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MANUAL FOR THE ECOLOGICAL RESTORATION OF MANGROVES FOR THE WIDER CARIBBEAN REGION

For reasons of public health and safety associated with COVID-19, this meeting is being convened virtually. Delegates are kindly requested to access all meeting documents electronically for download as necessary.

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Ecological Mangrove Restoration Guide of the Mesoamerican Reef System and the Wider Caribbean Region

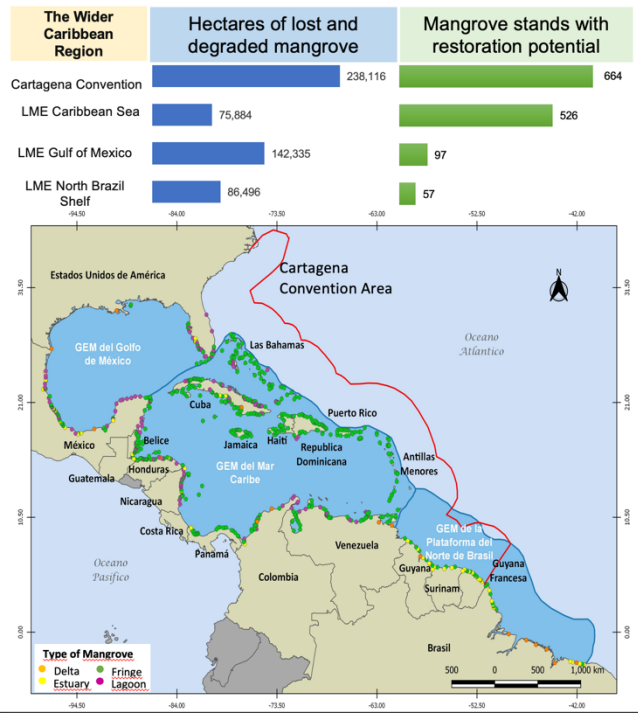


Claudia Teutli-Hernández, Jorge A. Herrera-Silveira, Diana Cisneros-de la Cruz, Francisco A. Comín, Daniel Arceo, Oscar Pérez, Eunice Pech, Pedro J. Robles, Xavier Chiappa Carrara



Mangroves in Latin America and the Caribbean represent 26% of the world coverage; 80.5% of this area is found in the Atlantic coast and the Caribbean, known as the Wider Caribbean region^{1,2}. The population in the region strongly depends on the ecosystems and coastal-marine resources, especially in the small insular states of the developing Caribbean^{2,3}. The mangrove coastal marine ecosystem is an economic foundation of the region due to all the ecosystem services it provides to the population. Some of its interactions are critical, such as with fisheries, tourism (representing revenue of up to USD 47 million)⁴, as well as its role as a natural barrier against hurricanes, storms, and floods, with an estimated value of USD 23-45 mil/ha for the Caribbean⁵. Mangroves help mitigate climate change due to their capacity of storing and sequestering CO₂, which is the most abundant greenhouse gas in the atmosphere. Although mangroves are highly important in America and the Caribbean, 24% has been reduced in the past 25 years^{1,6}. Resource overexploitation, pollution, the disorganized change in soil use, and the effects of climate change, such as the rise in sea level, are some of the leading causes for its degradation^{1,7,8}. This mangrove loss in the Caribbean region has resulted in economic loss. Also, due to the region's high vulnerability to hurricanes, the safety of people, food, property, and livelihoods of coastal populations are now at risk.

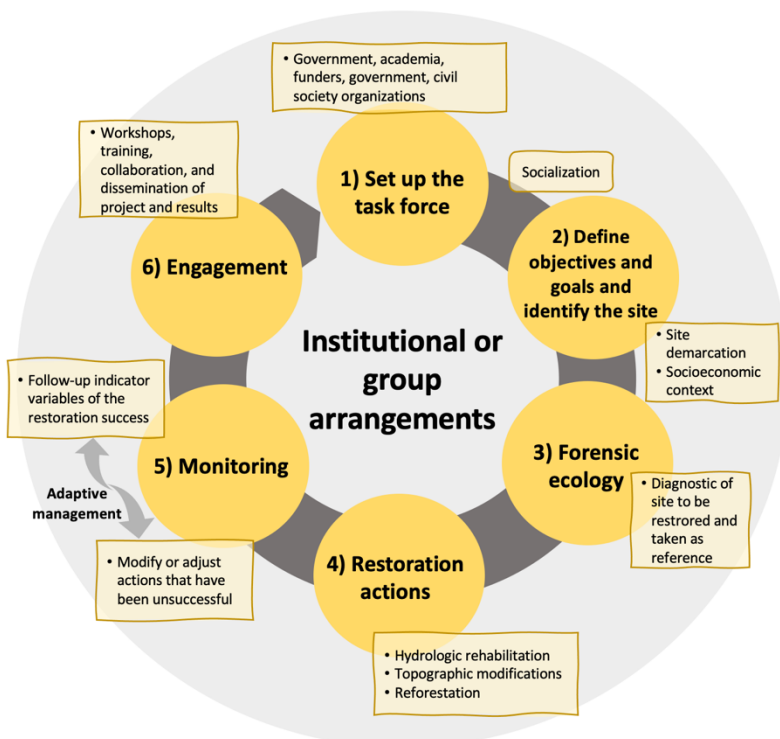
Therefore, mangrove conservation and restoration are a priority in the Wider Caribbean region, where different strategies have been developed, particularly the “Regional Strategy for Mangrove Management, Conservation, Restoration, and Monitoring in the Mesoamerican Reef. 2020-2025.” This strategy is coordinated by MAR Fund, Smithsonian Institution along with MAR2R/CCAD/WWF-GEF Project and the German Cooperation in Guatemala for the Mesoamerican Reef (MAR) ecoregion, one of the major biodiversity hotspots in the world^{9,10}. There is also the Regional Strategy and Action Plan for the Valuation, Protection, and/or Restoration of Key Marine Habitats in the Wider Caribbean 2021-2030 (RSAP), developed under the sub-program SPAW of the Cartagena Convention. Under the Convention's framework and on the decade of restoration declared by the UN, mangrove restoration is considered a Nature-based Solution (NbS), allowing to address the effects of climate change, biodiversity conservation, and the economic and social well-being of its residents, contributing to the Sustainable Development Goals.



In the Wider Caribbean region, comprised of the Large Marine Ecosystem (LME) of the Caribbean Sea, the Gulf of Mexico, and the Brazil Shelf, 304,751 hectares of mangrove are estimated to be lost and degraded, of which at least 680 sites have the potential of being restored¹¹. However, the recovery and mangrove trends in the Wider Caribbean are not promising because, despite all efforts, only a small percentage of the degraded areas have been recovered¹². In order to contribute to the implementation of goals, strategies, and international agreements, the United Nations Environmental Programme – The Cartagena Convention (with UNDP-CLME+ funds), the Mesoamerican Reef Fund (MAR Fund), and the project Integrated Ridge-to-Reef Management of the Mesoamerican Reef Ecoregion (MAR2R/CCAD-SICA/GEF-WWF) joined efforts to develop this guide that attempts to contribute to the

strengthening of local and regional capacities for mangrove restoration in the Wider Caribbean. The strategy presented in this guide is built on the integration of ecological, economic, and social components. Scientific knowledge, lessons learned, and its transfer to coastal communities is the basis of this guide. The overall conceptual framework has been published and successfully implemented since 2007 in at least ten sites on the coasts of the Gulf of Mexico, the Caribbean Sea, and the South Pacific.

Mangrove Restoration Strategy

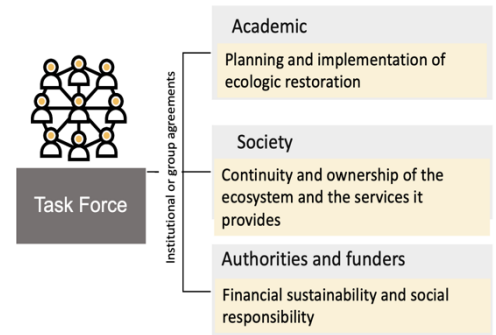


The restoration strategy developed in this guide is based on a series of steps focusing on standards and principles of ecological restoration included in the document by the Society for Ecological Restoration¹³. The foundation of this strategy lies in the institutional arrangements and agreements that strengthen the task force's governance and provide certainty to the actions and responsibilities of each participant during the restoration, ensuring long-term economic sustainability and continuity of the restored ecosystem. It considers a multidisciplinary approach that combines social, ecological, and financial components so that each project is built on an ecological basis, yet it should be financially feasible and socially acceptable. The strategy process consists of the following:

Set up the task force

1

Participation and representation of the different interested sectors are encouraged, enabling adequate governance and cohesiveness throughout the project. The involvement of the academic sector, members of the local community, organized social groups, indigenous peoples, civil organizations, authorities in the environmental sector, and representatives of the financial entities is promoted. Each sector adds different strengths to the project's implementation.



Define objectives and goals and identify the site

2

The site must be selected based on the needs of the community and the ecosystem services that they seek to recover. After the objectives have been established, the area to be recovered must be demarcated. Why does it need to be restored? (obtain a benefit or solve a problem), When will it be restored? Who will implement and coordinate the activities? Goals and objectives should be quantifiable and verifiable through success indicator variables in the short-, medium-, and long-term in order to assess the degree of performance of restoration actions.

Forensic ecology

3

Through the characterization and diagnosis of the site, the causes of degradation, as well as the ecological and social context, both historical and current, are identified. Unlike other mangrove restoration strategies, this component allows implementing site-specific actions.



Restoration actions

4

Restoration actions are based on the relation between geomorphology, hydrology, and the structural and functional characteristics of the mangrove ecosystem in different spatial and time scales. Restoration actions are planned and implemented based on the results of forensic ecology, which allows the implementation of site-specific actions. These are focused on recovering the suitable environmental conditions for the establishment and growth of new

mangrove individuals, either by natural regenerations or reforestation, mainly through hydrological rehabilitation by installing canals and modifying the topography.



Installation of canals



Topographic modifications

Monitoring

5

A follow-up of indicator variables is conducted to be able to assess the results of restoration actions. Success indicators are chosen according to the objectives and goals of the project. Regular assessments should be considered through which it is possible to quantify the restoration progress. Based on the observed results during monitoring, it is possible to strengthen or adjust the restoration actions under an **adaptive management** approach. A period of at least five years is suggested to establish the development as a result of the restoration.



2010



2019

Ecologic restoration of mangroves in Dzilam, Yucatan, Mexico

Engagement

6

The participation of society is an essential component. Communities and villages must always be the ultimate beneficiaries of the restoration. Their involvement throughout the entire process allows the inclusion of local and traditional knowledge. Also, when society is provided with knowledge, the valuation of the ecosystem, their participation in restoration, and the diversification of their activities for sustainable mangrove management are possible. This contributes to a long-term continuity of results by owning the site and the sustainable use of resources from ecosystem services recovered during restoration.

Social participation during restoration activities



Social group "Las Chelemeras"



Community participation in restoration activities



Environmental education workshops



Sustainable management by the community



The mangrove restoration strategy in this guide allows not only to recover the mangrove cover, but also the ecological functionality of the system, with which ecosystem services are recovered, contributing to the adaptation of communities. Therefore, it is an ecosystem-based adaptation strategy because society will benefit, which means that the interaction between socioeconomic and ecological systems will be modified so that both gain from it. Experiences obtained from each project are a valuable source of information, whether they were good or those that did not work as expected, yet both contribute to strengthening the current restoration strategies. The publication of this guide will help enhance the capacities of communities in the MAR and the Wider Caribbean region to tackle the challenges of climate change and strengthen the social and economic well-being of the region.

References

- 1-De Lacerda, L. D., Borges, R., & Ferreira, A. C. (2019). Neotropical mangroves: Conservation and sustainable use in a scenario of global climate change. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 29(8), 1347-1364.
- 2- United Nations Environment Programme- Caribbean Environment Programme (2020). Regional Strategy and Action Plan for the Valuation, Protection and/or Restoration of Key Marine Habitats in the Wider Caribbean 2021 – 2030. Port-of-Spain: CANARI.
- 3- Patil, P.G., Virdin, J., Diez, S.M., Roberts, J., Singh, A. (2016). Toward A Blue Economy: A Promise for Sustainable Growth in the Caribbean; An Overview. The World Bank, Washington D.C
- 4- Spalding, M., & Parrett, C. L. (2019). Global patterns in mangrove recreation and tourism. *Marine Policy*, 110, 103540.
- 5- Beck, M. W., N. Heck, S. Narayan, P. Menéndez, S.Torres-Ortega, I. J. Losada, May, M. Rogers, L. McFarlane- Connelly. 2020. "Reducing Caribbean Risk: Opportunities for Cost-Effective Mangrove Restoration and Insurance."The Nature Conservancy,Arlington, VA.
- 6- Wilson, R. (2017) Impacts of Climate Change on Mangrove Ecosystems in the Coastal and Marine Environments of Caribbean Small Island Developing States (SIDS), Caribbean Climate Change Report Card: Science Review 2017, pp 60-82
- 7- Ellison, A. M., & Farnsworth, E. J. (1996). Anthropogenic disturbance of Caribbean mangrove ecosystems: past impacts, present trends, and future predictions. *Biotropica*, 549-565.
- 8- Lugo, A. E. (2002). Conserving Latin American and Caribbean mangroves: issues and challenges. *Madera y Bosques*, 8, 5-25.
- 9- Cauty, S. W., Preziosi, R. F., & Rowntree, J. K. (2018). Dichotomy of mangrove management: A review of research and policy in the Mesoamerican reef region. *Ocean & Coastal Management*, 157, 40-49.
- 10- Rivas, A. B., González, C., Cauty, S., Rodríguez Olivet, C., Flamenco, X., González, M. J., & Escobedo, M. (2020). Regional Strategy for Mangrove Management, Conservation, Restoration and Monitoring in the Mesoamerican Reef 2020-2025.
- 11- Global Mangrove Watch
- 12- Romañach, S. S., DeAngelis, D. L., Koh, H. L., Li, Y., Teh, S. Y., Barizán, R. S. R., & Zhai, L. (2018). Conservation and restoration of mangroves: Global status, perspectives, and prognosis. *Ocean & Coastal Management*, 154, 72-82
- 13- SER (Society for Ecological Restoration International Science & Policy Working Group). 2004. The SER International Primer on Ecological Restoration. Society for Ecological Restoration International, Tucson, Arizona (available from www.ser.org) accessed April 2020.