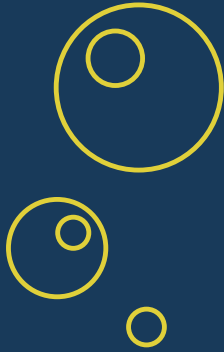


A FOUR-DIMENSIONAL AND CONNECTED OCEAN

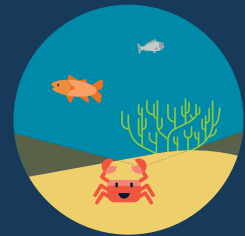
GLOBAL CHANGE AFFECTS



PHYSICAL OCEAN

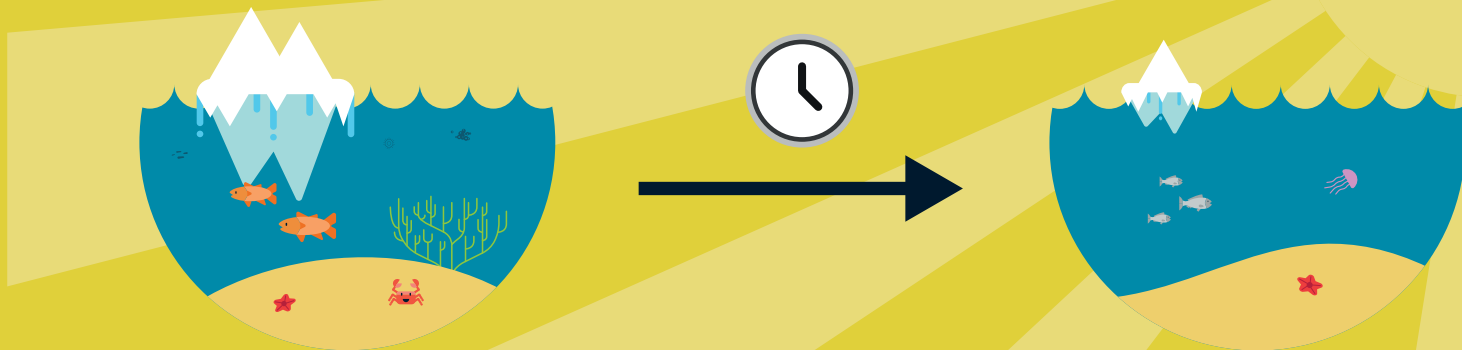


BIOGEOCHEMICAL OCEAN



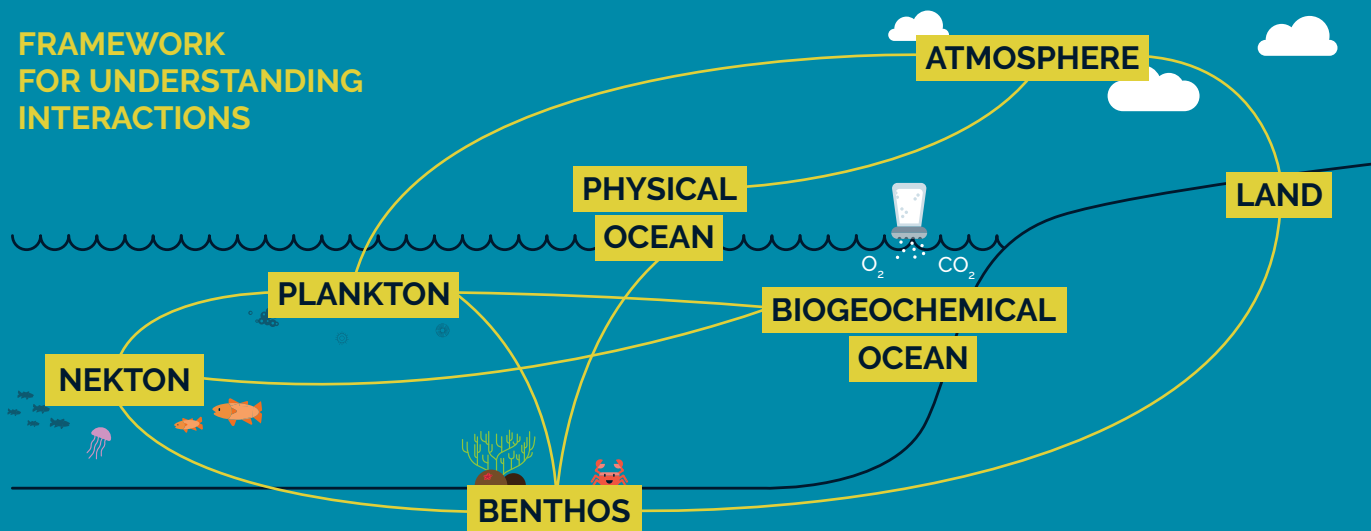
BIOLOGICAL OCEAN

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



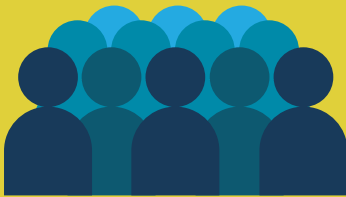
Littering



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



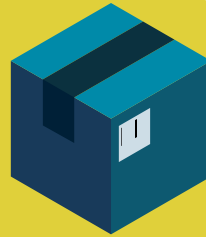
Some major influencers:



World Population



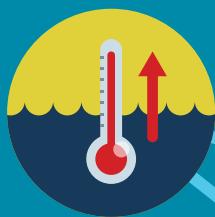
International Trade



Consumerism



KEY RECOMMENDATIONS



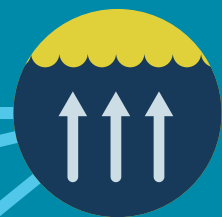
Rising Sea
Temperature



Salinity
Changes



Melting
Ice



Rising Sea
Level

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

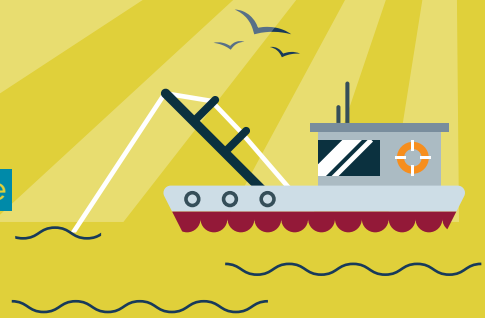
Examples

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

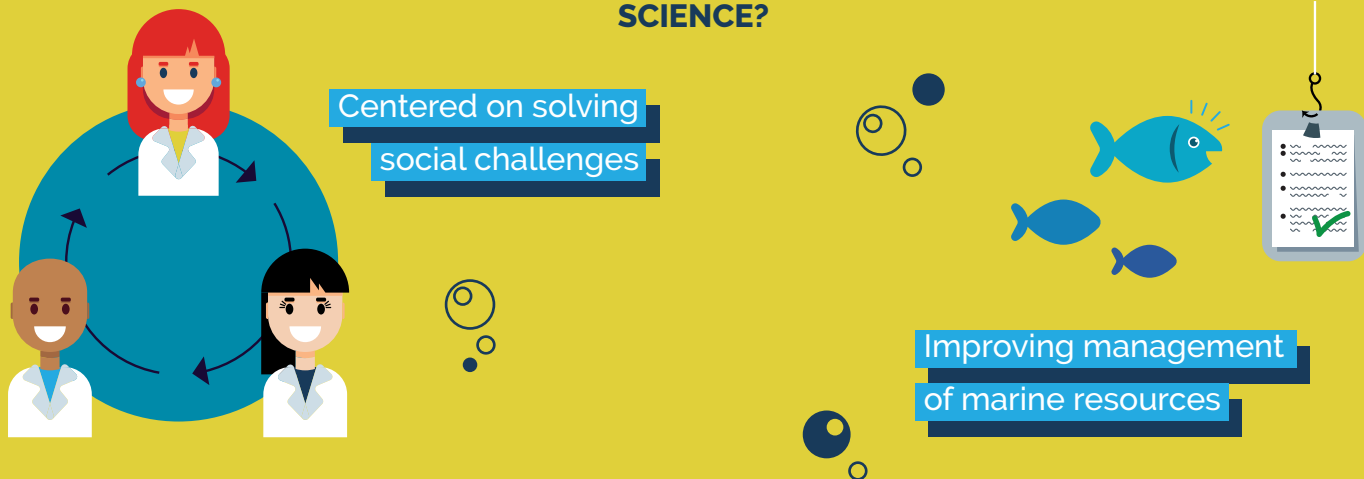


SOCIAL SCIENCES

NATURAL SCIENCES

HUMANITIES

WHAT IS SUSTAINABILITY SCIENCE?



KEY RECOMMENDATIONS



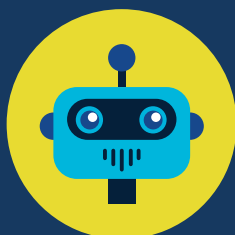


OCEAN TECHNOLOGIES

NOVEL TECHNOLOGIES



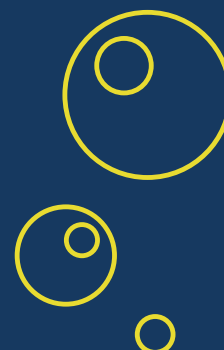
NEW SENSORS



ARTIFICIAL INTELLIGENCE



DRONES



FUTURE TRENDS

REAL TIME DATA



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



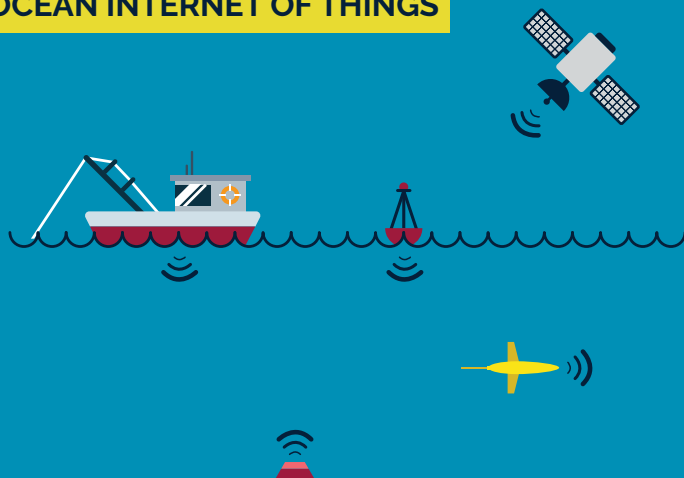
MOBILE



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.

