A Call for International Leadership and Coordination to Realize the Potential of Conservation Technology


Advancing technology represents an unprecedented opportunity to enhance our capacity to conserve the Earth’s biodiversity. However, this great potential is failing to materialize and rarely endures. We contend that unleashing the power of technology for conservation requires an internationally coordinated strategy that connects the conservation community and policy-makers with technologists. We argue an international conservation technology entity could (1) provide vision and leadership, (2) coordinate and deliver key services necessary to ensure translation from innovation to effective deployment and use of technology for on-the-ground conservation across the planet, and (3) help integrate innovation into biodiversity conservation policy from local to global scales, providing tools to monitor outcomes of conservation action and progress towards national and international biodiversity targets. This proposed entity could take the shape of an international alliance of conservation institutions or a formal intergovernmental institution. Active and targeted uptake of emerging technology can help society achieve biodiversity conservation goals.

Keywords: biodiversity, conservation, technology, open-source, innovation

With global climate systems changing at unprecedented rates (IPCC 2014), land-use intensification commandeering primary production, and continuing biodiversity loss thrusting us into the sixth mass extinction event, salvaging ecosystems and species has never been more challenging (IPBES 2019). Many anthropogenic pressures, including changes in climate and land cover are affecting natural systems at a planetary scale (Steffen et al. 2015), and solutions are hence required at a global scale. Rapid advances in technology have transformed agriculture, mining, and other industries. Similarly, a considered approach to technological advances in support of nature conservation is integral to enhancing our global capacity to halt the wave of environmental degradation and species extinction, and to documenting that progress (Snaddon et al. 2013, Pimm et al. 2015). But technology is not a silver bullet and must be nurtured and carefully targeted to ensure it meets its potential. Here we discuss the reasons why conservation innovation has not lived up to these expectations to date and describe key enabling services essential for technology development to scale-up for global impact. These services are not currently available to support individual efforts to develop conservation-targeted technology. We propose the establishment of an international entity to provide global leadership and coordinate such service provision, promoting, supporting, and helping finance the development of technologies instrumental to addressing conservation challenges.

Conservation technology

We are unlikely to meet global conservation and sustainability goals without significantly improving the capacity to (a) monitor natural systems and wildlife populations, and (b) avoid and mitigate threats to biodiversity. Innovations in, and adoption of conservation technology will be central to meeting these challenges over the next decade. We use the term conservation technology to refer to devices, software platforms, computing resources, algorithms, and biotechnology methods that can cater for the needs of the conservation community (Pearce 2012, Greenville and Emery 2016). Despite its shortcomings this term is becoming the standard description for technological solutions in this context. Conservation technologies can enhance our ability to collect, analyze and share data on wildlife species, ecosystems and processes, helping us understand their status and trends,
identify drivers of extinction and degradation, and monitor the efficacy and efficiency of conservation actions at a global scale (Joppa et al. 2016). They can also support conservation action on the ground, detecting and fighting illegal activities (e.g., remotely-sensed logging or fishing; Dunn et al. 2018), mitigating threats to biodiversity (e.g., biological invasions; Dejean et al. 2012), and restoring habitats (e.g., coral reefs; Anthony et al. 2017) at unprecedented scales.

The conservation community has a long history of applying technology for monitoring and management (Cooke et al. 2004, Pettorelli et al. 2014, Burton et al. 2015). New technologies are starting to address previously intractable conservation challenges, for example, discovering critical migratory routes with miniaturized trackers, monitoring remote seabird colonies by satellite, global platforms to monitor wildlife populations (wildlifeinsights.org), controlling the spread of invasive species with robots, tracking illegal forest clearing, and rediscovering species from trace DNA in the environment (Bridge et al. 2011, Groom et al. 2013, Schwaller et al. 2013, Hussey et al. 2015). Greater spatial and temporal monitoring scales can be achieved through integration of different technologies (Marvin et al. 2016). Emerging technologies, like synthetic biology (Piaggio et al. 2017), advanced artificial intelligence (Berger-Wolf et al. 2017), bio-batteries or the internet of things, promise increasingly powerful methods in coming decades for tackling conservation issues at global scales (Allan et al. 2018). However, although there are encouraging initiatives in conservation technology and promising signs of progress (Berger-Tal and Lahoz-Monfort 2018), there is currently a lack of global leadership, coordination, and support to maximize the positive impacts of conservation technology at the scale required to address global conservation challenges.

By enhancing on-the-ground management, research, monitoring, and policy, improved conservation technology, coupled with wider availability and uptake, will contribute to fulfilling obligations under international policy such as the Strategic Plan for Biodiversity 2011–2020 (Convention on Biological Diversity 2010), the United Nation’s Sustainable Development Goals (UN 2015), the Convention on International Trade in Endangered Species of Wild Fauna and Flora, and the Ramsar Convention on Wetlands. Improved uptake of technology will enhance knowledge and reporting and use of findings, enabling open tracking of progress toward internationally agreed targets (Snaddon et al. 2013). Capacity is currently lacking to monitor progress toward the achievement of agreed international biodiversity targets, diminishing their impact and social legitimacy, and limiting their power to halt environmental degradation and species extinction (IEAG 2015).

Opportunities and challenges

Since the industrial revolution, technology development has largely been driven by big industries like consumer electronics, infrastructure, biomedical, and the military (Berger-Tal and Lahoz-Monfort 2018). With a few but notable exceptions (e.g., telemetry; Kays et al. 2015), the conservation community has traditionally appropriated technologies developed for other purposes. But the technology landscape has massively changed in the last decade. Current trends see accelerating engineering achievements matched by low production costs, rapid prototyping, high computational power, and widespread access to the internet. Novel approaches to product development and the dawn of a new industrial revolution, with more agile design and production cycles, open the window to cheaper, more targeted technology. Some collaborative approaches, such as open-source hardware (Gibb 2014, Pearce 2017, Hill et al. 2018) and do-it-yourself or maker communities (Cressey 2017), are starting to harness collective knowledge thanks to near-global connectivity supported by emerging online platforms (and associated communities) for sharing and collaboration (e.g., www.instructables.com for electronics or www.thingiverse.com for digital designs including 3D-printing).

A growing international movement proposes that the time is ripe for the conservation community to move to the driver’s seat, becoming innovation leaders, actively seeking to design novel technologies and devices to suit the specific needs of the conservation community (Joppa et al. 2015, Allan et al. 2018, Berger-Tal and Lahoz-Monfort 2018). This unprecedented paradigm could provide cheaper, targeted, and modular tools, but will likely also face many technical, human, and organizational challenges. Within the last decade, similar calls to collaborative innovation “for good” have been made for accelerating discovery (e.g., open source scientific instrumentation; Pearce 2012, GOSH 2018) and contributing to sustainable development (Zelenika and Pearce 2014). Coupled with distributed manufacturing (Lowe 2019), open innovation has potential to produce technologies appropriate for local economic, political, and social conditions, sourced locally by communities to meet their needs, reducing the traditional dependency on foreign aid, large industries in developed nations, and traditional distribution channels (Zelenika and Pearce 2014). These arguments strongly resonate with the conservation community.

Some conservation organizations and research groups have already delved into small-scale development of conservation technology, either customizing off-the-shelf devices or even developing their own products (e.g., the Zoological Society of London’s Instant Detect camera-trap system), often in partnership with technologists. These technologies are sometimes disseminated as open-source (Hill et al. 2018) or intended as commercial products (Mennill et al. 2012, Kwok 2017). Despite some successes, conservation technology has only progressed in an ad hoc manner, largely based on individual uncoordinated initiatives. Overall, the potential of technology to assist on-the-ground conservation at global scales is not materializing well and fast enough. Project failure or lack of scaling are not typically reported or published, for obvious reasons. Based on the
collective experience of the authors, involved with different conservation technologies while working in academia, conservation organizations, and technology companies, we distinguish here two fundamental groups of reasons for this failure. First, the problem can be at the developer's end, either due to failed technical development, or the technology not scaling-up for impact. The latter could be due to lack of incentives: promising technology prototypes may be produced as part of research projects or within conservation organizations, but the interest to turn them into finalized products that are available to others (either commercially or as open source) is often missing. Even when the drive to expand exists, commercial and non-commercial attempts to scale-up technology may prove non-viable over the longer-term, for a variety of reasons including lack of existing valid business models and corresponding market, scarce funding for maintenance and customer support, or overestimating the size of the customer base or community of open-source contributors. Technology development itself may also fail if conservation organizations not familiar with engineering design and manufacturing processes underestimate the skills and resources required to custom-build or customize technology, particularly for use under the typically demanding field conditions.

Second, failure may also happen at the user's end. Inappropriate choices of technology, over-confidence, and over-reliance on technological solutions (the technology “hype”) or misplaced motivations to use them (e.g., quest for novelty or media attention) may lead to failed field deployment, or deployment of technologies that are not fit-for-purpose and hence do not help address conservation problems in practice, particularly considering a given ecological, social, and political context (McGowan et al. 2017).

Most of the reasons listed above reflect structural deficiencies in the way technology is developed, produced, distributed, and supported, rather than poor technologies, with organizations and individuals involved often lacking the business-oriented mindset that underpins general technology development (Iacona et al. 2019). This situation must change if technology is to play the transformative role necessary for global sustainability.

**Provision of key services for implementation**

Most of the individual ingredients for conservation technology to shift gears are already in place, including ingenuity, human and financial resources, connectivity, and data platforms. What is lacking is a series of key support functions, which we call here enabling services, that ensure the translation from innovation and development to sustained, effective application of technology at the scale needed for global conservation solutions. Such services would help support the full life-cycle of a technology product, from materials to ongoing service, maintenance, and recycling. These services would also help scale-up solutions for global impact, from drawing board to manufacturing and distribution of thousands of units. Other services like capacity building and best practice guidelines would also support uptake of appropriate technology by the conservation community. We identify three primary types of services (figure 1); the relevance of specific services will depend on the type of technology being developed (e.g., an electronic device versus computer software).

**Guidance and technical support.** Consumer-level technology often does not deliver exactly what conservation projects need. For example, an off-the-shelf drone may be ineffective for a specific biodiversity monitoring task without substantial customization (Pirotta et al. 2017). Conservation organizations are typically not familiar with or well equipped to manage engineering design and product manufacture processes. Such organizations are likely to underestimate the skills and resources required to customize fit-for-purpose technology. More broadly, technical support, product maintenance, and user training (e.g., field deployment techniques and/or data management and analysis) are also essential to ensure a sustained and efficient use of technology. In the open-source arena, needed services also include supporting the transition from prototypes (created by small-scale developers such as university researchers or individual innovators) to ready-to-use products by: purchasing batches; customizing the technology in-house to fit the needs of the conservation clients; and, if required, pooling designs from the wider open-source technology community, allowing for agile manufacturing. These services could support the development of customized conservation technology products at a reduced cost compared to generic commercially developed ones.

**Financial support.** Conservation projects and funding cycles are often not naturally matched to the requirements of technology design, development, iterative trialing, and the necessary failures associated with testing new technology in early stages. Short-term development is substantially easier to fund than the longer-term stages of the technology cycle, such as continued maintenance and support, or upgrades as technology matures. Moreover, some organizations may not have appropriate facilities to handle product commercialization. A financial buffer between technology developers and users is needed to minimize the impact of these issues. The human and financial resources required to sustain all the proposed services could be financed at least partly by reinvesting part of the income generated from providing technological solutions to the conservation community; this requires coordination when in a distributed collaborative open-source setting. Recent experiences (conservation technology initiatives that directly include revenue streams in their plans since ideation; e.g., AudioMoth, box 1) indicate there is a willingness to pay that premium. Freelance developers could also be employed when needed to fill development gaps, sustainably engaging with the wider open-source technology community. Furthermore, business-oriented planning and evaluation practices that have not been part
of the traditional conservation community toolbox, but are essential for developing and producing technology (Iacona et al. 2019), could be provided.

**Knowledge clearing house.** Objective, transparent appraisals of any technology are required to maximize trust with consumers and investors to expedite growth in development and uptake. A neutral entity is needed to collate and analyze feedback from field trials (failures and successes), synthesizing and providing independent advice (free of commercial interests) and honest appraisals of the limitations of technology. Understandably, it is unlikely that commercial companies would openly provide this kind of information. Best practice guidelines could be developed progressively, ensuring that the drive for developing or commissioning conservation technologies are aligned with conservation objectives and expectations, avoiding toxic motivations like the quest for novelty, seeking media attention or the appeal to “play” with new gadgets.

Many of the services above represent familiar concepts in the industry sector. Commercial technology businesses have traditionally taken care of the complete product pipeline from ideation to deployment and after-sales. But these services are currently either incomplete or non-existent in the emerging approaches to developing technology for conservation (box 2). Critical gaps in essential services can break this pipeline and compromise the long-term viability of products by disconnecting great conservation technology ideas and prototypes from their potential users at a global scale, driving the failure of many promising technology projects to deliver on-the-ground outcomes.
Box 1. The recently developed AudioMoth acoustic device (http://www.openacousticdevices.info) is one of the best existing examples of how technologist talent in a small independent team can achieve global scale, supported by service provision within the context of open innovation.

AudioMoth was developed by Open Acoustic Devices, a team of university researchers, as open-source technology; in a couple of years, it has become a popular device to assist monitoring for conservation. It can be assembled for significantly lower cost than the purchase of commercially available units, and performs well in field conditions (Hill et al. 2018). Unlike commercial alternatives, its processor can be programmed to run acoustic detection in-device. Both hardware (electronic board) and software designs are freely available online, with electronic schematics in CircuitHub (http://circuithub.com/projects/OpenAcoustics/AudioMoth), who can also manufacture it, and code in GitHub (http://github.com/OpenAcousticDevices/AudioMoth-Project). The hardware and software can be modified by anyone with the appropriate skills. Pictures from field tests of AudioMoth in the New Forest (United Kingdom) in search of the rare New Forest cicada Cicadetta montana (A) and in Belize’s tropical forests to detect gunshots (B). In (C), testing variability between devices during deployment in Belize. AudioMoth is a rare example of service provision that supports conservation technology development. Open Acoustics Devices designed the device but does not manufacture nor sell it. The Arribada Initiative (http://arribada.org), a UK-based conservation NGO established by a Shuttleworth Foundation Fellow (https://www.shuttleworthfoundation.org/fellows/alasdair-davies) has developed a group purchase model in unison with Open Acoustic Devices to aggregate demand from those around the world wishing to acquire AudioMoth units, and manage product shipping. Pooling a large order reduces manufacturing costs, hence driving down the price of a single device. Furthermore, any profits from sales are reinvested and made available to Open Acoustic Devices as a funding source to develop future versions of this device, fix bugs, or to cover support costs. This new approach ensures that the AudioMoth has a sustainable development pipeline and that the original developers are supported and financed appropriately, while avoiding the hassle of dealing with ordering and shipping.

AudioMoth and the Arribada Initiative represent an example of useful ad hoc service provision. The proposed conservation technology entity would have a greater capacity to provide or coordinate similar services that could help many projects from small teams to scale-up their products for global impact. Organizations like the Arribada Initiative could be part of the network of service providers coordinated and supported by the implementation arm of the entity. Other emerging small-scale developments that could benefit from support and service provision include the open-source FieldKit environmental sensing platform (by Conservify.org; http://conservify.org/core-projects/fieldkit) or the OpenCollar initiative (http://opencollar.io) to develop a radio-collar platform for tracking, as collaborative open innovation.

The way forward: international leadership and service coordination
We propose the establishment of an international entity that promotes the development and uptake of conservation technology for global impact, ensuring the continuity and sustainability of the conservation technology pipeline, from needs to support (box 2). This entity would achieve its mission by: (1) providing international leadership and coordinating conservation technology development within the broader technological landscape; (2) coordinating the delivery of the aforementioned key services to cover identified needs in a systematic way and with a business-oriented mindset; and (3)
Box 2. The conservation technology pipeline represents the steps from idea (motivated by the needs of the conservation community) to product deployment (by the conservation community).

Traditionally, commercial companies (developing either conservation-specific or consumer market technology) develop an idea into a manufactured product and provide after-sales support (including services like warranty and repairs, training, updates). This approach works well for high-volume consumer market products (e.g., GPS units), not specific for conservation use. Conservation-focused technology solutions tend to become expensive due to the smaller target market. Newly emerging models of technology development (e.g., collaborative open-source innovation) represent a big opportunity for conservation. In these, a developer designs a prototype but often does not manufacture it, and typically provides little or no after-sales services (the varying degree of involvement in those steps is indicated by the grey-lined area). Although some examples exist of conservation organizations taking ownership of the complete pipeline (i.e., acting as technology developers), typically they remain users (indicated by the grey-lined areas in other steps of the pipeline) and instigators of product ideas. We propose that an international entity should take ownership of providing the missing services, traditionally delivered by commercial companies, to cover the “new” gaps created between developers and users, ensuring the flow of the conservation technology pipeline. Depending on the case, provided services may extend into the research and development stages (grey-lined areas).

developing institutional links with global policy institutions (e.g., Convention on Biological Diversity) and providing strategic advice regarding conservation technology. Importantly, the conservation community should trust that this leadership, advice and services are provided with independence and transparency, free of commercial interests.

We believe the combination of leadership, service provision and linkage to policy and international institutions would provide solid grounds to progress conservation technology for impact. The entity would be well placed to address the reasons behind the current lack of significant progress, through several channels. The high profile of a globally recognized and legitimized entity would have strong leverage to attract the attention of a broad range of technologists (from individual “makers” to industrial companies) and connect them to the conservation community. Furthermore, a broad understanding of technology and conservation, coupled with recognized leadership, could lead to the creation of conservation technology roadmaps to help focus future development efforts into those technologies of greater impact. It could have means to incentivize small teams of developers to scale-up their ideas and prototypes of technologies identified as being of high impact for conservation and support this scaling process to deliver mature products that are either widely available or can be locally sourced, and that are viable over the longer-term, including all steps in the technology pipeline. It could also assist users (conservation researchers, practitioners, and policy makers) in their choice of appropriate technology and its effective and efficient field deployment and use, in collaboration with other existing players in this field (e.g., conservation technology online platforms and communities, conservation NGOs (nongovernmental organizations interested in guidelines for technology use).

By working at the interface between developers and users of conservation technologies (figure 1), the conservation...
technology entity would act as a buffer that decouples the respective risks and challenges of developers and users. It would free small-scale developers from the burden of providing services like customer support, marketing, and training, that may limit their capacity to scale-up and evolve their technology. This would allow them to concentrate their resources on their core interest of developing technology. The services provided would also shield the users from potential risks of working with non-commercial developers. For example, open-source designs could safeguard users from a specific developer moving on to other ventures, providing continuity. The global nature of this entity would also help connect the learnings from early technology adopters who will risk failing at times (as part of their role) with late adopters that only use mature technology for critical conservation projects that cannot afford failure. Although many of these elements can be provided in an ad hoc manner for specific cases, an international entity would provide the broad coverage, systematicity, overview, and leadership required to achieve wide impact.

Regardless of the exact nature of the proposed entity, we believe there are benefits in a two-pronged approach (figure 2). Our suggestion is inspired by the structure of the Technology Mechanism of the United Nations Framework Convention on Climate Change, UNFCCC (described in more detail in box 3), created to enhance climate technology development and transfer to developing countries. On one hand, the leadership arm of the entity (akin to the Technology Executive Committee of the UNFCCC Technology Mechanism) would provide leadership, strategic vision (e.g., identifying what technologies to concentrate on), oversee technology development, and provide policy advice and cross-institutional links with other intergovernmental entities regarding the use of conservation technology. On the other hand, the implementation arm (akin to the Climate Technology Centre and Network of the UNFCCC Technology Mechanism) would provide the key technical, financial, and knowledge support services discussed in the previous section. This could be a mixture of direct provision and by nurturing and coordinating an international network of independent service providers to fill critical gaps in the technology development pipeline (box 2). This implementation arm would function to identify and evaluate candidate technologies from developers, whether individual innovators, research labs, conservation organizations, or private sector companies. These processes would be informed by feedback from the conservation community.

**Exploring organizational models**

A range of organizational models could accommodate the roles we envisage for the proposed conservation technology entity; we sketch here several options. On one end of the spectrum, it could be loosely defined and consist of open partnerships between existing individual organizations and foundations (e.g., conservation NGOs), collaborating to offer leadership and key implementation services. Leading conservation organizations, private sector, and research universities could partner to deliver services that are available to all. Examples include computer vision models and training datasets for camera trap data made available through specific multi-institutional initiatives.
Box 3. Established in 2010, the Technology Mechanism of the United Nations Framework Convention on Climate Change (UNFCCC) is dedicated to helping countries “to develop and transfer climate technologies so that they can effectively reduce greenhouse gas emissions and adapt to the adverse effects of the changing climate”.

The UNFCCC’s Technology Mechanism consists of two bodies, the Technology Executive Committee (TEC), and the Climate Technology Centre and Network (CTCN). The TEC provides high-level leadership and policy advice on linking climate technologies with government policy, and identifies technology gaps and opportunities for member parties. It is also charged with maintaining effective cross-institutional policy links with other intergovernmental entities, such as the Global Environment Facility and Green Climate Fund. The CTCN, on the other hand, is focused on providing technical assistance to its members, and enhancing the rate at which technology is deployed on-the-ground through building networks between policy makers, technology providers, and crucially, financiers. Together, these two arms of the Technology Mechanism assist parties to the UNFCCC to develop climate-focused technology policies, foster collaborative networks, and access financing to fulfil their obligations and emissions reduction targets under the Paris Agreement.

The critical nature of service provisioning is demonstrated by the CTCN, which includes a coordinating center but also a large worldwide network of organizations (from academia, civil society, and research, and the finance, private, and public sectors) that deliver complementary services. There is a demonstrable demand for the CTCN’s services, with a membership base that doubled between 2015 and 2017, a concomitant 440% increase in requests for technical assistance, and 350 projects registered for financial support.

At the other end of the spectrum, the entity could be a formal institution, as a long-term centralized solution with a broader technology scope. We suggest that this institution could be intergovernmental. For instance, it could be shared among the United Nations Environment Program (UNEP) and the United Nations Development Program (UNDP), which have the mandate and capacity to establish links between countries, businesses, and communities globally. Although the intergovernmental option would certainly take longer to establish and be more bureaucratic, we believe it could provide stronger legitimacy for interacting with international policy, other international organizations (e.g., in sustainable development), individual governments, and industry. A UN-mandated institution could have leverage to attract technologists to contribute to nature conservation, and generate interest and momentum for collaborative innovation. It would keep a strong and explicit link to global biodiversity targets and agreements, including Article 16 of the Convention on Biological Diversity which explicitly calls for a transfer of technology to developing countries (Convention on Biological Diversity 1994). The leadership arm of the institution could be involved in exploring how technology can support the discussions under the Intergovernmental Science-Policy Platform on Biodiversity (IPBES), an intergovernmental body created to strengthen the science-policy interface for biodiversity and ecosystem services. Perhaps one of the strongest arguments for an intergovernmental institution is that of funding and social justice. It could provide funding mechanisms not available through other organizational structures, including formal instruments for nations to support economically the global effort to scale-up innovation for conservation of biodiversity and ecosystem services, and opportunities for developed countries to contribute funds, know-how, and technology to developing countries. The challenge is to do so while avoiding creating new forms of

(e.g., http://www.wildlifesigns.org), software tools for law enforcement (SMART; http://smartconservationtools.org), or the Application Programming Interfaces (API) approach deployed by Microsoft’s AI for Earth program to provide machine-learning based building blocks of new software services dedicated to biodiversity conservation. Other examples include NetHope (http://nethope.org) that brings organizations together for a common purpose; or online platforms specific to biodiversity, including wildlabs.net, a community of practice encompassing conservationists and technologists, or Conservation X Labs’ Digital Makerspace (conservationxlabs.com/digital-makerspace), which allows conservation technology projects to actively seek collaboration from technologists. Additionally, open committees could be formed to service some of the needs regarding standards, guidance, and knowledge (e.g., around new data streams, modelling approaches, or sensors). The main advantage of this pragmatic approach with a loosely-defined distributed entity is that it would provide an agile and flexible starting point to “get the ball rolling” based on existing organizations, in a way that is relatively easy to scale-up. The financing of these activities could be spread across participating organizations or a “conservation technology fund” could back some or all of the services. As a start, different components of this distributed entity might develop around specific types of technologies (e.g., acoustic monitoring) in a more organic way. In contrast, a more mature version of this entity would not be technology-specific but should be able to service a range of conservation technologies, depending on identified priorities and gaps, with the type of services provided matched to the needs of each type of technology. This higher level of coordination and global leadership could be achieved if these distributed partnerships coalesced into a single entity through a global alliance of conservation and technology stakeholders, who could collectively fund its activities.
technological and economic dependency; open innovation might be key to achieving this. The commitment from UN members to set up and finance the proposed institution could be partly offset by the overall savings through efficiency in delivering on existing biodiversity commitments, as such savings would derive from the institution’s role as a conservation technology catalyst. The arguments outlined here to support the option of an UN-based institution resonate with the mandates of the abovementioned Technology Mechanism of the UNFCCC, within the context of climate change and associated technologies.

Conclusions
Technology by itself will not solve our conservation problems. Economics, politics, culture, and ethical, equity and welfare considerations will determine the success of conservation actions and technology deployments therein (Sandbrook 2015, Driscoll et al. 2018). We also acknowledge the significant institutional, logistical, and political challenges to be overcome for such an entity to be created and become effective in realizing the potential of conservation technology—particularly if intergovernmental. However, time is too short and resources too thin to achieve critical conservation outcomes and halt degradation and species extinction without taking full advantage of the power of modern technology. Tapping targeted and well-developed technological solutions is a key part of the support needed for conservation to be effective in saving species and habitats. Thus, it is time to coordinate efforts to overcome the challenges and impediments. The long-term viability and growth of appropriate technology development, its uptake and use, can only be achieved collectively, with some degree of coordination and institutional support.

A coordinated approach to provision of key services, global leadership, and linkages to global biodiversity policy would contribute to scaling-up conservation efforts for global impact. The entity we propose would connect conservationists, academia, industry, and policy makers, anticipate future technology changes, mobilize capacity by connecting key stakeholders in the innovation chain, mitigate risks, and streamline the development pipeline for conservation technology. It would ensure the long-term viability of useful conservation technology products, sustainably growing a community of developers and users, and delivering benefits to both (figure 1). The promotion and support of open-source innovation could contribute to democratizing the development and use of conservation technology, providing more equitable opportunities for individuals, small organizations, and developing countries (Convention on Biological Diversity 1994, Baden et al. 2015). With conservation technology coming of age, and similar collaborations emerging for developing scientific instrumentation and technology for sustainable development, now is the time to establish the much-needed leadership, coordination, and services that will deliver tangible results for biodiversity conservation at global scales.

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