

planet.

The Allen Coral Atlas:

Coral reefs and identifying coastal zone threats from space

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explore 21



Global
Connection

Why are coral reefs important?



More than **500 million people depend on reefs** for food, storm protection, and tourism income, worth \$30+ billion annually

Without healthy coral reefs, the world faces an even **greater risk of significant marine species decline** and major disruption of coastal communities



Threats to coral reefs

- Rising ocean temperatures
- Sea level rise
- Acidification
- Pollution and sedimentation

Half of the world's coral reefs have died over the past 50 years, and 70-90% of the remainder could bleach and die by 2050...

...unless we do something.

State of the science and technology

A vibrant underwater photograph of a coral reef. The reef is covered in various types of coral, including acropora and pocillopora, in shades of yellow, green, and pink. Sunlight filters down from the surface in bright rays, illuminating the reef and creating a dappled light effect. A few small, colorful fish are visible swimming over the coral.

No globally comparable, high-resolution, detailed reef maps

No real-time global information on reef change

Current reef monitoring methods are unscalable

Local efforts are under-supported by global programs

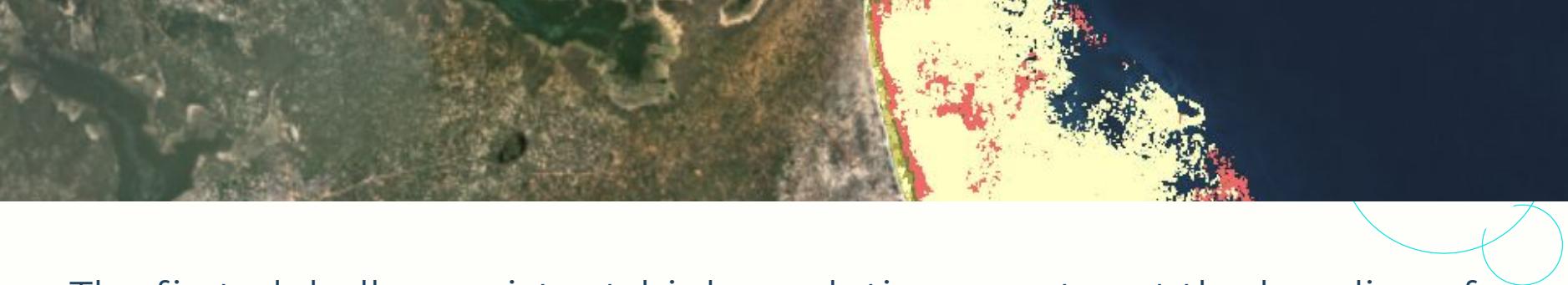
Beginnings of an Atlas



In late 2017, Paul G. Allen challenged his team at Vulcan to fill this data gap.

They convened an international group of experts who developed a novel idea: to map the world's tropical coral reefs from space.





The first globally consistent, high resolution map to set the baseline of coral reef habitat worldwide.

The first of its kind dynamic monitoring system to track coral bleaching as it occurs.

ALLEN CORAL ATLAS

Find Location

Mapped/Monitored Areas

< Proposed protected area <



Mini Map

Legend

Info/Help

Habitat maps

High resolution
benthic habitat and
geomorphic zone
maps of the world's
tropical coral reefs



explore 21

Benthic Map i Coral/Algae Seagrass Microalgal Mats Rock Rubble SandGeomorphic Map i

Brightening



Labels



Satellite Reef Imagery



Coral Reef Watch



Habitat maps

Mapping reefs for:

- marine spatial planning
- coral restoration
- survey planning

Find Location Mapped/Monitored Areas Proposed protected area

Proposed protected area

Stats Download data Edit Area

Selected area: 1.537 km² Mapped area: 1.218 km²

Geomorphic zones Benthic classes (in selected geomorphic zones)

	km ²	%
Sheltered Reef Slope	0.14	11.68
Reef Crest	0.07	5.74
Outer Reef Flat	0.50	41.38
Inner Reef Flat	0.24	19.79
Back Reef Slope	0.03	2.18
Shallow Lagoon	0.23	19.22

	km ²	%
Coral/Algae	0.17	13.95
Microalgal Mats	0.12	9.60
Rock	0.38	31.26
Rubble	0.37	30.16
Sand	0.14	11.50

Data Source: Planet Dove Imagery & Research Partners

1 km -17.90438, 179.26926

Atlas habitat maps are already moving the needle

Sri Lanka
Creation of a National Park at
Kayankerni Reef



Atlas habitat maps are already moving the needle

Mozambique
Country-wide
spatial planning



Atlas habitat maps are already moving the needle

Vanuatu

Resilience assessments and
country-wide spatial planning



Bleaching Detection

Foundational for
restoration
planning, protected
area management,
identifying climate
refugia, and rapid
response to
bleaching events



Hawai‘i to the World



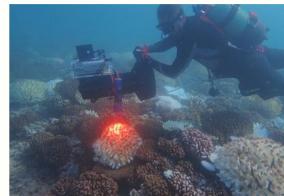
Social Outreach Campaign



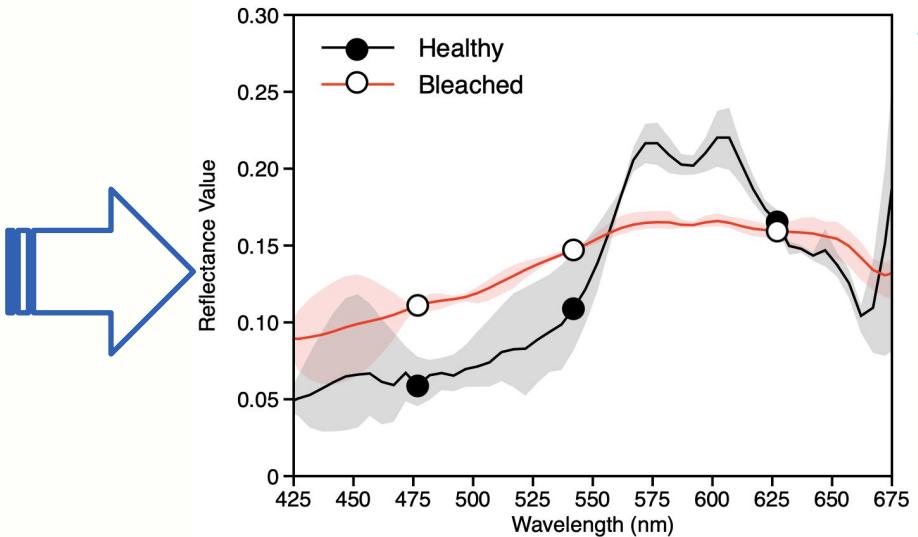
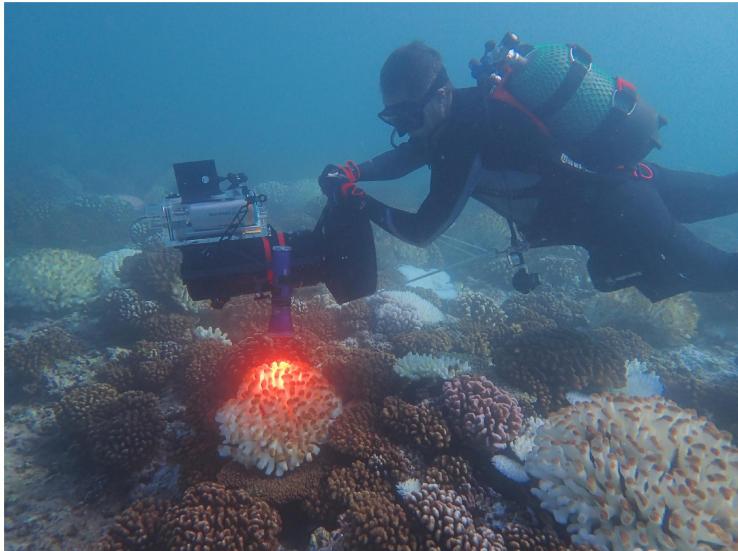
Citizen Science
Reporting of Bleaching
Observations

Professional Field
Measurements of Reef
Change

Airborne Mapping of Live
Coral Cover Before
Bleaching Event



Coral spectral transects



Hawai‘i to the World



Allen Coral Atlas
Bleaching Monitoring
System



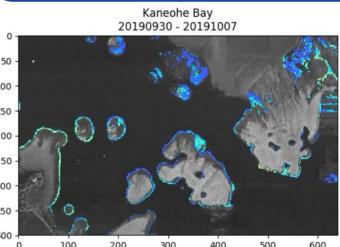
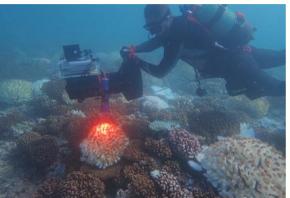
Social Outreach Campaign

Citizen Science
Reporting of Bleaching
Observations

Professional Field
Measurements of Reef
Change

Calibration of Weekly
Satellite Data on Coral
Bleaching

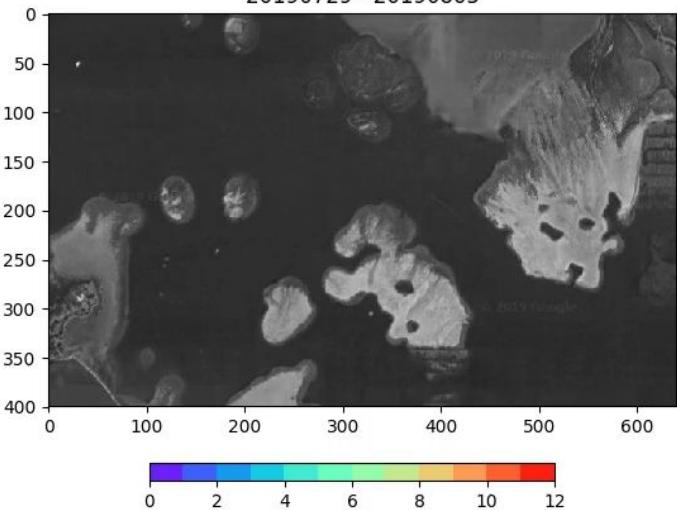
Airborne Mapping of Live
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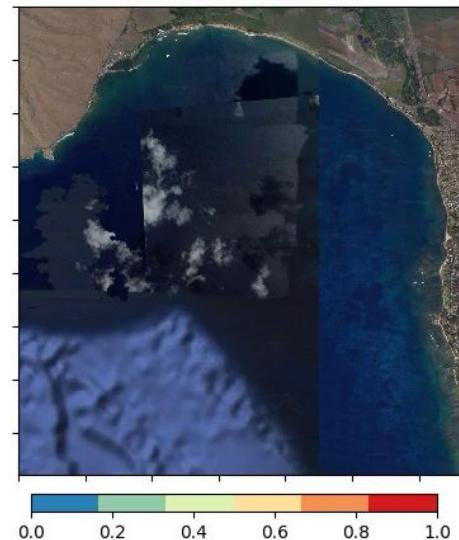


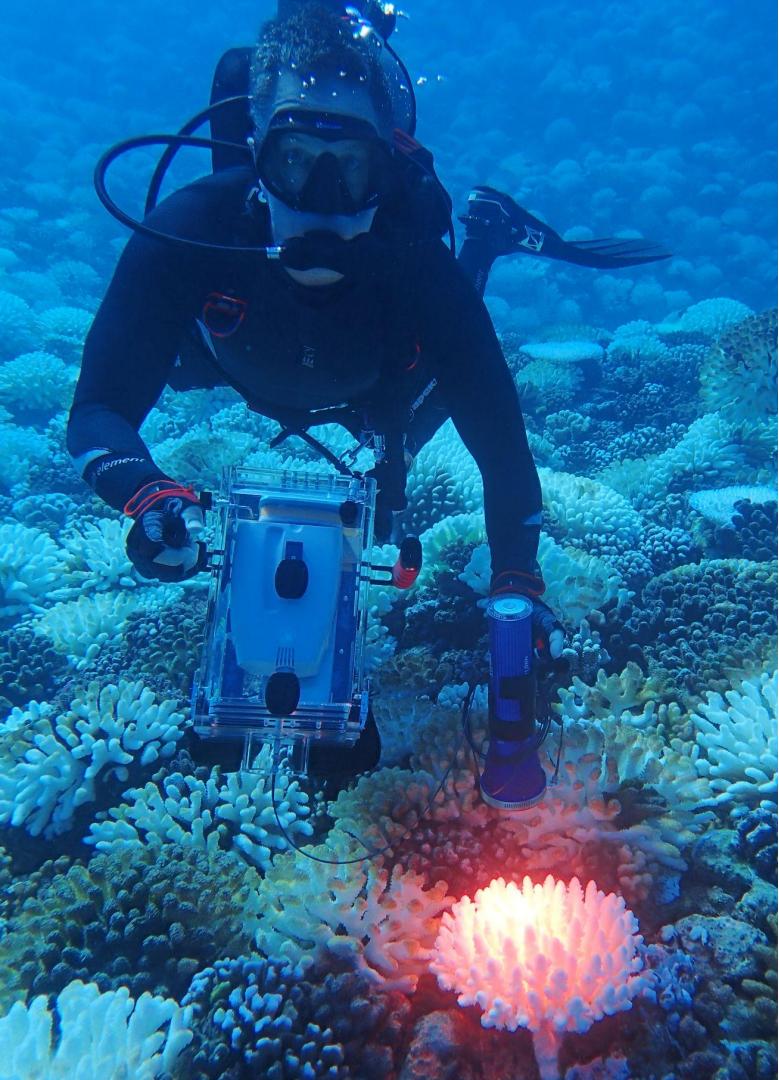
Global
Connection

Kaneohe Bay
20190729 - 20190805



West Maui
20190805 - 20190812





Bleaching detection



Detecting and analyzing live coral bleaching data globally with machine learning

System depicts bleaching **as it occurs in real time**, as seen from high resolution satellite imagery





Bleaching detection is already in use

A screenshot of the Allen Coral Atlas website. The main view is a satellite map of coral reefs in Indonesia, specifically the Raja Ampat archipelago. The map shows various island groups and their surrounding reefs. A legend on the left indicates three levels of bleaching: Low (yellow), Moderate (orange), and Severe (red). A callout box titled "Bleaching (Beta)" provides information about monitoring whitening events. It includes a date selector for "Data for week ending" (set to 15-Mar-2021), a color scale for "Level of bleaching" (Low, Moderate, Severe), and links for "Benthic Map", "Geomorphic Map", "Labels", "Satellite Reef Imagery", "Coral Reef Watch", and "Base Map". A coordinate overlay shows 5.28299, 122.75273. The top navigation bar includes links for "Atlas", "Blog", "Science & Methods", "Resources", "Our Partnership", and "My Account".

ALLEN CORAL ATLAS

Atlas | Blog | Science & Methods | Resources | Our Partnership | My Account

Find Location Mapped/Monitored Areas My Areas

Mini Map Legend High Contrast Mode Info/Help

Bleaching (Beta)

Possible bleaching events are indicated by whitening of the coral reefs detected in satellite imagery.

At any given time, we monitor at-risk areas that are likely to bleach according to NOAA's Coral Reef Watch Bleaching Alert Areas ([learn more](#)).

Data for week ending:

15-Mar-2021

Level of bleaching:

Low Moderate Severe

How are these levels calculated?

Benthic Map Geomorphic Map

Labels Satellite Reef Imagery

Coral Reef Watch Base Map

Legend

Bleaching

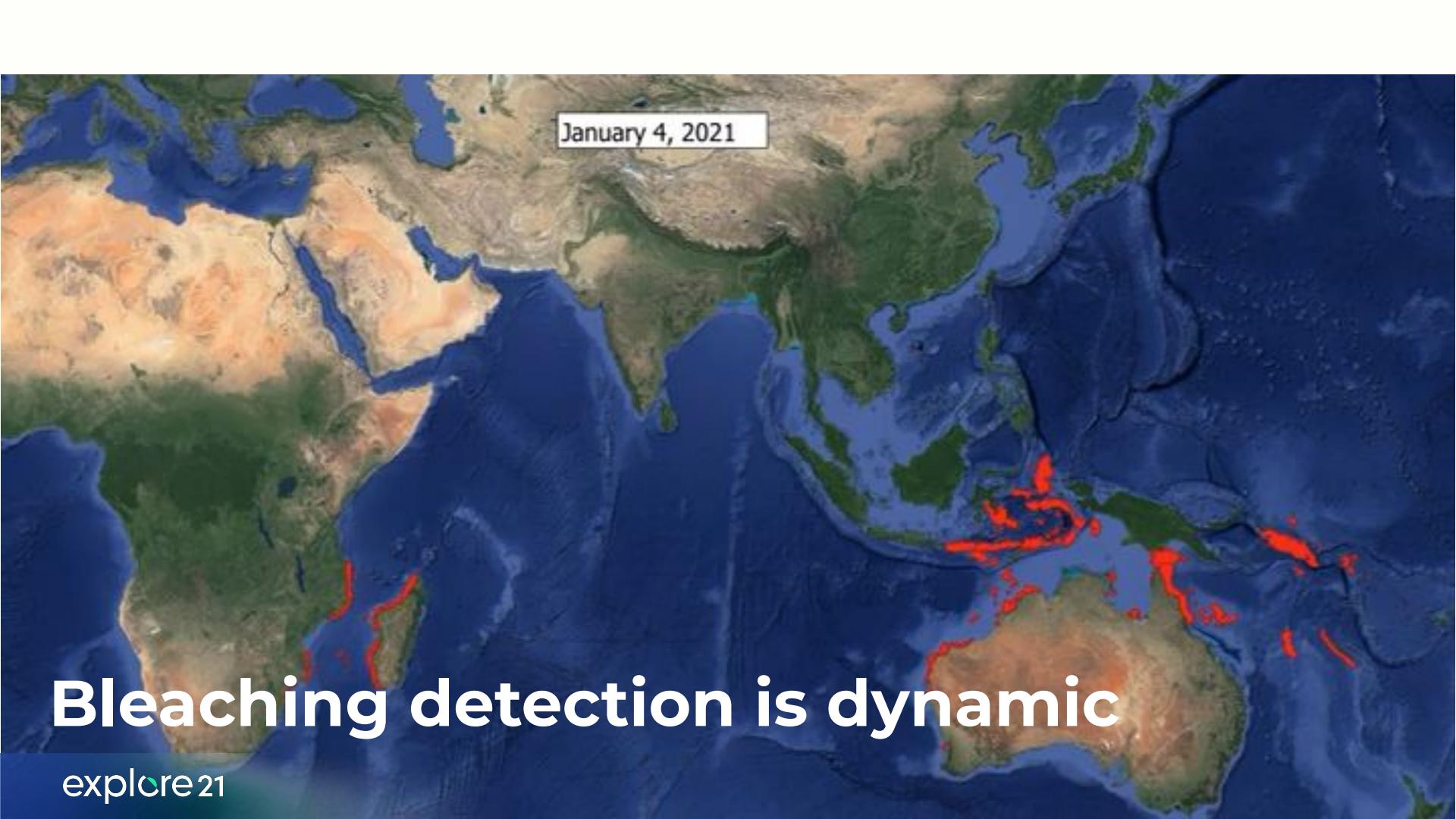
Severe

Moderate

Low

2 km

-5.28299, 122.75273



January 4, 2021

Bleaching detection is dynamic



The Atlas of the future

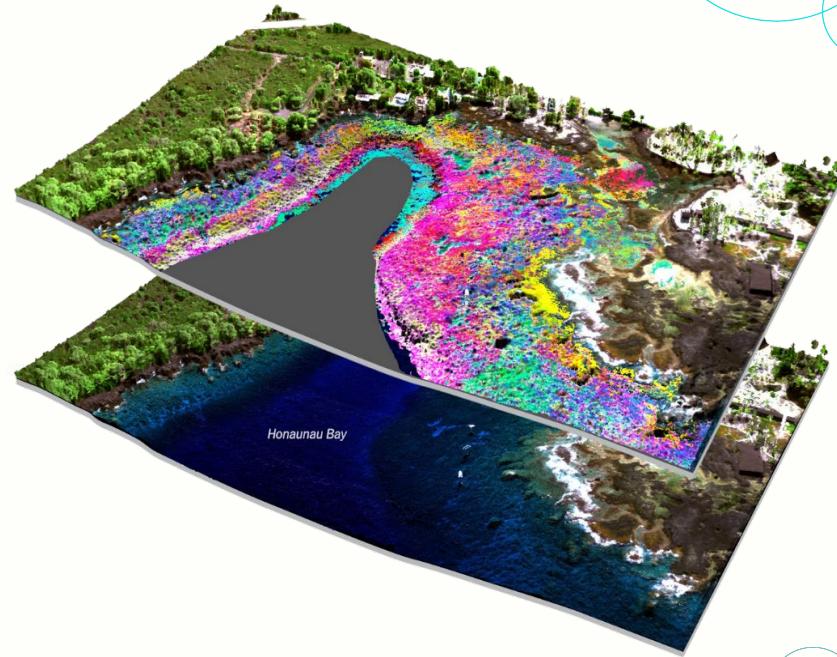
60% of the world's reefs experience damage from local activities like overfishing, coastal development and watershed pollution.



Innovating alongside new satellite capabilities

The next generation of observations from Earth orbit will incorporate hyperspectral imaging.

As new satellites emerge, the Atlas' capabilities will radically advance.



Decision support tools

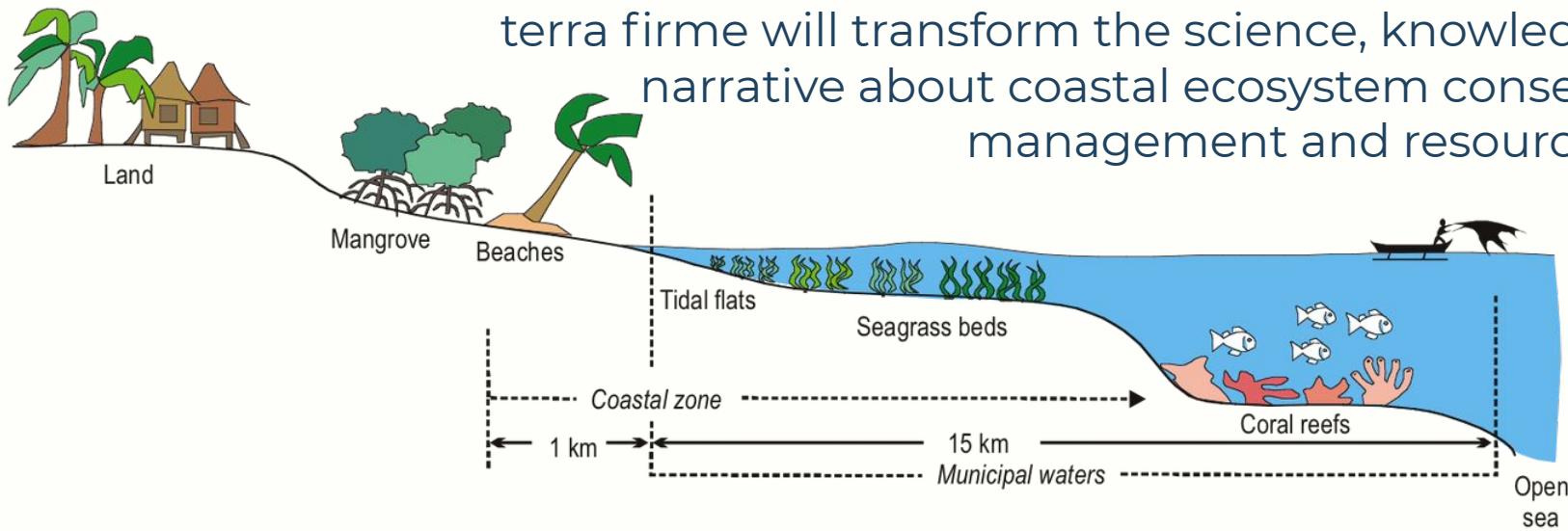
Advancing from simple diagnostics to generating prognostic assessments

Modelling scenarios for mitigating harmful impacts to the ecosystem

Land-sea integration



Moving inland, from seagrass and mangroves, all the way to terra firme will transform the science, knowledge, and narrative about coastal ecosystem conservation, management and resource policy



Turbid waters are dynamic



Global
Connection

Global turbid water monitoring



Monitoring quarterly global coastal waters to inform coastal management

