SPACES

PUTTING SPATIAL PLANNING ON THE MAP: HOW HIGH-AMBITION COUNTRIES ARE ACHIEVING NATURE AND CLIMATE GOALS

Policy Brief
November 2022

About SPACES

SPACES is an emerging coalition that mobilises spatial intelligence to support governments, businesses, financial institutions, funders, and investors in achieving climate and nature goals. SPACES is coordinated by the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and SYSTEMIQ, working with UNDP, IIASA and IIS, among other partners. It aims to support the use of spatial intelligence in achieving national climate and nature objectives, such as 30×30 targets, by implementing and accelerating spatial planning in countries

SPACES invites interested countries and national technical partners to explore participation in the coalition. Potential benefits include: (i) technical support and capacity building, including the development of national datasets, tools and databases, working with government departments and national institutions (ii) sharing of experiences between countries (iii) a route to short- and medium-term financial support for the development of spatial plans, including stakeholder engagement across sectors.

For more information, please visit www.spacescoalition.org, or contact info@spacescoalition.org

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About this brief

This brief aims to encourage decision-makers in governments to deploy integrated spatial planning to operationalize their commitments for nature and climate, such as 30×30 protection targets or land-based commitments under Nationally Determined Contributions to achieving climate goals. It describes five case studies that demonstrate the feasibility of integrated spatial planning. From these, the paper draws lessons for successful spatial planning and key recommendations for governments.

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Abstract

Spatial planning will play a critical role in integrating and operationalising national climate and nature targets, as is captured in Target 1 of the draft post-2020 global biodiversity framework of the Convention on Biological Diversity (CBD). With land-use change as the primary driver of terrestrial nature loss and the resulting carbon emissions, location-specific nature-based solutions that protect, sustainably manage and restore our ecosystems are needed. A spatial planning process, with participative mapping of nature-based solutions, is essential for success.

In this paper we describe five case studies that demonstrate the feasibility of integrated spatial planning efforts, how they help countries operationalize ambitious targets for nature and climate and move towards them. With the growing availability of tools, data and emerging technologies to support a strategic planning process for achieving sustainable zoning of different land/sea-use types there has never been a better (or more urgent) opportunity for countries to act.

To do so, countries can:

- **Commit to ambitious, integrated science-based targets on nature and climate**, such as the 2030 targets of the forthcoming post-2020 global biodiversity framework. Based on the draft text, Target 1 on spatial planning will guide the national implementation of other parts of the framework, such as Target 2 on restoration of 20% of degraded ecosystems, Target 3 on protecting at least 30% of the Earth's surface for nature, and Target 8 on contributing to climate change mitigation and adaptation, i.e. the use of nature-based solutions to meet Paris Agreement goals.
- **Create and publish spatially-explicit development plans**, including maps of current and intended future land use, to deliver national and global targets on climate and nature.
- **Embed spatial intelligence in national policy and standards** to incentivise and fund better data collection, use, and sharing.
- **Foster an iterative, inclusive and collaborative process** to deliver integrated action on climate and nature and access commercial and financial opportunities.

1

Introduction

The need for action is urgent – we are in a climate and nature emergency.

We are heading for at least a 3°C temperature rise this century – far above the 1.5˚C ambition set in Paris (United Nations Environment Programme, 2020). The latest IPCC report highlights that climate impacts are already more severe than anticipated. Half of the world's population faces water insecurity for at least a month a year, and the IPCC estimates that between 32 and 132 million people will be pushed into extreme poverty in the next decade alone (IPCC, 2022). At the same time, we are witnessing what scientists describe as "the sixth mass extinction since the beginning of life on Earth" with around half of the Earth's forests having been destroyed in less than half a century (WWF, 2020). The decline in nature and the disruption of climate regulation are at the heart of many of other societal challenges the world faces today. Challenges such as land degradation and desertification, pollution, poverty, food and water insecurity, human conflicts, and health disruption have been amplified by the COVID-19 pandemic, the impacts of the war in Ukraine, and the resulting economic impacts of supply chain instability and rampant inflation.

Governments around the world are responding to the climate crisis.

While the world is far from meeting energy decarbonization objectives, governments and other public and private sector stakeholders have a shared theory of change for how these goals can be operationalized. Most countries have defined national pathways to net zero, in line with the Paris Agreement, and many are ramping up ambition. However, despite some green shoots of progress, action for nature lags behind that for climate.

While often viewed separately – with decision-making being conducted in siloes — the climate and nature crises are fundamentally connected and require integrated approaches to be effectively addressed.

For example, climate-caused local population extinctions have been detected among 47% of species examined (IPCC, 2022). There is increasing recognition of the 'nature-climate nexus' and an urgent need to move from an "either/or" to a "both/and" practice (Mendiluce, 2022). There are significant opportunities for tackling nature, biodiversity, and climate in tandem (Pörtner *et al.*, 2021). Protecting, restoring, and sustainably managing nature delivers triple wins for (a) climate change mitigation and adaptation, (b) biodiversity conservation and recovery, and (c) human livelihoods, health and well-being. Nature and nature-based solutions can account for at least one-third of the emission reductions and carbon capture needed to reduce global greenhouse gas emissions to zero, as the Paris Agreement requires (Griscom *et al.*, 2017; FOLU, 2021; UNEP & IUCN, 2021).

And of course, there is a need to consider trade-offs and unintended consequences. Certain climate-focused interventions, such as the large-scale deployment of bioenergy dependent upon agricultural expansion, pose as much risk to nature as climate change itself (Hof *et al.* 2018).

Momentum among public and private sector actors to act on nature is building.

Nature-based solutions featured prominently at UNFCCC COP27 in Sharm el-Sheikh, including the launch of the Enhancing Nature-based Solutions for Climate Transformation (ENACT) initiative. However, countries' combined National Determined Contributions (NDCs) at COP27 are still not in line with the 1.5°C target. All eyes are now on the negotiations at CBD COP 15 in Montreal on a post-2020 global biodiversity framework, which will take the next step in addressing the twin crises of nature and climate. In parallel, over 100 governments have signed up to the High Ambition Coalition for Nature and People, which has a central aim of conserving 30% of the world's land and oceans by 2030 to protect biodiversity. As outlined in a recent paper from the World Economic Forum (WEF, 2022), the private sector is also following suit. Businesses are increasingly setting 'nature-positive' targets alongside 'net zero' commitments, and are beginning to take action to map their impacts and dependencies across value chains.

The question now therefore is how to operationalize ambitious nature targets, so that countries move from words to action.

The world has set ambitious nature targets in the past that did not trigger sufficient action. The Aichi Biodiversity Targets were agreed by Parties to the CBD about a decade before the UNFCCC adopted the Paris Agreement that established net-zero targets for every country. Yet, not a single Aichi Biodiversity Target was met, and earlier biodiversity targets also did not lead to sufficient policy or business action to halt the loss of biodiversity.

For many governments, the next steps of setting integrated national goals for climate and nature and agreeing pathways to meet those goals are proving complicated.

Two reasons for this stand out: first, the complexity of 'measuring' and prioritizing action on nature: IPBES shows that a multitude of drivers act on nature. Whereas measuring climate progress requires tracking impacts on one indicator, greenhouse gas emissions, measuring progress on nature requires understanding impacts and dependencies on multiple indicators, such as forest cover, soil health, water scarcity, presence of biodiversity, and so on.

Each of these indicators is location-specific and requires high-quality spatial data to support informed strategic planning. Second, the political challenges of land use planning: land use and land-use change are the biggest drivers of nature loss and the resulting increases in greenhouse gas emissions. Countries are wrestling with strategic questions like "how do we balance scaling up agriculture to enhance food security and commercial opportunities, with the protection of nature and biodiversity". These are difficult questions, and are inherently political, with various public and private stakeholders advocating for often competing outcomes.

Spatial planning offers a way forward for governments.

As called for Target 1 of the draft global biodiversity framework, spatial planning describes a collaborative process that draws on increasingly accurate and accessible data to support stakeholders to set national or regional climate and nature goals and agreeing pathways to reach them. A national spatial planning process, could, for example identify high-risk areas that are off-limits to development, seek out opportunities for nature-based solutions within production systems, support rigorous management of development impacts, and guide the restoration of degraded areas – and codify these priorities in a national map of land use. A few countries, notably Costa Rica, China, South Africa, Viet Nam and Indonesia, have kicked off spatial planning processes, which are already yielding positive outcomes.

This paper sets out for decision-makers in governments everywhere the key facts about spatial planning, and how it can be deployed for climate and nature. Section 2 introduces spatial planning as a process for that task; Section 3 shows spatial planning working in practice through case studies from the five countries listed above; and Section 4 distils four lessons about successful spatial planning drawn learned from those pioneers. Section 5 sets out key recommendations on what governments can do next.

2

Spatial planning - the process

Integrating nature and climate targets and delivering on ambitious goals for nature and climate requires a spatial or location-specific understanding of nature-related impacts and dependencies and associated risks and opportunities.

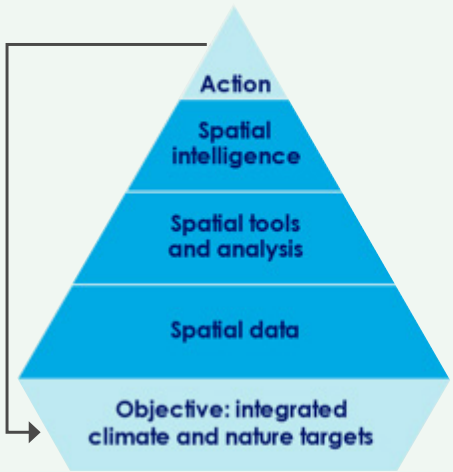
Integrating nature and climate targets and delivering on ambitious goals for nature and climate requires a spatial or location-specific understanding of nature-related impacts and dependencies and associated risks and opportunities. Land use and land-use change are the biggest drivers of nature loss and the resulting greenhouse gas emissions (or weakening of carbon sinks) (Díaz *et al*., 2019). Therefore, our ability to ensure that landscapes are optimally managed to halt biodiversity loss is ultimately a question of resolving and/or managing competition for land. This is spatial planning. In this way, we will address the numerous competing challenges of climate emergency, food and water insecurity, nature loss, poverty and loss of jobs and livelihoods, and the protection of the rights of Indigenous Peoples and Local Communities. Different land-use changes have different climate and nature impacts in different locations, for example, depending on the ecosystem services the area provides, the uniqueness of species in the area and the function of that area as a carbon store and/or sink. Location-based understanding is therefore a critical input to spatial planning by governments, society and businesses.

Definitions used in the context of SPACES: spatial planning and spatial intelligence

Spatial planning: the process of identifying how management zones can be organized spatially to achieve a series of objectives/strategies.

Note: There are many definitions of spatial planning. According to the Council of Europe Committee of Ministers, *"spatial planning gives geographical expression to the economic, social, cultural and ecological policies of society. It is at the same time a scientific discipline, an administrative technique and a policy developed as an interdisciplinary and comprehensive approach directed towards a balanced regional development and the physical organisation of space according to an overall strategy (Council of Europe Committee of Ministers, 1984)."*

Spatial intelligence: the use of spatial data, tools, analysis and visualisation to strengthen decision-making. It can help countries with their spatial planning practices. It can help businesses understand, manage and monitor their impacts and dependencies on nature, climate and people.



Countries should therefore promote spatial planning for nature, climate, and people, in line with Target 1 of the draft post-2020 global biodiversity framework.

Spatial planning includes gathering input data layers for mapping, analyses that integrate and optimize across multiple data layers to suggest areas for action for specific goals, updates of data layers for monitoring purposes, and the use of spatial data layers to derive metrics for reporting in both the public and the private sectors. Spatial data can be developed at the global or at the national scale. Global data can be used for global stocktaking and/or filling national data gaps, while national data is key for national policymaking and reporting. **Just as every nation is now required to produce decarbonisation pathways under their NDCs, so should they adopt an actionable roadmap towards integrated climate, nature and sustainable development targets.**

In particular, countries should include actionable maps of current, 2030, and 2050 land use and nature-based solutions in their climate, biodiversity, and/or national development strategies.

Initial maps might build on existing initiatives, like REDD+ programmes, and map indicators such as natural ecosystems cover, alongside identifying areas for food production, conservation, and other policy objectives, which will then gradually be refined over time through higher-resolution analysis, planning, and exploration with stakeholder groups. Making targets spatially explicit is critical for establishing a shared baseline and kick-starting action in the face of uncertainties. In addition, countries should use integrated spatial planning approaches to create maps that prioritize areas for action across multiple goals, including those around climate, biodiversity, and sustainable development targets. Essential to any country's decision-making toolkit, these maps combine stakeholder insight with the latest spatial data and technology to help countries take definitive, cross-sectoral action for people and nature. By contributing to robust Measuring, Reporting and Verification (MRV) systems and hence increasing trust from buyers and investors, integrated maps can also help countries access finance from nature and carbon credits, a market that is predicted to be worth upward of USD 50 billion by 2030 (Blaufelder *et al.*, 2021).

Technological advances in data generation and availability can help accelerate spatial planning and mapping.

For example:

- **Remote sensing** (e.g., via satellites and drones) allows for the monitoring and measurement of key variables, such as forest cover, at incredibly high resolution, and in areas that we were previously unable to track;
- **Widely available mobile technologies** to gather nature data anytime, anywhere in the world through citizen science networks (e.g., iNaturalist, which allows any individual with a smartphone to share georeferenced photographs or sound clips of wild species into a globally accessible database for expert identification);
- **Emerging technologies, such as environmental DNA and acoustic sensing**, that are starting to support more precise detection and monitoring of biodiversity at lower costs to enable informed decision making.

The argument for using spatial planning and spatial intelligence comes with a word of caution. Any spatial planning process must be highly transparent, participatory, inclusive and iterative to ensure that the needs of local populations, including Indigenous peoples, are understood, and incorporated.

Especially where land tenure is customary and poorly codified, spatial planning may have unintended negative consequences, including the displacement of Indigenous people and local communities – those closest and most ably positioned to manage the Earth's carbon-rich lands. Indigenous Peoples steward approximately 40 million km^2 in 87 countries, across all continents (Garnett *et al.*, 2018). This represents over a quarter of the world's land surface, and intersects with about 40% of all terrestrial protected areas and intact landscapes. Key to avoiding negative social impacts is ensuring that spatial planning processes are widely inclusive, are based in genuine consultation involving free, prior and informed consent for land-uses on Indigenous territories and are supported by participatory mapping processes.

In sum, when (and only when) embedded in such a participative and transparent process, maps are powerful catalysts of change.

They can solidify the role of land-use planning at the heart of policy discussions, serve as a monitoring and accountability framework, and act as a convening mechanism to drive multi-stakeholder collaboration. Critically, national spatial planning also provides much-needed clarity for businesses, which can leverage spatial data to map their supply chains and ensure their extended operations align with national and global objectives. In particular, businesses (e.g., agribusinesses and mining companies) need to know where "no go" areas are, to protect local communities and support nature/climate objectives. For this reason, we are seeing an increasing number of businesses call on governments to institute spatial planning, including for nature, climate, and people.

3

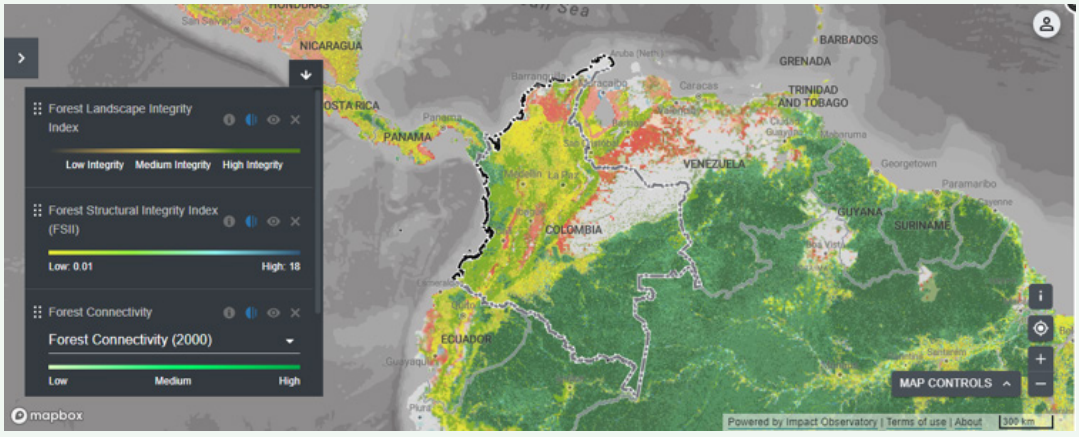
Spatial planning in practice: five case studies

Many countries have prepared initial land use or other national maps.

In particular, tropical countries have often mapped their forest assets as part of their REDD+ readiness programmes, as well as other natural ecosystems such as the Cerrado and Chaco. Advances in available tools and data sets (for examples, see Boxes 1 and 2) have made it easier to develop rich maps. **These maps have yet to be established at the heart of crucial policy discussions – suggesting that the importance of spatial planning has yet to be firmly established. As of now, actionable spatial maps are conspicuously absent from national climate, biodiversity and development strategies,** hampering integrated approaches to meeting economic, social and environmental objectives, including those under the draft post-2020 global biodiversity framework and the broader 2030 Agenda.

BOX 1. Global data and tools offer resources to map nature and ecosystem services for national action.

For example, policymakers and other stakeholders from over 125 countries are using the UN Biodiversity Lab (UNBL) spatial data platform to make data-driven decisions and progress towards their goals. UNBL grants users access to over 400 of the world's best global datasets on nature, climate, and sustainable development, and also enables them to create secure workspaces to upload their own national data layers for analysis, alongside global data. These secure workspaces can serve as common data repository for countries, sparking collaboration, insight, and action.



Screenshot of UN Biodiversity Lab, centered around Colombia, with a subset of data layers on forest integrity (Hansen et al., 2019; Jantz, P., et al., in prep) and connectivity selected (Grantham et al., 2020). Generated on the UN Biodiversity Lab. http://unbiodiversitylab.org/. Accessed 27 October 2022. DOI:10.34892/95q9-mp91. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

No climate strategy, including NDCs and long-term low-emission development strategies (LT-LEDS), has included an actionable map that could help guide mitigation and adaptation measures using nature-based solutions on land. Of the NBSAPs of 154 countries under the CBD, only 15% of official development aid eligible countries included spatial information that can guide action on the conservation and restoration of biodiversity (Cadena *et al.*, 2019).

BOX 2. Nature Map

In 2019, the Nature Map Earth initiative was launched, by the UN Sustainable Development Solutions Network (SDSN), the International Institute for Applied Systems Analysis (IIASA), the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and the International Institute for Sustainability (IIS). This initiative developed continuous, integrated maps showcasing the potential benefits of habitat conservation and restoration for biodiversity, carbon and freshwater provision. This effort was the first to truly integrate biodiversity, carbon and water conservation within a common approach to develop a single map of global areas of significance (Jung *et al.* 2021). AThe first global map of Forest Management was produced, recognizing a critical knowledge gap in understanding the location and potential of managed forest for biodiversity conservation and climate mitigation, and was one of multiple newly developed layers that fed into this conservation analysis.

The extent and resolution are ideal for global to sub-national investigation of priority regions for focussing conservation efforts, or for supporting international multilateral environmental agreements The Nature Map analyses have also been tailored for application at the national scale and partners in Mexico, Colombia and Argentina have been working closely with Nature Map on this. In Colombia, for example, an analysis of areas of importance for conservation action where synergies are maximized among biodiversity protection, carbon storage, and other environmental services shows that conserving 30% of these areas would meet 99% of the targets for threatened species and protect approximately 7.4 Gt of carbon in biomass and soils (Kapos *et al.*, 2022).

The global spatial data layers developed through Nature Map are all available on the UN Biodiversity Lab platform.

Nevertheless, there are green shoots of progress. Several 'first-mover' countries have embraced spatial planning and started to drive real action.

For example, Costa Rica's ambitious restoration and conservation policies became a headline issue in cabinet deliberations, after Carlos Manuel Rodriguez (Environment Minister 2002-2006 and 2018-2020), produced a set of maps that turned out to be inconsistent with maps used by the Minister of Agriculture. The two ministries then worked together to arrive at a shared approach, which proved vital for the country's successful restoration and conservation policies. As Rodriguez says: "maps are like coffee; they bring everyone around the table".

This section showcases five case studies of country spatial planning initiatives with initial results. The following section extrapolates some lessons learned on critical drivers for success:

3.1. Costa Rica: accelerating integrated land planning to reach climate and development objectives and tackle deforestation

"Nature is 30% of the climate solution and 100% of the other solutions"
Carlos Manuel Rodríguez, Former Minister of Environment and Energy of Costa Rica (MINAE, 2019).

CONTEXT

In the 1980s, Costa Rica had one of the highest deforestation rates in Latin America (3.2% annually) and had less than 25% of its original forest. Yet, in the 1990s, the country mobilized to halt and reverse forest loss in what is seen globally as a success story. Nevertheless, Costa Rica is still vulnerable to climate change and, by 2025, 2.5% of the country's Gross Domestic Product could be spent annually on reconstruction due to extreme weather events (AIDF, 2018).

PROCESSES UNDERTAKEN

Over the last two decades, Costa Rica has built a mutually supporting financial, legislative, scientific and community-engaged architecture in service of integrated social, climate and nature objectives. Besides developing a robust incentive scheme for nature-based solutions through its national payment system for environmental services (PES) and associated funds[1], the government has placed natural landscapes at the centre of decision-making processes, recognising their crucial role in the country's development strategy (MINAE, 2019, 2021). Strong policies on forest, land-use management and conservation have been anchored by integrated spatial planning processes involving multi-stakeholder engagement and map production on ecosystem services and land uses.

[1] The National Forestry Financing Fund (FONAFIFO) is a financial mechanism for forest recovery and conservation, which finances the PES scheme, which has 237,550 ha of private land enrolled through contracts.

Examples of these spatial planning processes are 1) the REDD+ National Strategy; and 2) the Essential Life Support Areas (ELSA) project, which uses a data-driven integrated land-use planning approach to create powerful maps that identify regions where nature-based solutions could have the greatest impact for Costa Rica's goals around nature, climate, and sustainable development.[2] (MINAE, 2019, 2021; Ogwal *et al*. 2020).

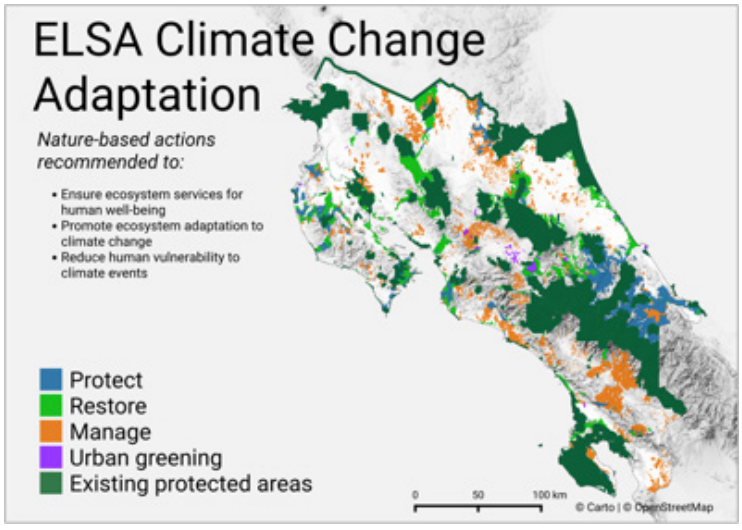
[2] Areas that conserve critical biodiversity and provide humans with food, water, and carbon storage (Ogwal *et al*. 2020).

NOTEWORTHY SPATIAL PLANNING INITIATIVES

Costa Rica created integrated maps to visualise the spatial overlap between the carbon and non-carbon benefits of nature. This work was carried out by the Ministry of Environment and Energy (MINAE) in the context of the REDD+ National Strategy (REDD+ NS), with the support of the UN-REDD Programme. The maps and spatial analyses support an implementation plan that aims to maximize the delivery of multiple benefits. The maps were developed to address relevant policies (by involving policymakers throughout the process) and the safeguards needed for nature and people (Pollini *et al*., 2019). The REDD+ NS was published in 2017 (FONAFIFO, 2017).

Costa Rica has also mapped the country's ELSAs, identifying areas where nature-based actions could simultaneously deliver across multiple climate change, biodiversity and sustainable development goals. Through a participatory process, national experts from MINAE, UNDP, the National Center for High Technology (CeNAT), and other leading organizations collaborated to select the country's priority nature-related policy targets and use the best-available national and global data to map these targets. The resulting national 'Map of Hope' indicates priority regions for protection, management, restoration, and urban greening. Shared through an adaptive webtool, this ELSA map can support data-driven decision-making, even as new policies and priorities arise (UNDP Costa Rica, 2022).

Convergence of seven environmental and social benefits considered in Costa Rica's REDD+ programme (source: Pollini et al., 2019). The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.



Locations where Costa Rica can take nature-based actions to support the achievement of its National Climate Adaptation Plan, identified through applying the ELSA methodology (MINAE, 2022). The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Due to the demonstrated utility of the national 'Map of Hope', MINAE and UNDP also created an ELSA map to directly support the country's National Climate Adaptation Plan. This map identifies important regions for climate change adaptation, demonstrating how and where nature can be safeguarded to shore up the country's defence against the effects of climate change (MINAE, 2022).

IMPACTS ON NATURE, CLIMATE, AND PEOPLE

Through spatial planning processes, Costa Rica has identified synergies in key national policies for nature-positive development. For example, the ELSA process is positively impacting the following policies: (1) National Adaptation Plan 2022-2026, guiding the application of nature-based solutions to help reduce climate-related impacts; (2) the ongoing creation of the State of the Environment National Report, which will provide information on the current environmental conditions of the country; and (3) the execution of the National Strategy for Landscape Restoration, which will select regions to restore that contribute to climate adaptation (MINAE, 2022).

3.2. China: towards an ecological red line

CONTEXT

Recent decades of rapid economic development in China have taken their toll on nature. More than a quarter of China's grasslands were lost to farming and mining between 2001 and 2011, and 90% of the country's remaining grassland is degraded. 57% of China's coastal wetlands have disappeared since the 1950s, primarily due to land reclamation, and the area covered by mangrove forests and coral reefs fell by 73% and 80%, respectively (Qiu, 2011).

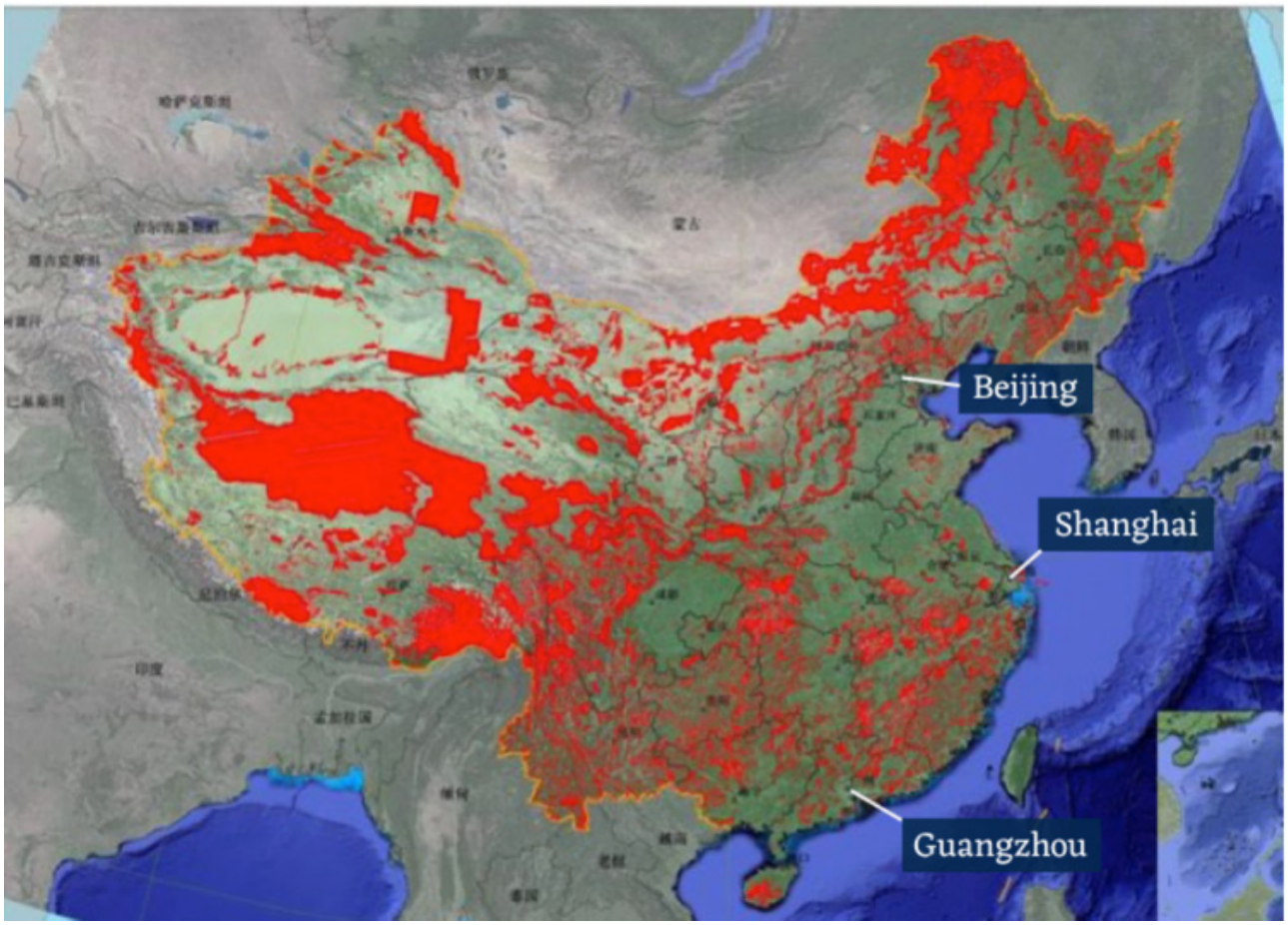
A series of major natural disasters like the 1998 flooding of the Yangtze River that killed thousands of people and caused over US$36bn in property damage, or the water shortages and sandstorms caused by grassland degradation, increased national awareness on the importance of healthy ecosystems. In the 2000s, there was an increasing recognition that food security is intrinsically linked to healthy ecosystems (China has 18% of the world population, but only 10% of its arable land) (Schmidt-Traub *et al.*, 2021). The concept of China as an "Ecological Civilisation" is now inscribed in the Constitution (Ouyang *et al.*, 2016; Bryan *et al.*, 2018; Jiang *et al.*, 2021; Zhao *et al.*, 2021).

PROCESSES UNDERTAKEN

China has identified essential ecological functional areas for biodiversity conservation, as well as the most ecologically fragile regions, and enforces stringent protection measures. These areas are "Ecological Conservation Red Lines" (ECRLs). The ECRL policy safeguards biodiversity and natural resources; red line zones need to maintain a very high level of environmental quality and are protected by an upper limit on resource usage (He *et al.*, 2018; Gao, 2019; Gordon, 2019; Schmidt-Traub *et al.*, 2020).

NOTEWORTHY SPATIAL PLANNING INITIATIVES

China has mapped ecosystem services for the entire country, combining many different data layers at different levels of granularity (country, province, county). A first scientific study (the 'ecosystem function zoning project') to inform nature protection ran from 2003 until 2008. During this period, large investments were made in Protected Areas. A second scientific study (the 'national ecosystem survey') followed between 2012 and 2014 to evaluate the impact of past investments in large-scale environmental improvement projects and highlight additional ecological functions of importance. This study involved more than 3,000 scientists and provides the most comprehensive analysis of China's ecosystem services. The results called for a more holistic approach to protecting nature and recommended investing in ecosystem protection and restoration. As a result of these recommendations, three pilot provinces developed granular ECRLs in 2012-2013. In 2017, guidelines to regulate the delineation of terrestrial ECRLs were published, and by 2018 all other provinces had ECRL maps (He *et al.*, 2018; Gordon, 2019).



Ecological conservation redlines in 2019. Red areas are the ECRLs highlighting areas of important for ecological functions. These initial delineations may change as the policy is still being rolled out in China (Schmidt-Traub, 2020). The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

IMPACTS ON NATURE, CLIMATE, AND PEOPLE

ECRLs have not been fully launched yet and are still being implemented; as such, their effectiveness cannot yet be measured. In recent months, however, a few high-profile development projects, both in marine and terrestrial environments, are said to have been halted in response to the ECRLs. ECRLs will play a significant role in biodiversity conservation, covering ecosystems such as forests, grasslands, deserts, wetlands, mangrove forests, coral reefs and seagrass beds across critical regions of biodiversity all over China, bringing the rarest and endangered species and their habitats under protection. By including habitats such as forests and grasslands, ECRLs will also benefit climate action because those ecosystems can store and sequester significant amounts of carbon and provide valuable climate change adaptation benefits. ECRLs are also expected to boost more green jobs through sectors such as ecotourism, with an ecological compensation mechanism designed to ensure the smooth transformation of lifestyles for those who live within delineated ECRLs (He *et al*., 2018; Gao, 2019; Gordon, 2019; Schmidt-Traub *et al*., 2020).

3.3. South Africa: implementing its NBSAP - protecting ecosystems via affordable spatial biodiversity assessments and land stewardship.

CONTEXT

South Africa is one of the 17 megadiverse countries in the world. Together, these countries host two-thirds of the planet's species (SANBI, 2019). The country harbours over 95,000 known species (DEA, 2018) and is home to 3 of the 36 recognised biodiversity hotspots worldwide (SANBI, 2019). Whilst there have been significant efforts to promote biodiversity protection, South Africa's protected areas currently only include 9% of the country. The country also has some critical ecosystem services in need of protection. 10% of the land surface provides 50% of annual run-off. Yet only 1/8th of these Strategic Water Source Areas are formally protected (SANBI, 2019). Moreover, the country's natural resources have historically been of substantial social and economic importance to its Indigenous people and local communities. Post-1990, increased democratisation has led to more inclusive decision-making processes to promote just and equitable access to natural resources for all communities (SANBI, 2019).

PROCESSES UNDERTAKEN

South Africa's National Biodiversity Strategy and Action Plan (NBSAP) includes detailed biodiversity maps for the use of all government, NGO, and private sector institutions. After passing the Protected Areas Act in 2003 and the Biodiversity Act in 2004, South Africa published its first NBSAP as a signatory of CBD in 2005. It is currently being implemented and supported by international funders and collaborations. The second (and current) NBSAP was published for 2015-2025 (Government of South Africa, 2015).

South Africa also uses an alternative to state-owned protected areas to protect nature: the National Biodiversity Stewardship Programme to protect and manage the land of significant biodiversity value through voluntary agreements with private and communal landowners. The biodiversity stewardship sites have a similar legal status to state-owned protected areas, with precise level of protection depending on their conservation value. They are 70-400 times cheaper to establish and 4-17 times cheaper to manage than state-owned protected areas. This approach accounts for more than two-thirds of the land-based protected area expansion between 2006 and 2016 (SANBI, 2019).

While national maps are a useful tool, biodiversity does not stop at national borders. South Africa participates in transboundary conservation work: it has agreements with all six of its neighbouring countries to establish six Transfrontier Conservation Areas known as "peace parks" (SANBI, 2019).

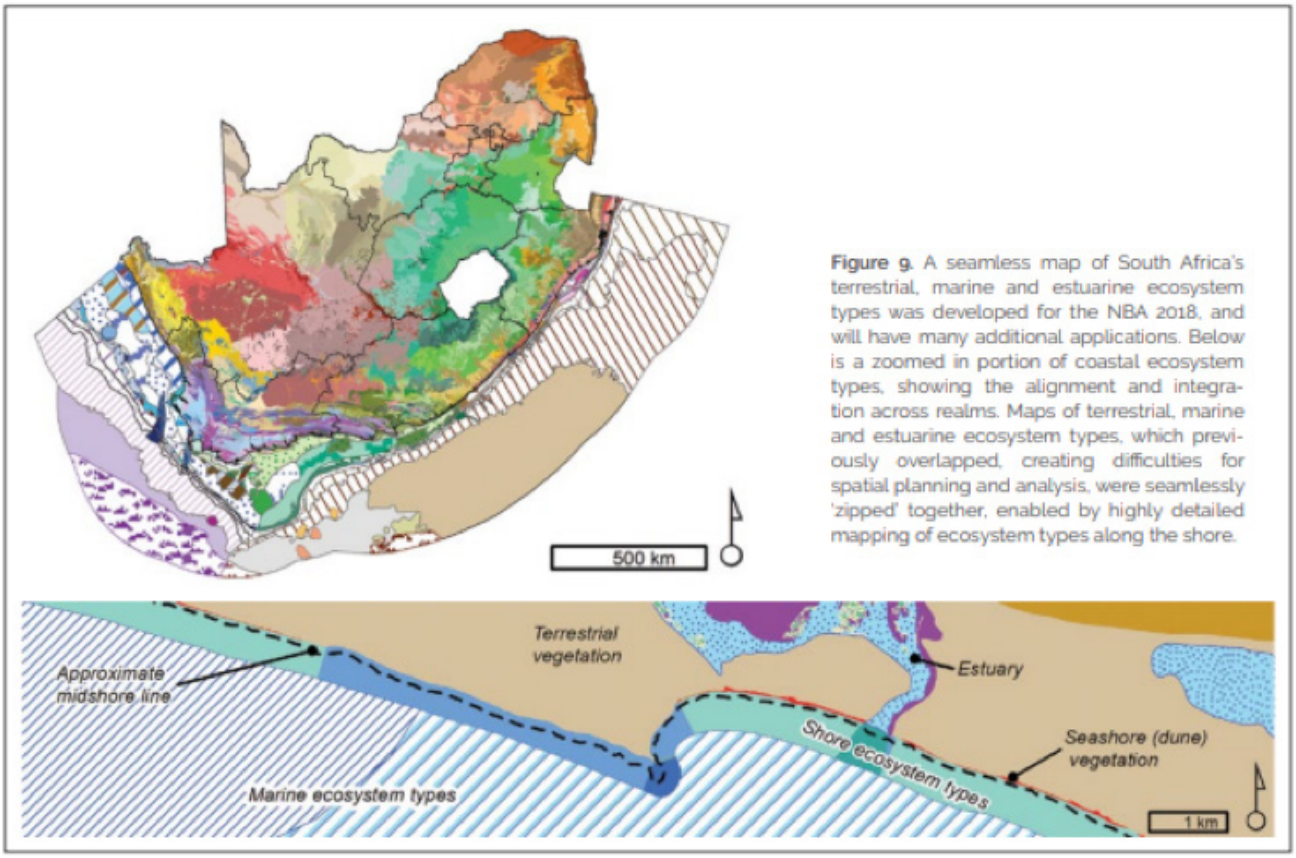


Figure 9. A seamless map of South Africa's terrestrial, marine and estuarine ecosystem types was developed for the NBA 2018, and will have many additional applications. Below is a zoomed in portion of coastal ecosystem types, showing the alignment and integration across realms. Maps of terrestrial, marine and estuarine ecosystem types, which previously overlapped, creating difficulties for spatial planning and analysis, were seamlessly 'zipped' together, enabled by highly detailed mapping of ecosystem types along the shore.

South Africa's seamless ecosystem map, from SANBI's "National Biodiversity Assessment" (2018). The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

NOTEWORTHY SPATIAL PLANNING INITIATIVES

South Africa produced its first National Spatial Biodiversity Assessment (NBA) in 2004, relatively quickly, with limited available data, budget and human capacity, showing that initial spatial assessments can kick-start a process of improvement (SANBI, 2019). That year, the South African National Biodiversity Institute (SANBI) was created, and the first NBA was published as part of their mandate to assess and monitor South Africa's biodiversity. The second and the third NBA were published in 2011 and in 2018, respectively. The NBA is used to inform policies, strategies and actions for managing and conserving biodiversity more effectively. South Africa has shared its knowledge regionally, with pilots underway in neighbouring countries (SANBI, 2019).

South Africa has high-quality biodiversity maps and strongly incorporates spatial information in its NBSAPs (SANBI & DEA, 2019). Indeed, since 2016, South Africa has had an aligned map and wall-to-wall biodiversity plans across all nine provinces, including for freshwater, estuarine and marine ecosystems. Their geographical scale is of sufficient clarity to be used in national, provincial, and local decision-making, and the underlying data have been made publicly available. These plans are one of the country's critical tools for including biodiversity within land-use planning, marine spatial planning, environmental authorisations and development decision-making (SANBI, 2019). A National Biodiversity Information System that will centralise the capture, aggregation, management, analysis and visualisation of all biodiversity data on a web-based platform is also under development (SANBI, 2019).

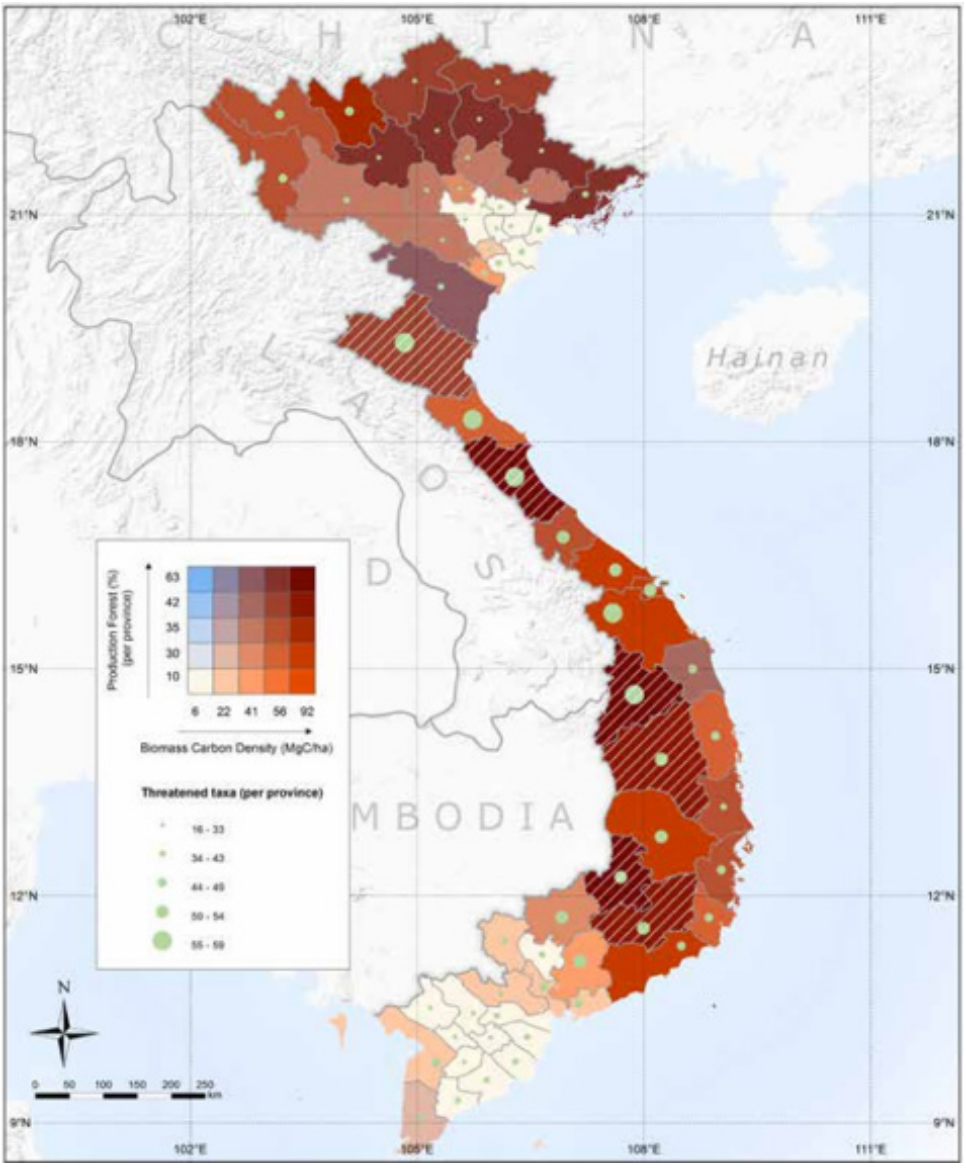
IMPACTS ON NATURE, CLIMATE, AND PEOPLE

Preliminary results have shown promise. Over half of the objectives of the first NBSAP have been fully or substantially achieved, with over 90% of objectives achieved to some extent. Although protected areas still cover only 9% of the country, this figure grew by 12% between 2015 and 2020 (SANBI, 2019). Outside of formal protected areas, systematic land-use and conservation planning have been effective in protecting biodiversity. For example, land clearing was reduced by 54-72% over ten years in the Mpumalanga Province thanks to the identification of Critical Biodiversity Areas, ranking highly among other spatially explicit conservation interventions (von Staden *et al.*, 2022). South Africa has also expanded its Biodiversity Stewardship Programme to the Rural Development sector, to create the Land Reform and Biodiversity Stewardship Initiative. This programme focuses on the coexistence of biodiversity conservation and sustainable commercial activities on the same site. This project aids communities living and earning a sustainable livelihood on their natural land (SANBI, 2019).

3.4. Viet Nam: combining different planning approaches (analysis, mapping, participatory) and legislation towards more integrated land-use planning.

CONTEXT

A dramatic reduction in forest cover (37%) between 1943 and 1991 and a reduction in mangrove forests (85%) between 1943 and 2008 have contributed to increased political awareness of the need for ecosystem protection. Since 2012, Viet Nam has created and expanded protected areas as part of its National Biodiversity Strategy to 2030. Whilst there is a clear and complete jurisdictional framework for ecosystem protection, Viet Nam has not yet optimally integrated its environment and climate goals into broader land-use planning. Moreover, the country's provinces cannot often produce integrated land-use plans, including maps (Mant *et al.*, 2013).



Synthesis map representing forest carbon stock distribution, biodiversity and conservation importance, and REDD+ activity potential (Mant et al., 2013). The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

PROCESSES UNDERTAKEN

Integrated land-use planning was piloted in the context of REDD+, focusing on forests. In 2012, the Prime Minister approved a National REDD+ Action Programme: 2011-2020 (NRAP), which was reviewed in 2016 and has just reached the end of its second implementation phase (2016-2020). Identifying a need for "a comprehensive and participatory planning process at the provincial level", the Government of Viet Nam, with support from the UN-REDD Viet Nam Phase II Programme, developed a methodology and piloted Provincial REDD+ Action Plans (PRAPs) in five pilot provinces (Mant *et al*., 2013; García-Rangel *et al*. 2017).

Viet Nam is now moving towards greater integration of climate and nature targets, beyond forests. In 2017, the Ministry of Planning and Investment developed the Integrated Planning Law, which aims to integrate development and environmental objectives in sectoral, national (marine and terrestrial) and provincial masterplans. Each province will prepare a master plan with integrated land-use maps through a participatory process, supported by guidance developed with GIZ. A broader enabling environment supports this process, including national environmental regulations, and an architecture to channel financing through "payments for forest ecosystem services" (PFES) (UNEP-WCMC, 2019; Charlotte Hicks, personal communication, 2022).

NOTEWORTHY SPATIAL PLANNING INITIATIVES

To produce the PRAPs, the five pilot provinces combined qualitative information, spatial analysis of quantitative information, and participatory approaches to reach the final maps and plans. A theory of change was developed in participatory workshops that built results chains focused on identifying problems and potential solutions. This methodology was guided by a facilitators manual developed for PRAPs and released as a general guide for subnational action REDD+ planning (FAO 2017; García-Rangel *et al*. 2017).

IMPACTS ON NATURE, CLIMATE, AND PEOPLE

Each PRAP was approved by the Provincial Peoples' Committee of the pilot province. As of 2020, 22 provinces have developed PRAPs (USAID, 2020), and the concept is widely incorporated into national REDD+ processes. As well as developing a detailed understanding of where and how REDD+ actions can be implemented to deliver the desired results, it aims to ensure ownership of the maps and plans by the provinces. Through the planning processes, provincial REDD+ teams and other stakeholders have benefited from increased capacity for REDD+ planning and implementation, with a clear understanding of the combined participatory and analytical methods used, leading to greater confidence in the results (UNEP-WCMC, 2019).

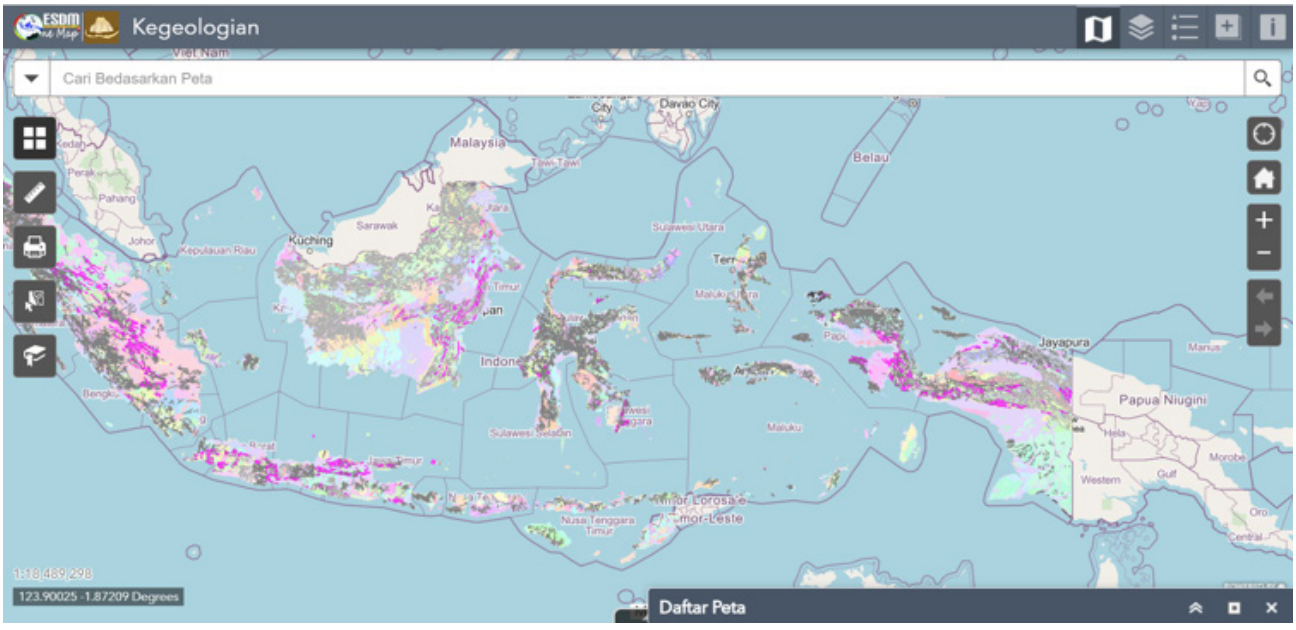
3.5. Indonesia: solid political leadership and enablement of REDD+ leads to the One Map and greater peatland protection.

CONTEXT

Indonesia is home to the third largest tropical forest in the world. It hosts 10 to 20% of all the world's species of flowering plants, mammals, reptiles, and birds (CBD, n.d.). However, Indonesia is also the sixth largest emitter of greenhouse gases globally, of which nearly half is caused by deforestation and peatland degradation/fire (Groom, Palmer & Sileci, 2022). Since 2015, Indonesia's deforestation has been steadily declining, driven by national interventions to strengthen forest and peatland governance, including in 2011 the introduction of a moratorium on issuing primary forest and peatland licenses (i.e. concessions to develop these areas for agriculture or timber) (Groom, Palmer & Sileci, 2022). Political will remains strong; in 2022, President Widodo announced the revocation of 192 forestry and palm oil permits, covering an area of 3.12 million ha (Foresthints.news, 2022).

PROCESSES UNDERTAKEN

Political leadership centred on the importance of environmental protection has provided real momentum to the national REDD+ programme. Former Indonesia President Susilo Bambang Yudhoyono emphasized the importance of tackling climate change and approved a federal REDD+ programme in 2010, reinforcing existing regulations on spatial planning, forestry, and the environment (Yuwati *et al.*, 2021).



Screenshot of Indonesia's publicly available online map, with geological data layers activated (ESDM The Map, 2022). The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Institutional reforms and REDD+ efforts in Indonesia transformed forest governance. In 2010, the letter of intent signed between Indonesia and Norway on REDD+ agreed to set up a national REDD+ agency outside the Ministry of Forest (MoF). The REDD+ agency initially drove work forward under the Presidential Delivery Unit for Development Monitoring and Oversight (UKP4), reporting directly to the president (Wibowo & Giessen, 2015). The REDD+ agency and the UKP4 implemented several impactful initiatives, including the One Map Initiative in 2010, which aimed to integrate spatial data on forest licenses and land use into one single map (Astuti & McGregor, 2015), and a forest concessions moratorium policy. In 2015, the agency was brought back into the newly integrated Ministry of Environment and Forestry, working closely with a new Directorate General of Climate Change Oversight.

NOTEWORTHY SPATIAL PLANNING INITIATIVES

The One Map Initiative aimed to revolutionise spatial mapping and forest governance in Indonesia by creating a single map for national planning. Early REDD+ work in 2010 identified differences in maps of primary forest prepared by the Ministry of Environment (MoE) and MoF (Astuti & McGregor, 2015; Shahab, 2016). This resulted in a forest moratorium policy – temporarily suspending the issuing of primary forest and peatland licenses, and creating a single map. Simultaneously, the One Map Initiative aimed to centralize existing forest data from local authorities and different ministries into One Database and enforce One Standard for map production. The initiative was also intended to include Indigenous peoples' maps. This process brought together stakeholders from different Ministries around One Map, and has helped to foster a more collaborative culture within government. However, it has not been able to absorb the work of NGOs to map millions of hectares of Indigenous customary lands, despite an objective to recognise these lands (Shahab, 2016; WION, 2021; Jong 2022).

Indonesia recognised that peatlands are essential for climate and nature and acted upon them with spatial data and planning. The country's peatlands (typically forested) store approximately "30% more carbon than the biomass of all Indonesian forests" (Warren *et al*., 2017). In 2016, President Widodo formulated a moratorium to strengthen peatland protection (No. 57/2016), which will remain in place until Indonesia's peatlands are successfully mapped. He also established the Peatland Restoration Agency, now Peatland and Mangrove Restoration Agency. The body created a spatial plan for peatland restoration across hydrologic units in seven priority provinces (interactive map at: https://en.prims.brg.go.id/). Strong targets for peatland rewetting and restoration have been established, but are challenging to meet given that clearing and drainage of these tropical peat swamp forests is carried out with agricultural land-uses in mind (Astuti *et al*., 2020).

IMPACTS ON NATURE, CLIMATE, AND PEOPLE

Spatial planning has played an important role in Indonesia's efforts to reduce deforestation and improve peatland protection. More than 1 million ha of peatland were rehabilitated between 2016 and 2020 (Astuti *et al*., 2020). Deforestation decreased from 610,000 hectares in 2012 to a record-low 115,459 hectares in 2020 and the deforestation rate has been steadily declining since 2015 (Jong 2021). It has helped to stimulate an enormous effort in participatory mapping, led by non-governmental organizations, but significant challenges persist here. Whilst legislation is in place to assign tenure of ancestral lands to Indigenous communities, formal recognition is proceeding slowly.

4

Lessons Learned: how to ensure that spatial planning delivers coordinated action on climate and nature

Integrated spatial planning requires a series of linked enablers to create the conditions for success. The following are critical elements needed for successful implementation:

1 **A clear, unified goal supported by the most senior decision-making levels.** Political will is needed to place nature and climate at the very core of the country's strategy. This requires a clear rationale or incentive for action – ideally translated into a simple message - combined with advocacy from high-level leadership, and alignment with policy. This high-level leadership should aim to kick-start a participative process for designing solutions and implementation. In China, central government leadership focused on ecosystem services, driven by the understanding of their importance for food security and the avoidance of natural disasters. In Costa Rica, key political figures identified deforestation as a critical priority responding to rapidly declining forest cover. In South Africa, senior figures rallied behind the implementation of the NBSAP. In Indonesia, presidential leadership in protecting forests and peatlands has been key. Former President Yudhoyono emphasized the importance of climate change in national politics and approved a national REDD+ programme (hence facilitating his country's access to carbon finance), and current President Widodo formulated a moratorium on new peatland conversion, and established restoration targets, which has led to a direct impact.

2 **The common use of harmonized maps that integrate nature, climate and socioeconomic activities**. China's integrated maps are an example of a wide-ranging land use planning effort integrating multiple layers, such as water retention, biodiversity protection, soil retention, sandstorm prevention, flood mitigation, food production and carbon sequestration. Much global data on such themes is already available to countries, for example thanks to the platform UN Biodiversity Lab and data providers such as Land & Carbon Lab or Nature Map. These can help to fill the gaps in available national datasets that are typically preferred by countries.

China's maps are linked to a national, overarching strategy (ECRL) and an aspiration inscribed in the Constitution (China as an Ecological Civilization) and used by all government bodies, at all levels (national, province, county). As another example, the cautious success of Indonesia's REDD+ activity can be in part attributed to its One Map approach. Similarly, the harmonisation of maps between Costa Rica's ministries led to accelerated progress on conservation and climate adaptation measures.

3 **An inclusive, participatory planning process that engages key national and community stakeholders:** Developing a spatial plan including current and future planned land uses can become a vital tool for engaging stakeholders to develop a shared vision of sustainable land use in a country and how nature and associated climate objectives can be achieved in ways that are just and fair. A planning process should align local and national authorities, the private sector, civil society, and the scientific and technical community. Particular care should be taken to ensure that IPLCs are included in the planning process. Aside from the fact that planning can greatly benefit from integrating traditional knowledge, concerns have been raised by multiple parties on the potential risks to IPLCs from high-level global climate and nature targets, including 30×30 (Eisen & Mudodosi, 2021). Communities' livelihoods and very existence can be at risk if spatial planning processes do not involve them in decision making or respect their rights to their territories (Castellino, 2021). Without adequate safeguards and commitments from the international community and, in particular, national governments, there is a real risk that action to achieve these targets could be taken in a manner which threatens the ecological integrity of Indigenous lands and excludes IPLCs from meaningfully participating in the processes that affect their communities and livelihoods.

The 'Cancun safeguards' for REDD+ programmes, agreed upon at UNFCCC COP 16, codify a set of principles that seek to ensure that REDD+ activities avoid environmental and social risks and impacts (do not harm) while promoting the benefits (do good) (UNFCCC, 2022). IPLCs have been using maps and safeguards under REDD+ and elsewhere to engage government officials and governments on how their land rights can be protected (Heiner *et al*, 2019). For example, the Saweto Dedicated Grant Mechanism (DGM), financed by the World Bank, enabled land security and sustainable forest management in the Peruvian Amazon. The programme recognised the central role of IPLCs in land stewardship, and coordinated efforts, along with the government, to achieve the legal recognition of 253 native communities, and land titling of 58 native communities (Quintallina, 2021). The case studies above show how Costa Rica, Viet Nam and Indonesia have embraced participatory planning approaches to varying degrees.

4 **Institutional and financing frameworks strong enough to embed spatial planning and to implement new national/sub-national land use goals**: Supporting spatial planning efforts with the right enabling institutional architecture, such as regulation backed up by enforcement and finance to 'pay for nature' is a critical success driver. Costa Rica provides a rich example of this enabling architecture. A robust legal framework codifies 'no deforestation without permits' and 'no deforestation allowed for urban development' provisions. Specific institutions are set up for data collection and mapping (National Environmental Information System produces maps annually). Promoting ecotourism supports enforcement and funding through the National Forestry Financing Fund (FONAFIFO) which funds Payments for Environment Services (PES), conservation, and protected area management, in part through a national fuel tax.

The cases presented in the previous section are leaders in spatial planning. Many countries will need technical support and capacity building for a successful process, including access to and use of spatial intelligence in a way that fulfills each country's needs.

5

Conclusion and actions for policymakers

Understanding the basic steps required for a rigorous and transparent spatial planning process for nature, climate, and people – in line with Target 1 of the draft post-2020 global biodiversity framework – will help trigger public and private sector action.

Spatial planning can help bring different stakeholders (and government ministries) around a shared vision that integrates nature and climate. It can help guide financial flows towards nature-positive activity, provide clarity for business, and offer a monitoring and evaluation framework for civil society to hold actors to account.

Spatial planning alone, however, is not a silver bullet. It helps to operationalize climate and nature targets, but this must be followed by rapid, and determined implementation. The spatial plan must be accompanied by policy and regulation where necessary to ensure that climate and nature targets are met, with social and environmental safeguards in place that protect the rights of Indigenous peoples and local communities.[3]

Accordingly, here are some key actions that policymakers can take to advance national spatial planning:

- **Commit to ambitious, integrated science-based targets for nature and climate,** such as the draft 2030 targets of the forthcoming post-2020 global biodiversity framework. Target 1 on spatial planning will guide the national implementation of other parts of the framework, such as Target 2 on restoration of 20% of degraded ecosystems, Target 3 on protecting at least 30% of the Earth's surface for nature, and Target 8 on contributing to climate change mitigation and adaptation, i.e. the use of nature-based solutions to meet Paris Agreement goals. Countries should ensure a commitment towards joint delivery on nature and climate targets, implementing through a whole-of-government approach.
- **Create and publish spatially-explicit development plans, including maps of current and intended future land use,** in support of national and global targets on climate and nature. For example, countries should revise their Nationally Determined Contributions (NDCs) and National Biodiversity Strategies (NBSAPs) to include these maps to provide clarity to all stakeholders, and ensure that climate and nature action is defined as a political priority.
- **Embed spatial intelligence in national policy and standards to incentivize and fund better data collection, use, and sharing,** for example by mandating the sharing of data collected in Environmental and Social Impact Assessments and/or publishing government-collected data, and investing in data collection programmes domestically and in countries where data is patchy.
- **Foster an iterative, inclusive and collaborative planning process to deliver integrated action on climate and nature and access commercial and financial opportunities,** for example, ensuring a consistent approach across relevant ministries, including indigenous peoples and local communities (IPLCs) in planning processes, and exploring commercial opportunities (e.g. through accessing carbon markets).

[3] Additionally, policymakers should also ensure the integration of spatial initiatives with other critical non-spatial initiatives, such as setting of dietary guidelines to promote locally-appropriate diets aligned to a 'planetary heath diet', tackling food loss and waste, and defining a sustainable trade strategy. Such discussions are beyond the scope of the paper.

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