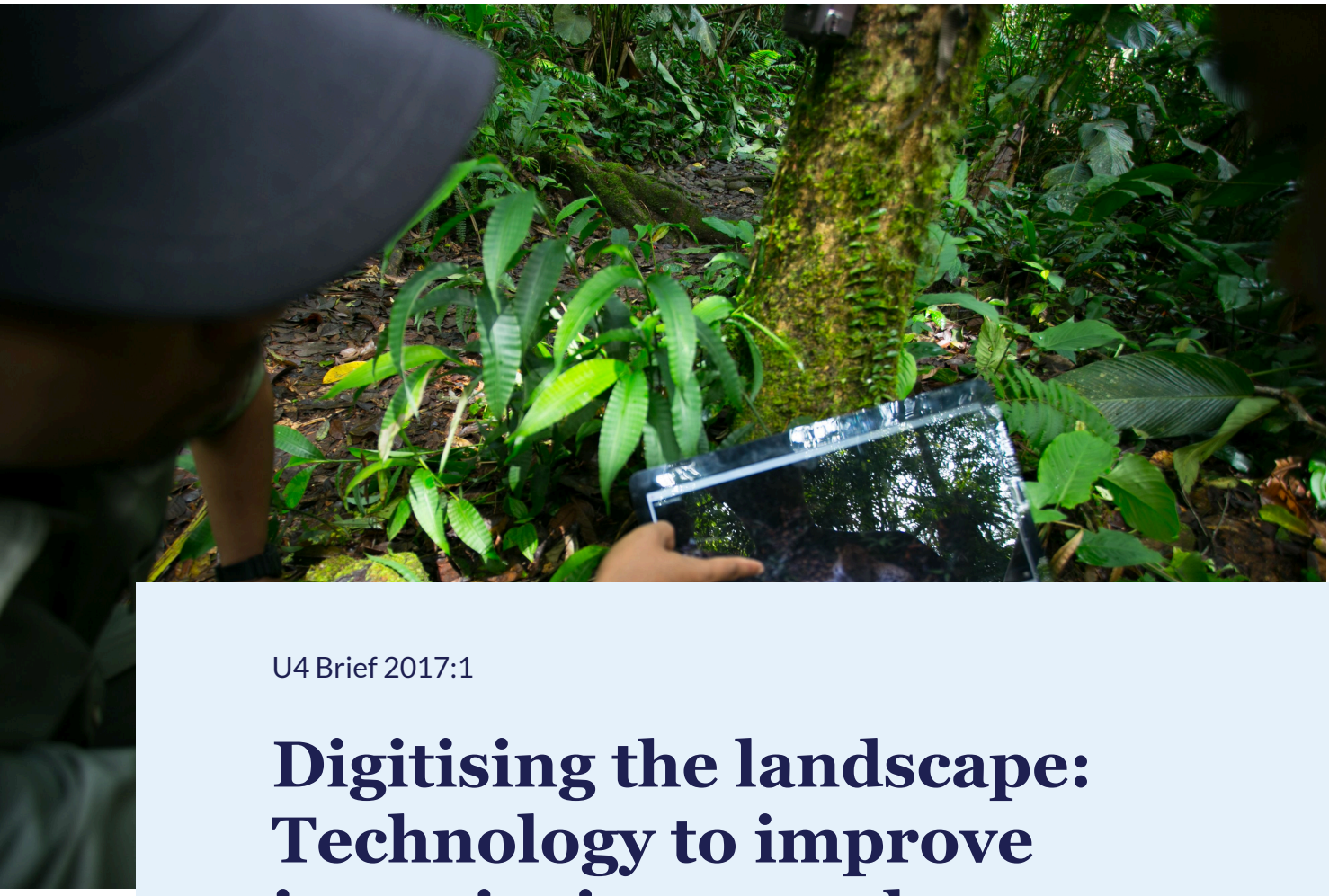
U4 ANTI-CORRUPTION RESOURCE CENTRE



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Digitising the landscape: Technology to improve integrity in natural resource management

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About U4
U4 is a team of anti-corruption advisers working to share research and evidence to help international development actors get sustainable results. The work involves dialogue, publications, online training, workshops, helpdesk, and innovation. U4 is a permanent centre at the Chr. Michelsen Institute (CMI) in Norway. CMI is a non-profit, multi-disciplinary research institute with social scientists specialising in development studies.
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Many information technology initiatives have emerged in recent years with the aim of improving natural resource management. These take a variety of technological forms designed either to directly curb corruption in resource extraction and production, or to enhance information flows, facilitate citizen participation, and hold specific actors accountable. Donors can play a role in connecting the divide between development practitioners, technologists, and researchers by supporting the use of tools in programs and evaluations.

Main points

- Technological tools have become an indispensible part of everyday life for citizens. The individuals who are negatively impacted by resource extraction can use technological tools to hold those in power to account
- We cannot ignore the potential for Facebook, Twitter, Google Maps or Instagram to benefit resource management. Their widespread use makes them a potential power for efficient campaigns.
- We have created a database of technological initiatives relevant for natural resource management. It has almost 400 examples of projects, organisations, and tools that apply technological innovations.
- Use of technologies are often successful when combined with existing social structures like farmers-organisations, youth groups or online communities.
- Donors can help connect the divide between development practitioners, technologists, and researchers by supporting the development and use of tools in programmes and evaluations.

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Technology for anti-corruption

Technology is increasingly being employed to curb corruption, particularly in the public sphere. For example, e-government initiatives in the form of digitized record-keeping, web-based procurement systems, and electronic service delivery aim to enhance transparency and accountability in public service provision (Baniaman 2015; Davies and Fumega 2014). Existing evidence shows that these initiatives have successfully reduced corruption in government by strengthening reform-oriented actors, limiting government officials' opportunities for discretionary behavior through improved monitoring of behavior, and enhancing citizens' access to information about government processes, and their ability to hold government accountable (Shim and Eom 2008; Andersen 2009).

Governments are heavily involved in the management of natural resources, but they do not always carry out resource management functions in transparent or accountable ways. Natural resource sectors are therefore particularly susceptible to corruption, and corruption is one of the primary reasons that resource-rich countries experience the so-called *resource curse*, or the *paradox of plenty* (Kolstad and Søreide 2009). Processes of resource extraction and production can create both incentives and opportunities for corrupt behavior due to the high value of many resources and the large amounts of discretionary and monopoly government power over access to, and use of, resources. This monopoly control over resource sectors, as well as a lack of citizen participation in decision-making about resource use, can result in little transparency within resource sectors. The social and economic consequences of corruption in the extraction and production of natural resources are serious, and include higher pollution and resource depletion rates, increased environmental destruction, heightened costs of extraction and production, revenue loss, entrenched poverty, violent conflict, human rights violations, and reduced trust in government.

By enabling and enhancing transparency, accountability, and participation mechanisms in resource management, technological initiatives have the potential to reduce corruption and thereby increase the likelihood that resource wealth will lead to positive development outcomes in developing countries. For example, technology-facilitated information flows and participatory mechanisms can help to ensure that oil and mining revenues

are spent for public rather than private interests. They can also remove the information asymmetries that enable illegal fishing and wildlife trafficking, and provide complaint channels that enable the public to hold individuals involved in decision-making about the use of land, forest, and water resources accountable.

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Mapping the digital landscape of natural resource management

We created a database [1] of existing technological initiatives relevant for natural resource management. It contains nearly 400 entries encompassing a wide and representative range of projects, organisations, and tools that rely on technological forms to operate. These initiatives are either focused directly on a particular resource, or they could be used in anti-corruption efforts within a resource sector due to their broadly applicable nature. They range from high-end surveillance and monitoring applications used by governments and large corporations worldwide, to free and open tools commonly used by activists and NGOs. Most of the initiatives exist in the form of 'freemium' software, which is free of charge at a basic level, but offers premium features with expanded functionality for a fee. To build this database, we relied on on crowd-sourced support generated through the NGO Standby Task Force.

The database entries are spread across four main sections – each with a set of relevant variables:

1. **Projects**
   A selection of ongoing or concluded projects with specific social goals

1. This database was available online until the hosting service shut down in December 2017. We aim to reestablish access to it for all readers.

where technology plays a significant role. These projects adhere to methodologies enabled by connectivity, collaboration, and high-end technology.

2. **Organisations**
   Information on organisations whose work depends on technological innovations. As customised technological initiatives have been developed for various purposes in these fields, many profit- and non-profit organisations have emerged around them. The projects that the listed organisations work on are typically collaborations between traditional development organisations and small, specialised organisations.
3. **Tools**
   Data on a wide spectrum of technology applications used for communication, management, surveillance, or visualisation of information. Some of these are free and several have been rapidly adopted by millions of people.
4. **Resources**
   References to literature and research reports as well as links to resources collected either by organisations, companies or through crowd-sourcing for the purpose of skills- and knowledge sharing.

The database lists 93 tools; 102 projects where technological tools play a major role; 98 organisations using technological tools, either for profit or non-profit purposes; and 73 resources and references. Each section contains more detailed categories of information.

We note two trends of interest in the development of these technological initiatives. The first is a temporal trend, as depicted in Figure 1: most of the initiatives are recent creations, with the majority emerging after 2010. Nearly three-quarters (72%) of the projects in the collection were launched less than six years ago. In general, the use of digital technology in natural resource management is a new phenomenon, one that is clearly on the rise, but we can also further disaggregate among the trends. As seen in Figure 1, while there has been a significant, steady linear increase in each of the four sections of the dataset, the numbers of tools and references have grown most since 2012 – evidence of both the rapid spread of technology as well as interest in its manifestations and effects. A second clear trend is that once a tool or project goes online, it usually supports simultaneous collaboration across technological solutions, given that cloud storage and global access to information have become the norm. A modern tool generally has interfaces

for desktop access, online browsing and mobile-operation. This means that the field worker can access the same information as at the home office, even if it is over a slow connection, thus enhancing the potential of technology to reduce corruption in resource management projects and programmes. This flexibility also enhances the ability of ordinary citizens to use tools.

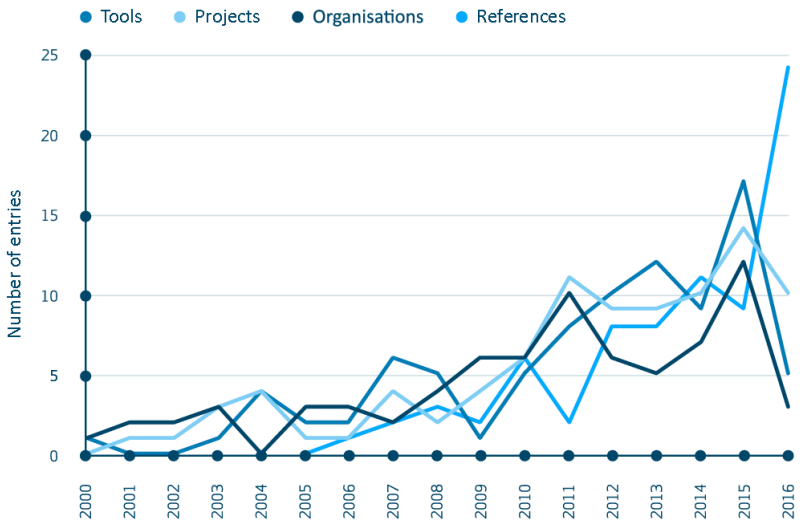

Figure 1: Time trends in technological innovations. The data was collected in June 2016. The number of entries for tools, projects, organisations and references created in 2016 therefore covers only the first six months of the year.

Examples of natural resource-specific technological initiatives

Below, we describe five examples of projects, organisations, and tools that have successfully employed technology for anti-corruption purposes related to natural resource management.

Protection Assistant for Wildlife Security – Artificial intelligence against wildlife poaching

Corruption is a key enabler of wildlife trafficking and poaching activities. Protection Assistant for Wildlife Security (PAWS) aims to help reduce wildlife poaching by creating patrol routes for wildlife rangers in areas where poachers are most likely to attack. Artificial intelligence creates predictions about poaching activity and generates random but achievable

patrol routes, increasing the likelihood that poachers will be caught and stopped, and possibly deterred from trying to poach in the future. This is based on analysis of historical data in combination with game-theoretic reasoning about the likely future behavior of poachers. Geo-coded information about past poaching attacks is combined with information about the terrain, distances, and outcomes of previous ranger routes. The initiative was first tested in Uganda in 2014, and is run by researchers from the University of Southern California in collaboration with other researchers and conservationists from around the world.

Miradi – Aligning conservation projects with international standards

Knowing whether anti-corruption programmes are achieving their goals can be a major challenge in the absence of uniform standards and indicators to monitor and evaluate progress. *Miradi* – a Swahili term for *project* or *goal* – is a digital project management tool that assists organisations to plan conservation projects according to a set of open, international standards. The aim is to provide a unified, consistent way to measure the effectiveness of organisational programmes. These standards are known as the Conservation Measurement Partnership's Open Standards for the Practice of Conservation. Inspired by the tax preparation software *TurboTax*, Miradi works by guiding the user through a series of questions, the answers to which are used to create project management, monitoring, and implementation plans that adhere to the Open Standards. Thousands of conservation projects around the world operate according to these standards, wherein testing assumptions by collecting monitoring data may lead to adaptation of these assumptions (so-called *adaptive management*). Adherence to a set of uniform standards makes it much easier to track progress on anti-corruption programmes in resource sectors, and to ensure that corruption does not impact conservation programmes. The Miradi website also features a community library, where key information about a select number of ongoing projects are published.

Adherence to uniform standards makes it easier to track progress on anti-corruption programmes in resource sectors, and limit negative impact due to corruption.

Logging Roads – Crowdmapping to document illegal logging in the Congo Basin

Corruption facilitates deforestation and illegal logging, which threaten to deplete the world's forests. The World Resources Institute and Moabi launched the Logging Roads Initiative to track and record the spread of logging roads in the Congo Basin rainforest, in order to try to prevent and raise awareness about forest loss in the region. Forests in this region are heavily impacted by illegal logging and poor forest management practices, the direct result of corruption. Logging Roads is an open data portal hosting 13 years of satellite imagery from multiple companies. The mapping data contains additional information on projects designed to reduce emissions from deforestation and forest degradation (REDD+), as well as map layers on oil and mining concessions, agriculture, and logging. Satellite imagery from various providers have been released for this project. The major tool for physically drawing the logging roads is called OpenStreetMap (OSM) and its Tasking Manager – a platform for collaborative online mapping and online volunteers who draw maps on a background of prepared satellite imagery. This enables large projects to be broken down to smaller parts and allows for online volunteers to take part in the mapping effort. A series of 'Mapping Parties' for Logging Roads have already been arranged in universities abroad and for interested volunteers in Kinshasa, Democratic Republic of Congo. The tool enables volunteers to pick a tiny square of the larger picture, draw the roads visible on the given satellite image, and convert the status of the square when done. Status and progress is shared with the community as the project moves forward. The major impact of this project is improved information about the scale and scope of illegal logging over time and space in the Congo Basin.

WildLeaks – Whistleblower technology to prevent wildlife and forest crimes

Poaching and the trafficking of endangered plant and animal species are directly facilitated by corruption. To help combat this problem, the Elephant Action League created WildLeaks, an anonymised reporting mechanism for wildlife and forest crimes. Reports are used to start investigations into these crimes, and once information is reviewed internally, it is passed on to NGOs, the media, and law enforcement agencies to take concrete action to stop these crimes. Unlike other "leaks"-organisations, information is never simply dumped into the public domain. Anonymous posts to WildLeaks are transmitted through the Tor-platform, a web-system designed to allow for anonymous, non-trackable connections. Alternatively, anonymous, encrypted messages can also be submitted through the Threema mobile application or through encrypted email. The design of the WildLeaks platform allows for non-technical individuals to submit material.

Imazon Mapping for sustainable development in the Amazon

The Amazon is one of the greatest biodiversity reserves in the world, but its destruction is threatened by corruption. Imazon is a research institute that applies geotechnology to environmental management. Online accessible maps are published regularly on the deforestation of the Amazon, an activity that is often facilitated by corruption. The institute also works with loggers to provide advice on sustainable logging and methods to reduce the environmental impact of logging activity. Local municipalities are trained in using geographic information tools such as GPS and other mapping technologies to increase their capacity to monitor deforestation. Imazon's *Deforestation Alert System* (SAD) produces monthly polygons of deforestation and forest degradation in order to improve the management of the Brazilian Amazon rainforest. Monthly deforestation alerts based on pixel-analysis of satellite imagery are verified by human analysts.

Opportunities and challenges for donors in using technology to fight corruption in natural resource management

The opportunities presented by technological innovations for reducing corruption in natural resource management are potentially vast. Sensors, cameras or microphones, whether they are attached to an animal (or a building), embedded inside the smartphone in the hands of an activist or mounted on a satellite represent new eyes, ears and voices that were not previously available. We can now be present in new ways and places: in remote areas, we can now "see" and report on what was previously invisible, and listen to voices previously not heard. Moreover, technological tools have in many ways become an indispensable part of everyday life and are readily available to ordinary citizens – the individuals who are often most negatively impacted by resource extraction but who can be empowered with technological tools to hold those in power to account. While we have collected information about specific technological initiatives for improving resource management, it should be noted that generic technological applications like Facebook, Twitter, Google Maps or Instagram are also useful tools for resource management and are already found in the activist toolbox. Their widespread use, both geographically and thematically, and their popularity and potential power for world-changing campaigns should not be ignored.

However, successfully using technology to reduce corruption in natural resource management is not without its challenges. First of all, information does not automatically translate into accountability; rather, people must be able to take action on the information that they receive. Moreover, some may claim that information technology enables criminal and unethical behaviour faster than authorities are able to follow. Second, context matters in why some digital initiatives are more successful than others. A significant number of the projects identified in the dataset describe situations where a number of technologies are successfully implemented because they have been combined with existing social structures like farmers-organisations, youth groups or online communities to achieve their goals. As natural resources has a physical and geographical component to it, projects combining digital tools, social organisations, and incentive systems may have the best potential for achieving their goals. Third, social norms about the appropriateness of certain technological forms, as well as sustainable

financing, are important for initiative success and survival. Finally, take-up of technological initiatives depends heavily on their financial cost and the degree to which specialized knowledge is required to use them.

...donors can enhance the legitimacy and social acceptance of technology, and work differently to mitigate and prevent corruption in natural resource management.

Donors can play a role in connecting the divide between development practitioners, technologists, and researchers by supporting the development and use of tools in programmes and evaluations. Support can come in the form of developing initiatives themselves, funding existing or start-up initiatives, or through supporting and involving in programming the networked technology hubs that are emerging all over the developing world. These hubs consist of spaces where local entrepreneurs gather to get access to tools, share knowledge and develop projects; they represent local nodes with access to global networks of technological competences and experiences. By strengthening local relationships and knowledge generation, donors can enhance the legitimacy and social acceptance of technology, and work differently to mitigate and prevent corruption in natural resource management.

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