2.2.1 Towards new guidance to develop and implement coastal adaptation integrating climate science

PARALLEL SESSION: TRANSFORMATIONS IN APPROACHES, THEMES AND SYSTEMS

28 March 2023

11:00 – 12:30

GEO GROUP ON EARTH OBSERVATIONS

NAPEXPO CHILE 2023

Sara Venturini, GEO Secretariat

Sara Venturini is the Climate Coordinator at the Group on Earth Observations (GEO) Secretariat.

At GEO she promotes access and the use of Earth observation data and solutions to inform and accelerate climate action by member countries.

She has 15 years' professional experience collaborating with UN agencies and advising governments and organisations around the world on developing and implementing climate change policies, and participating in multilateral climate negotiations.

She holds a PhD in Climate Change Science and Management from Ca’ Foscari University of Venice, Italy.

GEO: the single largest global partnership focused on Earth observations for impact

Evidence-based activities to support policy

GLOBAL POLICY

Earth observations for climate action under the UNFCCC. Disaster risk reduction under Sendai Framework. Land degradation neutrality with UNCCD. Nature-based solutions with CBD. Mercury monitoring under Minamata Convention for Mercury.

NATIONAL IMPLEMENTATION

Capacity development and projects. Agriculture monitoring for adaptation, flood early warning systems, impact of wildfires, coastal areas and ocean health, etc. Supplementary Technical Guidance to integrate Earth observations into National Adaptation Plans (NAPs).

Agenda

Presentations (30 min):

- **Joy Deep Chakrabartty, Knauss Fellow, NOAA / GEO Blue Planet**
- **Jorge Luis Vazquez-Aguirre, WMO**

Panel discussion and interaction with the audience (60 min):

- **Andria Rosado, Data Manager, CZMAI Belize**
- **Jonathan Hodge, Programme Director, CSIRO Chile / GEO Blue Planet**
- **David Ongo Nyang'acha, RCMRD / Digital Earth Africa focal point**

Survey

Join at

slido.com

#2742 174

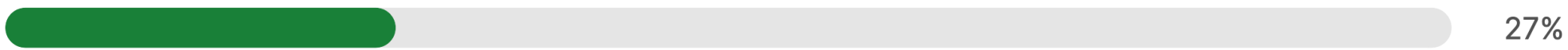
Are you planning to use Earth Observation data for your NAP process?

Multiple Choice Poll | 15 votes | 15 participants

Yes, I'm planning to - 4 votes

I'm already using it - 7 votes

I don't know how to access EO data - 4 votes



No, I'm not planning to - 0 votes

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Are you planning to use Earth Observation data for your NAP process?

Multiple Choice Poll | 15 votes | 15 participants

Yes, I'm planning to - 4 votes

27%

I'm already using it - 7 votes

47%

I don't know how to access EO data - 4 votes

27%

No, I'm not planning to - 0 votes

0%

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Do you think a separate sectoral NAP for the coastal areas is necessary ?

Multiple Choice Poll | 20 votes | 20 participants

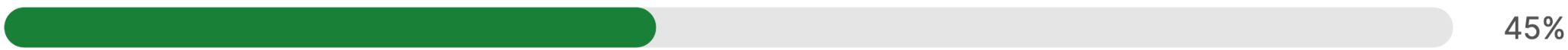
Yes, there should be a separate sectoral NAP for coastal areas - 4 votes

20%

No, coastal areas should be included in the main country NAP - 7 votes

35%

Not sure - 9 votes



45%

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Joy Deep Chakrabartty, GEO Blue Planet (NOAA/SOCD)

Joy Deep is a 2023 Knauss Fellow- working with GEO Blue Planet initiative within NOAA's Satellite Oceanography and Climatology Division (SOCD). He is a Ph.D. candidate in the Environmental Economics department at the University of Delaware. He also had a master's degree in Marine Policy and a bachelor's in Urban and Regional Planning. His works mainly focus on sustainable development, climate adaptation, natural resource valuation, behavioral modeling and environmental policy.

Earth Observations in coastal adaptation

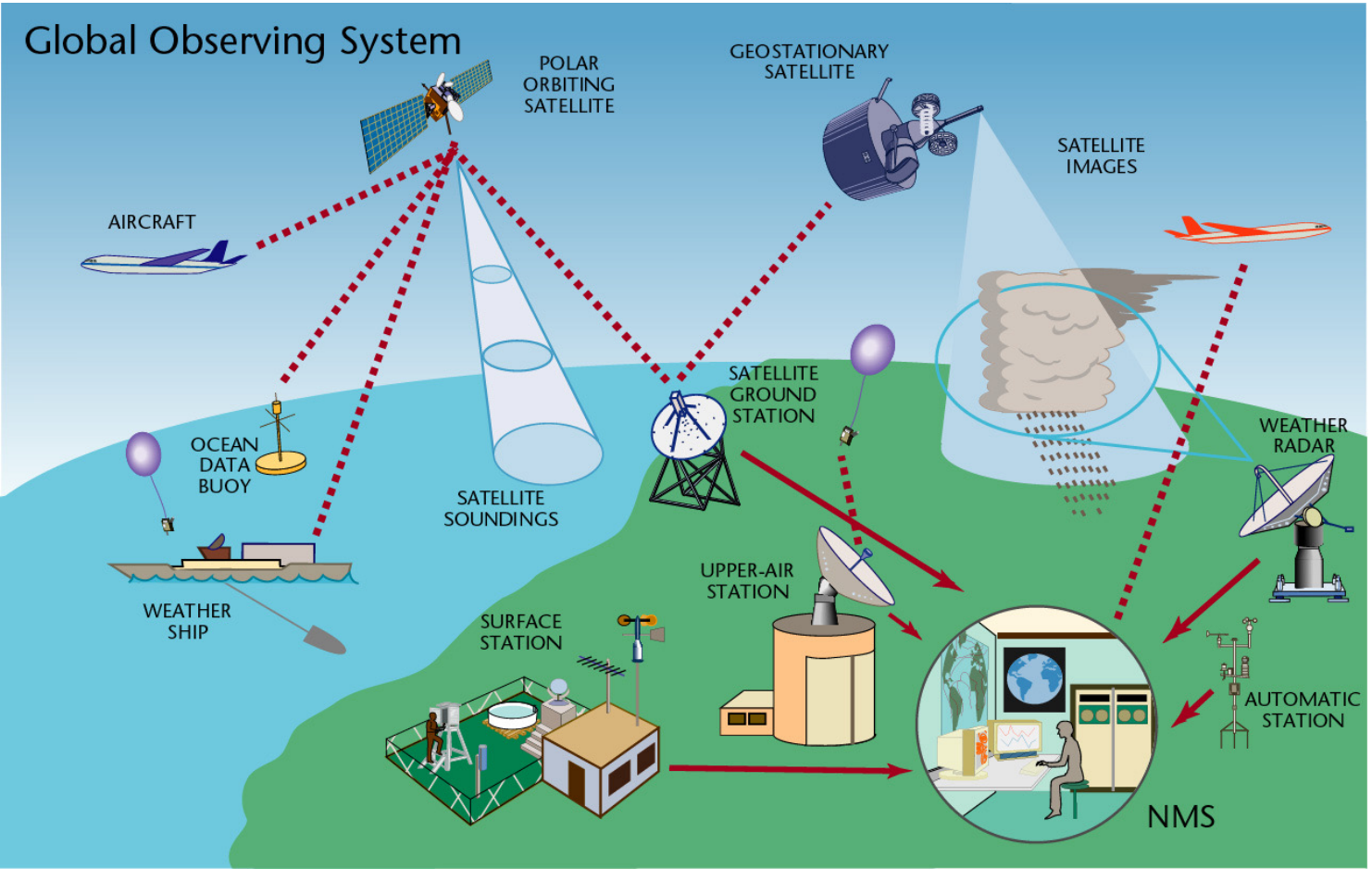
Joy Deep Chakrabartty
GEO Blue Planet Fellow
NOAA/NESDIS/STAR/SOCD

Content

- What is Earth Observation (EO)?
- How EO can help Ocean and Coastal monitoring?
- What kind of data EO can produce?
- How EO is used in different aspects of coastal adaptation?

What is Earth Observation System?

Earth observation is the gathering of information about planet Earth's physical, chemical and biological systems. It involves monitoring and assessing the status of, and changes in, the natural and man-made environment.



What is Earth Observation System?

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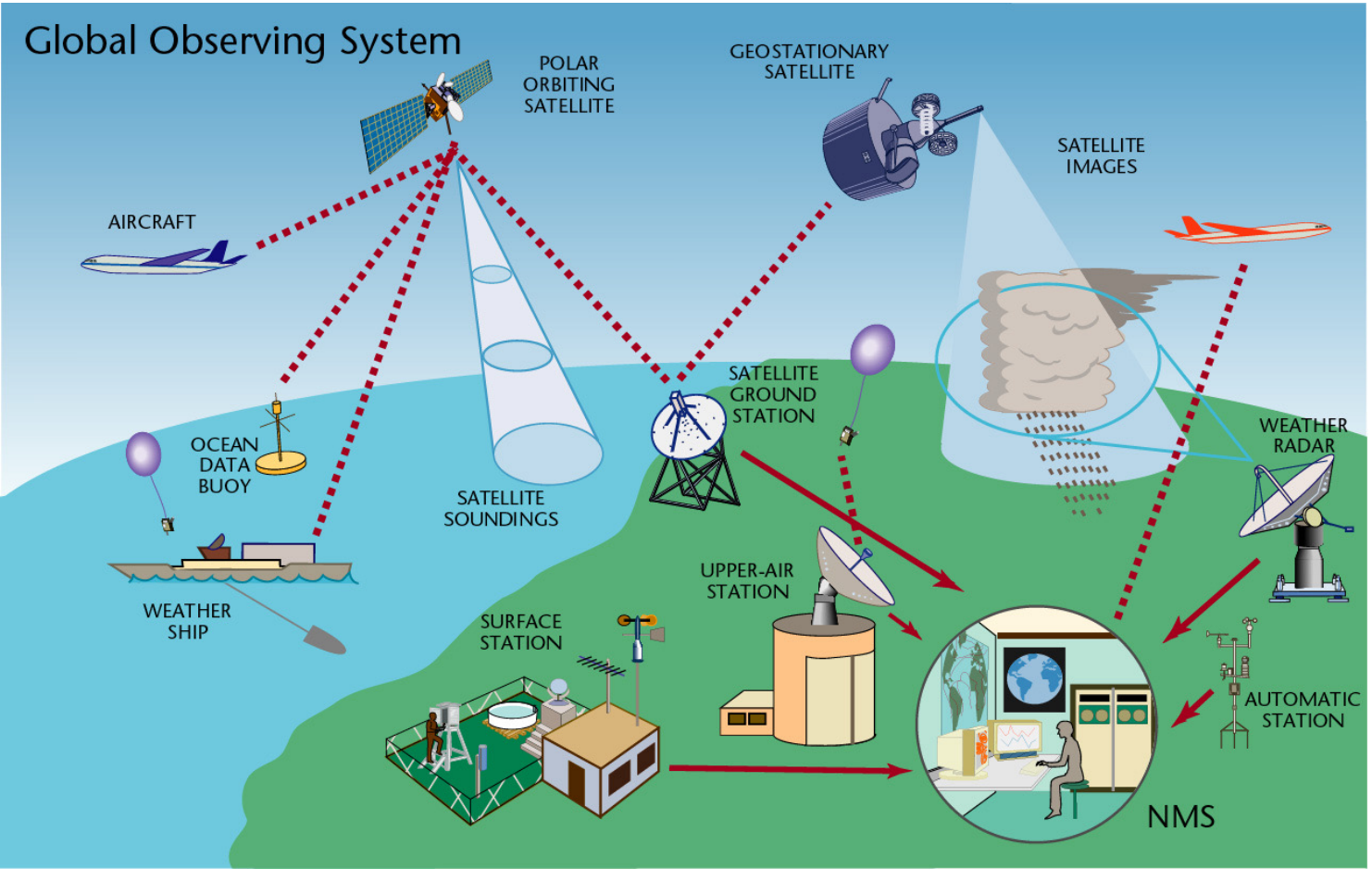

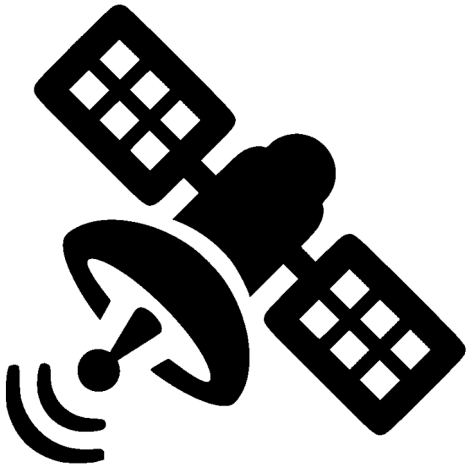

Space Based observation

In situ observation

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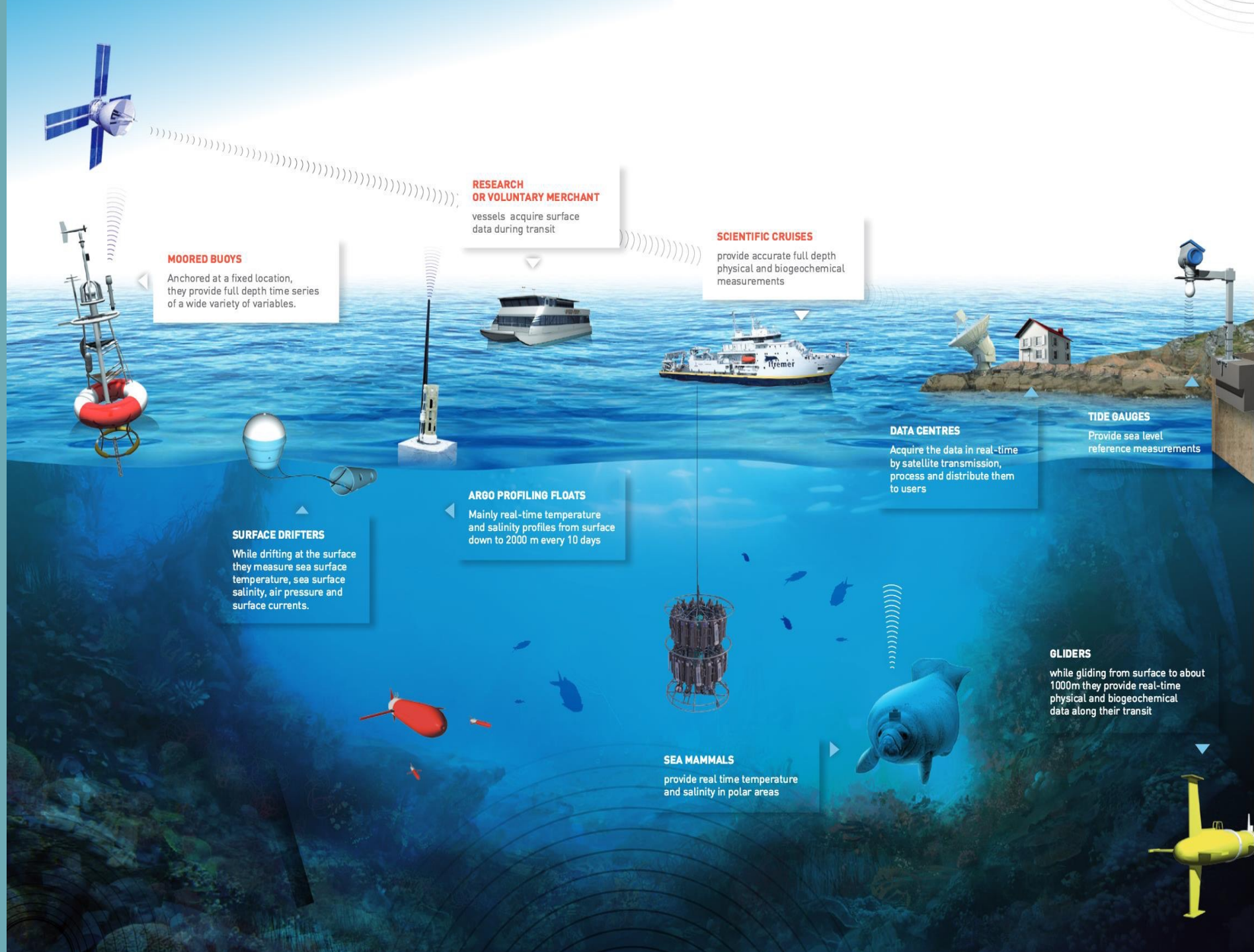
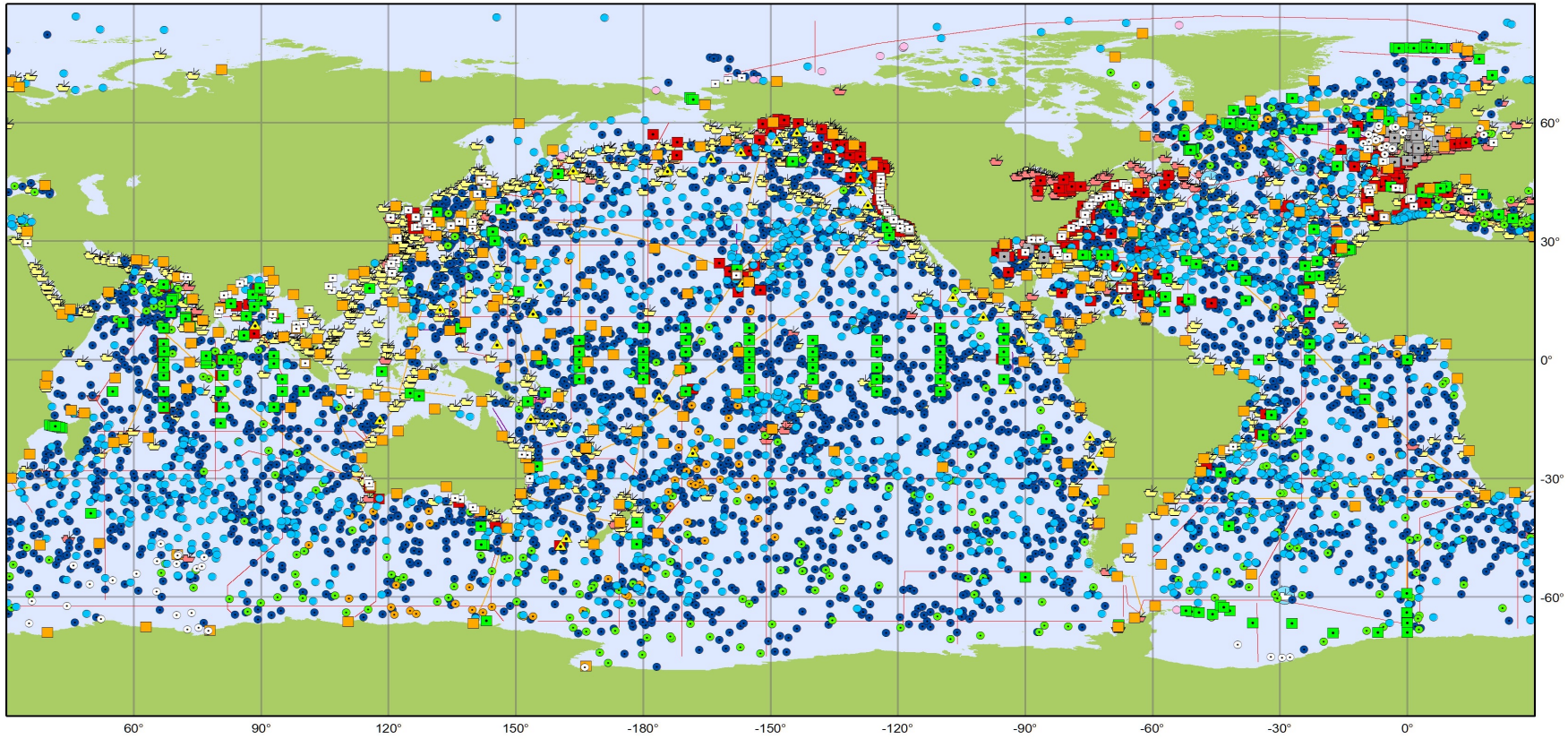
Ocean and Coastal Observing Systems



In situ observing systems



Main in situ Elements of the Global Ocean Observing System

April 2019

Profiling Floats (Argo)
- Core (3880)
- Deep (79)
- BioGeoChemical (352)

Data Buoys (DBCP)
- Surface Drifters (1444)
- Offshore Platforms (97)
- Ice Buoys (11)
- Moored Buoys (358)
- Tsunameters (38)

Timeseries (OceanSITES)
- Interdisciplinary Moorings (351)

Repeated Hydrography (GO-SHIP)
- Research Vessel Lines (62)

Sea Level (GLOSS)
- Tide Gauges (252)

Ship based Measurements (SOT)
- Automated Weather Stations (257)
- Manned Weather Stations (1324)
- Radiosondes (11)
- eXpendable BathyThermographs (34)

Other Networks
- HF Radars (270)
- Animal Borne Sensors (53)
- Ocean Gliders (31)

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Space based observing systems

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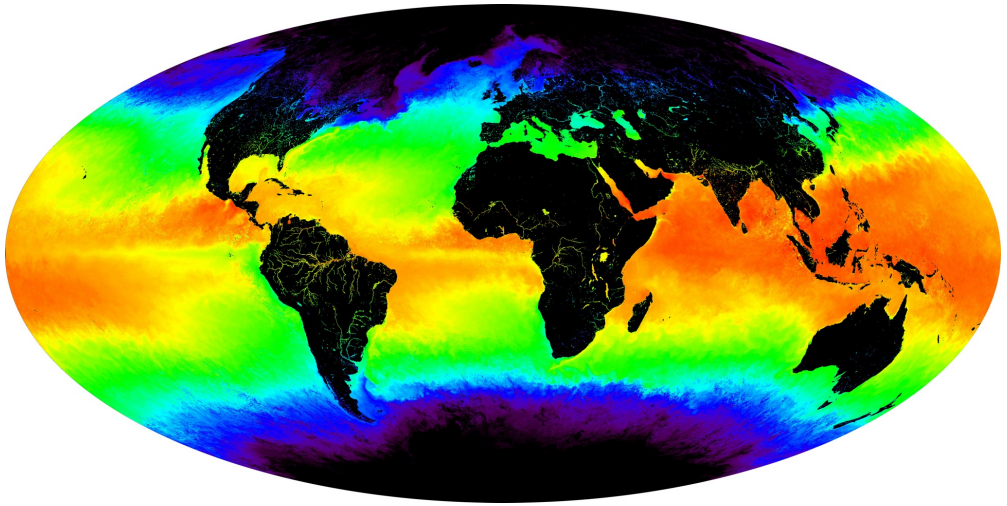
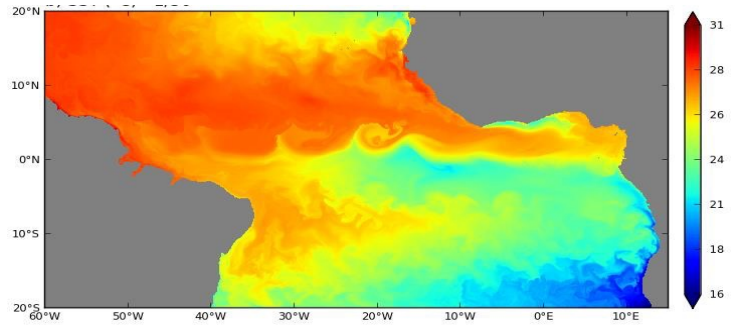
How can Earth Observation data and products be used for Coastal Adaptation ?

Earth Observation data modelling

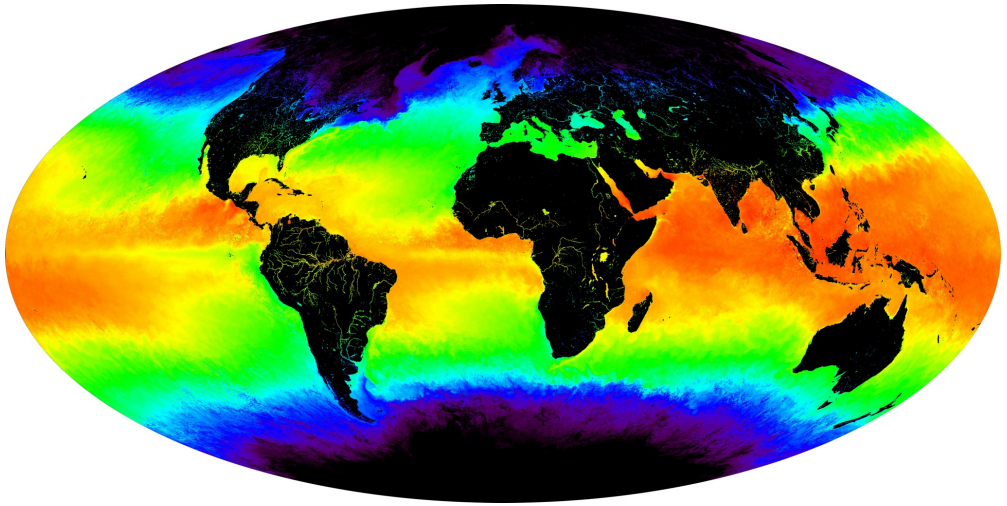


Global

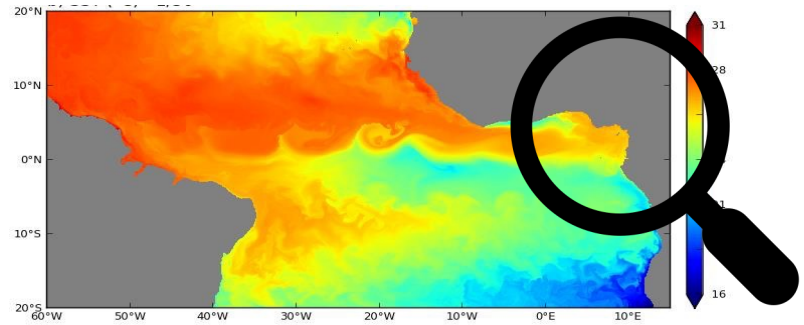


Basin (international)

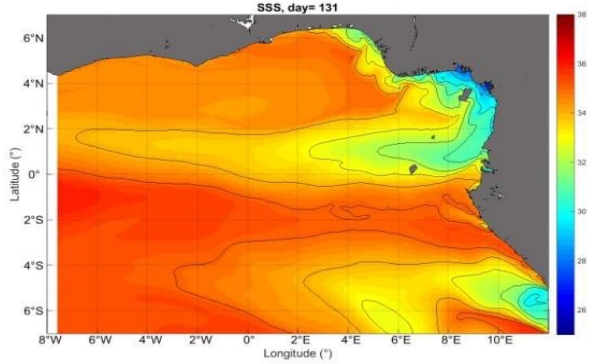
Earth Observation data modelling



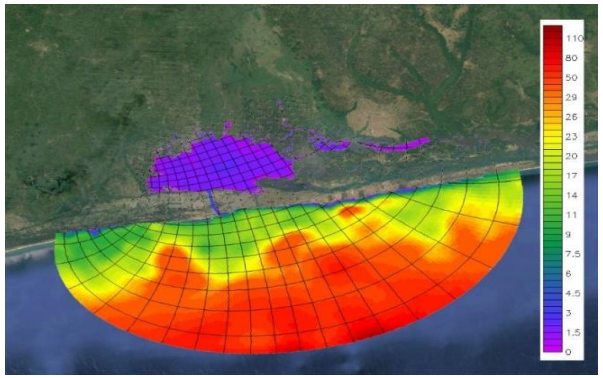
Global



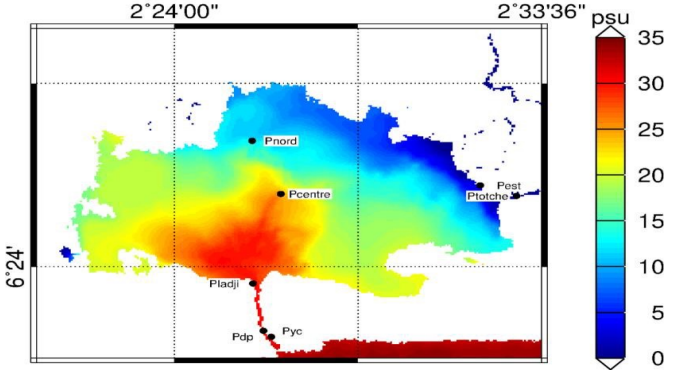
Basin (international)



Regional (international)



Regional (National)



Local (City)

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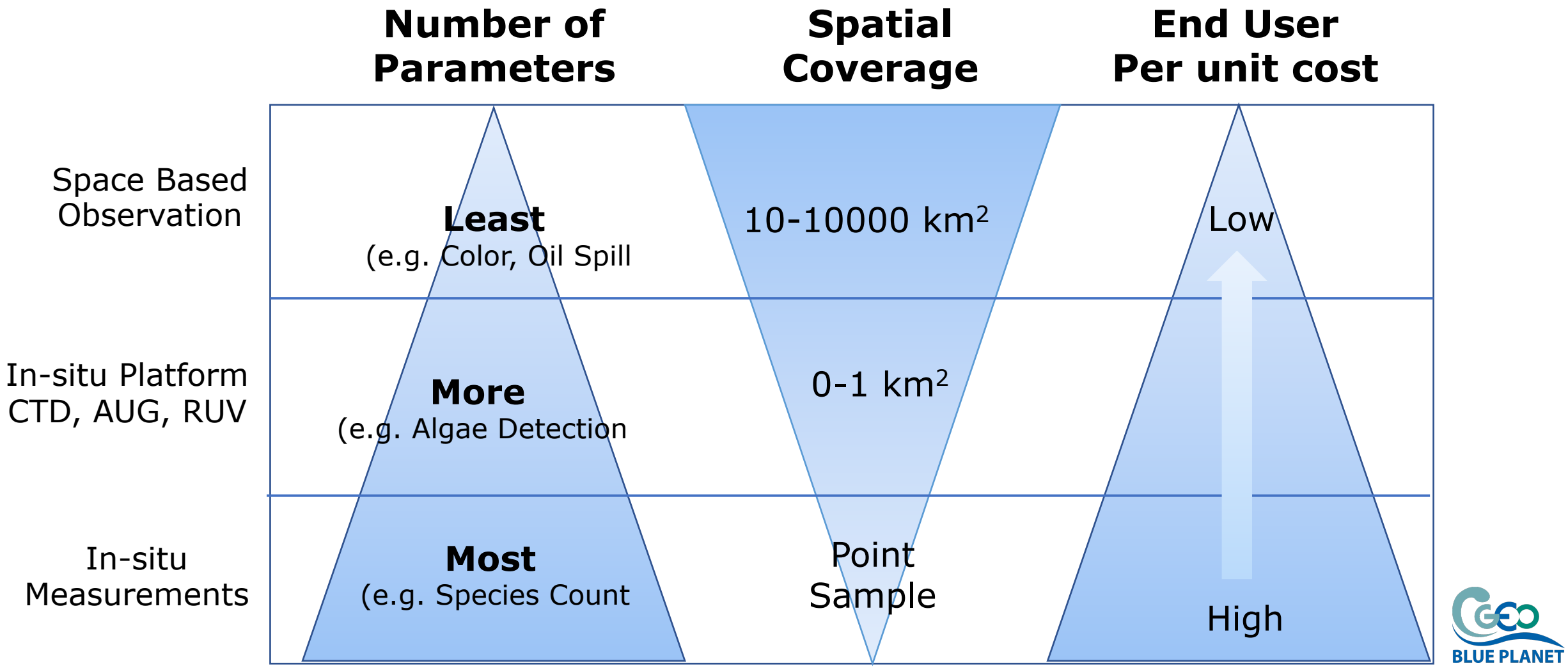
Comparison of monitoring approaches



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Satellite Observations

Sea Surface Height

Sea Surface Roughness

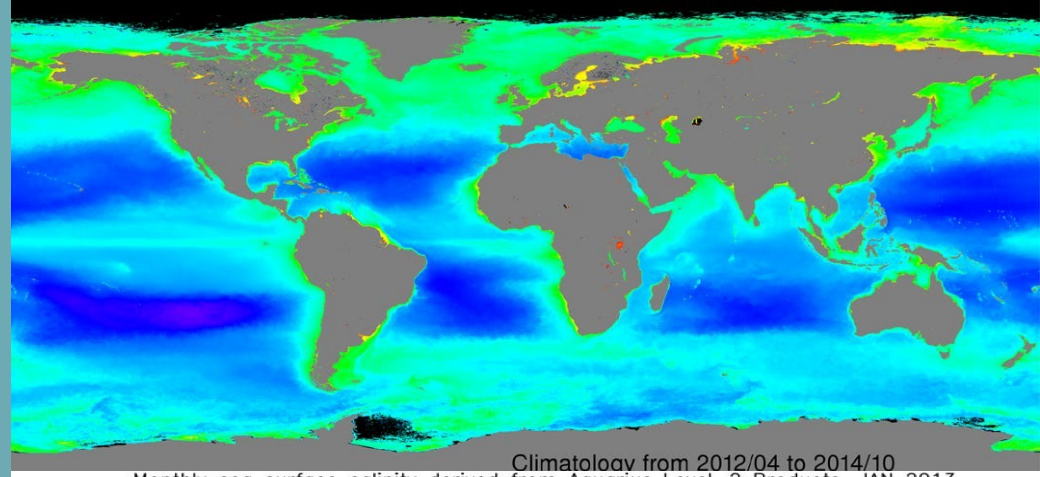
Sea Surface Salinity

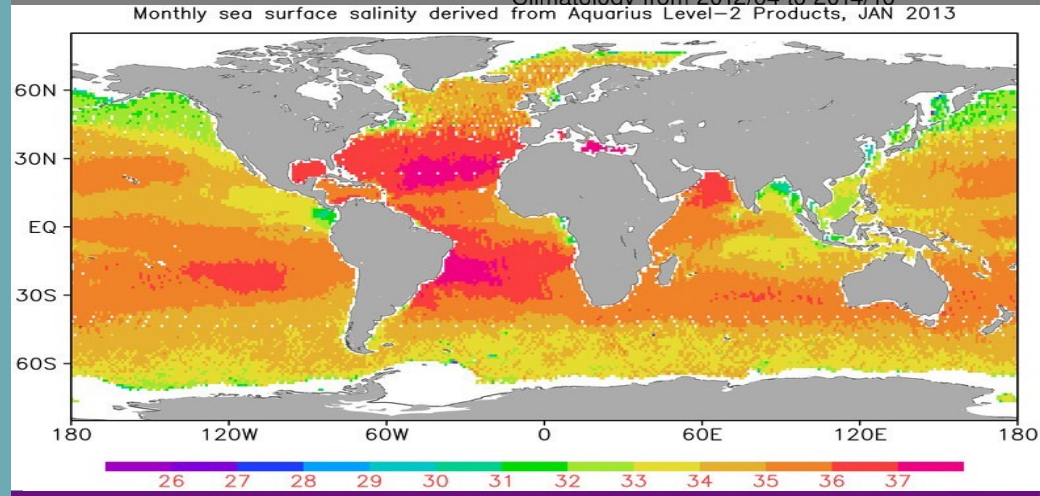
Sea Surface Temperature

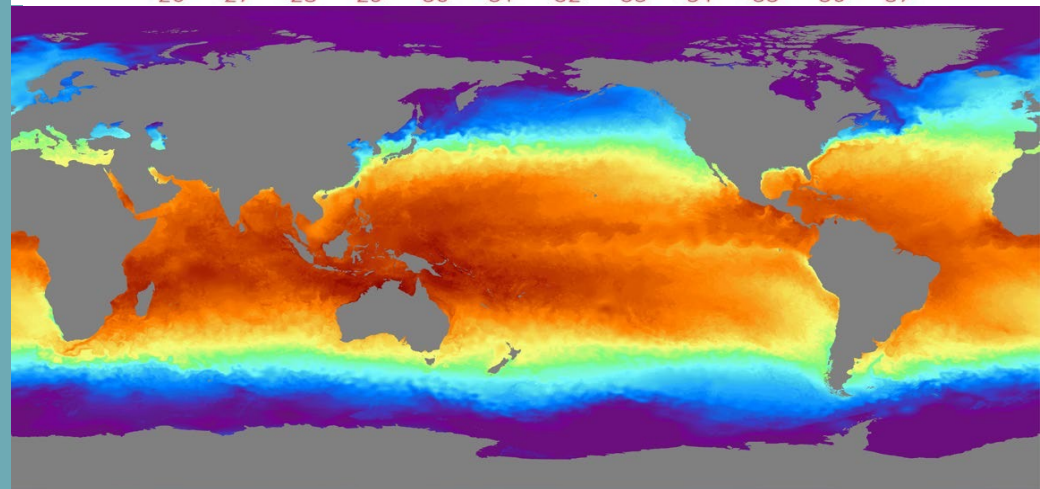
Ocean Color

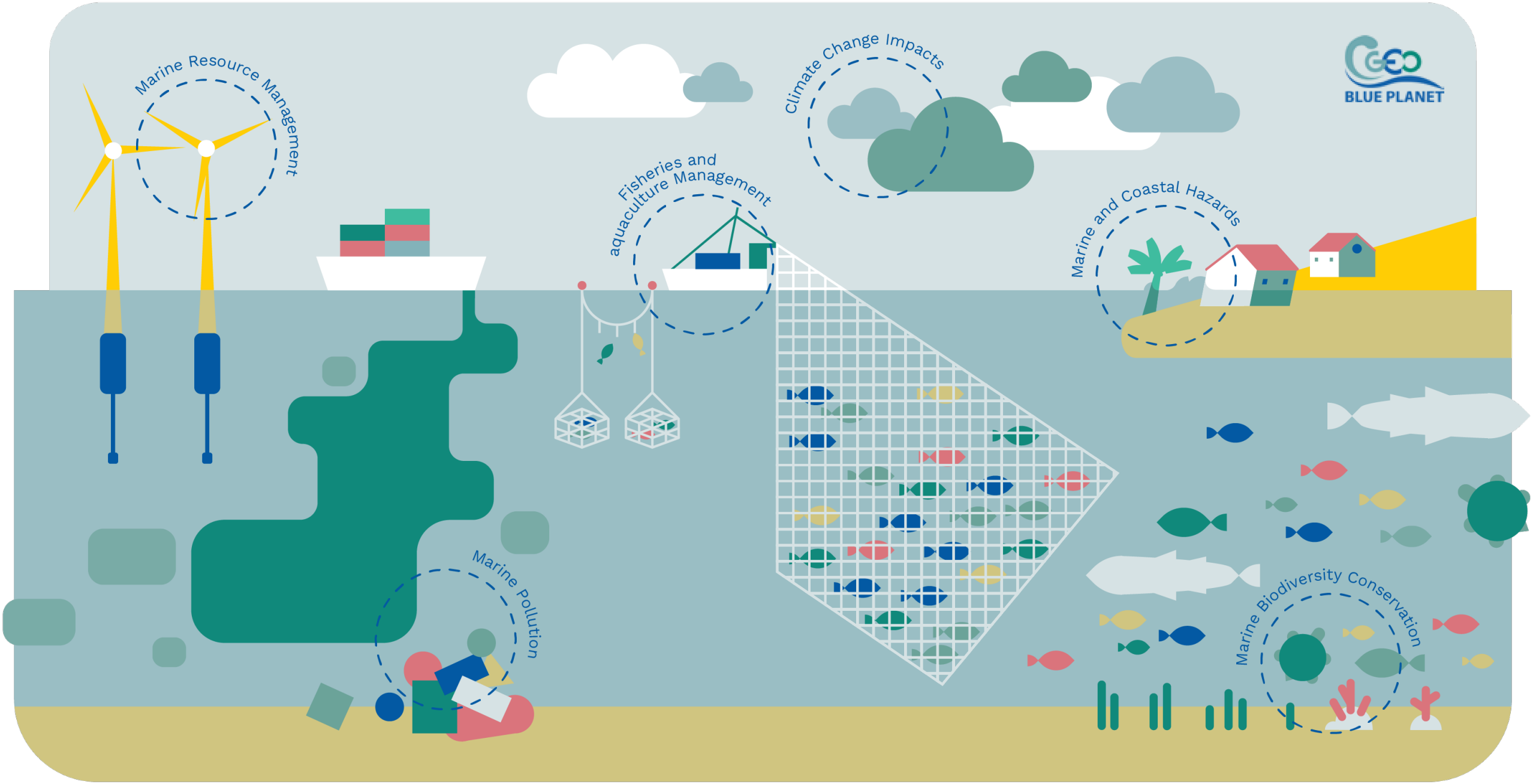
Ocean Surface Vector Winds

True Color Imagery








Marine Resource Management
Climate Change Impacts
Fisheries and aquaculture Management
Marine and Coastal Hazards
Marine Pollution
Marine Biodiversity Conservation
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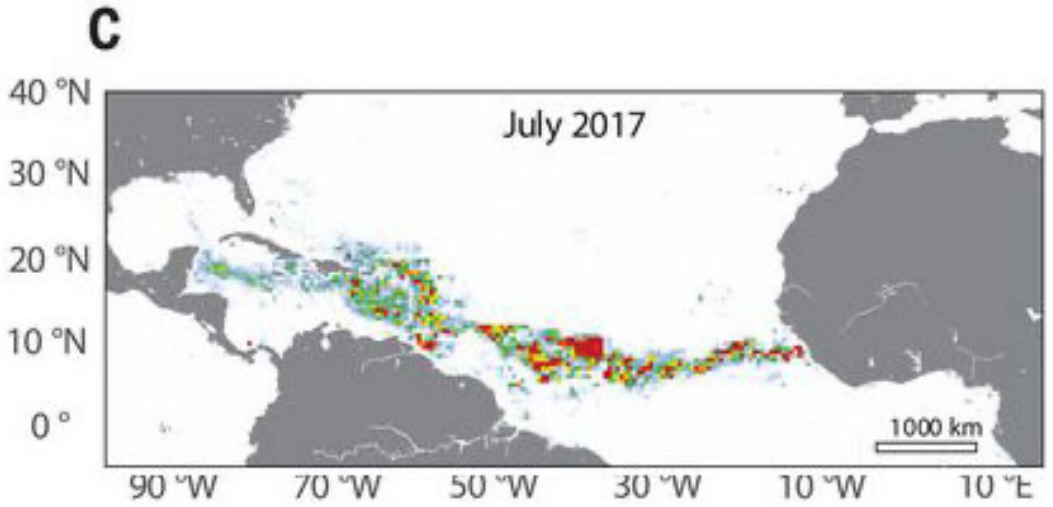
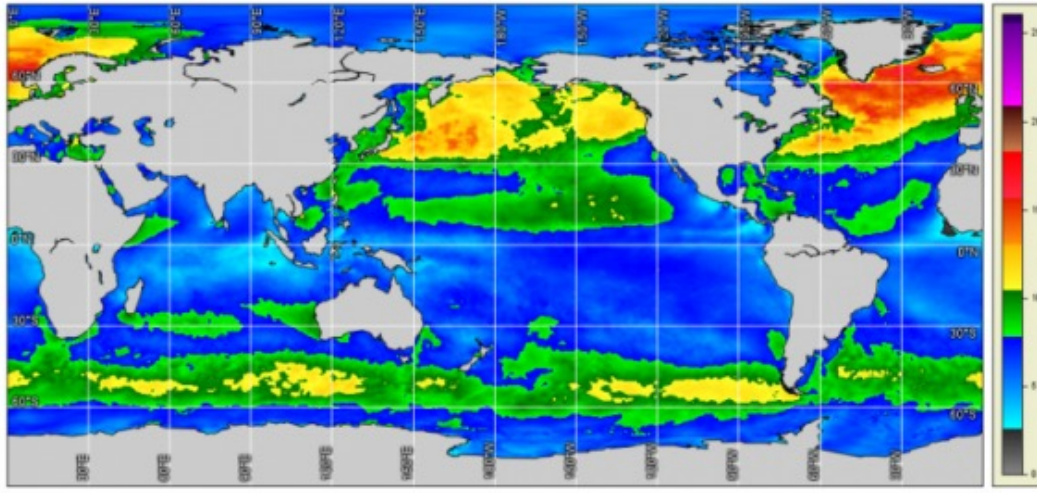
Marine Resource Management

Sargassum

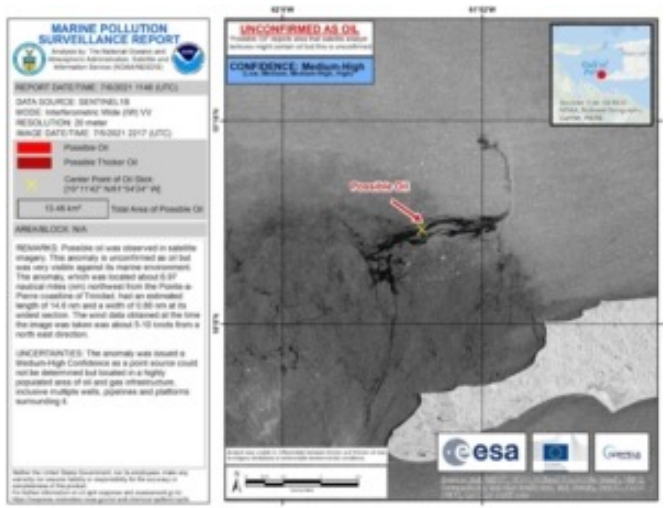


Renewable Energy

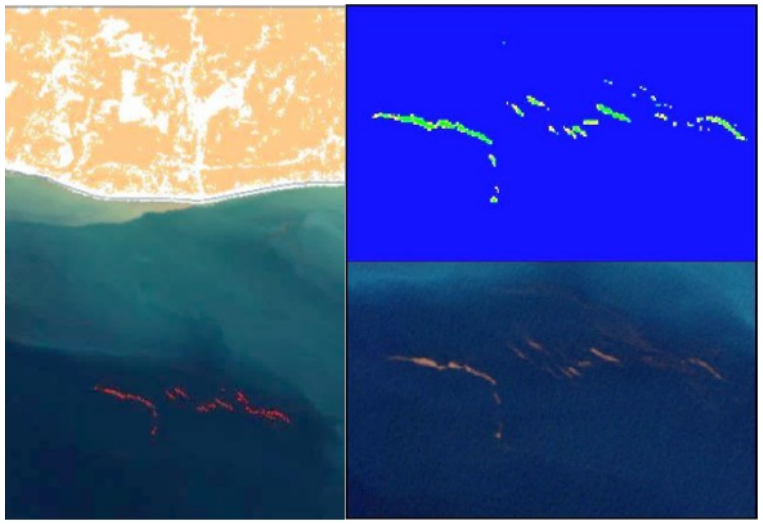


Marine and Coastal Pollution

Oil Spills



Marine Litter



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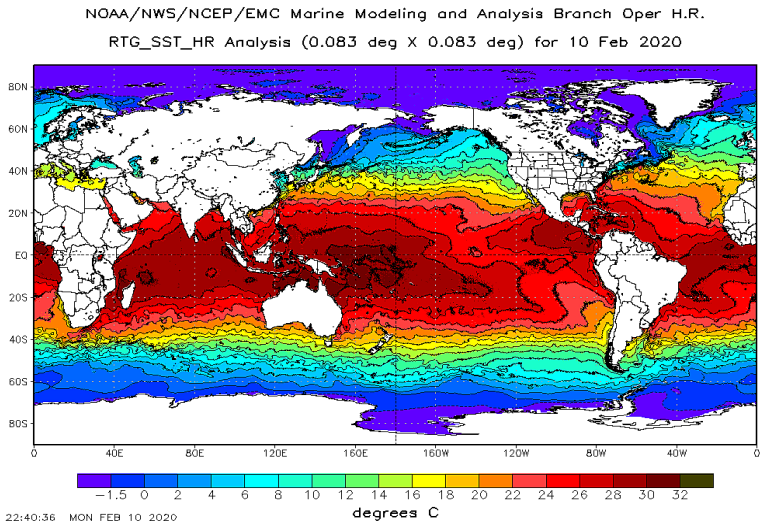
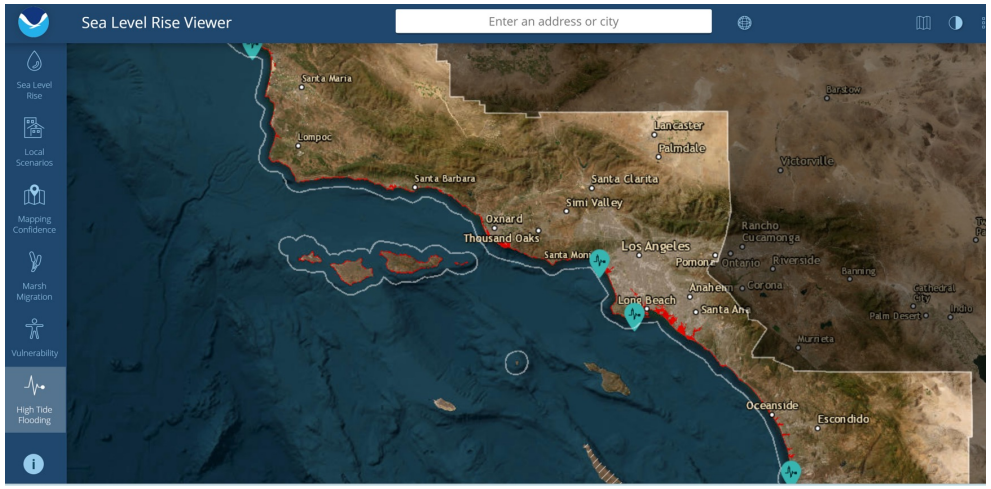
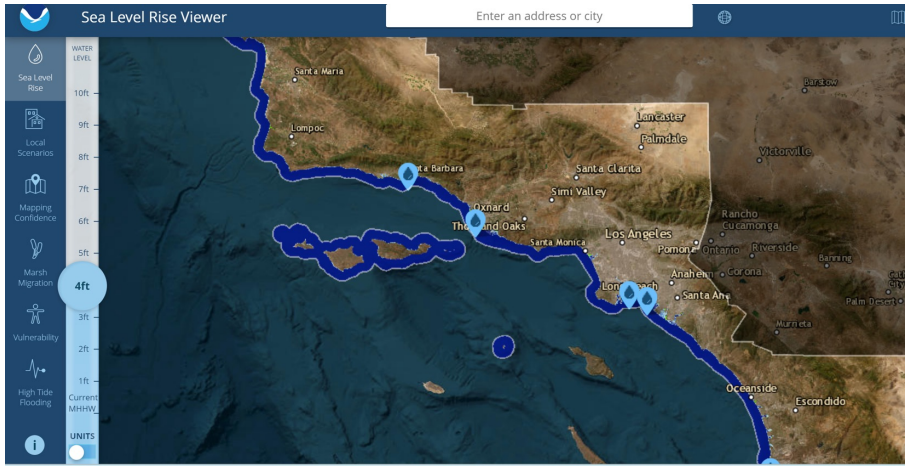
Climate Change Impacts



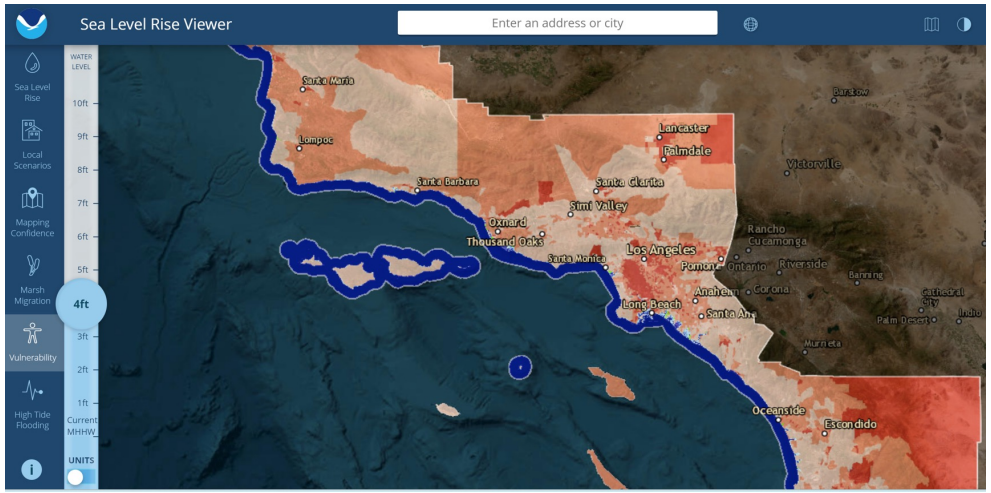
Sea Surface Warming



Flooding



Sea Level Rise



Coastal Vulnerability

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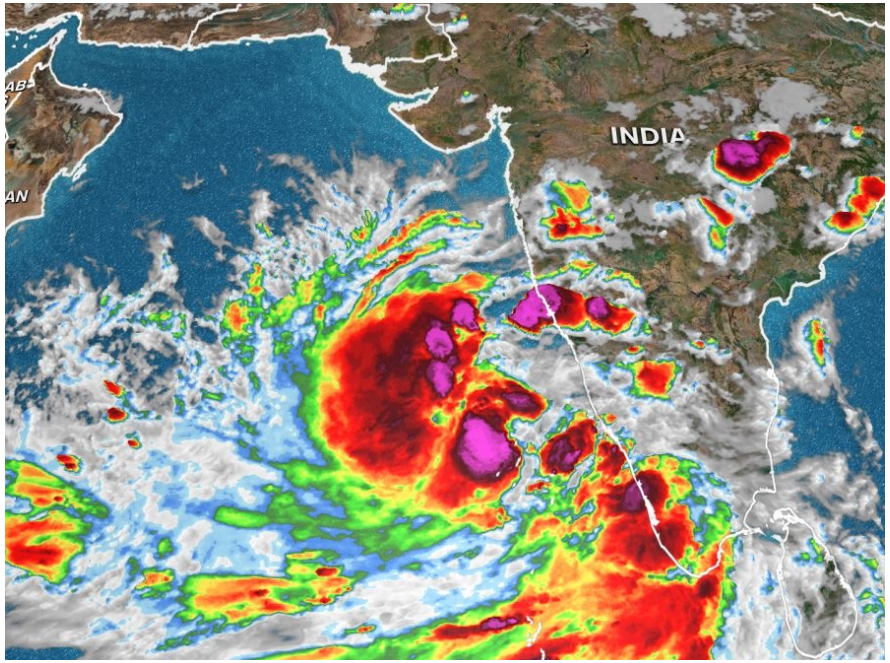
Marine and Coastal Hazards

- Deliver data and information required to forecast, mitigate and recover from disasters.
- Develop Early Warning System
- Provide information to prevent loss to marine and coastal biodiversity.



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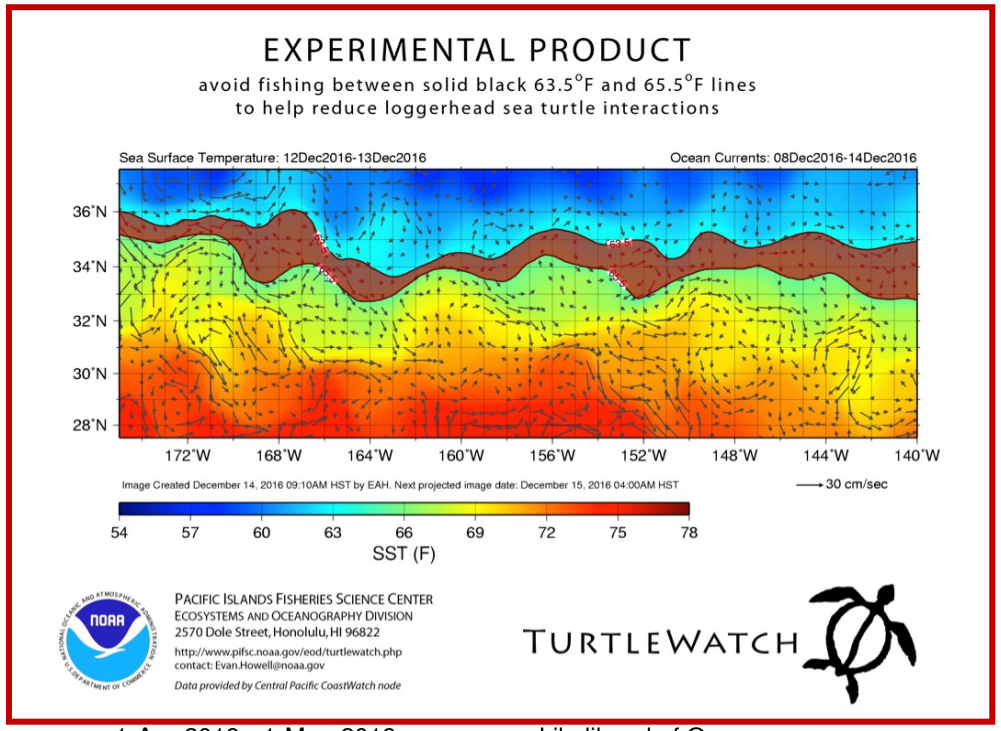
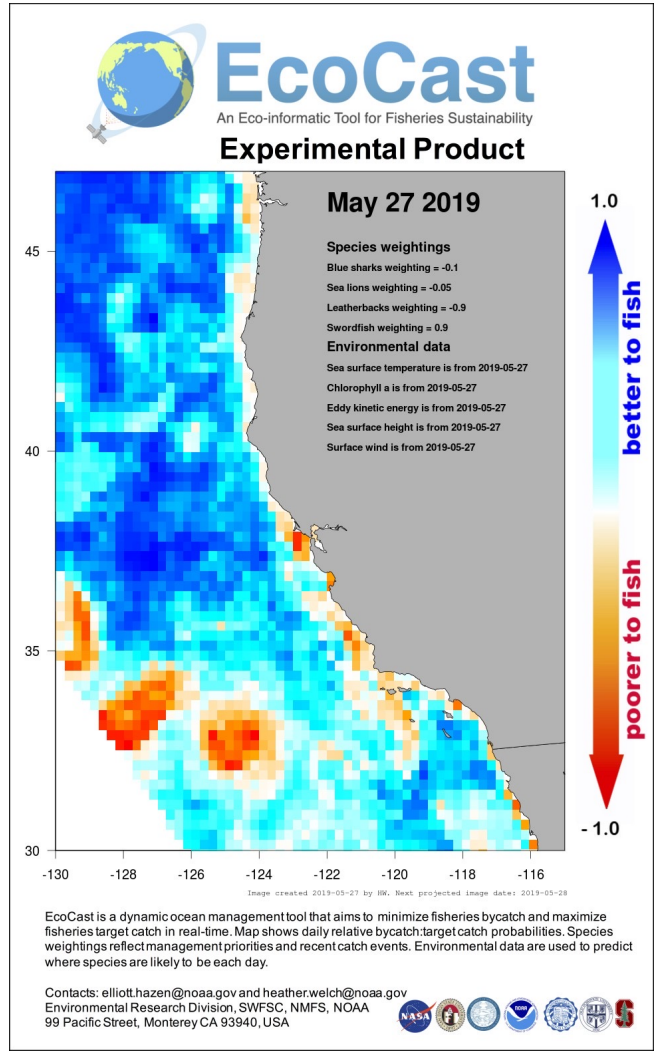
Fisheries & Aquaculture

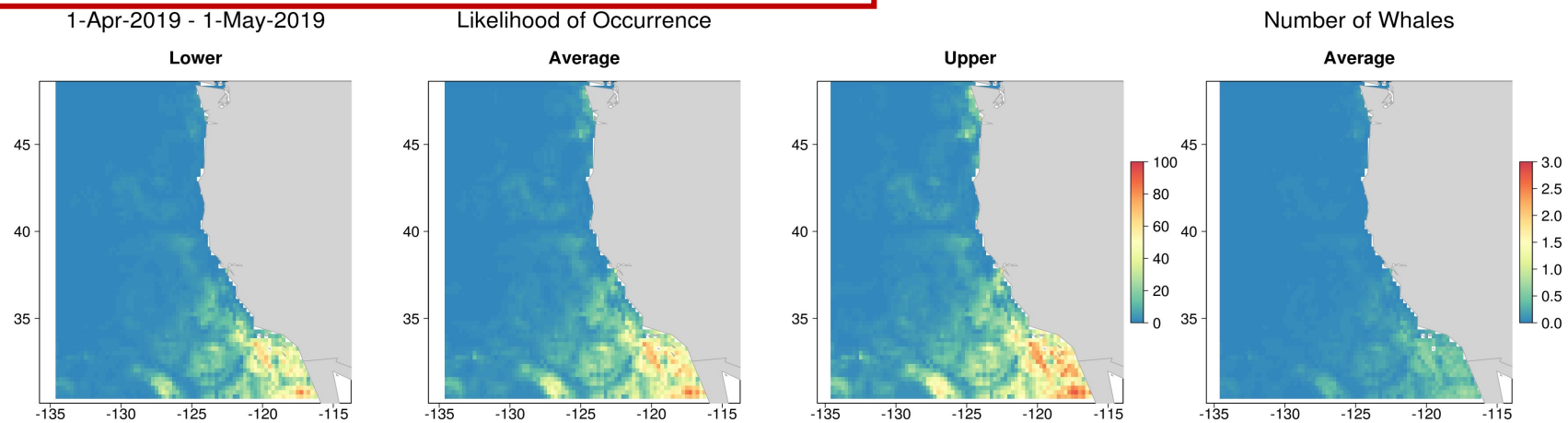


Protect

Forecast

Biodiversity





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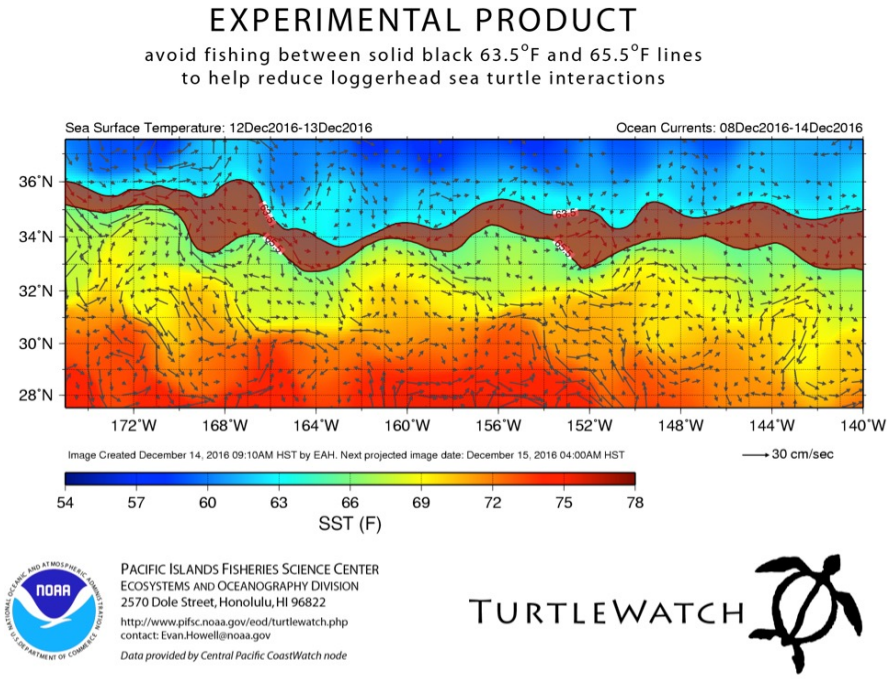
Fisheries & Aquaculture



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Forecast

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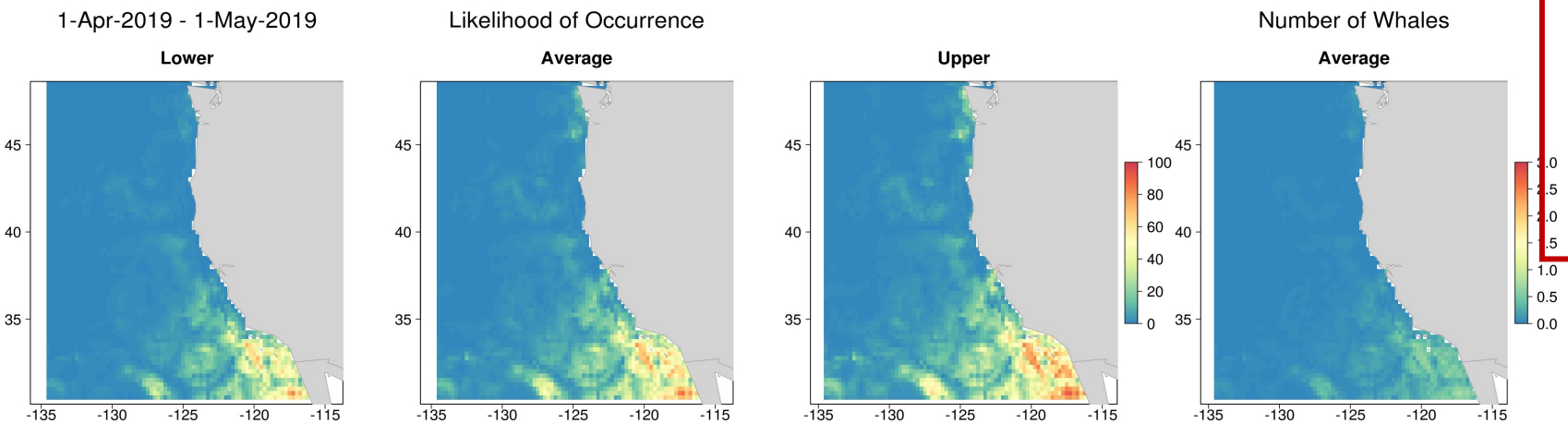

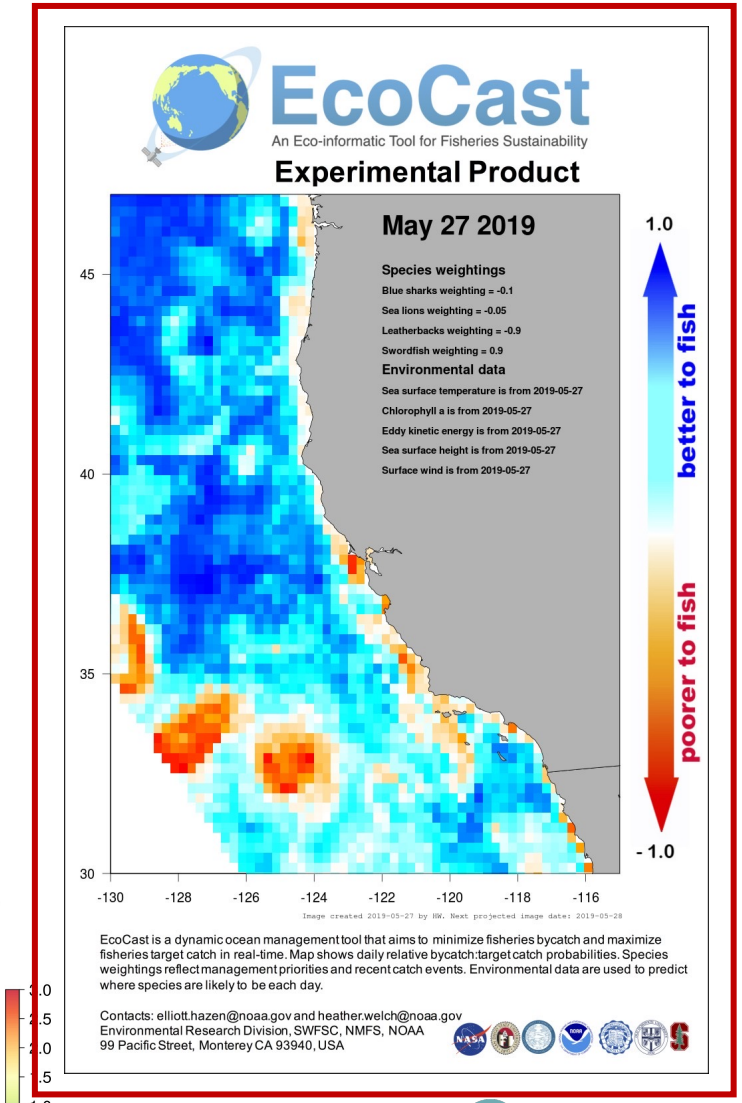

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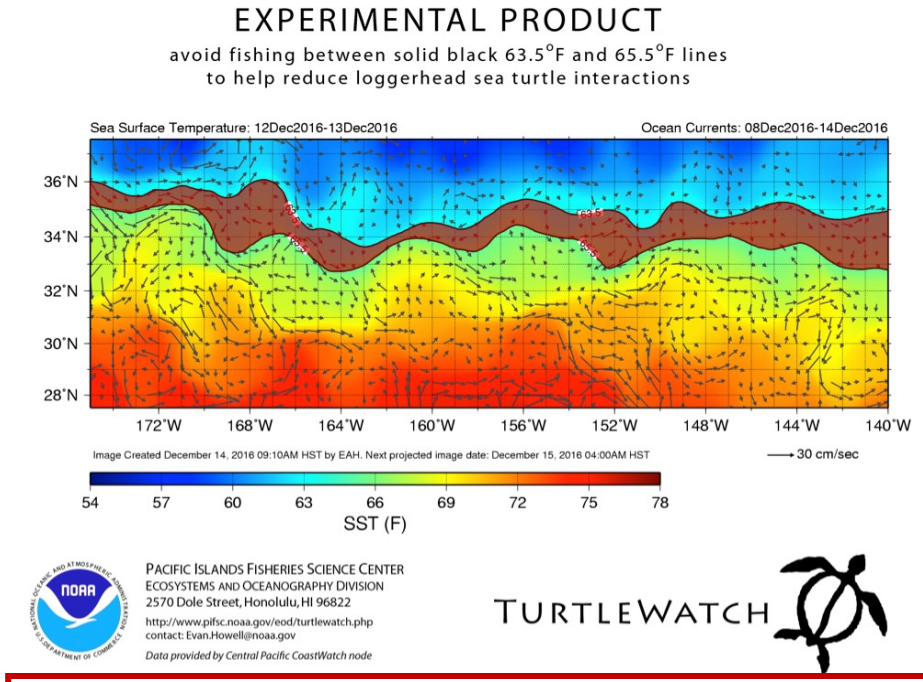
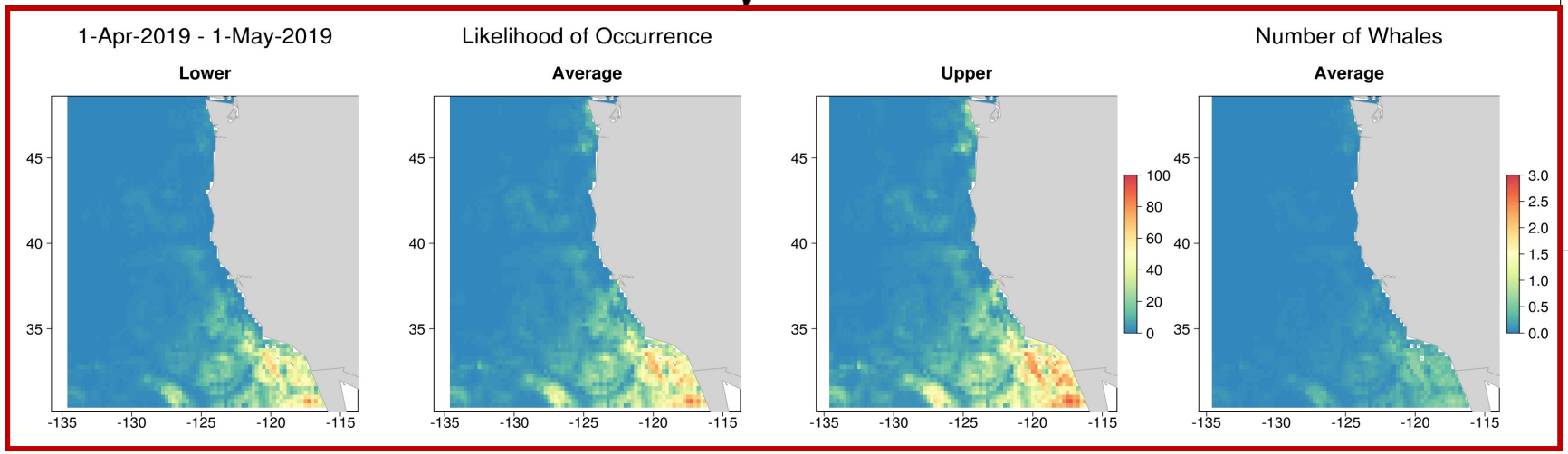
Fisheries & Aquaculture

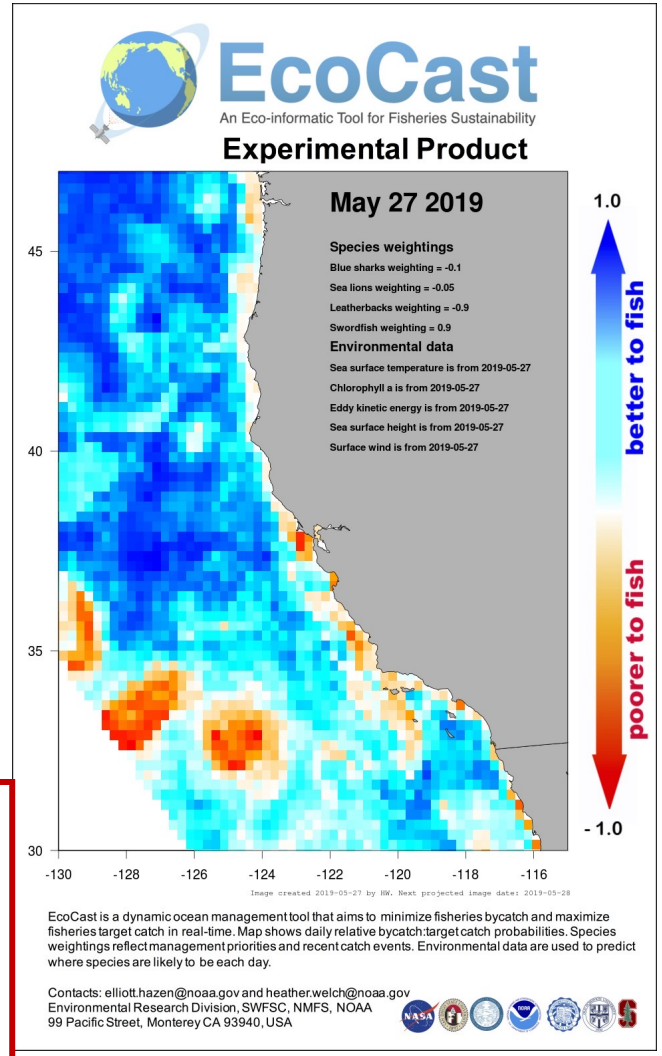


Protect

Forecast

Biodiversity





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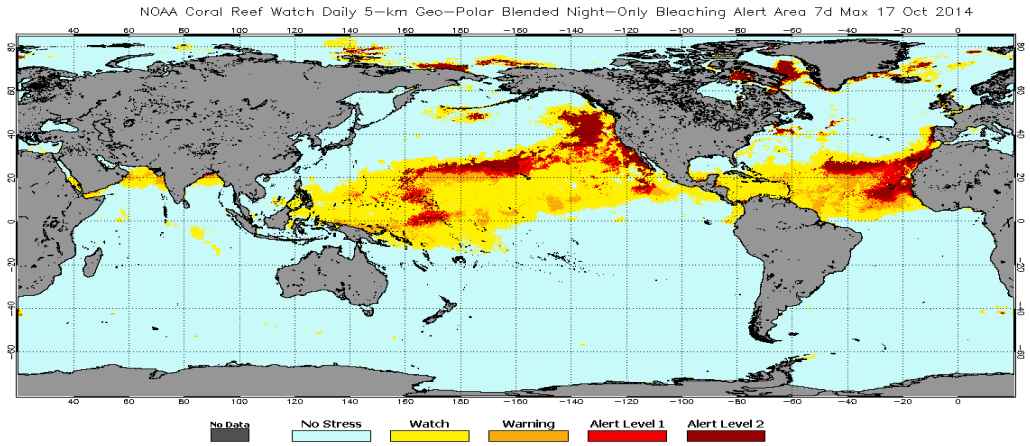
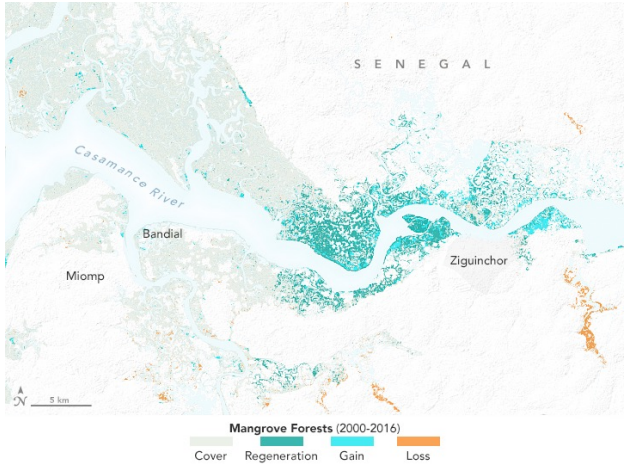
Biodiversity Conservation



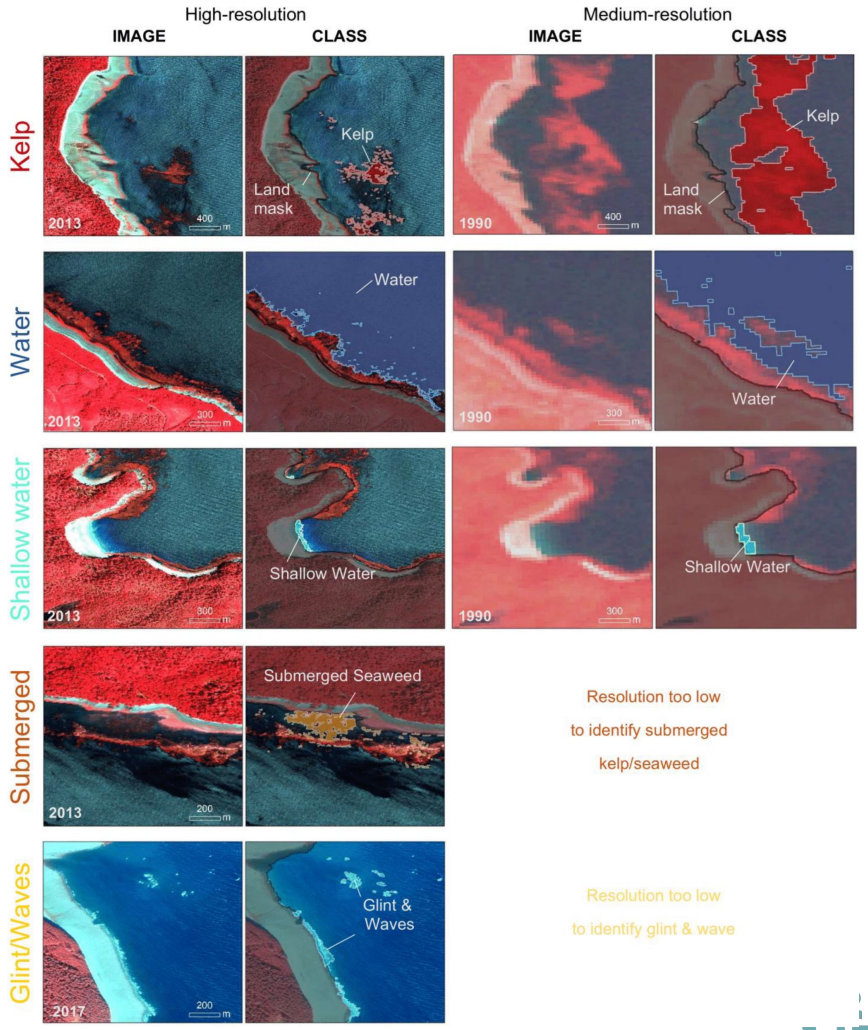
NOAA Coral Reef Watch



Open Access Article

A Multi-Satellite Mapping Framework for Floating Kelp Forests

by Lianna Gendall [1,*], Sarah B. Schroeder [1], Peter Wills [2], Margot Hessing-Lewis [2,3] and Maycira Costa [1]



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Earth Observations can provide vast amounts of data

Data can be used to develop products and tools for ocean & coastal Monitoring

Information from tools can contribute to the sustainable use of ocean and coastal resources

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Contacts

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joydeep@udel.edu

#NAPExpo #EO4Impact
@GEOSEC2025

GROUP ON EARTH OBSERVATIONS

NAPEXPO CHILE 2023

Jorge Luis Vazquez Aguirre, WMO

Jorge Vazquez is a Deputy Project Officer (short-term) at the Climate Services Branch, Services Department of the World Meteorological Organization. His background is in atmospheric science (B.Sc., M.Sc.) and climatology. He has been collaborating with WMO for more than a decade as part of Expert Teams in Technical Commissions including ET on Climate Change Detection and Indices, Sector-specific Climate Indices and Climate Information for Decision-making.

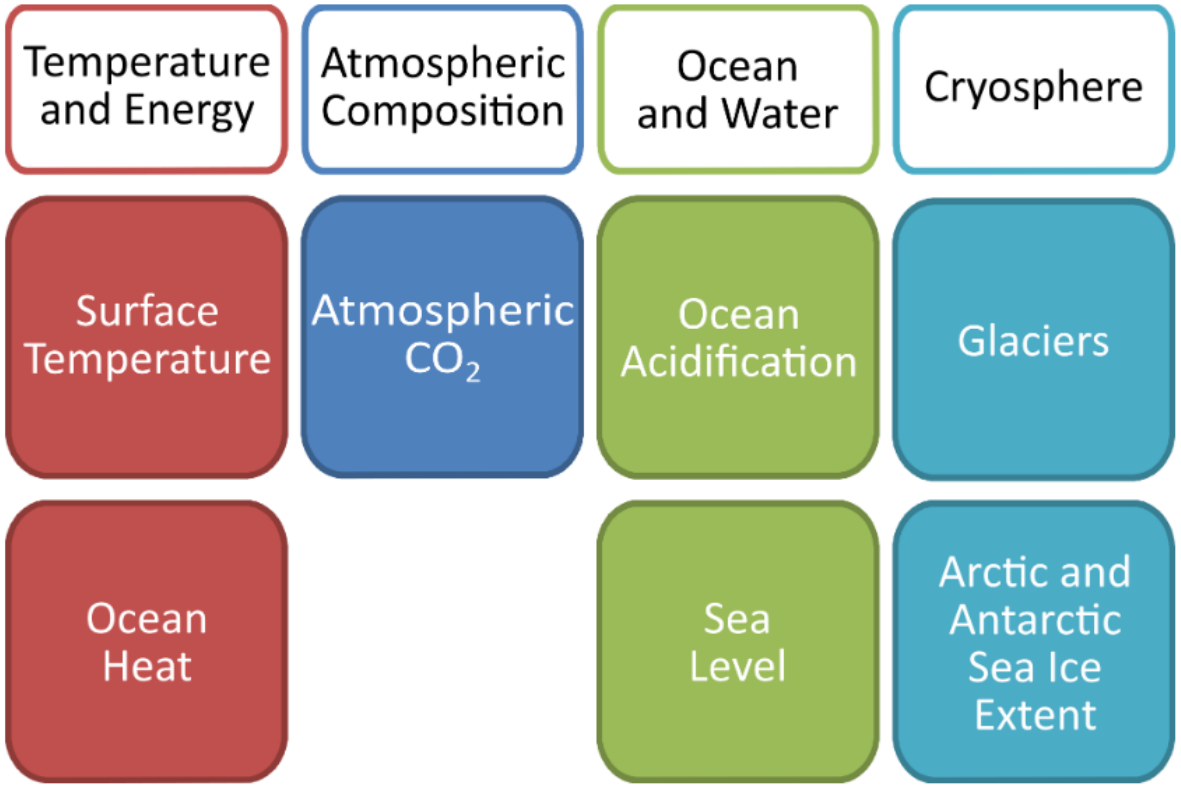
An introduction on the state of the climate indicators in relation to coastal vulnerability and hazards

Jorge Luis Vazquez Aguirre

WMO

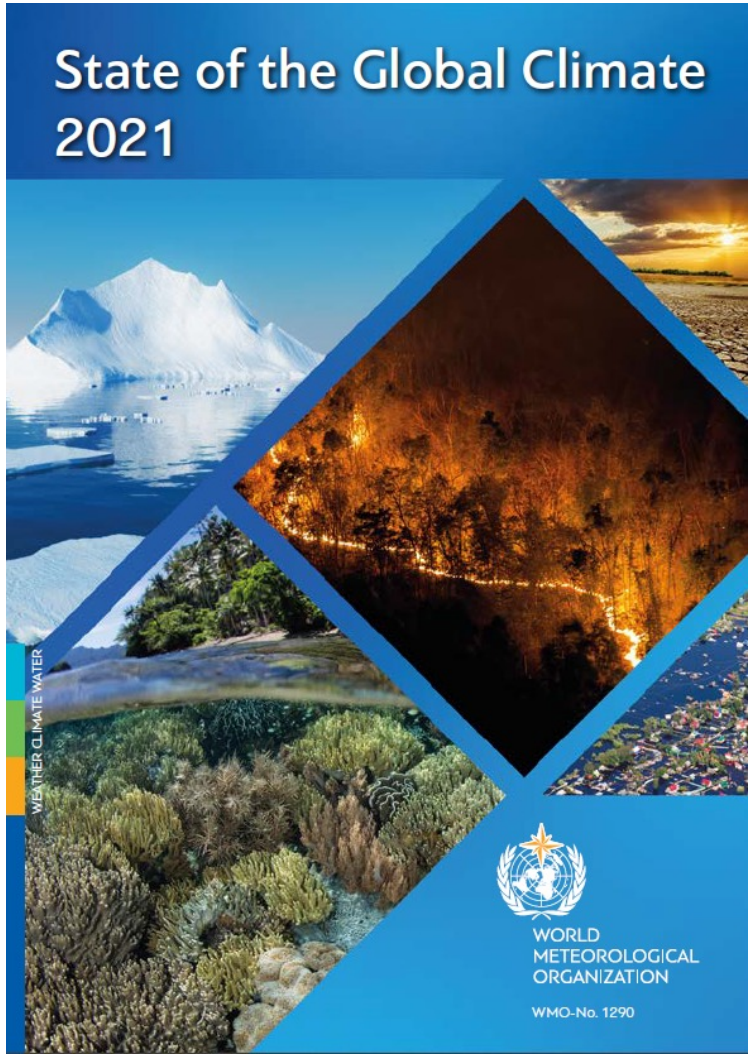
Global Climate Indicators (climate change)

- Reference period or base state
- Periodical assessment
- Different frequencies
- Reported by the IPCC
- Operationally monitored
- Uncertainty in specific impacts
- Climate change drivers



https://gcos.wmo.int/en/global-climate-indicators

WMO State of the Global Climate



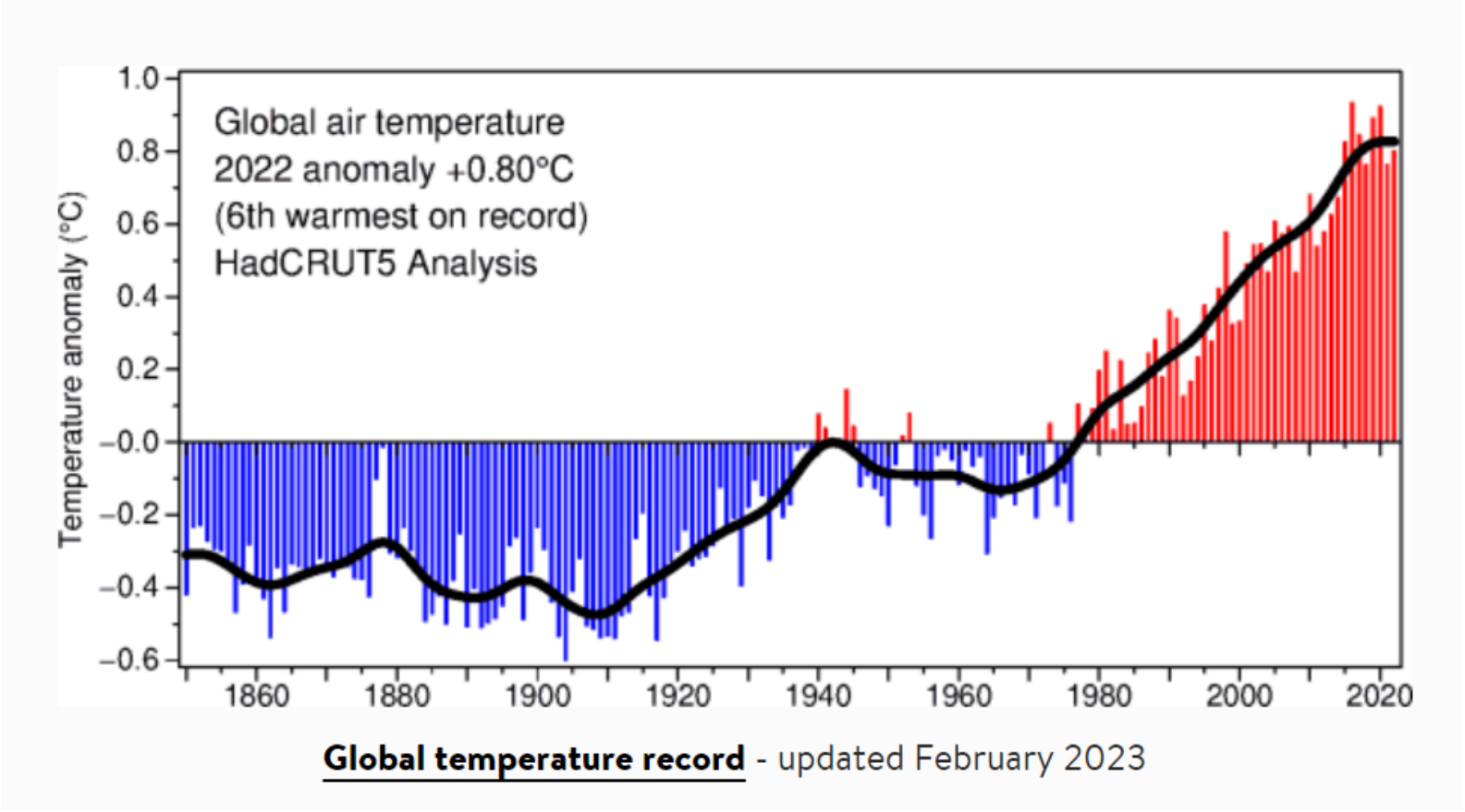
- On an annual basis, WMO publishes a report on the State of the Global Climate
- The report is comprehensive
- A provisional report is available early in the year
- https://library.wmo.int

WMO State of the Global Climate in 2022 (provisional)

- Extreme heatwaves
- Drought
- Devastating flooding
- The rate of sea level rise has doubled since 1993
- Sea level has risen by nearly 10 mm since January 2020
- Sea level in the past 2.5 years account for 10% of the overall
- Glaciers in the European Alps had a record melting rate
- Mass loss in the Greenland ice sheet
- Ocean heat at record levels in 2021 (last assessment)
- Final release of the report on April 2023

Global temperature

- Global air temperature 2022 anomaly was ¿0.80 C (6th warmest on record) – Climatic Research Unit, UK

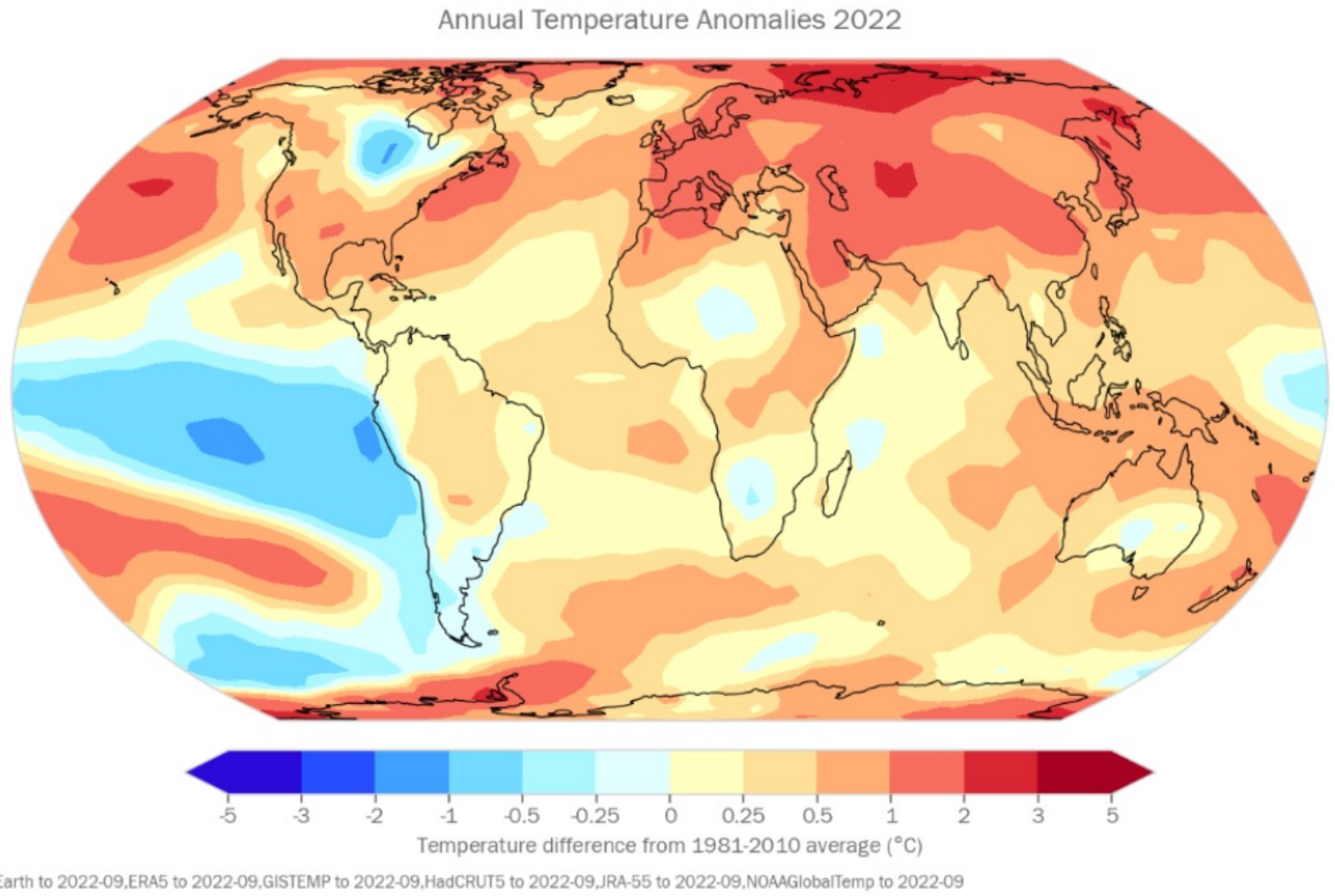


- Not the warmest probably related to presence of “La Niña”

https://www.uea.ac.uk/groups-and-centres/climatic-research-unit

Annual Temperature Anomalies 2022

- Anomaly map (Jan to Sep, 2022)

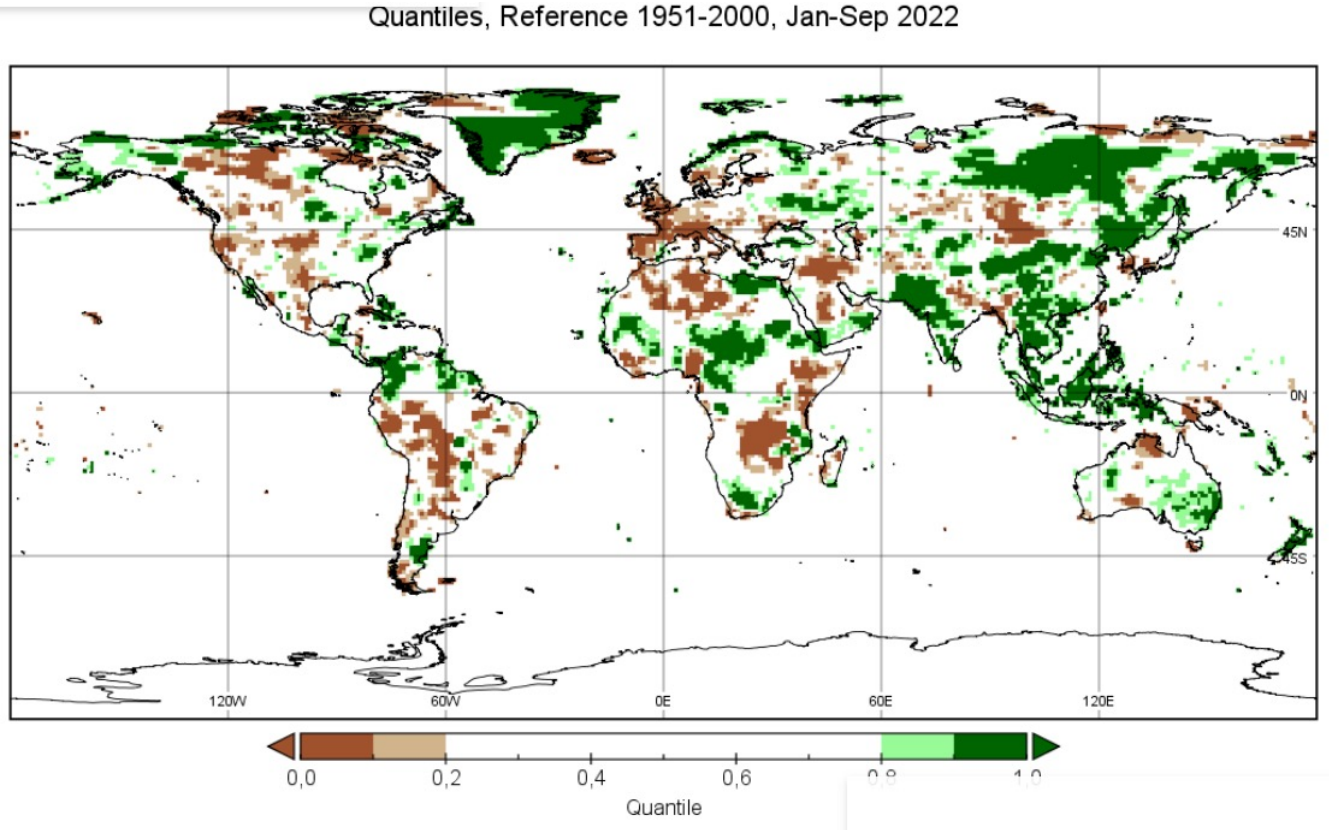


Precipitation

Precipitation Extremes

The majority of the Indian Subcontinent received high precipitation totals and the monsoon extended farther westward then usual towards Pakistan, where there was **extensive flooding**.

In 2022, large areas with **above normal precipitation** included large parts of Asia, the Maritime Continent, Australia, New Zealand, areas of northern South America, the Caribbean, west Africa, Sudan, coastal areas extending from western Libya to Egypt, and the southern Arabian Peninsula.



Meanwhile, regions with **rainfall deficit** included Europe, Central Asia, Northern Australia, Eastern Africa, most of North Africa, central and southern South America, and central and western North America.

Atmospheric composition

The annual increase of methane was 18 ppb from 2020 to 2021. **This is the largest increase on record.** Its causes are still being investigated.

Real-time data indicate that global greenhouse gas emissions continued to increase in 2022.

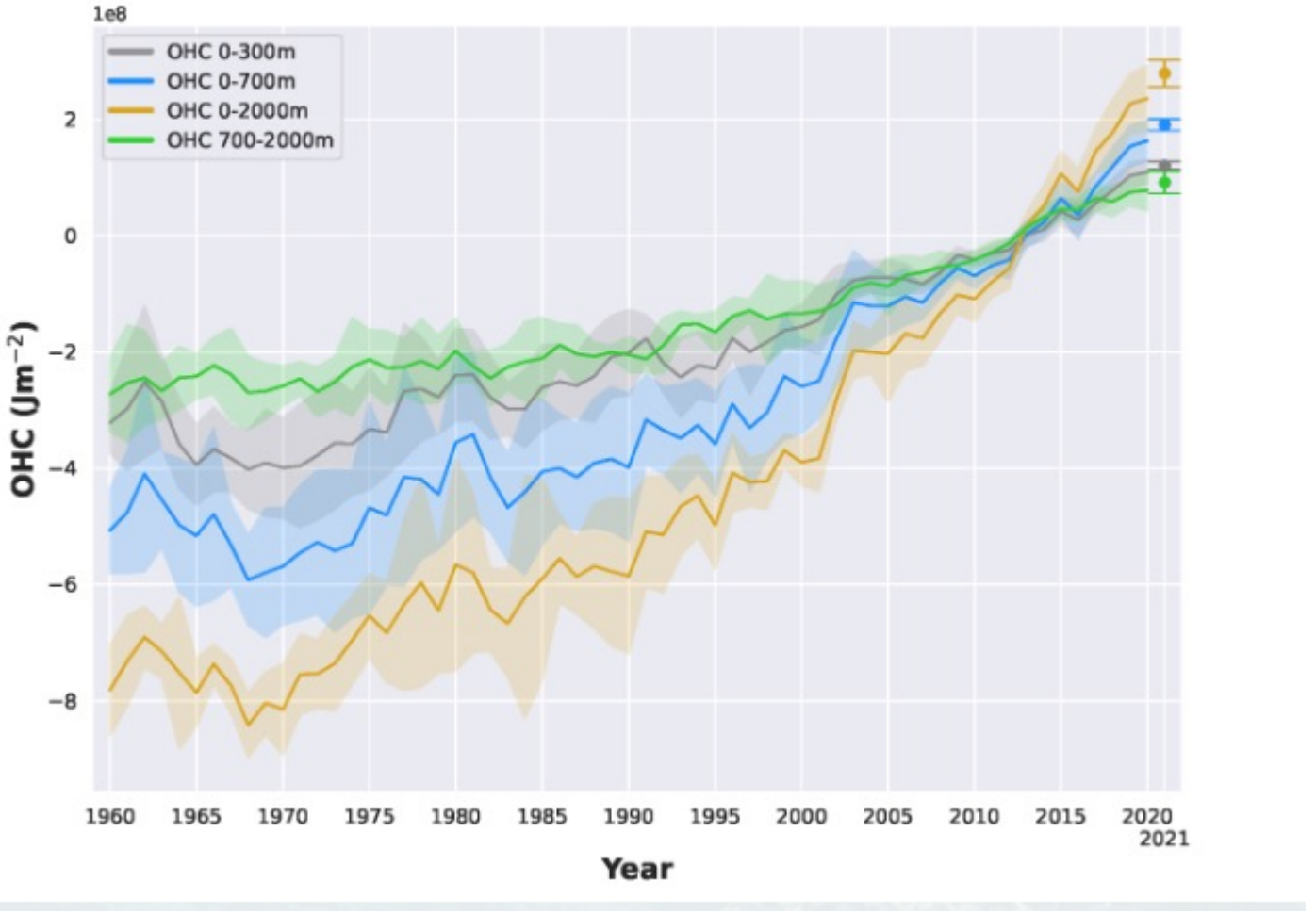
Carbon dioxide: 415.7ppm ± 0.2 = **149% of pre-industrial levels.**

Methane: 1908±2 ppb = **262% of pre-industrial levels.**

Nitrous oxide: 334.5±0.1 ppb = **124% of pre-industrial levels.**

Ocean Heat Content

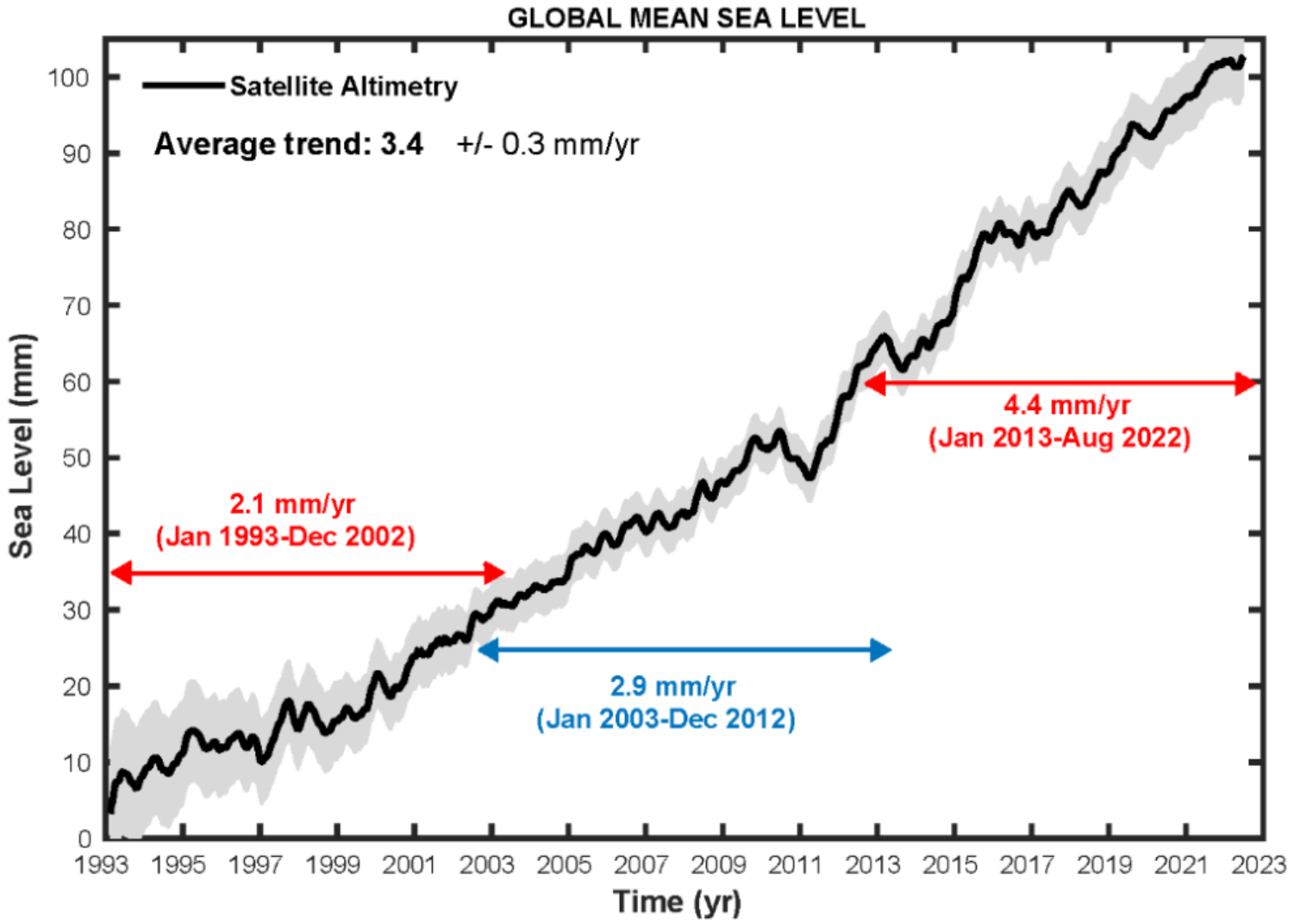
- As of 2021 (latest year evaluated) the Ocean has continued to warm



Global Sea Level Rise

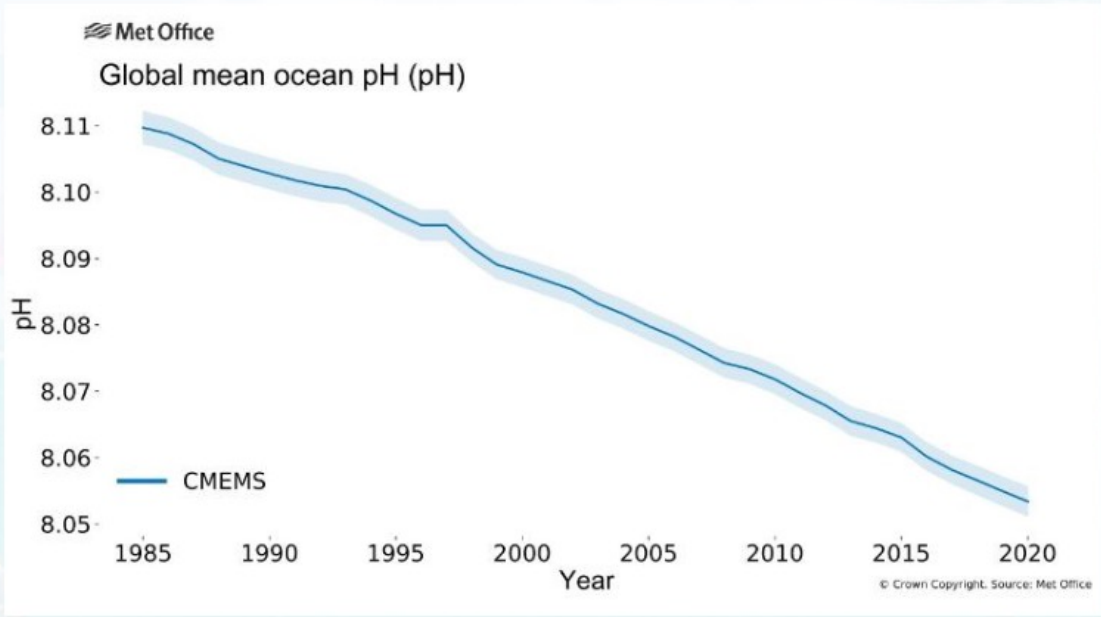
In 2022, global mean sea level (GMSL) continued to rise.

However, sea level does not rise equally everywhere: regional patterns of sea level change are dominated by local changes in ocean heat content and salinity.



Ocean acidification

- Global mean ocean pH declining at rates not seen in the past 26000 years

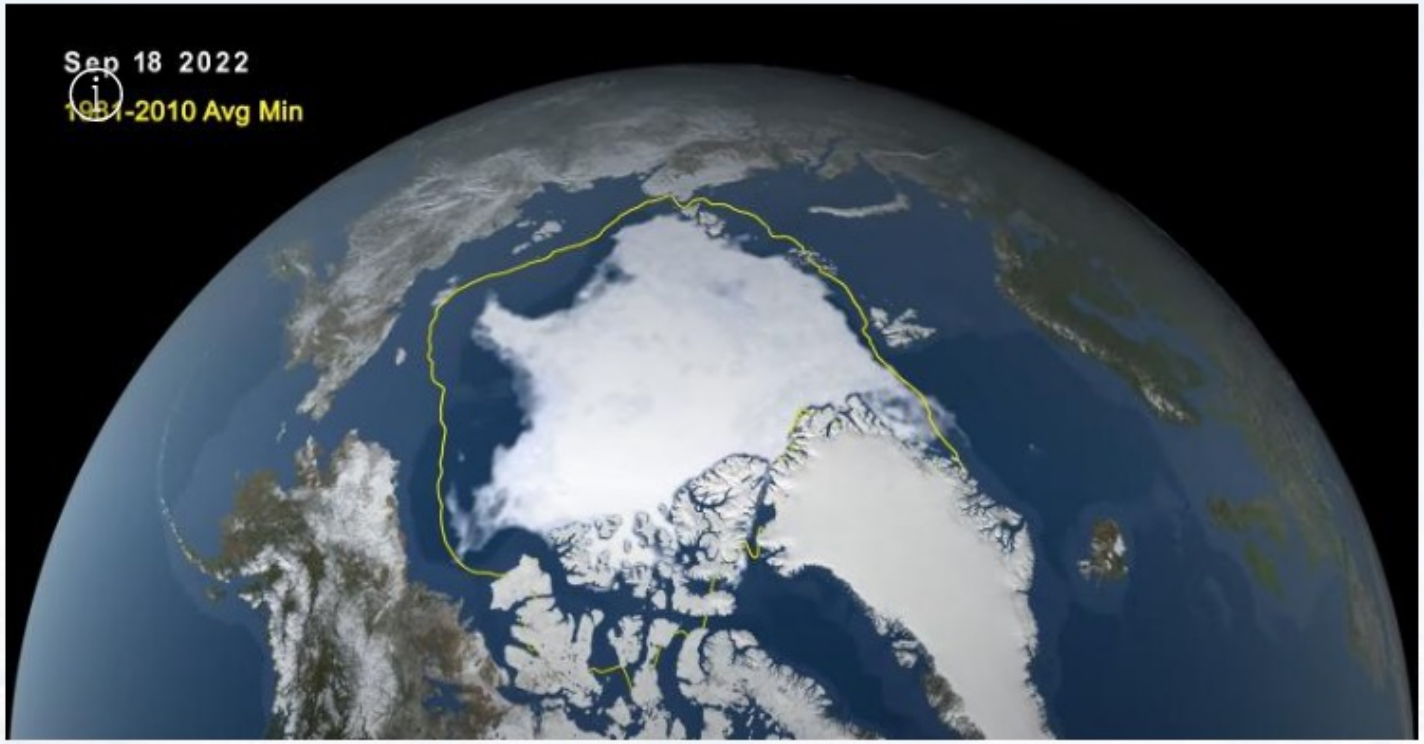


Global mean surface pH from E.U. Copernicus Marine Service Information (blue) covering the period 1985-2020. The shaded area indicates the estimated uncertainty in each estimate. Data from Copernicus Marine Environment Monitoring Service. Source: Met Office, United Kingdom.

Sea-Ice Extent

Arctic Sea Ice

Arctic sea-ice extent was below the long-term average for most of the year. The September extent was **1.54 million km^2 below the long-term mean extent**, making it tied for the 11th lowest monthly minimum ice extent in the satellite record.



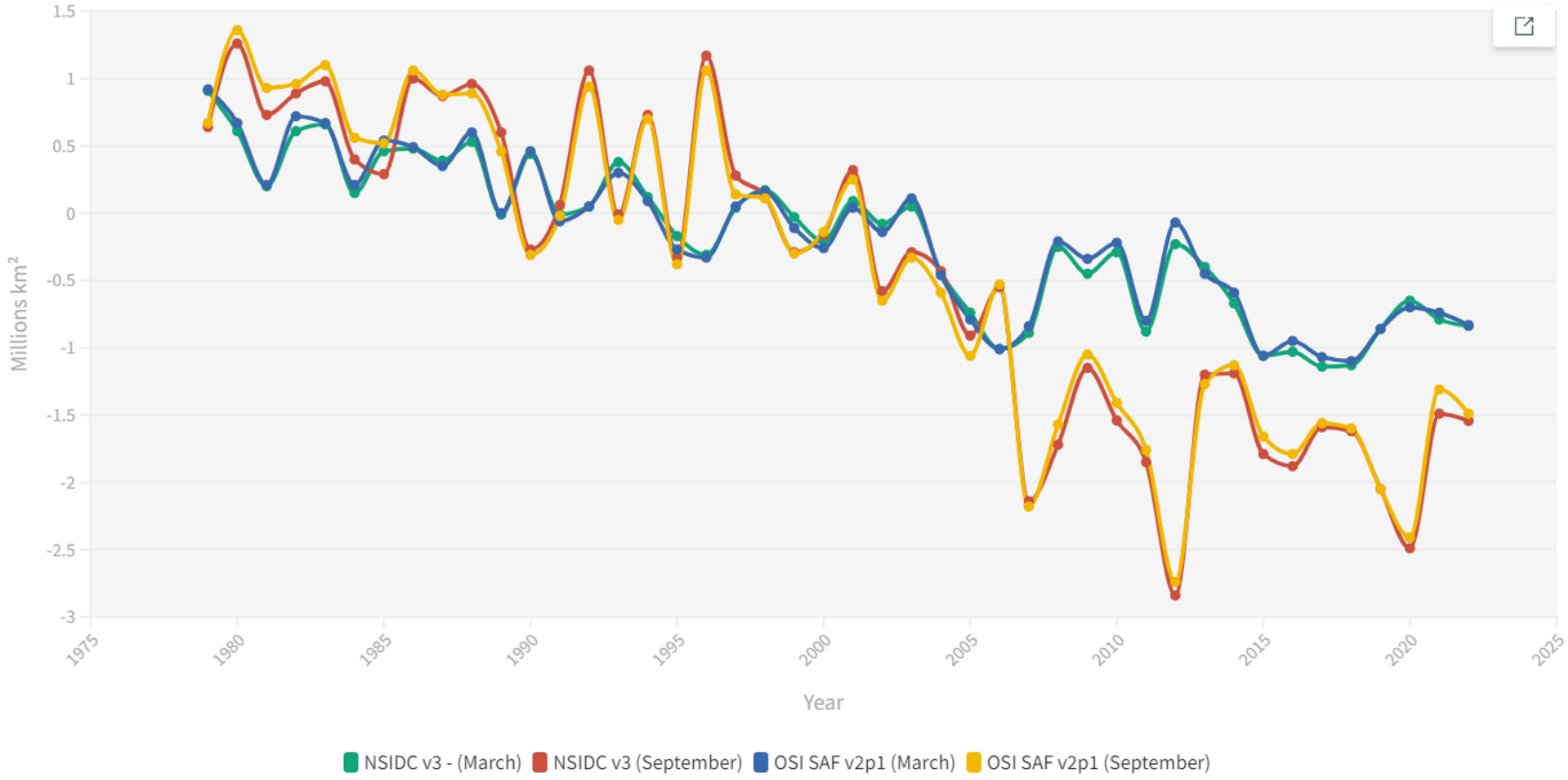
Minimum sea ice extent compared to the long-term average (1981-2010) in the Arctic on September 18, 2022.

Antarctic Sea Ice

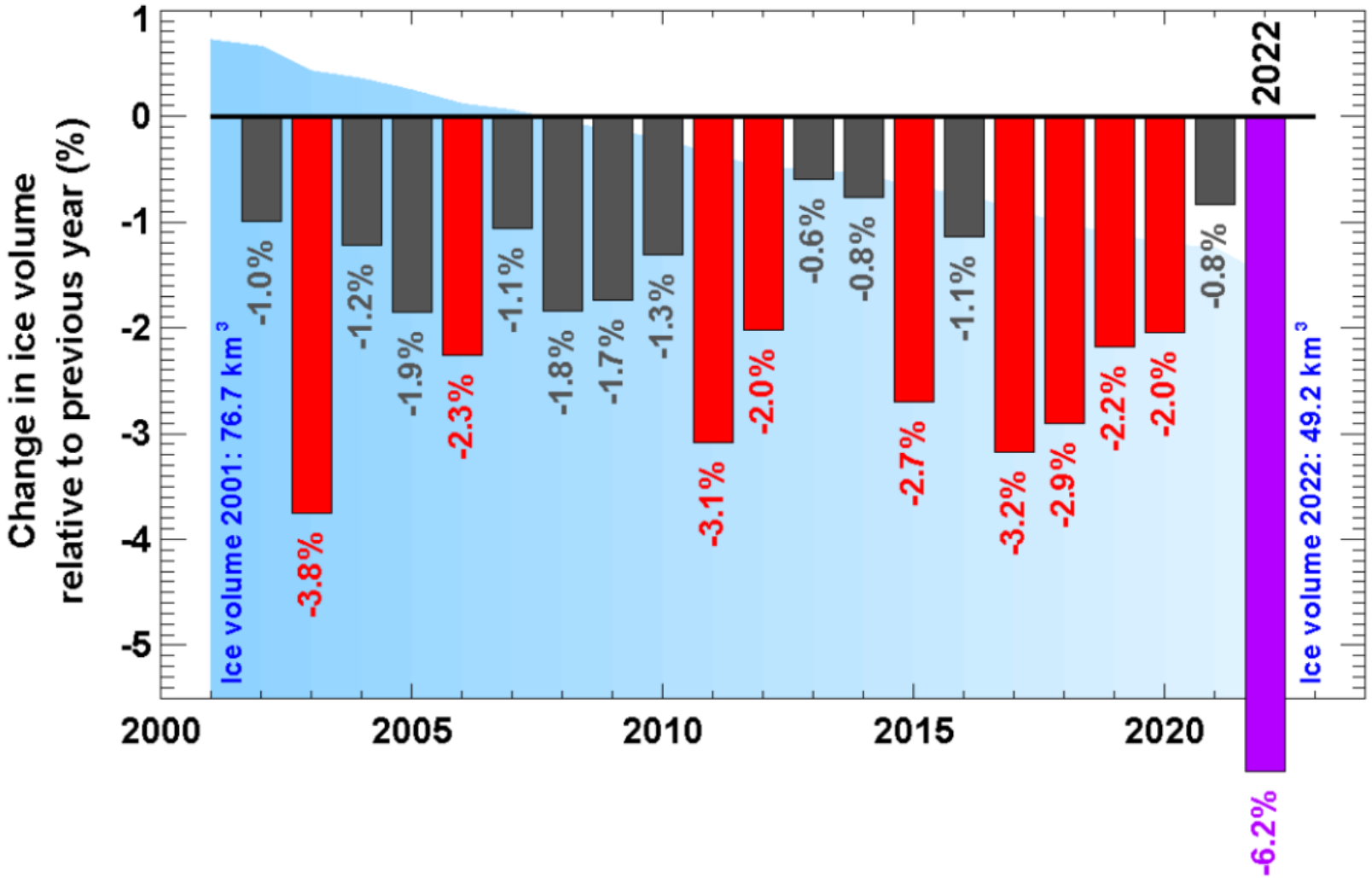
Antarctic sea-ice extent dropped to 1.92 million km2 on February 25 2022, the **lowest level on record** and almost 1 million km^2 below the long-term (1981-2010) mean.

Artic Sea-Ice Extent

- Difference from 1981-2010 average



Glacier Mass Loss



Exceptional Glacier Mass Loss in Swiss Alps

In the European Alps, records of glacier mass loss were shattered in 2022.

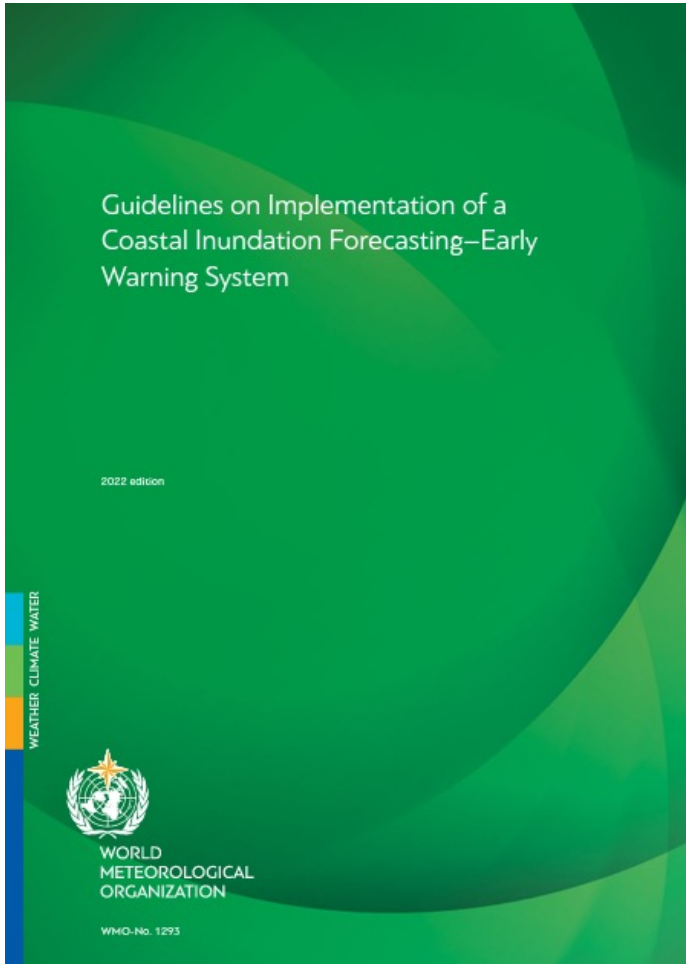
Mass losses were far beyond normal. In Switzerland **6% of the glacier ice volume was lost** between 2021 and 2022. There are three reasons for this extreme glacier melt.

1. Very little winter snow meant that the ice was unprotected in early summer.
2. Saharan dust blew over the Alps darkening the snow surface, making ice melt faster.
3. Long and persistent heat waves between May and early September 2022 led to massive ice loss.

Final remarks

- Observations and monitoring of the climate system give us information on global indicators
- Changes in the State of the Global Climate imply in turn, changes in the mechanisms of energy balance
- Atmospheric and oceanic circulation in response to those changes result in anomalous weather and climate patterns
- Such anomalies are usually the origin of extreme events
- Extreme events in specific variables (wind, temperature, sea level, waves, precipitation) increase hazards for coastal areas

WMO Guidance



Guidelines on Implementation of a Coastal Inundation Forecasting–Early Warning System

WMO 1293 (2022)

Language(s): English

Scan QR code

Contacts

WMO

https://public.wmo.int/en/our-mandate/climate/wmo-statement-state-of-global-climate

Twitter: @WMO

#NAPExpo #EO4Impact

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GROUP ON EARTH OBSERVATIONS

NAPEXPO CHILE 2023

Towards the new guidance of coastal adaptation

Joy Deep Chakrabartty

GEO Blue Planet Fellow

NOAA/NESDIS/STAR/SOCD

BLUE PLANET

Why is Ocean important ?

70% Surface

40% Population

3 Billion People

$1.5 T/year

80% Trade

50% O_2

200% by 2030

Why we need Coastal Adaptation Plan ?

Why we need Coastal NAP ?

Hazard

Why we need Coastal NAP ?

Hazard

Population & Vulnerability

Why we need Coastal NAP ?

Hazard

Population &
Vulnerability

Marine
Eco-system

Why we need Coastal NAP ?

Hazard

Population & Vulnerability

Marine Eco-system

Multi-jurisdictional

Why we need Coastal NAP ?

Hazard

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Multi-jurisdictional

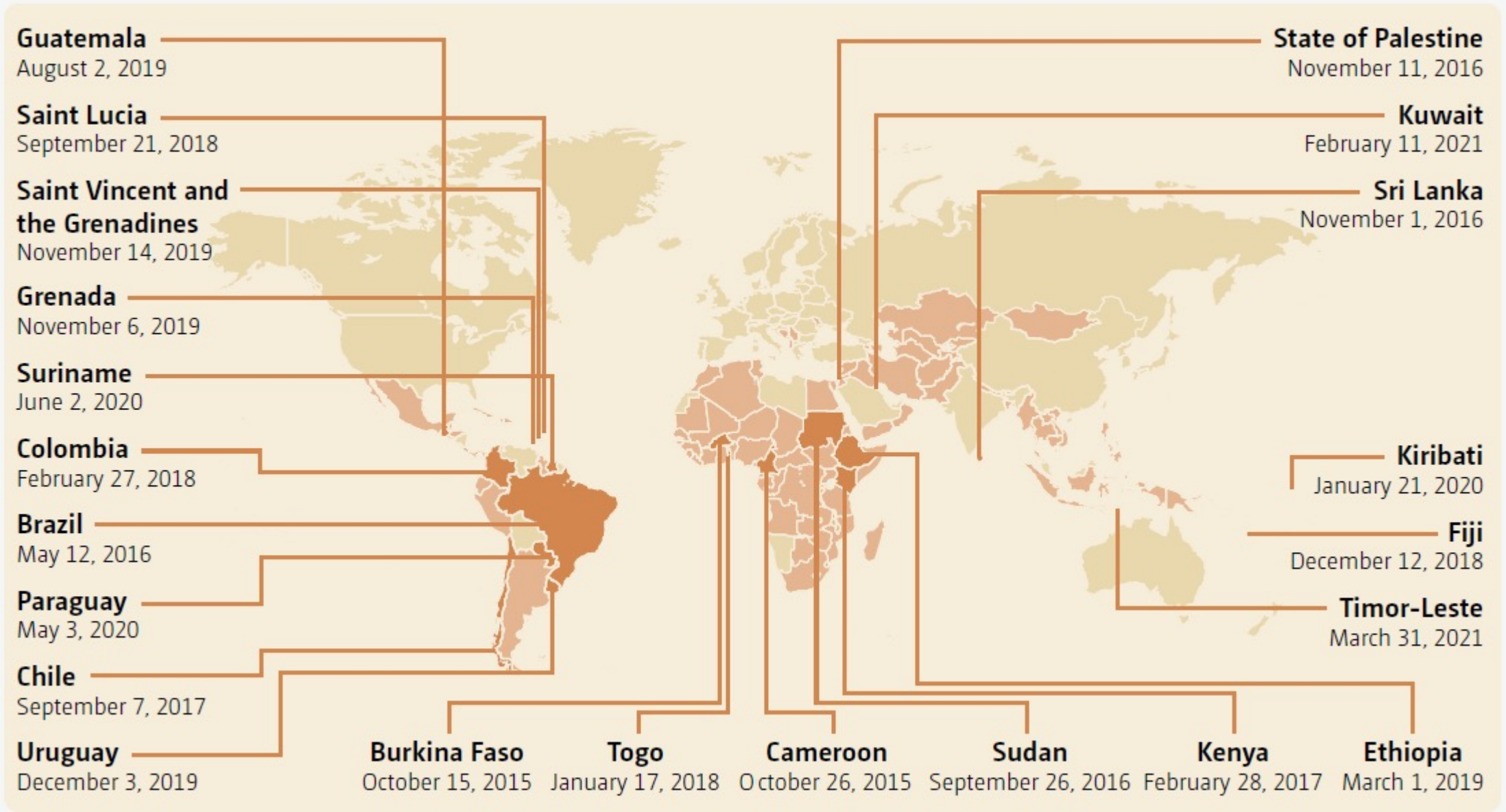
Modelling & Prediction

BLUE PLANET

What are we doing to support Coastal NAPs?

- Analysis of existing NAPs
- Engagement with country stakeholders
- Develop technical guidance for coastal NAPs

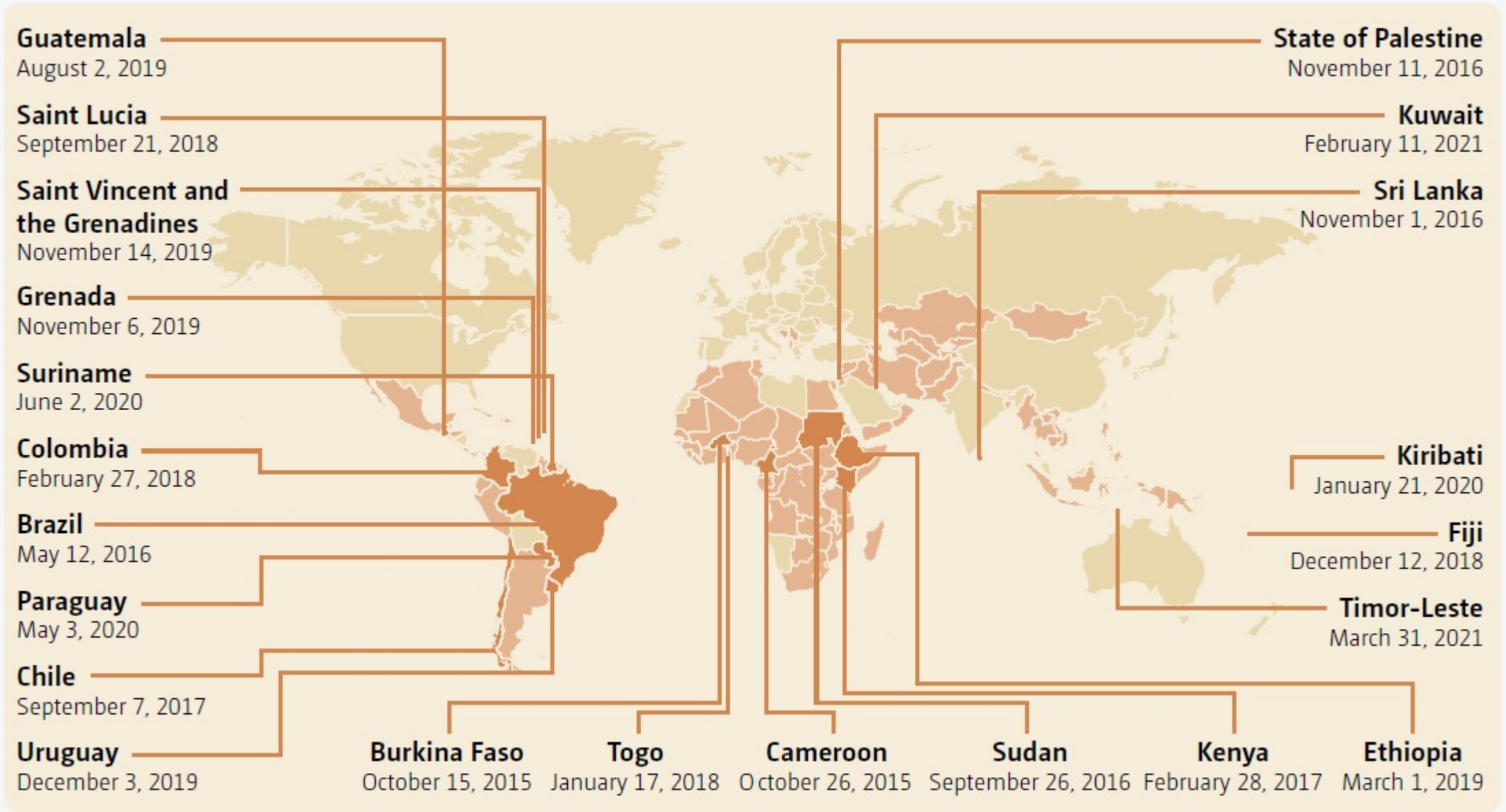
Existing NAPs



42 NAPs

GEO BLUE PLANET

Existing NAPs



42 NAPs

8 Sectoral NAPs

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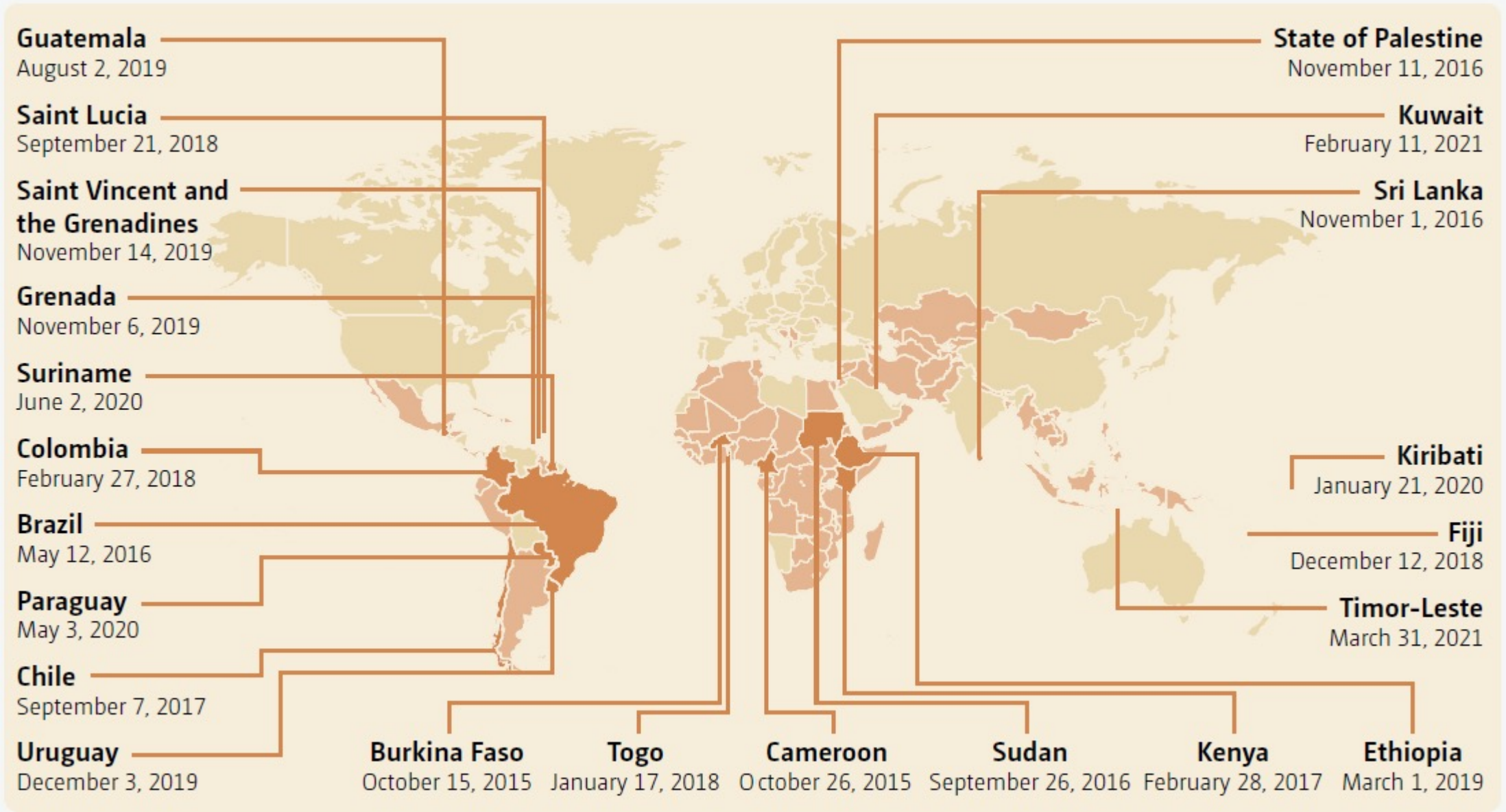
Existing NAPs



42 NAPs

8 Sectoral NAPs

1 Coastal NAP

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Coastal components in Existing NAPs

Hazard

Baseline Information

Climate Scenario

Climate Prediction

Coastal Ecosystem & Biodiversity

Vulnerable Group

Coastal components in Existing NAPs

Hazard

Baseline Information

Climate Scenario

Climate Prediction

Coastal Ecosystem & Biodiversity

Vulnerable Group

Economic

Data Access

Gender Sensitivity

Infrastructure

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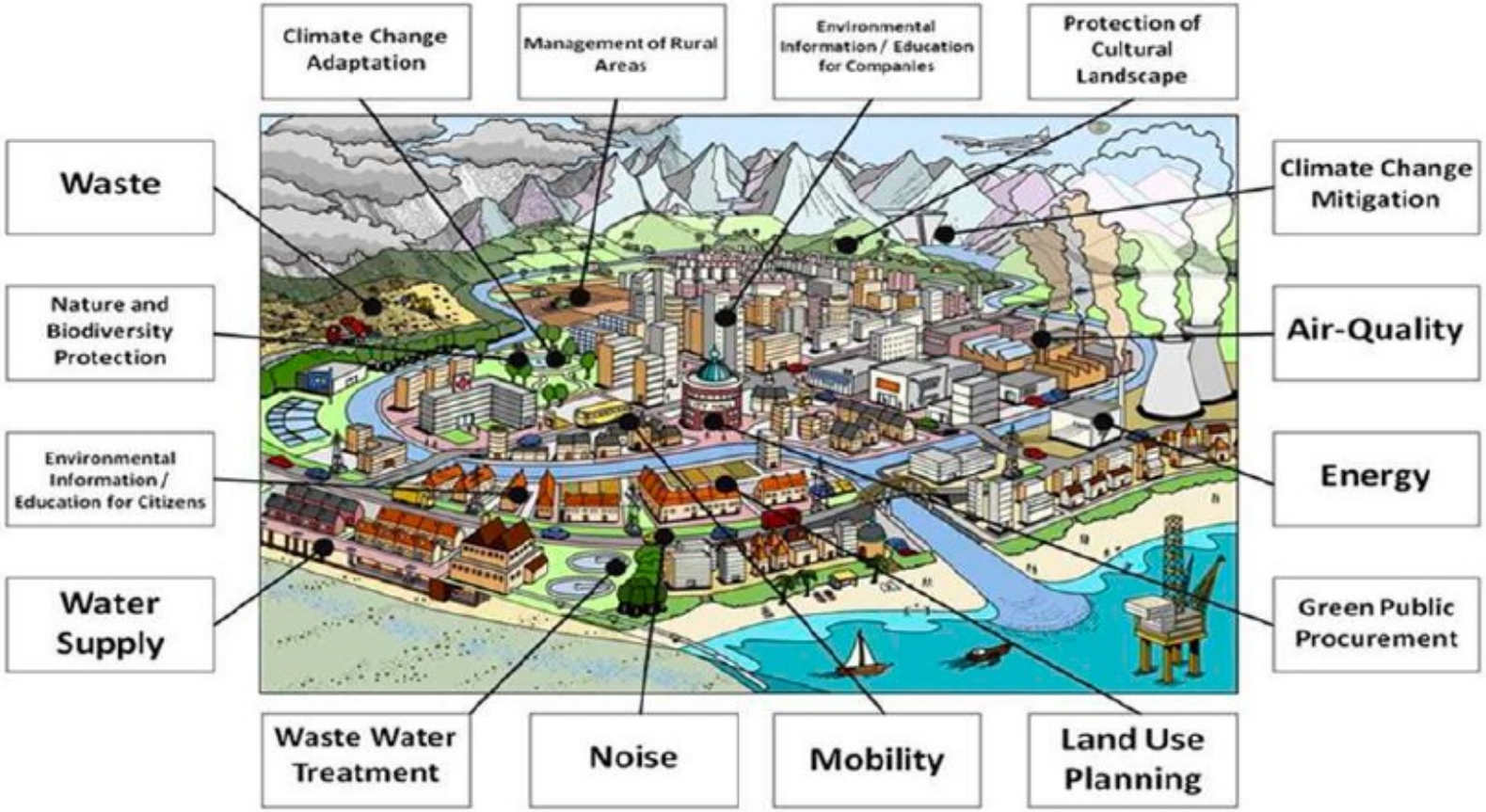
Approach to Coastal NAP

Integrated Coastal (Zone) Management



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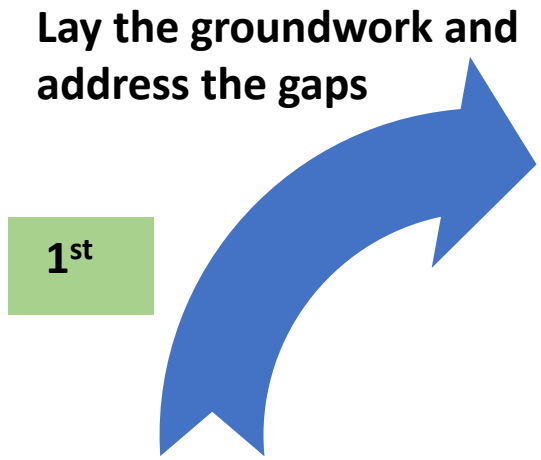
Coastal NAP process ?

- Based on modern scientific approach and best practices available.
- Should enhance the cross-sectoral integration of the sectoral NAPs
- Provide guidance to overcome the identified knowledge gaps and barriers.



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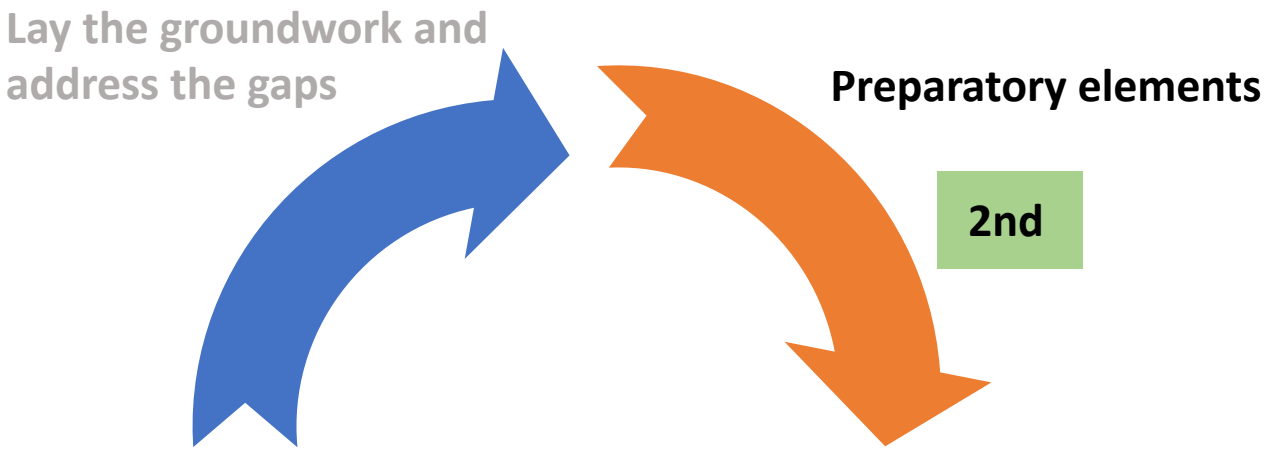

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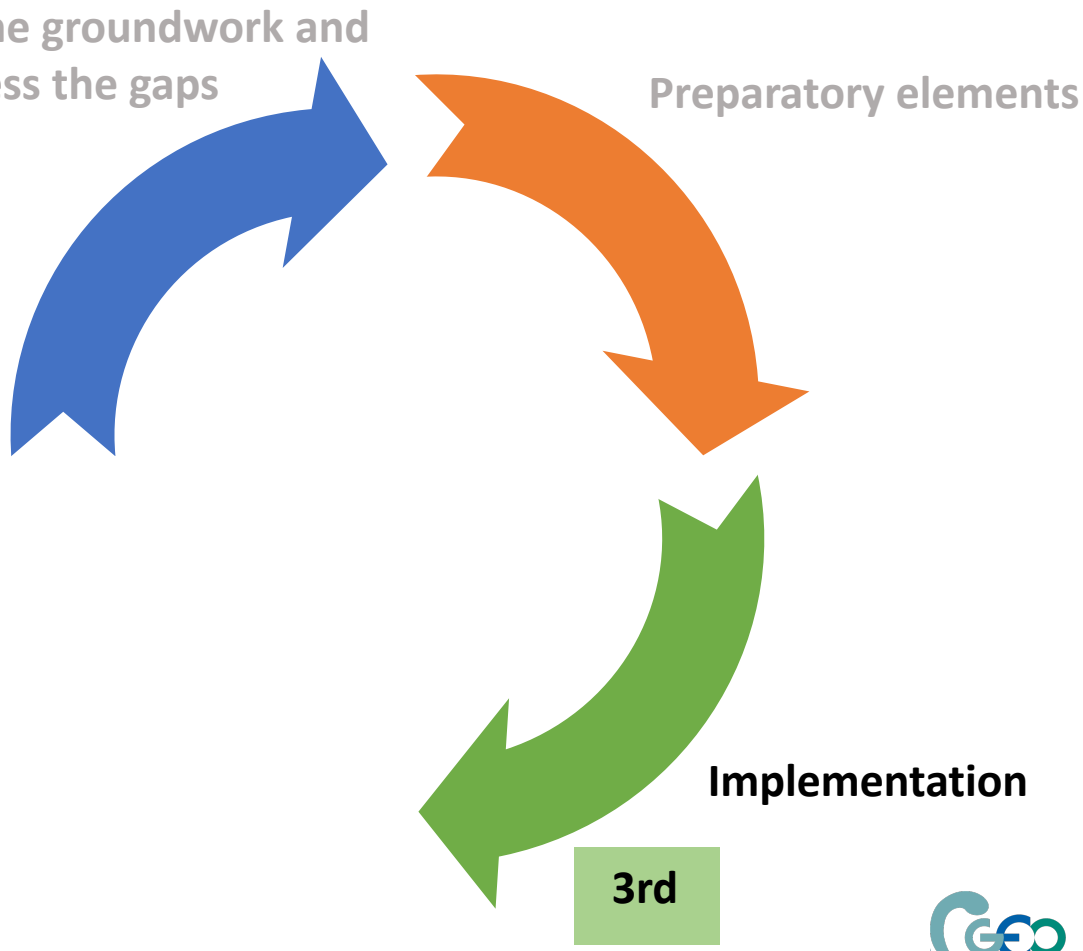

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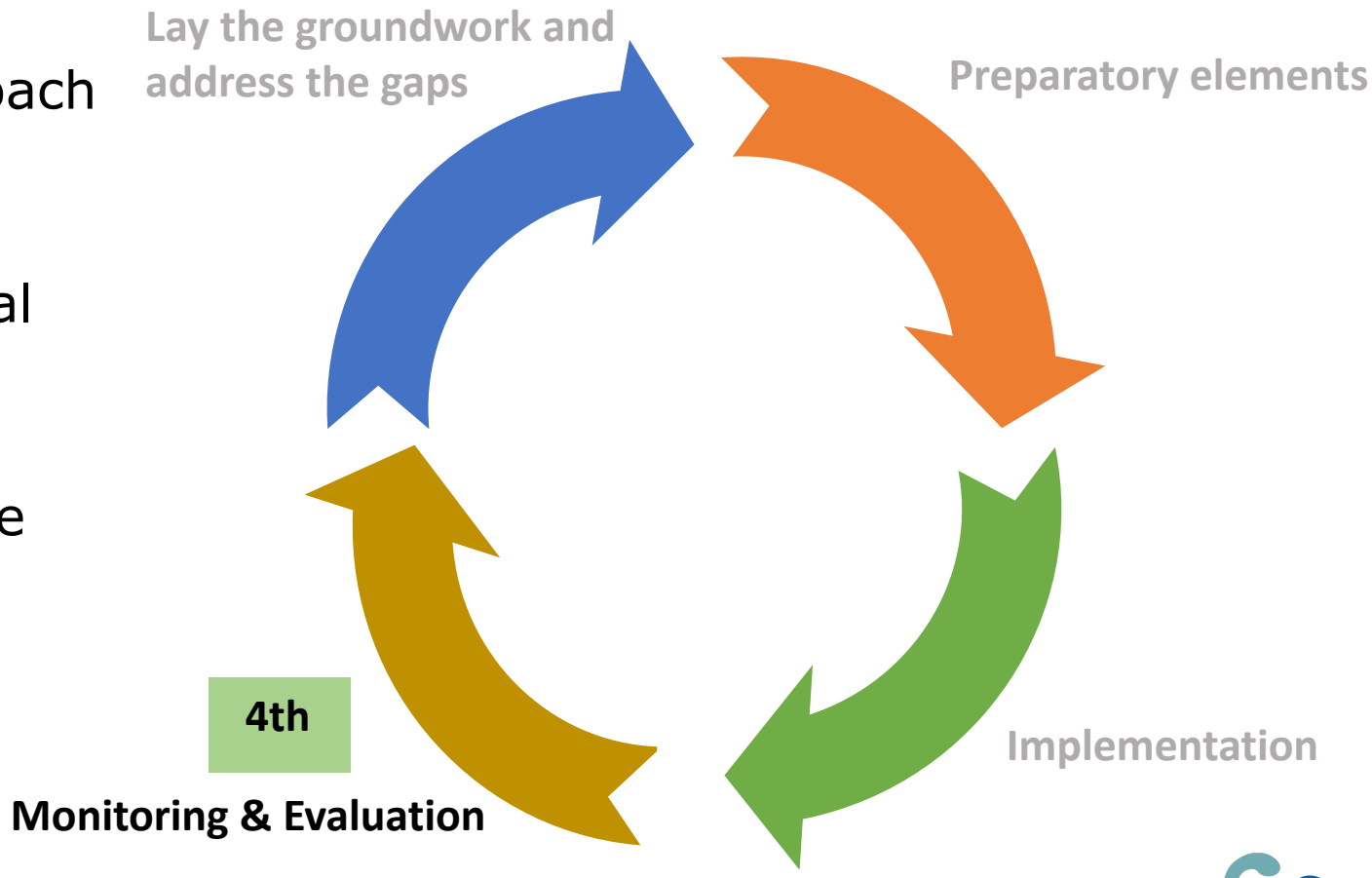


Phase 1: Laying the ground

Vulnerable Group

Governance

Country Driven

Baseline Information

Knowledge Gap

Workshop training

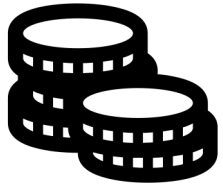
Phase 2: Preparatory elements

Vulnerable Assessment

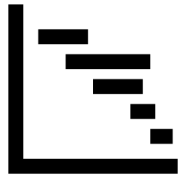
Adaptation options identification

Adaptation options prioritisation

Phase 3: Implementation



Resource & Expertise



Plan Timeline

Capacity Building

Country Driven

BLUE PLANET

Phase 4: Monitoring and evaluation

Evaluation framework and timeline

Country Driven

Identification of indicators

Monitoring of progress

Country Driven

Lesson learned

Country Driven

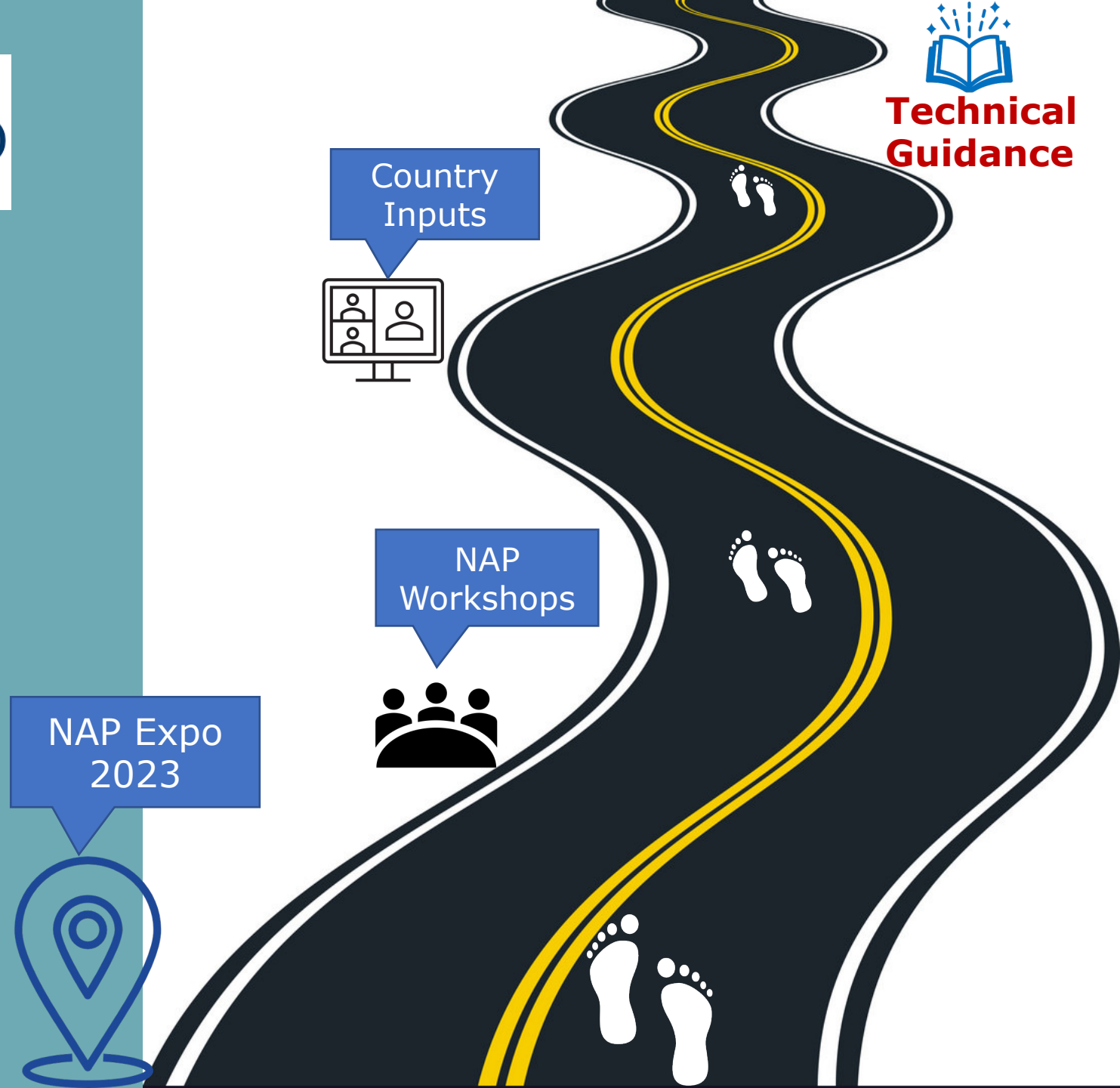
Technical Guidance for Coastal NAP

A pathway for sustainable coastal development

NAP Expo 2023

Technical Guidance for Coastal NAP

A pathway for sustainable coastal development



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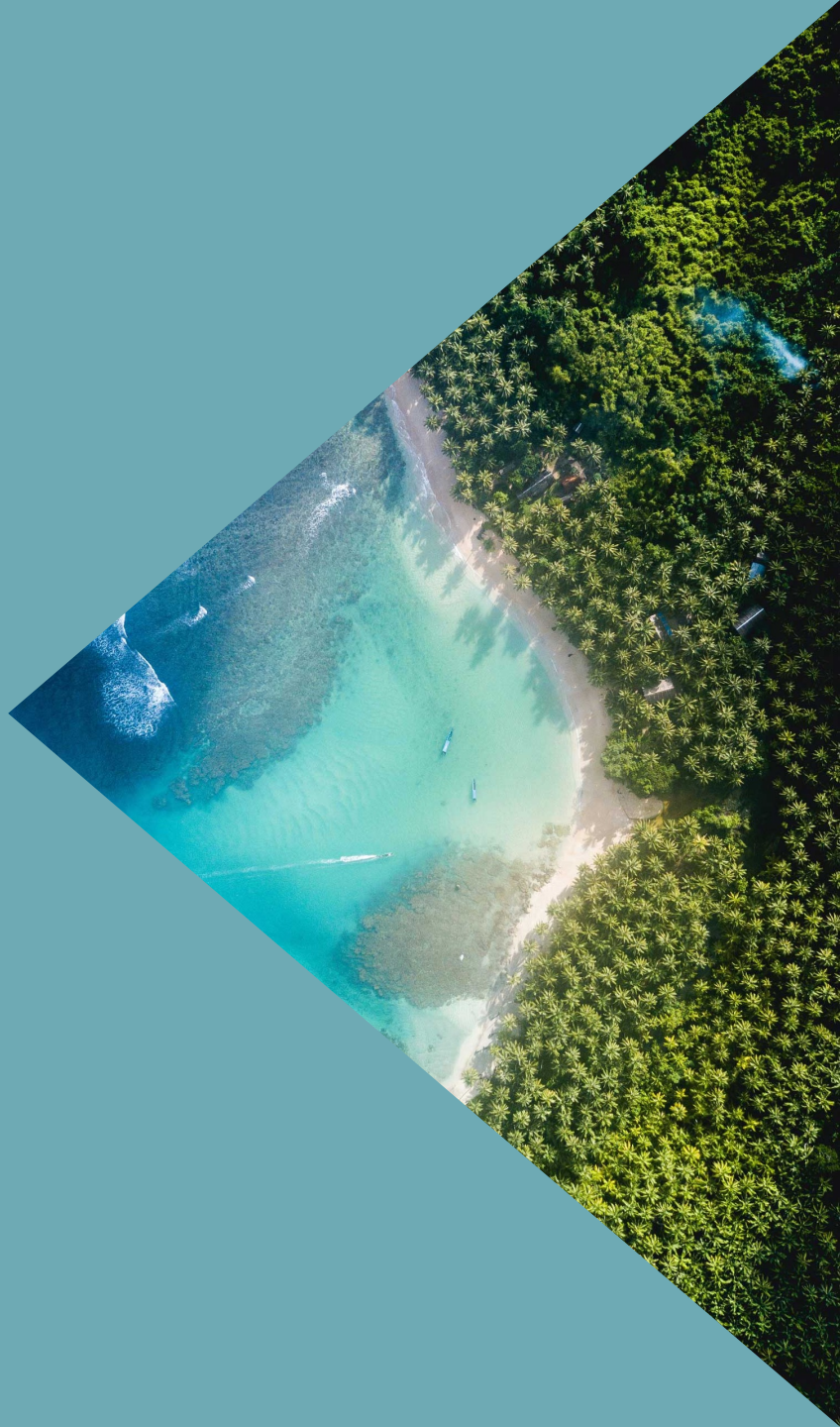
THANK YOU!



Contacts

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NAPEXPO CHILE 2023

Survey

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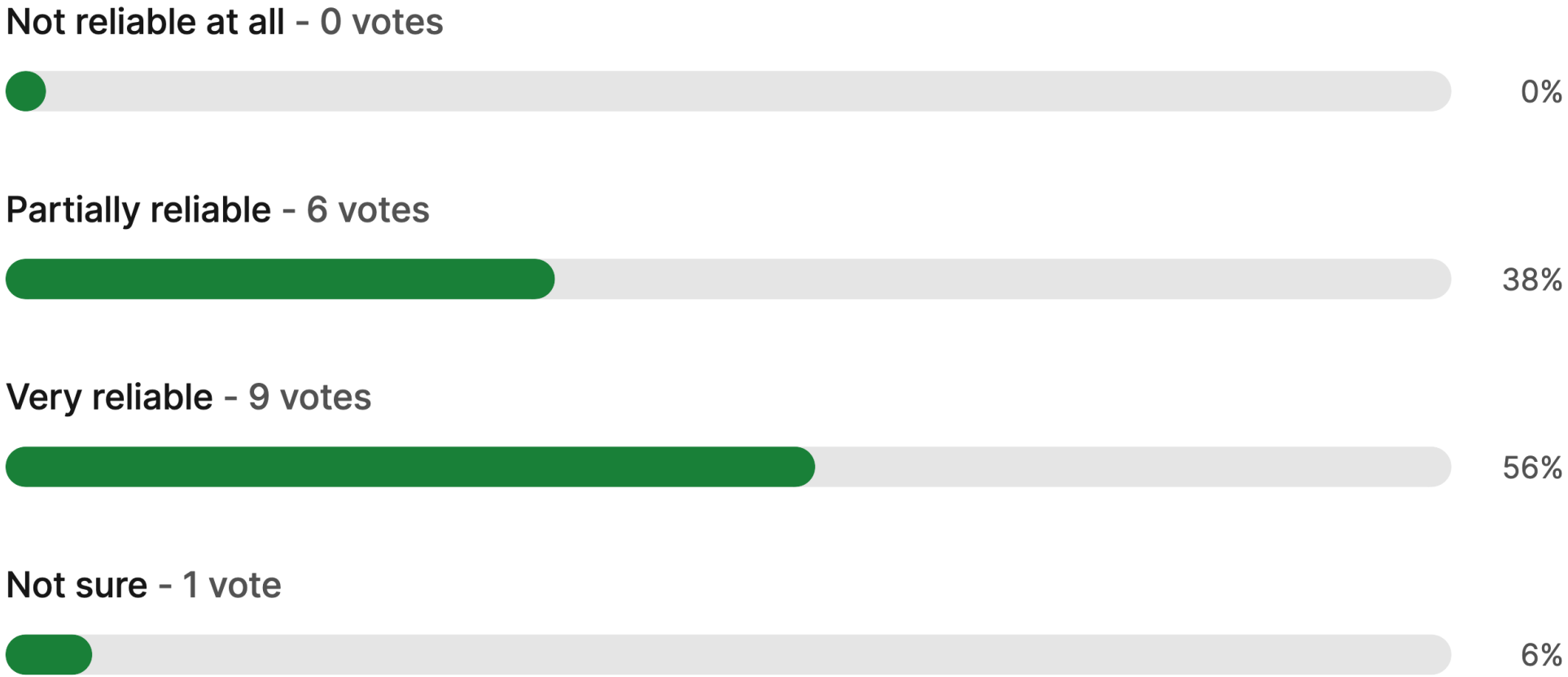
How reliable do you think Earth Observation data is for National Adaptation Planning?

Multiple Choice Poll | 16 votes | 16 participants



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After listening to this session, are you planning to use Earth Observation data for your NAP process?

Multiple Choice Poll | 12 votes | 12 participants

Yes - 6 votes

No - 0 votes

Already using - 6 votes

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For which components do you need Earth Observation support in your NAP the most?

Multiple Choice Poll | 14 votes | 14 participants

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Jonathan Hodge
GEO Blue Planet
Commonwealth Scientific and Industrial Research Organisation (CSIRO) Chile

Andria Rosado-Grinage
Coastal Zone Management Authority & Institute (CZMAI)
Belize

David Ongo Nyang'acha
Regional Centre For Mapping Of Resources For Development (RCMRD)
Digital Earth Africa

Panel discussion

1) Why is there such a disconnect between the current NAPs and the extent of scientific literature and availability of case studies on coastal adaptation?

2) What argument do you make for the inclusion of coastal areas in your country's NAPs?

3) How do you elevate the importance of the coastal areas so that they become a significant feature of the NAPs or warrant a stand-alone sectoral NAP?

4) Moving beyond planning and taking action, can you provide examples of successful activities and solutions involving Earth observations and climate services for coastal adaptation?

5) What could be new and different in this supplementary NAP guidance that would change the paradigm towards scaled up adaptation in coastal areas?