

Restoring Coral Reefs to Combat Climate Change and Biodiversity Loss



CORAL RELIEF!

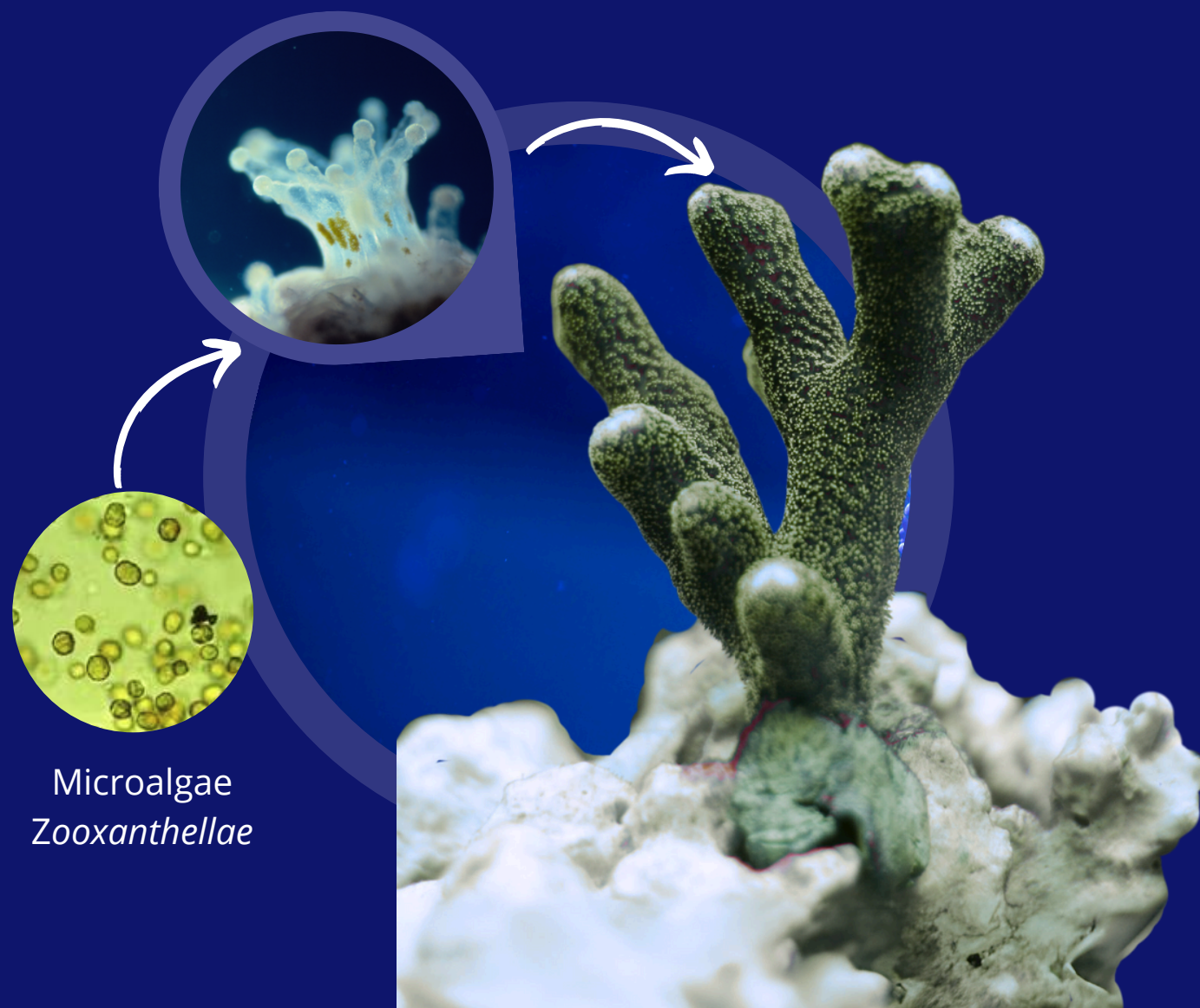
Targeting coral bleaching from its root-cause

- 1 Problem
 - 2 Solution
 - 3 Execution
 - 4 Impact
-

1

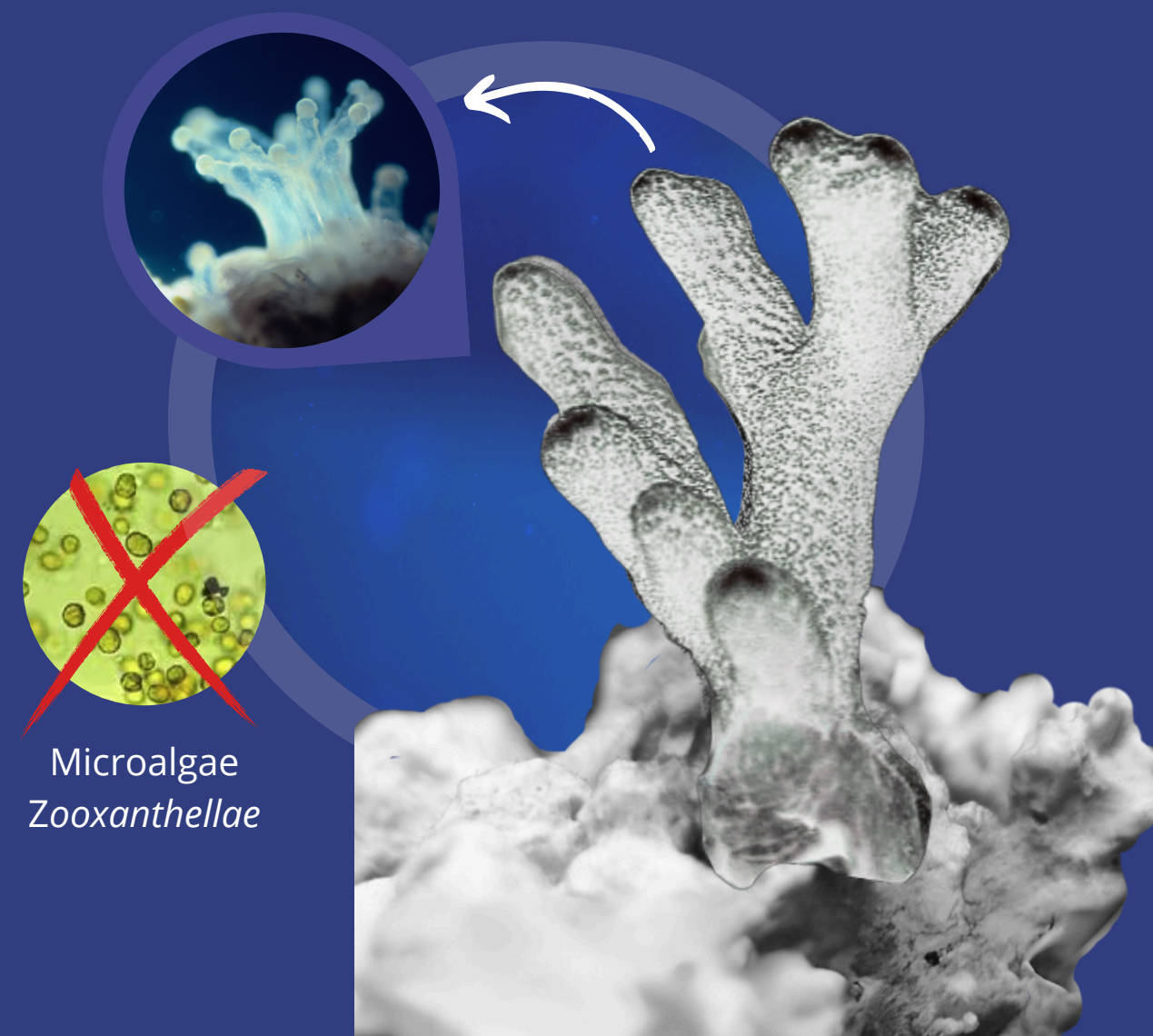
Problem

Normal Conditions



Under normal conditions, corals and their symbiotic microalgae, *Zooxanthellae*, share a mutually beneficial relationship that sustains reef ecosystems. The coral provides the algae with a protected environment and essential nutrients, while the algae, through photosynthesis, produce oxygen and supply up to 90% of the coral's energy needs in the form of organic compounds.

Increased Temperature



With rising ocean temperatures, the symbiotic microalgae that corals rely on become overactive, producing excessive reactive oxygen species. This stresses the coral, forcing it to expel the algae and turning it stark white—a process known as coral bleaching. Without intervention, the coral starves and dies, leading to ecosystem collapse.

Who is affected by this?

Coral bleaching affects both people and marine biodiversity with losses that could lead to billions in economic losses, endangering livelihoods, food security, and the stability of coastal communities worldwide.

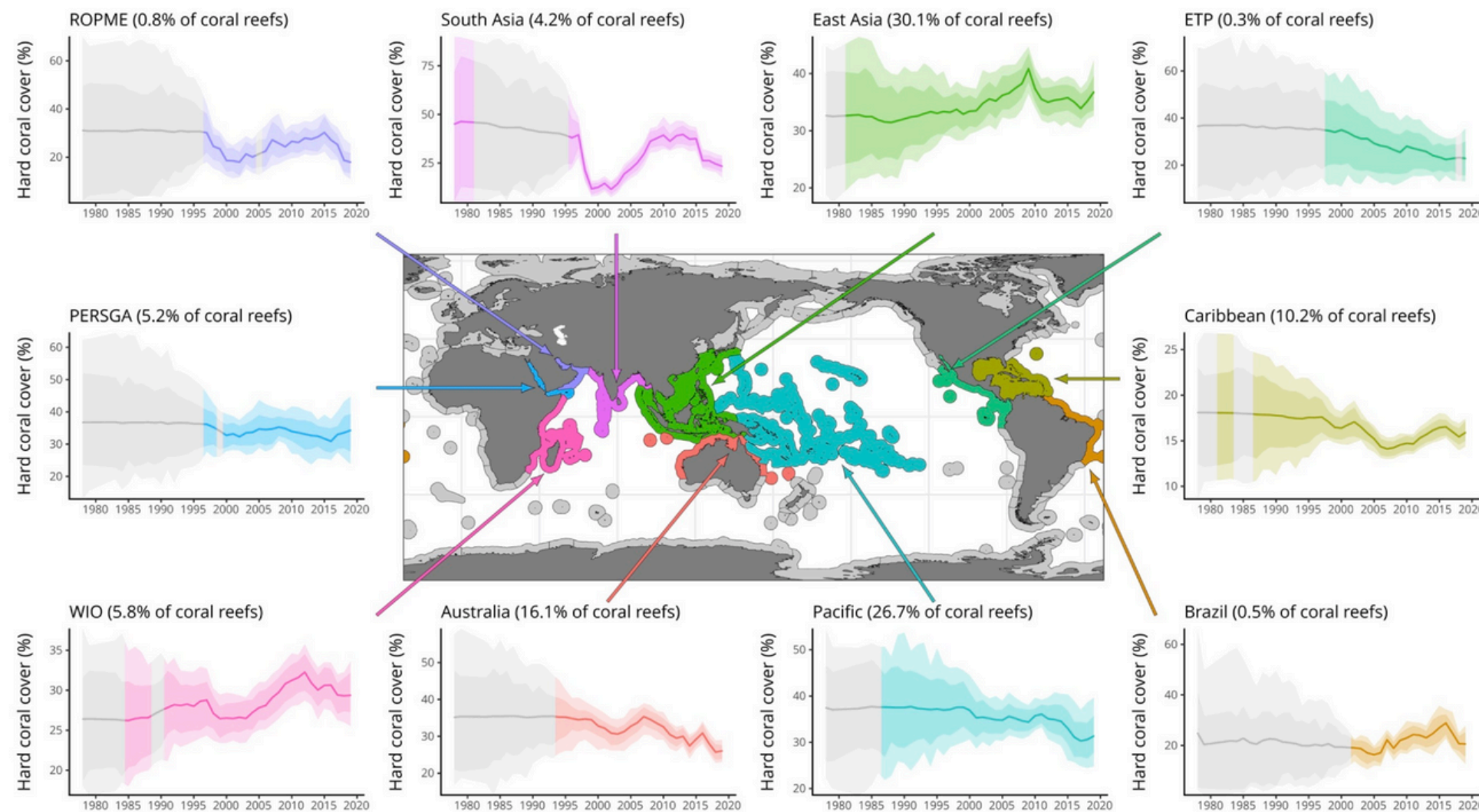


Coastal economies suffer from declining fish stocks, lost tourism, and weaker storm protection, putting livelihoods and food security at risk worldwide.



As reefs collapse, 25% and 40% of the fish population lose their habitat, disrupting ecosystems and fisheries

Magnitude



This graph illustrates the number of moderate and severe coral bleaching events recorded at 100 fixed global locations, providing insight into the increasing frequency of such events over time.

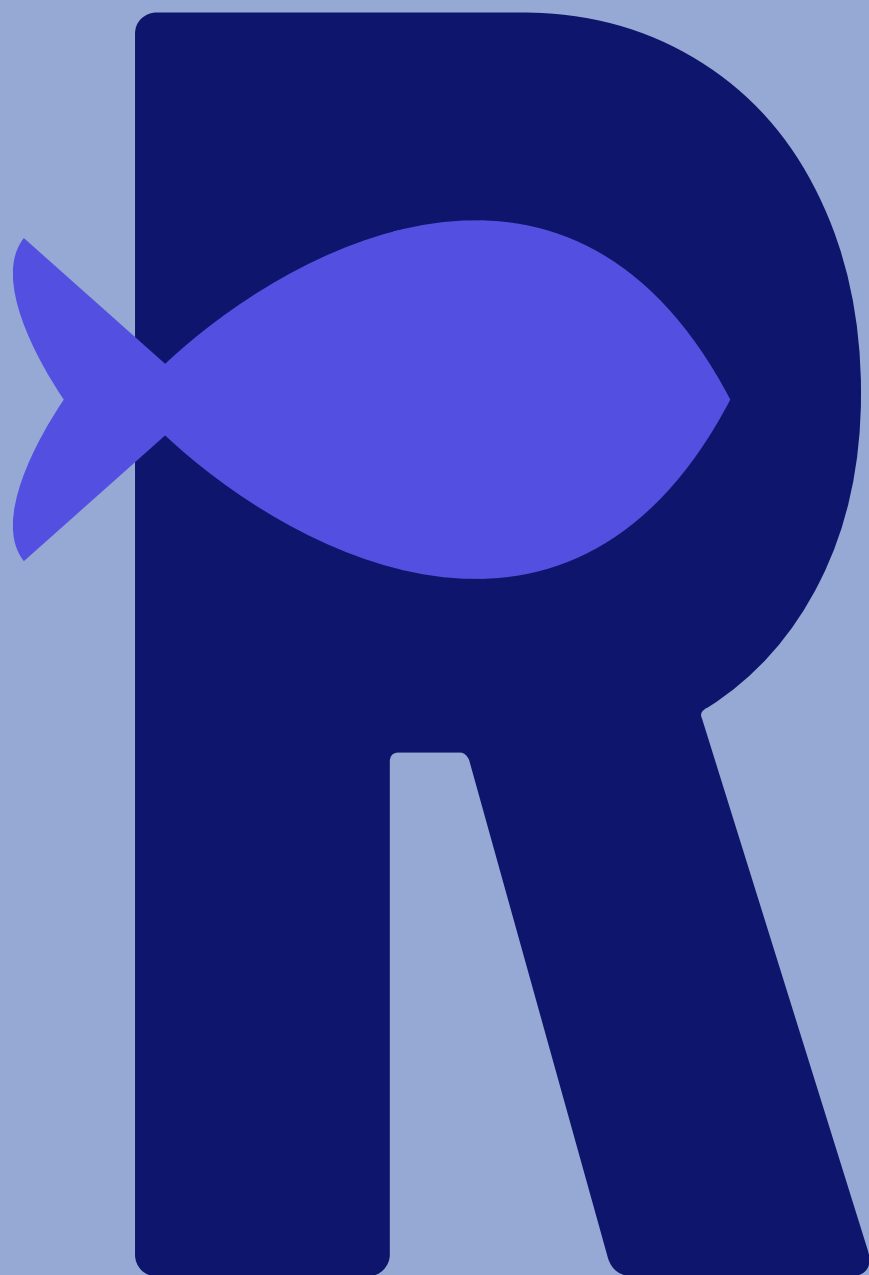
90% of corals
could disappear
by 2050 due to
climate change.

Over 50% of
corals have been
lost in the last
30 years.

14% of coral
cover vanished
in just a decade
(2009-2018).

2

Solution



About Our Company

Coral-Relief was founded after our team won a genetics competition with this innovative idea. By integrating synthetic biology and AI-powered monitoring, we develop heat-resistant coral polyps that restore reefs and prevent future bleaching. Our approach strengthens corals at the cellular level, ensuring long-term survival. Through strategic partnerships, we scale restoration efforts globally, driving a sustainable future for marine ecosystems.

¿HOW DOES IT WORK?

1

We locate areas in risk of bleaching with our AI powered remote monitoring system

2

Contact restoration organizations, governmental organizations & multinational corporations in the High-Risk area

3

Ensure the biocompatibility of our heat-resistant coral polyps and ecosystem

4

Transplant our stress-resistant coral polyps for them to regenerate the endangered reef stabilizing the coastal ecosystem

5

Queep track of health and growth over time with our remote monitoring system

Competitive Advantage

Long-Term Impact

High – resistant corals require minimal human intervention.

Scalability

High – engineered corals grow and sustain themselves.

Effectiveness

High – Synthetic biology & AI-powered monitoring to enhance coral resilience at the cellular level.



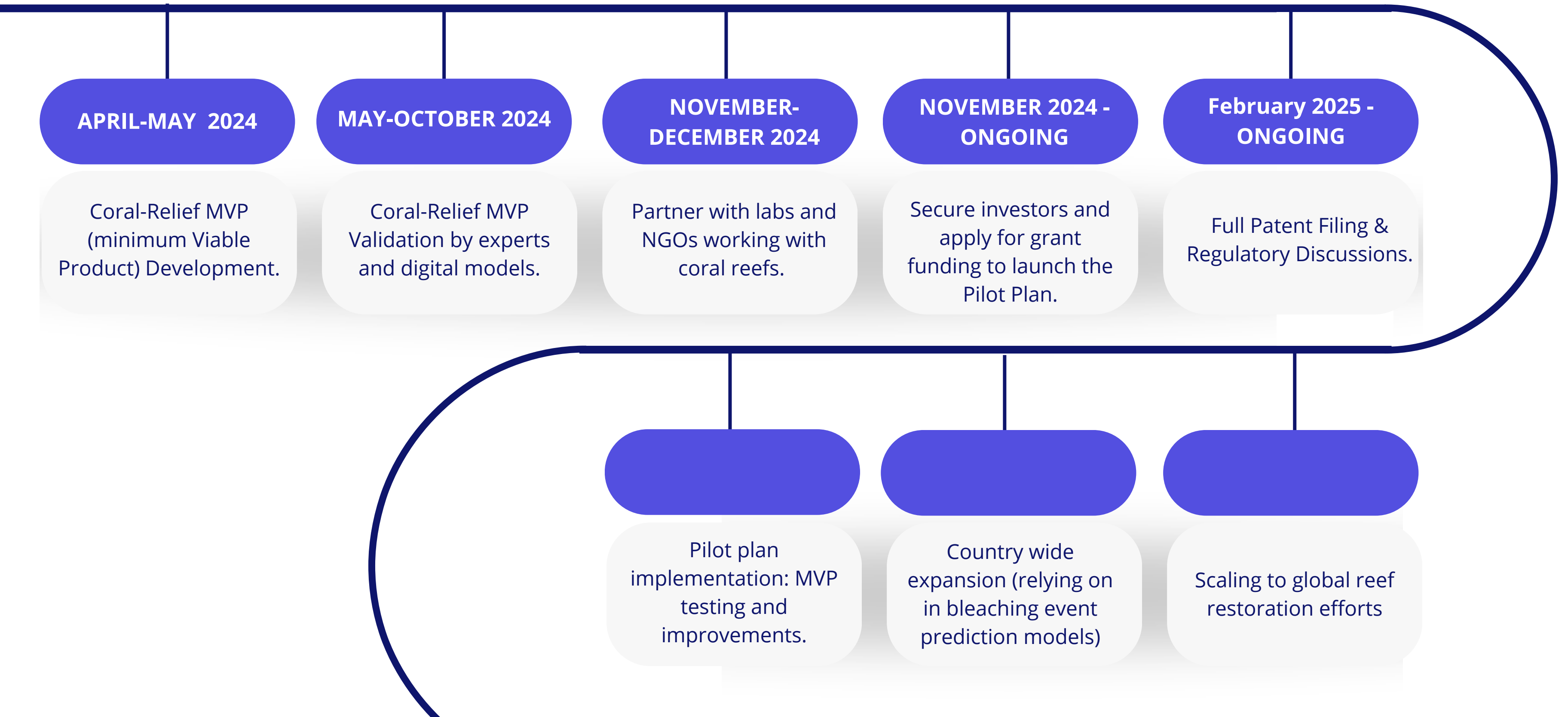
Sustainable Development Goals



3

Execution

Implementation road map



Pilot Program

Our Selected area of study



We chose Panama's coasts (Colon and Panama City region) as the ideal location for our pilot plan due to the **recurrence of coral bleaching events** and the **proactive efforts** of institutions such as the Smithsonian Tropical Research Institute and Reef Restoration Foundation Panama. We gain scientific insights and logistical support for our work through these **partnerships**. Additionally, **access to well-equipped laboratories** like INDICAST, located near our area of interest, enhances our research capabilities.

✓ **Equipped Lab facilities**

✓ **Interested Partners**

Pilot Program Implementation

PHASE 0	PHASE 1	PHASE 2
THEORETICAL DEVELOPMENT & VALIDATION • Conduct in-depth literature review on synthetic biology applications for coral resilience. • Develop mathematical and computational models to simulate genetic modifications. • Design initial genetic constructs for modified zooxanthellae and beneficial bacteria. • Identify regulatory and ethical considerations for genetic modification in marine environments. • Prepare preliminary research proposals for collaboration with scientific institutions. ✓ SUCCESS METRICS: 1. Completion of validated genetic construct designs. 2. Development of at least one computational model to simulate genetic modifications. 3. Formal documentation of regulatory requirements for deployment.	ON LAB DEVELOPMENT (PILOT PROGRAM) • Establish lab partnerships for controlled testing of genetically modified microalgae and bacteria. • Conduct experiments on oxidative stress reduction, heat resistance, and symbiosis efficiency. • Optimize gene expression levels for enhanced thermal resilience in zooxanthellae. • Evaluate the compatibility of modified organisms with coral polyps in controlled conditions. • Perform small-scale laboratory bioassays to assess bleaching resistance. ✓ SUCCESS METRICS: 1. Successful integration of engineered zooxanthellae into coral symbiosis. 2. Measurable reduction in reactive oxygen species (ROS) levels under heat stress. 3. Validation of at least two key genetic modifications that improve thermal tolerance.	EVALUATION AND ITERATION • Analyze experimental data from Phase 1 and refine genetic modifications. • Optimize nutrient requirements and microbial interactions for sustained coral health. • Address any unexpected negative effects and perform safety assessments. • Expand testing to larger coral samples in controlled lab environments. • Publish preliminary scientific findings and seek peer review. ✓ SUCCESS METRICS: 1. Demonstration of stable coral-microbe interactions over multiple growth cycles. 2. Proof of heat resistance improvement by at least X°C compared to non-modified corals. 3. Peer-reviewed validation or research preprints confirming feasibility.

Patenting & Enhancements

PHASE 3

PATENNTING

- File provisional patents for genetic modification techniques and bioengineering methods.
- Engage with intellectual property (IP) lawyers to establish global protection strategy.
- Ensure compliance with environmental and bioethics regulations.
- Develop non-disclosure agreements (NDAs) for research partners and investors.
- Explore licensing opportunities for technology commercialization.

✓ SUCCESS METRICS:

1. Filing of at least one provisional patent.
2. Legal validation of patentability in key markets (US, EU, Latin America, Asia-Pacific).
3. Establishment of NDAs and IP-sharing agreements with collaborators.

PHASE 4

CONTACT POTENTIAL CUSTOMERS

- Identify and engage with reef restoration organizations, sustainable fisheries, and marine NGOs.
- Develop business-to-business (B2B) partnerships for coral restoration projects.
- Conduct pilot deployment proposals with government agencies and conservation groups.
- Refine pricing model for scalable deployment.
- Initiate "Adopt-a-Coral" crowdfunding program for public involvement.

✓ SUCCESS METRICS:

1. Establishment of at least three strategic partnerships.
2. Securing pilot program funding and contracts.
3. Onboarding initial customers or early adopters.

PHASE 5

SCALING AND ENHANCEMENT

- Implement first field trials in natural reef environments.
- Utilize remote sensing and AI-driven monitoring for real-time tracking.
- Secure funding for large-scale production and deployment.
- Expand operations to multiple coral species and new geographic regions.
- Develop policy advocacy efforts to integrate bioengineered coral solutions into conservation strategies.

✓ SUCCESS METRICS:

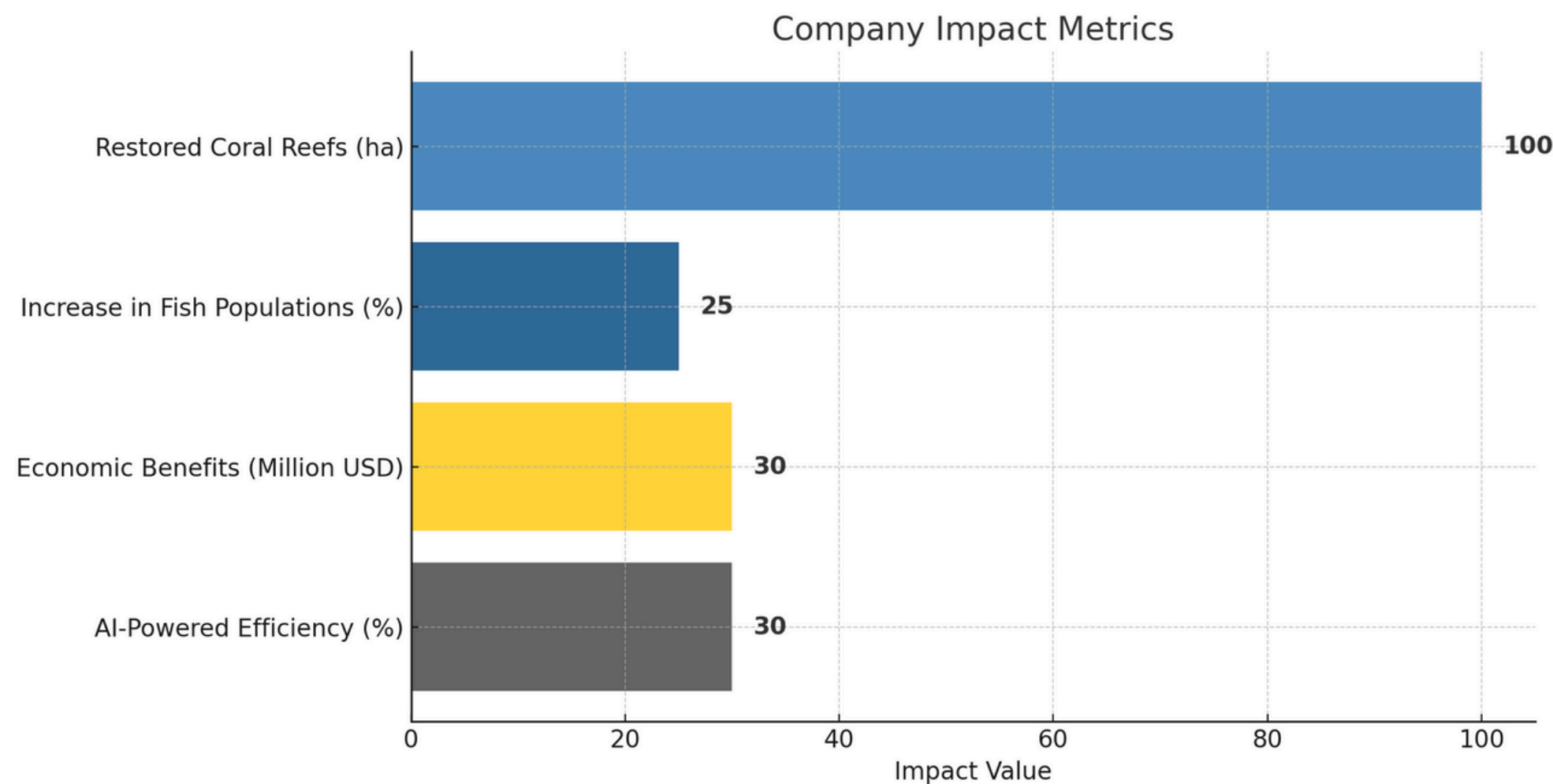
1. Successful pilot deployment with evidence of coral adaptation.
2. Real-time monitoring data showing enhanced survival rates.
3. Expansion of the customer base to multinational organizations.

4

Impact

Company Impact

3 year projections



Restored Coral Reefs
+100 ha

With our genetically enhanced coral polyps, we are restoring 100 hectares annually by the third year, reversing damage caused by bleaching.

Increase in fish
populations
+25%

Healthy reefs support 25% of marine species, enhancing fish stocks and restoring balance to damaged ecosystems.

Economic benefits
+\$30,000,000

We can explain in detail the momentum of the company and the basic facts that are taken to show that our company is in a traction phase.

Increase in
restoration efficiency
+30%

Using machine learning and remote sensing, we optimize reef monitoring and bleaching prediction, ensuring scalable, data-driven deployment.

Business Model Canvas

Problem Coral reef bleaching, caused by global warming, affects both marine ecosystems and coastal and island populations in Panama that depend on them. A clear example is indigenous communities, especially those living in coastal areas, which have a close relationship with coral reef ecosystems for their livelihood and culture, including fishing, the use of corals in medicine, tourism, etc.	Solution Selling coral polyps that, through genetic modifications, are resistant to climate stress. These corals will be grown in controlled structures that provide optimal conditions for their initial growth stages. Additionally, implementing an educational program in schools, universities, and institutions to raise awareness about the importance of coral reefs and why we must protect them.	Unique Value Proposition We offer a real, lasting, and resilient solution to the increasing climate instability that causes coral bleaching.	Unfair Advantage By using synthetic biology, we significantly reduce production time, as modifying a single polyp allows the expansion of fully climate-stress-resistant corals. This process will be conducted through an in-vitro cultivation method.	Customer Segments Our target customers are private and public companies dedicated to the preservation of marine ecosystems, fishing companies, and individuals interested in environmental conservation.
Existing Alternatives Organizations such as Reef2Reef and The Bocas Breeze have programs aimed at mitigating damage to coral reefs through contamination control and reforestation efforts.	Key Metrics • Number of polyps needed per square meter • Production time • Average number of polyps produced per coral • Coral bleaching metrics • Customer satisfaction rate and repeat purchases • Increase in the percentage of healthy corals in reforested areas	Key Resources • Certified knowledge in remote sensing • Direct contact with relevant companies • Proven scientific research	Channels • Direct contact with environmental companies and organizations • Direct product delivery to businesses along with consulting services • Online presence through a website, social media, scientific conventions, and awareness talks for the general public	Early Adopters Our early adopters are private and public companies dedicated to marine ecosystem preservation, fishing companies, and environmentally conscious individuals.
Cost Structure Fixed Costs: Laboratory equipment, R&D, staff salaries, remote monitoring, database maintenance. Variable Costs: Production, raw materials, basic services, marketing and advertising			Revenue Streams Pilot Project: Grants and sponsorship letters Once Developed: • B2B sales of coral polyps • "Adopt a Coral" program • Collaboration with fishing companies and national environmental institutions	

Market Validation

Coral Restoration & Sustainability

Market Demand & Adoption

- \$375 billion USD market for ocean conservation and blue economy initiatives.
- 90% of corals at risk by 2050, creating urgent demand for restoration solutions.
- Government and private sectors increasing funding for sustainable marine projects.

Early Validation & Interest

- ✓ Partnership discussions with leading marine conservation NGOs and government agencies.
- ✓ Investor and grant applications underway for large-scale pilot deployment.
- ✓ Growing B2B interest from sustainable fisheries, reef tourism operators, and climate-conscious



How InnovaNation Fueled Our Innovation

- 📢 Gave us Pitch & Communication Skills
- 🎯 Sharpened our Problem-Solving Skills
- 🤝 Gave us Access to Mentors in our Field of Study
- 🌐 Expanded Our Network & Opportunities
- 💡 Empowered us to not just dream, but take action

thank you Karin



“
InnovaNation changed the way we see the world and gave us skills, knowledge, and confidence to create real change and drive a better future
~ Coral-Relief team
”

Our Super Team



María Sepúlveda



Sofia Brezzi



Ricardo Sánchez



Diego Rodríguez

Thank You

Lets stay in contact!



Nuestra página web

<https://thecoralrelief.netlify.app/>



Gmail

thecoralrelief@gmail.com



Instagram



@THECORALRELIEF

