Reef Aquaculture Conservancy A. C.®

BLUE OCEAN CREDITS ®

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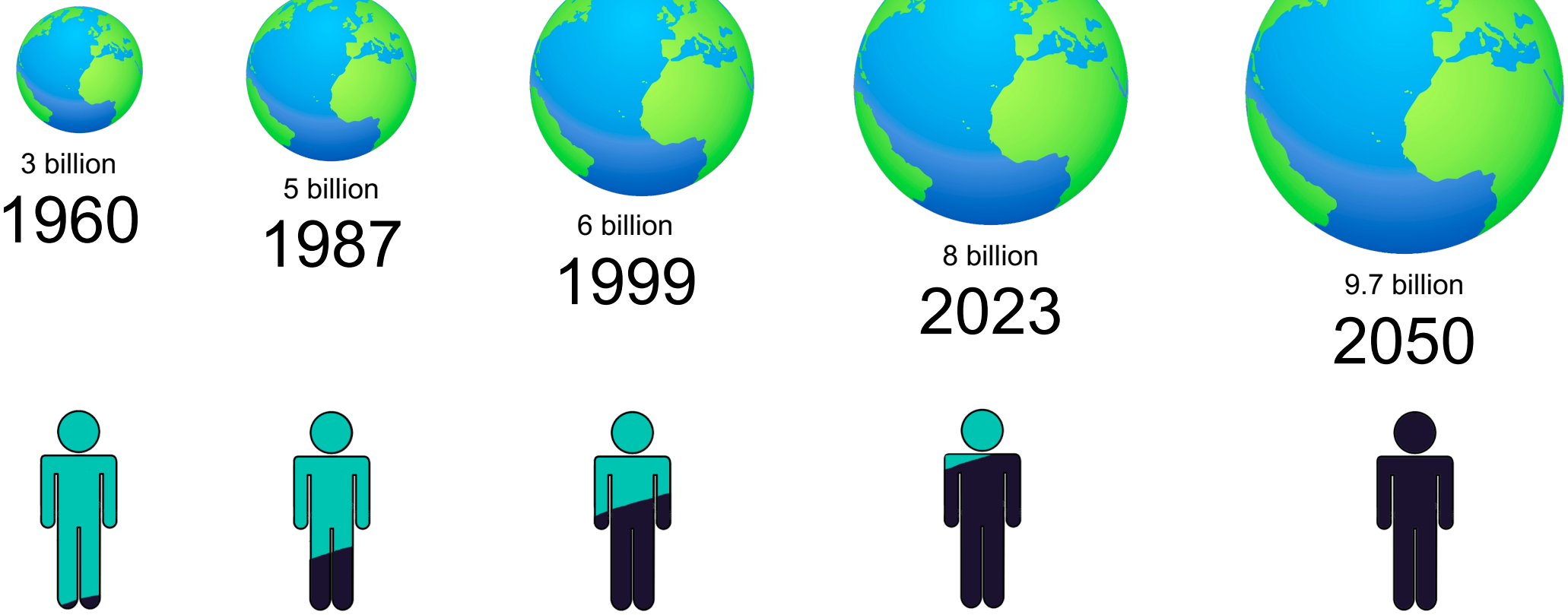
# Current and Future Perspectives on the Blue Carbon Economy

CORAL GARDEN. Melisa´s Garden, Raja Ampat, West Papua, Indonesia ©2023 Guillermo Corona, Reef Aquaculture Conservancy, Blue Ocean Credits Program

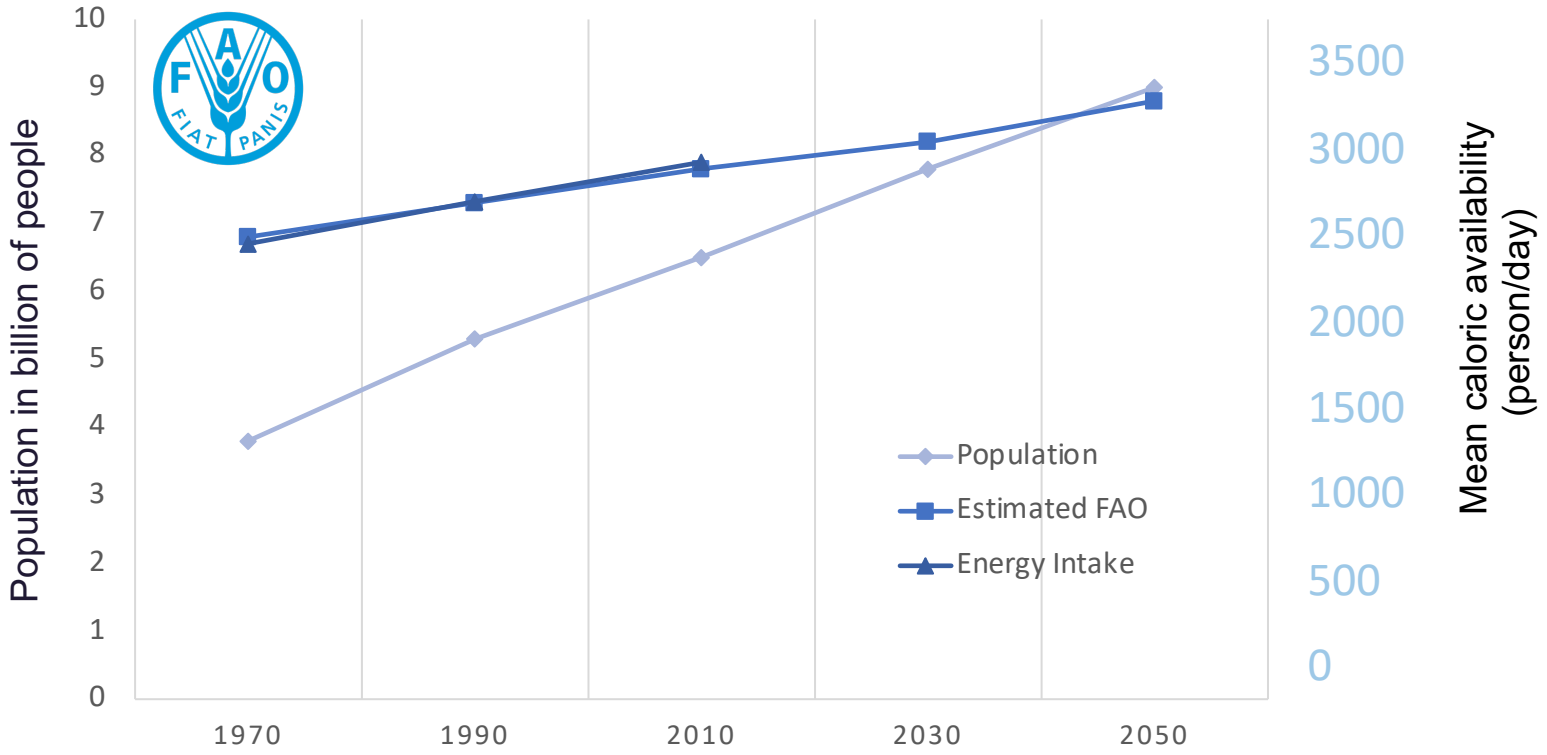
# Human population by 2050



# World population and food security by 2050

**Our future food security will depend on safeguarding our land, soil, and water resources**

(2021) Qu Dongyu, General Director FAO

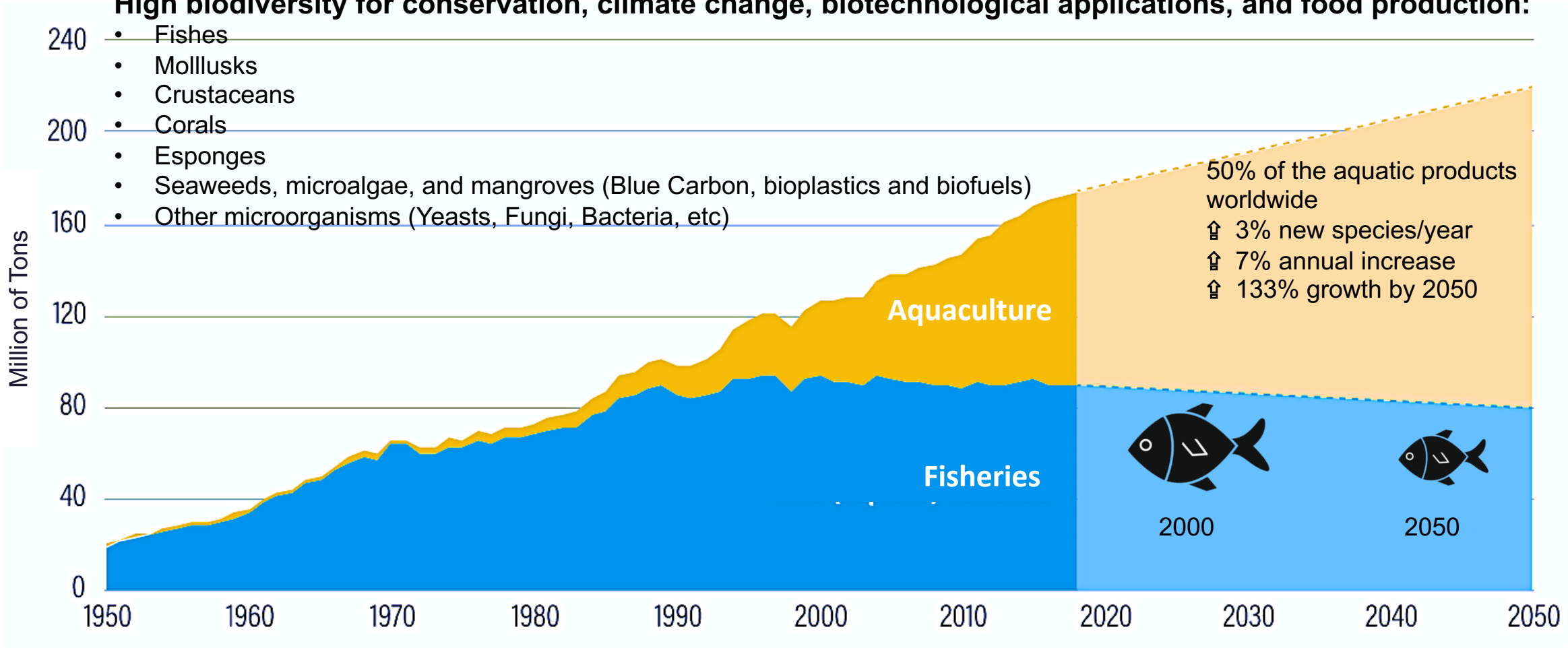



**3.1 billon people rely on aquatic foods as the main protein source**

# Sustainable aquaculture by 2050

**High biodiversity for conservation, climate change, biotechnological applications, and food production:**

- Fishes
- Molllusks
- Crustaceans
- Corals
- Esponges
- Seaweeds, microalgae, and mangroves (Blue Carbon, bioplastics and biofuels)
- Other microorganisms (Yeasts, Fungi, Bacteria, etc)

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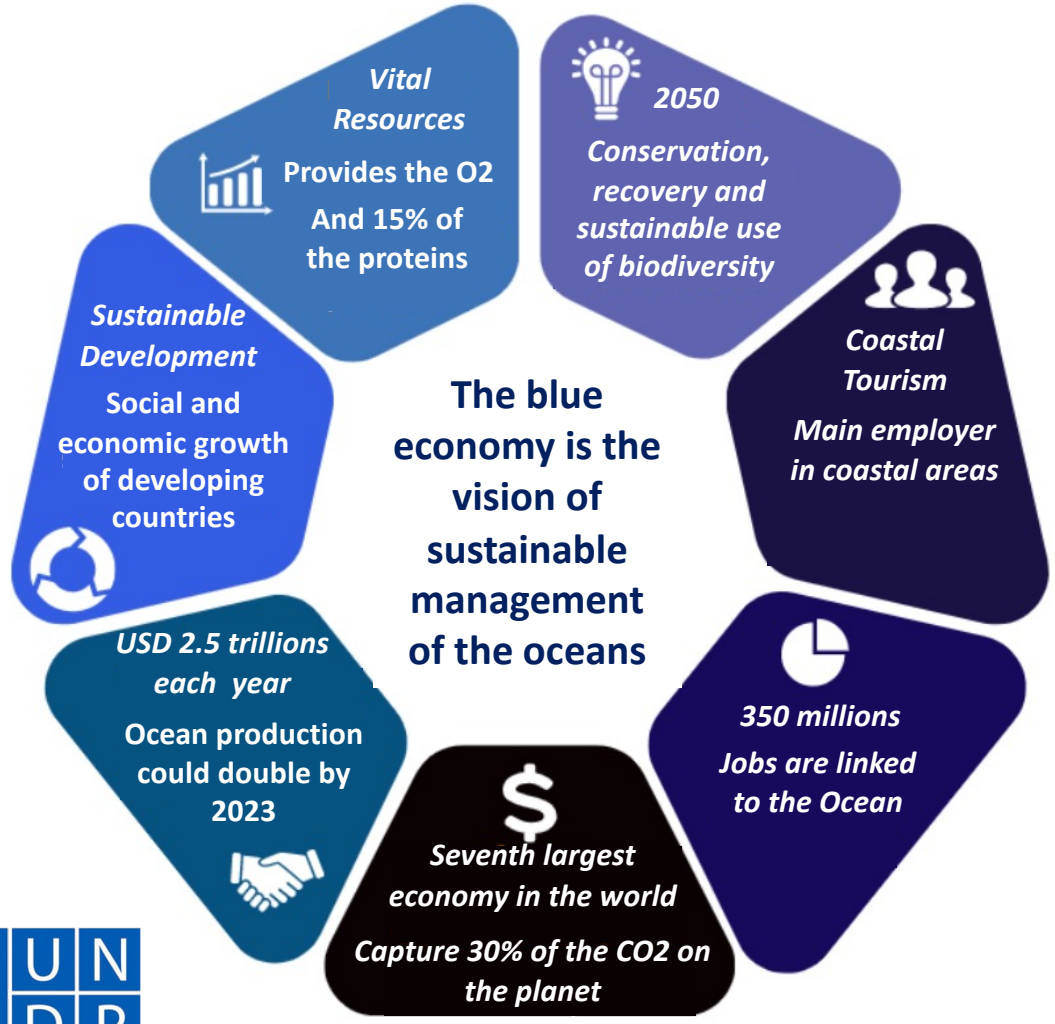
# Blue economy model 2050




Value of the Ocean: **USD 24 trillion**
Dependent people: **~3.5 billion**

**The Ocean:**

- **Absorbs 90% of the heat produced on the planet**
- **Is where 90% of commercial products are transported**
- **Produces 30% of oil and gas**
- **Provides environmental, social, and economic well-being for coastal communities**

# Blue Carbon Ecosystems (BCEs)

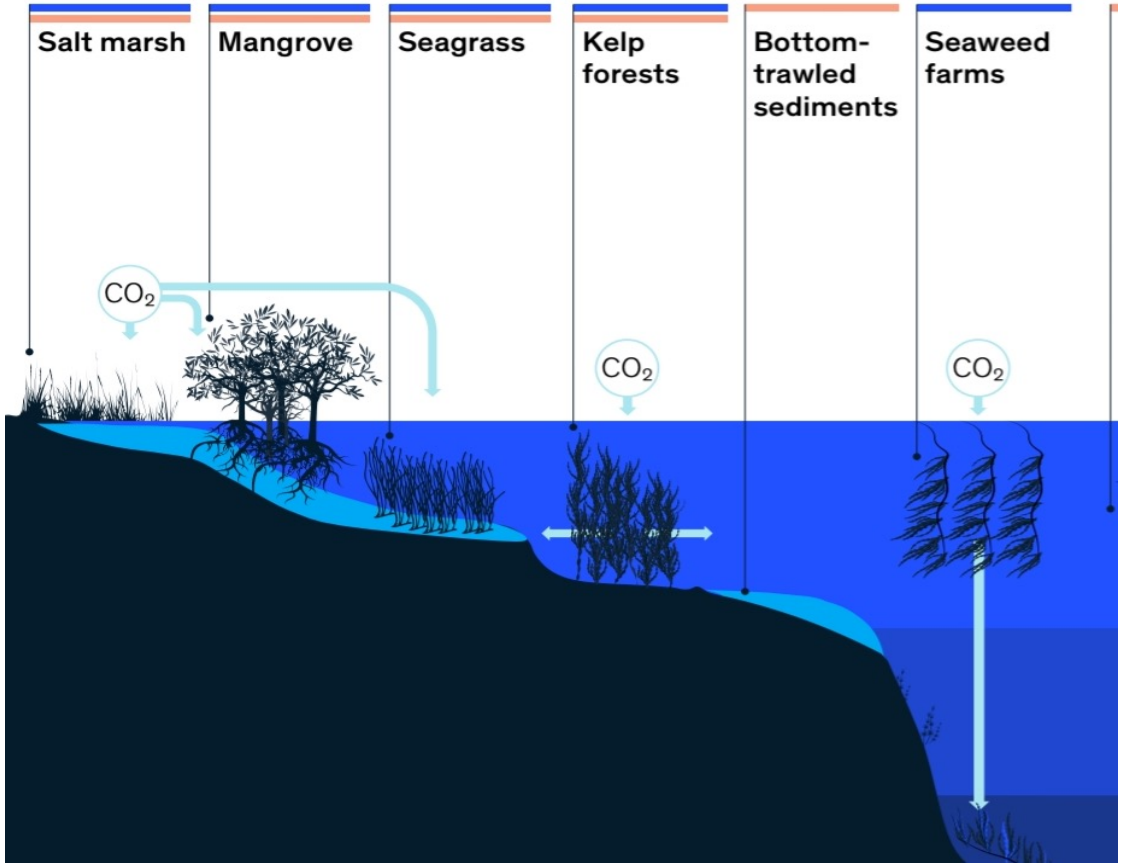
**Blue carbon is stored in coastal ecosystems:**

- Salt marshes
- Mangroves
- Seagrass meadows
- Seaweed/Kelp forests

**Main services provided:**

- Food and climate security
- Biodiversity conservation and ecotourism
- Water filtration and disease control
- Coastal protection and ocean acidification buffering

BCEs are responsible for 50% of the carbon stored (75 $GtCO_2$) in the ocean despite just covering 2% of the ocean's surface




McKinsey Sustainability

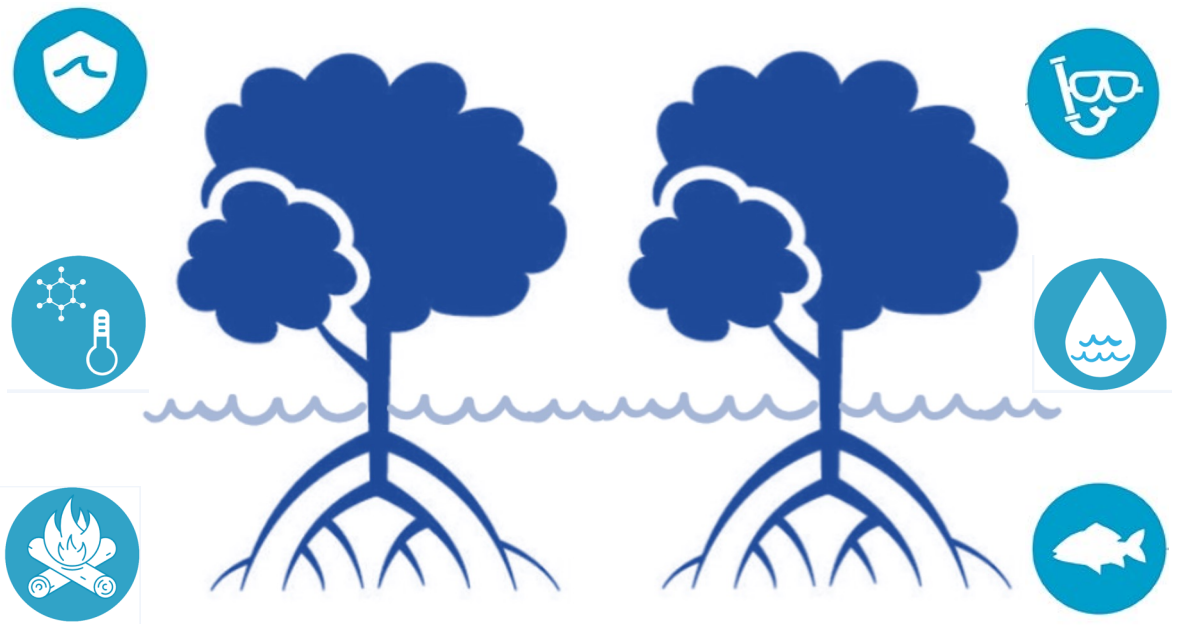
# Mangroves services value

Annual Value**: ~ USD 462-798 billion**
Valor 1 Ha.: **~ USD 33-57 thousand/year**
Dependent people: **~120 million**

**Coastal protection:**
5 times more profitable and effective than seawalls. Reduce 50 % of storm impacts

**Climate Change:**
Covers ~0.1% of the planet, but captures and stores 8-9 tons of CO2/Ha (3-5 times more than forests).

**Wood:**
For building materials and firewood



**Tourism:**
Kayaking, fishing, wildlife, tours, etc.
**USD 1,079/Ha.**

**Water filtration:**
2-5 hectares can filter 1 hectare of aquaculture farms.

**Fisheries and food production:**
Habitat for more than 3,000 species and enhance 25% the productivity of coral reefs

Reef Resilience Network · IUCN · WWF · GLOBAL MANGROVE ALLIANCE

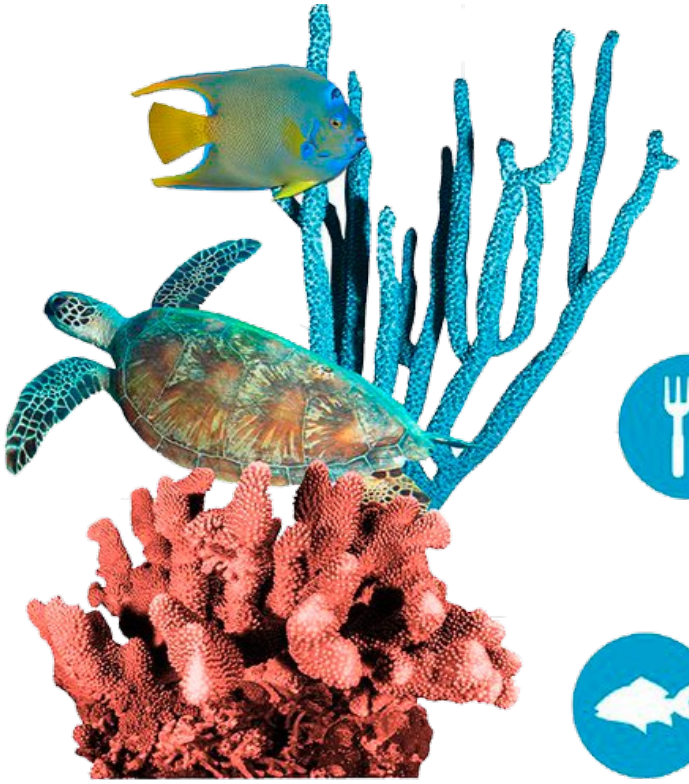
# Coral reefs services value

Current Value: **~USD 9.9 trillion**
Annual Value**: ~USD 375 billion**
1 Ha. Value **~USD 1.25 million/year**
Dependent people: **~500-1000 million**

**Coastal protection:**
Reduce 97% of wave energy.
**USD 272 billion/año**

**Climate Change:**
Cover <1% of the planet, but capture and store 70-90 million tons of CO2. Associated seagrass 8 tons of CO2/Ha

**Medicine:**
Anticancer and antivirals



**Tourism:**
70 million trips/year
**USD 36 billion**

**Food Production:**
5-10 tons of fish/km$^2$/year.
**USD 29.8 billion**

**Biodiversity:**
Habitat of the 25% of marine species

The Nature Conservancy · The Climate Trust · ocean-climate.org · coral GUARDIAN

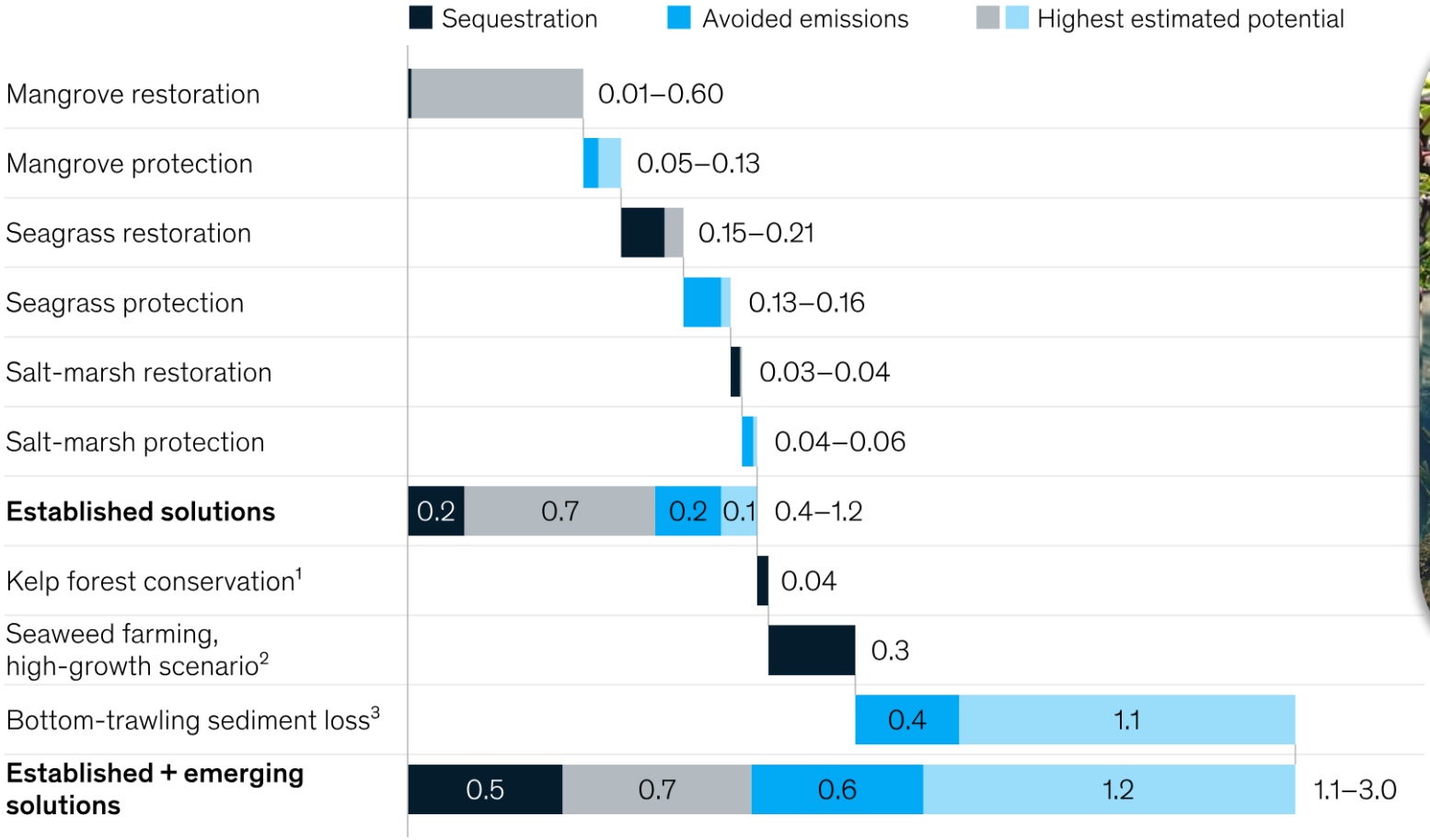
# BCEs and coral reefs are threatened

**¿2030 - 2050?**

- Lost: Coral Reefs **50%**, Tidal Marshes **50%**, Mangroves **35%**, Seagrass meadows **30%**
- 70-90% of these ecosystems are threatened
- Destruction of the natural, social, and economic capital (BCEs release 1 $GtCO_2$)
- They could disappear in the next 3 decades

# Blue carbon capture potential of BCEs by 2050

**Abatement potential from established and emerging blue-carbon solutions by 2050,**
$GtCO_2$ equivalent per year

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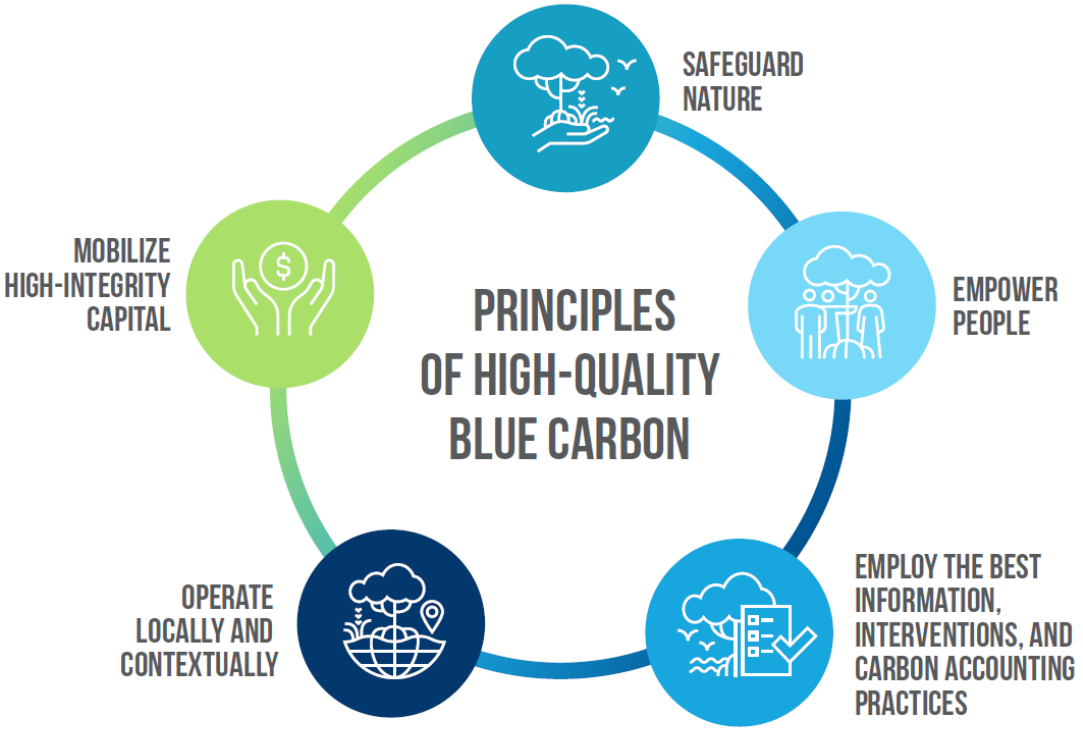
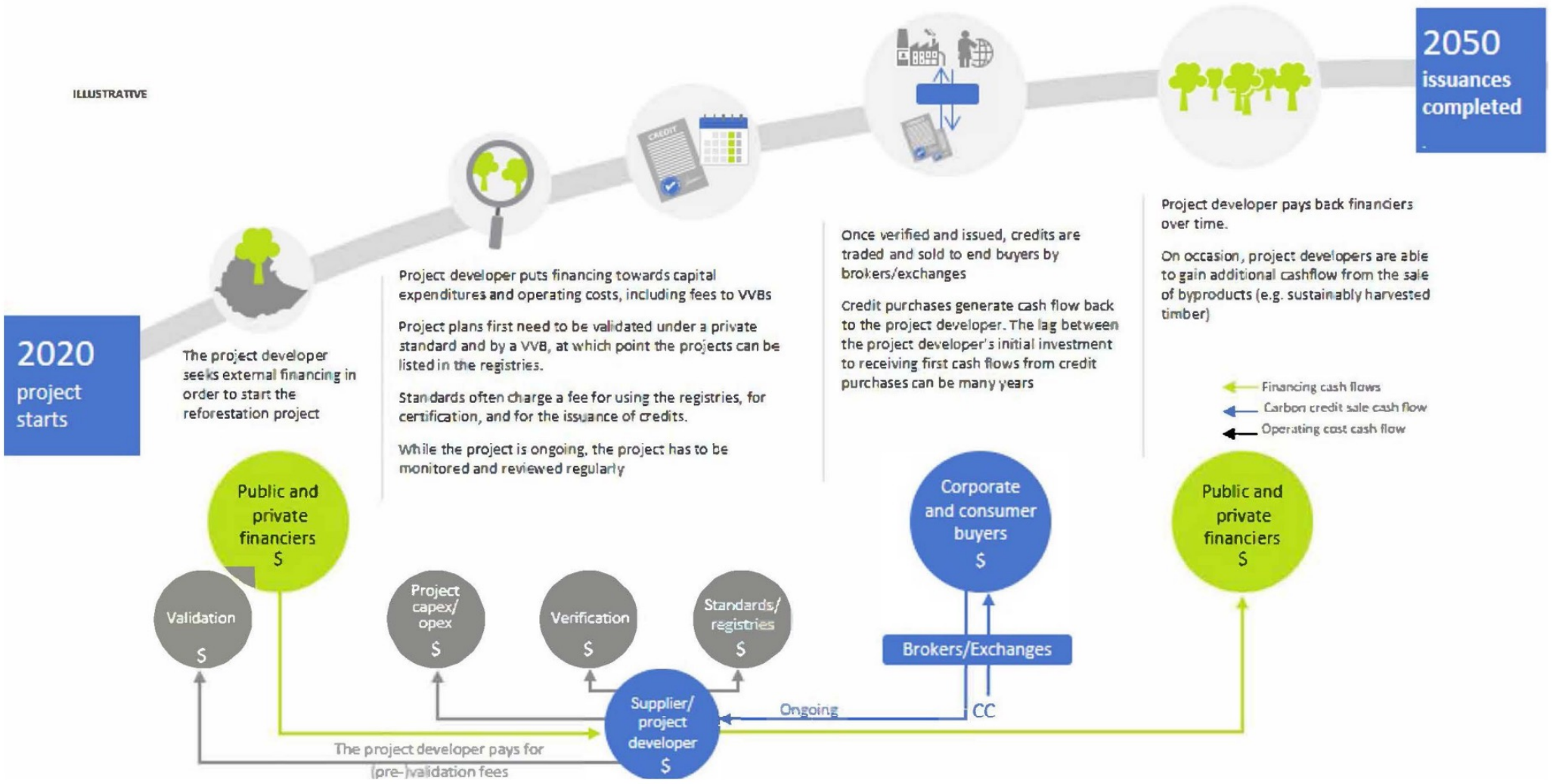
# Carbon credits categories

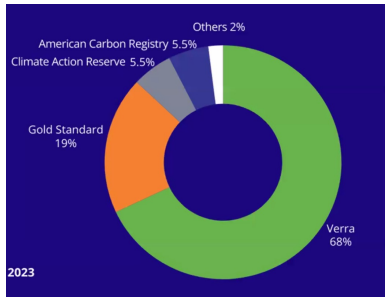

WORLD ECONOMIC FORUM

Ecosystem Marketplace
A FOREST TRENDS INITIATIVE

# Life cycle and cashflow of a carbon credit



# Carbon market initiatives

| | Suppliers | | | Market intermediaries | | | | | Buyers | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Project design & development | Validation | Verification/issuance | Supply-chain financing | Trading (pricing, execution | Risk management | Settlement & retirement | Market & reference data | Compliance | Voluntary |
| **Ongoing initiatives** | **Supply aggregation** at portfolio level | **Standard and process guidance** for registration, verification and issuance: ART, VERRA, American Carbon Registry, Gold Standard | **Investment fund** focused on supply creation eg, Livelihoods carbon funds | **DLT based[1] exchange** on carbon projects: ICC, AirCarbon Exchange, InterWork Alliance | | | **Central registry** on carbon projects under different standards: IHS Markit, The World Bank | | **Solutions** for corporate buyers: IETA, The Open Group Open Footprint Forum |
| | **Support for supply creation** | **Code of conduct** for quality assurance and supplier audit: ICROA, University of Oxford, WWF, EDF, Öko-Institut e.V. | | **Sector spe-cific carbon pricing solution**: EDF | | | Providing market **info-rmation & trans-parency**: Ecosystem Marketplace, EDF, IETA | | **Industry consortium** adhering to common code of conduct and standards: CORSIA | |
| |   | **Avoiding Double Counting** Working Group: ClimateWorks Foundation | | | | | | | **Facilitate & incentivize buyers** (incl. individuals): Transform to Net Zero, CO2OL Effect | |
| | Natural Climate Solutions Alliance, World Economic Forum, wbcsd | | | **Guidance for natural climate solution credits** | | | | | Natural Climate Solutions Alliance, World Economic Forum, wbcsd | |

TSVCM

THE INTEGRITY COUNCIL FOR THE VOLUNTARY CARBON MARKET

# Voluntary and compliance carbon markets

## VOLUNTARY MARKETS

Function in parallel to compliance markets and **do not fulfil a legal obligation.**

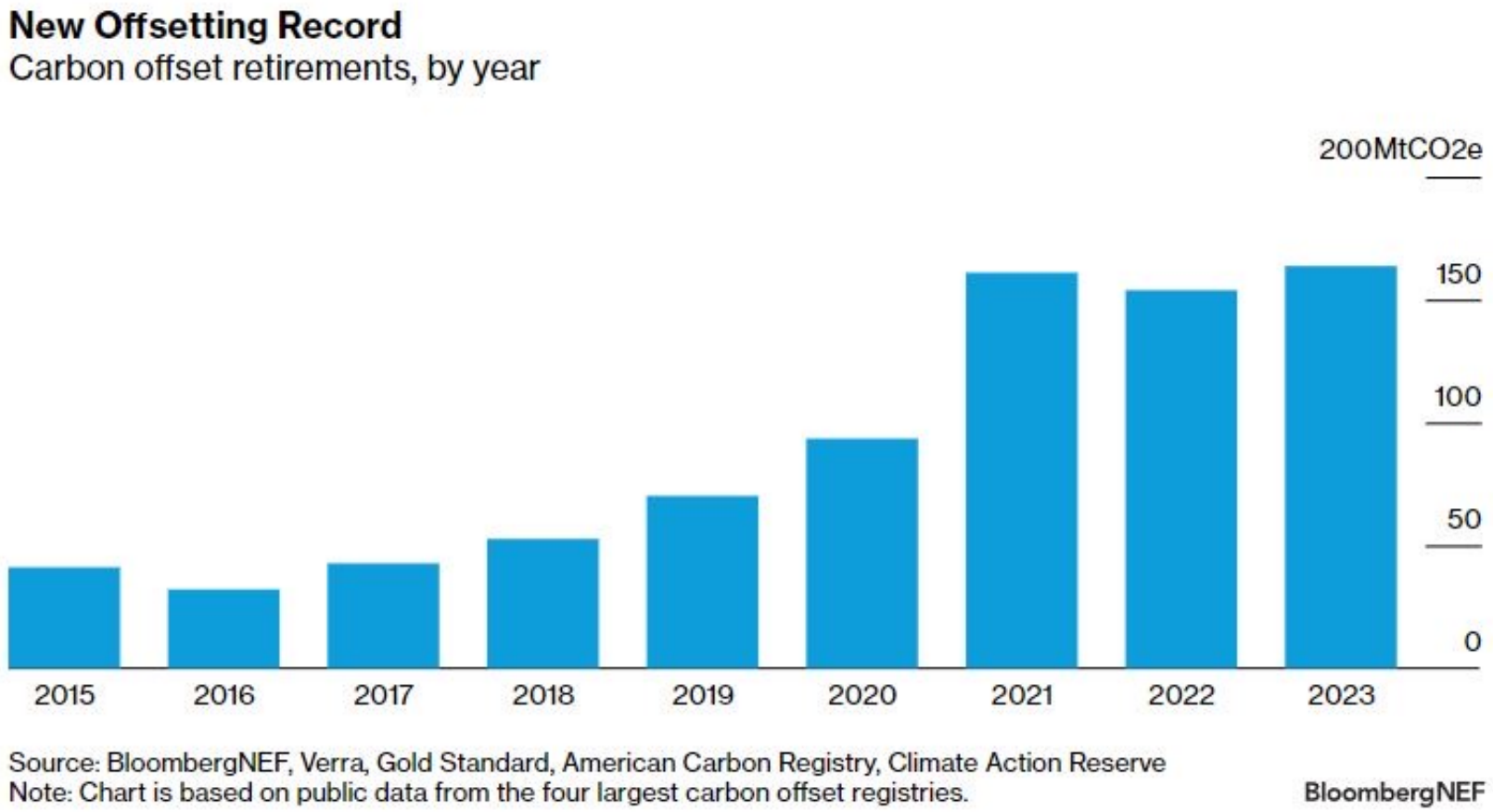
**Demand** for voluntary carbon credits driven by growing **voluntary climate action, pledges and stakeholder pressure.**

- Companies first reduce emissions as much as possible
- Companies neutralize the non-abated remainder of their emissions by purchasing voluntary carbon credits

## COMPLIANCE MARKETS

Enable countries and companies to fulfil **obligations under the Paris Accord**

- For countries, current obligations are driven through the Kyoto Protocol (e.g. Clean Development Mechanism)
- For companies, obligations arise through emission trading schemes or national carbon taxes some that allow use of offsets.

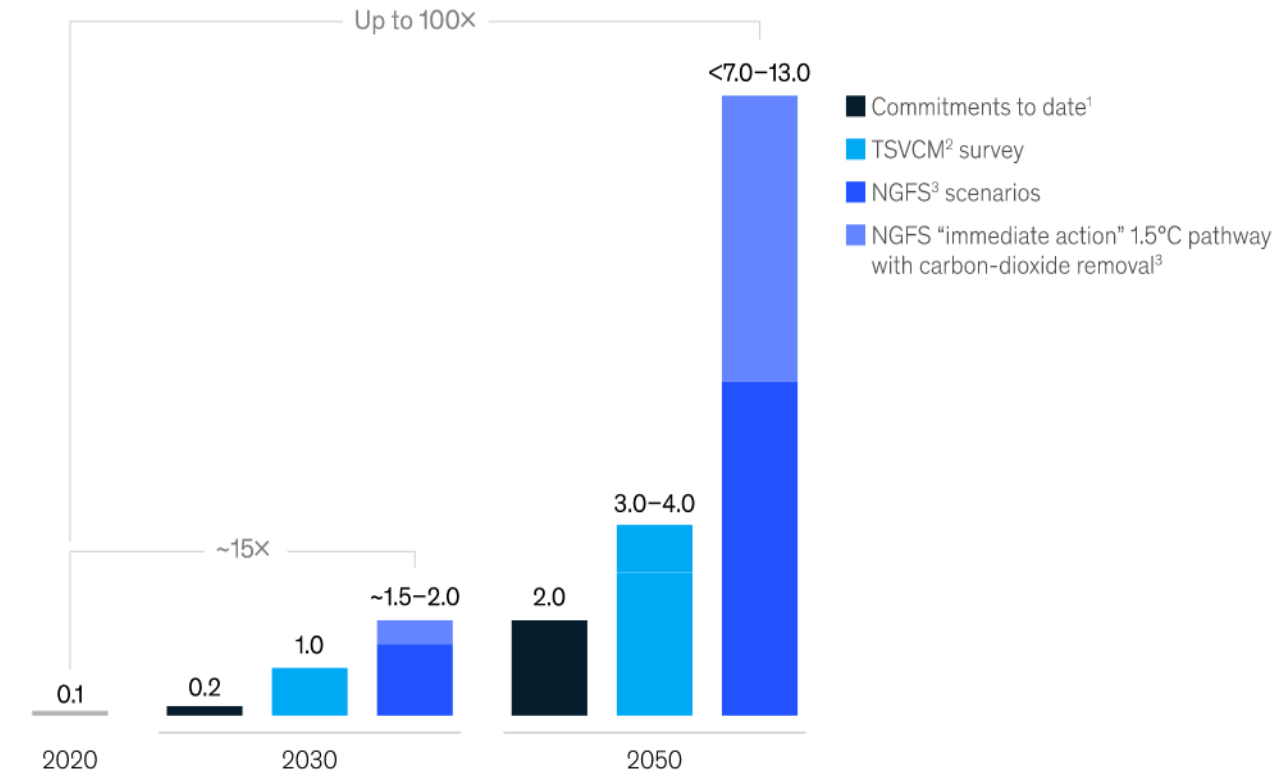



Climate Impact X

# Potential Carbon Credit Demand 2030-2050

**Global demand for voluntary carbon credits could increase by a factor of 15 by 2030 and a factor of 100 by 2050.**

**Voluntary demand scenarios for carbon credits,** gigatons per year



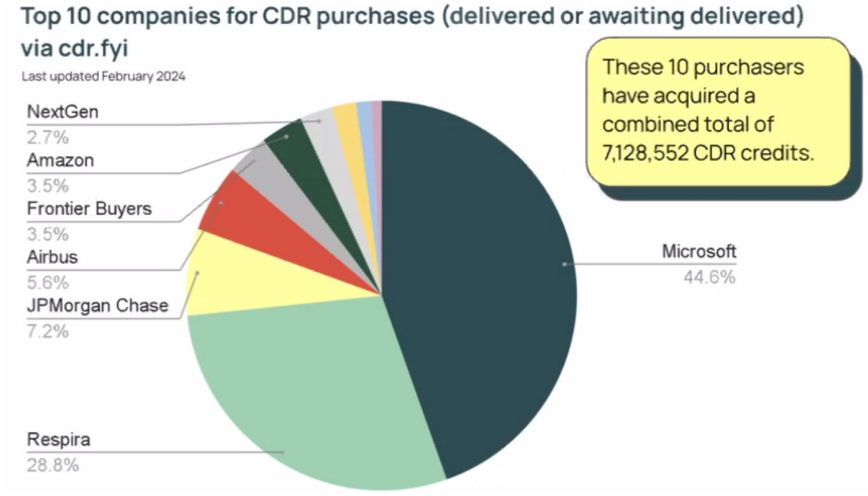

NGFS Central Banks and Supervisors Network for Greening the Financial System

TSVCM

Climate Impact X

To meet the 2015 Paris Climate Goals:

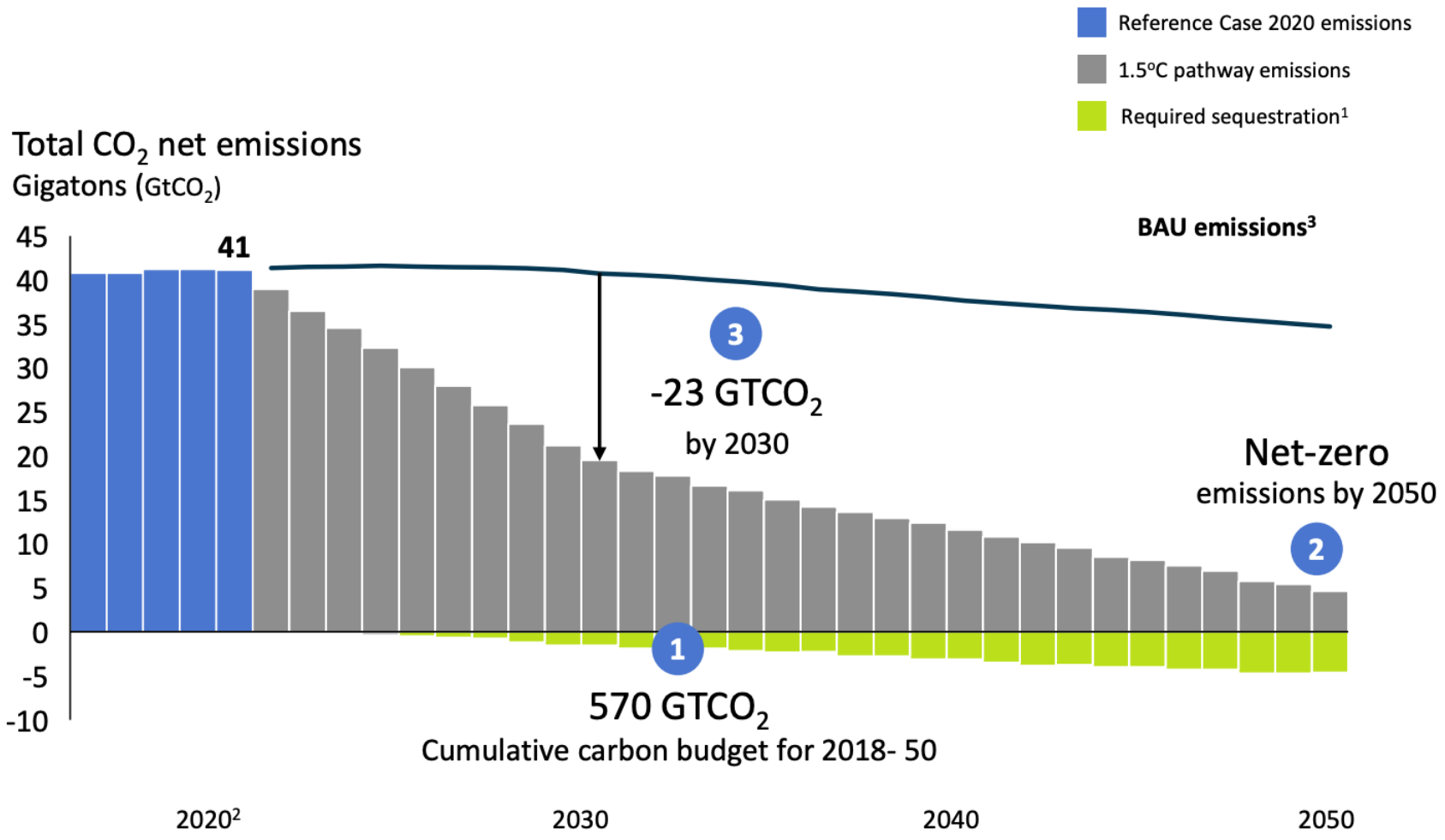
- Companies need to buy "1.5 to 2.0 gigatons of carbon dioxide ($GtCO_2$) by 2030"
- Market in 2023 USD 103.8 billion, and is set to grow at a CAGR of 14.8% from 2024 to 2032.
- 36% of the S&P 500 buy carbon credits (Tech companies, Oil & gas, Fast-moving consumer goods, airlines, Financial).



# Potential Annual Carbon Credit Supply by 2030


Climate Impact X

# Carbon emissions reduction needed by 2050




1. In order to reach the **1.5°C** goal we must remain within the **570 $GTCO_2$ carbon budget**
2. By 2050 **all remaining emissions need to be fully offset** by sequestration (net zero)
3. To set us on this path we must reduce net emissions by **23 $GTCO_2$ by 2030**

TSV CM McKinsey Sustainability

# ¿Who we are?

- RAC is a registered international NGO headquartered in Mexico and consists of an interdisciplinary team of professionals

- RAC implements nature-based solutions and innovative blue carbon initiatives as the Blue Ocean Credits Program

# Blue Ocean Credits Program (BOCP)

- RAC through the BOCP develops holistic, resilient, scalable, long-term sustainable strategies to conserve blue carbon ecosystems´ high social, environmental, and economic value for the well-being of present and future generations

- Project 2022-2023: Mesoamerican coastal decarbonization efforts: An innovative, integral, and ecosystem approach

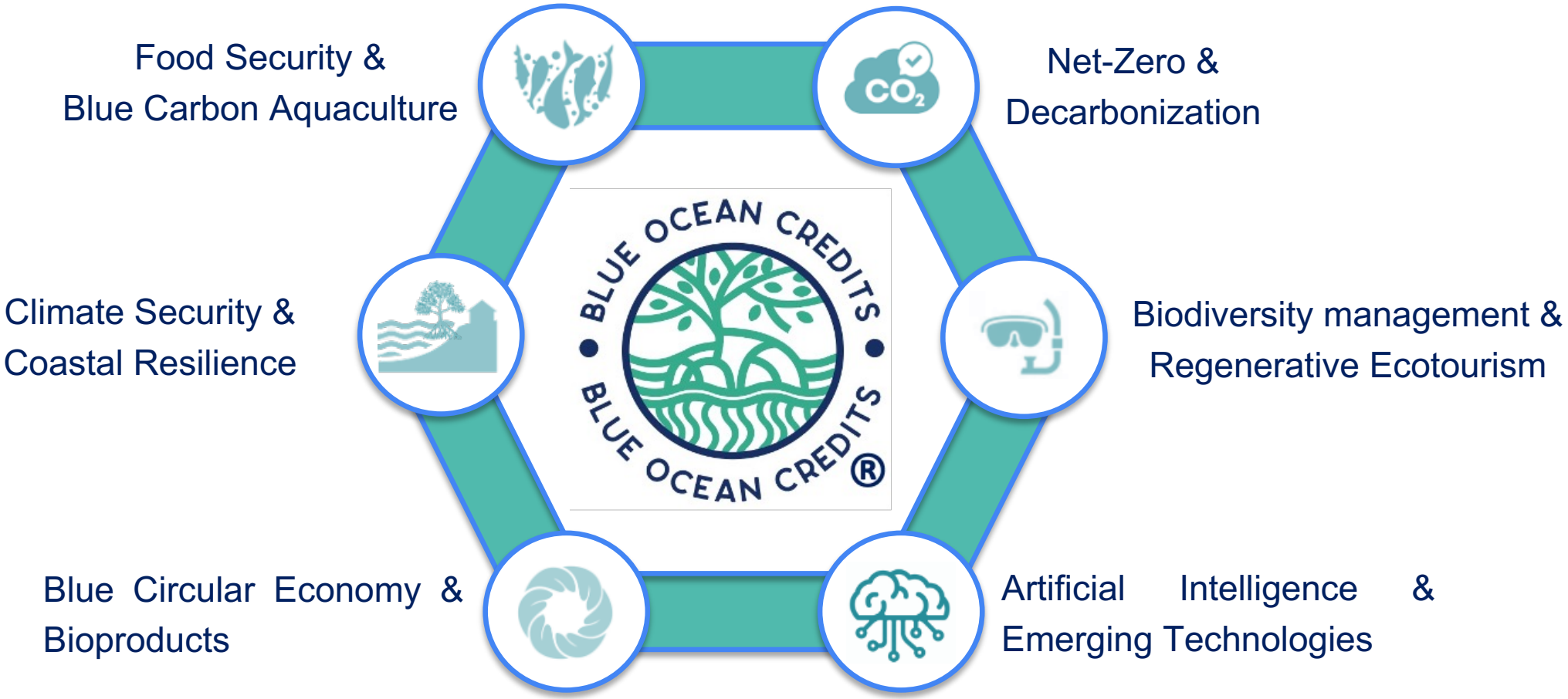
- Project 2023-2024: Blue Ocean Credits Program: Accelerating the Coastal Decarbonization Efforts in the Mesoamerican Reef System

- Both projects are funded by the Net Zero Research Fund, Climate Change Center of Excellence of Scotiabank, Canada

Scotiabank®

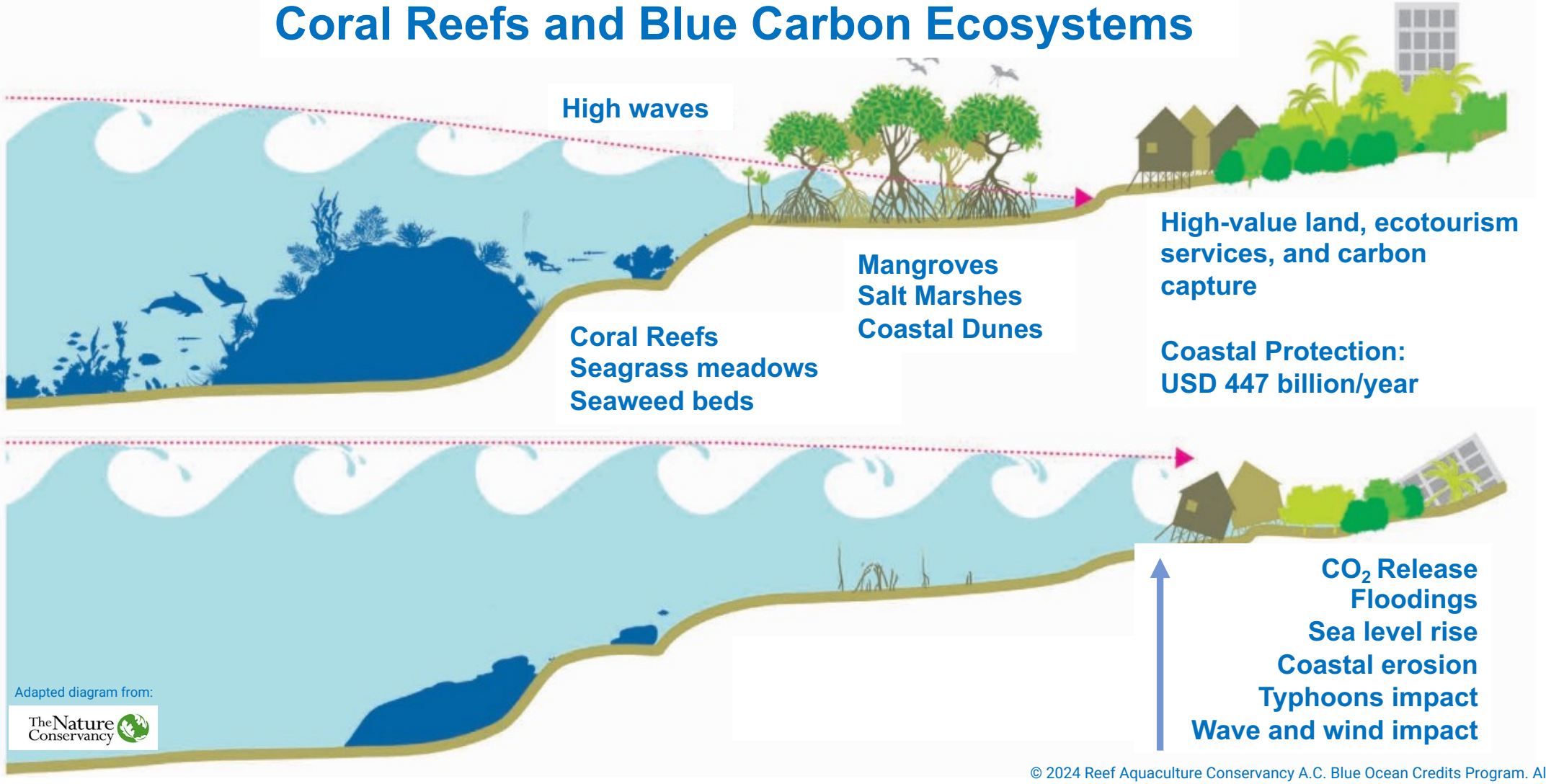
# Strategic BOCP focus

**Strategic focus areas to achieve the long-term implementation of blue nature-based business solutions in coastal areas**



# BOCP: Blue Nature-Based Coastal Protection

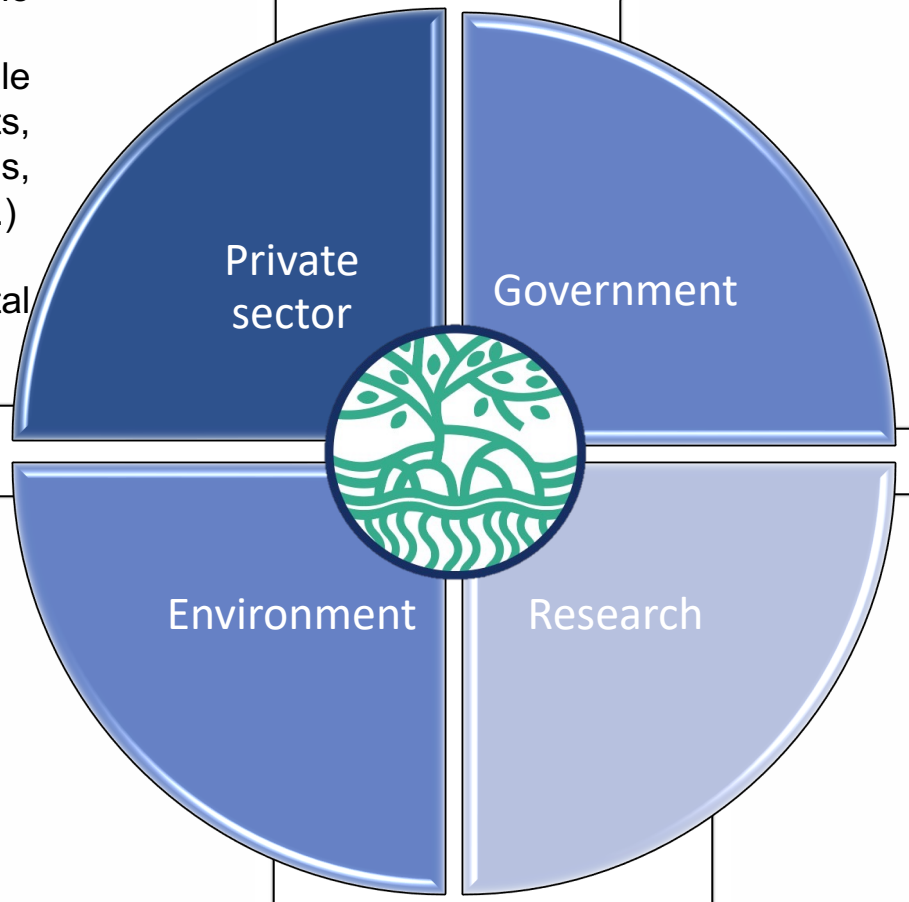
## Coral Reefs and Blue Carbon Ecosystems



# BOCP: Circular Blue Carbon Economy

Promotes the sustainable business establishments (Ecotourism, sustainable aquaculture, bioproducts, rehabilitation services, technology development, etc.)

Increases the value of coastal land and sells carbon credits




Implements national blue carbon projects for decarbonization

Increases sustainable employment opportunities

Enhances the food and climate security of the coastal communities

Decreases the pressure on coastal ecosystems

Increases coastal ecosystems' biomass

Enhances coastal protection and management of MPAs

Increases the blue carbon capture and storage

Promotes the blue carbon ecosystems research

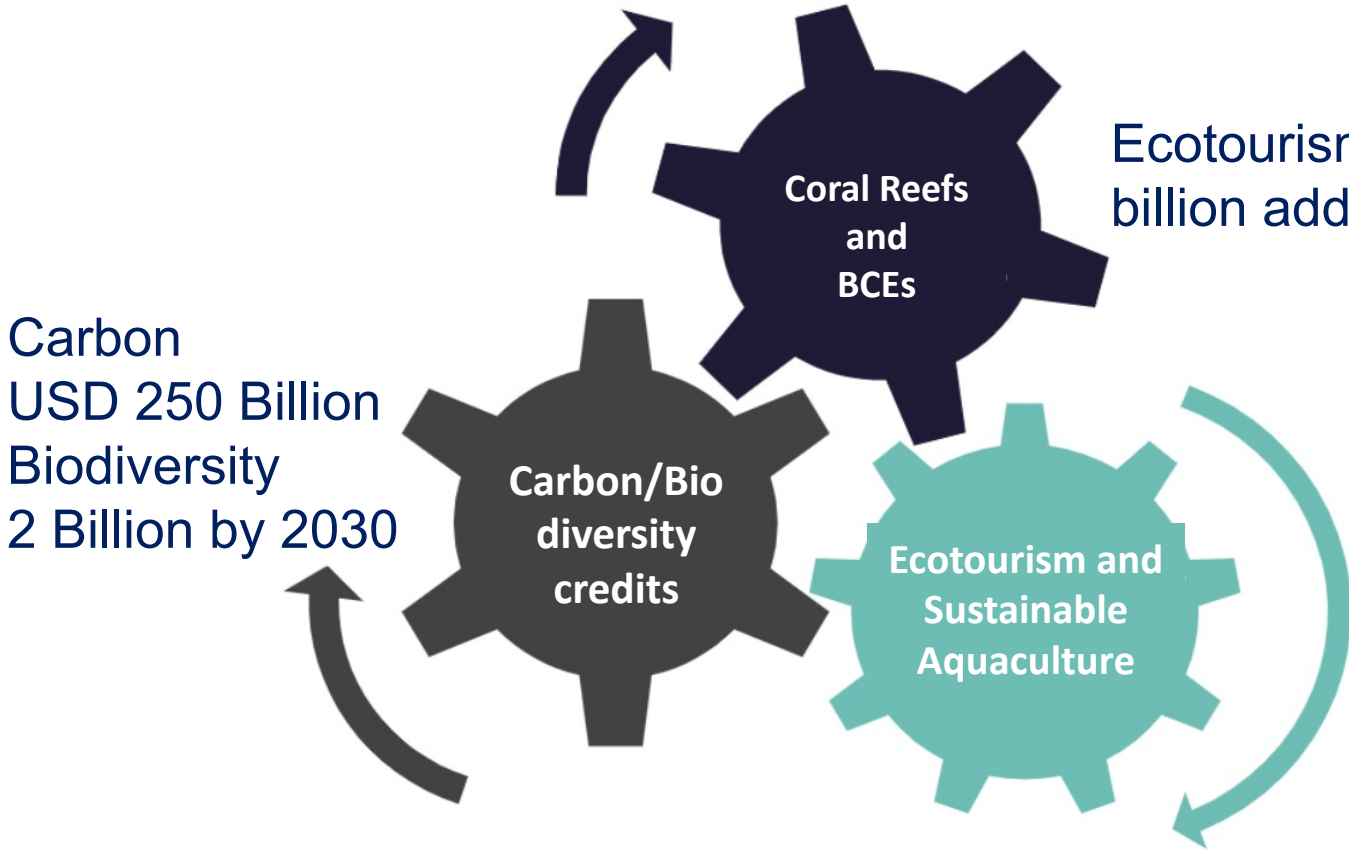
Improves the outcomes of sustainable projects

Develops innovative techniques for ecosystems´ rehabilitation, restoration, and conservation

# BOCP: Nature-based solutions are the future of sustainable business

- If businesses prioritize nature can generate:
- USD 10.1 trillion in new business opportunities
- 395 million of new sustainable jobs

**¡The most efficient economic model is Nature!**




Ecotourism USD 290 billion additional/year

Carbon
USD 250 Billion
Biodiversity
2 Billion by 2030

Sustainable Aquaculture
USD 115 billion additional/year

ET= USD 300 billions (2019) SA= USD 250 billions (2020) CC=978.56 billions (2022)

# International BOCP Traction



























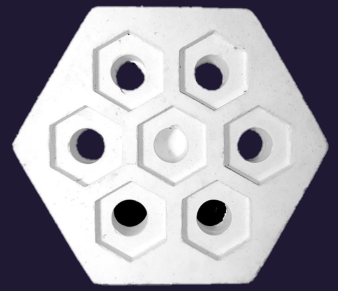

# Innovations: Net-Zero AragoReef

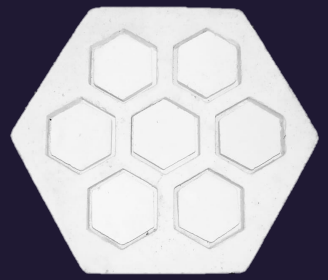
- Exclusive sustainable formulation with natural characteristics
- High content of porous aragonite, versatile, aesthetic, durable, pH buffering action
- Marine life fully colonizes the AragoReef structures after 3 months

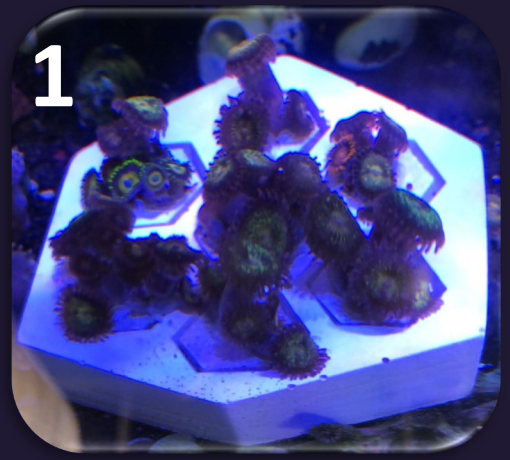


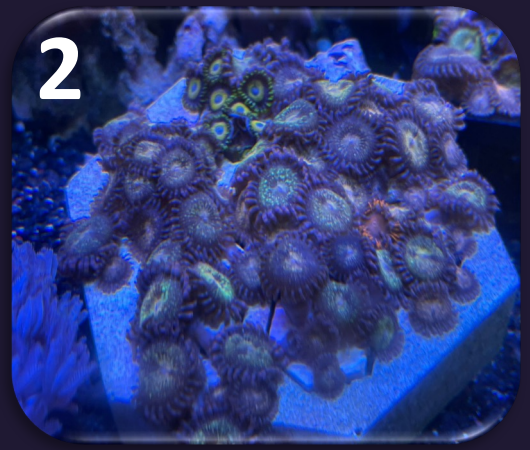


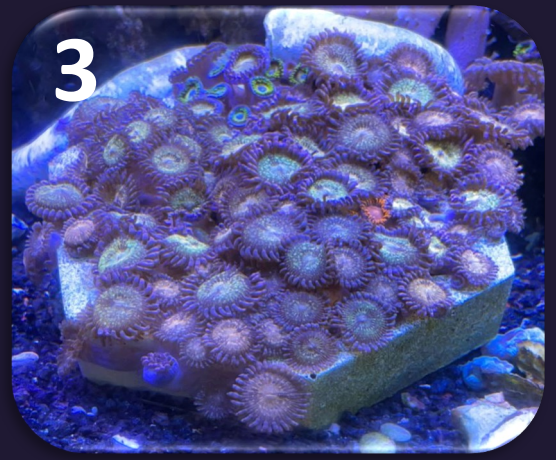

# Net-Zero CoralHive propagation system










# Hard and soft corals on the Net-Zero CoralHive

# Scientific validation of AragoReef in the Mesoamerican Reef System and Mexican Pacific

- Scientific validation of AragoReef as a marine bio-substrate
- Mexican Pacific (Zihuatanejo) vs Caribbean (Puerto Morelos)

# Coral Aquaculture in the Mesoamerican Reef System

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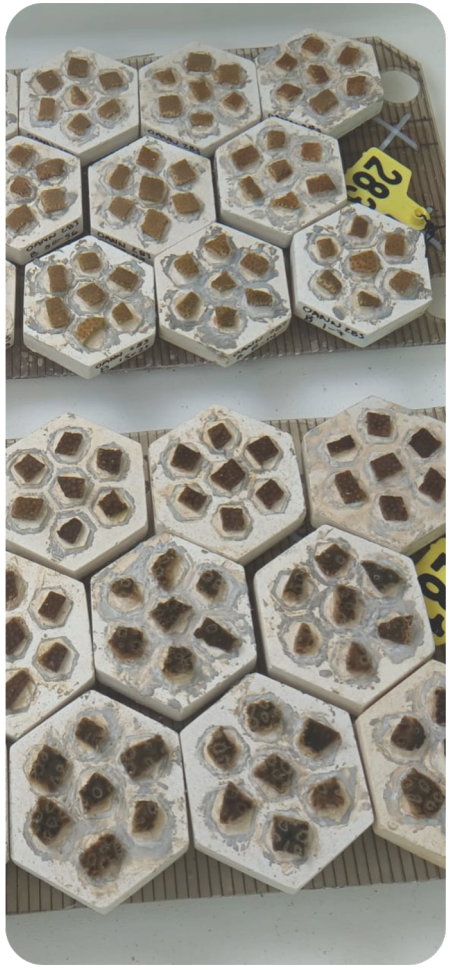
CICA

- Developed hexagonal plugs and port plugs of AragoReef for coral micro-fragmentation (*Diploria spp., Pseudodiploria spp.,Orbicella spp.*)



# Net-Zero Intelligent Multi-Trophic AragoReef System (Net-Zero iMTARS)

- 3-Dimensional habitats (Crustaceans, Mollusks, Algae, Corals, Seagrass, etc.)
- Modular and scalable systems (Multiple configurations)
- AragoReef 3D design and printing technology

# Net-Zero iMTARS in El Meco-Cancun

- Deployment and monitoring of the iMTARS in ”El Meco”
- Ecotourism and blue carbon projects on corals and segrasses

# BIOARMONIA in El Meco-Cancun

- 3 BIOARMONIA modules (21 Net-Zero iMTARS)
- 254 aquacultured staghorn coral colonies (*Acropora cervicornis*)
- 12 aquacultured boulder star coral colonies (*Orbicella spp.*)

# Corals against white spot syndrome (WSS)

NSU Florida
Halmos College of Arts and Sciences
NOVA SOUTHEASTERN UNIVERSITY

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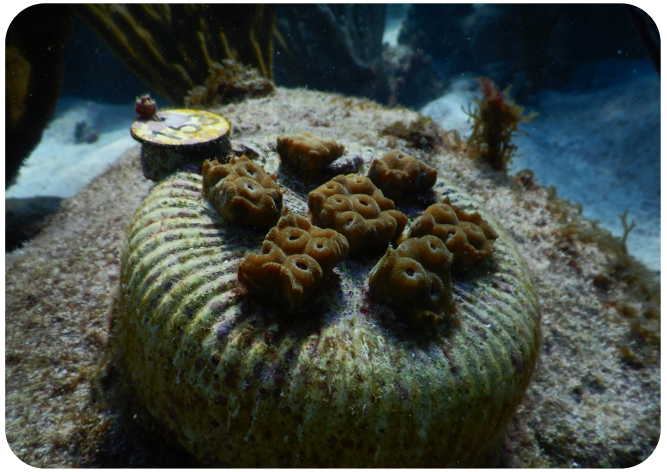
CICA

CORAL SMA

Developed AragoReef structures to reintroduction of the massive corals affected by the WSS (*Diploria spp., Pseudodiploria spp., y Orbicella spp.)*



# Herviborous spiny crab aquaculture

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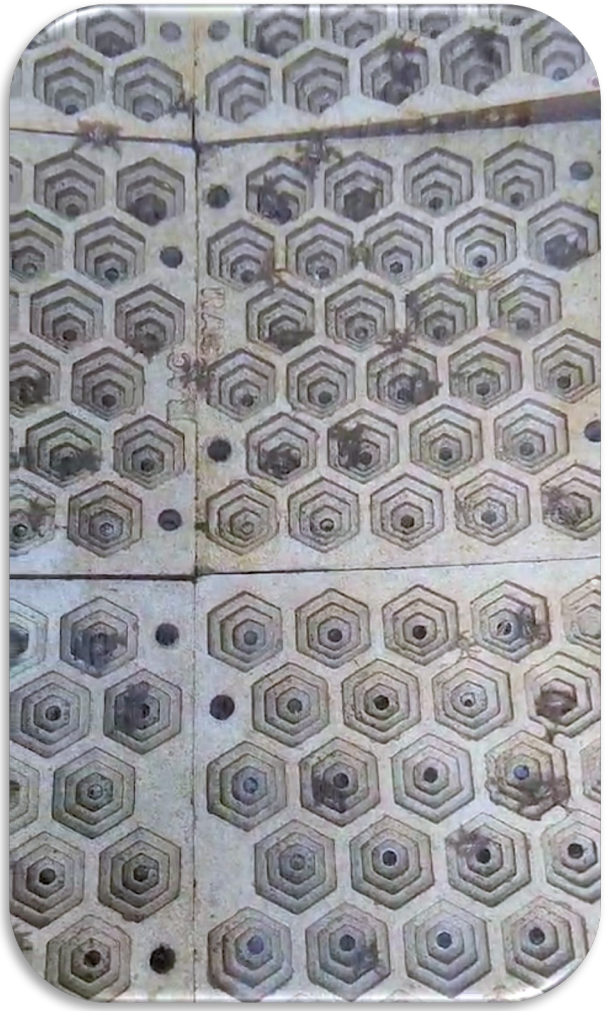
Smithsonian Institution

Healthy Reefs for healthy people

CICA

- Developed AragoReef structures to enhance the culture of spiny crab (*Mithrax spinosissimus*)




# Coral gardening and seagrass rehabilitation

mayakoba™ mexico

BACABES DEL MAR
Servicios profesionales

- Coral gardens designed and deployed (*Acropora palmata, A. cervicornis, A. prolifera*) and seagrass bed rehabilitation (*Thalassia testudinum, Halodule wrightii*) for conservation/ecotourism activities

# Sustainable production of biochar from sargassum seaweed

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INSTITUTO MEXICANO DE INVESTIGACIÓN EN PESCA Y ACUACULTURA SUSTENTABLES

CICA

CERAMICA artel

- Developed an innovative and energy-efficient furnace to produce pelletized biochar

# Sustainable production of biofertilizers and alternative proteins from sargassum seaweed

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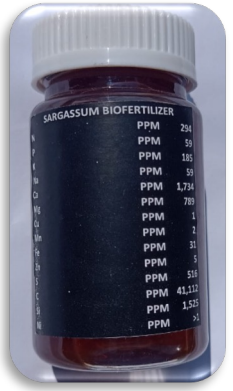
INSTITUTO MEXICANO DE INVESTIGACIÓN EN PESCA Y ACUACULTURA SUSTENTABLES
CICA

- Implemented an integral management system to produce biofertilizers and alternative proteins (Black Soldier Fly and California Red Worms)




# Vessel collector design for sargassum seaweed

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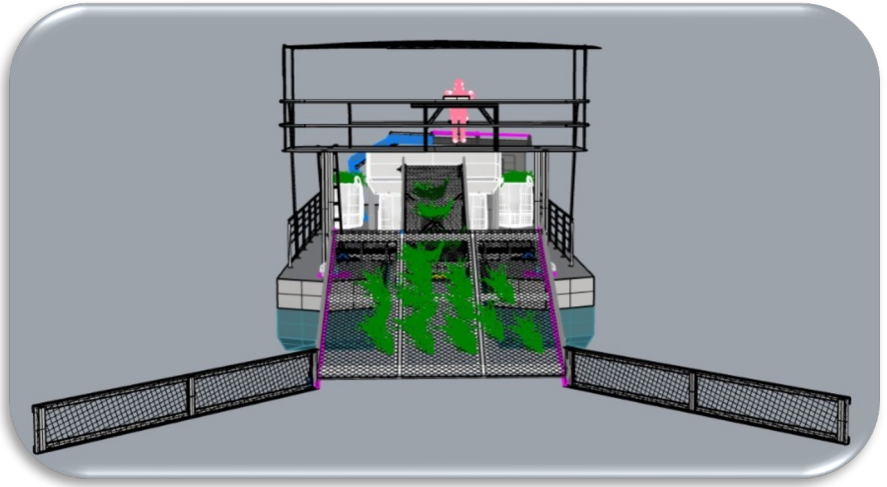
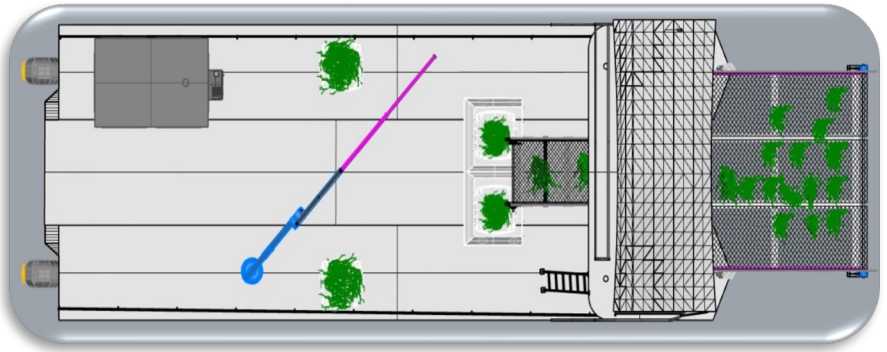
INSTITUTO MEXICANO DE INVESTIGACIÓN EN PESCA Y ACUACULTURA SUSTENTABLES

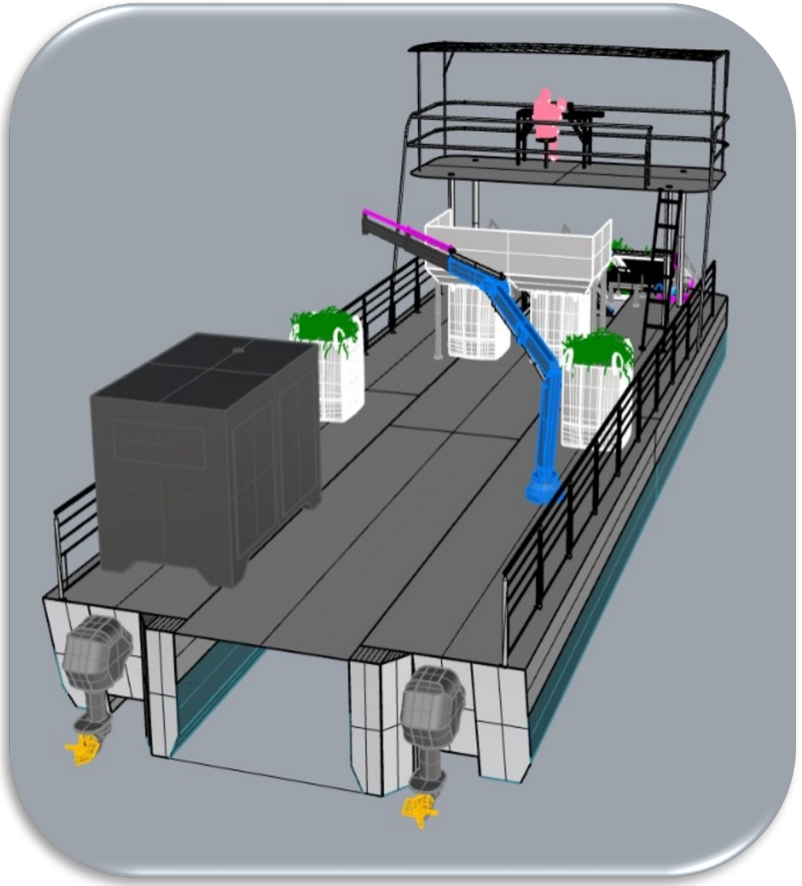
CERAMICA artel

CICA

- Designed of a cost-efficient sargassum vessel collector for the Caribbean waters







# A healthy planet relies on a healthy ocean

## Contact

Dr. Guillermo Corona
President
e-mail: info@reefac.org
Whatsapp. (+521)4431904435
Web: www.reefac.org

Reef
Aquaculture
Conservancy A. C.