# Namibia Case Study: Cost-Benefit Analysis of Curbing Illegal Wildlife Trade

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# Acronyms

| | |
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| AED | African Elephant Database |
| AERSG | African Elephant and Rhino Specialist Group |
| AfESG | African Elephant Specialist Group |
| APU | Anti-Poaching Unit |
| BAU | Business As Usual |
| CBA | Cost-Benefit Analysis |
| CBNRM | Community Based Natural Resource Management |
| CITES | Convention on International Trade in Endangered Species |
| DWNP | Directorate of Wildlife and National Parks |
| DSS | Directorate of Scientific Services |
| GPTF | Game Products Trust Fund |
| IMF | International Monetary Fund |
| IRDNC | Integrated Rural Development and Nature Conservation |
| IUCN | International Union for the Conservation of Nature |
| IUCN/SSC | IUCN/ Species Survival Commission |
| IWT | Illegal Wildlife Trade |
| MEFT | Ministry of Environment, Forestry and Tourism (Namibia) |
| MIKE | Monitoring the Illegal Killing of Elephant |
| NAMPOL | Namibian Police Force |
| NDF | Namibian Defense Force |
| NGO | Non-Governmental Organization |
| NNF | Namibia Nature Foundation |
| NPV | Net Present Value |
| SADC | Southern African Development Community |
| SRT | Save the Rhino Trust |
| UNWTO | United Nations World Tourism Organization |
| USAID | United States Agency for International Development |
| WPSU | Wildlife Protection Services Unit |
| WWF | World Wildlife Fund |

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# Executive Summary

Since 2014, Namibia has seen a surge in wildlife poaching as a result of increasing international demand and depleting wildlife populations in other areas of the world. This has led to the loss of high-value species (such as elephants, rhinos, and pangolins) and concern about ecosystem impacts and associated economic losses. For instance, Namibia has become a key country for illegally sourced rhino horn, with a total of 416 rhino poached between 2013 and 2019, compared to only 13 rhinos poached between 2005 and 2013 (MEFT; 2020b, Milliken, 2014). The Namibian Financial Intelligence Center estimated that the foregone revenue in Namibia (or revenue circulated in illegal markets rather than legal ones) from trade in illegal markets for elephant tusks was about N$690,151 (NAD in 2013) and about N$141,506 (NAD in 2012) for rhino horn. The biggest costs from these activities, however, are the losses in tourism revenue, trophy hunting, limited live sales, and many other impacts that translate into further losses in tax revenue, loss of wildlife populations, and an increase in the problems posed by an underground economy, including corruption and crime. These costs are still ill-understood.

As a response to this surge in wildlife crime, a diverse range of public and private actors have ramped up their efforts to curb illegal wildlife trade (IWT) nationally and across borders. Among other activities, the Namibian government established a multi-agency task force, the Blue Rhino Task Team, to combat illegal wildlife crime and international aid and local funding has been increasingly funneled towards these efforts. Private game reserves have also invested considerable resources to this end as well as community conservancies. These efforts have been relatively successful, slowing down the rate of poaching of rhinos and elephants, and increasing the number of arrests for activities related to these types of crimes. However, these investments are being made with little information on the costs of IWT and the benefits being generated by curbing it. This type of economic information is important to justify the investments being made and ensure that the benefits generated are greater than the costs and that economically viable solutions are being implemented.

This study investigates the economic implications of investing in curbing IWT through a cost benefit analysis (CBA) of current investments in Namibia and compares the results against an alternative scenario where no investments are being made in curbing IWT as well as to a scenario where more investments are being made in further curbing it. The CBA monetizes costs and benefits from IWT curbing initiatives and sets them up to be consistently compared across time, in order to inform and guide investment decisions.

The CBA focused on three key actors leading current investments in curbing IWT in Namibia: 1) the national government – including through public international aid, 2) communities living on communal land, and 3) private landholders. Nationwide impacts to the tourism industry at large are also considered. Two key species, rhinos and elephants, are used as proxies for the suite of costs and benefits associated with curbing IWT.

Thus, the main functional unit of analysis is population size for rhinos and elephants; therefore, all costs and benefits were modeled in relation to a change in population size for each species. Each actor manages a different population or proportion of the population of each species, which was modelled based on

current management practices and data available. The three scenarios were denominated as (1) the Business as Usual (BAU) scenario, which describes the current investments and poaching, (2) a scenario of increased investment and lower poaching (No Poaching scenario), and (3) a scenario for reference where poaching goes practically uncurbed (High Poaching scenario).

In the first step of this analysis, the most salient categories of costs and benefits associated with curbing IWT were identified. Subsequently, those that could be quantified, given the data available, were retained for the analysis. Costs include primarily the expenditures on programs and activities to stop IWT but also include some indirect costs associated with higher levels of corruption and crime. Benefits include primarily income from trophy hunting and revenue from wildlife watching (such as rhino and elephant photography and other non-consumptive tourism) as well as revenue from live sales of animals done by the government.

The results of the CBA show that considerable investments are being made in curbing IWT. The economic cost of curbing IWT was conservatively estimated at about N$2 billion over 10 years, with average yearly costs of about N$250 million across actors. Most of the cost is undertaken by the government supported by international funding and NGOs, with public funding covering about 77% of the cost calculated in this study. Nevertheless, working in a synergistic and collaborative way with private landholders and communities results in more effective action, and this also demands considerable resources from these partners.

The benefits of curbing IWT are significant and critical to the Namibian economy. Including all tourism businesses benefiting from the presence of wildlife species, such as rhinos and elephants, total net benefits amount to about N$18 billion over the ten-year period under the current situation. In terms of benefits by type of actor, the government receives the highest benefits, at about N$2.6 billion over ten years, or about N$260million annually. Private landholders also receive significant benefits, at about N$2.5 billion over ten years, or about N$250 million annually. Communities obtain about N$933 million of benefits over ten years, or about N$92 million annually.

One of the most important indicators generated with the CBA is the net benefit comparison across scenarios, these are the benefits minus costs. Here, the No Poaching scenario created the most benefits, with net benefits of about N$22 billion over ten years (Figure a), which is a 20% increase from the business as usual (BAU) scenario, representing current spending and curbing efforts. The High Poaching scenario presented the lowest net benefits, with less than N$13 billion over ten years. Also, it is worth noting that the benefits of the No Poaching scenario are not generated by the poaching activities but represent overall tourism, hunting and live sales that would continue to happen, even with higher poaching levels.

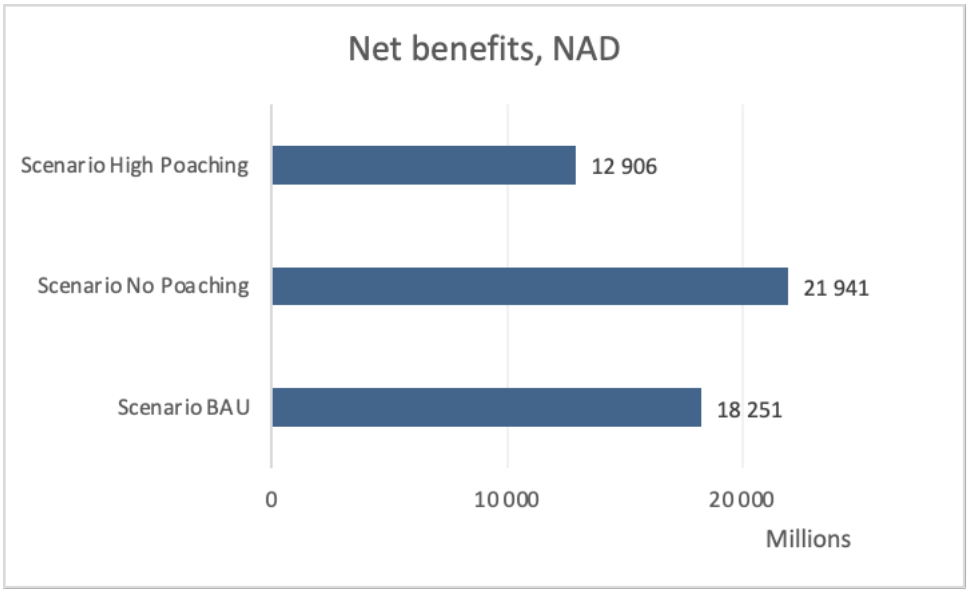


*Figure a. NPV of net benefits across scenarios*

There are notable differences in the distribution of economic impacts across the three actors studied. First, government and private landholders saw the biggest benefit from increased spending in the curbing of IWT (No Poaching scenario). Government's net benefits over ten years increases from N$1.1 billion (BAU) to almost N$1.8 billion (No Poaching), a 64% increase, and private landholders increase their net benefits from N$2.1 billion (BAU) to N$2.5 billion (No Poaching), a 15% increase. The net benefits for communities under a No Poaching scenario increases far less, by 3% only or N$25 million over ten years. This may be partly due to the fact that revenue to poachers was captured as a financial revenue in communities added to the fact that communities also see more Human Wildlife Conflict and obtain less benefits from tourism and hunting related to rhinos. However, an important finding is that the High Poaching scenario results in significant losses for the three actors compared to business as usual (BAU) (Figure b).

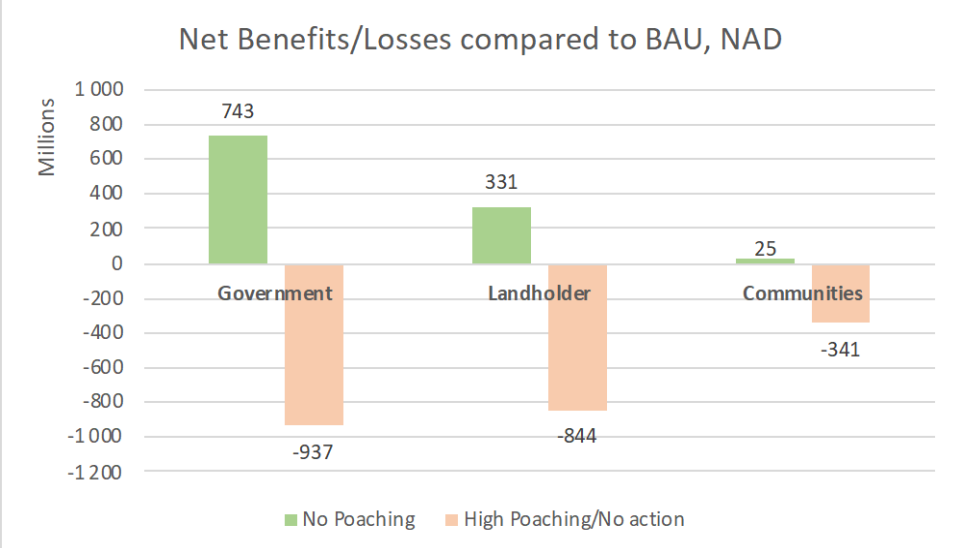


*Figure b. Comparison of net benefits (NPV over ten years) of No Poaching and High Poaching scenario relative to BAU*

Overall, the CBA shows that it makes economic sense to invest in curbing illegal wildlife trade. Even though this study included primarily local financial benefits associated with protecting rhino and elephant populations, the results were very clear – benefits greatly outweigh costs. Expanding the scope of this study will likely amplify these findings. The tourism economy is an economic engine in the country, and it sustains a large percent of the population directly and indirectly. However, it requires investments to sustain the attributes that make Namibia a unique destination and wildlife populations are one of these important attributes.

Some important findings require further reflection. The fact that the additional benefits generated from tourism by conservancies under the No Poaching scenario are fairly low could be explained by the more limited impact of wildlife population increase on tourism revenue in conservancies. Further study would be required to investigate communities' costs and benefits in greater detail and including more species of wildlife. Indeed, this result, added to the fact that the No Poaching scenario is costly to poachers, that there is wildlife conflict with elephant populations, and that conservancies do not manage as much rhino tourism, in comparison to the other actors, has important implications that deserve close attention. For example, an effort to offer alternative sources of income to poachers is critical and communities as a whole might need extra incentives to ensure commitment to increasing their efforts and investments in IWT curbing. Moreover, as human-wildlife conflict costs increase for communities, the requirement for compensation from government or the private sector becomes more significant. It is imperative to ensure that those bearing the costs of living with elephant receive the greatest benefits and that these are optimized through good governance and management at community/conservancy level.

It should also be noted that in the context of stringent government budget constraints and pressures, it is important to ensure that IWT curbing initiatives can be sufficiently funded and that there is cooperation among actors to reap the collective benefits of a healthy wildlife population. It may also be essential to find other sources of financing to build resilience into funding sources. Since government and international funding bears the highest burden of the cost and benefits that accrue to private actors and the economy at large, curbing efforts should be designed with this in mind.

# Introduction

Despite consensus around the negative impacts of illegal wildlife trade (IWT) on the economic prosperity of southern African countries and communities, quantitative evidence of the impacts of IWT on national and regional economies in southern Africa remains scarce. The World Bank (2019) estimated that IWT is causing natural capital losses of at least US$15 million per year globally, this is only a small fraction of the economic costs of IWT that represents the loss of ecological functions and does not include financial losses such as impacts to the tourism industry or to government revenues. The report also highlights the need for further evidence of the loss in wildlife capital and the erosion of broader financial values due to IWT. This study contributes to filling this gap through the assessment of the costs and benefits of curbing IWT in Namibia. This national cost-benefit analysis (CBA) constitutes the first step towards a broader regional economic assessment of IWT as well as other country studies in southern Africa.

A CBA is an economic tool used to evaluate the impact of policies or initiatives that affect a population's wellbeing (Hanley, & Barbier, 2009; Wegner & Pascual, 2011). It consists of the monetization of costs and benefits generated by a policy initiative which are borne by different economic actors (Hanley & Barbier, 2009). Often this involves translating biophysical and/or social information into a common metric (monetary units) to allow comparisons. By doing so the CBA provides an integral vision of the investment question at hand (Pearce, Atkinson, & Mourato, 2006). By monetizing both costs and benefits, the CBA gives important information about the economic viability of policy initiatives, and it can help justify investment decisions and provide a better understanding of potential trade-offs. Often, CBAs are used in combination with other impact assessment tools, as they emphasize monetary impacts but may leave out outcomes that are not monetary.

In this case study, the cost-benefit analysis provides insights into the economic justification of investing in the fight against IWT in Namibia. As poaching threats have intensified over the past seven years, the need for investments in anti-poaching and IWT curbing efforts has also increased, but little is known about the returns generated by these investments for the Namibian economy and society at large, as well as the distribution of costs and benefits across actors. This study attempts to shed light on these returns by providing evidence on the net benefits generated by IWT curbing initiatives in Namibia, and the potential losses of not acting against IWT for the Namibian economy.

This study focuses on the costs and benefits of curbing IWT as incurred by three key actors: 1) the national government (including international public funding with NGOs), 2) communities living on communal land and 3) private landholders. Since a CBA gives important information on investment decisions, it was deemed that those who are investing most in curbing IWT would benefit from a better understanding of the returns on these investments. Although impacts to the tourism industry at large are considered in the global results, the specific impacts to each of these three actors were examined in detail.

The study focuses on two key species, rhinoceros (both *Diceros bicornis bicornis* and *Ceratotherium simum simum*) and elephants (*Loxodonta africana*), to measure rates of IWT and the success of curbing it. Although many species of wildlife are traded illegally, including pangolins, lions, and others, and efforts to curb IWT benefit all species, only rhinos and elephants are included here because of the availability of data and an underlying assumption that they accurately represent overall poaching trends and are the main targets of investments into anti-poaching. Geographically, only national-level costs and benefits are included.

Although there are many impacts and revenue flows outside of the country, these are out of the scope of this study.

## Context and aim of the study

Since the poaching crisis of the 1980s, Namibia had maintained relatively low levels of wildlife crime and managed to rebuild strong wildlife populations, including elephants and rhinos, through extensive conservation management efforts in national parks, community-based conservation areas (conservancies), and private game reserves (MEFT, 2020a; MEFT, 2020b; Martin, 1994; IUCN AfRSG data). These conservation efforts have been growing hand in hand with wildlife-based economic activities such as photographic tourism, and carefully managed hunting.

However, since 2014, Namibia has experienced a surge in poaching events, especially of high-value species (elephants, rhinos, and pangolins), as a result of increasing international demand and depleting populations in other areas of the world. For instance, Namibia has become a key country for illegally sourced rhino horn, with an estimated total of 416 rhinos poached between 2013 and 2019 (see Figure 1), whereas only 13 rhinos were poached between 2005 and 2013 (MEFT, 2021b; Milliken, 2014). Pangolins are also highly targeted, with 66 dead pangolins seized in 2020, while elephants remain under threat especially in the north-eastern regions of the country (MEFT, 2021b).

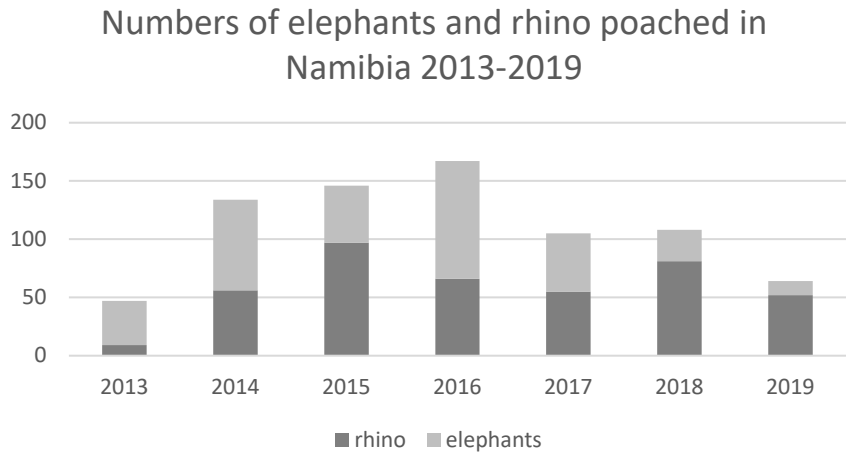


*Figure 1 Rhinos and elephants poached in Namibia*

*Source: MEFT data extracted from Wildlife Crime Report (MEFT, 2021b) and National Strategy on Wildlife Protection and Law Enforcement (MEFT, 2021a)*

The total value of illegally traded wildlife products has not been estimated for Namibia but Martin and Stiles (2017) in their assessment of Illicit Financial Flows (IFFs) related to wildlife trade in southern Africa, estimated that the illegal trade in rhino horn generated about US$43 million per year, and the illegal ivory trade about US$38 million per year regionally. Most of the value derived from the illegal trade in ivory products, rhino horn and pangolins is obtained outside the region, in destination markets, while the income generated from IWT in Namibia is understood to be quite low as only the lower agents of the value chain are located in the country. A report compiling prosecution cases in Namibia mentions prices between US$650 – US$1,200 per rhino horn at poacher level and up to US$5,100-US$7,000 per horn for the

intermediary (Financial Intelligence Center, 2017).[1] Other sources cite lower values. Lindsey et al. (2015) cite the price of raw ivory at US$150-$200/kg while foot soldiers may only get US$100 per hunt. The Financial Intelligence Center estimates first level poachers only get about US$33/kg of ivory and has records of illegal sales of rhino horn at less than US$150 (Financial Intelligence Center, 2017). More importantly, the economic loss, defined as the foregone revenue for legal transactions, has been estimated by the Financial Intelligence Center by using street prices for final goods multiplied by the poaching amounts estimated yearly between 2005-2013. In this type of analysis, the Financial Intelligence Center, estimated that economic losses from elephant tusks were about N$690,151 (NAD in 2013) and about N$141,506 (NAD in 2012) for rhino horn. These translate into losses in tax revenue, losses in revenue to legal actors, loss of wildlife populations and the benefits they generate, and an increase in the problems posed by an underground economy, including corruption and crime.

As a response to the recent surge in wildlife crime, a diverse range of public and private actors have ramped up their efforts to curb IWT nationally and across borders. In 2017, the Namibian government increased the penalties for illegal wildlife trafficking through an amendment of the Controlled Wildlife Products and Trade Act 9 of 2008. Penalties for the illegal possession of controlled wildlife products such as elephant, rhino, and pangolin, increased from a fine of N$20,000 (US$1,586) or five years imprisonment to N$15 million (US$853,611) or imprisonment for up to 15 years, or both. Furthermore, dealing, export or import of these products can result in a fine of up to N$25 million (US$1,422,680), or imprisonment for up to 25 years, or both. These increased fines are intended to deter behavior by making the risk more costly than the expected revenue from engaging in IWT.

The government has also established a multi-agency task force, Blue Rhino Task Team, which includes the Intelligence and Investigation Unit (IIU) under the Wildlife Protection Services Division in MEFT and the Protected Resources Division (PRD) of the Namibian Police Force (NAMPOL). Several projects supporting the government and private sector's efforts to combat wildlife crime are being implemented across the country through international aid funding and the involvement of local and international NGOs such as the Rooikat Trust, World Wildlife Fund (WWF), Save the Rhino Trust (SRT), and the Namibia Nature Foundation (NNF). These efforts are also supported by local funding such as the B2Gold funding for rhino protection and the Namibia Chamber of Environment support for pangolin protection. Private game reserves with rhinos have also increased their investments in security and anti-poaching. Community conservancies with their game guards have been involved in the fight against poaching through programs such as the Rhino Ranger program.

Investments from governments and funding partners support both anti-poaching activities on the ground and counter-trafficking efforts, which work in a synergistic and cooperative manner. These efforts appear to have slowed down the poaching of rhinos and elephants, and increased the number of arrests, including pre-emptive arrests whereby poachers were arrested before they could poach. In 2019, about 62% of rhino-related arrests were pre-emptive arrests (MEFT, 2021a).

[1] When relevant, our study uses prices of N$20,000 per horn (according to police records quoted by the Financial Intelligence Center 2017) and US$33 per kg of ivory for first line poachers (Financial Intelligence Center 2017).

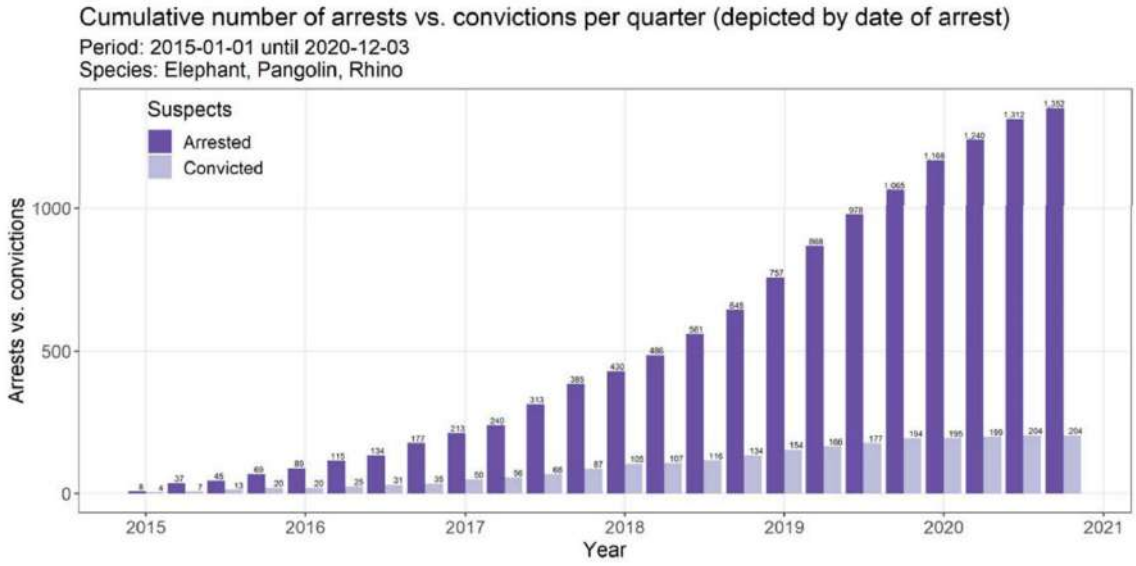


*Figure 2. Arrests and convictions in Namibia for elephants, pangolins and rhinos*

*Source: MEFT 2021a, National Strategy of Wildlife Protection and Law Enforcement*

However, as presented in the Figure 2 above, the number of prosecutions for wildlife crime increased at a much slower pace than the number of arrests. A lot of reasons contribute to explaining this gap, such as delays in the judicial systems due to cases overload as the intensified investigations have led to more arrests, and limited resources, but this could also reflect a difficulty for the judiciary to make the case for stringent prosecutions due to a lack of evidence about the severity of impacts of IWT on Namibia's economy and society.

Because the new surge in wildlife crime in Namibia is fairly recent, awareness on the severity of poaching threats and on the costs of IWT to the Namibian society and economy remains limited. Yet the impacts of IWT and the costs of protecting species under increasing threats from commercial poaching in Namibia are substantial. A large share of the country's wildlife economy relies on healthy populations of iconic species such as elephants, rhinos, and lions. The country's reputation as a safe and poaching-free country significantly contributed to the growth of the wildlife tourism sector since 2000 (including photographic tourism and trophy hunting). In 2015, Smith and Porsche estimated that wildlife tourism in Namibia generated up to N$15 billion every year, including direct and indirect expenditures, and that this was largely fueled by the presence of rhinos.[2] These sectors directly finance conservation efforts across the country and benefit local communities through job creation and the provisioning of meat and cash income. They also bring investments into rural areas in dire need of better access to jobs and training and in turn can generate significant social benefits in remote areas of Namibia.

IWT erodes economic benefits derived from wildlife-based activities but also has much broader negative impacts on the economy due to its promotion of corruption, and the foregone public revenues from illicit economies it generates. The involvement of organized crime syndicates into poaching and IWT with

[2] This study assumes a more conservative value for the size of the rhino and elephant tourism economy, valued at N$1,543,500,000, based on attribution factors noted by Turpie et al. (2010).

sophisticated means have also increased the levels of violence associated with wildlife crime, with significant impacts for the country's safety and security. Overall, the cost of corruption is greater than the direct sum of money spent on fighting crime and corruption because these activities undermine the ability of the state to promote sustainable and inclusive growth and they drain public resources away from social programs like education, health care, and infrastructure— the kinds of investments that can improve economic performance and raise living standards for all (IMF, 2019). These risks require an ever-increasing level of investment from the public and private sectors to maintain safety and curb IWT.

In addition to the direct costs, there are also opportunity costs (foregone benefits), when limited public resources are spent on fighting wildlife crime and corruption, diverting resources from more productive sectors of development, such as infrastructure investments or development projects. This is particularly salient in Namibia, where government revenues have been contracting severely since 2016 due to an economic slowdown and an increasing share of the MEFT budget being directed towards anti-poaching activities. Financial investments into conservation activities have also been limited due to the needs of emergency responses to high poaching and the challenges of corruption.

Poaching pressure intensification has not only imposed costs on society, but has also led to a significant increase of investments in curbing IWT, therefore information on the specific costs and benefits associated with IWT, on the beneficiaries and cost-bearers, and the economic implications of successfully curbing IWT is important to make informed decisions. It should be emphasized that the results of this analysis should not be interpreted as a cost-benefit analysis of IWT but rather a cost-benefit analysis of curbing IWT. This difference is important in that the costs of curbing IWT are not attributed to IWT but instead are attributed to the efforts to curb it. Therefore, this study sheds light on the benefits generated by the effort of all actors in curbing IWT in Namibia, while also highlighting the costs of protecting endangered species such as rhinos against increasing poaching pressures. These are important values to highlight as these species are valued at the global level and wildlife loss has implications beyond the national borders, yet it remains largely the responsibility of local governments and communities to protect these resources.

Providing evidence on the benefits of curbing IWT to Namibian citizens and on the potential costs of inaction can help stakeholders address wildlife crime in strategic and efficient ways. For instance, it could support members of the judiciary in building legal arguments during prosecution cases. It could also provide better information to policymakers and other actors investing in curbing IWT on their return on investment. Moreover, the CBA can highlight what types of benefits can be expected, the distribution of costs and outcomes, and provide information to identify and implement effective strategies that create the most benefits to the country and to specific actors.

## Overview of Cost Benefit Analysis as an Economic Tool

A Cost-Benefit Analysis (CBA) is a decision-making tool that is widely used to help systematically understand the potential impacts — both positive and negative — of policy changes, initiatives, or investments. It is helpful because it translates impacts and benefits into a common metric, monetary units, allowing us to compare across projects and options that have different impacts through time. The information derived helps make an informed decision based on the different types of costs and benefits incurred by different parties, and can be used in conjunction with other impact assessment tools.

In general, a cost-benefit analysis includes three basic steps. First annual costs and benefits are determined and quantified, then these are added over the lifetime of the project/initiative, and then these are discounted into a Net Present Value (NPV). The selection of costs and benefits is crucial to set a study boundary and ensure that key impacts and actors are included. Some impacts may not have a dollar value (e.g., loss of biodiversity, cultural impacts, etc.), in which case an attempt to assign a dollar value can be made through the use of non-market valuation methods in order to include them in the CBA. When data are not available, or costs and benefits cannot be translated realistically into dollar values, their impacts will be omitted from the analysis and thus the decision-making process.

A CBA must also account for the expected change in the value of benefits and costs over the foreseeable future. The temporal horizon for the analysis can be dependent on the decision being made, the project lifetime, and levels of uncertainty about future costs and benefits (shorter temporal horizons will have less uncertainty but also give a truncated result). Common temporal horizons are 10 years, 25 years, or 50 years into the future. Discount rates are used in order to value the flow of costs and benefits over time.

Discount rates are adjustments that account for two things: 1) People value present-day costs and benefits more than those that accrue in the future, and 2) Money spent today could have generated more money if saved or invested. A higher discount rate means benefits and costs that will accrue in 20 years, for example are valued less today. As the discount rate increases, future costs and benefits are devalued further; as the discount rate falls, they gain value. To account for this intergenerational consideration, the discount rate applied for analyzing natural resource values tends to be closer to 2% versus the traditional, market-based rate of about 7%.

A CBA is also meaningful compared to alternative scenarios. Normally, CBAs are conducted for multiple project alternatives as well as a no-action scenario. A no-action scenario serves as a benchmark for interpreting the impacts of the project alternatives. The no-action scenario is the most likely condition expected to exist in the future in the absence of the proposed project. Examining the no-action scenario establishes a clear economic rationale for taking action to address the problem. Assumptions about a future without action can be very influential in the results, and uncertainty around projections needs to be acknowledged and addressed and presented transparently. Those assumptions with the highest impact on the results should be addressed in a sensitivity analysis and studied more in depth to improve the accuracy of projections.

Also, there are several indicators that can be derived from a CBA. For example, the net benefits generated indicate how much value is generated by the project. A benefit-cost ratio (BCR) shows the ratio of benefits to costs, meaning that for every dollar invested how much you get in return. The internal rate of return (IRR) shows how long it will take to recover an initial investment, if benefits are expected to be larger in a more distant, among other. The distribution of costs and benefits may be a priority or the ability to meet policy objectives, which would have implications on the indicator to look at. For distribution concerns, a net benefit comparison to the target group can be done. For public policy, net benefits generated is often the preferred indicator.

The result of a CBA is largely shaped by the types of costs and benefits included. There are often many types of costs and benefits associated with a policy change (or in this case with the curbing of IWT), however many of these may not be included in the CBA because they are difficult to quantify, have little data available, or are not well understood. Also, many costs and benefits can be of a second or third order,

meaning that they happen indirectly in a chain of events, where it is difficult to predict how these will change in a systematic way as a result of an intervention. For example, the economic cost of IWT contributing to a culture of corruption in the country and how that translates into quantifiable outcomes like changes in the number of deaths per year may not be quantifiable or monetizable. Often it is very resource-intensive to attempt to quantify or value these impacts and therefore they may not be included in the CBA, despite their importance. For these reasons, it is common to include only the most prevalent costs and benefits in the CBA. Therefore, the decision on what costs and benefits to include has a big impact on the results obtained and has to be done with attention to include those with the largest impacts and with most certainty, considering data limitations.

The valuation of costs and benefits is often based on market prices in existing markets and as projected in the future. Costs and benefits that are not traded in markets, such as water quality, biological control, or disaster risk reduction can be valued with non-market valuation methods. These methods involve the use of market proxies from substitute or complementary goods which are analyzed to infer the value of the non-market goods and services (such as market prices, economic multipliers, or non-market prices).

Also, given that many costs and benefits will not be included in the CBA of the intervention, it is important to be transparent of the study boundaries and acknowledge other important costs and benefits that could not be included and, if possible, offer some hypotheses on the likely impact they would have on the obtained results if included. Often costs and benefits not included can be described qualitatively and considered in the interpretation of results.

One of the most common sources of error and uncertainty in CBAs are related to the forecasting of trends for key variables. Forecasting future conditions, including revenues and costs can be very difficult and it can also involve critical assumptions that determine the results of the CBA. Often these depend on a mix of interacting factors that are also often influenced by external forces that may not be foreseeable at the time. For example, forecasts on revenue flows to the tourism sector did not predict the Covid-19 pandemic impacts prior to it happening. This external force had a significant impact on the industry and may change the results of previous forecasts. Special attention should be given to the forecasting exercise. A sensitivity analysis should be done with variables that have the most uncertainty as well as those that have the greatest impact on results.

Finally, it is important to note that a CBA is one of many decision-making aid tools that does not necessarily account for all important factors and impacts.

# Methods for this CBA on Curbing IWT

## Scope of the study

This study focuses on the costs and benefits of curbing IWT as incurred by three key actors: 1) the national government (including international funds), 2) private landholders, and 3) communities living on communal land. Although impacts to the tourism industry at large are considered in the national-level results, the specific impacts to each of these three actors were the examined in more detail. The study also focuses on two key species, rhinos and elephants, to measure rates of IWT and the success of curbing it. Although many species of wildlife are traded illegally, including pangolins, lions, and others, and efforts to curb IWT benefit all species; only rhinos and elephants were included because of the availability of data and an

underlying assumption that they are a good proxy for overall poaching trends and the bulk of benefits received from wildlife activities. Geographically, this study focuses exclusively on national-level costs and benefits of curbing IWT in Namibia, and does not include any transboundary costs and benefits.

### Species

Although IWT impacts a wide array of fauna and flora in Namibia, this study focuses on populations of rhinos and elephants as the main drivers of costs and benefits related to curbing IWT. The limited data available on populations for other traded species - such as pangolin - coupled with a lack of evidence on the relationship between the population size of these species and expected impacts on tourism and hunting, constrained the scope of this study. The population size of elephants and rhinos were key functional units to the CBA model built. These were used to estimate and forecast costs and benefits related to hunting revenues, wildlife tourism, and poacher revenue into the future. As poaching rates increase or decrease, population size varies and translates to costs and/or benefits to related industries.

However, IWT is a cross-species phenomenon that needs to be tackled as such. Despite this restriction to rhinos and elephants, it is expected that the costs and benefits valued in this study represent a large share of the quantifiable IWT-related costs and benefits in Namibia. Anti-poaching expenditures to protect rhinos and elephants benefit other species and although it is difficult to disaggregate expenditures by species, rhinos and elephants are critical species of interest that serve as a proxy for the efforts at large. By including all costs related to IWT, the cost part of this CBA is likely to be larger than what would be attributable to rhino and elephants only.

Similarly benefits, such as wildlife tourism, are realized through a variety of attributes of which poached species are one of many. Hunting revenues valued in this CBA reflected only rhino and elephant hunts while tourism revenues at the park level were restricted to only those that hosted rhinos and/or elephants. Nature-based wildlife tourism was used as a whole in some cases, such as in the nation-wide benefit calculation, which may be an overestimate of the benefits in that it includes other species also. However, it is assumed that rhinos and elephants, as iconic species, are major contributors to wildlife tourism attractiveness in Namibia (Smith and Porsch, 2015; Naidoo et al., 2016).

### Actors

This study focused on the key actors bearing the financial costs of IWT curbing initiatives. Since a CBA gives important information for investment decisions, it was deemed that those who are investing most in curbing IWT would benefit from a better understanding of the returns on these investments. The three main actors include: 1) government (and associated international aid and NGOs), 2) private landholders (game farms and game reserves owners), and 3) local communities living in communal land including communal conservancies.

#### Government

Expenditures on curbing IWT are primarily born by the national government and associated international public funding and aid. These include the Ministry of Environment, Forestry and Tourism's budget on wildlife protection and law enforcement, and international funding for projects implemented by NGOs and MEFT. In terms of benefits, the largest source of revenue modelled in the CBA comes from tax revenue collected from the wildlife-tourism sector. Based on findings from the IMF (2019), it was assumed that as

crime decreased from IWT curbing, government agencies would be able to collect higher percentages of revenue from the tourism industry. Other sources of revenue for the government include park entry fees and tourism concessions, revenue from trophy hunting permits and licenses and the sale of live elephants and black rhinos (See Appendix Table A3 for further details on costs and benefits attribution assumptions).

### Private landholders: game farms and game reserves

Private landholders owning and managing game farms and game reserves invest significant resources in addressing IWT, especially for rhino protection. These landowners manage tourism associated with rhinos as well as some general wildlife tourism enterprises. Many of them own white rhinos, while a few of them also own elephants and/or are custodians of black rhinos. Further details on the tourism profile and costs and benefits attributed to private landholders are available in Appendix Table A3.

### Communities living in communal land, including communal conservancies

Communal conservancies have been very successful in their efforts at curbing IWT (Kahler and Gore, 2015). Empowering communities to manage their own resources and people has proven to be effective, especially if they can directly obtain incentives for doing so through participating in and receiving benefits from tourism industries and trophy hunting. One of the main anti-poaching activities that conservancies are sponsoring is the patrolling of their community conservation areas, including across most of the black rhino range in North-West Namibia. Due to their status, conservancies obtain revenues from joint ventures (JVs) and locally managed enterprises focused on wildlife tourism as well as trophy hunting.[3] Many communal conservancies own elephants while some are also custodians of black rhinos.

Revenue earned by poachers on the ground was also accounted for within this group. Based on the fact that many foot soldiers are from Namibia (91% of suspects according to MEFT 2021b), we assume that poachers receive and spend some of their revenue in these communities.[4] Usually, the income raised by foot soldiers and poachers is a small fraction of the end market price but still significant relatively to rural income levels (N$20,000 per rhino horn and US$33 per kilogram of ivory according to the Financial Intelligence Center 2017). No other revenue from IWT is incorporated into the model, assuming most of this revenue leaks out of the country. Communities also bear the costs of human-wildlife conflict, although the only information that was available was on the compensation received for these, so this cost sums in the government cost. Finally, it was assumed that loss of lives related to IWT mainly affects local communities as rangers on one side and poachers on the other are assumed to be from local communities.

### Namibian economy

The costs and benefits estimated in this study are calculated across these three main groups, and summed up to provide a national cost-benefit analysis. The national-level analysis also includes impacts to the wildlife-based tourism sector as a whole (including total expenditures made in photographic tourism and

[3] In Namibia's North-West region communal areas, some tourism operators also contribute significantly to the fight against poaching of rhinos, through their presence but also by supporting community rhino rangers. The authors could however not include these contributions in the communities' cost and benefits calculations due to lack of data.

[4] It is however acknowledged that poachers rarely poach within their own communities' area, and that a share of poachers come from abroad – about 10%. However, since only the foot soldier's income is included in the calculations – omitting any income from Namibians at other stage of the traffic – poaching revenues attributed to Namibian foot soldiers living in communal land remain a conservative estimate.

trophy hunting) at the national level. This sector generates value added for all three groups of actors as presented below, however its economic contribution impacts a broader set of actors than just those directly involved in the fight against IWT identified for this study, including hotels, restaurants, retail, and other services where visitors directly spend money. In this case the benefits generated from the sector are presented as a contribution to the overall national economy and society. Indirect and induced expenditures, which include intermediaries such as wholesalers or business that serve or provide supplies to hotels and restaurants, were not included.

## Costs and benefits identification and valuation

The CBA for curbing IWT consisted of three major steps. First, all costs and benefits that could be included were identified. Second, a functional unit was identified to relate changes in poaching to quantifiable costs and benefits. Finally, each cost and benefit was estimated and projected through the next ten years.

For the first step, a list of potential costs and benefits associated with curbing IWT in Namibia was established based on a literature review and expert consultations (see Table 1). The list of costs and benefits showcases the most well-understood ones, which include direct expenditures on curbing IWT and the revenues from recreational activities (hunting and wildlife tourism) directly linked to the presence of rhinos and elephants. It also included live sales of these animals, which the government undertakes to curb human-wildlife conflict and rewild and restock other protected parks and habitats throughout Africa. These benefits were chosen because of their salience and because they could be modeled in relation to population changes, using hunting or sales rates. For tourism revenue, several studies found a close relationship between the size of wildlife populations and tourism revenue. This relationship could be linear and proportional (Porsch and Smith, 2015) or even higher with some studies suggesting that tourist visitation increased by 370% when elephant population density increases (Naidoo et al. 2016). A linear and proportional relationship was adopted here.

Other benefits related to healthy rhino and elephant populations include ecological services (such as landscape management, seed dispersal, biological control of other species, waste assimilation, habitat for other species, etc.) provided by elephants and rhinos and the intrinsic value placed on rhinos and elephants as charismatic species (MEFT, 2020a). Given the fact that Namibia has the largest population of free-roaming black rhinos in the world and a well-known reputation in the conservation community, these values are especially important. However, since the information available was not easily quantifiable or attributable to changes in population sizes, these could not be included in this CBA.

Indirect benefits were also identified. Stakeholders mentioned that poaching levels could affect Namibia's international reputation as a safe country for tourism and business. This benefit is partly considered through the increase in tourism revenue associated with a decrease in poaching rates/increase in rhino population.

Direct costs include expenditures in anti-poaching and wildlife crime prevention in Namibia. These are tracked by government agencies, conservancies, and private land holders. Their exact impact on poaching levels is harder to estimate but can be inferred from historical data and through scenario assumptions (See Appendix Tables A2 and A3 for a detailed list of scenario assumptions).

Stakeholders also mentioned the cost of corruption, fueled by IWT financial flows. These are complex and difficult phenomena to predict as a function of poaching levels or elephant and rhino population size. Corruption affects social, political, and economic institutions altogether, and such analysis is not within the scope of this study. However, the direct cost of illegal economic activity related to IWT is accounted for through a change in the percentage of tax revenue collected from legal tourism, based on findings from the IMF (2019).

Another cost noted was the opportunity cost of funds diverted from economic development projects and into anti-poaching activities. Given that public resources are limited and IWT has become a growing problem in recent years, there has been concern that resources that would have been otherwise used for sustainable economic development, are being limited due to the resources needed for curbing IWT. This cost is partially accounted for by adding international aid for IWT curbing as a cost and in the no-poaching scenario, having a share of international development funding transferred from a cost (anti-poaching) to a benefit (development investments) over the years.

*Table 1. Identification of benefits and costs associated with curbing IWT*

| | Identification | Inclusion in CBA |
|---|---|---|
| Benefits | Wildlife-viewing tourism revenue | |
| | Trophy hunting revenue | |
| | Live sales | |
| | Reputational benefit for Namibia | *Embedded in the increase in tourism and trophy hunting revenue.* |
| | Other hunting values, including meat | *Meat value included only for elephant hunted for trophy in conservancies.* |
| | Intrinsic value of rhinos and elephants (value placed on conservation of iconic species) | |
| | Ecological services (e.g., landscape management, pollination and seed dispersal, waste assimilation, habitat for other species, etc.) | |
| Costs | Direct expenditures into anti-poaching and wildlife crime prevention for each actor | |
| | Damages and losses from Human-Wildlife Conflict | |
| | Loss of human lives from widespread crime | *A conservative approach of one additional death per year once IWT ramps up.* |
| | Opportunity cost of expenditure into wildlife crime prevention | *Reflected in the transfer of aid money to benefits as expenditures decrease.* |
| | Cost of widespread corruption | *Reflected in loss in tax revenue.* |

**green = included in the study, orange = either partly included or indirectly accounted for in another benefit/cost category, red = not included.*

## Costs and benefits valuation

The benefits side of the equation of this CBA includes the financial revenues obtained from the conservation of at-risk species. These can be understood as the benefits that are protected when IWT is curbed, and which vary as poaching increases or decreases in each scenario. The cost side of the equation includes the financial costs of the programs and initiatives being implemented to curb IWT. The effectiveness of these programs is assumed based on the amount of expenditure on IWT curbing and it is translated into a variable of population size for each species. It is important to note that in this framework curbing IWT is the target investment to analyze, and hence the costs of curbing IWT are not attributed to IWT itself.

The costs and benefits included in this CBA are modeled as dependent on the annual population of white and black rhinos and elephants. These are modeled over a ten-year temporal horizon, where, as poaching rates change, populations for each species change and trigger changes on the various costs and benefits included. Year 0 is the base year and reflects available data from 2010 to 2019, collected from government reports and interviews (MEFT, 2020a; MEFT, 2021b; Proposals on Rhino to the CITES CoP18, 2019; Financial Intelligence Center, 2017).

### Benefits included in the CBA

The main categories of benefits included in this CBA are: 1) trophy hunting and live sales of animals, and 2) wildlife-based tourism revenue.

These are directly dependent on the population size of rhinos and elephants and are significant sources of revenues for the government, conservancies, and private landholders (see Figure 3).


*Figure 3. Benefits from wildlife populations included in the CBA*

#### Trophy hunting and live sales

A varying share of the population of each species is allocated as "quotas" for live sales and trophy hunting to each actor. The amount of trophy hunting and live sales that each actor could expect was determined based on existing rates and expected changes in populations.

Current prices per animal or hunt, and hunting and/or sales rates were used to estimate income generated from live sales and trophy hunting (see Tables A2 and A3 in Appendix for more details). To validate these estimates, baseline income estimates for Year 0 were compared to actual income data collected for the year 2019 or the earliest data year available. Income estimates then varies based on population, changing hunting and live sales rate, as well as prices overtime (See Appendix Tables A2 and A3.)

Wildlife-based tourism

Wildlife viewing fuels a tourism economy in the country which is large and diverse. Having one of the world's largest populations of black and white rhinos, Namibia is a popular tourist destination for these unique opportunities. Some studies suggest that as much as 80% of international tourism to Africa is lured by the opportunity to see rare species native to the continent (Porsch et al., 2015).

To estimate economy-wide benefits and government tax revenue from wildlife tourism, the total revenue generated by wildlife viewing tourism in Namibia was estimated, based on available tourism expenditures statistics (estimated at US$350,000,000 by UN World Tourism Organization 2020) and assumptions about the proportion of tourism whose primary activity is wildlife watching (conservatively estimated to be about 31% of total tourism based on assumptions by Turpie et al. 2010 and Forsythe et al. 2018). Trophy hunting is also a large part of wildlife tourism in Namibia. We used MacLaren et al. (2019) estimates of revenue from trophy hunting in Namibia based on 2016 MEFT hunting permit data, as a baseline for overall trophy hunting contribution to the national economy (N$431 million).

To estimate the benefits derived from wildlife-viewing (e.g., photographic) tourism for each group of actors, baseline tourism income was collected from existing data for each group for the year 2019. It was then assumed that this income varies proportional to rhino populations (i.e., 1% change in population equals 1% change in revenue), following the approach by Porsch and Smith (2015). Rhinos were used as a proxy for changes in population since elephant populations became too large in the low-poaching scenario and were stabilized in the model to maintain realistic scenarios.

In order to ensure that the variation in income could be attributed to a change in rhino and elephant populations, the baseline income data collected was restricted to areas where rhino and elephants occur. For the government, income from wildlife viewing comes from three sources: (i) park entrance fees, (ii) tourism concession fees, and (iii) tax revenue from wildlife-viewing tourists' expenditures in Namibia.[5] In conservancies, the revenue from wildlife-viewing tourism was estimated from the NACSO database on income and expenditures of conservancies in Namibia for the year 2019. The income generated from tourism joint ventures and community-led campsites was collected for conservancies with elephants and/or rhinos in their area only (see conservancy list in Appendix Table A4.).

The revenue generated by wildlife viewing in private game reserves and farms was estimated based on an estimated number of tourist days per year (MEFT Tourist Statistical Report 2019), an estimation of the proportion of value of nature-based tourism generated in freehold land in Namibia (Forsythe et al., 2018), average expenditures of USD$200/per day, and a subset of private land that manages rhinos (25%). Since

[5] Income from park entrance fees and tourism concessions were collected for parks and concessions with rhino and/or elephants only (Etosha NP, Mudumu NP, Bwabwata NP, Khaudum NP, Mangetti NP, and Palmwag concession). Tax revenues were assumed to be start at a baseline value of 10% of the wildlife-viewing tourism expenditures, based on Namibia's VAT rate.

this method relied on various secondary sources, results were validated against alternative calculation methods, which all yielded similar numbers.

A summary of the methods and assumptions can be found in Appendix.

### Costs included in the CBA

The main component of costs included in this study is the expenditures made by all actors to fight against the poaching of rhino and elephants in Namibia. However, some opportunity costs and some indirect costs were also considered. These relate to foregone opportunities to invest in development programs and some conservative proxies for the costs of widespread crime.

#### Government and NGOs

Public funding represents the lion's share of spending on curbing IWT. For the government, expenditures in anti-poaching and wildlife crime prevention include expenditures from the Ministry of Environment, Forestry and Tourism, Game-Products Trust Fund, Namibian Police, Namibian Defense Force, Customs, and Ministry of Justice (see Table 2).

International funding and NGO support for anti-poaching and wildlife crime prevention is added to government costs as it is visualized as an opportunity cost for investment in other development activities.

*Table 2: Government expenditures attribution list*

| Institution | Attribution | Source |
|---|---|---|
| Ministry of Environment, Forestry and Tourism | Salaries of all Wildlife Protection Services Unit staff (DWNP)<br>Salaries of Rhino Unit staff (DSS)<br>Expenditure for NAMPOL rations in northern parks<br>Average dehorning costs<br>Average helicopter patrols costs | Interviews |
| GPTF | Investment in anti-poaching 2018 | Report |
| NAMPOL | Salaries of officers covering Northern Parks area | Interviews |
| NDF | Salaries of officers covering Northern Parks area | Interviews |
| Customs | Cost of Operation Thunder | Interviews |
| Ministry of Justice | 1% of total MoJ budget to deal with wildlife crime cases | Interviews, MTEF |
| International Aid/NGOs | 2020 IWT project budgets for WWF, NNF, SRT (USAID, INL funded), Rooikat Trust (Wildcat Foundation), and ODA to MEFT (US Fish and Wildlife Services) | WWF budget database and interviews |

#### Conservancies

Although conservancies' resources are scarce, they have committed to investing in curbing efforts in order to address concerns with these illegal activities. The expenditures of conservancies in anti-poaching and wildlife crime prevention efforts were estimated based on NACSO conservancies expenditure data from 2011 to 2018. This estimation included only conservancies located in areas within rhino and elephant ranges (53 conservancies out of 85, see table A4 in Appendix).

Human-Wildlife Conflict (HWC) is also a concern to communities as high damages are reported every year. In 2019, these damages included seven deaths, 1,400 heads of livestock lost, and 1,600 acres of cropland damaged by various wildlife species (MEFT, 2020c). In this CBA, this cost was included based on government compensation expenditures reported at N$4,357,800 for 2019 (*ibid*.). These were pegged to elephant populations as elephants account for most of the reported damages (Kahler and Gore, 2015).

Private landholders: game farms and game reserves

Private landholders are a key player in curbing IWT as they manage a large touristic sector that depends on these populations. Data availability on expenditures from private farm/game reserves owners is limited, and was thus estimated based on interviews[6] and a set of assumptions. Only black and/or white rhinos on their land were included and their investments in anti-poaching were estimated. These private farms were categorized in high, medium, or low expenditure groups based on their size, number of rhinos, establishment of their anti-poaching unit, and use of aerial surveillance technology.[7] Expenditures ranged from NAD $48,000 to NAD $2million per year in the BAU scenario. It was noted that private farms spend about 15% of what government spends on anti-poaching.[8] This percentage was used in the No-Poaching Scenario to estimate proportional increases (see Appendix for further details).

## Scenarios, assumptions, and forecasting

Since a CBA is most meaningful when compared to alternative scenarios, three scenarios were modeled. The optimal course of action can best be evaluated in comparison to alternative courses of action (or inaction) to see what the gains and the losses would be.

This study provides an analysis of costs and benefits under the following three different scenarios:

- The Baseline scenario (or Business as Usual – BAU): reflects current spending levels, poaching rates, population levels, and current streams of benefits.
- The No Poaching scenario: reflects a realistic maximum effort and effectiveness scenario under which IWT is significantly curbed within five years.
- The High Poaching scenario: Is presented as a benchmark to evaluate benefits relative to a hypothetical counterfactual. In this scenario the fight against wildlife crime is massively defunded and poaching cases ramp up rapidly.

Figure 4 provides an overview of the scenarios included.

[6] For confidentiality purposes the institutions interviewed cannot be disclosed.

[7] Not all this information was available for all farms, full information was collected for 28 farms out of 90. The rest were allocated to a category based on farm size and number of rhinos.

[8] It is acknowledged however that private landholders directly benefit from government efforts on anti-poaching which covers the whole of Namibia, explaining their relatively low expenses compared to government.

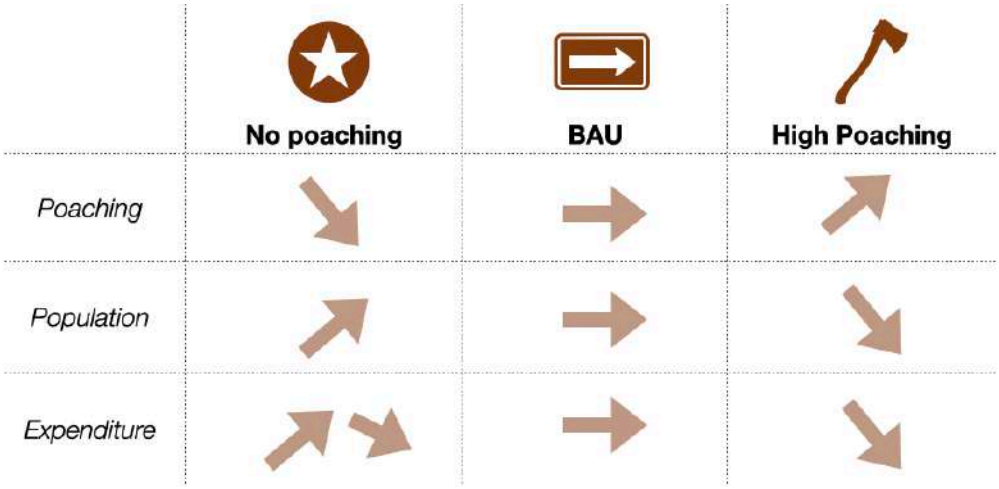


*Figure 4. Three scenarios included in this BCA*

All the scenarios were modeled over a 10-year time horizon. This was chosen due to data availability and the limited ability to accurately project costs and benefits further into the future. It should be noted that elephant and rhino population projections start with an already active population and are assumed to have a normal distribution. Also, since benefits are expected to be realized in the short term, promptly after investment and there is no delay in cause and effect in the variables modeled, this temporal horizon provides a good idea of the results that can be expected.

Discount rates are used to account for the potential cost of capital (opportunity cost from not investing in other profitable activities) and an assumed time preference for benefits now rather than in the future. By using discount rates, future costs and benefits are presented through the lens of these two factors in net present dollars. Given natural resources valuations often merit a lower discount rate, the discount rate applied in this analysis was 2%.

The BAU, or baseline scenario, describes current efforts to curb IWT. It begins with a snapshot of the present (2019), modelled as Year 0, and maintains the situation relatively stable across the 10 years. There are some increases in population sizes, assuming natural growth rates from an already active population, and hence benefits are expected to increase through time. The costs and benefits values for Year 0 are estimated based on current data and assumptions as described in the Appendix.

Poaching levels for rhinos in 2019 were about 2% of the total population (with 52 rhinos poached out of a population of about 2,200), the five-year average was about 3% of the population (based on statistics extracted from MEFT 2021b). The number of poached elephants was similar with a five-year average of 67 elephants poached every year, although in 2019 the number reported was much lower at 12 elephants (MEFT 2021b). However, since the population of elephants is much larger, the percent of the population that is poached every year is closer to 0.25%. Since the natural rate of population growth for these species is between 3% to 6% (IUCN, 2019), populations are still expected to increase in the BAU. The effectiveness of current curbing efforts is expected to maintain poaching at current rates.

### No Poaching Scenario

The objective of the No Poaching scenario is to demonstrate the benefits that could be expected if poaching is eliminated or brought to minimal levels. The effectiveness of different specific actions was not evaluated in comparison to each other for several reasons. Firstly, there was not enough disaggregated and longitudinal data available to even attempt such an exercise. Secondly, most anti-poaching efforts are effective when implemented in an integrated manner, as they complement and reinforce each other.

For the No Poaching scenario, an external assumption was made that poaching could be curbed almost completely within 7 to 10 years. The cost of achieving this could range from existing proposals being considered by the Namibian government in the Revised National Strategy on Wildlife Protection and Law Enforcement (2021 – 2025), assuming they are effective, to what others have estimated for such a goal. For example, in Naidoo et al. (2016) it was noted that elephant poaching could be eliminated by investing about US$565 per square kilometer of elephant habitat. Assuming an area of about 20,000 square kilometers of protected areas, this would translate to about US$116,000,000 per year (in 2020 USD). For this analysis, current government proposals to significantly curb IWT, amounting to an additional N$110,000,000 per year for the next five years were used as the cost part of the equation (MEFT 2021). In addition, conservancies and private landholders would invest proportional amounts in addition to what they are currently investing. The potential costs related to an increase in Human-Wildlife Conflict linked to a larger elephant population is also included in the costs of this scenario.

Details on poaching rate, hunting and live sales rate evolution over 10 years, as well as further value assumptions are available in Appendix Tables A2 and A3.

### High Poaching/ No Action Scenario

Normally, CBAs include a no-action scenario that serves as a benchmark for interpreting the impacts of the investment alternatives. In this analysis the no-action scenario reflects a future with no investment in curbing IWT and escalating poaching rates as a result. This was modeled as the most likely conditions in the absence of any effort to curb IWT.

It should be noted, however, that the High Poaching scenario still includes high levels of benefits from existing tourism revenues and trophy hunting that still takes place. These revenues are not being generated specifically by the fact that no action is being taken to curb IWT but rather they continue to exist to some level but decrease as wildlife populations decrease and reputation worsens. Although this framework creates somewhat of an artificial set of benefits associated with the High Poaching scenario, it allows for scenarios to be compared along the same metrics.

Details on poaching rate, hunting and live sales rate evolution over 10 years, as well as further value assumptions are available in Appendix Tables A2 and A3.

## Results

### Population results under three scenarios

Population projections are based on current population sizes and the impacts of a natural growth rate, poaching rates, hunting rates and the sale of live animals through time. The white rhino population was

estimated at about 1,000 animals at Year 0 (CITES, 2019),[9] the black rhino population at 1,850 (Financial Intelligence Center 2017), and the elephant population at 22,754[10] (IUCN 2016, MEFT 2020a).

Under BAU, white rhino populations continue to see a natural growth rate of 6%, poaching rates of 2.5%, hunting rates of 0.5%, and the sale of live animals at 1.5%. Under the No Poaching scenario, natural growth rates increase to healthier levels, assumed to be 7.5% according to IUCN (2020) studies, rhino poaching would gradually decrease to 0 by Year 10, hunting rates would remain stable at 0.5%, as would the sale of live animals. Under the High Poaching scenario, natural growth rates would decrease to poor levels, assumed at 2.5% (IUCN, 2020), poaching rates would gradually increase every year until they peak at 22% at Year 5, legal hunting would cease due to threatened populations and live sales would eventually cease. The impact of these dynamics can be observed in Figure 5.

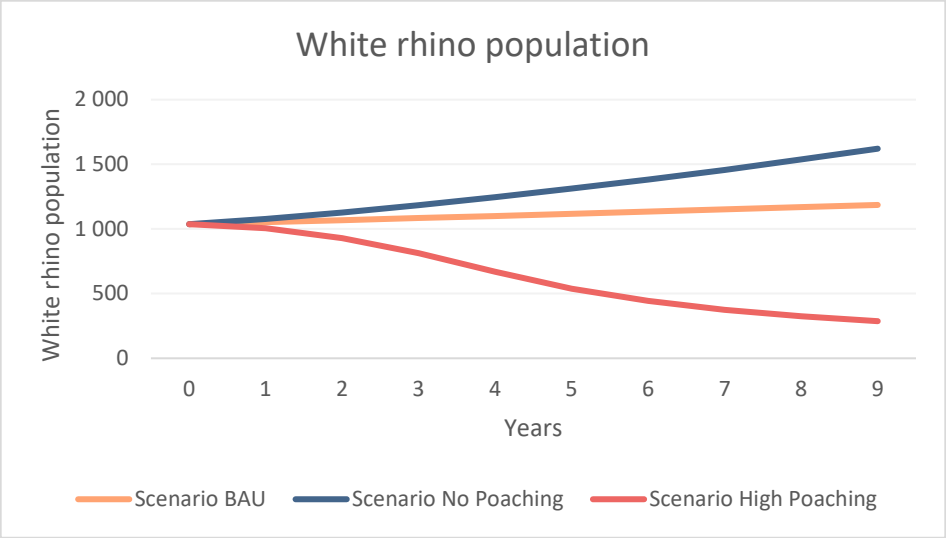


*Figure 5. White rhino population projections under three scenarios*

For black rhinos, BAU assumes the continuation of current growth rates of 3%, poaching rates of 2.5%, two hunts during a ten-year period,[11] and no sale of live animals. The No Poaching scenario assumes an increase in natural growth rates to 7.5% per year (according to IUCN 2020 models), a gradual decrease in poaching rates that comes to 0 at Year 10, a gradual increase in hunting rates to 0.15% of the population by Year 2 (which equates to between three to five hunts per year once populations are healthy), and an increase from one sale to two sales of about four to six rhinos each within ten years. For the High Poaching scenario, population growth rates decrease to 2.5%, poaching increases to 22% by Year 5 and then declines to 14% by Year 10, and there are no legal hunts or sale of live animals. The impact of these dynamics can be observed in Figure 6.

[9] https://cites.org/sites/default/files/eng/cop/18/prop/010319/E-CoP18-Prop-09.pdf

[10] The total elephant population estimates for Namibia varies between sources, the number of 22,754 was used as it is the reference for Namibian policy and planning and is nationally considered the best estimate based on available knowledge (MEFT, 2020a). However, this could further vary as new and more sophisticated data is collected and thus should be treated with care.

[11] It was noted that there are more frequent black rhino hunts, however, many of those were deemed to generate lower revenue since they are often for the purpose or wildlife management and so were not included in the model

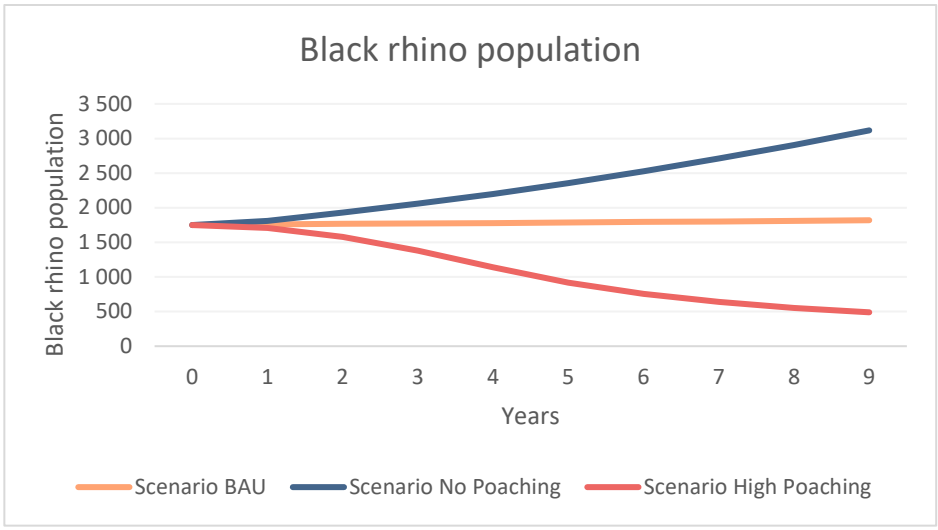


*Figure 6. Black rhino population projections under three scenarios*

For elephants in BAU, natural growth rates are 5%, poaching rates stay at 0.3%, hunting rates at 0.5%,[12] and the sale of live animals increase to 1% at Year 10. The sales rate relies on the assumption that a market for elephants will grow as repopulation needs and interests are increasing in parts of Africa where elephants are quickly disappearing. Under the No Poaching scenario conditions stay the same as in BAU except poaching rates decrease to 0.04% by Year 10 and sales rate increase to 1.5% by year 7. For the High Poaching scenario, natural growth rate decreases to 2.5%, poaching rates increase to 11% by Year 10, hunting rates decrease to 0.1% as do sales of live animals. The impact of these dynamics can be observed in Figure 7 below.

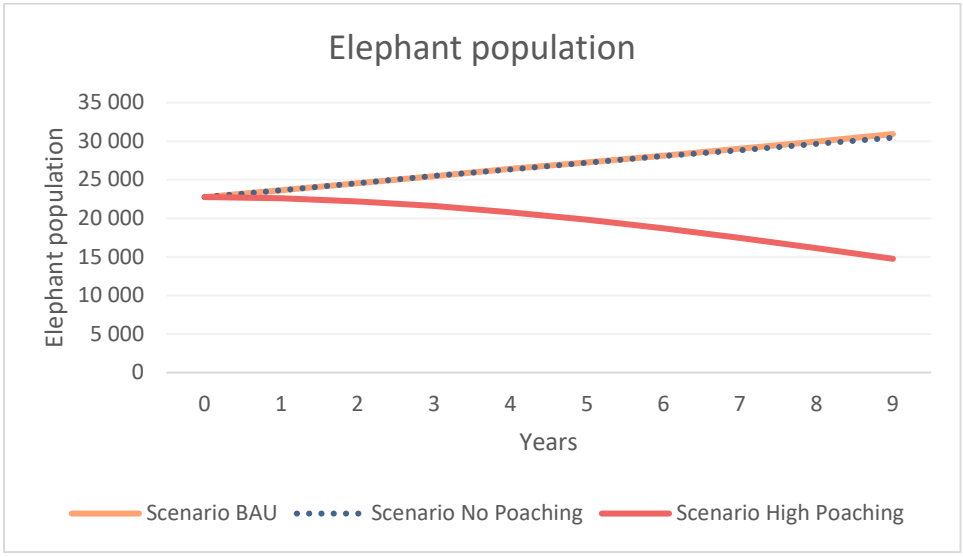


*Figure 7. Elephant population projections under three scenarios*

The population size through time is an important result in itself, as maintaining or increasing populations can be the final goal for many investors and stakeholders. Also, given that many benefits associated with

[12] This is based on recommendations for a healthy local population as indicated in the Draft National Elephant Strategy (MEFT, 2021a). If about 3% of the total elephant population is suitable for trophy hunting, this assumes that 16% of this suitable population is hunted every year. This could be an over-estimate, which would then be compensated by the omission of benefits from other kind of elephant hunts into the model.

these wildlife species could not be estimated (e.g., intrinsic conservation value or ecosystem services like seed dispersal), these values could be added using the obtained information on population projections.

## Benefits, costs, and net present value

The total benefits generated in each scenario is one of the most important indicators from a public policy perspective. The benefits modeled in the CBA represent economic activity in the Namibian economy, which translates into jobs, income, and other multiplier effects that in turn benefit many other supporting industries and actors. The benefits generated under each scenario are illustrated in Figure 8. NPV of Benefits generated under three scenarios, by actor. These benefits are the total net revenue generated over ten years, using a 2% real discount rate.

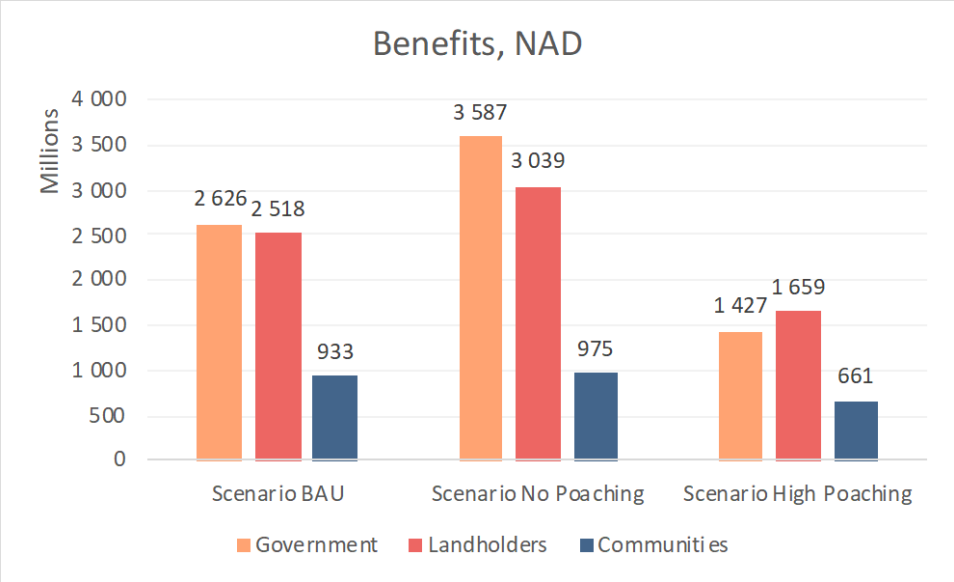


*Figure 8. NPV of Benefits generated under three scenarios, by actor*

As illustrated, the No Poaching scenario created the highest levels of benefits for government and private landholders. Government revenue increases from N$2.6 billion to almost N$3.6 billion and private landholders increase their revenue from N$2.5 billion to N$3 billion in the No Poaching Scenario. Benefits for communities increases only a little, by N$42 million, in the No Poaching scenario compared to BAU. This may be due to the loss of income for poachers in the No Poaching scenario – as this group includes both benefits to conservancies (tourism and hunting) and the revenue from poaching for local poachers. This suggests that although the increase in benefits for conservancies under the No Poaching scenario could cover the loss in income to local poachers, these additional benefits remain quite small. However, the increase in income to poachers in the High Poaching scenario is not sufficient to cover the loss in tourism and hunting income to conservancies. This aspect is further discussed in the following "Discussion" section.

Overall, the High Poaching scenario is not an economically attractive scenario for any of the actors. Government revenue are less than half of the No Poaching scenario (at N$1.4 billion) and decrease by more than $1 billion compared to BAU.

The cost side of the equation represents the size of the investment needed to achieve these benefits as well as some indirect costs such as increased mortality risks and human wildlife conflict that goes unmanaged. These are illustrated in Figure 9 below.

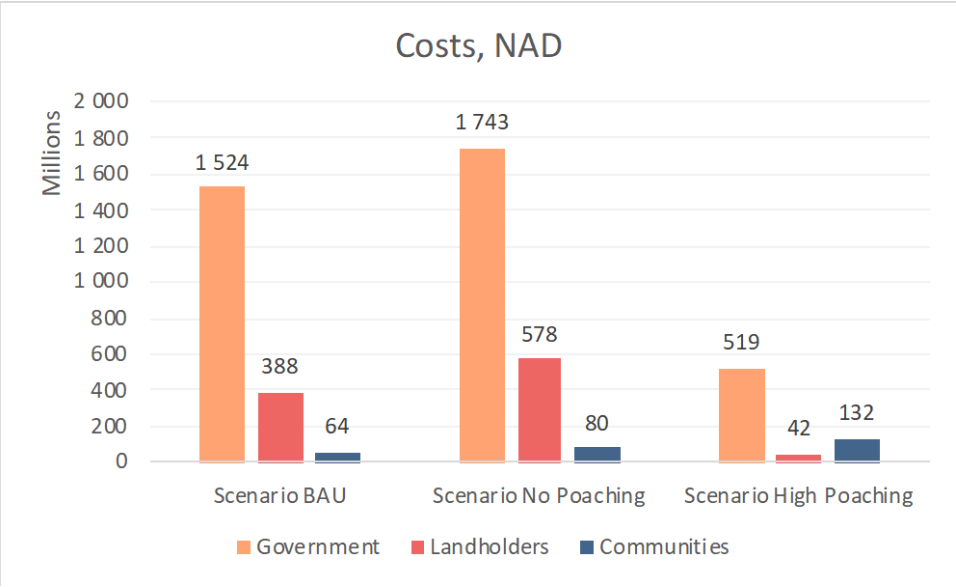


*Figure 9. NPV of Costs of curbing IWT under three scenarios, by actor*

As shown above, the costs of the No Poaching scenario are highest, since a reduction of IWT will require significant investments. Government funding alone increases from N$1.5 billion over ten years to about N$1.7 billion. In the High Poaching scenario, almost all spending in curbing IWT is eliminated, leaving only some bare bone spending to maintain some minimal staff as well as some amount of international aid for IWT curbing that is available in the initial years but that is phased out over time. In the High Poaching model, even though direct financial spending by conservancies on curbing IWT is minimal, new costs are created from the growing poaching sector, such as increased death risks from widespread poaching and increased crime and corruption.

However, the logic of the CBA analysis is that neither costs nor benefits alone provide enough information to make an informed and financially viable decision. The logic is to identify smart investments, where the highest net benefit is generated (that is benefits minus costs). Net benefits for the three scenarios are presented in Figure 10. These benefits include costs and benefits across the three actors (government, conservancies, and private land holders) as well as economy-wide benefits, obtained primarily by private actors that are part of the tourism industry (e.g., hotels, restaurants, guides, etc.). These net benefits are discounted over time, at a 2% discount rate.

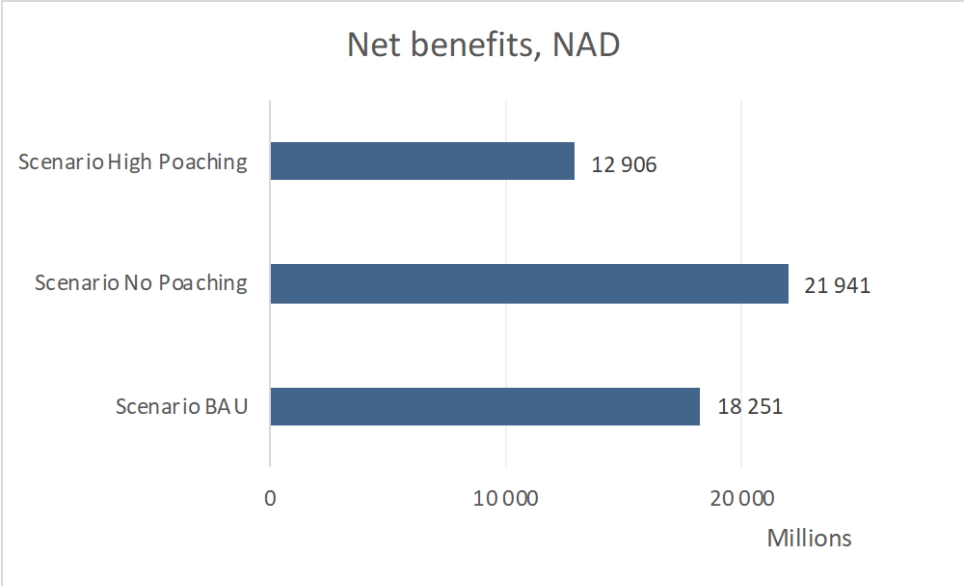


*Figure 10. NPV of net benefits obtained from investments in curbing IWT under three scenarios*

As shown by the net benefit results, the No Poaching scenario has significantly higher net benefits than the other two scenarios, with almost N$22 billion in benefits over the ten-year temporal horizon. The BAU scenario, follows with net benefits of N$18 billion. Therefore, although currently almost N$2 billion are expected to be spent across actors to curb IWT over the next ten years, the benefits are still greater than these costs, by N$18 billion. These could increase to almost N$22 billion of benefits distributed across society if an additional N$550 million are invested over ten years (No Poaching scenario). In the High Poaching Scenario, although costs are minimal at about N$690 million over ten years, benefits are also lowest than under all other scenarios. In fact, no action on curbing IWT would imply losses to the tourism and hunting economies, relative to what is being obtained right now. These would translate to job losses and larger economic impacts. And since there is no investment being made and populations collapse, the tourism industry becomes less attractive over time and leads to a growing reduction in visitors and visitor spending.

In order to understand the expected impacts of alternative scenarios, a comparison to the baseline scenario (BAU) highlights the direction of the expected impacts relative to the present. In this light, the No Poaching scenario generates significant net benefits (N$3.6 billion over ten years), while the High Poaching scenario would generate net losses (N$5.4 billion over ten years), as illustrated in Figure 11.

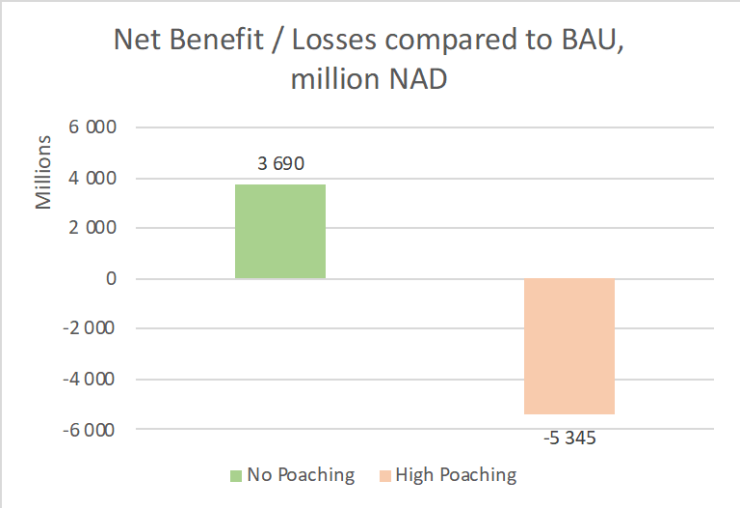


*Figure 11. Net benefits (NPV) compared to BAU (baseline) scenario*

As shown in Figure 12 below, these effects are most pronounced for the government and private landholders. Local community benefits increase slightly under the No Poaching scenario when compared to BAU, but in a much lower proportion. This may be explained by the fact that poaching revenue was included as a revenue for the communities and the fact that the government and private landholders primarily manage rhinos. Therefore, although tourism and hunting revenues increase in the No Poaching scenario, compared to BAU, poachers' income reductions and increases HWC cost keep the net benefits low. However, increased government revenue is more than able to compensate for these losses, while still yielding a net benefit across actors. The High Poaching scenario results in significant losses for all actors. The consequences of these results are further discussed in the "Discussion" section below.

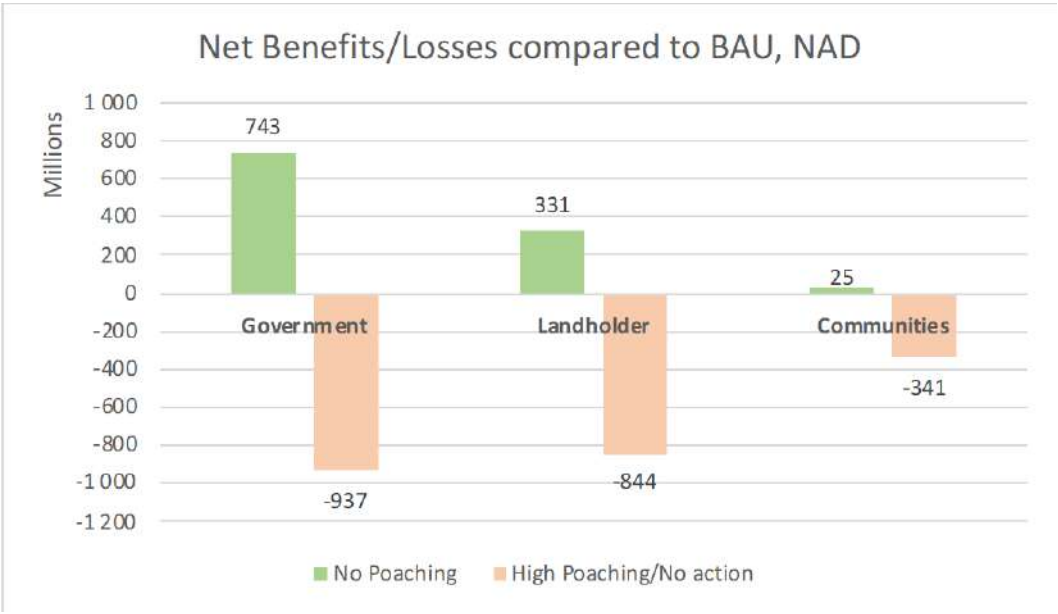


*Figure 12. NPV of net benefits compared to BAU, by actor*

The stream of economy-wide benefits (from the tourism and trophy hunting industry as well as resources available for productive development projects) can also be compared across scenarios (Figure 13). This

represents yearly benefits rather than cumulative benefits over the ten-year horizon. In this graph, the No Poaching scenario yields larger benefits, which accentuate over time and the High Poaching scenario underperforms the baseline scenario (BAU). As wildlife population numbers decrease, so do the economic benefits they generate.

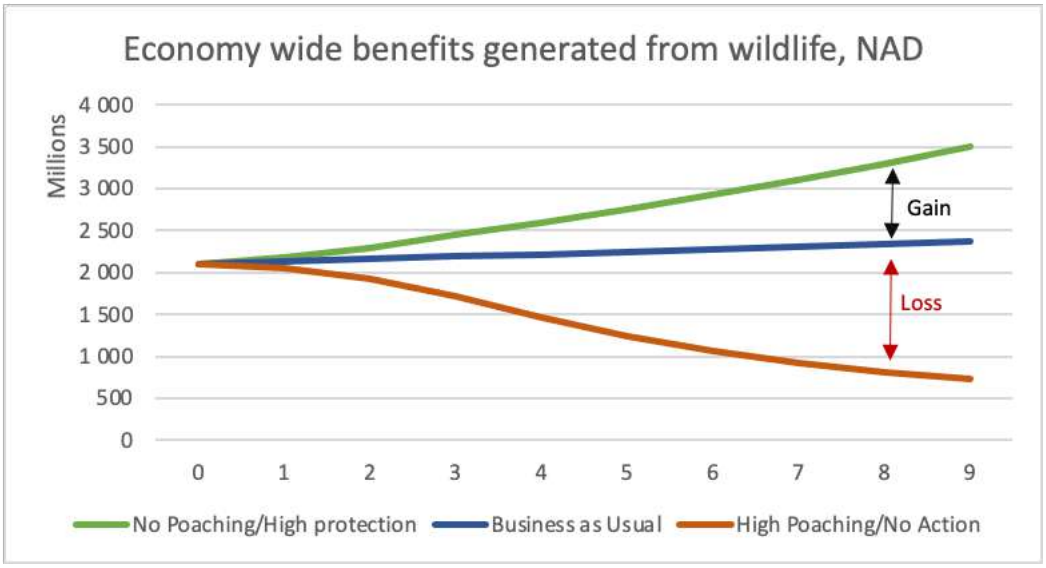


*Figure 13. Economy-wide benefits over time for three scenarios*

An additional indicator that can be considered is the benefit-cost ratio (BCR), which highlights the return on investment for every dollar spent on protecting wildlife species. This indicator is not relevant for the High Poaching scenario since no investment is being made in protecting wildlife species. Instead, it provides information on individual returns generated by the IWT curbing initiatives and the cost and benefit distribution between the actors. As Table 3 shows, the No Poaching scenario has a slightly higher return on investment for the three actors combined, yielding about N$3.17 per N$1 invested. This does not account for economy-wide benefits generated beyond the three actors, which would make the return on investment be about N$9.14 per $1 invested. Government also stands to benefit the most from an increase in efforts to curb IWT, going from a BCR of 1.7 to a 2.06, which is a preferred investment BCR to ensure that the initiatives are financially viable. This finding is important since government is the largest investor in curbing IWT. Private landholders and communities and conservancies see a slight decline in their BCRs but still remain in a very beneficial situation from the investments.

*Table 3. Benefit cost ratio for investments in curbing IWT in the BAU and No Poaching scenario**

| | BCR for BAU | BCR for No Poaching |
|---|---|---|
| Government | 1.7 | 2.06 |
| Private land holders | 6.5 | 5.26 |
| Communities and conservancies | 14.7 | 12.14 |
| Combined for the three actors | 3.07 | 3.17 |

**Since the High Poaching scenario makes no investments in protecting wildlife species, no BCR can be calculated.*

## Sensitivity analysis and alternative scenarios

Assumptions with the most impact and highest uncertainty should be examined under alternative assumptions to see the robustness of the results obtained. For this, several sets of assumptions were examined in more detail through a sensitivity analysis. Assumptions that were noted for review were the rate of poaching, correcting for the uncertainty around private landholder tourism revenue, the size of the tourism sector, and the effect of the discount rate.

### Poaching rate

First, poaching rates were increased to an even higher rate under the High Poaching scenario, based on expert feedback, resulting in near extinction of rhinos by Year 10 and a poaching rate of almost 50% for elephants by Year 10. As expected, the higher poaching rate only accentuates the results previously obtained (see Figure 14), with the High Poaching scenario falling further behind in ranking, and implying losses relative to BAU of about N$7 billion, over ten years. It is interesting to note that increasing the poaching rate results in even less benefits for the High Poaching scenario (N$11.7 billion), when compared to the base High Poaching scenario (N$12.9 billion) modelled in the core results, implying that increased poaching revenue from even higher poaching does not compensate for the higher losses that the tourism industry suffers.

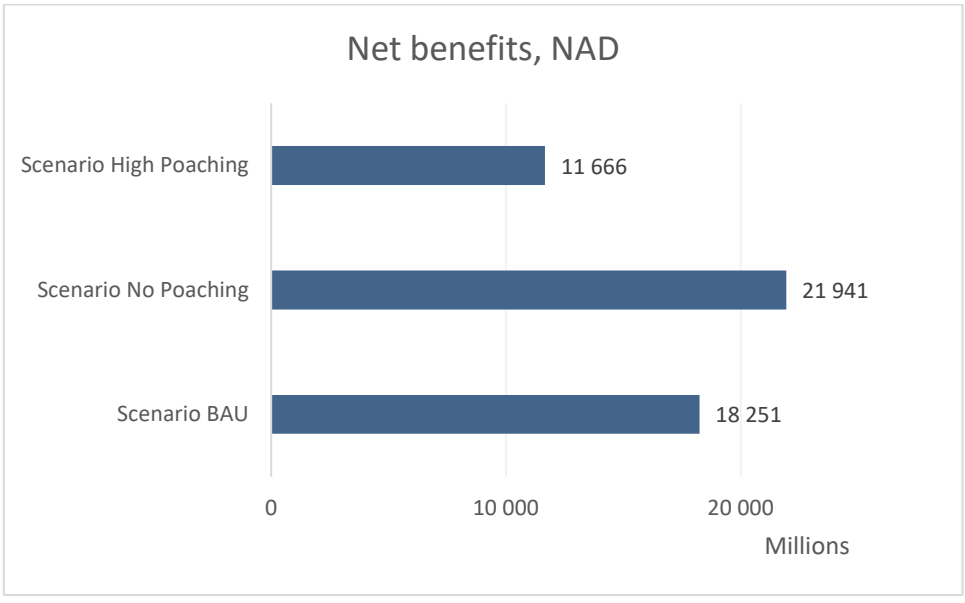


*Figure 14. NPV of net benefits three scenarios, with assumption of higher poaching rates*

### Tourism revenue for private landholders

Given that data on tourism revenue for private landholders was scarce and that this benefit was estimated using several different secondary sources and assumptions, which may have overestimated the amount of revenue that private landholders get from tourism, this amount was reduced to a number comparable to what government and communities are getting for wildlife-viewing tourism, N$85,000,000 per year.

Although this value is not informed by data, it is presented here to explore the possibility that revenue to private landholders could be smaller.

Although in this exercise, net benefits for society change very little, with a No Poaching scenario still performing best for the economy (Figure 15), the distribution of benefits across actors changes more drastically, as shown in Figure 16. In this case, private landholders do not gain from a No-Poaching scenario, relative to BAU, and actually have higher net benefits under a High Poaching scenario due to the fact that they stop spending on curbing IWT.

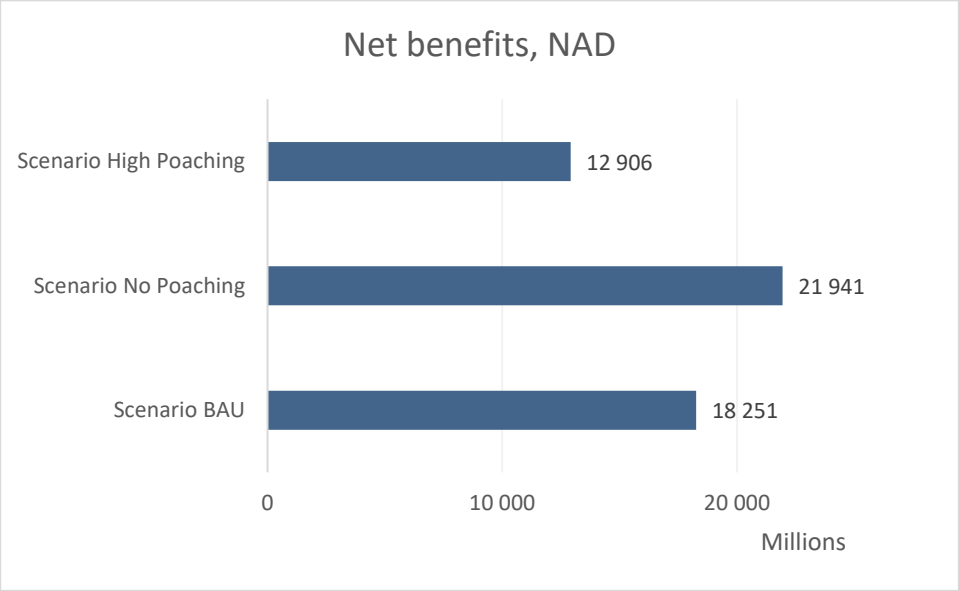


*Figure 15. NPV of net benefits obtained under the assumption that private landholders receive less tourism revenue*

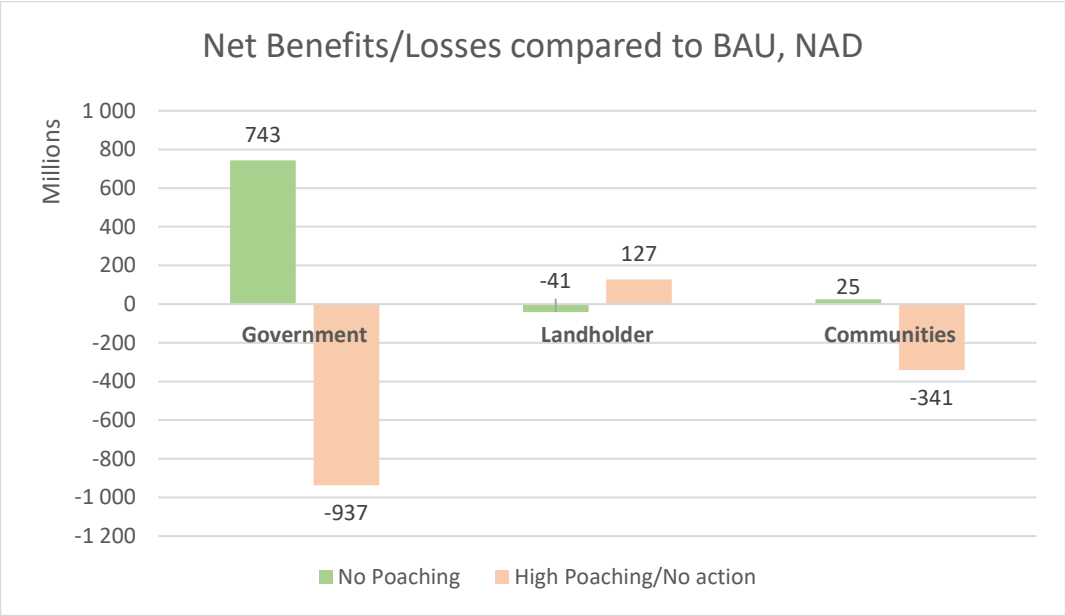


*Figure 16. NPV comparison of net benefits relative to BAU, by actor, under the assumption that private landholders receive less revenue from tourism*

This is an important finding worth exploring in more detail. In this study, three different methods for estimating private landholder revenue were explored: 1) based on total tourism expenditures and a distribution of these based on Forsythe et al. (2018), 2) based on an estimate of tourist visits (MEFT, 2019) and an average expenditure per day of US$200/day, and 3) based on income reports from an interview with a high-end resort that reported revenue of about US$250,000 per year. All three methods yielded a total tourism revenue of about N$315 million to N$390 million per year for all the private farms with rhinos in the country. Therefore, since the sensitivity analysis method is not based on any data, it was deemed too imprecise to override the other methods employed to calculate revenue for private landholders. Nevertheless, the findings of the sensitivity analysis are helpful for a better interpretation of the spectrum of possibilities for this actor.

A loss in overall tourism revenue

Since one of the largest categories of revenue across the CBA is tourism, and a change in these revenues could significantly impact the results of this CBA, a sensitivity analysis was conducted simulating a shock to the tourism industry in Namibia, as has been the case during the COVID-19 crisis. For this, it was assumed that all tourism and trophy hunting revenue would drop by 50% of its current levels in Year 1 and remain that low for the entire period of analysis. No change was made to expenditures on IWT curbing. This drop in tourism revenue across all actors and all scenarios allows to test the sensitivity of the results to the size of the tourism industry. Such a cut in revenue would impact the return that the various actors get for their investment in wildlife protection.

As expected, this change decreases net benefits in every scenario. However, even with this assumption, the ranking of the results according to their net benefits continues to be the same (Figure 17), meaning that the No Poaching scenario still generates more net benefits than BAU, and the High Poaching still presents net losses as compared to BAU. The difference between them is just not as pronounced as our central CBA. Even bigger cuts in tourism revenue were explored, for example by reducing them to 10% of their current levels at Year 5 but results remained consistent in their ranking.

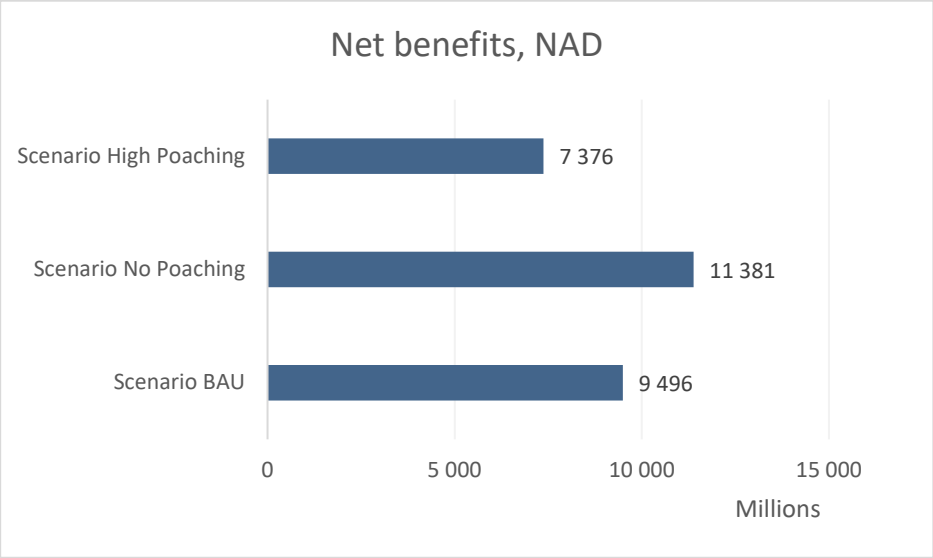


*Figure 17. Net benefits for three scenarios, assuming tourism and trophy hunting revenues are reduced to 50% of current levels*

Discount rate

A last round of sensitivity analysis was conducted, with different assumptions about the discount rate. First results were calculated with a zero-discount rate, so as to transparently show the actual flows of revenue that can be expected, without discounting the value of costs and benefits incurred in the future. In this scenario, the results obtained rank in the same order, but the net benefits increase for all scenarios (Figure 18). The difference in net benefits between High Poaching and No Poaching increases since the higher benefits that No Poaching generates are further in the future and these acquire more weight once discounting is removed.

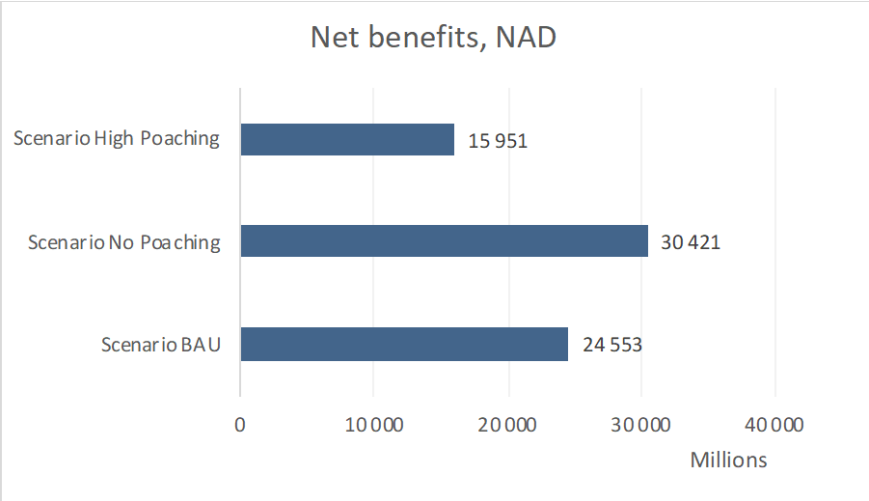


*Figure 18. Net benefits for three scenarios using a zero-discount rate over the ten-year time horizon*

Alternatively, if an 8% discount rate – reflecting current interest rates in Namibia- is applied, net benefits decrease as shown in Figure 19. In this case, the net benefits are closer to each other and the differences between the scenarios less pronounced. This result highlights the fact that the benefits from the investment in curbing IWT grow over time and the difference between the scenarios will be larger further into the future.

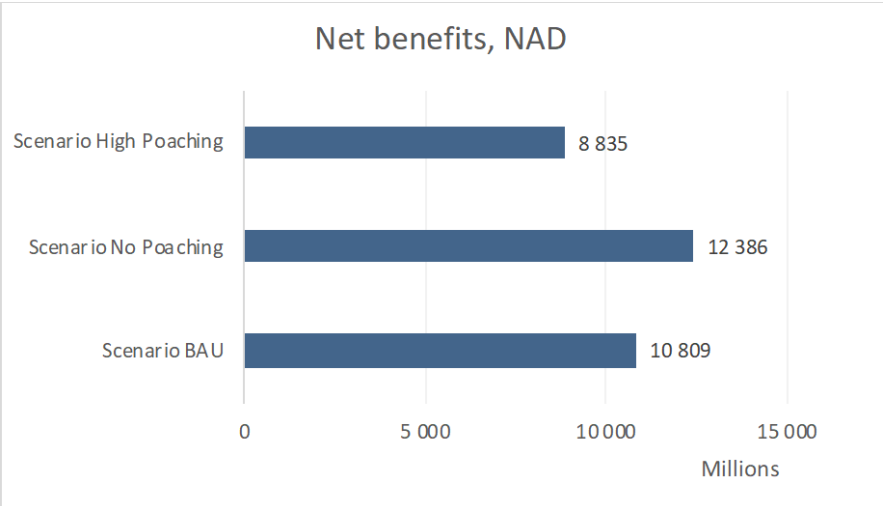


*Figure 19. Net benefits for three scenarios using an 8% discount rate over the ten-year temporal horizon*

However, overall, the sensitivity analyses conducted show that the results are relatively robust, with the No Poaching scenario yielding the most net benefits, followed by the current investments (BAU scenario) and with the High Poaching implying losses from the current situation.

## Main observations on the results

Overall, the CBA shows that it makes economic sense to invest in curbing illegal wildlife trade. Even though this study included primarily local financial benefits associated with protecting rhino and elephant populations, the results were very clear – benefits greatly outweigh costs. The tourism economy is an economic engine in the country, and it sustains a large percent of the population directly and indirectly. However, it requires investments to sustain the attributes that make Namibia a unique destination and wildlife populations are one of these important attributes.

In this study the size of the tourism economy that directly benefits from the presence of rhinos and elephants (and other wildlife at risk of poaching) was estimated to be about N$2.1 billion per year. Some of this tourism is non-consumptive (wildlife viewing) while other is consumptive and is directly dependent on population size (trophy hunting). Poaching not only decreases the attribute of wildlife abundance, but also decreases other attributes such as safety and friendly political environments, which also attract tourists.

As was shown in this study, it is estimated that government, private landholders, and conservancies are currently investing about N$200 million per year, which amounts to about N$2 billion over a ten-year period to curb IWT. This translates into benefits (accrued to the actors over the same time) of about N$6 billion. If the benefits to other actors (mainly private actors in the tourism economy) are included, then benefits increase to about N$18 billion over ten years. This is a very worthwhile investment. In terms of distribution of these costs and benefits, currently, conservancies have the highest BCR, getting about N$14 in benefits for every N$1 spent. This is followed by private landholders, who are getting about N$6.5 per N$1 spent. The government, who is bearing the bulk of the cost, has the lowest BCR, getting about N$1.7 per N$1 spent. This should be analyzed in light of the role of government as the steward of public goods and services. Most of the benefits generated by public investments into wildlife protection and law enforcement accrue to Namibian society, and in this case communities and landholders. This explains why the B/C ratio of government is lower than those of other actors.

If projected increases in spending are effective at further curbing IWT, net benefits could improve greatly. According to this study, the proposed N$550 million additional public funds to curb IWT (MEFT, 2021), could translate into an increase in benefits of about N$1.1 billion across the three actors compared to BAU, to a total of about N$7.6 billion, and if the tourism economy is factored in, these benefits increase to about N$22 billion. The distribution of costs and benefits change somewhat. First, government return on investment improves as the benefit/cost ratio increases to more than 2 (i.e., government gets N$2 for every N$1 invested). Contrarily, the benefit/cost ratio for local communities decreases slightly, and their net benefits, although increasing, are not much higher under the No Poaching scenario than under the current situation (BAU scenario). The fact that the additional benefits generated from tourism by conservancies under the No Poaching scenario only marginally outweigh the cost from foregone revenue to poachers within local communities could be explained by the more limited impact of wildlife population increase on tourism revenue in conservancies. Further study would be required to investigate communities' costs and benefits in greater detail and including more species of wildlife. Indeed, this result, added to the fact that the No Poaching scenario is costly to poachers, that there is wildlife conflict with elephant populations, and

that conservancies do not benefit as much from rhino tourism, in comparison to the other actors, has important implications that deserve close attention. For example, an effort to offer alternative sources of income to poachers is critical and communities as a whole might need extra incentives to ensure commitment to increasing their efforts and investments in IWT curbing. Moreover, as human-wildlife conflict costs increase for communities, the requirement for compensation from government or the private sector becomes more significant. It is imperative to ensure that those living with the costs of elephant conflict receive the greatest benefits and that these are optimized through good governance and management at the community/conservancy level.

It should also be noted that in the context of stringent government budget constraints and pressures, IWT curbing initiatives need to be sufficiently funded and done in cooperation among actors to reap the collective benefits of a healthy wildlife population. It may also be essential to find other sources of financing to build resilience into funding sources. Since government bears the highest burden of the cost and benefits that accrue to private actors and the economy at large, curbing efforts should be designed with this in mind. Also, it is important to note that IWT is a trans-national problem. It is fueled by international demand, with consumers willing to pay high prices in black markets. However, the price paid by final consumers can be several orders of magnitude higher than what foot soldiers in Namibia receive. This means that while local poachers bear most of the risk, the revenue they get is also the lowest. The largest profits are generated outside the country by foreign intermediaries. Meanwhile, the local Namibian government has to bear a large cost trying to stop a market that is lucrative to these international actors (IWT intermediaries), which is a hard economic force to fight against.

Finally, given that many people and organizations around the world also place a high value on the protection of the unique species found in Namibia, it should be acknowledged that the benefits generated in terms of conservation value are likely to be much higher than what is calculated in this CBA.

## Gaps and Limitations

The results of this CBA should be interpreted in the context of limited data availability and biophysical/socioeconomic modeling. First, the data on these types of investments may either be confidential, not tracked consistently or at the species level, or hard to disaggregate into a cause-and-effect relationship. There was limited time series data on both costs and benefits components, constraining the study to modeling two species over a 10-year timeframe. However, it is expected that the gap between the No Poaching and High Poaching Scenarios further widens with a longer time horizon and with the inclusion of other high value species such as pangolins and lions.

Establishing cause and effect relationships from IWT curbing initiatives to poaching levels, to population size, to activity in tourism sectors, to the distribution of these benefits by actor, requires the availability of specific data and studies, complex modeling and in the absence of modeling, informed assumptions that link the biophysical world with the economic world. The data, studies, and assumptions used in this CBA are outlined in detail in Appendix, however there is room for error once the data and assumptions are brought together into the cause-and-effect framework of the CBA. Sensitivity analyses were conducted in several nodes of high uncertainty to test the robustness of the results. Even though the findings seem robust, results should still be interpreted as general (not exact) numbers and used with some caution.

For example, within the context of the COVID-19 crisis, high uncertainty remains on the future trends of the wildlife tourism economy, which constitutes the core stream of benefits related to curbing IWT in Namibia. In 2020, wildlife viewing tourism and trophy hunting has come to an almost complete halt, leaving the sectors in great difficulty. Although it is expected that tourism will recover, sensitive debate about trophy hunting (MacNamara et al., 2015), as well as more generally the carbon footprint of overseas tourism, suggest that these sectors could experience changes in the future.

Another dynamic that deserves greater attention is the price elasticity of the various economic activities modeled. Prices can change as demand and supply changes over time or the quality of experiences and products change. For example, if markets are flooded with poached goods, such as ivory, the price obtained can significantly decrease. Also, if hunting opportunities increase, as wildlife populations grow, and the quality of trophy hunting increases, the price of trophy hunting may change. These price dynamics were incorporated to a limited extent, however, and should be examined more closely.

Another important aspect to note is that the CBA focused mainly on direct costs of IWT program implementation and direct benefits to industries working with wildlife populations. However, there are some significant indirect effects that were not modeled, which are particularly important to fully understand the benefits of curbing IWT. For example, a bigger IWT sector can translate into many costs to communities and societies, including widespread corruption and crime, decreases in foreign investment, development opportunities, and overall community health. Some of these impacts were partially included but are likely big underestimates of these types of costs. Further research would be required to investigate other benefits such as the intrinsic value of species, larger cost of corruption, and other sectors indirectly impacted by the wildlife economy.

Although invaluable information and data was shared by the MEFT and private game reserves, the data collected for private landholders only covers one third of the targeted rhino farms. The assessment of costs and benefits for private game reserves owners thus relies on numerous assumptions. These estimates could be refined with a detailed study, including extensive surveying, to collect and analyze financial data of these farms in Namibia, which is out of the scope of this study.

Based on the data collected and interviews conducted, it was also assumed that another stream of benefits which could grow with population is the sale of live animals, especially elephants for repopulation in other African countries. However, the development of this market is uncertain, and currently the demand for live elephants is particularly low – due to the high management costs and costs of human-wildlife conflicts (HWC). As the elephant population increases in Namibia (under our No Poaching scenario), strategies to manage the population – and avoid an outbreak in HWC – will either involve more hunting and live sales or an increase in shooting of problem animals. This must be considered in more detail as the costs and benefits streams of these different activities can vary significantly. Moreover, the issue of increasing cost of HWC for communities deserves attention. In our model, it is assumed that all costs of human-elephant conflicts are covered by compensation transferred from the government to communities – compensation that reaches N$5 million per year as elephant population increases in our No Poaching scenario. It should be noted that in reality some damages might not be fully covered by compensations.

Some southern African countries have been advocating for the establishment of legal markets for ivory and rhino horn, and some stakeholders suggested to include the foregone or additional revenue from potential legal sales of ivory and rhino horn into this cost-benefit analysis. However, it was decided to omit this

potential market for two main reasons. On one hand, the likelihood of such a legal market being established remains low and uncertain. On the other hand, and most importantly, the introduction of such a market would surely have strong impacts on poaching dynamics and prices, which in turn would make our poaching rate assumptions and price references for different scenarios doubtful. Such an intervention would require an analysis in and of itself, modelling different responses in poaching rates and prices, based on different type of market structure and quantities put into the legal market.

# Conclusion and next steps

In light of recent surges in IWT and the investments that have been made by government, private game reserves, and community conservancies to curb it, this report provides economic evidence on the real costs of IWT and the benefits of curbing it. In order to understand the costs associated with IWT, the economic viability of investing in curbing it, and the trade-offs that can be expected as IWT is tackled; this study carries out a CBA of curbing IWT in Namibia. The CBA monetizes costs and benefits from IWT curbing initiatives and sets them up to be consistently compared across time and with each other, in order to inform and guide investment decisions. The CBA was conducted for the context of Namibia and focused on three key actors leading current investments in curbing IWT: 1) the national government (including international funding), 2) communities living on communal land, and 3) private landholders. In addition, impacts to the tourism industry at a national level were also considered. The study also focused on two key species, rhinos and elephants, as proxies for the larger values associated with IWT. The three scenarios modeled were: (1) the Business as Usual (BAU) scenario, representing current investments, (2) a scenario of increased investment and lower poaching (No Poaching scenario), and (3) a scenario for reference where poaching goes practically uncurbed (High Poaching scenario).

Overall, the CBA shows that it makes economic sense to invest in curbing illegal wildlife trade. With a focus on mostly financial benefits, the results obtained show that benefits greatly outweigh costs. The No Poaching scenario created the most net benefits, about N$22 billion over ten years, to the Namibian economy. The cost of achieving these benefits was estimated to be about N$2.4 billion, spread across the three groups of actors. In contrast, in the absence of these IWT curbing investments, economic losses of about N$5.3 billion, could be expected (these are the results of the High poaching scenario relative to BAU scenario).

The government, including international funding, bears the largest share of the investments being made on curbing IWT (about 77% of the overall cost), subsidizing some of the benefits obtained by other actors. An analysis of the distribution of the costs and benefits estimated in this analysis provides some important information to consider in the design of initiatives aimed at IWT, especially on the unequal redistribution of net benefits to communities who bear the cost of living with wildlife and that sometime rely on poaching as a source of income in a country with high levels of rural poverty and unemployment. The trade-offs between community benefits and poachers' foregone revenue in a case of decreasing poaching rates thus need to be better understood and communities' economic participation in the wildlife economy should be further promoted.

## Next steps

For a more comprehensive analysis of the Namibian context, further research should include a more detailed study on IWT at the community-level. The results obtained in this exercise indicate that the trade-offs between poaching revenue and tourism revenue for communities should be investigated in further detail, using a wider lens on wildlife tourism revenue (beyond elephants and rhinos) and behavioral research to understand incentives and disincentives. Returns on investments in curbing IWT for private game reserves and projections for tourism and hunting revenue recovery after the COVID-19 crisis are also needed. Given that there was a lot of concern noted by the actors on the impacts they experienced from COVID-19 and the full extent of these impacts are not yet known.

Also, better knowledge on the ecosystem services rendered by high value species (rhino and elephants but also pangolins and lions) is needed to improve current understanding of the relationship between population size and different streams of benefits, including services like seed dispersal, nutrient cycling or biological control. Establishing reliable ecosystem service values for threatened species will fill critical data gaps on the economic losses resulting from decreases in wildlife populations.

This CBA study provides a framework and a template method and approach for replication in other southern African countries and at regional level for SADC, as streams of benefits and costs tend to be similar. Some assumptions are easily transferred to other places, such as the relationships between poaching, natural growth rates, and population size. Other places will require more data collection, such as the size of the tourism economy and relative participation of different actors. In order to expand on the results obtained in this CBA, it is essential to have transparent records of expenditures of all actors involved in the fight against IWT overtime. To replicate these types of CBA in other SADC countries, greater collection and integration of expenditure data will have to be realized at SADC level, as well as national levels. A full accounting of expenditures from national governments, donors, non-governmental organizations, foundations, and private actors is essential to assess and compare costs of different measures and exchange on best practices.

This report will be followed by a dissemination effort focusing both on the results and the methodology used to facilitate replication of this approach in other countries in the region. Such analysis at national and regional level could shed light on the real costs of combating wildlife crime and the potential benefits from reducing wildlife crime. This information can support law enforcement and policymaking at SADC level by providing economic evidence on the costs and benefits of curbing IWT.

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# Appendix

*Table A 1: Baseline (BAU) Data and assumptions for estimating benefits from live sales and trophy hunting*

| | Species | Baseline quantity | Values per animal | Actors |
|---|---|---|---|---|
| Live sales | *Elephants* | 0.3% of total population | N$100,000 | Government |
| | *White Rhino* | 1.5% of total population | US$7,000 | Private owners |
| | *Black Rhino* | 0.2% but only once in 10 years | N$300,000 | Government |
| Trophy hunting | *Elephants* | 0.5% of total population | N$221,895 | 30% government<br>70% conservancies |
| | *White Rhino* | 0.5% of total population | N$710,000 (trophy fee + daily fees – 10 days) | Private owners |
| | *Black Rhino* | 0.2% but only twice in 10 years | US$350,000 | Government |

*Table A 2: Population modelling assumptions across scenarios*

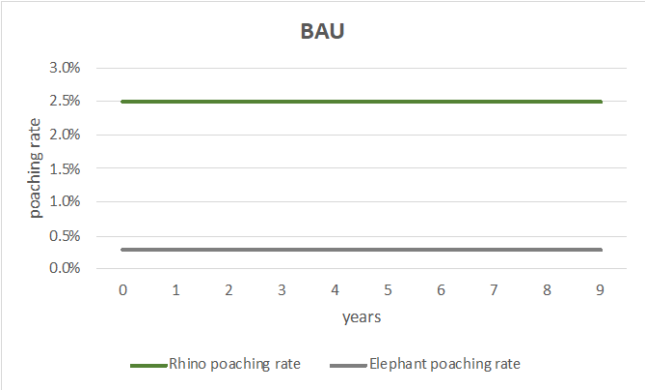
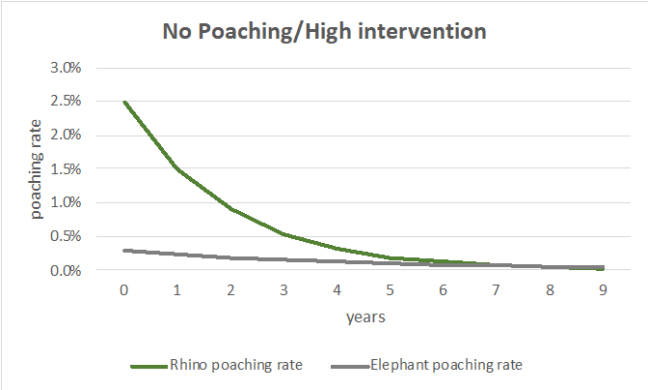
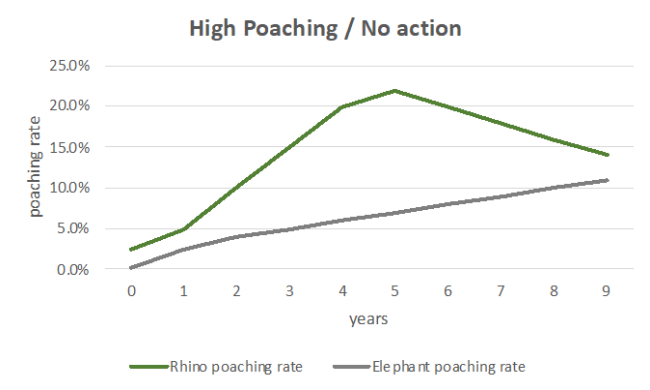
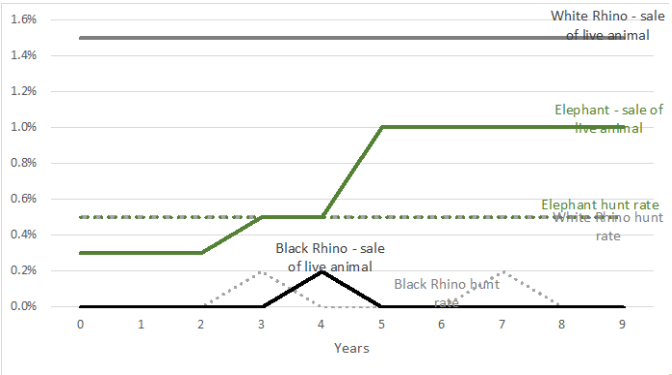
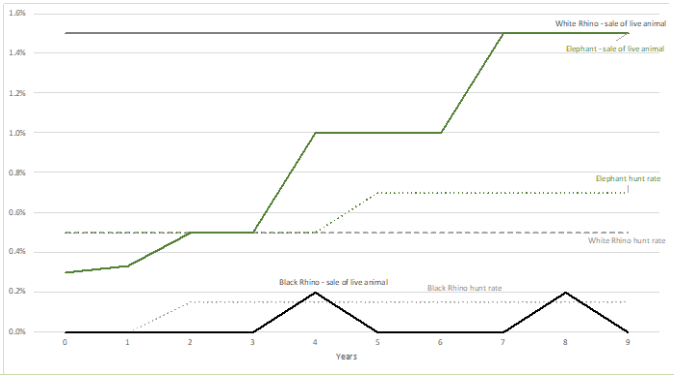
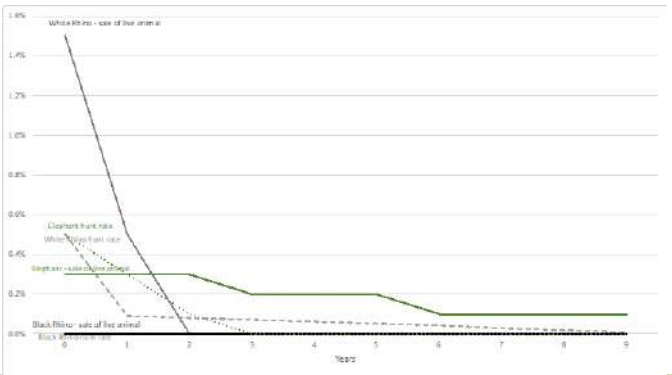
| | Species | BAU | No Poaching | High Poaching |
|---|---|---|---|---|
| Growth rate | White Rhino | constant 6% | constant 7.5% | constant 2.5% |
| | Black Rhino | constant 3% | 5% year 1-2,<br>7.5% year 3-10 | constant 2.5% |
| | Elephants | constant 5% | constant 5% | constant 2.5% |
| **Poaching rate** | | | | |
| |  |  |  |
| **Hunt rate & Live Sales rate** | | | | |
| |  |  |  |

*Table A 3: Key valuation assumptions across scenarios*

| | Attribution assumptions | Value Assumptions BAU | Value Assumptions No Poaching | Value Assumptions High Poaching |
|---|---|---|---|---|
| **Government** | | | | |
| **Benefits** | | | | |
| ***Revenue from trophy hunting permits and licenses*** | 30% of elephant hunts, and black rhino hunts only | Elephants: constant hunt rate at 0.5% of population, @ N$219,895 per animal<br><br>Black Rhino: only two years hunts (year 4 and 7), 0.2% of population @ US$350,000 per animal | Elephants: increasing hunt rate, 0.5% from year 1-4, 0.7% year 5-10, @N$219,895 per animal<br>Black Rhino: hunts every year from year 2, 0.15% of population @ US$350,000 per animal | Elephants: decreasing hunt rate, from 0.5% to reach 0% at year 3, then 0%, @N$219,895 per animal<br>Black Rhino: no hunt |
| ***Tourism revenue to government (Park entry fees + Tourism concession fees)*** | Parks and concessions with rhino and/or elephants only (Etosha NP, Mudumu NP, Bwabwata NP, Khaudum NP, Mangetti NP, and Palmwag concession) | Baseline: total income entrance fees and concession fees 2019 (MEFT)<br>Increases 1%:1% with total population of rhino and elephants | Baseline: total income entrance fees and concession fees 2019 (MEFT)<br>Increases 1%:1% with total population of rhino and elephants | Baseline: total income entrance fees and concession fees 2019 (MEFT)<br>Decreases 1%:1% with total population of rhino and elephants |
| ***Sales of live elephant (auction)*** | Only government sells elephants | Increasing selling rate as population grows from 0.3% to 1% in year 5, then stable at 1% year 5-10 @N$100,000 per animal | Increasing selling rate from 0.3% to reach 1.5% in year 7 then stable @100,000 per animal | Decreasing selling rate to 0.1% by year 6, then stable. @100,000 per animal |
| ***Sales of live rhinos (black)*** | Only government sells black rhino | No sales except year 5 at 0.2% of population, @ N$300,000 per animal | Sales in year 4 and 8 at 0.2% of population, @N$500,000 | No sales |

| | Attribution assumptions | Value Assumptions BAU | Value Assumptions No Poaching | Value Assumptions High Poaching |
|---|---|---|---|---|
| ***Tax revenue from expenditures in wildlife viewing*** | VAT for tourism expenditure | VAT = 10% of tourism expenditure | VAT= Start with 10% and move to 14% gradually in the first 5 years, then stable | Less is collected due to increased illicit financial flows, VAT= 5% collected only. |
| **Costs** | | | | |
| ***MEFT budget on anti-poaching and wildlife crime prevention*** | | 15% of MEFT budget (2019) goes into wildlife crime prevention and anti-poaching (about half of the PA management and wildlife protection budget) | Baseline spending (BAU assumption) with an additional N$110 million every year until year 5 (based on Wildlife crime and law enforcement strategy and action plan budget), then budget decreases 20% every year until year 10. | Minimum service = only salaries from WPSU and Rhino unit |
| ***NAMPOL budget on anti-poaching and wildlife crime*** | Salaries of officers covering Northern Parks area | 440 officers @N$60,000 per year | Same as BAU | Expenditures halved in year 1, then 0 (complete withdrawal of NAMPOL) |
| ***MoJ expenditure on wildlife crime*** | 1-3% of cases are wildlife crime related | 1% of total MoJ budget to deal with wildlife crime cases | Same as BAU | Expenditures halved in year 1, then 0 |
| ***GPTF expenditure on anti-poaching*** | Expenditure in anti-poaching | Constant from 2018 baseline | Same as BAU | Expenditures halved in year 1, then 0 |
| ***Customs expenditure in control of IWT*** | Only cost of Operation Thunder | Cost of Operation Thunder, constant every year | Same as BAU | Expenditures halved in year 1, then 0 (complete withdrawal of Customs) |
| ***NDF expenditure*** | Salaries of officers covering Northern Parks area | 250 officers, with 200 cadet, 27 2nd lieutenant, 2 lieutenant, 1 captain | Same as BAU | Expenditures halved in year 1, then 0 (complete withdrawal of NDF) |
| ***Compensation for wildlife conflict*** | | 2019 government compensation expenditures @ N$4,357,800 = average N$198 per elephant. | Varies with elephant population @ N$198 per elephant | Varies with elephant population @ N$198 per elephant |
| ***International aid/NGO*** | Budget for main wildlife crime prevention projects | Baseline: 2020 IWT project budget for WWF, NNF, SRT (USAID, INL funded), Rooikat Trust (Wildcat Foundation), and ODA to MEFT (US | BAU baseline constant until year 3, then decrease by 20% every year until year 10. The 20% are transferred to benefits from other development aid projects. | Defunding : decrease by 20% every year from BAU baseline in year 0. |

| | Attribution assumptions | Value Assumptions BAU | Value Assumptions No Poaching | Value Assumptions High Poaching |
|---|---|---|---|---|
| | | Fish and Wildlife Services), remaining constant | | |
| **Private farmers and landholders** | | | | |
| **Benefits** | | | | |
| ***Trophy hunting*** | White rhinos only | Hunt rate at 0.5% constant @N$710,000 per animal hunted (includes 10 days of daily fees at N$21,000 per day, trophy fee at N$500,000 per animal) | Same as BAU | Hunt rate down to 0.1% year 1-5, then no more hunting, N$ values same as BAU |
| ***Photographic tourism*** | 31% of tourism spending attributable to wildlife viewing<br>23% of tourism values are generated on private land<br>25% of game ranches manage rhinos | Baseline: Based on 1.5 million visitors to Namibia as stated in the MEFT Tourist Statistical Report 2019 and an assumption that 31% of this value was attributable to wildlife-viewing (based on Turpie et al. 2010). Also based on an average stay at a private ranch of 4 days and daily expenditures of $200/day and only counting about 25% of ranches that manage rhinos.<br>Then varies 1%:1% with rhino population | Same as BAU, varies 1%:1% with rhino population | Same as BAU, varies 1%:1% with rhino population |
| ***Live sales*** | White rhinos only, 80% are owned privately | Selling rate: 1.5% constant<br>Value: US$7,000 per animal | Selling rate: 1.5% constant<br>Value: US$7,000 per animal from year 1-5, then increases by 20% every year to reach US$17,000 in year 9 | Selling rate: 0.5% in year 0, then no more sales. |
| **Costs** | | | | |

| | Attribution assumptions | Value Assumptions BAU | Value Assumptions No Poaching | Value Assumptions High Poaching |
|---|---|---|---|---|
| Expenditures on anti-poaching | Only game reserves with rhinos (90 farms) | Private farms categorized in high, medium, or low expenditure groups based on their size, number of rhinos, antipoaching unit, and aerial surveillance technology.<br>high expenditure = 10 farms @N$2 million per year or more,<br>medium expenditure = 18 @ N$700,000- N$850,000 per year,<br>low expenditure = 62 @ N$48,000 per year. | Increase in expenditure for each category =<br>high expenditure = 10 farms @N$4.8 million per year,<br>medium expenditure = 18 @ N$1 million per year,<br>low expenditure = 62 @ N$240,000 per year. | no spending after year 0 |
| **Conservancies and their communities** | | | | |
| **Benefits** | | | | |
| ***Revenue from tourism (JV +SMEs )*** | Conservancies with rhino and/or elephants in their area | From NACSO conservancy income database, income from tourism joint venture and community led campsites 2019 (in targeted conservancies only).<br>Varies 1%:1% with rhino and elephant population overtime. | Same as BAU, varies 1%:1% with rhino and elephant population | Same as BAU, varies 1%:1% with rhino and elephant population |
| ***Revenue from trophy hunting (fees + wages)*** | Conservancies with rhino and/or elephants in their area, hunting of elephants only, assuming 70% of population on conservancies + meat from the remaining 30% hunted in state land. | Elephant hunt rate: 0.5% constant<br>Value: N$221,895 per animal hunted (includes N$9,000 for meat per elephant) | Elephant hunt rate: 0.5% year 0-5, then 0.7%<br>Value: N$221,895 per animal hunted (includes N$9,000 for meat per elephant) | Gradually decreases to reach 0 by year 3, no hunt after this.<br>Value: N$221,895 per animal hunted (includes N$9,000 for meat per elephant) |
| ***Poachers Income*** | | | | |
| ***Rhino poaching total income for foot soldiers*** | | Stable poaching rate 2.5%<br>Value: N$20,000 per rhino (Financial Intelligence Center 2017) | Poaching rate decreases to reach 0 by year 8, after this no income for foot soldiers<br>Value: N$20,000 per rhino | Poaching rate increases up to 22% in year 5 and stabilizes at 14% afterwards.<br>Value: N$20,000 per rhino |

| | Attribution assumptions | Value Assumptions BAU | Value Assumptions No Poaching | Value Assumptions High Poaching |
|---|---|---|---|---|
| ***Elephant poaching total income for foot soldier*** | | Stable poaching rate at 0.3%<br>Value: N$21,000 per elephant, based on a price of US$33 per kg of ivory and 10 kgs of tusk per elephant (Financial Intelligence Center 2017) | Poaching rate decreases by 20% every year to near 0 by year 9<br>Value: N$4,620 per elephant | Poaching rate increases up to 11%by year 9<br>Value: N$4,620 per elephant |
| **Costs** | | | | |
| ***Investment in anti-poaching*** | Conservancies with rhino and/or elephants in their area, 70% of game guards attributed to anti-poaching. | Baseline from 2018 expenditure data (field costs, uniforms, salaries, diem and field allowance,), - 42% of these expenditures attributed wildlife crime prevention and anti-poaching. Baseline remains constant. | Same as BAU | Expenditure stops after year 0 |
| ***Loss of life*** | Rangers and poachers (foot soldiers) | None | None | 1 life lost every year starting year 3, statistical value of life = N$12,505,000 per person |
| **Nationwide economic and social benefits** | | | | |
| ***Economy wide benefits*** | Aid support transferred from WCP to other productive development sectors | No transfer | 20% of aid funding goes to economic development projects every year | No transfer |
| ***Wildlife viewing tourism*** | 2020 Tourism receipts, 31% attributable to wildlife watching (Turpie et al. 2010) | Varies 1%:1% with rhino population | Varies 1%:1% with rhino population | Varies 1%:1% with rhino population |
| ***Trophy hunting*** | Overall sector (highly depends on a no poaching reputation) | Varies 1%:1% with total rhino and elephant population | Varies 1%:1% with total rhino and elephant population | Varies 1%:1% with total rhino and elephant population |

*Table A 4: Conservancy*

| | |
|---|---|
| 1 | !Khoro !Goreb |
| 2 | //Huab |
| 3 | ≠Khoadi-//Hôas |
| 4 | Anabeb |
| 5 | Balyerwa |
| 6 | Bamunu |
| 7 | Doro !nawas |
| 8 | Dzoti |
| 9 | Ehi-Rovipuka |
| 10 | Eiseb |
| 11 | George Mukoya |
| 12 | Iipumbu Ya Tshilongo |
| 13 | Impalila |
| 14 | Kabulabula |
| 15 | Kasika |
| 16 | King Nehale |
| 17 | Kwandu |
| 18 | Kyaramacan |
| 19 | Lusese |
| 20 | Mashi |
| 21 | Maurus Nekaro |
| 22 | Mayuni |
| 23 | Muduva Nyangana |
| 24 | N≠a Jaqna |
| 25 | Nakabowela |
| 26 | Nyae Nyae |
| 27 | Ohungu |
| 28 | Okangundumba |
| 29 | Omatendeka |
| 30 | Ombujokanguindi |
| 31 | Ondjou |
| 32 | Orupupa |
| 33 | Otjambangu |
| 34 | Otjikondavirongo |
| 35 | Otjikonfovirongo |
| 36 | Otjiu-West |
| 37 | Otjombande |
| 38 | Otjombinde |
| 39 | Otuzemba |
| 40 | Ozondundu |
| 41 | Puros |
| 42 | Salambala |
| 43 | Sesfontein |
| 44 | Sheya Shuushona |
| 45 | Sikunga |
| 46 | Sobbe |
| 47 | Sorris Sorris |
| 48 | Torra |
| 49 | Tsibeb |
| 50 | Uibasen Twyfelfontein |
| 51 | Uukolonkadhi Ruacana |
| 52 | Uukwaluudhi |
| 53 | Wuparo |