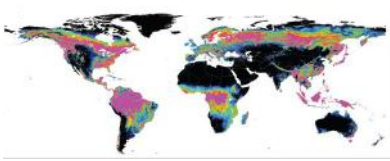
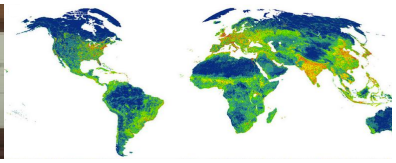
Using Spatial Data to Inform National Biodiversity Planning and Reporting and to Strengthen Implementation of Sustainable Development Goals



The Project

Over the next 15 years, global population will expand by more than 1.2 billion people, and demand for food will increase by 35%, for water by 40%, and for energy by 50%. Our urban footprint is expected to triple, having profound impacts on biodiversity. Because of the trends declining biodiversity and increased pressures, conservation will continue to be critical to sustaining the world's essential ecosystem services – food, water, jobs, livelihoods, protection from climate, especially for the poor and vulnerable – especially under climate change scenarios.

Spatial data can be used as a powerful tool to make actionable decisions that protect human livelihoods and conserve critical biodiversity. Although often presented as a zero-sum game, conservation and development are tightly interwoven in today's world. For example, protecting key watersheds can safeguard the well-being of a city of millions. Spatial data has the potential to play a transformative role in meeting conservation and development needs by identifying priority zones for conservation, mixed land-use and development.

Despite its potential, countries are not using spatial data to inform conservation decision-making. A recent study from UNDP analyzed the number and type of maps in post-2010 NBSAPs and 5th National Reports as a proxy for the degree to which a country is utilizing geospatial data for decision-making. Results show that a shockingly low number of countries are using geospatial data: 87 countries (83%) have a combined average of seven maps or fewer between both reports, and 73 countries (70%) have a combined average of four maps or fewer between both reports. As we work to deliver on the Sustainable Development Goals set by the 2030 Agenda on Sustainable Development, spatial data will be an imperative component of national planning and implementation.

The problem: National policymakers are not accessing spatial data to make informed conservation and development planning decisions. Often, these data layers already exist but decision-makers do not know where to access them or how to use them. In other cases, data do not exist, but we have the technology and expertise to create them.

The solution: This project brings together world-class researchers, NASA, and the United Nations Development Programme (UNDP) in order to provide accessible, high quality spatial data to national policymakers. Our goal is to provide every country with actionable spatial data to make conservation decisions. Our team will: (1) develop high-quality spatial data, (2) analyze these data in ways relevant to users' decision-making, and (3) create an accessible tool that allows decision-makers to use and analyze these data to make actionable national conservation and development planning decisions.

The project will serve as a vehicle to accelerate the use of spatial data to deliver on the Sustainable Development Goals (SDGs). This project is part of a broader UNDP effort to promote innovative use of spatial data to address pressing global challenges.

The Science

Data Provision and Project Support

[Cindy Schmidt](#)
NASA

NASA draws on its Earth Observing System of satellites to address critical challenges facing our planet: climate change, sea level rise, freshwater resources, and extreme weather events. As an innovation leader in Earth and climate science, NASA is constantly expanding our understanding of Earth from space, drawing on an exceptional team of experts and decades of cutting-edge scientific research.

What will these scientists contribute to the project?

- Access to cutting-edge spatial data including products derived from Landsat, GLAS, DMSP-OLS, Modis, MERIS, and SRTM missions.
- Support for the timely delivery of research and outreach tools.

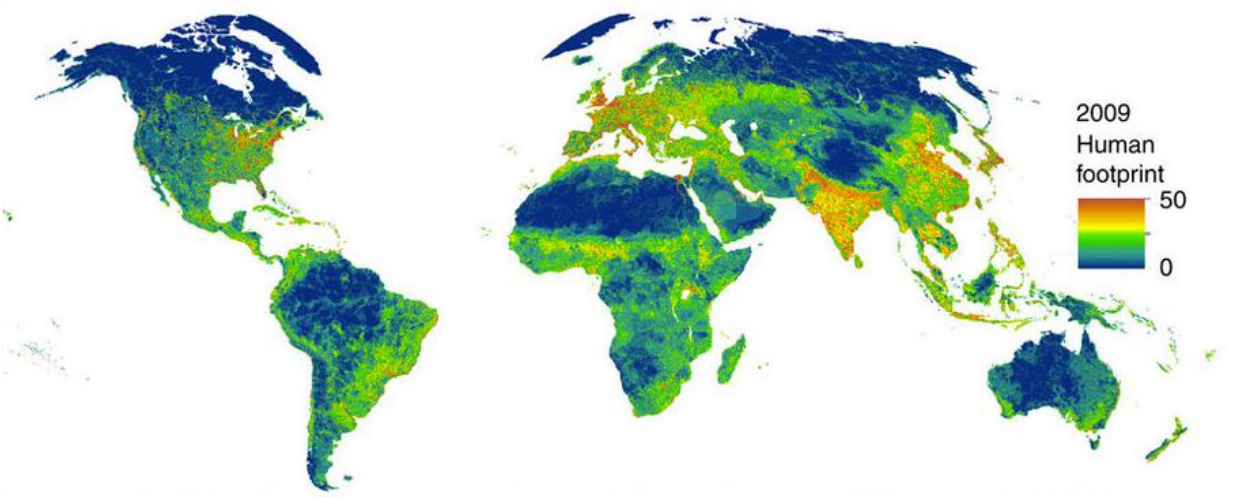
Data Layer 1: Human Footprint

[James Watson](#)
The University of Queensland & Wildlife Conservation Society

[Oscar Venter](#)
University of Northern British Columbia

The Human Footprint provides a means to ascertain the extent of human modification of natural habitats. Using eight globally consistent datasets – built environment, population density, electric infrastructure, croplands, pasturelands, railways, major roadways, and navigable waterways – this metric quantifies human pressure on ecosystems around the world.

For news coverage of the recent findings from this team, see: The Guardian | National Geographic | Huffington Post



The global human footprint map for 2009 using a 0–50 cool to hot color scale, where 50 is the highest human footprint.

What will these scientists contribute to the project?

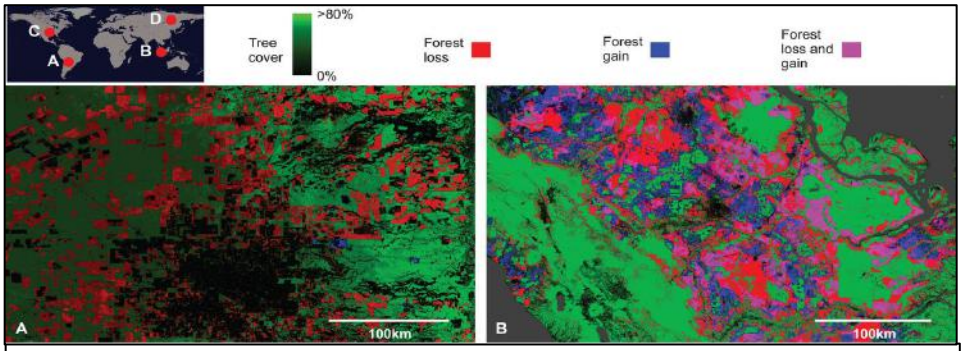
- Updated global human footprint datasets for the years 2000 and 2012. In combination with datasets from 1993 and 2009, this will enable us to assess changes in human pressure over nearly 20 years.
- Extinction risk analyses for mammals based on human footprint.
- Projected wilderness decline by 2030. A voluntary commitment to support this project.

Data Layer 2: Forest Condition

[Matt Hansen](#)
University of Maryland

Forest cover data provides a way to spatialize and visualize global tree cover for all trees greater than 5 meters in height. Hansen's team has collected tree cover data annually since 2000, providing an invaluable global record of loss and gain in tree cover over time. The team's techniques enable them to analyze trends in disturbances and loss, identify drivers in particular landscapes, assess whether change is caused by humans or other events, and send alerts to countries based on real-time changes in forest cover.

For news coverage of the recent findings from this team, see: The Washington Post | Nature News | The Guardian



Regional subsets of 2000 tree cover and 2000 to 2012 forest loss and gain.
(**A**) Paraguay, centered at 21.9°S, 59.8°W; (**B**) Indonesia, centered at 0.4°S, 101.5°E.

What will these scientists contribute to the project?

- Global per pixel mapping of forest type as primary, old growth, or natural forest.
- Automated assessments of changes in minimally disturbed 'hinterland forests'.
- Intact forest landscape assessments to evaluate whether disturbances are human-caused.
- Assessment of disturbance trends and drivers of forest cover change.
- Relative threat assessment and prioritization of areas that are critical for conservation or restoration.

Data Layer 3: Forest Integrity in Support of a Land Health Index

[Andrew Hansen](#)
Montana State University

[Linda Phillips](#)
Montana State University

Hansen and Phillips will integrate data on the human footprint (see Data Layer 1) and forest condition (see Data Layer 2) to derive a forest integrity layer, which describes the capacity of forests to maintain natural processes and associated biodiversity.

The Land Health Index measures ecological integrity, which is the capacity of a system to maintain its characteristic structure and ecosystem function. The Land Health Index provides data at various resolutions that are useful to different actors for difference purposes: Level 1 – policy decisions; Level 2 – national and international red lists; Level 3 – local ecosystem managers; Level 4 – scientists. Forest integrity will be used to demonstrate development of a key data layer for the Land Health Index.

For news coverage of the recent findings from this team, see: NASA | Sierra Club | New York Times

What will these scientists contribute to the project?

- Global identification and integration of vital signs of interest to conservation at detailed resolution, demonstrated by a forest integrity layer that integrates forest condition and impacts of human pressure.

- Mechanisms to monitor these vital signs and to assess whether they are improving or degrading.
- Support to compile these data and layers from other teams to create a tool that facilitates the use of spatial data for national biodiversity and development plans.

Data Layers 4 & 5: Forest Fragmentation and Connectivity

for

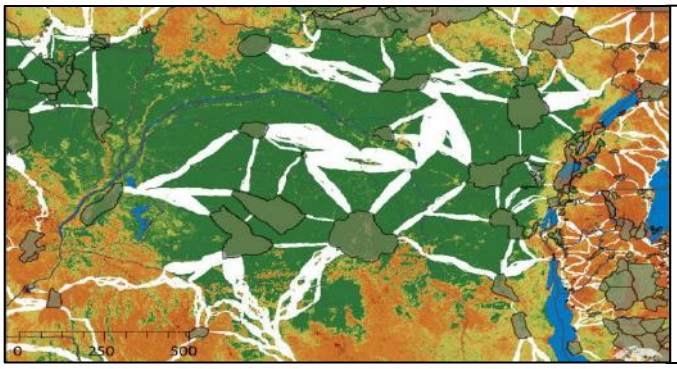
Scott Goetz
Northern Arizona University

Patrick Jantz
Northern Arizona University

Goetz and Jantz will quantify the fragmentation of high integrity forest patches (see Data Layer 3) using landscape pattern indices that describe fundamental aspects of forest pattern such as area, edge and isolation. They will use network analysis to quantify the connectivity of high integrity forest patches, accounting the distance between patches, the integrity of the intervening landscape, patch size, and patch configuration. These analyses can summarize the status and trends of forest fragmentation and identify forest patches that are priorities for connectivity in a particular ecosystem or landscape.

What will these scientists contribute to the project?

- Global forest fragmentation and connectivity data to identify critical areas for terrestrial biodiversity conservation. These data can be reported at the scale of a country, state/province, or ecoregion to facilitate better decision-making at various levels.
- Country-specific fragmentation and connectivity data to identify important areas for iconic species identified in NBSAPs.
- Country-specific scenarios so decision makers can see the impact of conservation or loss of particular forest patches.



Corridors (in white) traversing high biomass forest (in green) between protected areas (outlined in black). A similar approach can be used to map and analyze corridors that traverse high integrity forests.

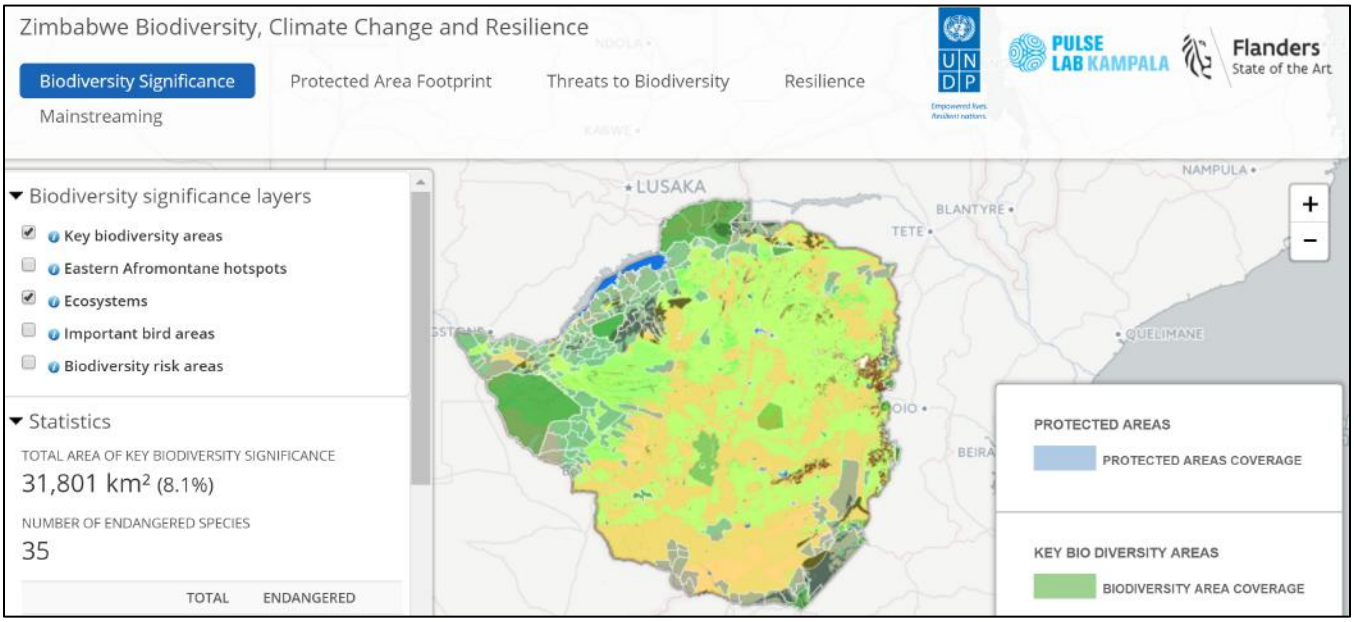
For news coverage of the recent findings from this team, see: Pulitzer Center | National Geographic

The Spatial Planning Portal

Using Spatial Data Layers to Construct a Spatial Planning Portal

Paula Hidalgo-Sanchis
UN Pulse Lab Kampala

UN Global Pulse is a flagship innovation initiative of the United Nations Secretary-General on big data. Its mission is to accelerate discovery, development and scaled adoption of big data innovation for sustainable development and humanitarian action. To this end, Global Pulse works to promote awareness of the opportunities big data presents for sustainable development, forge public-private data sharing partnerships, generate high-impact analytical tools and approaches through its network of Pulse Labs, and drive broad adoption of useful innovations across the UN System. Their most recent collaboration with UNDP led to the creation of the Nyanga Tool, a customized mapping tool to support conservation decision-making in Zimbabwe.



What will this team bring to the project?

- Compilation of global spatial data layers from science team and existing sources into a single, compatible database
- Construction of an accessible online tool that allows access to all global data layers, and user-friendly functions such as 'click to create' shapefiles.
- Access to additional layers on a regional or per-country basis.
- Innovative approaches that utilize citizen reporting (radio feeds, twitter) for biodiversity monitoring to assess conservation priorities and needs.

The Capacity Team

Connecting Science, Policy, and Practice: Building Capacity to Integrate Spatial Data into National Decision-making

With a US$1.6 billion biodiversity portfolio – the largest in the UN system – UNDP plays a prominent role in supporting conservation and development in order to deliver on international agreements and targets, including the Sustainable Development Goals and Aichi Biodiversity Targets.

Through a four-year project UNDP's Global Programme on Nature Development, in partnership with UN Environment-World Conservation Monitoring Centre (UNEP-WCMC) has provided technical support 145 countries to revise their National Biodiversity Strategies and Action Plans (NBSAPs). Over the next four years, UNDP will work with these same countries to develop their Sixth National Reports on the state of biodiversity within their borders. Through these projects, UNDP has built relationships with policymakers and practitioners that enable us to ensure that cutting-edge scientific data is presented and shared in a way that is useful, applicable, and relevant to countries.

Jamison Ervin
UNDP

Christina Supples
UNDP

Annie Virnig
UNDP

Heena Ahmed
UNDP

For news coverage of the recent findings from this team, see: Our Perspectives | Exposure

What will this team contribute to the project?

- Assessment of current use of spatial data in national policy documents such as NBSAPs and Fifth National Reports.
- Assessment of each country's current capacity to understand and apply spatial data.
- Assessment of what types of tools and datasets are most useful to each country.
- Capacity-building for countries to use tools produced by the project team through webinars, e-learning modules, and in-person trainings.
- Vehicle for connecting scientific research to national decision making in order to deliver on the Sustainable Development Goals and Aichi Biodiversity Targets.

Opportunities for Collaboration

We are forming an advisory group to guide this project going forward. The group will include representatives from UN agencies, international NGOs, scientific research institutions, and government.

Working with the premier institutions in the field, we are working to create a dynamic tool that utilizes all available high-quality data on ecosystem health and human pressures. **Join us! We welcome data and innovation to support of broader goal of harnessing spatial data to meet the SDGs.** We offer cobranding and high visibility on a project that brings together science, capacity building, and key government users.

The tool will include all possible globally consistent layers that facilitate actionable conservation decisions. When quality global datasets are not available (e.g., invasive alien species) or applicable (e.g., tropical fire incidences), the tool will share regional data with relevant countries.

Public Data Layers Available for Inclusion	**Data Layers Added by This Project**	**Data Layers Needed**
Political	*Environment*	*Boundaries*
Global Administrative Boundaries	Forest cover (updated)	Indigenous and Community Conserved Areas
	Forest integrity	Land Tenure and Rights
Environment	Forest connectivity	
World Database on Protected Areas	Time series data	*Environment*
5 km Buffer Zone for Protected Areas	Predictive modeling	Invasive alien species
World Heritage Sites		Water quality and volume
Global Key Biodiversity Areas	*Human*	
Global Biodiversity Hotspots	Human footprint (updated)	*Human-Environment Nexus*
Zero Extinction Sites		Coastal Habitat Quality
Ramsar		Conservation Management
Important Bird Areas		Disease incidences
IUCN Red List		Essential Ecosystem Services
USGS Global Ecosystem Data		Fire
Landuse/Landcover (Globcover)		Freshwater Human Footprint
Freshwater Ecoregions of the World		Invasive Alien Species
		National Concessions (mining, timber)
Human-Environment Nexus		Natural Disaster Risks
Global Fires		Pollution Point Sources
Climate Change		Sustainable Management
Mining Sites (Not free)		Resource Productivity
World Population		Water Use Demand
Open Street Map		
Dams		

The Vision: What Spatial Data do we need to make decisions that address Global Goals?

Key questions related to the Aichi Biodiversity Targets for which geospatial data are critical, and their relationship to the Sustainable Development Goals and Targets	Data layers required to answer key questions and provide actionable information to planners
• Where are the most important opportunities for managing biodiversity to reduce poverty? (Aichi Biodiversity Target 2; SDG 1.1; 1.2; 1.5)	• Overlay of population, poverty and land rights including indigenous peoples; land cover/land cover change; habitat intactness; protected areas; and ecosystem services - livelihoods
• Where is natural resource management likely to exceed safe ecological limits and where are the areas most important to implement sustainable management? (Aichi Biodiversity Target 4; SDG 6.4, 15.1, 15.2)	• Overlay of land use and land use change; ecosystem distribution and intactness; resource productivity and availability; natural resource management intensity; protected areas
• Where are the highest rates of loss of natural habitats occurring, including forest ecosystems and where are the best opportunities for halving degradation and fragmentation? (Aichi Biodiversity Target 5, SDG 15.1, 15.2; 15.5)	• Overlay of land cover/land cover change (especially for forests); habitat intactness and degradation; human footprint; future footprint; protected areas
• Where are the most important opportunities for promoting sustainable management of agriculture, forestry and aquaculture? (Aichi Biodiversity Target 7; SDG 15.2, 15.3)	• Overlay of sustainable management maps for agriculture, aquaculture and forestry operations; land use; land cover; habitat intactness; key biodiversity areas
• Where are the important point sources for pollution, including nutrients, and what are the most important opportunities for minimizing the impacts of pollution? (Aichi Biodiversity Target 8; SDG 3.9; 6.3; 14.1)	• Overlay of pollution point sources; water quality and volume; water use; population maps; population and poverty; ecosystem services – water
• Where are the pathways for invasive alien species, and where can management interventions have the biggest impact in controlling, eradicating and preventing invasive species? (Aichi Biodiversity Target 9; SDG 15.8)	• Overlay of invasive alien species; transportation; habitat intactness; human footprint; future footprint
• Where are the areas of coral reefs and other vulnerable ecosystems that are most vulnerable to climate change or ocean acidification, and where are the opportunities for maintaining integrity and functioning through protection, restoration and sustainable use? (Aichi Biodiversity Target 10; SDG 14.3)	• Overlay of protected areas; human footprint; habitat intactness – coastal habitats; climate vulnerability
• Where are most important opportunities to create new protected areas and improve existing ones in order to improve representativeness, connectivity and management effectiveness? (Aichi Biodiversity Target 11; SDG 14.5, 15.1, 15.4, 15.7, 15.9)	• Overlay of protected areas; habitat intactness, human footprint; key biodiversity areas; future footprint
• Where are the most important opportunities to protect, restore and sustainably manage ecosystems in order to decrease the decline of species populations and to avoid extinctions? (Aichi Biodiversity Target 12, SDG 14.2; 14.5; 15.1; 15.4; 15.7; 15.9)	• Overlay of key biodiversity areas; human footprint; future footprint; protected areas; habitat intactness
• Where are the most important opportunities to protect and restore ecosystems in order to sustain essential ecosystem services, including water, health, livelihoods and well-being, especially for women, indigenous and local communities, and the poor and vulnerable? (Aichi Biodiversity Target 14; SDG 1.1; 1.2; 1.5; 2.1; 2.4; 6.1; 6.5; 6.6)	• Overlay of protected areas; key biodiversity areas; human footprint; habitat intactness; population and poverty; and essential ecosystem services data layers

***** *Questions highlighted in blue can be answered by this project. For all others we are actively seeking collaboration to obtain underlined data.*