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United Nations Office on Drugs and Crime

World Wildlife Crime Report

Trafficking in protected species



UNITED NATIONS OFFICE ON DRUGS AND CRIME
Vienna

World Wildlife Crime Report

Trafficking in protected species

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Preface

The heedless exploitation of nature by humans has led to unprecedented biodiversity loss and a worsening climate crisis. It is also a threat to human health, as highlighted by the COVID-19 pandemic. Three-quarters of all emerging infectious diseases are zoonotic, according to the United Nations Environment Programme, transferred from animals to humans, facilitated by environmental destruction and wildlife crime.

Links between the global health crisis and the illegal exploitation of wildlife have been in the spotlight since it was suggested that wet markets selling wildlife, in this case pangolins, could have facilitated the transfer of COVID-19 to humans. The spike in public awareness of this connection has led to a push for new bans on the sale of wild animals for consumption.

It is against this backdrop that the second edition of the World Wildlife Crime Report is published by the United Nations Office on Drugs and Crime (UNODC).

The report shows wildlife crime to be a business that is global; lucrative, with high demand driving high prices; and extremely widespread. Nearly 6,000 different species of fauna and flora have been seized between 1999 and 2018, with nearly every country in the world playing a role in the illicit wildlife trade.

The need to stop wildlife trafficking has gained an increasingly prominent place on the political agenda over the past years. Since the publication of UNODC's first World Wildlife Crime Report in 2016, regulation has increased for several wildlife markets, including that for pangolin products.

International trade in all pangolin species is now banned. Despite this, growing volumes are being seized each year. The present edition of the World Wildlife Crime Report shows that between 2014 and 2018, seizures of pangolin scales increased tenfold.

Such developments point to the many challenges which Governments face in preventing and countering wildlife and forest crime.

The present report shows that regulations on wildlife crime can trigger replacement effects, for example, geographic displacement of trade exploiting legislative gaps between countries, or a shift from protected to alternative species. Robust research and analysis, as well as consistent legislation within countries and across regions are essential to eliminate loopholes. Identifying and addressing the vulnerabilities of legal markets to infiltration by the illicit trade is also key to strengthening the global regulatory system. Public awareness of the scale and impact of the threats posed by wildlife crime can help reduce demand for products of the illegal wildlife trade and increase support for action.

Building upon UNODC's research and analysis work, the Office's Global Programme for Combating Wildlife and Forest Crime provides policy guidance and technical assistance to requesting countries. UNODC draws upon its role as guardian of the United Nations Convention against Transnational Organized Crime and the United Nations Convention against Corruption to build the capacities of law enforcement and criminal justice institutions, and support the communities impacted by wildlife crime.

Putting an end to wildlife crime is an essential part of building back better from the COVID-19 crisis. As we prepare the road to recovery, we have the chance to reset our relationship with nature and lay the foundations of a more just and more resilient world – working together to eliminate wildlife trafficking, prevent future pandemics and put us back on track towards the Sustainable Development Goals. I hope that the second edition of the UNODC World Wildlife Crime Report will be a useful resource to all our stakeholders, contributing to new and sustained action that can close gaps in awareness, knowledge, legislation, and resources – for the sake of people and planet.

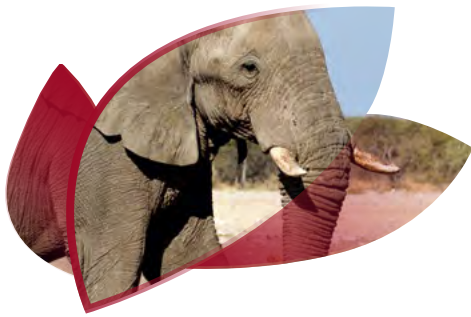


Ghada Waly
Executive Director

United Nations
Office on Drugs and Crime

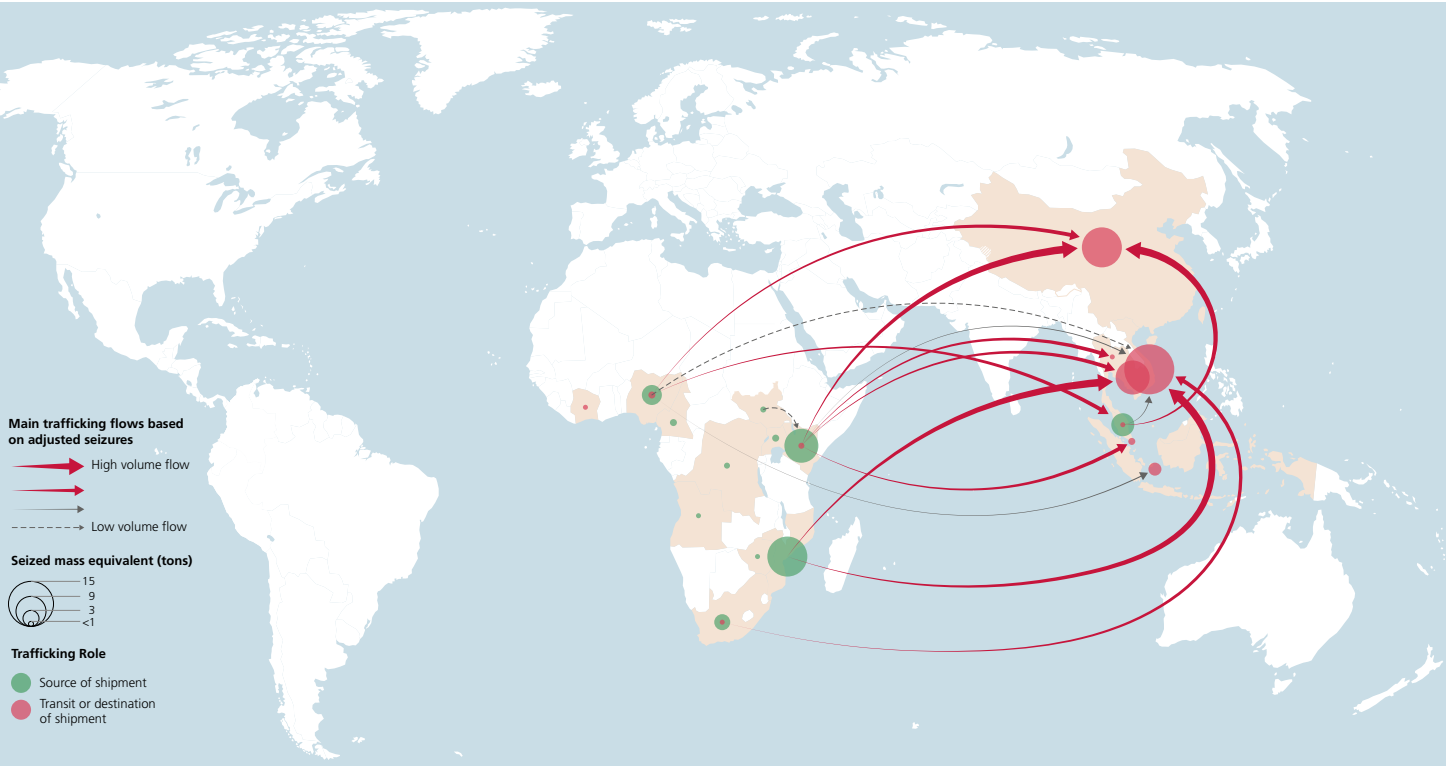
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AFRICAN ELEPHANT TUSKS AND RHINOCEROS HORNS

Map 1 : Trafficking flow map - Elephant ivory (2014-2018)



Source: UNODC World WISE Database

The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas). The year 2018 is based on partial data.

In the last *World Wildlife Crime Report*, elephant ivory and rhino horns were discussed separately. Ivory was discussed under the heading of “art, décor, and jewellery” and as an investment commodity. Rhino horn was classified as a traditional medicine, although it was already apparent at that time that it had also become a status item. In the last four years, the evidence has mounted that rhino horn is being sold for its artistic and investment value, so it is similar to ivory in this respect. The two commodities are sourced from different regions in Africa but require similar skills and equipment to procure. They also share many commonalities in their primary destination markets. For these reasons, the two species are considered together here.

The poaching of both elephants and rhinos appears to be in decline, as do the markets generally. For ivory, a downward trend since 2011 can be seen in the best available indicators of poaching, smuggling, and price. A similar, but more recent, trend can be seen with rhino horn poaching and prices, although seizures of rhino horns have continuously risen. A 2019 surge in very large seizures of both commodities may be related to the unloading of stocks in response to declining prices. This chapter reviews the data and discusses some explanations for these trends.

African elephant ivory

Ivory comes from elephants, particularly African elephants.¹ There are at least two different ways to estimate

the number of elephants poached in Africa, and thus the size of the illicit ivory supply entering the market annually. Elephant *population* estimates can be compared across time and *poaching* data can be modelled to estimate the number of elephants illegally killed:

- Population estimates can be compared between two assessment dates; after accounting for natural growth rate and taking into consideration other factors that may lead to unexpected mortality (such as drought), unexplained declines could be attributed to poaching.
- Detections of elephant poaching can be compared to detections of elephants who died of other causes; based on natural



mortality rates, the share of natural deaths detected can be estimated, and this share used to estimate the number of poaching deaths that occurred.²

How many elephants are being lost?

Elephant populations are studied by many independent scientists, and the results of these studies are compiled and analysed by the African Elephant Specialist Group (AfESG) of the International Union for the Conservation of Nature (IUCN). In addition to the regular scientific efforts, a concentrated study was conducted on savannah elephant populations using aerial surveys in 18 range states in 2015, dubbed “the Great Elephant Census”.³ The results of these surveys were integrated into the IUCN *African Elephant Status Report 2016* (AESR 2016).⁴ The AESR 2016 reports a strong decline in elephant populations based on estimates made in 2006 and 2015 (Figures 1 and 2).

The AESR 2016 estimated that there were just over 400,000 elephants in the areas surveyed⁵ and over 100,000 in the areas not systematically surveyed,⁶ which combined cover 62

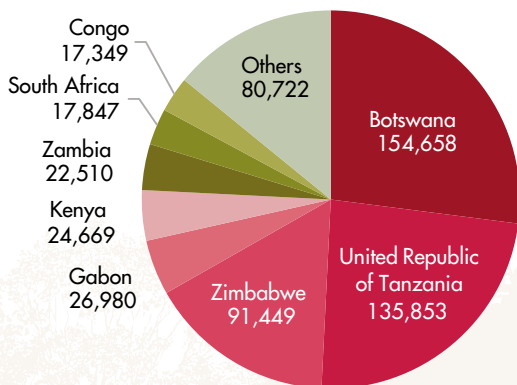
per cent of the known and possible elephant range. The AESR compared their 2015 figures to similar estimates made for 2006 and found that there had been a net decline in elephant populations of about 111,000 elephants in the areas comparably surveyed in the intervening years.⁷ This decline suggests that unexplained losses not only offset expected natural population growth (which would have left the population unchanged) but also reduced the continental elephant population by an average of about 10,000 elephants per year.

While not all the missing elephants were poached, available data show that poaching over the last decade undoubtedly accounts for a significant portion of the elephants killed,⁸ potentially resulting in some one thousand metric tons of illegal ivory over the decade, or an average of about 100 MT per year.⁹ Evidence discussed below suggests that the actual amount of poaching varied greatly between years, so in some years more than 10,000 were lost, and in some, less. This average only gives a sense of the order of magnitude of the illicit ivory supply entering the market in recent years.

Over half of this continental decline can be attributed to losses in the United Republic of Tanzania, where the estimated population declined from 135,853 in 2006 to 50,433 in 2015.¹² The elephant populations in the Selous and Ruaha reserves in Tanzania alone declined by nearly 75,000 elephants between 2006 and 2013. Since 2015, Tanzania has increased its efforts against poaching and trafficking, supported by NGOs. These efforts include actions undertaken through its National Ivory Action Plan (NIAP),¹³ as well as the undertaking of the ICCWC Analytic Toolkit on Wildlife and Forest Crime. Early indications are that this work is having some effect.

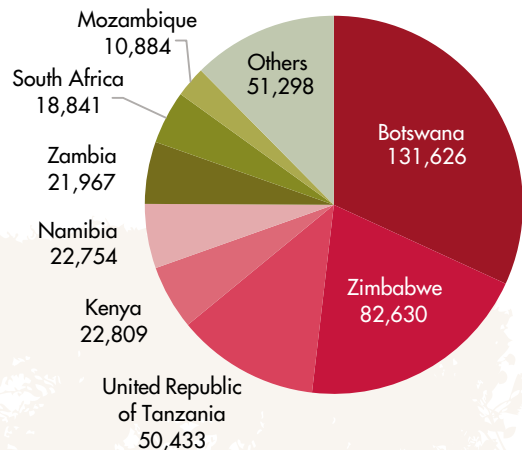
Other areas where the IUCN noted negative population trends associated with poaching included Gabon, Congo and Cameroon (home to the so-called TRIDOM range), as well as northern Mozambique (the Niassa range along the border with the United Republic of Tanzania and the Selous reserve) and parts of Kenya. Serious long-term declines were also noted in the populations of Central Africa¹⁴ as well as parts of Southern Africa (parts of Zimbabwe, Angola, and, to a lesser extent,

Fig. 1 : Estimated number of elephants residing in African countries in 2006 (556,973 elephants)¹⁰



Source: IUCN 2007

Fig. 2 : Estimated number of elephants residing in African countries in 2015 (413,242 elephants)¹¹



Source: IUCN 2016

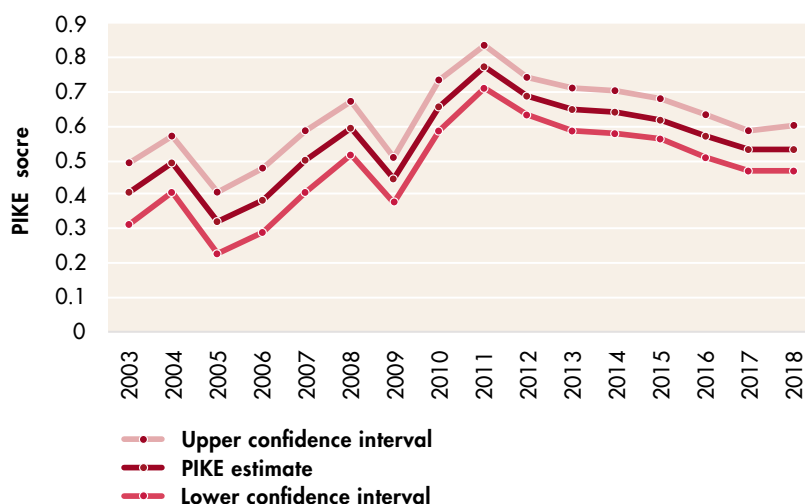
Zambia), which were attributed in part to poaching.¹⁵

These national population trends resonate with the findings of DNA research conducted on 28 major ivory seizures between 2010 and 2016.¹⁶ The majority of the seizures were traced back to two broad elephant populations: one extending from central Tanzania to northern Mozambique (including Selous and Ruaha), and one centred on the TRIDOM area (north-east Gabon, north-west Congo, and south-east Cameroon).¹⁷ They also align with the trafficking data, discussed below, which indicate East African (Mombasa) and West African (Lagos) hubs for illicit trade.

How many elephants are poached?

Another way of estimating the number of elephants poached (and thus the illegal ivory supply) is to extrapolate from elephant carcass data. Trends in elephant poaching are monitored by the CITES program “Monitoring the Illegal Killing of Elephants” (MIKE). Based on a network of over 60 sentinel sites, participating rangers report the number of dead elephants they detect and the share of these dead elephants that appear to have been illegally killed. According to CITES, the designated MIKE sites in Africa hold an estimated 30 – 40 per cent of the African elephant population.¹⁸ The “share of the detected elephant carcasses that have been illegally killed” is known as the Proportion of Illegally Killed Elephants (PIKE), and it is calculated at the subregional and continental levels, adjusted for sample variation.¹⁹ Since 2002, over 22,000 elephant carcasses have been so categorized, with between 1,000 and 2,000 observations per year between 2007 and 2018. Detections of both elephant carcasses and illegally killed elephants peaked in 2012, but the PIKE score was highest in 2011. Since then, it has declined every year until 2018, during which it increased by about 0.6 per cent.²⁰

Fig. 3 PIKE score for Africa, 2003-2018



Source: CITES MIKE



Box 1: Assumptions and limitations in the poaching-based estimate of illegal ivory supply presented in this report

Like any estimate of the size of a hidden population, the estimate of the number of illegally killed elephants presented in this chapter is based on certain assumptions and limitations. The reliability of the estimates is sub-

ject to the validity of these assumptions which concern the demography of elephants, the nature of the carcass survey, and the selection of the sites for observation:

<i>Demographic</i>	The baseline death and birth rates are derived from a few, increasing populations
	It is assumed that the age structure does not impact on elephant survival or reproduction
	No effect of ecologically good or bad years in elephant mortality is taken into account
<i>Carcass Survey</i>	No feedback from illegal killing is included in the model
	Density dependent effects are not taken into account
	It is assumed there is no bias in the detection of natural versus illegally killed carcasses
<i>Site Selection</i>	Patrol effort consistency across time is assumed
	It is assumed that the patrol effort is spatially representative of elephant distribution
	It is assumed that sites are representative of poaching levels in the region
	No ecological differences between sites are taken into account



If elephants dying of natural causes and elephants poached are equally likely to be detected, it is possible to use the PIKE scores, estimates of natural mortality, and population figures to estimate the number of elephants poached. Crudely put, the ratio of the proportion of the carcasses illegally killed to the proportion that died of other causes can act as a multiplier to the natural rate of mortality in the elephant population. This provides an estimate of the poaching rate, as long these data are robust to the model assumptions (Box 3.1). This estimated poaching rate can then be multiplied by the population size to estimate the actual number of poached animals.²¹ This approach has been applied in the past to generate poaching estimates between 2010 and 2012²² and was extended to 2018 using updated population and PIKE data (Figure 4). These estimates suggest some 157,000 elephants were poached between 2010 and 2018, or an average of about 17,000 elephants per year.²³ They show a declining trend in poaching since 2011, rising again slightly in 2017 and 2018 (Figure 4).²⁴

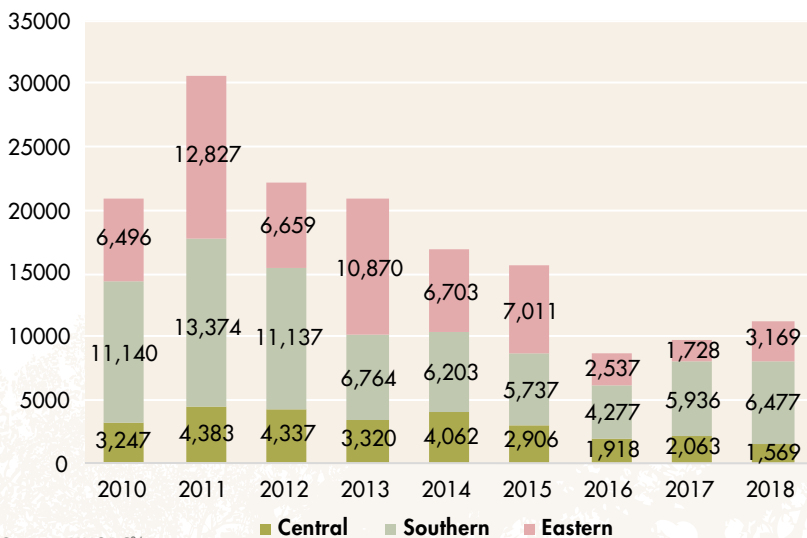
This analysis shows that the intensity of the poaching must be differentiated from the amount of illicit ivory produced. The PIKE score measures the

intensity of poaching, not the volume of poaching. A relatively low PIKE score in a large population could produce more illicit ivory than a high PIKE score in a small population. According to the PIKE-based analysis conducted for this report, Southern Africa, despite its low PIKE scores, was responsible for the largest share of the elephants poached between 2010 and 2018. Oddly, this composition is not reflected in the population data, the forensic data, or the trafficking data, which indicate an Eastern African source as predominant in recent years.

There could be several reasons for this inconsistency. It could be an issue of data quality for one or more of the considered indicators. It is also possible that some parts of Southern Africa, with its large elephant populations, have been an unrecognised source of elephant ivory. The low PIKE values and, therefore, low estimated rate of poaching in many Southern African populations may be sustainable, meaning the level of poaching does not drive a population decline. For instance, using the modelled demographic rates, it would be expected that the poaching of up to 4,000 elephants annually in northern Botswana would not cause a decline in the size of the population.²⁵

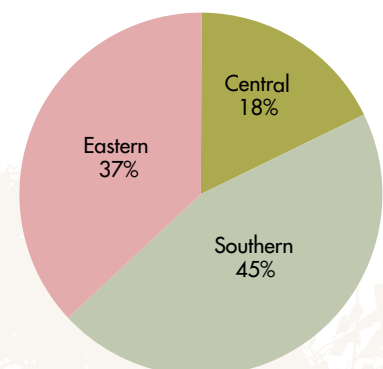
While not directly relevant for estimation purposes, aerial surveys, such as those conducted during the Great Elephant Census, can provide another indicator of poaching intensity: the “carcass ratio”. The total number of elephants detected (live and dead) can be compared to the number of carcasses observed. A “carcass ratio” of less than 8 per cent is said to be indicative of growing elephant populations.²⁸ Whether these elephants died of natural causes or were poached is impossible to determine from the air, and environmental conditions can affect the rate at which carcasses disappear. Still, the stark variation between countries with regard to the share of dead elephants detected in aerial surveys gives some indication of the variation in threats faced across the continent, and high shares of dead elephants relative to live elephants in Cameroon (83%),²⁹ Mozambique (32%), Angola (30%) and the United Republic of Tanzania (26%) show higher mortality risk in these areas. High carcass ratios, possibly indicating high poaching levels, were found in the northern section of Tsavo East National Park, Kenya (52% carcass ratio), Niassa National Reserve, Mozambique (42%), and Rungwa Game Reserve, Tanzania (36%), areas also highlighted by the forensic data.³⁰

Fig. 4 Estimated annual numbers of illegally killed elephants in Central, Eastern and Southern Africa (median figures)



Source: UNODC²⁶

Fig. 5 Regional share of estimated elephants poached in Africa, 2010-2018



Source: UNODC²⁷

Looking at both population-based and poaching data-based estimates, it appears that between 10,000 (population loss average) and 17,000 (poaching estimate average) elephants were poached per year between 2006 and 2018, producing potentially between 100 MT and 170 MT of illicit ivory on average per year.

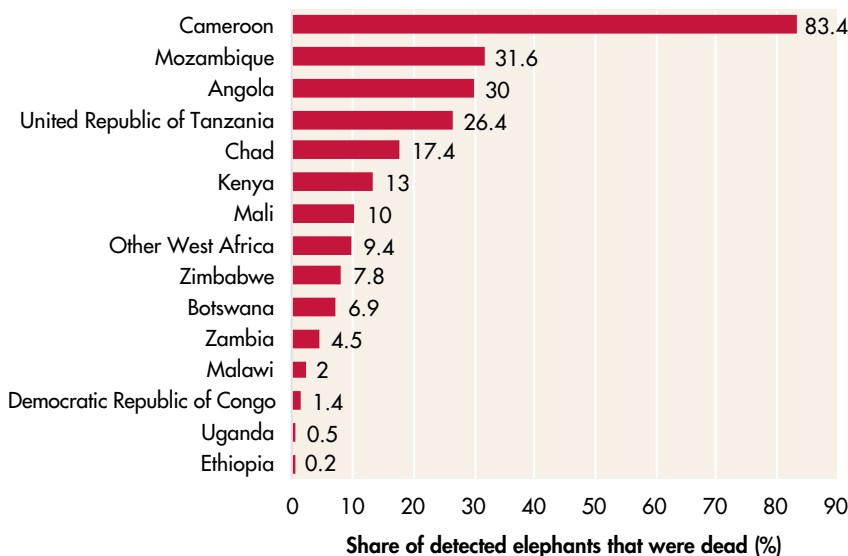
Based on both population modelling³² and the PIKE estimate, it appears that the illegal ivory supply has been declining since 2011. If demand is constant or growing, then a decline in supply would normally result in a rise in prices. But despite indications that the supply of ivory is declining, the price of ivory in Africa also appears to have declined since 2014. UNODC fieldwork conducted in 2018 in Kenya and the United Republic of Tanzania found that poachers were being paid between half and one-third of the price they were paid in 2014 (Figure 7). Reports from the field even suggested that some poachers were holding onto their tusks in hopes that the price would eventually rise.³³

Trafficking

Trafficking patterns can be detected through seizure records, but these do not give an accurate representation of the volume of the trafficking because it is not clear what share of the contraband flow is being seized, and this share can vary from year to year. This is particularly true with ivory seizures, where the total volume seized regularly doubles or halves year-on-year (Figure 8). Nonetheless, long term trends can be triangulated with other trend data to give an indication of market dynamics.

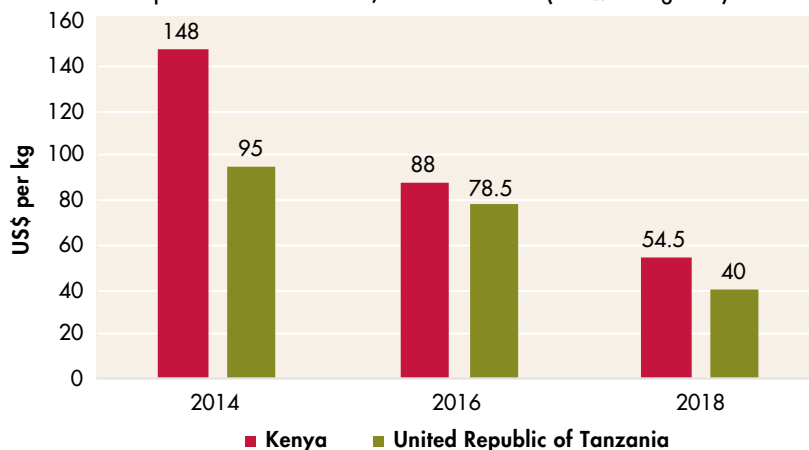
The official CITES data on elephant ivory seizures are maintained by TRAFFIC in the Elephant Trade Information System (ETIS). These raw data show the total annual weight of seizures reported to ETIS began to decline in 2013 and the number of seizures declined after 2011.³⁴ The trend parallels the decline seen

Fig. 6 Estimated share of observed elephants that were dead in 2015 surveys (carcass ratio)



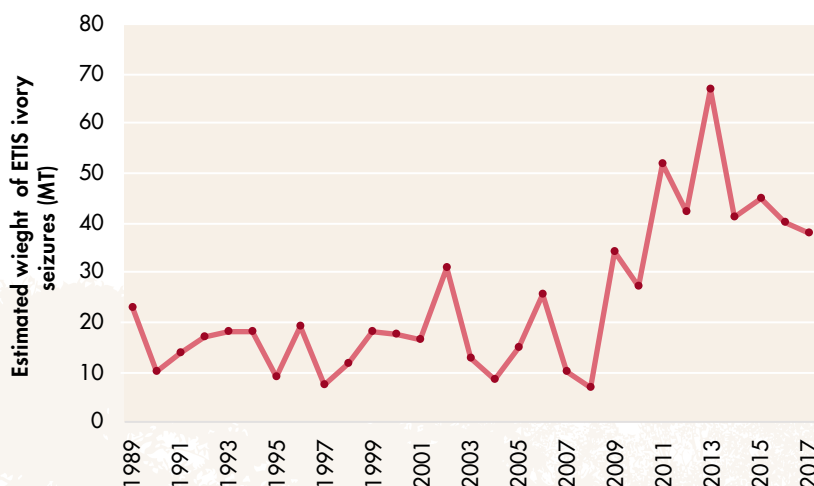
Source: Great Elephant Census³¹

Fig. 7 Ivory prices paid to poachers in Kenya and United Republic of Tanzania, 2014-2018 (US\$/kilogram)



Source: UNODC fieldwork

Fig. 8 Estimated weight of ETIS-recorded ivory seizures, 1989-2017 (MT)



Source: ETIS.³⁵



in the poaching data: both indicate that ivory trafficking grew between about 2007 and around 2011-2013 and has experienced an overall decline since that time.

If, as suggested above, an average about 100 MT to 170 MT of illicit ivory per year were generated between 2010 and 2018, the ETIS seizure figures suggest a high rate of interdiction: 17% to 35% on average across the decade.³⁶

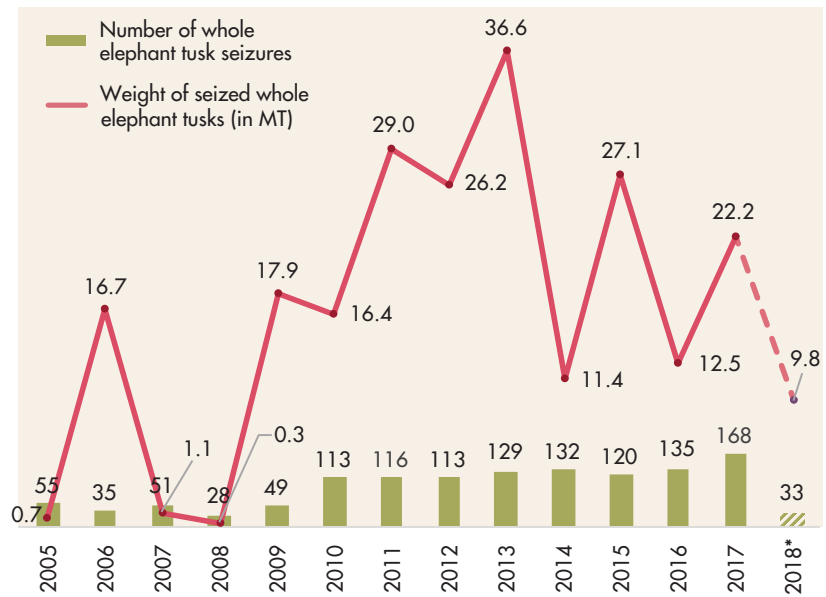
While it lacks the long time series, World WISE contains a comparable number of ivory seizures to ETIS in recent years. Looking just at tusks, the trend between 2007 and 2017 is similar to the ETIS raw data (Figure 9), with sharp growth between 2009 and 2013 and an uneven decline since then. Based on World WISE records of some 1262 African elephant tusk seizures where an alleged destination was known, between 2005-2017, China and South-East Asia were the destination of 90 per cent of these shipments by weight (Figure 10). However, some of the countries listed as destinations in World WISE for illicit ivory shipments are highly likely to be transit countries. While

destination markets for raw ivory do exist outside South-East Asia and China,³⁷ it appears that almost all the illicit tusks detected are bound for this region.

Analysis using the latest data shows a different picture in the identified destination of illegal ivory shipments to that in the previous *World Wildlife*

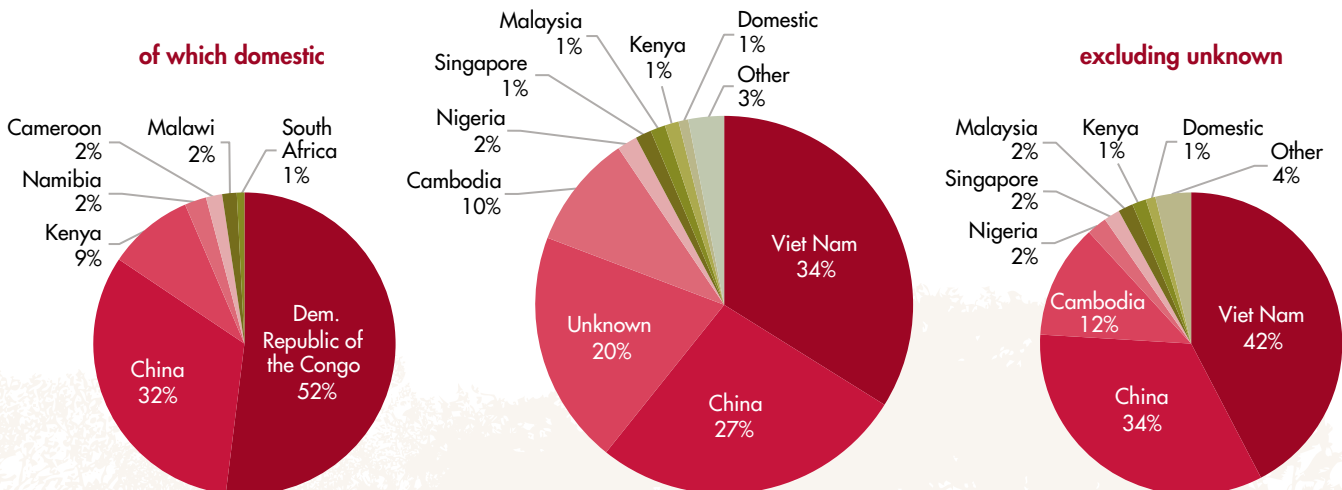
Crime Report, with a growing role for countries like Viet Nam and Cambodia. For example, using data up to 2015, Viet Nam was the destination of about 3 per cent of total weight of ivory interdicted, but using recent data (2015-2019), the share has increased to 34 per cent. Recently, almost all the major seizures recorded in World WISE were destined for Viet

Fig. 9 : Weight of elephant tusk seizures and total number of seizures captured in World WISE, 2005-2018 (metric tons)



Source: UNODC World WISE Database

Fig. 10 : Share of reported national destination of ivory tusk seizures, (total reported seizures 104 MT), 2015-2019³⁸



Source: UNODC World WISE Database

Nam and Cambodia,³⁹ although data in World WISE for 2018 and 2019 do not have the same coverage as previous years.

Just five large scale seizures made in 2019, totalling over 30 MT,⁴⁰ would make it a record year in terms of seizures, contradicting the downward seizure trend seen since 2014. Since poaching levels appear to be down, this suggests either improved interdiction (a higher share of the ivory flow being captured) or sourcing from stockpiles (not from recent illegal killings).

Forensic research suggests that a limited number of criminal groups may be responsible for a large share of the ivory seized (and, possibly, trafficked). This conclusion was reached by linking ivory shipments to a common trafficking organization when DNA from the same elephant was found in two seizures. A large share of the seizures tested could be thus linked together, suggesting as few as three or four major criminal groups were involved in the bulk of the trafficking.⁴¹

Another trafficking trend of note is the growth of mixed seizures

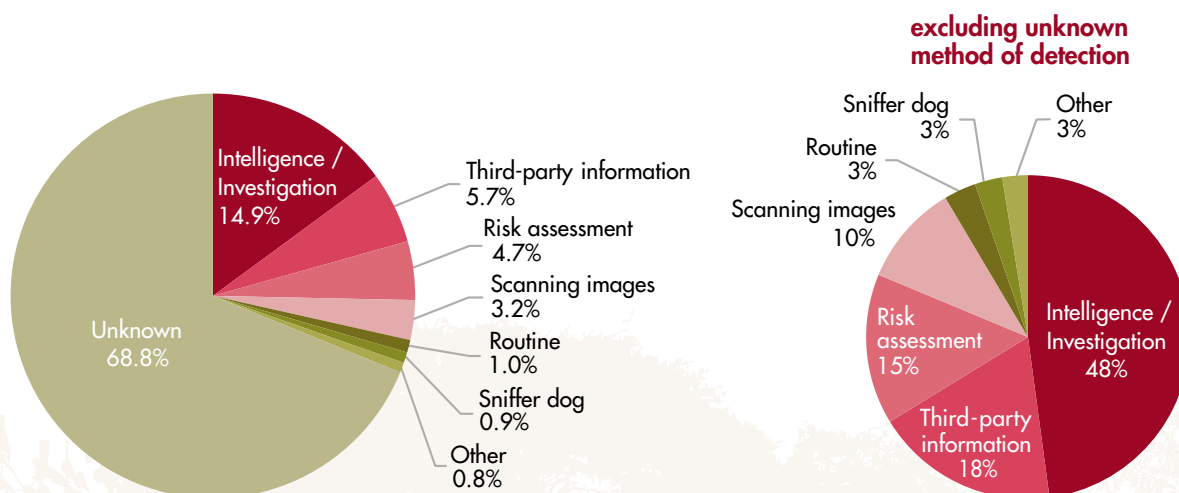
containing both ivory and pangolin scales, often in large volumes. For example, on 21 July 2019, the government of Singapore seized almost 12 metric tons of pangolin scales alongside almost nine metric tons of ivory – remarkably large quantities of both commodities – in a container coming from the DRC on its way to Viet Nam, declared as timber. Wildlife seizures containing products of multiple species are fairly rare in World WISE, so this recent trend is worthy of attention. It is possible that ivory traffickers, facing declining demand, are taking advantage of their established networks to move a commodity for which demand is growing: pangolin scales. The *West and Central Africa Wildlife Crime Threat Assessment* noted that interviewed poachers knew that hunting pangolins was illegal, but they felt this offence was taken less seriously than elephant poaching.⁴²

Based on an analysis of 265 cases of ivory tusk seizures (accounting for 72 metric tons of ivory), made in 41 countries⁴³ (where the reason for the seizure was reported), it appears that the vast majority were made due to investigations, risk-assessments, and tip-offs, with only 3% being found

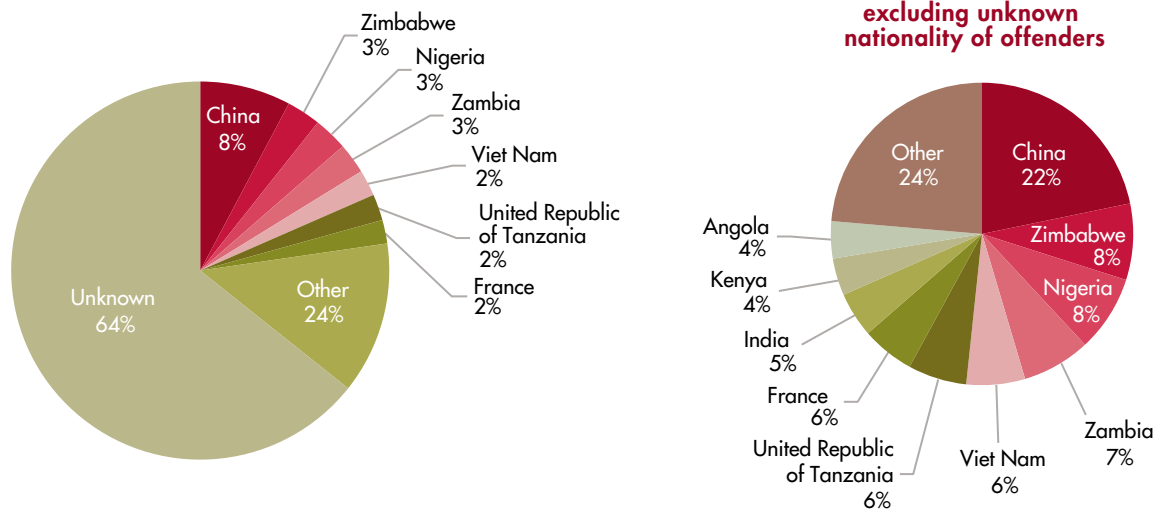
during routine inspections (Figure 11). This highlights the importance of intelligence-driven approaches and risk management practices in ivory interdiction. Countries that seize a lot of ivory do so because they have invested in finding it. Based on records involving the seizure of 144 metric tons of ivory tusks, China (specifically the Kwai Chung area of Hong Kong) and Viet Nam (specifically Hai Phong) lead the world in ivory seizures, followed by Port Klang in Malaysia and Mombasa in Kenya.

Based on those cases where the exact location of the seizure was specified, most of the tusks were seized at sea-ports, although private houses and airports were also frequent sites of tusk seizures. The majority of the tusks were found hidden in freight, although not all were concealed. Most seizures involving shipping containers do not present immediate opportunities for arrests but, based on 221 cases where arrests were reported in connection with the seizures, Chinese nationals were most frequently arrested, followed by Zimbabwean, Nigerian, Zambian, and Vietnamese nationals (Figure 12).

Fig. 11 Share of the most frequent method of detection in ivory tusk seizures (in mass equivalent), 2004-2018⁴⁴



Source: UNODC World WISE Database

**Fig. 12** : Share of the nationality of persons arrested in connection with ivory tusk seizures, 2009-2018⁴⁵

Source: UNODC World WISE Database

Destination markets

Numerous reports on Asian markets have indicated a decline in the price of illicit raw ivory tusks after 2014. This trend parallels the decline in price paid in Africa. Based on observational studies, prices in China almost tripled between 2010 and 2014, only to drop below their 2010 levels by 2018 (Figure 13). This declining trend was also reflected in price data gathered by the Chinese police in 50 law enforcement operations between 2015 and 2017 (Figure 14). These trends in China were paralleled by a decline seen by the Wildlife Justice Commission in 22 undercover price quotations in Viet Nam. The 2018 price observed in China (by TRAF-FIC) and Viet Nam (by WJC) are very similar, and both are similar to the price in 2010.

Another indicator of the decline of the ivory market comes from studies on the type of objects being offered for sale in markets in South-East Asia and China. Surveys conducted around 2014 in China noted the sudden presence of whole polished tusks in urban markets. The last World Wildlife Crime Report suggested these were marketed to speculators

more interested in the raw material than the art or jewellery that could be made from it. Large carved art-pieces were also prominent in the Chinese market at this time. However, a 2017 survey of 22 cities in China found that 90% of the illegal ivory objects offered for sale were small items, primarily jewellery.⁴⁹ This suggests that interest in buying raw ivory or large artworks for their investment value has declined, leaving only the retail market for trinkets. Of course, large investors in raw ivory were unlikely to buy from visible retail establishments even during peak demand, but the decline in visible high-value items is a significant indicator of the health of the market. It is also possible that sales have moved on-line, but physical markets remain important in this market. Recent surveys in China suggest only a small share of ivory buyers (17 per cent in 2018) bought ivory online, with most buying it in person either in China or while overseas.⁵⁰

The situation in South-East Asia appears to be similar. Today, the ivory markets in Viet Nam and Thailand seem largely limited to bangles, amulets, and other jewellery. A 2018 survey of 60 online sellers and 852 physical outlets in 13 locations in

Viet Nam found that 90 per cent of over 10,000 items reviewed were jewellery, and only the top 1% were priced over US\$200.⁵¹ The number of items viewed was fewer than a less extensive survey conducted in 2015, which also noted the lack of expensive items in the market.⁵² A 2016 survey of ivory markets in Bangkok found the number of objects observed for sale dropped sharply over an 18-month period between the end of 2014 and mid-2016 (Figure). Some 86 per cent of the objects observed were jewellery, and only 4 per cent were carved ivory, with the number of carved ivory objects dropping from 614 in December 2014 to just 10 in May 2016.⁵³

In Japan, which retains a legal domestic ivory market, most (80 per cent) ivory is used to produce *hanko* name seals,⁵⁴ though ivory is also worked into jewellery and other finished products often targeted at an international tourist clientele.⁵⁵ A survey of Japan's physical ivory market and auctions in 2018 found a strong reduction in the number of whole tusks offered for sale.⁵⁶

Thus, surveys conducted in the largest known ivory markets globally seem

to reflect a move toward a smaller number of smaller objects, consistent with an overall reduction in the volume of ivory available.

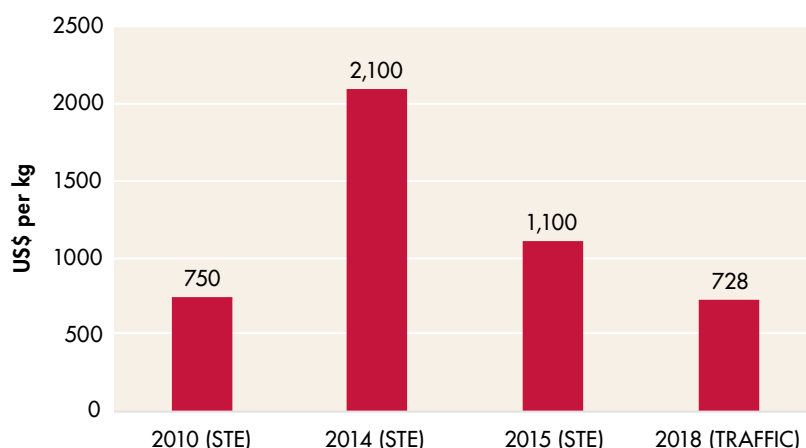
Trend analysis

The downward trend in supply and price is likely due to some combination of several factors. As discussed above, an average of around 100 to 200 metric tons of ivory had been entering the market annually since 2007. Ivory is a durable good, so unless the market continued to expand, at some point supply would exceed demand. The exact point when this occurred is unclear but was likely sometime between 2011 and 2015, and prices fell as the market adjusted.

The timing of this over-supply could have been influenced by a number of factors, including declining demand. One factor that surely affected demand was a radical change in the legal regime in some of the key legal ivory markets,

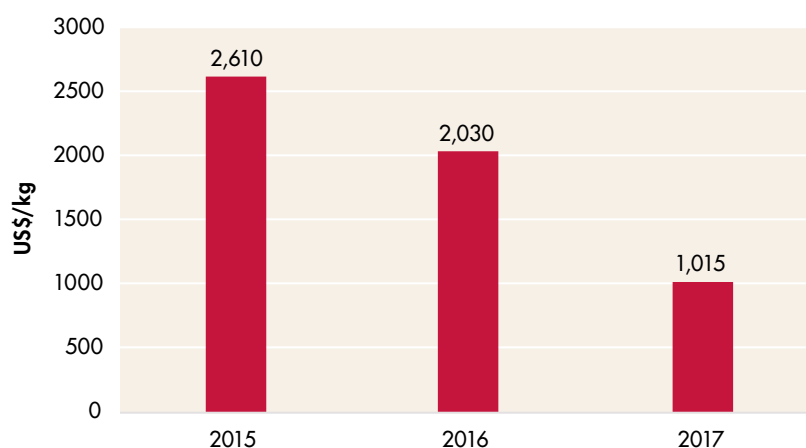
In December 2015, two of the largest ivory consumer markets globally – China and the United States of America – publicly committed to closing their legal domestic markets for ivory in the future.⁵⁷ Since the publication of the last *World Wildlife Crime Report*, this promise has been enacted in law in both countries. On 6 June 2016, the relevant rules under the United States Endangered Species Act were revised, prohibiting import, export, and interstate trade of African elephant ivory, with very limited exceptions.⁵⁸ On 30 December 2016, the Chinese government announced its decision to end the commercial processing and sale of ivory by the end of 2017.⁵⁹ In 2018, the Hong Kong Special Administrative Region of China also announced that would implement a three-step plan to phase out the trade in elephant ivory by the end of 2021, and to impose heavier penalties to enhance deterrence of the illicit trade in endangered species.⁶⁰

Fig. 13 : Wholesale prices for illegal ivory in China, selected years (US\$/kilogram)



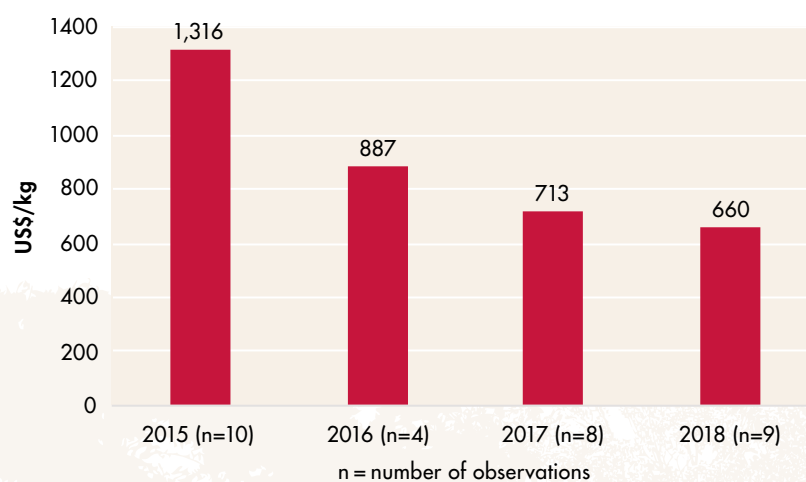
Source: Various sources.⁴⁶

Fig. 14 : Illegal raw ivory tusk price in China, 2015-2017 (US\$/kilogram)



Source: Chinese law enforcement, as reported by TRAFFIC.⁴⁷

Fig. 15 : Wholesale prices for illegal ivory in Viet Nam, 2015-2017 (US\$/kilogram)



Source: Wildlife Justice Commission.⁴⁸

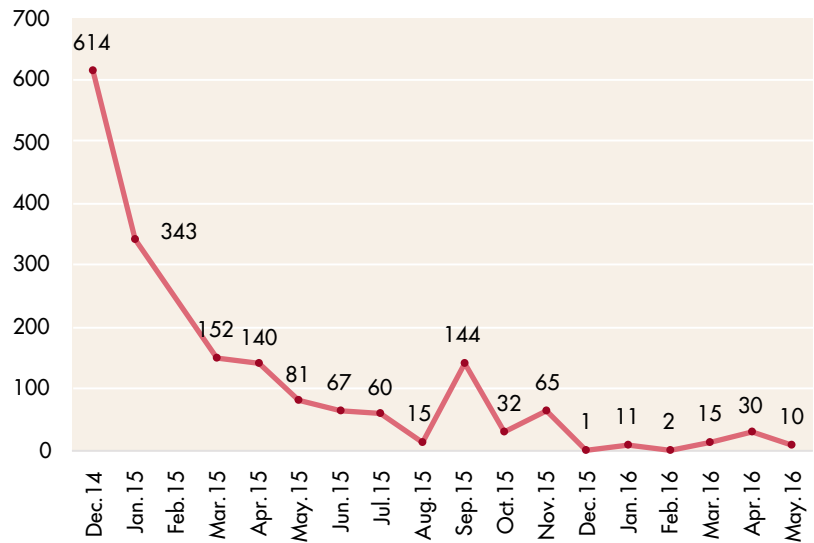


In addition, Thailand has taken significant measures to criminalize the trade of African elephant ivory. Thailand initiated a series of reforms at the beginning of 2015, including the listing of African elephants on the national protected species list, mandatory countrywide registration of privately-owned ivory objects and several other measures.⁶¹ In response, some 40,000 people registered over 200 metric tons of ivory with the national authorities, underscoring the importance of Thailand as an important ivory market. Significant reduction in ivory for sale in the domestic market was observed in 2016.⁶² While not a ban on domestic sales, these measures appear to have dramatically reduced the visible retailing of ivory in Bangkok.⁶³

These restrictions in the legal market may have had an impact on the illegal one. Targeted surveys conducted in 2017 and 2018 in China found that many consumers have lost interest in ivory.⁶⁴ Even among those open to the purchase of ivory, the share that had purchased in the previous year declined. Some respondents said they saw owning ivory as shameful after the ban. In other words, the closing of the legal ivory market changed the way people view ivory as a product. Despite this shift, the survey found a contingent of die-hard ivory buyers, primarily affluent men who travelled abroad frequently and purchased the ivory while overseas.⁶⁵ In this way, tightened controls in China likely had the unintended consequence of displacing ivory markets into neighbouring countries.

It may be that speculation, not retail demand, was driving the poaching since 2007, as suggested by the previous *World Wildlife Crime Report*. Of course, by its nature, speculation is not directly tied to retail demand. The price of gold, for example, is not determined by trends in the retail jewellery market. But ivory's value as an investment may have declined relative

Fig. 16 : Number of carved ivory objects identified in Bangkok, December 2014-May 2016



Source: TRAFFIC

to competing investment vehicles due to the tighter controls.

Once large investors began to sell, the cascading flood of ivory could have pushed the price for poached ivory down. One problem with the idea that tightened legal market controls undermined demand is the timing of the decline. These policy innovations only started in 2015. The data presented above suggest that poaching has been declining since 2011 and price has been declining since 2014. It may be that while poaching peaked in 2011, ivory trafficking only peaked in 2013 as suggested by seizure data or in 2015, as suggested by modelled ETIS data.

It is also possible that, as researchers have suggested,⁶⁶ prices began to drop in anticipation of the legal market ban. If the speculators knew in advance that market restrictions were forthcoming, they could have started dumping their ivory stocks in response. Buyers for this surplus could have been those who were directly involved in producing ivory artefacts: the carving factories. These buyers know what retail ivory objects can be sold for, so the price they were

willing to pay would be much lower than the speculative price paid in 2014. Thus, the illicit market wholesale price as reported by market observers in 2018 is about the same as that observed before the boom in 2010: about US\$750 per kilogram.⁶⁷

Based on just the five major seizures cited above, it appears the global seizure trend will reverse in 2019. Poaching data for 2019 are not yet available but would have to reverse starkly to match the seizure trend. Unless evidence of renewed poaching emerges, this suggests either an increase in interdiction rate or the use of stocks rather than freshly poached elephants.



Box 2. Helmeted hornbill ivory: “Red ivory”

Despite its CITES Appendix I listing since 1975, escalating demand for hornbill ivory in recent years has contributed to the up-listing of the Helmeted hornbill (*Rhinoplax vigil*) from a “Threatened” IUCN Red list status in 2012 to a “Critically Endangered” status in 2015.^a Also known as red ivory, golden jade, or “ho-ting,” the hornbill’s casque has long been considered a natural ivory substitute.^b Unlike elephant, hippo and walrus ivory, which are dentine material, the casque of the helmeted hornbill is made of solid keratin.^c The casque is orange-yellow in its raw appearance with a thin red outer layer on the upper portion, which may disappear once polished.^d It is softer than elephant ivory and relatively easy to carve.^e

After being listed on CITES Appendix I, the international market for helmeted

hornbill ivory all but collapsed, with relatively low volumes of illegal trade occurring until sometime around the early 2010s. Hornbill ivory is reportedly worth five times that of black-market elephant ivory by weight^f During 59 separate events between 2010 to 2017, 2,878 casques, worth US\$3 million were seized.^g

Most seizures occurred in Indonesia (a range State) and China (a destination market), peaking in 2012 and 2013.^h Between 2014 and 2016, Indonesia reported at least 48 poaching cases in Sumatra (primarily in Leuser and Bukit Barisan Selatan National Parks)ⁱ and by 2016, Indonesian authorities had confiscated 1,398 casques in 25 seizures.^j Poachers in Indonesia have confirmed the existence of organized crime networks in the trade, also targeting other

species such as tigers and pangolins.^k There have also been reports of seizures in Malaysia and Thailand.^l The seizure of 72 helmeted hornbill casques at Soekarno Hatta Airport (Jakarta) in July 2019 highlights that illegal trade is still occurring.^m

There are still many unknowns about the illegal trade in helmeted hornbill. Of special importance given current ivory poaching trends, is whether and how much a decline in ivory supply could lead poachers to source helmeted hornbill as a possible replacement product, whether consumers would accept such a change, and if non-wild sources could meet a possible shifted demand to this substitute.

a BirdLife International. *Rhinoplax vigil*. *The IUCN Red List of Threatened Species* 2018: e.T22682464A134206677 (2018).

b Liang, J., Li, H., Lu, T., Zhang, J., Shen, M. & Zhou, J., ‘Identification characteristics of natural and imitation hornbill ivory’, *J. Gemmology* 34: 42–49, 2014; Espinoza, E. O. and Mann, M.-J., *Identification guide for ivory and ivory substitutes*. Geneva, Switzerland: CITES Secretariat, 1999; Kane, R.E., ‘Hornbill ivory’, *Gems and Gemology*, pp. 96–97, 1981.

c Kane (1981); Liang *et al.* (2014) *ibid.*; CITES CoP 17, Doc. 69, *Illegal trade in the helmeted Hornbill* (*Rhinoplax vigil*), 2016.

d Liang *et al.* (2014); Kane (1981).

e Liang *et al.* (2014); CITES (2016).

f Environmental Investigation Agency, *Seeing ‘red’ – the often-hidden colour of wildlife contraband*, 2015 (available at: <https://eia-international.org/news/seeing-red-the-often-hidden-colour-of-wildlife-contraband/>).

g Jain, A., Lee, J. G. H., Chao, N., Lees, C., Orenstein, R., Strang, B. C., Chang, S. C. L., Marthy, W., Yeap, C. A., Hadiprakarsa, Y. Y. and Rao, M. (Eds), *Helmeted Hornbill (Rhinoplax vigil): Status Review, Range-wide Conservation Strategy and Action Plan (2018-2027)*. IUCN Species Survival Commission Hornbill Specialist Group, 2018.

h Jain *et al.* (2018); Beastall, C., Shepherd, C.R., Hadipraksarsa, Y. and Martyr, D., ‘Trade in the Helmeted Hornbill *Rhinoplax vigil*: the ‘ivory hornbill’’, *Bird Conservation International* 26(2): 137–146, 2016.

i CITES, 69th meeting of the Standing Committee (SC69), Document 61 (Rev. 1), *Species specific matters. Illegal trade in the helmeted hornbill (Rhinoplax vigil): Report of the Secretariat*, 2017.

j CITES (2017); Indonesia Ministry of Environment (Kementerian Lingkungan Hidup dan Kehutanan), *Strategi dan Rencana Aksi Konservasi Rangkong Gading (Rhinoplax vigil) Indonesia 2018-2028*, Jakarta, Indonesia: KLHK (available

at: http://ksdae.menlhk.go.id/assets/publikasi/SRAK%20Rangkong%20Gading_Published.pdf).

k Beastall *et al.* (2016).

l Jain *et al.* (2018).

m Indonesia Ministry of Environment and Forestry (KLHK), KLHK Gagalkan Penyelundupan 72 Paruh Burung Rangkong ke Hongkong. [In Indonesian]. Press release. Nomor: SP. 261/HUMAS/PP/HMS.3/7/2019 (available at: http://ppid.menlhk.go.id/siaran_pers/browse/1997#).



Endnotes

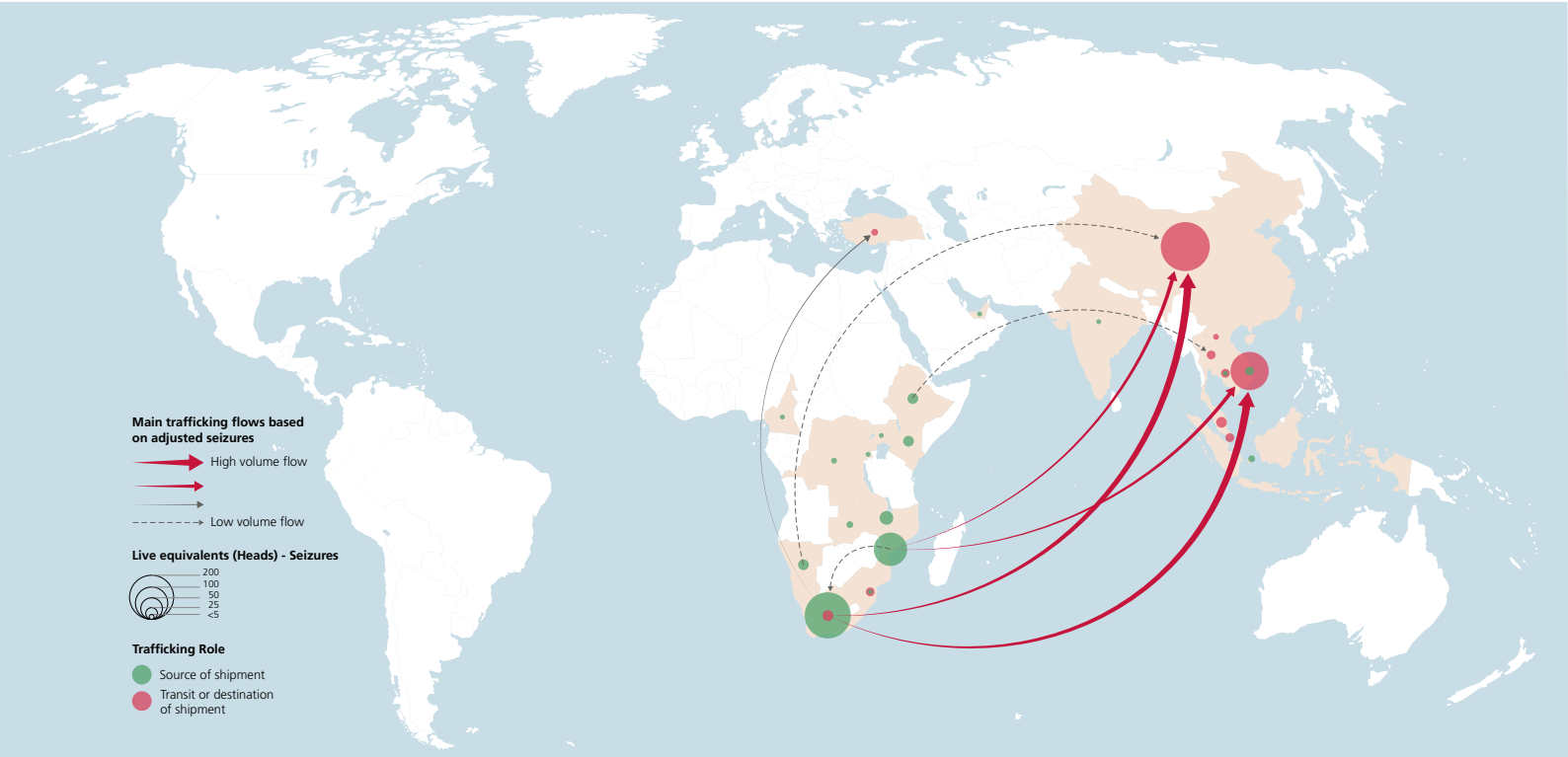
- 1 This chapter focuses on African species of elephants and rhinoceros, although there are Asian species of both animals. Although Asian elephants and rhinos are also subject to poaching, seizures indicate that the illegal trade is presently dominated by the flow from Africa to Asia. For the purposes of precision and simplicity, the chapter focuses on this dominant flow.
- 2 There are about half a million African elephants left and every year some of them die of natural causes. Due to its recognized value, their ivory is usually stockpiled by the state. Ivory is a durable good and can last for centuries, so stockpiles naturally accumulate. Since international trade in ivory is not allowed for CITES parties, these stockpiles can be a source of illegal supply. In addition, every year thousands of elephants are illegally killed for their ivory. Since it is this killing that is of concern to conservationists, this chapter focuses on the illegal ivory supply from elephants that have been poached.
- 3 Chase, M., Schlossberg, S., Griffin, C., Bouché, P., Djene, S., Elkan, P., Ferreira, S., Grossman, F., Kohi, E., Landen, K., Omondi, P., Peltier, A., Selier, S. and Sutcliffe, R., 'Continent-wide survey reveals massive decline in African savannah elephants'. *Peer J*, Vol. 4, No. 2354, 2016.
- 4 Thouless, C., Dublin, H., Blanc, J., Skinner, D., Daniel, T., Taylor, R., Maisels, F., Frederick H. and Bouché, P., *African Elephant Status Report 2016: an update from the African Elephant Database*, Occasional Paper Series of the IUCN Species Survival Commission, No. 60 IUCN/SSC Africa Elephant Specialist Group, IUCN, 2016.
- 5 415,428 ± 20,111. See IUCN 2016, op. cit. p. 29. These estimates are based on the latest population surveys available in the scientific literature, extensively vetted for reliability by the top authorities in the field, and therefore represent the best available data on elephant populations.
- 6 117,127 to 135,384, *ibid*.
- 7 The report notes that some new populations were found in areas surveyed for the first time, reducing the difference between two estimated number of elephants based on surveys to about 93,000.
- 8 CITES SC69 Annex document, p. 15.
- 9 There is a great need for an updated estimate of the amount of ivory carried by each elephant, which could be done through the centralized ivory stockpile databases held by several Member States. Although several figures have been used, the traditional yield has been estimated at 1.8 tusks per elephant and about 5.5 kg per tusk, resulting in an average of about 10 kg ivory per elephant. See Martin, R., Cumming, D., Craig, G., Gibson, D. and Peake, D., *Decision-Making Mechanisms and Necessary Conditions for a Future Trade in African Elephant ivory: Final Report* (CITES SC62 Doc. 46.4 Annex A), 24 May 2012, p. 16.
- 10 Combined "definite" and "probable" estimates; does not include "possible" or "speculative" estimates.
- 11 Does not include guesses or uncertainty range.
- 12 IUCN 2016 op. cit. p.3.
- 13 Such as the development of a National Anti-Poaching Strategy, the creation of a National Taskforce on Anti-Poaching, an increase in intelligence-led investigations, increased prosecution, and steep sentences for wildlife trafficking. Tanzania exited the NIAP process in 2019. See CITES, 71st meeting of the Standing Committee (SC71), Document 11, Annex 1: National Ivory Action Plan (NIAP) process: Implementation of Step 1 of the Guidelines to the NIAP process - Identification of Parties to participate in the NIAP process.
- 14 Chad, Central African Republic, the Democratic Republic of the Congo and Equatorial Guinea
- 15 IUCN 2016, op. cit. Parts of this region were also seriously affected by drought during this period.
- 16 According to CITES Resolution Conf. 10.10, *Trade in elephant specimens*, all ivory seizures over 500 kg should be submitted to forensic analysis but it appears that only 20% to 25% have been.
- 17 Wasser, S., Brown, L., Mailand, C., Mondol, S., Clark, W., Laurie, C. and Weir, B., 'Genetic assignment of large seizures of elephant ivory reveals Africa's major poaching hotspots', *Science*, Vol. 349 No. 6243, 2015. In TRIDOM, areas affected include the Minkébé National Park in Gabon, the Mengame Wildlife Sanctuary, the Abong-Mbang Forest Reserve, Bénoué National Park, Bouba Ndjidah National Park, Faro National Park, and the Yoko area in Cameroon. Using Cameroon as an example, the Mengame Wildlife Sanctuary was estimated in 2003 to have more than 1,000 elephants; the 2011 revision was 10. In addition, poaching around 2012 appears to have virtually wiped out the savanna elephant populations of northern Cameroon. Reserves that had previously held elephants with a zero population estimate in 2016 include Abong-Mbang Forest Reserve, Bénoué National Park, Bouba Ndjidah National Park, Faro National Park, and the Yoko area. See IUCN 2007 and IUCN 2016 op. cit.
- 18 CITES CoP18 Doc.69.2 (2019), *Species specific matters: Elephants (Elephantidae spp.)*, Report on Monitoring the Illegal Killing of Elephants (MIKE).
- 19 See online data repository, which contains R script for analyses of data from the Monitoring the Illegal Killing of Elephants (MIKE) Programme to produce outputs for reports to CITES (<https://github.com/CITES-MIKE/MIKE-LSMEANS>).
- 20 That is, from a revised PIKE of 0.52948 in 2017 to 0.53544 in 2018, for an increase of 0.00596. However, 2018 also had the smallest overall carcass count since 2010: 1314, compared to an average of 1780 between 2011 and 2017.
- 21 The method used here is explained in detail in the Methodological Annex.
- 22 Wittemyer, G., Northrup, J. M., Blanc, J., Douglas-Hamilton, I., Omondi, P. and Burnham, K. P., 'Ivory poaching drives decline in African elephants', *Proceedings of the National Academy of Sciences*, Vol. 111, No. 36, 2014.
- 23 Wittemyer, G., 'Revisiting estimates of elephant poaching across Africa', Working Paper prepared for UNODC, 2018. Available in the online Methodological Annex.
- 24 See Chapter 8.
- 25 Wittemyer, G., 2020, *in litt*.
- 26 Analysis performed by George Wittemyer for UNODC (full paper available in the Methodological Annex). PIKE data from West Africa were insufficient for an estimate to be produced. Based on estimated poaching of over 150,000 elephants.
- 27 *Ibid*.
- 28 Chase, M., Schlossberg, S., Griffin, C., Bouché, P., Djene, S., Elkan, P., Ferreira, S., Grossman, F., Kohi, E., Landen, K., Omondi, P., Peltier, A., Selier, S. and Sutcliffe, R., 'Continent-wide survey reveals massive decline in African savannah elephants'. *Peer J*, Vol. 4, No. 2354, 2016. See also Douglas-Hamilton, I. and Burrill, A., 'Using Elephant Carcass Ratios to Determine Population Trends'. *African Wildlife: Research and Management*, 1991, pp. 98—105.
- 29 This very high share was based on a very small observed elephant population (148). Most of Cameroon's elephants are forest elephants, which are difficult to view from the air.
- 30 Chase et al. 2016, op. cit.
- 31 *Ibid*.
- 32 Martin, R., Cumming, D., Craig, G., Gibson, D. and Peake, D., *Decision-Making Mechanisms and Necessary Conditions for a Future Trade in African Elephant ivory: Final Report* (CITES SC62 Doc. 46.4 Annex A), 24 May 2012, p. 16.
- 33 UNODC fieldwork conducted in 2018 in Kenya and the United Republic of Tanzania. See online Methodological Annex for details.
- 34 In addition to these raw data, ETIS models intended to address bias found a later peak, in 2015. See CITES CoP18 Doc.69.3 (2019), *Species specific matters: Elephants (Elephantidae spp.)*, Report on the Elephant Trade Information System (ETIS).
- 35 Milliken, T., Underwood, F., Burn, R. and Sangalakula, L., *The Elephant Trade Information System (ETIS) and the Illicit Trade in Ivory: A report to the 18th meeting of the Conference of the Parties to CITES*, CoP18 Doc. 69.3 (Rev. 1) Annex 1, December 2018.
- 36 Interdiction rate is usually estimated at the level of 10-15 per cent. To get lower interdiction rates with the same seizure estimates, the total amount of new illegal ivory generated would need to be increased, either by increasing the yield per animal above 10 kg or increasing the number of animals poached above 20,000. It is also possible that seizures are exaggerated by incorrect weight imputation.

- 37 The “other” countries indicated include Kenya, Philippines, Sudan, United Arab Emirates, France and the United States.
- 38 The data for 2018 and 2019 are not complete.
- 39 For example, in December 2018, Cambodian customs seized 1,026 tusks (3.2 MT) at the Phnom Penh port in a shipping container from Mozambique that was never claimed. In January 2019, 2.1 MT of tusks were seized by China at Hong Kong, China, coming from Nigeria on their way to Viet Nam, alongside 8.2 MT of pangolin scales. Also that month, Uganda seized 3.3 MT of ivory alongside pangolin scales crossing into South Sudan on its way to Viet Nam, arresting two Vietnamese nationals. In March 2019, 9.1 MT ivory were seized by Viet Nam coming from the Democratic Republic of the Congo, one of the largest ivory seizures ever made. In April, the Mozambican tax authorities seized 867 pieces of ivory weighing 3.4 MT in a container of plastic waste destined for Cambodia. In July 2019, 8.8 MT of ivory was seized by Singapore coming from the Democratic Republic of the Congo to Viet Nam (alongside 11.9 MT of pangolin scales). Large amounts of ivory continue to be seized in China, such as the March seizure of 7.48 MT ivory by Chinese authorities in the village of Gaogou, Anhui, from a group that smuggled from Nigeria.
- 40 Ibid.
- 41 Wasser, S., Torkelson, A., Winters, M., Horeaux, Y., Tucker, S., Otiende, M., Sitam, F., Buckleton, J. and Weir, B., ‘Combating transnational organized crime by linking multiple large ivory seizures to the same dealer’, *Science Advances*, Vol 4, no. 9, eaat0625, 2018.
- 42 See CITES CoP 18, Doc. 34 (2019), *Interpretation and implementation matters: General compliance and enforcement: Wildlife crime enforcement and support in West and Central Africa*.
- 43 Out of 1,176 ivory tusk seizures in World WISE.
- 44 2018 data are not complete.
- 45 2018 data are not complete.
- 46 “STE” stands for “Save the Elephants” and refers to surveys conducted by Vigne and Martin. Martin, E. and Vigne, L., *The Ivory Dynasty: A Report on the Soaring Demand for Elephant and Mammoth Ivory in Southern China*, Elephant Family, The Aspinall Foundation and Columbus Zoo and Aquarium, 2011; Vigne, L. and Martin, E., *China faces a conservation challenge: The expanding elephant and mammoth ivory trade in Beijing and Shanghai*, Nairobi: Save the Elephants and Aspinall Foundation, 2014; Vigne, L. and Martin, E., *Decline in the Legal Ivory Trade in China in Anticipation of a Ban*, Nairobi: Save the Elephants, 2017. Yu Xiao, *China’s Ivory Market after the Ivory Trade Ban in 2018*, Beijing: TRAFFIC, 2018.
- 47 Yuankun Zhao et al 2018 op cit
- 48 Data transmitted directly from WJC, 19 April 2019.
- 49 Yuankun et al 2017 op cit.
- 50 Meijer, W., Scheer, S., Whan, E., Yang, C. and Kritski, E., *Demand under the Ban – China Ivory Consumption Research Post-ban 2018*, Beijing: TRAFFIC and WWF, 2018.
- 51 Nguyen, M. D. T., Indenbaum, R. A. and Willemssen, M., *From Tusk to Trinket: Persistent illegal ivory markets in Viet Nam*. Ha Noi: TRAFFIC, 2018.
- 52 Vigne and Martin observed 16,099 ivory items at 242 open outlets in six locations. See Vigne and Martin 2016, op cit.
- 53 Krishnasamy, K., Milliken, T. and Savini, C., *In Transition: Bangkok’s Ivory Market – An 18-month survey of Bangkok’s ivory market*. TRAFFIC, Southeast Asia Regional Office, Petaling Jaya, Selangor, Malaysia, 2016.
- 54 Martin, E. and Stiles, D., *The Ivory Markets of East Asia, Save the Elephants*, 2003.
- 55 Kitade, T. and Nishino, R., *Ivory Towers: An assessment of Japan’s ivory trade and domestic market*, TRAFFIC, Tokyo, Japan, 2017.
- 56 Kitade, T. and Nishino, R., *Slow Progress: A Reassessment of Japan’s Ivory Market in 2018*, TRAFFIC, Tokyo, Japan, 2018. According to data from Japan’s Ministry of Environment, as of the end of 2019, Japan had a registered stockpile of 181 metric tons of whole tusks and an additional 68.7 metric tons of cut pieces of raw ivory.
- 57 The White House, Office of the Press Secretary, *Fact sheet: President Xi Jinping’s State Visit to the United States*, 25 September 2015; State Council of China, *Notice of the General Office of the State Council on Orderly Stopping Commercial Processing and Sales of Ivory and Products*, Notice 103 of 2016, 30 December 2016 (available at: http://www.gov.cn/zhengce/content/2016-12/30/content_5155017.htm).
- 58 50 CFR Part 17, “Endangered and Threatened Wildlife and Plants; Revision of the Section 4(d) Rule for the African Elephant (*Loxodonta africana*); Final Rule”. *Federal Register*, Vol. 81, No. 108, Monday, June 6, 2016.
- 59 State Council of China, *Notice of the General Office of the State Council on the Orderly Stopping of Commercial Processing and Sales of Ivory and Products*, Notice 103 of 2016, 30 December 2016.
- 60 CITES, Notification to the parties, No. 2018/057, China: Stricter domestic measures on ivory trade in Hong Kong Special Administrative Region, China, 1 June 2018 (available at: <https://www.cites.org/sites/default/files/notif/E-Notif-2018-057.pdf>).
- 61 See Annex 1 to document SC66 Doc. 29 (Rev. 1) pg. 29 and 30: <https://cites.org/sites/default/files/eng/com/sc/66/E-SC66-29-Rev1.pdf>.
- 62 CITES, 69th meeting of the Standing Committee (SC69), Document 29.3, paras. 122-127: *National ivory action plans process: report of the Secretariat*.
- 63 Krishnasamy, Milliken and Savini, 2016, op cit.
- 64 Meijer, W., Scheer, S., Whan, E., Yang, C. and Kritski, E., *Demand under the Ban – China Ivory Consumption Research Post-ban 2018*, Beijing: TRAFFIC and WWF, 2018.
- 65 Ibid.
- 66 Vigne and Martin 2017, op cit.
- 67 See the price trend discussion above.



Map 2

Trafficking flow map - African rhinoceros horns (2014-2018)



Source: UNODC World WISE Database

The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. The year 2018 is based on partial data.

Rhinoceros horn

African rhinos differ from African elephants in that there are far fewer of them, and they are far more concentrated geographically.¹ For every remaining African rhino (about 25,000 of them) there are perhaps 20 African elephants, and while it takes five countries to comprise three-quarters of the remaining elephants, 75 per cent of the remaining rhinos can be found in just one: South Africa. South Africa has been so successful in breeding rhinos that it has managed to export 538 live rhinos since 2014, feeding growing wild and captive populations in other countries. Drought and poaching have caused South Africa's rhino population to decline since 2012, however, driving down the overall continental population.²

Around 7,500, or over 40 per cent, of these South African rhinos are privately owned by ranchers and private

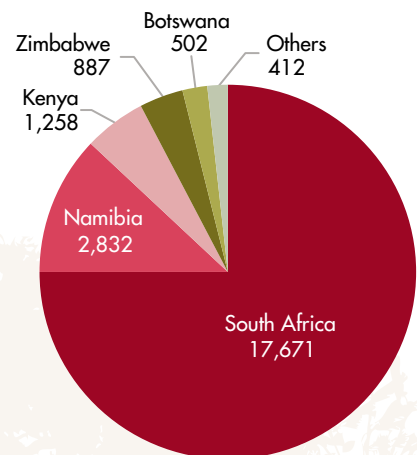
game reserves.³ These operations have weathered a decline in the price of a live rhino by two-thirds between 2007 and 2018.⁴ While legal prices have declined, the threat of poaching has imposed substantial security costs for rhino ranchers.⁵ In this way, the illegal trade poses an additional threat to rhino populations: it threatens to make these private holdings unsustainable.

Poaching

Similar to ivory, there have recently been indications of a decline in the market for rhino horn, as both supply (poaching) and price indicators are declining. South Africa, which experienced 86 per cent of the recorded poaching incidents between 2006 and 2017, has seen a declining trend in its poaching numbers every year since 2014. In 2019, the number of poaching incidents decreased to 594, the lowest level since 2011.

Anecdotal data gathered on prices paid to poachers historically in Kenya, the United Republic of Tanzania and South Africa in 2018 were erratic and showed no clear trend. The consensus among experts interviewed, however,

Fig. 17 Estimated numbers of rhinoceroses by country in 2017



Source: IUCN

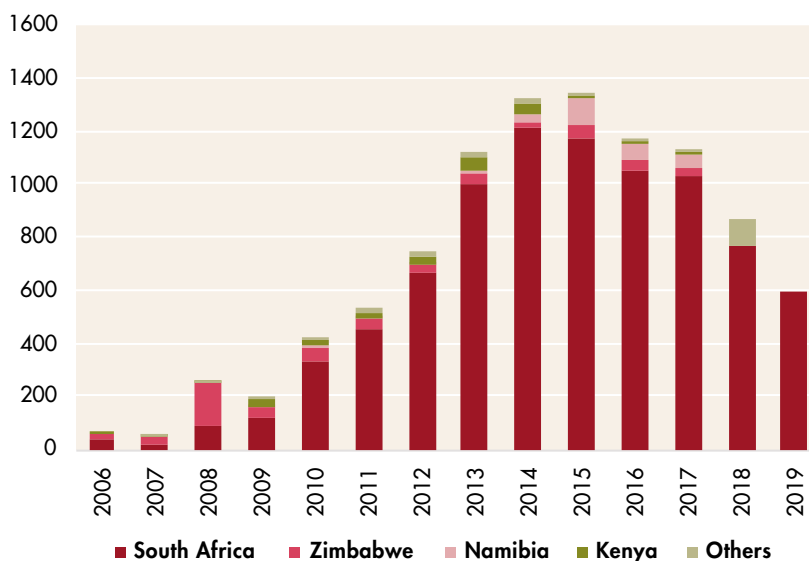
was that the price increased dramatically between 2013 and 2014 and had declined since then (Figure 19).

Trafficking

World WISE shows a strongly increasing trend in the number and weight of rhino horns seized, from 16 seizures in 2008 to 105 in 2017 (Figure 20). This trend stands in contrast to the declining number of poaching incidents and suggests increased enforcement has resulted in a higher share of the illicit flow being captured⁷ or that some of the horn being seized is flowing from either public or private stockpiles. Based on World WISE data between 2014 and 2019 where the final destination was known,⁸ accounting for about two metric tons of horn, more than three-quarters of the weight of horn was destined for China and Viet Nam. (Figure 21). Many of the seizures made in South Africa were domestic; the intended destination of this horn was unknown.

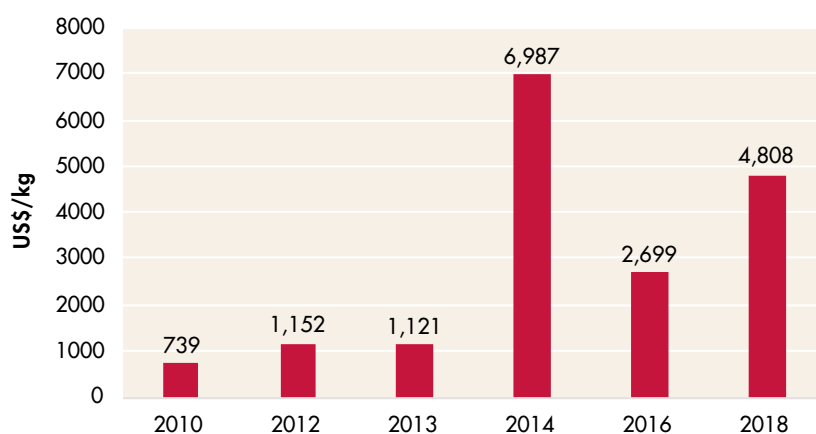
Because rhino horn is relatively portable and value intensive, the vast majority is trafficked by air in luggage and personal baggage (sometimes wrapped in tinfoil) and is seized at airports with a relatively large number of seizures involving arrests. According to World WISE data for the period 2010 to 2017, Chinese (including 24 suspects in 2017 alone), Vietnamese, Indian, and South African nationals are most commonly implicated in rhinoceros horn smuggling. Most of the Chinese suspects were arrested in China or South Africa; most of the Vietnamese in Viet Nam or Mozambique. All the Indians arrested were arrested in India, but it is unclear whether the horn they were carrying was of African or Indian origin. All the South Africans associated with seizures recorded in World WISE were arrested in their home country, although, according to the CITES Secretariat, in April 2019 a South African national was arrested in Viet Nam and 13 rhino horns confiscated. Maputo (in the suburb of Matola and

Fig. 18 : Number of poaching incidents in Africa, 2006-2019



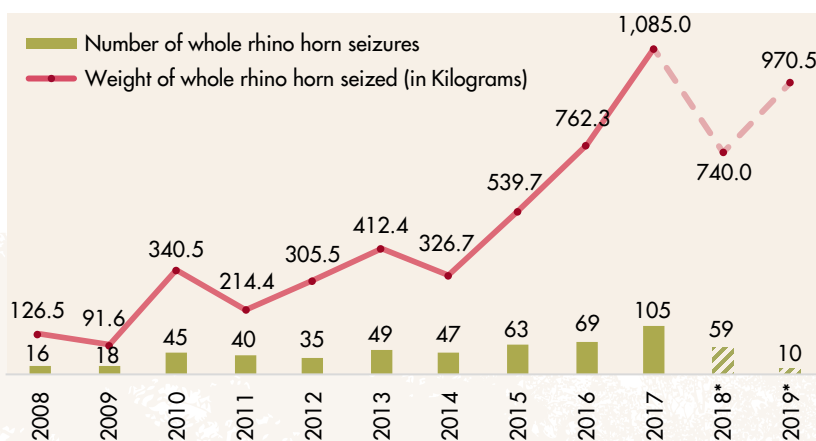
Source: IUCN (Emslie and Knight) and South African Department of Environment, Forestry, and Fisheries.⁶

Fig. 19 : Reported prices paid for rhino horns to poachers in East and Southern Africa



Source: UNODC fieldwork

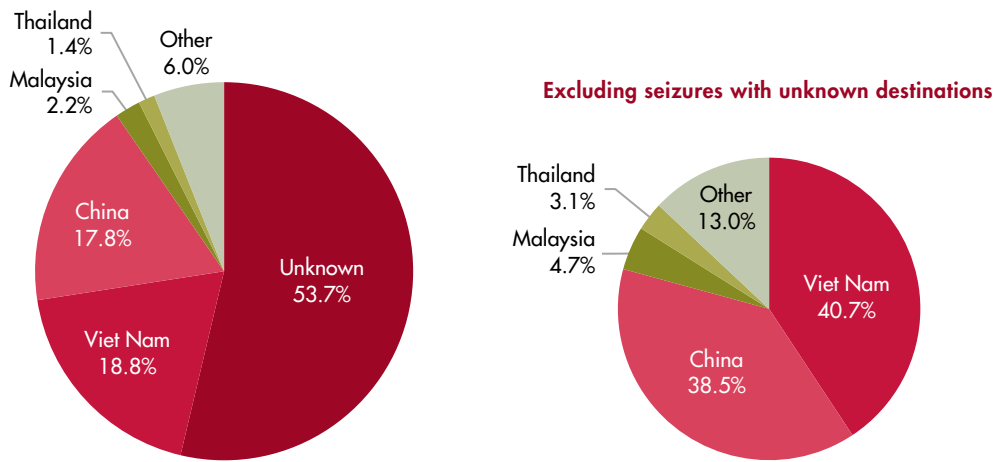
Fig. 20 : Kilograms of horn seized, 2008-2019



Source: UNODC World WISE Database



Fig. 21 : Reported national destination of rhino horn seizures by weight, 2002-2019



Source: UNODC World WISE Database

at Maputo International Airport), Johannesburg and Hanoi are the three places where the most rhino horn has been seized.

More recent seizures found in World WISE include the following:

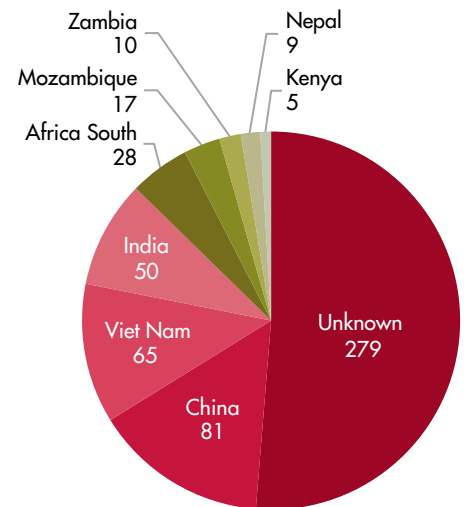
- On 20 August 2018, 116 kg of rhino horn en route to Viet Nam were seized by Malaysia.
- In January 2019, 116 kg of rhino horn en route to Dubai were seized in South Africa.
- On 8 February 2019, 21 rhino horns coming from South Africa and en route to Viet Nam were seized in Istanbul, Turkey.
- On 14 February 2019, 40 kg of rhino horn coming from South Africa and en route to Viet Nam was seized in the Hong Kong Special Administrative Region of China.
- On 5 April 2019, 82.5 kg rhino horn from South Africa and en route to Malaysia were seized in the Hong Kong Special Administrative Region of China.

Since most of these seizures took place in the first quarter of 2019 and amounted to almost 500 kg, the year is on track to be another record year for rhino horn seizures.⁹ At the same time, poaching is clearly declining. If the 600 rhinos poached in South Africa in 2019 all bore five kilograms of horn, then about three metric tons would have generated that year, and more than one-sixth of that total would have been seized in just the five seizures detailed above. Just like ivory, the conclusion is that either the rate of interdiction has gone up or that a non-poaching source of rhino horn must be feeding the market, such as stockpiles.

Destination markets

Based on trafficking data, most rhino horn is destined for the consumer markets in China and Viet Nam. Recent market surveys have shown that, similar to ivory, demand for rhino horn in Viet Nam often involves Chinese nationals seeking to move the product to China. These surveys indicate a growing demand for rhino horn jewellery and décor items, including traditional libation bowls, rather than medicine. Also similar to elephant ivory, the prices paid for rhino horn appear to be in decline in Viet Nam since around 2014 or 2015.¹⁰

Fig. 22 : Number of people arrested for rhino horn trafficking by nationality, 2010-2017

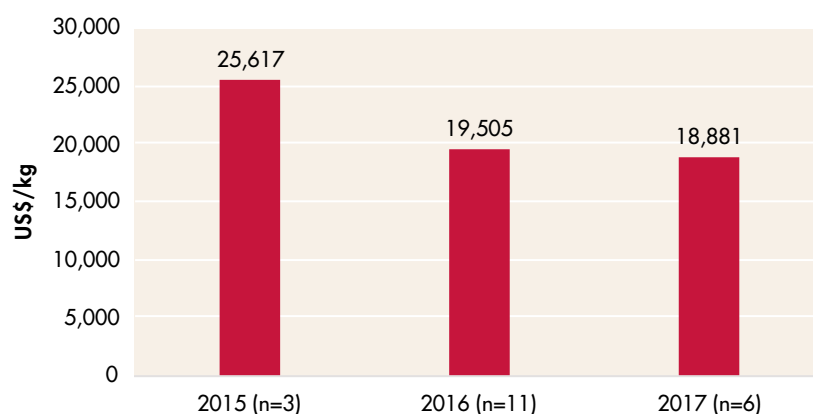


Source: UNODC World WISE Database

Analysis

It is too soon to confirm a decline in the rhino horn market. Like ivory, declines in new supply (poaching) seem to be teamed with declines in price in the destination markets. Unlike ivory, seizures show a clear and consistent upward trend. This could be due to improvements in the rate of interdiction or a genuine increase in the flow. If the flow has increased as poaching has decreased, this could suggest the new supply is coming from existing stocks. Many of these stockpiles are in private hands and can be sold in some range states. Sellers may be motivated by declining prices and possibly declining interest.

Fig. 23 Average wholesale prices of whole rhino horn observed in markets in Viet Nam, 2015-2017



Source: Wildlife Justice Commission¹¹
 'n' refers to the number of market observations in each year factored into this average price

Endnotes

- There are two species of African rhinos, white and black. White rhinos carry more horn than black rhinos: 5.88 kg of horn per white rhino versus 2.65 kg for black rhinos. See Pienaar, D. J., Hall-Martin, A. J. and Hitchins, P. M., 'Horn growth rates of free-ranging white and black rhinoceros', *Koedoe*, Vol 34, No 2, 1991, pp. 97-105. But no distinction is made between the two species by horn traffickers and the species is rarely identified in the seizure records. For these reasons, no distinction is made between the two species in this chapter.
- This includes 18,067 white rhinos (86% of which are found in South Africa) and 5,495 black rhinos (37% of which are found in South Africa and 34% in Namibia) as of 2017. Other countries with significant rhino populations include Kenya (1,258 rhinos), Zimbabwe (887 rhinos) and Botswana (502 rhinos). Lesser populations are found in Eswatini, Malawi, Mozambique, Rwanda, Uganda, United Republic of Tanzania and Zambia. See CITES CoP18, Doc. 83.1, Annex 2, p. 2 (2019), *Species specific matters: Rhinoceroses (Rhinocerotidae spp.)*, Report of the Standing Committee and the Secretariat.
- Nearly half (49.3%) of the continental white rhino population is now privately owned.
- CITES CoP18, Doc. 83.1, p. 9 and Annex 2, p. 5 (2019), *Species specific matters: Rhinoceroses (Rhinocerotidae spp.)*, Report of the Standing Committee and the Secretariat.
- For example, South Africa's largest private rhino breeder has posted his accounts on-line reporting that security alone was costing US\$400,000 per month. Save the Rhino, *World's largest 'rhino farm' at risk of collapse*, 19 June 2018 (available at: <https://www.savetherhino.org/thorny-issues/rhino-farm-at-risk-of-collapse/>).
- CITES CoP18, Doc. 83.1, p. 7. Data from 2018 include projected values for "other" countries. South African data for 2019 were announced on 3 February 2020 (South Africa, Department of Environment, Forestry and Fisheries, *Department of Environment, Forestry and Fisheries report back on rhino poaching in South Africa in 2019*, press release, 3 February 2020.) Estimates for other countries are not available, although media reports suggest poaching in Botswana has increased.
- See para. 27 in CITES CoP18, Doc. 83.1 (2019), *Species specific matters: Rhinoceroses (Rhinocerotidae spp.)*, Report of the Standing Committee and the Secretariat for more discussion of this trend.
- Out of 350 rhino horn seizures.
- Media reports suggest this trend continued through the first half of the year. For example, on 13 April 2019, 167 rhino horns sourced from a private stockpile and destined for South-East Asian markets were seized in South Africa. On 17 June 2019, 246 kg of rhino horn were seized on a ship in coastal waters of Guangdong. On 25 July 2019, 55 rhino horns weighing 125 kg were seized at Noi Bai International Airport in Viet Nam.
- Stoner, S., Verheij, P. and Jun Wu, M., *Black Business: Illegal Rhino Horn Trade Dynamics in Nbi Khe, Viet Nam from a Criminal Perspective, A Case Study*, Wildlife Justice Commission, 2017.
- Ibid.



Supply and value chains and illicit financial flows from the trade in ivory and rhino horn

The market for illicit wildlife products is – like all other markets – driven by profit. In recent years, wildlife crime has grown into a significant and specialized area of transnational organized crime, driven by high demand.¹ Illicit wildlife trade is a highly lucrative business, with wildlife products commanding high prices on international, illicit markets.

Wildlife criminal cases very often start and end with the seizure, with limited investigation into the wider criminal network beyond the poacher or courier. Financial investigation and anti-money-laundering techniques are rarely used in the fight against wildlife crime.² As a result, there are major gaps in the understanding of the financial flows behind wildlife crime, which means that inadequate measures are being undertaken to mitigate the risks of wildlife crime and associated money-laundering.

Little is known about the profits made by organized crime groups from illicit wildlife trafficking and the significant gaps in understanding supply and demand for certain wildlife products make such estimates challenging. Existing estimates that monetarize the size of wildlife trafficking and crime are highly aggregated and utilize broad frameworks that include environmental costs and loss of public revenues. These aggregates are useful for advocacy purposes but have limited usefulness for understanding how wildlife traffickers operate and for monitoring and evaluating progress made in containing the illicit profits and financial flows generated by the illegal wildlife trade.³ Estimates of the monetary value of global wildlife crime also suffer the challenge of internationally defining the crime.⁴

A detailed understanding of the value chain of illegal wildlife products, from producers (e.g., poachers) through intermediaries to end consumers, allows for identifying vulnerabilities that may enable disruption of illegal markets and the value chain. This encompasses understanding the trading patterns, assessing the value added at each step of the value chain, the overall illicit income generated and the income made by each group of actors, as well as analysing illicit financial flows from the trade in illegal wildlife products.

This chapter presents such an analysis using the examples of illegal trade in ivory and rhino horn, which were selected out of relevance and data availability. Both come from large, valuable and endangered animals and have received considerable attention from national law enforcement authorities and international bodies, such as the United Nations⁵ and other governmental and non-governmental organizations concerned with wildlife conservation. Because of this attention, these two species are better documented than most others, and the information available allows for an estimation of the volumes traded, as well as the economic value of the markets and associated illicit financial flows.

The analysis demonstrates the importance of profits as an engine for wildlife. It also provides countries with a tool to monitor trends to understand if progress is being made in disrupting the illicit financial flows related to wildlife trafficking.

The illegal trade in ivory and rhino horn

Over the past decade, complex and diverse illegal supply chains for rhino horn and ivory have developed, and trafficking routes from Africa to Asia span multiple countries. Exploiting weaknesses and adapting dynamically to changed situations, traffickers move ivory and rhino horn by land, sea and air, often concealed in legitimate cargo.⁶

Citizens of destination countries in Asia are often heavily engaged within Africa in rhino horn and ivory trafficking. They play major roles in the acquisition and transport of rhino horn out of Africa to Asian destinations.⁷ Motivated by the potential high revenues, these trafficking networks form a crucial part of the illegal supply chains.

A comprehensive understanding of the entire trade chain from poacher to end-consumer allows for a careful formulation of policy responses in the countries affected by the illegal trade in rhino horn and ivory.

A model supply chain of illegal trade in ivory and rhino horn

The illegal supply chain for ivory and rhino horn describes the processes and actors involved in sourcing, manufacturing, trafficking and selling products to end consumers.

The illicit supply chains start with poaching: Most of the ivory and rhino horn on illicit markets come from (newly) illegally killed animals



Box 1: The value of wildlife crime: concepts and estimates

The ‘value’ of an illegal activity can be defined in different ways, depending on purpose of the estimates and on the conceptual framework behind the estimates.

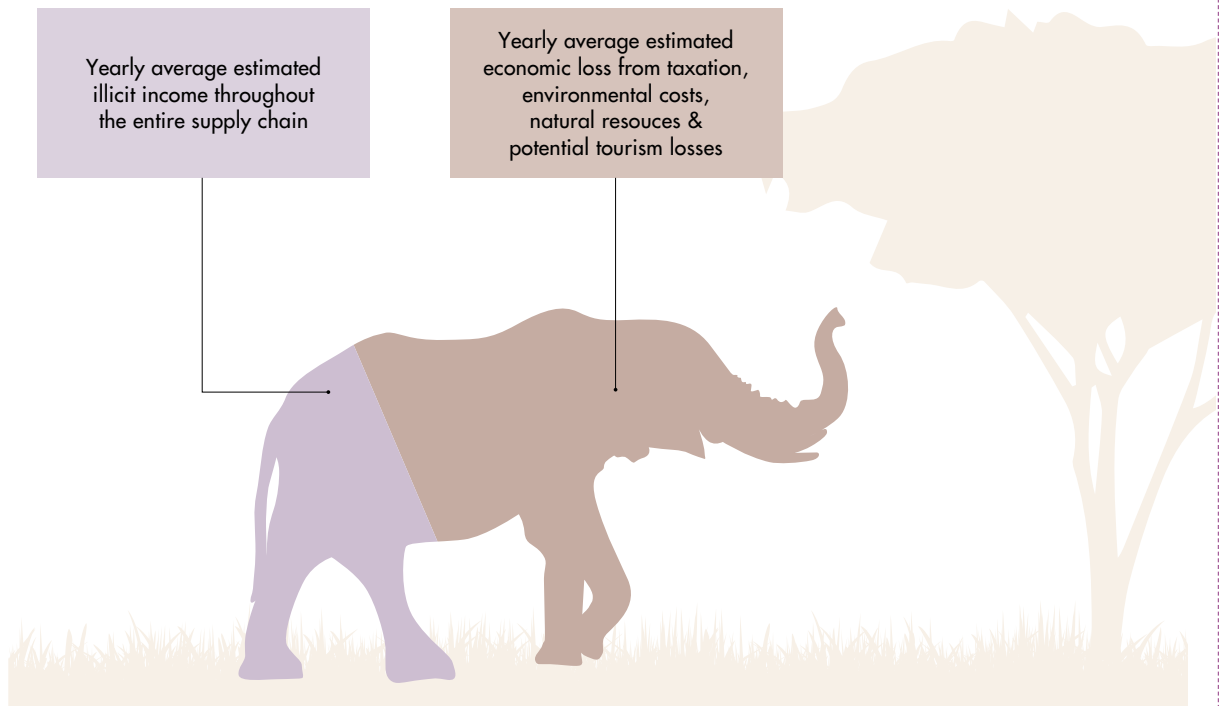
In economic terms, the value of an activity can be measured by the overall income they generate, be it licit or illicit income. Estimating markets in economic terms often involves estimating the amounts produced and sold, and the value thereof. Such measurements are (most often) direct estimates, which means that they are estimated in direct relation to the underlying economic activity, and reflect – in simple terms – the amount of money made by all participating in a certain economic activity. This approach is in line with the System of National Accounts, a standard

used by all countries to construct the gross domestic product (GDP) and it has been applied to illegal activities, too.^a

Other approaches to quantify wildlife trafficking have used broader concepts such as economic loss and have adopted a full cost analysis. These concepts do not measure the value of wildlife trafficking as described above in the context of generated income, but they consider factors such as loss of taxes or other licit income and assets through the illicit nature of the activity. In the context of wildlife, this includes environmental costs and damage^b e.g., through the loss of capacity for carbon sequestration in illegal forestation,^c (potential) loss of tourism^d through loss of species diversity, or loss of natural resources through e.g. illegal fisheries. Estimates produced

through this approach are by their very nature much larger than those constructed on the basis of economic value and are not comparable to illicit income estimates.

The estimates provided in this chapter focus on illicit income and are in line with the System of National Accounts and Eurostat’s recommendations^e on how to incorporate illicit income in GDP estimates. The estimates are based on a disaggregated, direct measurement approach using estimates on supply of rhino horn and ivory and respective price data. The approach allows for frequent updates based on updated price and supply data and thus facilitates a close monitoring of the market.



a Eurostat (2018), *Handbook on the compilation of statistics on illegal economic activities in national accounts and balance of payments*, Luxembourg.
 b For detailed discussion on environmental crime see Christian Nellemann, Rune Henriksen, Patricia Raxter, Neville Ash, and Elizabeth Mrema (eds), *The Environmental Crime Crisis – Threats to Sustainable Development from Illegal Exploitation and Trade in Wildlife and*

Forest Resources. A UNEP Rapid Response Assessment. United Nations Environment Programme and GRID-Arendal, Nairobi and Arendal, 2014, p. 23.
 c World Bank. 2019. *Illegal Logging, Fishing, and Wildlife Trade: The Costs and How to Combat it*. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/32806> License: CC BY 3.0 IGO.”

d Robin Naidoo, Brendan Fisher, Andrea Manica & Andrew Balmford, *Estimating economic losses to tourism in Africa from the illegal killing of elephants*. Nature communications 7.1 (2016): 1-9.
 e Eurostat, op cit.

and some – comparatively small – amounts from other sources such as stockpile thefts or theft from natural mortalities.

As shown in chapter 3, 86 per cent of the recorded rhino poaching incidents between 2006 and 2017 took place in South Africa, which was home to 75 per cent of the African rhino population in 2017.⁸ Other countries of origin of illegally sourced rhino horn were for example Zimbabwe, Namibia and Kenya. Elephant populations are much larger and less concentrated than rhino populations, and research showed that illegal killings of elephants took place in a large number of range States, in Southern Africa, Eastern Africa and Central Africa.⁹

Once poached, the horn and tusks are collected and further trafficked. These products are passed on or sold to local traders and then to intermediaries who compile and organize larger shipments at the national level or subregional level. Typically, these shipments are then trafficked by internationally connected individuals or groups to destination markets in Asia, where wholesale and retail traders sell final products to end-consumers. Small quantities are also trafficked towards destinations outside Asia.

According to UNODC World WISE seizure data from 2015-2019, most ivory tusk shipments were destined to Viet Nam (42 per cent), China (34 per cent) and Cambodia (12 per cent). For rhino horn, based on a longer time period from 2002 to 2019, the main destinations were similar, with Viet Nam (41 per cent), China (39 per cent), Malaysia (5 per cent) and Thailand (3 per cent).¹⁰

A common model to describe the illegal supply chain uses six different trade levels: poachers, runners or brokers, intermediaries, exporters, importers/wholesalers and retail traders. While there are some differences between the rhino horn and ivory



Box 2: Illicit supply chains

Supply chain analysis helps to understand the functioning of illicit markets and how organized crime groups interact to organize the – often global – illicit trade in goods and services.

Supply chains exist in licit and illicit markets alike. Broadly speaking, a supply chain is a set of actors involved in the (licit or illicit) flows of products, services, information and finances from the source to the end customer. A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer demand (the term ‘market’ encompasses all actors who are producing, trading and purchasing a good or service).

Illicit supply chains share many of the same functional attributes as licit ones.

Criminal organizations plan activities, source and procure raw materials, manufacture, refine, transport, store inventory, sell and distribute products to customers. Often more than one group is involved in the supply chain, fulfilling different roles.

The primary differences between licit and illicit supply chains lie in risk levels and mitigation strategies. Organized crime groups face the risk of detection and arrest by law enforcement and the risk of losing products when they are confiscated by authorities. Actors in illicit supply chains face logistical challenges and extra costs to conceal their operations.

trades, the general set-up of the illegal supply chain appears to be comparable.¹¹ The levels may vary case by case in composition and nature, and some products may not be handled by all levels when arriving at their end-consumer; they provide, however, a useful model for analysing illegal markets.

Poachers can be roughly grouped by their degree of professionalization.^{12,13} Subsistence or artisanal poachers are usually from poor communities and are driven by the need to sustain their livelihoods. These poachers are not highly organized, often hunt opportunistically and do not use long range weapons or tranquillizers.¹⁴ They are often driven by their socio-economic situation,¹⁵ taking the risk of poaching for comparatively little reward.

On the other side, there are highly organized poachers and poaching groups who work with a degree of professionalisation, and are well equipped with, for example, long-range weapons. This has been reported for rhino horn poachers,¹⁶ and was substantiated by reports on the increased involvement of military personnel,

police officers or game scouts, all of whom would have had specialized training to develop tracking or shooting skills.¹⁷ These poachers achieve higher prices for their products, are often paid up front and are well connected with trafficking organizations who organize the further trafficking of the illicit products.

Poachers may work independently or may be hired by trafficking groups (‘dependent poacher’). A poaching group typically comprises a skilled shooter, an experienced tusk or horn cutter, and porters to carry food, water and the product back to safety. A rhino poaching group will usually be smaller than one for elephants; two to four members for rhinos and from four to more than a dozen for elephants.¹⁸ Independent poachers self-finance the hunt and sell the horn or tusk to the highest bidder; dependent poachers are hired and subsidized by others higher up in the supply chain.

Besides poaching, rhino horn and ivory can enter the illegal market from stockpile theft (for example,



from government-held repositories of seized products), and from being harvested from natural mortalities or legal killings (such as problem animal control).

Runners or brokers are the next link in the supply chain. These low-level traffickers usually live in the vicinity of the poaching areas and are familiar with community leaders and persons who purchase the products from the

poacher(s). These players are often termed ‘runners’ in Southern Africa, ‘brokers’ in East Africa or ‘commanditaires’ in Francophone Africa (if they have ordered and financed the hunt). In most cases, the persons involved in the onward trafficking of illegal wildlife parts are not the same persons carrying out the poaching.¹⁹ There are indications that higher-level traffickers systematically attempt to distance themselves from the

poaching offence.²⁰ Runners or brokers separate higher-level traffickers from poachers.

Intermediaries or dealers operate at the national level and are often based in a large urban area. They aggregate products and either sell them to exporters or export them themselves (in this case this role conflates with the next). Intermediaries are tasked with the logistical organization of the transaction and the transport of the products to exporters or international wholesalers. Intermediaries are often of Asian (destination country) descent but are resident in or close to source countries.²¹

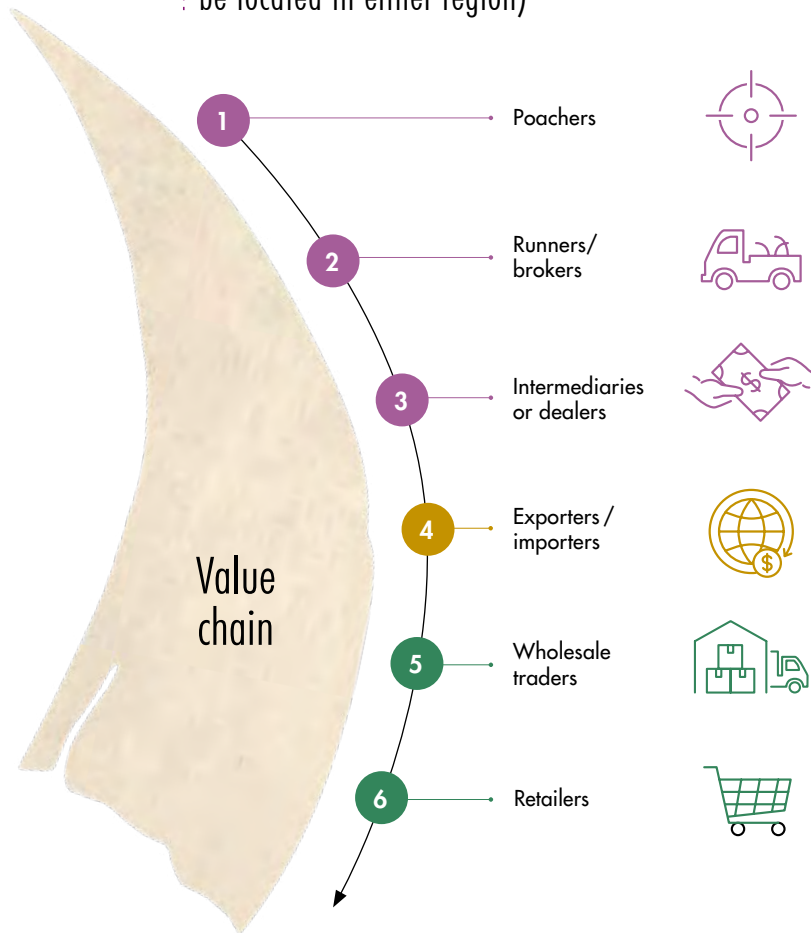
Exporters/importers are usually part of organized crime groups. They facilitate international trafficking (for example, by using front companies and corrupting authorities), and carry out packing, preparation of paperwork and export of the products. Packing may involve specialists who make use of fake stones, hollowed out logs or other methods to conceal the products. These players are based in cities with an international airport or seaport. The products can be shipped in containers by sea or air freight, carried by air by couriers in personal luggage, or sent in packages by courier service or the post.

Wholesale traders receive the products in the destination country. Once in the country, the products are processed²² and sold to end consumers at markets, jewellery stores and other retail outlets or online.

Retailers in destination markets sell refined products to end-consumers, where the supply chain ends.

Besides these actors, who can be categorized as “primary actors” and handle ivory or rhino horn products directly, many others make profits by providing supporting services, such as transportation or money-laundering. Others facilitate the trade by taking bribes; at lower levels, it is generally

Fig. 1 Actors along the value chain of rhino horn and ivory (violet actors are thought to be in Africa, green ones in destination countries, yellow may be located in either region)



Source: Adapted from INTERPOL and UN Environment, Strategic Report: Environment, Peace and Security – A Convergence of Threats, p. 40, 2016; Maggs, K., ‘South Africa’s National Strategy for the safety and security of rhino populations and other relevant government and private sector initiatives’ in Dean, C. (ed.), Proceedings of the tenth meeting of the IUCN African Rhino Specialist Group, 5-10 March 2011, pp. 130–146, 2011 and Milliken, T. and Shaw, J., The South Africa – Viet Nam Rhino Horn Trade Nexus, TRAFFIC, 2012.



Box 3: Limitations and strengths of seizure data

Organized crime groups invest a lot of effort in concealing their activities. For this reason, statistics on trade patterns and routes, volumes traded and profits made are hard to come by.

Seizure data provide some insight into the illegal trade. A seized parcel is an indication of illegal activity and accompanying information on alleged origin and destination or the nationality of the offenders can shed light on operations otherwise conducted in the dark.

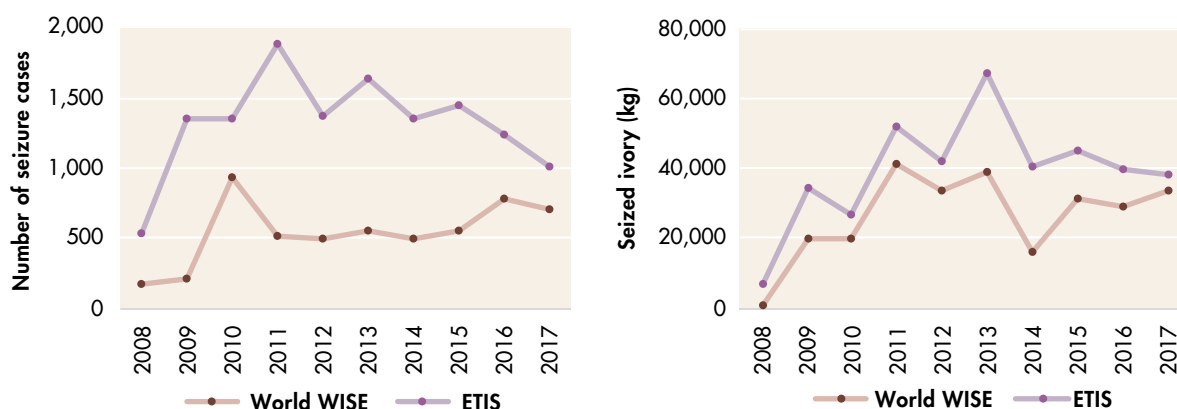
Seizure data require careful interpretation because they are a mixed indicator, demonstrating both the presence of a problem and the initiative of the relevant authorities in addressing it. On

their own, they cannot be used to demonstrate the magnitude of trafficking or effectiveness and capacity of law enforcement.

When used in aggregated form and interpreted together with other indicators, seizure data can yield insights on major trafficking routes, concealment methods and techniques used by traffickers. Data from ivory seizures for example provide valuable information on transit and destination countries, and make it possible to assess the share of ivory taken out of the trade by law enforcement. This report uses seizure data included in UNODC World WISE Database for the analysis.

There is a parallel data collection system, the CITES Elephant Trade Information System (ETIS), which appears to be more complete than UNODC's data. A comparison between aggregated data reported by ETIS^a and World WISE shows that the ETIS system recorded more seizure cases and more seized weight over time. Data reported by ETIS was only available in aggregated form and include imputation of missing weights, but no open source information was available to assess it and understand how much it accounts for the difference between the two database systems.

Fig. 2 Comparison between ETIS and World WISE ivory seizure data, 2008 - 2017



Source: Source: ETIS^a and UNODC World WISE database

^a T. Milliken, F. Underwood, R. Burn and L. Sangalakula, *The Elephant Trade Information System (ETIS) and the Illicit Trade in Ivory: A report to the 18th meeting of the Conference of the Parties to CITES*. CoP18 Doc. 69.3 (Rev. 1) Annex 1, December 2018.

local police officers and park rangers who take their cut, while at the international level, it is custom officers at the borders and high-level officials.²³ These groups are facilitators and beneficiaries of the illegal trade in wildlife goods, and part of the illicit supply chain, too.

No generalization fits all cases. There have been reports²⁴ that some trafficking networks of East Asian origin operate in South Africa, and process and craft rhino horn locally into final

products before smuggling them to consumers in Asia. Police investigations in South Africa have uncovered small home workshops where rhino horn is cut into rough “discs”, beads and bracelets are manufactured, and offcuts and rhino horn powder are packaged for export. Other cases suggest that intermediaries, exporters and wholesalers conflate. In such cases, the supply chains are cut short and involve a smaller number of actors.

The size of the illicit market

The illicit markets for ivory and rhino horn comprise all buyers and sellers, and thus all actors in the supply chain, including end consumers. The market sizes in monetary terms is defined as the total illicit income generated from the trade in ivory and rhino horn.

Overall illicit income is calculated as amounts purchased multiplied by



prices. There are, however, no direct estimates of the annual amounts of rhino horn and ivory purchased by customers in destination countries, or data on the numbers of buyers and sellers: Studies have investigated the number of ivory and rhino horn items displayed,²⁵ estimated the weight of the items,²⁶ or studied the behaviour and motivation of customers.²⁷ None of these studies allowed for the inference of the total amounts of ivory or rhino horn purchased in a year, however.

One quantity that can be assessed is supply: elephant and rhino populations are well-documented, and (relatively) good poaching data are available. These data together with estimates on average amounts of rhino horn and ivory per animal yield an annual average supply of raw ivory and rhino horn from poaching. Data on rhino horn and ivory entering the market from sources other than poaching are less robust but can be used to complete the assessment.

With supply estimates available, the total quantities purchased by end consumers can be assessed considering that along the supply chain product is seized by law enforcement, stockpiled or otherwise lost. In terms of where the final products are purchased UNODC World WISE data is used to estimate the destination of the products.

Combining all these data allows for an assessment of the volumes purchased by end consumers in

destination countries under certain (critical) assumptions (see Boxes 3 and 4). Multiplying these volumes with respective prices yields the illicit gross income generated from the trade in ivory and rhino horn and thus a market size estimate in monetary terms. Disaggregated price data allow for a further breakdown of the illicit income by group of actors, providing an indication of the distribution of income along the supply chain.

Annual supply of rhino horn

As described in chapter 3, between 2016 and 2018,²⁸ an annual average of 1,060 rhinos have been illegally killed in Eastern and Southern Africa.²⁹ Each animal carried two horns, weighing on average together 5.56 kilograms or 2.78 kilogram each.³⁰ This yielded some 2,100 horns³¹ or 5.8 tons of rhino horn harvested from poached animals per year. Of these, 91 per cent or 5.3 tons were estimated to have entered the illegal market (sold onwards), the remainder supposedly recovered in the field before being sold.³²

Poached animals are not the only source of rhino horn entering the illegal market. Emslie et al. (2019) estimated that an annual average of 113 horns or 314 kilograms of horn were obtained from sources other than poaching, such as stockpile theft, theft from natural mortalities or trophy hunting.³³ In these ways, an estimated total of some 5.6 tons of

rhino horn entered the illegal market in Africa each year between 2016 and 2018.

These numbers may be underestimations and are surrounded by some uncertainty. The numbers of illegally killed rhinos are to be understood as minimum numbers, since it is possible that carcasses were not detected. The weight of horn per animal is an average that may mask significant variation in the data. Older animals have larger horns than younger ones, males larger than females, and the probability of being poached might vary depending on horn size. Estimated recoveries from the field and shares of horns entering from other sources may also vary over time.

Annual supply of ivory

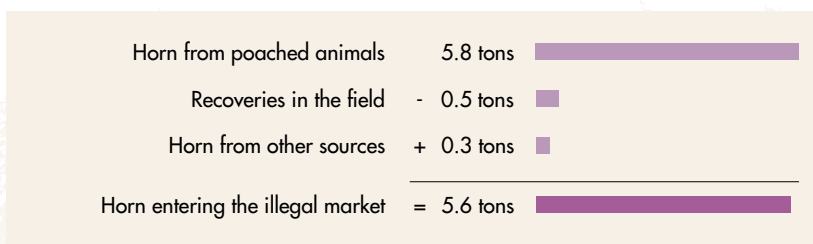
Illegally traded ivory can come from a variety of sources. Most important for conservation of the elephant species is ivory harvested from illegally killed elephants, but ivory can also originate from private stockpiles or from leakages from national ivory repositories. Such repositories hold ivory seized during law enforcement operations or harvested from legal killings (for example, killings in the context of problem animal control) or natural mortalities.

Ivory from illegally killed elephants

As detailed in Chapter 3, there are two ways to estimate the number of elephants poached, and thus the size of illicit ivory supply. This chapter used results from a modelling approach that determined the numbers of illegally killed elephants by using data on detected elephants' carcasses (illegally killed or died from natural causes) recorded by the CITES program "Monitoring the Illegal Killing of Elephants" (MIKE).³⁴

As with rhino horn, a three-year average of the latest available data of

Fig. 3 Rhino horn entering the illegal market, annual average 2016-2018



Note: Numbers are rounded, calculations were done with full precision.

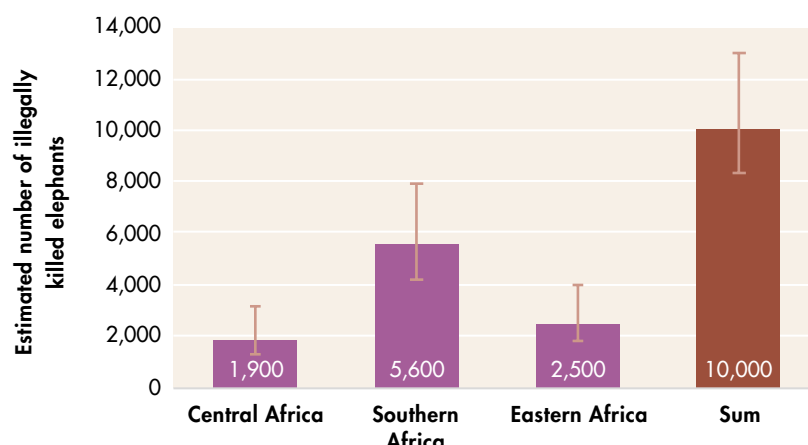
illegally killed elephants was used as a basis for estimating the illegal ivory supply. Between 2016 and 2018, an estimated average of 10,000 (range 8,300 – 13,000)³⁵ elephants were illegally killed per year in Central, Southern and Eastern Africa.

These estimates are highly uncertain. The model used to estimate the number of illegally killed elephants incorporated variation in demographic rates and from the carcass sampling process (reflected in the ranges), but not from population survey data. The model was run on carcass data from MIKE sites in Central, Southern and Eastern Africa, but did not incorporate information from West Africa due to their comparatively lower reporting rates.³⁶

The IUCN African Elephant Status Report 2016 put the estimated elephant population in a bracket of roughly ± 5 per cent and acknowledged that there “*may be an additional 117,127 to 135,384 elephants in areas not systematically surveyed.*”³⁷ These additional population numbers are obtained from statistically less reliable methods and referred to as ‘guesses’. Guesses potentially add another 28 to 33 per cent to the total elephant population, and are of significant size in Central Africa, where in addition to the estimated 24,119 \pm 2,865 elephants, another 87,190 to 103,355 (up to 4 times as many) may exist. Elephants may have been poached from these populations, but the estimated poaching rates cannot be directly applied to guessed elephant populations. In absence of any means to estimate poaching rates for elephant populations in this category, the total estimates are considered to be on the lower, conservative side.

The estimated numbers of illegally killed elephants combined with estimates of the average weight of elephant tusks yield an estimate of the ivory entering the illegal market per year.

Fig. 4 : Estimated numbers of illegally killed elephants, total and by subregion, 3-year-average, 2016-2018



Source: UNODC estimates based on modelling by George Wittemyer
 Note: Uncertainty ranges represent a 95 per cent confidence interval. The model incorporated variation in demographic rates and from the carcass sampling process, but no uncertainties from the underlying population survey data.

Table 1 : Annual estimated ivory harvested from illegally killed elephants, 3-year average 2016-2018

SUB-REGION	TONS OF IVORY HARVESTED PER YEAR
Central Africa	19.2 (12.7-32.2) tons
Eastern Africa	25.8 (18.1 - 40.4) tons
Southern Africa	57.1 (42.7-81.2) tons
West Africa*	2.9 tons
Total	105 (88 – 136) tons

Source: UNODC estimates based on modelling by George Wittemyer
 * Note: The illegal killing rate applied to West Africa is a weighted average of the other subregions (UNODC calculations). The ranges reflect the 95% confidence intervals of the estimates on illegally killed elephants.

Elephant tusks are continuously growing front teeth that come usually, but not always, in pairs. The yield figure used historically has been 1.9 tusks per elephant and about 5.5 kg per tusk, resulting in an average of some 10 kilograms³⁸ per elephant.³⁹ Applying such an average to estimated numbers of illegally killed elephants provides an order of magnitude but can be misleading. Poachers would seek out older, male animals with the largest tusks to increase the ivory yield per hunt, so the above average might be at the lower end for mature, undisturbed populations. In populations that already suffered substantial losses in the oldest age groups, average expected ivory yield per poached animal may have

drastically decreased⁴⁰ and the above number may overestimate the current ivory yield.⁴¹

Combining estimates of illegally killed elephants with estimates of the average ivory yielded per elephant results in an annual average of 105 (88-136) tons of ivory available for the illegal market between 2016 and 2018.

Ivory from other sources

Poaching is not the only source for ivory entering the illegal market. There are national stocks of tusks in source, transit and destination countries, and ivory has gone missing in the past.⁴² These stockpiles accrue due



to several factors, including legal killings, natural elephant mortality and seizures of contraband.

In the absence of systematic monitoring and public reporting on ivory stocks held by countries affected by ivory trafficking,⁴³ producing a well-founded estimate of ivory stocks and leakages does not appear to be feasible. There are, however, some indications of the magnitude of leakages in comparison to the annual supply of newly sourced ivory.

Cerling et. al.⁴⁴ used C-14 dating methods to determine the time between elephant death and tusk seizure. The examination of 231 African ivory samples from 14 seizures made between 2002 and 2014 showed that the lag time between elephant death and seizure had median values generally ranging between 6 months and 3 years. The authors concluded that they did not find evidence that long-term government or other stockpiles contributed significant amounts of ivory to the illegal trade and emphasized that poached ivory was being rapidly moved into the illegal trade.

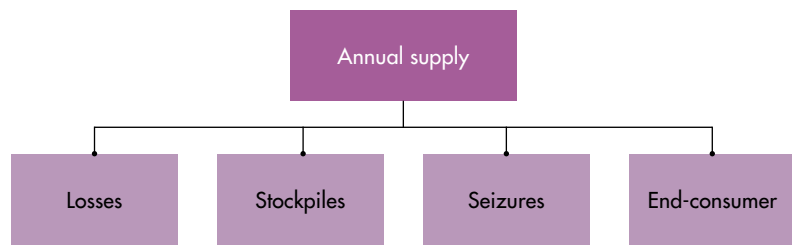
Estimates presented by Nkoke et al.⁴⁵ point towards amounts that are small compared to ivory collected from poaching: The authors estimated a minimum amounts of stockpile leakages in Central Africa of a total of 56.5 tons over the course of 26 years (1990 to 2015).

Leakages from repositories may thus be small in comparison to the ivory harvested from poached animals and leakages are not considered in the following analysis. It needs to be stressed that the available data is very weak, and more data is needed to come to a reliable estimate of leakages from legal stockpiles.

Volumes reaching the end-consumer

All rhino horn and ivory entering the illegal market in a year is either

Fig. 5 Flow chart of illicit ivory and rhino horn products



purchased by end consumers, seized by law enforcement, stockpiled for later sale or otherwise lost in the process. How much of the supply reaches end consumers is therefore determined by the amounts seized, stockpiled or lost.

Stockpiles or inventories may be kept by all actors (poachers, traffickers, wholesalers and retailers) along the supply chain. Some actors may keep stocks as an investment to speculate on higher prices,⁴⁶ others may hold on to products to wait for less risky trafficking opportunities or to collect more products to collate a larger shipment. Losses include products rendered unusable during transportation, products lost during manufacture of items⁴⁷ and products disposed to avoid arrest. With the uncertainty around stockpiles and in absence of data to estimate losses other than seizures, the calculations in this report assume that all products that enter the market over a certain period are either seized or sold to end consumers in the same period (this goes with the implicit assumption that inventories are constant, that is, products entering inventories are offset by products entering the market from inventories).

The annual estimates are based on three-year averages of supply and seizures, which is thought to account for some delays in the supply chain between source and destination of the product and to smooth the volatility in seizure data.

A detailed description of trafficking modalities, routes, origin and destination countries can be found in Chapter 3. Here, the focus is on the overall volumes traded from Africa to destination countries in Asia and on the approximation of the illicit income generated by the illicit trade at a regional level.

Rhino horn

Between 2016 and 2018, an annual average of 426 kg⁴⁸ of rhino horn and rhino horn parts were seized in Africa and 500 kg in Asia, according to data from the UNODC World WISE Database. In total, some 976 kg were seized per year (50 kg outside of Asia and Africa).

The data, together with the assessment that there is hardly a retail market for rhino horn in Southern and Eastern Africa,⁴⁹ indicate that the main flow of rhino horn originates in Southern and Eastern Africa and goes to East and South-East Asia for final consumption. A minor flow of rhino horn could be destined for the European market (accounting for four per cent of all World WISE seizures). However, out of all products seized in Europe between 2016 and 2018 for which a destination country was reported, 43 per cent were destined for East Asia and 15 per cent for South-East Asia. The remainder, less than two per cent all horn seized, was believed to have its final destination in Europe.

Combining supply estimates with seized amounts and destinations of flows, makes it possible to estimate that out of the 5.6 tons of rhino horns entering the illegal market each year, 5.2 tons leave Africa and out of these, 4.6 tons reach end-consumers in Asia. Less than 100 kg might be destined for other regions in the world.⁵⁰

Ivory

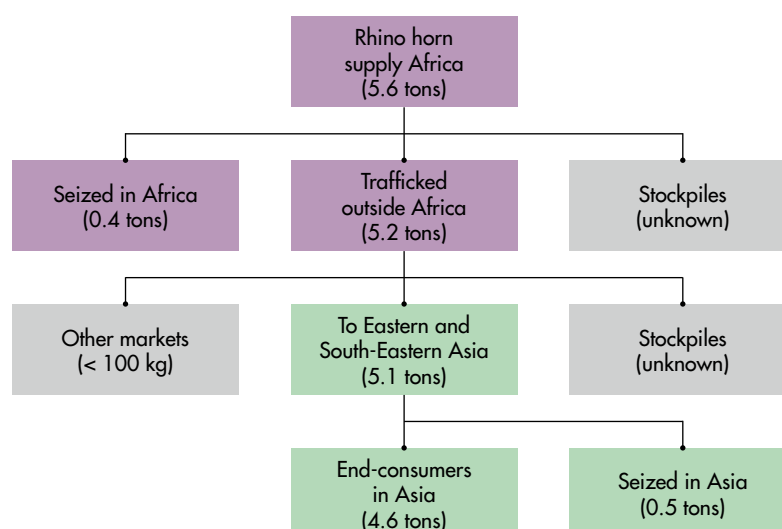
A similar calculation can be made for ivory. The destination of the products is estimated by using the country of destination of the shipments, as reported by Member States.⁵¹ If all ivory harvested within a certain period is consumed in the same period,⁵² and if the information provided on the destination of represents actual trade patterns, the following flows of ivory can be deduced.

An annual average of 105 (88 – 136) tons of ivory was supplied from African range states between 2016 and 2018. Based on World WISE seizures,⁵³ out of these, 5 tons were seized by law enforcement in the region, and 9 tons were destined for the region,⁵⁴ leaving 92 tons available for export to destination markets. Some 88 tons reach Asian countries via various routes (including routes passing through European countries). In Asia, 24 tons were seized by law enforcement and 63 tons remained available for consumption. Some 3.6 tons were destined for Europe, of which 2 were seized and 1.6 were thought to be consumed.

The value of the illicit market

The annual, overall gross illicit income generated by ivory was estimated to be US\$400 (310 – 570) million and the income generated by rhino horn US\$230 (170 – 280) million in between 2016 and 2018. The gross income is the overall income made by retailers. These estimates pertain to the quantities reaching South-East

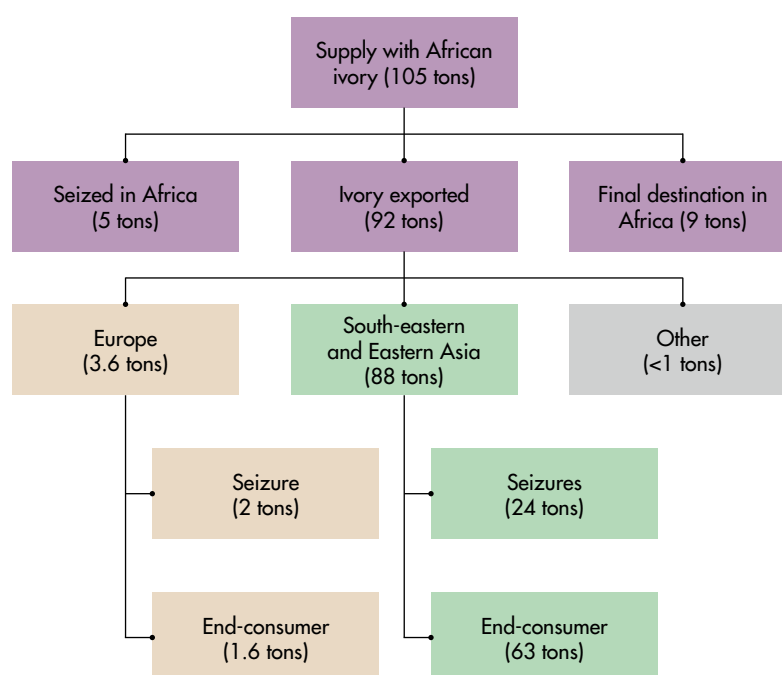
Fig. 6 Flows of rhino horn, annual estimates based on 2016-2018 data



Source: UNODC estimations

Note: Numbers are rounded, calculations were conducted in full precision. Seizure data for 2018 was approximated with an average of 2016 and 2017.

Fig. 7 Flows of ivory, annual estimates based on 2016-2018 data



Source: UNODC estimations

Note: Numbers are rounded, calculations were conducted in full precision. Seizure data for 2018 was approximated with an average of 2016 and 2017.



Box 4: Uncertainty surrounding the estimates: impact of assumptions

All estimates presented on market sizes and illicit income are subject to uncertainty. Each estimate is based on incomplete information. Access to better information may affect the quality of the estimates.

Illegal killings of elephants. The methodology yields results on the lower, cautious side. Better information on elephant populations and the geographical distribution of poaching may lead to an increase in the supply of ivory (as would incorporating estimates on Asian ivory). The extrapolation made using the proportion of illegally killed elephants is based on a number of assumptions (see Box 1 in chapter 3).

Leakages of ivory and rhino horn from private and government repositories. The few data points available^a indicate leaked quantities that are small in comparison to supply from newly killed elephants and rhinos. Better data might yield an increased supply of ivory and rhino horn.

Seizures. Seizures are suspected to be underreported,^b and a comparison of officially reported seizures with media reports corroborated the hypothesis that seizures officially reported may not be complete. More complete seizure data would decrease the amounts of ivory and rhino horn reaching end consumers and thus decrease the market value.

Ivory yield per elephant. The impact of better data on this element is unclear. The data used for the calculations are based on natural measurements. Selective poaching may lead to larger tusks, on average, when old, male animals are sought out. In populations that already suffered substantial losses in the oldest age groups, the average expected ivory yield per poached animal may be much smaller than the assumed size in the calculations.

Losses in production. Milliken et al estimate that up to 30 per cent of the ivory is lost in the carving process^c when final products are made from ivory and rhino horn. If these losses are incorporated into the estimates, the estimated weight of ivory and rhino reaching end consumers - thus the value of the retail market - would decrease accordingly.

a Nkoke, S. C. et. al., *Ivory markets in Central Africa*, TRAFFIC, September 2017.
 b T. Milliken, F. Underwood, R. Burn and L. Sangalakula, *The Elephant Trade Information System (ETIS) and the Illicit Trade in Ivory: A report to the 18th meeting of the Conference of the Parties to CITES*. CoP18 Doc. 69.3 (Rev. 1) Annex 1, December 2018.
 c In CITES document CoP14 Doc. 53.2, the losses through various carving and mechanized manufacturing processes were taken as 30 per cent. Losses could thus be of significant size and reduce the estimated illicit financial flows accordingly.

and East Asia. There are indications that rhino horn and ivory are sold in other regions, too, for example, in Europe. These markets are not considered here given that their size is very small, and that price data are not available.

In the absence of a systematic monitoring of prices by Member States, UNODC undertook field and desk research to collect prices of ivory and rhino horn at all levels of the supply chain.⁵⁵ The prices used were average prices covering multiple years. A multi-year average was used to smoothen year-on-year variations, to increase sample sizes and to make the value estimates consistent with the supply estimates.

With these prices, the illicit income generated can be further broken down by group using the supply chain model presented above. Intermediaries, exporters and wholesale traders are grouped together under “international trafficking”.

For both products, the largest increases in prices - and thus income - are found between wholesale and retail selling in Asian countries. As in many other licit and illicit markets, the largest value added is generated in retail. At this stage, rhino horn and ivory are manufactured into artistic products with qualities varying from machine made items to carefully crafted pieces of art.

Table 2 Annual illicit income generated by the illicit trade in ivory and rhino horn (US\$ millions), annual average, 2016-2018

	IVORY	RHINO HORN
Overall market size Asia (end-consumer), gross income	US\$ 400 (310 – 570) million	US\$ 230 (170 – 280) million
Retail	US\$ 260 – 490 million	US\$ 120 – 160 million
International trafficking	US\$ 38 – 60 million	US\$ 28 – 79 million
Runners and brokers	US\$ 7 – 11 million	US\$ 7 – 15 million
Poachers	US\$ 8 – 13 million	US\$ 6 – 43 million

Note: International trafficking summarizes intermediaries, exporters and wholesale traders. The income presented as breakdown of the overall market size is the gross income minus the income of the actors earlier in the supply chain. The estimates are to be understood as orders of magnitude, not robust statistics. The numbers are based on the model of a consecutive supply chain: poacher – trafficker Africa – international trade – trafficker Asia – retail Asia. This model is thought to be applicable to a majority of cases, but not all. One such exception would be manufacturing in Africa and direct shipments to end consumers in Asia. The ranges reflect different degrees of uncertainty (see methodology section).

The price data at retail needs thus to be interpreted with caution. The prices cover a very broad range, with prices per kg differing between minimum and maximum by a factor of 13 in ivory items and a factor of 36 for rhino horn products, reflecting the wide range of possible qualities (see Box 6). Using an average price masks these large differences, and the resulting values therefore represent an order of magnitude rather than a precise statistical estimate.

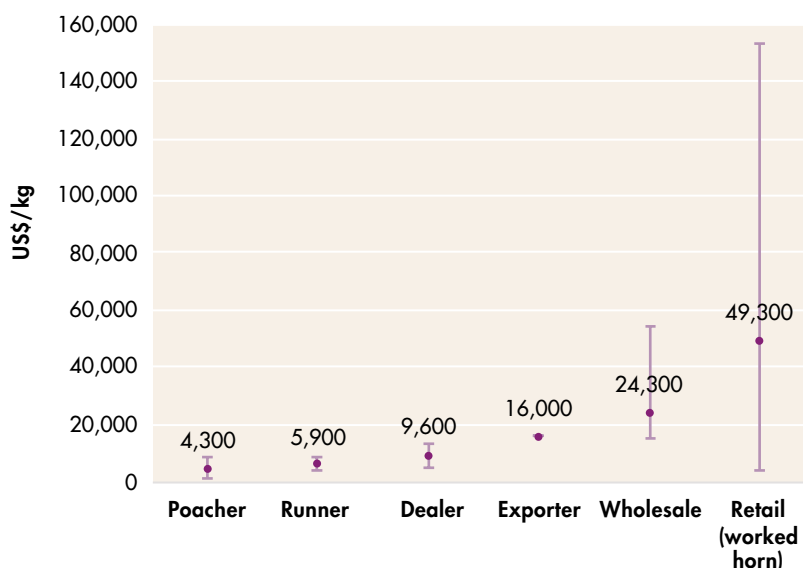
Comparing the rates of increase (mark-ups) of prices between rhino horn and ivory shows that they are consistently higher for ivory than for rhino horn. Mark-ups cover profits (net income) and costs. They are thus not only reflecting the actor's desire or ability to make profits, but also the costs an actor incurs. Besides overall market dynamics and the dynamics between actors, their power in price negotiations, the costs and the related business models can drive differences in prices between trade levels.

Gross income and net income

As every productive process, illicit income can be represented by three main aggregates: illicit gross income (or output), intermediate expenditure or intermediate costs, and value added, presented in this chapter as illicit net income (see Box 7).

The estimated annual illicit income broken down by actor does not reflect the net income, which accounts for all the costs the actors face in conducting the illicit activity (intermediate expenditure). Net income is key to understanding the proceeds of crime along the supply chains and it is the more accurate metric for comparing the profitability of crime across the actors of the supply chain. Net income is the income available to actors for consuming other goods and services and for investing in licit or other illicit activities or terrorist groups.

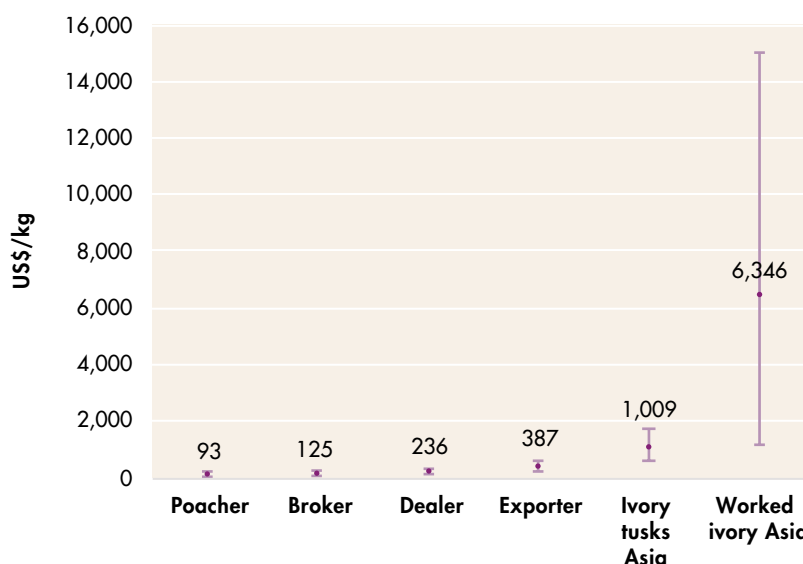
Fig. 8 : Variation of price data for rhino horn, by trade level, multi-year average, 2014-2018



Source: UNODC estimations based on data collected in 52 field interviews and available literature (poacher to exporter) and on data provided by the Wildlife Justice Commission and the Environmental Investigation Agency, UK (wholesale to retail). Mid-points are a simple average of all observations (weighted by weight where available). To increase sample sizes and coverage, data from 2016 to 2018 was supplemented with earlier years.

Note: Ranges reflect varying degrees of uncertainty.

Fig. 9 : Variation of ivory price data, by trade level, multi-year average, 2014-2018.

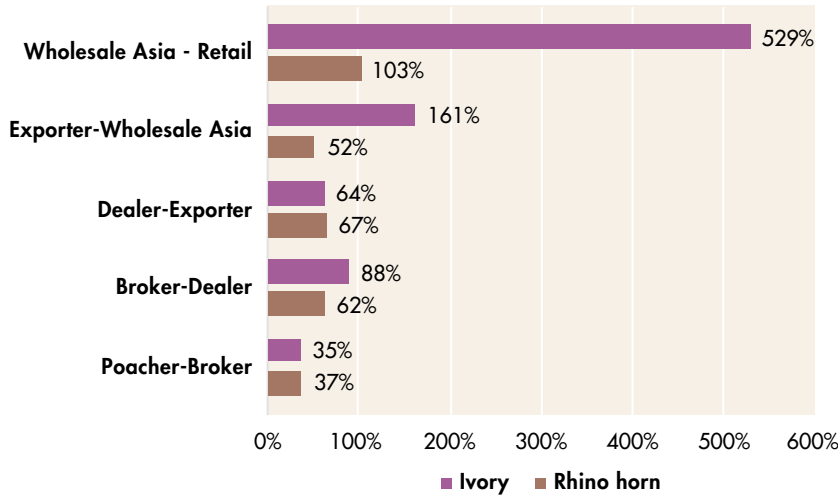


Source: UNODC estimations based on data collected in 52 field interviews and available literature (poacher to exporter) and on data provided by the Wildlife Justice Commission and the Environmental Investigation Agency, UK (wholesale to retail). Mid-points are a simple average of all observations (weighted by weight where available). To increase sample sizes and coverage, data from 2016 to 2018 was supplemented with earlier years.

Note: Ranges reflect varying degrees of uncertainty.



Fig. 10 Percentage increase of per kilogram-prices between different actors in the supply chain, rhino horn and ivory, average 2014-2018



Source: UNODC estimations

Only the percentage changes from one level to the next are shown. Ranges are omitted for clarity.



Box 5: Rhino horn is less valuable than commonly believed

The prices of rhino horn found during the research for this study were significantly lower than the widely quoted US\$65,000 per kilogram at the wholesale level in Asian countries.^a The average price found was US\$24,300; less than half of the prices frequently reported by media sources.

The price data used in this report for destination countries is based on two main sources: Stoner et al.^b who collected prices between 2015 and 2016 in a village in Viet Nam that held at this point more than one ton of rhino horn products (see Case study 3), and prices provided by the Wildlife Justice Commission^c and the Environmental Investigation Agency.^d The majority of prices was collected by Stoner et al.

In absence of more detailed price data, it is not possible to assess whether the high prices cited in the media (which appear to date to 2012) have been overestimated and/or were higher than the now observed prices due to differences in the market structure. There are indications for an actual reduction in prices (see Chapter 3 and Stoner et al. 2018, note b), but it remains unclear

if the reduction can explain the magnitude of the differences in prices.

At US\$24,300 per kg of raw rhino horn, rhino horn might not be more valuable than gold. It is, however, as the efforts made to poach rhinos show, still a highly sought-after product that yields sound revenues to those involved in the trade.

a Tracking down this number was challenging. In their oft-quoted article, Biggs et al. (Biggs, D., Courchamp, F., Martin, R. and Possingham, H. P., 'Legal trade of Africa's rhino horns', *Science*, 339(6123), 1038-1039, 2013) list US\$65,000 per kg as price, naming a National Geographic blog entry as a source (*Record 618 South African Rhinos Poached for Horns in 2012, so far, 11 December 2012*, available at: <https://blog.nationalgeographic.org/2012/12/11/record-618-south-african-rhinos-poached-for-horns-in-2012-so-far/>). This source appears to be a dead end, however, as it does not provide the origin of this number.

b Stoner, S., Verheij, P. and Jun Wu, M., 'Illegal rhino horn trade in Nhi Khe, Viet Nam,' *UNODC Forum on Crime and Society*, Vol. 9, Nos. 1 and 2, 2018.

c In litt.

d In litt.



Box 6: Price building at the retail level

The large differences in retail prices of ivory and rhino horn are due to the large variation in quality and artistic value of the products. A product carefully crafted by hand commands higher prices than a product that is produced (partially) by machines.

The material used can make a difference too. Stoner et al.^a noted for rhino horn that "the structure and colouring of a rhino horn differs from base to tip. If a segment of rhino horn is cut from the middle and held up to the light, it has a translucent, amber glow. In contrast, horn tips are compressed, almost black, and the material is much firmer than the base of the horn. Colour and density can affect the price. In general, the blacker the horn, the more expensive it will be.

The most precious part is the core, sometimes referred to as the "meat", where it is darkest, gradually fading into brown, red, yellow and even white in successive concentric rings towards the surface. The tip is the most expensive part of the horn because that is believed to be where the energy of the rhino is concentrated."

Ivory as a material is more homogenous, although the products are very diverse. Ivory products range from machine-produced chopsticks or bangles to highly artistically crafted whole tusks with respective great variations in prices.^b

a Stoner, S., Verheij, P. and Jun Wu, M., 'Illegal rhino horn trade in Nhi Khe, Viet Nam,' *UNODC Forum on Crime and Society*, Vol. 9, Nos. 1 and 2, 2018.

b See Gao, Y., and Clark, S. G., 'Elephant ivory trade in China: Trends and drivers', *Biological Conservation*, 180, 23-30, 2014 for a detailed discussion on ivory products.



Box 7: Market size, illicit income and expenditure

The **market** for a product involves all buyers and sellers of the product in a certain geographic region. Its size can be determined by the number of buyers and sellers, the amounts traded and the respective prices.

Illicit gross income (market value or sales) is the value of illicit goods and services produced in a given period (for example, a year). The value is determined as quantity multiplied by price, where prices need to correspond to the geographic extension of the market under consideration. In a global market, gross income is represented by retail prices and corresponding quantities sold at retail; in a country, the appropriate prices may be domestic retail prices multiplied by domestic consumption and export prices multiplied by the amounts of goods exported.

$$\text{Gross income} = \text{Quantity purchased} * \text{Price.}$$

Intermediate expenditure is the value of inputs acquired to produce the illicit goods and services over a given period. The value of inputs is determined as quantity multiplied by price. Intermediate expenditures for poachers may include lodging, transportation, guns or bribes to persons facilitating the trade. Intermediate expenditure for traffickers includes the costs for purchasing raw material (for example, the payments traffickers make to poachers), but also others, such as expenditure for transportation or bribes.

Illicit net income of an actor or a group of actors is the illicit gross income minus intermediate expenditure. Illicit net income is the income available to an actor after accounting for costs.

$$\text{Net income} = \text{Gross income} - \text{Costs.}$$

Net income is the income that remains with the actors after accounting for their

expenditures.^a Net income is considered to be the more suitable metric for comparing the amounts of money made by actors.

Illicit income generation refers to all transactions that are carried out in a certain illicit productive process (supply chain) where profits are made. Here, it refers to all transactions directly related to the trade in ivory or rhino horn. Income generation can be represented by three main aggregates: gross income, intermediate expenditure (or intermediate cost), and net income or value added.

Once the illicit income is generated, it is used by the actors. **Income management** refers to all transactions of illicit (net) income outside of income generating activities, such as purchasing property or movement of funds to offshore bank accounts.

^a This corresponds to the value added in national economics.

The available data did not allow for a comprehensive estimation of costs and net income, although understanding the cost structure affecting different actors would provide insights into the trade business models.

The costs of the illicit trade

Organizing crime can be costly. The illegal trade in ivory and rhino horn comprises all activities also found in the legal sphere, such as the procurement, production, transportation, sales and distribution of commodities; and all these activities are associated with expenditures for the organizers. Operations of illegal nature require additional precautions to evade detection, arrest and prosecution by law enforcement, to mitigate the risk of interception, and to conceal or erase traces that may lead to the organizers themselves.

These costs can be substantial. Case study 1 showed that the costs of purchasing and transporting ivory for international traffickers can make up from two-thirds to 90 per cent of their gross income, with bribes alone making up from 4 to 10 per cent of the sales value. A different study⁵⁶ on smuggling in South-East Asia found that border officials were paid an 'unofficial fee' from US\$10-20 per shipment.

The possible cost components can be grouped into four broad categories.⁵⁷

- Operational costs, which are costs encountered in activities required to facilitate the smuggling. Examples are transportation, labour, material and other inputs.
- Concealment costs, stemming from the actor's activities to conceal and disguise their operations. These costs comprise, for example, the costs for concealment in transportation (such as hiding products in legal shipments), financing safe houses used for hiding products, or purchasing custom-made vehicles (or modifying existing vehicles) to transport illegal commodities.
- Evasion costs, associated with evading arrest and prosecution by law enforcement. Organizers of large-scale operations employ intermediaries to distance themselves from the poaching offence and from the goods and services trafficked. They use complex structures to launder the proceeds of crime into legal businesses, use non-traceable ways for monetary transactions (including nominee accounts, shell companies) and pay other criminal organizations to protect their contraband (security payments).



--- Corruption costs, that can be part of any of the above or be a separate category. Corruption costs are payments (bribes) to government officials and other corruptive acts or that facilitate the illegal trade at all levels.

Each link in the supply chain faces different costs, and the costs can vary significantly between cases, depending on the business model, the size of the operation and the modus operandi of the organized crime group. Analysing the possible costs components by group of actors yields insights into their finances and helps to shed light on the motivations for choosing one business model over the other.

Poachers and first-level traffickers

The costs of poaching operations can vary substantially and depend on the business model under which poachers operate. Independent poachers finance their own guns, ammunition, food and transport. To make up for their expenses, these poachers may achieve higher prices than dependent ones, who are hired and subsidized by individuals higher up in the supply chain. Dependent poachers are thought to have less influence on the price building process than independent ones.⁵⁸

The differences in prices between ivory and rhino horn are substantial. At the poacher's level, a kilogram of rhino horn is 55 times more valuable than a kilogram of ivory and a poached elephant yields on average some US\$1,000 for its ivory,⁵⁹ but a rhino some US\$24,000 for its horns.⁶⁰

These differences may not directly translate into a difference in net income of the same magnitude. There are indications that rhino poachers may face – on average - higher costs than elephant poachers. The data available on the costs of poaching is scattered for both species. Fenio⁶¹ obtained data from in-depth

interviews in communities where rhino poaching takes place. The interviewed persons reported that poachers spend between three to four days on a hunt, and community members can make up to US\$1,000 per night for providing shelter to poaching gangs (some nights however may be spent in the bush). That shows how much income poaching can bring to local communities.

Other cost components depend on the methods used. Cost components identified in the literature include costs for guns and rifles,⁶² transportation,⁶³ the use of helicopters,⁶⁴ bribes to law enforcement, and other equipment such as tranquilisers to sedate the animals before harvesting the horn.⁶⁵ All these require well-organized logistics and substantive up-front investments.

Such sophisticated methods do not seem to be applied for killing elephants. Elephants are more easily accessible due to the larger population size and the fact that populations are more wide-spread. Leggett and Salgueiro⁶⁶ researched the motivations of elephant poachers in selected areas of the Central African Republic. Acknowledging the limitations of transferability of the findings to areas other than the studied one, they found that hunting remained an important part of the livelihoods of many people, including elephant hunting.

These findings can be indications that elephant poachers are operating – on average – more opportunistically, are less specialized in hunting elephants and might therefore employ simpler and less costly methods of hunting than rhino poachers. Moreto and Lemieux⁶⁷ reported the use of snares, wire traps, poison or nails to catch elephants, and spears as weapons to kill the trapped animals.

Another difference may lie in profits: in addition to the income made from ivory, elephant meat was mentioned⁶⁸

as traditional and highly prized meat, with a considerable cash value, even in poor areas. The estimated income made from the ivory of a poached elephant may thus underestimate the overall income made from an elephant.

Elephant poaching thus appears not to be in the hands of few, highly organized groups, but more an activity conducted as one of many different strategies to build one's livelihood. In contrast to rhinos, which mostly live in heavily monitored national parks, elephants can in some places be hunted with little risk of detection, and indeed, all the interviewees of Leggett and Salgueiro⁶⁹ in the researched parks perceived the risk from law enforcement as marginal.

All these findings rather speak for low-cost operations with little risk of detection, which can be an indication of why elephant poaching is profitable⁷⁰ even when much smaller prices are obtained than for rhino horn. This however does not exclude that highly organized elephant poaching operations are being conducted.

Runners and brokers

Little is known about runners and brokers who link poachers with international traffickers. The services provided by this group⁷¹ encompasses everything from collecting and storing the ivory to concealing it for transport to paying off law enforcement officers. It is used by those who have the funds available to distance themselves from handling the contraband to evade arrest.

International traffickers

Intercontinental trafficking of large shipments from Africa to Asia requires well-organized logistics, and illegal operations have unique requirements in terms of routing and transportation that make them distinct from legal trade. Trafficking logistics are specifically designed to evade detection by



Case study 1: “The Shuidong connection” - the gains and costs of trafficking

In 2017 an organized crime group (OCG) trafficked three tons of ivory from Africa to Shuidong in China. The case led to convictions of several individuals in 2019 by the Anti-Smuggling Bureau of China Customs.^b

The case provided evidence for a number of distinct practices:^c

- The OCG consisted of individuals operating from China. World Customs Organisation, China Customs disrupts major wildlife trafficking syndicate, *WCO News 88 – Panorama*. Details on the case can be found here: Environmental Investigation Agency (EIA), *The Shuidong Connection: Exposing the global hub of the illegal ivory trade, 2017*.
- The OCG employed locals in Africa to collect and store the tusks in order to minimize physical contact with the ivory.
- The group chose complex trade routes with multiple transit ports such as Mombasa (Kenya), Singapore, Busan (Republic of Korea), and Hai Phong (Viet Nam) for shipping products from Africa to China.
- The OCG used a variety of legitimate products to conceal several tons of ivory in containers. The goods used to conceal ivory included plastic pellets, sea shells, peanuts and tea leaves.
- All payments in Africa were made in US dollars, with the group using black-market moneychangers based in Dar es Salaam (United Republic of Tanzania) and Pemba (Mozambique). Money was paid in Chinese renminbi into designated accounts in China, after which

local moneychangers in Africa were informed, who then provided the cash for collection in dollars.

The traffickers who were arrested financed the operation and made US\$720 per kg of ivory, yielding a gross income of US\$2.16 million. After deducting costs of the operation, net earnings of US\$80 to 240 per kg or US\$234,000 to 720,000 per operation remained for the group of at least three persons.

The information presented on this operation highlights the following:

A single shipment can result in a noteworthy gross income; the remaining net income may be much smaller (here, between 10 and 30 per cent of the gross income).

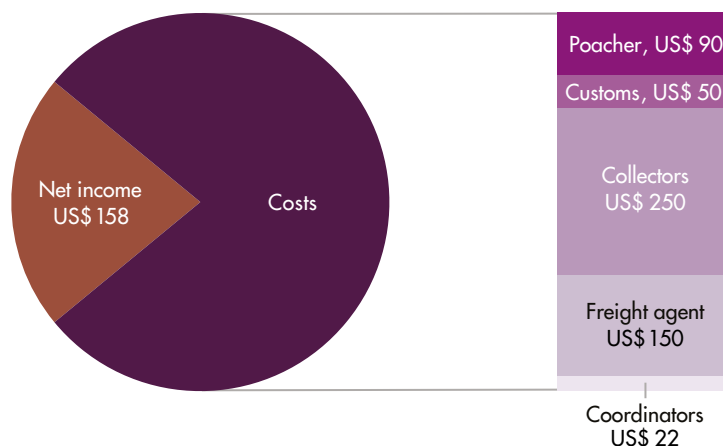
A single shipment of large size requires a large number of persons involved and the organizers behind the trade use complex structures to distance themselves from the predicate offence of poaching.

The high volumes of funds involved show potential to use financial investigations to identify and prosecute the organisers of the trade

a World Customs Organisation, ‘China Customs disrupts major wildlife trafficking syndicate, *WCO News 88 – Panorama*. Details on the case can be found here: Environmental Investigation Agency (EIA), *The Shuidong Connection: Exposing the global hub of the illegal ivory trade, 2017*.⁹

b Ibid.

Fig. 11 Gross and net income (US\$ per kilogram) of ivory traffickers in the “Shuidong Connection”, 2016.



Source: See footnote a

Table 3

Costs for traffickers and net income of a single shipment of ivory from Africa to Asia.

ACTOR	PRICE PER KILOGRAM (USD)	OVERALL EXPENDITURE (USD)
Poachers	80-100	240,000-300,000
Collectors of ivory (low to mid-level traffickers), packers in Africa	200-300	600,000-900,000
Customs (bribes)	30-70	90,000-210,000
Freight agent onwards trafficking	150	450,000
Coordinators of the shipments	22	66,000
Net income traffickers	80 – 240	234,000 – 720,000

Source: See footnote a



law enforcement and to reduce the risk of interception.

All this can be costly. In an exceptional case study, EIA documented a shipment of three tons of ivory from Africa to Asia, including all the logistics and costs that the traffickers faced (see Case study 1).

How traffickers may decide their modus operandi

The means of transport, routes, concealment methods and the logistics involved are strongly interlinked as one determines the other. How traffickers or trafficking groups make decisions may differ from operation to operation and may be led by different circumstances and need including a drive to minimize the costs of the operation while maximizing the income.

When choosing their modus operandi, organized crime groups may compare expected costs and income. Expected costs involve all costs related to the transportation logistics, including bribes, and the perceived risk of losing a shipment to law enforcement or being arrested. The expected income is the income that can be achieved when successfully selling all illegal products multiplied by the probability that the sale will be completed.

A basic distinction can be made between choosing to ship small or large amounts. Whole rhino horns seized between 2014 and 2019 had a median weight of 4.4 kilograms per seizure; 2 per cent of seizure cases were larger than 100 kg (accounting for 28 per cent of seized weight) and none were larger than 500 kg.⁷² Ivory seizures had median weight of 12.8 kg per seizure, and 18 per cent of seizures were larger than 100 kg, and 7 per cent larger than 500 kg (accounting for 79 per cent of seized weight).⁷³

The main means of transport for rhino horn appears to be air. Between 2014 and 2019, 62 per cent of all rhino horn was seized in air traffic. The second largest quantity was seized on the road (31 per cent), together accounting for 93 per cent of all seized weight. Ivory on the other hand was seized in largest quantities in maritime traffic (62 per cent), followed by road (14 per cent) and air (10 per cent).

Larger shipments promise higher income per operation but require larger upfront investments and stronger logistics. A large shipment requires logistics on the ground in source and destination countries. Products need to be purchased and collected, stored, then packed, moved to a seaport and transported to the destination country. The logistics, personnel and cash requirements can be substantive and require up front investments to purchase all the ivory needed (see Case Study 2). Logistics in destination countries involve the need for buyers and storage for the product if it cannot be sold immediately.

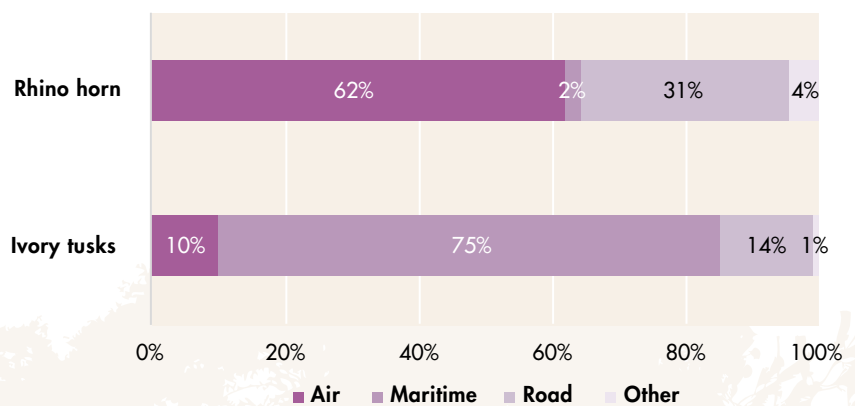
There are differences in the personnel requirements, too. Large shipments require more personnel, more transactions and more communication between the persons involved. All

these are potential weaknesses that can be exploited by law enforcement and thus increase the risks of detection. However, due to economies of scale, costs per unit may decrease and the returns on investment could increase.

Lastly, more complex operations use the services of persons specialized in facilitating the movement of large amounts of money across borders. While the intra-African trade of ivory and rhino horn is reportedly mostly financed by cash transactions,⁷⁴ transferring larger amounts of money from destination to source countries requires formal or informal money service providers. These services, in particular when operating in the illegal sphere, incur costs that need to be priced in.

Smaller scale shipments, on the other hand, involve – in all likelihood – less complex structures. Trafficking a small number of rhino horns requires less upfront investment, storage or personnel handling the products in source countries. Finding buyers in destination countries may be easier, and in demand shipments (for example, by mail order or through internet-based trade) link the trafficker directly to the end consumer, cutting costs for intermediaries.

Fig. 12 Means of transport for ivory and rhino horn, as percentage of total weight seized, 2014-2019



Source: UNODC World WISE Database

Note: Based on seizures where information on means of transport was available (236 ivory seizure cases and 144 rhino horn seizure cases). "Other" includes mail, rail and seizures that took place e.g., in a house or other stationary place.

In small shipments, the per-operation gross income is smaller; however, low-level logistics can reduce costs drastically and the remaining net income can be considerable.

The risk, or perceived risk, of being intercepted may vary in the different

scenarios (more complex operations may allow the organizers to distance themselves from the products more effectively) and may affect pricing.

Retail

Retailers finally sell the illegal products directly to end consumers. Retailers may operate openly in shops or hidden, with remote communication with customers if the selling is, for example web-based.



Case study 2: The ivory queen

UNODC's SHERLOC database contains a significant case ("The ivory queen") involving the conviction of a major ivory trafficking ring.^a The following are extracts from the case documentation.

The case received wide attention from the media. The main perpetrator and was soon after referred to as the "Ivory Queen". Intensifying the public interest in the case was the long period of time the illegal business was maintained (14 years); the amount of money generated; the iconic specimen trafficked (elephant ivory); and the fact that a female foreigner, who held a public position, was heading the illegal operations.

Adding to the severity of the case was the fact that the main perpetrator was involved in several public and private engagements during the time of her arrest. She was the vice-president of the China-Africa Business Council and operating a Chinese restaurant as well as an investment company in the United Republic of Tanzania. Moreover, she was fluent in Swahili, having lived in Tanzania for several years already.

In 2015, three perpetrators were found guilty of running one of Africa's biggest ivory smuggling rings in Dar Es Salaam, United Republic of Tanzania. The three individuals smuggled 860 elephant tusks, worth more than 5.4 billion Tanzanian shilling (around US\$2.5 million) between 2000 and 2014.

In total, 11 witnesses testified against the trio. They were able to report that the head of the operations received ivory tusks from the other two perpe-

trators and shipped them through the port of Dar Es Salaam to Asia.

The witnesses were individuals that had been contracted by the perpetrators in functions such as security guard, taxi driver, waiter or banker. The perpetrators denied all accusations; however, the considerable evidence led the judge to sentence each of the three individuals to 15 years' imprisonment. The court ordered the confiscation of the buildings used for the illegal operations and a fine double the value of ivory trafficked.

Some details from the judgement:

- One of the witnesses worked at a bank where two of the offenders held bank accounts. The bank statements that showed the transactions proved the business relationship of the two individuals to the court.
- The convicted Tanzanian nationals were tasked with collecting ivory from various places, and the operations of these two were financed by the Chinese citizen.
- The trio used property in the country to store and hide tusks for later shipment.
- The offenders kept books of their operations, which helped the court to establish that 860 tusks had been trafficked over the time period.

^a UNODC, Sharing Electronic Resources and Laws on Crime (SHERLOC), Case Law Database, available at: sherloc.unodc.org. Case number TZAx002.



Box 8: Economic damage caused by seizures

Intercepting wildlife contraband reduces the amount of product available on the market and acts as a deterrent to criminals, as seized contraband is an economic loss for those trafficking it.

The damage caused by a seizure is affected by the mark-ups in the supply chain.^a With an increasing value and increasing mark-ups, the value of the products seized closer to the destination is much higher than the value of products at lower levels. With that, the costs of replacing seized products in source countries are much lower for organized crime groups than the cost of replacing the same amounts seized at the retail level.

By weight, most of the products seized come from large seizures at the international trafficking level (such as intermediaries, importers/exporters or wholesalers in Asia). The monetary loss of trafficking chains is thus not reflected by the retail prices that would have been accrued, but in the prices at the level where the seizure is made.

^a For a discussion of drug markets see: Caulkins, J. P., and Reuter, P., 'What price data tell us about drug markets', *Journal of drug issues*, 28.3: 593-612, 1998.



Depending on the risk level for selling of ivory and rhino horn, retail sellers may openly operate as any legal business or may have to resort to clandestine operations (see Case study 3 for a detailed description). An important element of the retail market is the quality of the product. Higher quality products require more labour inputs than lower quality ones, but can achieve higher profits.

Illicit financial flows

Volumes of IFF from ivory and rhino horn

The 2030 Agenda for Sustainable Development⁷⁵ identified the reduction of illicit financial flows (IFFs) as a priority area to build peaceful societies around the world. Countering IFFs is considered as crucial component of global efforts to promote peace, justice and strong institutions as reflected in the SDG target 16.4.⁷⁶

IFFs are cross-border flows of resources that are illicitly generated

(for example, originating in criminal activities or tax evasion), illicitly transferred (for example, violating currency controls), or illicitly used (for example, for financing terrorism). IFFs concern the exchange of value, which includes currency but also the exchange of goods and services and financial and non-financial assets.⁷⁷ As such, IFFs are a flow measure as opposed to illicit income which measures a stock. ‘Cross-border’ means that an exchange is made between a resident and a non-resident of a country, regardless of their geographical location.⁷⁸

IFFs can emerge at various stages of illicit activities, relating to different actions and exchanges. A basic distinction of transactions can be made based on their purpose: transactions can be performed for either generating or managing income. Income generation describes transactions that directly generate illicit income or that are performed in the context of the production of illicit goods and services (e.g., for purchasing necessary inputs). Income management describes transactions related to the

use of the illicit income for investment in financial and non-financial assets or for consuming goods and services.⁷⁹ An income management transaction would be acquiring real estate with illicit income in a different country.

The overall volumes of IFF in the illegal trade in ivory and rhino horn depend on the number and size of cross-border transactions of the illicit income. The larger the volumes that are transferred across borders and the more frequently such transactions occur along the supply chain, the larger the related IFFs are.

In terms of income generation, the overall number of transactions constituting IFF depends on the (geographical) complexity of the supply chains. If supply chains are short and final products are sold directly from the source to the destination country, only a few cross-border transactions are involved. If complex constructs involve actors from many countries, more complex cross-border transactions are made, which in turn increases the overall volumes of IFF.



Box 9: Major rhino horn seizures in air cargo

Viet Nam

On 25 July 2019, at the warehouse of the Noi Bai Cargo Terminal Service JSC (NCTS), Viet Nam, national authorities and the Viet Nam Institute of Ecology and Biological Resources inspected 14 suspicious packages. The packages were transported from the United Arab Emirates via airplane to Noi Bai International Airport.

The forces identified 55 rhino horn pieces with a total weight of 125.15kg. The horns were hidden inside gypsum blocks to evade detection.

Source: Customs news under the general department of Vietnam customs, “*Holding in custody 125.15kg of rhino horn transported to Noi Bai International Airport*”, press release, <https://customsnews.vn/holding-in-custody-12515kg-of-rhino-horn-transported-to-noi-bai-international-airport-11467.html>

Hong Kong, China

On 5 April 2019, Hong Kong Customs seized 82.5 kg of suspected rhino horn with an estimated market value of about US\$16.5 million from a trans-shipment cargo at the Hong Kong International Airport. This was a record seizure of suspected rhino horn in the past five years.

Customs officers screened cargo that arrived from South Africa with Malaysia as its destination. The cargo was declared as “auto parts” but suspicious X-ray images alerted the authorities. The seizure was made subsequent to the opening of the consignment.

Source: The Government of the Hong Kong Special Administrative Region, *Hong Kong Customs makes a five-year record seizure of suspected rhino horn under smuggling*, press release, 6 April 2019.

Turkey

In February 2019, a Turkish customs enforcement team confiscated 21 rhino horns, and seven packs of wild animal claws at Istanbul Atatürk Airport. Authorities through X-ray imaging detected horn-shaped objects in the suitcases belonging to two suspected passengers reportedly flying from Southern Africa to East Asia.

Turkish police detained the two passengers for carrying rhino horns.

Source: Hurriyet Daily News, *Rhino horns seized at Istanbul Atatürk Airport*, February 2019 (available at: <https://www.hurriyetdailynews.com/photo-rhino-horns-seized-at-istanbul-ataturk-airport-141102#photo-1>).



Case study 3: Retail sale in South-East Asia

Stoner et. al.^a documented research conducted by the Wildlife Justice Commission on the illegal trade in rhino horn products in a village in Viet Nam in 2015 and 2016. The research was based on six field investigations in the village over the course of July 2015 to October 2016, and on monitoring of 36 Facebook and 27 WeChat accounts to detect illegal advertisement and sales of wildlife products. The following summarizes the findings.

The rhino horn trade in the village catered to tourists mainly interested in ornamental objects, rather than medicine. The larger shops in the market arranged the smuggling of products into China. The traders used Chinese terms in relation to the illicit trade and prices were primarily quoted in Chinese Renminbi. The traders were found to use Chinese bank accounts for the receipt of payments for wildlife products. In addition, an emerging trend of Chinese buyers using WeChat Wallet to pay Vietnamese suppliers was identified. This is a payment application within the instant messaging service WeChat.

During the one-year research, large amounts of rhino horn, ivory, tiger and other illegal wildlife parts and products were found for sale. The quantity of raw and processed rhino horn alone amounted to an estimated 1,061 kg, corresponding to between 401 and 579 rhinos killed.^b Since about 1,000 rhinos have been poached annually in the years prior to the research, and far lower volumes before 2013, this represents a substantial portion of the global market.

Stoner et. al. estimated the retail value of the rhino horn items observed between 2015 and 2016 at US\$42.7 million. While profit margins were not estimated, this represents a significant sum, given the limited number of traders identified and the size of the village (in 2016, an estimated 600 families lived in the village).

The retail outlets had a number of policies in place similar to those of legitimate businesses, including:

- Volume discounts;
- A deposit policy (usually quoted at between 20–30 per cent);
- Refunds for shipments intercepted by enforcement agencies;
- Use of international bank accounts.

The traders offered delivery services for rhino horn products to China. The strong preference for certain delivery points suggested that their ability to offer this service was dependent on connections to specific locations where, according to the trades of the village, border control officials could be corrupted. Investigators observed that the delivery services were important to Chinese customers. The fee requested varied by destination, an average of US\$357 per kilogram was charged for delivery to Pingxiang, on the border, and an average of \$893 for delivery to Fujian Province, which lies further away. In addition to corruption of border control officials, interviewed traders suggested that local police corruption was essential to their business model.

Many of the traders used social media platforms for advertising their products, with WeChat and Facebook being the platforms of choice. While fewer traders (some 10 per cent of all observed) used both platforms to advertise their products, others displayed a clear preference for one or the other, possibly indicating the target audience, given that Facebook is not available in China while WeChat is a Chinese platform.

a Stoner, S., Verheij, P. and Jun Wu, M., 'Illegal rhino horn trade in Nhi Khe, Viet Nam,' *UNODC Forum on Crime and Society*, Vol. 9, Nos. 1 and 2, 2018.

b Stoner et. al. used the following calculations. Raw horn: in 2015, only front horns were observed, therefore, one rhino horn or rhino horn tip was taken to represent one rhino. During 2016, several back horns were observed in addition to front horns; one rhino horn or rhino horn tip was considered to represent a minimum of half a rhino, and a maximum of one rhino. For processed rhino horn products, the total weight recorded was divided by 2 kilograms, which was the average weight of rhino horns observed.



Fig. 13 Illicit income and illicit financial flows

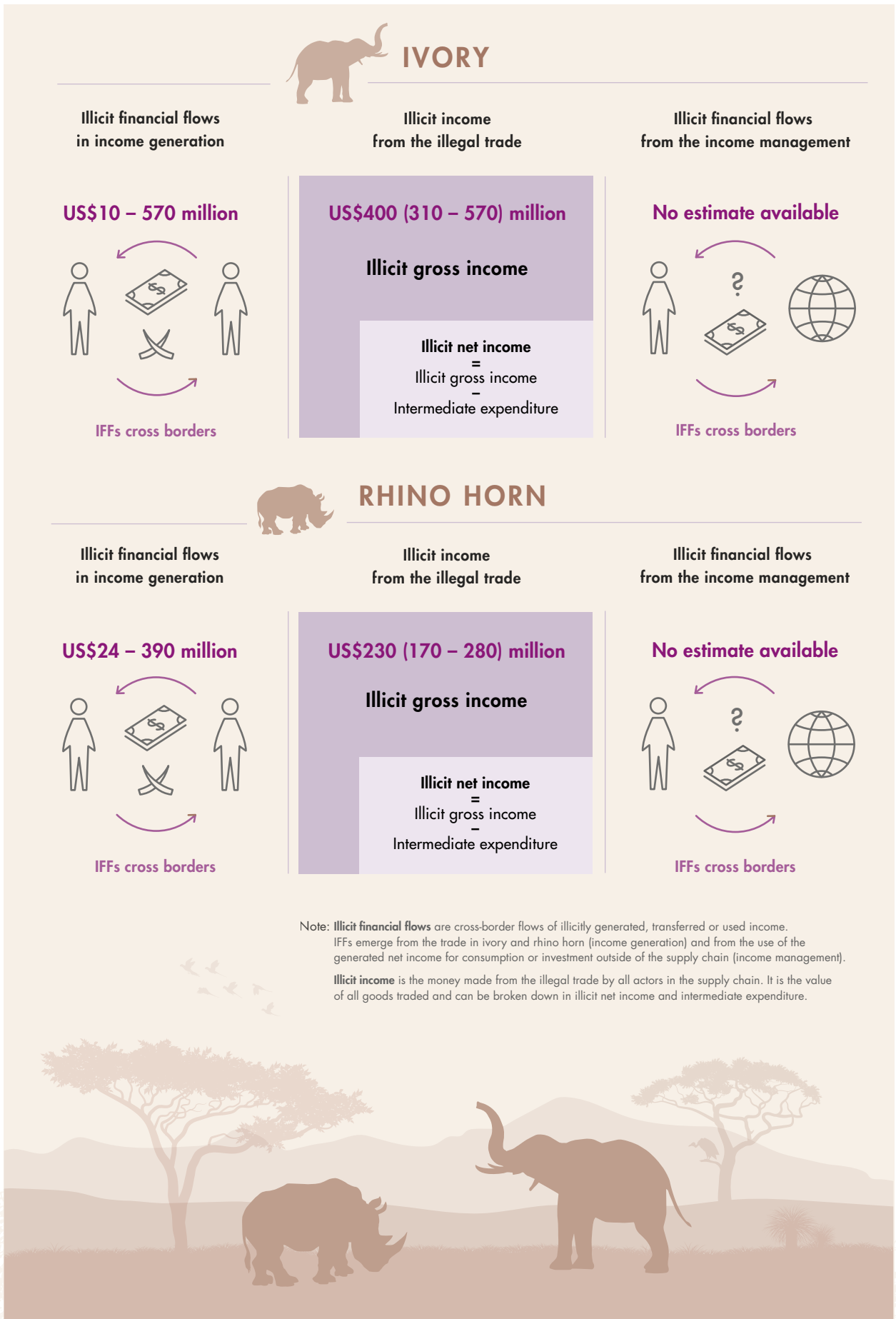
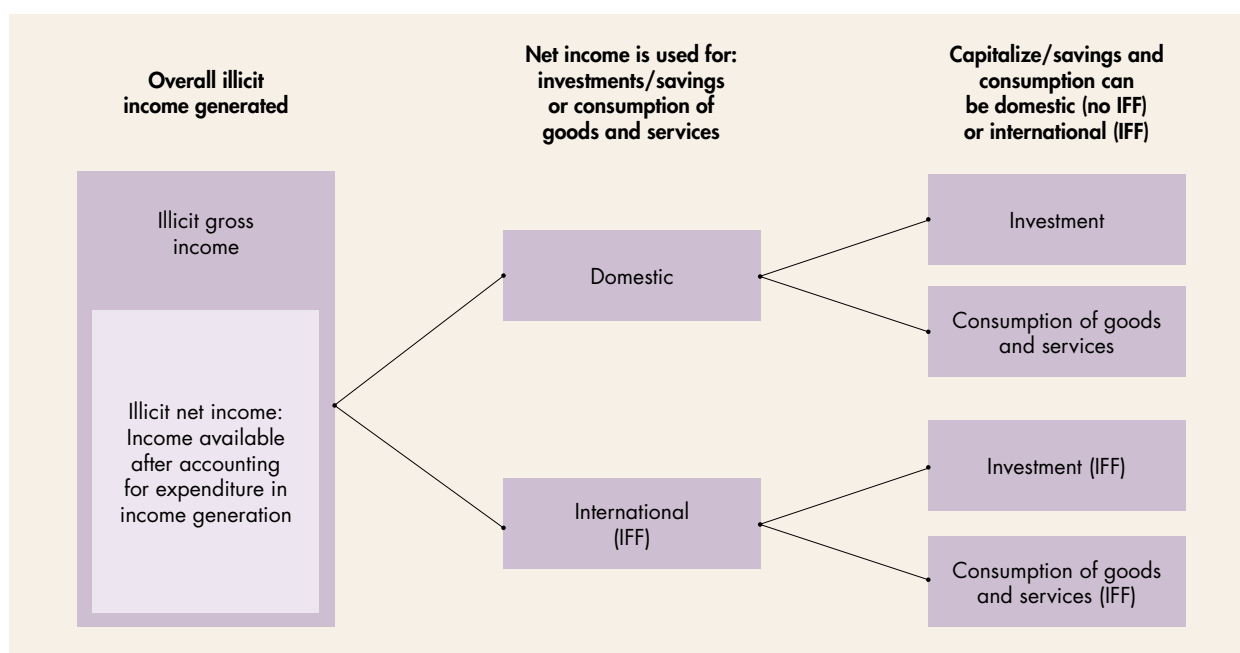


Fig. 14 Streams of illicit income management (IFF and non-IFF)



The overall volume of the transactions depends on the value that is transferred between the trade levels.

The volumes of illicit income moved across borders for income management depend on a variety of factors, all of which are more challenging to estimate and monitor than volumes illegally traded and their value. A few possible determinants can be listed without claiming to be comprehensive (for more details see Box 10):

- Only income that is available to the actors can be moved abroad. The available income is part of the net illicit income, but not all net income is available for cross-border movements. At least some of the illicit income generated will likely remain in the country where the illegal activity takes place⁸⁰ to be used for daily, 'normal' expenditures such as housing, transportation, food and other daily needs.
- The structure of the illicit market can play an important role. In a competitive market that involves a large number of small-scale players, the net income available

may be smaller and more evenly distributed. In such a scenario, there are no players making excessive profits that may benefit from being moved abroad. If, on the other hand, the international trade is in the hands of a few, highly successful organized crime groups,⁸¹ these groups may make substantive amounts of money that they might move abroad.

- The proportion of net income moved abroad depends on the actors' propensity to invest and consume internationally rather than investing and consuming domestically. This in turn may be determined by their personal characteristics/attitudes/preferences as well as structural characteristics of the country in which the illicit income is generated.

Numerical examples and a simulation study

The available data were not comprehensive enough to produce a statistical estimate of the overall IFFs from the illegal trade in rhino horn

or ivory (income generation flows). However, by using different scenarios and numerical simulations,⁸² an order of magnitude of the IFFs involved can be mapped out. The scenarios considered were based on possible numbers of transactions along the supply chain (length of the supply chains) and on different proportions of volumes transferred that constitute IFFs (e.g., only a certain proportion of wholesale-retail transactions cross a border and thus constitutes an IFF).

The possible range of IFFs for the scenarios considered was for rhino horn between US\$24 and 390 million a year and the average of all scenarios was \$163 million. For ivory, the minimum was \$10 million and the maximum \$570 million with an average value of \$240 million.⁸³ The IFF do not include bribes or income management flows; if these were included, the resulting IFFs would be correspondingly larger. The results show that the volume of IFF could be almost twice as large as the overall illicit income generated.

The more complex the supply chains (the more actors are involved), the more complex and diverse the



Box 10: Illicit financial flows from income management: possible drivers and motivations

Illicit financial flows from income management are challenging to measure. There is no standardized way to assess the proportion of illicit net income moved abroad, nor to measure how much illicit income enters a country from outside. Direct measurement methods (for example, based on identifying illicit transactions) are difficult to employ as the money-laundering process is clandestine in nature. The following presents an initial list of factors that may drive individuals to send illicit income to another country (push factors) and factors that may influence the decision of the destination of the funds (pull factors).

Push factors: motivating people to send their illicit income abroad

Most push factors that apply when legal income is invested abroad apply to illicit income, too. Reasons to invest or spend the illicit income abroad may include, for example, buying products and services that do not exist domestically or not at the desired prices or quality, sending money to family/friends abroad in the form of remittances, diversifying investment or increasing the security of investments (for example, against political instability or currency crises).

There are, however, factors that are specific to (large amounts^a of) illicit income. Concealing illicit income and moving it abroad requires some effort and may incur costs. It may therefore be – all other things being equal – the preferable choice to keep illicit income in the country where it was earned. There are, however, certain reasons that push individuals to spend/invest illicit income abroad.

Avoiding scrutiny from law enforcement. Sending illicit income abroad can reduce (perceived) scrutiny from law enforcement. The degree to which domestic law enforcement is effective in detecting and confiscating the proceeds of crime may push illegal income to other countries.

Avoiding scrutiny from family and friends. Illicit income may involve a degree of stigma and maintaining a lifestyle that is hard to explain by legal earnings may cause unwanted atten-

tion. Individuals may therefore choose to diversify their spending to other countries, for example by purchasing real estate abroad.

The political environment. Political instability and a lack of trust in the government can motivate criminals to move their money abroad. In highly corrupt environments, criminals may not trust the authorities to maintain impunity and may choose to move their illicit income abroad to secure it in case of a change in the political environment.

Limited domestic possibilities to launder money. Large volumes of illegal income may call for sophisticated money-laundering schemes, such as shell companies or assistance from professional money-laundering service providers.^b If such services do not exist in the criminals' home country or if the available services are too costly or otherwise unfavourable, criminals may opt to launder their proceeds via other countries.

Factors that attract illicit income from abroad

Some research has argued that factors that influence consumption and savings patterns of licit income influence consumption and savings of illicit income, too:^c if countries are likely to attract legal income from other countries, they may also attract illicit income. The effect was assumed to become proportionally larger with the level of illicit proceeds generated in the sending countries.

Factors that have been shown to attract income from abroad include common borders, common languages, common colonial legacies^d, common legal systems^e and common currencies^f, to mention some. For financial investments, the size, reliability, sophistication and financial openness to foreign investments of the financial sector are also likely to be factors in attracting income from abroad.

Other factors pertain specifically to illicit income, for example, the lack of effective measures against money-laundering. Effective measures include but are not limited to:^g Providing proper and effective money-laundering legislation;

providing regulators, law enforcement and supervisors proper tools, incentives and authority to combat IFF from other countries; making it easy and effective for national authorities engaging in international cooperation regarding money-laundering.

The availability of high-risk money-laundering products and services,^h such as shell companies, may be another factor. Such products can be used to hide the beneficial owner and provide a layer of anonymity, which make them attractive for hiding illicit proceeds. Sectors that operate unregulated are likewise commonly seen as high-risk, such as lawyers, hawala brokers or the real estate sector, as all these operate unregulated in several jurisdictions.ⁱ

- a Often well above the average gross domestic product (GDP) per capita in each country.
- b For more info see: Financial Action Task Force (FATF), *Professional Money Laundering*, FATF Report, July 2018.
- c Walker, J. and Unger, B., 'Measuring Global Money Laundering: "The Walker Gravity Model"', *Review of Law and Economics*, 5 (2), January 2009.
- d Ekanayake, E. M., Mukherjee, A. and Veeramacheni, B., 'Trade Blocks and the Gravity Model: A Study of Economic Integration among Asian Developing Countries', *Journal of Economic Integration*, 25(4), 627-643, December 2010.
- e Anderson, J. E. and van Wincoop, E., 'Trade Costs', *Journal of Economic Literature*, 42, pp. 691-751, September 2004.
- f Miron, D., Mićlaus, P. and Vamvu, D., 'Estimating the Effect of Common Currencies on Trade: Blooming or Withering Roses?', *Procedia Economics and Finance*, 6, pp. 595-603, 2013.
- g To see more about contextual factors, see Financial Action Task Force (FATF), *Methodology for Assessing Compliance with the FATF Recommendations and the Effectiveness of AML/CFT Systems*, updated October 2019.
- h See Asia-Pacific Group on Money Laundering, World Bank and Financial Action Task Force, *FATF Guidance: Anti-Money Laundering and Terrorist Financing Measures and Financial Inclusion*, June 2011.
- i See Asia-Pacific Group on Money Laundering, World Bank and Financial Action Task Force, *FATF Guidance: Anti-Money Laundering and Terrorist Financing Measures and Financial Inclusion*, June 2011.

resulting IFF can be. The illegal trade in ivory – larger in volumes and with (presumably) longer supply chains – generate a broader possible range of IFF than the illegal trade in rhino horn. However, compared to overall volumes trafficked, rhino horn has a large potential for IFF.

To illustrate the effect of complexity on IFF with an example, case study 6. is used. The case study includes few details but may represent a short supply chain. Namibia is a source country for rhino horns. Assuming that the suspect obtained rhino horn from residents in Namibia and sold it directly to wholesalers or retailers in a destination country (China or Viet Nam), a single illicit financial flow would have occurred from the destination country (outflow) to Namibia (inflow).

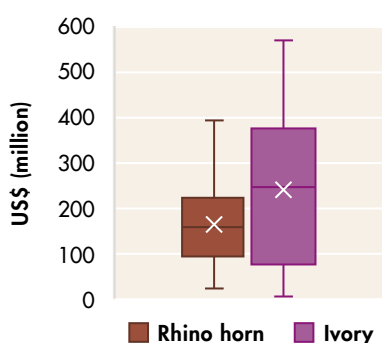
The case study could be part of a more complex scenario, too. Residents in Namibia could have purchased the rhino horns from residents of a nearby country (for example, South Africa or Mozambique) and then sold the horns onwards to the suspect in Namibia. Further trafficking could involve the suspect selling the products to wholesalers in South-East Asia who then sold it onwards to Chinese or other end consumers (see, for example, Mid-level traders in Namibia.). In addition, bribes would be paid to customs officers in transit countries who are resident in other jurisdictions.

In addition to the complexity of the supply chain, the locations of the specific actors can strongly affect the overall IFFs. If wholesalers and retailers are in different jurisdictions (see,

for example, Case study 3), the overall amounts of IFF are much larger, since the mark-ups between these two levels are much higher than for the other levels. The overall IFFs are less affected if poachers and intermediaries are not in different jurisdictions since the volume of transactions between these actors is smaller.

The very broad range of possible IFF volumes could be narrowed down with better information on the distribution networks (number of cross-border transactions). More precise estimates would be achieved by incorporating country level price data, and country level demand and supply data. Such data could help to formulate more precise model assumptions, which lead to a smaller range of possible outcomes.

Fig. 15 Annual IFF Resulting from for the trafficking of ivory and rhino horn (US\$ millions) 2016-2018



Note: based on ~14,000 possible scenarios. The depicted box shows the range of 50% of all values for each commodity; the whiskers show (here) the maximum and minimum values possible. The simulated lengths of the supply chain followed a truncated normal distribution with mean 3.5 for rhino horn and 4.5 for ivory (to account for the possibly more complex supply chains of the ivory trade), and a standard deviation of 2. The values were based on discussed prices multiplied by the estimated overall amounts trafficked (point estimates) between actors. At each trade level, a randomly chosen percentage between 20% and 80% of volumes transferred constituted an IFF with equal probability. Each IFF was only counted once, either as in- or outflow, and not twice. The minima reflect a situation when all rhino horn/ivory is purchased by foreign residents at poachers' prices, the maxima the situation when all transactions can cross borders and are 80 per cent IFFs. No additional flows from income management or intermediate expenditure such as bribes were considered. Including such flows would increase the IFFs accordingly.



Case study 4: Mid-level traders in Namibia

A Chinese citizen was arrested in a town in north-western Namibia for dealing in illegal rhino horns in 2014. The man was arrested in a sting operation after police received a tip off from members of the public that a Chinese trader had sent out people to look for elephant tusks and rhino horns for him to buy. At the time of arrest, he was in possession of two rhino horns.

According to the police sources, locals were given an estimation of what they would be paid and contact details of the local link up. The going rate was said to be between US\$640 and \$1,300 per horn. The intermediary sold the horn for \$3,200 to \$5,100. The locals were paid in cash and the

Chinese national did not use the banking system in Namibia. It was suspected that money was to be laundered through legitimate businesses and front companies in the construction, mining and tourism industries.

The case study also indicated that it was commonly accepted locally that the Chinese community does not make much use of the financial system. Their businesses are cash intensive.

Source: Republic of Namibia Financial Intelligence Centre, *Trends and typology report No 1 of 2017: Rhino and elephant poaching, illegal trade in related wildlife products and associated money laundering in Namibia*, 2017.



Endnotes

- 1 UNODC and the Asia/Pacific Group on Money Laundering (APG), *Enhancing the Detection, Investigation and Disruption of Illicit Financial Flows from Wildlife Crime*, 2017.
- 2 Ibid.
- 3 See Box 1
- 4 Every country protects its own animals, fish, timber and other plant life in different ways. There is no international agreement in defining wildlife crime. The UNODC World Wildlife Crime Report focuses on CITES-listed species, which alone include roughly 35,000 species, but there are species illegally traded that are not regulated by CITES.
- 5 See, for example, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Resolution Conf. 9.14. (Rev. CoP17), *Conservation of and trade in African and Asian rhinoceroses*, 2016.
- 6 UNODC, *World Wildlife Crime Report: Trafficking in protected species*, 2016.
- 7 Emslie, R. H. et al, *African and Asian Rhinoceroses – Status, Conservation and Trade*, a report from the IUCN Species Survival Commission (IUCN SSC) African and Asian Rhino Specialist Groups and TRAFFIC to the CITES Secretariat pursuant to Resolution Conf. 9.14 (Rev. CoP17), 2019.
- 8 Ibid.
- 9 For a detailed analysis of the latest trends in ivory and rhino horn trafficking see Chapter 3.
- 10 Percentages based on seizures where the destination of shipments was reported (see Chapter 3).
- 11 Supply chain actors and descriptions: Maggs, K. (2011) and Milliken and Shaw (2012) (both *ibid.*) and based on interviews with experts conducted during UNDOC background research. Within Africa, the scheme thought to have a pyramid structure, with many poachers, fewer brokers and only a small number of exporters.
- 12 Eastern and Southern Africa Anti-Money Laundering Group (ESAAMLG), *A Special Typology Report on Poaching and illegal trade in wildlife and wildlife products and associated money laundering in the ESAAMLG region*, 2016; Milliken, T. and Shaw, J., *The South Africa – Viet Nam Rhino Horn Trade Nexus*, TRAFFIC, 2012.
- 13 Another distinction could be made between targeted poaching and killings in human/elephant conflict. The latter were found to be rare (see Hauenstein, S., Kshatriya, M., Blanc, J. et al. African elephant poaching rates correlate with local poverty, national corruption and global ivory price. *Nat Commun* 10, 2242 (2019). <https://doi.org/10.1038/s41467-019-09993-2>)
- 14 Eastern and Southern Africa Anti-Money Laundering Group (ESAAMLG) op cit.
- 15 For elephant poaching, annual poaching rates were found to strongly correlate with proxies of ivory demand in China, between-country and between-site variation was strongly associated with indicators of corruption and poverty. Hauenstein, S., Kshatriya, M., Blanc, J. et al. op cit.
- 16 Milliken and Shaw (2012), op cit.
- 17 Ibid.
- 18 Milliken and Shaw, 2012, op cit; Stiles, D., *Elephant Meat Trade in Central Africa: Summary Report*, International Union for Conservation of Nature (IUCN), 2011.
- 19 Eastern and Southern Africa Anti-Money Laundering Group (ESAAMLG), op cit.
- 20 Republic of Namibia Financial Intelligence Centre, *Trends and typology report No 1 of 2017: Rhino and elephant poaching, illegal trade in related wildlife products and associated money laundering in Namibia*, 2017.
- 21 Emslie, R. H. et al, *African and Asian Rhinoceroses – Status, Conservation and Trade*, a report from the IUCN Species Survival Commission (IUCN SSC) African and Asian Rhino Specialist Groups and TRAFFIC to the CITES Secretariat pursuant to Resolution Conf. 9.14 (Rev. CoP17), 2019.
- 22 Processors could be another level in the supply chain. Processors obtain ivory and rhino horn from importers, process it into ornaments or medicine and sell it onwards to retailers. This level is omitted in absence of respective price data.
- 23 Eastern and Southern Africa Anti-Money Laundering Group (ESAAMLG), *A Special Typology Report on Poaching and illegal trade in wildlife and wildlife products and associated money laundering in the ESAAMLG region*, 2016.
- 24 Moneron, S., Okes, N. and Rademeyer, J., *Pendants, powder and pathways: A rapid assessment of smuggling routes and techniques used in the illicit trade in African rhino horn*, TRAFFIC, 2017.
- 25 See for example, Vigne, L., and Martin, E., 'Consumption of elephant and mammoth ivory increases in southern China', *Pachyderm*, 49, 79-89, 2011; Gao, Y., and Clark, S. G., 'Elephant ivory trade in China: Trends and drivers', *Biological Conservation*, 180, 23-30, 2014.;
- 26 Stoner, S., Verheij, P. and Jun Wu, M., 'Illegal rhino horn trade in Nhi Khe, Viet Nam,' *UNODC Forum on Crime and Society*, Vol. 9, Nos. 1 and 2, 2018.
- 27 Xiao, Y., 'China's ivory market after the ivory trade ban in 2018', *TRAFFIC briefing paper*, September 2018.
- 28 The following calculations apply a three-year average to smoothen year-on-year variations and to make data comparable to price data.
- 29 Knight, M., 'African Rhino Specialist Group report', *Pachyderm*, 59: 14-26, 2018. and Emslie, R. H. et al, *African and Asian Rhinoceroses – Status, Conservation and Trade*, a report from the IUCN Species Survival Commission (IUCN SSC) African and Asian Rhino Specialist Groups and TRAFFIC to the CITES Secretariat pursuant to Resolution Conf. 9.14 (Rev. CoP17), 2019.
- 30 Pienaar, D. J., Hall-Martin, A. J. and Hitchins, P. M., 'Horn growth rates of free-ranging white and black rhinoceros', *Koedoe* 34.2: 97-105, 1991; Martin, E.B., 'Rhino horn weights', *IUCN Traffic Bulletin*, 5(2): 23, 1983.; Martin, E. B. and Ryan, T. C. I., 'How Much Rhino Horn has come onto International Markets since 1970?', *Pachyderm*, Vol 13, 1990.
- 31 Following Emslie et al. (2019, op.cit.), the average number of horns per rhino was assumed to be 1.98. Numbers are rounded, calculations were done with full precision.
- 32 Emslie et al. (2019, op. cit.) assumed recoveries in 9 per cent of rhino poaching cases.
- 33 Emslie et al. (2019 op cit.) provided estimates for the reference period from January 2016 to December 2017; here the average was applied for 2018, too.
- 34 Analysis performed by George Wittemyer who updated and extended the estimates presented in Wittemyer et al. 2014 for the years 2010 to 2018 (paper made available to UNODC). A three-year average of 2016 to 2018 was the basis for the calculations. While outputs from Wittemyer et al. 2014 relied on published birth and death rates for African savanna elephants, the present model was updated such that estimates for forest elephants were based on more recently published data on forest elephant demography (natural mortality and natality).
- 35 95 per cent confidence interval (rounded).
- 36 UNODC approximated illegal killing rates in West Africa by a weighted average of the subregions Central, Eastern and Southern Africa.
- 37 Thouless, C. R. et. al., 'African Elephant Status Report 2016: an update from the African Elephant Database', *Occasional Paper Series of the IUCN Species Survival Commission*, No. 60 IUCN / SSC Africa Elephant Specialist Group, IUCN, 2016, p. 3.
- 38 More precisely, it is 10.25 kilograms (1.88 tusks per elephant with 5.45 kilogram each); see Parker, I.S.C. and Martin, E.B. 1982. "How many elephants are killed for the ivory trade?" *Oryx* XVI, 235-239. An alternate tusk weight sometimes used is 6.9 kg per elephant, which would reduce volumes by one-third, but this figure is derived from an analysis of the average weight of a raw ivory piece in illicit trade, not a whole tusk weight; See Hunter, Nigel, Esmond Martin, and Tom Milliken. "Determining the number of elephants required to supply current unregulated ivory markets in Africa and Asia." *Pachyderm* 36. January–June (2004): 116-128.
- 39 Martin, R.B. et. al., *Decision-Making Mechanisms and Necessary Conditions for a Future Trade in African Elephant ivory: Final Report*, CITES document SC62 Doc. 46.4., 2012, p. 16. "The mean tusk weight for the male ivory in all age classes is 8.36kg and that for the females is 2.55kg. This results in mean tusk weight for both genders of 5.45kg, assuming an even gender spread."
- 40 See e.g. Chiyo, P. I., Obanda, V. and Korir, D. K., 'Illegal tusk harvest and the decline of tusk size in the African elephant', *Ecology and Evolution*, 5: 5216-5229, 2015. The authors found that severe ivory harvesting in the 1970s and 1980s may have had a lasting impact on tusk sizes, since it eliminated large tuskers among survivors and elephants born thereafter had smaller tusks. Poaching can also favour the prevalence of the genetic condition of tusklessness, see Jachmann, H., Berry, P. S. and Imae, H., "Tusklessness in African

- elephants: a future trend', *African Journal of Ecology*, 33: 230-235, 1995.
- 41 To approximate the effects of selective poaching, simulation models can be applied that model the expected population structure based on various assumptions. The models investigated for this study indicated a decline of average ivory per illegally killed elephant from over 20 kg per animal prior 2007 to only some 4 to 6 kg per animals in 2016 (Martin, R., *Illegal killing of elephants and ivory production*, paper prepared for the United Nations Office on Drugs and Crime, 2019). There is, however, only limited empirical evidence that can validate the simulated outputs. In the subsequent analysis, the 'traditional' conversion ratio of roughly 10 kg per elephant is therefore used, while acknowledging the uncertainty and the potential bias behind this number. The underlying idea is that poachers face a trade-off between hunting time and tusk size: the less frequent elephants with large tusks become, the more likely it is that poachers seek out smaller elephants, which then reduces the average ivory outtake per poached elephant.
 - 42 See e.g., CITES SC65 Doc. 42.2 and SC65 Doc. 42.7, Sixty-fifth meeting of the Standing Committee Geneva (Switzerland), 7-11 July 2014; and CITES SC69 Doc 51, Sixty-ninth meeting of the Standing Committee. Geneva (Switzerland), 27 November - 1 December 2017.
 - 43 Paragraph 6. e) of Resolution Conf. 10.10 (Rev.CoP17) urges CITES parties to maintain inventories of government-held and where possible significant privately held stockpiles of ivory and inform the CITES secretariat of the level of this stock. CITES document SC70 Doc. 49.1 comments that the CITES secretariat is aware of a number of ivory thefts from government-held stockpiles, but "in order to avoid elevating potential security risks, it has not included details of the information that it has received from the Parties in [report SC70 Doc. 49.1]".
 - 44 Cerling, T. E., et al., 'Radiocarbon dating of seized ivory confirms rapid decline in African elephant populations and provides insight into illegal trade,' *Proceedings of the National Academy of Sciences*, 113.47: 13330-13335, 2016.
 - 45 Nkoke, S. C. et. al., *Ivory markets in Central Africa*, TRAFFIC, September 2017.
 - 46 The UNODC *World Wildlife Crime Report* (2016) chapter on ivory explored the possibility that ivory became an object of speculation and was being kept in stockpiles.
 - 47 Wastage of ivory in the carving process has been estimated to make up an average of 30 per cent (see Milliken, T., 'The Japanese trade in ivory: tradition, CITES and the elusive search for sustainable utilisation', in Cobb, S. (Ed.), *The Ivory Trade and Future of the African Elephant*, Ivory Trade Review Group, 1989).
 - 48 Conversion ratios for numbers seized to seized weight were applied where needed.
 - 49 Eastern and Southern Africa Anti-Money Laundering Group (ESAAMLG), *A Special Typology Report on Poaching and illegal trade in wildlife and wildlife products and associated money laundering in the ESAAMLG region*, 2016.
 - 50 This stems from the assumption that the shares of rhino horn seized outside of Africa and Asia reflect the shares traded outside of these regions. This is a strong assumption, as described in Box 3.
 - 51 While seizure data is a valuable source of information, there are limitations as the information on the origins and destinations of shipments may not be reported in a systematic way, which potentially introduces bias.
 - 52 Implying that stockpiles remain of the same size.
 - 53 2018 was approximated with an 2016-2017 average.
 - 54 These could be for local processing and markets, or these destinations could be merely way stops towards destinations outside the region. If the latter is the case for a significant portion of seized weight, the amounts reaching end-consumers would increase accordingly.
 - 55 Fieldwork involved interviews with law enforcement agencies, experts on the illegal wildlife trade from academia and NGOs, and key informant interviews. During fieldwork, 52 interviews were conducted in Central, Eastern and Southern Africa, and numerous reference publications were studied. Additional price data was provided by the Wildlife Justice Commission (WJC) and the Environmental Investigation Agency (United Kingdom), who collated price data from investigations in destination countries.
 - 56 Wildlife Conservation Society, In Plain Sight: An Analysis of Transnational Wildlife Crimes in Quang Ninh Province, Viet Nam. Hanoi: Wildlife Conservation Society Viet Nam Program, 2012.
 - 57 Extended from Basu, Gautam. "Concealment, corruption, and evasion: A transaction cost and case analysis of illicit supply chain activity." *Journal of Transportation Security* 7.3 (2014): 209-226.
 - 58 Eastern and Southern Africa Anti-Money Laundering Group (ESAAMLG), *A Special Typology Report on Poaching and illegal trade in wildlife and wildlife products and associated money laundering in the ESAAMLG region*, 2016.
 - 59 Excluding potential income from selling the meat of the elephant.
 - 60 Based on price data and average weights collected per animal.
 - 61 Fenio, K. G., *Poaching rhino horn in South Africa and Mozambique: Community and expert views from the trenches*, U.S. Department of State, November 2014.
 - 62 An interviewee in Fenio 2014 (ibid.) reported that in their village, 7-10 people all use (rent) one rifle and purchase ammunition for hunting rhinos. The respondent named police officers as possible source for the rifle.
 - 63 Fenio 2014 (ibid.) reported the widespread use of "high-tech 4x4" vehicles by poachers.
 - 64 Milliken, T. and Shaw, J., *The South Africa - Viet Nam Rhino Horn Trade Nexus: A Deadly Combination of Institutional Lapses, Corrupt Wildlife Industry Professionals and Asian Crime Syndicates*, TRAFFIC, 2012.
 - 65 Eastern and Southern Africa Anti-Money Laundering Group (ESAAMLG), *A Special Typology Report on Poaching and illegal trade in wildlife and wildlife products and associated money laundering in the ESAAMLG region*, 2016. The rhino subsequently dies either from an overdose of tranquilizers or bleeds to death, usually after the poachers are gone. It is said to take less than seven minutes to bring down the animal.
 - 66 Leggett, T. and Salgueiro, J., 'The motivations of elephant poachers in the Central African Republic,' *UNODC Forum on Crime and Society*, Vol. 9, Nos. 1 and 2, pp. 1-16, 2018.
 - 67 Moreto, William & Lemieux, A. (2015). Poaching in Uganda: Perspectives of Law Enforcement Rangers. *Deviant Behavior*. 36. 1-21. 10.1080/01639625.2014.977184.
 - 68 Ibid.
 - 69 Leggett, T. and Salgueiro, J., 'The motivations of elephant poachers in the Central African Republic,' *UNODC Forum on Crime and Society*, Vol. 9, Nos. 1 and 2, pp. 1-16, 2018.
 - 70 In subsistence poaching, if nothing else is available, even a very low expected return may motivate some to engage in poaching.
 - 71 Case Study 1 referred to services provided by this group of actors as "Dragon" service.
 - 72 UNODC World WISE Database, based on 350 analysed cases.
 - 73 UNODC World WISE Database, based on 600 analysed cases.
 - 74 Republic of Namibia Financial Intelligence Centre, *Trends and typology report No 1 of 2017: Rhino and elephant poaching, illegal trade in related wildlife products and associated money laundering in Namibia*, 2017; Eastern and Southern Africa Anti-Money Laundering Group (ESAAMLG), *A Special Typology Report on Poaching and illegal trade in wildlife and wildlife products and associated money laundering in the ESAAMLG region*, 2016.
 - 75 Further information on the 2030 Agenda – including all goals, targets and indicators – is available at the United Nations Sustainable Development Goals knowledge platform: <https://sustainabledevelopment.un.org/>
 - 76 This target calls on countries to: "[b]y 2030, significantly reduce illicit financial flows and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organised crime". Progress towards SDG target 16.4 (IFF) is measured by indicator 16.4.1, "Total value of inward and outward IFFs in current United States dollars". The United Nations Conference on Trade and Development (UNCTAD) and the United Nations Office on Drugs and Crime (UNODC) are the custodian agencies of the indicator and have worked jointly on a statistical definition and a measurement framework for the indicator, which was published in the SDG indicator metadata repository on the SDG website of the United Nations Statistics Division: <https://unstats.un.org/sdgs/metadata/files/Metadata-16-04-01.pdf>.



- 77 Cross-border bartering - the exchange of (here illicit) goods and services for other goods and services that is a common practice in illicit markets - is also considered as IFF.
- 78 A resident of a country has their centre of economic interest within the country. This definition is different from a legal one and follows the international Balance of Payments statistics, see International Monetary Fund (IMF), *Balance of Payments Manual*, Fifth Edition, 2005, para. 58. If a resident of country A pays a resident of country B in cash, it is an IFF even if both parties are at the same location.
- 79 Economists distinguish between spending for acquiring utility (consumption of goods and services) and spending for acquiring future income, which is investment. Savings (e.g., in bank accounts for gaining interest) are part of investments.
- 80 There may be cases where all the net income from trafficking is available to the trafficker, for example, if all daily consumption needs are covered by other, legitimate businesses. However, on average, some of the net income will stay in the country where it has been generated.
- 81 See, for example, Case Study 2.
- 82 A Monte Carlo simulation calculates the potential outcomes of a large number of hypothetical scenarios. Its results reflect possible IFFs depending on different model inputs.
- 83 In the supply chain model used, both markets have a theoretical maximum value of IFF transactions when all 6 different trade levels are in 6 different jurisdictions and if all transactions between the actors are IFF. The resulting maximum IFF are an annual US\$540 million for rhino horn and \$720 million for ivory. The maxima presented in the paragraph are the maximum model outputs.