# USE OF TECHNOLOGY TO COMBAT POACHING: SOLUTION OR PROBLEM?

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## ABSTRACT

*This paper explores questions about whether science and technology can be employed to win the war against poaching especially of elephants and rhinos. Like all wars, technology can be used on both sides of the battle. The focus is on describing what measures have been taken in an international attempt to halt the dramatic decline in the number of elephants and rhinos, especially in Africa. These include information and communication technology, special task forces, satellite technology, radio technology, mapping technology and aircraft such as planes, helicopters and drones. Biology can also be employed using DNA technology as well as training dogs.*

*Unlike traditional military battles, the enemy is very difficult to identify since the international crime syndicate is involved. Victory is far from clear and definitive as the killing of the British helicopter pilot Roger Gower in Serengeti National Park in January, 2016 illustrates. Some attempt is made to justify investments in crime prevention equipment and methods although a rigorous cost benefit analysis is very difficult.*

***Keywords***: technology, drones, environmental crime, organized crime, DNA, poaching

## 1.0 INTRODUCTION

Growing concern about the extent to which organized crime is undermining stability and prosperity on the African continent is galvanizing a search for analytical tools and its clamor for more research to understand the contextual forces at play and how best to undermine them. Whereas debates on organized crime primarily centered on the developed world, and then in Latin America and Central Asia, the focus has shifted to Africa. The relevance of organized crime as an issue in Africa is now increasingly being perceived as a quintessentially Africa concern. This is the opinion expressed in the recent report entitled *Unholy Alliances: Organized Crime in Southern Africa* (2015) put out by the Global Initiative against Transnational Organized Crime and Rosa Luxemburg Stiftung based on discussions by a panel of experts in 2015. When trying to find solutions, the report notes that the role of Western countries and companies as exploiters and consumers in Africa must sit in the foreground. The focus on Africa has largely coincided with the accompanying realization over the last decade that not only does organized crime threaten development but that development-oriented solutions are necessary to combat it. [Philippa Garson, 2015]

Wildlife conservation experts in Tanzania have advised the government to apply modern science and technology in protecting and conserving wild animals, particularly the endangered species.

In the current modern and technology era, there is no need of applying traditional methods of protecting wild animals which has also proved to be a failure. What is needed are modern tools and methods which can give a clear picture of what is going on in various animal reserves and then report to responsible authorities without the necessarily physical presence of the officers. [Malela Kassim, 2013]

The end of the Cold War and reductions in development aid opened the space for criminal financing of state structures. Growing demand in Asia and the Middle East for both licit and illicit goods has fueled trade in Africa. The burgeoning market for recreational drugs and wildlife products has caused criminal networks in Africa to grow and become increasingly professional and militarized. Beyond a few examples such as the gangs of the Western Cape in South Africa, or patterns of organized crime in Nigeria, classic definitions of organized crime do not apply in Africa. Three key components comprise a "protection economy". Firstly, provision of violence or "the people with guns" to secure the movement of contraband which can vary for elements in the security forces themselves to militia, to gangs, to private security companies. Secondly, corruption – involving payment to key government officials. Thirdly, criminal investment in the communities themselves to ensure legitimacy and smooth operation, such as payment to political parties or financing local facilities. Every major criminal network operating on the continent contains these three elements in varying degrees. Where such overlaps between crime, state and politics occur, traditional law and order responses – such as seizure of contraband and locking up culprits (usually those at the lowest levels) – will not solve the problems. [Philippa Garson, 2015] This paper will focus on the question of whether science and technology may be a feasible alternative solution. [Philippa Garson, 2015]

In 2012 the slaughter of 22 elephants in the Garamba National Park in northeastern Democratic Republic of Congo shows that the hit job was done by professionals who swooped over their quarry in a helicopter before opening fire. It was one of the worst killing of elephants in living memory according to the head of international cooperation for the Congolese state conservation agency, ICCN. The grim booty was likely smuggled through South Sudan or Uganda which form part of an "Ivory Road" linking Africa to Asia. Conservationists say that elephant and rhino poaching is surging and is an illegal piece of Asia's scramble for African resources, driven by the growing purchasing power of the region's newly affluent classes. According to TRAFFIC's Elephant Trade Information System, since 2004 the trend has been upwards after a decline in the 1990s. The culprit is demand for Asia and particularly China, Thailand and Vietnam. [*The Guardian*, April 26, 2012] These economies are becoming more advanced but they still adhere to traditional beliefs. In many parts of Asia, ivory and rhino horn powder are valued for ceremonial purposes, for religious purposes and for cultural purposes. As China has developed economically, and consumers accumulated more wealth, more and more people have been able to afford lavish goods. Ivory carvings are seen as a high status symbol of luxury for many. A United Nations Environment Program released a report (2013) that pointed out weak law enforcement, poor governance and political and military conflicts as the main national level factors that facilitate poaching and allow illicit trade in ivory to grow. [*Daily News*, October 6, 2013]

The demand for ivory has surged to the point that the tusks of a single adult elephant can be worth more than 10 times the average annual income in many African countries. The smugglers

are African based, Asian run crime syndicates. They are highly adaptive to law enforcement interventions, constantly changing routes and *modus operandi*. [Jeffrey Gettleman, 2012] According the TRAFFIC, illegal wildlife trade is one of the most lucrative international organized crimes yet it is not treated seriously by many governments. Yet the organized criminal syndicates behind the poaching are also destabilizing national security and putting the lives of park rangers at risk. [Paul Redfern, 2012]. For example, the Xaysavang syndicate enlisted young Thai women – trafficked to work in strip clubs and massage parlors – to pose as rhino hunters in South Africa. In the Czech Republic "white horses" are used in a smuggling ring operating between the Czech Republic, Slovakia, Switzerland, Germany, South Africa and Vietnam. A number of high profile individuals including diplomats have been caught in international organized crime involved in poaching. The privileges of the Vienna Convention on Diplomatic Relations present a tantalizing opportunity to commit a perfect crime For example, North Korean diplomatic missions were involved in illegal rhino horn and ivory trade dating back to 1986. [*The Guardian*, July 17-23,2016]

Like many of Southern Africa's problems, rhino poaching and its related crimes are made possible to a large extent by corruption. Borders, bureaucracy and a tangle of vastly different laws and legal jurisdictions are a boon to transnational criminal networks and a bane to the law enforcement agencies rallied against them. Entities like Interpol, Europol, CITES and the World Customs Organization are only as good as the government officials in member states who are delegated to work with them. Again and again, their efforts to target syndicates in multiple jurisdictions are hamstrung or restricted by corruption, incompetence, governments that are unwilling or incapable of acting, a lack of information sharing, petty jealousies and approaches to tackling crime that wrongly emphasize arrests and seizures over targeted investigations and convictions as a barometer of success. Porous borders, of course, are also a significant challenge, with corruption being rife in numerous countries along the smuggling routes. Transparency International's Corruption Perceptions Index scored countries on a scale of 0 (very corrupt) to 100 (very clean). South Africa scored 44, Mozambique scored 31 and Zimbabwe 21, Vietnam tied with Mozambique while China came in at a not very promising 37. [*The Guardian*, July 17-23,2016]

In South Africa, meanwhile, law enforcement remain hamstrung by staffing problems and disintegration of co-operative departments. The closure of the police's Endangered Species Protection Unit in the early 2000s, widespread maladministration, corruption and political meddling in the South African Police Service and its Crime Intelligence division and pervasive ill-discipline in the South African National Defense Force have had a severely detrimental effect on efforts to curb poaching. According to various reports in South Africa, the international community cannot continue operating according to the silo effect. Transnational rhino horn trafficking networks cannot be addressed in isolation in rhino range states or destination and consumer countries. To have real impact, they must be disrupted along the length of the illicit supply chain. [*The Guardian*, July 17-23,2016]

Africa is in the midst of an epic elephant and rhino slaughter. Conservation groups say poachers are wiping out tens of thousands of elephants and rhinos a year, more than at any time in the previous two decades, with the underground ivory and rhino horn trade becoming increasingly militarized. Like blood diamonds from Sierra Leone or plundered minerals from Congo, ivory

and rhino horns are the latest conflict resources in Africa, dragged out of remote battle zones, easily converted into cash and now fueling conflicts across the continent. Some of Africa's most notorious armed groups, including the Lord's Resistance Army, the Al Shabab and Darfur's Janjaweed, are using the tusks to buy weapons and sustain their mayhem. Organized crime syndicates are linking up with them to move the ivory around the world, exploiting turbulent states, porous borders and corrupt officials from sub-Saharan Africa to China according to law enforcement officials. [Jeffrey Gentleman, 2012]

The profile of a poacher has varied over the years, from AK-wielding Somali nomads to poor rural dwellers armed with ancient muskets out to get quick income or put meat on the table. As the profits have increased, however, so has the involvement of organized crime. The biggest challenge is that in the last few years there has been a big shift from ordinary poachers to organized crime groups according to CITES [Convention on International Trade in Endangered Species of Wild Fauna and Flora]. It is the treaty that governs trade in plants and animals. Organized crime groups are really well resourced and they have significant networks globally. We are dealing with serious transnational organized crime. For example in the Congolese example above, the poachers shot from the air because the trajectory of the bullet wounds. Helicopters do not come cheaply and their use points to a high level of organization. Many of Africa's poaching "hot-spots" have a few things in common, notably their remoteness. Big animals tend to be far from large numbers of people and the scrutiny that goes with them, giving poachers a virtual free hand. In South Africa a park ranger in Kruger National Park can have a poacher-tracking kit which includes an assault rifle and backpacks with radios, night goggles and an incredibly powerful spotlight that throws a beam hundreds of meters away. Yet despite the price tag of all of the equipment close to US $ 30,000, Kruger National Park is hardly winning its war with poachers. [*The Guardian*, April 26,2016].

This paper would like to ask the question whether science and technology can be employed to win the war against poaching especially of elephants and rhinos. Like all wars, technology can be used on both sides of the battle. The focus will be on describing what measures have been taken in an international attempt to halt the dramatic decline in the number of elephants and rhinos, especially in Africa. Unlike traditional military battles, the enemy is very difficult to identify since the international crime syndicate is involved. Victory is far from clear and definitive. Some attempt is made to justify investments in crime prevention equipment and methods although a rigorous cost benefit analysis is very difficult.

### 1.1 International Cooperation in Combating Poaching

Organized environmental crime is known to pose a multi-layered threat to human security, yet it has long been treated as a low priority by law enforcers, seen as a fluffy "green" issue that belongs in the domain of environmentalists. But due to a variety of factors – including its escalation over the past decades, its links to terrorist activities, the rising value of environmental contraband and the clear lack of success among those trying to stem the tide – these crimes are inching their way up the to-do lists of law enforcers, politicians and policymakers. On the international stage, politicians – alarmed by increasing evidence of links between terrorist organizations and organized environmental crime – are taking a more visible stand against wildlife trafficking. In July, 2013, US President Barack Obama set up a taskforce on wildlife

trafficking and pledged US $10 million to fight it. The money is earmarked to train wildlife police and fight poverty. But according to an adviser on environmental organized crime for the Global Initiative Against Transnational Organized Crime launched in 2013, this is a mere drop in the ocean. [*Daily News*, October 5, 2013] Obama's executive order, issued in July, 2013, called for an Advisory Council on Wildlife Trafficking which was formed in September, 2013. The council will advise the new Presidential Task Force on Wildlife Trafficking in its efforts to influence governments to enact new laws for stronger policing and investigation of poachers and traffickers. The key to reducing poaching is reducing the poverty that motivates Africans to do the dirty work of buyers. The US is one of the largest markets for illegal ivory. The US Justice Department prosecutes traffickers and buyers using a police network known as Operation Crash. Police action in the US helps blunt criticism in parts of the world where US demands for stronger policing are considered hypocritical. [Darryl Fears, 2013]

Funded by the governments of Norway and Switzerland, the Global Initiative is a network of leading experts in the field of organized crime, which aims to bring together a wide range of players in government and civil society to find ways to combat illicit trafficking and trade. *The Global Response to Transnational Organized Environmental Crime* (2013) is a report documenting environmental crimes around the world. Such crimes are on the rise in terms of variety, volume and value. Their impact is far greater than the simple destruction of natural resources and habitats. They affect human security in the form of conflict, rule of law and access to essentials such as safe drinking water, food sources and shelter. The crimes documented range from illicit trade in plants and animals and illegal logging, fishing and mineral extraction to production and trade of ozone-depleting substances, toxic dumping and "grey areas" such as large scale natural resource extraction. The most fragile countries – those lacking infrastructure and effective policing but often rich in untapped natural resources – are the most vulnerable to exploitation, and the poorest communities suffer the most. Communities are losing food supplies and tourism jobs through unsustainable hunting, fishing and – often illegal – deforestation. [*Daily News*, October 5, 2013]

It is impossible to quantify what proportion of organized crime is environmental crime, although 25 percent is a commonly repeated figure. This number comes from a UN Office on Drugs and Crime estimate of the scope of the problem in the Asia-Pacific region. It is often extrapolated as a global estimate. Even less is known about how much organized environmental crime drains from the legitimate economy. To complicate matters, the line between organized crime is often blurred, since the same trafficking networks are frequently used for both. There is a need to look at environmental organized crime in terms of value as well as the global response to the problem. Who are the actors? What are they doing? Is it sufficient, and if not, what can we do? Current efforts are failing. Part of the problem is that legislation and penalties vary enormously between countries. Better synchronization of goals is needed. There are plenty of international and country specific strategies but few linkages between them. A perennial problem is that the environmental agencies tasked with handling environmental crime lack the capacity or jurisdiction to stop it, while law enforcement agencies fail to prioritize it. But as the financial incentives of these crimes soar, so do the stakes. For example, a rhino horn in 2013 could fetch US $ 250,000 and a single fishing trawler expedition can bring in US $1 million worth of fish. [*Daily News*, October 5, 2013] Fortunately the international London Conference on Illegal

Wildlife Trade in February, 2014 was organized precisely to address the problem of international cooperation by both buyer and seller countries. [*Daily News*, October 5, 2013]

There is evidence that heavy weaponry, such a rocket mortars and semi-automatic weapons as well as helicopters, are being used by poachers Julian Rademeyer, whose book, *Killing for Profit*, exposes the illicit rhino horn trade in South Africa. Frequently, top players like allege kingpin Vixay Keosavang, who is dubbed "the Pablo Escabar of wildlife trafficking", is said to operate with impunity in his home country of Laos. He has powerful links to government officials and other powerful elites. No amount of policing can eliminate the fact that environmental crimes are widely seen as a passport out of poverty. Many communities do not benefit from conservation efforts. The Global Initiative could facilitate faster action through information sharing. Crime syndicates move and adapt very quickly. The only way to stop them is to move quickly too. Signing endless Memoranda of Understanding does not speed up the bureaucratic and diplomatic delays in dealing with transnational environmental crime. Unlike the murky and rapidly evolving world of cybercrime, environmental crime is a more conventional commodity trade. [*Daily News*, October 5, 2013]

Millions of rand have been thrown at testing and implementing sophisticated technology to protect rhinos from poachers in South Africa. Unfortunately, expensive technology appears to have had little effect on the number of rhinos poached. The number of people arrested has increased annually, but so has the number of animals killed. In 2014, the Howard G. Buffet Foundation in the US donated US $23.7 million to a three year initiative to fight rhino poaching in the Kruger National Park. Its strategy uses technology to create an intensive protection zone using detection and tracking equipment on the ground and in the air. Other foreign funders include the Dutch and Swedish postcode lotteries, which donated US $21 million to fund the deployment of drones. In December, 2012 the Ichikowitz Family Foundation – whose core interest is defense and security company Paramount – and SANParks launched the Seeker Seabird, a specialist reconnaissance aircraft with sophisticated surveillance technology. It was used to monitor areas where poaching was more common. The aircraft has since been switched for one with a different configuration that can also endure the hot conditions in the Kruger National Park for longer periods. However, the results of using technology to combat poaching are disappointing. They react to incidents rather than preventing one. SANParks is now focused on surveillance, detection and early warning systems. [*Financial Mail*, August 1 – 6, 2014]

Uganda, Rwanda and the Democratic Republic of Congo have agreed to jointly monitor the movement of wildlife across their common boundaries. Due to shared ecosystems, animals are often known to cross between Rwanda and DR Congo or DR Congo and Uganda. The US $92 million plan – to be funded among others by the European Union and USAID – entails conservation of biodiversity and other national and cultural heritage across boundaries. According to the agreement, the countries will share tourism revenues on a 50-50 basis, as well as engage in research and design of information management programmes. [Halima Abdallah, 2009]

In June, 2015, Tanzania's National and Transnational Services Crimes Investigation Unit [NTSCIU] set up a Special Task Force to tackle poaching. From January to July, 2015 the NTSCIU was responsible for a total of 803 ivory poachers and illegal traders being arrested with

an approximately average of 90 arrests per month. In October, 2015, the NTSCIU scored a major success with the arrest of Yang Feng Glan, a Chinese women dubbed the “Queen of Ivory”. She is considered to be one of the most notorious ivory traffickers in East Africa and a key link in the Tanzania-China illegal ivory trade route.

### 1.2 Information and Communication Technology

A group of international organizations fighting illicit wildlife trafficking in 2014 introduced a new website aimed at assisting whistleblowers who want to aid in the fight against wildlife crimes. Wildleaks, the first platform of its kind, is an online portal where its creators say whistleblowers can safely and anonymously reveal information on wildlife crimes. Globally, this illegal trade is thought in 2014 to be worth over US $ 17 billion a year, some of which is thought to be helping finance terrorism, particularly in Africa. Officially launched on February 6, 2014, Wildleaks is funded by the US based Elephant Action League [EAL] and run by a group of former law enforcement officers, journalists, and environmental NGOs across five continents. The goal of Wildleaks is to facilitate the arrest and the prosecution of traffickers, corrupt government individuals, and anyone behind wildlife and forest crime. Any individual who witnesses a wildlife crime or possesses any type of related information – documents, files, images or videos – can use the website to transmit that information to Wildleaks, using either of two routes of varying strength encryption. The completely anonymous encryption route makes use of “Tor” technology – more commonly known as the “Dark Net” . It does not disclose the sender’s IP address or any other information. Whistleblower are especially encouraged if they live in oppressive regimes where communication is not free and where local governments themselves may actually be engaging in wildlife crime. [*The Guardian*, February 12, 2014]

Once Wildleaks receives any leaked information, the individuals and organizations behind the project will first assess its accuracy and reliability. Thereafter, Wildleaks will try to forward the findings to law enforcement agencies such as Interpol or to trusted government authorities. However, if governments will not cooperate, the last option would be a leak to the media. The goal is to work side by side with law enforcement agencies across the globe and create a bridge between the public and law enforcement. The launch of Wildleaks came shortly before the London Conference of Illegal Wildlife Trade in February, 2014. This conference brought together key actors in the global wildlife community to craft a global response to the illicit killing and trading of wildlife and forest. [*The Guardian*, February 12, 2014]

### 1.3 Special Task Forces

African governments and private conservation groups are increasingly turning to militarized anti-poaching tactics to suppress the rise of illegal wildlife trade according to a new Small Arms Survey. The past few years have seen African countries adopt military tactics in their anti-poaching efforts following an unprecedented spike or increase in the demand for ivory, rhino horn and other endangered species in Asian markets. This has made protecting African wildlife a dangerous business as poachers use sophisticated military hardware such as high caliber hunting rifles, large ammunition and even helicopters. Hence the need for paramilitary forces. In 2013 more than 100 park rangers lost their lives in the line of duty, with poachers and militia responsible for 69 of those deaths, according to the International Union for the Conservancy of

Nature [IUCN]. Poaching is now an international security issue. African governments have responded by militarizing wildlife conservation efforts, and some countries have even deployed national armies to protect elephants and rhinos. Cameroon, Botswana, Kenya, South Africa and Zimbabwe are among the countries that have recently increased military involvement and the use of military techniques and technology in anti-poaching efforts according to the Small Arms Survey. In Kenya, two private conservancies, Lewa and Ol Pejeta, are leading the way in militarizing security in their parks, significantly reducing incidents of poaching. They have developed reliable intelligence networks with the communities around them, complementing them with sniffer dogs, attack dogs, helicopters and other aircraft for a fast response in case of threats. In 2014, the World Parks Congress recognized the two as the best protected conservancies in the world. [Trevor Analo, 2015].

The International Police Organization [Interpol] wants Kenya, Uganda and Tanzania to urgently establish national environment security taskforces [NESTS] to combat the rising cases of illegal wildlife traffic in the region. Interpol, the agency that coordinates the work of security officers all over the world, says the illegal wildlife trade is fast becoming a security threat, after investigations revealed that some of the proceeds were being used to fund terrorists and rebel groups in East Africa. NESTS should be multi-agency cooperatives comprising police officers, customs officials, environmental agencies, prosecutors, non-governmental organizations [NGOs] and international partners. The task forces would make it easier to coordinate fighting wildlife crime. To keep up the fight against the illegal trade, the Canadian government in 2014 donated US $2 million in emergency funding to support security agents and improve security coordination among East African elephant range countries. The illegal trade is not only a security threat but also a danger to the livelihoods of communities that depend on wildlife survival. [Samuel Karanja and Jeff Otieno, 2014]

Interpol dispatched a team to Nairobi in 2014 to help fight illegal ivory trafficking and other environmental issues in the country. The Environmental Security Unit [ESU] is based at the Interpol Regional Bureau for East Africa at the Directorate of Criminal Investigations headquarters. The Unit has been established at a time when the country is facing a great challenge in conserving the environment and wildlife as a result of poaching. The team will collaborate with national law enforcement agencies and Interpol National Central Bureaus [NCBs] in the region to increase information exchange, support intelligence analysis and assist national and regional investigations with a particular focus on wildlife crime. The team will work with countries and partner organizations to further the activities of its Project Wisdom, which combats elephant and rhinoceros poaching and the illegal trade in ivory. The project is funded by the Wildcat Foundation. This includes capacity building initiatives and creating a regional network for environmental protection. The team aims at disrupting the transnational criminal groups involved not only in wildlife crime, but also other serious forms of crime. [*The Citizen*, October 9, 2014] The Wildlife-TRAPS Project in Kenya, implemented by TRAFFIC in collaboration with the International Union for Conservation of Nature [IUCN], strengthens the knowledge base, resolve and cooperation of governments, inter-governmental organizations, the private sector and NGOs, in tackling wildlife trafficking between Africa and Asia. [*The Guardian*, April 16, 2015]

In 2016, Tanzania worked on a new security strategy to help curb poaching of elephants and other crimes against wildlife within and outside protected areas. The new strategy included training a special force that will be equipped with modern and high tech surveillance equipment to detect elephant poachers and other criminals operation inside Tanzania's protected parks. The government changed the working system of game rangers to allow them to handle and use modern anti-poaching weapons and surveillance equipment. The strategy will be fully implemented in early 2017 and will enable Tanzania to increase its high elephant herd numbers. During his presidential campaign rallies in 2015, President John Magufuli vowed to end elephant poaching. He said that he will ensure that each ranger is assigned 30 elephants to protect and will be held responsible for their killing. He appointed Major General Gaudence Milanzi as the Permanent Secretary in the Ministry of Natural Resources and Tourism. He promised the army man would deal with poachers. [Apolinari Tairo, 2016] The new national anti-poaching squad is mainly comprises members of the intelligence community. The new drive included the formation of multi-agency task forces on wildlife crime and anti-poaching intelligence to strengthen the war against the vice. [Edward Qorro, 2016] The College of Wildlife Management, Mweka [CAWM] has initiated paramilitary training. In the spirit of making the wildlife conservation more successful, the college now has a paramilitary training course as part of the training. The college which is a center of excellence in East Africa, regularly reviews its curricula by involving stakeholders to incorporate emerging challenges and market demands. [Deus Ngowi, 2015]

At least 50 park rangers from the Selous National Park in April, 2015 successfully completed a month long anti-poaching training conducted by US Marines and Navy from the Special-Purpose Marine Air-Ground Task Force Crisis Response-Africa. The training and knowledge gained was important in the fight against wildlife poaching which has become more organized globally than before. This was the first in a series of training events to help improve the rangers' capacity to combat illicit trafficking in the Selous Game Reserve. Some of the training topics included handling of weapons and safety, combat marksmanship, patrol movement formation, reaction to contact drills, First Aid, mission planning, land navigation, vehicle maintenance, and fundamentals of offensive operations. The training ended with a three day "Field Training Exercise" that comprised 25 patrols which covered over 100 kilometers of the reserve. [*The Guardian*, April 10, 2015]

As a consequence of the tragic death of British helicopter pilot Rogers Gower in January, 2016, the Ministry of Natural Resources and Tourism has set up a special task force comprising officers from different departments in this ministry. They include the Tanzania Wildlife Authority [TAWA], Tanzania National Parks [TANAPA], Ngorongoro Conservation Area Authority [NCAA] and Tanzania Forest Service Agency [TSF]. This special task force will also work closely with the Tanzania Intelligence and Security Services [TISS], criminal justice system, Tanzania Ports Authority [TPA], Tanzania Airport Authority [TAA], Tanzania Revenue Authority [TRA], local and international conservation organizations and other stakeholders. The task force will be responsible with coordinating efforts and resources as well as follow up on taskforce groups established in eight zones, targeting individuals and networks that control illegal trade in elephant tusks, timber and logs. The government is changing the working system for game wardens – from civilian to paramilitary system and also bringing back forest rangers

who will be trained in handling weapons to curb illegal harvesting of tree for timber and logs in the country's forest. [Rose Athumani, 2016]

New infantry style tactics of concealment and ambush by armed park rangers are credited with turning the tide in the war against poachers of the endangered rhino on one front, in South Africa's Madikwe Game Reserve. Since April, 2013, Madikwe rangers previously so under-equipped that they lacked even boots underwent military training overseen by a former British special forces soldier. They have been kitted out with state-of-the-art gear provided by the Ichikowitz Family Foundation, a charity that supports anti-poaching initiatives on the African continent. The numbers suggest that this strategy is working. The killing stopped in Madikwe, while the toll has continued to rise in the rest of South Africa. The rangers in Madikwe, mostly rural Africans drawn from the region, have bushcraft skills and a rich knowledge of flora and fauna honed from lifetimes spent in the rough countryside. But their equipment was shoddy and they had no military training, putting them at a distinct disadvantage when confronted by well-armed poachers backed by international organized crime syndicates. The Madikwe rangers now have scopes mounted on their rifles and torches or flashlights for night patrols, among other equipment upgrades.

The success of such tactics in Madikwe compared to Kruger National Park may come down to size and geography. At almost 20,000 square kilometers, Kruger is nearly 40 time the size of Madikwe. Even putting 40 times the number of boots on the ground there may not help that much because its wildness areas are so remote and far off the beaten track. Kruger also has a 350 kilometer long border with Mozambique, one of the world's poorest countries where rural villages are often densely populated, providing plenty of recruits for the lucrative business of rhino poaching. Madikwe by contrast shares a border with sparsely populated and relative affluent Botswana. Still the Madikwe success could be rolled out elsewhere in the country if donor or state funds are made available. Small populations also mean that word spreads fast. [*The Guardian*, November 3, 2013]

## 2.0 SURVEILLANCE

### 2.1 Satellite Technology

US intelligence agencies are considering whether to provide information, analysis and possibly tactical lessons to African governments about how to attack wildlife poaching networks. Infrared and photographic imagery from satellite and other data could help locate and track herds of animals and bands of poachers. Wildlife rangers would benefit from better equipment and by adapting some of the techniques, tactics and procedures used by military intelligence officers. In many respects, networks of illicit poachers and buyers resemble terrorist networks that US military intelligence has developed tools to counter. The tools used to understand and defeat these networks can be shared with governments and wildlife services. These include the methods, known collectively as geospatial intelligence or "GeoInt", used to analyze, correlate and disseminate large amounts of data to understand relationships that are not immediately evident. There is increased congressional interest in harnessing the intelligence community to assist in counter-poaching. The US House Appropriation Committee's fiscal 2016 Defense Bill said trafficking, particularly of African elephant ivory, can be used as a source of funding by

terrorist groups and extremist militia in Central and East Africa. The committee encouraged the intelligence community to share information and analysis on transnational criminal organizations and others that facilitate illegal wildlife trafficking. Illegal wildlife trade in 2016 became the world's fourth largest international organized crime, according to a University of Washington study published by the journal *Science* in 2016. The wildlife trafficking market is worth an estimated US $8 billion to US $ 10 billion a year. A new counter poaching partnership in Kenya called "tenBoma" [which means "Ten Houses"] is named after a Kenyan community policing philosophy. Announced in March, 2016 by the Kenyan government, ten Boma intends to attach poaching networks by using better armed Kenya Wildlife Service rangers and intense analysis of unclassified satellite imagery to stop poachers before animals are killed. [Tony Capaccio, 2016]

In 2015 TANAPA launched a special programme for monitoring of elephants by satellite as part of efforts to protect the animals which are particularly targeted by poachers. Funded by the United Nations Development Programme [UNDP] the programme first concerned 30 elephants of Ruaha National Park and was equipped with radio transmitters. The satellite check will regularly provide information on the seasonal movement of these thick skinned animals and contribute to the implementation of conservation corridors and dispersal areas for better protection of the elephants. The main goal of this monitoring is to obtain information on the seasonal movements of elephants within the Greater Ruaha Landscape that will contribute to the establishment of landscape conservation corridors and dispersal areas for better elephant protection. This information will help rangers to plan more informed patrols outside the core protected area. A new census in 2015 at the Selous-Mikumi ecosystem, one of Tanzania's biggest wildlife sanctuaries, revealed the elephant population had plummeted to just 13,084 from 38,975 in 2009, representing a 66 per cent decline. In the Southern Ruaha-Rungwa area that was hardest hit, the population went from 34,000 to a mere 8,000. The situation is a "toxic blend" of rampant corruption, powerful Chinese crime syndicates and security in the country's Southern national parks that was all but non-existent. The disappearance of so many elephants from Ruaha-Rungwa could only be explained by the involvement of the International Crime gangs who have industrialized the killing of Africa's mega fauna. [Ashery Mkama, 2015]

Helped by a US $1.5 million donation from an American philanthropist David Bonderman and his Wildcat Foundation, the Tanzania's National and Transnational Serious Crimes Investigation Unit [NTSCIU] squad started to tackle poaching using the lessons learned hunting Al Qaeda in the years after the group bombed two US embassies in East Africa in 1998. The capture of the suspected leader of a global elephant poaching ring, Yang Feng Glan, a 66 year old Chinese national dubbed the "Ivory Queen", was the result of new breakthroughs in Tanzania's fight against an increasingly rapacious poaching trade. The police started concentrating on the poachers' own technology – guns and phones – and using it against them. The history on a suspect's gun, the phone calls he or she makes, and the money they move, create a trail of evidence. Immediately after a suspect was captured in the baobab-studded hills of the Ruaha-Rungwa ecosystem, the agents focused on the suspect's weapon. Tracing how the poacher obtained that gun led to the person one level above in the syndicate and pointed in the direction of a team. But Ms. Yang fled to Uganda. More than a year later her phone revealed where she was. NTSCIU was able to pull up poachers' phone numbers and call histories. Computer software was used to delineate links between on the ground poachers, dealers and

transnational criminal gangs. A server flagged to NTSCIU mobile numbers when they were active but did not record calls. This means agents can also track payments, helping to build up a picture of who was involved. Tanzanian agents discovered that Ms. Yang was back in Dar es Salaam but had no photographs of her. Again her mobile phone helped them tack her to a house in the center. They captured her after she came out of the house. [Drazen Jorgic, 2016]

### 2.2 Radio Technology

Kenya's wildlife authorities in 2015 launched a radio system to help protect elephants and rhinos from poachers. Kenya Wildlife Service [KWS] purchased the about US $8 million encrypted radios from the French firm Ellipse Projects which are now used in the country's eight national parks. The network is superior, fulfills the most advanced professional mobile radio requirements and ensures secure communication between fixed mobile and portable radios. The radio network provides a dedicated set of microwave / Ultra High Frequency links to allow communication between different parks and the KWS headquarters located in Nairobi. KWS expects the system to be effective in combating poaching, protecting tourists and generally improving radio communication within the Service. Currently, KWS utilizes an analogue, two-way radio network which operates on a Very High Frequency band used for communicating around and within the national park gates, patrol teams, between vehicles and other KS stations. This system is outdated as it is analogue. The system has no encryption, suffers from poor speech quality and is only limited to transmitting sound. The radio upgrade will greatly improve effectiveness of the radio system that is widely used for communication within the various parks of KWS in management of park operations and security. The upgrade will see an improvement in various security protocols that will be introduced in the new system. It will also allow for remote administration of radio handsets so that should they fall in the wrong hands, they may be remotely disabled. The project also has a component for solar power, which will be installed within three conservation areas as well as other identified strategic locations within the various KWS stations. [*The Guardian*, June 12, 2015]

Tanzania has a security system that can alert authorities on ongoing poaching activities at game reserves. This system is used by citizens to give instant reports to the Tanzania National Parks Authority [TANAPA] whenever there are suspicious activities including poaching within the park. They send an SMS to a network that will directly go to the authority and warders of the respective park. The invention is named Benjamin Mkapa Anti-Poaching System after a student pursuing Bachelor of Science Information and Communication Technology at the University of Dodoma [UDOM] who invented the security system. After the message alert at the specific reserve, it shall also alert the guard on duty who will be deployed to the poaching area. All information on the incidents shall be reserved in a special device to inform the leader on the number of poaching incidents that have occurred on a particular day and the person that worked on it. The university administration is in talks with TANAPA to test the performance of the device at different national reserves. [*The Guardian*, August 12, 2016]

## 3.0 MAPPING TECHNOLOGY

### 3.1 Google Earth

The use of information communication technology [ICT] can boost efforts to fight poaching in Tanzania. Such devices can be used to track movements of wild animals and easily locate poachers. By doing so, law enforcers can deal with poachers according to ICT experts. With the use of General Package Radio Service [GPRS], it is possible to monitor movements of wild animals and target the expected poachers. GPRS is a standard for wireless communications which runs at speeds of up to 115 kilobits per second compared with current GSM [Global System for Mobile Communications] systems' 9.6 kilobits. GPRS was originally standardized by European Telecommunications Standards Institute [ETSI] in response to the earlier CDPD and i-mode packet switched cellular technologies. It is now maintained by the 3rd Generation Partnership Project [3GPP]. Microsoft normally has a programme for disseminating a number of solutions such as controlling road accidents. Local experts in Kenya have designed GPRS devices to track the movement of vehicles. It is possible for Tanzania to adopt GPRS for tracking movements of elephants to control dangers against poachers. Such devices trace movements through electronic signals connected with the broadcasting system. [Ludger Kasumuni, 2013]

The Wildlife Crime Technology Project in Baltimore, Maryland, USA hopes to use thermal cameras and machine learning to identify humans and trigger automated alerts to nearby park rangers when suspected poachers cross into parks. It is hoped that the technology could be make more affordable to monitor miles of roads in East Africa and solve the growing poaching problem. The US $7,000 thermal cameras were chosen over everything from drones to buried fibre optics, seismic technology and radar systems. The work is being funded by a grant from Google's Global Impact Award. The plan is to mount the cameras on poles along roadways. A small computer attached to the camera will run software that identifies moving objects and classifies them. Solar panels with power the cameras and computer. If a human walks into a park, the camera can recognize the movement and send a text message or e-mail to park rangers via radio signals. The farther the cameras can see, the fewer are needed to provide coverage which would lower costs. It is predicted that it will take a couple of days to learn an environment and properly identify objects. For example, it should eventually ignore regular movements such as swaying grass or tree limbs. [Matt McFarland, 2015]

In the remote wilds of northern Kenya's Samburu reserve, the latest technology from US internet giant Google creates three dimensional maps using data from satellite tracking elephant collars, providing security for the animals in the short term and helping protect their habitat in the long term. It is a priceless bank of information demonstrating the complex near real time map, where tiny elephant computer icons are shown moving across an enormous television screen. The mapping technology is protected from would be poachers with tough security measures. It is possible to use the tracking technology overlaid on Google Earth and hence understand the migration patterns of elephants. His will build better protection around them. Each collared elephant shows up on a map overlaid with land use, as farmland and development encroach ever closer on wilderness areas. Hundreds have been collared all across Africa. In the short term, it helps improve security for the animals. In the long term, it allows better planning to establish corridors for the animals – areas often extremely vulnerable to human development. The

technology is not cheap. Each collar costs some US $ 8,000 to buy, fit and maintain. Complementing the maps, researchers track the complex family trees, recording every animal with long registration numbers. [Peter Martell, 2015].

The Tanzanian Parliamentary Group on Sustainable Natural Resources Conservation and Utilization [TPGSNRCU] in 2013 was in discussion with three worldwide technology providers to enable satellite tracking of the country's endangered species. The technology providers involved in the discussion were Google, Microsoft and Apple. Upon adoption of the satellite tracking system, the move will safeguard the lives of each elephant in the country. Anti-poaching officers are not enough to cover the entire country. [Sylivester Domasa and Lusekelo Philemon. 2013]

## 4.0 AVIATION

### 4.1 Aircraft

#### 4.1.1 Airplanes

Tanganyika Wildlife Safari, which is a group of tourist hunting and photographic companies based in Dar es Salaam acquired a Tsh. 200 million brand new light aircraft for anti-poaching patrols in the Selous Game Reserve. The two seater aircraft that can fly at the speed of a motor vehicle was launched in March, 2015 . The Selous Game Reserve is a very large area where game scouts need to have eyes in the sky that could spot poachers. The aircraft is a Njnja 912 ULS made in France. The aircraft flies for four hours daily with the pilot and a game ranger patrolling remote areas of the Selous Game Reserve, one of the largest faunal reserves of the world, located in southern Tanzania and covering an area of 54,600 square kilometers. Mantra Tanzania Limited, a uranium mining company, shared the costs of maintaining the aircraft. [*The Citizen*, March 18, 2015]

In November, 2015 Germany donated two surveillance aircraft worth over Tsh. 1 billion to be used in the fight against illegal wildlife killings in the National Parks and Game Reserves. Each is to be manned by two personnel. The planes are specifically made for low flying aerial patrol and were dispatched to Selous Game Reserve, which is the largest Game Reserve on the continent, and to Serengeti, the country's second largest National Park. German's assistance to wildlife conservation is historical. In 1982 the Selous Game Reserve was recognized as a UNESCO World Heritage Site and is now regarded as "in danger". The aircraft were transported in pieces and assembled in Nairobi. Each of the reconnaissance planes is valued at US $ 250,000. [Marc Nkwame, 2015] The aircraft will be deployed by Frankfurt Zoological Society [FZS] in close cooperation with the Tanzania Wildlife Management Authority [TAWA] for surveillance of wildlife in the Selous Game Reserve and to support the fight against poaching. [*The Guardian*, April 4, 2016]

#### 4.1.2 Helicopters

In May, 2010 the government advised the Tanzania National Parks [TANAPA] management to look into the possibility of using a helicopter in patrolling national parks and game reserves to

check increasing incidents of poaching in the country. [*The Guardian*, May 10,2016] As a result in May, 2014 three helicopters were procured and six pilots trained. In addition, vehicles to support the airborne surveys with ground logistics were secured as the government intensified its anti-poaching campaign. The government in collaboration with Tanzania National Parks [TANAPA] and Ngorongoro Conservation Area Authority [NCAA] is purchased the three brand new helicopters. The chopper models are the Robinson helicopter R44 and the Bell helicopters. One of the helicopters is conducting airborne surveys in the Selous Game Reserve, another is serving NCAA and the last one is overseeing TANAPA jurisdictions. All three helicopters only do anti-poaching work and are accompanied by units of vehicles for ground logistics. At least 12 vehicles are manned by well-trained commandos trained at Pasiansi Wildlife Training Institute [PWTI] and authorized to arrest poachers. Using helicopters is one of the best ways to fight poaching as it allows authorities to cover more ground much faster. The government also employed new rangers. [Lusekelo Philemon, 2014]

However, Tanzania's wildlife division is in dire need of local professional pilots to run its anti-poaching helicopters which are responsible for wildlife surveillance in the country's National Parks and Game Reserves. Tanzania has few pilots who are ready to work in the area of wildlife conservation. Sometimes Tanzania is compelled to use pilots from other security agencies [like police] to do air patrols. It is necessary for the wildlife unit and other affiliated conservation institutions to have its own pilots. The government is trying to train pilots inside and outside the country. In December, 2014, there were three students pursuing pilot studies in South Africa and three others in the United States. The Tanzania Hunting Operators Association [TAHOA] has mobilized financial resources to finance pilot training. [*The Guardian*, December 22, 2014]

Unfortunately, being involved in anti-poaching operations in a helicopter can be very dangerous even fatal work because there are desperate people involved who are armed and committing a crime. Rogers Gower (37), an experienced British helicopter pilot was flying low over a wildlife reserve in the Simiyu region in the Maswa Game Reserve adjacent to the Serengeti National Park in Tanzania on January 29, 2016 when a poacher's AK-47 machine gun bullet punctured the underside of this helicopter. The poacher was heavily armed with sophisticated weaponry. The 5HFGF helicopter was brought down between Makao Wildlife Management Area [MWA} and Mwiba Wildlife Ranch near Gururuma river which drains into Lake Eyasi. He managed to crash land the helicopter but died of his injuries soon afterward before rescuers found their way to the scene. His South African colleague and safari guide Nick Bester survived the crash. [Zephania Ubwani, 2016] A former accountant, Gower was a qualified pilot who has lived in Africa since 2006 and has been involved in British Army exercises within Tanzania. He flew for Tropic Air Kenya for four years and left in August, 2015 to pursue flying ambitions in Tanzania. His brother Max Gower set up a "Just Giving" Facebook page aimed at raising 50,000 pounds in his brother's memory to help anti-poaching efforts in Tanzania. [Edward Qorro, 2016] Captain Roger Gower worked closely with Bathawk Recon, a private sector anti-poaching service company registered in Tanzania to develop and deploy UAV surveillance for parks and reserves.[ Giza Mdoe, 2016]

In reaction to the event that shocked the conservation world, Wildlife at Risk International [WAR] said that we are in the middle of a war situation and the people at the frontlines are risking their lives every day while trying to protect elephants and other species from being wiped out. The killed pilot worked for the Texas based Friedkin Conservation Fund which has had

operations in Tanzania for several years. It was the first time their operation was directly and fatally targeted in their seven years of aerial anti-poaching patrols. It showed how far armed poachers are prepared to go in order to protect themselves when threatened with an active anti-poaching force. World Animal Protection [WAP] said 53 rangers had died while trying to protect animals in 2015 in areas under serious poaching threat. [Zephania Ubwani, 2016] The Thin Green Line, which trains park rangers and anti-poaching personnel, estimates that 1,000 rangers have been killed in the past 10 years, three quarters of them by commercial poachers and armed militia groups. There is also the psychological toll of the constant combat. Rangers suffer the same scars as soldiers at war. This is a guerilla warfare situation. South African National Parks [SANParks] requires that rangers see a psychologist after any direct engagement with a poacher. Elephant poaching is high risk but high payoff, and increasingly controlled by organized crime networks with military style weapons. The actual dirty work is done by mostly poor, mostly desperate foot soldiers who have few other opportunities to make as much money as the ivory dealers are offering. In exchange, the crime syndicates get ivory that fuels a global black market worth hundreds of millions of dollars. [Sarah Kaplan, 2016]

The Gower incident has been interpreted to show three important things worthy of looking into by Tanzania's security organs. First, it was a clear demonstration of the extent poachers in Tanzania are ready to go in order to get what they want. Second, bringing down a chopper and killing the pilot is an act of war, a demonstration that poachers do not fear Tanzania's security organs. Anti-poaching units must realize they are contending with criminals who are well versed with the use of sophisticated weapons. The poachers could be people with a military background. Finally, the Tanzanian government has failed miserably in dealing with poachers despite getting massive assistance from the international community. It is only a well knitted network of criminals who are capable of committing this crime and the ring leaders must be caught, not the mules. This sad development is the first of its kind in the history of Tanzania. [Attila Tagline, 2016] Four of the nine people who stood trial on charges of shooting down a helicopter and killing the British pilot, Rodgers Gower, were sentenced on February 11, 2016 to a total of 70 years in jail after pleading guilty of illegal possession of two rifles and ammunitions. Two of the accused men were ordered to pay Tsh. 10 million in fines each. The accused will serve 20 years in jail each.

### 4.2 Drones

One of the long term proposed solutions in anti-poaching efforts is the use of unmanned small and light weight planes with stabilized video imagery that can work day and night, tracking poachers and sending information on a ground control system. [Deus Ngowi, 2015] A lot of UAV anti-poaching projects are actually what could be termed as "Direct Ranger Support". They extend the ranger's monitoring capacity as well as facilitate pursuit but they do not actually find poachers. The present state of UAV technology used in Tanzania has only the capacity to "detect humans" in poaching areas. This is quite different from what is required for the "response mission" to capture the detected poachers. [*The Guardian*, November 9, 2015] The Arusha based Bathawk Recon [BHR] business model proposes a private sector Unmanned Aerial Vehicle [UAV] anti-poaching service. It brings the highest level of international expertise and technology to bear on the anti-poaching question. It will do so in a manner cheaper and more effectively that the public sector.

The new UAV technology presents a very real and immediate opportunity to tackle the problem at the source. Initial trials with French planes proved ineffective , due to multiple factors. The planes were incompatible with a number of features, including weather, largeness of the parks and time they need to be airborne. However, a different company, Martin UAV from Texas in the United States, had more successful trials using the Super Bat DA-50 plane. Martin UAV is sure that the technology matches properly with the Tanzanian situation. Their planes have been used for small units surveillance, anti-piracy, aerial mapping, urban monitoring, border patrol, force protection, pipe line inspection, perimeter security and damage assessment. The UAV is sized to fit in a small suburban utility vehicle [car] and is easily transportable to any location a four wheel drive [4WD] vehicle can reach. The Super Bat assembles in minutes without any tools. A crew of two can have it flying within 15 minutes. The Super Bat's car top catapult launch capability and skid landing minimize the need for dedicated infrastructure. A small clearing is all it needs for launch and recovery. It carries a Cloud Cap TASE 150 or 200 stabilized gimbal and automatic target tracking and geo-location capabilities. Built with Kevlar, aluminum and carbon fibre, the Super Bat is rugged and built to last. The Super Bat has a built-in intelligence of its own and cannot get lost nor cross the borders within which it is directed, whether a park or a country. Tanzanians can be trained to operate the aircraft so there is no need for foreigners to take up employment. Martin UAV has trained students from the College of African Wildlife Management – Mweka. [Deus Ngowi, 2015]

The Arusha based Tanzanian private firm Bathawk Recon in collaboration with TANAPA and the Private Sector Foundation [TPSF} finished final trials of Unmanned Aerial Vehicle [UAV] surveillance to check poaching in National Parks and Game Reserves in September, 2015. The trials of the proposed anti-poaching initiative were carried out at the Mkomazi National Park in Tanga and Kilimanjaro regions at the meeting point of the Usambara and Pare Eastern Arc Mountains. The five day trials closed with the testing of the UAV model "Super Bat DA-50" to be adopted for the Bathawk large scale UAV surveillance concept across the nation's National Parks and Game Reserves. Although everyone agrees that aerial surveillance is needed, no one project has really achieved a workable scalable model to deploy UAV in a way that will really make a difference. Over the course of five days, Bathawk Recon and Aviation Unmanned [who supply the Super Bat] successfully tested their equipment and the proposed operation plan. Wildlife and aviation officials were present as well as experts from the national parks where the service was deployed.

Earliest in March, 2015 another set of trials were held in Africa's largest protected natural reserve, Selous Game Reserve, a World Heritage Site where Tanzania's greatest population of elephants call home. In previous trials, Bathawk fielded the DT-26s, a more powerful version of the UAV flown in the Tarangire. [*The Guardian*, September 17, 2015]. Using a UAV model Delair Tech DT-18, thanks to the equipment's infra-red images, researchers were able to remotely view in pitch darkness over 200 buffaloes moving along the Tarangire River valley. The idea is to have teams that can be deployed widely, operate simply and cover large tracks of ground – exceeding thousands of square kilometers. The DT-18's can fly multiple missions every day but will in most cases operate stealthily in the night. As the UAV flies, it sends images to screens at the monitoring station allowing a live field of covered land to be viewed. The images are clear. [Giza Mdoe, 2014] Drones are also being used in the world famous Masan Mara National Reserve in Nark County, Kenya. The pilotless technology was borrowed from

Israel. The drones use radio frequencies pinned on rhinos and elephants to monitor the landscape and the animals' movement. [*Daily Nation*, June 10, 2016]

The development was the direct result of efforts by the Tanzania Private Sector Foundation to utilize the private sector's resources to stop poaching. This is a mechanism that brings government and the private sector into partnership in anti-poaching efforts. The use of UAV's is very promising. The trials were meant to serve as an example of how UAV surveillance can be organized, distributed, coordinated and costs estimated. The exercise is to demonstrate how surveillance systems might be deployed. Along with the UAVs, camps will be established and "Pods" – operational units – equipped with multiple aircraft, vehicles and communication equipment will be deployed. These pods will monitor, identify, follow and deliver suspected poachers to wildlife authorities and include in their capabilities significant tactical expertise in developing operations.

The trio of the African Wildlife Foundation, a leading international NGO, Bathawk Recon Tanzania and the Tanzania Private Sector Foundation form the Private Sector Anti-poaching Initiative [PSAPI]. PSAPI is designed to support private sector entities' ability to contact anti-poaching services to the government, specifically UAV operations and the associated development of tactical actions and intelligence gathering. In 2013, UAVs came to be used in South Africa to help tackle the number of endangered rhino deaths in Kruger National Park and elsewhere. The unmanned "silent watchers" are also used in Nepal and India to also help curb the slaughter of rhinos. [*The Guardian*, September 17, 2015] The UAVs are fitted with high resolution digital cameras which can pick up photos day and night. Despite its small size [hardly three meters from the nose to the tail and the same distance from end of one wing to another] equivalent to that of a large eagle, it can fly a maximum of 15,000 feet above sea level and can remain airborne for as many as eight hours. This makes it perfect for those on the ground to track down armed gangs.

High tech is now entering the fight against poaching in Kenya as the Ol Pejeta Conservancy has announced they raised funds equal to almost Ksh. 4 million needed to buy an UAV, aka drone, to have eyes in the skies over the sprawling 90, 000 hectare estate, which serves as a combined cattle ranch and a wildlife conservancy. It is hoped the combined with the rapid deployment unit of rangers, security officers and volunteers, supported by Nanyuki based Tropic Air's helicopters, this will prevent the poaching now seen escalating in other parts of Kenya. Although the drone is not armed, in the eyes of some conservationists a serious omission – though this poses both legal as well as other questions – the nonstop surveillance will be able to direct ground and airborne teams to any given location, where suspicious movement of cars and people is spotted. [Jan Fox, 2013]

## 5.0 BIOLOGY

### 5.1 DNA / Forensic Research

The wildlife trade monitoring network TRAFFIC is deploying a new forensic weapon – DNA testing – to track illegal ivory products responsible for the slaughter of hundreds of endangered elephants in Asia and Africa. Widely used in criminal cases, forensic DNA examination [

Deoxyribonucleic acid] can help identify whether the elephant tusk is from Asia or Africa. The ability to use DNA and other forensic expertise provides great support to law enforcement. One current project is a collaborative effort between Thailand's Department of National Parks, Wildlife and Plant Conservation [DNP] and TRAFFIC to battle the widespread illegal trade of ivory in Thailand. Any wildlife product, by definition, is associated with life and therefore open for DNA examination. In theory it could be a very widely employed technique in addressing wildlife trafficking. The African elephant [*Loxodonta Africana*] is found in 37 countries in sub-Sahara Africa and the Asian elephant [*Elephas Maximas*] is found in Thailand and 12 other Asian countries. A study by the DNP's Wildlife Forensics Crime Unit [WIFOS Laboratory] said forensic results show that African elephant ivory accounted for a majority of the items tested. This indicates that African elephant ivory is prominently represented in the retail outlets in Bangkok. [*Daily News*, February 27, 2015]

This capability supports the enforcement component of Thailand's revised National Ivory Action Plan [NIAP] submitted to CITES in September, 2014. The plan was developed to control ivory trade in Thailand and strengthen measures to prevent illegal international trade. It includes a strong focus on law enforcement and regulation, including the execution of a robust ivory registration system. The Thai government in January, 2015 passed new legislation to regulate and control the possession and trade of ivory that can be shown to have come from domesticated Asian elephants in Thailand. Penalties for failing to register could result in up to three years imprisonment and /or a maximum fine of Thai Baht 6 million [nearly US $ 200,000]. [*Daily News*, February 27, 2015]

Tanzanian and Kenyan conservationists have partnered with a US based university to source for DNA materials for 200 species of birds and animals highly targeted by poachers for commercial purposes. The partnership between the Kenya Forest Service, Tanzania Wildlife Research Institute, Sokoine University of Agriculture in Tanzania, National Museums of Kenya, Kenya Wildlife Service, International Center for Insect Physiology and Ecology [ICIPE], and the Smithsonian Institution will locally implement the project. The teams funded by USAID PEER are sourcing for blood, tissue, skin, hair and faecal samples collected during routine checks from conservancies, bird sanctuaries, rehabilitation centres and National Parks in Kenya and Tanzania to establish the region's first DNA Barcodes reference library. Researchers will then be ready to attend court to prove that the confiscated game trophies, live insects and animals were sourced from Kenya or Tanzania confirming the same via DNA technology to identify the exact location where the exhibits were sourced. It is this DNA evidence that is required to ensure 100 per cent conviction against poachers most of whom commit offences under the cover of darkness and mostly during heavy rains when rangers confine themselves indoors.

The Barcode Wildlife Project is currently being implemented in Mexico, Kenya, Nigeria, South Africa, Nepat and Ecuador where joint teams comprising researchers, law enforcers and prosecutors have partnered to strengthen criminal cases brought against poachers. The species targeted range from rhinos, elephants, lions, leopards, cheetahs, snakes, among other listed on the Convention on International Trade in Endangered Species list of Wild Fauna and Flora's [CITES] appendices. The Barcode Wildlife Project plans to create a public free-for-use reference library on DNA barcodes for 2,000 endangered species protected under CITES. [James Kariuki and Deogratias Kamagi, 2016]

Kenya is establishing a forensic laboratory to trace the origin of seized wildlife products in the East African region. The laboratory, being constructed with the help and expertise of the US government, was fully operational in 2015 and targeted mainly at elephant tusks and rhino horns. The decision was in line with recommendations made at the last Convention on International Trade in Endangered Species [CITES COP 16] meeting in Bangkok, Thailand. It recognized that illegal trade in elephant specimens is an international problem that requires all elephant range states and consumer states to take urgent and concerted efforts to combat it. The meeting also highlighted the importance of addressing the entire crime chain, including determining which elephant populations are most affected by poaching. [Jeff Otieno, 2014]

Being able to trace the origin of seized ivory trophies will help to come up with effective strategies to combat poaching. Environmentalists have been pushing for more advanced scientific techniques to combat illegal trade in wildlife products because international treaties are not enough. Although the seizure of contraband is a success, investigations normally end at the point of seizure. Thanks to advances in science, it is now possible to trace seized ivory and rhino horns back to their origins using DNA-based technology. This can help law enforcement agencies redirect their efforts to poaching. East Africa is one of the few remaining regions in the world with large elephant and rhino populations, which in recent years has been targeted by poachers. The fight against poaching in Kenya has received a major boost from the US government which donated US $3 million in 2014. Kenya and the US have identified three key areas of intervention: helping community conservancies build their protection mechanisms; strengthening Kenya's investigations of wildlife trafficking crimes; and enhancing the judiciary's ability to process wildlife trafficking cases in court. Kenya has become a transit point for trafficking of contraband trophies due to its strategic geographical location. Kenya has already crafted a National Ivory Action Plan to enhance co-operation among the state, state law enforcement agencies and non-state agencies.

Poor collaboration between state and non-state agencies has been identified as one of the challenges East African countries face in fighting illegal wildlife trade. A task force was appointed in 2014 to look into ways of strengthening the wildlife regulator, Kenya Wildlife Service [KWS], in view of the rising cases of wildlife poaching in the region. The task force recommended an overhaul of the organization's structure and operations. It was plagued by overlapping functions, poor reporting systems and fragmentation of departments. If Africa lets its wildlife to be decimated to extinction, the continent will lose the future economic potential of wildlife-based tourism, which in 2014 stood at over US $ 1.36 billion in Kenya alone. At the regional level, EAC countries are working on strengthening collaboration in anti-poaching activities One such program is the joint wildlife census conducted in the region. EAC members will continue conducting regular census in the Mara-Serengeti ecosystem, Tsavo-Kilimanjaro West and Natron-Magadi ecosystems as one way of monitoring wildlife population. [Jeff Otieno, 2014]

According to DNA research, the trade in illegal ivory has been fueled primarily by two poaching hotspots in Africa. In the past nine years or so, most savannah elephant tusks have come from Tanzania and Mozambique while most forest elephant tusks have originated in Gabon, the Democratic Republic of Congo and the Central African Republic. Researchers at the

University of Washington analyzed 28 ivory seizures between 1996 and 2014, each containing half a tonne of tusks or more. They then analyzed the DNA in large seizures of ivory and assigned them to specific elephant populations across the continent. The research suggests that poachers move on to new pastures fairly soon after such hotspots are identified. To determine the location of major elephant poaching sites, the researchers first sampled DNA from the dung of 1,350 elephants, both savannah and forest elephants, from 71 different locations across 29 African countries, using their results to create a map of elephant populations. The goal is to establish where the organized criminal networks responsible for these massive shipments are targeting elephants and then to focus law enforcement efforts on those poaching hotspots. [Christabel Ligami, 2015]

Testing of 6.5 tonnes of illegal elephant ivory seized in Singapore in 2002, 3.9 tonnes confiscated in Hong Kong in 2006, and another 11 tonnes confiscated in Hong Kong, Taiwan and Japan determined that the massive consignments came for closely related elephants in specific localities. They were eastern Zambia for the Singapore seizure, a small section of eastern Gabon and neighboring Congo for the single Hong Kong seizure and southern Tanzania / northern Mozambique for all samples in the 11 tonne seizure. Those findings prove that organized gangs were filling purchase orders by targeting whole herds in certain areas rather than by collecting ivory from disparate sources, as was previously thought. Their results suggest that 96 per cent of ivory seizures originated from a total of four geographical areas and that after 2007, the vast majority of ivory seizures became concentrated in just two areas. The findings also indicate that most ivory seizures were shipped (or about to be shipped) out of a different country from the one where they originated. However, these regions probably would not remain hotspots for long. The researchers suggest that their DNA forensics techniques could be adapted for other animals as well. Its accuracy could be improved to help law enforcement identify poaching hotspots in time to mount co-ordinated, international responses. [Christabel Ligami, 2015]

### 5.2 Use of Dogs

The development in science and technology, increase in human activities, terrorism and piracy have led to an increase of insecurity in various places, especially in vital installations such as ports. Ports being one of the major gateways for people and goods, they demand high level of security to ensure that people, goods and vessels entering and leaving port facilities are safe and secure. It is therefore important to ensure the proper measures and mechanisms are devised to accommodate the level of safety and security required. The governments of Tanzania and the Customs and Border Protection [CBP] of the US have launched a “Canine Detection Program”. Through this programme, Tanzanian police officers with specially trained dogs will be posted at the Dar es Salaam Port and Julius Kambarage Nyerere International Airport [JNIA] in the country’s commercial city to help detect heroin and smuggled ivory. The program began in September, 2015. This program will help in a war against criminals determined to destroy Tanzania through drug trafficking and destruction of natural habitats. This canine program has assisted international partners in developing and enhancing similar schemes through sharing experience, expertise and resources. CBP has trained more than 200 Tanzanian police and wildlife personnel to combat drug, human, wildlife trafficking and poaching. [*The Guardian,* May 4, 2015]

The US Customs and Border Protection [CBP] in collaboration with the ministries of Transport, Home Affairs and Natural Resources and Tourism launched a new "Canine Detection Programme" in Tanzania in 2015 to support government efforts in tackling trafficking of illicit drugs and ivory. The programme was implemented at the Julius Nyerere International Airport [JNIA] and Dar es Salaam port to curb contrabands. Through the program, CBP trained police officers at its facility in the US and provided four trained sniffer dogs, a pair of each to be posted at the port and the airport to detect drugs and ivory. The programme was designed to train officers from the canine unit of the Tanzania Police Force. CBP also assisted in other aspects of the programme such as the development of an effective administrative management system, continued training and a health programme for the dogs. This new collaboration builds on a long standing partnership between Tanzania and the United States in security and law enforcement operations. For example, the CBP has trained more than 200 Tanzanian police and wildlife personnel through the Regional Rural Border Patrol Unit. In 2015 ten Tanzanian participated in an instructor programme that equipped them to teach the Regional Rural Border Patrol curriculum. CBP is a unified border agency within the US Department of Homeland Security. It charged with the management control and protection of US borders at and between the official ports of entry. Advancement of science and technology, terrorism and piracy have led to an increase of insecurity in vital installations in Tanzania like ports. [Ashery Mkama,2015]

Special dogs trained to trace poachers will be used by the Serengeti National Park [SENAPA] to combat poaching that threatens the existence of elephants and other wild animals. The use of dogs has proved useful as they managed to trace poachers in three incidents after an elephant was killed in the park. The dogs have been trained in tracing poachers wherever they might be hiding in the park. The dogs are usually led to the carcass of a killed animal. From there, they can tack the poacher who killed the animal and smoke him out of his hideout. [Anceth Nyahore, 2015]

## 6.0 CONCLUSIONS

One of the new terms that has become popular in the international news media today is environmental crime. Mankind is becoming more and more conscious of the dangers of destroying the environment and depleting scarce resources. A new awareness about this evil has given rise to cooperation at all levels – local, national and international. This paper was particularly concerned about the environment crime in the form of the dramatic decline in the populations of elephants and rhinos. They are being slaughtered for their tusks and horns. The international crime syndicate seems to be behind this lucrative but illegal trade.

This paper explored questions about whether science and technology can be employed to win the war against poaching. Like all wars, technology can be used on both sides of the battle. The focus was on describing what measures have been taken in an international attempt to halt the illegal trade in elephant tusks and rhino horns, especially in Africa. Information and communication technology can be used to monitor not only the movement of elephants and rhinos but also criminals thanks to the work of Interpol. Wildleaks is an important website to help whistleblowers report criminal activities at the local and international level. Special task forces have been set up in many countries where the level of poaching has reach alarming levels. These forces try to use modern military management and technology techniques.

Global satellite technology and radio technology have made it possible to track the physical movements of wildlife in surprising detail. The GPS system employs the latest mapping technology to determine their exact location including their seasonal movement. Such information will greatly help rangers to trap poachers. Aircraft technology has also been helpful especially the use of planes and helicopters. However, they require a human pilot and therefore can only cover a limited area. The tragic killing of a British helicopter pilot by poacher in Serengeti National Park in January, 2016 pointed out the dangers of using this technology. Fortunately, the newly emerging technology of unmanned drones provides hope that this danger can be overcome. In addition, it is hope that costs will eventually be reduced as economies of scale become possible. Biology has also been employed in the fight again poaching. DNA technology has already been used to determine the precise geographical location of smuggled ivory tusks for Africa that were seized in faraway places such as East Asia. In addition, through proper training, animals such as dogs and even rats can help detect smuggled wildlife products.

Unlike traditional military battles, the enemy is very difficult to identify since the international crime syndicate is involved. Victory is far from clear and definitive. Like all wars, a high level of expenditures are required to win. Hence, some attempts can be made to justify investments in these special kinds of crime prevention equipment and methods. Nevertheless, a rigorous cost benefit analysis is still very difficult because of the uncertainties involved.

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