GLOBAL INFORMATION SOCIETY WATCH 2020

Technology, the environment and a sustainable world: Responses from the global South

Association for Progressive Communications (APC)
and Swedish International Development Cooperation Agency (Sida)

Global Information Society Watch 2020
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APC would like to thank the Swedish International Development Cooperation Agency (Sida) for their support for Global Information Society Watch 2020.

Published by APC
2021

Global Information Society Watch 2020 – web and e-book
ISBN 978-92-95113-40-4
APC-202104-CIPP-R-EN-DIGITAL-330

UGANDA

CATCHING THE POACHERS: AI IN WILDLIFE CONSERVATION

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Introduction

The COVID-19 pandemic has been a wakeup call for modern society. With most scientists believing it was caused by zoonotic transfer resulting from a mix of contemporary farming methods, the exploitation of species through the illegal wildlife trade (with transmission possible through a pangolin) and the conditions at overcrowded and unsanitary "wet" markets, it can appear a symptom of an imbalance between contemporary behaviour and a more organic way of living.[1] This has only been compounded by the way that social media has been used to spread misinformation about the virus, leading to the risk that technology becomes perceived as part of the problem rather than part of the solution to the issue of sustainability.[2]

This report, however, will highlight one way that a sophisticated technological advance, specifically artificial intelligence (AI), is being harnessed to defend nature. Using the east African state of Uganda as an example, it will show how – in order to protect wildlife from those who wish to exploit it for profit – cutting-edge contemporary solutions have been adopted to address the poaching crisis, and thereby also protect key landscapes and enable the development of sustainable economic models for local communities. Although there is still much work to be done to harness the full potential benefits, this is an important example of how the latest technological innovations can defend our relationship with nature, not undermine it.

The illegal wildlife trade

The highly sophisticated illegal trade in wildlife and wildlife products endangers species around the globe. It is the fourth most profitable transnational crime after the drug trade, arms dealing and human trafficking, being worth between USD 7 billion and USD 23 billion a year.[3] It is often run by well-organised criminal networks that seek to exploit the high rewards and low risks of the trade. It undermines environmental efforts, fuels corruption, threatens the rule of law, and hurts communities dependent on wildlife tourism.[4]

The demand for wildlife products is often fuelled by their perceived medicinal value or the social status associated with them. At other times it is driven by the desire to possess exotic pets or own rare plants and animals. At the local level, poaching is also the result of poverty, corruption and political instability. In all cases, the illegal poaching, trade and consumption of wildlife is one of the most destructive and destabilising conservation threats.[5]

Its impact on global populations of elephants and rhinos has received international attention, but other mammals are under equally severe pressure. This includes cats – such as lions, tigers and snow leopards – and primates, including the great apes. Many species of reptiles, birds, amphibians, fish and invertebrates also require urgent action to protect them.[6] The pangolin, the scaly-skinned mammal sought for its meat and scales and which was possibly a zoonotic conduit for COVID-19, is believed the world's most illegally trafficked mammal of all, with poachers killing an estimated one million African pangolins over the last decade for meat, a delicacy in parts of Asia, and keratin scales, an ingredient in traditional Chinese medicine.[7]

Uganda is one of the nations whose wildlife has been particularly impacted. In the 1960s the country had more mega-herbivores such as elephants and hippos per square kilometre than any other African country. By the 1980s its elephant population alone had been reduced to around 700 to 800, although conservation efforts since have seen

1 UK Research and Innovation. (2020, 14 April). Where did the new coronavirus come from? https://coronavirusexplained.ukri.org/en/article/cad0006

2 EBRD. (2020, 15 June). Is technology in the era of Covid-19 a threat to democracy? https://www.ebrd.com/news/2020/is-technology-in-the-era-of-covid19-a-threat-to-democracy.html

3 https://www.thegef.org/topics/illegal-wildlife-trade

4 https://www.worldwildlife.org/threats/illegal-wildlife-trade

5 USAID. (2017). *What Drives Demand For Wildlife?* https://www.usaidwildlifeasia.org/resources/reports/inbox/what-drives-demand-for-wildlife

6 Cookson, C. (2019, 3 October). Global wildlife trade a key factor in species decline. *Financial Times*. https://www.ft.com/content/f2f48da6-e513-11e9-b112-9624ec9edc59

7 https://www.traffic.org/what-we-do/species/pangolins

its number rise to around 5,000.[8] Uganda is also a major transit route for illegal wildlife and illegal wildlife products, much of it being smuggled from the Democratic Republic of Congo. This has resulted in the rise of crime syndicates focused on the trade, particularly in ivory and pangolins.[9]

This matters not only for conservation reasons but for social and economic ones too. Until the present impact on the tourism sector caused by COVID-19, the number of tourists to Africa was expected to increase from 62 million in 2016 to 134 million people in 2030.[10] Four out of every five tourists who come do so for a wildlife experience.[11] Even post-COVID, a large increase is still predicted, not least as people are expected to now be looking for a more nature-based holiday experience.[12] In response, Uganda has been working actively to develop its wildlife tourism product, and the local communities around its national parks can potentially benefit economically from having a thriving wildlife tourism sector, in the context of often traditionally poorly paid employment opportunities in these areas.[13] Therefore, the threat to the country's wildlife poses a threat to the development aims of the country and of these communities too.

Tackling the poachers

One of the greatest challenges facing conservationists is that the poachers often appear to be one step ahead of their efforts, a result of the natural dispersal of species populations and the limited number of wildlife rangers that existing budgetary constraints enable to be employed. Technology is one solution to fill this gap, and Uganda has pioneered two of the most innovative and important such solutions: SMART and PAWS. Both have proved successful in giving rangers an advantage over poachers, and the trials in Uganda resulted in both solutions being adopted in other countries facing similar challenges.

SMART

SMART stands for the Spatial Monitoring and Reporting Tool and is an open-source solution.[14] It is an accessible and powerful software to manage law enforcement data. It works through rangers in the field collecting data during their daily patrols so that it can then be computer analysed to provide understanding of poaching trends and hotspots. The data gathered is extensive, including elements such as the locations of animals, evidence of animal poaching such as the placement of snares, and any arrests for illegal activities. It is logged by the rangers using a hand-held device, or when not enough such devices are available, by recording the data via paper and pen for inclusion once back at base.

The data is then fed into a central computer that can then be asked specific questions such as: Where did my rangers go? How many foot patrols resulted in poacher arrests? Or where were carcasses recorded? The information is converted into visually informative maps, charts and reports – for example, to show locations of carcass sightings and trends in their detection rate. These are then corrected for any unintentional biases caused by the number of times a specific area is patrolled. An area visited the most will likely result in a greater concentration of data, for example, but that does not mean it is necessarily the most likely poached hotspot. Similarly, an area visited sparingly will likely produce little data, but nevertheless may be an area where poaching is actually on the rise. This correction therefore enables the identification of unusual trends and warnings of isolated but significant activity. The result is that conservation managers can more effectively record data and analyse the impact of patrols retrospectively.[15]

The system was developed by an international partnership of conservation organisations. This was comprised of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Monitoring the Illegal Killing of Elephants (MIKE) programme, the Frankfurt Zoological Society, Global Wildlife Conservation, North Carolina Zoo, Panthera, Peace Parks Foundation, the Wildlife Conservation Society, the World Wildlife Fund and the Zoological Society of London.[16]

8 Pandey, A. (2015, 18 August). Ugandan elephants' long march to recovery. *DW*. https://www.dw.com/en/ugandan-elephants-long-march-to-recovery/a-18655456

9 Rossi, A. (2018). *Uganda Wildlife Trafficking Assessment*. TRAFFIC. https://www.traffic.org/publications/reports/uganda-wildlife-trafficking-assessment

10 Signé, L. (2018). *Africa's tourism potential: Trends, drivers, opportunities, and strategies*. Brookings Institution. https://www.brookings.edu/wp-content/uploads/2018/12/Africas-tourism-potential_LandrySigne1.pdf

11 Space for Giants. (2019). *Building A Wildlife Economy*. https://spaceforgiantstest.squarespace.com/s/Building-Africas-Wildlife-Economy-Space-for-Giants-Working-Paper-1.pdf

12 Derrick, F. (2020, 10 July). Wellness travel: Why it could be the post-coronavirus stress-buster you need. *Skyscanner*. https://www.skyscanner.net/news/wellness-travel-coronavirus-stress-buster

13 Ledger, E. (2017, 5 October). How tourism can safeguard African wildlife. *The Independent*. https://www.independent.co.uk/voices/campaigns/GiantsClub/Uganda/how-tourism-can-safeguard-african-wildlife-a7985141.html

14 Huger, J. (20 June 2013). Open source spatial monitoring gets SMART for conservation. *Opensource.com*. https://opensource.com/life/13/6/SMART

15 https://smartconservationtools.org

16 https://www.zsl.org/conservation/how-we-work/conservation-technology/implementing-the-smart-approach

The original trial for the system was Queen Elizabeth National Park in Uganda, one of the country's most important protected areas for elephant conservation, but also an area that had particularly suffered from poaching.[17] It was the accumulation of data there that made its impact so meaningful. Once implemented, over a 12-year period the detection of illegal activity such as wildlife poaching and cattle encroachment increased by as much as 250% despite no increase in the number of rangers deployed.[18] Indeed, its success was so great that the Uganda Wildlife Authority extended its use across its protected area network.

The Uganda trial also resulted in it being implemented at a further 147 sites around the globe. The protected area and wildlife agencies of seven countries have now committed to following Uganda and implementing it across their protected area networks. These are Belize, Bhutan, Colombia, Gabon, Madagascar, Peru and Thailand.[19] In all these locations, they also found that it enabled conservation managers to more effectively coordinate their protection efforts.

PAWS

PAWS stands for Protection Assistant for Wildlife Security and is a game theory-based protection assistant.[20] The successful implementation of SMART in Uganda enabled it to be the first country in which – following research beginning in 2013 – PAWS was trialled in 2014 and then again in 2016.[21] The SMART programme meant there was already an accumulation of data for this new, AI-driven approach, which was developed by applied science academies at institutions including Harvard and the University of Southern California.

Game theory is the study of strategic decision making. It has proved particularly informative in the struggle against poaching as, in that game, there are two players with dramatically conflicting objectives and both act logically in their own interests. For example, if the rangers take the same patrol routes every day, then the poachers will succeed by simply moving elsewhere. Therefore, it is in the rangers' interest to behave randomly, but they do not want to behave totally randomly, as otherwise they might not go to where the poachers are likely to be. Ideally, in deciding routes, the rangers want to deter poachers from going to places with lots of animals by patrolling them regularly. Also, the poachers would ideally be deterred from poaching in areas where there are fewer animals, because not only do they know the chance of catching an animal there is low, but also that there is a chance of a surprise patrol. It is by factoring in all these variables (including factors such as terrain and the weather) that PAWS has helped determine the optimum daily routes that the available pool of rangers should patrol.

SMART enables the impact of patrols to be more effectively assessed, but it does not help create patrol routes or identify targets to protect. It is still a human – the patrol manager – who does this, and humans find it hard to generate credible schedules that are also unpredictable. We are instinctively drawn to pre-existing patterns. PAWS, however, builds on SMART and provides an automated approach that has resulted in much more efficient and randomised patrolling routes.

The trial at Queen Elizabeth National Park found that the PAWS-assisted patrols outperformed traditional patrols in both human activities and animals seen per kilometre surveyed.[22] As a result of PAWS, for example, the implementation team identified a poaching hotspot that rangers had not previously patrolled. On arriving in the area, they discovered an elephant that had its tusks cut off as well as a snare hidden nearby. During subsequent tests a further 10 antelope snares were discovered before any animals were injured or killed.[23] In fact, so successful was the pilot that its use was extended to a second Ugandan National Park – Murchison Falls – in 2017 before being extended to a park in Cambodia in 2019. Now, following support for the project from Microsoft AI, an improved version building on what was learned from the Ugandan and Cambodian trials is planned to be launched in a further 10 to 20 parks.[24] Increasingly, AI will be helping globally in ensuring that wildlife rangers can get the upper hand on the poachers preying on our planet's endangered wildlife.

17 University of York. (2016, 17 August). Poaching patrol: new ranger methods decrease illegal activities. https://www.york.ac.uk/biology/news-events/news/2016/poachingpatrolnewrangermethodsdecreaseillegalactivities

18 Harfenist, E. (2016, 20 August). New Tech Increases Detection Of Illegal Acts In Protected Areas. *Vocativ*. https://www.vocativ.com/352526/new-tech-increases-detection-of-illegal-acts-in-protected-areas/index.html

19 Montefiore, A. (2016, 15 March). The Spatial Monitoring and Reporting Tool (SMART). *WILDLABS*. https://www.wildlabs.net/resources/case-studies/spatial-monitoring-and-reporting-tool-smart

20 https://sc.cs.cmu.edu/research-detail/102-protection-assistant-for-wildlife-security

21 Ibid.; Zewe, A. (2019, 11 October). Artificial intelligence helps rangers protect endangered wildlife. *Phys.org*. https://phys.org/news/2019-10-artificial-intelligence-rangers-endangered-wildlife.html

22 Synced. (2019, 19 October). AI In Wildlife Conservation. *Synced*. https://syncedreview.com/2019/10/19/ai-in-wildlife-conservation

23 Zewe, A. (2019, 11 October). Op. cit.

24 Ibid.

Conclusion

The SMART and PAWS approach taken in Uganda provides an example of a concrete response to the current environmental crisis and provides a solution that has impacted poaching in the country. It therefore is a clear and measurable example of technology delivering positive change.

However, this report is being published at a unique time as a result of the COVID-19 pandemic. With the eyes of the world focused elsewhere, those who prey on endangered wildlife have exploited the disruption caused by the virus. Endangered animals are under threat as the limitations imposed on movement hamper wildlife rangers and conservationists, and the sudden collapse in funding caused by the economic consequences of the pandemic puts at risk the future of protection programmes.[25] With tourism having also collapsed, revenues that funded wildlife protection have disappeared and poachers have been encouraged by the absence of visitors.[26] Local communities, facing poverty, are on occasion resorting to killing wild animals to survive.[27]

In July 2020, the head of the Uganda Wildlife Authority, Sam Mwandha, warned that criminal networks involved in the illegal trade of wildlife were exploiting the COVID-19 situation to increase poaching. The same time that he spoke, Uganda announced an elephant had been killed by a snare in Murchison Falls National Park by poachers wanting its ivory. During March to April, 822 snares laid by poachers to trap wildlife were found in Uganda's Bwindi Park, compared to just 21 in the same period the previous year – a rise of 3,814%. Mwandha told the media that in the era of COVID-19, "[f]unds are needed to address poaching, encroachment and illegal wildlife trade."[28]

The challenge that national parks like those in Uganda face is therefore now likely going to be greater. Part of the solution to that will be securing funding to assist the work of the country's wildlife authority and conservation NGOs operating there, so that rangers can continue to do their work. But part will also be utilising the innovative spirit that produced SMART and PAWS to develop new solutions. We urgently need to keep innovating to create new partnerships with industry, government and academia to develop further technological answers. Technology partnerships have the potential to be transformative in the area of wildlife conservation, enabling conservationists to target resources more efficiently and more effectively and to scale impact. In 2020 such an approach is needed more than ever before.

Action steps

The following steps are necessary in Uganda:

- NGOs in Uganda need to reach out to tech companies to secure further technological innovations in this space. One way would be to stage a one-day digital conference for conservationists and representatives of such firms to interact and discuss.
- Civil society organisations in Uganda need to urgently assess the humanitarian needs of local communities near protected areas and create an updated computer database of where food is absent to identify urgent need and limit the extent to which people turn to bushmeat hunting through necessity.
- NGOs need to lobby Western governments so that they are aware of the impact that the COVID-19 pandemic and its consequences for tourism are having on local communities, and to secure interventions for long-term solutions – including paying for representatives from local communities to be trained to become data gatherers for SMART, and therefore local "conservation custodians".
- The extension of PAWS due to the support for the project from Microsoft AI provides an important opportunity for greater engagement. Civil society organisations should work with the Uganda Wildlife Authority to ensure technical training for local nationals to undertake the technical work involved rather than foreign nationals being employed to do this.

25 Wildlife and Countryside Link. (2020). *Environment and Conservation Organisations Coronavirus Impact Survey Report*. https://www.heritagefund.org.uk/sites/default/files/media/attachments/Coronavirus%20eNGO%20survey%20analysis%20report_1.pdf

26 Greenfield, P., & Muiruri, P. (2020, 5 May). Conservation in crisis: ecotourism collapse threatens communities and wildlife. *The Guardian*. https://www.theguardian.com/environment/2020/may/05/conservation-in-crisis-covid-19-coronavirus-ecotourism-collapse-threatens-communities-and-wildlife-a0e

27 Matthews, A. (2020, 21 May). The wild animals at risk in lockdown. *BBC*. https://www.bbc.com/future/article/20200520-the-link-between-animals-and-covid-19

28 Ledger, E. (2020, 20 August). The 'catastrophic' conservation emergency left in Covid's wake. *The Independent*. https://www.independent.co.uk/news/world/coronavirus-catasrophic-conservation-emergency-illegal-wildlife-trade-a9619901.html

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The world is facing an unprecedented climate and environmental emergency. Scientists have identified human activity as primarily responsible for the climate crisis, which together with rampant environmental pollution, and the unbridled activities of the extractive and agricultural industries, pose a direct threat to the sustainability of life on this planet.

This edition of Global Information Society Watch (GISWatch) seeks to understand the constructive role that technology can play in confronting the crises. It disrupts the normative understanding of technology being an easy panacea to the planet's environmental challenges and suggests that a nuanced and contextual use of technology is necessary for real sustainability to be achieved. A series of thematic reports frame different aspects of the relationship between digital technology and environmental sustainability from a human rights and social justice perspective, while 46 country and regional reports explore the diverse frontiers where technology meets the needs of both the environment and communities, and where technology itself becomes a challenge to a sustainable future.

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