Harnessing artificial intelligence to address organised environmental crime in Africa

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Summary

Artificial intelligence (AI) offers innovative solutions for addressing a range of illegal activities that impact Africa’s environment. This report explores how AI is being used in Africa to provide intelligence on organised environmental crime, craft tools to assess its impact, and develop methods to detect and prevent environmental criminal activities. It discusses the challenges and opportunities AI poses for policing environmental crime in Africa, and proposes recommendations that would allow AI-powered policing to make a real difference on the continent.

Recommendations

- African governments and organisations should invest in gathering large, local data sets to allow AI models to produce appropriate and relevant solutions.
- Investments in digital and communication infrastructure need to be made across Africa to improve and expand access to and affordability of AI solutions.
- Police forces across Africa should include technology and AI skills capacity building into their basic and professional development training curricula.
- Guardrails should be established through legislation to protect data, ensure privacy where necessary, and regulate the use of AI.
- Public-private partnerships must be strengthened for law enforcement agencies across Africa to receive the technology and training they need to effectively embed AI tools into their methodologies to combat environmental (and other) organised crime.
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Introduction

AI has attracted considerable attention over the past few years, evoking both hope in the development of solutions for a better world and terror of a dystopian future.

Among its range of positive applications, AI offers innovative solutions for addressing the wide range of illegal activities that impact the environment across the globe, such as wildlife crime and the illegal trade in natural resources. These crimes are highly lucrative and tend to receive less law enforcement attention than other serious and violent crimes. As a result, transnational organised criminal groups increasingly use organised environmental crime to create wealth, fund their operations and even finance terror groups.

Africa’s wealth of natural resources has attracted organised criminal groups determined to profit from environmental crime. Despite their limited general use on the continent, AI-powered tools are being developed and implemented to address environmental crime in a whole new way.

Policy: Why AI is important for policing organised environmental crime in Africa

Effective law enforcement is based on access to quality data. AI technology has the ability to process massive amounts of data in a relatively short time. It can extract what is useful to map the movements of criminals and illicit goods, identify patterns in criminal behaviour and activities, and make focused connections, saving police hours of search and analysis work.

This is being recognised on a global level. In April 2024, in response to a Policing Productivity Review, the British government outlined how £230 million would be spent on AI technology to help the police save 38 million hours of police time that could be better spent reducing crime and keeping communities safe.

In 2023, the European Union began implementing a project using AI to detect and prevent organised environmental crime by providing improved and comprehensive intelligence.

Across Africa, the enforcement, investigation and prosecution of organised environmental crimes are severely under-resourced (because they occur in remote areas and are expensive and time-consuming to police) and treated as low priority. This despite their significant costs to the environment, economy and society. But AI can be – and already is being – used to do some of the resource-heavy and complex aspects of investigating environmental crime.

AI tools are currently being piloted or implemented to assist police in various African countries with the illegal wildlife trade (TrailGuard AI and Operation Pangolin), illegal fishing (Skylight and FishGuard) and illegal mining (Digital Earth Africa). These initiatives and others like them should be capitalised on, not only to lower the cost and level of capacity required to police remote environmental crimes, but also to increase the scale and speed with which law enforcement can respond to crimes happening in real time.

There are certainly challenges and risks to harnessing AI for law enforcement in Africa. These include limitations in availability of local data, inadequate basic communication and digital infrastructure, lack of technical skills, a dearth of investment in research and development, reactive (rather than proactive and flexible) regulatory systems, and the threat posed by criminals.

But by engaging with the potential posed by AI, policymakers across Africa could make a real difference in the fight against organised and complex crimes. They should:

- Enable or build the capacity to gather large, local and relevant data sets
- Invest in digital and communication infrastructure
- Generate the human capacity and skills for AI development and implementation
- Urgently draft and enact legislation and policy on AI to ensure its use is regulated
- Leverage collaborative models of public-private partnerships.

AI has the potential to generate very powerful crime-fighting tools – Africa must embrace this potential and set the parameters for its ethical use now.

This report outlines the character of organised environmental crime in Africa. It then explores how AI has already been leveraged worldwide to provide comprehensive intelligence on organised environmental criminal activities, craft tools to assess the impact of environmental crime, and develop solutions for detecting and preventing environmental criminal activities. Case studies on the use of AI in the illegal wildlife trade (IWT), irregular, unreported and unregulated (IUU) fishing and illegal mining in different contexts in Africa shed light on how this technology is being harnessed for positive change.

The report discusses some of the challenges and opportunities that AI poses for policing environmental crime in Africa before concluding with a set of recommendations that would allow AI-powered policing to make a real difference on the continent.

**Methodology**

ENACT undertook an extensive literature review on organised environmental crime and AI. From this, various AI projects and tools being developed and implemented across Africa were identified. In-depth interviews were conducted with conservationists, developers and experts working on these tools to offer a snapshot of the use of AI to address environmental crimes across Africa.

**Terms and definitions**

**Environmental crime**

There is no universally accepted definition of the term ‘environmental crime’. The United Nations Environment Programme (UNEP) refers to it as ‘a collective term to describe illegal activities harming the environment and aimed at benefiting individuals or groups or companies from the exploitation of, damage to, trade or theft of natural resources, including, but not limited to serious crimes and transnational organized crime.’

The types of crime covered by the umbrella term ‘environmental crime’ are generally understood to include:

- Illegal poaching of and trade in wildlife and plants
- Illegal logging/deforestation and associated timber trafficking
- IUU fishing
- Illegal dumping, disposal and trade in waste and chemicals
- Pollution crime
- Illegal trade in ozone-depleting substances
- Illegal mining and trade in precious metals and minerals

‘Organised environmental crime’ refers to any type of environmental crime carried out by organised criminal groups and networks, either nationally or transnationally, on a large scale.

**Artificial intelligence**

There is no single definition of AI, and any definition will inevitably need to change over time as technology advances. Currently, and in broad terms, AI refers to computer systems that are taught to perform complex tasks that historically only a human could do. Using AI, machines (especially computer systems) simulate ‘human intelligence processes’, including ‘aspects of reasoning, learning, perception, prediction, planning or control’.

In layman’s terms, AI is essentially powered by data. Large amounts of data are processed by a tool that has been developed to perform tasks given to it through algorithms. Algorithms take input, perform a series of mathematical calculations and provide an output. Much of what is involved in building an AI tool is done through repeated trial and error, as the tool is taught what to recognise and how to process it.

**Using AI to police crime**

Effective law enforcement is based on access to quality data. Over the past decade or so, the vast quantities of data that have come with the increased use of video and photo surveillance, satellite global positioning
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systems (GPS), online social media presence, facial recognition software, digital financial transactions and so on, means that AI has become a valuable tool in policing a range of crimes.

AI technology has the ability to process massive amounts of data in a relatively short time, and extract what is useful to map the movements of criminals and illicit goods, identify patterns in behaviour and activities and make targeted connections. This ‘frees [police] investigators from the heavy search and comparison activities [and] greatly improves the efficiency of the investigation.’ Predictive policing, facilitated by AI algorithms, allows law enforcement to anticipate ahead of time where and how crime is likely to take place and intervene accordingly, while facial recognition powered by AI allows for the real-time automated detection of potential suspects. For example, police in the United Kingdom (UK) estimate that a relatively simple AI-driven data redaction tool will save 9 500 officer and staff hours per year, and Miami police estimate that using AI-powered facial recognition software saves their officers ‘weeks’ worth of time.

These technologies are not without controversy. Because predictive policing models are based on historical data that may have inherent biases, some geographical areas or groups of people may be subject to ‘over-policing’. This exacerbates existing stereotypes, discrimination and prejudice, and continues to criminalise certain races, ethnicities or cultures. Al-driven surveillance may collect potentially sensitive location data on private individuals with no links to crime, while authoritarian governments may use legitimate AI policing systems to monitor political opponents or suppress critical civil society voices.

AI can be developed to gather large data sets, bypass infrastructure deficiencies and compensate for a lack of technical skills

However, with the appropriate checks, balances and guardrails in place, AI can be revolutionary in helping to curb and even prevent crime that happens in inaccessible places or across vast spaces, such as environmental crime.

But Africa is in the unique position of being able to exploit AI itself to leapfrog some of the challenges posed above. As will be seen below, AI can be developed to gather the large data sets needed, bypass infrastructure deficiencies and compensate for a lack of technical skills. In addition, leveraging existing private-public and international partnerships allows governments in Africa to attract investment and get ahead of the curve in crafting regulations. So, while the use of AI generally – and in policing specifically – is currently nascent and perhaps idealistic, if embraced, the opportunities offered by AI in Africa are real.

Policing environmental crime through AI around the globe

Policing environmental crime is expensive, time-consuming and complex. But AI can be – and already is being – used to do some of the resource-heavy aspects of investigating and preventing environmental crime across the globe, including processing vast amounts of data and finding meaningful patterns.

Launched in December 2022, PERIVALLON is a European Union (EU) project aimed at detecting and preventing organised environmental crime across the EU by leveraging the latest advancements in AI to provide improved and comprehensive intelligence. PERIVALLON’s objectives include:

- Providing advanced AI-based geospatial intelligence and remote sensing solutions to improve the detection and investigation capabilities of EU law enforcement
- Developing improved AI-based extraction, analysis and correlation technologies to identify illegal environmental crime activities
• Developing a trustworthy, transparent and easy-to-use environmental crime monitoring platform that collects crime evidence that can be used in court, as well as providing decision support by identifying patterns, assessing the likelihood of criminal activities and forecasting trends

• Enabling improved cooperation between European police authorities, border guards and other national authorities and international actors through secure and transparent information exchange

• Promoting continuous evaluation, improvement and training of developed tools and solutions in order to enhance uptake of new technologies for existing and emerging capability gaps

PERIVALLON is piloting use cases (that is, testing how a system can be used to achieve specific goals or tasks) on illegal waste disposal detection, intentional dumping of polluting substances on land and in water, transnational illegal trafficking of waste electronic and electrical equipment, and the illegal trade in ozone-depleting substances and hydrofluorocarbons.

The Environmental Investigation Agency, an international non-governmental organisation (NGO), is partnering with the Alan Turing Institute to develop an AI tool that will contribute to tackling the illegal trade in tigers and tiger parts. Investigators are collecting images of live tigers, tiger carcasses and skins to build a database of tiger stripe patterns. These patterns are as distinctive as human fingerprints. They draw on data from camera traps, campaigners, professional and amateur photographers and police investigators.

Scientists are developing an AI tool to process the images and either find a match if the tiger stripes are known or add the stripes to the database if unknown. Once fully functional, this AI tool will be able to help identify live tigers and tiger skins seized as part of the illegal trade. For example, by feeding the image of stripes from a seized tiger skin into the AI tool and matching this to an existing image, investigators can determine where that tiger was last seen. They can also determine a window for when it might have been killed, and where its skin ended up.

This will help track the potential route the tiger or skin took, even across borders. Identifying a pattern of trafficking routes across time and place will allow investigators to intercept and be one step ahead of poachers. Although the AI tool is still in its infancy, researchers are optimistic that it can be adapted for other animal species with unique markings.

Scientists are also developing AI tools to tackle illegal logging in the Amazon. Rainforest Connection uses an acoustic monitoring system to send real-time alerts based on the sounds of incursion into areas vulnerable to illegal logging, such as chainsaws and logging trucks. The Guardian Platform, powered by soundscape data sent from its devices, uses AI to ‘deliver rapid insight into what’s happening in vast forest ecosystems, identify potentially harmful behavior, and help on-the-ground rangers pinpoint and stop damaging activities as they occur.”

River water contaminated with waste
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Similarly, Imazon, a Brazilian research institute, partnered with Microsoft AI to enhance their forest modelling. Satellite images of the Brazilian Amazon are processed by an AI tool to detect unofficial roads and other risk factors of deforestation. The output from this process is translated into interactive maps highlighting high-risk areas, probability maps and dashboards, all of which are used to create risk alerts and facilitate decision making for safeguarding the rainforest.\textsuperscript{19}

**Environmental crime in Africa**

Globally, organised environmental crime is one of the fastest growing and most lucrative organised crime types.\textsuperscript{20} The Financial Action Task Force (FATF) – an intergovernmental organisation aimed at combating financial crime – estimates that environmental crime generates between US$110 billion and US$281 billion in criminal gains annually.\textsuperscript{21}

FATF reports that three forms of environmental crime – illegal logging, illegal mining and waste trafficking – account for two-thirds of this figure. The World Bank puts this figure even higher, estimating that the illegal logging, fishing and wildlife trades cost the global economy US$1 trillion or more a year, mostly in ecosystem services that are not currently priced by the market.\textsuperscript{22}

Africa has an abundance of natural resources. UNEP estimates that the continent accounts for around 30\% of the world’s mineral reserves, with the largest reserves of cobalt, diamonds, platinum and uranium.\textsuperscript{23} The Congo Basin is the world’s second largest tropical rainforest and its biggest carbon sink, absorbing 4\% of the world’s carbon dioxide emissions.\textsuperscript{24}

Africa’s Blue Economy contributes approximately US$300 billion in economic activities for the continent and supports nearly 50 million jobs.\textsuperscript{25} This natural capital (which represents 30\% to 50\% of the national wealth of most African countries),\textsuperscript{26} together with its vast spaces (many of which are un- or under-governed),\textsuperscript{27} limited state capacity and proliferation of non-state armed actors and criminal groups, places Africa on the frontline of environmental crime.

Apart from the enormous financial cost, environmental crimes have a direct and immediate negative impact on the natural environment in which the crime is happening. Illegal mining and logging cause erosion and deforestation, as well as soil and water contamination from pollutants used in the extraction of minerals and the processing of raw timber.\textsuperscript{28} This results in biodiversity loss and the destruction of arable land, which in turn threatens the health and livelihoods of rural communities.

Similarly, IWT and IUU fishing threatens biodiversity by destroying functioning terrestrial and marine ecosystems. This negatively impacts income streams and food security for local communities. IWT also leads directly to an increased risk of diseases that are spread between animals and people and infectious diseases in human populations.\textsuperscript{29}

Environmental crimes are borderless – the raw product, as well as goods processed from it, are trafficked between countries and internationally. Other forms of organised crime often converge with, are integral to or flow from environmental crime. For instance, human trafficking and forced labour have been linked to both...
illegal mining and IUU fishing. Established smuggling routes for arms, drugs or counterfeit goods are used to traffic illegal minerals and wildlife products, and criminal actors or networks often overlap across different crime types. The proceeds from environmental crime are used not only to fund the ongoing operations of transnational criminal groups, but also to finance terrorist organisations.

Environmental crimes were once perceived to be ‘victimless’ because they are not perpetrated against an individual or group and their impact may not be felt immediately or even for many years. However, ‘the harms caused by organized environmental crime are diffuse and tend to result in collective victimization, affecting communities, including future generations, through cumulative health, environmental, economic and development harms.’

### Juvenile sharks caught by artisanal fishermen at Songolo, Republic of the Congo

*Source: Oluwole Ojewale/ENACT*
The 2019 Global Assessment Report on Biodiversity and Ecosystem Services found that because nature is essential for achieving the Sustainable Development Goals (SDGs), 'current negative trends in biodiversity and ecosystems will undermine progress towards 80 per cent (35 out of 44) of the assessed targets of [SDGs] related to poverty, hunger, health, water, cities, climate, oceans and land.'

Environmental crimes also pose a significant security threat, not only to national governments in Africa but to regions and the continent as a whole. This is because of their links to other transnational organised crimes, illicit financial flows, financing of militias, non-state armed groups and terrorist organisations, fuelling of corruption and undermining of the rule of law and good governance.

The negative impact of climate change is becoming more apparent on a global level, and more is being understood about environmental crime, including its harms and links with other forms of transnational organised crime. With this comes an increasing urgency to develop innovative ways to prevent and address the crisis before its effects are irreversible.

Using AI to police environmental crime in Africa: case studies

In Africa, the 'enforcement, investigation and prosecution of [environmental] crimes are severely under-resourced, and environmental crimes are often treated as a low priority by policymakers, governments, and courts, with the result that perpetrators are often not prosecuted, and in some jurisdictions face few if any consequences.'

Although the use of AI to investigate and prevent crime is nascent in Africa, there are currently numerous initiatives seeking to contribute to the fight against environmental organised crime in different settings across the continent.

Illegal wildlife trade

IWT is endemic across Africa and carries with it significant costs:

- To the environment – a decrease or loss of wildlife species negatively impacts biodiversity, which in turn leads to 'a degradation of some ecosystem functioning [including] biological control of pests and disease, food web functions, and landscape management.'
- To the economy – costs range from losses to the tourism and legal hunting sectors, to spending on wildlife protection and security. Although various studies have tried to quantify the cost of IWT in Africa, any attempt is 'likely dwarfed by [the] missing or hidden values of biodiversity.'
- To society – there is loss of life, both of rangers and poachers, and communities are exposed to the violence, corruption and other forms of transnational organised crime that converge with IWT.

There have been various efforts to develop innovative technology solutions that enhance wildlife conservation and address wildlife-human conflict across Africa. These include using drones and satellite...
data to more accurately count wildlife populations, sensors and collars to track animal movements, and collecting DNA from environmental samples to collect biodiversity data in specific settings.

Some of this innovative technology specifically employs AI to help address and prevent the organised IWT in Africa. Two such case studies are outlined below.

**TrailGuard AI**

Camera traps have been used for decades to record the location and population size of different wildlife species, as well as their behaviour and interactions with each other and humans. More recently, networked camera traps, which can send images via cell phone signal or over satellite connections in near real time, have become a useful tool in the fight against poaching. However, despite their potential, several challenges have limited the usefulness of camera traps for addressing IWT.

Eric Dinerstein, Director of Nightjar at RESOLVE, spoke to ENACT about the TrailGuard AI system. He said battery power and connectivity were the two biggest challenges for camera traps or any sensor providing information in real time from remote places to designated authorities who could act on it. TrailGuard AI, launched by RESOLVE in 2019, solved both, he said. At its simplest, TrailGuard AI is a security system of trail cameras providing information that enables national parks’ officials to detect, stop and arrest poachers before they kill wildlife.

Trail cameras take images of whatever triggers the motion sensor – which could be as significant as a rare animal species or poacher and as insignificant as changes in light conditions or a waving blade of grass. This results in several problems. The Secure Digital card will fill up with thousands of unusable images; the camera will transmit all the images, regardless of their worth, at great expense; and the camera’s battery will run down quickly. Whether the batteries are rechargeable or not, changing or recharging them from where they are located in remote, often inaccessible areas requires complex logistics and wastes time and manpower.

Even at a small size, transmitting images is 20 times more taxing on battery life than loading and running an AI algorithm on a chip in the camera. This means that if a system can filter out 99% of the false positive images and send only the objects of interest, it is way ahead of the game. However, this is hard to do and requires developing highly accurate AI models, as well as finding low-power computer vision chips that can perform at a high level. Very few companies make these powerful AI computer vision chips, and it is extremely expensive to access the chips (typically up to US$500 000 is required just to gain access to the chips).

**Cameras are durable and fitted with sophisticated vision processing**

TrailGuard AI partnered with Intel on accessing and developing software for the computer vision chips. A tiny Intel® MyriadX™ vision processing unit inside each camera detects objects and classifies images. The cameras themselves are very small, easily camouflaged and positioned along trails in places where local intelligence has identified a threat. Dinerstein explains that because the AI in the camera is agnostic to angle, the cameras can be hidden six to 10 metres up a tree and still detect poachers walking by.

The cameras remain off unless triggered by the motion sensor. If triggered, the system wakes up and works incredibly fast – grabbing frames, processing the images through the AI algorithm and sending relevant images to the designated authorities. If there is good cell transmission, it takes no more than 30 seconds from a lion, elephant or poacher triggering the camera to seeing the image on a cell phone or in a telegram app. If the system is using satellite rather than cell transmission, it will take a bit longer, but the appropriate authorities will still have more than enough time to mount a real-time response.

Technology senses motion, grabs a frame and processes the image through AI to identify elephants

When the system is deployed, only a list of authorised individuals receives the images. The list is usually limited for safety and confidentiality reasons. The names of designated people are entered into the TrailGuard AI server, and they receive the images over email or telegram app. TrailGuard AI prefers to work only with authorities or organisations that have a rapid response capability and can act immediately on the images received.

The system also works in conjunction with other anti-poaching interventions, such as the use of scent dogs.

Taking scent dogs and their handlers out into vast national park areas to find the scent of intruders is akin

Real-time alerts enable real-time responses

The cameras sense motion, grab a frame and process the image through AI to identify elephants.
to trying to find a needle in a haystack. But if the location of the poachers is known from an image taken by one of the TrailGuard AI cameras, the dogs can be taken to that location and track from there. While Dinerstein says it is difficult to use images as evidence against poachers in court, due to accusations of image manipulation, TrailGuard AI does make it possible for poachers to be caught in the act and arrested.

As a non-profit organisation working to protect people and animals, TrailGuard AI works in partnership with national parks, NGOs and the police. The TrailGuard AI system is sold through a RESOLVE-established company called Nightjar. External donors often sponsor poorly resourced NGOs or national parks needing the technology. TrailGuard AI is easy to install and requires minimal training – the end-user just needs to connect the battery and the system starts to work immediately. Nightjar also has simple training videos and illustrated PowerPoint presentations that guide users through tips on placement and camouflage. As Dinerstein points out, ‘You never want to introduce technology that requires a lot of training – it’ll just sit on the shelf, or if it gets broken or damaged, it won’t get repaired.’

**Operation Pangolin**

Launched in February 2023, Operation Pangolin is a collaboration between universities, conservation initiatives and Gabon’s National Agency for National Parks. The project team aims to capitalise on ‘the latest advances in technology, interdisciplinary conservation science, big data, and artificial intelligence to generate and unify diverse data sources to inform sustainable and cost-effective solutions to the global biodiversity crisis associated with wildlife crime.’ The project is currently operating in Gabon and Cameroon and is working closely with Nigerian stakeholders.

Bistra Dilkina, University of Southern California (USC) Computer Science and Industrial and Systems Engineering Associate Professor and Center for AI in Society Co-Director, and Alasdair Davies, Technical Director of the UK-based Arribada Initiative, are part of the Operation Pangolin team. They said the project aims to understand where pangolins are, who is poaching them, how and where they are being traded and trafficked, and how this information could help reduce the number killed every year. Davies said by ‘creating opportunities to get data out of the field in an effective and efficient way so that it can be processed by the AI models, raw data – in the form of images or audio – can be turned into real value for wildlife conservation.’

The AI tool that will be used in Operation Pangolin is still in development but, once it is implemented, the team envisions that the technology will operate on several levels:

- Collecting and processing data: existing sensors for collecting wildlife data, like camera traps and audio recorders, will be deployed in conservation areas. Existing sensors will be adapted, and new sensors designed, to suit the purposes of the project. Researchers aim to develop machine learning to recognise pangolins in images from both camera traps and thermal cameras.

**An African Ground Pangolin safely released in a remote area of Namibia**

Source: Joris Komen/Flickr
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- Understanding and predicting poaching: Spatial Monitoring and Reporting Tool data from ranger patrols inside the conservation area will be used to build predictive models of where new snares and traps are likely to be placed. This will help in planning and implementing route patrols.

- Understanding trafficking: the long-term aim of the project is to understand what happens when poached wildlife leaves the conservation areas. Researchers aim to develop models that predict where those animals end up and how they get there – in other words, which roads, rivers, paths or trains they might travel on (to the airport or port if it is for international trade), to where and which markets they are sold in. Project researchers have had preliminary proof of concept success in building AI models to predict international trafficking routes using historical route data on origin, destination and transit points from seizures at airports. The first challenge is that while 300 seizure records constitute a lot of data in the conservation world, it is a tiny data set in the AI world. The second challenge is that while predicting trafficking routes on the airline networks (which are well defined, set and predictable) is one thing, predicting trafficking routes on other means of transport (such as roads, trains and even footpaths) is much harder, especially on a cross-border and regional scale. The open-ended goal is to figure out whether in-country or in-region trafficking routes can be predicted, and a big part of doing this would be to understand if enough data exists to test these ideas.

For the project team, investing effort into finding the right local partners is crucial, not only for successfully developing the AI tool but for the longevity of the tool in helping to protect wildlife and address organised environmental crime. As Dilkina explains, 'The tool is an empty shell without the local data. We need local champions.' The project is currently engaging local community stakeholders and actors on the ground to understand how best to make the AI tools fit for purpose, in terms of language/translation, technical accessibility and affordability.

The project team is also working on figuring out possible pathways for capacity building on the ground locally so that the data, technologies and tools continue to be used and offer value beyond the scope of the project. There are different components to the project (as outlined above), and some components will require more technical competence than others. For example, monitoring wildlife inside the conservation areas can work independently of tracking the trafficking routes across the region, which requires more specific expertise. The developed AI tool or set of tools is intended for use by local communities, NGOs and law enforcement. The predictions made by the tools can be used to enhance law enforcement actions, such as guiding investigations and increasing arrests. It can also be used to inform local policy, such as creating alternative livelihoods for those suspected of being serial poachers and habitually involved in trafficking.

Illegal fishing

As with IWT, IUU fishing along Africa’s coastlines results in a range of harms:

- To the environment – IUU fishing endangers fragile marine ecosystems, damages habitats and threatens aquatic biodiversity. It has also been directly linked to the amount of plastic litter in the oceans, as vessels involved in IUU fishing dump incriminating equipment if they are at risk of being caught. This abandoned gear is also responsible for trapping and killing other species of fish.51

- To the economy – West Africa alone accounts for 40% of global IUU fishing incidents, costing the region an estimated US$1.3 billion annually.52 Coastal countries in East Africa are estimated to lose approximately US$400 million in catches and nearly US$1 billion in fish-related processed products per year.53

- To society – IUU fishing depletes fish stocks, which threatens the food security and nutritional intake of coastal communities. It also undermines the livelihoods of small-scale fishermen and those involved in the fishing or fishery-related industries, such as boat building and net making. The destruction of marine ecosystems and protected areas has a direct impact on the revenue from and jobs sustained by tourism.54

The following two case studies outline how AI is being used to combat IUU fishing where it is most prevalent in Africa.
Skylight

Developed by the Allen Institute for AI (AI2), Skylight is a marine data platform that applies computer vision, machine learning and various other AI techniques to satellite data to provide alerts that guide law enforcement to act against illegal fishing. The Skylight team estimates that about 70 countries – including Madagascar, Kenya, Gabon and nations around the Gulf of Guinea – are using the platform effectively on a regular basis.

Maritime fishing vessels produce signature movements based on the type of fishing they are conducting, such as longlining, purse seining, splitting, jigging, trawling, etc. Skylight focuses on vessels that can be tracked by satellite through their GPS coordinates, which are transmitted via automatic identification systems (AIS). These include distant water fleets (that operate outside their own countries’ exclusive economic zones (EEZs), travel long distances and spend long periods of time at sea), foreign fleets, and vessels larger than 10 metres.

Ted Schmitt, Senior Director of Conservation and Programme Manager for Skylight at AI2, told ENACT that in addition to AIS data, Skylight identifies vessels from images from multiple satellites, including the EU’s Copernicus Sentinel-1 and Sentinel-2, the United States’ (US) National Aeronautics and Space Administration and National Oceanic and Atmospheric Administration Visible Infrared Imaging Radiometer Suite, and other open-source satellite constellations.

Technical pipelines bring this data into Skylight’s database, where it is processed and run through Skylight’s AI algorithms – both pattern detection and computer vision. The pattern detection algorithms are trained on vessel movement identification and analysis that have been meticulously annotated by subject matter experts. The AI recognises patterns to identify the fishing activities of different types of vessels.

**Chart 1: Example of fishing behaviour annotated by an expert in Skylight’s platform**

Source: Skylight, Charting New Waters – Skylight’s Work to Revolutionize Maritime Data Annotation
The computer vision algorithms are trained to detect vessels in various types of satellite imagery. In this way, Skylight can monitor fishing activity across the world’s oceans daily – something that would not be possible no matter how much human capacity was dedicated to it. In essence, Skylight’s AI assimilates knowledge from subject matter experts and rapidly applies it globally, repeatedly, to detect instances of illegal fishing across the oceans.

The Skylight platform is used by coastguards and other maritime enforcement agencies, such as maritime police, port authorities, fishery agencies and park services, to monitor their territorial waters and EEZs. Skylight alerts authorities to patterns or detections, showing them where on the map it is happening. This allows the authorities to narrow down what they focus on when assessing potential non-compliant or illegal activity.

Officials apply their local knowledge of national laws, their organisation’s priorities and mandate, along with the resources at their disposal, to determine how to respond or investigate. Since the data is in real time (or very near), it holds operational significance – in other words, the data is received quickly enough that the organisation can act promptly, enabling timely intervention if necessary. Schmitt told ENACT that they had ‘examples of coast guards going out based on Skylight data, carrying out interdictions, boarding vessels and finding shark fins and other illegal fishing activity, as well as other criminal activity.’

Skylight works through partners who have in-country capacity, such as field programmes, local staff and language. One of its biggest partners is the United Nations Office on Drugs and Crime’s Global Maritime Crime Programme. Skylight provides the tool, and the partners provide the capacity to deliver and train the officials who will be using the tool.

Skylight also leverages well-funded government platforms by providing them with AI-powered data. Skylight is integrated into the EU and US government-funded and -built (but globally accessible) maritime surveillance and information-sharing platforms. The EU’s CRIMARIO (Critical Maritime Routes Indo-Pacific) (Indian Ocean) and YARIS (Yaoundé Architecture Regional Information System) (Gulf of Guinea) programmes aim to enhance information exchange and analysis to support maritime coordination and crisis management, and strengthen maritime surveillance, policing, investigation and prosecutions.

The US’s SeaVision is a web-based maritime situational awareness tool that enables users to view and share maritime information to improve maritime operations, increase maritime security and build partnerships in the maritime community. Partner countries have access to Skylight through these platforms. For Schmitt, it’s a symbiotic relationship: ‘We’re filling a gap by providing AI technology. And it works for everyone because we leverage their substantial funding, support and global presence, and provide them with useful technology.’
FishGuard

FishGuard is an AI initiative that aims to strengthen maritime law enforcement by identifying, tackling and reducing IUU fishing operations in coastal and Small Island Developing States.

FishGuard uses both short-range (40 km to 100 km) and long-range (250 km to 700 km) commercial drones, which can be launched from land or from boats at sea, to monitor and document activity across large marine areas. The drones are able to autonomously determine their optimal flight path. An AI device installed on the drones uses cognitive vision algorithms to verify the type of vessel observed. It can determine whether the boat is operating in a protected area, and whether it has authorisation to do so, and identify the presence of ‘dark targets’ (unregistered vessels) in territorial waters.

The AI device integrates a variety of different data sources, including satellites with optical and synthetic-aperture radar remote sensing equipment, Earth observation data, AIS (tracking systems using ship transceivers), vessel monitoring systems and reports from local fishers.

If a suspicious vessel is detected, the drones can alert the authorities via satellite by relaying the vessel’s location, identification number and number of people on board.

FishGuard is a partnership between ATLAN Space, GRID-Arendal and Trygg Mat Tracking. ATLAN Space, a Moroccan technology start-up, has developed the AI that enables commercial drones to increase their flight range and learn from their environment. Trygg Mat Tracking equips these drones with a fisheries development tool called FACT, enabling long-range drones to detect unauthorised vessels or suspicious behaviour, document illegal activities, and submit situation reports to local fisheries authorities. GRID-Arendal is responsible for FishGuard’s public relations and outreach activity.

FishGuard is currently being piloted in the Seychelles by the Seychelles Fishing Authority. The Seychelles provides an ideal location – it is impossible to patrol all of its 1.3 million-square-km EEZ and fishing laws are difficult to enforce over such a vast area, especially with limited resources. Valentin Emelin, who leads GRID-Arendal’s Transboundary Governance & Environmental Crime programme, says: ‘Physical control is very difficult … with patrol boats that you can count on the fingers of one or two hands … and one or two planes that can do reconnaissance flights or surveillance flights.’ Seychelles Air Force pilots have been trained to fly the drones in partnership with the Seychelles Coast Guard.

Drones are used by the Seychelles Air Force in collaboration with the Coast Guard

Through international collaboration, technology enables tracking over vast territorial waters


Illegal mining

Africa has vast reserves of mineral deposits. The lucrative nature of these minerals has made them a target for organised criminal groups, to the detriment of:

- The environment – illegal mining’s negative effects on the environment include soil erosion, the formation of sinkholes, loss of biodiversity, and contamination of the soil, groundwater and surface water. Criminal networks involved in illegal mining also use prohibited equipment, devices, pollutants or chemicals, including explosives and ozone-depleting substances, all of which impact the environment negatively.

- The economy – illegal mining costs the economies of African countries tens of billions of dollars in lost export earnings, taxes and royalties, increased security, destroyed infrastructure and decreased investment. South Africa alone is estimated to lose US$365 million annually to illegal mining, while the Ghanaian government lost about US$2.3 billion in tax revenue between 2010 and 2017.

- Society – illegal mining impacts rural habitats and livelihoods, damaging the ecological systems that humans depend on to survive. It also results in health risks and even death, both for the illegal miners and local communities. Other social consequences include increased violence due to conflicts over resources, displacement, and an increase in other forms of organised crime such as arms and human trafficking.

Digital Earth Africa

Digital Earth Africa (DEA) aims to provide actionable data to governments and organisations across Africa by using satellite imagery in a usable format.

Raw satellite data contains valuable information but is cumbersome to acquire, scale, analyse and store. DEA takes vast raw geospatial satellite data from across Africa and translates it into analysis-ready data (ARD). This is done by, for example, orthorectification (the process whereby image distortions and displacements caused by sensor tilt and topographic relief are removed) and cleaning the images of atmospheric attenuation and radiation irregularities. Open Data Cube (ODC) technology – the engine for accessing, managing and analysing these large data sets – is applied to the ARD, after which the data is processed through different AI algorithms and applications, depending on the desired outcome.

DEA uses these techniques to provide insights into illegal mining activities in specific locations in Africa. Changes in land use can be observed and compared using satellite imagery from different points in time. For instance, surface-level activities such as creating artificial ponds, clearing vegetation and building access roads may suggest that illegal mining is taking place in that location.

DEA uses data from the European Space Agency satellites: Sentinel-1, a polar-orbiting, all-weather, day-and-night radar imaging mission for land and ocean services; and Sentinel-2, a polar-orbiting, multispectral high-resolution imaging mission for land monitoring that provides imagery of vegetation, soil and water cover, inland waterways and coastal areas. This data is analysed to pinpoint illegal mining sites, estimate their size, and even allows the user to go back in time to find out when the illegal activity started (using data from the Landsat satellite series, which dates back to the 1980s).

DEA works primarily through partnerships across a range of sectors, including government, private, NGO, academia and research. Training and capacity development is a key part of expanding the use of DEA data across the continent. In 2022, the DEA team participated in over 40 in-person training and awareness events and workshops across 12 countries in Africa, reaching more than 400 people from over 55 institutions. They also have an online, bilingual learning platform.

Ghana’s government has partnered with DEA to identify illegal mining activities

Ghana’s government has partnered with DEA to identify illegal mining activities outside of mining concessions. Analysis based on Sentinel-1 and Sentinel-2 data is helping to create annual composite maps of illicit mining area footprints. The provision of such localised, real-time data on illegal mining activities can help make the deployment of limited resources more cost-efficient and effective.
These maps are being used to monitor degraded mining sites, as well as to plan interventions and land restoration activities.\textsuperscript{74}

**Discussion: challenges and opportunities**

Despite its current uses and enormous potential for good, there are a range of challenges facing the adoption of AI tools to address environmental crime in Africa. Some of these challenges create their own opportunities, while others may limit the use of AI on the continent.

**Data**

AI depends on large groups of relevant, appropriate and high-quality data. Because Africa lacks both big data sets and structured data ecosystems, one of the challenges is ensuring that AI systems developed for and implemented in Africa are ‘trained on data that accurately reflects the local population and addresses the unique challenges faced by the continent.’\textsuperscript{75}

Other data-related challenges, especially for law enforcement agencies wanting to use AI to tackle crime, include the high costs of gathering and accessing data, storing the vast troves of data needed to develop AI, and making sure that sensitive data is secure. Another challenge is that large amounts of data in policing
Harnessing AI to address organised environmental crime in Africa

(such as search and seizure records or evidence of trafficking routes) may not constitute large enough data sets for AI purposes – this is why data sets need to be built up over time.

While governments and organisations in Africa need to become more proactive about gathering large, local data sets, the expansion of AI across the continent will in itself generate more local data. Organisations like DEA are already paving the way for making generalised data more relevant to African purposes and more accessible.

Connectivity and infrastructure

Environmental crimes generally occur in remote, often ungoverned spaces. The lack of physical and technical infrastructure, as well as connectivity, can pose a challenge for using technology to address these crimes. Issues that need to be considered include getting the equipment into (and out of) situ in remote areas with rugged terrain, and keeping the equipment charged and maintained. Also, whether any cell phone networks cover the area and are strong enough to transmit the data, what satellites can be accessed, and how realistic it will be to send in a rapid response team.

While AI can actually help with this by processing big data sets locally in the field, a reliable form of connectivity is still necessary. For example, Dilkina and Davies explain that terabytes of data cannot be transferred from somewhere remote. But AI in the field can infer that of the 20 000 images taken by trail cameras, 150 are of pangolins and only this valuable data is sent to the cloud for processing. Davies told ENACT that understanding the local environment in which the AI would work was key, ‘otherwise, solutions will be developed and introduced expecting the environment to exist when, in reality, it doesn’t.’

Data sharing versus privacy

With AI tools developed for the common good, there is a real tension between data sharing and data privacy.

Operation Pangolin has tried to navigate this tension by establishing protocols to regulate both data sharing and data privacy. The methodology and technology for both the sensors and AI in Operation Pangolin are open source. The intention is that the collection of data on pangolins will be used for good and will help conserve the species. Opening up access to this valuable scientific data means that academic, scientific, conservation and local communities can use it to understand the species better. Dilkina and Davies stress that, ‘Some information has more value being shared with the community.’

However, the team also know that they will be working with sensitive data once the project is established. The tool will not be used to make predictions about people, but it will contain valuable information on the location of pangolins and the routes, markets and hotspots of pangolin trafficking.

While this is positive for science and conservation, Dilkina and Davies explain that the data always has to be seen through the lens of whether and in what ways it can be used negatively and with adverse effects. As such, they will institute carefully considered guardrails on how to share the data, who to share it with and how to make it accessible in the right way. As an AI expert, Dilkina says she is ‘acutely aware of how things can go wrong if the people that develop these models are not applying best practices or paying a lot of attention to possible errors.’

Capacity

While the AI developers creating solutions to environmental crimes are constantly striving to ensure that the technology is easy to use and requires minimum training, capacity building and retaining skills can still be challenges to consider. Many law enforcement agencies in Africa require only a school-leaving certificate and basic training to join, which means that very specific capacity building is needed to effectively use AI tools for enforcement.

Schmitt notes that, in his experience of rolling out Skylight, there is a high rotation of staff through different roles in law enforcement. This makes it difficult to retain staff who are trained and competent on the system.
However, one area of improvement that developers are working on is lowering the burden on human analysts. For Schmitt, the goal is to have ‘an expert in a box’ – while the analysts need to know what questions to ask, the system will be able to provide instant answers. This will lower the capacity bar, both in terms of the amount of training and experience that analysts need to operate the technology. This will help to mitigate against high staff turnover in law enforcement, as well as bridge the skills gap.

Ownership

The ownership of the data, equipment and tools also needs to be taken into consideration. Although most developers have local implementing partners on the ground, careful thought needs to go into the sustainability of the project. Where do the capacity, resources, leadership and interest/passion reside?

For Operation Pangolin, it is a question of whether ownership lies with their partnering NGOs, the local communities that the NGO supports or law enforcement – who is invested enough in the project and the outcomes to ensure sustainability? Davies explains that this is why the Operation Pangolin team is interdisciplinary, with experts in technology, AI, conservation, biology, criminology and the social sciences. In this way, the team can bridge the gap between science, social-ecological systems, policy and law enforcement.

Understanding these groups and systems can help them engage with and get the buy-in of local communities and NGOs with the vision of creating sustainable solutions that continue to work for communities beyond the life and funding of the project. Dilkina says in their case the goal ‘is not to develop and give people a trained model. It’s more like – here is a technique and you need to put your own data in it and fit the model to your place and your situation.’

Criminal elements

Schmitt makes the point that ‘technology is agnostic … it can be used for bad; it can be used for good; and it can be used across a lot of different use cases.’ Unfortunately, as with any new technology that has been developed as a force for good, AI and AI tools can be manipulated and used for illegal activities by criminals.

Corrupt officials, or those involved in the environmental crime being committed, may put pressure on those working with the technology not to act on or respond to the information provided, or to destroy the data/evidence gathered by the technology. Corrupt officials or civilians with access to the technology may also ‘feed’ or sell the data to criminals. This could provide them with real-time information of where, for instance, to target the wildlife in the national park, or which areas to stay away from to avoid detection. Criminal actors may figure out the algorithms and technologies and either use it to their own advantage in finding the wildlife, or to avoid detection.

Dinerstein explains that TrailGuard tries to diminish the threat of criminal actors by carefully screening partner organisations and monitoring the data in their ecosystem (they can shut down the servers if they identify that images are being misused). Data is also encrypted and, typically, few park staff (usually two or three) are aware that the system has been installed and in which locations. TrailGuard AI is also simple to set up and take down, so that units can be shifted in response to seasonal or frequent movements of poaching gangs based on new intel.

There is also a risk that law enforcement agencies could use legitimate AI tools for unauthorised civilian surveillance, acting as a tool for repression and profiling and posing a real threat to privacy rights.

Skylight deliberately does not track personal identifying information. It provides an analysis on vessel movements, highlighting potentially anomalous activity for both government and NGOs to act on.
Because the ultimate action is in the hands of the local authorities where the activity is happening, it is crucial that the technology is in the hands of the proper authorities and that they have the capacity to use that technology.

For these reasons, it is crucial that extensive vetting processes and due diligence are conducted by implementing partners to mitigate the threat of misuse by executing agencies.

Complexities

There are many complexities involved in addressing environmental crime. These include the laws that govern the different crimes, the overlapping and sometimes competing jurisdictions, and the dissonance in priorities between the different role players in the environmental crime space.

This not only makes it difficult to fine-tune the machine learning for the AI tool to work optimally but may impact the usefulness of the data as legal evidence. Drones are only regulated by aviation legislation in most countries, including many in Africa. This raises a question about whether purpose-specific legislation should be introduced in countries where drones will be used to police environmental crimes. Such legislation would also need to define in which circumstances police can use drones, regulate privacy and data protection, determine whether warrants are justified and establish the admissibility of drone-collected evidence in court. When it comes to monitoring and regulating IUU, Schmitt says while fisheries agencies are concerned with extracting as many fish as they possibly can (with a focus on revenue and tax generation), law enforcement agencies have to prioritise which crimes to focus on, and parks services or environment ministries focus on ecosystem health and wildlife conservation. While all these sectors are vital to the health of the oceans, competing priorities can make the vision of a single AI tool to address illegal fishing difficult to realise.

But layers of complexity can be added to what AI tools are capable of processing. For Operation Pangolin, this means a tool that pieces together all the data on pangolin locations (national parks, trafficking routes and national, regional and international markets), but also layers on top of that the law enforcement activities that are happening across these locations. For Skylight, it would mean embedding the laws applicable to that EEZ or maritime area within their current platform. Analysts could then immediately determine if the type of fishing they see happening is allowed in that area or at that time of year.

Layers of complexity are precisely what can be added to what AI tools are capable of processing

Regulation

As crucial debates and policy conversations on AI are being held worldwide, Davies makes the point that ‘it makes sense for governments in Africa to be at the table now as opposed to saying, “We’ll just let them figure it out and later on we’ll adapt it to ourselves.” Because they will obviously provide a very different perspective. It’s very important to have a voice – even if they’re not currently using AI but they anticipate they will eventually come to use it.’

In a positive step, the African Union (AU) has published a white paper on regulation and responsible adoption of AI in Africa towards achievement of AU Agenda 2063, and an AI roadmap for Africa. The white paper encourages African countries to:

- develop AI policies, regulations, and ethical frameworks that promote data privacy, security, transparency, and accountability. Robust data protection laws could be established, and public awareness and participation in AI policymaking promoted.
The roadmap sets out six strategic pillars:

1. Human capital development for AI, such as education, skills and work
2. Infrastructure and data needs for solid foundations and use in AI systems
3. Enabling regulation, policy and governance environments for AI development and deployment
4. Economic investments in AI and AI commercialisation
5. Building sustainable partnerships through ecosystems and networking
6. Building monitoring and evaluation capacity for AI strategies in Africa

While the Government AI Readiness Index 2023 ranks Sub-Saharan Africa as the least prepared region in the world, ‘signifying serious challenges to government AI adoption’, it does reflect that the region made considerable progress over the past year. Three countries (Rwanda, Senegal and Benin) adopted new national AI strategies. Three (Côte d’Ivoire, Namibia and Rwanda) are working towards adopting strategies in line with the UN Educational, Scientific and Cultural Organization’s ‘Recommendations on the Ethics of AI’. Ethiopia and Nigeria have announced that they are drafting AI strategies.

These developments are particularly important at this relatively early stage of AI use in Africa, given how geopolitical competition in AI may leave African states vulnerable to the power plays of countries at the cutting edge of AI technology. It is hoped that the AU’s roadmap and forthcoming strategy will provide important guidance and a blueprint for individual African countries to follow in drafting their own national AI strategies.

Potential

Despite these issues, AI is here to stay, and advances in AI technology will be rapid in the coming five years. Already working to address organised environmental crime in Africa, AI tools have the potential to impact a range of organised crimes that occur in inaccessible and under- or ungoverned areas in Africa.

With their low power usage and innovative AI, TrailGuard AI’s cameras are built for remote areas and could be adapted to track crimes that use obscure trails in isolated areas, including drugs, arms and human trafficking, illegal logging and mining, and goods smuggling. They could also be used in areas where insurgents and militia groups cross borders to occupy national parks, poach wildlife and kill rangers, such as Virunga National Park in the Democratic Republic of the Congo. Dinerstein told ENACT that while TrailGuard AI was not shying away from expanding to include these crimes, there were legal and ethical complexities that needed to be worked through to allow evaluation of each application.
Similarly, the AI-powered drone technology used in FishGuard, or satellite technology used by DEA, could be adapted to identify other forms of organised crime. These could include illegally extracted natural resources (including minerals and timber), human or drug trafficking, illegal land use and cross-border smuggling. DEA estimates that if Earth observation data could be used to reduce illegal mining by detecting mining sites and reducing the illicit trade in minerals by 5%, and ARD makes up 50% of that, US$375 million a year could potentially be saved using ARD powered by AI. For illegal logging, this number is US$195 million a year.

**Chart 3: Costs saved by using ARD to detect illegal mining and illegal logging**

**Mining – Illegal mining/illicit mineral trade**

- Africa’s loss through illicit mineral trade: according to African Development Bank, $15 billion are lost through illicit mineral trading.
- For mitigation of illicit mineral trade a 5% EO impact was modelled based on recommendation from experts: $15 billion x 5% = $750 million.
- Potential ARD benefit (part of EO benefit) = 50%. The availability of free satellite data over the entire continent of Africa over many years up to the present, makes ARD an immeasurable source of data to uncover illicit practices in the mining sector: $750 million x 50% = $375 million.
- Total ARD benefit = $375 million per year.

**Forestry – Illegal logging**

- Estimated value of illicit logging in Africa per year and illicit trade in Africa’s forest is approximately $13 billion.
- Potential reduction of illicit logging through EO: example from Amazonia shows that illegal logging can be reduced by up to 60% with use of EO and law enforcement. We calculate conservatively with 30%: $13 billion x 30% = $3.9 billion.
- Potential ARD benefit: EO contribution 10% (other contributions 90% e.g. from law enforcement), of which 50% benefit is from ARD: $3.9 billion x 50% = $1.95 billion.
- Total ARD benefit = $195 million per year.

Source: DEA, Analysis ready data: A smart way to use Earth observation for Africa’s rising nations

Apart from expanding into other forms of organised crime, AI tools are also poised to become more sophisticated and perform more complex tasks.

**Key conditions for AI policing of environmental crime to thrive in Africa**

Given all the issues outlined above, what key conditions are necessary to enable the gains from AI to be realised in the policing of environmental crime in Africa?

- **Data:**
  - It is crucial for governments and organisations across Africa to become more proactive about gathering large, local data sets that will allow AI models to produce appropriate and relevant solutions. This will also entail establishing, capacitating and making accessible local data centres to store and curate the data.
• At the same time, digital and communication infrastructure needs to be invested in to vastly improve and expand access and affordability. This will be a long-term and costly exercise but is fundamental to creating a comprehensive AI architecture for Africa.

• Human capacity and skills:
  • Generating human capacity and skills for AI development and implementation begins with a solid foundation in science, technology, engineering and maths at schools. While this is easier said than done when many state schools lack the most basic of educational supplies, it is a prerequisite for keeping pace with the rest of the world.
  • For law enforcement specifically, police forces across Africa will need to include technology and AI skills capacity building into their basic cadet training and have it as an ongoing exercise. This is to ensure that staff rotations do not affect the efficacy of AI-powered police interventions.

• Regulation:
  • Because AI is driven by data, guardrails are imperative to protect that data and ensure privacy where necessary. It is highly likely that the data the police use for law enforcement will be sensitive and confidential, which makes the development and implementation of safeguarding frameworks even more important.
  • While the forthcoming AU strategy is a step in the right direction, national governments must take the initiative to draft and enact legislation on AI to ensure its use is regulated. The challenge here is to draft legislation that allows for policies to be dynamic and flexible enough to keep pace with the ever-changing nature and advancement of the technology.

• Role of the private and public sectors:
  • While the much slower legislative and public policy debates and processes around AI play out, collaborative models of public-private partnerships can provide a more immediate pathway for action. These partnerships provide a practical way for law enforcement agencies across Africa to receive the technology and training they need to effectively embed AI tools into their methodologies for combatting environmental (and other forms of) organised crime. They bring with them numerous benefits, including technical expertise, resources, equipment, information sharing, help ensuring the sustainability of interventions, and even shared responsibility for the efficacy of the intervention.
  • Local stakeholders and civil society can provide an important contributory and oversight function during the development of AI legislation and regulation, especially where it relates to policing. Encouraging the participation of a broad set of actors ‘will help open realizable pathways for enhanced data stewardship and oversight of AI systems – dual priorities amid the rise of emerging technologies within Africa.’

Conclusion

It remains to be seen whether these AI-powered interventions are isolated cases or if AI really does offer the prospect of achieving systemic change in the way law enforcement combats environmental organised crime across Africa. However, AI does have the potential to generate very powerful crime-fighting tools. These lower the cost and level of capacity required to police remote environmental crimes, at the same time increasing the scale and speed with which law enforcement can respond to crimes happening in real time.

By increasing the amount of data gathered and processed and lowering the capacity required to analyse that data, AI frees up police time and resources to take effective action. ‘And, if you just put the right safeguards around AI tools, which I think is entirely possible, they can be game changers,’ says Schmitt. Law enforcement agencies across Africa have the opportunity to leverage and benefit from partnerships with technology developers, NGOs and international organisations to introduce or scale existing AI technology as a force multiplier in the fight against environmental organised crime.

As the technology rapidly advances globally, Africa needs to develop the appropriate data infrastructure and accessibility, and invest in human capacity, to realise the potential of AI across the continent. At the same time, guardrails and regulations need to keep pace with the implementation of the technology to ensure the ethical and responsible use of AI in Africa.
Appendix A

RESOLVE

RESOLVE is a non-partisan, non-governmental organisation that works across sectors to design and build solutions to environmental, social and health challenges. The team includes mediators, policy experts, strategists, scientists and facilitators. Its project work is related to healthy communities, conservation and sustainable resources.

TrailGuard AI is a system developed by Steve Gulick (a conservation technologist), Intel and RESOLVE’s Biodiversity and Wildlife Solutions (BWS) programme. BWS tackles pressing conservation problems, including the approaching extinction of endangered wildlife and threats to habitats, through the design and scaling of innovative technology, global agreements and targeted land protection.

For more information, visit: www.resolve.ngo/

Operation Pangolin

Operation Pangolin is a multidisciplinary, multi-institutional and multimillion-dollar global initiative operating throughout Africa and Asia over the next six years. Partner organisations include Florida International University; the University of Oxford; University of Southern California; University of Maryland; Arribada Institute; Agence Nationale des Parcs Nationaux; Zoological Society of London; and International Union for Conservation of Nature Species Survival Commission Pangolin Specialist Group.

The team includes interdisciplinary conservation scientists, technologists, AI experts, social scientists, conservation biologists, pangolin experts and community facilitators.

The project aims to synthesise information from wildlife crime, population monitoring and socio-ecological systems through AI analytical pipelines to support sustainable, socially legitimate and locally led conservation interventions; evidence-informed international policy implementation; and predictive tools for addressing wildlife crime.

For more information, visit: https://gfjc.fiu.edu/operation-pangolin/index.html

Allen Institute for AI

Founded in 2014, the Allen Institute for AI (AI2) is a non-profit research institute with the mission of conducting high-impact AI research and engineering in service of the common good.

AI2 takes a results-oriented approach to complex challenges in AI across the areas of natural language processing, computer vision, AI for the environment, and experimentation and communication.

Skylight is one of several zero-revenue projects developed under the AI for the environment umbrella at AI2. Skylight’s mission is to bridge the data gap in marine conservation by leveraging AI and big data to provide free, operationally relevant and high-quality insights for under-resourced states and marine protected areas.

For more information, visit: www.skylight.global/

ATLAN Space

ATLAN Space partnered with GRID-Arendal and Trygg Mat Tracking to develop FishGuard.

ATLAN Space is a Moroccan technology start-up that develops AI to guide autonomous drones. Trygg Mat Tracking is a Norwegian non-profit organisation that provides national fishery authorities and international organisations with fisheries intelligence, analysis and capacity building, targeting a reduction in illegal fishing and broader improvements in ocean governance.

GRID-Arendal is a non-profit communication centre that transforms environmental data into science-based information products and provides capacity-building services that enable better environmental
governance. They have programmes on Polar and Climate, Marine Environment, Waste and Marine Litter, and Transboundary Governance & Environmental Crime.

For more information, visit: https://atranspace.com/; www.tm-tracking.org/; and www.grida.no/

**Digital Earth Africa**

Based in Pretoria, South Africa, Digital Earth Africa (DEA) translates Earth observations into insights that will support sustainable development. DEA is funded by the US-based Leona M. and Harry B. Helmsley Charitable Trust as well as the Australian government. The Australian government also provides technical and operational expertise from Digital Earth Australia.

For more information, visit: www.digitalearthafrica.org/

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**Notes**


7. The estimate is based on real examples: "A detective constable redacted a phone download of 578 pages for her colleague in 20 minutes, which would previously have taken a couple of days; an officer redacted an 806-page document in approximately an hour; and a field intelligence officer redacted 350,000 cells in an Excel spreadsheet in 30 minutes, something that would have previously taken four hours." See: P Jacques, AI saving thousands of hours of officers' time, https://policeprofessional.com/news/ai-saving-thousands-of-hours-of-officers-time/, January 2024.


13. Ibid.

14. The term ‘use case’ is used to describe all the possible steps a user may perform to interact with the system. It is a list of actions or event steps typically defining the interactions between an actor and system to achieve a goal. See: www.browserstack.com/guide/use-case-vs-test-case.


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2019. Ecosystem services are the many varied direct and indirect benefits to humans provided by the natural environment and healthy ecosystems.


25 U Rashid Sumaila. Africa’s Blue Economy can continue to deliver huge benefits to the continent. www.bookings.edu/articles/africas-blue-economy-can-continue-to-deliver-huge-benefits-to-the-continent/


27 Un- or under-governed spaces refer to both physical territory and non-physical space in which effective state sovereignty and control is either absent or only partial (e.g. the judiciary). Or where formal state institutions and rule of law serve little or no function. See: Foreign & Commonwealth Office, The link between ‘ungoverned spaces’ and terrorism: myth or reality?. https://assets.publishing.service.gov.uk/media/5a8066caed915d74e622e3ea/FINAL_Ungoverned_spaces.pdf. 2014.


37 K Bolt et al. explain that: “Biodiversity plays a fundamental role in ecosystem functioning and therefore underpins the delivery of all ecosystem benefits … Biodiversity provides nature’s insurance, helping adapt to shocks and stresses, such as climatic change and disease. An assessment that only considers the flow of benefits provided today will overlook the likelihood of benefits being supported into the future, and therefore these values are also missing.” K Bolt et al. Biodiversity at the heart of accounting for natural capital: the key to credibility. p. 2, 10. https://naturalcapitalcoalition.org/wp-content/uploads/2016/07/CCI-Natural-Capital-Paper-July-2016-low-res.pdf. 2016.


40 RESOLVE is a non-governmental organisation that engages multidisciplinary expertise to design solutions to global challenges. Interview with Eric Dinerstein on 4 December 2023.


42 Interview with Eric Dinerstein on 4 December 2023.


45 Nightjar LLC (Nightjar) is a limited liability social benefit company organised and funded to achieve the social and environmental objectives of developing durable, long-lasting, high-technology devices to facilitate protection and monitoring of endangered species, reduce human-wildlife conflict, and to stop wildlife poaching and illegal logging. See: https://www.nightjar.tech/blank-1.

46 Interview with Eric Dinerstein on 4 December 2023.


49 Interview with Bistra Dilkina and Alasdair Davies on 30 November 2023.

50 Ibid.


About the author

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About ENACT

ENACT builds knowledge and skills to enhance Africa’s response to transnational organised crime. ENACT analyses how organised crime affects stability, governance, the rule of law and development in Africa, and works to mitigate its impact. ENACT is implemented by the ISS in partnership with INTERPOL and the Global Initiative Against Transnational Organized Crime.

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