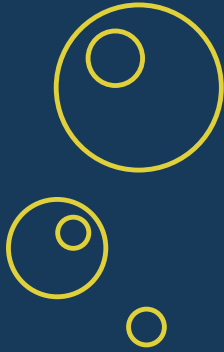


A FOUR-DIMENSIONAL AND CONNECTED OCEAN

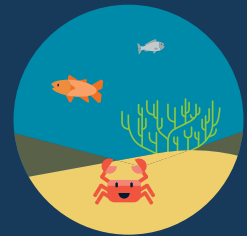
GLOBAL CHANGE AFFECTS



PHYSICAL
OCEAN

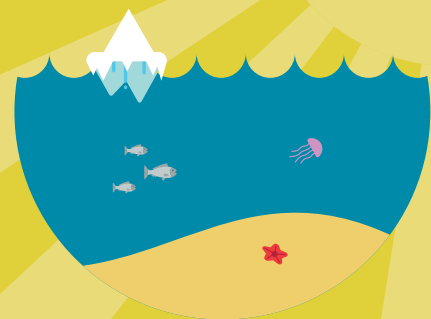
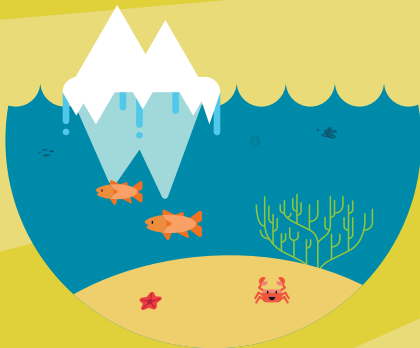


BIOGEOCHEMICAL
OCEAN



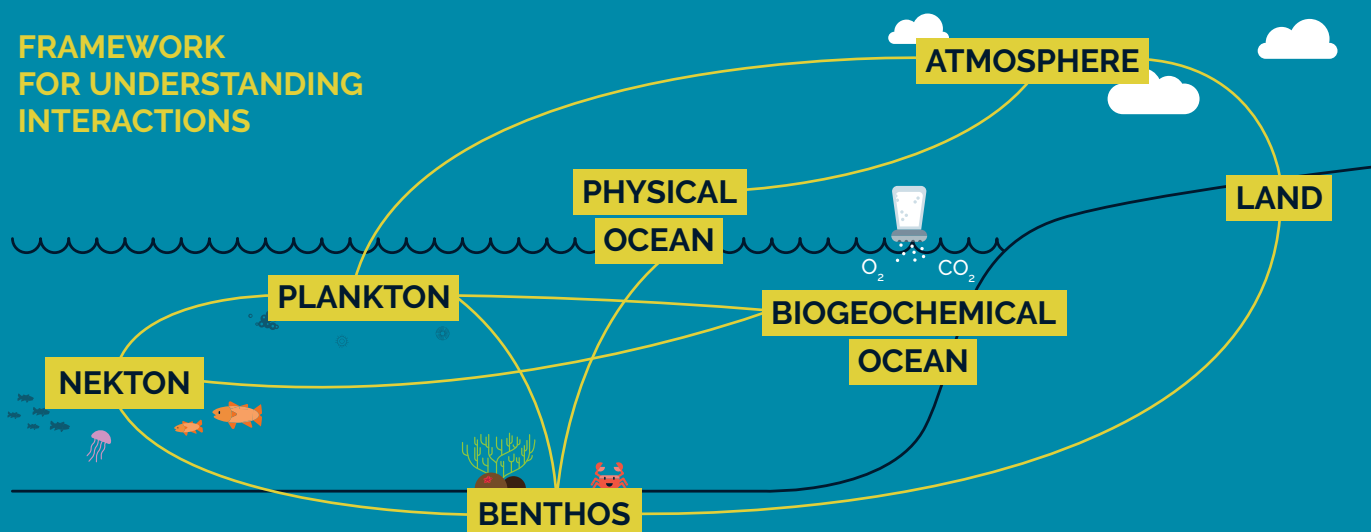
BIOLOGICAL
OCEAN

OVER TIME



KEY RECOMMENDATIONS

FRAMEWORK FOR UNDERSTANDING INTERACTIONS



A MULTI-STRESSED AND RAPIDLY CHANGING OCEAN

HUMAN ACTIVITIES HAVE AN IMPACT ON THE OCEAN



Polution



Overfishing



Littering



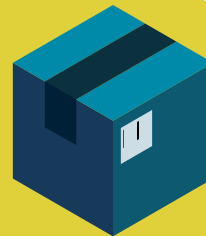
OUR EARTH IS CHANGING AND THE IMPACT ON OUR OCEANS IS EVIDENT



World Population



International Trade

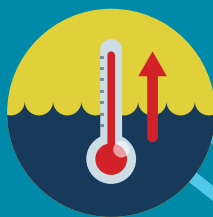


Consumerism

Some major influencers:



KEY RECOMMENDATIONS



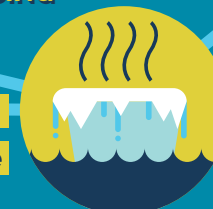
**Rising Sea
Temperature**



**Salinity
Changes**



**Rising Sea
Level**



**Melting
Ice**

FRAMEWORK FOR UNDERSTANDING INTERACTIONS



SCIENCE OF SURPRISES

EXTREME EVENTS HAVE IMPACT ON LOCAL ECOSYSTEMS

Extreme events in the ocean are difficult to predict and prevent. Their impact on local ecosystems can be devastating.



HEAT WAVES



FLOODS



EARTHQUAKES



TSUNAMIS

SMALL CHANGES CAN TRIGGER BIG ONES!



Temperature changes can lead to full ecosystem shifts!

EXTREME EVENTS IMPACT THE MARINE ECOSYSTEM SERVICES

Examples

Changing fishing seasons <
Reducing coastal protection <

LOTS OF CASUALTIES!

We need to build strategies to take the impacts of extreme events into account!



KEY RECOMMENDATIONS

OBSERVATIONS IN THE RIGHT PLACE



ENHANCED MODELLING AND FORECASTING



IMPROVED EARLY WARNING



SUSTAINABILITY SCIENCE FOR THE OCEAN

WORKING IN SILOS



SOCIAL SCIENCES

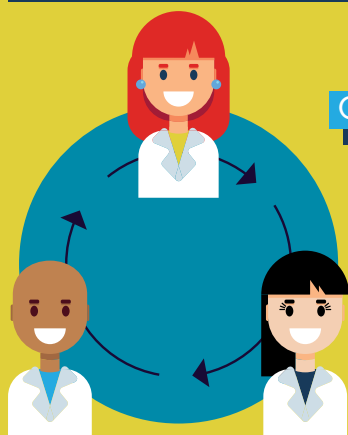


NATURAL SCIENCES



HUMANITIES

WHAT IS SUSTAINABILITY SCIENCE?



Centered on solving
social challenges



Improving management
of marine resources

KEY RECOMMENDATIONS



SUSTAINABILITY AT THE CORE
OF MARINE RESEARCH AGENDA



NEW GENERATION OF
SUSTAINABILITY SCIENTISTS



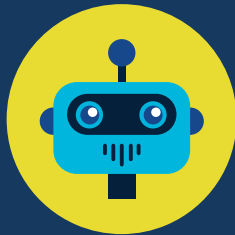
ESTABLISH MARINE
SUSTAINABILITY FORUM

OCEAN TECHNOLOGIES

NOVEL TECHNOLOGIES



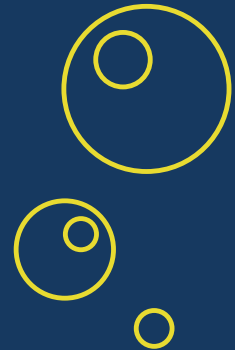
NEW SENSORS



ARTIFICIAL INTELLIGENCE



DRONES



FUTURE TRENDS

REAL TIME DATA



All data to be openly available to everyone in real time.



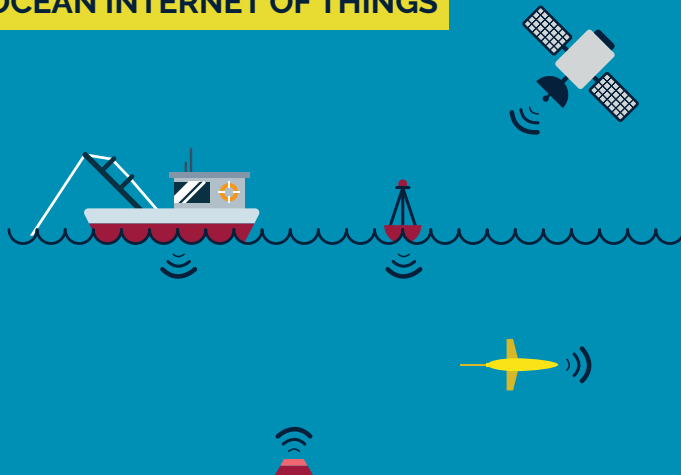
MOBILE



COMPUTER

KEY RECOMMENDATIONS

OCEAN INTERNET OF THINGS



TOWARDS A DIGITAL OCEAN

In the future virtual reality software for diving into the sea would allow humans to explore the ocean.

