The central role of the ocean for Earth’s climate, society and sustainable development

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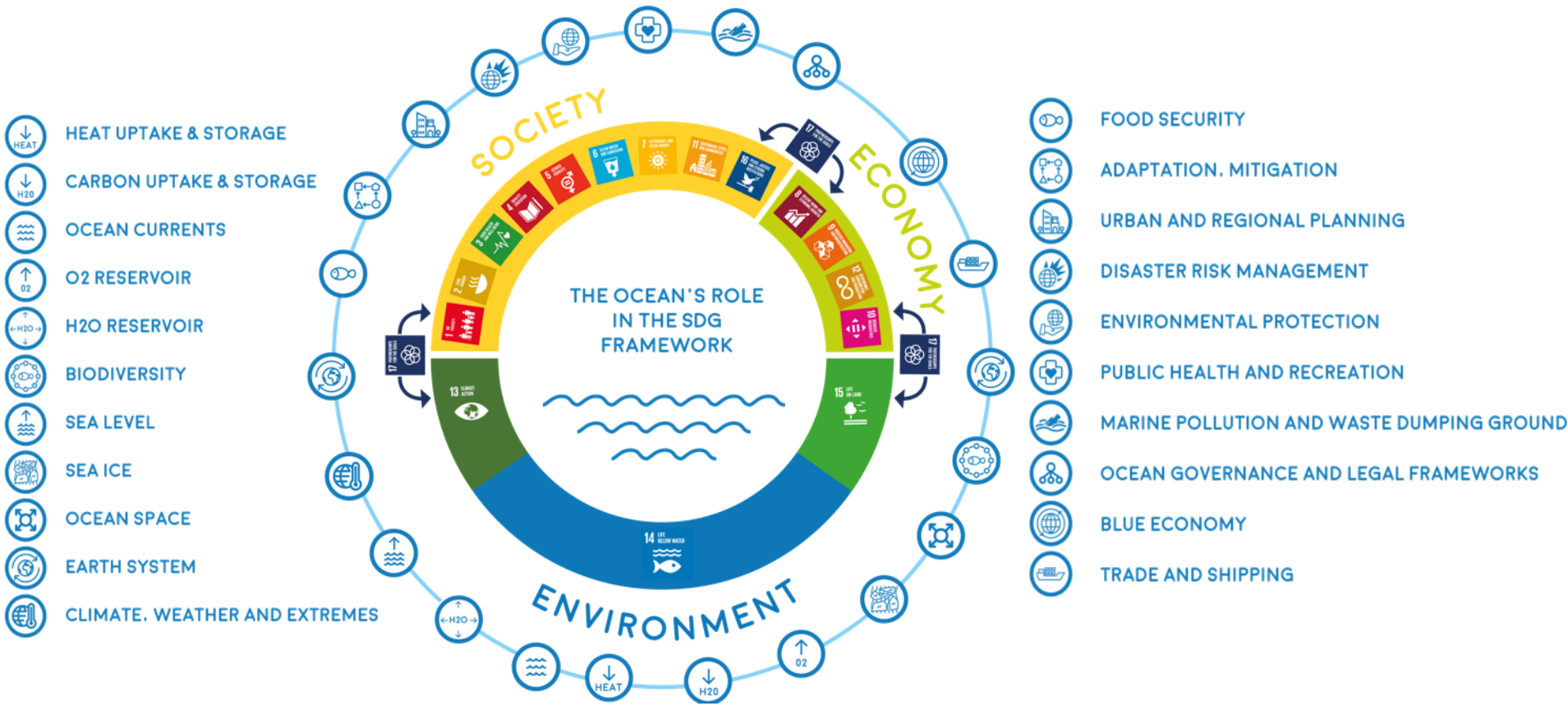
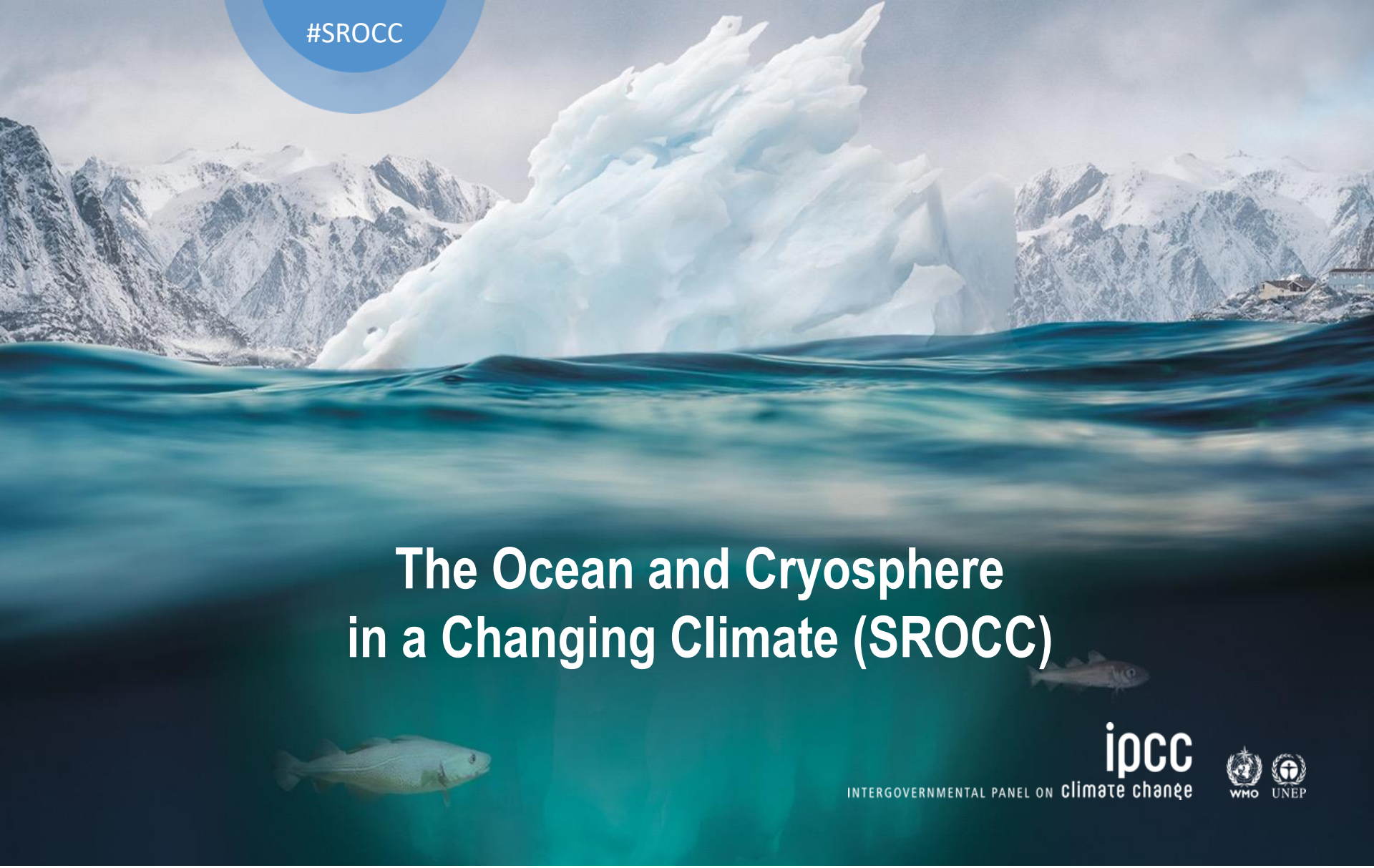
THE WORLD OCEAN DRIVES GLOBAL SYSTEMS AND PLAYS A FUNDAMENTAL ROLE IN THE SDG FRAMEWORK



von Schuckmann, K., E. Holland, P. Haugan, P. Thomson, 2020, Journal of Marine Policy

#SROCC



The Ocean and Cryosphere in a Changing Climate (SROCC)

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INTERGOVERNMENTAL PANEL ON climate change
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https://www.ipcc.ch/srocc/

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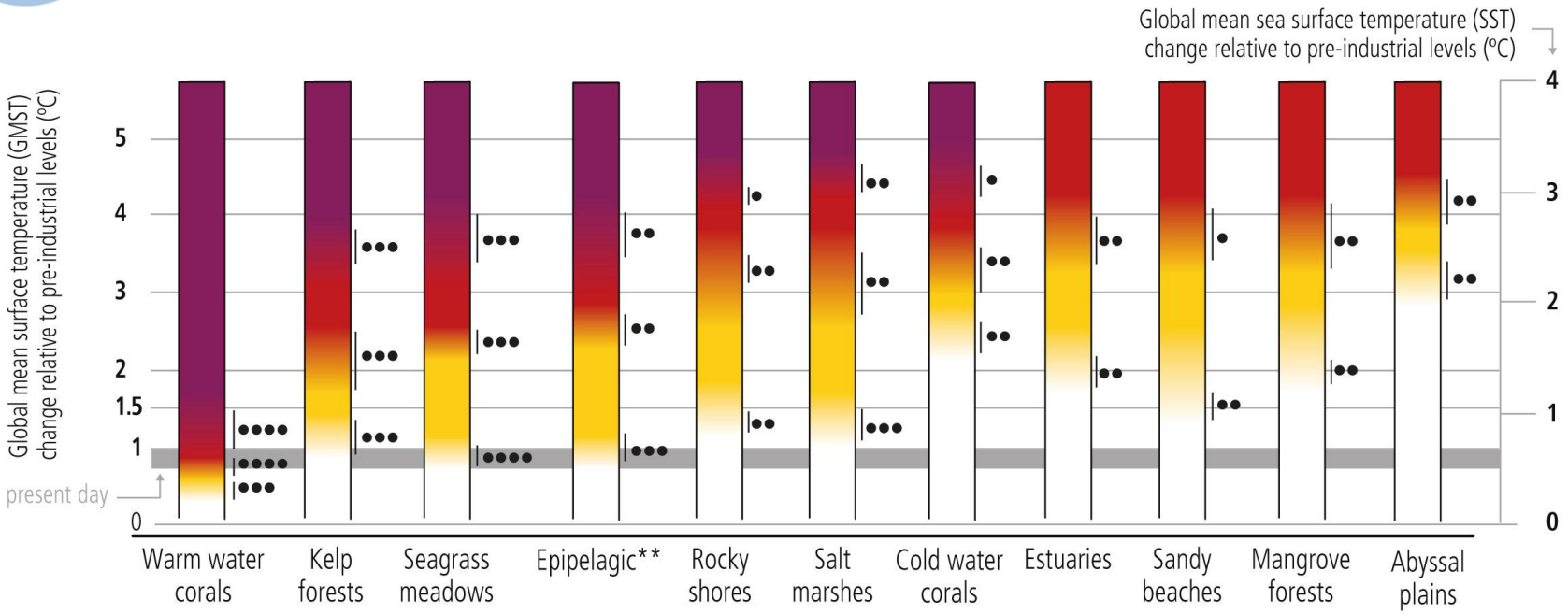
Impacts and risks on ocean ecosystems from climate change



Level of added impacts/risks

- **Very high** — **Purple:** Very high probability of severe impacts/ risks and the presence of significant irreversibility or the persistence of climate-related hazards, combined with persistence of climate-related hazards, combined with limited ability to adapt due to the nature of the hazard or impacts/risks.
- **High** — **Red:** Significant and widespread impacts/risks.
- **Moderate** — **Yellow:** Impacts/risks are detectable and attributable to climate change with at least medium confidence.
- **Undetectable** — **White:** Impacts/risks are undetectable.

Confidence level for transition

●●●● = Very high
●●● = High
●● = Medium
● = Low
| = Transition range

**see figure caption for definition

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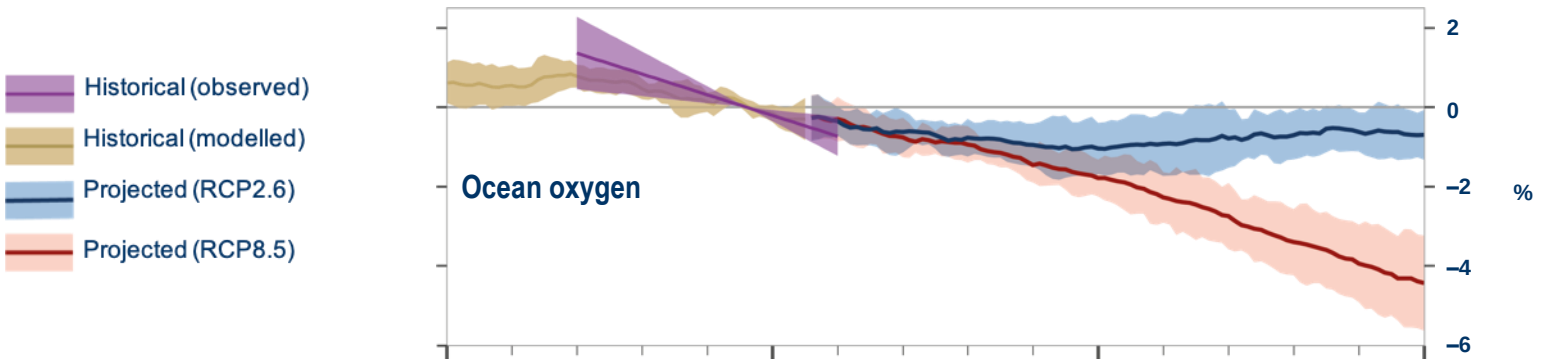
Low greenhouse gas emission scenario, with high mitigation (**RCP2.6**).
Gives a 2 in 3 chance of limiting warming to below 2°C by 2100.
2081-2100 temperature = +1.6°C (±0.7°C)
2081-2100 CO_2 concentration = 426 ppm

Historical (observed)
Historical (modelled)
Projected (RCP2.6)
Projected (RCP8.5)

High greenhouse gas emission scenario in the absence of policies to combat climate change (**RCP8.5**).
2081-2100 temperature = +4.3°C (±1.1°C)
2081-2100 CO_2 concentration = 850 ppm

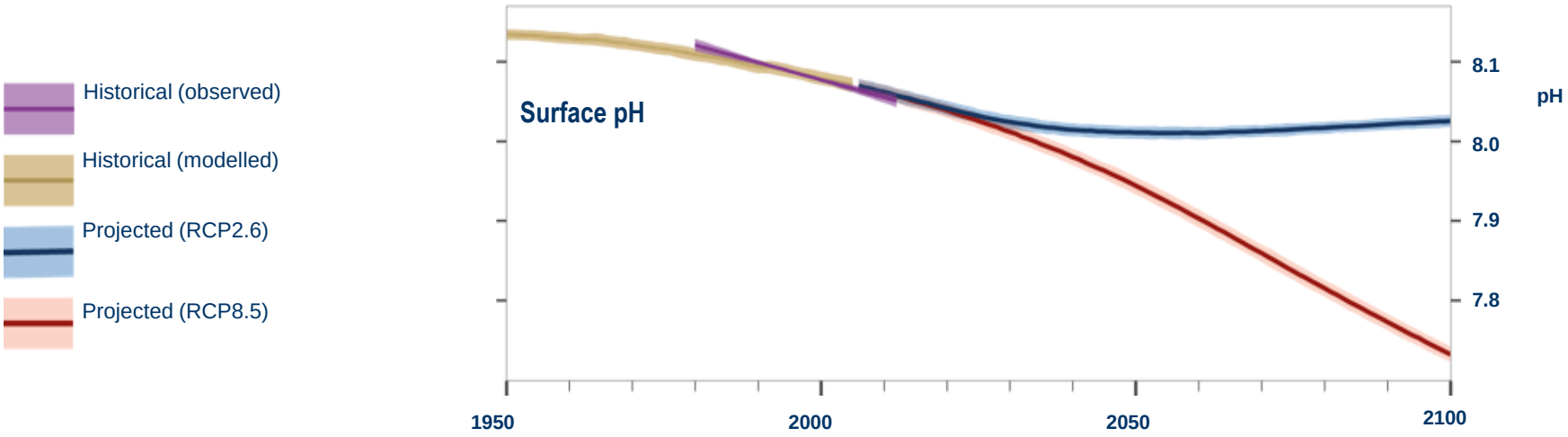
Ocean deoxygenation



- A loss of oxygen has occurred from the surface to 1000 m
- Ocean oxygen is projected to further decline over the 21st century.

Ocean acidification

The **ocean** has **taken up 20-30% of the global emissions** from human activities over the past 3 decades.



As a **consequence** of anthropogenic carbon uptake, the ocean has undergone **increasing surface acidification** and **continued carbon uptake** by the ocean **by 2100 is virtually certain** to exacerbate ocean acidification.

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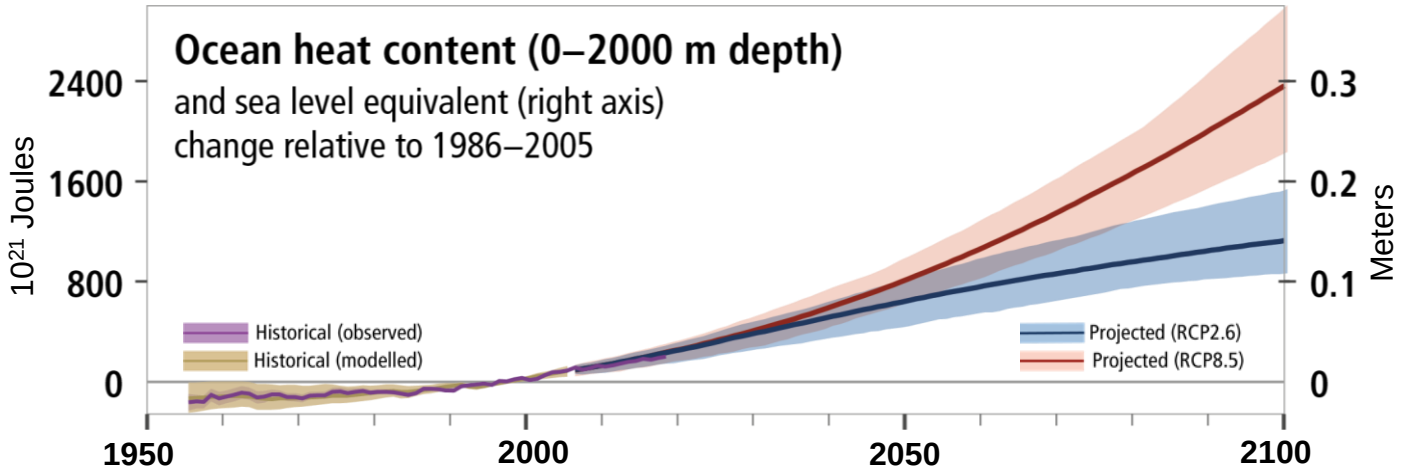
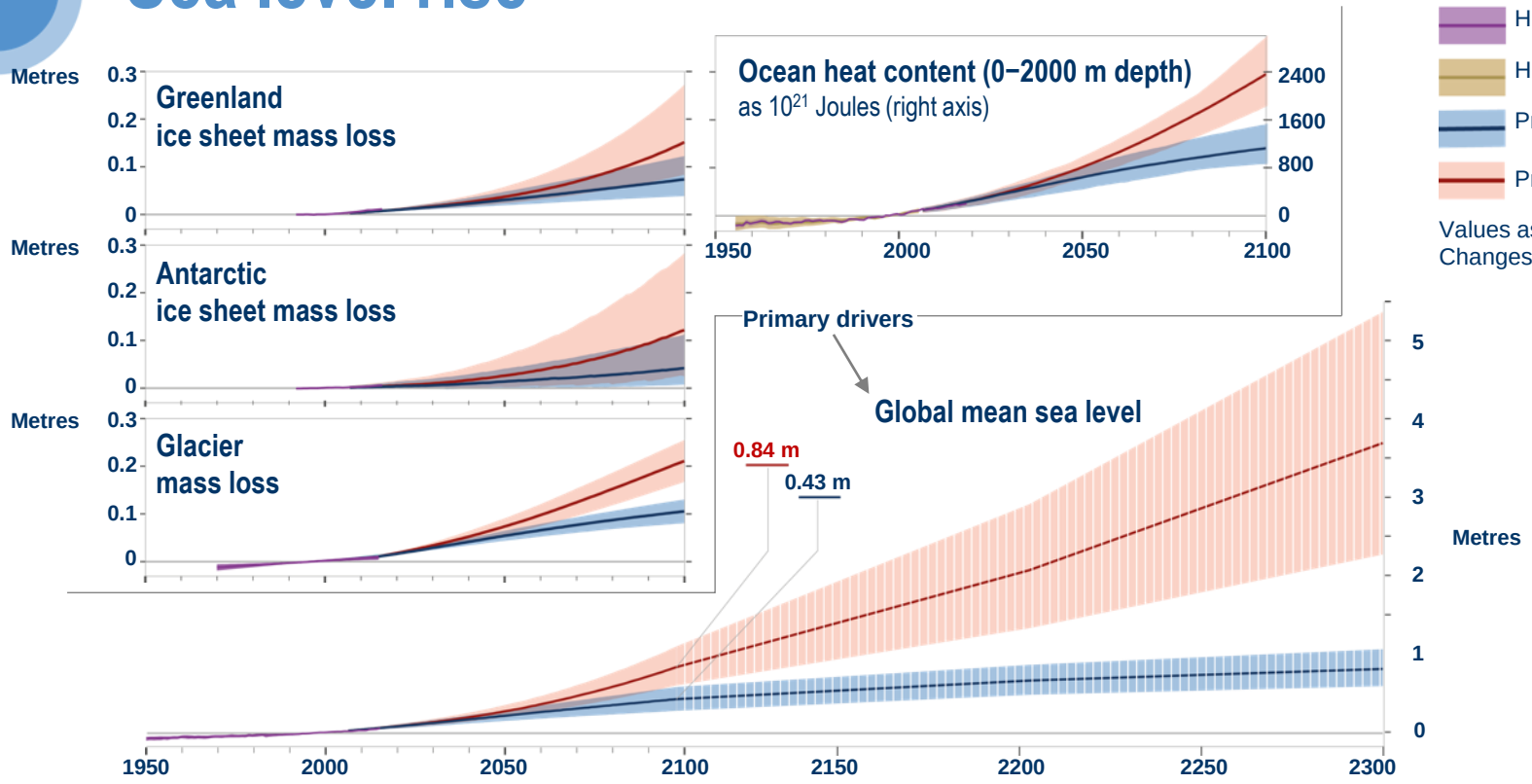
Ocean warming

Due to emissions of heat-trapping gases resulting from human activities, the global ocean has warmed as it has taken up more than 90% of the excess heat in the climate system, making climate change irreversible.



- **Ocean warming is continuing unabated**. Since the last three decades, the rate of ocean warming has increased and around half of the total heat gain in the global ocean has occurred in the Southern Ocean in the last decade.
- **The ocean will continue to warm throughout the 21st century**. By 2100, the ocean will take up 2 to 4 times more heat if global warming is limited to 2°C and up to 5 to 7 times at higher emissions.

Sea level rise



- During the 20th century, the global mean sea level rose by about 15cm. Sea level **is currently rising more than twice as fast and will further accelerate** reaching up to 1.10 m in 2100 if emissions are not sharply reduced.

- **There is no scenario that stops sea level rise this century**. We have the choice between below 1 metre and up to several metres of sea level rise by 2300

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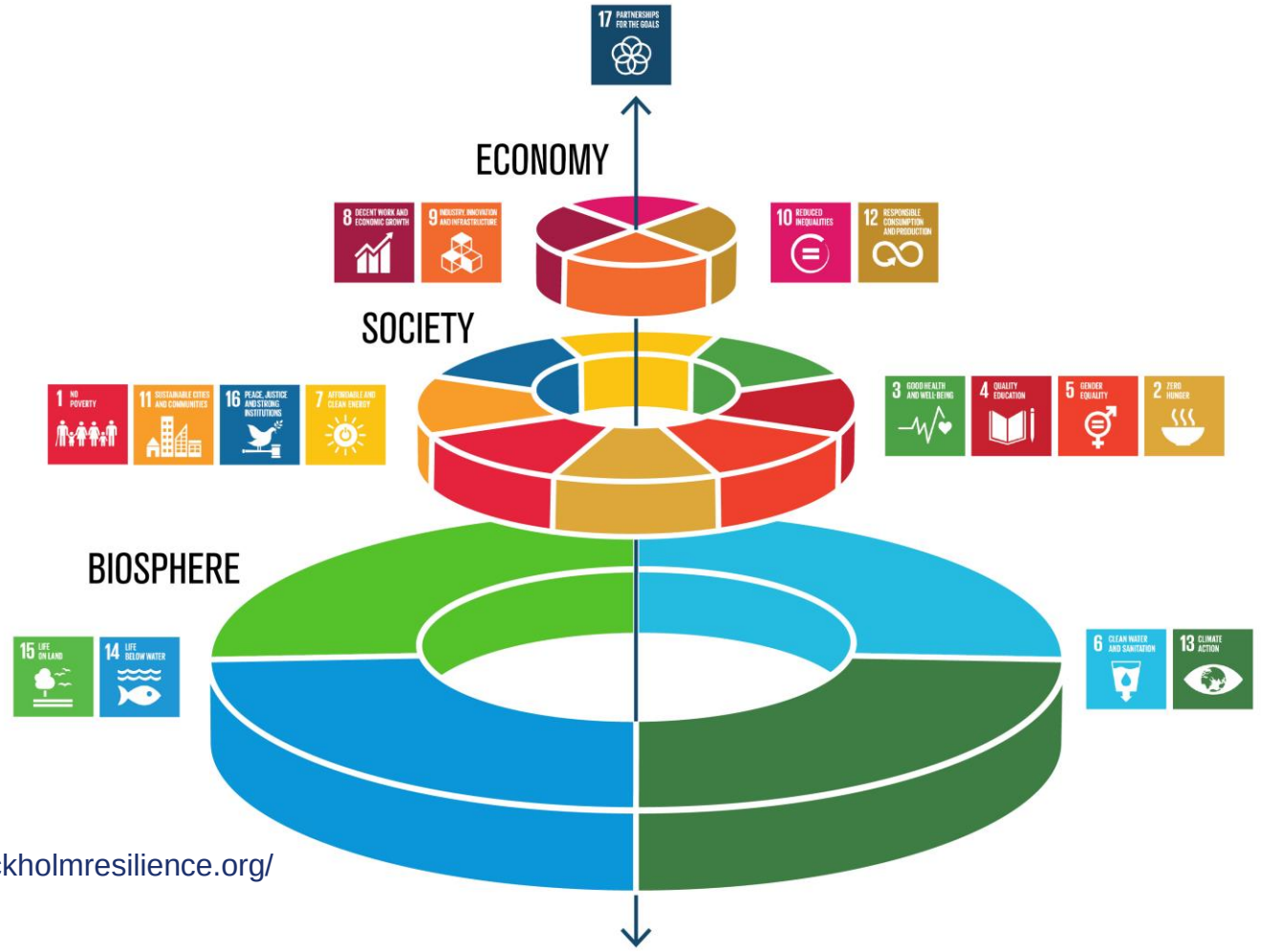
Sustainable Development Goals: Economy & Society are embedded parts of the Environment

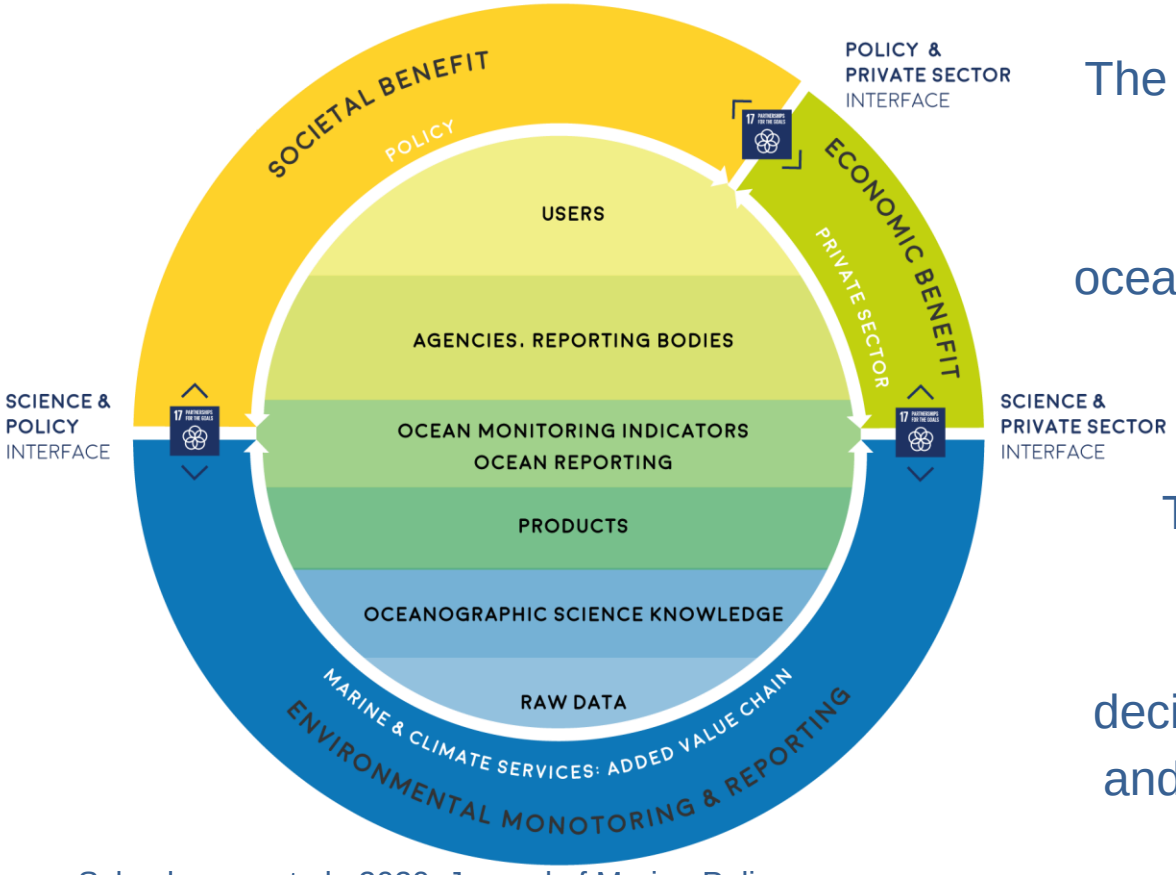


https://www.stockholmresilience.org/

The wedding cake presentation for the SDGs: moving away from the current sectorial approach where social, economic, and ecological development are seen as separate parts.

Added value chain for science based data & information

HOW CAN WE ACHIEVE KNOWLEDGE TRANSFER ACROSS THE PILLARS' INTERFACES ?



von Schuckmann et al., 2020, Journal of Marine Policy

The added-value chain is the core of Ocean and climate services that connects raw products and oceanographic science knowledge to high-quality data products, and indicators.

These added-value products can provide the evidence basis for agencies and reporting bodies, decision makers, other stakeholders and the public, yielding societal and economic benefit.

Global partnerships under SDG 17 at the science policy & science/private interface support the optimized use of environmental information through the added-value chain.

Added value chain for science based data & information

implemented by: MERCATOR OCEAN INTERNATIONAL

https://marine.copernicus.eu/

Copernicus Marine Service

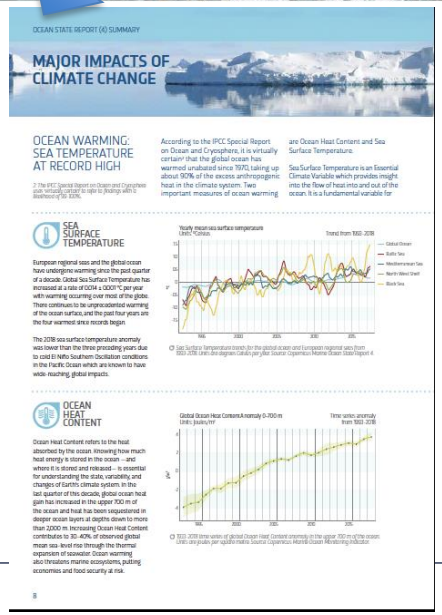
Providing free and open marine data and services to enable marine policy implementation, support Blue growth and scientific innovation.

Access Data >

DATA	EXPERTISE	TRENDS	EXPLORATION
OCEAN PRODUCTS	**OCEAN STATE REPORT**	**OCEAN MONITORING INDICATORS**	**OCEAN VISUALISATION**
A robust ocean data catalogue, to download or visualise data including hindcasts, nowcasts and forecasts.	Extensive annual analysis on the state of the ocean over nearly 20 years and severe/notable annual events.	Essential variables monitoring the health of the ocean over the past quarter of a century.	Dive into our 4D digital oceans through our visualisation tool in the past, present and future.

OCEAN STATE REPORT

https://marine.copernicus.eu/science-learning/ocean-monitoring-indicators/



OCEAN MONITORING INDICATORS

https://marine.copernicus.eu/science-learning/ocean-monitoring-indicators/

Ocean Monitoring Indicators (OMI)

Track the changes in the ocean associated with climate change

- Ocean Acidification (Seawater pH)
- Ocean Heat
- Sea Level including Thermosteric Rise
- Sea Ice Extent
- Arctic Freshwater

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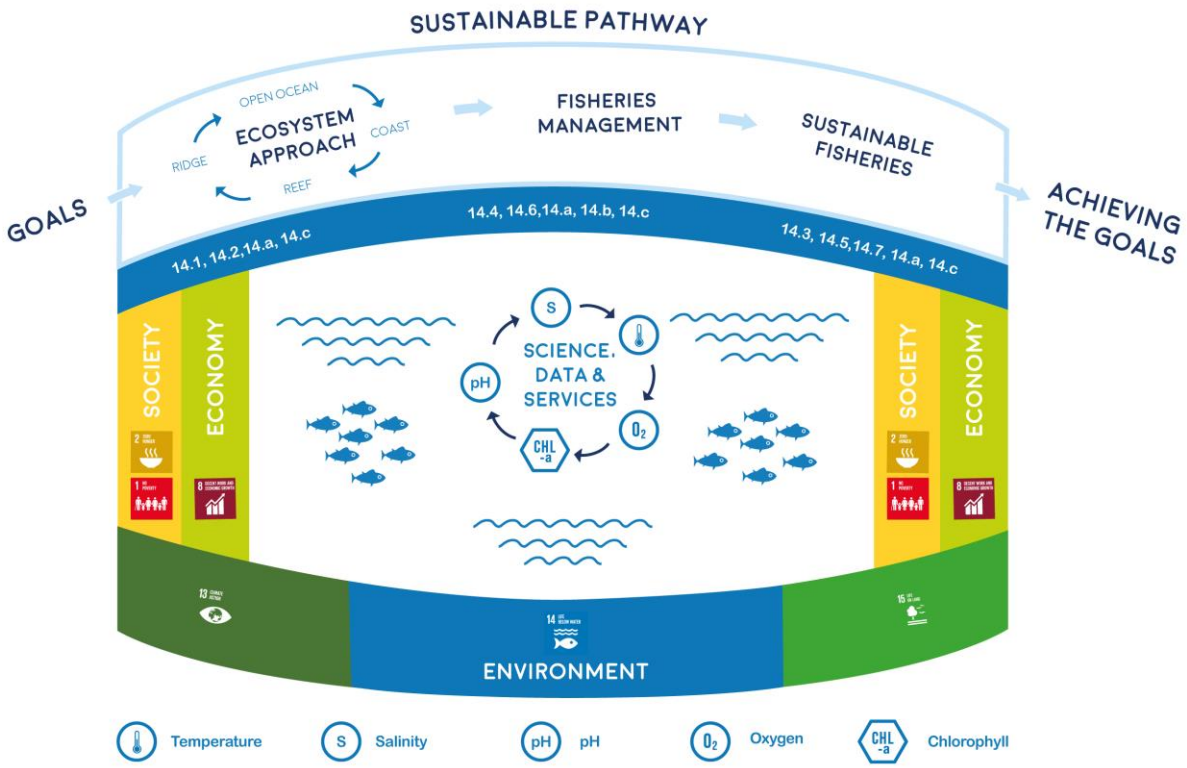
SOCIETY

ECONOMY

The combined use of environmental Essential Variables can support a holistic ecosystem approach to substantially improve fisheries management and support the development of sustainable fisheries.



von Schuckmann et al., 2020, Journal of Marine Policy

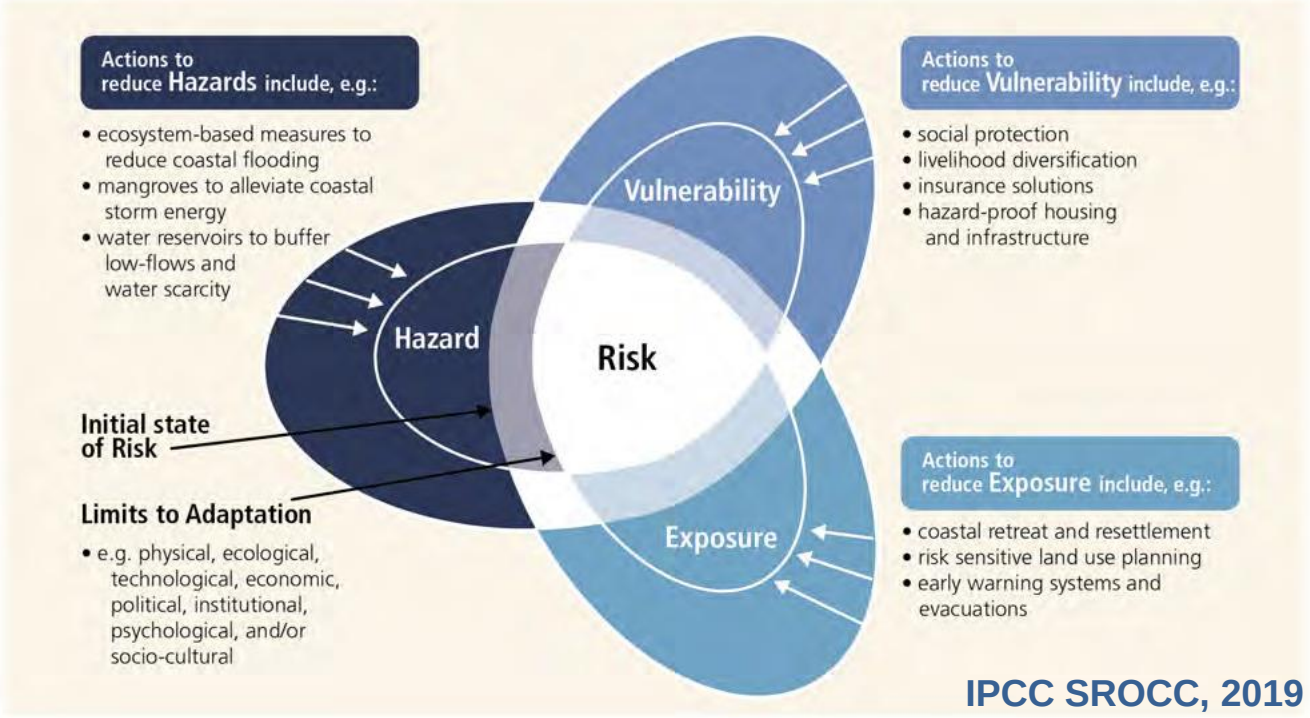
In this example, the environmental variables are key to inform the sustainable stewardship required to meet the SDG targets.

Sustainable fisheries will support a sustainable blue economy that simultaneously embraces environmental stewardship to support society and sustainable economy.

IMPACT OF CLIMATE CHANGE

Risk from climate change-related effects:

(1) environmental hazards triggered by climate change,
(2) exposure of humans, infrastructure and ecosystems to those hazards, and
(3) systems' vulnerabilities



IPCC SROCC, 2019

Addressing the different risk components involves assessing and selecting options for policy and action.

Such decision-making entails evaluation of the effectiveness, efficiency, efficacy, and acceptance of actions.

Policy, management and governance instruments require sustainable Ocean stewardship informed by best available Ocean science, data and services.

Thank you !

Any questions ?

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