Colors Back to the Sea: The Conservation Story that Restored Life to the Reefs.

Tamandaré, Brazil
Senac Pernambuco
Local Destinations (including villages, cities, municipalities, islands)
Nature & Environment

Summary of Good Practice Story
Tamandaré, a coastal town in Pernambuco, Brazil, within the Costa dos Corais protected area, faces coral bleaching that threatens up to 90% of the world's reefs by 2050, compounding local pressures on a marine ecosystem that supports tourism and subsistence fishing. Building on three decades of protection through the Tamandaré Bay Exclusion Zone (established 1999 by CEPENE and UFPE), fisheries engineer Rudã Fernandes founded Coral Biofactory in 2021 with WWF-Brazil and Boticário Group Foundation support, developing 3D-printed coral cultivation technology and a land-based laboratory. After a devastating 2024 bleaching event wiped out its open-water nurseries, the team shifted to controlled indoor cultivation before ocean reintroduction, while training local fishers and raft captains (jangadeiros) to maintain nurseries and opening its research centre to regenerative tourism and education. By 2025-2026 the initiative had managed over 18,000 corals across six native species, restored reef area in three locations, and produced three scientific papers and multiple patents. The core lesson: climate resilience must be built in from the start, brutal losses should fuel technological adaptation rather than retreat, and local communities must be active team members, not just an audience, for conservation to take hold.

Setting the Scene: Destination & context

To truly experience Tamandaré, a coastal town of 23,000 inhabitants on the southern coast of Pernambuco, one must yield to the rhythm of the tides. Far beyond the international fame of idyllic beaches like Praia dos Carneiros, the town boasts a living ecosystem, where coconut groves, warm waters, and local tourism strive to balance with nature. This vibrant soul is reflected in the hands of its artisans and the rich flavors of its coastal gastronomy.

Geographically and historically connected, Tamandaré is nestled within environmental protection areas (Costa dos Corais and Guadalupe APAs) that preserve its biodiversity and the meeting of the Formoso River with the mangroves. Furthermore, the town keeps its historical and religious heritage alive through the 17th-century Santo Inácio de Loyola Fort and the 18th-century São Bento Chapel.

As the headquarters of Coral Biofactory — the first Brazilian startup dedicated to reef restoration —, Tamandaré merges biotechnology with the knowledge of local fishers and residents to engage the community in environmental preservation, ensuring the future of its natural wealth.

The Turning Point: Why change was needed

Global warming and the resulting rise in ocean temperatures threaten to extinguish up to 90% of the planet's coral reefs by 2050 due to bleaching, a biological collapse that disrupts the essential symbiosis between corals and microalgae. In Tamandaré (PE), this crisis is compounded by local pressures, causing large-scale necrosis and reef death. This scenario compromises coastal protection against erosion, while also threatening tourism and local subsistence fishing.

To tackle the problem, the region relies on a solid history of conservation, driven since the 1990s by the partnership between CEPENE (National Center for Research and Conservation of Marine Biodiversity of the Northeast) and UFPE (Federal University of Pernambuco), which culminated in the creation of the Tamandaré Bay Exclusion Zone in 1999 — a protected area with highly positive results in the recovery of marine biodiversity. However, accelerating climate change demanded even more active and technological responses. In light of this, based on the doctoral research of fisheries engineer Rudã Fernandes started in 2017 with the support of the Boticário Group Foundation, a technology focused on managing corals in the laboratory and in the ocean was developed.

Created in 2021 with the support of WWF-Brazil, Coral Biofactory is the country's first reef restoration startup, uniting cutting-edge science and local conservation in a bioeconomy model.

The Vision: What you set out to do

Aiming to generate real ecological impact in coral cultivation, Coral Biofactory was born from doctoral research and a 3D-printing patent, moving science from the laboratory to the market. Financially supported by WWF-Brazil and the Boticário Group Foundation, the startup began operations in Tamandaré in 2022. Through a partnership with CEPENE/ICMBio, the initiative

installed a land-based laboratory integrated with floating research stations on the water to expand its cultivation capacity.
The focus centers on developing both in-situ (natural) and ex-situ (controlled) cultivation methodologies. Despite facing severe adversities, such as the intense 2024 coral bleaching episode that caused high mortality and delayed schedules, the team reinforced its socio-environmental resilience. Backed by strategic partners like CEPENE/ICMBio, the Federal University of Pernambuco (UFPE), and the Coastal Recife Institute (IRCOS), the initiative renewed its local infrastructure and executed pilot cycles that successfully returned batches of corals to nature. Today, the operation manages a robust infrastructure with a capacity for 1,600 animals from Tamandaré and Maragogi, sustained by regenerative tourism and coral adoption programs.

The Journey: How change happened
Step 1: Origin and Initial Assessment
Founder Rudã Fernandes leveraged his background as an aquarist and fisheries engineer to create Coral Biofactory. The project began with a comprehensive biological and socio-economic diagnosis of the local reef environment and community interactions.

Step 2: Solution Development (The Land Base)
In 2022, a strategic partnership with CEPENE/ICMBio in Tamandaré (PE) established a land-based laboratory. This support area utilizes controlled tanks to safely cultivate and grow coral fragments before ocean introduction.

Step 3: Compliance and Articulation
Operating within the Costa dos Corais APA, the startup secured official legal licenses from ICMBio for safe coral management. The action plan was co-designed with regulatory bodies and local communities to ensure economic security and sustainable transitions.

Step 4: Operationalization and Management
Ocean operations expand across two integrated fronts:

Reef Area: Direct marine management, including mapping, nursery (farm) maintenance, transplantation, and colony recovery.

Informative Environment: Digital platforms, dashboards, and media sharing data to promote global ocean literacy.

Impact and Community Engagement
The initiative drives regional socio-economic transformation through two main tools:

Regenerative Tourism and Education: The Tamandaré research center serves as a public awareness hub, educating residents and visitors on marine protection.

Local Capacity Building: Training fishers, raft captains (jangadeiros), and tourism operators to maintain nurseries and adopt regenerative practices, securing long-term environmental and economic benefits.

The Breakthrough: What you achieved

A Model for Ecological Safeguard

The technical cooperation between Coral Biofactory and CEPENE/ICMBio serves as a sustainability anchor in Tamandaré, balancing rapid real estate and tourism growth with natural heritage conservation. By proving that degradation can be reversed, the initiative reframes climate hopelessness and mobilizes community and public authorities.

Ecological and Scientific Achievements (2025–2026)

Coral Management: Over 18,000 corals managed across the Costa dos Corais APA, actively working with six native species (predominantly Millepora alcicornis, along with Siderastrea stellata, Porites astreoides, Favia gravida, Mussismilia harttii, and Montastrea cavernosa).

Geographic Reach: Active restoration documented in Maragogi, Tamandaré, and Porto de Galinhas (recovering ~0.8 m² of direct reef area).

Scientific Legacy: Production of three academic papers (one published) and a history of three patents (two licensed and one co-authored/filed in 2024).

Socio-Economic Impact and Regenerative Tourism

The partnership is shifting local mindsets, inspiring fishers, sailors, and operators to conserve their marine backyard and explore income opportunities through regenerative tourism. While still in its initial stages, the initiative is shaping a new visitor profile. By opening CEPENE's facilities to the public, tourists are educated on ecosystem fragility, transforming passive observation into positive-impact tourism.

Reflections: What you learned and what others can learn

The climate crisis has forced a radical shift in marine conservation strategies in Pernambuco, the region most severely affected by coral bleaching in Brazil due to extreme heatwaves.

The 2024 Crisis and Strategy Shift: After suffering a 100% loss of corals in its open underwater nurseries, the project abandoned traditional direct cultivation in the sea. The new approach focuses on controlled indoor environments (laboratories) to strengthen the organisms before introducing them into nature.

Scientific Innovation and Data: In partnership with UFPE and CEPENE/ICMBio, the initiative focuses on mapping genetic/nutritional resilience and on ecological engineering (such as artificial shading in the ocean). Additionally, strict data traceability was implemented to replace loose information with solid scientific evidence, which is crucial for fundraising.

Practical Lessons:

Prioritize climate resilience from day one.

Involve the local community as an active part of the team, and not just as an audience.

View brutal losses as fuel for technological evolution.

Protect the ecosystem as a whole (including mangroves and estuaries) to ensure nature's self-recovery.

The Ripple Effect: Lasting impact
While Tamandaré faces ongoing sustainable management challenges and a local community still in the early stages of environmental awareness, the partnership among Biofábrica de Corais, CEPENE/ICMBio, and UFPE has grown into a monumental model of resilience.

A 30-Year Legacy: The current success of the partnership relies heavily on the Tamandaré Exclusion Zone—a reef area protected by CEPENE/ICMBio for three decades. Banning fishing and predatory tourism turned this area into a biodiverse genetic bank, providing the ecological stability needed for today’s modern coral transplantation and nursery protocols.

A Blueprint for the Nation: Having successfully responded to the devastating 2024 bleaching event with applied science, this project blends institutional research with technological innovation. It now serves as a national blueprint for reef restoration across Brazil.

Community Shift Through Practice: Although local engagement is a slow process, practical results are convincing the community. Artisanal fishers are noticing increased fish stocks near the exclusion zone, and global scientific interest is sparking local pride, helping residents recognize their marine ecosystem as a national treasure.

Awards or Certifications
- 2022 - 1st Place in the Pernambuco Tourism Award, under the category 'Innovation and Sustainability in Tourism' (Startup incubated by the UFPE Technology Park wins the Pernambuco Tourism Award - Innovation News - UFPE)

- 2023 - 1st Place in the category 'Sustainable Tourism and Climate Change Mitigation/Adaptation Actions' at the National Tourism Award (National Tourism Award: discover 5 initiatives connected to responsible tourism | Viajar Verde)
- 2024 - Finalist in the 'Green Investment Innovation Challenge' (Green Investment Innovation Challenge)
- 2025 - 2nd Place in the category 'Best Initiatives for Tackling Climate Change and Biodiversity Conservation' at the Responsible Tourism Award (Responsible Tourism Award)
- 2025 - 1st Place in the 'Environmental' category at the 1st Brazil-Portugal International Sustainability Award (Brazil-Portugal International Sustainability Award)

Web Articles

https://alnb.com.br/brasil/biofabrica-de-corais-conquista-premio-embratur-e-projeta-turismo-regenerativo/ https://integridadeesg.insightnet.com.br/startup-de-recuperacao-de-corais-impulsiona-turismo-sustentavel-em-pernambuco/

Other Relevant Links

https://www.instagram.com/biofabricadecorais/

Quotes or Testimonials

https://www.instagram.com/stories/highlights/18017511568555799/