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OF WILD FAUNA AND FLORA



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RHINO HORN TRAFFICKING AS A FORM OF TRANSNATIONAL ORGANISED CRIME (2012–2021):
2022 GLOBAL THREAT ASSESSMENT

1. This information document is submitted by the United Kingdom of Great Britain and Northern Ireland on behalf of the Wildlife Justice Commission and World Wide Fund for Nature in relation to agenda item 75.*

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**Rhino horn trafficking as a form of transnational organised crime (2012–2021):
2022 Global Threat Assessment**



Submitted by the United Kingdom of Great Britain & Northern Ireland at the request of the Wildlife Justice Commission and World Wide Fund for Nature, in relation to agenda item 75.

This document presents the Executive Summary of the *Rhino Horn Trafficking as a Form of Transnational Organised Crime (2012-2021): 2022 Global Threat Assessment*, prepared by the Wildlife Justice Commission with the support of WWF, as a comprehensive analysis of rhino horn trafficking during the decade from 1 January 2012 to 31 December 2021.

The threat assessment was compiled from the analysis of 674 rhino horn seizure incidents that occurred globally during this decade, in addition to seven years of criminal intelligence and findings from Wildlife Justice Commission investigations into rhino horn trafficking conducted since 2015, and other open-source research.

This document aims to provide information to support Parties in the implementation and enforcement of CITES and rhino-related decisions and proposals.

The key findings and recommendations are provided below, and the text of the Executive Summary follows. For further reading, the full threat assessment is available at <https://wildlifejustice.org/>.

Key findings

- **Six countries and territories have dominated rhino horn trafficking routes**

Although more than 50 countries and territories were implicated in rhino horn trafficking over the decade, six have dominated the supply chain as source, transit, and destination locations: South Africa, Mozambique, Malaysia, Hong Kong SAR, Vietnam, and China.

- **Weight of rhino horn seizures increased, despite a reduction in poaching**

More than 7.5 tonnes of rhino horns were seized globally during the decade. The average shipment weight increased markedly after 2017, despite a reduction in rhino poaching across Africa and the COVID-19 pandemic. This could indicate a greater involvement of organised crime groups as larger volumes of product are moved to increase profit margins per shipment.

- **Criminal groups routinely exploit legal stockpiles of rhino horns for illegal trade**

Analysis indicates that at least 974 kg and potentially up to one-third of all seized rhino horns globally originated from the theft or illegal sale of both privately-owned and government-owned legally held stockpiles. This avenue of supply may have increased since the moratorium on domestic rhino horn trade in South Africa was lifted in 2017.

- **Rhino horn is most frequently smuggled as a sole wildlife commodity**

This may reflect a more specific supply chain or the need to move product quickly to maintain its “freshness”. Even so, rhino horn trafficking is not a specialised crime type, with the same criminal networks often dealing in an array of illicit commodities.

- **Rhino horns are most frequently smuggled on commercial airlines**

However, the modus operandi is shifting from small shipments in passenger luggage to larger shipments by air cargo. This trend began prior to the pandemic and coincided with the use of more direct smuggling routes. Few maritime shipment seizures have been made, suggesting inadequate law enforcement targeting of this mode of transport.

- **One-third of rhino horns are smuggled unconcealed**

Rhino horn shipments are most often smuggled with no concealment at all, which is a notable difference from other wildlife products and illicit commodities generally. It could suggest traffickers are more reliant on corrupt elements to move rhino horn shipments through the supply chain, making it unnecessary to disguise the products.

- **Predominantly online trade in closed networks**

The use of online trade, social media platforms, and instant messaging apps has increased substantially to become the most important channel through which rhino horn is distributed in the

illegal trade. The use of WeChat has notably declined due to fear of law enforcement detection, with many traders switching to WhatsApp, Telegram and Signal, which are perceived to be safer.

- **Prolific Vietnamese and Chinese criminal networks are driving the trafficking throughout the supply chain**

Although Vietnam is known to be a primary destination for rhino horn, investigations indicate a substantial proportion of the horn entering Vietnam is sold to Chinese buyers and smuggled overland into China. This suggests Vietnam is a highly significant transit and distribution area for products ultimately bound for China.

- **Strong demand for carved rhino horn products**

Investigations indicate there is a strong demand for rhino horn in China for its potential as an investment item and carved products such as jewellery and decorative artefacts. Only a small amount of horn appears to be in demand for medicinal purposes, usually the offcuts and leftover pieces following the carving process. These findings contradict the current narrative that the main market for rhino horn is driven by Vietnamese demand for use in health tonics and hangover cures.

- **The value of rhino horn is rising**

Analysed trends suggest the value of rhino horn declined across the supply chain to its lowest levels in 2020, but they are now increasing again. Investigations have consistently found the wholesale rhino horn value in destination countries to be less than one-third of the USD 65,000/kg value that is commonly cited in the media. Despite this, it retains a much higher value than other wildlife commodities such as elephant ivory, which may explain its continued demand in the marketplace.

Recommendations

1. Countries must enact their international commitments to treat wildlife crime as a form of transnational organised crime. The response across the entire supply chain must be geared towards tackling transnational organised crime in terms of resources and approach.
2. Targeted strategies and actions should be developed by all countries and territories along the trafficking routes to prevent or reduce the opportunity for corrupt behaviour. Investigations should also increase the focus on identifying and removing the corrupt elements enabling crime.
3. The perception of wildlife trafficking as a low-risk, high-reward crime must be quashed to counter its growing allure to organised crime. Law enforcement agencies should take pre-emptive action against new threats of non-traditional criminal methods including trade on the dark web and the use of cryptocurrency, which are likely to grow in significance.
4. Broader and more consistent use of advanced and sophisticated law enforcement practices, such as controlled deliveries and international cooperation, is essential to investigate network members located in all countries along the supply chain and prevent crime displacement.
5. Systematic application of intelligence and analysis is needed to identify and map out criminal network members and to tackle the problem from an organised crime perspective.
6. Consideration should be given to greater use of financial investigation in parallel with criminal investigations to identify proceeds of crime and facilitate asset recovery, which is proven to achieve a deterrent effect.
7. Diversion of stockpiled horns into illegal trade must be curbed to ensure supply chain integrity. Given the links between the movement of horn from illegally killed rhinos and harvested horns, these two supply chains should be managed as a connected threat.
8. Demand reduction and behavioural change initiatives have a long-term but vital role to play. However, there is an apparent gap in knowledge about the nature and scale of Chinese demand for rhino horn, and accordingly, more research and investment are needed to improve insight into these markets.

Acronyms

CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DFFE	Department of Forestry, Fisheries, and the Environment
DRC	Democratic Republic of Congo
PDR	(Lao) People's Democratic Republic
RMB	Chinese Renminbi
SAR	(Hong Kong) Special Administrative Region
UNODC	United Nations Office on Drugs and Crime
USD	United States Dollar

Introduction

Rhino horn trafficking remains a severe problem that needs to be addressed with a new sense of urgency as transnational organised crime.

This threat assessment presents a comprehensive analysis of rhino horn trafficking during the decade from 1 January 2012 to 31 December 2021.

It was compiled following an analysis of 674 rhino horn seizure incidents collected from open-source reports that occurred globally during this decade, in addition to seven years of criminal intelligence and findings from Wildlife Justice Commission investigations into rhino horn trafficking conducted since 2015, and other open-source research. (Refer to Appendix 1 for details on the methodology).

This assessment aims to examine the driving forces behind the trade and changes in the criminal landscape. It also considers the threat to rhinos in 2022, with recommendations to help inform interventions to address this issue and ensure the global response is commensurate and appropriately targeted to current and future needs.

1. Overview of the past decade of rhino horn trade

In 2012, South Africa and Vietnam were identified as forming the nexus of a rhino poaching crisis with new criminal dimensions that had not previously been observed, involving unscrupulous wildlife professionals, complicit government officials, and Asian criminal networks. At that time, insight into the potential role of other countries was hazy, there was scant data available on the rhino horn market in Vietnam, and little understanding of the structure of criminal supply chains.¹

Ten years on the intelligence picture is considerably richer. However, despite extensive interventions in many countries to tackle crimes relating to rhinos, none have led to a sustained decline in illicit trade or the value of rhino horn as a criminal commodity.

While poaching rates across Africa have decreased by more than 50% since the peak in 2015, they remain high at equivalent levels seen at the start of the crisis.² Poached horns from South Africa continue to be a key source for the illicit supply chain.³ Investigations indicate the main consumer market is China where rhino horn is in demand primarily as luxury carved products sought-after for their rarity as collectable items and the prestige of ownership. Vietnam continues to be a key market, while also being a crucial gateway for rhino horn trade into China.⁴ Only a small proportion of horn is in demand for medicinal purposes, usually sourced from the offcuts and leftover pieces following the carving process.⁵

¹ Milliken, T. and Shaw, J. (2012), [The South Africa – Vietnam Rhino Horn Trade Nexus](#). TRAFFIC, Johannesburg, South Africa.

² CITES CoP19 Doc.75 (Annex 4), 'African and Asian Rhinoceros – Status, Conservation and Trade', prepared by IUCN Species Survival Commission's African and Asian Rhino Specialist Groups and TRAFFIC, pp.30-31.

³ Ibid.

⁴ Based on intelligence and findings from Wildlife Justice Commission investigations.

⁵ Wildlife Justice Commission (2017), [Operation Phoenix Briefing](#);

Wildlife Justice Commission, (2017), [Black Business: Illegal Rhino Horn Trade Dynamics in Nhi Khe, Viet Nam from a Criminal Perspective](#).

2. Key findings on criminal dynamics

(i) Six countries and territories have dominated rhino horn trafficking routes

Seizure analysis reveals that although more than 50 countries and territories were implicated in rhino horn trafficking over the decade, six dominated the supply chain as source, transit, and destination locations: South Africa, Vietnam, Mozambique, China, Malaysia, and Hong Kong SAR (Table 1). From 2018 onwards, there was a notable shift towards more direct trafficking routes to Vietnam and China with fewer transit points. During 2020–2021, trafficking routes became more consistent and simplified, assessed to be due to the limited availability of transportation options during the COVID-19 pandemic.⁶

Table 1: Top 10 countries and territories implicated in 100 kg or more of rhino horn seizures as origin, transit, or destination locations, 2012-2021.

Country/territory	Weight (kg) and proportion of horns seized (%) per period ⁷					
	2012-2013	2014-2015	2016-2017	2018-2019	2020-2021	Total
South Africa	424 (45%)	303 (26%)	975 (55%)	1,357 (56%)	695 (54%)	3,754 (49%)
Vietnam	284 (30%)	395 (34%)	307 (17%)	598 (25%)	431 (34%)	2,015 (27%)
Mozambique	169 (18%)	435 (38%)	240 (14%)	411 (17%)	39 (3%)	1,294 (17%)
China	122 (13%)	236 (21%)	167 (9%)	657 (27%)	42 (3%)	1,224 (16%)
Malaysia	42 (4%)	142 (12%)	51 (3%)	239 (10%)	414 (32%)	888 (12%)
Hong Kong SAR	70 (7%)	56 (5%)	270 (15%)	255 (10%)	3 (1%)	654 (9%)
Kenya	62 (7%)	33 (3%)	282 (16%)	3 (1%)	6 (1%)	386 (5%)
Qatar	70 (7%)	89 (8%)	90 (5%)	103 (4%)	15 (1%)	367 (5%)
United Arab Emirates	6 (1%)	22 (2%)	24 (1%)	273 (11%)	0	325 (4%)
Namibia	0	12 (1%)	107 (6%)	25 (1%)	83 (7%)	228 (3%)

(ii) South Africa and Vietnam continue to be the two countries most consistently implicated in rhino horn trafficking

South Africa was linked to half of all rhino horns seized globally and Vietnam to just over a quarter. Although not unexpected given South Africa has the world’s largest rhino population, the consistent level of trafficking implicating these two countries is indicative of the extent to which criminality is embedded in both. Barring a few recent and notable exceptions, the lack of prosecutions and convictions of high-level criminals has enabled transnational organised crime networks to continue their operations with minimal disruption.

(iii) Malaysia is playing an increasingly important role as a transit point for shipments from Africa to Asia

The volume of seized horns linked to Malaysia has grown substantially since 2018. During the last two years in particular, Malaysia emerged as the dominant transit point linked to 32% of all rhino horns seized globally, displacing Hong Kong SAR as the major Asian transit point. This could be related to factors such as the perceived reliability of Malaysian air and seaports to guarantee the protection of shipments and the presence of key transport facilitators in the country.

⁶ Refer to Appendix 2 for more detailed analysis of the variations in trafficking routes.

⁷ Note: In this table, rhino horn seizures were attributed to all the jurisdictions that were reported to be along the trafficking route, not only the jurisdiction that made the seizure. The percentages in this table represent the weight of rhino horn seizures each jurisdiction was implicated in as a proportion of the total weight of rhino horn seized globally during each period. Because a seizure can be counted more than once if it is attributed to multiple jurisdictions as source, transit, or destination locations, the percentages do not add up to 100%.

(iv) Weight of rhino horn seizures increased, despite a reduction in poaching

More than 7.5 tonnes of rhino horns were seized globally during the decade. The average shipment weight increased markedly after 2017, growing by 52% to 28.7 kg in 2018–2019, and then by another 55% to 44.5 kg in 2020–2021 (Figure 1). This trend occurred despite an overall reduction in rhino poaching across Africa and the disruption in supply chain logistics associated with the COVID-19 pandemic that is believed to have led to an overall reduction in global wildlife smuggling.⁸ This expansion in the size of shipments could indicate a greater involvement of organised crime groups as the trade is monopolised by fewer key networks rather than many disparate actors, while higher volumes of product are moved to increase the profit margins per shipment.

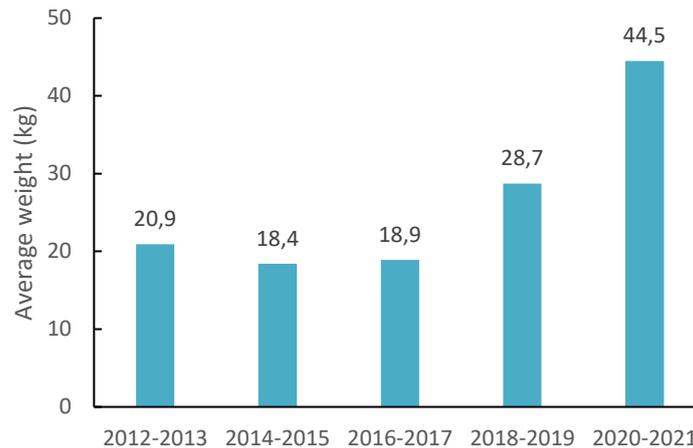


Figure 1: Average weight (kg) of smuggled shipments of African rhino horns, 2012–2021

(v) Criminal groups routinely exploit legal stockpiles: significant quantities of harvested horns are diverted into illegal trade

Intelligence gathered by the Wildlife Justice Commission indicates that criminal groups routinely access stockpiles of harvested rhino horns for the illegal trade. Some suppliers send mixed shipments comprising 20–40% poached horns with 60–80% harvested horns, suggesting they also have connections to rhino poaching networks. This is evidenced through the detection of such shipments (Image 1) and is indicative of entrenched and organised criminality. It appears this avenue of supply may have increased following the lifting of the moratorium on the domestic rhino horn trade in South Africa in 2017 (Figure 2).⁹

During 2016–2021, at least 974 kg of rhino horns seized in 11 incidents (representing 18% of all horns seized during this period) originated from the theft or illegal sale of both private- and government-owned legally held stockpiles. The seizures included, from South Africa: the 2019 seizure of 181 horns from private rhino breeder John Hume’s stocks,¹⁰ and 19 horns seized in 2021 linked to game farmer Dawie Groenewald but originating from a government stockpile;¹¹ and in China, a 2019 seizure of 250 kg of rhino horn that included 70 microchipped horns.¹²

⁸ A reduction in illegal wildlife seizures was observed during the pandemic, while intelligence from wildlife traffickers indicated they had struggled to move shipments across borders during this period: Wildlife Justice Commission (2020), [Rapid assessment of the Impact of COVID-19 on Wildlife Trafficking](#).

⁹ https://www.dffe.gov.za/mediarelease/molewa_notes_constitutionalcourtdecision

¹⁰ <https://www.iol.co.za/pretoria-news/news/breeder-fails-to-get-back-181-confiscated-rhino-horns-worth-r10-million-1fbdcfce-e764-4f55-937c-a63e4338393f>

¹¹ <https://www.iol.co.za/pretoria-news/news/game-farmer-businessman-caught-with-rhino-horns-get-bail-f82fb080-f018-4949-92d0-649f7efdbae6>

Intelligence later gathered on the case suggested the horns originated from a government stockpile at a North West reserve and were supplied to Groenewald by a corrupt conservation official.

¹² <https://www.chinanews.com.cn/sh/2021/07-19/9523130.shtml>

Further analysis of the seizure data indicated an additional 1,546 kg of rhino horns over the whole decade were potentially diverted from legal stockpiles. The combined total of 2,520 kg represents around a third of all rhino horns seized globally.



Image 1: A shipment of 82.5 kg of rhino horns seized in Hong Kong SAR in April 2019 that contains both poached horns and several with a smooth, flat top and a flat base (commonly referred to as “bread loaves” in the illegal trade), indicating they could have resulted from a second or subsequent dehorning procedure. Source: Hong Kong Customs.

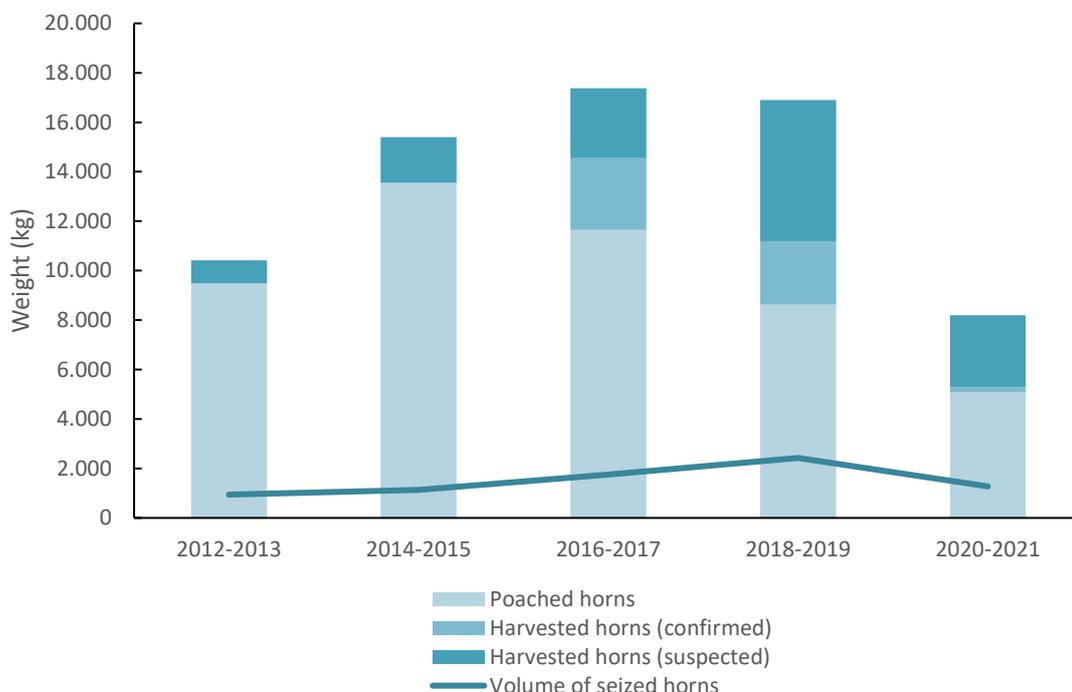


Figure 2: Estimated supply of African rhino horns entering illegal trade 2012–2021 based on reported rhino poaching in Africa and estimated diversion from legal stockpiles, compared to the volume of horns detected and seized globally by law enforcement authorities. (Refer to Appendix 3 for detailed calculation notes).

(vi) One-third of rhino horns are smuggled unconcealed, suggesting a reliance on corruption to move shipments along the supply chain

Seizure reports reveal that rhino horn is most frequently smuggled without concealment, accounting for one-third of all horns seized by volume. This is a notable point of difference from other wildlife products trafficked from Africa to Asia, such as elephant ivory¹³ and pangolin scales,¹⁴ which are almost invariably hidden within a cover load of legal commodities. The lack of concealment suggests traffickers could be reliant on corrupt elements to move rhino horn shipments through the supply chain, rendering it unnecessary to disguise the products.

(vii) Rhino horns are most frequently smuggled on commercial airlines, but the trend is shifting from small shipments in passenger luggage to larger shipments by air cargo

Horns smuggled in passenger luggage accounted for 143 cases totalling 1,920 kg, peaking in 2016–2017 with 48 cases then declining to just six cases in 2020–2021, possibly due to COVID-19-related travel restrictions. Although air cargo seizures remained comparatively low during the decade, with 17 cases totalling 854 kg, the volume of horns seized from this modus operandi increased markedly from 2018–2019.¹⁵ These trends began prior to the pandemic and coincided with the use of more direct smuggling routes, pointing to the greater involvement of organised crime groups and their ability to move large volumes of product through more streamlined supply chains.

Although there were no notable trends in the number of seizures or weight of horns smuggled by sea (12 seizures totalling 676 kg during the decade), several large seizures highlight the threat this transportation method poses, including the seizure of 250 kg of rhino horn en route from Mozambique to China by a fishing vessel in 2019.¹⁶ Wildlife Justice Commission investigation findings suggest that many major rhino horn shipments have been successfully transported by sea, but the fact that so few have been intercepted could suggest it is an under-represented threat.¹⁷

(viii) Rhino horn is most frequently smuggled as a sole wildlife commodity

Rhino horn is most frequently smuggled out of Africa as a sole wildlife product (representing 80% of seizures), rather than in mixed shipments with other commodities. The reasons for this are complex, possibly reflecting a more specialised rhino horn supply chain or the need to move product quickly to maintain its “freshness”.¹⁸ However, rhino horn trafficking is not a specialised type of crime and criminal networks will deal in whichever commodities are lucrative and in demand.

¹³ Wildlife Justice Commission (2019), [Snapshot Analysis on Ivory Smuggling 2015-2019](#).

¹⁴ Wildlife Justice Commission (2020), [Scaling Up: The Rapid Growth in the Industrial Scale Trafficking of Pangolin Scales \(2016-2019\)](#).

¹⁵ 75% of the volume of horns seized from air cargo (639 kg) occurred in the years 2018-2021.

¹⁶ <https://www.chinanews.com.cn/sh/2021/07-19/9523130.shtml>

¹⁷ For example, the Wildlife Justice Commission has collected intelligence of at least three maritime shipments that were successfully imported into Vietnam: 300 kg of rhino horn and 10 tonnes of ivory in 2017, 200 kg of rhino horn in 2018, and another of 400 kg of rhino horn, 7 tonnes of ivory, and 2 tonnes of shark fins in 2018.

¹⁸ Intelligence collected during Wildlife Justice Commission investigations indicates that “freshness” is a desirable characteristic of rhino horns in the illegal trade, with horns commonly available for sale one day and sold the next in a fast-moving supply chain.

(ix) Poor detection of rhino horn trafficking in transit locations

Law enforcement detection of illegal rhino horn shipments in key transit locations is generally low (Table 2). This is particularly true for Malaysia in 2020–2021 and also for the United Arab Emirates and Qatar. Seizure data indicate the latter is a frequently used transit location, yet Qatar has only ever made one publicly reported rhino horn seizure.¹⁹ There may be less incentive for authorities to profile or inspect transiting shipments, but it appears there is an opportunity for enhanced law enforcement efforts.

Table 2: Detection rates per period for jurisdictions most frequently linked to rhino horn smuggling, 2012-2021.

Country/territory	2012-2013		2014-2015		2016-2017		2018-2019		2020-2021		Total Links
	Links	Detection									
South Africa	43	79 %	47	74 %	80	71 %	79	61 %	27	81 %	276
China	25	60 %	41	80 %	21	57 %	50	82 %	18	67 %	155
Vietnam	26	54 %	34	41 %	29	59 %	37	35 %	20	45 %	146
India	11	64 %	26	81 %	27	74 %	18	61 %	13	77 %	95
Hong Kong SAR	6	50 %	7	43 %	28	43 %	26	54 %	1	0 %	68
Mozambique	12	58 %	18	56 %	16	38 %	18	44 %	3	33 %	67
Namibia	0	N/A	2	100 %	14	64 %	6	100 %	21	90 %	43
Qatar	7	0 %	4	25 %	6	0 %	8	0 %	3	0 %	28
Kenya	5	40 %	8	63 %	8	25 %	2	100 %	1	100 %	24
Nepal	0	N/A	7	86 %	3	67 %	3	100 %	10	90 %	23
Thailand	8	38 %	4	50 %	9	56 %	2	0 %	0	N/A	23
Indonesia	1	0 %	0	N/A	9	44 %	4	75 %	0	N/A	14
Malaysia	1	0 %	1	0 %	3	33 %	3	33 %	6	17 %	14
Singapore	1	0 %	4	50 %	4	25 %	1	0 %	4	50 %	14
Angola	0	N/A	1	0 %	4	0 %	4	50 %	4	25 %	13
Germany	6	33 %	1	100 %	3	67 %	1	100 %	2	50 %	13
United Arab Emirates	2	50 %	1	0 %	6	0 %	3	0 %	0	N/A	12

(x) Asian rhino horn trafficking is declining, but Myanmar could pose a threat

Asian rhino horns comprise just 14.4% of global rhino horn seizures and only 0.8% of the total weight of contraband seized. A consistent decline in the number and weight of Asian rhino horn seizures was evident from 2014–2015 (Figure 3). However, a smuggling route from India into Myanmar and then onwards into Southeast Asia and China appears to be increasing in relevance.²⁰ Along with socio-political factors that provide ideal conditions for criminal activity to flourish, there is a risk that trafficking through Myanmar could grow as a potential threat to Asian rhinos.

¹⁹ However, the Wildlife Justice Commission is in receipt of intelligence of an additional rhino horn seizure made by Qatar in May 2022 that was not publicly reported, and it is possible there are other cases as well.

²⁰ <https://scroll.in/article/971322/rhino-poachers-in-north-east-have-links-with-manipur-insurgents-police-say>

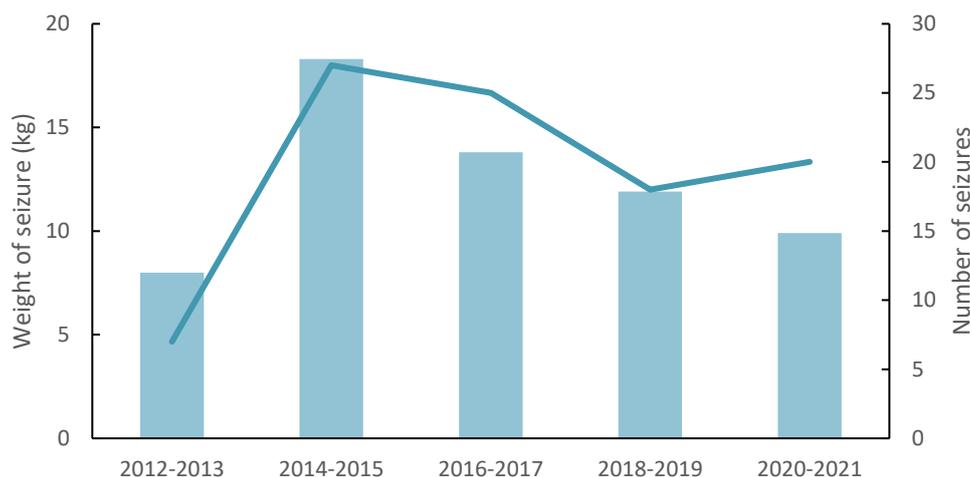


Figure 3: Number and weight of reported Asian rhino horn seizures, 2012-2021.

(xi) Rhino horn trafficking and other criminal activities are linked

Several high-profile cases of crime convergence with rhino horn trafficking have been documented.²¹ They include a criminal network in East Africa trafficking rhino horn and ivory alongside heroin²² and a criminal network involved in various fraudulent schemes that stole rhino horns from museums, zoos, and auction houses across Europe.²³ Seizure data indicate there could also be crime convergence with firearms, illicit drugs, and other commodities in approximately 10% of cases. Further information and intelligence analysis are required to understand the nature and scope of this threat.

(xii) Fake rhino horns are rarely detected by law enforcement authorities

Only three out of the total 674 seizures indicated the potential involvement of fake horns. In these cases, authorities sought forensic tests to verify the products although the test results are not publicly known. There is very little data to indicate the extent to which fake products circulate in the black market.

3. The criminal supply chain

Poaching and supply of rhino horn

Prolific Vietnamese and Chinese criminal networks are driving rhino horn trafficking throughout the global supply chain. The decade witnessed the rising prominence of Mozambican poaching networks, deeper entrenchment of Vietnamese trafficking networks operating in South Africa and Mozambique, and an increasing prevalence of large quantities of harvested horns in the illegal trade. The sourcing and supply of poached rhino horn from locations other than South Africa and Mozambique — including Kenya, Namibia, and Botswana — generally involves much smaller quantities. Several rhino horn traffickers are based in the Democratic Republic of the Congo (DRC), with some apparently using Zambia to store and consolidate horns, while Angola is emerging as a key trafficking hub for Vietnamese criminal networks.²⁴

²¹ Wildlife Justice Commission (2021), [Convergence of Wildlife Crime with Other Forms of Organised Crime](https://www.justice.gov/usao-sdny/pr/members-african-criminal-enterprise-charged-large-scale-trafficking-rhinoceros-horns)

²² <https://www.justice.gov/usao-sdny/pr/members-african-criminal-enterprise-charged-large-scale-trafficking-rhinoceros-horns>

²³ <https://www.sundayworld.com/crime/world-crime/from-africa-to-iceland-norway-to-new-zealand-rathkeale-rovers-travellers-have-dealt-in-everything-from-tarmac-to-rhino-horn-40059841.html>

²⁴ Based on intelligence and findings from 16 different multi-year investigations conducted by the Wildlife Justice Commission into rhino-related crimes in 11 African and Asian countries.

Transportation and trafficking of rhino horn

Following their export from Africa, rhino horn shipments are generally moved through one or more transit points before reaching their intended destination. Transporters facilitate the international trafficking of products, ensuring that shipments are cleared through seaports and airports by utilising their connections within customs authorities, freight forwarding agencies, airlines, and shipping and logistics companies. To avoid detection, transporters often export goods to a specific location under one bill of lading, then re-export the shipment to another transit point or its destination under a “new” bill of lading. Complicit clearing agents may switch the bill of lading while shipments are unloaded and repacked, perhaps with new cover materials or in different shipping containers. Transporters may also utilise front companies with access to shipping routes and other useful business infrastructure to facilitate the passage of contraband.²⁵

Sale of rhino horn in destination markets

“If you know who to talk to, you’ll find there’s a lot of rhino horn available in Vietnam” – Vietnamese trafficker, May 2021.

Seizure data indicate that rhino horn shipments are primarily destined for Vietnam and China. According to Wildlife Justice Commission investigations, a substantial proportion of rhino horn entering Vietnam is sold to Chinese buyers and smuggled overland into China.²⁶ This direction of trade is also borne out in court case judgements from China.²⁷ Horn is also smuggled into China via transcontinental flights from Africa transiting through Hong Kong SAR.²⁸ Small retail markets for rhino horn also exist in Cambodia, Lao PDR, Myanmar, Thailand, Japan, the Republic of Korea, and Taiwan.²⁹

As early as 2012, Nhi Khe village near Hanoi was identified as a key physical market for rhino horn in Vietnam.³⁰ Wildlife Justice Commission investigations found the market supplied an almost entirely Chinese clientele with worked rhino horn products, with interpreters connecting buyers and sellers, prices quoted in RMB, and payments made to Chinese bank accounts. Following extensive publicity regarding the market, including the Wildlife Justice Commission’s Public Hearing in November 2016,³¹ law enforcement inspections in Nhi Khe increased from 2016 onwards. In response, the trade became progressively covert and displaced to other locations in Vietnam.

²⁵ Ibid.

²⁶ Wildlife Justice Commission (2017), *Operation Phoenix Briefing*; Wildlife Justice Commission, (2017), *Black Business: Illegal Rhino Horn Trade Dynamics in Nhi Khe, Viet Nam from a Criminal Perspective*.

²⁷ According to analysis by the Wildlife Justice Commission of 210 cases involving the smuggling, purchase, sale, or transportation of raw or processed rhino horn products convicted in China between 2017 and 2021. Case judgements were published at: <https://wenshu.court.gov.cn/>

²⁸ Ibid.

²⁹ Krishnasamy, K. & Zavagli, M. (2020), *Southeast Asia: At the heart of wildlife trade*, TRAFFIC, Southeast Asia Regional Office.

Environmental Investigation Agency (2015). *Sin City: Illegal wildlife trade in Laos’ Golden Triangle Special Economic Zone*. London, UK.

Vigne, L. (2021). *The Rhino Horn and Ivory Trade, 1980-2020*. Doctoral dissertation, Oxford Brookes University.

³⁰ Wildlife Justice Commission, (2017), *Black Business: Illegal Rhino Horn Trade Dynamics in Nhi Khe, Viet Nam from a Criminal Perspective*.

³¹ <https://wildlifejustice.org/governments-urged-support-viet-nam-implementing-public-hearing-recommendations/>

4. Predominantly online trade in closed networks

“You, you look at my WeChat Moment, then you will know what products I do. Rhino horn, tiger, ivory, and a lot” – Chinese trafficker, 2017.



Image 2: In August 2017, a major Vietnamese trafficker offered the Wildlife Justice Commission 76 rhino horns via WeChat in a single transaction, highlighting the huge volume of product he was able to move.

Source: Wildlife Justice Commission.

Wildlife Justice Commission research found extremely low levels of rhino horn trade occurring on e-commerce platforms, suggesting they do not pose a substantial threat as facilitators of this particular crime.³²

Transactions mostly take place through close, trusted contacts, with traders preferring to use messaging and social media apps that provide greater levels of privacy and security.³³ WeChat is widely used among traders in Vietnam, Lao PDR, Cambodia, South Africa, Malaysia, Mozambique, and Nigeria. Analysis of court case judgements from China also shows WeChat continues to be a preferred communication and trading platform for Chinese criminals.³⁴ Chinese law enforcement monitoring of WeChat is having a clear impact on the way traders use it. The Wildlife Justice Commission found traders only using voice messages to discuss products and some refusing to post pictures on WeChat Moments. Several high-level brokers in Vietnam now deliberately avoid WeChat, instead using WhatsApp, Telegram, or Signal, which are banned in mainland China. Many traffickers globally opt to move communications to WhatsApp after initially making contact with buyers via a social networking platform such as Facebook.³⁵ Facebook appears to be the preferred online platform for brokers to advertise their products for the Vietnamese market³⁶ and the platform is widely used elsewhere in Southeast Asia.³⁷

³² Wildlife Justice Commission (2021), [Wildlife Trade on E-Commerce Sites in China, With a Focus on Mammoth Ivory: A Rapid Assessment](#). Other research has similarly found a very low prevalence of rhino horn trade on e-commerce platforms: Endangered Wildlife Trust (2022). *Report on rhino horn and elephant ivory being advertised for sale on e-commerce and social network platforms in South Africa*.

³³ Based on intelligence and findings from 16 different multi-year investigations conducted by the Wildlife Justice Commission into rhino-related crimes in 11 African and Asian countries.

³⁴ Wildlife Justice Commission analysed 210 rhino horn cases convicted between 2017 and 2021, published on China Judgements Online, accessed at: <https://wenshu.court.gov.cn/>

³⁵ Based on intelligence and findings from 16 different multi-year investigations conducted by the Wildlife Justice Commission into rhino-related crimes in 11 African and Asian countries.

³⁶ Wildlife Justice Commission (2017), [Black Business: Illegal rhino horn trade dynamics in Nhi Khe, Vietnam from a criminal perspective](#). During investigations of rhino trade in Vietnam from 2015 to 2016, Facebook alone was found to be used by 20% of traders, while around 10% of traders used by Facebook and WeChat.

³⁷ <https://www.reuters.com/article/us-myanmar-wildlife-idUSKCN2520C3>; <https://news.mongabay.com/2022/04/a-risky-business-online-illegal-wildlife-trade-continues-to-soar-in-myanmar/>

5. Rhino horn value

Wildlife Justice Commission investigations from January 2016–February 2022 collected wholesale price data (price per kg) of raw rhino horns in eight African and Asian countries,³⁸ corresponding to various points along the illegal supply chain (Figure 4).

(i) Wholesale rhino horn value is consistently less than one-third of the commonly reported USD 65,000/kg

The wholesale rhino horn value in trade was consistently found to be less than one-third of the USD 65,000/kg value commonly quoted in the media, ranging from USD 10,694/kg to 22,257/kg in Vietnam. At source locations in South Africa and Mozambique, it can be one-tenth that amount, ranging from USD 3,382/kg to 10,667/kg. Despite substantially lower values than commonly quoted, rhino horn is nonetheless still regarded in criminal circles as being very profitable.³⁹

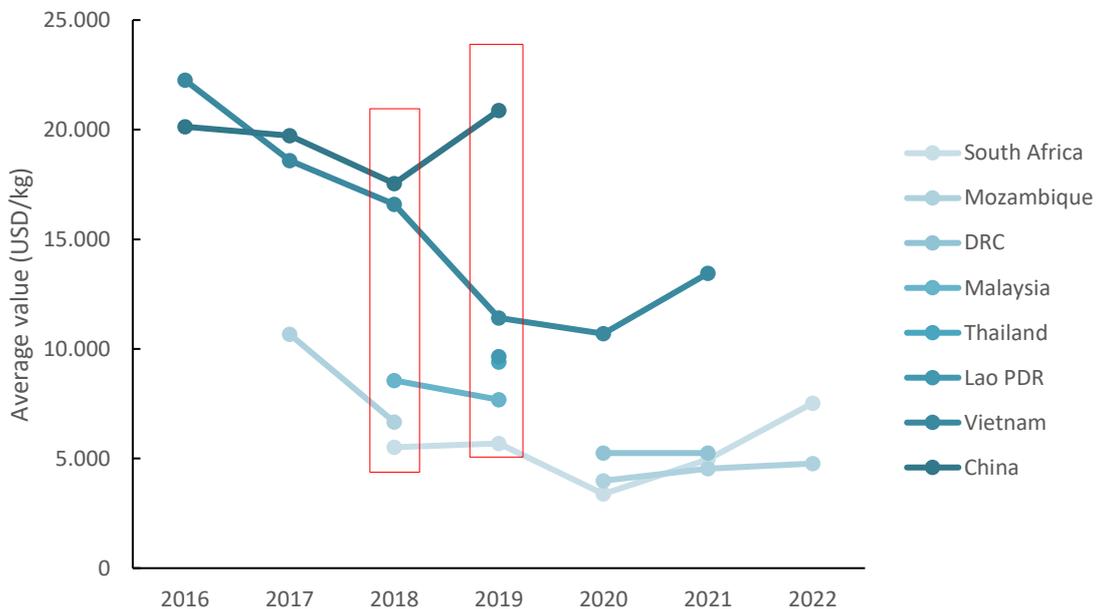


Figure 4: Average value of raw rhino horn (USD/kg) in eight African and Asian countries, 2016–2022. The red boxes highlight the incremental value increases as horns move through the supply chain from source to destination. Source: Data from Wildlife Justice Commission investigations.

(ii) Values in African source locations are increasing after falling to their lowest levels in 2020

Rhino horn values reached their lowest levels recorded at source locations by the Wildlife Justice Commission in 2020 (USD 3,382/kg in South Africa and USD 3,987/kg in Mozambique), but they have subsequently started to rise again. The highest average value yet in South Africa was recorded in February 2022 at USD 7,529/kg. The rise could potentially reflect increased law enforcement risk, as the rate of detection has increased in the last two years, or possibly that demand is now exceeding supply, although the price elasticity of demand for rhino horn is unknown.

³⁸ Price data was gathered by Wildlife Justice Commission operatives during undercover dealings with traffickers and brokers in South Africa, Mozambique, DRC, Malaysia, Thailand, Lao PDR, Vietnam, and China. Some price data for China was also collected from an assessment of published court judgements of rhino-related crime cases in China. Refer to Appendix I for more details on the methodology of the price data analysis.

³⁹ During undercover engagements, various traffickers have claimed that other wildlife products such as ivory are no longer worth the effort or risk due to declining value, while rhino horn still retains a comparatively high value. It is presumed that the persistent demand for rhino horn in the illegal trade is a key factor in it maintaining a high value.

(iii) Destination value trends mirror those in source locations

Value trend patterns in destination countries mirror those in source countries, with a close symmetry between the trend lines for Vietnam and South Africa (Figure 3). This suggests that price fluctuations are replicated across the supply chain. The highest values were recorded in China at the end of the supply chain, ranging from USD 17,545/kg to 20,881/kg.

(iv) Average mark-up increases along the supply chain by 33–60% between origin and transit points, and 66–98% between transit and destination points

Rhino horn becomes more expensive as it moves from origin to transit and destination locations, accumulating additional transportation costs, facilitation fees, and each handler's profit margins at every stage of the supply chain. The cumulative price increase as horns move from South Africa to China is most clearly observed in 2018 and 2019 when the most data points were collected across the supply chain (as highlighted by the red boxes in Figure 4).

(v) Price data consistent with Malaysia as the initial transit point in Asia

Values recorded by investigators in Thailand and Lao PDR were approximately USD 2,000/kg higher than in Malaysia, suggesting the latter is an initial transit point in Asia before horns are onward shipped. This finding corroborates intelligence from wildlife traffickers who described Malaysia as their preferred transit point for moving rhino horn shipments into Asia.⁴⁰

Other factors influencing rhino horn prices

- **Smuggling costs:** These comprise the additional costs for transportation, clearance, delivery, and handling fees that are incurred each time a shipment changes hands in the smuggling process.
- **Front vs back horns:** The smaller size of back horns limits the type and quantity of products they can be processed into, rendering them less preferable and therefore cheaper than the front horn in illegal trade.⁴¹
- **Poached vs harvested horns:** There is little clarity on how the provenance of horns influences the price: in source countries, both higher and lower prices for harvested horns and poached horns have been quoted to Wildlife Justice Commission investigators.
- **Retail price factors:** Several factors affect the final retail price of carved rhino horn products, including the quality and artistic value of the carving, the colour of the horn (blacker-coloured products are the most expensive), and factors relating to size, weight, and product type. Horn powder is the cheapest product and is usually derived from offcuts in the carving process.

Payment methods

To protect and hide their money, criminals use different payment methods to move funds through the supply chain and evade detection. The four methods most frequently encountered are cash payments, bank transfers, underground banking systems (such as hawala or feiqian) and mobile payment services.

⁴⁰ Since 2016, Wildlife Justice Commission investigations have documented various traffickers operating in China, Lao PDR, and Vietnam who claimed Malaysia to be "safe" and "the easiest" transit point for smuggling rhino horns and other wildlife products from Africa to Asia, regardless of whether they are transported by air or by sea.

⁴¹ Intelligence indicates front horns can be 25-50% more expensive than back horns at the beginning of the supply chain in African countries. This difference reduces by the time horns are sold in transit and destination locations in Asia, with front horns being 15-25% higher than back horns, possibly because transportation costs and smuggling fees are the same regardless of whether a shipment comprises front or back horns.

Illicit income generated from rhino horn trafficking

The value of the illegal rhino horn trade at the wholesale level and the potential income generated by criminal networks were estimated by comparing rhino horn price data with poaching and seizure data. The overall gross illicit income⁴² generated at the wholesale level during the decade was estimated to be between USD 874 million – 1.13 billion (Refer to Appendix 3 for detailed calculation notes). This is believed to be a conservative estimate of the trade as it does not account for any retail trade of processed products to consumers, which is substantial and would generate considerably more than this amount.

6. Use and consumption of rhino horn

The rhino horn trade in Asian consumer countries centres on two distinct markets: one which uses the horn as a luxury product and status symbol, and the other for its purported medicinal properties for dispelling heat, detoxification, cooling the blood and treating *wenbing* or warm-heat infectious diseases.⁴³

Since 2015, the Wildlife Justice Commission's investigations in Vietnam have found the majority of rhino horns are used to carve luxury products for a predominantly Chinese clientele, with only a small amount of horn in demand for medicinal purposes, usually the offcuts and leftover pieces following the carving process.⁴⁴ Although Vietnam plays a major criminal role in driving the trafficking of rhino horn throughout the supply chain, this finding contradicts the current narrative that the market for rhino horn is driven by Vietnamese demand for medicinal use in health tonics and hangover cures and as a status symbol.

A different group of stakeholders is involved in supplying the demand for carved rhino horn products, including antique dealers, art collectors, investors, speculators, auction houses, investment companies, and museums.⁴⁵ Cases have emerged of raw rhino horns being processed into fake antiques (coined *zuo jiu*, meaning "to make old")⁴⁶ and there is concern that the legal trade in antique rhino horn artefacts could be used to launder new horns.⁴⁷

7. Impact of law enforcement efforts

All countries affected along the supply chain need to step up their efforts to ensure that wildlife crime is tackled in an effective and enduring manner. There are several common areas where countries can enhance their law enforcement efforts, particularly in conducting investigations after seizures are made to identify the owners or facilitators of those shipments, and focusing on the prosecution of cases involving higher-level suspects to have a greater impact on disrupting the trade.

⁴² The estimated revenue generated from the trade, it is not equivalent to the profit generated by the trade, which is what would be remaining after subtracting all costs and expenses from the gross income.

⁴³ Cheung, H., Mazerolle, L., Possingham, H. P., & Biggs, D. (2018). *Medicinal use and legalized trade of rhinoceros horn from the perspective of traditional Chinese medicine practitioners in Hong Kong*. *Tropical Conservation Science*, 11, 1940082918787428.

Cheung, H. (2021). *Rhinoceros Horn and Traditional Chinese Medicine: Demand in China*. Doctoral dissertation, University of Queensland.

⁴⁴ Wildlife Justice Commission (2017), [Operation Phoenix Briefing](#)

Wildlife Justice Commission, (2017), [Black Business: Illegal Rhino Horn Trade Dynamics in Nhi Khe, Viet Nam from a Criminal Perspective](#)

⁴⁵ Gao, Y., Stoner, K. J., Lee, A. T., & Clark, S. G. (2016). Rhino horn trade in China: An analysis of the art and antiques market. *Biological Conservation*, 201, pp.343-347.

⁴⁶ For example: <https://www.justice.gov/usao-nj/pr/ringleader-international-rhino-smuggling-conspiracy-pleads-guilty-new-jersey-wildlife>

⁴⁷ Hübschle, A. (2016). *A game of horns: transnational flows of rhino horn*. Doctoral dissertation, University of Cologne. <https://www.savetherhino.org/our-work/reducing-illegal-trade/rhino-horn-could-be-laundered-in-uk-antique-trade/>; <https://animalsurvival.org/trade-and-legislation/criminals-may-be-using-antiques-as-a-way-to-launder-rhino-horn/>

The following are examples of good law enforcement practices from each of the six countries and territories that dominate rhino horn trafficking that should be adopted and implemented systematically across all jurisdictions in the supply chain:

- **South Africa:** The Environmental Enforcement Fusion Centre has been established as a national facility providing analytical capacity and integrating intelligence-led enforcement to boost tactical and strategic anti-poaching efforts.
- **Mozambique:** The appointment of special prosecutors in each province mandated to deal with environmental crimes, assisted by technical experts in the responsible investigating agencies.
- **Malaysia:** Establishing a multi-agency task force to address wildlife crime, involving national and state-based law enforcement agencies and environmental authorities.
- **Hong Kong SAR:** Policy reform to recognise wildlife trafficking as a form of serious organised crime, enabling the use of wider investigation powers, confiscation of proceeds of crime, and heavier sentences for convictions in such cases.
- **Vietnam:** Targeting the investigation, arrest, and prosecution of high-level wildlife criminals, with successful convictions of two of the country's biggest wildlife traffickers and the recent arrest of the alleged leader of another criminal network.
- **China:** Targeting investigations on entire criminal networks, including national citizens committing wildlife crimes in foreign jurisdictions, and engaging in international cooperation to bring them to justice.

8. Role of corruption in illegal trade

Corruption is a crucial enabler of all forms of wildlife crime, and rhino poaching and rhino horn trafficking are no exception. It facilitates criminal operations to acquire and move horns throughout the supply chain and undermines the criminal justice system. Corruption can occur in any location and involve public or private sector actors. All other efforts to combat rhino poaching and the illegal rhino horn trade will fail unless corruption is tackled.

There are many illustrative examples of how corrupt acts such as bribery, embezzlement, and abuse of office are playing out across the illegal rhino horn supply chain, including park rangers providing tip-offs to poachers, criminal groups paying bribes for law enforcement protection, to facilitate customs clearance to move their shipments, to secure bail or release from custody, and government officials stealing from rhino horn stockpiles. While South Africa⁴⁸ and China⁴⁹ are taking important steps to address corrupt behaviour and treat corruption risks, the absence of cases in other key countries suggests a lack of focus and effort on this critical issue.

9. Impact of COVID-19

Sharp reductions in both the number of rhinos poached across Africa and global rhino horn seizures during 2020 underline the abrupt impact of COVID-19 prevention measures in strangling criminal operations. However, this was only a temporary lull as criminal networks adapted to the new operating environment, with poaching rates increasing again in 2021 and into 2022.⁵⁰

In addition, seizure analysis shows that the average weight of African rhino horn shipments increased to their highest levels during the COVID-19 pandemic, more horn was smuggled by air

⁴⁸ Targeted investigations in South Africa have resulted in growing numbers of arrests and convictions of police and rangers in relation to rhino poaching and rhino horn trafficking offences. For example, DFFE reported that 21 officials were arrested in such cases in 2017.

⁴⁹ Analysis of Chinese court case judgements between 2019–2021 found at least 10 cases involving government officials facilitating rhino horn smuggling, accepting rhino horn bribes, or purchasing rhino horn.

⁵⁰ https://www.dffe.gov.za/mediarelease/creecy_259rhinopoached

cargo, and trafficking routes became more consistent and simplified (Appendix 2), presumably due to the limited availability of transportation options. Larger organised crime groups with more resources and connections are likely to have adapted better to the changing conditions than less relevant players.

The lack of Chinese customers at physical wildlife markets in Southeast Asia⁵¹ is believed to have boosted the online sale of rhino horn products, primarily on communication apps and social networking platforms.⁵²

10. Recalibrating the response to tackle transnational organised crime

There has been little substantive progress in combating the crisis that has seen 9,561 rhinos illegally killed across Africa⁵³ and 7.5 tonnes of rhino horns seized from illegal trade globally during the decade. The scale of the problem has eclipsed anything envisaged in 2012.

Meanwhile, there is irrefutable evidence of the involvement of transnational organised crime driving rhino poaching and rhino horn trafficking, and it is clear that all six key countries and territories along the rhino horn supply chain have been too slow in shifting their response from “conservation crisis” to “crime problem”.

All jurisdictions—regardless of whether they are source, transit, or destination locations—need to step up and redirect their efforts to ensure crime is confronted in an effective, coordinated, and enduring manner.

Law enforcement on its own will not stop the poaching of rhinos or the trafficking of horns, but the full weight of law enforcement has not yet been applied to address this issue.

Many law enforcement methodologies that should be common practice are still not being adequately or effectively used, such as conducting in-depth, intelligence-led investigations that focus on the criminal network rather than the individual, conducting further investigations after seizure incidents to identify the product owners, using advanced investigation techniques, conducting parallel financial or corruption investigations, and seizing assets.

The status quo cannot be maintained for another decade. All law enforcement efforts must be urgently reviewed and recalibrated to respond better to the complex dynamics of the illegal trade and to dismantle the criminal networks behind it to protect rhinos for the future.

⁵¹ Wildlife Justice Commission investigations in 2020 found traders and service providers connected to wildlife markets in Cambodia and Lao PDR particularly struggled during the pandemic due to travel restrictions and border closures that prevented access to their mainly Chinese clientele.

⁵² <https://news.mongabay.com/2022/04/a-risky-business-online-illegal-wildlife-trade-continues-to-soar-in-myanmar/>

⁵³ CITES CoP19 Doc.75 (Annex 4), *African and Asian Rhinoceros – Status, Conservation and Trade*, prepared by IUCN Species Survival Commission’s African and Asian Rhino Specialist Groups and TRAFFIC, pp.30–31.

Policy implications and pending threats

The barriers to achieving coordinated, proactive law enforcement efforts must be overcome to have an impact on tackling the transnational organised crime behind rhino horn trafficking. Meanwhile, new threats to rhinos are emerging.

1. Low prioritisation of wildlife crime

Despite clear evidence of the involvement of transnational organised crime, there has been a relative global failure to combat rhino horn trafficking. Too often, wildlife crime is given low prioritisation and left to the responsibility of environmental authorities to handle alone. However, environmental authorities typically do not have the relevant law enforcement tools, expertise, or resources to investigate transnational organised crime. It is essential that traditional law enforcement agencies that have these powers and skill sets are engaged and given the mandate and necessary resources to lead investigations into rhino horn trafficking crimes.

The danger often facing authorities charged with handling cases is nowhere more demonstrated than in the murder of one of South Africa's most successful anti-poaching detectives, Lieutenant Colonel Leroy Bruwer, while he was driving to work in March 2020.⁵⁴ Bruwer was the investigating officer in the case against rhino poaching kingpins Petros "Mr Big" Mabuza and "Big Joe" Joseph Nyalunga, a former police officer turned organised crime figure. The murder in July 2022 of Anton Mzimba, the Head of Ranger Services at Timbavati Game Reserve, South Africa at his home points to an escalating occurrence of these violent attacks.⁵⁵

Until countries begin to act meaningfully on their commitments made in the United Nations and other international fora to treat rhino horn trafficking and other serious wildlife crimes as transnational organised crime, this situation is unlikely to change.

Recommendation 1:

Countries need to enact their international commitments to treat wildlife crime as a form of transnational organised crime. The response across the entire supply chain must be geared towards tackling transnational organised crime in terms of resources and approach.

2. Tackling corruption is key

All efforts to combat rhino poaching and rhino horn trafficking will fail unless corruption is tackled. Corruption creates resilient criminal networks due to its enabling and facilitating role,⁵⁶ but if the likelihood of corrupt practices can be minimised, then opportunities to engage in wildlife crime should also diminish.⁵⁷ Identifying where corruption risks exist in the rhino horn supply chain can help authorities to develop targeted strategies and actions to prevent corrupt behaviour and make it more difficult for criminal networks to exploit regulatory systems.

Consideration must also be given to increasing the focus on corruption during investigations to identify and weed out those in the private and public sectors who are engaging in corrupt practices

⁵⁴ <https://lowvelder.co.za/537829/member-saps-mpumalanga-shot-r37-lydenburg/>

⁵⁵ <https://www.news24.com/news24/southafrica/news/wildlife-warrior-and-game-ranger-anton-mzimba-shot-dead-20220727>

⁵⁶ Ayling, J. (2012), '*What Sustains Wildlife Crime? Rhino Horn Trading and the Resilience of Criminal Networks*', Working Paper 2/2012 Transnational Environmental Crime Project.

⁵⁷ UNODC (2020), *Scaling Back Corruption: A Guide on Addressing Corruption for Wildlife Management Authorities*, p.7.

that enable rhino horn trafficking. For example, this could include analysis of a suspect's phone following arrest to identify the key members of their network and any corrupt contacts as entry points for further investigation. However, apart from South Africa and China, very few arrests and convictions of corrupt actors were found in other key countries and territories along the rhino horn supply chain, suggesting a dire lack of focus on this matter.

Recommendation 2:

All countries and territories along the trafficking routes need to take coordinated action to address the insidious corruption that undermines all law enforcement efforts. Corruption risks within the rhino horn supply chain must be addressed to strengthen regulatory systems, alongside an increased investigative focus to remove the corrupt elements enabling crime.

3. The growing allure for organised crime and evolving criminal methods

A great concern is that wildlife trafficking may become more attractive to transnational organised crime networks due to the profitability of high-value products, such as rhino horn, and the perceived low risk of law enforcement action against this type of crime. Several observations of the use of non-traditional methods to commit crime can already be seen in the illegal rhino horn trade, such as trade on the dark web and the use of cryptocurrency for financial transactions, which could indicate the growing involvement of transnational organised crime. As wildlife crime increasingly moves online and criminal networks adopt or exploit new technologies to facilitate their operations, it creates new challenges and hurdles for law enforcement authorities when it comes to investigations. The question is how to stay ahead of, or prepare for, these types of developments when there are still often inadequate responses to the well-known, traditional criminal methods.

The Dark Web:

Recent research on the dark web by the Wildlife Justice Commission⁵⁸ found indications of the rhino horn trade:

- There were 27 mentions of “rhino horn” in the Gold & Diamonds dark web forum, posted between July 2016 and December 2021.
- On one dark web forum, six users sought to buy rhino horn, six offered to sell rhino horns in their possession, and four indicated they had previously bought rhino horns.

Illegal wildlife products are likely traded opportunistically by criminals already on the dark web due to their involvement in the illicit trade of other commodities. Given this, there is potential for convergence between wildlife crime and other forms of criminality facilitated by this platform that needs to be explored further.⁵⁹ The use of the dark web may become a more relevant threat as law enforcement endeavours to mop up wildlife crime occurring on the open web. Furthermore, messaging apps, such as WeChat, have taken extensive efforts to eradicate criminal activities from their platforms, which will inevitably drive some core elements of criminality underground.

⁵⁸ Unpublished preliminary research conducted in 2021.

⁵⁹ Other studies have also found indications of illegal wildlife trade on the dark web, such as research conducted by INTERPOL: <https://www.interpol.int/fr/Actualites-et-evenements/Actualites/2017/Research-identifies-illegal-wildlife-trade-on-the-Darknet>

Cryptocurrency:

In ongoing investigations, the Wildlife Justice Commission has mapped the use of cryptocurrency in wildlife crime for the first time through intelligence of over 1,000 financial transactions. Analysis of these transactions revealed a small number of prolific individuals and accounts suspected to be linked to wildlife trafficking in key countries. This presents a unique opportunity to disrupt organised trafficking through the use of coordinated international anti-money laundering interventions.

Recommendation 3:

The perception of wildlife trafficking as a low-risk, high-reward crime must be quashed to counter its growing allure to transnational organised crime networks. Although the risks posed by both the dark web and cryptocurrency in the context of wildlife crime are currently assessed as low, government agencies mandated to respond to wildlife crime are encouraged to take pre-emptive action against these threats, which are likely to grow in significance as law enforcement efforts improve in tackling serious and organised criminal elements.

4. Crime displacement

When law enforcement action effectively targets key crime areas and they become too “hot” to use, criminal activity will displace to other locations or use different methods that present a lower risk of detection. While the strengthened law enforcement approaches in countries such as China and South Africa are encouraging, there are indications that spatial and tactical crime displacement are already occurring in response. To neutralise the threat of crime displacement, law enforcement approaches must be coordinated and intelligence-led across the supply chain. In the absence of international cooperation and with little likelihood of prosecution for high-level criminals, criminal activity could intensify in areas with weaker law enforcement.

Spatial displacement:

- Rhino poaching appears to be moving from Kruger National Park to other parks and provinces in South Africa (such as KwaZulu-Natal province⁶⁰) and to other countries in southern Africa (such as Botswana and Namibia⁶¹).
- Horns sourced from countries other than South Africa, including Kenya, Botswana, and Namibia, are thought to be linked to traffickers based in countries including DRC and Angola.⁶² DRC is also suspected of being an alternative smuggling hub for ivory and pangolin scale traffickers previously operating from Nigeria, as Nigeria is now deemed to be too hot following a series of high-volume wildlife seizures and associated arrests. These factors may coalesce to present the risk of wildlife crime intensifying in DRC.
- This analysis has identified the re-routing of the transportation of rhino horn shipments from Hong Kong SAR to Malaysia, which is illustrative of how smuggling routes are changed to evade law enforcement detection. The recent arrest of a major Malaysian wildlife trafficker in June 2022⁶³ could have a significant influence on the criminal landscape and trafficking routes, with intelligence suggesting that crime displacement could potentially see Cambodia increase as a transit location of concern.
- Several recent rhino horn seizures suggest a potential return to the use of European countries as transit locations in trafficking routes, which may be a cause for future concern.

⁶⁰ <https://maroelamedia.co.za/nuus/sa-nuus/102-renosters-al-vanjaar-in-kzn-gestroop/>

⁶¹ Namibian authorities discovered 11 rhino carcasses in Etosha National Park in June 2022: <https://www.reuters.com/world/africa/namibia-rhino-poaching-surges-june-ministry-says-2022-06-15/>

⁶² Based on intelligence and findings from Wildlife Justice Commission investigations.

⁶³ <https://www.bangkokpost.com/thailand/general/2337103/arrested-malaysian-wanted-for-worldwide-wildlife-trafficking>

These include two seizures in Germany of 3.8 kg of horn in December 2021⁶⁴ and 6.7 kg of horn in January 2022⁶⁵ and a seizure of two rhino horns in Portugal in July 2022.⁶⁶

- Angola has been identified as a source and transit country in all the Wildlife Justice Commission's ivory operations since 2015. The decline in the ivory trade in recent years⁶⁷ and the sustained interest in rhino horn means Angola may become a country of increasing concern in rhino horn trafficking. Intelligence suggests that this threat is transpiring, with criminals indicating Angola is used as a transit country for wildlife originating from southern Africa (rhino horn, captive-bred tiger and/or lion items) and central Africa (ivory, pangolin scales) and it is reported to be where some consolidation of rhino horn to be moved by air takes place. For example, two Angolan men were arrested in the country in October 2021 for trafficking 10 rhino horns, likely sourced from poached rhinos in a neighbouring country.⁶⁸ Furthermore, the 2022 rhino horn seizures in Germany and Portugal mentioned above were both reported to have originated from Angola. The geographic positioning of Angola bordering Namibia and Zambia and close to Botswana as potential sources of horns, and close to the DRC as a known trafficking hub, may further add to this risk.

Tactical displacement:

- An increase in the average volume of horn in shipments coincides with a change in smuggling from passenger luggage to air cargo and the use of more direct trafficking routes. This could point to the greater involvement of organised crime groups.
- In response to increased airport security measures during the COVID-19 pandemic, some traffickers appear to be prioritising the safer shipment of their products using maritime transportation over a fast turnaround time by air. However, the limited number of seizures of maritime shipments suggests this transportation method could be an underrepresented threat for rhino horn smuggling that is not being adequately targeted.
- Wildlife Justice Commission investigations have found ivory traffickers switching to rhino horn due to the decline in demand for ivory and the higher profitability of rhino horn. This has been particularly prominent in Mozambique.

Recommendation 4:

International cooperation and controlled deliveries are essential to identify and investigate network members located in other countries along the supply chain and involved in buying, transporting, and distributing rhino horn. Broader and more consistent use of advanced and sophisticated law enforcement practices typically applied in other types of transnational organised crime must be employed to ensure a cohesive and coordinated global response to address rhino horn trafficking and to prevent the displacement of criminal activity from one place to another.

⁶⁴ <https://nordsachsen24.de/2022/am-flughafen-zoll-entdeckt-hornstuecke-vom-nashorn-in-paketen/>

⁶⁵ <https://www.newsweek.com/fifteen-pounds-rhino-horn-found-false-bottom-box-1712172>

⁶⁶ <https://angolantimes.com/2022/07/23/two-rhino-horns-seized-in-lisbon/>

⁶⁷ Wildlife Justice Commission (2020), *Rapid Assessment of the Illegal Ivory Trade in 2020*.

⁶⁸ <https://novojornal.co.ao/sociedade/interior/pn-deteve-dois-homens-com-10-chifres-de-rinoceronte-que-pretendiam-vender-por-4-milhoes-kz---foi-preciso-matar-10-animais-em-risco-grave-de-extincao-para-os-obter-105161.html>

5. Lack of systematic application of intelligence and analysis

Intelligence is a crucial tactical asset when corruption and a lack of advanced investigative capacity exists, as it seeks to identify the most prolific elements of crime and enables the focus of limited law enforcement resources on the greatest criminal threats.

Extensive intelligence analysis by the Wildlife Justice Commission on large-scale trafficking of wildlife between Africa and Asia revealed targets in Nigeria, DRC, and Mozambique with direct links to high-level Vietnamese targets sourcing ivory, pangolin scales, and rhino horn to be trafficked to Vietnam. These targets are integral to the management and control of organised wildlife crime and the entry of products into Vietnam. Furthermore, criminal networks are now funnelling a large volume of products through fewer concentrated channels, exposing locations such as South Africa, Malaysia, and Vietnam as potential choke points in the supply chain where law enforcement efforts could be targeted to achieve maximum impact.

Intelligence capacity to address threats to rhinos has improved over the past few years, particularly within South Africa and China. However, this threat needs to be managed from a supply chain perspective, supported by better information sharing practices, both regionally and globally.

Recommendation 5:

Intelligence analysis and organised crime group mapping are useful techniques to identify and map out members of the criminal network who may be dispersed across many countries and to tackle the problem from a transnational organised crime point of view. Applying analytical techniques such as crime pattern analysis to identify crime series will also provide more insights as to how such crimes may be linked; for example, the attribution of shipments of rhino horns to a crime series, which may fit the profile of one offender or a network of offenders.

6. Implications of China's strengthened law enforcement strategy

China has significantly and meaningfully ramped up its efforts to address wildlife crime and trafficking, with a particular focus on organised criminal activity. While it is positive that investigations are targeting and arresting entire Chinese criminal networks,⁶⁹ the downside is that uneven and fragmented law enforcement approaches from other countries in the supply chain present opportunities for other crime groups to take over. In Nigeria, DRC, South Africa, Mozambique, Angola, and Namibia, the Wildlife Justice Commission is finding that Vietnamese criminal networks are filling the void left by the removal of Chinese networks. Only in South Africa do Chinese networks still dominate the illegal rhino horn trade.

Accompanying the success of investigations, prosecutions, and convictions in China is the heavy sentencing which seeks to address the higher tier of organised wildlife crime, rather than targeting lower-level players such as poachers or couriers, who are easily replaced. Chinese court cases analysed by the Wildlife Justice Commission demonstrate China's commitment to tackling transnational organised crime, with the large number of participants charged in many of the cases, the volume of illegal products seized, and the amount of money and assets recovered from criminal proceeds.

⁶⁹ For example: <https://www.chinanews.com.cn/sh/2021/07-19/9523130.shtml>

Recommendation 6:

Other countries along the supply chain should aim to replicate the law enforcement efforts of China, where possible, especially in terms of the level of prosecution, sentencing, and asset recovery that is now being applied to serious wildlife criminals. These core elements are proven to achieve a deterrent effect, with financial penalties associated with asset recovery known to be the most critical component in deterring crime.

Consideration should be given to greater use of financial investigations conducted in parallel with criminal investigations to map out associated money laundering, identify proceeds of crime to facilitate asset recovery, and eliminate the perception of rhino horn trafficking as a low-risk, profitable activity.

7. Growing presence of horns originating from legal stockpiles in illegal trade

This research finds that potentially up to one-third of rhino horns seized globally may have originated from legal horn stockpiles.⁷⁰ Specifically, within South Africa, incidents involving harvested horns originating from stockpiles can be perceived as a permitting issue and not as a criminal offence, disregarding the inherent link to transnational organised crime. It is suspected that this source of rhino horn is enabling crime, yet one that represents a much lower risk in terms of punishment from law enforcement than horn originating from a poached rhino. This ongoing supply, which is believed to be increasing, has the potential to be vast when considering the volume of horn in stockpiles held in many locations across several countries.

Diversion of stockpiled horns into illegal trade must be curbed to ensure supply chain integrity of the legal domestic horn trade, strengthen the stockpile regulatory system, and support law enforcement efforts to manage the rhino poaching threat. Illegal trade of harvested horns only serves to benefit criminality and damages conservation efforts.

Recommendation 7:

In any country with rhino horn stockpiles, domestic violations involving stockpiled horns should not be treated separately from international rhino horn smuggling offences. Given the links between the movement of horn from illegally killed rhinos and harvested horns, these two supply chains should be addressed and managed as a connected threat.

8. Gaps in knowledge on consumer drivers and uses of rhino horn

The findings presented in this report indicate that the demand for rhino horns as a criminal commodity shows no signs of abating. If demand for a high-value commodity persists, criminality will find a way to service and monetise this demand for as long as customers are willing to pay. While law enforcement efforts are designed to remove the immediate threat, they should not be relied on as the sole means to eradicate crime. It requires a multi-faceted solution, one aspect of which must

⁷⁰ Refer to Key finding 2(v) of this assessment.

incorporate social science-based solutions such as behavioural change.⁷¹ However, effecting behavioural change to reduce consumer demand is a long-term strategy and efforts have not yet been sufficient to drive a reduction in the ongoing illicit trade of rhino horn. To date, such initiatives have focused on Vietnam, seeking to reduce the demand for rhino horn used for medicinal or recreational purposes and luxury gifts. The popular use of rhino horn as items of jewellery, libation cups, or the stockpiling of whole horns for their investment value in China or in other consumer markets has not received the same level of focus. These other types of rhino horn use in Chinese consumer markets may have indeed been the key driving force for rhino horn demand, but it has been serviced *predominantly* by Vietnamese criminals facilitating its entry into Asia, leading to a misunderstanding about where the core demand over the past decade has emanated.

Recommendation 8:

Demand reduction and behavioural change initiatives should be fully informed about the various aspects that drive consumer choices. However, there is an apparent gap in knowledge about the nature and scale of Chinese demand for rhino horn, and accordingly more research and investment are needed to improve insight into these markets, especially concerning the carving process, market distribution, and the use of rhino horn as an investment product. In addition, there is a need to be proactive in identifying other countries where demand in various forms or markets could increase in the future.

⁷¹ Graham-Rowe, D. (2011). *Biodiversity: Endangered and in demand*. Nature 480, pp. S101–S103.

Appendix 1 – Methodology

Understanding intelligence

Intelligence is a value-added product that is formed from the collection and analysis of relevant information from various sources. It is also a process, encompassing a continuous cycle of tasking, data collection, collation, analysis, dissemination, and feedback. This continuous process is responsible for the generation of an intelligence product, the purpose of which is to interpret the criminal environment and inform the thinking of decision-makers.

Investigations and intelligence

Sanitised intelligence and findings from the Wildlife Justice Commission's investigations are interwoven throughout this report to provide context and insights into changes in the criminal dynamics of rhino horn trafficking. The Wildlife Justice Commission's investigation approach is modelled on recognised and proven law enforcement methodology. It uses a combination of undercover operatives, covert surveillance, and networks of trusted informants to collect intelligence and evidence across the supply chain, from source to destination.

A team of criminal intelligence analysts analyse data and information to guide the work of the undercover operatives, and the information they unearth feeds back into the intelligence cycle. All intelligence is verified and corroborated to ensure it is as robust and accurate as possible, and that it is documented to an evidentiary standard.

Since its formation in 2015, the Wildlife Justice Commission has worked on 16 different multi-year investigations involving rhino-related crimes in 11 countries across the supply chain. This work has generated almost 1,400 case notes concerning the criminal activity of over 1,200 persons of interest. Following the dissemination of intelligence to law enforcement agencies in those countries, the Wildlife Justice Commission has supported the arrests of 36 high-level criminals involved in rhino-related crimes in six countries in Africa and Asia.

Subject rating and targeting

The Wildlife Justice Commission has developed an internal risk rating system to assess a subject's level of criminality according to factors such as their role in the network, modus operandi, geographical range across which they operate, and estimated conservation impact, among others. Wildlife Justice Commission investigations target those mid- to high-level individuals who are pivotal to the criminal network, and whose removal would have the greatest impact in preventing the network from reorganising quickly, thereby causing disruption and slowing the trade. Intelligence in this report is collected on these higher-level individuals, their close associates and network members, and is considered to be illustrative of large portions of the illegal rhino horn trade.

Seizure dataset collection

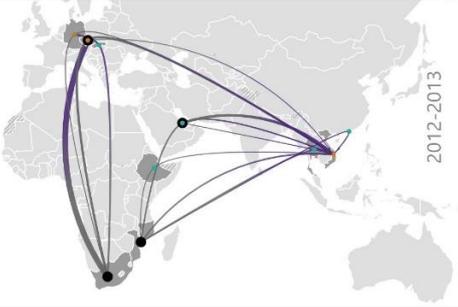
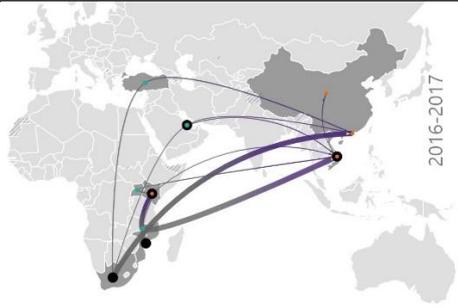
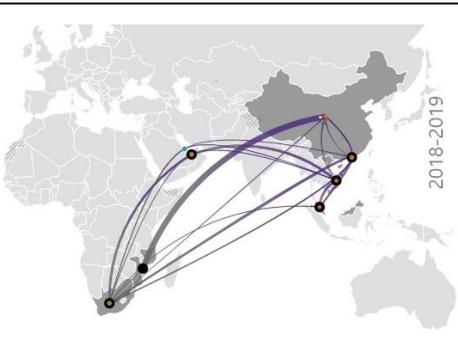
The dataset of 674 rhino horn seizures was collected from open-source reports, primarily media articles, law enforcement press releases, court records, and other published reports, which were identified through keyword searches. The seizure incidents involved raw rhino horns, whole or in pieces, from any rhino species, occurring at any location globally, during the period from 1 January 2012 to 31 December 2021. Although it is substantial, there will be gaps in the dataset as the search methodology may not have detected all open-source reports. Intelligence and findings from Wildlife Justice Commission investigations have been integrated throughout this report where relevant as another source of information to assist with making inferences between seizure data and the realities of illegal trade.

Price data analysis

A dataset of wholesale black market prices per kilogram for raw rhino horns was gathered by Wildlife Justice Commission operatives during undercover dealings with traffickers and brokers in South Africa, Mozambique, DRC, Malaysia, Thailand, Lao PDR, Vietnam, and China, from January 2016 to February 2022. Some price data was also collected from an assessment of published court judgements of rhino horn trade and trafficking cases in China. All prices were converted to USD to make them comparable across the supply chain.

The wholesale price data was collected during investigations of mid- to high-level criminals. Wildlife Justice Commission investigators always negotiate prices to ensure as far as possible that the final price offered reflects the current street values. Retail prices are usually quoted by the gram or by unit and can vary significantly according to a range of subjective factors such as horn colour, size, carving quality, artistic value, and product type. Retail price data was not included in this assessment as the Wildlife Justice Commission does not consider it to be relevant for the analysis of criminal dynamics and understanding threats at the higher criminal level.

Appendix 2 - Rhino horn trafficking routes

<p>2012-2013</p> <p>The most prominent routes during this period saw Vietnam as a destination country.</p> <p>Shipments originating from South Africa used European transit points.</p> <p>Those originating from Mozambique transited most frequently through Thailand.</p>	
<p>2014-2015</p> <p>Vietnam continued to be the main destination for the largest seizures recorded during this period, with all routes originating in Mozambique and transiting the Middle East and/or Southeast Asia. Qatar established itself as a key transit location for air transportation of rhino horns and has continued to play a critical role to the present day.</p> <p>The routes originating in South Africa shifted and were often sent directly to China during this period.</p> <p>Western Africa – most notably Nigeria – was recorded as a key exit point or transit location for horns en route to China, which was not observed in any other period.</p>	
<p>2016-2017</p> <p>While the South African routes for large shipments continued to be sent to China (via Hong Kong SAR), they were no longer direct.</p> <p>An important trafficking route during this period originated in Mozambique, exiting Africa through Kenya with the destination of Vietnam.</p>	
<p>2018-2019</p> <p>Origin countries remained constant during this period, while destinations switched: the South African routes were destined for Vietnam and the Mozambican routes for China.</p> <p>Interestingly, one shipment originating in Mozambique transited South Africa on its way to China.</p> <p>Malaysia emerged as the most critical transit point for horns from South Africa. Although the final destination of the Malaysian routes is unclear, one recorded seizure points to Vietnam.</p>	
<p>2020-2021</p> <p>South Africa became the most significant African exit point for large shipments and Vietnam remained the major destination country.</p> <p>In an apparent exception, the Philippines was used to smuggle 113 kg of African rhino horns to Vietnam. The role of the Philippines in international trafficking routes for African rhino horns remains an intelligence gap.</p> <p>Malaysia consolidated its role as a key transit country.</p>	

Appendix 3 – Calculations for gross illicit income generated by rhino horn trade

The overall gross illicit income generated by the trade of raw rhino horns at the wholesale level during the 10 years from 2012-2021 is estimated to be between USD 874 million – 1.13 billion. This figure is believed to be a conservative estimate and does not account for any retail trade of processed products to consumers, which would generate considerably more than this amount.

This estimation follows the methodology described in the UNODC World Wildlife Crime Report 2020. The detailed calculations and various assumptions that underpin this estimation are described below in Tables 3.1-3.4.

Table 3.1: Estimating the amount of African rhino horn produced through poaching incidents, 2012-2021

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Reported poached rhinos	751	1,123	1,327	1,352	1,167	1,134	930	773	503	501
No. horns produced	1,502	2,246	2,654	2,704	2,334	2,268	1,860	1,546	1,006	1,002
Estimated weight of horns (kg)	4,176	6,244	7,378	7,517	6,489	6,305	5,171	4,298	2,797	2,786
Assumed recovery of horns in the field (9%)	376	562	664	677	584	567	465	387	252	251
Poached horn entering trade (kg)	3,800	5,682	6,714	6,840	5,905	5,738	4,706	3,911	2,545	2,535
Total per period (kg)	9,482		13,554		11,643		8,617		5,080	

Explanatory notes and assumptions:

- The African rhino poaching figures are based on data reported to the CITES Secretariat.⁷²
- It is assumed that each rhino poached yields two horns.
- For the calculation of the weight of one African rhino horn, the method employed by Milliken (2014) was followed: Given that the mean weight of horn from white rhinos is 2.94 kg per horn and from black rhinos is 1.33 kg per horn, and based on the assumption that 90% of rhino horns in illegal trade are from white rhinos, an average of 2.78 kg was used to represent the weight of one African rhino horn.⁷³
- Based on UNODC methodology, it is assumed that 9% of poached horns are recovered in the field through anti-poaching and law enforcement operations.⁷⁴ This quantity was subtracted from the estimated weight of horns to arrive at an estimation of the volume of poached horn that is available to enter illegal trade.

⁷² CITES CoP19 Doc.75 (Annex 4), 'African and Asian Rhinoceroses – Status, Conservation and Trade', prepared by IUCN Species Survival Commission's African and Asian Rhino Specialist Groups and TRAFFIC, pp.9-10.

⁷³ Milliken, T. (2014), *Illegal Trade in Ivory and Rhino Horn: An Assessment Report to Improve Law Enforcement Under the Wildlife TRAPS Project*. USAID and TRAFFIC.

⁷⁴ UNODC (2020), *World Wildlife Crime Report*, p.114.

Table 3.2: Estimating the proportion of harvested horn from legal stockpiles diverted into illegal trade based on the proportion of harvested horns observed in seizures, 2012-2021

Period	2012-2013	2014-2015	2016-2017	2018-2019	2020-2021
Total volume of African horns seized (kg)	942	1,130	1,754	2,424	1,272
Confirmed harvested horns seized (kg)	0	0	359	563	53
Suspected harvested horns seized (kg)	88	141	237	641	439
Harvested horn ratio in seizures (%)	9%	12%	20-33%	23-49%	4-38%

Explanatory notes and assumptions:

- The volume of seized African rhino horns is based on the seizure dataset collected from open-source reports that was used in this report, minus the Asian horn seizure data in Figure 3.
- The confirmed seizures of harvested horns are based on the data described in Key Finding 2(v) of this assessment.
- The suspected seizures of harvested horns are based on the data described in Key Finding 2(v) of this assessment.
- It is assumed that the proportion of harvested horns in the illegal trade would be equivalent to the proportion of harvested horns that are observed in seizures. The ratio of harvested horn in seizures was calculated based on the volume of confirmed and suspected seizures of harvested horns as a percentage of the total volume of all seized horns.

Table 3.3: Estimating the total supply of rhino horns entering illegal trade, 2012-2021

Period	2012-2013	2014-2015	2016-2017	2018-2019	2020-2021
Ratio of poached and harvested horns in supply (%P, %H)	91%P 9%H	88%P 12%H	67-80%P 20-33%H	51-77%P 23-49%H	62-96%P 4-38%H
Poached horn supply (kg)	9,482	13,554	11,643	8,617	5,080
Harvested horn supply (kg)	937	1,848	2,911-5,735	2,574-8,279	212-3,114
Total supply (kg)	10,419	15,402	14,554-17,378	11,191-16,896	5,292-8,194

Explanatory notes and assumptions:

- Supply is assumed to consist of horns produced through poached rhinos and harvested horns diverted into illegal trade from stockpiles. As the harvested horn ratio was calculated in Table 3.2, the ratio of poached horn in supply is assumed to be the balance of this to form 100% of the supply.
- The poached horn supply per period was calculated in Table 3.1. Based on this quantity and the ratio of poached horn in supply, the total supply can be calculated, along with the harvested horn component.

Table 3.4: Estimating the volume and value of rhino horns reaching Asian destination locations, 2012-2021

Period	2012-2013	2014-2015	2016-2017	2018-2019	2020-2021	Total
Total supply (kg)	10,419	15,402	14,554- 17,378	11,191- 16,896	5,292-8,194	
Total volume of seized horns (kg)	942	1,130	1,754	2,424	1,272	
Volume reaching destination (kg)	9,477	14,272	12,800- 15,624	8,767- 14,472	4,020-6,922	
Vietnam average value (USD/kg)	18,591- 22,257	18,591- 22,257	20,424	14,006	12,069	
Minimum value (USD)	176,186,907	265,330,752	261,427,200	122,790,602	48,517,380	874,252,841
Maximum value (USD)	210,929,589	317,651,904	319,104,576	202,694,832	83,541,618	1,133,922,519

Explanatory notes and assumptions:

- By subtracting the total volume of seized horns from the total supply of horns, we are left with the volume of horns in trade that are assumed to reach their end destination.
- Vietnam was selected as the basis for the value calculation, as it is one of the major destination countries for rhino horn and has the most price data points available to make the calculation. In the absence of price data for the years 2012-2015, a range based on the average values for the years 2016 and 2017 was used. As there was a declining trend in values between 2016 and 2020, it is possible that prices in 2012-2015 were higher than the range used in this calculation, and the calculated values, therefore, represent conservative estimates.
- The minimum and maximum values were calculated by multiplying the volume of horns assumed to reach their end destination by the average value in Vietnam.