

Carbono Azul: **contexto global y regional**

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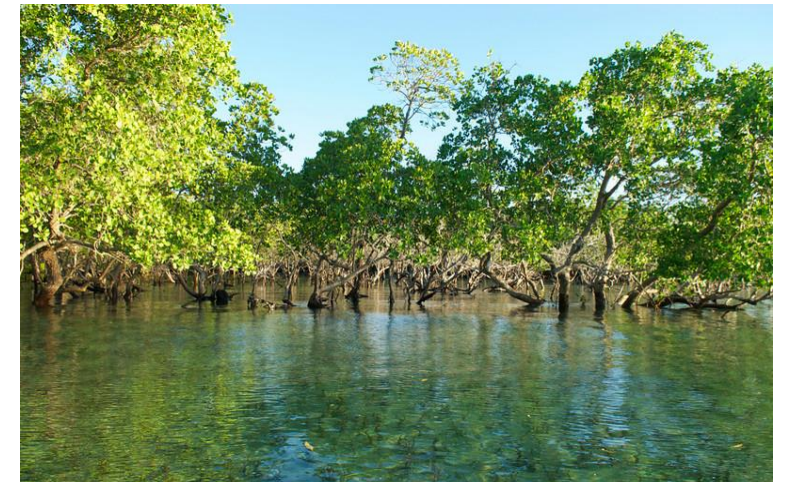
**Taller: “Desarrollo de una Estrategia para la Conservación y Restauración de
Manglares en el Arrecife Mesoamericano”**

18 al 20 de septiembre 2019, Guatemala



Iniciativa Internacional de Carbono Azul

- Reconoce valor de servicios ecosistémicos de ambientes marino costeros
- Rol en mitigación y adaptación al CC
- Dos grupos de trabajo
 - Ciencia y política
 - Insumos: IPCC, Rio+20, COP



Grupo de Trabajo Científico

- Potenciar base científica
- Atraer atención global
- Crear estándares
- Desarrollar guías
- Brindar apoyo a políticas
- Identificar regiones prioritarias



Photo credit: Tamara Thomas

Mangroves among the most carbon-rich forests in the tropics

Daniel C. Donato^{1*}, J. Boone Kauffman², Daniel Murdiyarso³, Sofyan Kurnianto³, Melanie Stidham⁴ and Markku Kanninen⁵

Mangrove forests in the tropics, and support fisheries production. The extent of mangrove forests has declined in the past half century, but culture expansion resulting from mangrove loss is a lack of broad-scale quantification of whole-ecosystem carbon stocks in these ecosystems. We quantified whole-ecosystem carbon stocks in 25 mangrove forest regions—spanning 12 countries—using a mangrove area and carbon density to estimate that mangrove forests in the tropics, collectively, store 1,000 Gt of carbon in their above-ground biomass, 1,000 Gt in their below-ground biomass, and 1,000 Gt in their soil. This total is equivalent to the carbon stored in all the world's forests. Mangrove forests are among the most carbon-rich forests in the tropics, and their loss represents a significant source of carbon emissions. Our findings emphasize the need for improved mangrove conservation and management, and the need for improved accounting of mangrove carbon stocks in national greenhouse gas inventories.

Deforestation and degradation of global anthropogenic carbon stocks are only to fossil fuel emissions. The REDD+ agreements highlight the need for improved accounting of mangrove carbon stocks in national greenhouse gas inventories. The REDD+ agreements highlight the need for improved accounting of mangrove carbon stocks in national greenhouse gas inventories.

Tropical wetland organic soils up to 100 cm depth contain 1,000 Gt of organic C reserves. Disproportionate loss of organic C reserves to the atmosphere by peat fires associated with climate change has been estimated at 0.02–0.12 Pg C yr⁻¹. Fossil fuel emissions specifically address change mitigation strategies.

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NATURE GEOSCIENCE | 1

REVIEWS REVIEWS REVIEWS

A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO₂

Elizabeth Mcleod^{1*}, Gail L. Chmura², Steven Bouillon³, Rodney Salm⁴, Mats Björk⁴, Carlos M. Duarte^{5,6}, Catherine E. Lovelock⁷, William H. Schlesinger⁸, and Brian R. Silliman⁹

Recent research has highlighted the valuable role that coastal and marine ecosystems play in sequestering carbon dioxide (CO₂). The carbon (C) sequestered in vegetated coastal ecosystems, specifically mangrove forests, seagrass beds, and salt marshes, has been termed “blue carbon” because of its magnitude smaller than that of terrestrial forests, the area to long-term C sequestration is much greater, in part because of the high C:N:P stoichiometry of these ecosystems. Matter and associated organic C during tidal inundation. Degradation and salt marshes in sequestering C, and the other goods and services provided by these ecosystems at critical rates and action is urgently needed to prevent further degradation and loss of these ecosystems. Sequestration value provides a strong argument for their protection and improvement. Improve scientific understanding of the underlying mechanisms. Here, we identify key areas of uncertainty and specific research needs.

Front Ecol Environ 2011; doi:10.1890/110004

The global average atmospheric carbon dioxide (CO₂) concentration rose to 387 parts per million (ppm) in December 2009 (ESRL/NOAA 2009), the highest level it has reached over the past 800 000 years (Lüthi et al. 2008)

In a nutshell:

- Despite their relatively small global extent, vegetated coastal ecosystems (mangrove forests, seagrass beds, salt marshes) are disproportionately important in sequestering carbon dioxide when compared with terrestrial ecosystems
- Although the importance of coastal vegetated ecosystems as natural sinks is partly due to their high primary productivity, a key mechanism is their efficiency in trapping sediments and associated carbon from outside their ecosystem boundaries
- These “blue carbon” sinks are being lost at critical rates and action is urgently required to prevent further degradation and loss
- Improved scientific understanding of the factors that influence carbon sequestration in these ecosystems is needed to identify sites that are high priorities for restoration and/or conservation management

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<https://doi.org/10.1038/s41558-018-0162-5>

Global controls on carbon storage in mangrove soils

André S. Rovai^{1,2*}, Robert R. Twilley¹, Edward Castañeda-Moya^{1,8}, Pablo Riul^{1,3}, Miguel Cifuentes-Jara⁴, Marilyn Manrow-Villalobos⁴, Paulo A. Horta^{2,5}, José C. Simonassi⁶, Alessandra L. Fonseca⁷ and Paulo R. Pagliosa^{2,7}

Global-scale variation in mangrove ecosystem properties has been explained using a conceptual framework linking geomorphological processes to distinct coastal environmental settings (CES) for nearly 50 years. However, these assumptions have not been empirically tested at the global scale. Here, we show that CES account for global variability in mangrove soil C:N:P stoichiometry and soil organic carbon (SOC) stocks. Using this ecogeomorphology framework, we developed a global model that captures variation in mangrove SOC stocks compatible with distinct CES. We show that mangrove SOC stocks have been underestimated by up to 50% (a difference of roughly 200 Mg ha⁻¹) in carbonate settings and overestimated by up to 86% (around 400 Mg ha⁻¹) in deltaic coastlines. Moreover, we provide information for 57 nations that currently lack SOC data, enabling these

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Seagrass ecosystems as a globally significant carbon stock

James W. Fourqurean^{1*}, Carlos M. Duarte^{2,3}, Hilary Kennedy⁴, Núria Marbà², Marianne Holmer⁵, Miguel Angel Mateo⁶, Eugenia T. Apostolaki⁷, Gary A. Kendrick^{3,8}, Dorthe Krause-Jensen⁹, Karen J. McGlath¹⁰

The protection of terrestrial ecosystem carbon stores. Organic stores of seagrass and conservation schemes for seagrass biomass and full inventories exist to a more conservative carbon stocks, we estimate that seagrass loss could release 100 Gt of biomass and the top

The remineralization of terrestrial ecosystem carbon stores. Organic stores of seagrass and conservation schemes for seagrass biomass and full inventories exist to a more conservative carbon stocks, we estimate that seagrass loss could release 100 Gt of biomass and the top

OPEN ACCESS Freely available online

PLOS ONE

Estimating Global “Blue Carbon” Emissions from Conversion and Degradation of Vegetated Coastal Ecosystems

Linwood Pendleton^{1*}, Daniel C. Donato^{2,3*}, Brian C. Murray¹, Stephen Crooks³, W. Aaron Jenkins¹, Samantha Siffleet⁴, Christopher Craft⁵, James W. Fourqurean⁶, J. Boone Kauffman⁷, Núria Marbà⁸, Patrick Megonigal⁹, Emily Pidgeon¹⁰, Dorothee Herr¹¹, David Gordon¹, Alexis Baldera¹²

¹Nicholas Institute for Environmental Policy Solutions, Duke University, Durham, North Carolina, United States of America, ²Ecosystem & Landscape Ecology Lab, University of Wisconsin, Madison, Wisconsin, United States of America, ³ESA Philip Williams & Associates, San Francisco, California, United States of America, ⁴United States Environmental Protection Agency, Research Triangle Park, North Carolina, United States of America, ⁵School of Public and Environmental Affairs, Indiana University, Bloomington, Indiana, United States of America, ⁶Department of Biological Sciences and Southeast Environmental Research Center, Florida International University, North Miami, Florida, United States of America, ⁷Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon, United States of America and Center for International Forest Research, Bogor, Indonesia, ⁸Department of Global Change Research, Mediterranean Institute for Advanced Studies, Esporles, Illes Balears, Spain, ⁹Smithsonian Environmental Research Center, Edgewater, Maryland, United States of America, ¹⁰Conservation International, Arlington, Virginia, United States of America, ¹¹Department of Biology, University of California, San Diego, La Jolla, California, United States of America, ¹²The Ocean Conservancy, Baton Rouge, Louisiana, United States of America

in vegetated coastal ecosystems—marshes, seagrass beds, and mangroves (hereafter referred to as “blue carbon”). Relatively unappreciated, however, is the loss of previously-sequestered carbon. Residing in these ecosystems are large stocks of carbon. When these ecosystems are converted or degraded, this carbon is released to the atmosphere, with significant economic implications. Combining the global carbon stocks in each of the three ecosystems (marshes, seagrass beds, and mangroves) with estimates of carbon loss from conversion and degradation, we estimate that 1.02–1.02 Pg (billion tons) of carbon dioxide are released annually from the conversion and degradation of these ecosystems. These emissions account for 10–10% of global carbon emissions. These results highlight the need for improved accounting of carbon emissions from the conversion and degradation of these ecosystems, and the need for improved accounting of carbon emissions from the conversion and degradation of these ecosystems.

“Blue Carbon” Emissions from Conversion and Degradation of

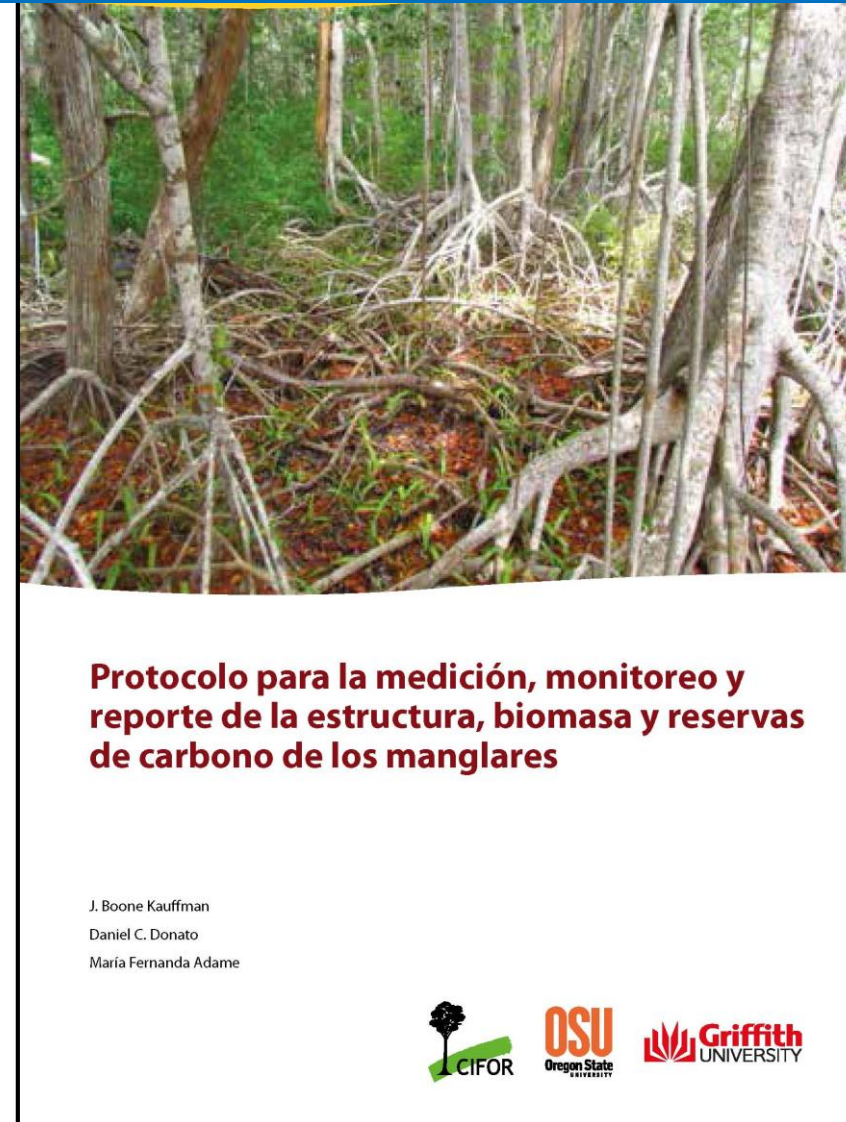
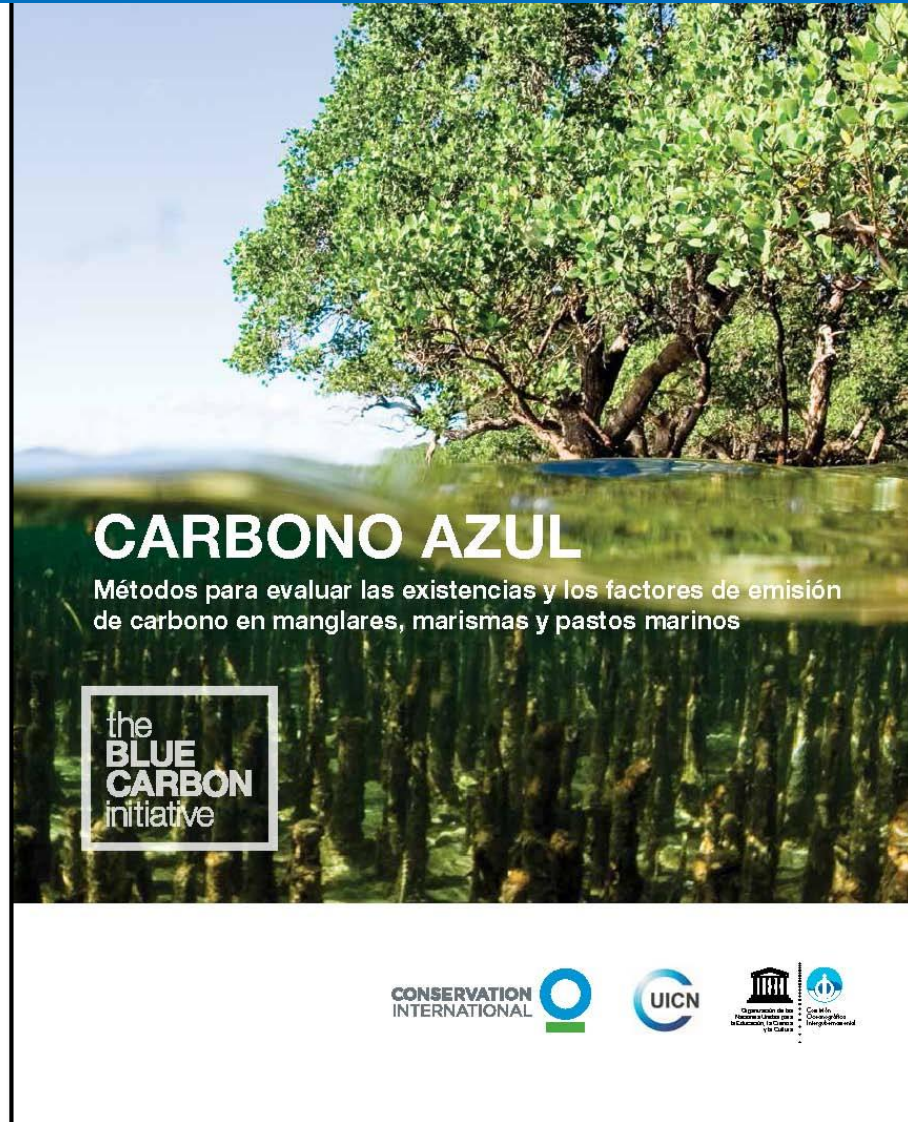
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and Roger and Victoria Sant. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Associates, a commercial source. This does not alter the findings and conclusions of this article.

mangroves, and seagrass beds. These coastal carbon stocks are referred to as “blue carbon” [2,3]. The loss of carbon stored by these ecosystems is still an active field, but the potential contribution to GHG from their degradation is clear. Yet these emissions are so far relatively

Desarrollo metodológico internacional



Métodos + capacidades regionales



Manual Centroamericano para la Medición de Carbono Azul en Manglares

Describe los métodos y buenas prácticas para el diseño de inventarios forestales de carbono azul para manglares de Centroamérica.



Proyecto
Protección de Reservas y
Sumideros de Carbono en los
Manglares y Áreas Protegidas
de Panamá

↑---↑
CO₂
↓

PROPUESTA DE
PROTOCOLO
PARA MEDICIÓN
DE CARBONO EN
ECOSISTEMAS DE
MANGLARES EN
PANAMÁ



MIAMBIENTE

ARAP

CONSERVACIÓN
INTERNACIONAL
Panamá

Wetlands

Wetlands

Wetlands

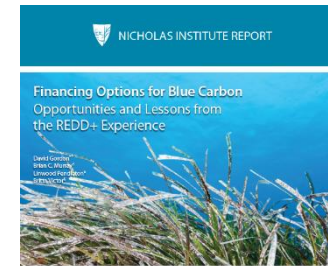
Cuidemos nuestros manglares, ellos nos protegen.



- Panamá
- El Salvador
- Rep. Dominicana, Honduras
- Colombia, Ecuador

Grupo de Trabajo de Políticas

- Alimentar política climática internacional
- Desarrollar marcos políticos e institucionales
- Promover esquemas financieros



Mecanismos internacionales

- Opciones bajo la CMNUCC:
 - Kyoto/París (MDL?)
 - NDC
 - NAMA
 - REDD+
- Mercados voluntarios
 - VCS/VERRA
 - CCBA, Plan Vivo
- Acuerdos bilaterales
- Iniciativas empresariales

“Mainstreaming” carbono azul

Fortalecimiento
capacidades y
diseminación
conocimiento

Vulnerabilidad
social y
ecológica

Fortalecimiento
marcos políticos

Inventarios
carbono y
emisiones
históricas

Valoración
servicios
ecosistémicos

Promoción
redes de
práctica y
proyectos

Base científica: dinámica del carbono

1. Inventarios de carbono en manglares

- Cuantificación de carbono en áreas prioritarias
- Capacidades actores locales y nacionales



2. Modelado geoespacial de emisiones

- Dinámica uso de la tierra + Balances de C
- Evaluación de degradación y potencial de restauración (capital natural)



Análisis ambientales y sociales

3. Valoración de servicios ecosistémicos

- Base para esquemas PSA
- Más allá del carbono – prioridades locales



4. Análisis de vulnerabilidad social y ecológica

- Entender relación medios de vida locales y manglares
- Aclara nivel de dependencia humana-ecosistema
- Propuestas intervenciones para adaptación y desarrollo



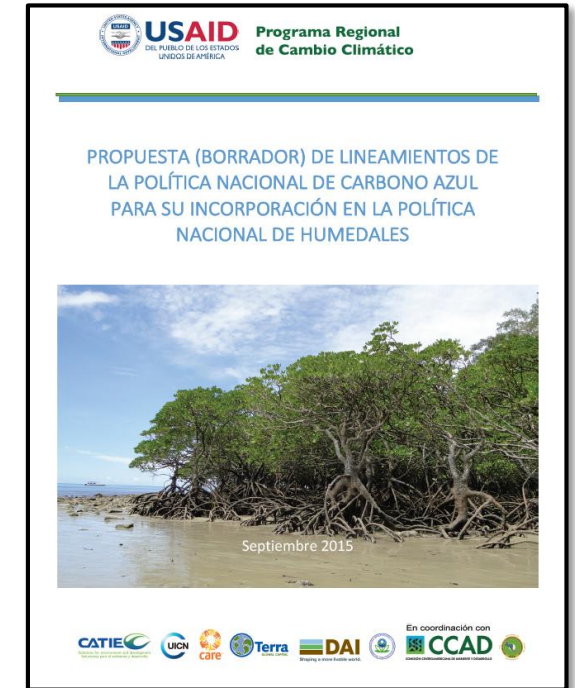
Incidencia - Política y redes de acción

5. Desarrollo de marcos políticos nacionales

- Permite involucramiento nacional en Carbono Azul
- Aclara roles institucionales y relación con otras políticas/mecanismos (Ej. REDD+)

6. Promoción de redes de “práctica azul”

- Permite escalamiento hacia arriba/afuera
- Intercambio de conocimientos
- Cataliza procesos adicionales



Actualidad región CARD

Acciones	GT	HN	ES	CR	PA	RD
Inventarios de C	x	X	X	X	X	X
Dinámica UTCUT	x	X	X	X	X	X
Servicios ecosistémicos			X	X		
Valoración SE			X	X		
Vulnerabilidad				X		
Procesos políticos		X	X	X	X	X
Manejo/restauración		X	X		X	X



Actualidad regional América Latina

- Diversidad de opciones, acciones y mecanismos
 - Categoría en los INF
 - Inclusión en MRV para REDD+
 - Adopción en INGEI
 - Mecanismos globales: NDCs, NAMAs
 - Mecanismos Nacionales: PSA/PSE
 - Proyectos y mercados
- Avances diversos según país:
 - Centroamérica y República Dominicana + Caribe
 - Colombia, Ecuador, México, Surinam

Actualidad regional LAC

- Interés creciente en el tema
- Mayoría países con categoría manglares en INF
 - Corresponde con MRV para REDD+
- No hay desarrollo con INGEI
- Inclusión disímil en NDC – no hay operatividad
- NAMAs azules - incipientes

¿Hacia dónde vamos?

- Asegurar adopción e internalización por parte de los gobiernos
- Integrar carbono azul en
 - Mecanismos internacionales – “Guidelines NDC”
 - Proyectos de desarrollo vía mecanismos financieros
- Buscar sinergias adaptación-mitigación (SAM)
- Escalamiento a través de intercambios y redes



Desafíos de implementación “azul”

Técnicos

Política y finanzas

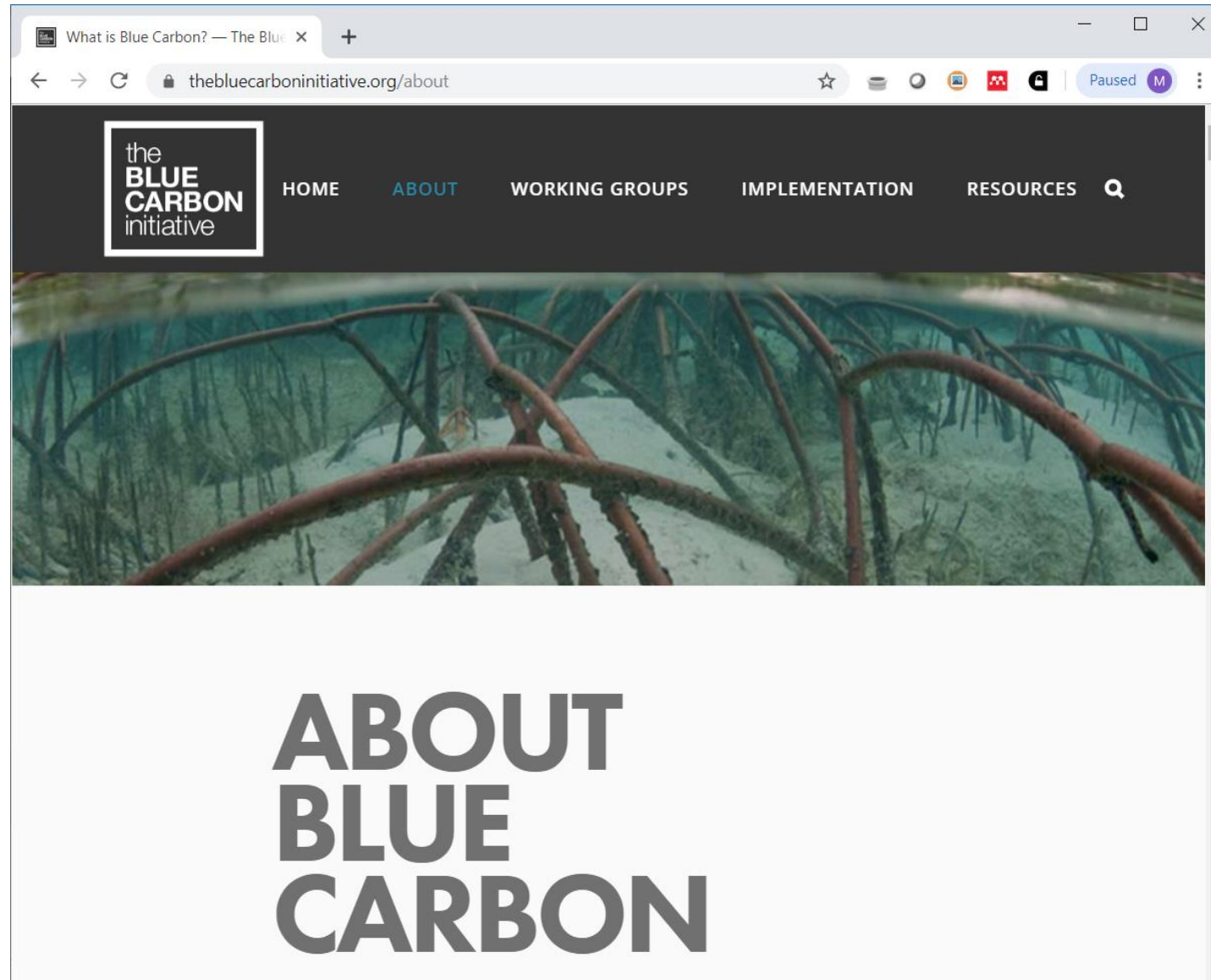
¿Programa Regional de Carbono Azul?

- México, América Central, Caribe, Colombia, Ecuador, ... ?
- Temas potenciales:
 - Mitigación Y Adaptación
 - Desarrollo sostenible y manejo costero
 - Restauración ecológica
 - Conectividad “vertical” cuencas marino-costeras
 - Aplicables a manejo de paisajes productivos
 - Propuestas enviadas a IKI, GCF, CBF, etc.
 - Mecanismos financieros



Más información - IBCI

[https://www.thebluecarbon
initiative.org](https://www.thebluecarboninitiative.org)



Más información - CATIE

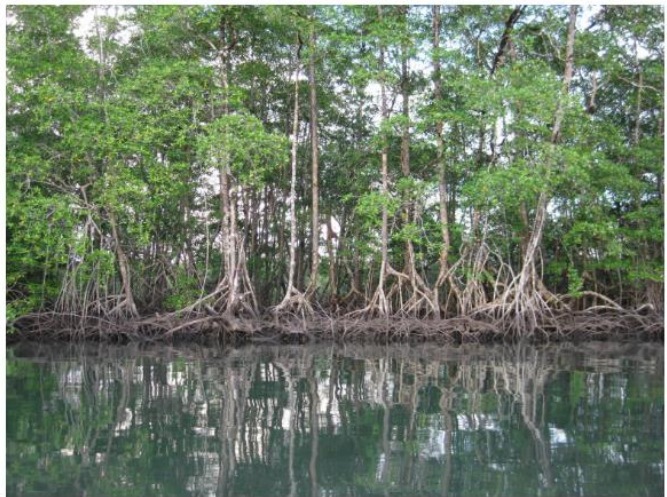
Blue Carbon A-Z: from small projects to policy development

Full Solution

Blue Carbon A-Z: from small projects to policy development

 **CATIE**
Solutions for environment and development
Soluciones para el ambiente y desarrollo

by [Miguel Cifuentes](#)
[Tropical Agriculture and Higher Education Center \(CATIE\)](#)



Mangrove research helps improve 'blue carbon' project planning and design
© Miguel Cifuentes

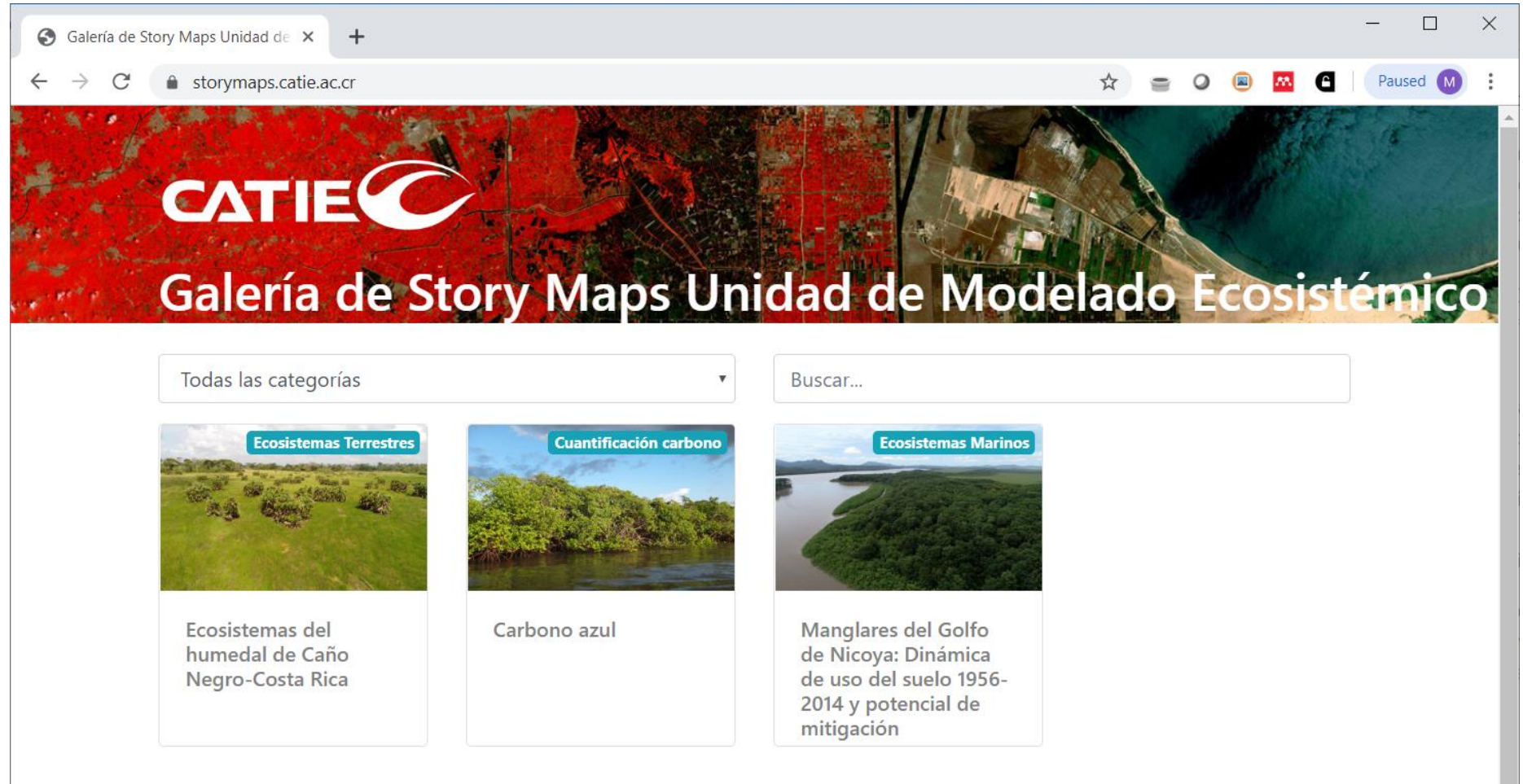
<https://panorama.solutions/en/solution/blue-carbon-z-small-projects-policy-development>

<https://labmeh.catie.ac.cr/category/zona-costera/>



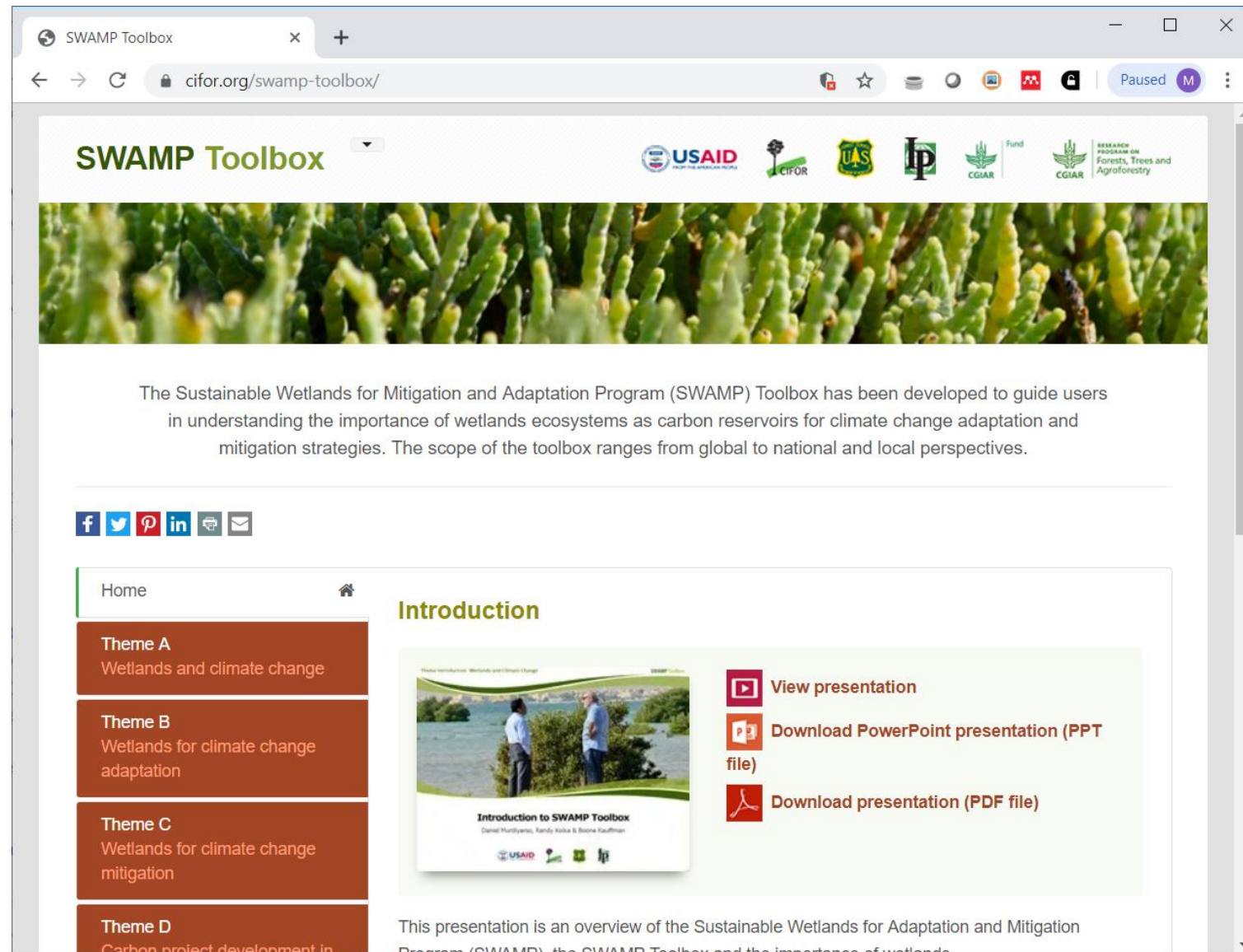
Más información - CATIE

<https://storymaps.catie.ac.cr/>



Más información - CIFOR

<https://www.cifor.org/swamp-toolbox/>



The screenshot shows the SWAMP Toolbox website in a web browser. The browser's address bar displays [cifor.org/swamp-toolbox/](https://www.cifor.org/swamp-toolbox/). The website header features the "SWAMP Toolbox" title and a navigation menu with icons for USAID, CIFOR, U.S. Forest Service, IP, Fund, and CGIAR. Below the header is a large image of green, succulent-like plants. The main content area contains a paragraph explaining the SWAMP Toolbox's purpose: "The Sustainable Wetlands for Mitigation and Adaptation Program (SWAMP) Toolbox has been developed to guide users in understanding the importance of wetlands ecosystems as carbon reservoirs for climate change adaptation and mitigation strategies. The scope of the toolbox ranges from global to national and local perspectives." Below this text are social media sharing icons for Facebook, Twitter, Pinterest, LinkedIn, and Email. The left sidebar has a "Home" link and four theme categories: Theme A (Wetlands and climate change), Theme B (Wetlands for climate change adaptation), Theme C (Wetlands for climate change mitigation), and Theme D (Carbon project development in). The main content area is titled "Introduction" and features a presentation thumbnail titled "Introduction to SWAMP Toolbox" by Daniel Murthy, Kandy Kiska, and Bonnie Kaufman. To the right of the thumbnail are three links: "View presentation", "Download PowerPoint presentation (PPT file)", and "Download presentation (PDF file)". At the bottom, a paragraph states: "This presentation is an overview of the Sustainable Wetlands for Adaptation and Mitigation Program (SWAMP), the SWAMP Toolbox and the importance of wetlands."

Gracias

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