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The Rhino Horn Trafficking Network of the Groenewald Gang

No. 10

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Disclaimer

The facts and the analysis presented herein are sustained in documents and interviews exposed in mass media and judicial records related to the criminal networks analyzed. No primary information uncovering facts has been gathered, which means that only secondary sources were consulted, from legal to media documents. In the case of the names mentioned, quoted or referenced on indictments—with the exception of those specifically mentioned, quoted or referenced in the text as definitively condemned-, the presumption of innocence, in observance of individual rights is always preserved.

The judicial truth is the jurisdiction of the courts, which by law will decide whether the defendants are innocent or guilty.¹ It is stated that belonging to, participating in, being connected to, or appearing on a network, as analyzed herein, does not imply having committed a criminal act or being engaged in a criminal enterprise. It is always possible to belong, participate, be connected, or appear on a network as an agent promoting interests that are socially and institutionally beneficial, or as a result of coercion, among other reasons unrelated to criminal acts committed by the agent.

Table of Contents

Introduction	7
1. Methodology and basic concepts	7
Social Network Analysis.....	7
The Graph.....	8
Indicators of Direct Centrality and Betweenness	9
2. The Case	10
Background	10
Sources	11
3. The Network.....	13
Nodes/agents.....	13
Interactions.....	15
Betweenness: Capacity to arbitrate information and resources.....	18
Direct Centrality.....	21
Conclusions.....	21
Bibliography	23

Introduction

This document presents the model of a criminal network engaged in poaching and trafficking of rhino horn. This paper is one of the first efforts to understand the structure and specific characteristics of the individuals and groups participating in this criminal market using social network analysis.

The criminal network analyzed in this paper is a model of a case that was relevant in that those involved in the criminal network were high-income game farm owners and veterinarians who used a variety of means to obtain rhino horn. More importantly, the huge numbers of rhino horns associated with the group brought national attention on them. The primary trafficker in this case caught the attention of enforcement agencies in South Africa and The United States.

The document has 5 parts. After this introduction, the second part is a presentation of the methodology and the most relevant concepts related to Social Network Analysis. The third part includes information about the present case and the sources consulted for elaborating the model. In the fourth part the results informing about the characteristics of the network are presented: (i) The types of agents, (ii) the types of interactions established, (iii) the agents with the highest capacity to arbitrate information in the network and (iv) the agents with the highest concentration of direct interactions. In the fifth part, the conclusions are presented.

1. Methodology and basic concepts

Social Network Analysis

Social Network Analysis (SNA) is a collection of procedures that facilitates an understanding of interactions among individuals or groups. In the present paper, SNA was used to illustrate how social agents interacted over a period of time in order to accomplish criminal objectives.

The social agents participating in the present network were classified through categories generated according to the analyzed information. On the other hand, the interactions established by those social agents were classified under three main categories or dimensions: (i) Economic interactions, which groups subcategories consisting of the physical movement of money and financial transactions, (ii) political interactions, which groups interactions established *with* and *among* political leaders, candidates and some

officials, and (iii) violent and coercive interactions. Although interactions can be usually classified under any of these categories, there are cases in which additional categories must be applied. SNA allows interactions established by various types of social agents to be illustrated and analyzed, rather than just shown in a traditional hierarchy.

Through algorithms, SNA allows the relevant agents intervening in the network, the sub-networks, the emerging structures, the types of social agents and the types of relationships to be identified and highlighted. In the present analysis, the “relevant” social agents are (i) the ‘hub’ of the network, on which direct interactions are concentrated, and (ii) the structural bridge with the greatest capacity to arbitrate among the flows of resources and information. Due to the possibilities of analysis and visualization, SNA has been used to analyze the structure and characteristics of illicit networks (Morselli, 2008; Johnson, Reitzel, Norwood, McCoy, Cummings, & Tate, 2013; Radil, Flint, & Tita, 2010).

The Graph

The criminal situation analyzed in this paper requires interactions of collaboration or confrontation; therefore, it can be analyzed as a social network: “*Social networks can be defined as ‘a group of collaborating (and/or competing) entities that are related to each other’*” (den Bossche & Segers, 2013, p. 39). Social networks are analyzed through *nodes* that represent individuals and *lines* or *arcs* that represent the interactions or ties. Therefore, “(...) *a network is defined as a set of nodes connected by ties*” (Worrell, Wasko, & Johnstn, 2013, p. 128).

The present case was modeled through a technology of analysis and graphing developed by Scientific Vortex Incorporated. The technology, consisting of protocols for processing, categorizing and analyzing information, generates a database of nodes and interactions. This database allows subsequently analyzing information and characteristics related to specific nodes or interactions.

The first protocol for analyzing the sources of information, consists of identifying “relationships” or “interactions” between two agents, according to the following grammar structure:

[[Name Actor 1[Description Actor 1]][interaction[verb word \wedge action word]] [[Name Actor 2[Description Actor 2]]]

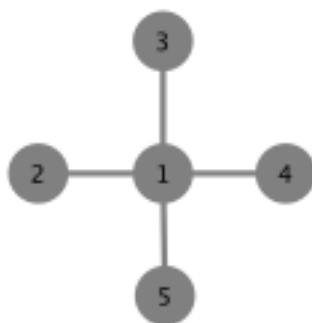
Each section of this grammar structure is included and processed in the system, through specific protocols that consolidate the mentioned database. The database is then analyzed through additional protocols to generate SNA graphs like the ones presented below, and to calculate and identify the centrality of each node.

In the present analysis each node represents a social agent; therefore, the concept of “node/agent” is used to identify each individual or corporation participating in the network. As previously stated, each line connecting two nodes represents a social interaction. Also, the arrow in the line represents the specific direction of that interaction: “For instance, if the node/agent X interacts *with/to* node/agent Z, then there is an arrow from a node representing X to a node representing Z.” (Salcedo-Albaran, Goga, & Goredema, 2014)

Indicators of Direct Centrality and Betweenness

Regarding the “centrality” of a node/agent, it is important to differentiate two meanings of centrality: The most connected node/agent or the node/agent with the highest capacity to intervene in the routes of the network. On the one hand, the direct centrality indicator allows identifying the amount of direct interactions established by each node/agent. For instance, in the figure 1 the node/agent 1 has 4 direct interactions, while the nodes 2, 3, 4 and 5 only have one direct interaction with the node 1. Since there is a total of 8 total interactions, the node/agent 1 concentrates 50% (4) of the total direct interactions, the nodes/agents 2, 3 and 4 concentrate 12,5%. In this situation, the node/agent 1 is the hub of graph 1, because it registers the highest direct centrality indicator.

Figure 1. Example of a graph with 5 nodes/agents interacting



The second meaning of “centrality” allows identifying the node/agent with the highest capacity to arbitrate or intervene in the geodesic routes of the network, known as “the structural bridge”. While in graph 1 there are only 4 direct interactions, there is a higher

number of geodesic routes, which are the paths that indirectly connect all the nodes/agents. For instance, there is a geodesic route connecting the nodes 2 and 3 through the node 1, and there is another geodesic route connecting nodes 2 and 4 also through node 1, etc. Those geodesic routes are, therefore, represent the paths of information and resources that flow across the network.

After calculating the total number of geodesic routes connecting the nodes/agents of the network, it is possible to identify through the betweenness indicator the node/agent with the highest capacity to intervene in those geodesic routes. As it can be observed in graph 1, the node 1 intervenes in every route of the network because there is not a single path that doesn't go through the node/agent 1, therefore it registers a betweenness indicator of 100%.

2. The Case

Background

The case of Dawie Groenewald and his gang is one of the more high-profile recent cases of rhino poaching and trafficking in South Africa. The particular dynamics of the supply chain differs from conceptions stating that marginalized and disaffected hunters poach rhinos from parks and then sell the horn to middlemen and transnational organized criminals.¹

Figure 2. Traditional conception of the rhino trafficking supply chain.



However, Dawie Groenewald is a wealthy, white game farm owner who worked with other actors such as veterinarians and other game farm owners, with business links across the country. In fact, this group used a variety of illegal means to obtain and sell rhino horn, hunts and other endangered species. As discussed below, the network was mainly configured by nodes/agents that manipulated and misused legal procedures and institutions. The Groenewald case therefore illustrates a growing problem within the game farm community, in which seemingly legitimate actors and game farm owners are able to earn substantially

¹ (i) M Montesh, *Rhino Poaching: A new form of organised crime*, Working Paper, University of South Africa, <http://goo.gl/0TXvxQ>; (ii) See, "Poaching Crisis in South Africa", Available in: <http://goo.gl/Abky4W>; (iii) Stop Rhino Poaching, *Behind the trigger: The many faces of rhino poaching*, Available in: <http://goo.gl/D2Q2Js>

larger profits from the illegal trade in rhino products, than from the game farms that they own and operate. Law enforcement is impeded by various loopholes, ambiguities and problems.

Groenewald and his gang were able to obtain horn through various means. An example would be ‘selling’ a hunting trip to a foreign hunter and then stating that the horn could not be exported. Groenewald would then make a profit on both the hunt and on the illegal exporting of the horn. Another scheme would be to falsify documentation related to the horn so that it could be smuggled and sold. Problems related to the policy and legislation are illustrated by the fact that Groenewald was able to obtain permits for the trade in rhinos and rhino hunts after his indictment.² Dawie Groenewald and the rest of his “gang” would therefore use business transactions, sham hunts and falsified documentation to obtain rhino horn. He has also been indicted in the United States for selling hunts to hunters with the aim of obtaining horn. In fact, Dawie Groenewald did not only focus on rhino horn and was indicted in the United States in 2010 for selling an illegal leopard hunt. This took place just months before his arrest in South Africa.

The trial was set to start in August 2015, but postponements are expected and it is not clear when the case will begin. Groenewald is now on bail for 1 million rand (about USD\$80 000). Over R55 million rand in assets were also seized from members of the gang as part of the raid.

Sources

The source gathered to model the present network was an affidavit from the investigating officer in the case, as well as the state’s case against Groenewald and his network. Col Johan Jooste who leads the endangered species unit at South **Africa’s** elite Directorate of Priority Crime Investigation (DPCI), commonly known as the ‘Hawks’ wrote the affidavit. The arrest of the network was the outcome of a fifteen-month investigation known as ‘Project Cruiser’.

Seven respondents were named in the supporting affidavit and nine people were arrested during the course of the investigating, namely:

1. Dawie Groenewald
2. Karel Toet

² IOL (2011) Rhino hunting scandal. Available in: <http://goo.gl/COZMRI>

3. Maria Toet
4. Sariette Groenewald
5. Tielman Erasmus
6. Gys Du Preez
7. Nardus Rossouw
8. Koos Pronk
9. Manie du Plessis

The hub and structural bridge of the network, Dawie Groenewald:

- Faces 1,736 counts of racketeering, money laundering, fraud, intimidation and illegal hunting and dealing in rhino horns.
- Is accused of killing 59 of his own rhinos for their horns.
- Illegally dehorned dozens of rhinos and sold at least 384 horns over a four year period.³

What is noticeable is that those listed have a variety of professions such as veterinarians and game farm owners. The scheme, which operated quite loosely with Dawie Groenewald at the nucleus of the structure, revolved around a variety of lawful interactions that mainly consisted of scams and frauds to change paperwork, permits and tracking devices on horns. The horns and rhinos were obtained in various ways, including many legitimate deals. These two characteristics: **the involvement of lawful agents and the usually “lawful” deals, sustain the “gray” nature of this network.** In fact, due to these deals, it is noted that the majority of those involved are businesspeople that often own game farms. These businesspeople were often offered lucrative deals for rhino horn and many turned them down. Others only realized later that the deals were for the illegal procurement of rhino horn.

The scheme also required the participation of veterinarians who acted as middlemen in the facilitation of rhino horn trafficking and liaised with other game farm owners to provided assistance when necessary. **Also, those nodes/agents identified as “wives”** were intimately involved, providing help with paperwork and documentation. The network extended into using other peripheral players such as pilots and butchers for getting rid of the rhino carcasses.

³ Killing for Profit. Exposing the illegal Rhino Horn Trade. Groenewald Gang Trial Postponed. Available in: <https://goo.gl/FLdSpn>

3. The Network

Nodes/agents

After processing the mentioned source, 104 nodes/agents were registered.

The 104 nodes/agents were classified under two main categories: Private (90%) and public servants (10%). The percentages of nodes/agents therefore illustrate a scheme in which the private sector plays a critical role in the various stages of obtaining fraudulent licenses, poaching, selling and transporting the rhino horn.

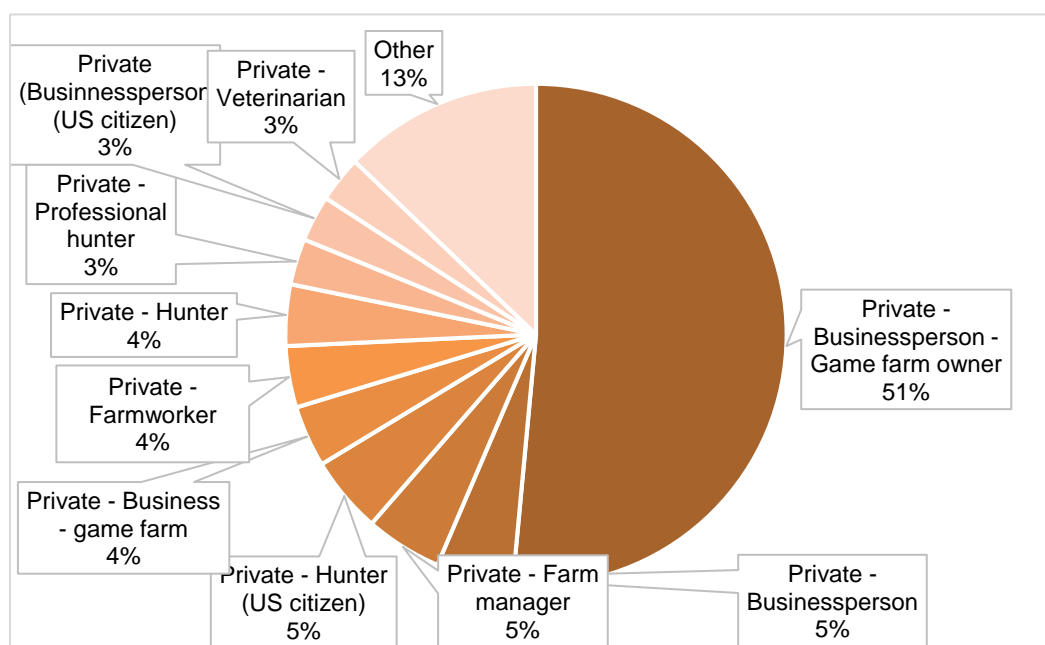
The 94 nodes/agents operating within the private sector were categorized as presented in the table 1 and the figure 3. **It calls the attention the high participation of “Businesspersons” specifically classified as “Game farm owners”** in the entire scheme of rhino horn trafficking. With 41 nodes/agents, **“Game farm owners”** is a more relevant type of nodes/agents, even more than “hunters”, with 11 nodes/agents.

Table 1. Nodes/agents categorized as “private”.

Private - Businessperson - Game farm owner	41
Private	11
Private – Business	4
Private – Businessperson	4
Private - Farm manager	4
Private - Hunter (US citizen)	4
Private - Business - game farm	3
Private – Farmworker	3
Private – Hunter	3
Private - professional hunter	3
Private - Businessperson (US citizen)	2
Private – Veterinarian	2
Private - Business – Butchery	1
Private - Business - closed corporation	1
Private - Hunting Director	1

Private – Pilot	1
Private - Security Officer	1
Private - Spanish citizen	1
Private – Taxidermist	1
Private - Veterinarian - Game farm owner	1
Private - Warehouse owner	1
Private – worker	1

Figure 3. Nodes/agents categorized as “private”



Regarding the subcategory “Private – Hunter”, it also shows that 4 hunters are United States citizens: (i) Alfred Glen Davey (PR-HUUSCIAGD); (ii) Dennis Whittington (PR-HUUSCIDW); (iii) Jimmy Van Amstel (CI-HUUSCIJVA) and (iv) Wayne Duncan (PR-HUUSCIWD).

The 9 nodes/agents categorized as “State officials” (table 2) performed their activities mainly within law enforcement and governmental offices. Unlike many criminal organisations, most of the officials in this scheme were “bright” nodes/agents, either involved in investigating the group or part of the state apparatus in some other respects. Specifically, 6 were involved only in legitimately investigating the network; one of these was threatened for his involvement, and another experienced attempts to influence him to destroy the documents associated with the arrest of two of the network members. Therefore, the concern in this

case is the manner in which the Groenewald gang tricked management inspectors and compliance officers, using official documentation.

The remaining 3 state-based actors were directly involved in the trade of rhinos with actors in the network, although there is no indication that they were aware that there was criminality involved.

It should be noted and there have been numerous instances of corruption of officials including those in the police and the South African National Parks.

Table 2. Nodes/agents categorized as “State officials”

State Officials	
State Official - Environmental Compliance Officer	1
State Official - Environmental Management Inspector	2
State Official – Government	4
State Official - Law enforcement – Police	1
State Official - Law enforcement - Police – DPCI	2

Interactions

A total of 159 interactions were identified and classified under the following categories:

Table 3. Interactions

Interactions	
Business	99
Applied for permits on behalf	20
Operative - Dehorned rhino with or for	20
Family	5
Official – Investigated	5
Crime	3
Arrested together	2
Attempted to influence	1
Financial - Paid bail for	1
Logistics - gave elephant tusks	1
Reported to the police	1
Violence – Threat	1

Figure 4. Main categories of interactions

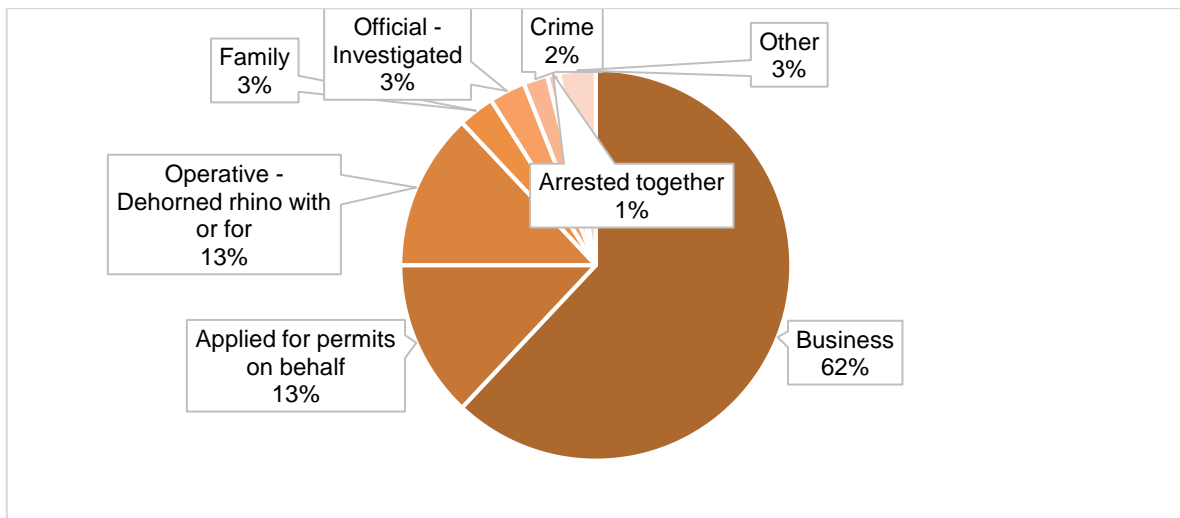
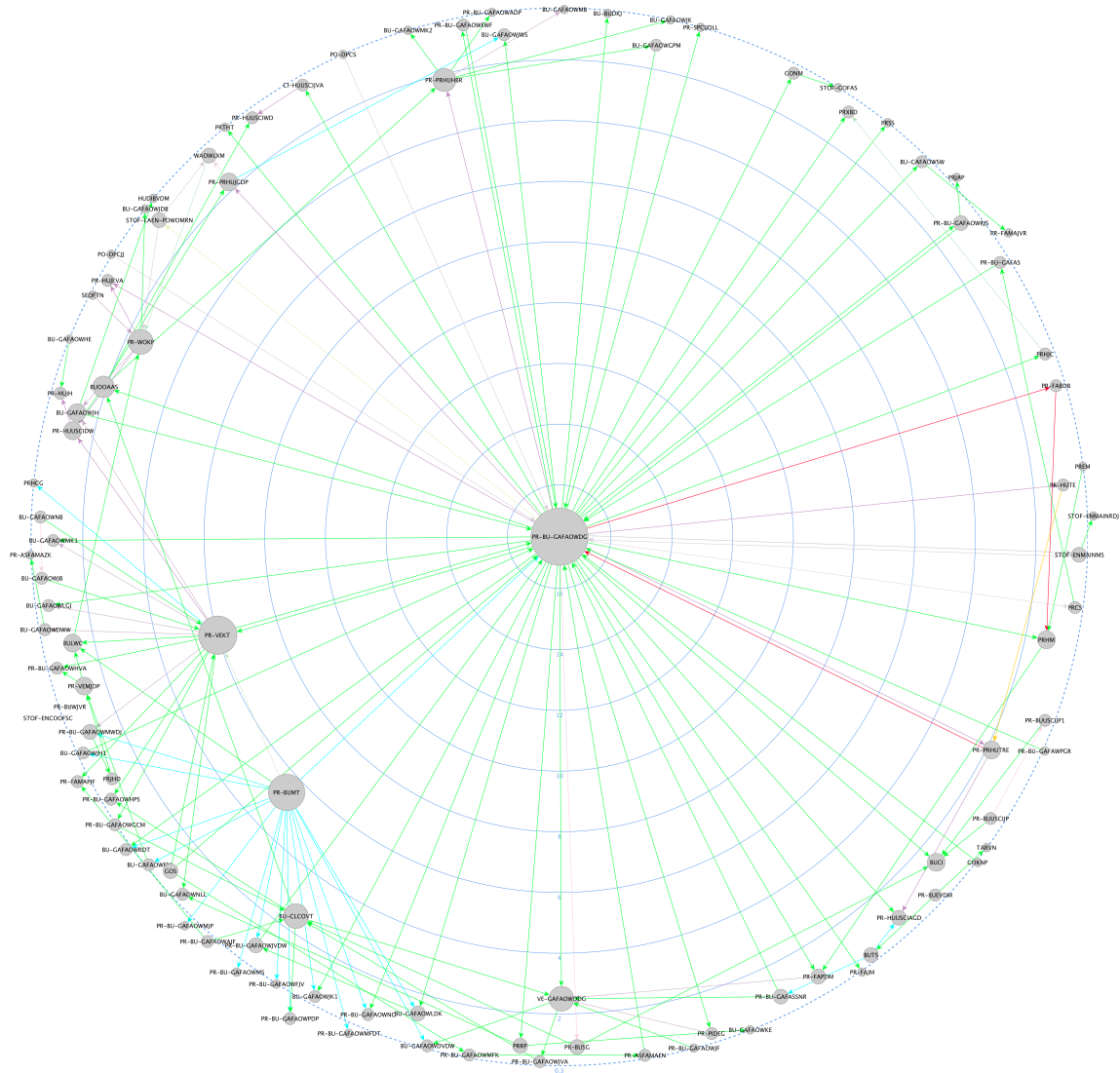


Figure 5. Graph with radial distribution of nodes/agents. Size and location represent indicator of direct centrality. Main interactions: (i) Green lines represent “Business” interactions, (ii) light blue lines represent interactions categorized as “Applied for permits on behalf”, (iii) dark blue lines represent “Operative” interactions, (iv) red lines represent “crime interactions, (v) orange lines represent “Family” interactions and (vi) grey lines represent other interactions.



Coinciding with the high participation of “grey” nodes/agents operating across the lawful and criminal sectors of society, which was specially observed in the case of the “businesspersons”, the interactions are also categorized by a grey scheme executed mainly in the lawful sectors of society, through “Businesses” (62%). The following are the subcategories of interactions identified in the “Business” category:

Figure 6. Interactions categorized as “Business”

“Business” interactions	
Business - sold rhino to	31
Business – Employed	15
Business	9
Business - Sold rhino horn to	8
Business - traded rhinos	8
Business - manages or directs	6
Business - offered to buy rhino horn	4
Business – Owns	4
Business - provided with hunt	4
Business - transported rhino for	4
Other	6
Business - allowed access to farm	2
Business – colleagues	1

As can be observed, the “Business” category groups fraudulent interactions in which legitimate processes were used for achieving the criminal purposes of trafficking. In fact, only 63 interactions out of 154 were defined as strictly illegal: (i) two as “Crime - Logistic - gave a firearm to”, and (iv) one categorized as “Crime – staged a crime for”. As a result, it is difficult to identify and prosecute situations and schemes of rhino horn trafficking similar to those observed in the present network, since the actors and institutions involved are mainly legal. This network, therefore, is a good example of a criminal structure that could not operate without corruption, support and interactions with lawful nodes/agents and institutions. In this specific case, those interactions are concretized through “businesses” and fraudulent use of legal procedures, such as hunting permits.

Betweenness: Capacity to arbitrate information and resources

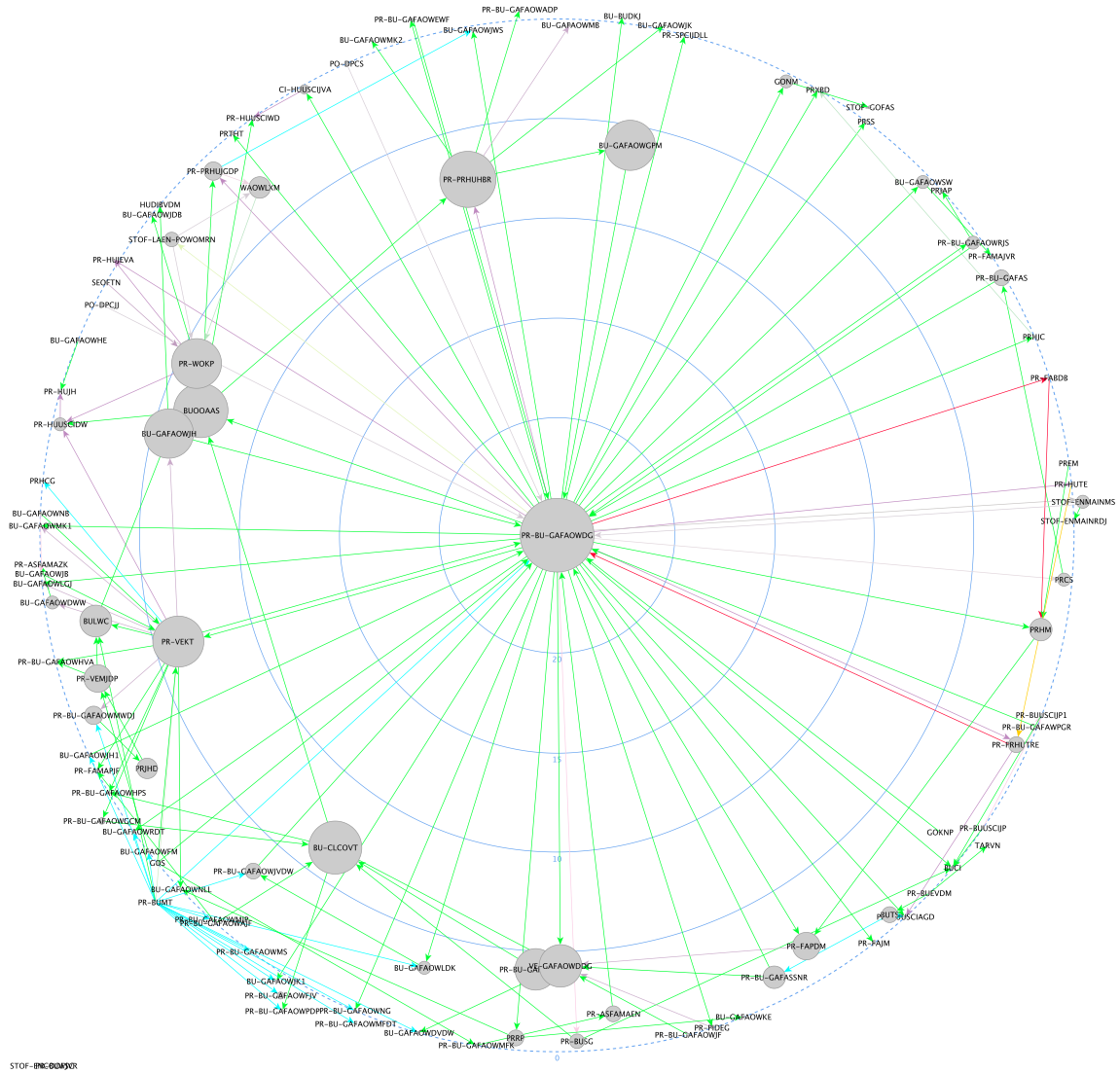
Bearing in mind that two nodes/agents can indirectly connect through geodesic routes established across other nodes/agents of the network, the indicator of betweenness determines the proportion of geodesic routes in which each node/agent intervenes. In this case, the node/agent with the highest indicator of betweenness is Dawid Groenewald (PR-BU-GAFAOWDG). This node/agent registers a betweenness indicator of 25.9%, which means that Dawid Groenewald, categorized as a “Game farm owner”, intervenes in just over a quarter of the total amount of geodesic routes and therefore has a role as structural bridge of the criminal network.

The second node/agent with the highest indicator of betweenness is Hermanus Bernardus Rossouw (PR-PRHUHBR), **categorized as “Private - professional hunter”, with 7.5%, while** the third one is **the Business “Out of Africa Adventurous Safaris”, identified with the code BUOOAAS**, with an indicator of 7%. These three nodes/agents intervene in 40.4% of the interactions, which means that they stabilize the criminal structure. This means that there is no criminal **or “dark”** nodes/agents intervening across the geodesic routes of the network with the relevance and capacity observed in Groenewald, Hermanus Bernardus Rossouw and Out of Africa Adventurous Safaris. In other words, this network was primarily stabilized by Groenewald, through his management of the hunting outfitting business Out of Africa, and its employment of especially Rossouw to hunt and to approach other rhino owners in numerous successful and unsuccessful attempts to gain access to their horns.

Although the node/agent with the highest indicator of betweenness intervenes in a quarter of the total amount of geodesic routes, in total 38 nodes/agents intervene at some extent. This means that despite the high intervention achieved by the structural bridge Dawid Groenewald, the network is also resilient because 37% of the nodes/agents intervene in the geodesic routes, which implies that it is difficult to destroy the entire structure in terms of its indirect flows. Several geodesic routes allow the flowing of logistic and economic resources like payments, information, social capital and procedures for achieving fraudulent use of documents. Therefore, although isolating the node/agent Dawid Groenewald would affect the structure of indirect interactions, it would not block the entire flowing of resources. In fact, the level of resilience of the network, or its capacity to adapt to external perturbations, is illustrated in the Figure 7: The nodes/agents with large size are local structural bridges with capacity to arbitrate resources and establish indirect connections even if Dawid Groenewald is not operating.

The indicator of betweenness for all the nodes/agents of the network is presented in Annex 1. Also, the graph below illustrates the structure of the network according to the betweenness indicator.

Figure 7. Graph with radial distribution. Size and location represent indicator of Betweenness. Main types of interactions: (i) Green lines represent "Business" interactions, (ii) light blue lines represent interactions categorized as "Applied for permits on behalf", (iii) dark blue lines represent "Operative" interactions, (iv) red lines represent "crime interactions, (v) orange lines represent "Family" interactions and (vi) grey lines represent other interactions.



Direct Centrality

The node/agent with the highest indicator of direct centrality is also Dawid Groenewald (PR-PRHUDG), with 17.7%. This means that Groenewald is not only the structural bridge with the highest indicator of betweenness, but he is also the hub of the criminal network, concentrating 17.7% out of the total direct interactions. The second node/agent with the highest indicator of direct centrality is Karel Toet (PR-VEKT), “Private – Veterinarian” with an indicator of 6%, and the third one is Mariza Toet (PR-BUMT), “Private – Businessperson”, with 5.4%. This trio’s centrality is due to their roles in the network and illustrate the fact that in most of the illegal trades of rhinos, Groenewald was the direct seller or purchaser, Karel Toet was the veterinarian authorized by the permits to transport the animals between the relevant game farms, and Mariza Toet applied for all the permits on behalf of the parties. Many of the permits for these sales and transportations were fraudulent, most often in that they failed to honestly disclose whether or not the rhinos were dehorned.

As it was observed in the three highest indicators of betweenness, the nodes/agents with the three highest indicators of direct centrality are not criminal, but grey nodes/agents operating within lawful organizations and institutions categorized as businesses. This indicator also illustrates the relevant role played by a lawful veterinarian within the criminal scheme.

The indicator of direct centrality for all the nodes/agents of the criminal network is presented in Annex 2. Also, the structure of the criminal network according to the indicator of direct centrality was presented in the figure 5.

Conclusions

The network analyzed in this paper exemplified a criminal structure that is mainly configured by “grey” nodes/agents operating through procedures that are not strictly illegal. As stated at the beginning of this paper, this case was relevant because the majority of the transactions to obtain rhino horn were not dependent on poaching, but instead the group relied on fraudulent documents, pseudo-hunts (see earlier paper), and illegal purchasing of rhino horn. Rather than engaging with level 1 and 2 (discussed in earlier paper) actors, the primary involvement took place with legitimate businesspeople. This criminal scheme illustrates that formal and lawful institutions were manipulated and used for achieving criminal objectives, since Groenewald was able to manipulate hunting permits and licenses

in order to obtain rhino horn. Due to state interventions, horn could only be exported as a trophy, so the Groenewald gang was able to use these pseudo-hunts to obtain the horn that he would later sell in the black market. This type of crime does not exist in isolation and a host of similar incidences, involving game farm owners and high-ranking state officials, can be found in this case.⁴.

The case also illustrates how policy may be manipulated to serve in the interests of a criminal group. The group justified many of their transactions as they stated that once an animal was set to be hunted, it made no difference who killed the animal or if they were able to take the horn. In fact, Groenewald went on to state that:

"(...) I'm killing them because of the system. We are forced to shoot them because that is the only way the trophies can be sold and exported. You have to kill the animal to sell its horns."⁵

Groenewald also laid blame toward the staterun SanParks, arguing that they willingly sold the rhino to make a profit, at R22 million in 2008 and R52million in 2009.⁶ Groenewald was also able to dupe officials through falsification and fraud in their documentation, suggesting that stronger policy and checks need to be developed.

The "grey" nodes/agents are mainly "Businessperson" (57%), which was the most relevant type of actor within the "Private" main category. Since those nodes/agents operated within the private and lawful sector of society, the main type of interaction registered in the network was "Business" with 62%.

The "grey" nature of the present network is also reflected in the fact that the most relevant node/agent who stabilized the network as structural bridge and hub Dawid Groenewald, categorized as "Game farm owner". This node/agent acted, in each case, close to other private actors – other businesspeople and veterinarian- to fraudulently use legitimate hunting permits.

⁴ Saving Rhinos (2012) Rhino crimes, are the right people going to jail? Available in: <http://goo.gl/eDFnyt>

⁵ Laurel Neme (2014) U.S. Indictment Accuses South African brothers of Trafficking Rhino Horns. National Geographic news. Available in: <http://goo.gl/chJB9q>

⁶ Killing for profit (2014) The groenewald gang on trial. Available in: <http://goo.gl/uf07fu>

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Annex 1. Betweenness Indicator.

Id	Bet
PR-BU-GAFAOWDG	25.9
PR-PRHUHBR	7.5
BUOOAAS	7
BU-CLCOVT	6.7
PR-VEKT	6.2
BU-GAFAOWGPM	6
PR-WOKP	5.9
BU-GAFAOWJH	5.8
VE-GAFAOWDDG	4.3
PR-BU-GAFAOWJVA	4.1
BULWC	2.4
PR-VEMJDP	1.8
PR-FAPDM	1.8
PRHM	1.2
PR-BU-GAFASSNR	1.2
WAOWLXM	1.1
PRJHD	1
PR-PRHUJGDP	0.8
PR-BU-GAFAOWMWDJ	0.8
PRRP	0.6
PR-PRHUTRE	0.6
PR-BU-GAFAS	0.6
PR-BU-GAFAOWJVDW	0.6
PR-ASFAMAEN	0.6
BUTS	0.6
STOF-LAEN-POWOMRN	0.5
PR-BUSG	0.5
STOF-ENMAINMS	0.4
PRCS	0.4
PR-HUUSCIDW	0.4
PR-BU-GAFAOWRJS	0.4
GONM	0.4
BU-GAFAOWSW	0.4
BU-GAFAOWLDK	0.4
BU-GAFAOWDWW	0.4
CI-HUUSCIJVA	0.2
PR-BU-GAFAOWGCM	0.1
TARVN	0
STOF-GOFAS	0
STOF-ENMAINRDJ	0
STOF-ENCOOFSC	0
SEOFTN	0
PRXBD	0
PRTHT	0
PRSS	0
PRJAP	0
PRHJC	0
PRHCG	0
PREM	0
PR-SPCIJDLL	0
PR-PIDEG	0
PR-HUUSCIWD	0
PR-HUUSCIAGD	0
PR-HUTE	0
PR-HUJH	0
PR-HUJEVA	0
PR-FAMAPIJF	0
PR-FAMAJVR	0
PR-FAJM	0
PR-FABDB	0
PR-BUWJVR	0
PR-BUUSCIJ1	0
PR-BUUSCIJ	0

PR-BUMT	0
PR-BUEVDM	0
PR-BU-GAFAWPGR	0
PR-BU-GAFAOWPDP	0
PR-BU-GAFAOWNG	0
PR-BU-GAFAOWMS	0
PR-BU-GAFAOWMJP	0
PR-BU-GAFAOWMFK	0
PR-BU-GAFAOWMFDT	0
PR-BU-GAFAOWJF	0
PR-BU-GAFAOWHVA	0
PR-BU-GAFAOWHPS	0
PR-BU-GAFAOWFJV	0
PR-BU-GAFAOWEWF	0
PR-BU-GAFAOWAJF	0
PR-BU-GAFAOWADP	0
PR-ASFAMAZK	0
PO-DPCS	0
PO-DPCJJ	0
HUDIBVDM	0
GOS	0
GOKNP	0
BUCI	0
BU-GAFAOWRDT	0
BU-GAFAOWNLL	0
BU-GAFAOWNB	0
BU-GAFAOWMK2	0
BU-GAFAOWMK1	0
BU-GAFAOWMB	0
BU-GAFAOWLGJ	0
BU-GAFAOWKE	0
BU-GAFAOWJWS	0
BU-GAFAOWJK1	0
BU-GAFAOWJK	0
BU-GAFAOWJH1	0
BU-GAFAOWJDB	0
BU-GAFAOWJB	0
BU-GAFAOWHE	0
BU-GAFAOWFM	0
BU-GAFAOWDWDW	0
BU-BUDKJ	0

Annex 2. Direct Centrality Indicator.

Id	Degree
PR-BU-GAFAOWDG	17.7
PR-VEKT	6
PR-BUMT	5.4
BU-CLCOVT	2.5
PR-WOKP	2.5
VE-GAFAOWDDG	2.5
PR-PRHUHBR	2.2
BUOOAAS	1.9
BU-GAFAOWJH	1.3
BUCI	1.3
BULWC	1.3
PR-HUUSCIDW	1.3
PR-PRHUJGDP	1.3
PR-PRHUTRE	1.3
PR-VEMJDP	1.3
PRHM	1.3
BU-GAFAOWLDK	0.9
BUTS	0.9
GOS	0.9
PR-BU-GAFAOWJVDW	0.9
PR-BU-GAFAOWMWDJ	0.9
PR-BU-GAFAOWRJS	0.9
PR-BU-GAFASSNR	0.9
PR-BUSG	0.9
PR-FAPDM	0.9
PR-HUUSCIAGD	0.9
PRRP	0.9
STOF-ENMAINMS	0.9
STOF-LAEN-POWOMRN	0.9
WAOWLXM	0.9
BU-GAFAOWVDW	0.6
BU-GAFAOWDWW	0.6
BU-GAFAOWFM	0.6
BU-GAFAOWGPM	0.6
BU-GAFAOWJB	0.6
BU-GAFAOWJH1	0.6
BU-GAFAOWJK1	0.6
BU-GAFAOWJWS	0.6
BU-GAFAOWLGJ	0.6
BU-GAFAOWMK1	0.6
BU-GAFAOWNB	0.6
BU-GAFAOWNLL	0.6
BU-GAFAOWRDT	0.6
BU-GAFAOWSW	0.6
CI-HUUSCIJVA	0.6
GONM	0.6
PR-ASFAMAEN	0.6
PR-BU-GAFAOWAJF	0.6
PR-BU-GAFAOWEWF	0.6
PR-BU-GAFAOWGCM	0.6
PR-BU-GAFAOWHPS	0.6
PR-BU-GAFAOWHVA	0.6
PR-BU-GAFAOWJVA	0.6
PR-BU-GAFAOWMFK	0.6
PR-BU-GAFAOWNG	0.6
PR-BU-GAFAOWPDP	0.6
PR-BU-GAFAS	0.6
PR-BUEVDM	0.6
PR-BUUSCIJP	0.6
PR-BUUSCIJP1	0.6

PR-FABDB	0.6
PR-FAMAPJF	0.6
PR-HUJEVA	0.6
PR-HUJH	0.6
PR-HUTE	0.6
PR-HUUSCIWD	0.6
PR-PIDEG	0.6
PRCS	0.6
PRHJC	0.6
PRJHD	0.6
PRXBD	0.6
BU-BUDKJ	0.3
BU-GAFAOWHE	0.3
BU-GAFAOWJDB	0.3
BU-GAFAOWJK	0.3
BU-GAFAOWKE	0.3
BU-GAFAOWMB	0.3
BU-GAFAOWMK2	0.3
GOKNP	0.3
HUDIBVDM	0.3
PO-DPCJJ	0.3
PO-DPCS	0.3
PR-ASFAMAZK	0.3
PR-BU-GAFAOWADP	0.3
PR-BU-GAFAOWFJV	0.3
PR-BU-GAFAOWJF	0.3
PR-BU-GAFAOWMFD	0.3
PR-BU-GAFAOWMJP	0.3
PR-BU-GAFAOWMS	0.3
PR-BU-GAFAWPGR	0.3
PR-FAJM	0.3
PR-FAMAJVR	0.3
PR-SPCIJDLL	0.3
PREM	0.3
PRHCG	0.3
PRJAP	0.3
PRSS	0.3
PRTHT	0.3
SEOFTN	0.3
STOF-ENMAINRDJ	0.3
STOF-GOFAS	0.3
TARVN	0.3
PR-BUWJVR	0
STOF-ENCOOFSC	0

Annex 3. Total list of nodes/agents

Name		Code	Type
Adriaan Du Plessis	40251	PR-BU-GAFAOWADP	Private - Businessperson - Game farm owner
Alan James Fourie	40212	PR-BU-GAFAOWAJF	Private - Businessperson - Game farm owner
Alfred Glen Davey	40145	PR-HUUSCIAGD	Private - Hunter (US citizen)
Barend De Bruin	40121	PR-FABDB	Private - Farmworker
Botes van der Merwe	40224	HUDIBVDM	Private - Hunting Director
Catfish Investments 59	40095	BUCI	Business
Coena Smith	42266	PRCS	Private
Colonel Johan Jooste	40078	PO-DPCJJ	State Official - Law enforcement - Police - DPCI
Colonel Smith	40079	PO-DPCS	State Official - Law enforcement - Police - DPCI
Daniel Karl Johnson	40350	BU-BUDKJ	Private - Business - Butchery
David van der Westhuizen	40306	BU-GAFAOWDVDW	Private - Businessperson - Game farm owner
Dawid Groenewald	40082	PR-BU-GAFAOWDVG	Private - Businessperson - Game farm owner
Dennis Whittington	40159	PR-HUUSCIDW	Private - Hunter (US citizen)
Dewald Erlank Gouws	40142	PR-PIDEG	Private - Pilot
Dr Douw Grobler	40240	VE-GAFAOWDDG	Private - Veterinarian - Game farm owner
Dr Walter Ward	40206	BU-GAFAOWDWW	Private - Businessperson - Game farm owner
Eghardt Nel	42268	PR-ASFAMAEN	Private - Farm manager
Erich Werner Ferreira	40218	PR-BU-GAFAOWEWF	Private - Businessperson - Game farm owner
Ernest Musiva	40173	PREM	Private
Estie van der Merwe	40149	PR-BUEVDM	Private - Businessperson
Farouk Moolia	40304	BU-GAFAOWFM	Private - Businessperson - Game farm owner
Francois Alwyn Smit	42339	STOF-GOFAS	State Official - Government
Frederik Johannes Visser	40187	PR-BU-GAFAOWFJV	Private - Businessperson - Game farm owner
Gary Paul Murphy	40352	BU-GAFAOWGPM	Private - Businessperson - Game farm owner
Gehard Cornelius Minaar	40203	PR-BU-GAFAOWGCM	Private - Businessperson - Game farm owner
Hendrik Petrus Steenkamp	40214	PR-BU-GAFAOWHPS	Private - Businessperson - Game farm owner
Hendrik van Aswegen	40208	PR-BU-GAFAOWHVA	Private - Businessperson - Game farm owner
Hennie Erwee	40189	BU-GAFAOWHE	Private - Businessperson - Game farm owner
Henry Christo Gomez	40156	PRHCG	Private
Hermanus Bernardus Rossouw	42240	PR-PRHUHBR	Private - professional hunter
Hlualani Mlati	40166	PRHM	Private
Huong Jiang Chu	40127	PRHJC	Private
James Edward van Amstel	40254	PR-HUJEVA	Private - Hunter
Jan Abraham Pienaar	42296	PRJAP	Private
Jan De Beer	40323	BU-GAFAOWJDB	Private - Businessperson - Game farm owner
Jan Kleyhnans	40249	BU-GAFAOWJK	Private - Businessperson - Game farm owner
Jan Walter Slippers	40295	BU-GAFAOWJWS	Private - Businessperson - Game farm owner
Japie Horn	40162	PR-HUJH	Private - Hunter
JC De Los Lobos	42288	PR-SPCIJDLL	Private - Spanish citizen
Jimmy Van Amstel	40200	CI-HUUSCIJVA	Private - Hunter (US citizen)
Joan Pouleson	42230	PR-BUUSCIJP1	Private - Businessperson (US citizen)
Johan Bosch	40268	BU-GAFAOWJB	Private - Businessperson - Game farm owner
Johan Kruger	40319	BU-GAFAOWJK1	Private - Businessperson - Game farm owner
Johan van Altena	42308	PR-BU-GAFAOWJVA	Private - Businessperson - Game farm owner
Johan van Rooyen	42299	PR-FAMAJVR	Private - Farm manager
Johannes Gysbert Du Preez	40100	PR-PRHUJGDP	Private - professional hunter
Johannes Hendrich Dercksen	42257	PRJHD	Private
Johannes Huyser	40223	BU-GAFAOWJH	Private - Businessperson - Game farm owner
Johannes van der Westhuizen	40346	PR-BU-GAFAOWJVDW	Private - Businessperson - Game farm owner
John Hume	40298	BU-GAFAOWJH1	Private - Businessperson - Game farm owner
John Pouleson	40097	PR-BUUSCIJP	Private - Businessperson (US citizen)
Jonathan Fourie	40290	PR-BU-GAFAOWJF	Private - Businessperson - Game farm owner
Joseph Maluleke	42277	PR-FAJM	Private - Farmworker
Karel Toet	40109	PR-VEKT	Private - Veterinarian
Karl Erichson	40235	BU-GAFAOWKE	Private - Businessperson - Game farm owner

Koos Pronk	40118	PR-WOKP	Private - worker
Kruger National Park	40344	GOKNP	State Official - Government
Le Xuan Minh	40260	WAOWLXM	Private - Warehouse owner
Leon de Kock	40317	BU-GAFAOWLDK	Private - Businessperson - Game farm owner
Limpopo Wildlife Consultants	42243	BULWC	Business
Lodewyk Goosen Jnr	40280	BU-GAFAOWLGJ	Private - Businessperson - Game farm owner
Manus Johannes du Plessis	40119	PR-VEMJDP	Private - Veterinarian
Mario Scholtz	40314	STOF-ENMAINMS	State Official - Environmental Management Inspector
Marius Kotze	40287	BU-GAFAOWMK2	Private - Businessperson - Game farm owner
Mariza Toet	40106	PR-BUMT	Private - Businessperson
Mark Knezovich	40238	BU-GAFAOWMK1	Private - Businessperson - Game farm owner
Marthinus Steyl	40300	PR-BU-GAFAOWMS	Private - Businessperson - Game farm owner
Marthinus Willem de Jager	40180	PR-BU-GAFAOWWDJ	Private - Businessperson - Game farm owner
Matthys Bekker	40246	BU-GAFAOWMB	Private - Businessperson - Game farm owner
Mr FG Kinnear	40194	PR-BU-GAFAOWMFK	Private - Businessperson - Game farm owner
Mr FJP du Toit	42347	PR-BU-GAFAOWMFDT	Private - Businessperson - Game farm owner
Mr JL Pienaar	42345	PR-BU-GAFAOWMJP	Private - Businessperson - Game farm owner
Nadien Bosch	40271	BU-GAFAOWNB	Private - Businessperson - Game farm owner
Naledi Municipality	40326	GONM	State Official - Government
Nicolaas Louis Laurens	40232	BU-GAFAOWNLL	Private - Businessperson - Game farm owner
Nicolas Grobbelaar	40333	PR-BU-GAFAOWNG	Private - Businessperson - Game farm owner
Out of Africa Adventurous Safaris	40086	BUOOAAS	Business
Paul Dimokatso Mathoromela	40120	PR-FAPDM	Private - Farmworker
Petrus Jacobus Fourie	42275	PR-FAMAPJF	Private - Farm manager
Pieter du Plessis	40330	PR-BU-GAFAOWPDP	Private - Businessperson - Game farm owner
Reino du Toit	40310	BU-GAFAOWRDT	Private - Businessperson - Game farm owner
Reuben Jan Saayman	40216	PR-BU-GAFAOWRJS	Private - Businessperson - Game farm owner
Riaan de Jager	42328	STOF-ENMAINRDJ	State Official - Environmental Management Inspector
Riaan Pool	42303	PRRP	Private
Rudi van Niekerk	40152	TARVN	Private - Taxidermist
Sabie Sand Nature Reserve	40338	PR-BU-GAFASSNR	Private - Business - game farm
SanParks	40341	GOS	State Official - Government
Sariette Groenewald	40091	PR-BUSG	Private - Businessperson
Shambala	42290	PR-BU-GAFAS	Private - Business - game farm
Stephanus Coetzee	40155	STOF-ENCOOFSC	State Official - Environmental Compliance Officer
Stuart Williams	40229	BU-GAFAOWSW	Private - Businessperson - Game farm owner
Suzette Saayman	42350	PRSS	Private
Teiufdi Nyoni	40257	SEOFTN	Private - Security Officer
Theo Erasmus	40276	PR-HUTE	Private - Hunter
Tielman Roos Erasmus	40099	PR-PRHUTRE	Private - professional hunter
Trophy Solutions	42247	BUTS	Business
Tuan Hung Tran	42352	PRHT	Private
Valinor Trading 142	42226	BU-CLCOVT	Private - Business - closed corporation
Warrant Officer Masocha Rodgers Ntlhamu	40263	STOF-LAEN-POWOMRN	State Official - Law enforcement - Police
Wayne Duncan	40197	PR-HUUSCIWD	Private - Hunter (US citizen)
Welgevonden Private Game Reserve	42280	PR-BU-GAFAWPGR	Private - Business - game farm
Willem Jacobus van Rooyen	40182	PR-BUWJVR	Private - Businessperson
Xion Binh Dang	40128	PRXBD	Private
Zacharia Kekana	42273	PR-ASFAMAZK	Private - Farm manager

About the Authors

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Khalil Goga is a Researcher for the Transnational Threats and International Crime Division of ISS Pretoria. He has been researching organized crime in Africa since 2009. He previously lectured at the University of KwaZulu-Natal, from where he received both his undergraduate and master's degrees.

Charles Goredema

Charles Goredema is the chief consultant and director of the Informed Solutions to Economic Crime in Africa (ISECA). Charles has over 20 years' experience in advising policy makers, law enforcement practitioners and private corporations on strategies against economic and financial crime. He also worked as a senior research fellow for the Institute for Security Studies (ISS).

Eduardo Salcedo Albarán

Philosopher and MsC in Political Science. Founder and CEO at Vortex Foundation. Eduardo has researched in the areas of organized crime, kidnapping, corruption, drug-trafficking and State Capture. As partner, advisor or consultant, he currently researches on the structure and impact of Transnational Criminal Networks with scholars, institutes and Universities in North, Central and South America, Europe and Africa.