



GUIDANCE NOTE

*Lessons Learned in Conservation Technology –
Data Collection, Processing, and Management*



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1. INTRODUCTION

Wildlife is threatened by escalating challenges including habitat loss, illegal wildlife trade (IWT), and climate change. The Global Environment Facility (GEF)–funded, and World Bank–led, Global Wildlife Program (GWP) is strengthening wildlife conservation across Asia, Africa, Latin America, and the Caribbean. Projects within the GWP focus on protected area management, reducing poaching, trafficking, and demand of wildlife and illegal wildlife products, and promotion of wildlife-based economies. Across all these activities, there is a need to better manage, monitor, and mitigate threats while increasing the efficiency and effectiveness of conservation activities. This is where conservation technology comes in.

Technology is evolving and becoming more accessible and user-friendly. Tools like remote camera traps, acoustic sensors, drones, and biologging devices are increasingly helping us study, manage, and protect diverse species and ecosystems across the planet¹. However, as these environmental sensors become cheaper, better, and more easily integrated, it becomes critical that conservationists have the tools that enable accessible and effective processing, analysis, and sharing of the data being produced by these sensors.

Historically, the major challenge facing conservationists looking to deploy technology has been about getting access to affordable, fit-for-purpose, working hardware — and this has been where attention (and budgets) has been focused. However, with the increase in sensors available to collect data in conservation, the situation has gone from having little data to an overwhelming amount of data. Questions around data analysis, management, and sharing are emerging as significant — and often unexpected — challenges in deploying technology.

When looking to incorporate technology into conservation programs, it is critical that practitioners consider how they will transform data into actionable and shareable management insights during the planning phase, alongside questions of what technology to use. Otherwise, there is a high risk that technology will be deployed to collect critical information about ecosystems and the success of conservation interventions, only for this data to sit on a hard drive on a shelf or on a researcher's computer, rather than being used to effectively monitor, impact, and inform management decisions.

¹ Speaker, T. et al. (2022) 'A global community-sourced assessment of the State of Conservation Technology', *Conservation Biology*, 36(3). doi:10.1111/cobi.13871.

When considering conservation technology, questions about selecting the right hardware option (i.e., What drone should I use? How do I set up this camera trap?) are usually front of mind. These questions are important, and there are a growing number of resources available to support practitioners to make decisions about technology hardware options². However, GWP projects that have successfully integrated technology into their conservation work highlighted that a best practice approach to technology is holistic. It focuses on the needs — What am I trying to find out? Why are we building this database? What do I (or my user) need to be able to do? — and then considers the technology options available, taking into account the data and analytical requirements, access requirements, training and transition needs, and potential ongoing and hidden costs.



Defining the purpose for integrating and using technology means asking:
What am I trying to find out? What data do I need to make a decision? How do I collect this data? How do I analyze this data to give me the information I need to be able to take action? Who needs to see this data?

2. ABOUT THIS GUIDANCE NOTE

The objective of this guidance note is to illustrate the experiences, lessons learned, and top tips on the use of technology in wildlife conservation emerging from across the GWP.

The document summarizes findings from a virtual GWP knowledge exchange event held in March 2023, where GWP project representatives and external experts shared their experiences and insights on integrating technology into conservation activities.

The document is structured around three key themes to consider when using conservation technology, which respond to the needs of GWP projects:



Data Collection

How to integrate technology on the ground?



Data Processing

How can artificial intelligence (AI) help?



Data Management & Sharing

How to make sure the right people have access to the right information to make decisions?

² Conservation Technology Best Practice Guides Collection (2023) WILDLABS.NET.
Available at: <https://wildlabs.net/collection/best-practice-guides> (Accessed: 11 May 2023).



3. KEY THEMES IN CONSERVATION TECHNOLOGY

3.1. Data Collection

How to integrate technology on the ground?

Technology is being deployed successfully in GWP projects to support biodiversity monitoring, enable human-wildlife coexistence, and combat poaching and illegal trade of wildlife. Camera traps, bio-loggers, and smartphone apps are being used to track jaguars and alert community members to the movement of animals across their farms in Panama; bioacoustics devices are being deployed to monitor ecosystems in Mozambique and have led to the discovery of new populations of endangered species; drones are supporting rangers in monitoring vast areas in Zimbabwe; and smartphone apps are supporting customs officials in Indonesia to monitor and intervene in the illegal movements of wildlife products across borders.

Across a spectrum of technologies, there are commonalities in the best practice approaches highlighted by GWP teams. Regardless of the specific technology in use, teams emphasized a systematic approach, where they spoke to others using or developing similar technologies, established a clear use case that was specific to their needs, developed a pilot phase to test the technology and involve key stakeholders, and planned a roll out phase that included significant investment in capacity building and training, alongside the introduction of a new technology tool.

“Talk to the people who will use the technology and get the specs right before purchasing. Think about how will you collect your data, where will you store it? Is the equipment you have (i.e., your computers) right for the data? Invest in training!”

Chipangura (“Chip”) Chirara, GWP Zimbabwe



Lessons learned

1. **Be clear about the purpose of the technology.** Don't be distracted by an exciting, high-tech solution that could work, instead focus on solving a specific challenge. The Indonesia team found success where other projects have failed by focusing on a clear need and building a simple solution: a user-friendly library of species that customs officials could check. Similar projects have jumped to the more ambitious goal of building a system that uses AI to identify species from photos and failed. By focusing on delivering the specific technology solution that answers the immediate need of their end user, the Indonesia project is building trust and laying the groundwork, so they are in the position to potentially attempt to build a more advanced AI-powered system in the future. The Belize team, likewise, emphasized this best practice approach.

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'Before we started, we asked: Why are we building this database? What do we want it to do? Answer: We want to make better decisions as a government. It will be a decision-making tool for policies to reduce human-wildlife conflict. This is where we focused, this is how we envisaged doing reports and so shaped our decisions.'

Yanira Pop, GWP Belize

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2. **Learn from other people, avoid their mistakes.** Many GWP teams found value in speaking with other users at an early stage to avoid common pitfalls. The team from Indonesia highlighted that understanding the weaknesses and strengths of previous applications, in terms of functionalities to prioritize in building the technology and how to get users to trust and adopt the tool, was critical in shaping their plan for developing a new IWT app for customs officials. Likewise, GWP Belize viewed speaking to an experienced team as an opportunity to learn and potentially collaborate. Mexico has established a database to track jaguars nationally so, early in the planning phase, the Belize team invited Mexico to present their work. By sharing approaches early on, the teams can make decisions (e.g., about a common data structure) that will make it easier to achieve their long-term goal of ensuring that these databases can talk to each other and track jaguars across the region.
3. **Invest in a pilot phase to refine the specifications and field-test requirements for the technology before buying further equipment.** GWP Zimbabwe invested in a pilot phase when integrating drones into their operations. As they spent time talking to the people who were using the technology day-to-day, their understanding of the requirements evolved, and these conversations ensured that they got the specifications right when investing further in the technology.



4. **Prepare for ongoing investment in training, documentation, and capacity building.** The ongoing investment in training is a critical cost that must not be underestimated. As a guide, the Zimbabwe team strongly recommended allocating 1.5 times the budget to buy technology for training. For example, if they are buying a drone for \$20,000, they will ensure there is \$30,000 available to train staff in its use. Alongside training workshops, ensuring access to written documentation and tutorial guides is critical to ensure effective and sustained adoption of any new technology.
5. **Use technology as an opportunity to enhance relationships with local stakeholders.** Technology is not a replacement for the work required to build and maintain relationships with local communities and stakeholders, but it can play a critical role in enabling and sometimes accelerating this work. In Panama, technology is supporting human-wildlife coexistence work by powerfully changing perceptions of jaguars with farmers, who are involved in all stages of technology implementation. They see the images of jaguars captured by camera traps and can track the animals' live movements across their farms through GPS collars and a smartphone app. This data has transformed how local farmers view the wildlife sharing their land, with video footage of jaguars shifting the perceptions of even the most apprehensive farmers.

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'Tech is an addition to the work of building relationships, being in contact with community, talking to the farmers. It's not a replacement.'

Ricardo Moreno, GWP Panama

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6. **Watch out for unexpected, ongoing costs.** Unexpected costs are a common experience with conservation technology, particularly when technology comes via donations or partnerships. GWP Mozambique provided critical advice to avoid encountering unexpected technology costs, advising that projects carefully check contracts with service providers for unforeseen initial or ongoing costs. This is particularly important when working with a service provider who is providing work or technology free of charge via a donation. In these situations, there can be extra requirements before the donated technology can be used that may not be covered in the donation. Additionally, a donation may only cover the costs of using a technology for a limited time, resulting in unexpected ongoing costs for further use. The Mozambique team recommended ensuring there is a robust contract in place that covers these aspects. Confirming that there is a plan for both the upfront cost of purchasing a technology and the ongoing costs to run, maintain, and repair it, particularly for software projects, is critical, and must be considered at the early stage of a project.



3.2. Data Processing

How can AI help a conservation project?

Processing and analyzing the significant amounts of data collected with different technologies like camera traps, acoustics, biologgers, or drones remains a significant challenge for many projects. The team in Mozambique highlighted this growing issue:



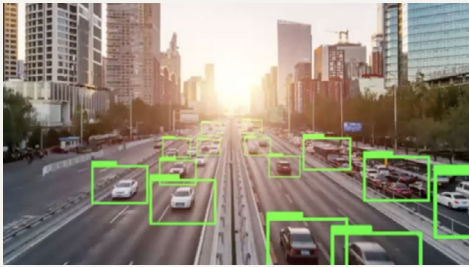
'Acoustics is a cost effective, non-invasive method of data collection, but these approaches generate a tremendous amount of data – hundreds of thousands, even millions of sound files that have to be processed and stored. Software needs to be trained to recognize target species – you'll need to spend some time doing this. AI could be a help in the future.'

Piotr Naskrecki, GWP Mozambique



In the same way that satellite and remote sensing technologies transformed how we monitor environmental change from above, AI coupled with sensors like camera traps and bioacoustics recorders will allow us to scale how we monitor ecosystems on the ground. AI can learn how to identify which photos out of thousands contain rare species, or pinpoint an animal call out of hours of field recordings. This could greatly reduce the manual labor required to collect conservation data. AI is an emerging tool that is receiving a lot of interest, but it remains difficult for many practitioners to ascertain whether it is an appropriate technology to incorporate into their work in the immediate future to support data processing or decision making, or whether existing tools and approaches to manually process data are still the best option for most conservation projects.

There are two main categories of tasks that applications of AI in conservation fall into:



1

AI FOR DATA PROCESSING

- People and AI are both good at this
- People find this very boring
- AI has no opinion on “boring”
- People are limited in number, AI mostly is not



2

AI FOR DECISION MAKING

- People are much better at this than AI
- People find this interesting
- An unlimited number of people would not make this easier

Although researchers are exploring applications of AI in decision making, it remains challenging for AI to provide recommendations for planning (Where should I plant my trees? Which land should I protect?) or forecasting (Under climate scenario XYZ, how will the population of species ABC change? How much is the cost of commodity X going to change if we implement legislation Y?).

The majority of existing and emerging applications of AI in conservation are focused in the first category, that is tasks that are about leveraging AI for accelerating data processing. Most potential applications are about ways AI can be used to do mundane work (i.e., repetitive data processing), so that conservationists can spend more of their time on analytical work (i.e., higher level decision making).

Even in these scenarios that focus on accelerating mundane work, there are limitations to keep in mind. AI can accelerate, not automate. If starting out with AI in conservation work, it is best to focus attention on the mundane tasks where AI is having, or will have, successes over the next couple of years. These include 1) reviewing sensor data from drones, camera traps, and acoustics, and 2) document processing.

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‘AI is really good at these things, and it really can help you. But there are essentially no tasks right now where AI can completely automate data review. So, you should think of AI as helping with stuff where you know the right answer, but not helping by completely automating it, helping by making you lots and lots faster at it.’

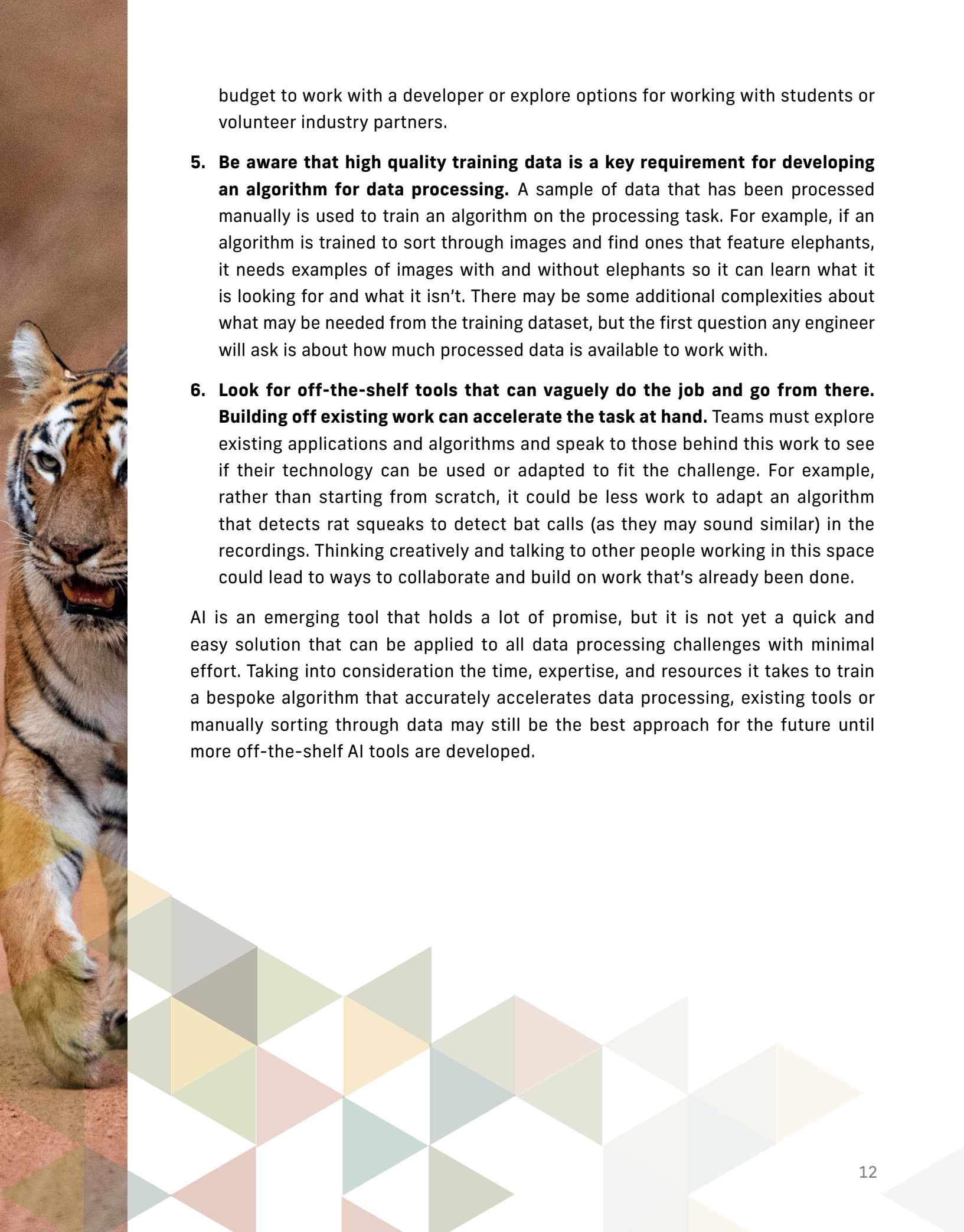
Dan Morris, Google AI for Nature and Society

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Lessons learned

- 1. Prioritize AI for situations where data processing takes significant time.** While the data processing challenge may be one that is suitable for AI, if it is only a small part of the time being spent on the project then it may not be worth trying to leverage AI. For example, in a drone survey project, it may take two days to get into the field and capture the imagery required. In total, this data capture may take 10 person days, because there is a team of five people going out there. In comparison, if data processing only takes two hours, while it may be mundane it may not be worth training an AI model to help.
- 2. Have a plan for how to use the imperfect results from an AI system.** An AI model will offer predictions of what it thinks is in images or audio, but it will not give perfect results with 100% certainty. It is critical to have a plan for how to use the imperfect results AI provides and incorporate them into the workflow and tools already being used.
- 3. Look for a way to break down a complex problem into a smaller part that AI can tackle.** The AI tools currently available may not be sufficiently advanced to be applied to complex data processing challenges. However, once the overall goal is divided into smaller steps, then AI can help. For example, consider an acoustic survey where there are two bird species that have very similar calls and the aim is to distinguish between all the bird calls in the recording. While it may be challenging to train an AI model to distinguish between the two species with similar calls, AI could be useful in speeding up the first few stages by sorting out all the recordings that have a third species that is of no interest to the study or the research. By having AI do this, there is time left in the final stage of analysis rather than time spent processing all the data. Similarly, AI can help save time by moving all the empty or blank images taken from a camera trap so that only those images with animals in them can be analyzed. To use AI effectively, it is important to consider if the problem can be broken down to identify a part that the technology could address effectively.
- 4. Ensure sufficient technical expertise in the team, particularly in AI and software engineering.** There are a small but growing number of user-friendly, out-of-the-box AI-enabled tools that can be deployed to support conservation data processing without high levels of technological expertise, like MegaDetector, Wildlife Insights, BirdNET, and Arbimon. However, processing challenges may require the software engineering capabilities to adapt or to develop a new algorithm suitable for the data and processing goals. If these skills are not available in the immediate team, managers should ensure that there is enough



budget to work with a developer or explore options for working with students or volunteer industry partners.

5. **Be aware that high quality training data is a key requirement for developing an algorithm for data processing.** A sample of data that has been processed manually is used to train an algorithm on the processing task. For example, if an algorithm is trained to sort through images and find ones that feature elephants, it needs examples of images with and without elephants so it can learn what it is looking for and what it isn't. There may be some additional complexities about what may be needed from the training dataset, but the first question any engineer will ask is about how much processed data is available to work with.
6. **Look for off-the-shelf tools that can vaguely do the job and go from there. Building off existing work can accelerate the task at hand.** Teams must explore existing applications and algorithms and speak to those behind this work to see if their technology can be used or adapted to fit the challenge. For example, rather than starting from scratch, it could be less work to adapt an algorithm that detects rat squeaks to detect bat calls (as they may sound similar) in the recordings. Thinking creatively and talking to other people working in this space could lead to ways to collaborate and build on work that's already been done.

AI is an emerging tool that holds a lot of promise, but it is not yet a quick and easy solution that can be applied to all data processing challenges with minimal effort. Taking into consideration the time, expertise, and resources it takes to train a bespoke algorithm that accurately accelerates data processing, existing tools or manually sorting through data may still be the best approach for the future until more off-the-shelf AI tools are developed.



3.3. Data Management and Sharing

How to get the right people access to the right information to make decisions?

As the uptake of new technologies and systems accelerates across protected areas, NGOs, and public and private operators, islands of technology and data are beginning to emerge. How to overcome the siloing of information as data becomes ever more accessible at a project or conservation area level?

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‘Numerous projects are collecting data all the time. Can we think of a system that allows pooling of data to avoid duplication?’

A workshop participant

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Data management and sharing are significant challenges, and the best practice approaches shared by GWP projects included the importance of data sharing agreements, persistent discussions, and close collaboration with partners when scaling up from project-level to multistakeholder databases and information sharing.

The first step in getting the right information in the right hands is to take control of the various streams of data being collected within the organization. In Mozambique, the National Administration of Conservation Areas uses [Earthranger](#). The team shared that the tool is helping revolutionize conservation area management, by providing a single user interface that displays data from many different sensors and sources operational within a protected area. Previously, a common setup would have had someone sitting in front of multiple screens all showing different software in an operations room, managing multiple radio systems, patrols, keeping notes on vehicle movements, and any other information that might be being collected. With Earthranger, all this information is funneled into the system and shown on a single display, which then outputs reports, decisions, and alerts.



A streamlined data management system like Earthranger can be a step towards overcoming data silos within and scaling data sharing beyond a project or organization.

In Mozambique, most national parks already have Earthranger or are on the way to getting it installed. In the future, a common operating system could offer the opportunity to link up databases across individual platforms. This could mean not just

sharing data across protected areas but ultimately supporting the sharing of significant resources like aircrafts being shared across partners to conduct surveys. Although the potential is clear, there are challenges identified related to interoperability, harmonization, shared resources, communication flow, transparency of database location, and others.

In Belize, the Forest Department is already making headway towards this ultimate vision of pooling data by building a collaborative network of partners to address the data silo challenge. They are creating a national database for jaguar movements so that NGOs and organizations who collect data in a patchwork of projects across the landscape can share and consolidate information. With this central database, the Government of Belize will be able to use the data as a decision-making tool for policies to reduce HWC. The first step in this process is to create a Memorandum of Understanding (MOU) that outlines the specific data sharing agreement. This provides a legal framework that sets out terms that support organizations collaborating by 1) standardizing data collection, 2) standardizing and promoting effective use of data, 3) ensuring everyone's data is protected, and 4) ensuring ownership and the source of data is acknowledged.

Transforming data into insights to support decision making goes far beyond the analysis and interpretation of a single dataset generated from one type of sensor. Even within a single protected area, supporting effective management usually requires compiling and processing data from multiple sources, produced by different technologies, and sometimes owned and managed by different organizations. Scaling up to understand what is happening across a landscape, continent, or the globe is a powerful opportunity for harnessing conservation data to inform government and intergovernmental decision making. However, even at the landscape level, gaining a full picture of the movement of a species across a region or country requires many organizations to coordinate, collaborate, and share data. This is a significant challenge, but also a tremendous opportunity for technology to empower conservation efforts.



Lessons learned

1. **Continuous discussions and close collaboration with partners is key when establishing data sharing systems.** GWP Belize looked for ways to break down barriers and resistance to encourage participation rather than enforce it, asking, “Where are the wins and motivations for people to join?” They considered making research permits contingent on participation in the data sharing initiative, but focused more on highlighting positive outcomes for organizations, such as the benefit of being able to highlight their role in this database as part of funding applications.
2. **Risks related to data integration, quality, privacy, and security may act as barriers for stakeholders to participate and share accurate, complete, and reliable data.** Belize emphasized that stakeholders need to be able to trust that sensitive data are protected to avoid unauthorized access, misuse, or disclosure. Likewise, Mozambique talked about the importance of understanding the data and information technology chain, and the team’s key recommendations also highlighted the need for deciding and establishing data licensing practices and protocols, and managing databases and metadata.

“

‘We can’t be satisfied with just the information showing up on our screen. We need to ask ‘Where is the data, where does it come from, who can actually interfere in terms of force?’ We can equip our rangers with firearms and train them, but if we share our information through these systems and networks, we are also exposing ourselves to a number of other risks that are not being taken care of.’

Franziska Steinbruch, GWP Mozambique

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3. **Know the true cost of transitioning to new technology systems.** The caution to be wary of hidden, unexpected costs came through again in the context of transitioning to new technology systems. As with any new approach or technology, there are transition issues to be aware of. GWP Mozambique found that conventional and analogue technology doesn’t easily integrate with new technology; it requires a full system change. This is in terms of hardware (upgrading from technologies that are reliant on manual upload of data), the software environment, and human resources and what people are capable of. Teams emphasized the need to be careful of hidden or unexpected costs with service providers. It is important to ensure that a contract is in place and covers all aspects of technology implementation.



- 4. Manage databases and metadata carefully, with clear protocols for communication flows, for data, and for the sharing of instruments or equipment.** This will ensure clarity on the administrative responsibility, including answers to questions on who is responsible, and for what. Who has access to instruments, raw data, processed data, archive, metadata? It is very important to define these administrative roles.
- 5. Decide and establish data ownership licensing practices and protocols.** The Mozambique team indicated that very often it's not the management entity of a protected area that owns or purchases the technology hardware and infrastructure, but an NGO, partner, or research group. The source of hardware and infrastructure often determines ownership over data, and the purpose and priorities of these different stakeholders can sometimes be at odds. If the hardware owner needs to publish, they may be working on a far slower timeline for sharing data than what is needed by a protected area manager, who requires the information to make decisions. Ownership and usage of data needs to be discussed and worked through by stakeholders ahead of data collection, so that projects are being set up with the right objectives and take into account management needs.
- 6. Institute backups in-country, not just in the cloud.** GWP Mozambique highlighted issues potentially arising when data storage or data provider services are not in the country. For example, these can raise potential issues with security failures and cyber threats.

SUMMARY OF LESSONS LEARNED ABOUT INCORPORATING TECHNOLOGY INTO CONSERVATION PROJECTS



Data Collection

- ❑ Be clear about the purpose of the technology.
- ❑ Learn from other people, avoid their mistakes.
- ❑ Invest in a pilot phase to refine the specifications and field-test requirements for the technology.
- ❑ Prepare for ongoing investment in training, documentation, and capacity building.
- ❑ Use technology as an opportunity to enhance relationships with local stakeholders.
- ❑ Watch out for unexpected, ongoing costs.



Data processing

- ❑ Prioritize AI for situations where data processing takes significant time.
- ❑ Have a plan for how to use the imperfect results from an AI system.
- ❑ Look for a way to break down a complex problem into a smaller part that AI can tackle.
- ❑ Ensure some level of technical expertise in the team, particularly with reference to AI and software engineering.
- ❑ Be aware that high quality training data is a key requirement for developing an algorithm for data processing.
- ❑ Look for off-the-shelf tools that even vaguely do the job and go from there.



Data management and sharing

- ❑ Continuous discussions and close collaboration with partners is key when establishing data sharing systems.
- ❑ Consider risks related to data integration, quality, privacy, and security that may act as barriers.
- ❑ Know the true cost of transitioning to new technology systems.
- ❑ Manage databases and metadata with protocols for communication flows, and for data and for the sharing of equipment.
- ❑ Decide and establish data ownership licensing practices and protocols.
- ❑ Institute backups in-country, not just in the cloud

4. TOOLS AND RESOURCES

Data Collection

There are a growing number of resources to help select the right device and plan deployment effectively.

Resources to explore the breadth of technologies available in conservation include the GWP's conservation [e-library](#) which collates information about technological solutions that help combat illegal wildlife trade, the [Conservation Tech Directory](#), the [IUCN MOOC for conservation technology](#), and the extensive library of case studies, articles, and recorded tutorials and talks on the [WILDLABS platform](#) and [YouTube channel](#).

Conservation Technology Database

What conservation issue are you looking to address?

Show All Poaching Wildlife Trade Wildlife Demand Wildlife Monitoring

What location are you planning to use this technology in?

Show All Protected and Conserved Areas Buffer Zones and Corridors Community field, boma, livestock enclosures, or village Customs, Ports and Airports Online Private Reserves

Who will use or implement this technology?


Show All Rangers Protected Areas Authorities Community Members Law Enforcement NGOs Conservationists Private Operators

Filter by Keywords

wpeWatch Web Platform	SMART – Spatial Monitoring and Reporting Tool	Connected Conservation	Nature Intelligence System	I of the Elephant	Smart Parks
Forward Looking InfraRed (FLIR) Thermal Technology	Nixx Investigation Lab	WildLeaks	Savannah Tracking Devices	Wildlife Insights	Instant Wild
AI Guardian of Endangered Species	Instant Detect 2.0	EarthRanger	Meerkat Wide Area Surveillance System	Rainforest Connection	WildTrack Footprint Identification Technology

THE GWP EBOOK ON CONSERVATION TECHNOLOGY SCREENSHOT.

There are in-depth [Best Practice Guides](#) published on all major technologies used for conservation. These guides can provide a detailed roadmap and resource for planning and using a specific technology effectively, including:

	Camera Traps
	Acoustic Monitoring
	Remote Sensing: Lidar
	Satellite Remote Sensing
	Drones
	An introduction to satellite tracking technologies for tracking wildlife
	Good practice guidelines for long-term ecoacoustic monitoring in the UK
	A practical guide to DNA based methods for biodiversity assessment

The [forums](#) on WILDLABS are a useful resource to ask questions and speak to experienced users.

[The State of Conservation Technology](#) highlights the ongoing performance and potential impact of current tools, user and developer constraints, and key opportunities for growth and innovation in the sector.



Data Processing & AI

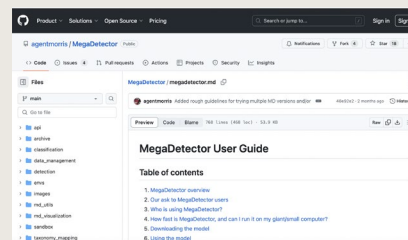
The [AI for Conservation Group](#) on WILDLABS is an open community and is an easily accessible place to have questions about AI answered by experts. There is a closed AI for Conservation Slack group run by Sara Beery that is also a great way to source advice. (Request access by emailing community@wildlabs.net).

The [AI for Conservation Office Hours](#) program runs twice a year and offers virtual 1:1 sessions, connecting conservationists with AI experts so that they can get the advice they need on using AI tools in the context of their own project and what to try next on the path to success.



WILDLIFE INSIGHTS

Provides data management infrastructure and AI tools to help identify the species in photos and get rid of blank images.



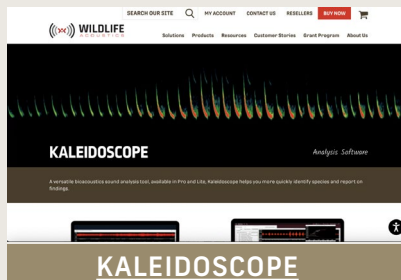
MEGADETECTOR

An AI model that helps people get rid of all the images that don't have any animals in them. It separates images that have animals, people, vehicles, or are empty, so that there is time to spend on the difficult species identification questions in the data.



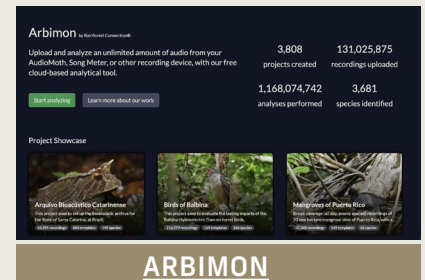
EARTHRANGER

A protected area management tool used to manage field data in real-time. Learn more about it in this [Live Q&A](#).



KALEIDOSCOPE

A versatile bioacoustics sound analysis tool, available in Pro and Lite, that helps quickly identify species and report on findings.



ARBIMON

A free, cloud-based analytical tool for bioacoustics from Rainforest Connection.

Data Management and Sharing

To explore the latest advancements and emerging developments in data sharing and archiving, this [WILDLABS Virtual Meetup](#) brought together experts to explore this issue in the context of movement ecology. To ask questions and discover additional resources on any tools related to data management, including Earthranger and SMART, visit the [WILDLABS Data Management and Processing Tools group](#).

To learn more about Earthranger specifically, visit earthranger.com and explore this [Live Q&A](#). Earthranger has an [established user community forum](#), however an Earthranger account is needed to access it.





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