UN Biodiversity Lab

How the UN Champions Digital Public Goods for the Global Commons

This case study is a modified excerpt from a forthcoming Action Research Report on digital public goods by UNDP. UN Biodiversity Lab is a data DPG in the Digital Public Goods Alliance's registry.

The UN Development Programme (UNDP) and other international organizations are growing their influence in the landscape of digital public goods (DPGs), by supporting digital innovations that can be replicated and used by local ecosystems. With the UN's role in convening and influencing policies, there is a case for UN agencies to support data and capacity building platforms as DPGs. These are a significant part of the DPG movement, yet too often go unrecognized. Whilst there are many open datasets extant, they are often hard for global audiences to discover, and difficult for policymakers to use and analyze. Consequently, creating global platforms as DPGs that support access to data, as well as the capacity to use them, is critical to the UN's agenda on developing national capacity and supporting evidence-based decision-making.

The UN Biodiversity Lab (UNBL) is a global platform for the public good that assists actors to use high-quality spatial data to monitor biodiversity loss and make evidence-based decisions for conservation and sustainable development. Recognizing platforms like UNBL as DPGs demonstrates how DPGs can be built and leveraged by international organizations. Launched in 2018 by the Secretariat of the Convention on Biological Diversity (CBD), UNDP, the UN Environment Programme (UNEP), and the UN Environment Programme World Conservation Monitoring Centre (UNDP-WCMC), UNBL provides novel ways for policymakers to interact

with spatial data, aiding them in identifying and solving critical issues in biodiversity conservation, climate change, and sustainable development. In October 2021, an updated UN Biodiversity Lab 2.0 was launched as a free, open-source platform that has since been accredited as a data DPG. This designation recognizes UNBL's role in bringing together 400 of the world's best global spatial data layers from more than 40 data providers for use in research, policymaking, and innovative software applications, based on the terms of use from the data providers who generate this wealth of knowledge.

Six lessons from UNBL relevant for open-source projects and DPGs

While UNBL is one of many platforms responding to the demand for innovative data aggregation, mapping, and visualization tools in the environmental sector, it is unique in its focus on collating high-quality national and global data on biodiversity. Its stewardship by UN-based actors, emphasis on the intersection between nature and nature-dependent development, and its focus on the CBD also serve to distinguish it amongst others. UNBL has succeeded on a scale where others have not because of its unique functionality that supercharged its entry into a crowded field. In addition, it acknowledges the importance of leading by following—of empowering national stakeholders to work with the best combination of data and analytics. Continued iteration and technical support have enabled it to function as a digital public good for global policymakers. UNBL is a good example of the type of DPG the UN system is best poised to develop and support.

Looking forward, the governing coalition ought to upgrade the core functionality of UNBL and explore additional use cases as it scales as a DPG. The champions of the project will need to improve the functionality of UNBL to attract a diverse range of users - especially amongst nongovernment actors. From a technical standpoint, proposed changes include improving UNBL's digital infrastructure and connections via APIs to open-source repositories—both on the UNBL public platform and within UNBL workspaces. The following lessons learned from UNBL illuminate important points that are relevant for the evolution of the broader DPG community.

Lesson #1: Policymakers need new tools to use data for action, something DPGs can support

While the core technology of UNBL was not revolutionary in the spatial data community, its positioning at the intersection of conservation and sustainable development sets UNBL up for success. The provision of geospatial analytics to use data and calculate metrics helps UNBL focus on a wider set of user needs. Traditionally, to extract summary statistics from geospatial data, users required technical knowledge of geographic information systems (GIS). The UNBL platform embeds that functionality, thus enabling various spatial analysis that can inform critical decisions. With the release of UNBL 2.0, a new suite of touch-button metrics and an intuitive user interface evolved this functionality further. The technology underneath the platform is fully open source, affording it the opportunity to innovate in the technology itself. The UNBL team plans to expand the metrics capabilities and add new features that support the creation of action maps using spatial optimization and enable scenario-building functions. The development of curated tools to generate intelligence from the best-available data has been critical to uptake by governments and other actors. UNBL demonstrates a clear example of the role DPGs can play in supporting policymakers to access and use spatial data for evidence-based decision-making.

Lesson #2: Creating open-source DPGs from scratch addresses challenges from proprietary systems

The decision to fully open source UNBL 2.0 allowed replication of the requisite functionalities from proprietary systems to serve raster and vector data and calculate metrics. With the SpatioTemporal Asset Catalogue (STAC) and Cloud-Optimised GeoTIFF (COG) architecture introduced in UNBL 2.0, the platform is now a pioneer of using open-source geospatial tools in a cloud-based environment. STAC and COG have become increasingly common and more critical. STAC catalogues increase the discoverability of geospatial data throughout the internet, providing broader access and more efficient data analysis workflows. The UNBL STAC catalogue provides an open and centralized place to discover, access and manage an extensive range of science-related datasets. The UNBL STAC catalogue will continue to grow as the UNBL team curates new and noteworthy environmental data and will remain a valuable resource for users.

Lesson #3: Global platforms' varied functionality means they can function as DPGs

While many DPGs tend to develop a proof of concept and minimum viable product, and then seek the resources to scale, UNBL shows how UN-led innovation can drive adoption and scaling from the outset and improve the product over time. Today, UNBL is principally a data-centric DPG but has the potential to function as a DPG on multiple levels. It is based on open-source software but provides open data and content, and many of its predefined metrics might be classified as open standards. Instead of being intended for technical specialists, it is a DPG designed by experts for policymakers, and it is highly intentional in how it seeks to translate data into insights for actionable policymaking. In this way, it offers a unique path forward for the future development of DPGs.

Lesson #4: International organizations' DPGs need a defined audience and ties to recognized initiatives for success

While there are many data platforms for biodiversity, UNBL distinguishes itself through robust functionality and the metrics it provides in addition to biodiversity data that render clear value to its audiences. Of these audiences, one stands out -- national policymakers working to deliver on commitments to nature-dependent development through the three Rio Conventions, especially the CBD. New functionalities will be introduced in UNBL 2.0 to help make the platform directly relevant to the post-2020 global biodiversity framework of the CBD as well as the Sustainable Development Goals (SDGs), which it only notionally supports currently. In addition to providing global datasets, UNBL actively encourages policymakers to use national data via the platform. This approach recognizes the higher resolution of national data, and the fact that it is validated for government use. While many DPGs support the CBD and the 2030 Agenda in principle, the very distinct application of UNBL for policymakers implementing commitments to international agreements makes its efficacy more easily understood, easier to measure and strengthens engagement among governments.

Lesson #5: Collaborative governance, when well-defined, is a strength of DPGs

The collaborative model of the four organizations supporting UNBL is demonstrative of how the UN system can drive rapid product scaling. The teams supporting UNBL succeeded through collaboration, because it enabled different teams to focus on different aspects of the project. The four convening partners lead the platform vision and overall management,

ensuring a platform firmly anchored within the UN system. By its unique ability to unite expertise in the management of environmental data, leverage on-the-ground connections to policymakers in nearly 170 countries, as well as tap into the CBD Secretariat's mission to support signatory nations in their commitments on biodiversity, UNBL demonstrate a breadth of expertise to meet user needs. Diverse technical partners provide support. The Impact Observatory (IO) team reinforces the backend of the platform, whilst the UN International Computing Centre (UNICC) provides secure UN hosting. Microsoft offers the Azure cloud as well as collaboration on technical innovation through its Planetary Computer, and the National Aeronautics and Space Administration of the United States (NASA) applies platform functionalities as a decision support system through its applied sciences division. The collaboration with more than 40 data providers ensures that UNBL shares the most up-to-date version of high-quality global data on nature, carbon, and human well-being. From the outset, the conditions of this partnership have been clearly defined and enable the platform to grow and flourish.

Lesson #6: Managing community engagement and inputs will be critical for success as DPGs

Community engagement will determine the path forward for global platforms like UNBL as a DPG. It has not yet been determined how management of software changes to the source code would be allocated via governance versus community inputs. Decisions around modifying the architecture of the codebase will require the buy-in and approval of the convening coalition. This issue will need to be addressed.

Recommendations

UNBL should continue upgrading and expanding its core functionality. This guarantees partner buy-in to the core offering. A secondary issue touches upon UNBL's engaged wider community. Future community engagement with the platform must be in alignment with its goals. It must also determine a sustainable, long-term business model. Whilst there remains some question about how UNBL will continue to scale and evolve, a collaboratively governed, hybrid platform-and-data model holds promise for the future of how policymakers and nontechnical specialists think about and use DPGs in their own work. UNBL will continue to offer compelling lessons to the DPG community.

Detailed study of UNBL

The following section is dedicated to those keen to learn more about specific elements of UNBL. It details UNBL's technical design, business model, organizational stewardship, community support and potential for replication and scaling as an open-source product.

Technical overview

UNBL seeks to make spatial data and maps on biodiversity, climate change, and sustainable development openly accessible to environmental policymakers without requiring GIS expertise. In addition to uniting over 400 of the best global spatial data layers, the platform calculates dynamic indicators on the fly covering anywhere in the world. The first version of UNBL was a basic tool focused on making geospatial data for biodiversity accessible to those with more limited technical capacity through a web-based platform that contained both proprietary and open-source code. The original platform was less intuitive for users and had fewer data layers and analytic capabilities. The development of UNBL 2.0 focused on increasing usability, expanding the range of data and tools, becoming fully open source, improving core functionality, enhancing the user interface, and adding accessibility features.

UNBL 2.0 is now an open-source system based on technology developed by the National Geographic Society (NGS) that is currently maintained by IO, a technical partner. The development of UNBL 2.0 leveraged a multimillion-dollar investment from NGS. In this new form, the platform uses the most up-to-date open-source geospatial tools to enhance functionality and utility. The resulting platform enables users to access hundreds of global data layers and a set of metrics calculating key environmental indicators on more than 4,000 territories around the world. In addition, UNBL workspaces are available to national policymakers and other noncommercial stakeholders where datasets can be uploaded to share insights, plan interventions and monitor change.

The platform's data resides in the cloud, with raster data located in Microsoft Azure as COGs on UNICC servers. The COG file format enhances data performance in a cloud environment. A STAC provides a rich search interface so users can find metadata encompassing spatial and temporal extents or by the license and provider of a dataset. STAC also contains a link to the location of each COG to support the backend of UNBL 2.0. When a user requests data for a certain region, the STAC provides a link to an open-source map tiling service, TiTiler, which pulls only the data for that region. The COG format avoids loading an entire global dataset at

once. The new UNBL platform combines the best of UNBL 1.0 with next-generation open-source GIS tools to access hundreds of global data layers and metric calculations.

Business model

The current business model for UNBL is predicated upon project-based funding, a series of allocations that have helped to fund areas like technical development, project management, communications, and capacity building. Over time, the team envisages migration to a diversified business model that includes provision for core funding from convening partners. So far, the success of the platform and its increasing institutionalization within both UNDP and UNEP has meant that UNBL has been able to continue to sustain itself using project-level funding allocations. All involved parties remain committed to ensuring the platform is sufficiently funded. The UNBL team will continue to explore options for diversifying funding sources to ensure the business model and community support structures for UNBL meet demand.

Organizational stewardship

UNBL assembles a diverse coalition of partners, technical partners, data providers, and donors to create sustainable impact for nature, climate, and development. The UNBL convening partners, including the CBD Secretariat, UNDP, UNEP, and UNEP-WCMC, jointly provide strategic direction and vision for the platform. The UNBL technical partners, including IO, Microsoft, NASA, and UNICC contribute key expertise to implement this vision. More than 40 different data providers and eight different donors contribute the underlying spatial data and funding essential to UNBL's success. The UNBL team consists of 10-15 people working part time.

The open-source technology underlying UNBL 2.0 is wholly owned by the UNBL partnership. While this configuration between the four organizations has remained stable, it may need to adapt to distinguish between maintenance of the core source code and additional project management creating new metrics and functionality. The UNBL teams are considering how a community engagement model could support the goals of (1) improving the functionality of the platform by responding to user needs and (2) managing the core source code. Such considerations shape the direction of the initiative and how the platform is supported, enabling it to tap into the community of digital innovation while maintaining trusted UN stewardship.

Community support

UNBL has enjoyed rapid uptake of its platform in the community of environmental policymakers working on biodiversity. The original UNBL documented 360 active policymakers and 55,000 visitors to the site. UNBL 1.0 led to an 81 percent increase in the number of maps in nations' reports on biodiversity to the CBD. UNBL 2.0 has 1,188 new users, 146 new requests for workspaces on the platform (109 of which have been approved based on UNBL's noncommercial use criteria), and 37,274 platform visits. In addition, the UNBL partnership has organized 10 events and training sessions that have reached more than 11,000 people.

Though community use of the platform is flourishing, UNBL needs to expand community engagement beyond convening and technical partners. One opportunity resides in accepting new features or core contributions from outside. This allows UNBL to explore how it can engage at the forefront of digital innovation while continuing its governance by the UN to retain its qualities as a trusted platform for governments.

Replication and scaling

While the platform previously focused on obtaining the support of national policymakers' commitments to the CBD, the platform is now open to any non-commercial users. Consequently, UNBL has not only seen increased adoption among governments, but also many requests from civil society and UN agencies to use the platform to track, monitor, and demonstrate impact. UNBL workspaces, which are secure work areas in the platform where approved users can upload subnational and national data and share them with designated users, are swiftly growing in number. Previously only available to national policymakers, UNBL now makes these workspaces available to any noncommercial users.

Although UNBL continues to focus functionality development on its core users—government policymakers working to deliver on commitments to the CBD—its spatial data, metrics, and workspaces can support related work from academics, Indigenous peoples, NGOs, research organizations, and UN agencies. UNBL plans to leverage the UNEP's and UNDP's combined network to drive adoption. Such a plan requires resources and capacity and, in all probability, customization of the platform. Future replications of the platform will have to ensure that, regardless of sector, data availability is sufficient.

There are widespread opportunities to use UNBL to advocate for nature-based solutions to climate change and sustainable development. Thought has been given to how a similar platform could be replicated for energy and sustainable development. Initiatives such as UNDP's maps of hope build on the spatial data available via UNBL and use systematic conservation planning to identify essential life support areas (ELSA) where protecting, managing, and restoring nature can best contribute to national objectives for biodiversity, climate, and human wellbeing. A proof-of-concept ELSA Tool was released on UNBL in 2022 for Colombia, Costa Rica, and South Africa through funding from the Gordon and Betty Moore Foundation, with the potential to be scaled to any country in the world.

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