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Biodiversity futures: digital approaches to knowledge and conservation of biological diversity

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Abstract. Biodiversity, encompassing species diversity, genetic resources, and ecosystems, is essential for human well-being and quality of life. However, the scale of human activities has significantly impacted the planet's biodiversity, with many species facing extinction in the coming decades with unknown consequences. Global commitments, such as the Aichi Biodiversity Targets and the United Nations (UN) Sustainable Development Goals, are not delivering consistent results, and progress on conservation has been frustratingly slow. With a short time frame to meet the 2030 targets of the Kunming-Montreal Global Biodiversity Framework, urgent action is needed to address the crisis. Digital technologies emerge as indispensable tools in understanding, monitoring, and conserving biodiversity. They offer multiple solutions, from remote sensing to citizens involvement mediated by science apps, providing unprecedented volumes of data and innovative tools for conservation efforts. Despite their immense potential, digital solutions raise concerns about technology and data accessibility, environmental impacts, and technical limitations, as well as the need for specialized human resources, robust collaboration networks, and effective communication strategies. This paper, drawn from discussions at the Digital with Purpose Global Summit in 2023 and 2024, held in Portugal, and complemented by expert opinion and literature, reflects on existing biodiversity-related digital technologies, identifies challenges and opportunities, and proposes steps to strengthen the nexus between technology and the biodiversity agenda. By providing science and technology stakeholders with recommendations on accelerating the role of digital technologies in biodiversity knowledge and conservation, it aims to catalyse impactful change in this critical field of devising brighter futures for biodiversity and humanity.

1 Introduction

Our planet is facing a biodiversity crisis largely due to human activities. One of the most comprehensive assessments of global biodiversity to date, as outlined by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019), reports that we have significantly altered most of the Earth's land surface and impacted its oceans; some 85 % of the world's wetlands and 50 % of its coral reefs have been destroyed; forest cover has declined in highly biodiverse regions, particularly in the tropics; and one in four known animal or plant species that have been studied in detail is threatened with extinction, which is happening at an unprecedent rate (Ceballos et al., 2015).

Despite global agreements on these matters, we are not doing enough to halt biodiversity loss and degradation. The Aichi Biodiversity Targets, set by the United Nations (UN) in 2010, were largely missed by the 2020 deadline, with just 6 of the 20 targets being met and only partially (CBD, 2020). We are now far from delivering on the promises made in 2015 to protect and sustainably use marine and terrestrial ecosystems and natural resources by 2030, as set out in the Sustainable Development Goals. Halfway to that deadline, less than 30 % of progress indicators for Goals 14 ("Life under Water") and 15 ("Life on Land") are on track to be met (UN, 2023). Environmental problems, such as ocean pollution, overfishing, desertification, forest loss, and a lack of sufficient protected areas, are not being adequately addressed. In December 2022, governments adopted the Kunming-Montreal Global Biodiversity Framework (GBF), a fresh round of goals to preserve Earth's living environment. The GBF outlines a set of 23 urgent biodiversity targets for 2030 and a more ambitious vision to be achieved by 2050 (CBD, 2022; Aubert and Dudley, 2024). With less than 6 years to fulfil these renewed commitments, progress on targets and resource mobilization is very slow and seems to lack coordinated governmental and institutional support, as was evident in Cali, Colombia, at the COP16, which, despite the creation of the Cali Fund, failed to secure concrete agreements for biodiversity conservation funding (DG-ENV, 2024).

Technology has always played a role in biodiversity knowledge and conservation. Early naturalists relied not only on pencil and paper to document species and habitats during their expeditions, but also on plant presses, compasses, magnifiers, and microscopes, for instance (MacGregor, 2018). As technology evolved, so did the understanding of how our interactions with nature affected ecosystems and resources, oftentimes with new technologies fuelling our capacity to negatively modify our environment. Even with these caveats, technological innovation is now seen as a catalyst for the transformative change society must undergo to address the biodiversity crisis. The magnitude of the challenges we face requires new tools to amplify our capacity to collect, analyse, and share data; to scale up our conservation efforts and make them more efficient; to identify and predict trends; to generate awareness among all sectors of society; and to boost collaboration between different sectors and stakeholders.

On the one hand, digital technologies offer an increasingly wide range of solutions for understanding, monitoring, and protecting biodiversity. Satellites, drones, and sensors have improved our ability to observe, monitor, and catalogue the functioning and health of ecosystems (Cavender-Bares et al., 2022). Artificial intelligence is being used to compile and analyse large datasets in ways that were unimaginable just a few years ago. Technologies that have been used for decades, such as camera traps, are now coupled with computer vision and machine learning (Silvestro et al., 2022). Mobile apps promote citizen science and conservation awareness among the public (Lemmens et al., 2021). Online repositories, libraries, and other platforms facilitate data sharing and collaboration across the scientific community. Blockchain, bioacoustics, virtual reality, and several other technologies have been added to the tools available for biodiversity research and conservation (Lahoz-Monfort and Magrath, 2021). On the other hand, we must also be aware of the impacts and social and environmental costs accompanying digital technology use and development, which require huge amounts of energy and critical materials and resources, account for a large percentage of global carbon emissions, and add up to the mounting e-waste (Creutzig et al., 2022). Furthermore, the present emphasis on datafication, if led uncritically, may reinforce the existing power imbalances embedded within information flows and knowledge structures, thereby aggravating the existing divides between the Global South and western institutions (Milan and Treré, 2019; Sandbrook et al., 2021).

The Digital with Purpose Global Summit (DwP), organized by the Global Enabling Sustainability Initiative (GeSI), connects global leaders, decision-makers, and experts from diverse fields to accelerate the use and adoption of digital innovations for the benefit of society. For the past two editions, the authors have co-organized the Biodiversity Futures programme within the DwP, bringing together researchers, community leaders, NGOs, policymakers, innovation and industry leaders, and science communicators from around the world. Our main goal with this paper is to report and reflect on the discussions at the DwP2023 and DwP2024 in order to offer a brief overview of existing biodiversity-related digital technologies and, above all, to identify the current challenges and opportunities to strengthen the nexus between digital and biodiversity agendas.

2 Opportunities and challenges of digital technologies

Cataloguing and assessing the distribution of biological organisms represent just the most straightforward tasks that may be more effectively and efficiently accomplished as technology evolves. However, the potential applications of digital tools in this field are vast. Consider the following example. There is a growing concern that new roads are being built at an accelerated pace, often with minimal planning and consideration for natural ecosystems. By 2050, it is estimated that the global road network will have expanded by an additional 25×10^6 km (Laurance and Arrea, 2017). The expansion of these infrastructures has the potential to exacerbate a range of negative impacts on biodiversity, particularly in tropical forests. These include habitat fragmentation, poaching, illegal logging, and land grabbing, among other effects. The mapping of these linear structures on a large scale represents a challenging and time-consuming undertaking (Engert et al., 2024). While satellite imagery is an invaluable tool for monitoring deforestation, it is less effective for identifying new roads that are obscured by vegetation. These so-called "ghost roads" remain significantly under-mapped on a global scale. To address this issue, Sloan and colleagues have employed artificial intelligence techniques by training three machine learning models on publicly accessible road data, resulting in the accurate generation of automated road mapping (Sloan et al., 2024). Such integrated strategies show the potential of digital tools and may lead to the development of fully automated monitoring frameworks, for instance applied to ecological communities, to detect, track, classify, and count multiple species and record behavioural and morphological traits (Besson et al., 2022).

In plant sciences, digital technologies are driving significant advancements. For example, precision agriculture uses drones, sensors, and artificial intelligence (AI) to monitor crop health, soil conditions, and weather patterns, optimizing resource use and increasing yields, and plant phenomics uses machine learning to analyse vast datasets of plant traits, accelerating plant breeding programmes (Brink, 2024).

Digital technologies can also play a role in understanding and maintaining the links between cultural and biological heritage, reflected in biocultural diversity. For instance, the emergence of transdisciplinary environmental research fields, such as digital plant humanities, attends to the interconnected material, historical, cultural, and technological facets of the botanical world, working on the assessment and preservation of local and indigenous knowledge (Arthur and Ryan, 2024).

Novel approaches to monitoring the natural world can also serve as valuable tools for achieving objectives within a One Health context. To illustrate, the University of Oxford has devised a system for the identification and tracking of mosquito species on a smartphone application – HumBug – that records the insects' flight sounds (Sinka et al., 2021). The system enables a more effective identification of vectors of diseases such as malaria, which is responsible for over 600 000 deaths annually, predominantly in developing countries (WHO, 2022).

The development and rapid uptake of digital tools and technologies are accompanied by inherent constraints and difficulties. A recent report by the Global Partnership on Artificial Intelligence (GPAI) notes that while AI has the potential to assist in understanding biodiversity trends and drivers, as well as in policymaking and action, it may, in certain circumstances, fail to add significant value or yield poor and biased results. AI models trained with skewed, biased, or highly contextual biological data may extrapolate patterns and provide weak correlations (GPAI, 2022). Along this algorithmic bias, a further concern is that technologies which generate knowledge at the macrolevel through automation may ultimately result in the marginalization of traditional knowledge at the microlevel, thereby exacerbating existing inequalities if the rights and capacities of local communities are not fully considered (AIPP, 2023).

The increasing collection and storage of biodiversity data through citizen science applications and other technologies give rise to concerns regarding data bias, privacy, and accessibility (Sandbrook et al., 2021). While technology can assist in the gathering and interpretation of vast amounts of data, it is essential to consider the socioecological variables that may introduce bias (Carlen et al., 2024), the role of gatekeepers in this process, and the parameters of data and technology access (Hsing et al., 2024). A global, community-sourced assessment of the state of conservation technology based on a survey of 248 individuals in 37 countries mapped the strengths and weaknesses of 11 types of technology (Speaker et al., 2022). Some of the limitations identified are technical in nature, such as issues with batteries or connectivity that restrict the effectiveness of camera traps and networked sensors. Other obstacles to the adoption of these technologies are more structural in nature, including their cost and the simple fact that some of them are not straightforward to use. In summary, although a plethora of digital conservation technologies are available, they are not yet plug-and-play solutions that can be readily deployed in any context.

A further factor to be considered when adopting digital technologies is their impact on the environment and on the use of natural resources. Sensors, drones, satellites, smartphones, and cameras require energy to function, and batteries include rare materials in their composition, the mining of which is often an environmental and social problem. Furthermore, when no longer in use, this equipment needs to be disposed of in an environmentally responsible manner, at the risk of generating harmful electronic waste (Creutzig et al., 2022).

2.1 Digital technologies for biodiversity

From carbon offsetting to the preservation of traditional knowledge, ecosystem assessment, species identification, and pollution monitoring, the use of digital technologies encompasses a wide range of initiatives aimed at addressing environmental challenges and promoting sustainability. These tools highlight the importance of data-driven approaches, community engagement, technological innovation, and conservation efforts. The list of currently available resources is inspiring, reflecting the extensive and integrated present-day use of digital technologies for biodiversity purposes (see August et al., 2015; Lahoz-Monfort and Magrath, 2021; Besson et al., 2022; Speaker et al., 2022). Although this field is undergoing continuous improvement and expansion, it seems useful to assemble a selection of illustrative examples demonstrating the integration of the digital agenda within the domain of biodiversity knowledge and conservation.

Remote sensing: Remote sensing uses a variety of technologies, such as satellites, drones, radar, lidar, GPS, GIS, and sensors, to map and monitor ecosystems and detect illegal activities such as poaching, logging, and illegal trade (Cavender-Bares et al., 2022). Online forest monitoring platforms, for example, combine satellite imagery and radar data to create maps that allow anyone to track deforestation, forest fires, ghost roads, and other changes in forest cover around the world in real time (Sloan et al., 2024).

Artificial intelligence: AI is a powerful technology for monitoring nature (Silvestro et al., 2022). Machine learning has been instrumental in collecting and analysing massive amounts of data and predicting changes in ecosystems, using historical and environmental variables. Computer vision makes it possible to identify species and their behaviour from images taken by camera traps or satellites – currently the most common application of AI in biodiversity monitoring.

Environmental DNA (eDNA): DNA from soil and water samples collected with easy-to-use devices provides detailed information about the species that are present in a given area, allowing us to delve into the cryptic and invisible, for instance, in the soil compartment. Environmental DNA (eDNA) can be used for many purposes, including environmental impact assessments and sequencing and analysis technologies, including DNA barcoding and metagenomics, which feed information into large online genetic databases (Sahu et al., 2023).

Computational bioacoustics: Acoustic monitoring of animals has been in use as early as the beginning of the 20th century (Mankin et al., 2011). In recent decades, however, computational bioacoustics has developed dramatically, driven by modern and affordable equipment and the power of computing. Bioacoustics has been applied to monitor the abundance, behaviour, and whereabouts of birds, frogs, bats, marine mammals, bees, and mosquitoes and even the health of coral reefs (Williams et al., 2022; Pérez-Granados, 2023).

Blockchain: Blockchain seems to be particularly useful for tracking the legal and environmental integrity of products derived from natural resources by tracing their origin at any point in a supply chain. Finance is another area where blockchain is already present, especially in cryptocurrencies. Blockchain was the main financial technology applied to biodiversity among 60 tools analysed by a green digital finance report in 2020 (GDFA, 2020).

Mobile apps: User-friendly applications that allow anyone with a smartphone to collect and share data about the natural world and how we interact with them are revolutionizing the role of citizen science (Lemmens et al., 2021). By reporting species sightings and other observations, citizens create knowledge about biodiversity and contribute to research and management planning of natural areas. Increasingly, mobile apps are integrated with AI algorithms that identify species and automate data analysis and sharing.

Virtual reality: By immersing users in digital environments that are otherwise inaccessible, virtual reality (VR) and augmented reality (AR) offer a wealth of opportunities for research, education, and conservation projects. Many nature parks offer 360° audiovisual virtual tours that can be accessed on computers and headsets. Other projects offer VR experiences to raise awareness on biodiversity loss. VR and AR also have the potential for training (Arce-Lopera et al., 2021; Ferzli et al., 2019) and for fundraising efforts (Nelson et al., 2020).

Data sharing platforms: Online data sharing platforms are essential for providing access to the growing volume of biodiversity information to researchers, conservationists, policymakers, students, and the general public. There are already many research infrastructures, both regional and global, that act as one-stop platforms linking different data repositories on life on Earth, such as the Global Biodiversity Information Facility (GBIF), which have been instrumental in generating new knowledge and defining conservation priorities (Güntsch et al., 2024).

2.2 The power of individuals and communities

Digital technologies are fuelling momentum in the field of individuals' contributions to and participation in knowledge production. Because of its importance in terms of both data creation and what it means to the openness, transparency, and understanding of science, citizen science, in its many forms and designations (contributory, community, participatory; see Ellwood et al., 2023), is an integral part of a successful biodiversity conservation strategy. Most citizen science biodiversity-related projects involve the public in collecting and sharing data about what they see in nature. Laypeople participation in natural observations has a long history, but this involvement has grown significantly with the shift from more organized projects, such as surveys of plants or animals in a region over a period of time, to less structured and decentralized projects, with more relaxed protocols and commitments, where citizens use mobile applications at their own pace and will (Johnston et al., 2023).

A constellation of online platforms and apps is available to anyone wishing to report sightings, learn about biodiversity, and contribute to the production of scientific knowledge. Their aims are diverse, ranging from simply collecting data on major taxonomic groups, such as plants, insects, birds, mammals, or reptiles, to focusing on specific objectives such as mapping marine litter or monitoring invasive species (Price-Jones et al., 2022). People-generated data are actively contributing to biodiversity research. For instance, data collected by citizen science applications were used by researchers to assess bird diversity in urban areas in the United States (Callaghan et al., 2019) and to study birds and butterflies in Natura 2000 sites in Europe (Pellissier et al., 2020). Other examples include the census of sea slugs in the Tasman Sea (Nimbs and Smith, 2018) or a citizen science initiative that found 197 taxa of fungi new to Denmark and 15 new species to science (Heilmann-Clausen et al., 2019). These participatory science initiatives have an impact on citizens themselves. A survey of participants of 63 projects in Europe, Australia, and Aotearoa / New Zealand found positive outcomes in terms of knowledge and skill acquisition, interest in science and the environment, and behaviour changes towards the environment (Peter et al., 2021).

3 Priorities for safeguarding biodiversity

The discussions at the DwP, in 2023 and 2024, highlighted several priorities, including the identification of existing knowledge gaps as a cross-cutting issue in any meaningful effort to accelerate biodiversity knowledge and conservation. To some extent, many of the identified priorities themselves represent knowledge gaps, given that the urgency of addressing them requires more and better information. By analysing the focus of the priorities for biodiversity knowledge and conservation, both by topic and by the stages in which they are to be implemented, the following sections contextualize their importance, elucidate how they can benefit from the development and use of digital tools and technologies, and demonstrate how the power of people and the digital agenda can be mobilized for biodiversity conservation.

3.1 Knowledge and conservation

A fundamental objective of biodiversity research is to gain an understanding of the vast number of species that exist on Earth. To that end, new generations of taxonomic experts need to be trained, and large collaborative networks in systematics must be promoted, particularly in economically disadvantaged but biodiverse countries. Cross-disciplinary collaboration between taxonomists, evolutionary biologists, and ecologists can enhance the impact of biodiversity research, particularly when supported by the consistent use of scientific collections, achieved by mass digitization of specimens and the widespread accessibility of scientific knowledge and data on biodiversity. However, initiatives that integrate and value traditional knowledge, ecological and cultural, must be implemented without delay.

The use of advanced technologies is enabling new insights through the promotion of global collaboration for the collection and dissemination of data and the processing of these extensive datasets. Large investments are being made in information infrastructure, but the promotion of data sharing in common formats must be achieved. It is of utmost importance to ease the sharing of technology and knowledge across geographical boundaries, particularly between the Global South and the Global North, to effectively address the biodiversity crisis. The promotion of open access to data and the assurance of compatibility with existing systems help prevent duplication of information and foster collaboration.

Conservation efforts should be concentrated on mitigating the adverse effects of habitat disruption; reversing the loss of biodiversity functions; and addressing global change drivers, including pollution, over-exploitation, and climate change. Improved management of wetland ecosystems is essential for the sequestration of carbon and the maintenance of biodiversity. It is of equal importance to preserve and restore marine and coastal habitats, as these areas frequently represent biodiversity hotspots and provide vital ecosystem services. The effective management of the spread of invasive alien species and the restoration of degraded habitats represent pivotal actions for the sustenance of ecosystem health and resilience.

The development of national and international standards for nature and area accounting and the creation of metrics to track progress on international agendas are also priorities. For example, the development of a fair and inclusive definition of other effective area-based conservation measures (OECMs) is a crucial step. This definition should be valid to a diverse range of rights holders and actors, including indigenous peoples and local communities, government agencies, sectoral actors, private organizations, and individuals.

Digital technologies offer innovative avenues to achieve these goals. Artificial intelligence (AI) and machine learning are being employed to enhance the effectiveness of conservation efforts through more detailed mapping and management. Virtual research environments (VREs) are online platforms that integrate resources at all levels of e-infrastructure, including networking, computing, data, software, and user interfaces. VREs have the potential to function as virtual workspaces where researchers can access data, analyse information, and collaborate with colleagues across disciplines on various aspects of biodiversity (e.g. TaxonWorks). Metaverse technologies, including virtual and augmented reality, can revolutionize learning and thinking by providing access to more inclusive scientific labs and research networks, overcoming spatial and temporal barriers in a secure, affordable, and environmentally friendly way.

3.2 Detection and monitoring

The priorities for biodiversity recognition and monitoring include improvements in detection capability, the mapping and tracking of ecological functions across diverse ecosystems, the promotion of long-term monitoring studies, and the continuous assessment of environmental conditions. The involvement of citizens in these activities has become a significant aspect to consider, driven by a proliferation of interest and the emergence of numerous initiatives in the domain of participatory community science.

Furthermore, making use of larger computational capacities, efforts should be directed towards the development of predictive models that can anticipate adverse events and identify potential impacts on natural resources. Such categorization of conservation efforts can enhance more targeted and effective actions, ensuring that critical areas and species receive the attention they require. These actions must be designed to enhance our comprehension of changes in both nearby and remote ecosystems, thereby aiding the formulation of more successful conservation strategies.

Digital tools and technologies have transformed the way biodiversity is recorded and monitored. The streamlining of data collection and analysis processes, coupled with the use of AI and machine learning for the processing of large datasets, represents pivotal areas of advancement. Technologies such as AI-based identification and mapping accelerate monitoring and tracking of changes, including the early detection of wildfires, illegal poaching, logging, and processes of biological invasion. Visualization tools and open access to data repositories have allowed for greater transparency and stakeholder engagement, rendering data more accessible and user-friendly. The creation of biodiversity data portals has enhanced our capacity to centralize and disseminate scientific information, simultaneously serving as important popular communication platforms.

3.3 Integration and innovation

Any successful strategy needs to communicate in clear terms, disseminating the need for the conservation of biodiversity to wider audiences while also fostering an understanding of the interconnections between cultural and biological diversity. Games with social impact seem to effectively generate awareness and improve environmental literacy and should thus be the focus of additional efforts. For instance, E-Line Media, in partnership with traditional storytellers from the Iñupiat indigenous people of Alaska, developed Kisima Inŋitchuŋa (Never Alone), a game aiming to disseminate the narratives of native folklore through entertainment while also fostering renewed interest in Alaskan indigenous culture.

Biodiversity should be more integrated into the broader design and development processes in order to create sustainable, productive, and urban environments. This objective is aligned with the principles of precision agriculture and the thinking and development of smart cities. The implementation of blue–green infrastructure in urban areas has the potential to enhance biodiversity while simultaneously providing ecosystem services that improve human well-being. It seems clear that innovation and sustainable practices need to be developed and applied in the agricultural sector, as the growth in population and subsequent demand for food are expected to present significant challenges to biodiversity conservation. This integration will be contingent upon the design and implementation of nature-based solutions, multifunctional agroecosystems, and the advancement and adoption of water technologies.

3.4 Development and uptake of digital technologies

The use of digital technologies requires an acknowledgement of the restricted access to and limited proficiency in digital technologies that are prevalent in numerous countries, particularly in economically disadvantaged regions. Prioritizing investments in the development of human capacity in these areas has the potential to significantly enhance global biodiversity conservation efforts. By enhancing access to digital resources and providing instructions on their use, it is possible to guarantee a more equal distribution of technological advantages and encourage global involvement in safeguard initiatives.

Innovation in digital technology for biodiversity conservation must be collaborative and inclusive. The collective identification of challenges and the co-creation of solutions with users and relevant stakeholders will guarantee the development of more effective and sustainable outcomes. Co-developing and co-creating end-to-end digital solutions with the contribution of all interested parties ensure that technologies are tailored to real-world needs and challenges. A relevant example that needs to be addressed is the prevalent issue of AI training with potentially biased data.

Collaboration between private sector experts, digital technology leaders, and science-led conservation entities must be established to facilitate the development of practical and impactful solutions. Furthermore, creating awareness on the role of nature in contributing to human well-being through educational, policy, and governance initiatives will allow for more informed and supportive conservation actions. Piloting digital technologies in local contexts and expanding successful initiatives to broader networks can demonstrate the practical benefits of these tools and encourage wider adoption.

3.5 Sustainable funding and resources

Securing adequate funding is critical for the success of long-term monitoring projects and other conservation initiatives. The development of business models that support the collection and sharing of primary data as global public goods while focusing on value-added analytical services has the potential to drive innovation and sustainability in biodiversity conservation. This entails ensuring that financial resources are allocated to the most appropriate expertise for the specific tasks at hand, thereby optimizing the impact of conservation efforts. Chief among these is the recognition of the invaluable services that local and indigenous communities provide to the global community in terms of effective conservation efforts and enhancing climate change resilience. Despite representing less than 5 % of the global population, the world's estimated 370 million indigenous people manage over 25 % of the Earth's land surface in many biodiversity hotspots (Garnett et al., 2018). Enabling shared research, development, and innovation agendas can align priorities and resources towards common goals. Targeted funding and joint calls for funding can help shape research priorities and encourage collaborative efforts.

3.6 Ethical and responsible development

It is now clear that conserving biodiversity is humanity's duty but also equates to a human right. The development and deployment of digital technologies in the field of biodiversity conservation must be informed by a commitment to transparency, ethical conduct, and responsibility. We should systematically address greenwashing initiatives in order to maintain credibility and trust. The creation of suitable digital tools for governance and management, based on bottom-up consultancy, ensures that solutions are firmly rooted in local realities and needs and that the access to and benefits derived from data are shared in a fair manner. The identification and resolution of technological constraints during the innovation and development phases can facilitate the creation of more effective and sustainable tools. It is imperative to acknowledge the environmental impact of digital technologies and strive towards the development of more sustainable solutions.

3.7 Knowledge sharing and collaboration

Increasing collaboration at local, national, and international levels can break down barriers between different disciplines and domains. A comprehensive understanding of biodiversity through shared knowledge is necessary for informed decision-making and effective conservation strategies.

Training and communication around existing standards and technologies are essential for maximizing the use of digital tools in biodiversity conservation. Organizing targeted workshops, presentations, and events, particularly in the Global South, can raise awareness and build capacity. A better understanding of stakeholders' needs can drive more effective training programmes. Providing safe spaces for networking, dialogue, and collaboration will nurture long-term relationships and facilitate the exchange of experiences, ideas, results, and solutions. Establishing multi-stakeholder platforms for ongoing dialogue is essential for sustained collaboration. Enabling knowledge sharing through digital platforms and open data initiatives can enhance collaboration and innovation. Creating platforms that all stakeholders can use and agreeing on a common infrastructure model that incentivizes cooperation and sharing are crucial. Ensuring proper credit and attribution can encourage participation and collaboration.

4 The futures of biodiversity

The DwP Biodiversity Futures programme has been acting as a biodiversity think lab of a global community that is engaged in a concerted effort to secure a sustainable and biodiverse future for our planet. Discussions at summits provided us with multiple digital perspectives and strategies to address biodiversity knowledge, loss, and conservation. This path involves creating a beneficial relationship between biodiversity protection and technological progress, ensuring that digital tools and innovations are sustainable in themselves and can effectively contribute to supporting conservation efforts. We emphasize the importance of considering the complex perspectives of the multiple actors involved in biodiversity stewardship to achieve informed and just decision-making, global collaboration, public participation, and the integration of digital agenda solutions in conservation.

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