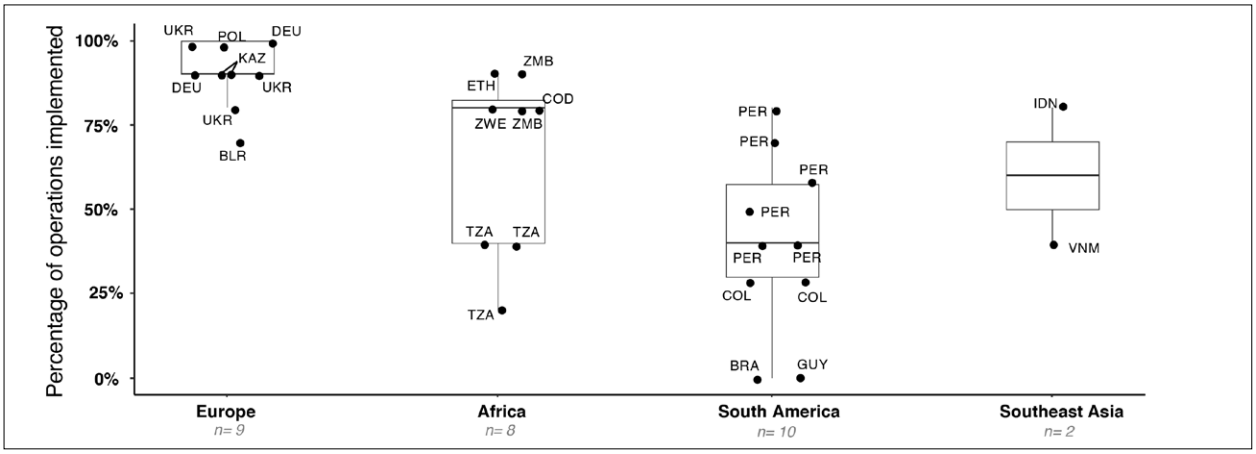

FIG. 6. Extent to which protected areas included in the study were able to execute their planned operations despite COVID-19. The central hinge of box plots corresponds to the median, and the lower and upper hinges correspond to the first and third quartiles (25th and 75th percentiles). The whiskers correspond to the largest and smallest value no further than 1.5 IQR from the hinge. n: sample size.

Not all PA operations were equally affected (Fig. 7). According to the survey, the most disrupted operations were community and training activities, which were reduced or even completely stopped in most PAs across all regions.

In 41% of the studied PAs, regular patrols (i.e., ground or boat patrols) were reported to remain unchanged. However, in about a third of the PAs, patrol levels were reduced or stopped altogether. Meanwhile, in about one fifth of the PAs, patrolling efforts increased in response to an anticipated or observed rise in illegal activities. Regionally, patrols were most negatively affected in South American sites, where 70% of the PAs experienced reductions in regular patrols, including complete halts in Brazil and Guyana. In contrast, there were no reports of significant decreases in patrols across Europe and Africa (with the exception of two Tanzanian sites).

Reductions in biological monitoring activities (i.e., habitat and wildlife monitoring) were reported in about half of the PAs but remained mostly unchanged in the other half. External research projects were canceled or reduced in most PAs across all regions due to the COVID-19 restrictions – although European PAs were slightly less affected in this regard. In some South American PAs, respondents reported that indigenous communities had been able to continue monitoring activities despite the restrictions.

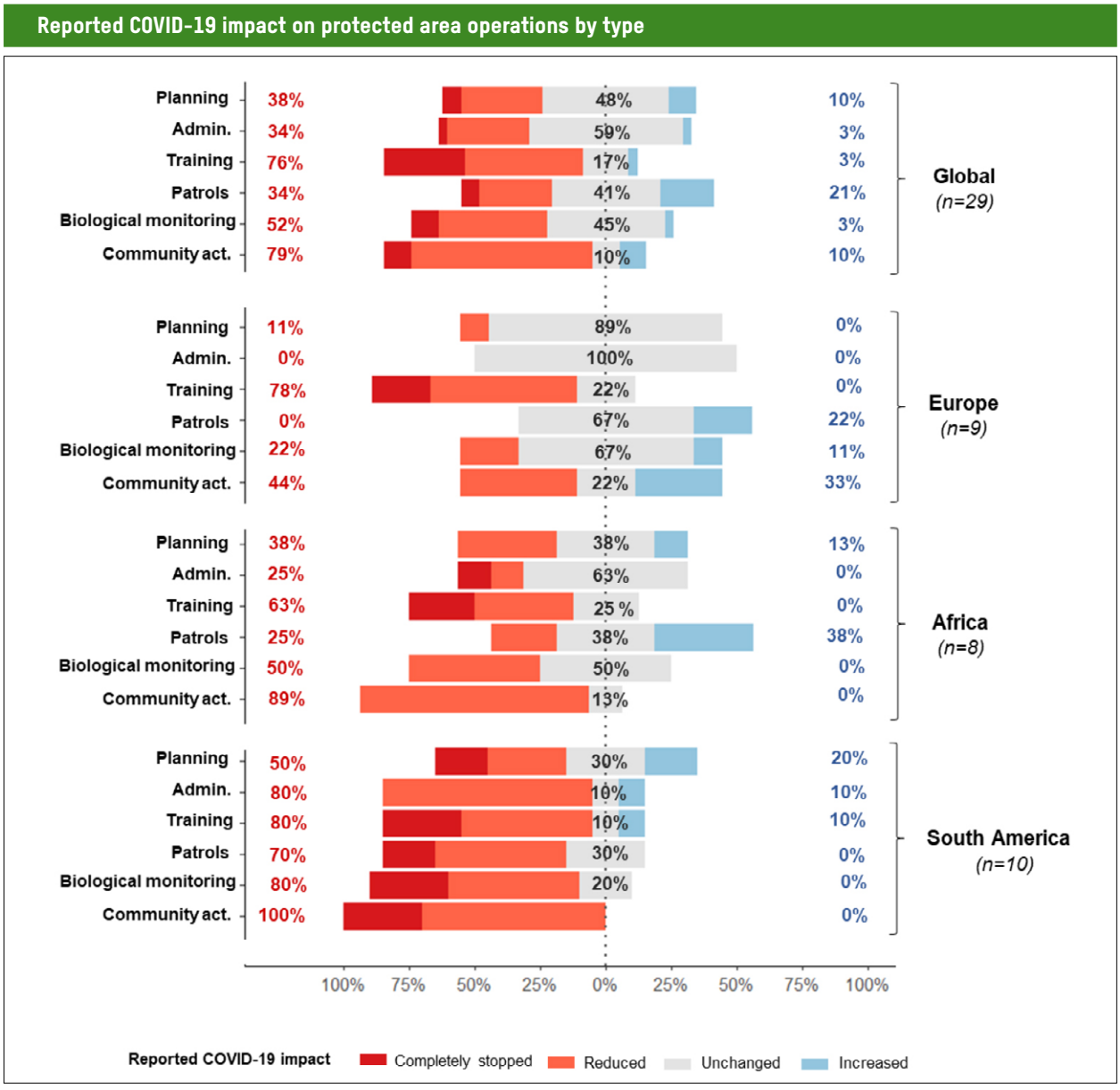

FIG. 7. Reported COVID-19 impacts on key protected area operations at sites included in the study. The results are provided both for the total sample and by region. Percentages are calculated based on the grouping of negative, neutral, and positive reported impacts but the color code allows for further differentiation on impact levels. n: sample size.

Community activities were either reduced or completely stopped in the vast majority of PAs, including all of the PAs in South America, Southeast Asia, and East and Southern Africa. These activities were less affected across European PAs, where about a third of the sites reported that these activities continued unchanged and about a fifth reported increases. Consultation processes operated as normal in only 10% of the PAs. Regular efforts to support local sustainable livelihoods were negatively affected in the majority of PAs but continued or even increased in at least 28% of the PAs. It is important to note that PAs and FZS projects did provide some additional support to local communities on account of the pandemic. However, it emerged from this study that regular initiatives to support community livelihoods were hindered by COVID-19. In addition, follow-up interviews highlighted the heterogenous way in which community engagement has been affected within single PAs – e.g., some communities benefited more than others from additional support triggered by COVID-19. Environmental education activities were also stopped or reduced in 76% of the PAs globally, mostly due to the closure of schools and restrictions on gatherings. However, there were some attempts to implement these activities via virtual platforms, mostly in Europe.

2.6. LOCAL AND INDIGENOUS COMMUNITIES

The survey included questions to gather information on the impacts of COVID-19 on local and indigenous communities and their interaction with conservation actors. These questions tackled issues such as observed changes in population densities around PAs, perceived changes in local benefits, and changes in attitudes towards the PA. However, some respondents found it challenging to provide accurate assessments in this regard, especially when the COVID-19 restrictions had severely impacted communications with local and indigenous communities. Another challenge experienced by respondents resulted from the high heterogeneity among local communities, in their engagement with the PA, and in the impacts of COVID-19 on both. Thus, their answers were meant to provide only general overviews of the situation.

Only five PAs were aware of increases in migratory influxes of people caused by COVID-19 (one in Southern Africa, three in South America, and one in Southeast Asia). Increases in local population numbers reportedly resulted from the return of locals who used to work abroad or in urban areas and had lost their jobs due to COVID-19.

Nearly half of the respondents believed that the benefits that communities used to get from conservation had decreased as a result of COVID-19. The loss of benefits referred to the collapse of tourism, a reduction in employment and income, and the reduction or halt in PA operations with communities. PAs and FZS projects provided emergency support to local communities to help minimize and prevent the impacts of COVID-19 on their health and food security. However, respondents rarely perceived this support to compensate for the loss of benefits and engagement triggered by COVID-19 and the restrictions. The reported reduction in benefits could potentially worsen local attitudes towards conservation. But so far, most respondents suspected that local attitudes had not changed.

Overall, respondents felt that threats to PAs could increase as a result of the simultaneous decrease in local benefits and support received by communities from conservation initiatives and the economic downturn. Primary concerns surrounded the collapse of tourism, the reduction and halt in community engagement via environmental education activities and meetings, urban-to-rural migration flows, and the economic crisis triggered by COVID-19. These concerns related to the pandemic's impact on local communities were most common among African and South American PAs – with over half of respondents reporting being very or extremely worried.

2.7. WILDLIFE AND HABITATS OF PROTECTED AREAS

Only a few PAs reported changes in PA wildlife that they could relate to COVID-19. These changes were always positive and referred to increases in wildlife sightings and sightings in unusual places, presumably as a result of a decrease in tourism and movement of people. The most notable impact in this regard may be the observations made in the Serengeti National Park, where it was reported that *"black rhinos had been moving more than usual, presumably as a result of reduced tourism, with rhinos settling in areas which had not seen rhinos for decades."* There were also reports and camera trap data showing increased wildlife sightings in unusual areas within some Peruvian PAs.

Despite the relatively few reported impacts of COVID-19 on the ecological conditions of PAs, respondents recognized that the changes in threats triggered by the pandemic would affect wildlife and habitats in the medium and long-term. In fact,

data gathered through the survey suggest that COVID-19 has exacerbated threats to PAs (Fig. 8). Seventy-nine percent of the PAs included in the study reported an increase in at least one of the threats considered in Figure 8. However, not all threats were equally affected, and some increases occurred to levels that were lower than anticipated. In relative terms, drug trafficking was the threat that increased in the largest number of sites, followed by bushmeat hunting and mining. In a few PAs, respondents reported that COVID-19 had triggered a reduction in some threats. Most notably, 29% of the PAs where tourism and recreation used to be considered a threat reported that the pandemic had alleviated these pressures. Threats associated with recreational activities were only reported to have increased in some European sites, as these were the only places where numbers of visitors had increased during the pandemic.

The impacts of COVID-19 on threats were notably different across regions (Fig. 9). For instance, most PA threats were reportedly unaffected by COVID-19 across European and African sites. However, fires (in association to increases in other threats like recreation and livestock grazing), bushmeat hunting, and recreational pressures were reported to be increasing in some European sites. Mild increases in bushmeat hunting (increasing in three PAs only despite being a threat in all PAs) and fishing (in two PAs only, although it was considered somewhat a threat in seven PAs) were reported in African PAs. In contrast, all of the South American PAs included in this survey reported increases in threats in association with COVID-19. Most notably, the pandemic was reported to be exacerbating important threats such as drug cultivation and trafficking (increasing in all six PAs where this was a threat), alluvial gold mining (increasing in 89% of the nine PAs where this was a threat), agricultural expansion, and fires (increasing in half of the eight PAs where it was a threat, and associated to agricultural expansion and livestock grazing). In Southeast Asia, threats were reported to have increased both at Indonesian and Vietnamese sites.

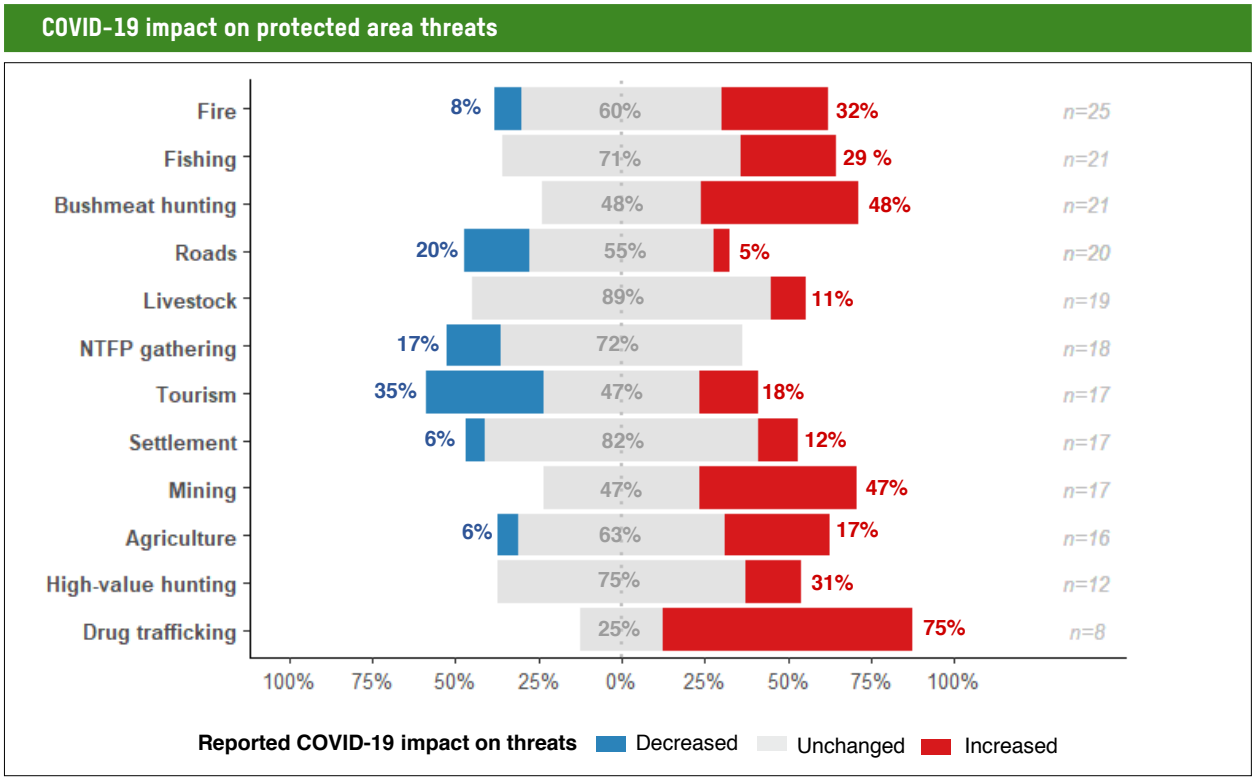

FIG. 8. Reported COVID-19 impacts on threats to protected areas (PAs) included in the study. Percentages are calculated based only on the total of PAs reporting that threats used to occur in the PA even prior to COVID-19 (n). Percentages summarize the proportion of reported increases, decreases, and no changes. Note that percentages may not add up to 100% if respondents did not know how COVID-19 had impacted threat levels. NTFP=Non-Timber Forest Products.

There were concerns that COVID-19 could continue aggravating threats to PAs. In fact, 41% of respondents reported being at least very worried about the potential impacts of COVID-19 on PA threats in the near future. Fears of future increases in threats were most acute across Africa (63% were very or extremely concerned) and South America (40%). Nevertheless, 17% of the respondents (mostly from European PAs) reported being not so worried about the future impact of COVID-19 on PA threats.

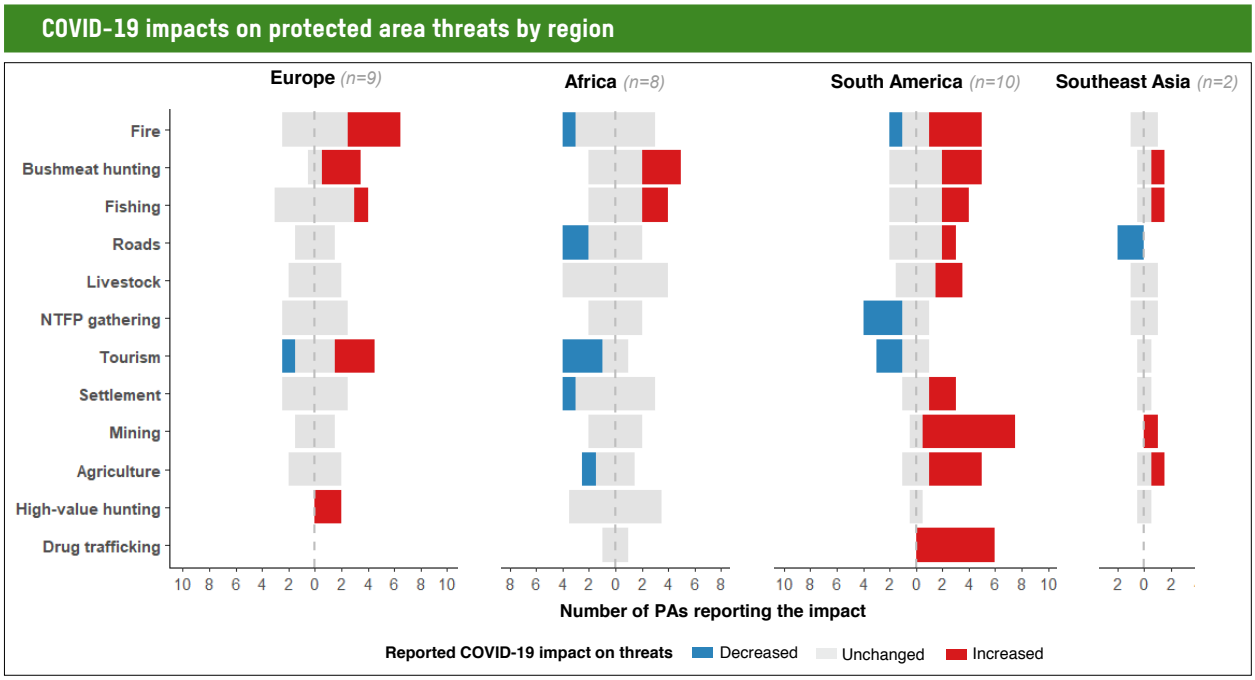

FIG. 9. Number of protected areas (PAs) included in the study reporting changes on threats in relation to COVID-19 by region. NTFP=Non-Timber Forest Products.

3. FINAL REMARKS

3.1. FUTURE EXPECTATIONS AND MAJOR REASONS FOR CONCERN

FZS Projects

Respondents acknowledged a great deal of uncertainty regarding the future and long-term impacts of COVID-19 on FZS projects. Thirty-nine percent of respondents believed that their projects would be slightly weakened after the pandemic. Nevertheless, nearly a third of respondents believed that FZS projects would be strengthened as a result of the pandemic. Interestingly, all of these projects were based in South America or Africa, the two regions where COVID-19 impacts on conservation had been reported to be the greatest. In fact, there was no significant correlation between the overall impact of COVID-19 reported by a project and the expected future long-term outcome. Optimistic future expectation were justified by the opportunities brought by the pandemic to strengthen partnerships, identify weaknesses, and learn lessons.

The most common reasons for concern among FZS projects included potential losses and reductions in available funding – due to the economic crisis and a change of priorities in governments and donors – and further delays and cancellation of activities if restrictions were maintained or intensified. The traveling and gathering restrictions were also perceived as a threat to previously established partnerships with governments and local communities. If restrictions were sustained for long periods, respondents working for South American projects feared that governance in the Amazon basin would be severely weakened.

Supported Protected Areas

Over half of the respondents believed that PAs would come out of the COVID-19 pandemic weakened. Still, a few respondents (less than a fifth globally and mostly from Europe) anticipated that the PAs could be strengthened thanks to the lessons learned from the pandemic and a potential increase in the public awareness of the importance of PAs for human wellbeing and public health. Still, many respondents highlighted that the eventual outcome could lay at any of the two extremes given the high uncertainty around COVID-19.

Funding shortages for PAs together with a potential increase in PA threats were the two main concerns of respondents. Across Europe, concerns regarding funding and a second wave prevailed. For African PAs, the major reasons for concern were funding issues and the impacts of the crisis on local communities and consequently on threats to PAs. Across South America, the principal worry was an increase in threats.

3.2. LESSONS & OPPORTUNITIES

Despite the negative impacts and challenges experienced by FZS projects and PAs as a result of the pandemic, respondents identified several opportunities emerging from the crisis (Table 2). For instance, respondents recognized that the pandemic had brought new opportunities for FZS projects and PAs to strengthen partnerships with key stakeholders. Respondents also believed that the pandemic had raised awareness among politicians and society about the importance of protecting nature for both preventing future pandemics and mental wellbeing, which could, in the long-term, be beneficial both for PAs and FZS projects.

Opportunities emerging from COVID-19

TABLE 2. Reported opportunities emerging from the COVID-19 pandemic for Frankfurt Zoological Society's (FZS) projects and protected areas (PAs) where these operate. The table includes the opportunities grouped by themes and examples of respondents' quotes referring to the same.

Opportunities for FZS projects	Examples of quotes
Strengthened partnerships with government partners	*"We can leverage our improved relationship with our government and conservation partner by working together and supporting them during these difficult times. Our commitment and support to our partners have increased, and we have been able to mobilize fast to do so."* *(respondent, FZS project in East Africa)* *"PA authorities have gained trust in FZS as a project partner."* *(respondent, FZS project in Eastern Europe)*
Strengthened relations with local communities	*"The relationship of the project with communities has strengthened because [the project] has increased support to them."* *(respondent, FZS project in South America)*
New funding opportunities	*"There are opportunities to take up emergency funding opportunities that come up due to COVID-19."* *(respondent, FZS project in East Africa)*
Fewer physical meetings – more time for planning/desk work	*"The reduction in face-to-face meetings has allowed us more time for planning."* *(respondent, FZS project in East Africa)* *"Having numerous online meetings added a new quality to communication. It has intensified and rationalized communication, which would have required more time and costs for travel and transport."* *(respondent, FZS project in Southeast Asia)*
Increased appreciation for PAs	*"People have shown more interest in conservation and PAs as a result of COVID-19. This interest could be transformed into increased support for wilderness."* *(respondent, FZS project in Central Europe)* *"Hopefully, we will use the consequences of this zoonotic pandemic to promote conservation and have a bigger impact."* *(respondent, FZS project in South America)*
Opportunities for arotected areas	**Examples of quotes**
Strengthened relations between PAs and local communities	*"Local, and especially indigenous communities, have realized that the PA can bring benefits to them in the form of non-conservation-related support, as they are the best-established state institution close to their land."* *(respondent, PA in South America)* *"The health support provided to communities has resulted in a better relationship with local communities."* *(respondent, PA in South America)*
Reduction in wildlife disturbance as a result of reduced movement and visitation to PAs	*"The PA infrastructure is not well-developed, so people very often walk in wild and sensitive areas. Thus, the decrease in tourism has reduced their impact on the natural ecosystems."* *(respondent, PA in Eastern Europe)*
More interest and appreciation of PAs	*"During the pandemic lockdown, people realized the value of PAs and visitation increased."* *(respondent, PA in Central Europe)*

The pandemic also brought new opportunities for learning lessons by revealing the vulnerabilities and strengths of current funding mechanisms, implementation systems, and partnerships of both FZS projects and PAs (Table 3). Three main lessons emerged for both FZS projects and PAs: 1) the need to build more resilient and flexible funding streams, 2) the need to plan and prepare for unforeseen disturbances, 3) the need to build capacity for enabling remote implementation and communications. Occasionally, respondents reported that action had been initiated based on the newly learned lessons. For instance, some PAs have incorporated the possibility of future similar health crises in their planning activities. Some FZS projects and PAs have started to strengthen the capacity of their teams to work remotely, and others were reconsidering their models of generating revenues via tourism.

Lessons emerging from COVID-19

TABLE 3. Reported lessons emerging from the COVID-19 pandemic for Frankfurt Zoological Society's (FZS) projects and protected areas (PAs) where these operate. The table includes the lessons grouped by themes and examples of respondents' quotes referring to the same.

Lessons for FZS projects	Examples of quotes
Funding should become more resilient and flexible. This should involve: – Diversification of funding streams – Long-term commitments by donors – Building reserves or contingency budgets for these types of crisis – Flexibility in fund allocations in crisis situations	*"We will need to change the way we deal with private donors. Verbal commitments for only one year at a time is suicidal."* *(respondent, FZS project in Southern Africa)* *"We need to have a diverse range of donors and supporters."* *(respondent, FZS project in Southern Africa)* *"We must consider a budget for this type of contingency."* *(respondent, FZS project in South America)*
FZS projects should prepare for future unforeseen events and pandemics and establish clear guidelines for project implementation during such crises. The potential occurrence of unforeseen and rare events that can disrupt or prevent project implementation must be considered during planning. There is a need to develop adaptive models for project implementation and to establish clear guidelines and protocols to guide action during such events.	*"During project planning, we have to consider, analyze and elaborate a proper mitigation plan for even the most remote risk."* *(respondent, FZS project in South America)* *"The possibility of future pandemics and its potential effect on project implementation must be considered."* *(respondent, FZS project in South America)*
Capacity for remote implementation and communication must be strengthened	*"We must support remote communications systems in all our project areas to be prepared for the remote execution of project activities."* *(respondent, FZS project in South America)*
Virtual meetings can save time and money Virtual calls can be an effective and efficient means for communication, within the project and with external partners	*"Online meetings can replace better than expected a lot of personal meetings."* *(respondent, FZS project in Eastern Europe)* *"I usually traveled to the capital once a month but went last week for the first time in five months and, although a face to face meeting is always better, it is possible to do business remotely."* *(respondent, FZS project in Southern Africa)*
Strong partnerships with key stakeholders are crucial, especially in times of crises	*"A solid working relationship with stakeholders should be a priority for projects as this enables and facilitates remote communication"* *(respondent, FZS project in Eastern Europe)* *"COVID-19 has exposed the need for strong relationships and trust with partners and donors. Without that, we would have struggled."* *(respondent, FZS project in Southern Africa)*

Lessons for protected areas	Examples of quotes
PA should become more resilient and flexible. This should involve: – Diversification of funding streams – Avoiding overreliance on single revenue sources – Building reserves or contingency budgets for these types of crisis	*"There is a need to have emergency funds for conservation during periods of crisis."* *(respondent, PA in East Africa)* *"PAs cannot just depend on donor and tourism income; there is a need for more reliable income streams."* *(respondent, PA in Southern Africa)*
New models for generating revenues via tourism should be developed to adapt to the new situation, while avoiding overreliance on this funding stream.	*"The PA's income generation is currently too much linked to visitor numbers."* *(respondent, PA in East Africa)* *"In the past, PAs and nature conservation have always been about tourism and getting tourists to pay for all the costs. But COVID-19 has shown that we should look at alternatives to tourism."* *(respondent, PA in Southern Africa)* *"The PA must look into alternative means of making income through tourism."* *(respondent, PA in East Africa)* *"There is a need to promote domestic tourism."* *(respondent, PA in East Africa)*
PAs should prepare for future unforeseen events and pandemics and establish clear guidelines for project implementation during such crises. The potential occurrence of unforeseen and rare events that can disrupt or prevent the implementation of key PA activities must considered during planning. There is a need to develop adaptive models for the implementation of activities and to establish clear guidelines and protocols to guide action during such events.	*"There is a need to elaborate prevention and action protocols to face any fortuitous event like COVID-19."* *(respondent, PA in South America* *"There has to be a better and more robust planning and response mechanisms for times of crisis like this."* *(respondent, PA in East Africa)*
Law enforcement efforts must be maintained or increased during a crisis like COVID-19. Especially during a crisis like COVID-19, patrol levels and surveillance mechanisms must be maintained or even increased to respond to potential increases in threats.	*"We have learned that in a state of strict quarantine, the negative impact on the PA via increased recreation increases."* *([espondent, PA in Eastern Europe)*
Lessons regarding engagement with local communities, including: – Supporting local communities in times of hardship can improve their attitudes towards the PA and strengthen relations. – ´Local and indigenous communities have proven to be a key stakeholder in keeping PAs functioning in times of crisis.	*"IIndigenous communities have emerged as the most important stakeholder for us in the PA. They have taken charge of everything."* *(respondent, PA in South America)* *"Being flexible to help support local community issues with COVID-19 and show solidarity with local people can help to build collaboration and consensus on the PA management."* *(respondent, PA in East Africa)*
Capacity for remote implementation and communication must be strengthened.	*"There is a need for more robust communication lines in place between communities, rangers, and PA."* *(respondent, PA in South America)* *"[We realized that there was a] poor supply of computer equipment."* *(respondent, PA in Eastern Europe)* *"The PA needs to strengthen its capacity for remote work and virtual communication. The capacity must be strengthened especially at control posts – to ensure surveillance operations and facilitate law enforcement responses – and to enable meetings and planning with local communities during the restrictions."* *(respondent, PA in South America)*
The support and partnership with NGOs as a key strength of PAs.	*"As an NGO, FZS's role is very important in keeping things going in the PA. Without FZS, the work in the park and outside with communities would largely have shut down. Unexpected threats such as COVID-19 show the fragile nature of government at one level in that strategic work shuts down."* *(respondent, PA in East Africa)*

3.3. CONCLUSION

The results of this survey indicate that the first six months of the COVID-19 pandemic had an overall negative impact on conservation efforts, affecting all dimensions of FZS projects and PAs – from funding to threats. The pandemic had been significantly negative for PAs in the Global South, where several sites reported an exacerbation of threats and a reduction in funding streams. In South America, a region particularly hard hit by the pandemic and strict lockdowns, conservation efforts on the ground had been comparatively more disrupted than in the other regions. The long and severe lockdowns in South American countries were associated with a concerning widespread increase in mining and drug trafficking in PAs, as well as other threats. Conservation practitioners working in the region were concerned that, if COVID-19 restrictions continued, the pandemic could result in a loss of governance across PAs in the Amazon region.

The disruptive effect of the pandemic on conservation work has depended not only on the magnitude of the public health crisis in the country, but also on the different conservation models and characteristics of FZS projects and PAs. For instance, PAs highly reliant on tourism revenues, such as those in Tanzania, are suffering more than others from funding reductions even though the country had reported relatively fewer cases of COVID-19 and had implemented a comparatively mild containment response.

Despite the new challenges and pressures posed by the COVID-19 pandemic, the crisis has unveiled ways in which both FZS projects and PAs can improve and become more resilient and ensure that conservation efforts can be maintained in the long-term.

[1] Greenfield & Muiruri (2020) Conservation in crisis: ecotourism collapse threatens communities and wildlife. → see

[2] Briggs, H. (2020) Coronavirus: Fears of spike in poaching as pandemic poverty strikes. → see

[3] Bang, A., & Khadakkar, S. (2020). Opinion: Biodiversity conservation during a global crisis: Consequences and the way forward. Proceedings of the National Academy of Sciences.

[4] Hockings, M., et al. (2020). Editorial essay: COVID-19 and protected and conserved areas. Parks, 26(1).

[5] Lindsey, P. et al (2020). Conserving Africa's wildlife and wildlands through the COVID-19 crisis and beyond. Nature ecology & evolution, 4(10), 1300-1310.

[6] Neupane, D. (2020). How conservation will be impacted in the COVID-19 pandemic. Wildlife Biology, 2020(2).

[7] Rondeau, D., et al. (2020). The Consequences of COVID-19 and Other Disasters for Wildlife and Biodiversity. Environmental and Resource Economics, 76(4), 945-961.

Abbreviations and acronyms

BLR	Belarus
BRA	Brazil
COD	Democratic Republic of Congo
COL	Colombia
DEU	Germany
ETH	Ethiopia
ERC	Ecosystem Restoration Concession
FMU	Forest Management Unit
FZS	Frankfurt Zoological Society
GUY	Guyana
IDN	Indonesia
KAZ	Kazakhstan
NNP	National Nature Park
NP	National Park
NR	Nature Reserve
PA	Protected Area
PER	Peru
POL	Poland
SVK	Slovakia
TZA	Tanzania
UKR	Ukraine
VNM	Vietnam
WMA	Wildlife Management Area
WA	Wilderness Area
ZMB	Zambia
ZWE	Zimbabwe