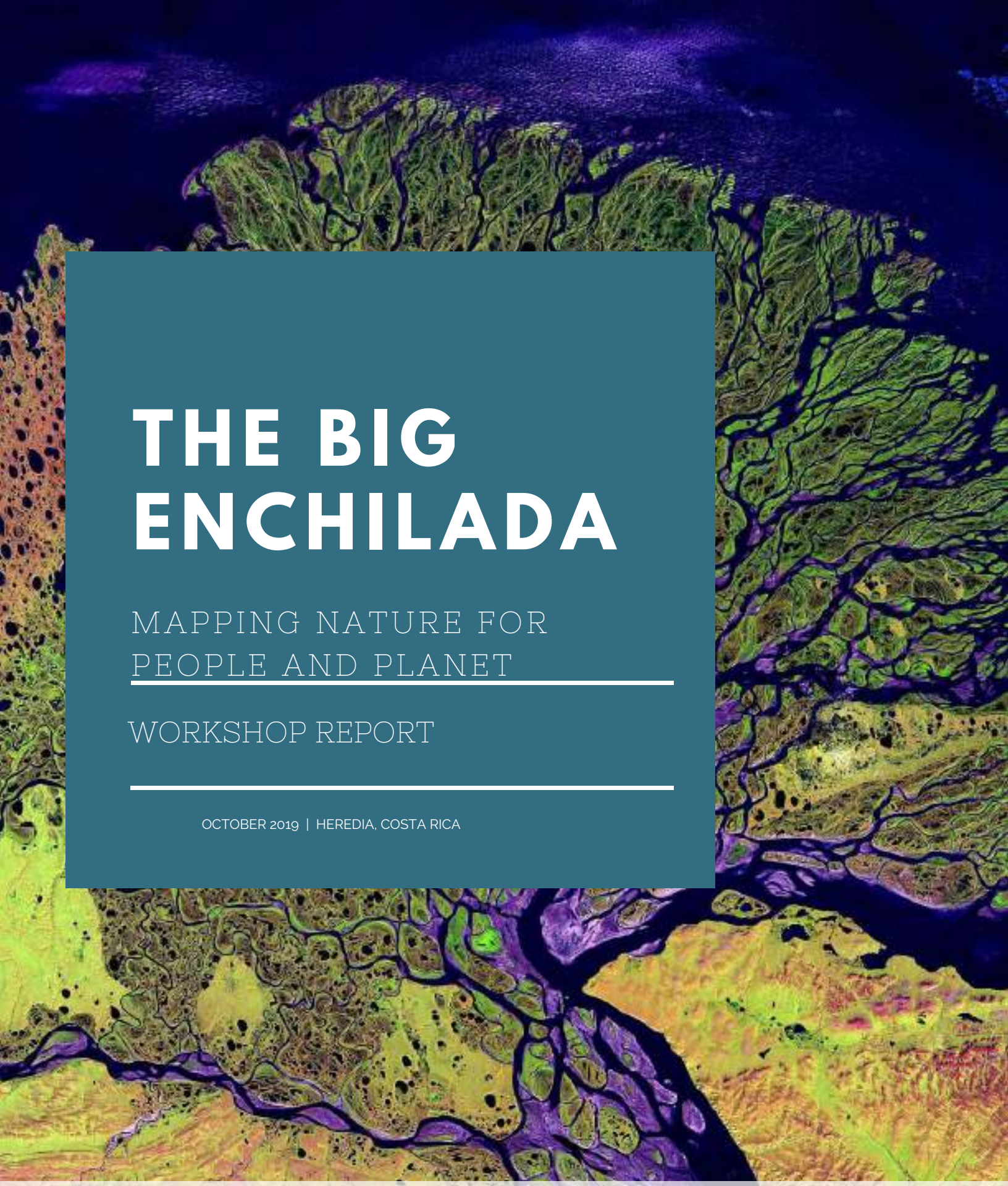


THE BIG ENCHILADA

MAPPING NATURE FOR PEOPLE AND PLANET

WORKSHOP REPORT

OCTOBER 2019 | HEREDIA, COSTA RICA

MINAE SIMOCUTE UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA one earth gef UNDP

CONTENTS

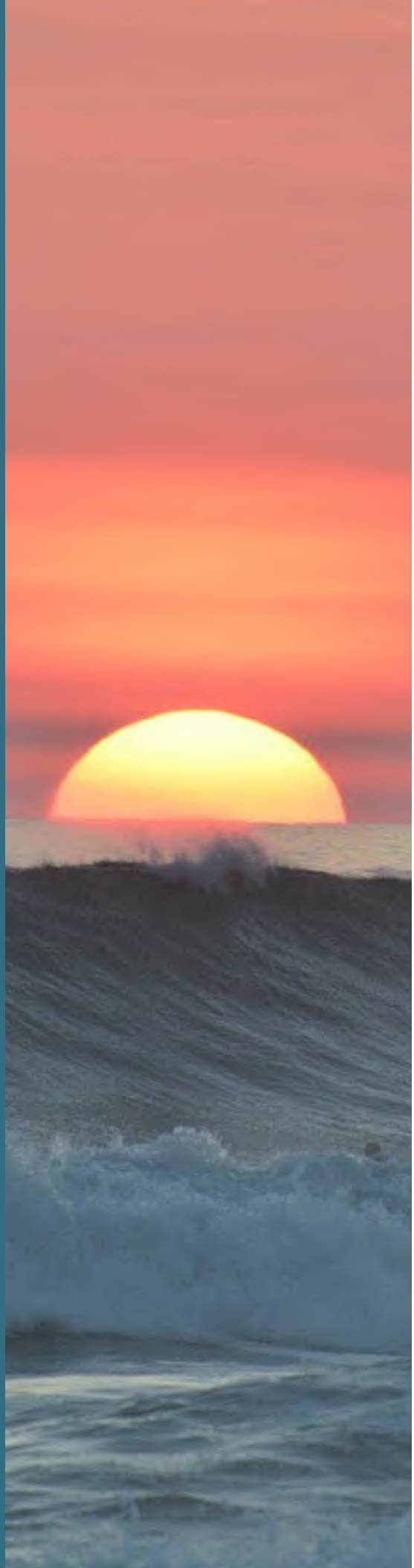
EXECUTIVE SUMMARY

From 22-24 October, The Ministry of Environment and Energy of Costa Rica (MINAE), UNDP Costa Rica, and the UNDP Nature for Development, with support from the GEF and One Earth, brought together over 60 world-class scientists and policy experts from Costa Rica and around the globe to answer the question: how can we use spatial data to identify nature-based solutions for biodiversity, climate, and sustainable development?. The three-day workshop was followed by a high-level session that shared outputs and next steps with key stakeholders.

The workshop's goals were to:

- Engage key national and global stakeholders involved in science and policy for nature, climate, and sustainable development.
- Introduce the 'essential life support area' vision - identifying and prioritizing where policymakers can take nature-based actions to deliver across a suite of national priorities for conservation and sustainable development.
- Develop the methods to achieve this vision with cutting-edge, rigorous science.
- Identify the necessary global and national datasets.
- Evaluate the political context, map key stakeholders, and provide clear steps to use the data to deliver across commitments to the Convention on Biological Diversity (CBD), UN Framework Convention on Climate Change (UNFCCC), UN Convention to Combat Desertification (UNCCD), and 2030 Agenda for Sustainable Development.

Over the course of the three days, policy experts identified the 26 top targets and indicators from 11 different national policies and plans, including the National Development Plan, National Biodiversity Plan (NBSAP), and the Nationally Determined Contribution (NDC) to the UN Framework Convention on Climate



Change (UNFCCC). This simple exercise enabled an overview of the synergies among these diverse national commitments, and a clear landscape of targets for which spatial data and maps could support more effective implementation. Technical experts surveyed 73 national data sources and 104 global data sources on biodiversity, carbon, water security, food security, disaster risk reduction, and jobs/livelihoods to identify which would be most appropriate for the analysis. Together, the group reviewed the methods used to create the proof of concept map to determine revisions that would need to be made to ensure a rigorous, policy-relevant map of Costa Rica's essential life support areas.

Moving forward, Costa Rica is committed to working with UNDP to complete the first map of its essential life support areas to take action for biodiversity, climate, and sustainable development. Costa Rica will likewise serve as a regional and global leader, advocating for the power spatial data to guide action that can address the biodiversity and climate emergency. By creating rigorous science that can support countries to take action based on their national priorities, this project supports the delivery of the Rio Conventions and Sustainable Development Goals at national and global levels.

This report shares key presentations and synthesizes feedback received on data, methods, and policy priorities in order to guide further action in Costa Rica and around the world.

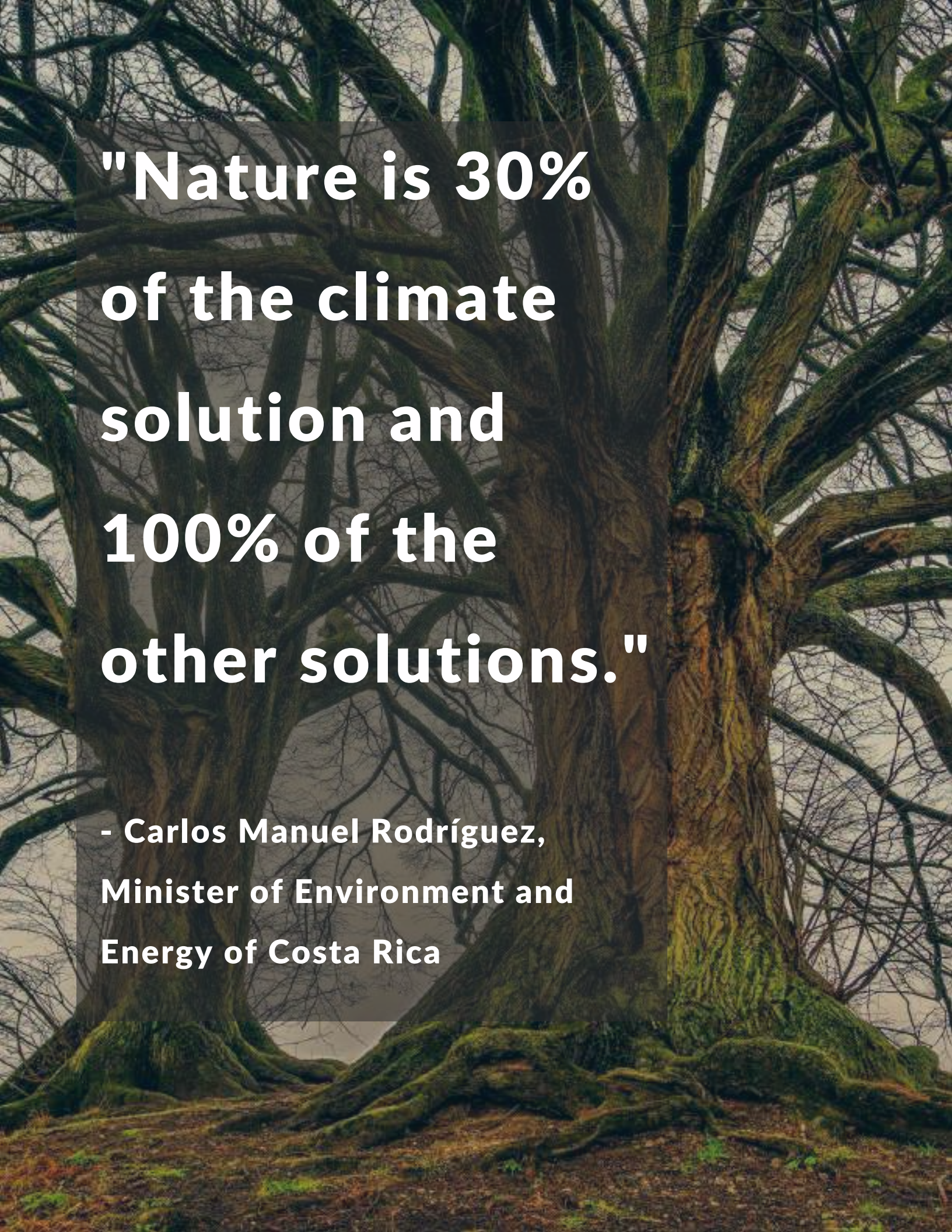
WORKSHOP OUTCOMES

The workshop led to:

- The engagement of 27 global participants from 17 institutions and 36 Costa Rican participants from 22 institutions in mappng Costa Rica's essential life support areas..
- An overview of the synergies among diverse national commitments, and a clear landscape of the 26 top targets for which spatial data and maps could support more effective implementation.
- A survey of 73 national data sources and 104 global data sources compiled on biodiversity, carbon, water security, food security, disaster risk reduction, and jobs/livelihoods to identify which would be most appropriate to include in the next iteration of the analysis.
- A detailed review of the methods used to create the proof of concept map of Costa Rica's essential life support areas.
- A compilation of suggested revisions to ensure a rigorous, policy-relevant map of Costa Rica's essential life support areas.
- A commitment from MINAE, UNDP Costa Rica, PRIAS Lab, and UNDP Nature for Development to iterate on the proof of concept to guide Costa Rica's policy and planning decisions on nature, climate, and sustainable development.

KEY RESOURCES

- WORKSHOP WEBPAGE
- PRESS RELEASE
- SUMMARY MATRIX OF DATA AND POLICIES
- DRAFT WORKFLOW FOR FUTURE WORK


"Nature is 30% of the climate solution and 100% of the other solutions."
- Carlos Manuel Rodríguez, Minister of Environment and Energy of Costa Rica

ABOUT THE WORKSHOP

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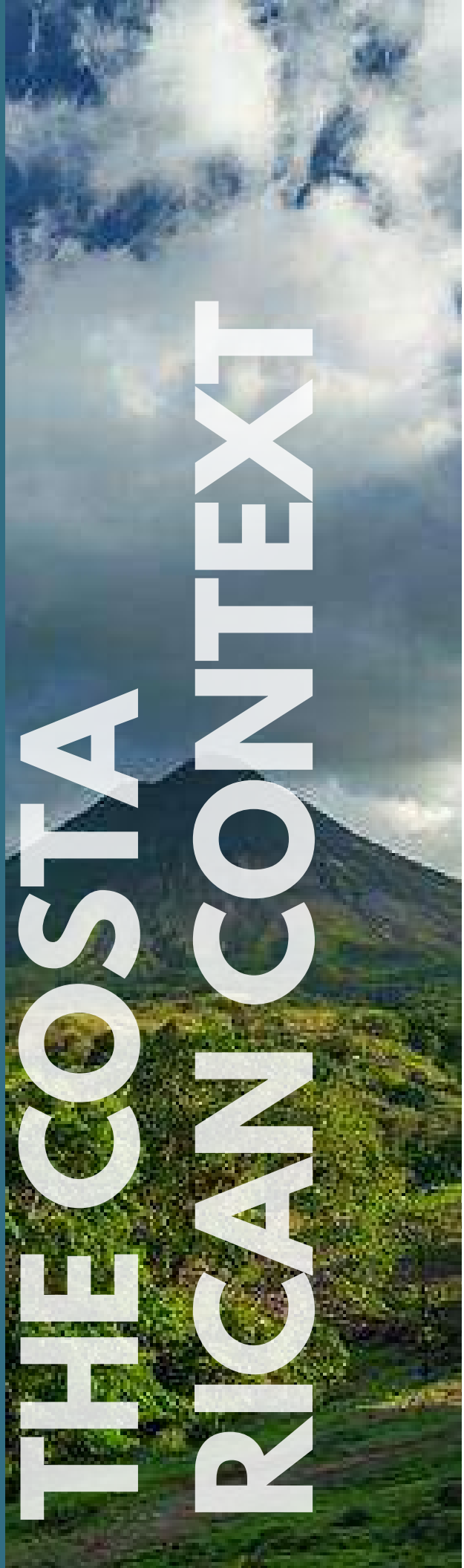


WELCOME

The day began with a warm welcome and an introduction to the Costa Rican context from José Vicente Troya, UNDP Resident Representative in Costa Rica; Carlos Manuel Rodríguez, Minister of Environment and Energy of Costa Rica; and Rafael Monge, Director of the National Center for Geoenvironmental Information (CENIGA by its acronym in Spanish) of MINAE.

UNDP in Costa Rica

UNDP Resident Representative José Vicente Troya opened the workshop, welcoming all participants and setting the scene. Building on a video from Greta Thunberg, he advocated that taking action to protect, restore, fund, and sustainably manage nature can provide critical solutions for the biodiversity and climate crises.

Costa Rica has pledged to become one of the first countries in the world to decarbonize its economy by 2050, and likewise to increase in forest cover from the current 52 percent to 60 percent. To accomplish these ambitious goals, the country must link its actions on nature, on climate, and on sustainable development. To do this, policymakers must know where they can prioritize investments to maintain Costa Rica's iconic biodiversity, to maximize climate change mitigation and adaptation efforts, and to deliver across our national priorities on water security, food security, disaster risk reduction, and jobs and livelihoods.

Spatial data, Troya emphasized, can help us to answer this question. He stressed UNDP's commitment to support countries to access and use spatial data to make better decisions for people and planet at the national and global levels. In Costa Rica, the UNDP country office and the Green Commodities Programme are working to end deforestation associated with agricultural production with MOCUPP, an innovative tool that uses satellite technology to monitor land use changes. Likewise, through UNDP's work in partnership with UN Environment and the Secretariat of the Convention of Biological Diversity at the global level, 137 countries now have access to over 100 of the world's best data layers on nature, climate, and sustainable development through the UN Biodiversity Lab.

These tools are excellent resources. But they do not – yet – provide us with the full answer needed. They do not – yet – provide the tools needed to identify where to take action to protect, restore, and sustainably manage nature for conservation, climate change mitigation, and ecosystem service provision. They do not – yet – enable Costa Rica to run customized analyses to identify where to take action based on national priorities and commitments.

Troya closed by emphasizing that this workshop had convened the world's top scientists, high-level policymakers, and policy experts who together could develop the scientific methods, cultivate political will, and map the connections across relevant commitments and policies to identify key nature-based solutions Costa Rica can prioritize to deliver to nature, climate, and sustainable development.

Nature-based Solutions as a Critical Priority for the Ministry of Environment and Energy (MINAE)

Carlos Manuel Rodríguez, Minister of Environment and Energy, complemented Troya's remarks, speaking on three key themes. First, he emphasized the critical need to uplift the role of nature in climate solutions. As host of the pre-Conference of the Parties to the UN Framework Convention on Climate Change (UNFCCC pre-COP), Costa Rica championed the agenda to showcase the critical role that nature plays. "Nature is 30% of the climate solution and 100% of the other solutions," Rodríguez declared. "Our objective here in Costa Rica is to let everyone know that investing in nature makes good economic sense." Yet, the vast majority of Parties to the UNFCCC are not discussing nature-based solutions as a key solution to the climate crisis. The Minister advocated for a strong campaign to build political will in 2020 to link the UNFCCC and the Convention on Biological Diversity (CBD), creating momentum that will have positively impacts for the UNFCCC and the nature-based Sustainable Development Goals (SDGs).

To do this, he emphasized the importance of rigorous science that can be applied to support policy processes. Science must guide the creation of national and international targets for nature and climate. For this, we need scientists who are working at the crossroads of the ecological and policymaking processes to help us to answer the questions of how we can protect, restore, and sustainably manage nature to address the biodiversity and climate crises. Rodríguez emphasized that of eight percent of Costa Rica's territory is terrestrial, that the country has committed to maintaining 60% forest cover by 2030, with 30% of this in protected areas and 30% in other areas. The country has likewise put in place economic policies to incentivize this.

In addition to the scientific basis for creating sound targets and prioritizing action, Rodríguez contended that rethinking the institutional framework will be essential. He commented: "We organize in ministries, agencies, secretaries the same way as we did 100 years ago. Do you think that is going to change? No. Does it need to change? Of course." In Costa Rica, MINAE also oversees energy, mining, and oceans, avoiding the division between renewable and non-renewable energy caused through the typical institutional set-up in many countries. By designing their government infrastructure to work at the landscape level, Costa Rica has been able to take a holistic approach to global challenges of climate change, biodiversity loss, and sustainable development. Today, this means that 300+ days out of the year the country runs on renewable energy. Other countries must critically look at the institutional arrangements in order to create the social and political will to decarbonize their economies and safeguard nature.

In closing, the Minister expressed his desire for scientifically rigorous data that could support Costa Rica to take action for the planet, and to lead the regional and global processes advocating for nature-based solutions to climate change.

Actors in Costa RIca Using Spatial Data to Take Action for People and Planet

Rafael Monge, Director of the National Center for Geoenvironmental Information (CENIGA by its acronym in Spanish) of MINAE offered the final introductory presentation to the Costa Rican context, introducing key agencies present at the workshop and highlighting Costa Rica's existing initiatives using spatial data. Over 28 national institutions and organizations were present, each working to produce key national data on nature and climate, or to use these data for action.

Among the initiatives Monge highlighted was Costa Rica's work on their Sixth National Report to the Convention on Biological Diversity, which contained 34 maps including those addressing questions of carbon sequestration, gender and productive sectors, and indigenous peoples and local communities. Likewise, Costa RIca is one of eight pilot countries participating in the NASA-funded Forest Integrity Project, a partnership among UNDP and five premier research institutions that is developing maps on forest cover, human pressure, forest integrity, and forest connectivity to identify 'last of the wilds' forests critical for biodiversity and carbon. Through another NASA-funded project, Costa Rica is working with the Natural Capital Project to improve linkages between earth observations and ecosystem service models. Finally, with the support of World Bank and other partners, Costa Rica is working to institutionalize the generation of national accounts on the value of nature. The data generated through these projects and many others will be made available at the national level through the SIMOCUTE platform, which is working to deliver key data to support governance and policymaking.

Monge concluded: "we're excited to show the world that evidence-based management of natural landscapes is essential for our future. We also see a clear need to identify synergies in our key national goals, targets, and policies for nature, climate, and. sustainable development. We see this workshop as an opportunity to continue this process in Costa Rica."

The Big Enchilada: Mapping Nature for People and Planet

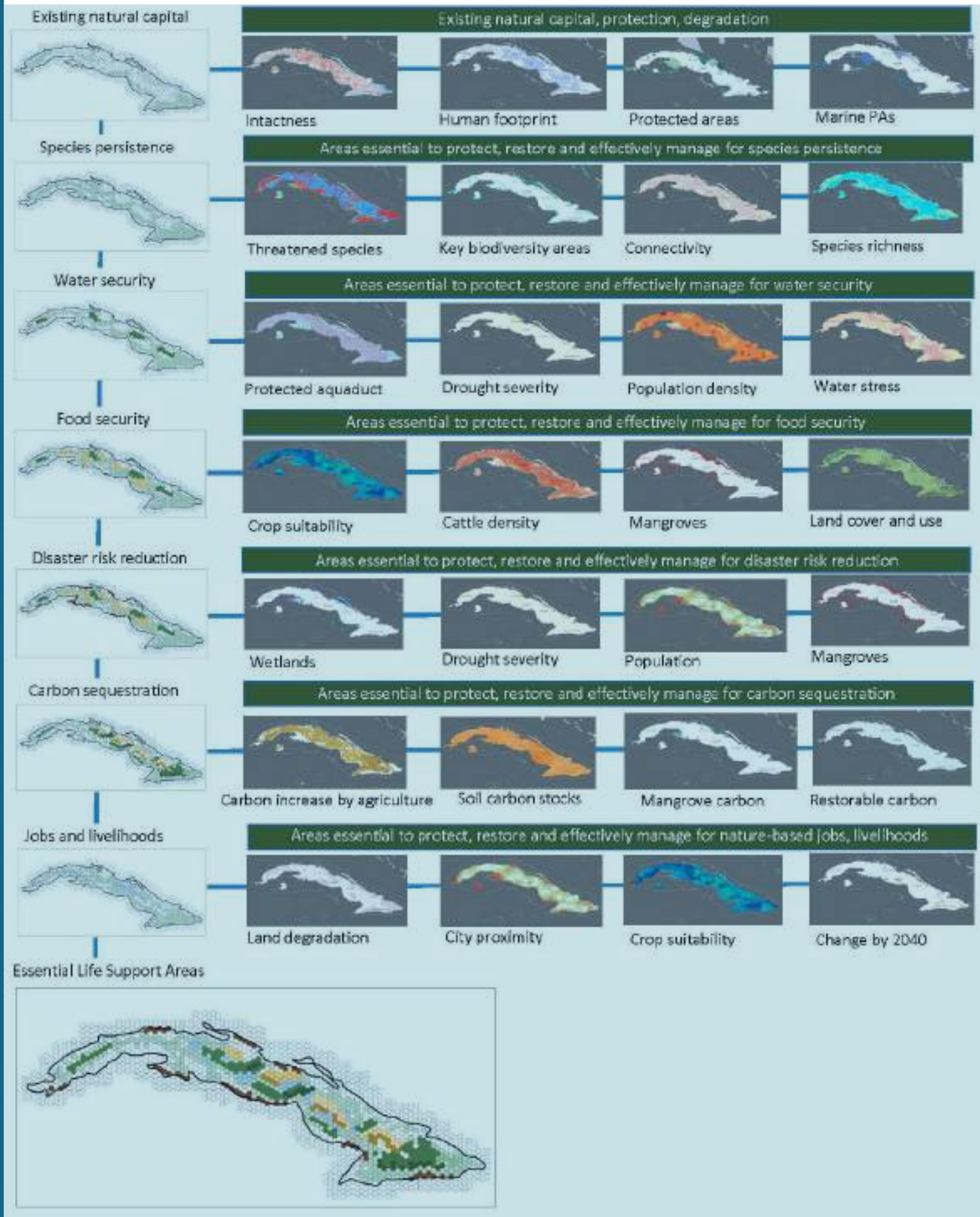
Jamison Ervin, Manager of the Nature for Development Programme at UNDP, framed the vision of the workshop – to develop a map of Costa Rica's 'essential life support areas' based on cutting-edge science, the best available national data, and national priorities in key policy and planning documents. "Traditionally, we stop and start with traditional conservation planning that focuse solely on species and ecosystem intactness", she said. "Conservationists just ask one question." She emphasized that to truly address the climate and biodiversity emergency, we must add nuance to that question by looking at how nature contributes to carbon sequestration, water security, disaster risk reduction, food security, and jobs/livelihoods. It is only by doing this that we can identify how nature underlines diverse national priorities, from climate change mitigation and adaptation, to sustainable development, to disaster risk planning. Likewise, it is only by creating a map that reflects national targets and indicators relating to these issues, in partnership with Costa Rican scientists and policymakers, that we can ensure utility at the national level.

The workshop aimed to do just that by creating a map of Costa Rica's essential life support areas (**Fig 1**). Essential life support areas are defined as areas that together conserve key biodiversity and provide humans with critical ecosystem services, such as carbon storage, food, fresh water, water filtration, and disaster risk reduction. Critically, the essential life support area approach will enable policymakers to construct intermediate 'theme maps' that show essential areas for biodiversity, carbon storage, food, fresh water, water filtration, and disaster risk reduction.

BOX 1: WHAT IS THE BIG ENCHILADA?

The Big Enchilada refers to the map of Costa Rica's essential life support areas, or areas that together conserve key biodiversity and provide humans with critical ecosystem services, such as carbon storage, food, fresh water, water filtration, and disaster risk reduction. Over the three days of the workshop, participants worked to identify the 'ingredients', or key input data; to refine the 'recipe', or the methods used to create the map; and evaluate the 'final dish', or the relevance of the final map based on Costa Rican context.

FIGURE 1: OVERVIEW CONCEPT FOR IDENTIFYING ESSENTIAL LIFE SUPPORT AREAS FOR PEOPLE & PLANET



These maps can be used to facilitate discussions among different ministries and stakeholders, and be weighted to create the final map of essential life support areas. There does not yet exist a scientific framework that can help policymakers to identify essential life support areas, and to take appropriate action to prioritize conservation and restoration based on their national needs and priorities. However, there exists a wealth of knowledge around systematic conservation planning and an explosion of data at the global and national levels that can make this vision possible.

Ervin emphasized that the essential life support area approach has four main components:

1. Consolidation of national level data to create a biodiversity baseline. Many countries have rich national data on biodiversity, land use change, and human pressure; however, it is often siloed and inaccessible. It is thus imperative that multi-stakeholder groups such as those who participated in this workshop identify the best sources of national level data, facilitate access, and ensure that it is validated for use in government decision-making. To facilitate this process, the workshop built on a list of national and global datasets compiled by teams at MINAE and UNDP.

2. Identification of national priorities for nature, climate, and sustainable development. To identify essential life support areas and prioritize action, it is essential to know each country's top policy targets and goals, as well as to identify synergies among different commitments. To facilitate this process, the workshop built on a rapid policy analysis that identified key nature-based targets and indicators in Costa Rica, compiled by teams at MINAE and UNDP.

3. Development of scientific methods to identify essential life support areas. Systematic conservation planning is a field that has focused on challenging questions such as these for the past 30 years. To create an essential life support area map, however, means critically looking at the input data and assumptions, evaluating the model itself, and revising and iterating based on critique from national and global experts. This workshop provided a forum to begin this process, based on a proof of concept for Costa Rica developed by world-class scientists at University of Northern British Columbia.

4. More informed national decision making and action for nature and sustainable development. The ultimate goal of this process is to build the capacity of countries such as Costa Rica to run these rigorous scientific analyses to identify essential life support areas in the country and take action based on their national priorities. By doing so, policymakers will be able to better determine risks and opportunities related to their natural capital, prioritize areas for protection, restoration and sustainable management, and align their policies and decisions to advance the three Rio Conventions and the 2030 Agenda.

Strategic Importance of the Essential Life Support Area Concept for Costa Rica

Carlos Cordero, Director of the Secretariat of Planning for the Environmental Sector (SEPLASA by its acronym in Spanish) of MINAE, emphasized the goal of the workshop to facilitate political decisions based on new scientific data on nature and sustainable development. Costa Rica is a country with high political will, and high technical capacity; yet it still faces silos among agencies, and it still faces data gaps. Cordero highlighted the value of having diverse participants together in the same place who could work together to inform both the science as well as how to use the science to make political decisions.

Stressing that the outputs of the workshop would be shared during a ministerial meeting, he emphasized the need to accomplish several things. First, to evaluate the quality of existing global and national spatial data on biodiversity, ecosystem services, and sustainable development: their precision, their technical quality, and whether they are an official or non-official source. Second, to assess the methods proposed to create a map of Costa Rica's essential life support areas – both to identify weaknesses and to understand the methodology so it can be used by experts in Costa Rica. Third, to evaluate what types of political decisions this map and the data underlying it can be used to support. He emphasized that the scientists in the room would evaluate the quality of the data, data available, and data gaps during the workshop, whereas the policy specialists would focus on the key targets and indicators for which these data could support action.

Cordero envisioned that the map of Costa Rica's essential life support areas would be a key contributor to Costa Rica's state of the environment report. It will also serve a key role in informing indicator development, and supporting action to deliver on key national priorities across the conservation and sustainable development agendas.

Introduction to Systematic Conservation Planning as a Strategy to Map Essential Life Support Areas in Costa Rica

Presentations from James Watson, University of Queensland and Wildlife Conservation Society, and Scott Atkinson, UNDP, introduced participants to the concepts behind systematic conservation planning.

Traditional conservation has focused on establishing projected areas based on iconic species. It has excluded ecosystem services to humans, non-iconic biodiversity, and key ecosystem processes. With the explosion of data from the fourth industrial revolution, we now have access to the types of data that we need to map biodiversity, ecosystem services, and threats at all levels.

Systematic conservation planning advocates for conservation areas that are Connected, Adequate, Representative, and Efficient (CARE). Connected conservation areas ensure that populations support each other, recolonization is possible, and animal movement occurs. Adequate conservation ensures that the total area under protection is enough to ensure the persistence of biodiversity features. Representative refers to sampling across the full range of variation for species, ecosystems, and ecosystem services. Finally, efficient conservation areas achieve their objectives at minimal cost.

These criteria are designed to help people identify the best places to project. However, identifying the 'best' is an inherently human and political process based on what is important in a given place – this could be natural environment, natural resources, ecosystem services, traditional knowledge and heritage, or many other factors. Thus to design an effective conservation plan, we must identify our broad goals, specific targets, and financial or political constraints.

In many cases, different goals or targets might raise conflicting priorities. As one simple example for Costa Rica, if the goal was to conserve key areas of the range for two iconic species – the panther and the resplendent quetzal – as well as the watershed for San Jose, it isn't clear which what areas should be conserved as these three areas are not synonymous.

Systematic conservation planning provides a simple calculation that can identify the optimal area to conserve based on this end goal and any financial or political restraints. It relies on setting some basic guidelines.

First, it is essential to identify a quantifiable target (e.g., percentage of jaguar habitat, percentage of resplendent quetzal habitat, and percentage of watershed). Second, planning units, or units of land or sea on which action can be taken. Third, a boundary length modifier that determines the compactness of the conservation area (values greater than 0 result in more complex reserves). Finally, a penalty factor imposed for not meeting the target in a given scenario. Systematic conservation planning effectively 'scores' different conservation options by adding together the cost of a planning unit, the boundary length of the reserve system, and the penalty factor for any unmet targets. Programs such as Marxan and PrioritizeR can quickly and effectively do this type of calculation to identify the most effective conservation options – those with the lowest score. These types of approaches can be adapted to national priorities by changing the cost of planning units, the boundary length modifier, and the penalty factor. Likewise, by producing a range of top conservation options, they can facilitate dialogue around which is most appropriate for national context.

Introducing the Initial Proof of Concept for Costa Rica

To create a map of Costa Rica's essential life support areas, the simple systematic conservation planning scenario introduced above can be enhanced to take into account different conservation actions and Costa Rica's national priorities. Oscar Venter, University of British Columbia, presented a proof of concept developed during the month prior to the workshop, showing draft methods and maps for Costa Rica's essential life support areas.

The strength of systematic conservation planning is that it can provide solutions for multiple objectives, while considering the differential costs and benefits of multiple conservation actions (e.g., restoring, protecting, managing). This enables a country to identify key places to act, and what actions are likely to be most effective there.

To develop this proof of concept to identify Costa Rica's essential life support areas, four steps were used (**Box 2**).

BOX 2: STEPS USED TO IDENTIFY ESSENTIAL LIFE SUPPORT AREAS.

1. DEVELOP THE PROBLEM FRAMEWORK BASED ON KEY POLICY NEEDS.
2. BRING TOGETHER AVAILABLE DATA.
3. RUN OPTIMIZATION FOR A RANGE OF SCENARIOS.
4. PRODUCE MAPS OF RESULTS.

Step 1: Reflect policy needs in a problem formulation. Systematic conservation planning offers two options that can reflect different policy needs or targets. The minimum set approach relies on specific targets such as conservation of 30% of jaguar range or production of 1.5 million tons of pineapple. It will identify where actions to protect, restore, and sustainably manage can most efficiently (lowest cost or least area) deliver on this target. The maximum coverage approach is budget (can be area)-based approach. For example, if the target is to protect 60% of Costa Rican land, restore 15%, and sustainably manage 15%, this approach will maximize the gains to planning units that can occur from protecting, restoring, and sustainably managing this amount of territory. For the proof of concept, the maximum coverage approach was used as this is more easily scalable to other countries, enabling Costa Rica to serve as a model for other countries in the region.

The second key need for formulating the problem is to identify where protection, restoration, and sustainable management are possible in Costa Rica. For this proof of concept, the human footprint was used to identify areas that are still ecologically intact (human footprint score < 14), which were designated as areas that could be protected. It likewise was used to identify anthropogenic landscapes (human footprint score 14-20) that could be targeted for restoration or sustainable use. This approach identifies where these actions can be done. However, it does not identify where they should be done based on Costa Rican context and law.

Step 2: Bring together the best data, and modify as needed to fit decision problem. For this proof of concept, datasets provided by CENIGA were used. These included: aboveground carbon, soilcarbon, agriculture, water importance, water quality, mangroves, wetlands, biodiversity intactness, corridors, and species.

Step 3: Run optimization for range of scenarios. To develop the problem costing, it is essential to set the effect of protection, restoration, and sustainable management on biodiversity, carbon, and ecosystem services. For this first iteration, the analysis assumed that protection would lead all conservation values to stay the same but reduce food provision; restoration would increase the value of most features by 50% but reduce food provision; and sustainable management would decrease the conservation value by 50% but maintain food provision. These numbers are rough proxies and would need to be refined in further iterations.

Scenarios were run to identify Costa Rica's essential life support areas when equal emphasis was placed on biodiversity, climate change, and sustainable development priorities (**Fig 2**). Scenarios were also run to identify how the location of essential life support areas would shift based if priority was placed on commitments to the Convention on Biological Diversity (biodiversity set as target over carbon and ecosystem services), the UNFCCC (carbon set as target over biodiversity and ecosystem services), and the Sustainable Development Goals (ecosystem services set as target biodiversity and carbon) (**Fig 3**).

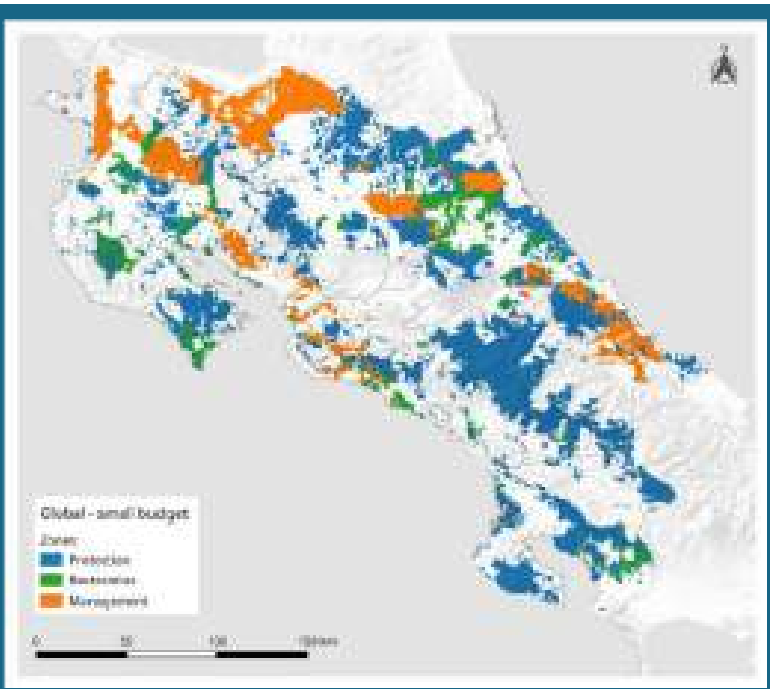
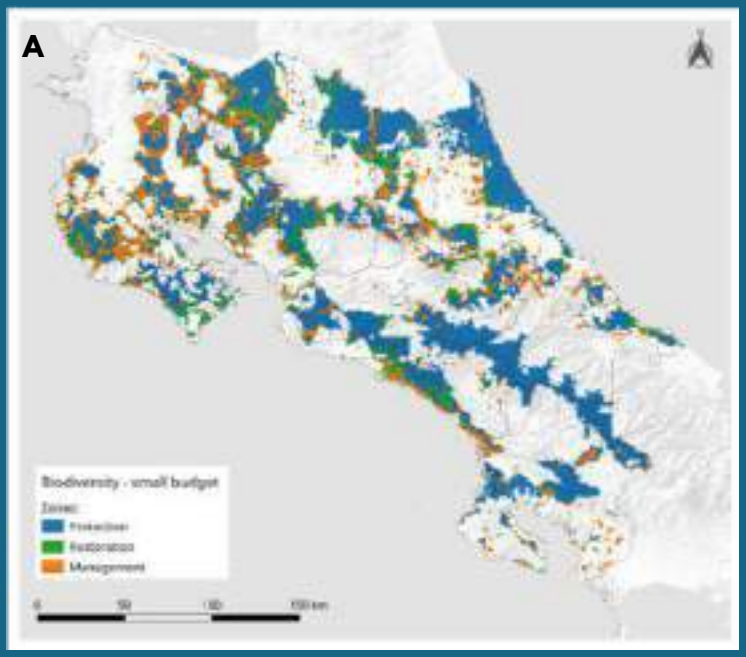
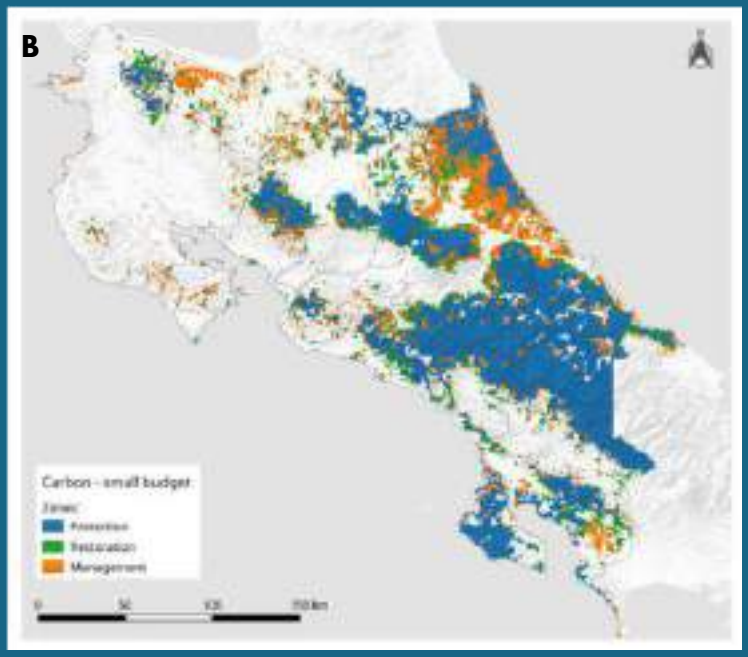


FIGURE 2: COSTA RICA'S ESSENTIAL LIFE SUPPORT AREAS.

This first iteration map of Costa Rica's essential life support areas shows where action should be taken to protect, restore, and sustainably manage if equal priority is placed on actions for biodiversity, climate change, and sustainable development.





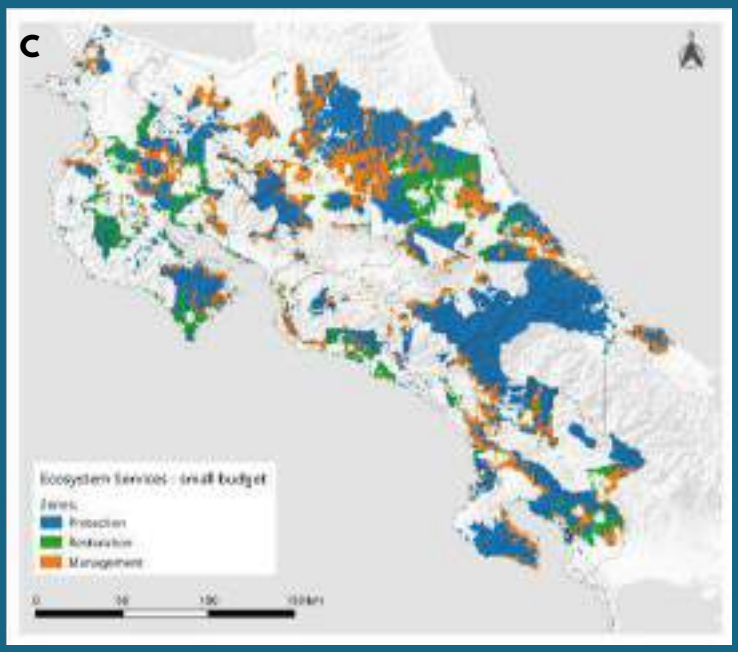


FIGURE 3: COSTA RICA'S ESSENTIAL LIFE SUPPORT AREAS.

In comparison to Figure 2, which weights priorities for biodiversity, climate, and sustainable development, these maps show the areas where action should be taken to protect, restore, and sustainably manage if: (A) biodiversity; (B) Carbon; and (C) Ecosystem services are set as the key priority relative to the others.

Step 4: Show results, refine scenarios, iterate. The maps created through these initial scenarios are the only the first iteration of Costa Rica's essential life support area map. Engaging with Costa Rican experts to refine scenarios and iterate these maps will be essential to ensure that they can inform decisions. The first iteration maps are an opportunity for learning and improvement. Even a refined and validated national priority map is never intended to be imposed on a country.

However, if policymakers trust the priorities that have led to the map, maps such as these can be useful for programs such as those wanting to expand forest cover by 4%, or to increase PES programs by a certain amount. To create an essential life support areas map that can guide implementation for Costa Rica, it will be critical to work in partnership to develop the methods for the Costa Rican context, identify the needed data, and train the key technical experts in the country to run these analyses.

The spirit of the workshop was to create a map that would bring together the Rio Conventions and SDGs, and that would provide a tool to facilitate dialogue across diverse ministries, with an ultimate goal of providing Minister Carlos Manuel Rodríguez with a map that can be shown to the world as a tool to support nature-based solutions for biodiversity, climate, and sustainable development. UNDP and the University of Northern British Columbia's goal is to provide the support needed to create this essential life support areas maps and position Costa Rica as a global leader.

DATA, METHODS, PROCESS

COOKING THE BIG COSTA RICAN ENCHILADA

Over the three days, participants discussed both the potential input datasets and methods used for the first iteration of Costa Rica's essential life support area map, and identified essential questions the analysis should answer. A science group reviewed the global and national input data, and a policy group completed a deep review of key policy documents to identify the key targets for which spatial data can support action. Together, the group also critiqued the methods for the first round of analysis and proposed a workplan for going forward.

IDENTIFICATION OF KEY QUESTIONS TO GUIDE THE ANALYSIS

Key Questions for Carbon

- Which kinds of forests/mangroves are most efficient for carbon capture?
- What is the difference between primary and secondary forests for carbon capture?
- What are the emissions from deforestation of different types of forests?
- What are the risks, including degradation, facing the five types of forests identified by Costa Rica for restoration – mangroves, palms, dry forest, moist forest, and very humid forests?
- Where can we use new types of agricultural production to flip the sector from carbon source to carbon sink? What types of agricultural production are most effective for this?
- Where can we restore forests to maximize carbon sequestration?
- Where is it important to avoid deforestation?
- Where is the existing REDD+ program?
- Where are existing Payment for Ecosystem Services (PES) Programs?
- What is the protected status for existing key carbon-rich ecosystems – peatlands, seagrass beds, wetlands?
- How do we create a map of stand structure/seral stage diversity for Costa Rica?
- How do we create a map of aboveground/belowground carbon sequestration and storage?
- What targets/indicators does a map for carbon need to address?

Key Questions for Water Security

- How do we map water health, flow, use, and quality?
- Where are areas that can ensure high water quality?
- What is the altitude of water sources?
- Where are areas of water risk?
- Where are regions of water stress?
- What are the main water sources outside of protected areas?
- Where are future areas of water risk and water sources inside and outside of protected areas?
- What and where are future water conditions?
- Where should forests be protected, restored for municipal drinking water?
- Where should forests be protected, restored for agriculture?
- Where are threats to forests that could or will affect water quality and quantity?
- Where and how should we prioritize which ecosystems are protected and restored based on land use type?

Key Questions for Food Security

- What is the distribution of agricultural suitability? How will this change in the future under climate change scenarios?
- Where are areas of high soil productivity? Which of these are at risk of urbanization?
- In which areas should regulation protect crops against urbanization?
- Where are different types of cultivated crops distributed?
- Where are areas of wild crop distribution?
- What are areas of crop/seed genetic biodiversity?
- What are essential foods and where are they found?
- Where can alternative crops be grown?
- What is the distribution of famine vulnerability?
- Where should we improve/restore soils?
- Where are existing areas for agroforestry and silvopastoral practices?
- Where are new areas for agroforestry and silvopastoral practices?
- Where are crops located close to natural areas that will cause pressure on nature – now and in the future?
- Where are areas important for non-timber forest products and wildlife?
- Where are key areas of marine diversity?
- Where is habitat for pollinators?
- Where should fisheries resources be protected and sustainably managed?

Key Questions for Disaster Risk Reduction

Note: In Costa Rica there are three levels that the government uses to approach the question of disaster risk reduction: risk, vulnerability, and risk management. Once data is available on risk and vulnerability, risk management can be discussed. Current geospatial data only shows risks.

- What are the most important natural hazards in Costa Rica?
- What is the priority of focus among landslides, earthquakes, volcanic eruptions, floods, and forest fires?
- Where are the risks from forest fires, landslides, earthquakes, volcanic eruptions, floods?
- Which areas should be restored in order to reduce landslides?
- Where are areas vulnerable to disaster now and in climate scenarios?
- Where are the most vulnerable populations?
- How are socioeconomic impacts of disaster distributed?
- What is the distribution of risk, vulnerability, and risk management?

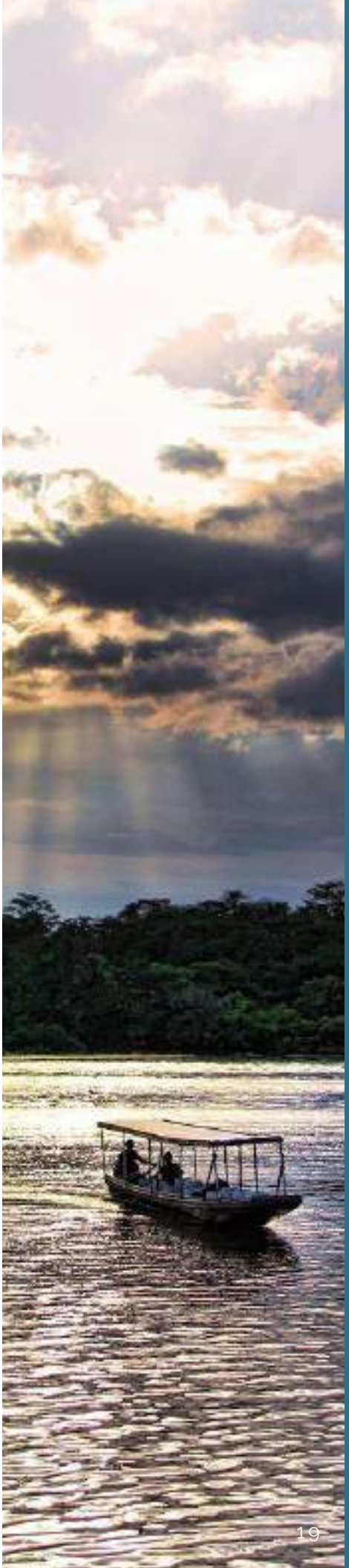
Key Questions for Nature-Dependent Jobs and Livelihoods

*Note: Nature-dependent jobs include businesses that generate economic growth and positive social and environmental impacts. In Costa Rica, the most visible jobs in this sector are around beekeeping and ecotourism.

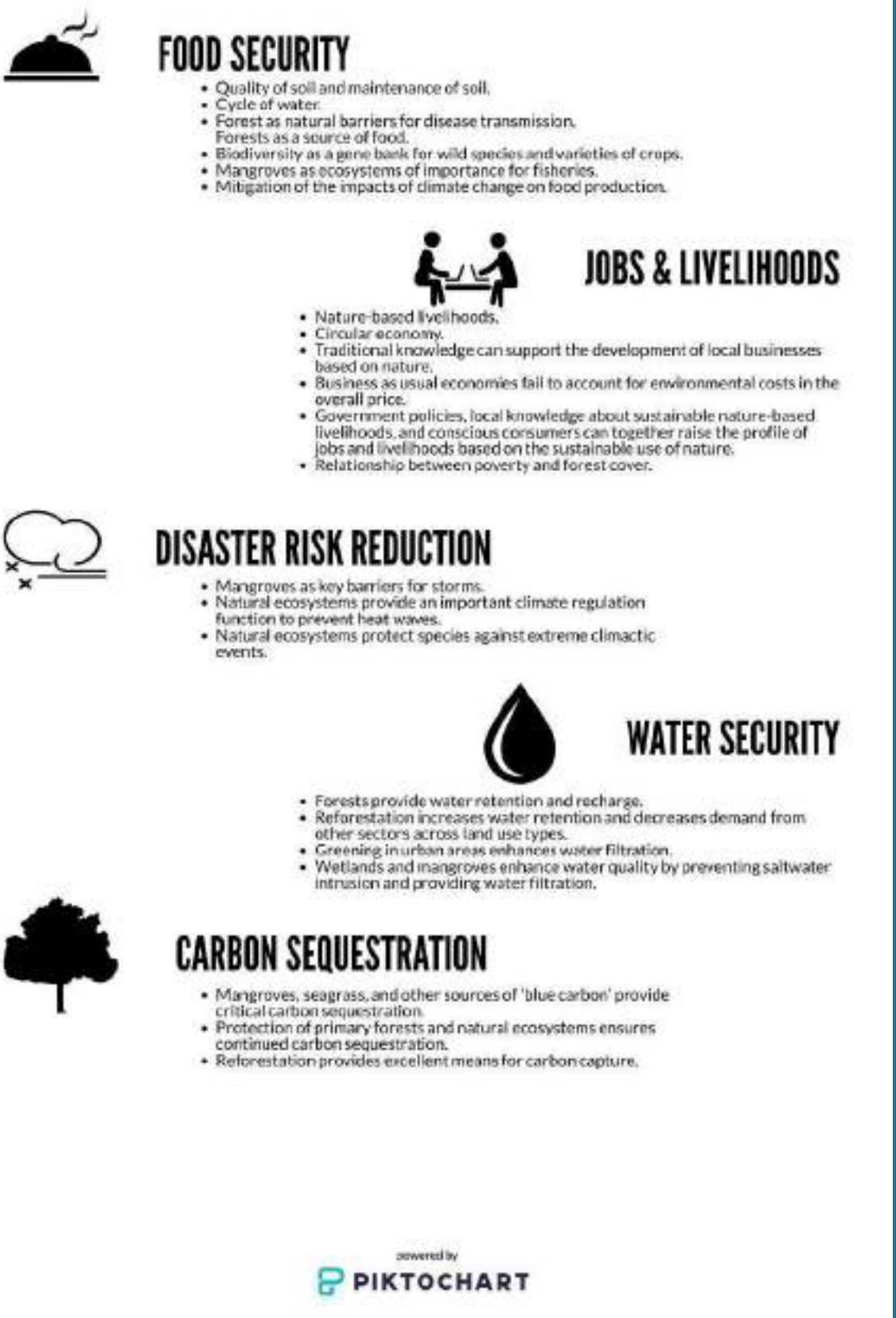
- Based on ecosystem services identified, which areas are most appropriate for blue and green economies?
- Where are indigenous communities located? Where are indigenous communities located who are using their traditional knowledge?
- Where are nature-dependent communities distributed?
- Where are corporate farms, commodities, subsistence, smallholders?
- Where are the areas with the highest possibilities to create green businesses?
- What is the distribution of sustainable nature-based industries, jobs, and livelihoods?
- What is the distribution of unsustainable nature-based industries, jobs, and livelihoods?
- What is distribution of poverty?
- How are marine livelihoods distributed?
- How are marine livelihoods potential distributed?
- Where are digital/technological capacities, innovation most important?
- What is current land use zoning? How should it be adapted?

Key Questions for Health

- What are areas vulnerable to vector diseases (such as dengue) now and in future?
- What is the distribution of malnutrition?



BOX 3: WHAT IS THE VALUE OF NATURE IN COSTA RICA FOR....?



PRIORITIZATION OF KEY POLICY TARGETS AND INDICATORS

Drawing on a rapid policy analysis conducted leading up to the workshop, participants identified key nature-based targets and indicators that could be advanced through the use of spatial data. The initial rapid policy analysis reviewed 11 different national policies, plans, and strategies (**Box 4**) to identify targets that could be supported by the advancement of nature-based solutions in Costa Rica. The policies analyzed were those that the Ministry of Environment and UNDP identified as closely related to nature-based solutions.

This analysis followed the definition of nature-based solutions as: "conservation, restoration, and/or improved land management actions that increase carbon storage and/or avoid greenhouse gas emissions across global forests, wetlands, grasslands, and agricultural lands". Targets, objectives, and indicators were identified from the plans surveyed if they provide an aspirational or actionable component to achieve or increase nature-based solutions. Targets, objectives, and indicators related to sensitization, monitoring, creating plans, education, and others, even if crucial for overall processes, were not included as they do not offer clear aspirational targets to promote or increase the use of nature-based solutions.

In general, many targets applied for two or more of the themes discussed during the workshop. For this reason, they were repeated in two or more themes in the spreadsheet. Costa Rica has many targets and ambitions in its current policies related to nature-based solutions. This analysis demonstrated that further alignment between them could facilitate the inter-institutional collaboration for implementation.

During the workshop, participants identified and prioritized targets from this analysis that can be supported by spatial data. The final sheet is available here (tabs 3-7).

BOX 4: POLICIES REVIEWED.

Policies analyzed:

1. National Development Plan
2. National Biodiversity Strategy
3. National Plan for Decarbonization
4. National Policy for Sustainable Production and Consumption
5. National Policy on Biodiversity*
6. National Policy for Climate Change Adaptation
7. National Strategy for Climate Change*
8. National Policy for Disaster Management*
9. REDD+ National Strategy Action Plan
10. National Policy for Potable Water
11. Strategic Plan for Food Security.

Policies included in the review:

1. National Development Plan
2. National Biodiversity Strategy
3. National Plan for Decarbonization
4. National Policy for Sustainable Production and Consumption
5. National Policy for Climate Change Adaptation
6. REDD+ National Strategy Action Plan
7. National Policy for Potable Water
8. Strategic Plan for Food Security.

*In the case of the National Policy on Biodiversity, the objectives are too wide. This plan frames what the State can or cannot do; the aspirational targets are included in the National Biodiversity Strategy. In the case of National Strategy for Climate Change and National Policy for Disaster Management, no targets or indicators related to nature-based solutions were identified.

They additionally identified additional plans that should be included in further analyses:

- Carbon sequestration: National Wetlands Policy, National Energy Plan (hydropower), National Degradation Plan (this is supposed to be updated in the near future – has watershed targets for the time it was published), National Compost Plan (forthcoming), Riperian Buffers Plan (forthcoming), Low-Carbon Livestock Strategy (2015-2034), NBSAP target for increase from 26.5% to 30% protection of terrestrial areas.
- Species & ecosystem persistence: NAMA Café.
- Food security & jobs/livelihoods: NAMA Café, NAMA Ganadería, Política Nacional del Mar 2013 – 2028, Política Nacional de Seguridad Alimentaria, Plan Estratégico de Seguridad Alimentaria 2017 2022, Plan Estratégico del Sector Agropecuario 2018 – 2022.
- Disaster risk reduction: Política Nacional de Saneamiento en Aguas Residuales 2016 – 2040, Política Nacional de Gestión de Riesgos 2016 – 2030, Plan Nacional de Gestión de Riesgos 2016 – 2020.

Additional Priorities Identified for Costa Rica

The points identified below are not necessarily tied to specific targets or indicators, but they provide key information about the Costa Rican context and priorities that could be considered along with the key questions and priority targets and indicators in future iterations of the methods.

- Adaptation to climate change should be factored into all thematic analyses.
- REDD+ and FONAFIO are not able to cover the demand for implementation of Payment for Ecosystem Services. They therefore need to identify areas where they can amplify this program. In particular, they need to know where restoration outside of protected areas should be focused.
- There is strong interest in restorative agriculture in the country. To identify areas suitable for this an aggregate data layer would need to be created that assesses the impact of restoration on agricultural lands and on other lands.
- The most important question to be addressed, from Costa Rican government standpoint, is the one about the agriculture: what kind of agriculture needs to be implemented to ensure optimal carbon sequestration? The drive to answer this question is driven by the economic impact of understanding the answer to this question.
- One of the main uses of this analysis will be for the state of the environment report as this will identify areas that Costa Rica needs to protect, restore, and sustainably manage.

KEY DATA INPUTS IDENTIFIED

The science group reviewed global data layers and national data layers to provide inputs to the scientific advisory committee going forward on which data are most critical to create maps for carbon sequestration, water security, disaster risk reduction, food security, and jobs/livelihoods. The results can be found in tab 2 here. The group also identified key data needs and potentially useful additional data.

Data Needs

- Need to identify and include all sources of carbon storage, both on land and sea.
- Need current carbon storage data.
- Need a more detailed soil carbon study (30m study is not enough; need at least 2m study).
- Need forests inventory.
- Need both biomass and density data.
- Need data on carbon level by type of forest.
- Need to measure not only the number of forests but also the quality of forests.
- Need to have a more accurate agricultural census, which includes point data on agriculture and cattle.
- Need more time series data. Data layers are snapshots in time, therefore by comparing differences and evolution between different time snapshots, by extrapolation, impact over time can be assessed.

Available Data to Include

- Need to have access to REDD+ data.
- Need to include maps from the Ministry of Agriculture related to land capacity.
- Need to include maps from the Rural Development Institute on soils
- Need to include maps from the Commission of Emergencies on disaster risk
- Need to include maps from the FAO Global Soil Organic Carbon study. This can be used despite the fact that it is a global map, since there is no updated national map for Costa Rica.
- Need to include maps from the National Institute on Technology Transfer in Agriculture related to land capacity and agriculture, including the data that was included in the global FAO GSOC map.
- Need to include non-official studies such as one from Alberta University.
- NASA satellite maps which could be leveraged; however satellite imagery needs to be validated at soil level.
- Costa Rica gov national study from 2013 (it has not been updated since).
- Data from related projects listed in the complementary initiatives section (pp. 30-31) should be reviewed for relevance.

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BOX 5: PROPOSED OVERALL METHODS

1. **Select base layers and themes, and weight them based on priority.** This step will identify data to include (base layers) and themes to focus on. This is a national decision, both for the data to include and themes to focus on. This process will include using the best data that is available from national and, where applicable, global levels as well as identifying data gaps.
2. **Develop aggregate thematic layers (biodiversity, carbon, water security, food security, disaster risk reduction, jobs/livelihoods).** This step will identify minimum critical set of base maps for each theme, and weight and aggregate them into a single continuous 'heat map' of areas important for each theme.
3. **Run thematic protect-manage-restore (PMR) algorithm in Marxan or Prioritzr.** This step will use the human footprint map, land use map, and other relevant datasets to identify opportunities for protection, sustainable management, and restoration for each aggregate thematic area.
   a. A team of Costa Rican technical and policy experts will need to decide how to identify laws that dictate where protection, restoration, and sustainable management can occur.
   b. This step will also have to determine the effect of protection, restoration, and management on each of themes and their base data layers. The protect-manage-restore algorithm will allow using the weighting of the base maps individually from the step 2 overall thematic maps showing where protection, management, and restoration should take place.

- 4. **Provide expert review of thematic layers to see if they pass the 'laugh test'.** This step will involve Costa Rican technical and policy experts, as well as the global scientific advisory committee. It will include adjusting rankings and weightings and potentially data base layers to ensure the final map is accepted as valid based on on-the-ground knowledge.

5. **Run PMR algorithm in Marxan or Prioritzr to create one map of Costa Rica's essential life support areas.** During method iteration, the team an also explore other ways to create the map of essential life support areas such as by combining thematic layers with protect-manage-restore priorities and aggregating into a single map. We are treating this first approach as a hypothesis.

6. **Review results and query against targets.** This step will involve Costa Rican technical and policy experts, as well as the global scientific advisory committee, and will include will comparing the different approaches used in Step 5 for validity. It will also look at whether the maps provided enable actions to meet the targets and indicators identified through the policy analysis.

7. **Iterate and adjust until the targets are met.** This step will involve Costa Rican technical and policy experts, as well as the global scientific advisory committee, and will include adjusting rankings and weightings the final map is accepted as valid based on on-the-ground knowledge.

FEEDBACK ON OVERALL METHODS

During the workshop, participants identified what they felt comfortable with, what they thought could be improved, and what they thought should be changed. These inputs will be used as guidance by the scientific advisory committee in further iterations of the methods.

Which steps are unclear? What do you have serious questions about?

● Steps 3, 4, 5: The algorithm needs to be unpacked and made more clear for communication with non-technical stakeholders.

What steps are you really comfortable with?

● Step 1 and 5: That the methods enable base layers and thematic layers to be weighted based on national priorities.

● Steps 4 and 7: Because they allow iteration, improvement, and space for consultation with experts at the national level.

What do you really not like? This are steps that you understand, but would like to adjust.

● Overall, there needs to be a clear visual for the process (e.g., **Fig. 4**), and a list of activities for each step so that all actors have a clear understanding of their role in preparing the map of Costa Rica's essential life support areas.

● Step 3: It will be essential to standardize among all the actors, the capabilities, technologies, algorithm generation, transfer protocols, processing, and dissemination of information to ensure that Costa Rican technical experts can take ownership of the process.

● Step 5: It will be important to include more detailed strategies and protocols for engaging other organizations and agencies.

What's missing?

● Step 1: Complete a comprehensive evaluation of technological infrastructure, software, algorithms, and technical knowledge.

● Step 1: Ensure that data needs are identified according to the objectives of the analysis. Likewise, need to ensure the compatibility and rigor of data used through criteria such as: scalability, integration, interoperability, information updating, and statistical foundation.

●Steps 1 and 5: Develop a mutually agreed guidance on how political and technical priorities translate into weighting. It should also account for the political reality that policy priorities will outweigh technical priorities.

● Steps 4 and 6: Conduct a statistical review of the margin of associated error of information generated, weighted validation of experts, periodicity of information, and scalability issues.

● Steps 6 and 7: Create a governance management model. This should identify all those responsible, the relationships between them, and identify who will coordinate the work of relevant stakeholders. This model should likewise ensure that there is a bridge between science and policy so that results are aligned with policy objectives.

Who needs to be engaged to take this further?

● High-level policymakers. Need to institutionalize this in national institutions to engage essential stakeholders critical for the process.

a. Agriculture
b. Tourism
c. Rural Development Institute
d. Academia
e. Local NGOs
f. Indigenous peoples and local communities
g. Marine
h. Commission of Emergencies
i. SIMOCUTE as a platform that unites many of the national institutions and data sources

FEEDBACK ON THE PROTECT-MANAGE-RESTORE ALGORITHM (STEPS 3 & 5)

● Need better data on national priorities (key targets/indicators) to structure the analysis to inform these priorities.

● Need to discuss whether the current approach (maximum coverage) or targets (minimum set) for each feature is a better approach for Costa Rica

● If the project team decides to stay with the maximum coverage approach, need to identify how much of the land and sea should be set aside for protection, restoration, and sustainable management based on existing targets/budgets.

● Need to determine where land can be protected, restored, or sustainably managed based on Costa Rican law.

● Need to ensure that zones within each ecoregion are captured.

● Need to think about priority species for Costa Rica.

● Need to identify a measure of social development (human development index) that could be integrated.

● Need to ensure that protected areas are locked in. For example, in the first iteration of the map, and northwest corner of Costa Rica is not appropriately represented. This is a national protected area that connects sea with dry forest and tropical forests. It is the only area in Costa Rica that has this characteristic of connecting these unique ecosystems.

● Need to determine the problem costing (impacts of protection, restoration, and sustainable management on biodiversity, carbon, and ecosystem services).

● Need to discuss whether restoration should be limited to the current protected area network.

● Need to review outputs with Costa Rican experts and identify issues.

● Need to ensure that methodology and outputs are officially validated as needed for Costa Rica.

● Need to understand what Costa Rica considers 'restoration'?

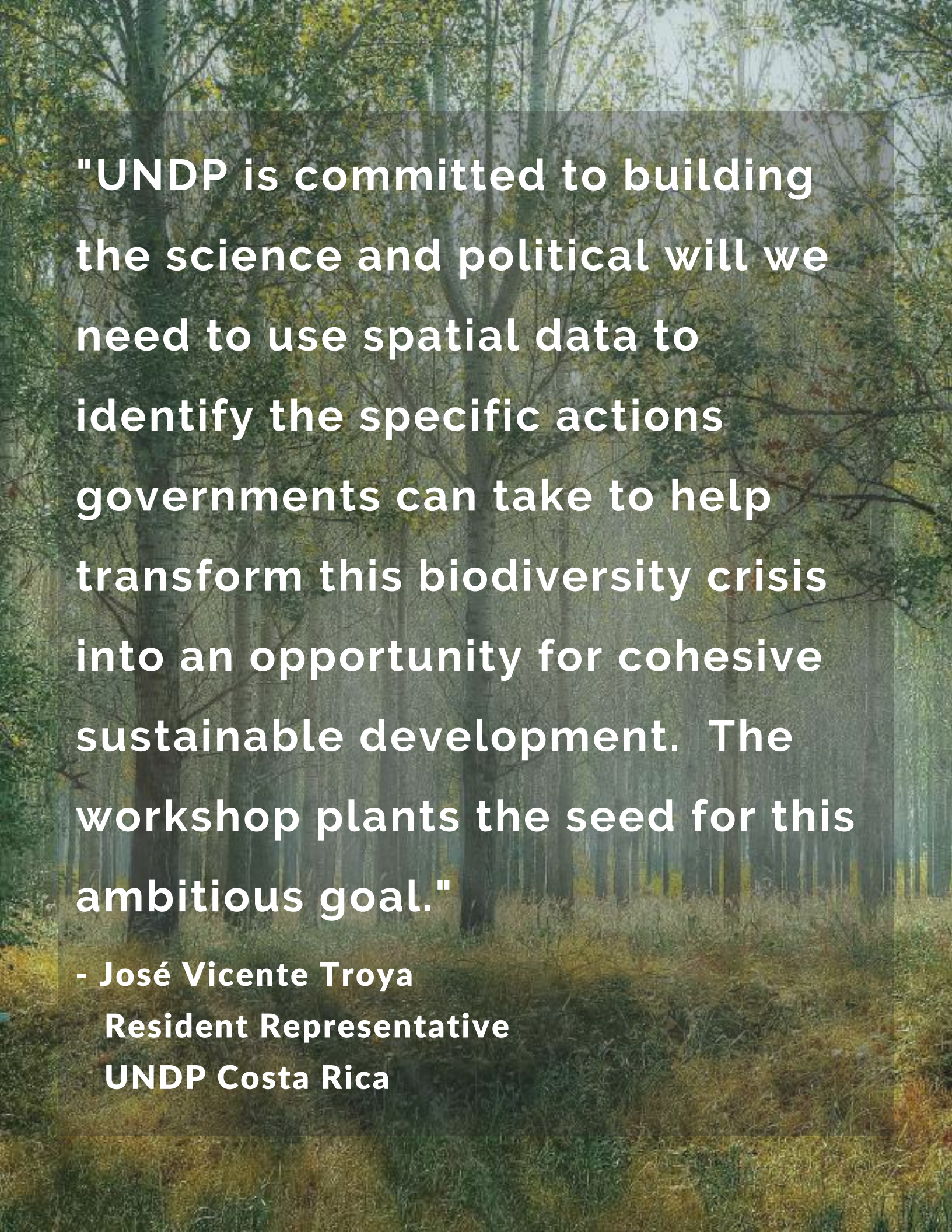
WORKPLAN DEVELOPMENT

In a collaborative exercise, participants worked on a draft workplan that identified the details of key steps in the process, key actors who should be involved, and rough timing. This document will be used as input for the project team to develop a final workflow.

Once the final workflow is developed, UNDP Nature for Development, UNDP Costa Rica, and MINAE will play key roles to facilitate stakeholder engagement and execute the project. PRIAS Lab will serve an essential role as the Costa Rican scientific counterpart to UNBC, working to adapt the ELSA methods to the Costa Rican context.

FIGURE 4: OVERVIEW OF PROCESS.

Draft overview schematic depicting the broad overall workflow for creating an essential life support area map for Costa Rica.



"UNDP is committed to building the science and political will we need to use spatial data to identify the specific actions governments can take to help transform this biodiversity crisis into an opportunity for cohesive sustainable development. The workshop plants the seed for this ambitious goal."

- José Vicente Troya
Resident Representative
UNDP Costa Rica

Considerations for Creating a Decision Support System

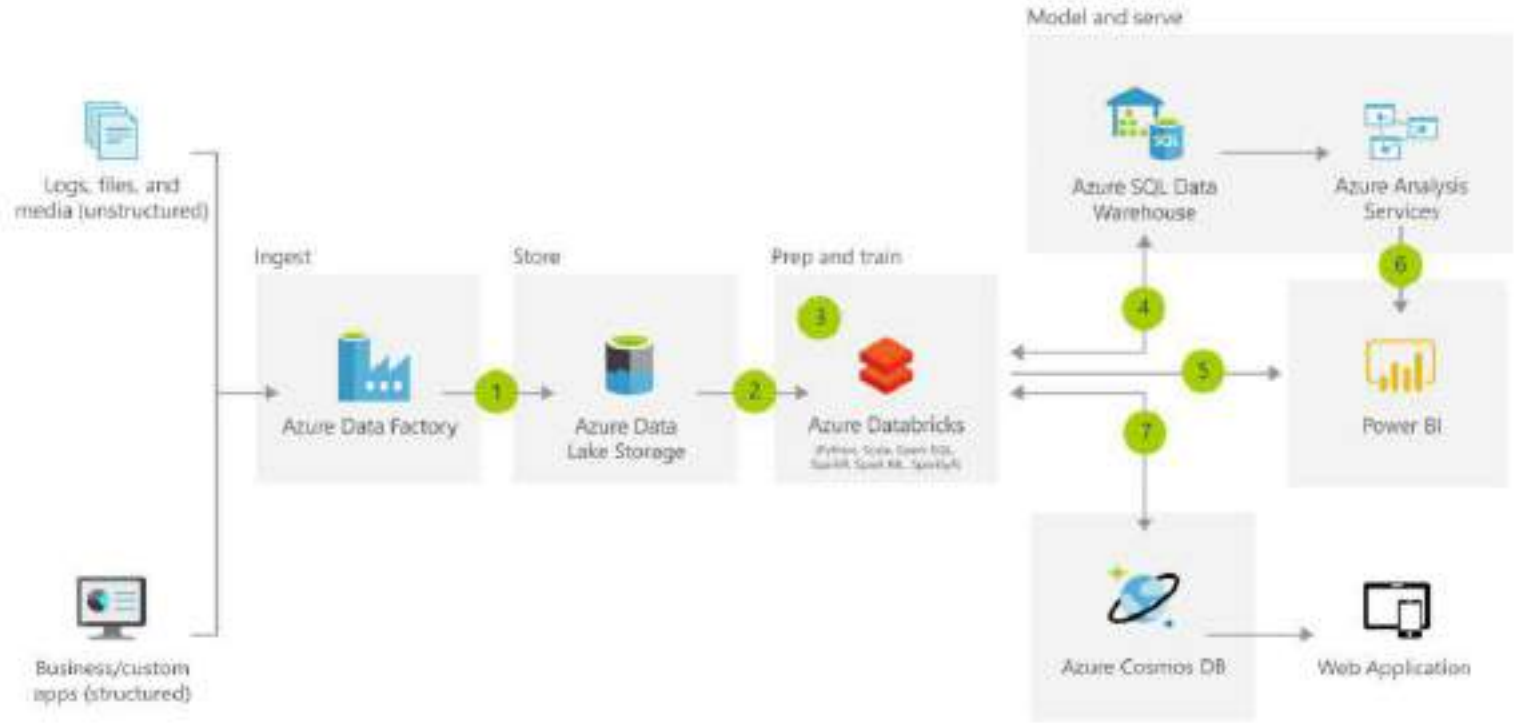
Randy Guthrie and Maria Clara Malori, Microsoft, provided an overview of the process for creating a decision support system for Costa Rica, and worked with the participants to identify key user needs. They emphasized that discussions throughout the course of the workshop had analyzed the needs, requirements, objectives for creating a map of Costa Rica's essential life support answers. To complement this work, Microsoft offers expertise in cloud solutions that could support to optimize or streamline these data. Likewise, the company can draw on years of experience to think about how to build a decision support system to ensures the data can be easily discovered by end users with specific needs.

They emphasized that when we think about providing information to decision makers, we shouldn't think just about a map. The map is just one small output that is part of a bigger digital process of managing data and information. A high-level outline of this process includes several steps (**Fig. 5**):

1. Integrate new data generated by the project with data that decision-makers already have locally.
2. Use tools that exist in a 'data factory' to take all inputs and do the data conditioning, feature engineering, conditioning, and data normalization.
3. Store data in a 'data lake'. This is designed to be very quickly accessed but is also relatively cost efficient in terms of storing petabytes or hexabytes of data. It is also in a format that is very efficient to do data analysis. From this point, any number of analytical and/or machine learning techniques can be used to develop the needed models. These can also be used to train models.
4. Store relational data in a SQL database.
5. Produce a data cube that can be exposed through visualization tools such as PowerBI to drill down into the data in deeper ways.
6. Store non-relational data in a 'cosmos database'.
7. Expose all data to user via web application.

In an interactive exercise, participants identified the core users for a decision support system in Costa Rica, functions that the decision support system would need to support, and identified questions that would need to be answered for the data included in such a system (**Box 6**).

FIGURE 5: DIGITAL PROCESS OF MANAGING INFORMATION



BOX 6: USER NEEDS FOR DECISION SUPPORT.

Users

- **Executive advisor and decision maker**
- **Researcher**
- **Data creator**
- **Data analyst**
- **Minister**

Needed information about data

- What are the different data formats?
- How often is new data available and/or is data updated?
- What is the condition of the data? How much is useful? How much processing is needed to use?

Needs

- As a **researcher,** I need to be able to map sediment water quality in a river to measure the impact on agriculture.
- As a **researcher**, I need to be able to visualize high resolution images affordably to perform visual interpretation of the sample points.
- As a **researcher**, I need the results of the biodiversity assessment to be easily visualizable by decision-makers.
- As an **analyst**, I need to identify the green coverage over an urban area to assess how the coverage increases or decreases relative to urban growth.
- As a **data creator**, I need to identify different coverages of productive landscapes in Costa Rica to provide input for the decision-making.

COMPLEMENTARY NATIONAL AND GLOBAL INITIATIVES

Throughout the course of the workshop, to take advantage of the rich group of expertise gathered in the room, participants heard lightening presentations from related initiatives at the national and global scales producing spatial data on nature, climate, and sustainable development.

NATIONAL

Carbon Map for Costa Rica

Cindy Schmidt, NASA, and Becky Chaplin-Kramer, Natural Capital Project, presented two projects underway from The Natural Capital Project and Stanford University to create a high-quality carbon map for Costa Rica. The first project uses LVIS airborne LiDAR data to provide information on forest structure along with satellite imagery to model biomass across the country. The second project, funded by NASA, will predict carbon in the future based on changes in climate using over 20 spatial variables encompassing landscape heterogeneity in soil, climate, and slope.

Evaluation of the Effectiveness of Payment for Ecosystem Services Schemes

Mauricio Vega, National University of Costa Rica, presented ongoing research to evaluate the effectiveness of Payment for Ecosystem Services schemes. The project draws on information from the national forest inventory using models from remote sensing, and includes three key datasets: Modis Nadir BRDF-adjusted Reflectance Daily (2014), WorldClim 2 Climate Surfaces (2017-2018), and Digital Elevation Model (2017-2018). The methods used will be validated for official government use. The study has just been published, therefore the methods can now be used with newer data to provide more current information. The process can also now be automatized using platforms such as Google Earth Engine to provide real-time data.

SIREFORE Platform

Mauricio Castillo, National System of Conservation Areas (SINAC by its acronym in Spanish), presented SIREFORE, which was created by SINAC as a portal for all forest-related data in Costa Rica. Through this portal, users can access the national forest inventory and view the volume, biomass, and carbon for every plot. Users can also ask the database to see all plots that fall within a province in Costa Rica. All data can be downloaded directly as an excel database.

GLOBAL

Nature Map

Xavier de Lamo, UNEP-WCMC, presented on work through the Nature Map initiative to develop improved spatial information on biodiversity, carbon storage, and other ecosystem services. The draft maps will be made available in January 2020 for feedback through UN Biodiversity Lab and the Nature Map Explorer. Among other dimensions the new data will improve taxonomic coverage of mammals, amphibians, and birds and include reptiles and plants as novel additions. They will also produce novel estimates on land use; develop more accurate estimations of water; and develop a global biomass carbon storage map.

The full list of data the initiative will create includes: forest management, vulnerable soil organic carbon density, biomass carbon density, total carbon density, species richness, threatened species richness, range size rarity, biodiversity intactness index, clean water provision, human pressure, areas of global significance for conservation, and areas of global significance for restoration. Data descriptions for each of these layers are available here.

Mapping Critical Natural Capital

Pam Collins, Conservation International, presented on work in partnership with the Natural Capital Project, Stanford University, University of Minnesota, King's College London, and numerous data providers to answer questions about ecosystem services at the global scale. The project will generate global maps on material, regulatory, and cultural ecosystem services, including: carbon (mangroves, soil, forests, peat, tundra), water quality (nitrogen, sediment), coastal protection, flood regulation, moisture recycling, freshwater fisheries, marine fisheries, coral reel livelihoods, recreation, linguistic diversity, timber & fuelwood, pollination, grazing/browsing/fodder, and wild food/non-timber forest products.

These maps will provide aggregations of global critical natural capital. The project defines natural capital as natural ecosystems that are essential to humanity and the planet. Essentially, by this definition, natural capital provides ecosystem services to people. At the global level, maps such as these could be to inform global processes, to inform the work of global development banks and intergovernmental institutions, and to provide global accounting of ecosystem services. This is different than what is needed at the national level, where it is essential to encourage conversation amongst ministries and develop strategies for implementation. However, despite their coarse resolution (10 kilometres to 1 kilommetre), these maps could potentially be useful for Costa Rica where no other data exists.

To make maps such as these meaningful, it is essential to understand the processes by which natural capital generates ecosystem services by reviewing and summarizing existing research on the topic. Likewise, it is critical to understand what we mean by services that benefit people – for example, a particular location could have impacts on populations that reside far away (e.g., by flood routing) or close by (e.g., by providing food from the forest). This requires mapping both the service location and the use location, depending on the type of ecosystem service. Another key question is to identify what ecosystem services are 'critical', by thinking about how we identify the most vulnerable populations dependent on these services. The project aims to think carefully about how to answer these questions, and to make their assumptions apparent.

If the project is able to get these assumptions right, the analyses can identify the most important places in the world for ecosystem services. This then raises important questions for how this is transitioned to policy.

Finally, the project is working to demonstrate how these analyses can be linked to the SDG framework to provide a common language for countries to communicate and unite towards common goals.

BOX 7: GLOBAL INITIATIVE MAPPING.

1. Map of the focus of various global level initiatives present at the workshop.

2. Detailed mapping of initiatives working on spatial data at the global level (created by UNEP-WCMC with Green Growth Knowledge Platform funding).

"I applaud this proposal, and believe Costa Rica should be on the front line of advancing this agenda. We are very successful, and are gaining recognition globally for our work on environmental issues. This could be an experiment that brings results not just for Costa Rica but for the world."

- Celeste Lopez
Vice Minister of Environmental Management, MINAE

OVERVIEW

The outcomes of the workshop were reported during a high-level session that included 15 participants, including Celeste Lopez, Vice Minister of Environmental Management; Xiomara Gonzalez, adviser to the Vice Minister of Agriculture, Carlos Cordero, Director of SEPLASA, MINAE; Rafael Monge, Director of CENIGA, MINAE; Kifah Sasa, title; and Jamison Ervin, Manager of the Nature for Development Programme, UNDP. The full list of participants is available here. The objective for the session was to facilitate high-level support for the essential life support areas in Costa Rica as well as to define timeline, roles, and responsibilities moving forward.

In particular, the session aimed to:

- Share the process of creating maps of Costa Rica's essential life support areas developed during the workshop.
- Discuss the capacity building necessary to train Costa Rican technical specialists to use these methods.
- Outline the steps needed to create a database of spatial data layers, origin, quality of information, and metadata to be managed by CENIGA.
- Discuss how these data and analyses can be explicitly tied to a database of national objectives, including public polices, sectoral plans, and intersectoral plans that will be managed by SEPLASA.
- Create a project workflow, timeline, and governance model.
- Explore how communication of results in Costa Rica can be used as a model for other countries in the region and globally.

DETAILED SUMMARY

The high-level session opened with a summary presentation of the outcomes of the workshop from Rafael Monge, Director of CENIGA, MINAE. Setting the stage for the discussion, Carlos Cordero, Director of SEPLASA, MINAE, emphasized that maps of Costa Rica's essential life support areas can help to accelerate discussion around the new agro-environmental agenda in Costa Rica. He highlighted that projects such as this can provide the data engender a shift from targets that look simply at the number of agroforestry projects to targets that show the impact of agriculture on the landscape and environment. He likewise emphasized that inter-ministerial meetings such as this one would be essential to ensure that the Ministry of Agriculture is integrated into the project and outputs meet their planning and implementation needs.

Celeste Lopez, Vice Minister of Environmental Management, responded in detail to the presentation, reflecting on the potential for use of the map of Costa Rica's essential life support areas for implementation and monitoring. She emphasized that the integration

of information is essential, and that in Costa Rica data is still fragmented among different ministries and agencies. This fragmentation of data makes it particularly challenging to facilitate integration of social elements into the conversation around environmental conservation. Costa Rica has been highly successful at establishing and managing protected areas, and facilitating recovery of forest cover through these, but the next hurdle will be to facilitate restoration and sustainable management in productive landscapes. For this, it will be essential to look at both information on social and environmental factors. Taking the example of water use in Guanacaste, she asked: "How do we know whether to prioritize it for golf, agriculture, human consumption or other activities?" At the moment, this depends on the law, which does not account for who will benefit from the resource use. We need to incorporate this social variable to make better decisions for resource management.

She emphasized that the potential – and the challenge – she saw for a map of Costa Rica's essential life support areas was to bring together the agendas on biodiversity, climate change, soils, and agriculture. She also highlighted the importance of including marine resources in this analysis. To successfully bring these agendas together, it will be important to have rigorous scientific data as well as an understanding of the political context. The Vice Minister closed with a strong endorsement of the project, saying: "I applaud this proposal, and believe Costa Rica should be on the front line of advancing this agenda. We are very successful, and are gaining recognition globally for our work on environmental issues. This could be an experiment that brings results not just for Costa Rica but for the world."

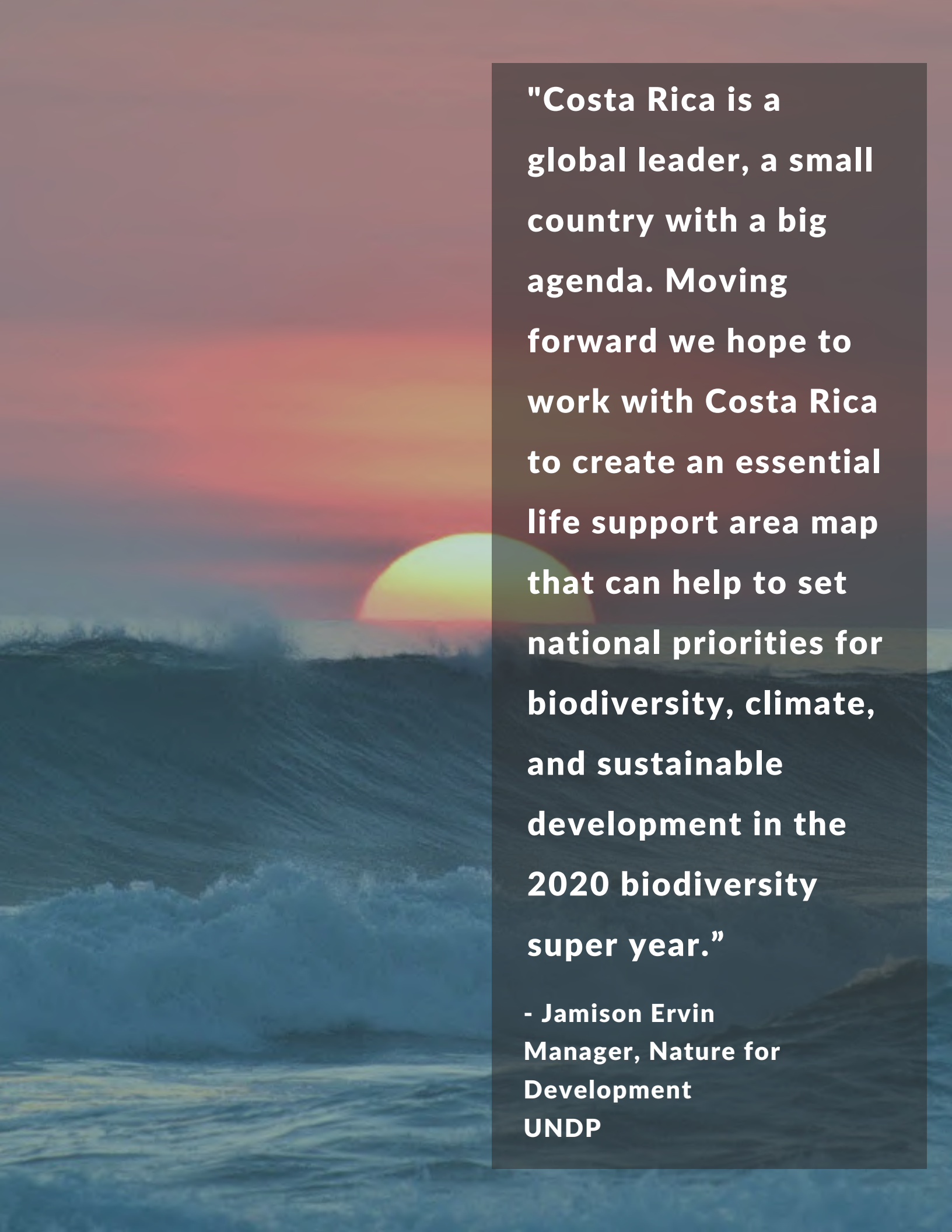
Further discussion clarified that although the proof of concept had focused on biodiversity, carbon, water security, food security, disaster risk reduction, and jobs/livelihoods, further iterations could focus on the selection of themes most important for Costa Rica. Likewise, the analyses could be customized to meet Costa Rica's particular needs. For example, a 20-mile buffer could be placed around protected areas to facilitate nature-based job creation.

Cordero stressed the importance of including technical knowledge in the decision-making, noting that one of the key benefits of this project is that it will be based on close interaction between the global and national teams, including training for Costa Rica's technical staff so that the process can be owned and managed in country. "We are now in a moment where we have a huge amount of information, and a huge amount of risk for natural resources. This is the time to use that information to take action, and to build the political will to take decisions that support conservation priorities", he said. He emphasized the importance of identifying potential for nature-based business as a current area of high interest for impact investors, and seconded the Vice Minister's comment about the importance of integrating marine maps.

Jamison Ervin responded: “Costa Rica is a global leader, a small country with a big agenda. Moving forward we hope to work with Costa Rica to create an essential life support area map that can help to set national priorities for biodiversity, climate, and sustainable development in the 2020 biodiversity super year.” She highlighted the importance of linking global, national, and private data sources and working with Costa Rica’s SIMOCUTE platform to make these data readily available. Oscar Venter, University of Northern British Columbia, explained that the analysis could optimize for a particular theme based on Costa Rica’s strategic national priorities. The analysis is being applied at the national level, but in the future these techniques could be used to look at specific regions of the country. To link the agricultural and environmental agendas, he stressed that it would be important to think critically about how to visualize indicators that demonstrate the impact of agriculture on the environment. Participants commented that it would be important to engage the agricultural zoning office in these analyses.

In Costa Rica, this process and its outputs will play a key role in strengthening sectoral planning for the environment, including in the first Sectorial Strategic Plan for Environment, Energy and Seas. The data will also be used by the ministry to deliver on other key national commitments such as the State of the Environment Report. In addition to supporting these ongoing initiatives, mapping Costa Rica’s essential life support areas can provide critical inputs to understand how prioritized actions within the environmental sector can contribute to a better distribution of wealth – a key priority for Costa Rica, and across Latin America.

In closing, Cordero noted the value of what has been accomplished to this point, and the foundation that it provided to link critical national and international agendas. He said: “Working are the first pilot country to map our essential life support areas is a great honor, but also a great responsibility. In Costa Rica, we have the capacity, and we have the will. This will be a milestone not only for Costa Rica but for the planet. It will be an example for people to follow from around the world.”



"Costa Rica is a global leader, a small country with a big agenda. Moving forward we hope to work with Costa Rica to create an essential life support area map that can help to set national priorities for biodiversity, climate, and sustainable development in the 2020 biodiversity super year."

- Jamison Ervin
Manager, Nature for Development
UNDP

NEXT STEPS

The workshop and high-level session served as a critical opportunity to engage diverse stakeholders from Costa Rica and around the world. Input on needed data, key policies, and refinements needed to the methods will guide work going forward. The project will be advanced by a core team from UNDP, MINAE, and PRIAS Lab, with input from a global scientific advisory committee. At key steps in the process, progress will be shared with the broader group. Likewise, relevant ministries and agencies will be brought in to advise on particular themes and analyses.

Due to a variety of factors, the core team agreed to adopt a two-pronged strategy:

1. **Developing presentations and speeches for the Twenty-fifth Meeting of the Conference of the Parties to the UNFCCC (UNFCCC COP25) and Twenty-third Meeting of the Subsidiary Body on Scientific, Technical, and Technological Advice to the CBD (CBD SBSTTA23).** These will build on the political importance of these events to showcase the essential life support areas as a key approach for integrated action across the Rio Conventions.
2. **Developing an extended work plan through the first half of 2020 to create a second iteration of Costa Rica's map of essential life support areas.** This extended work plan will include, on the policy side, conducting the review of additional policies identified during the workshop and prioritizing three to five key policies that will guide methods refinement. On the science side, next steps will include refining the essential list of data layers, pre-processing data were needed to answer the essential questions, and refining the methods based on input received during the workshop (pp. 24-25 of this report).

Throughout this work, a key component will be documenting the process to facilitate scale-up to other countries. The approach will be recorded, with emphasis on:

- Why data selected
- Why policies are selected
- Challenges in the process
- Documenting every decision junction

This documentation will be used to create a create comprehensive guidance. Other communications products highlighted as important include sound bites on the process, a short brochure detailing this work in Costa Rica, and a strategic session to determine name and branding for the future.

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It was an amazing combination of efforts that enabled us to pull this workshop off in just barely over four weeks that included the UN General Assembly and the pre-COP, and it is important to acknowledge everyone here. There were so many people who contributed in various ways, so even this list cannot be exhaustive. A huge thank you to all those listed below and all those others who contributed.

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- **Luis Eduarte and his team** at Hotel Bougainvillea who provided us with the most beautiful venue and ensured we were fed.


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