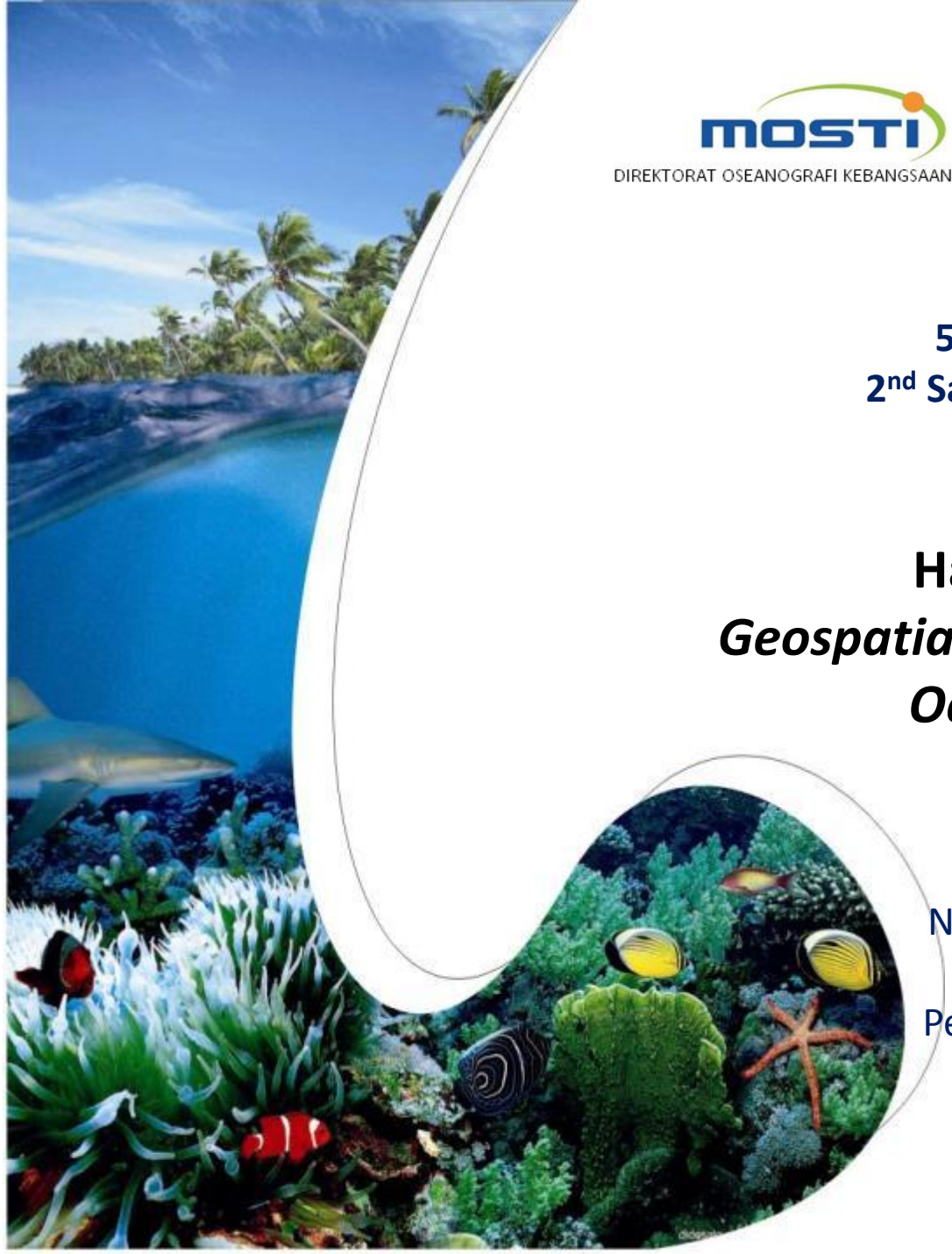


DIREKTORAT OSEANOGRAFI KEBANGSAAN (NOD)

MOSTI COMMERCIALISATION YEAR 2014
STI for Wealth Creation

5th Malaysia Geospatial Forum 2014
2nd Sabah International Surveyors' Congress
Fostering Domestic capacity for economic growth
11-12 Mac 2014
Sutera Harbour Resort, Kota Kinabalu, Sabah

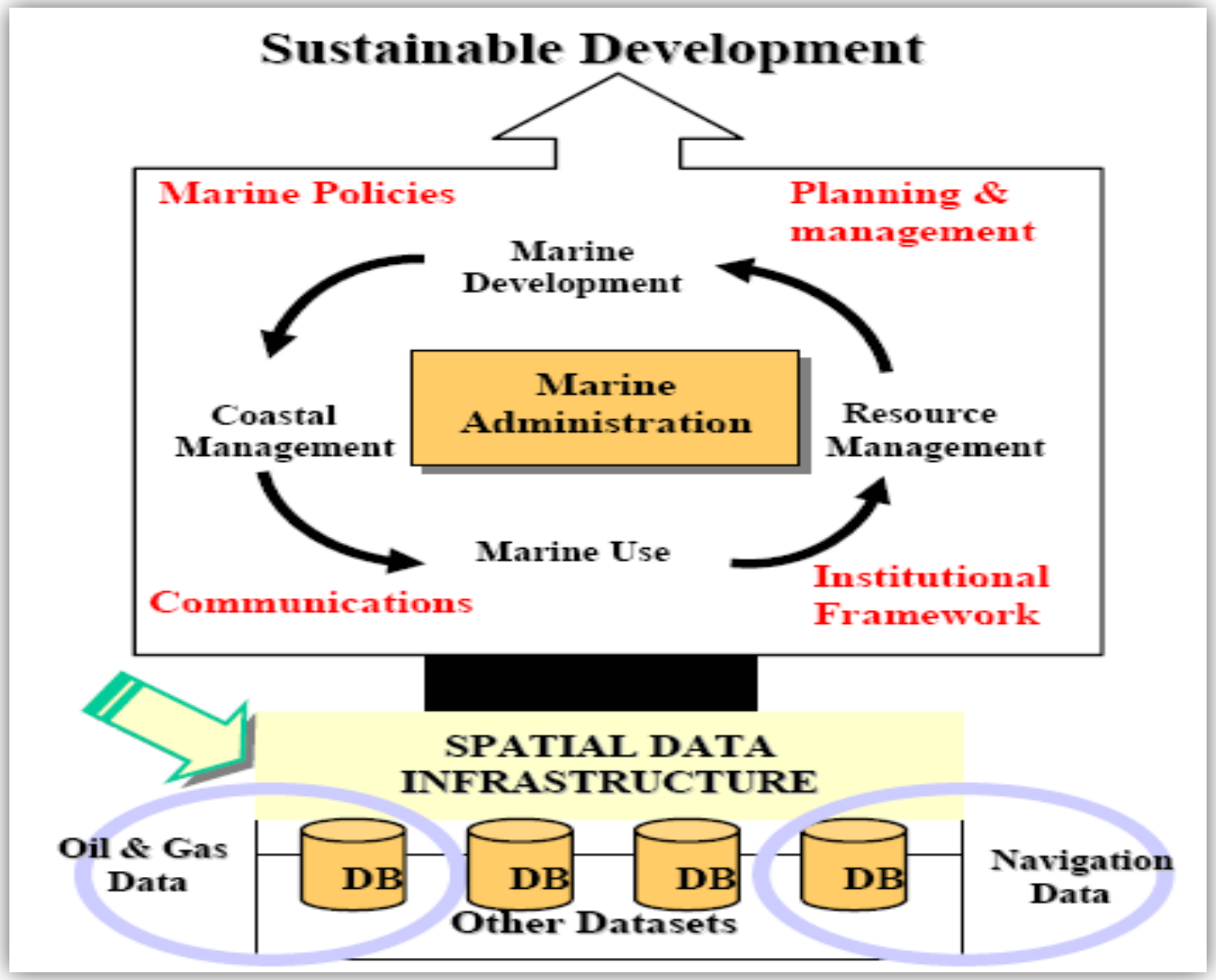
Harnessing Domestic Wealth
Geospatial Technology in the Management of Ocean and Coastal Resources

By
Nor Aieni Haji Mokhtar
National Oceanography Directorate, Ministry of Science, Technology and Innovation/
Perdana School of STI, Policy and Governance, University Technology Malaysia
International City Campus, Kuala Lumpur

PRESENTATION OUTLINE
Harnessing Domestic Wealth

- Introduction
  Ocean Policy and Ocean Data Management
- Malaysian Environmental project for Sustainable Ocean (MALESO)
- MyNODC & MSP, CT Atlas
- Coral Triangle Initiative
- Conclusion

GOALS & OBJECTIVES



A NATIONAL OCEAN POLICY FRAMEWORK

A Healthy Ocean Sector is Essential for a High-Income Nation

The move to a GREEN FUTURE

NATIONAL OCEAN POLICY

Transforming the Ocean Sector

By

Ministry of Science, Technology and Innovation (MOSTI)
in collaboration
with ministries and government agencies in Malaysia

DASAR LAUTAN NEGARA

Mentransformasikan Sektor Lautan

Oleh

Kementerian Sains, Teknologi dan Inovasi Malaysia (MOSTI)
dengan kerjasama
kementerian-kementerian dan agensi-agensi kerajaan di Malaysia

2011-2020

ST NSTIP 1
Generating, deploying and diffusing STI knowledge

ST5 NOP

Establish structures collection, storage, archive and sharing of ocean-related data by government agencies with multi-sector user to enable facilitation of innovation-led ocean economy, good governance and wise management of the ocean based on best available science and adequate information, and empowerment of marine talent

GOAL 1 NOP
Understand, Conserve & Restore Ocean Environment

ST NSTIP 2
Developing, harnessing and intensifying talent

ST3 NOP

Attract, nurture and retain highly skilled and specialised workforce and marine science and innovation entrepreneurs for a productive and healthy ocean sector

GOAL 4 NOP
Achieve Participatory, Responsible and Sustainable Development for Coast and Islands

ST NSTIP 3
Energising Industries

ST1 NOP

Facilitate public-private partnerships and value innovation of specialised marine industries, maximising sector and geographic advantages of economic clusters in growth corridors to achieve high-income and sustainable high-growth

GOAL 2 NOP
Support Sustainable Economic Growth and Opportunities

ST NSTIP 4
Transforming STI governance framework

ST4 NOP

Rationalising the organisation and structure of the relevant government agencies to optimise governance and implement best ocean management practices, including comprehensive engagement internationally to take effective action against the challenges and opportunities as well as to enable conciliation and dispute resolution

GOAL 3 NOP
Practice Good Ocean Governance

ST NSTIP 5
Enculturation of STI

ST2 NOP

Build vibrant and livable coastal cities and towns, institute measures to develop a climate resilient ocean sector, promote ocean renewable energy, implement marine spatial planning approaches to strengthen ecosystem-based management efforts, enhance coastal and coastal ecological assets and protect maritime heritage and build environment

GOAL 4 NOP
Achieve Participatory, Responsible and Sustainable Development for Coast and Islands

FOUNDATION

STI INCULTURATION, ETHICS AND HUMANITY

NATIONAL SCIENCE, TECHNOLOGY AND INNOVATION POLICY (NSTIP)
AND
NATIONAL OCEAN POLICY (NOP)

Economic Value

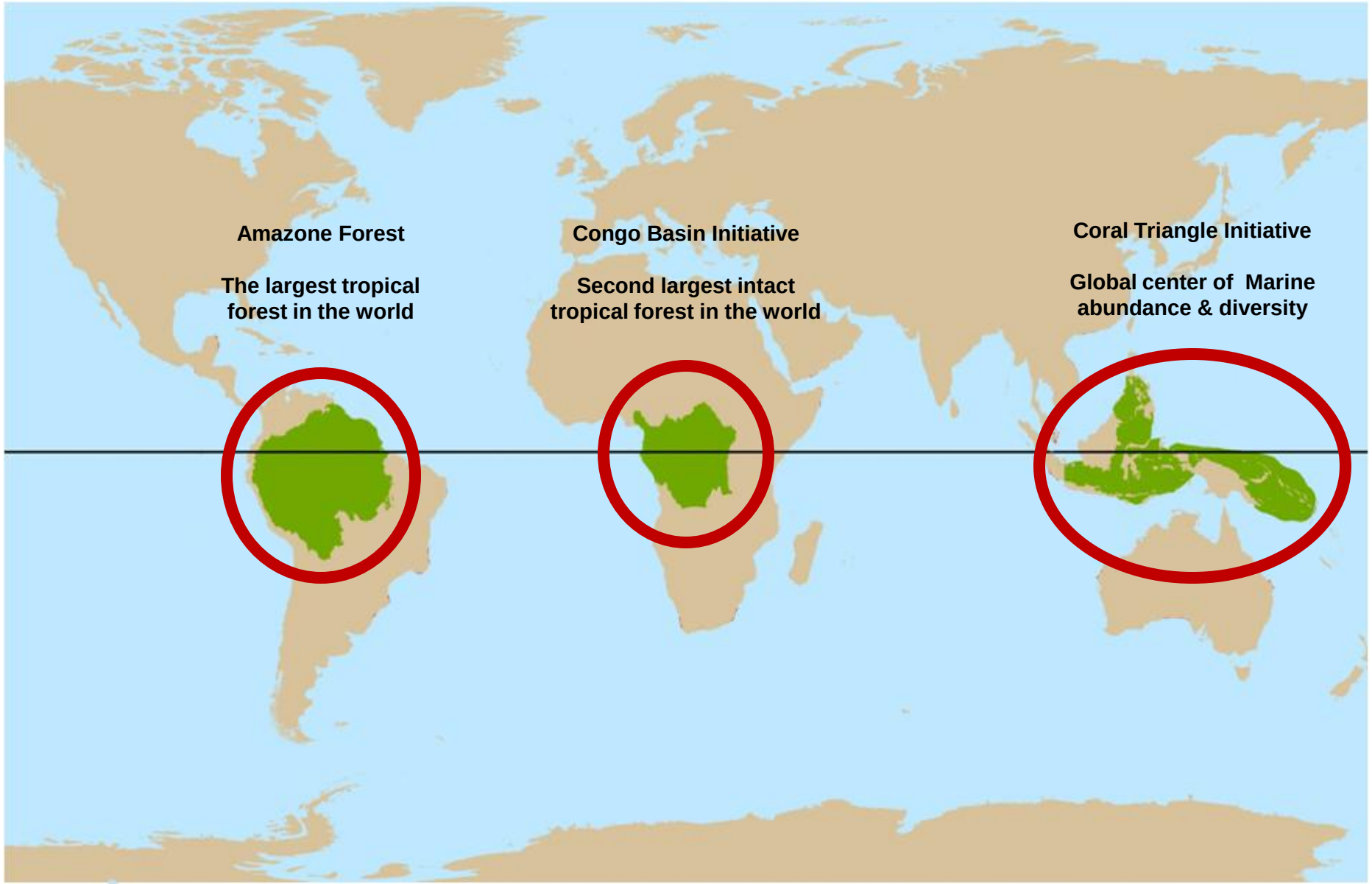
THE VALUE OF THE MARITIME ESTATE

- The value of Malaysia's 'Maritime Sector' is generated by a wide range of economic and resource-use activities, including *inter alia*:

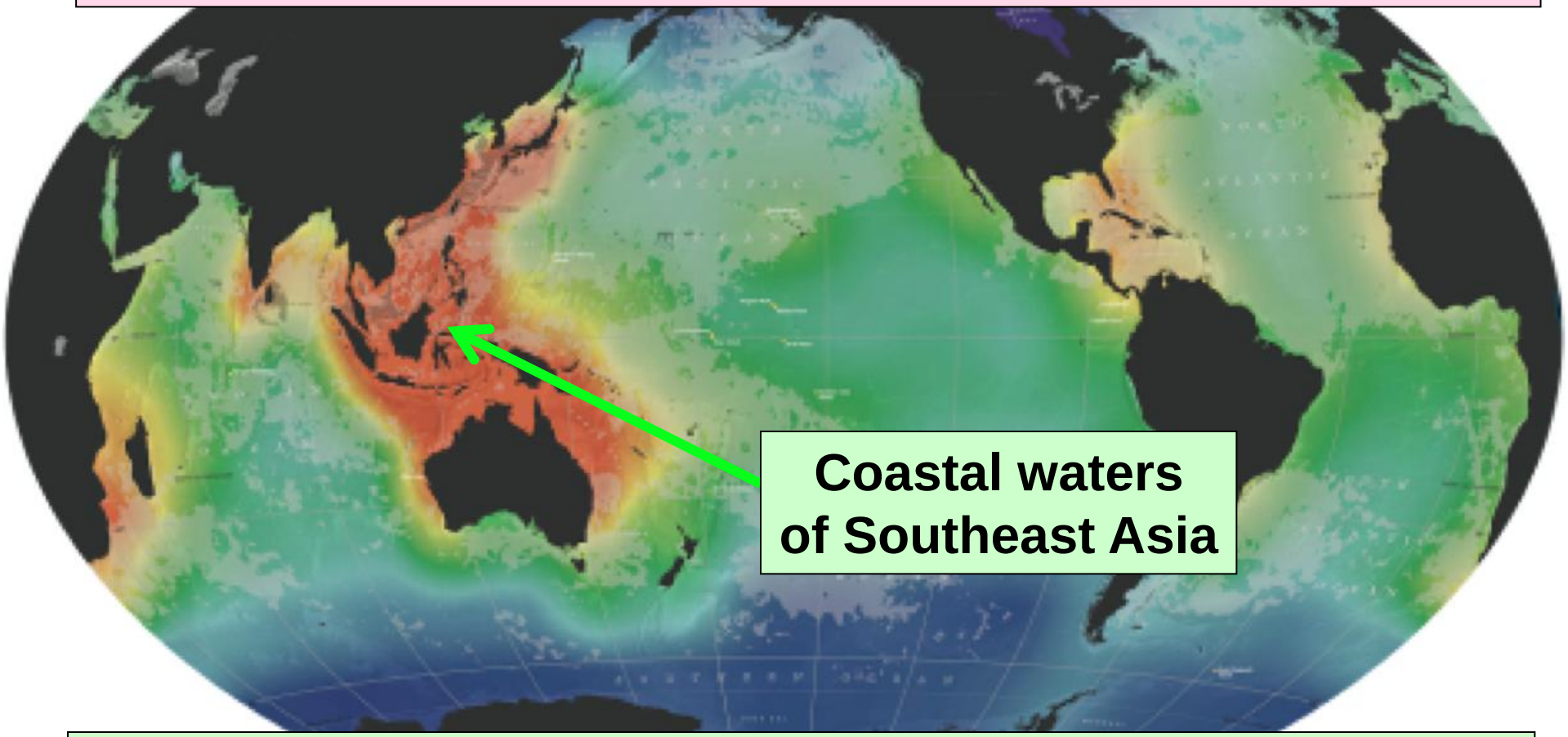
  - Maritime Transport
  - Marine Fisheries & Aquaculture
  - Marine and Coastal Tourism
  - Energy (oil and gas, and renewable)
  - Maritime Defence
  - Marine Consulting
  - Marine Education
  - Marine Engineering (including shipbuilding)
  - Marine Biotechnology
  - Maritime Law
  - Seabed Mining

Resource Management
Economic Benefits
SUSTAINABLE GROWTH

WORLD BIODIVERSITY CENTERS

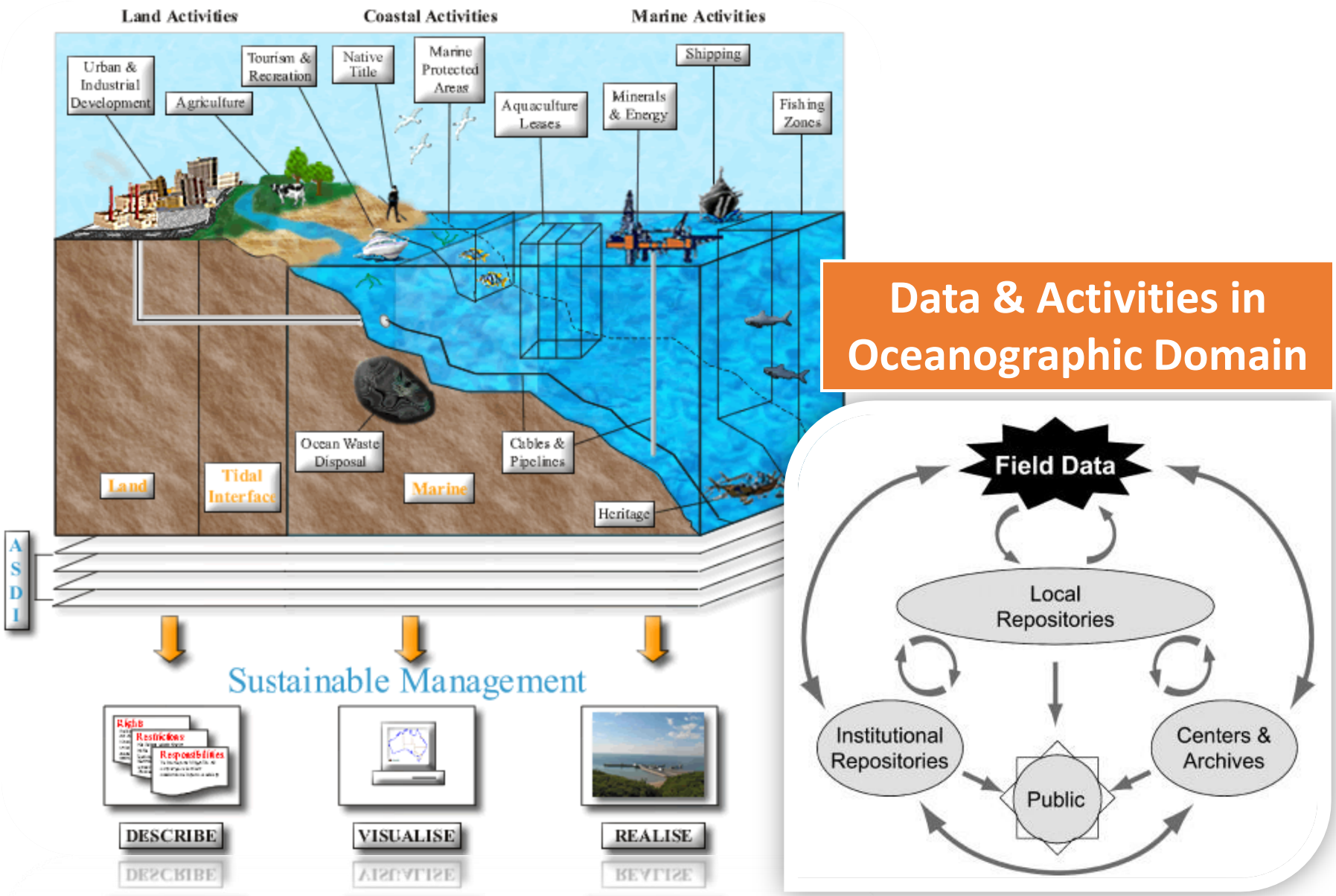


Global patterns of species richness as compiled from OBIS Database



- Maximum diversity in Southeast Asia
- A region with high impacts of human activity/climate change
- A region of highest potential diversity

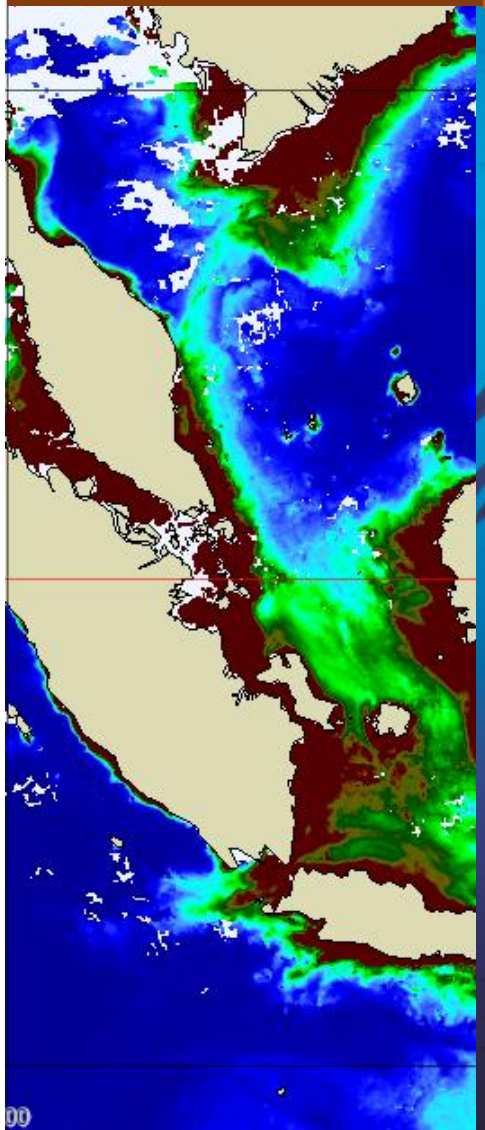
The Seas around us; Malaysia as Maritime Nation

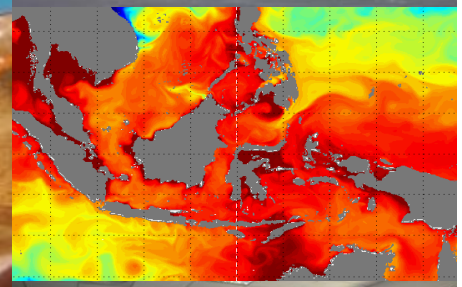


Data & Activities in Oceanographic Domain

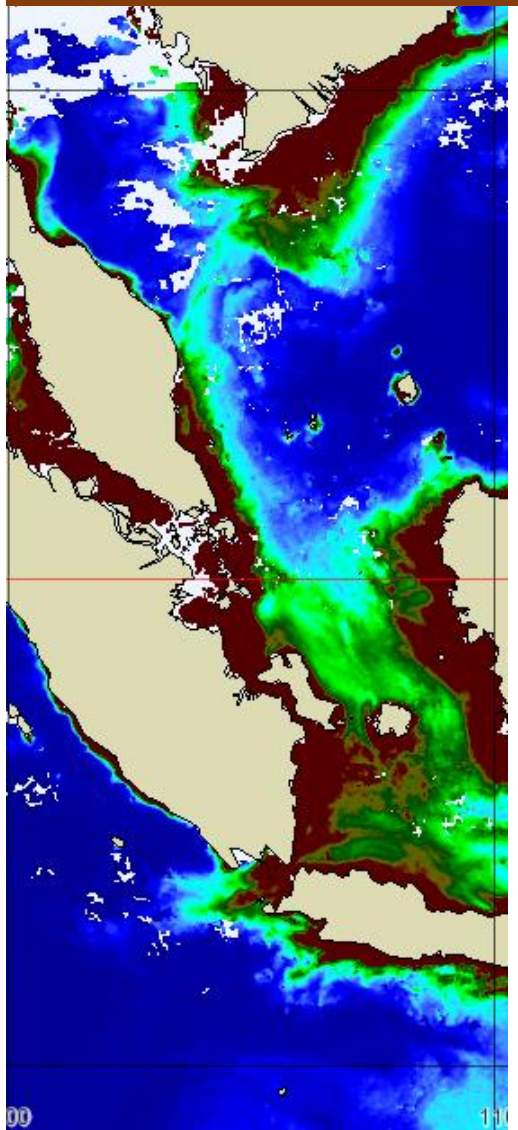
Mal**a**ysian **E**nvironmental project for **S**ustainable **O**cean

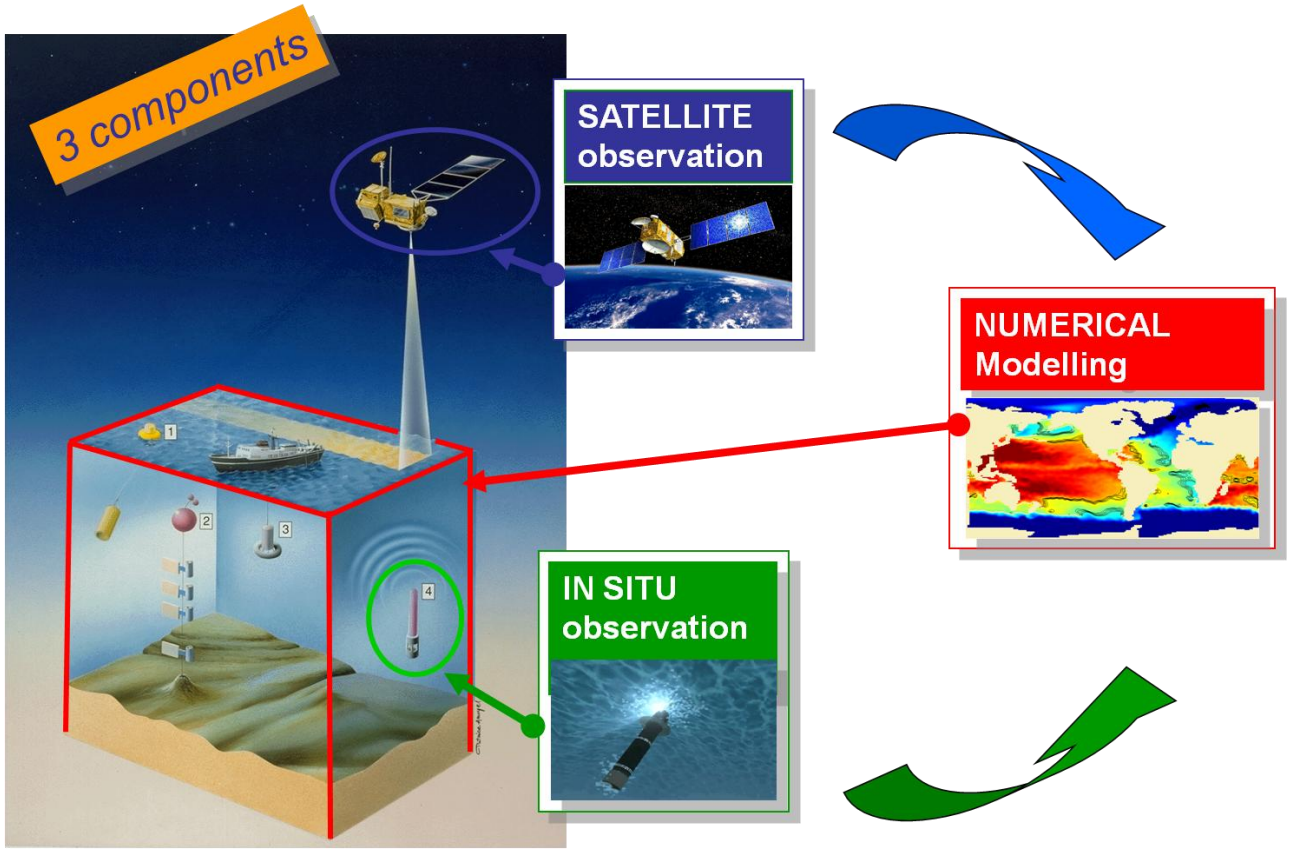
Collect and Provide Ocean Data	Monitor and Predict Evolution of Malaysian Resources	Training & Applications Development for Sustainable Ocean	MALESO SOLUTION



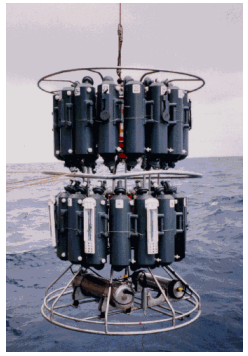


Collect and Provide Ocean Data





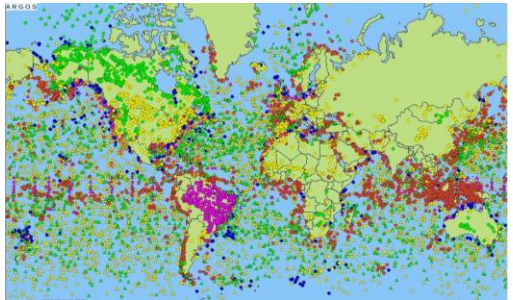
In situ observations



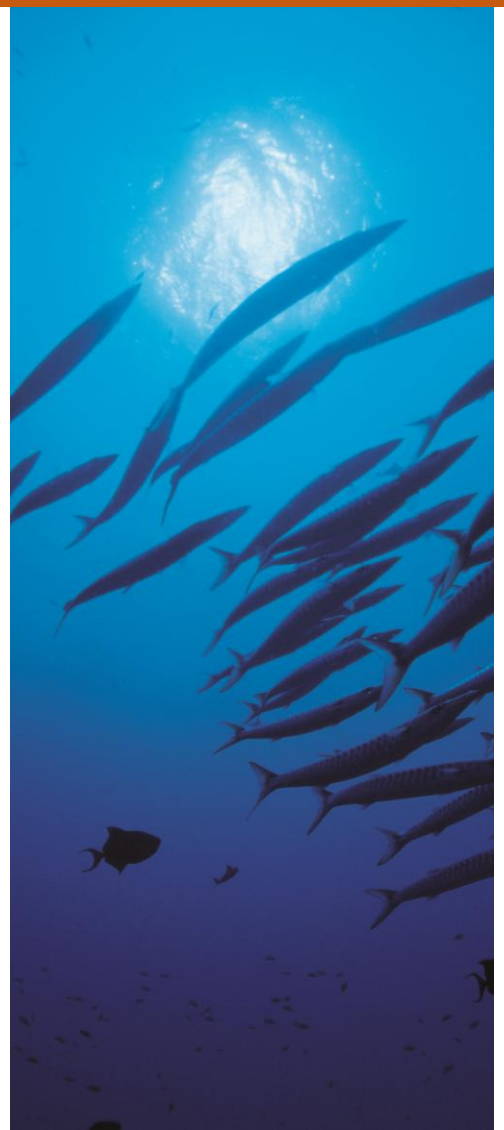


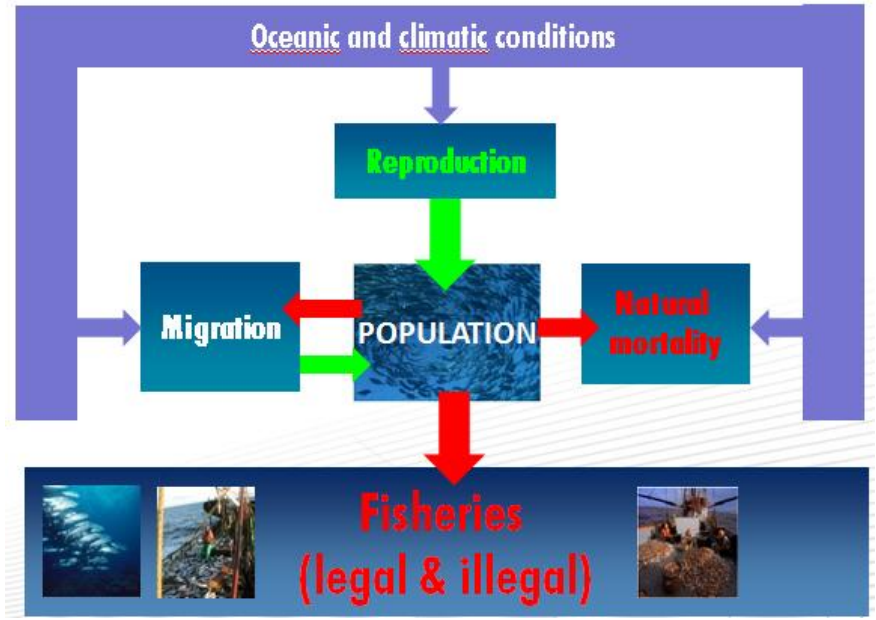

- Oceanographic in situ data:
  - ADCP
  - Buoys (Argo, moored buoys…)
  - Sensors on ships
  - Temperature/Salinity profiles (CTD, XBT, Argo floats, moorings…)
  - Surface currents from surface drifters
- Bio tagging on animals



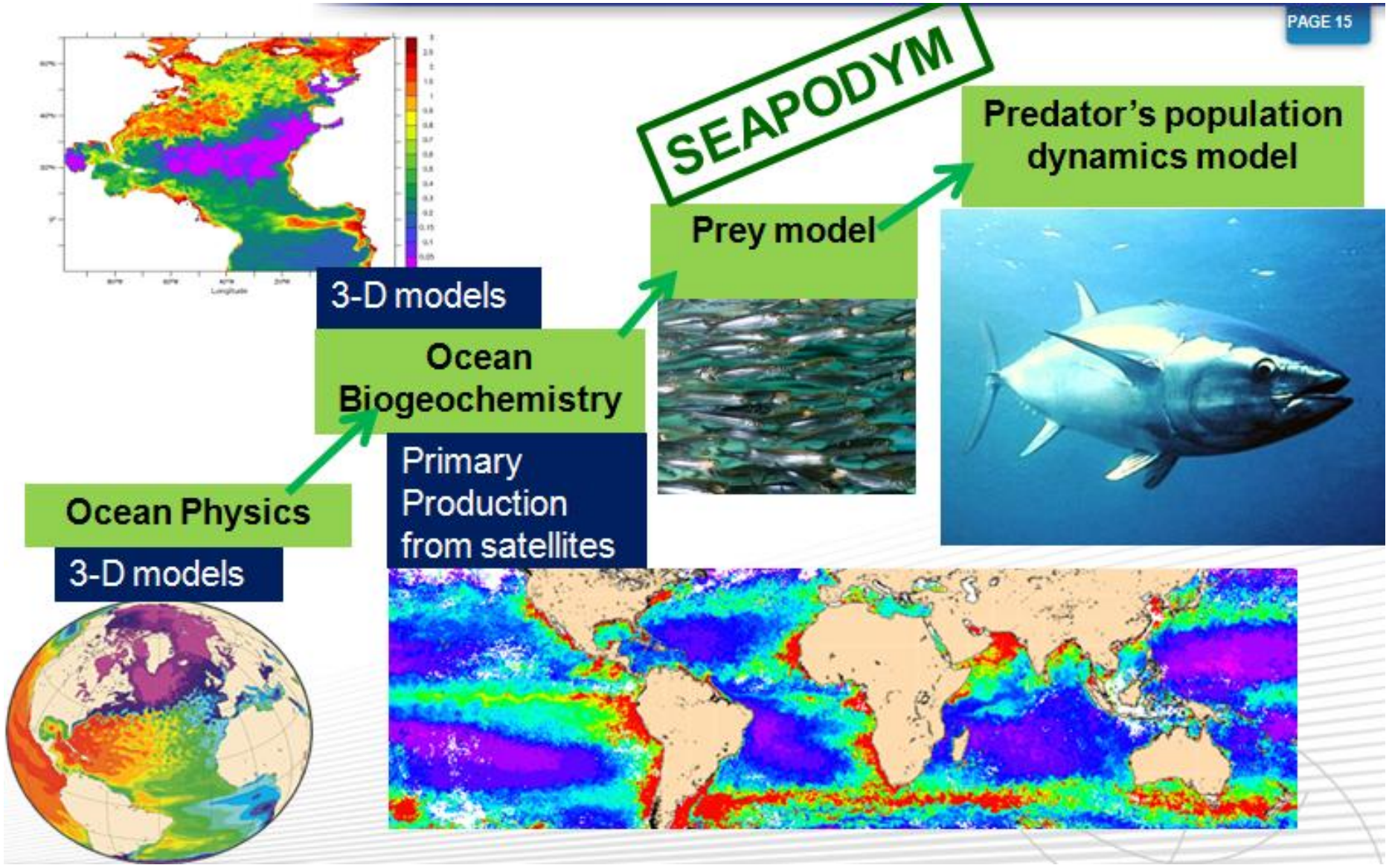



Monitor and Predict Evolution of Malaysian Resources

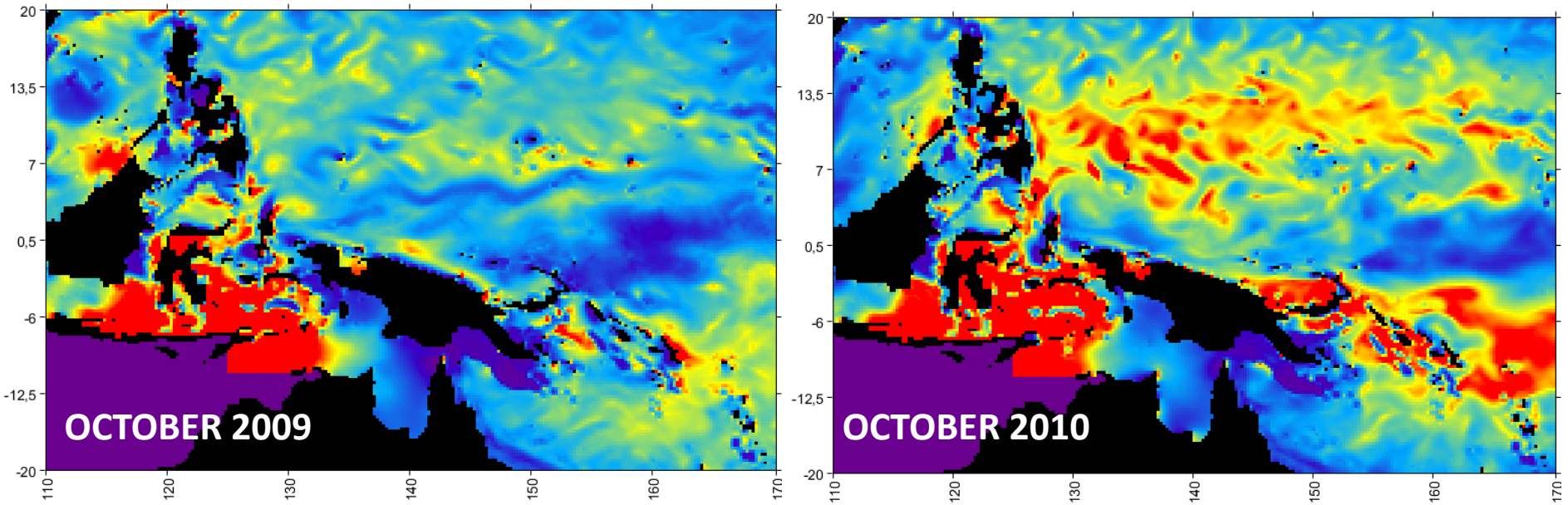




Identify and predict fish stock population areas



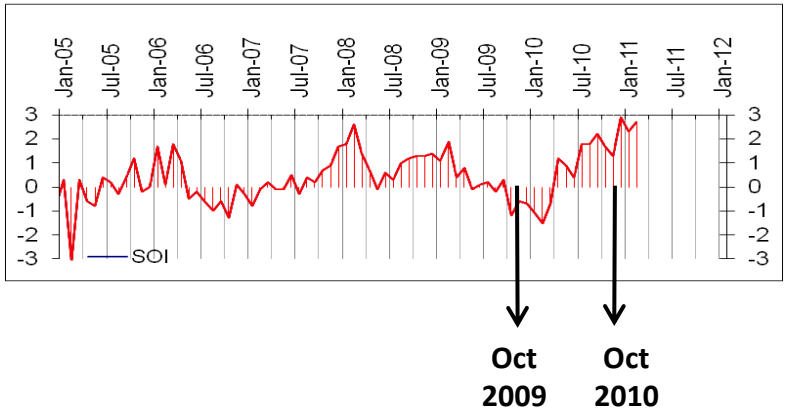
Example of natural variability in fish stocks



Evolution of skipjack tuna stock population density off Papua New Guinea and Almahera simulated by CLS with SEAPODYM (1/4°)

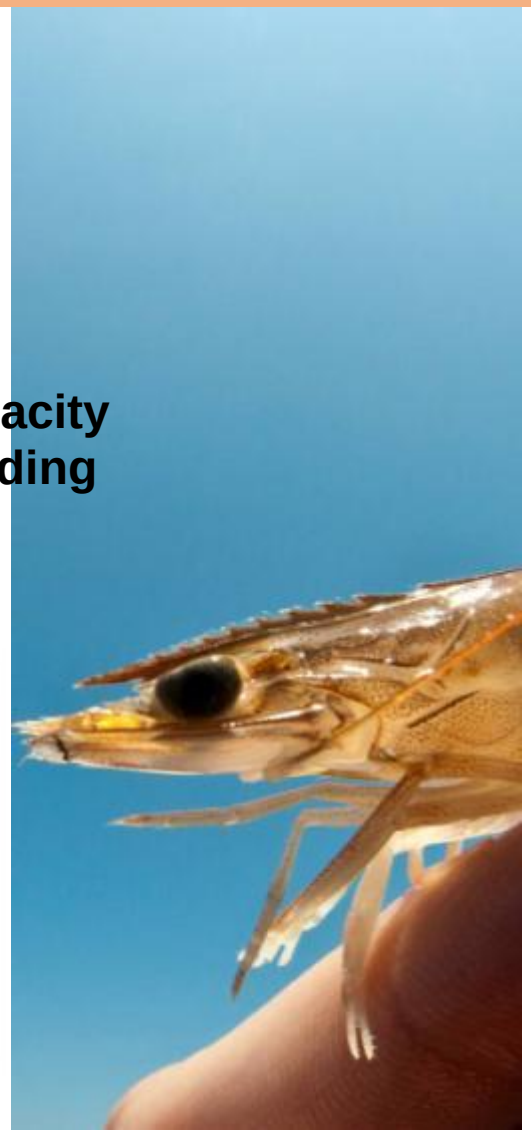
October 2009: a few months after the onset of **La Nina** (cold) event detrimental to skipjack reproduction in the Pacific

October 2010: a few months after an **El Nino** (warm) event inducing favorable reproduction conditions in the Pacific

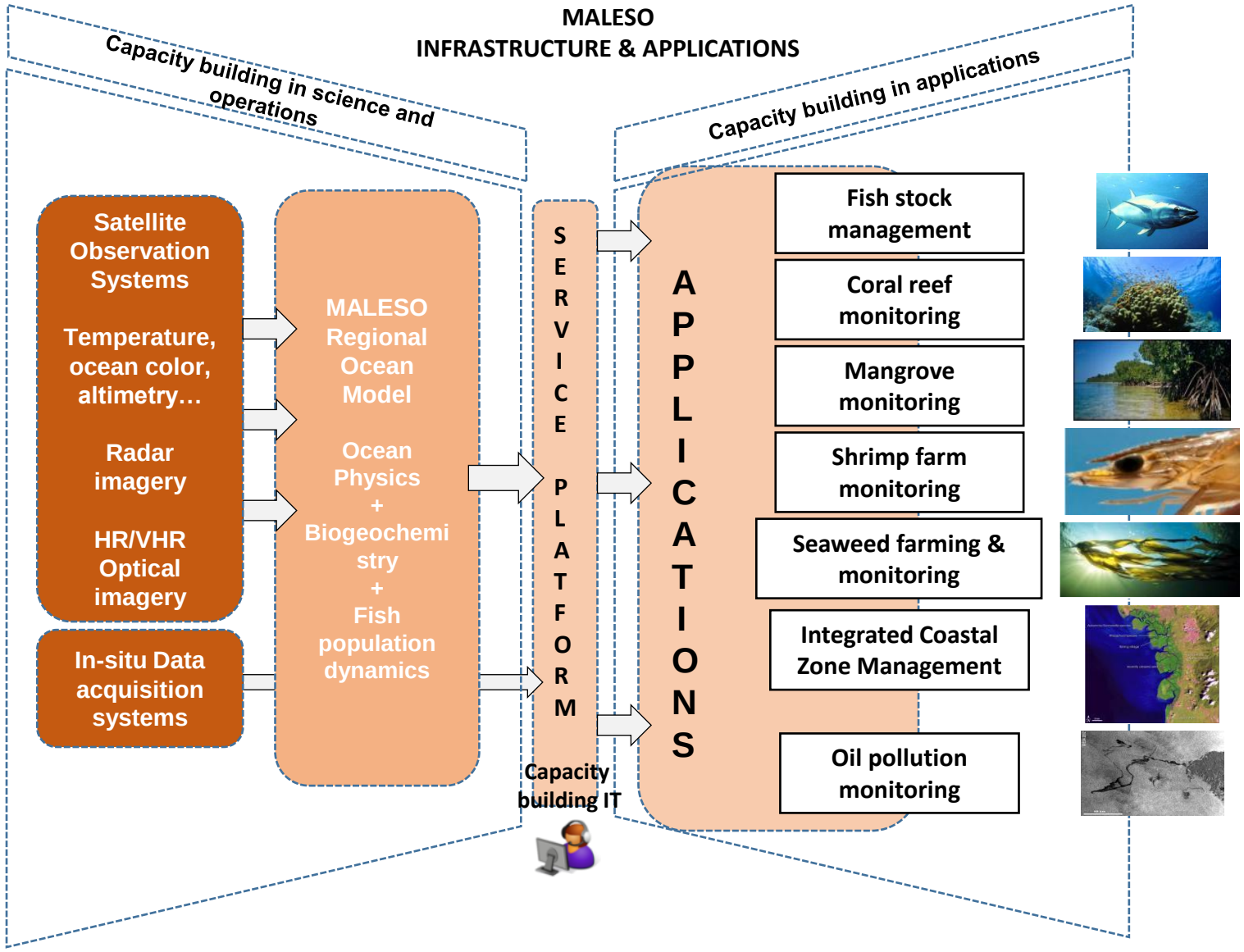


Training & Applications Development for Sustainable Ocean

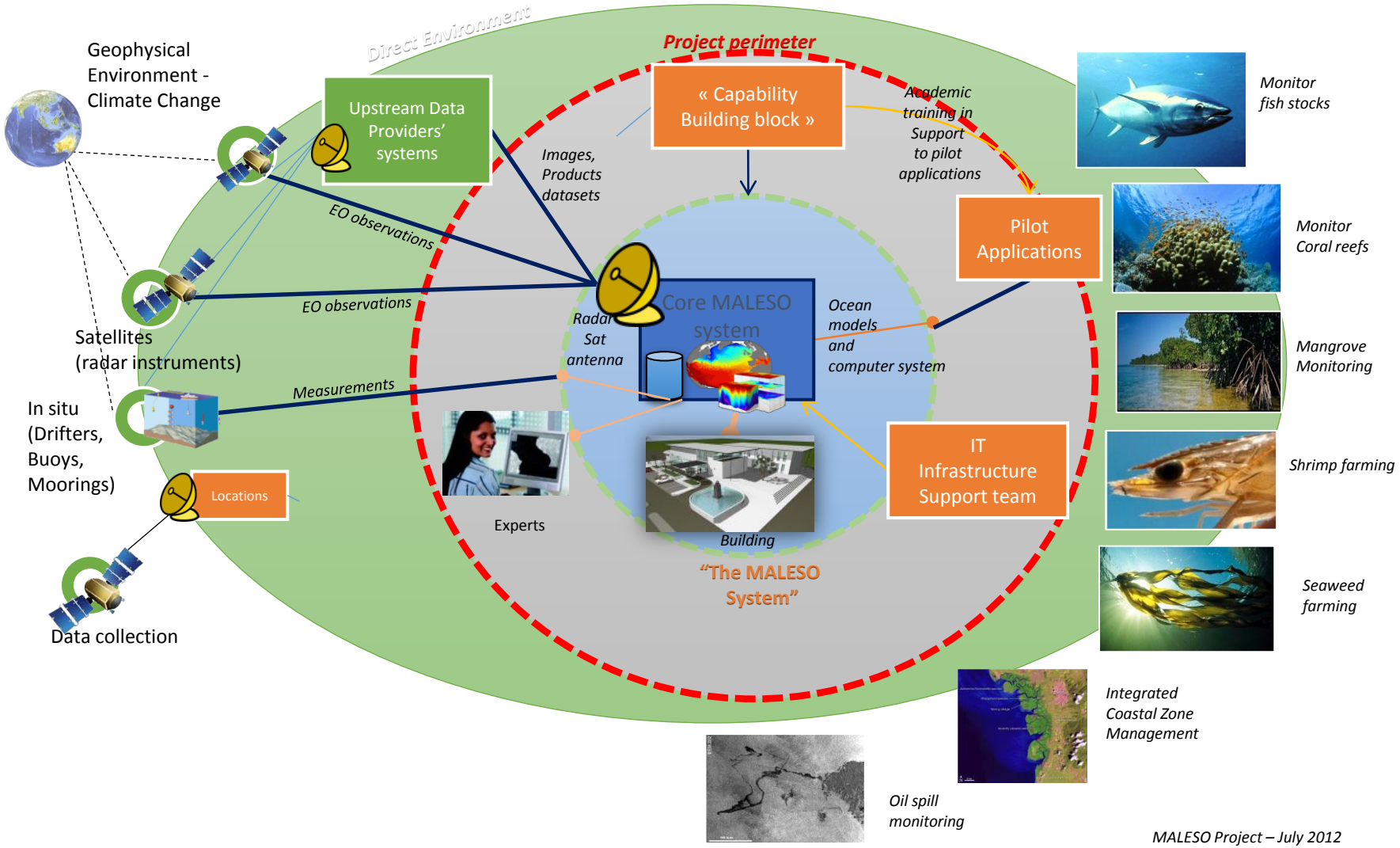
Capacity building



Applications for sustainable ocean

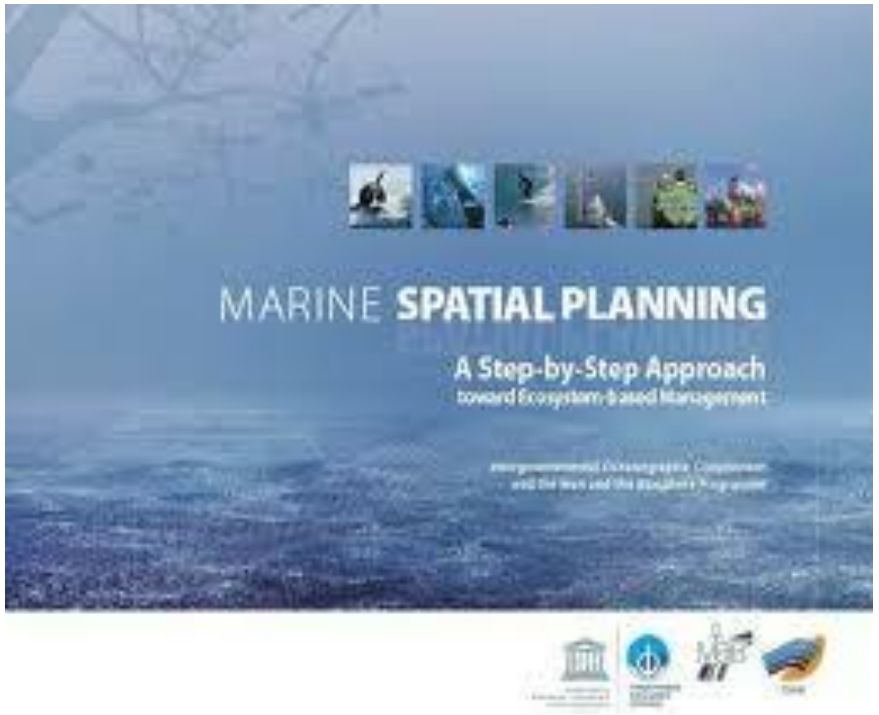


MALESO: fully integrated ocean data center



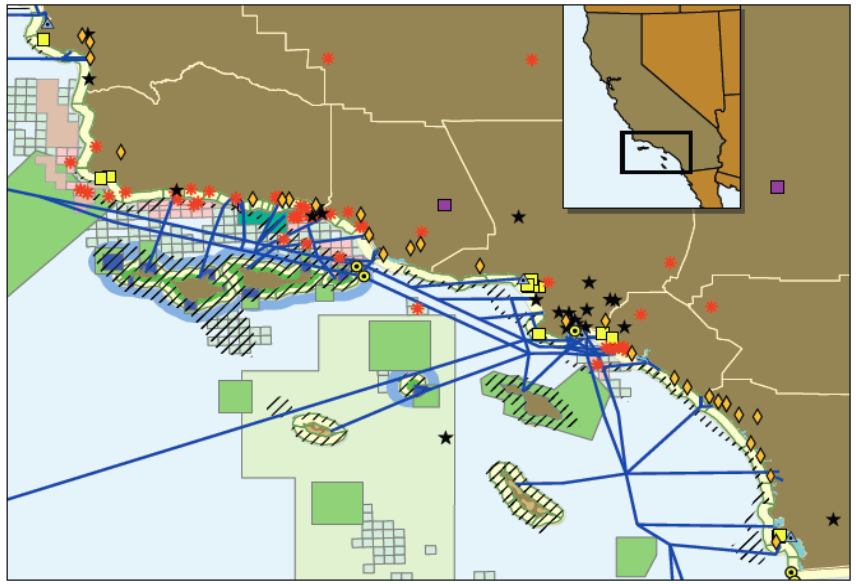
MALESO Project – July 2012

Marine Spatial Planning (MSP) Defined



- Incorporate all sectors
- Develop a participatory public process
- Use best available science
- Maintain ecosystem health
- Deliver ecosystem services
- Increase compatibility
- Reduce user conflicts
- Evaluate alternatives & tradeoffs

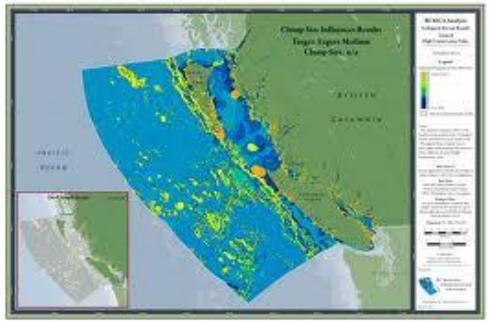
"a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process." UNESCO, 2009



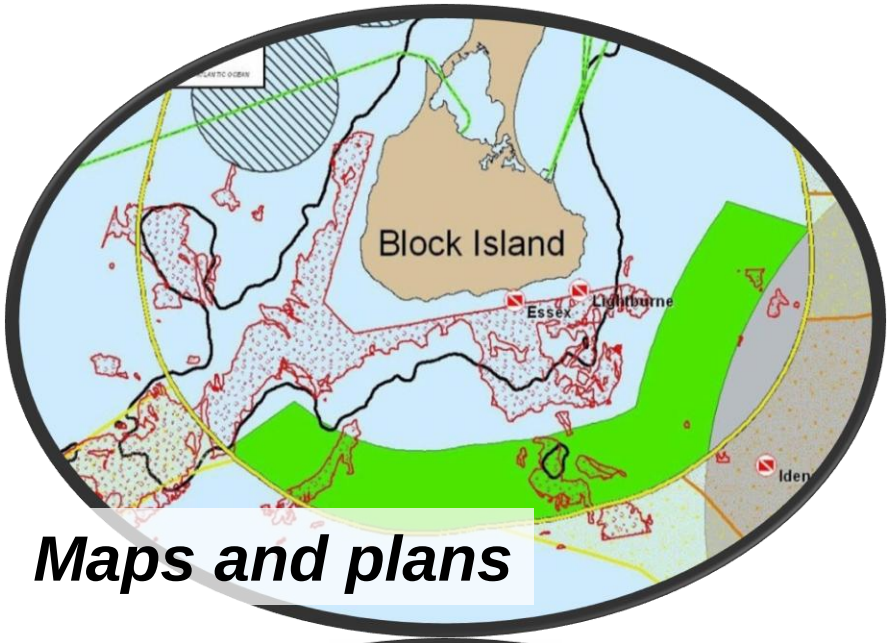
Marine spatial planning (MSP)

❑ **Marine spatial planning (MSP)** is a tool that brings together multiple users of the ocean to make coordinated decisions on how to use marine resources sustainably and strategically.

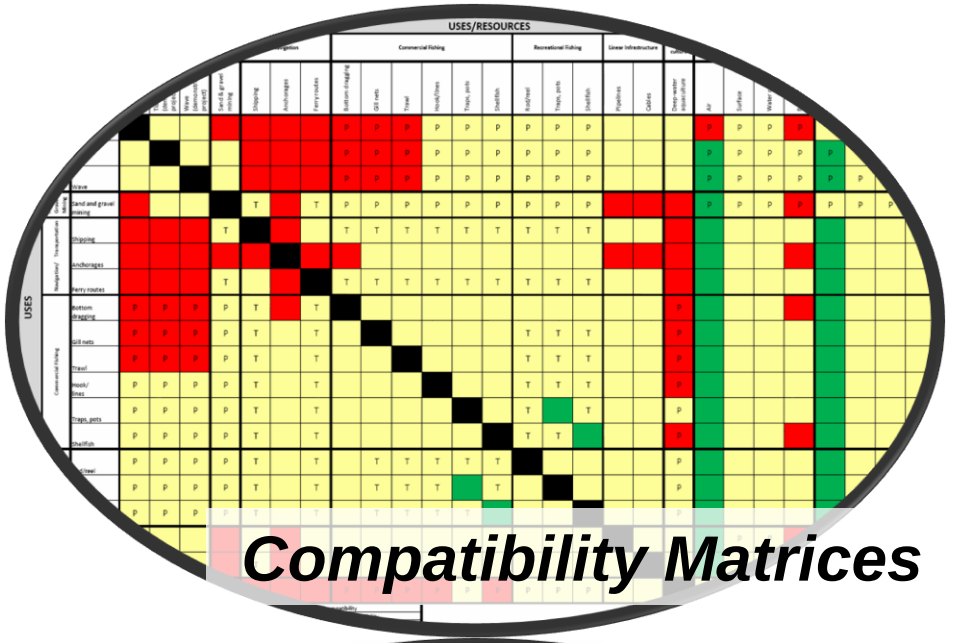
❑ MSP uses comprehensive maps in order to identify where and how an ocean area is being utilised and what natural resources and habitat exist.



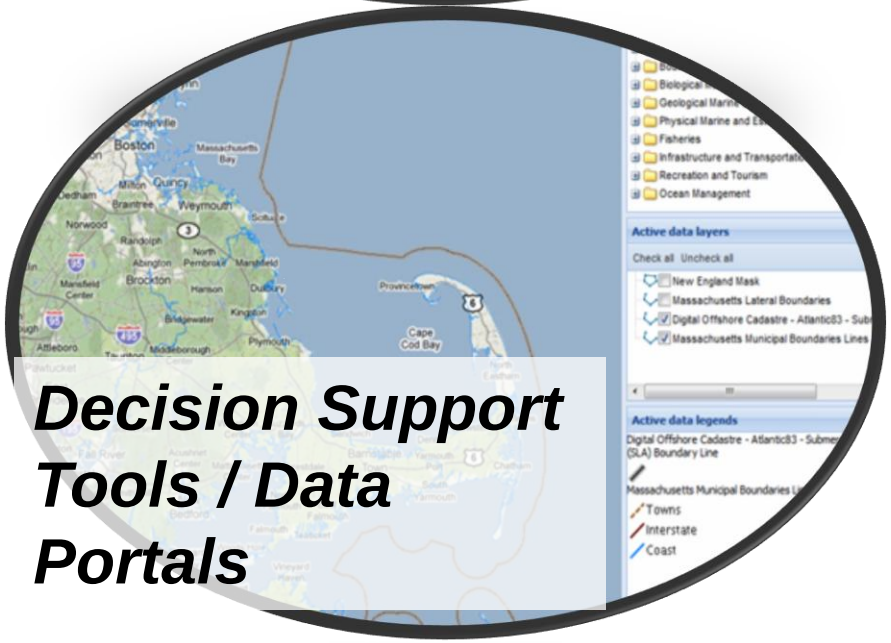
MSP requires strategic use of data



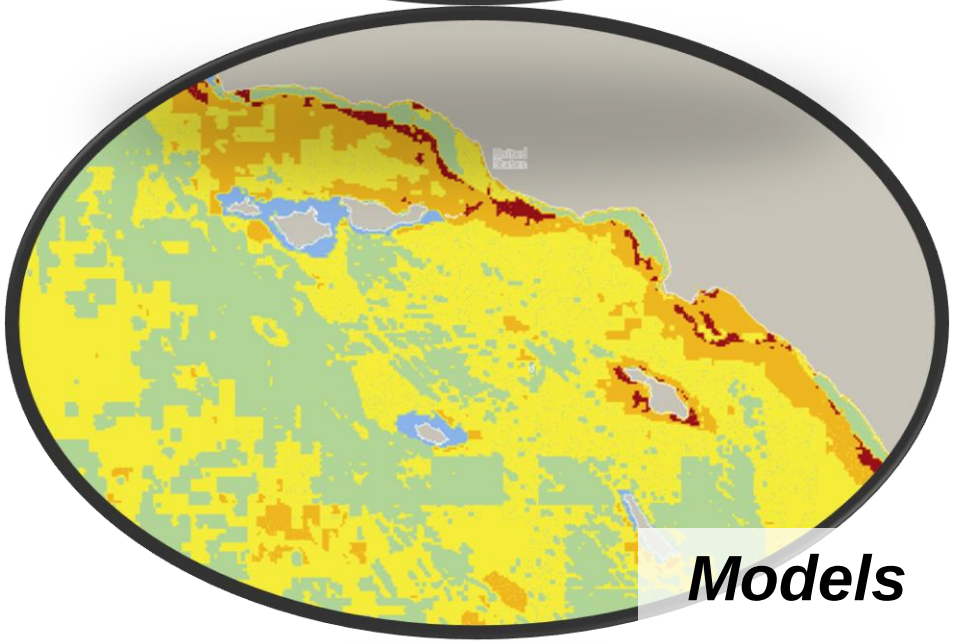
Maps and plans



Compatibility Matrices

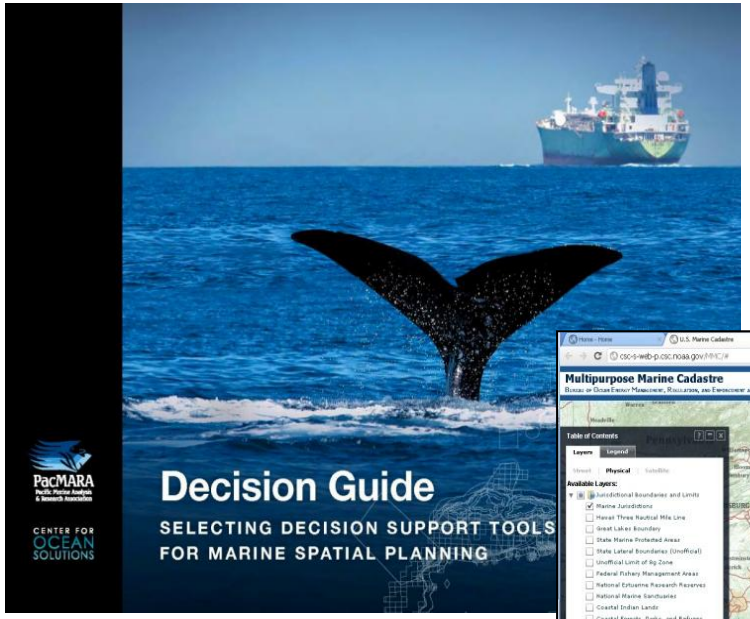


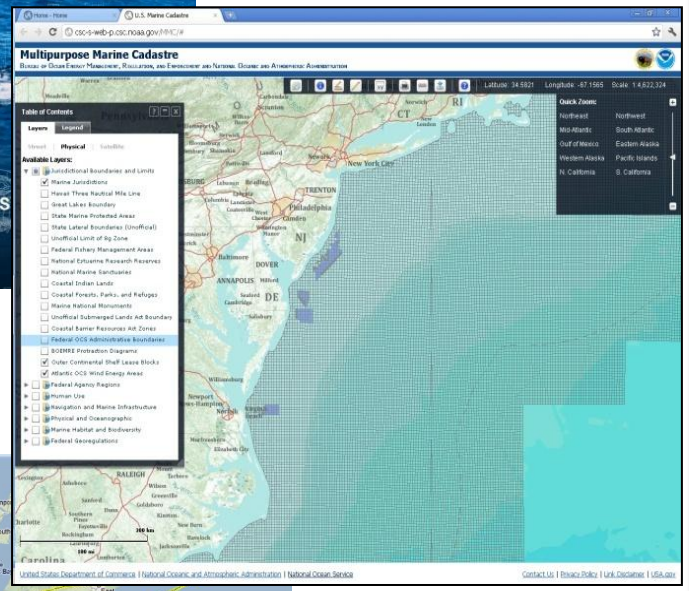
Decision Support Tools / Data Portals



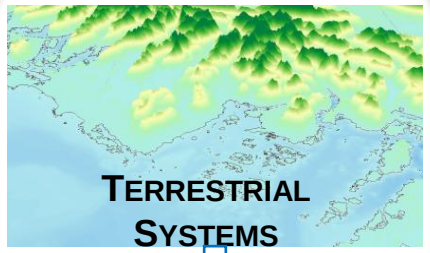
Models

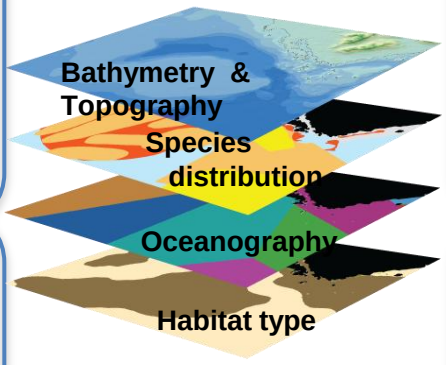
Decision support tools/Data portals

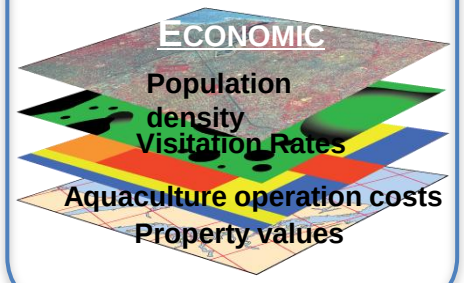




SCENARIOS

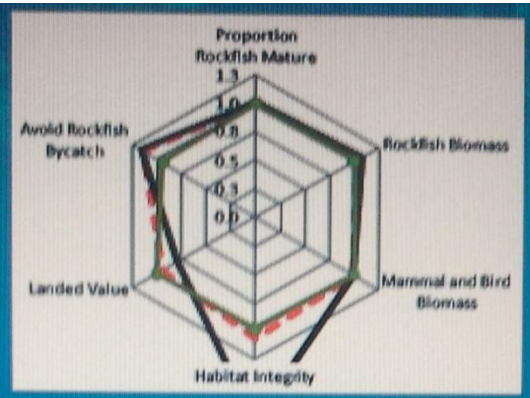






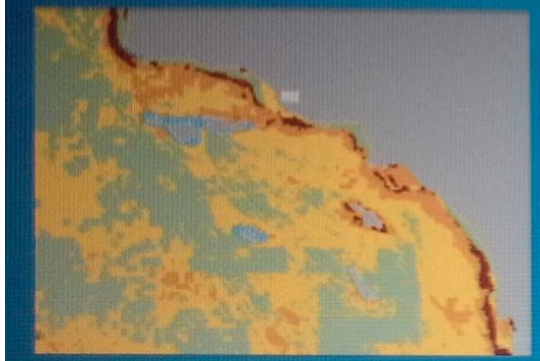
Creating the Guide

ARIES
ARtificial Intelligence for Ecosystem Services



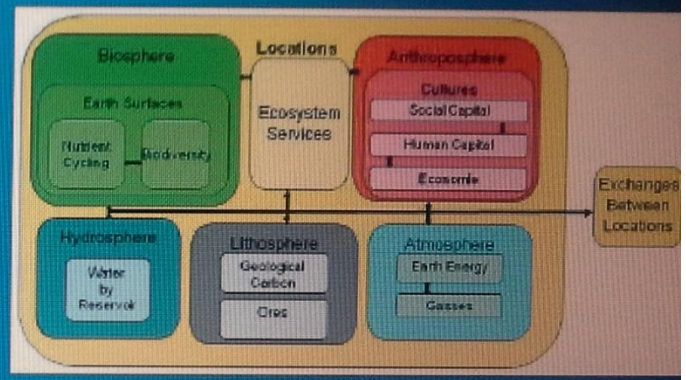
Atlantis

Coastal Resilience



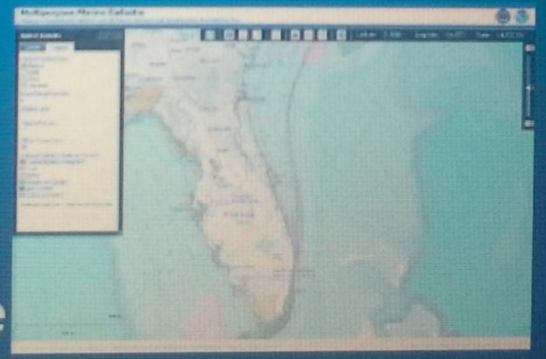
Cumulative Impacts

InVEST

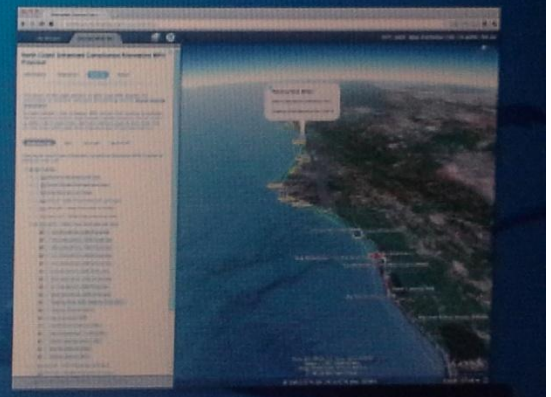


MIMES

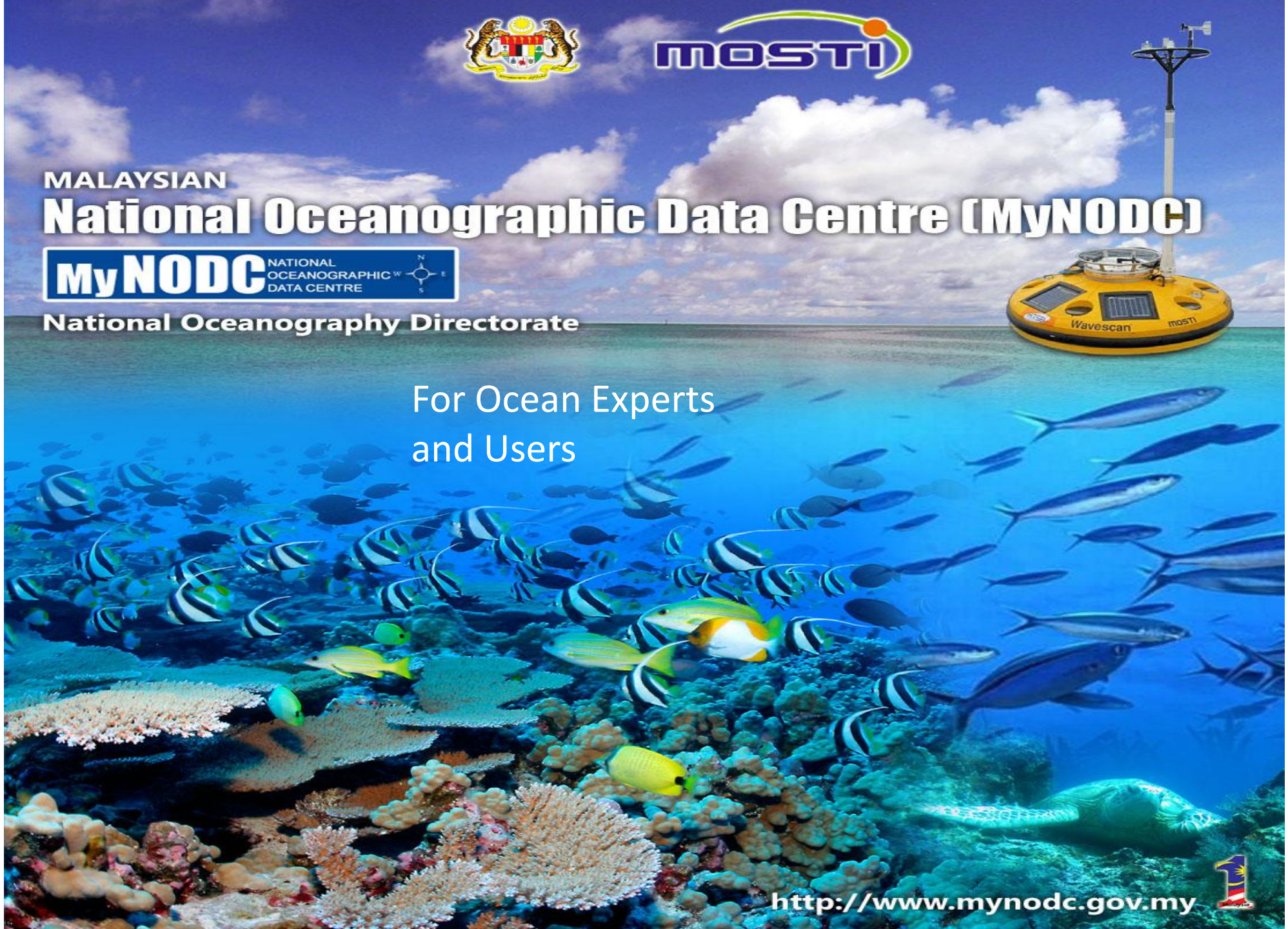
Marxan w/ Zones



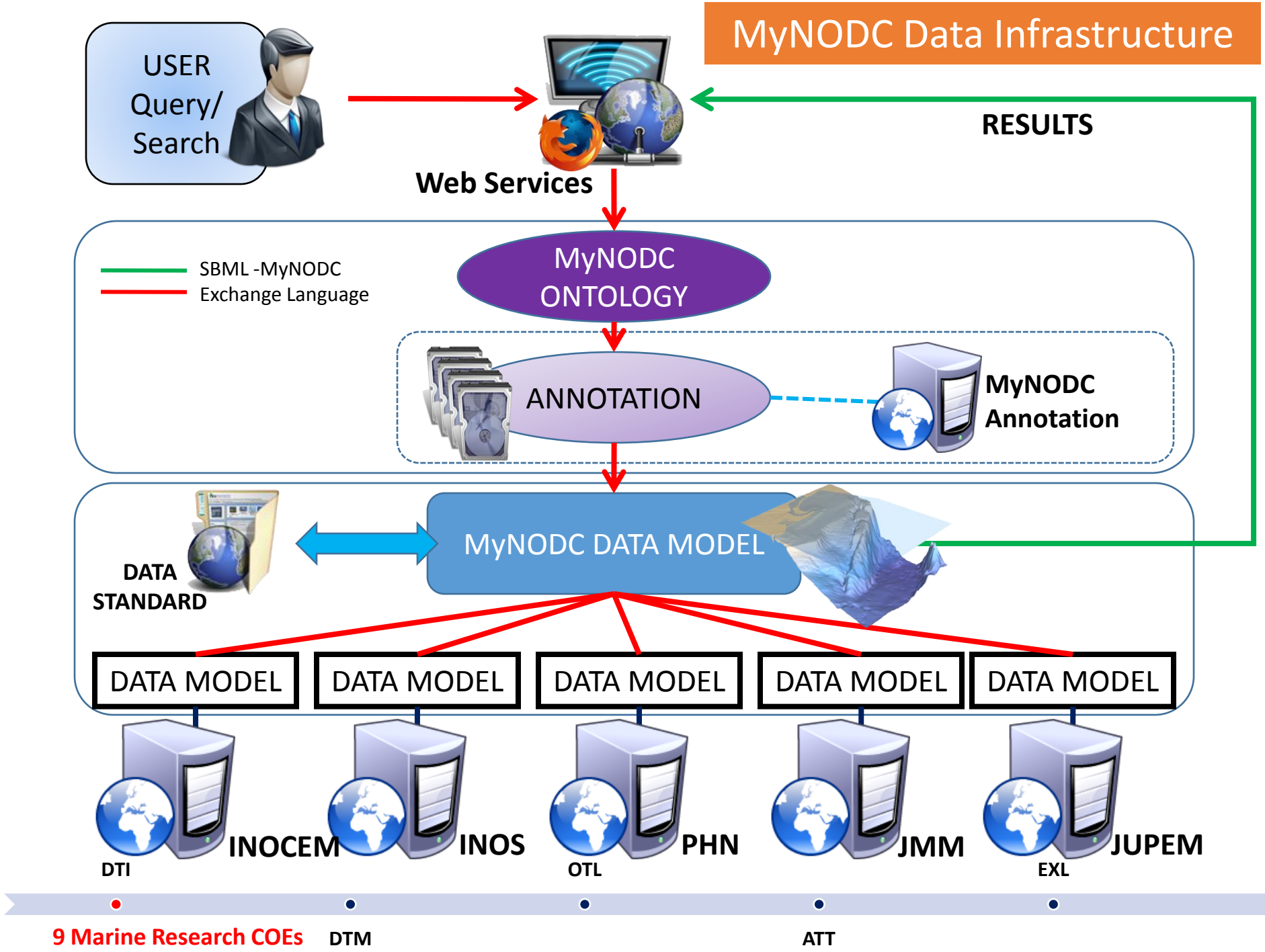
Multipurpose Marine Cadastre



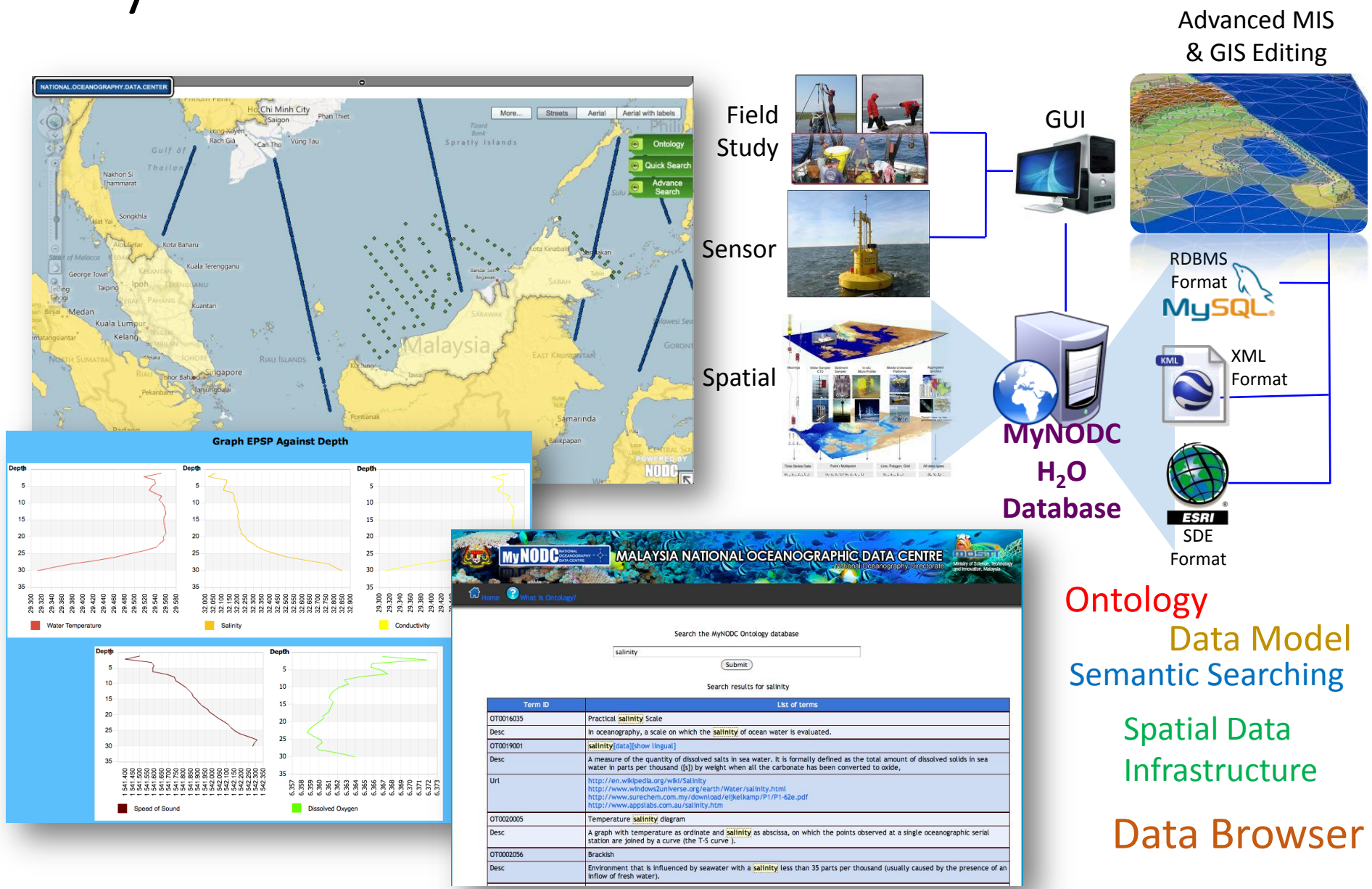
MarineMap


MOSTI
MALAYSIAN
National Oceanographic Data Centre (MyNODC)
MyNODC NATIONAL OCEANOGRAPHIC DATA CENTRE
National Oceanography Directorate
Wavescan
mosti
For Ocean Experts
and Users
http://www.mynodc.gov.my

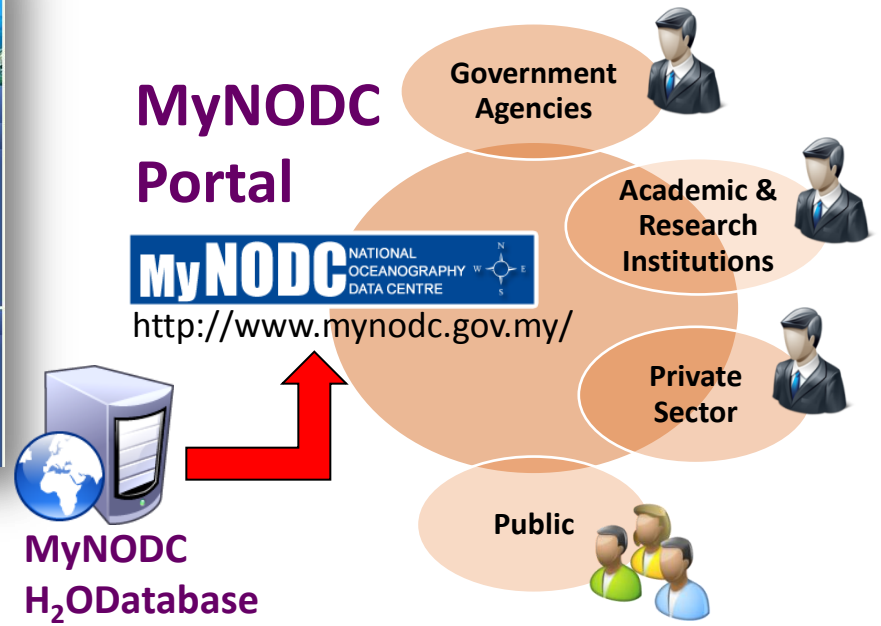
MyNODC Data Infrastructure



MyNODC Database

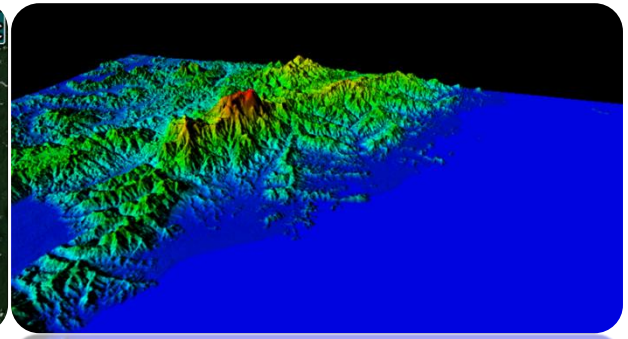


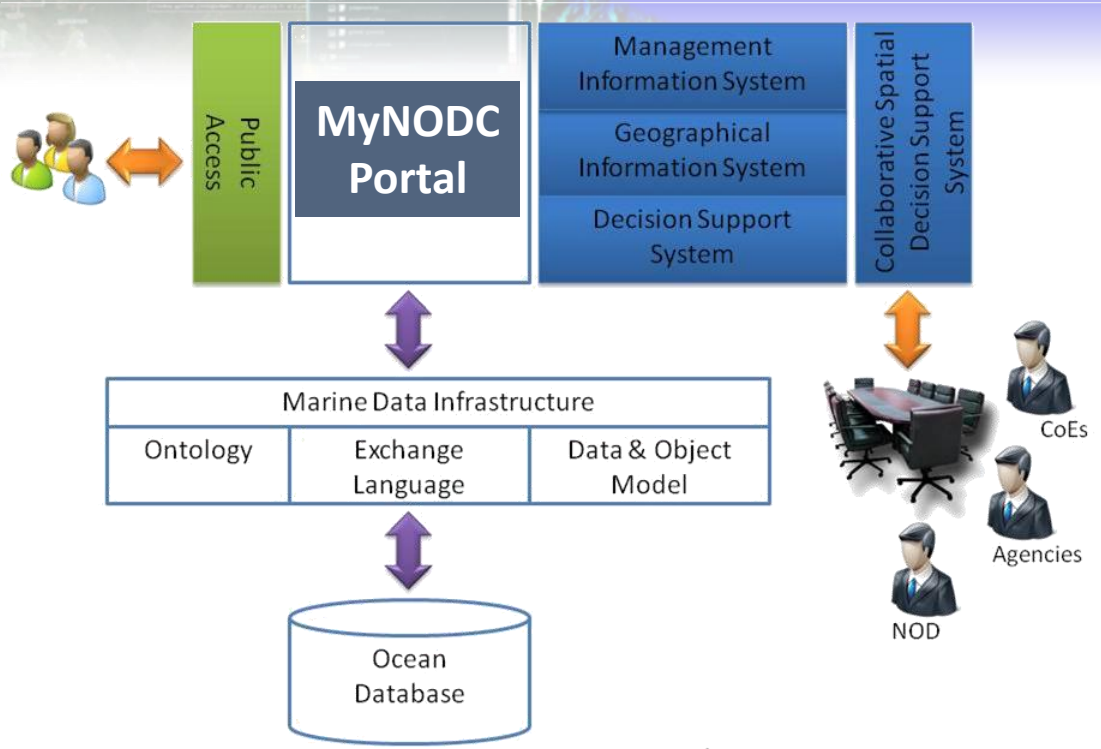
MyNODC Portal



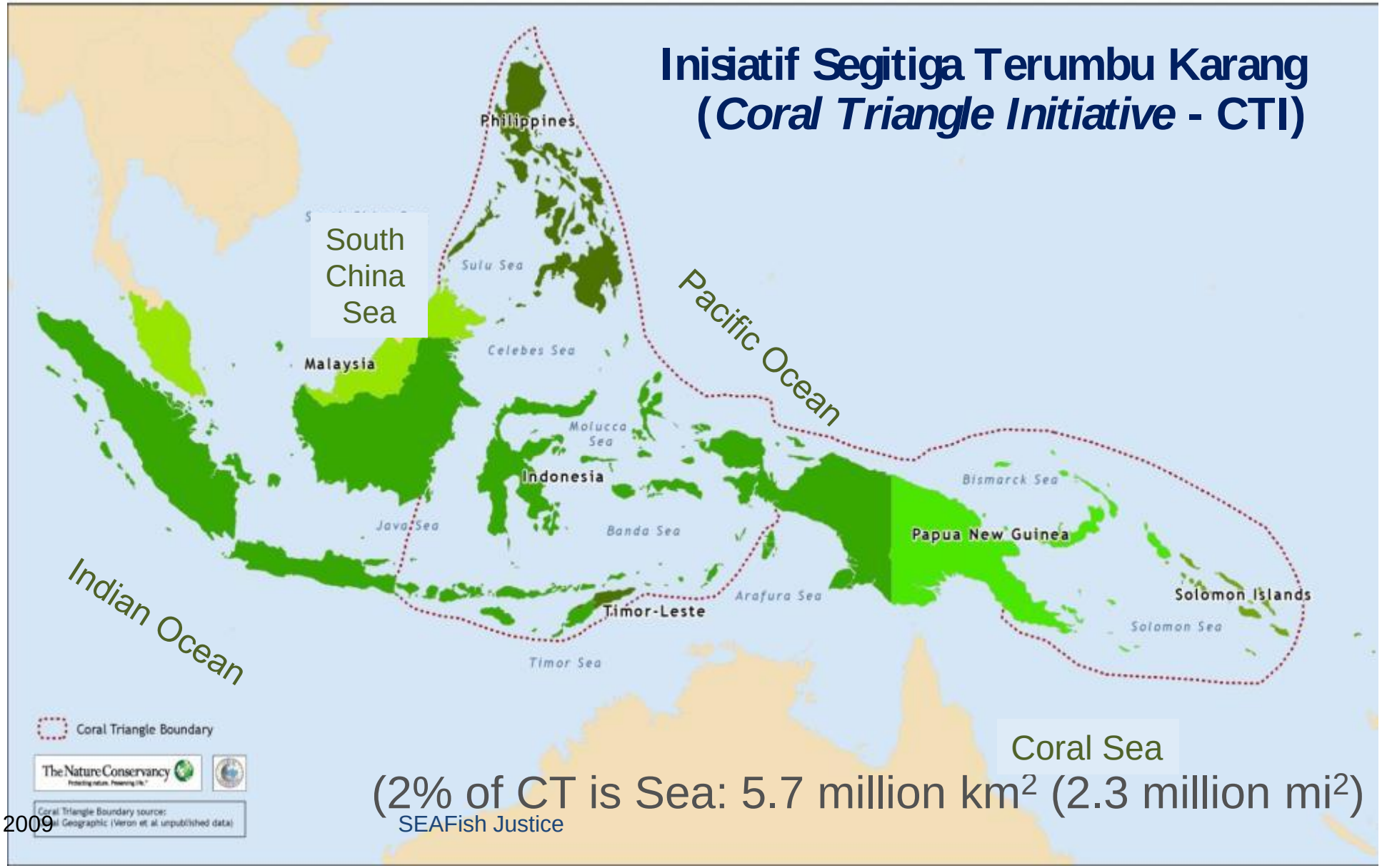
Forum e-Learning
Community Events
Publication News
Announcement
Oceanarium
MyNODCFacebook

Geospatial technology contribution

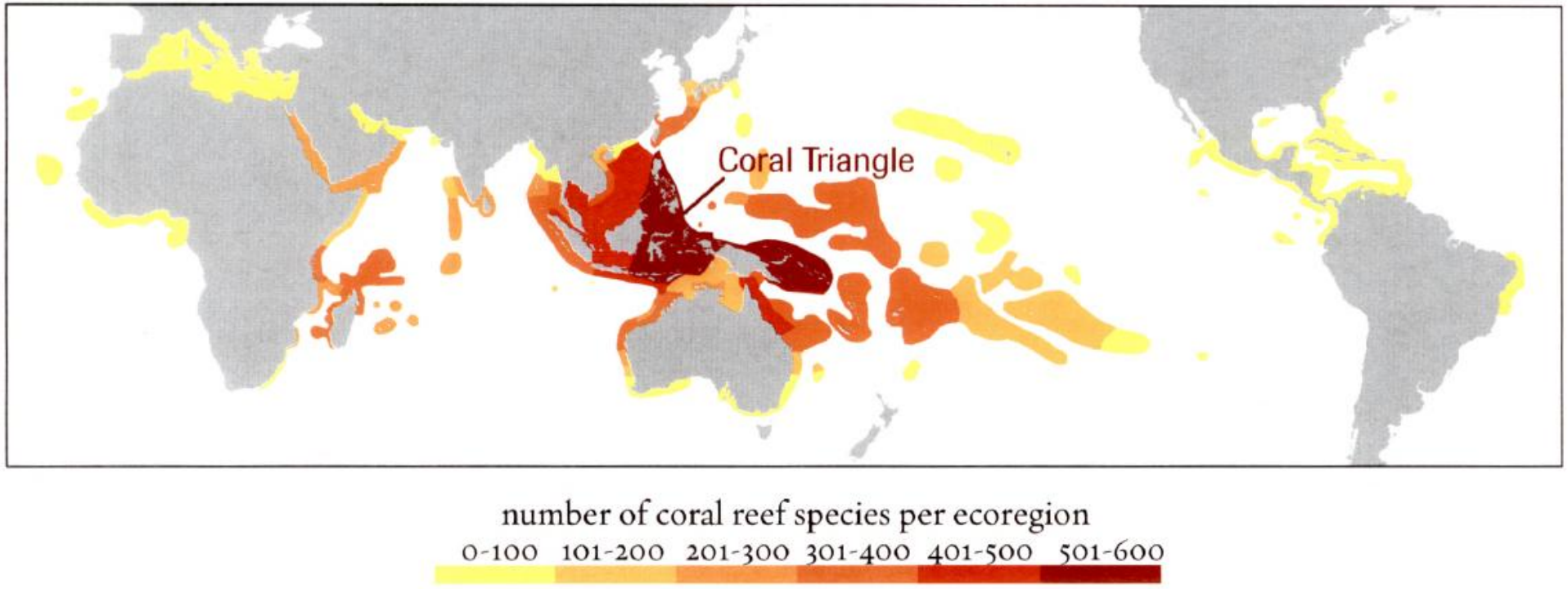




- Large quantities of oceanography data are being generated.
- To be useful, this data needs to be:
  - Stored
  - Distributed
  - Retrieved
  - Analyzed
  - Visualized
  - Interpreted
  - Shared with stakeholders


Inisiatif Segitiga Terumbu Karang
(Coral Triangle Initiative - CTI)
Philippines
South China Sea
Sulu Sea
Celebes Sea
Malaysia
Pacific Ocean
Molucca Sea
Indonesia
Bismarck Sea
Java Sea
Banda Sea
Papua New Guinea
Indian Ocean
Arafura Sea
Solomon Islands
Timor-Leste
Solomon Sea
Timor Sea
Coral Triangle Boundary
The Nature Conservancy
Coral Sea
(2% of CT is Sea: 5.7 million km² (2.3 million mi²)

CORAL DIVERSITY OF THE WORLD



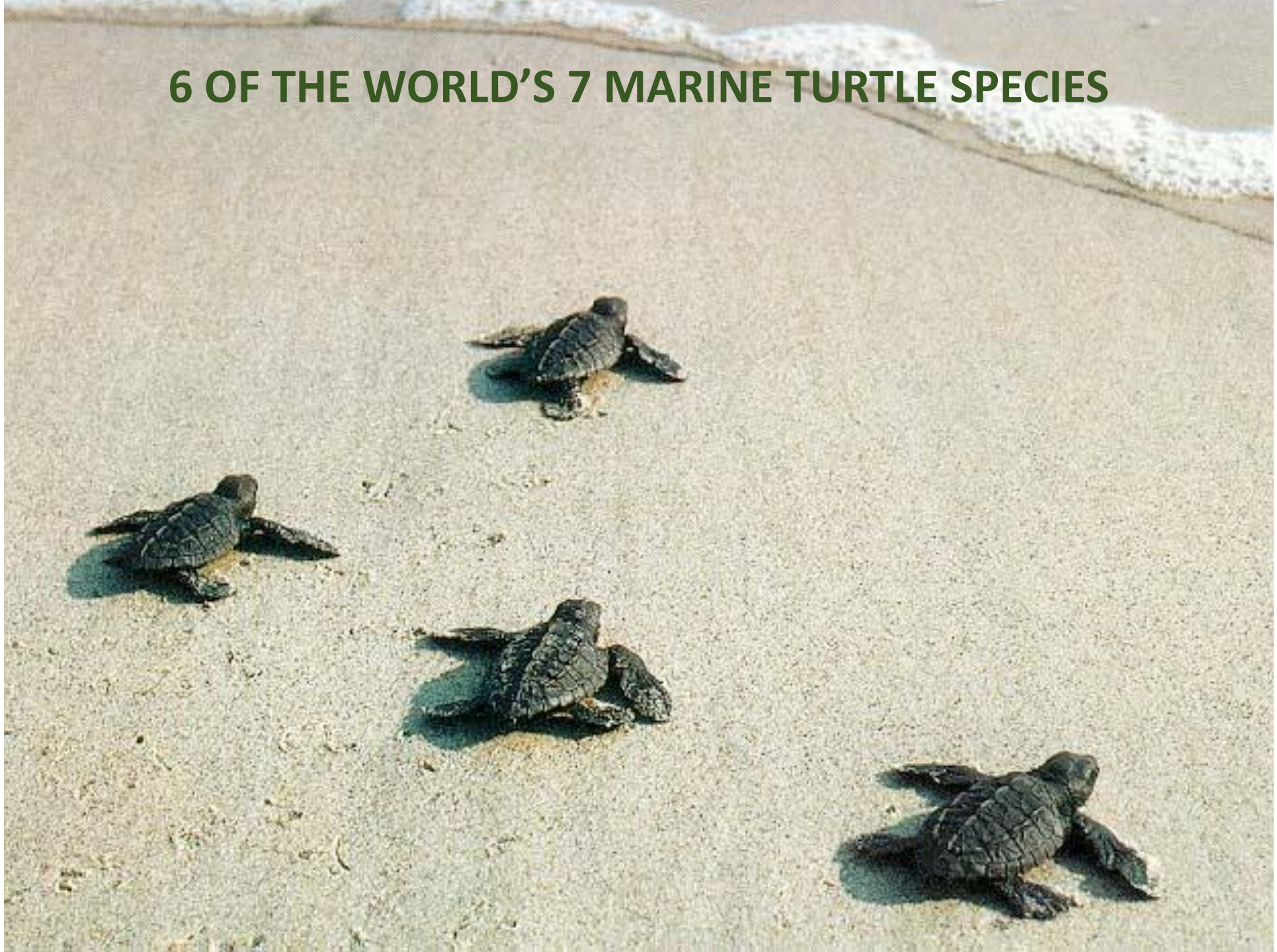
CTI Support Partners:
USAID, AUSAID, GEF, ADB,
WWF, The Nature Conservancy,
Conservation International, TNC

CTI: home to more than 75% of the world's known species of corals, exceeding 600 species, 35% of all known coral reef fish species-3,000 species of fish, largest tuna fishery spawning and juveniles growth area, large presence of six of the world's seven species of sea turtles, migrating sharks and manta rays, whales dolphins and coelacanths.

75% OF WORLD'S CORAL SPECIES

37% (2,228) OF THE WORLD'S CORAL REEF FISH SPECIES

6 OF THE WORLD'S 7 MARINE TURTLE SPECIES



Tuna spawning and nursery grounds

51 OF THE WORLD'S 70 MANGROVE SPECIES

23 OF THE WORLD'S 50 SEAGRASS SPECIES

Migratory pathway for cetaceans including Dugong

Why save the Coral Triangle?

- Ecosystem Resiliency
- Pharmaceuticals Potential?
- Livelihoods : 120 million people
- Habitats: $2.3 Billion /yr
- Tourism: $12 Billion / yr
- Live Reef Fish: $1 Bill / yr
- 50% of World Tuna stocks
- 60% of their protein from the sea

ASIA-PACIFIC REGIONAL TRADE IN LIVE REEF FOOD FISH

The Asia-Pacific LRFT is significant in terms of volumes traded (approximately 30,000t worth in excess of US$800 Million)

Goal 1

- Priority Seascapes Designated and Effectively Managed

Goal 2

- Ecosystem Approach to Management of Fisheries (EAFM) and Other Marine Resources Fully Applied

Goal 3

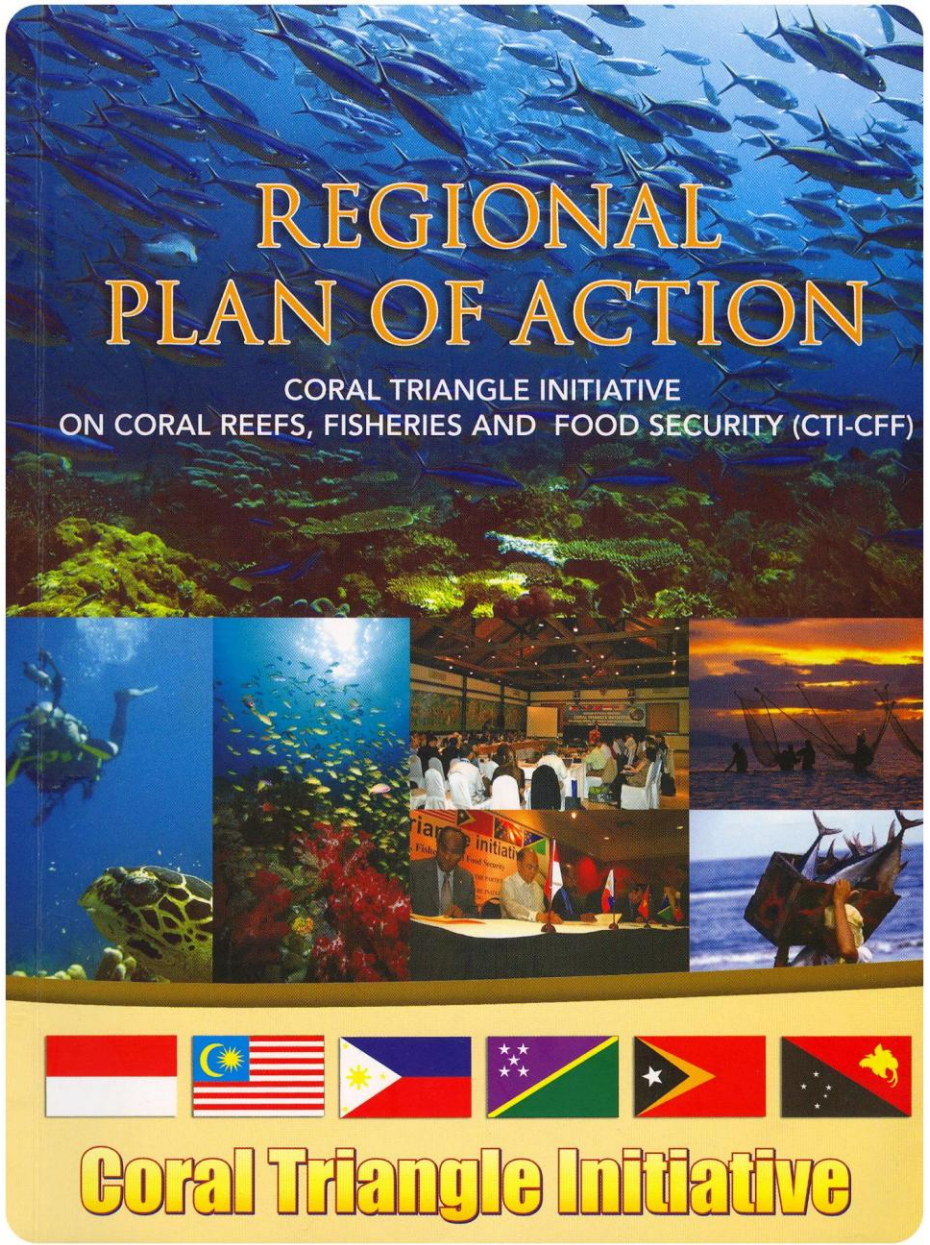
- Marine Protected Areas (MPAs) Established and Effectively Managed

Goal 4

- Climate Change Adaptation Measures Achieved

Goal 5

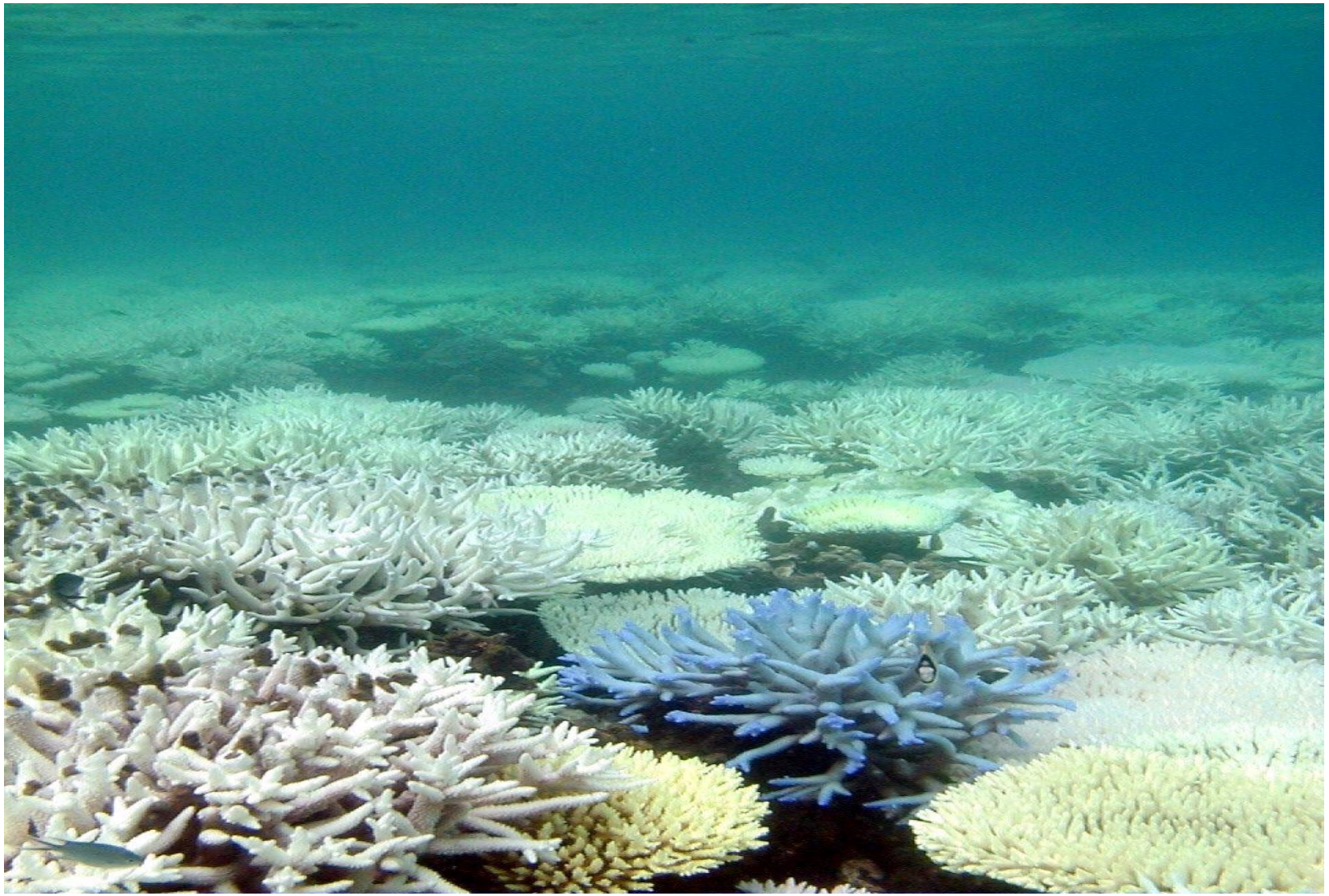
- Threatened Species Status Improving



Threats

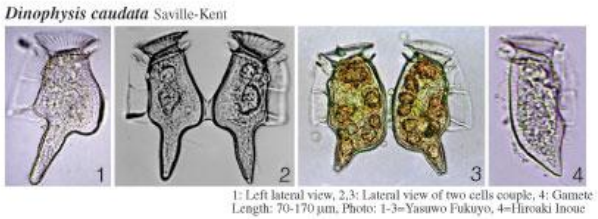
- Overfishing creates growth of certain fish and organisms that can be damaging to the reef if they appear in great numbers.

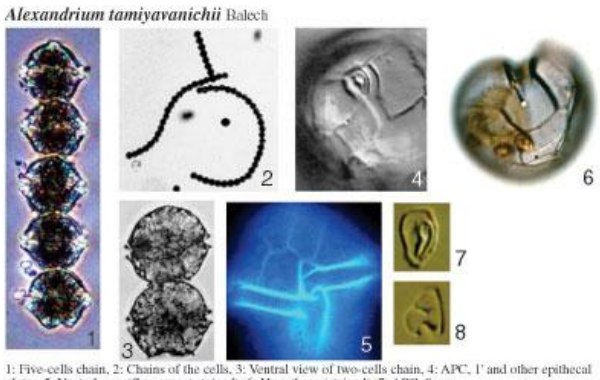
Threats from Coral bleaching

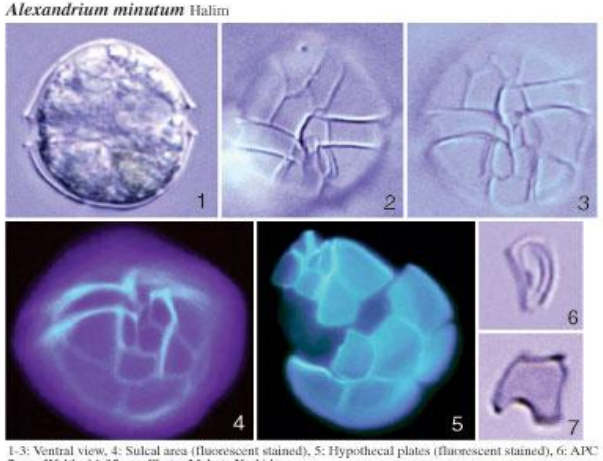


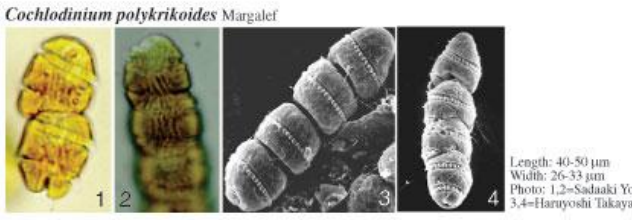
Threats

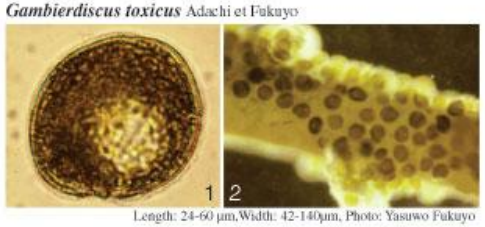
Red tide, Harmful Algae Bloom

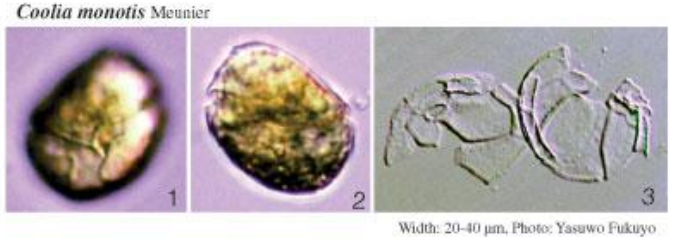




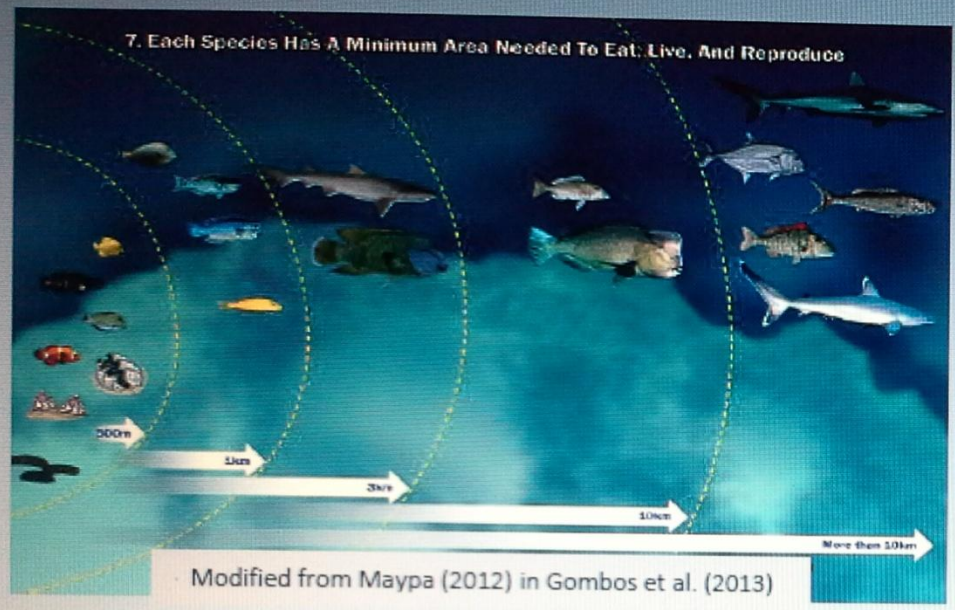






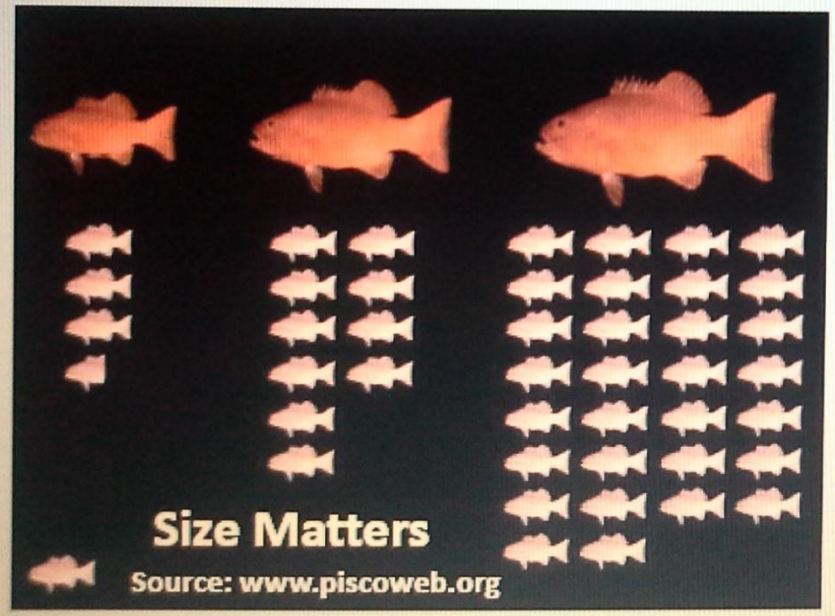


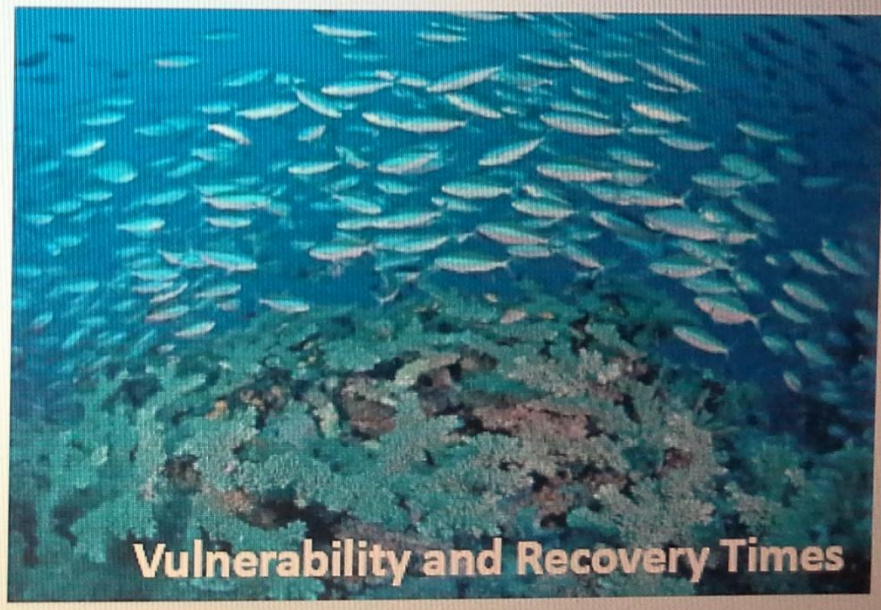
New and Exciting Science & Approaches



Modified from Maypa (2012) in Gombos et al. (2013)

Image © Queen triggerfish by Andy Rhyne





An online GIS database (http://ctatlas.reefbase.org)

Data management center for CT multi country with wide range of **spatial information** relating to managed areas, biological, habitats, threats, natural resources and oceanography in the Coral Triangle region

The Coral triangle Atlas; A tool for information management and decision support

Coral Triangle Datasets

Biological

Geography/ Base map

Habitat- Marine

Managed Area

Oceanography

Threats

Coral Species

Coral Triangle Boundary

Coral reef

Marine Protected Area

SST

Coral bleaching

Mangrove

Chlorophyl-a

Coral Disease

Fish species

CT Implementation area

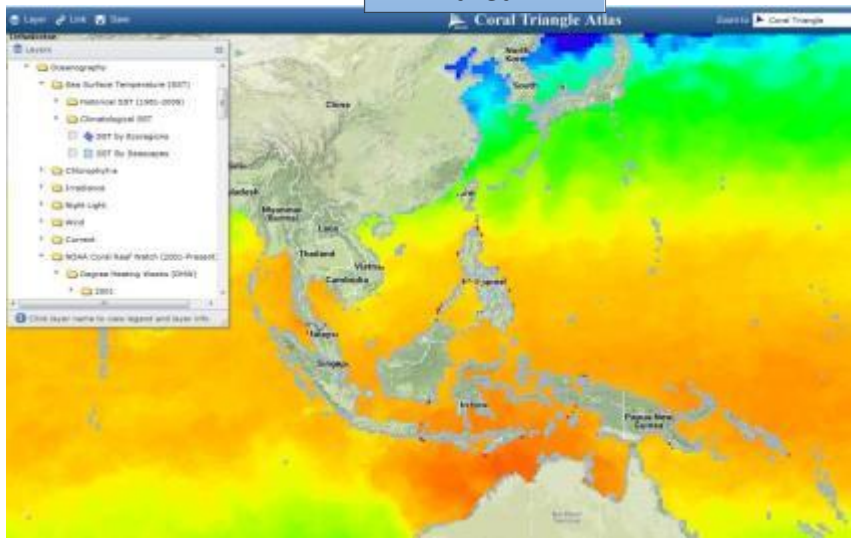
Seagrass

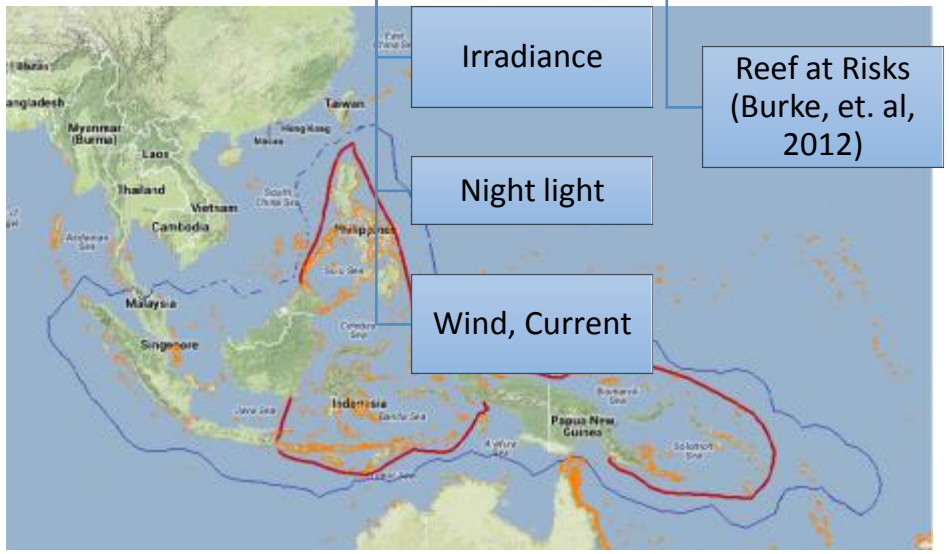
Irradiance

Reef at Risks (Burke, et. al, 2012)

Night light

Wind, Current

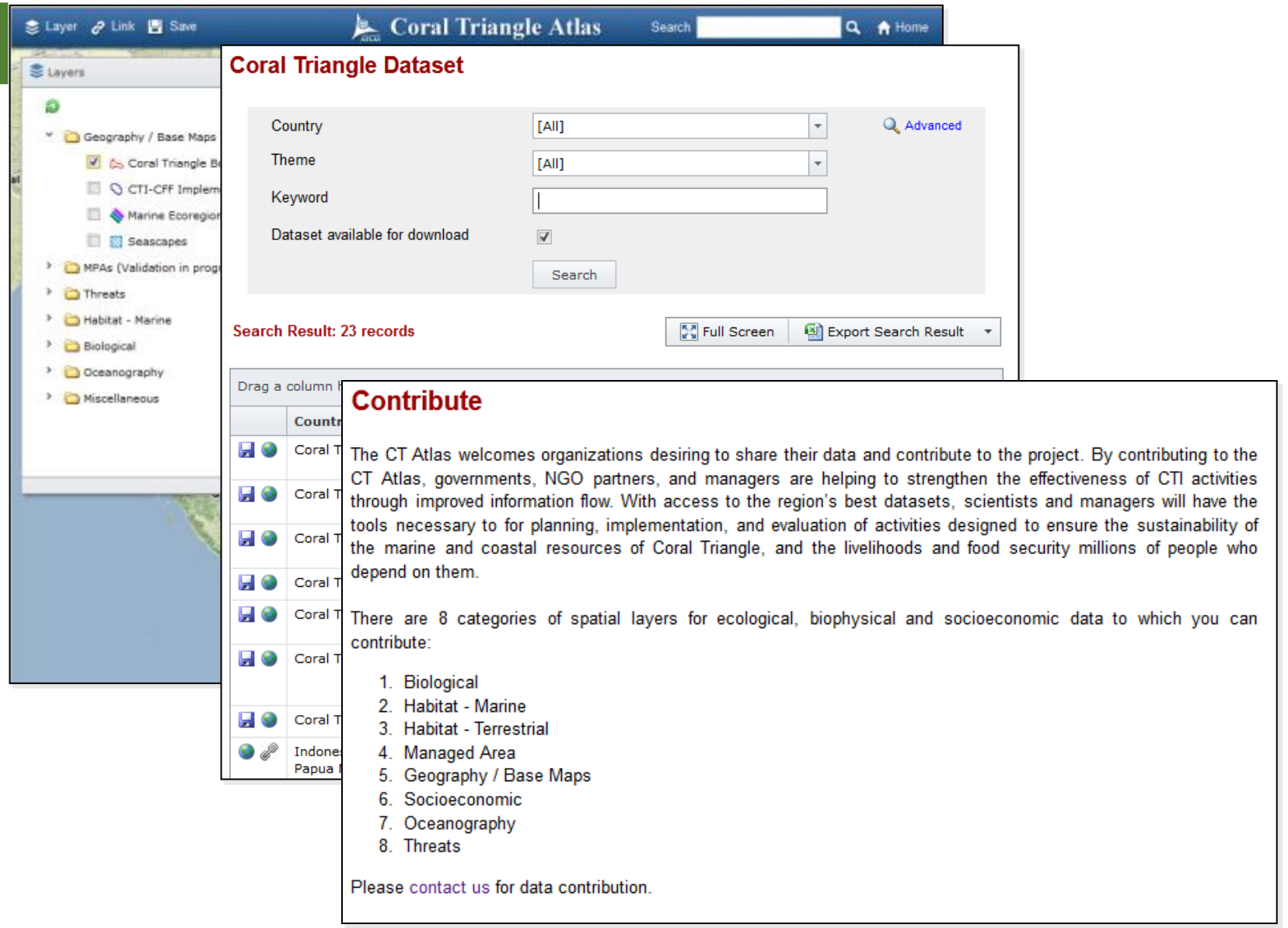




Data management center for Coral Triangle multi country with wide range of **spatial information** relating to managed areas, biological, habitats, threats, natural resources and oceanography in the Coral Triangle region

Spatial data

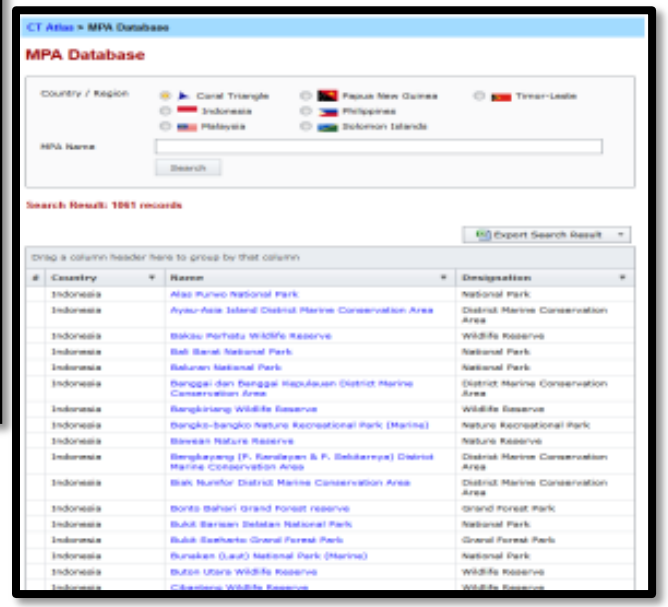
- Interactive Map
- Search & Download
- Contribute data



CT Atlas Support to The Regional CTI MPA TWG

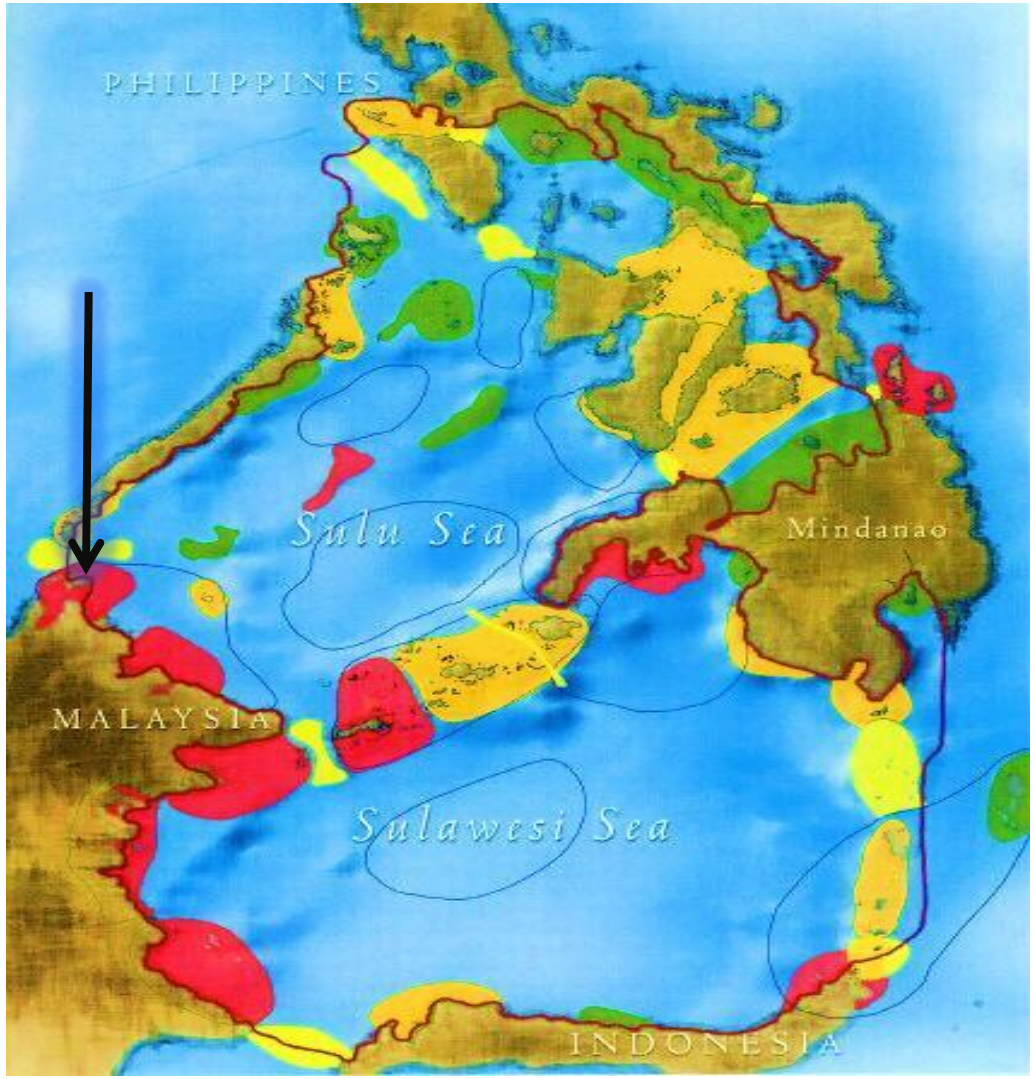
Recommended tools and approaches for use in developing and supporting CTMPAS -Respond to the need for a centralized system of storing information of MPAs required in Level 1 CTMPAs

CT Atlas MPA Database



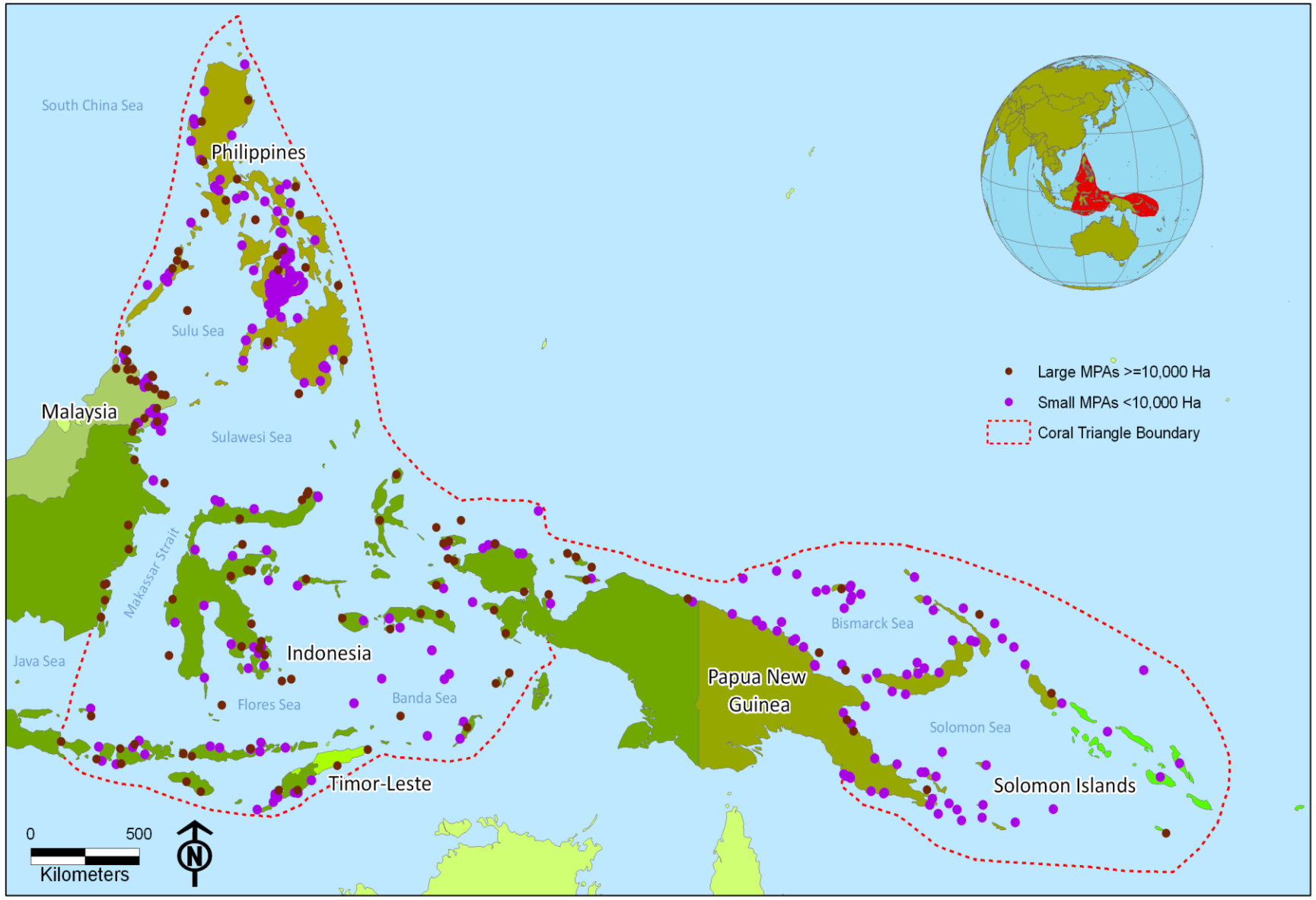
Recognised as a Priority Conservation Area in SSME*

- ❑ Productive marine ecosystem (coral reefs, sea grasses and mangroves)
- ❑ Fish habitat & breeding grounds
- ❑ A corridor route for various types of migratory marine animals (whales, dolphins, dugongs and turtles)



* *SSME – Sulu Sulawesi Marine Ecoregion*

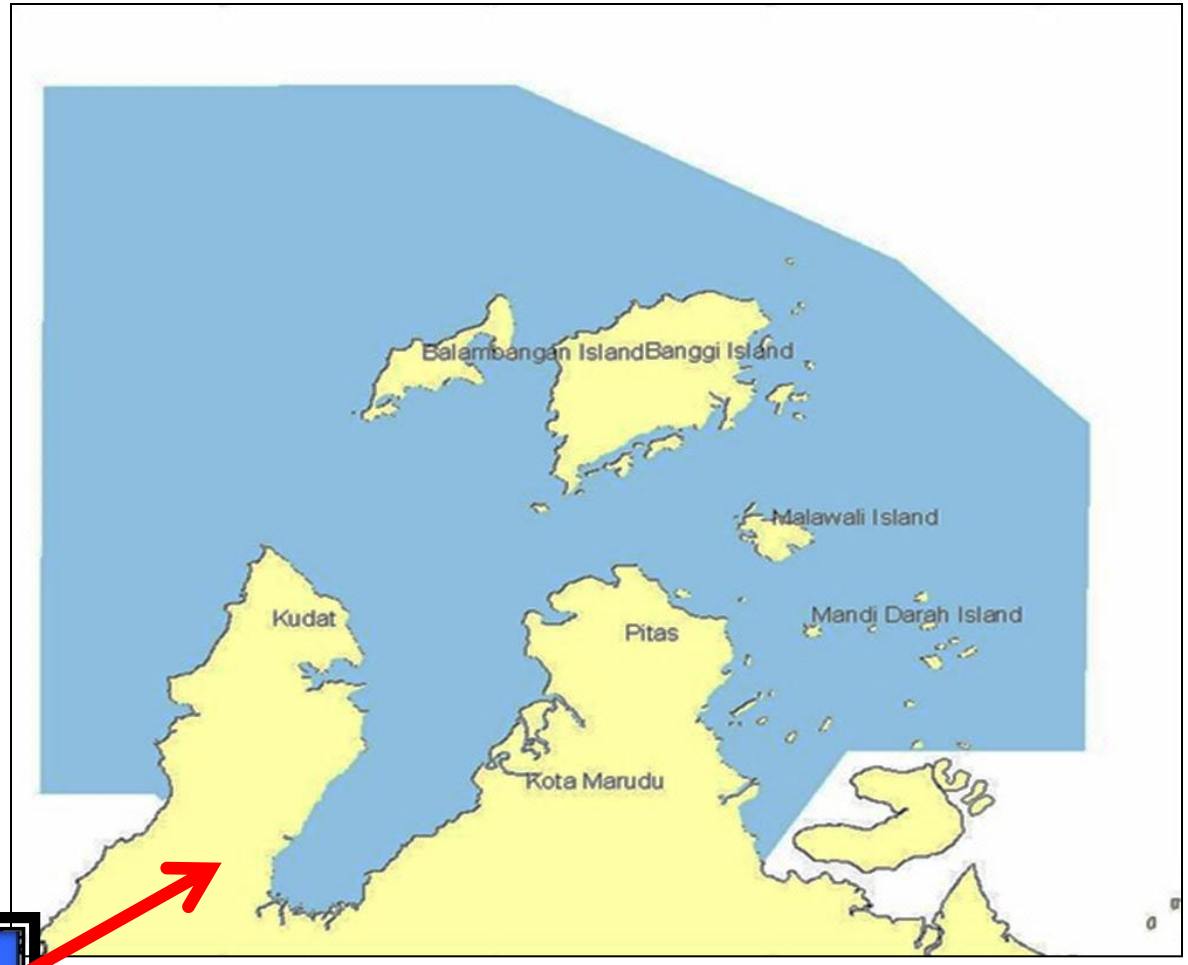
MPAs in the Coral Triangle (>1500)

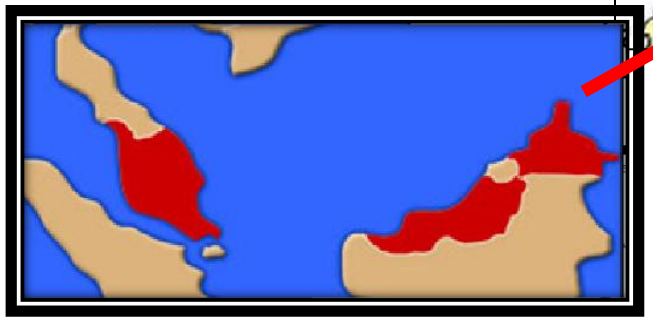


Coral Triangle boundary source: Coral Geographic (Veron et al unpublished data)
MPA source: WDPA v.2007

Tun Mustapha Park

- Area ~ 1.028 mill. ha. (2.54 mill. acres)
- More than 50 islands
- 3 districts: Kudat, Kota Marudu & Pitas
- Population: ~ 80,000 coastal people





Goals

1. Poverty Alleviation
2. Sustainable development
3. Conservation
4. To be gazetted as Marine Park by 2015

Application of MSP in Tun Mustapha Park

❑ Marxan – a software designed to aid spatial planning in conservation areas. MARXAN is fundamental as a decision support tool in designing zones for Marine Protected Areas.

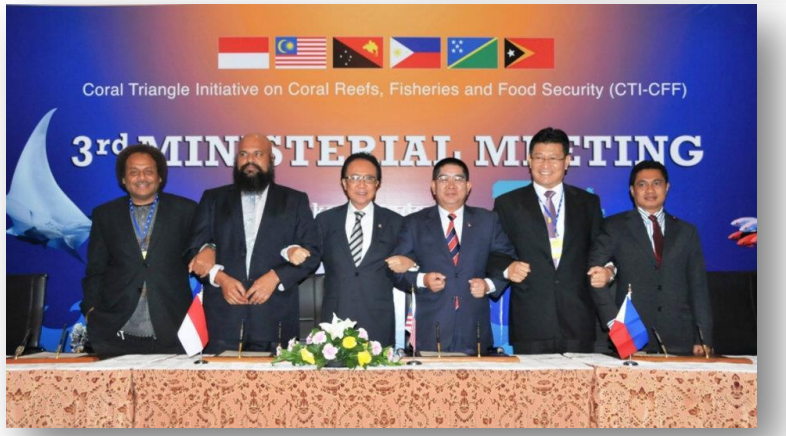
❑ Marxan is the main tool used in the ongoing zoning process of the proposed Tun Mustapha Park (TMP).

<u>4 ecological regions</u>
1.Preservation
2.Community managed
3. Multiple use
4.Commercial Fishing

❑ MARXAN allows the realisation of the multiple-use concept in Tun Mustapha Park, a globally important area within the Sulu Sulawesi Marine Ecoregion and the apex of the Coral Triangle, which encompasses the most biodiverse waters in the world

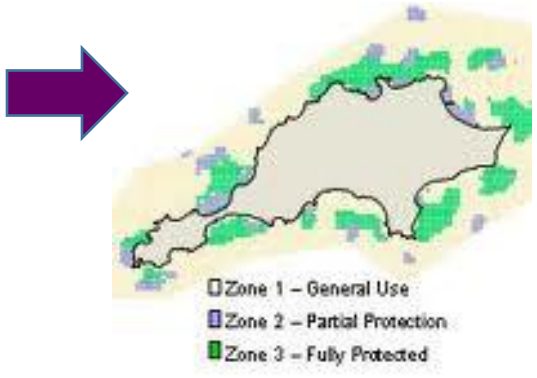
CORAL TRIANGLE INITIATIVE
ON CORAL REEFS, FISHERIES AND FOOD SECURITY

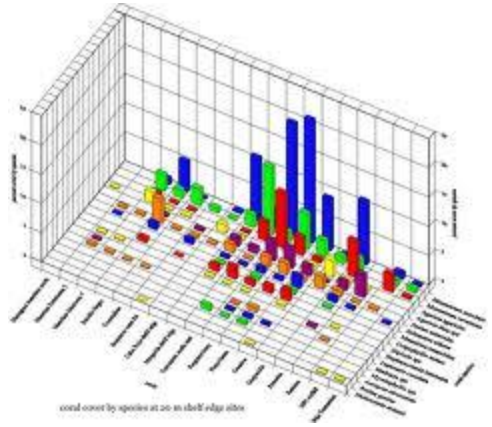
(Source: WWF)



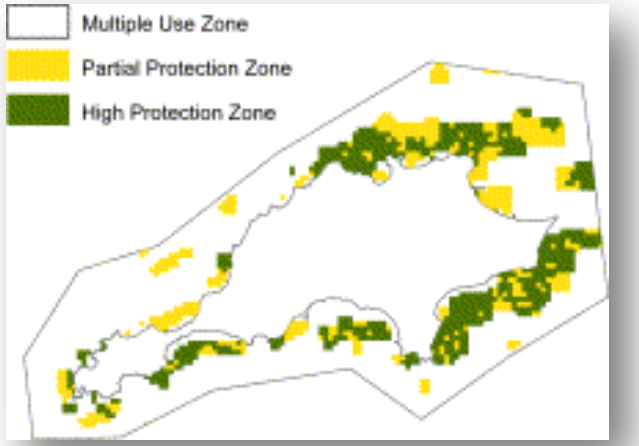
- Types of data obtained allows the software to focus and highlight sites to be prioritised for full protection. Data required ranged from significant marine species habitats to areas of ecological importance.

- E.g.: Percentage of coral cover;
  Populations of fish species;
  Important fishing grounds;and
  Areas providing vital services to mankind.





❑The software, which is based on data input by participating authorities assists in the zoning process by finding solutions to identify suitable reserve sites that will protect a suite of selected biodiversity targets.



❑ Partnerships between government and non-government agencies involved:

i. Sabah Parks;
ii. Department of Fisheries Sabah;
iii. Universiti Malaysia Sabah;
iv. WWF-Malaysia;
v. Town & Regional Planning Department;and
vi. Kudat District Office.

Final Thoughts

- Learn the strengths, weakness, ools and applications and examples of the different approaches
- Draft a *Strategy* that includes how and when to use different mechanisms for your need or organization
- Draft a Business Plan, and consider using multiple income streams