


Mapping a conservation research network to the Sustainable Development Goals

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Abstract

The United Nations Sustainable Development Goals (SDGs) provide a global blueprint to end extreme poverty, reduce inequality, and protect the planet. Progress toward these goals is falling short. Achieving the SDGs requires coordination among government, private industry, and nongovernmental organizations to align the actions of multiple sectors with SDG targets. Adapting an approach used by industry sectors, we mapped the Smithsonian Institution Working Land and Seascapes network to the SDGs. The network of programs aims to foster healthy and productive ecosystems through collaborations with diverse stakeholders. Across the network, we identified clear and measurable contributions to 16 of the 17 SDGs and specifically mapped past and current activities to 76 of the 169 targets, thereby demonstrating how conservation actions can contribute to achieving the SDGs, beyond SDGs 14 and 15. We also identified the need for clear results chain and greater capacity to achieve the SDGs and then provide examples of how different sectors can increase complementarity of their actions. By mapping activities to the SDGs, different sectors can increase alignment and strengthen collective contributions towards common global goals.

KEYWORDS

biodiversity conservation, global goals, mapping, Sustainable Development Goals, well-being, working landscapes, working seascapes

1 | INTRODUCTION

The United Nations (UN) Sustainable Development Goals (SDGs) outline a global plan for ending extreme poverty, reducing inequality, and protecting the planet,

all by 2030 (United Nations, 2015). With few years remaining, we are failing to achieve most of the targets set out in the 17 goals (Díaz et al., 2019), in part because of potential tradeoffs in achieving some targets, such as between food production and ecosystem protection

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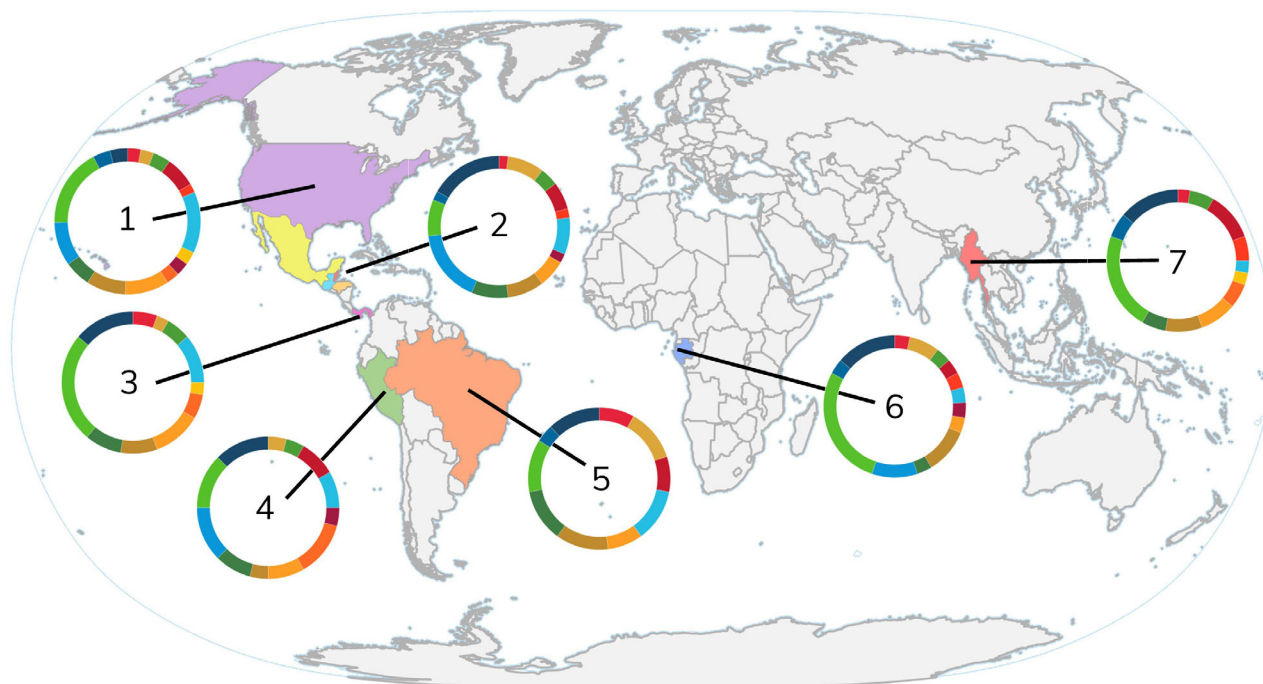
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(Nilsson et al., 2018). In addition, the COVID-19 pandemic has undermined progress toward the SDGs and increased inequalities (Barbier & Burgess, 2020; Heggen et al., 2020; Santos-Carrillo et al., 2020). Although UN Member States have adopted the SDGs, accelerated progress toward the goals could occur through increased coordination and collaboration among government, non-governmental organizations (NGOs), multilateral institutions, civil society, academia, and private sector actors, large and small.

Greater coordination among biodiversity conservation organizations and other sectors could further amplify the impacts of conservation actions beyond SDG 14—*Life Below Water* and SDG 15—*Life on Land*. Because biodiversity contributes broadly to achieving the SDGs (Blicharska et al., 2019; Pham-Truffert et al., 2020). Interventions such as ecosystem-based adaptation, natural climate solutions, and nature-based solutions are becoming

mainstream as solutions to socio-ecological problems (Chausson et al., 2020). Private industry has identified best practices within their sectors that align with the full suite of SDGs (IPIECA, 2017; World Business Council for Sustainable Development [WBCSD], 2019). The conservation sector should follow suit, mapping the actions of conservation organizations to the 17 individual goals and associated targets, could improve coordination with private industry sectors that have already mapped their actions to the SDGs, including the energy (IPIECA, 2017) and forestry sectors (WBCSD, 2019). Alignment of different sectors across the SDGs could facilitate a clearer vision of how these stakeholders can work together to address grand challenges facing humanity and the planet.

Here, we qualitatively mapped the Smithsonian Working Land and Seascapes (WLS) network to the 17 SDGs by identifying specific actions of WLS projects that



Country	Programs
1. United States of America	Salmon and People Project (Alaska)
	Virginia Working Landscapes (Virginia)
	Chesapeake Working Land and Seascapes (Maryland)
	Northern Great Plains Program (Montana)
2. Mesoamerican Reef Ecoregion (Mexico, Belize, Guatemala, Honduras)	Healthy Reefs for Healthy People Initiative
	Marine Conservation Program
3. Panama	Restoring Working Forests—Agua Salud
4. Brazil	Supporting Conservation Through Traditional Cattle Ranching
5. Peru	Sustainable Solutions for Linear Infrastructure
6. Gabon	Building Capacity for Sustainability
7. Myanmar	Planning for Sustainable Development

Sustainable Development Goals



FIGURE 1 Distribution of the Working Land and Seascape network projects and the contributions of projects within countries and regions to the different Sustainable Development Goals

likely contribute to underlying targets and indicators of progress toward the SDGs (hereafter, “mapping”). Our primary aims were to (1) assess the potential contributions of biodiversity conservation actions of the network to all 17 SDGs; (2) identify actions with potential to contribute to co-benefits among SDGs; and (3) recommend ways to strengthen links among the biodiversity conservation sector, and other sectors around efforts to achieve multiple SDGs.

2 | THE WLS NETWORK

WLS (<https://wls.si.edu/>) is a Smithsonian Institution initiative, which aims to foster healthy and productive landscapes and seascapes for the benefit of people and nature. The initiative comprises of a network of 14 programs across the Smithsonian Institution that work in 13 countries across four continents (Figure 1). *Working landscapes* are mosaics of native ecosystems and land uses that include the production of food, water, fiber, and fuel, as well as infrastructure that provides services such as transportation and energy (Deichmann et al., 2019; Kremen & Merenlender, 2018). A natural analog to working landscapes is *working seascapes* (Deichmann et al., 2019; Kremen & Merenlender, 2019). The matrix of marine ecosystems and infrastructure within coastal areas, near-shore and offshore waters, and the open ocean supports wild-caught fisheries, mariculture, energy infrastructure, and recreation, all of which can contribute to sustainable development (Aswani et al., 2018; McCauley et al., 2015). A holistic conservation approach wherein planning and interventions occur across landscapes and seascapes is an essential step toward sustainability, because at this scale, different sectors interact and enhance local actions to serve national and global targets (Reed et al., 2016). Therefore, mapping conservation efforts of the WLS network to the SDGs provides an opportunity to identify synergies both within the conservation sector and across sectors to protect the planet by promoting the connection between biodiversity and human well-being.

The WLS network has formalized an overarching theory of change (ToC), which identifies key causal pathways and results chains that detail the expected outcomes of specific actions and highlight the opportunities for engaging stakeholders in conservation planning, implementation, and evaluation. One objective of the WLS science strategy, which supports the ToC, is to connect network-wide science initiatives with the development, support, and evaluation of global prioritization frameworks, including the SDGs. Below, we identify and discuss opportunities and barriers to achieving this objective, while highlighting actions of WLS programs that are relevant to the SDG framework.

3 | MAPPING CONSERVATION'S CONTRIBUTIONS TO THE SDGs

The WBCSD has produced a roadmap to support current and future efforts by the private sector to integrate sustainable practices, decision-making, and governance within the SDG framework (WBCSD, 2018). Here, we focus primarily on the second component of the roadmap—identifying the areas where WLS activities have current and potential impacts on the SDGs. The mapping process consisted of reviewing the 17 SDGs, 169 targets, and 231 indicators, and identifying how projects within WLS have and can assist in achieving the targets.

A team of 6 WLS researchers with broad knowledge of the WLS portfolio reviewed all 169 SDG targets and discussed the potential contributions of WLS activities, outputs, and outcomes to achieve each target. This included the steps of identifying the key objective(s) of the target, which were then matched with the outputs and outcomes of published articles, reports, and research proposals. If there were sufficient overlap between the objective of the SDG target and the outputs and outcomes of a research project, a target was added to a short list of potential targets ($N = 70$). The short list was then shared with principal investigators and program staff affiliated with each WLS project for validation. Individual project personnel

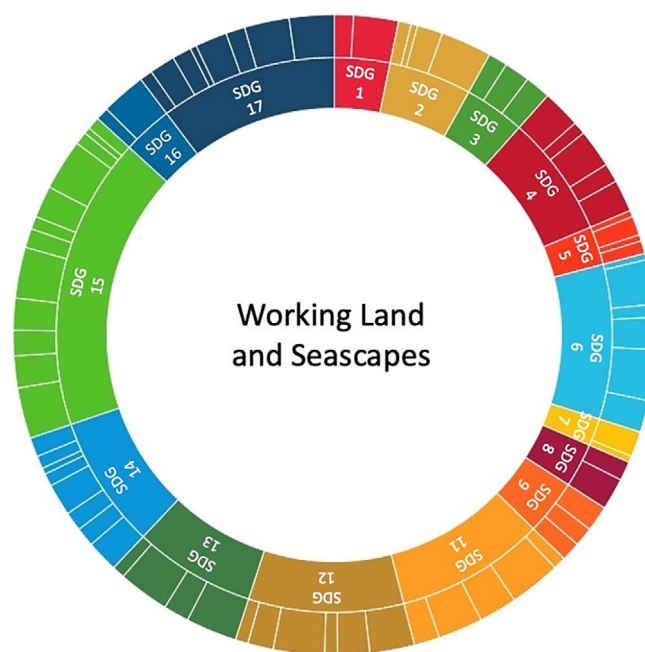


FIGURE 2 Sunburst of how programs in the Working Land and Seascapes (WLS) network map to 16 of the Sustainable Development Goals (SDGs) and 76 associated (see Table 1 for descriptors of the SDGs and corresponding targets). Size of each goal and target represents the number of projects within WLS associated with that target and goal. Sunburst was created in R using the sunburst package

TABLE 1 The Smithsonian Institution Working Land and Seascape network alignment to the Sustainable Development Goals (SDGs) targets, numbered targets are outcome targets (e.g., 1.4) and lettered target are means of implementation targets (letters, e.g., 3.d)

1. No poverty	12. Responsible consumption and production
1.4. Equal rights to ownership, basic services, technology and economic resources	12.2. Sustainable management and use of natural resources
1.5. Build resilience to environmental, economic and social disasters	12.4. Responsible management of chemicals and waste
2. Zero hunger	12.5. Substantially reduce waste generation
2.1. Universal access to safe and nutritious food	12.8. promote universal understanding of sustainable lifestyles
2.2. End all forms of malnutrition	12.a. Support developing countries' scientific and technological capacity for sustainable consumption and production
2.3. Double the productivity and incomes of small-scale food producers	12.b. Develop and implement tools to monitor sustainable tourism
2.4. Sustainable food production and resilient agricultural practices	
3. Good health and well-being	13. Climate action
3.6. Reduce road injuries and death	13.1. Strengthen resilience and adaptive capacity to climate related disasters
3.9. Reduce illnesses and death from hazardous chemicals and pollution	13.2. Increase climate change measures into policies and planning
3.d. Improve early warning systems for global health risks	13.3. Build knowledge and capacity to meet climate change
	13.b. Promote mechanisms to raise capacity for climate planning and management
4. Quality education	14. Life below water
4.3. Equitable access to affordable technical, vocational and higher education	14.1. Reduce marine pollution
4.4. Increase the number of people with relevant skills for financial success	14.2. Protect and restore ecosystems
4.5. Eliminate all discrimination in education	14.3. Reduce ocean acidification
4.7. Education for sustainable development and global citizenship	14.4. Sustainable fishing
4.b. Expand higher education scholarships for developing countries	14.5. Conserve coastal and marine areas
5. Gender equality	14.7. Increase the economic benefits from sustainable use of marine resources
5.5. Ensure full participation in leadership and decision-making	14.a. Increase scientific knowledge, research and technology for ocean health
5.a. Equal rights to ownership, basic services, technology and economic resources	14.b. Support small-scale fishers
5.b. Promote empowerment of women through technology	
5.c. Adopt and strengthen policies and enforceable legislation for gender equality	
6. Clean water and sanitation	15. Life on land
6.1. Safe and affordable drinking water	15.1. Conserve and restore terrestrial and freshwater ecosystems
6.3. Improve water quality, wastewater treatment and safe reuse	15.2. End deforestation and restore degraded forests
6.4. Increase water-use efficiency and ensure freshwater supplies	15.3. End desertification and restore degraded land
6.5. Implement integrated water resource management	15.4. Ensure conservation of mountain ecosystems
6.6. Protect and restore water-related ecosystems	15.5. Protect biodiversity and natural habitats
6.b. Support local engagement in water and sanitation management	15.6. Promote access to genetic resources and fair sharing of the benefits
7. Affordable and clean energy	15.7. Eliminate poaching and trafficking of protected species
7.2. Increase global percentage of renewable energy	15.8. Prevent invasive alien species on land and in water ecosystems
7.b. Expand and upgrade energy services for developing countries	15.9. Integrate ecosystem and biodiversity in governmental planning
	15.a. Increase financial resources to conserve and sustainably use ecosystems and biodiversity
	15.b. Finance and incentivize sustainable forest management
	15.c. Combat global poaching and trafficking
8. Decent work and economic growth	
8.6. Promote youth employment, education, and training	
8.9. Promote beneficial and sustainable tourism	

TABLE 1 (Continued)

9. Industry, innovation, and infrastructure	16. Peace, justice and strong institutions
9.1. Develop sustainable, resilient, and inclusive infrastructures	16.6. Develop effective, accountable, and transparent institutions
9.4. Upgrade all industries and infrastructures for sustainability	16.7. Ensure responsive, inclusive, and representative decision-making
9.a. Facilitate sustainable infrastructure development for developing countries	
11. Sustainable cities and communities	17. Partnerships for the goals
11.3. Inclusive and sustainable urbanization	17.3. Mobilize financial resources for developing countries
11.4. Protect the world's cultural and natural heritage	17.6. Knowledge sharing and cooperation for access to science, technology and innovation
11.5. Reduce the adverse effects of natural disasters	17.8. Strengthen the science, technology and innovation capacity for least developed countries
11.a. Strong national and regional development planning	17.9. Enhance SDG capacity in developing countries
11.b. Implement policies for inclusion, resource efficiency, and disaster risk reduction	17.14. Enhance policy coherence for sustainable development
	17.15. Respect national leadership to implement policies for the SDGs
	17.16. Enhance the global partnership for sustainable development
	17.17. Encourage effective partnerships

reviewed the target short list and identified project activities, outputs, and outcomes that have or could impact each target (Table S1). For a target to be retained or for another to be added to the finalized list, at least one example output or outcome that aligned with a target had to be provided. Where possible, a citable source was used to verify each example (Table S1). For example, WLS project activities were matched to target 3.6: reduce road injuries and death. Four projects were self-identified as having conservation applications that could meet the target's objectives, of reducing global deaths and injuries from road traffic accidents, by decreasing wildlife-vehicle collisions (Gregory et al., 2017; Scott et al., 2016; H. Vanthomme et al., 2015), and provided verification (Table S1).

Through qualitative mapping of WLS projects to the SDG targets, we identified clear contributions to nearly half of the targets, 76 of the 169 (45%), and all but 1 of 17 SDGs (Figure 2; Table 1). Although a quarter of these are associated with SDGs 14 and 15, most of the other SDGs are well represented, with the exception of SDG 10, *Reduced Inequalities* (Figure 2). Of the 76 targets mapped to WLS projects, 57 are outcome targets (e.g., 1.4 equal rights to ownership, basic services, technology and economic resources) and 19 are means of implementation targets (e.g., 3.d Improve early warning systems for global health risks) (Figure 2; Table 1).

4 | SYNERGIES AND CO-BENEFITS AMONG SDGs

Conservation interventions are potentially pivotal strategies for achieving multiple SDGs because of humanity's inescapable dependence on nature. However, there is

ongoing debate about whether conservation interventions can promote synergies among multiple goals, such as food security, poverty alleviation, and protection of natural resources, or if tradeoffs exist among these goals (Nilsson et al., 2016). Conservation interventions have traditionally targeted ecological outcomes (Carlson et al., 2021), and consequently, there are large gaps in our understanding of how common conservation actions affect concurrent social and ecological outcomes (Ban et al., 2019; Gill et al., 2019; McKinnon et al., 2016). However, there are cases where positive synergies between biodiversity and human well-being have been documented at various scales, thereby demonstrating the broader benefits of biodiversity conservation to sustainable development (Blicharska et al., 2019; Pham-Truffert et al., 2020). A key challenge for the conservation sector is identifying and promoting these synergies, where they exist, to achieve substantial progress towards multiple SDGs (Nilsson et al., 2016).

By mapping the outputs and outcomes of WLS research to SDG targets, we identified potential co-benefits of conservation actions with human well-being. To illustrate how WLS projects can contribute to multiple SDGs beyond 14 and 15, we highlight two in-depth case studies, the Mesoamerican Reef region (Box 1), and the Gamba Complex in southwestern Gabon (Box 2). We also provide brief summaries of the applicability of two other WLS projects to the SDGs. Researchers from the Agua Salud program at the Smithsonian Tropical Research Institute are using large-scale reforestation and mixed land-use experiments to understand biophysical processes to restore forests and water-related ecosystem services in the Panama Canal Watershed (Hall, Cerezo, et al., 2015; Stallard et al., 2010). The results of these

BOX 1 Case study of the Mesoamerican Reef region

The Mesoamerican reef (MAR) region is a transboundary resource shared by Mexico, Belize, Guatemala, and Honduras (Figure 3) and contains the UNESCO world heritage site Belize Barrier Reef Reserve System, Ramsar sites, and a network of 47 marine protected areas. The marine resources of the MAR support the livelihoods and food security of 2 million people in coastal communities along the 1000+ km of coastline. Due to climate and anthropogenic stressors, the MAR was classified as a critically endangered ecosystem in 2017 (Bland et al., 2017)

The combined activities of researchers of the National Museum of Natural History in the MAR mapped to 14 SDGs and 48 targets (Figure 1, Table S1). The Marine Conservation Program and the Healthy Reefs for Healthy People Initiative (HRI) work with local, national, and international partners to promote and improve marine resource management and to ensure inclusive decision-making processes (SDG, 5.a, 6.6, 16.7, 17.6, 17.9, 17.14, 17.15, 17.16, 17.17). Maintaining resilient coral reefs, mangroves, and seagrasses will protect and build resilience of coastlines and communities from extreme weather events associated with climate change and other stressors (SDG 3.d). Smithsonian programs support partners by conducting research and convening stakeholders to develop evidence-based management plans and strategies for the sustainable use of these resources, for example, a regional strategy for mangrove management (Rivas et al., 2020), and identify climate resilient habitats. Projects focus on building resilience in vulnerable coastal communities, fisheries, and marine ecosystems through nature-based solutions for climate change adaptation and mitigation (SDGs 1.5, 13.1, 13.2, 13.3, 13.b). This is achieved by assessing and developing sustainable alternative livelihoods, including tourism (SDG 8.9) and small-scale fisheries to promote food security (Canty et al., 2019; Canty & Deichmann, 2022) (SDGs 1.5, 2.1, 2.2, 2.4). Recent work has found evidence that marine protected areas in the region help maintain productive fisheries (SDGs 14.2, 14.4, 14.5, 14.7, 14.a, 14.b) and are associated with elevated income (SDG 1.5) and food security (SDGs 2.1, 2.2, 2.3, 2.4) of nearby coastal communities.

As part of a ridge-to-reef approach, HRI and partners have been working at various scales to assess and monitor water quality (SDGs 3.9, 6.3, 6.5, 6.b). To assist managers and communities in the management process, tools to monitor and evaluate their management actions using a range of well-described indicators, and technologies have been developed (McField & Kramer, 2007), for example, morphometric analyses (Canty et al., 2018), genetic analyses (Canty et al., 2021, 2022), and Google Earth Engine (Cissell et al., 2021). In addition, training in a range of field techniques and methodologies, for example, Atlantic and Gulf Rapid Reef Assessment, has been provided to stakeholders throughout the region, and the programs provide mentorship to fellows, interns, students, and volunteers to build capacity (SDGs 4.3, 4.4, 4.5, 4.b, 17.8). Sharing of experiences, knowledge, and information, for example, HRI Report Cards (McField et al., 2020), has been critical to integrating science into decision-making processes.

projects go beyond the protection and restoration of Panamanian forests and have numerous co-benefits, mapping to 11 SDGs and 36 targets (Figure 1, Table S1). These include increased climate resilience (Hall et al., 2022), with a focus on reduced flooding (Ogden et al., 2013) (SDGs 1.5, 11.5, 13.1, 13.2), improved water quality (Chavarria et al., 2021) and security (dos Reis Oliveira et al., 2019) (SDGs 6.3, 6.5), and natural heritage protection (SDG 11.4). This research is designed to improve the efficient use of natural resources (SDG 12.2), reinforce land tenure claims and provide economic benefits to landowners through carbon credits and sustainable forest management (Adamowicz et al., 2019; Hall, Kirn, et al., 2015; Sinacore et al., 2022) (SDG 1.4).

Similarly, researchers from the Smithsonian's National Zoo and Conservation Biology Institute working in Myanmar have been involved in conservation actions that mapped to a total of 13 SDGs and 36 targets (Figure 1, Table S1). They have worked to advise the government on linear infrastructure plans to reduce human-wildlife conflict (SDG 9.1, 9.a), including delineations of wildlife crossings to reduce wildlife-vehicle collisions (Scott et al., 2016) (SDG 3.6), and the protection of cultural and natural heritage sites (Suarez-Rubio et al., 2020) (SDG 11.4). Ecological studies aid in the selection of priority protection and restoration areas (Bhagwat et al., 2017) (SDG 6.6), identify climate resilient habitats, and inform policy (13.2). Activities include

BOX 2 Case study of the Gamba Complex of Protected Areas

The Gamba Complex of Protected Areas in southwestern Gabon (Figure 4) is comprised of two national parks separated by an “industrial corridor” that includes oil fields and logging concessions, two Ramsar sites, and a marine protected area, covering 11,000 km², which includes a mosaic of habitat types. From a small fishing village, Gamba has grown, through migration to service the oil industry, to a town of 9500 people. This growth has increased pressure on natural resources, resulting in increased unsustainable land-use practices and human–wildlife conflict (Lee et al., 2006)

The conservation actions implemented by researchers from the Smithsonian's National Zoo and Conservation Biology Institute, Gabon Biodiversity Program (GBP) mapped to 14 SDGs and 20 targets (Figure 1, Table S1). The aim of the program is to conserve biodiversity and safeguard the ecosystem services on which people's livelihoods depend and multiply its impact beyond biodiversity to support sustainability at industry and household levels. The GBP collaborates with multiple international and national stakeholders, including government, NGOs, and the private sector to support long-term regional conservation measures through research and education and by developing best practices. These facilitate sustainable development compatible with biodiversity conservation (Deichmann et al., 2017; Ngama et al., 2018; H. Vanthomme et al., 2015) (SDGs 9.a, 12.6, 16.7, 17.6) and bring financial resources from abroad (SDG 17.3). The GBP approach combines research with education and training to build the evidence, awareness, and capacity needed to manage and protect the Gamba Complex. For example, GBP and partners research ways to improve efficiency of anti-poaching missions (H. P. A. Vanthomme et al., 2017), and raise awareness about threatened and protected species, illegal wildlife trafficking, and the dangers of invasive species (Mikissa et al., 2016) (SDGs 15.1, 15.2, 15.4, 15.5, 15.7, 15.8, 15.c). Concurrently, the GBP builds capacity for nature-based solutions for climate change impacts and facilitates local action to support climate change mitigation and adaptation (SDGs 13.b, 13.3). This includes research in a ForestGEO plot to understand forest and carbon dynamics to increase understanding of how forests regenerate and alter under climate change scenarios (Anderson-Teixeira et al., 2015).

Partnerships with local organizations and communities help to support and diversify sustainable livelihoods that include ecotourism, agriculture, and small-scale fisheries. For example, to provide evidence to support a transition from slash and burn to climate- and biodiversity-friendly land-use practices, the GBP is testing sustainable means of improving soils and yields of subsistence agriculture. This is complemented by studies to understand the local socio-economic context of farming and the role of gender in resource management. The GBP contributes to technical professional training to develop local and national capacity for environmental sustainability, with efforts to ensure that meetings have equal gender representation (4.7, 5.a, 12.6, 12.8, 12.a, 14.1, 14.5). The GBP is also invested in future generations, working with primary schools and supporting science education in secondary schools, with a focus on the links between human well-being and environmental health, biodiversity conservation, climate change, and environmentally sound practices (4.7, 12.5, 12.8, 12.a, 14.1, 14.5).

developing locally led land management plans, which ensure the inclusion of women in conservation strategies (Allendorf et al., 2017) (SDG 5.c) and focus on the promotion of sustainable resource use practices (SDG 12.2, 14.b), such as the use of energy efficient stoves (SDG 7.2).

5 | STRENGTHENING CONSERVATION LINKS ACROSS SECTORS

The mapping process highlighted how and where conservation networks can contribute to multiple SDGs.

Mapping actions of the WLS network to the SDGs also revealed several opportunities and challenges for alignment of conservation organizations with other sectors around the SDGs. One principal challenge to the alignment of conservation programs with the SDGs is that targets and indicators only describe ultimate desired outcomes at national or international scales without guidelines for intermediate steps or targets along the way. Although this approach allows for a broad interpretation of how to achieve the final goals, intermediate outcomes may not be detected or reflected by the current indicators, potentially leading implementers to focus on the metrics themselves, rather than a comprehensive

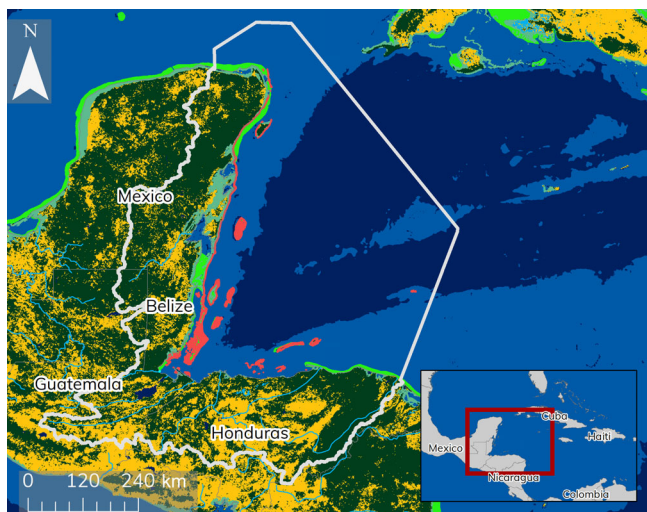


FIGURE 3 Map of the Mesoamerican reef ecoregion

approach to achieving the overall goal (Barnes et al., 2018). For example, consider target 1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social, and environmental shocks and disaster. The indicator is the number of deaths, missing persons and persons affected by disaster per 100,000 people (1.5.1). However, there are multiple intermediary steps required to reduce the number of deaths and missing persons, including building long-term resilience in ecosystems and communities. Many of these steps would need to be explicitly defined as part of a chain of intermediate results leading to the ultimate target (Fleming et al., 2019; Stewart et al., 2020). For example, resilience of coastal communities to climate change can be enhanced through improved management of marine resources, such as coral reefs, mangroves, seagrasses, or oyster reefs which provide nature-based solutions for climate change adaptation and mitigation (Chausson et al., 2020). The ability to evaluate and monitor each of these steps will not only substantially improve tracking progress toward targets and the overarching goals, but also identifies how conservation organizations of all sizes can make contributions to the SDGs and help scale localized efforts to global goals.

Currently, the broad scale of SDG targets and indicators limits entry points and tracking of contributions from many conservation organizations to intermediate outcomes at local and subnational scales, which may result in the underestimation of progress towards the SDGs. In fact, most NGOs and academic biodiversity conservation programs affect metrics at spatial and temporal scales where change would likely not be effectively

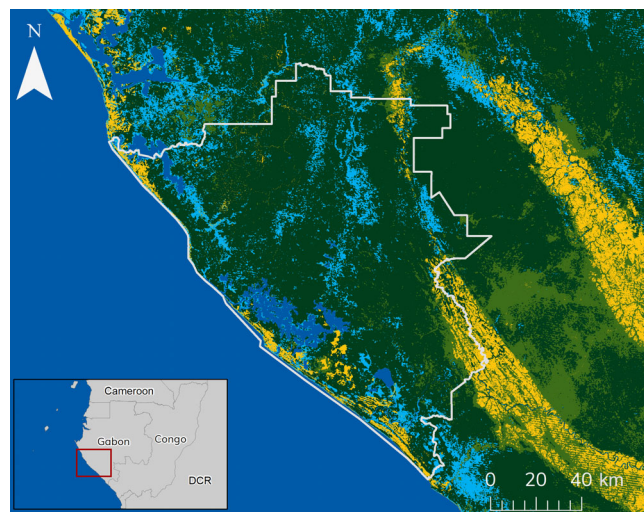


FIGURE 4 Map of the Gamba Complex of Protected Areas, Gabon

monitored using the current set of SDG indicators. Currently, it is up to individual countries and organizations to develop results chains, intermediate targets, and indicators, often without a fundamental understanding of the synergies between biodiversity and human well-being. The conservation community could elevate the contributions of our sector by taking the lead in proposing targets and indicators that specifically demonstrate the “green solutions” that can broadly support the SDGs. Previous efforts to create results chains in a ToC for SDG 3 highlight some pathways forward to improve health system performance, and provide a framework for developing results chains that account for the contributions of conservation to multiple SDGs (Seidman, 2017). Measuring socio-ecological tradeoffs and co-benefits of nature conservation across sectors and scales will enable a better understanding of how conservation actions contribute more broadly to the SDGs. Without intermediate targets and indicators at scales relevant to conservation actions, we are likely underestimating the true contributions of biodiversity conservation to the SDGs.

Although 231 different SDG indicators exist, improving the connection between indicators and targets and providing intermediate indicators aligned with clear results chains are opportunities to increase accountability and recognition of the contributions of the conservation sector to the SDGs. Enabling greater scaling of smaller projects or efforts toward these high-level goals will provide opportunities for different sectors (e.g., energy (IPIECA, 2017) and forestry sectors (WBCSD, 2019)) to align in the pursuit of the SDGs. The role of the state as the sole custodian of the SDGs has been challenged in the Arab world because corruption and militarization lead to marginalization of people and nature (El-Zein

et al., 2016). Therefore, the alignment of a diverse set of sectors would be a critical step in highlighting how a broader set of stakeholders can work together to achieve the goals and further democratize the process. For this to occur, these sectors require more specific and tractable indicators to monitor and evaluate their contributions to the SDGs, and to report to both their investors and consumers.

6 | CONCLUSION

Aligning conservation research and actions with the SDGs is a positive step, but there is need for greater understanding of co-benefits and tradeoffs among SDGs and whether conservation interventions scale to affect ultimate SDG targets. These questions require targeted research to improve the evidence base linking biodiversity and ecosystems conservation with human well-being. The conservation sector can also address these questions by developing and tracking an integrated suite of indicators as part of rigorous monitoring and evaluation frameworks across the SDGs. An ideal suite of indicators would be sensitive to impacts at scales relevant to industry sectors, conservation organizations, civil society, and governments. Through the mapping process we identify gaps and opportunities to create alliances among sectors that have mapped to SDGs. These cross-sector or multi-lateral collaborations can work more purposefully toward reaching the SDGs, potentially minimizing tradeoffs, and increasing co-benefits to generate outcomes greater than the sum of individual sector contributions. Using the WLS network as an example, we highlight how individual conservation projects and organizations contribute more broadly to achieving the SDGs, including improved health and well-being, quality education, and gender equality. Through mapping their activities to the SDGs, different sectors can strengthen contributions and increase alignment and complementarity toward common global goals. “Speaking the same language” as government and industry partners around the sustainable development agenda can facilitate opportunities for collaboration and multilateral advances and put the required results chains and capacity in place to achieve the goals. Through building government, conservation, civil society, and industry partnerships we can accelerate how these manifold challenges are overcome and make greater strides toward the SDGs to ensure benefits to people and nature.

AUTHOR CONTRIBUTIONS

Steven W.J. Canty, A. Justin Nowakowski, Grant M. Connette, Jessica L. Deichmann, Melissa Songer, and Thomas

S. Akre conceived the idea and produced the first drafts. All authors conducted mapping of projects to the SDGs and contributed to the final version of the manuscript.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Supporting information and relevant citations for the mapping of WLS to the SDGs can be found in supplementary materials.

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SUPPORTING INFORMATION

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