# Combining Earth Observation and Policy to Put Ecosystems at the Heart of Resilient Development in Costa Rica

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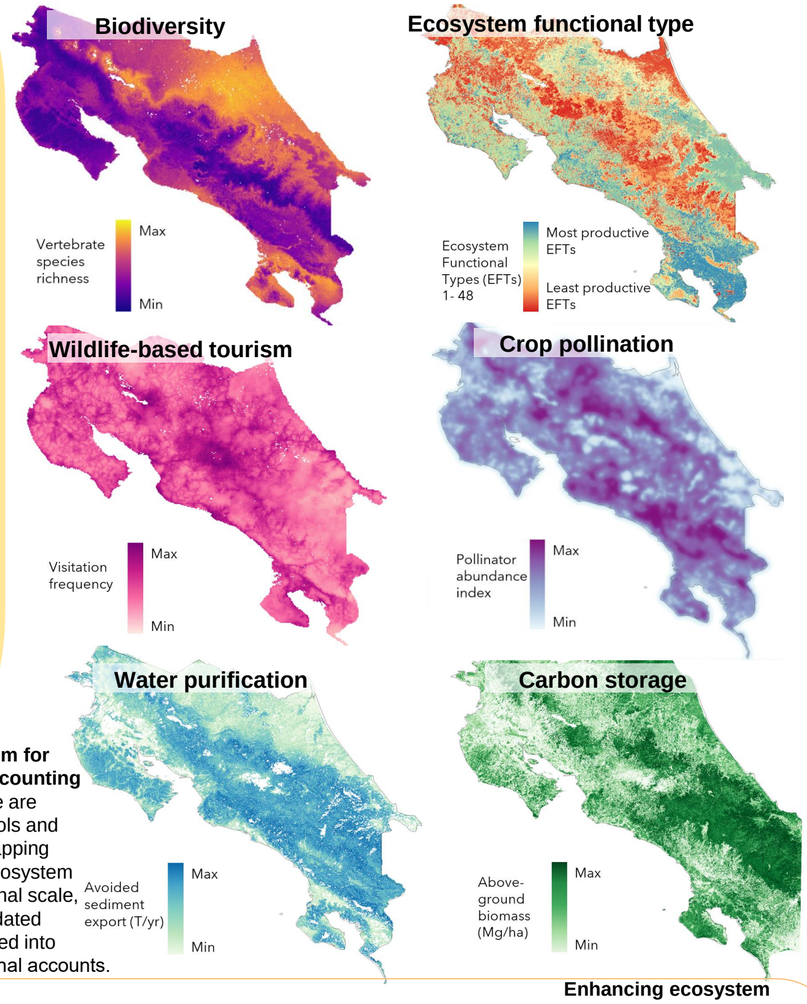
## Background

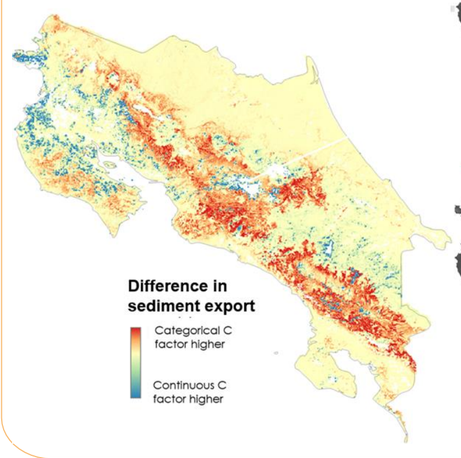
Human well-being relies on nature in myriad ways. To maintain the natural systems people rely on, decision-makers need information about how humans change nature and how those changes affect people around the world. Nature's benefits to people, or ecosystem services, support our food systems, our mental and physical health, our economies, our climate resilience and much more. To understand just how important these benefits are to people, we need to be able to map and model them.

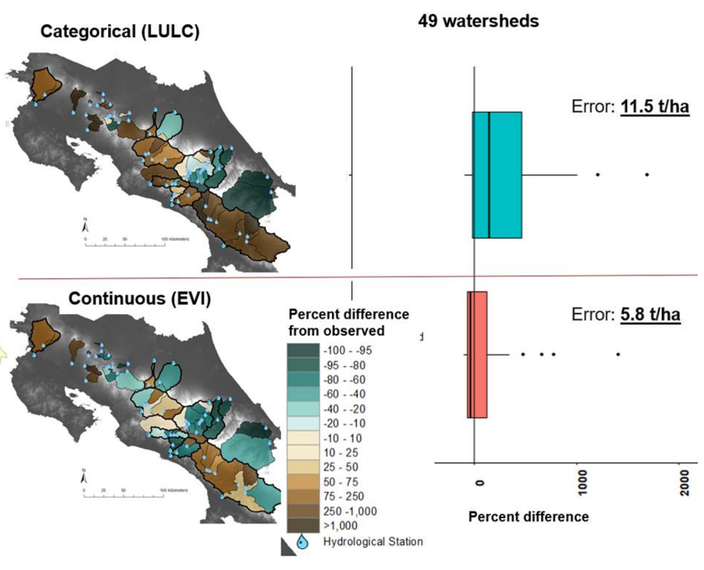
Rapid improvements in spatial data, computation and visualization present new opportunities for biodiversity and ecosystem service monitoring and modeling— especially in terms of its integration with Earth observations (EO) from satellite remote-sensing. Costa Rica is making strides in the use of geospatial information to enhance conservation policies and promote a sustainable and resilient development for all. In 2020, two initiatives led by the Ministry of Environment and Energy, in partnership with UNDP and The Natural Capital Project, have presented preliminary results that show great potential to generate and integrate timely, high-quality information that will increase the country's capacity to safeguard and sustainably manage its natural systems.

We can improve accuracy, accessibility and relevance of modeling nature's benefits by incorporating better information about ecosystem function from Earth observations.




**A modeling system for natural capital accounting in Costa Rica.** We are developing new tools and approaches for mapping biodiversity and ecosystem services at a national scale, using regularly updated satellite data, to feed into Costa Rica's national accounts.



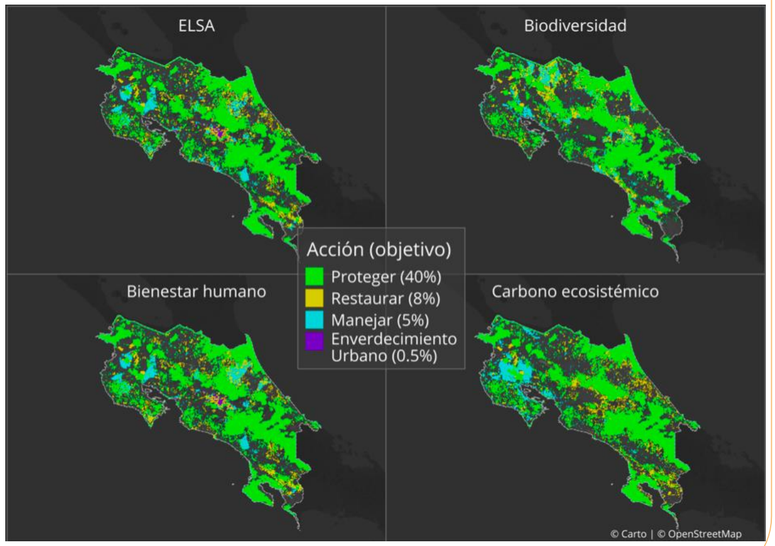




**Enhancing ecosystem service modeling with Earth observations: spotlight on sediment retention.** Satellite data can improve how we set the parameter determining how much sediment vegetation is capable of intercepting before it reaches a stream (called C-factor). The same habitat or land-use type may have a large amount of variability in its ability to perform this function, depending on ground cover, productivity, phenology, etc. We developed a C-factor based on the Enhanced Vegetation Index (EVI), which shows high spatial variation within individual LULC classes. Compared to sediment export predicted by LULC-based C-factor, sediment predicted by EVI is twice as accurate.

**Mapping Essential Life Support Areas (ELSAs):** Systemic challenges require comprehensive solutions. Many sectors often have conflicting priorities for the same landscape unit. ELSA mapping can help to address this issue by determining where specific nature-based actions can simultaneously achieve cross-sectoral priorities. It combines geospatial data for food and water security, disaster risk reduction, carbon sequestration, and biodiversity to identify the best locations for intervention. This analysis is run in a dynamic tool, allowing iterations of the process as national priorities change. Costa Rica is using the methodology to implement its agro-environmental agenda at the subnational level, as well as advancing its marine agenda. Finally, the national authorities are creating an interinstitutional agreement to encourage widespread use of the maps.

The ELSA Web tool utilizes the package PrioritizR to run Systematic Conservation Planning analyses. Policymakers can run different scenarios and discuss tradeoffs and synergies across different national priorities.

ELSA mapping integrates the best available national and global data to create a 'map of hope' that shows where nature-based actions can most effectively deliver on multisectoral development priorities including building climate resilience.




## Conclusions

Linking biodiversity and ecosystem services is an important step forward in, support of decisions on conservation of biodiversity, climate adaptation and sustainable development. The results of this work will be used to produce generalized models for linking Earth observations, biodiversity, and ecosystem services at local and regional scales that can be applied across the country, and ultimately extended to other parts of the world. Continuing its legacy being a world leader for developing policy that works for nature and people, Costa Rica is developing the knowledge and capacity in-country, in the framework of its National Land Use, Land Cover and Ecosystems Monitoring System (SIMOCUTE), to continue generating these analyses and use them in the publication of Ecosystemic Accounts, identifying Essential Life Support Areas, reporting on the quality and trends of the State of the Environment, designing the new mechanisms to expand the national Payment for Environmental Services Program, and in the implementation of the National Decarbonization Plan and the National Climate Adaptation Policy. Together these activities help put ecosystems at the heart of resilient development in Costa Rica.

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