Supply and value chains and illicit financial flows from the trade in ivory and rhinoceros 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 monetize 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 (for example 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 Nations[5] 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 crime. 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 is necessary because it 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

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

The 'value' of an illegal activity can be defined in different ways, depending the purpose of the estimates and the conceptual framework behind the estimates.
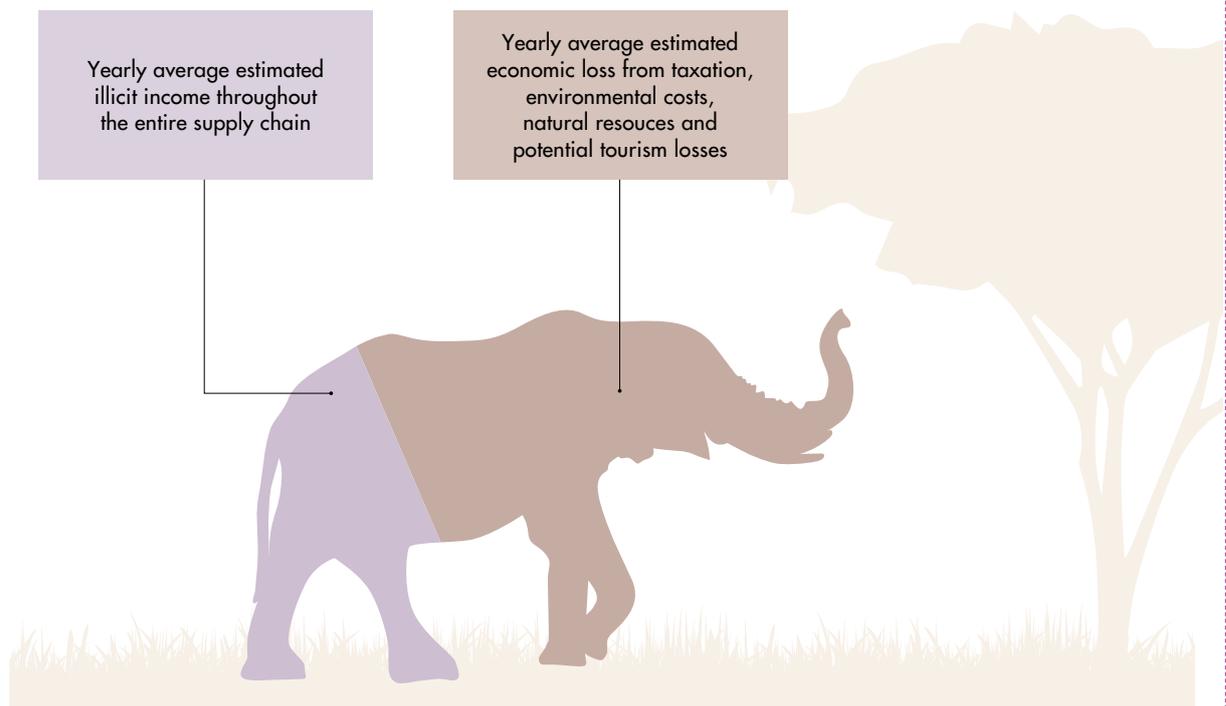
In economic terms, the value of an activity can be measured by the overall income they generate, be it licit or illicit income. Estimating markets in economic terms often involves estimating the amounts produced and sold, and the value thereof. Such measurements are (most often) direct estimates, which 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] for example 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 for example 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.

Yearly average estimated illicit income throughout the entire supply chain

Yearly average estimated economic loss from taxation, environmental costs, natural resouces and potential tourism losses

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.

from (newly) illegally killed animals 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, Eastern 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 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 for 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.

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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]
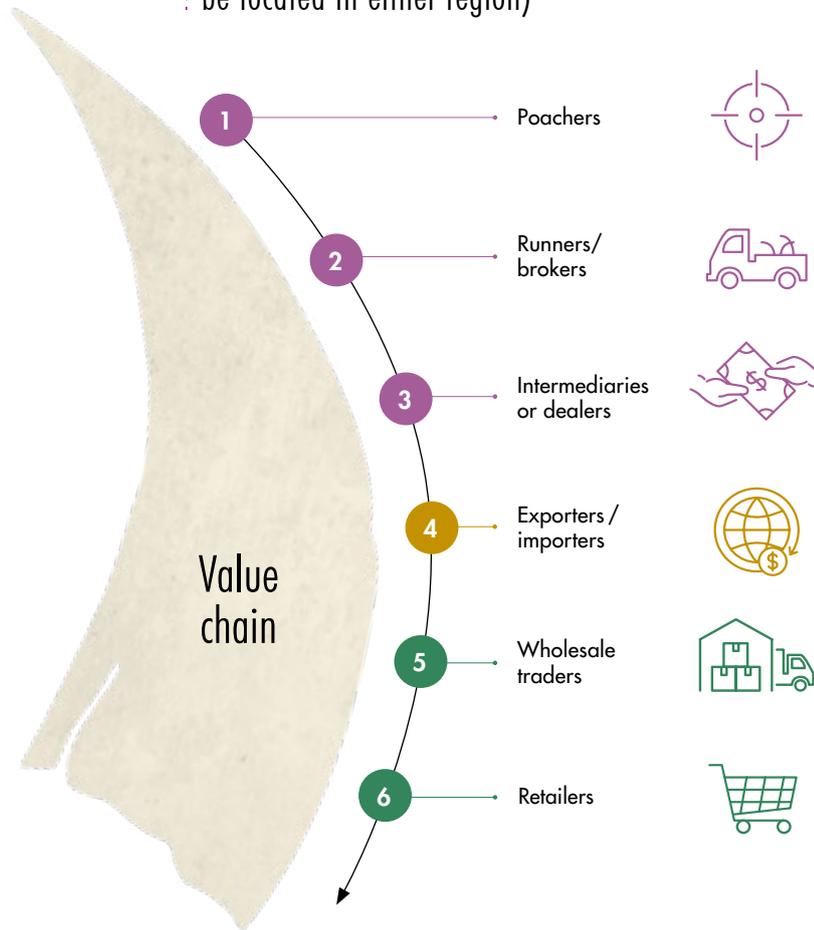
Exporters/importers are usually part of organized crime groups. They facilitate international trafficking (for example, by using front companies and corrupting authorities), and carry out packing, preparation of paperwork and export of the products. Packing may involve specialists who make use of fake 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 processed[22] 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)

1. Poachers
2. Runners/brokers
3. Intermediaries or dealers
4. Exporters/importers
5. Wholesale traders
6. Retailers

Value chain

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 citizenship 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
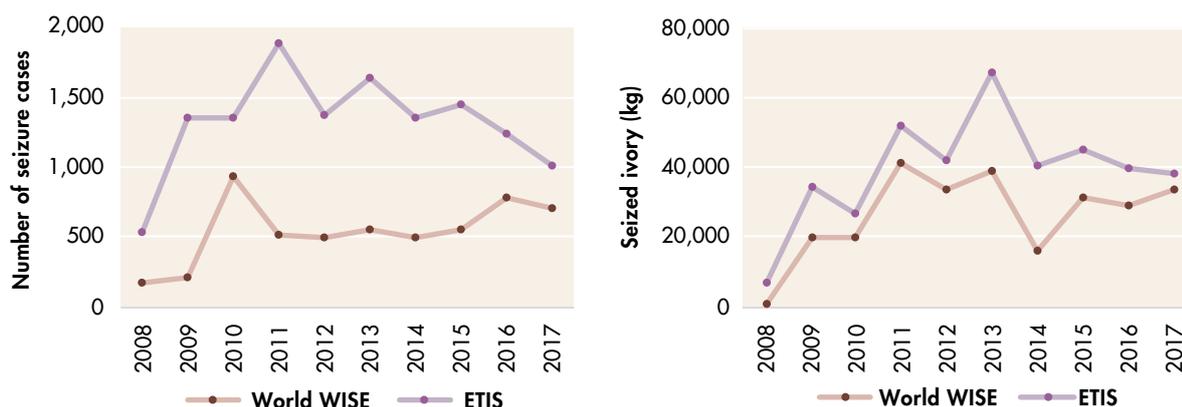
Source: Source: ETIS[a] and UNODC World WISE database

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 reports[24] 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 kg or 2.78 kg each.[30] This yielded some 2,100 horns[31] 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. It was estimated that an annual average of 113 horns or 314 kg 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 Tons of rhino horn entering the illegal market, annual average 2016-2018

Horn from poached animals	5.8 tons	
Recoveries in the field	- 0.5 tons	
Horn from other sources	+ 0.3 tons	
Horn entering the illegal market	= 5.6 tons	

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 ± 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
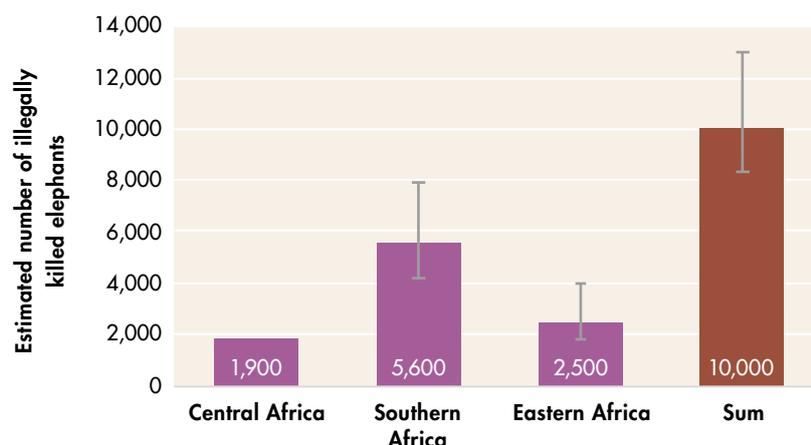
Source: UNODC estimates based on modelling by George Wittemyer

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 kg[38] 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 decreased[40] 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 purchased by end consumers, seized by

Fig. 5 Flows of illicit ivory and rhino horn products, by destination
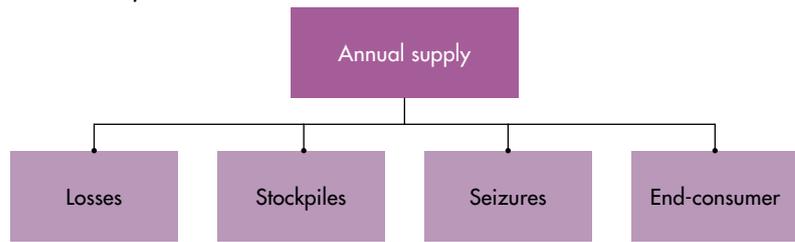
Source: UNODC

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 items[47] 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 kg[48] 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 4 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 2 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]
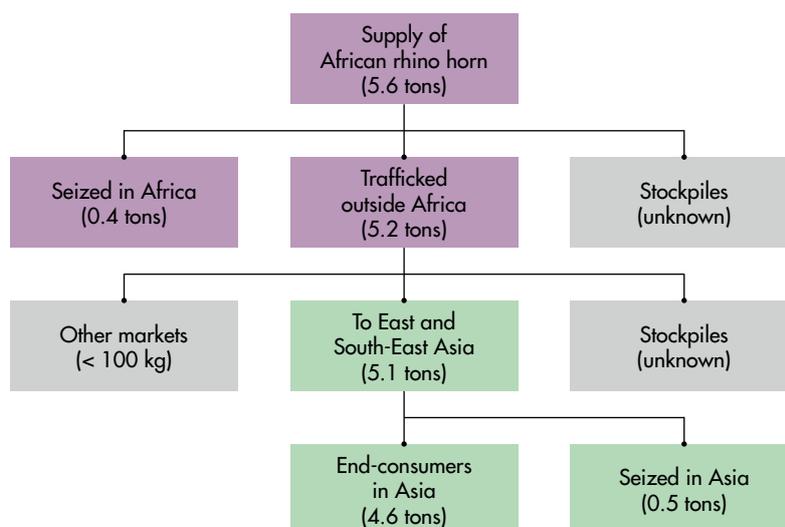
Ivory

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 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 between 2016 and 2018. The gross income is the overall income made by retailers. These estimates pertain to the quantities reaching South-East and East Asia.
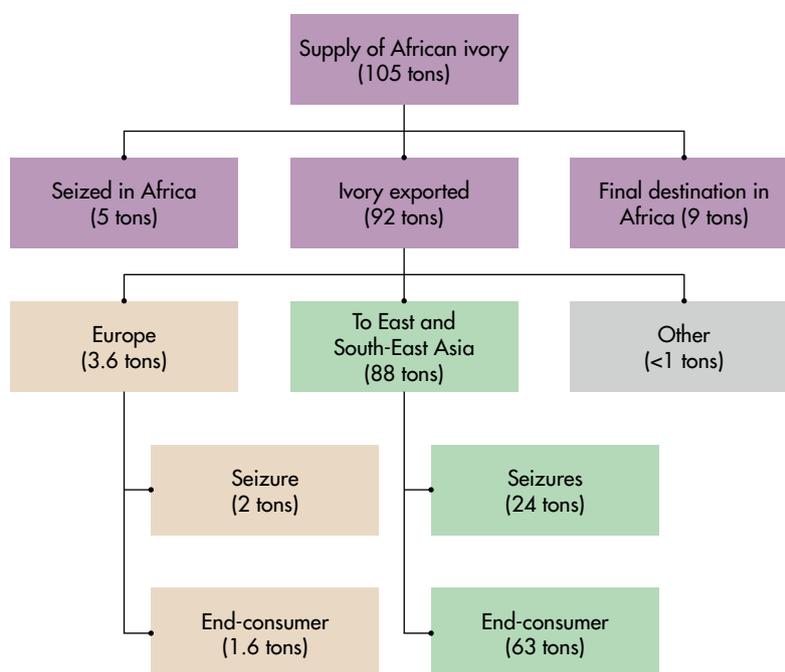
Fig. 6 Flows of rhino horn, annual estimates based on 2016-2018 data

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.

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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.

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 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.
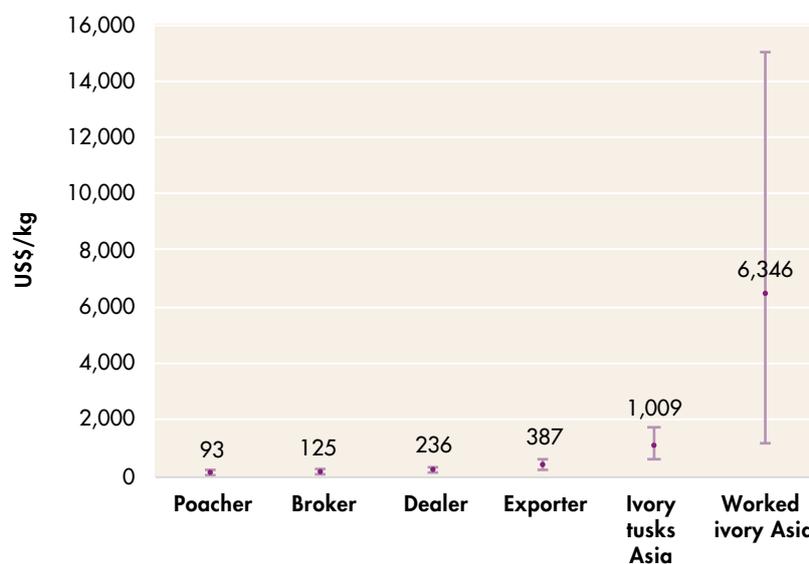
Fig. 8 Variation of price data for rhino horn, by trade level, multi-year average, 2014-2018
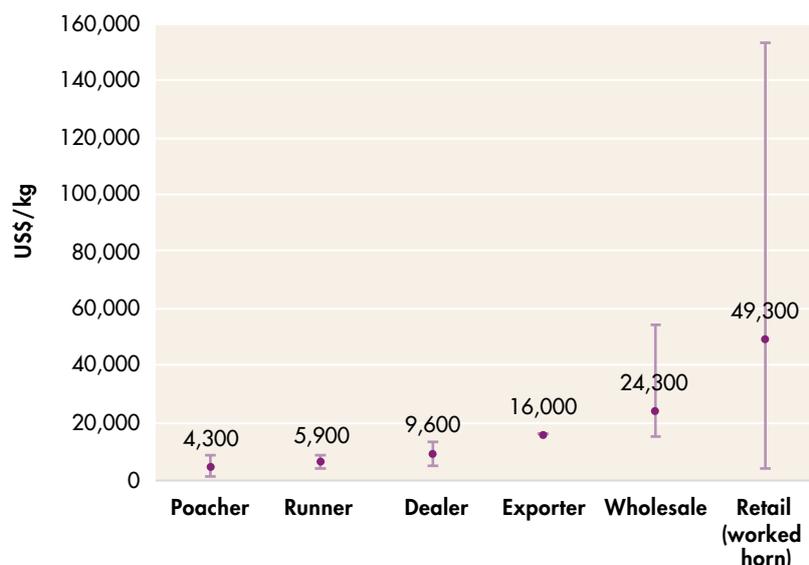
Source: UNODC estimations based on data collected in 52 field interviews and available literature (poacher to exporter) and on data provided by the Wildlife Justice Commission and the Environmental Investigation Agency, UK (wholesale to retail). Mid-points are a simple average of all observations (weighted 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 kg-prices between different actors in the supply chain, rhino horn and ivory, average 2014-2018
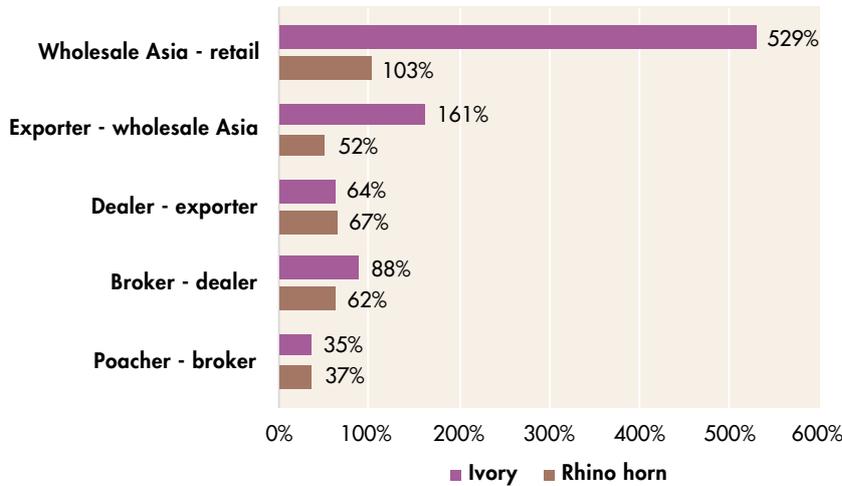
Source: UNODC estimations

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 the 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.

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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 F*orum 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]

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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.

Gross income =
*Quantity purchased * 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.

Net income =
Gross income - 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.

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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 an 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 (p. 121) shows 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 4 to 10 per cent of the sales value. A different study[56] 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 and 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 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 cost 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 kg of rhino horn is 55 times more valuable than a kg 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. Fenio[61] 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 Salgueiro[66] 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 Lemieux[67] 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 mentioned[68] 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 Salgueiro[69] 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 profitable[70] even when much lower 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 group[71] 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.[a]

The case provided evidence for a number of distinct practices:[b]

• The OCG consisted of individuals operating from China.[c]

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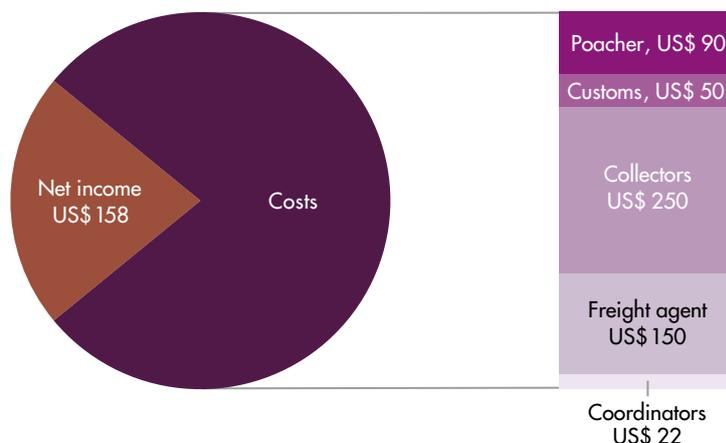
A single shipment of large size requires a large number of persons involved and the organizers behind the trade use complex structures to distance themselves from the predicate offence of poaching.

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

a   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.

b   Ibid.

c   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."

Fig. 11 Gross and net income (US$ per kg) of ivory traffickers in the "Shuidong Connection", 2016.

Poacher, US$ 90
Customs, US$ 50
Collectors US$ 250
Freight agent US$ 150
Coordinators US$ 22

Net income US$ 158

Costs

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 (US$)	OVERALL EXPENDITURE (US$)
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 kg 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
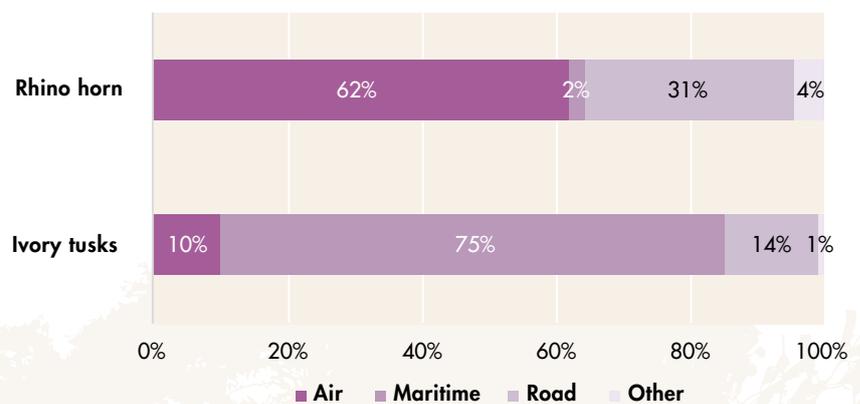
Source: UNODC World WISE Database

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 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 was soon after referred to as the "Ivory Queen". Intensifying 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.

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 perpetrators 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 court records:

• 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 citizens 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.

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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.

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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 Development[75] identified the reduction of illicit financial flows (IFFs) as a priority area to build peaceful societies around the world. Countering IFFs is considered a 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 (for example, 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 125.15 kg. 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 Ataturk 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] and the Wildlife Justice Commission documented 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 kg 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.

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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

IVORY

Illicit financial flows in income generation	Illicit income from the illegal trade	Illicit financial flows from the income management
US$10 – 570 million	**US$400 (310 – 570) million**	**No estimate available**
	Illicit gross income	
	Illicit net income = Illicit gross income – Intermediate expenditure	
IFFs cross borders		IFFs cross borders

RHINO HORN

Illicit financial flows in income generation	Illicit income from the illegal trade	Illicit financial flows from the income management
US$24 – 390 million	**US$230 (170 – 280) million**	**No estimate available**
	Illicit gross income	
	Illicit net income = Illicit gross income – Intermediate expenditure	
IFFs cross borders		IFFs cross borders

Note: **Illicit financial flows** are cross-border flows of illicitly generated, transferred or used income. IFFs emerge from the trade in ivory and rhino horn (income generation) and from the use of the generated net income for consumption or investment outside of the supply chain (income management).

Illicit income is the money made from the illegal trade by all actors in the supply chain. It is the value of all goods traded and can be broken down in illicit net income and intermediate expenditure.
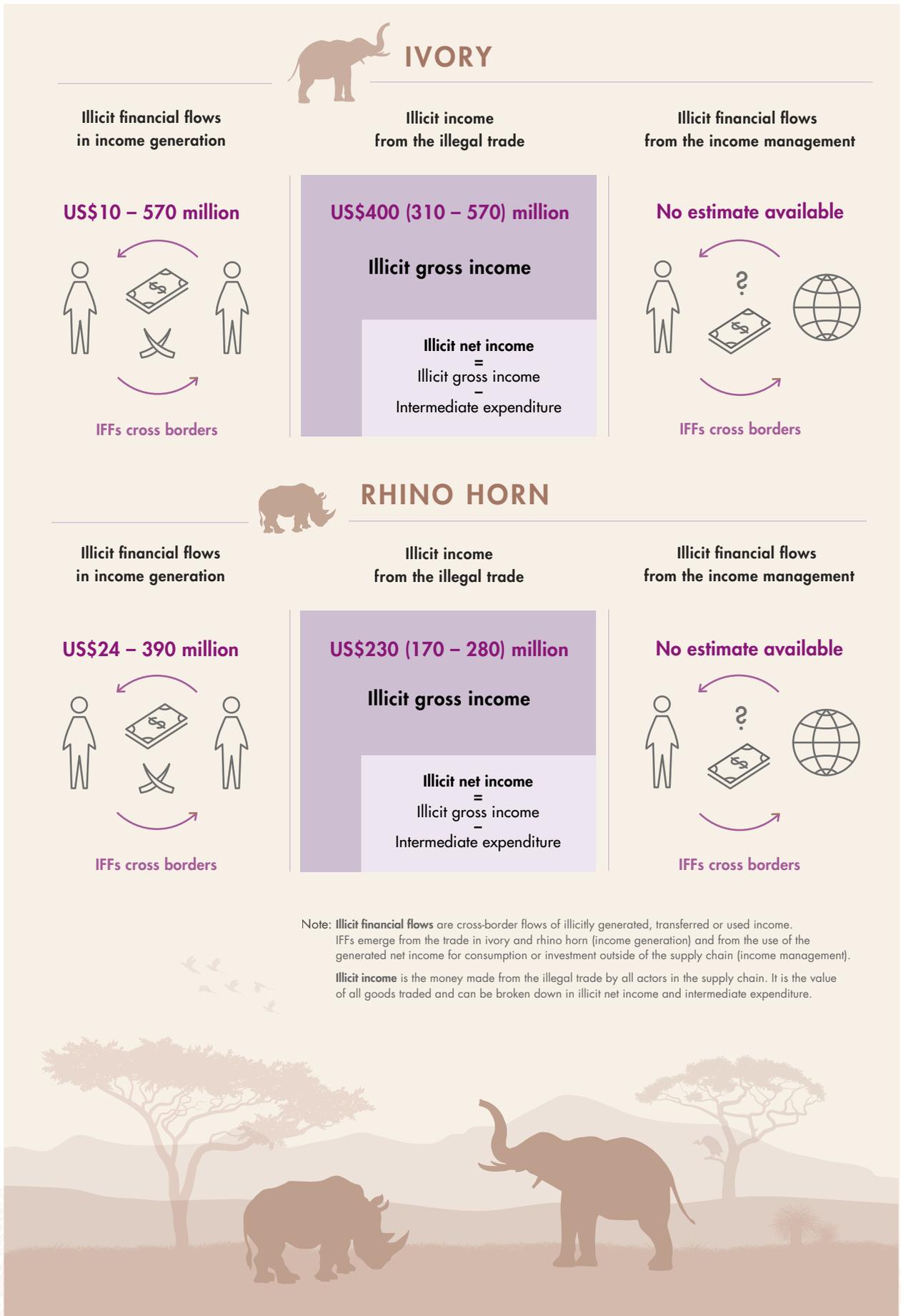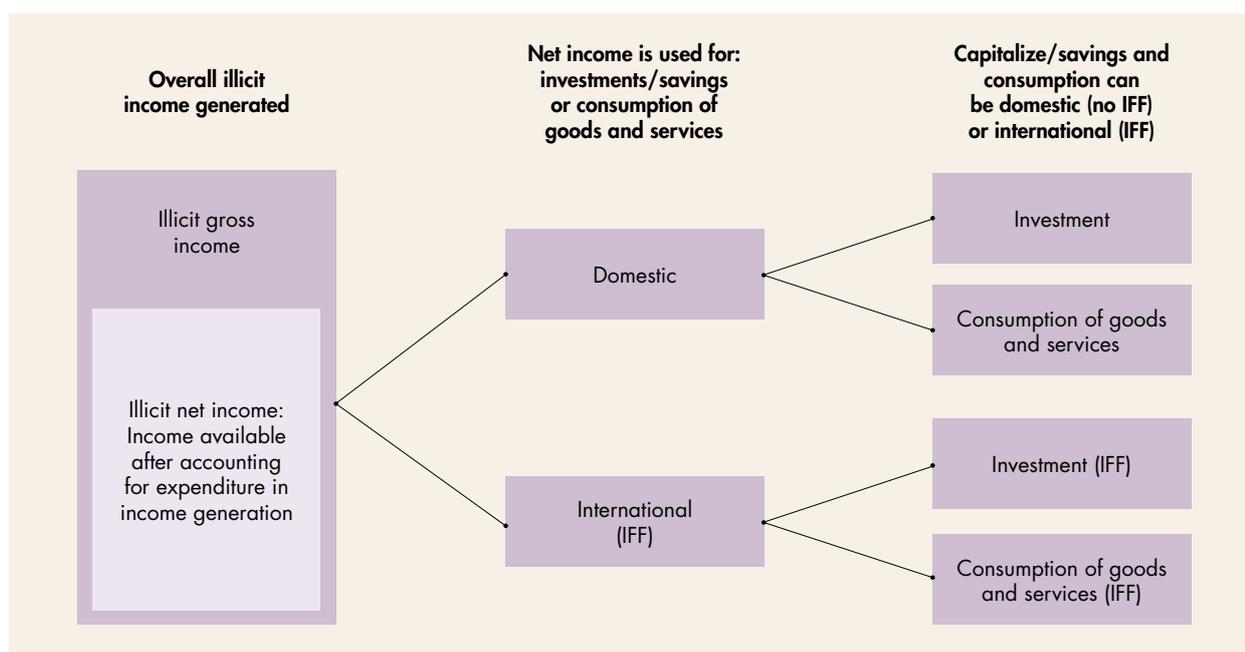
Fig. 14 Streams of illicit income management (IFF and non-IFF)

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 place[80] 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 (for example, 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 consumptions 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]

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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 Veeramacheneni, 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., Miclaus, 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 4 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 the trafficking of ivory and rhino horn (US$ millions) 2016-2018
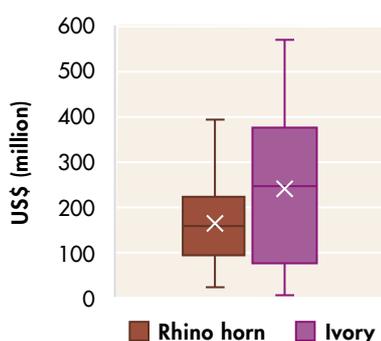
Note: based on ~14,000 possible scenarios. The depicted box shows the range of 50% of all values for each commodity; the whiskers show (here) the maximum and minimum values possible. The simulated lengths of the supply chain followed a truncated normal distribution with mean 3.5 for rhino horn and 4.5 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.

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 bank-

ing 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 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 tranquillizers 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.