

ONE PLANET - ONE OCEAN

FROM SCIENCE TO SOLUTIONS

Massive Open Online Course 2018 Resource Booklet



The Ocean encircles the globe, forming the largest interconnected ecosystem on earth. It provides a huge range of services on which we rely; food, energy, transportation, environmental resilience, but also immaterial benefits such as beauty, cultural identity and recreation that enhance our sense of well-being.

The pivotal role of the ocean in stabilizing climate, enabling a just distribution of economic prosperity and allowing for sustainable management and good governance of human activities is recognized in Goal 14 of the United Nations Sustainable Development Goals that focuses on the Ocean.

In this booklet you find the course resources that you can access through links. Follow the six course modules, each with a series of 10-minute lectures from experts. Access the open-source resources provided, and test your knowledge in the online quizzes.

We intend these resources to be of use to individuals seeking to browse and learn about integrated ocean issues, as well as for teachers, multipliers at the local and regional level and anyone interested in accessing and disseminating ocean knowledge.

Should you have questions, comments or suggestions, or wish to team with us on global ocean literacy, please contact us at oceanmooc@gmail.com.



MODULES: 01 One Planet - One Ocean | 02 Coasts | 03 Marine Ecosystems | 04 Fisheries & Aquaculture | 05 Marine Life & Minerals | 06 Ocean & Climate

MODULE 1: ONE PLANET - ONE OCEAN

Module Introduction



About this Module

This introductory video takes you through the modules and structure of the course. It presents the issues around human interactions with the ocean, and provides the broad framework for each of the modules you find here.

In this module you will hear the views of experts from a variety of disciplines. We present nuggets and insights from science, while realizing that ocean sustainability is about human behavior and human interactions with the ocean. We invite you to continually ask yourselves what this knowledge means to individuals and societies and how it can lead to a better stewardship of the ocean.

www.oceanmooc.org

Lectures

Unit 1.1.
The Ocean MOOC
Prof. Martin Visbeck



Unit 1.2.
The Ocean: A Finite Resource
Prof. Martin Visbeck



Unit 1.3.
Concepts of Sustainability
Prof. Konrad Ott



Unit 1.4. Economic Models of Sustainability
Prof. Martin Quaas



Unit 1.5.
Governing Global Commons
Prof. Nele Matz-Lück



Unit 1.6.
Values and Attitudes to the Ocean
Prof. Jörn Schmidt



Unit 1.7.
From Science to Solutions
Prof. Martin Visbeck



Accessory Material

Reading: Ocean Sustainable Development Goal 14
Video: SDG 14, an Ocean Opportunity - Global Ocean Commission
Reading: A Guide to SDG Interactions
Reading: The First Assessment of the State of the Ocean
Assignment: SDG14 Target 14.5.

Video: A Rescue package for the Ocean
Reading: From Decline to Recovery - a Rescue Package for the Ocean
Reading: Looking to the Future
Reading: Securing Blue Wealth
Assignment: Ocean Services

Video: What is Sustainability?
Video: In the Same Net - Ocean Life, Ethics and the Human Spirit
Reading: Ecosystem Services and Ethics
Reading: Road-map Towards a Sustainable Future?
Reading: Strong Sustainability - Sustainability Communication
Reading: Institutionalizing Strong Sustainability

Reading: Can Sustainable Development Co-exist with Current Economic Growth
Reading: Economic Growth Pathways and Environmental Sustainability
Reading: Economic development and Carbon Footprint

Video: Governing Marine Biodiversity
Video: Making Law on the High Seas
Reading: Law of the Sea
Interactive Scroll: Exclusive Economic Zone
Reading: UN Audiovisual Library of International Law
Reading: Regional Fishery Bodies
Reading: CITIES, GESAMP, IPOC Funds, The Polar Code, The Arctic Council

Reading: Perceptions, Values and Attitudes on Whales and Whale Watching
Reading: Ocean Related Research and Innovation
Reading: Understanding Audiences
Video: Ocean Literacy

Reading: Ocean Science Research is Key for a Sustainable Future
Reading: Securing Blue Wealth
Video: SDG14 - An Ocean Opportunity
Assignment: SDG Links

Module Introduction

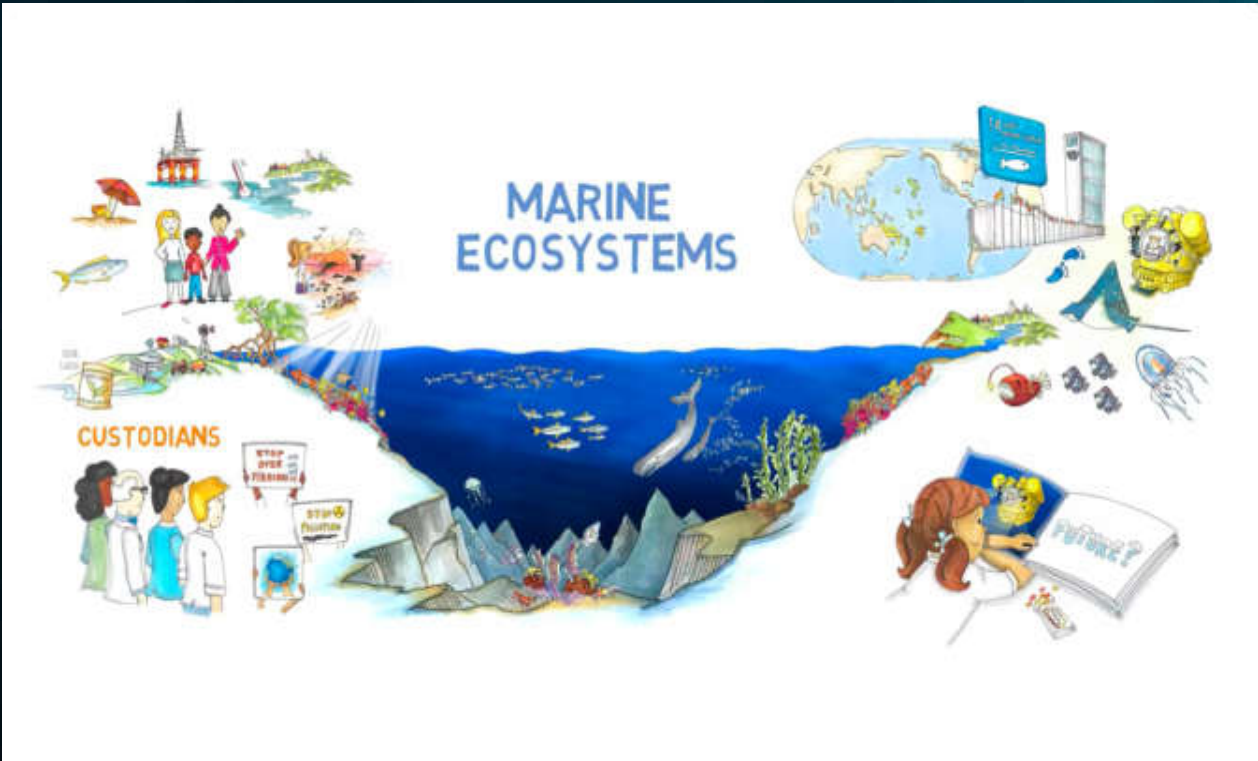


Accessory Material

Video: Regional Voices
Reading: Future Earth Coasts
Reading: Sustainability of Future Coasts and Estuaries: A Synthesis
Assignment: SDG14 Target 2

MODULE 3: MARINE ECOSYSTEMS

Module Introduction



About this Module

In this module, look beyond and under the ocean surface to explore the fascinating marine ecosystems of our ocean. The introductory video introduces the module structure. After a brief introduction to marine food chains and the fantastic variety of marine ecosystems, we will have a closer look at the mix of interacting stressors and marine ecosystem change and services. Subsequently we look at the natural resilience of life in the ocean and its capability to adapt. Finally, we will present some approaches to reduce anthropogenic stress on marine ecosystems and look into the legal options and challenges.

Lectures

Unit 3.1. Dance of the Plankton Prof. Ulf Reibesell	
Unit 3.2. Marine Ecosystem Change and Services Prof. Thorsten Reusch	
Unit 3.3. Valuing Ocean Assets Prof. Martin Quaas	
Unit 3.4. Resilience and Adaptation in the Ocean Prof. Thorsten Reusch	
Unit 3.5. Alien Species Migrations and Range Shifts Prof. Thorsten Reusch	
Unit 3.6. a) Ocean Plastic: Where is It Guest Lecturer: Dr. Erik van Sebille	
Unit 3.6. b) Ocean Plastic: Tackling Ocean Plastic Guest Lecturer: Olga Mironenko	
Unit 3.7. Marine Spatial Planning Prof. Nele Matz-Lück	

Accessory Material

Reading: Global Rotation of SeaWiFS Reading: Plankton Chronicles Reading: Tara Oceans Reading: Tara Oceans Plankton Study
Video: Ecosystem and Nutrient Management Reading: How the Sea Serves Us Reading: IPCC - Human Activities in Marine Ecosystems Reading: Baltic Sea Action Plan Assignment: Ocean Health Index
Video: Put a Value on Nature! Reading: Can You Put a Dollar Value on Nature? Reading: Price on Nature Reading: Natural Capital - What We Don't Value, We Destroy
Video: Explanation to Resilience Reading: Resilience Alliance Reading: Rethinking Ecosystem Resilience in the Face of Climate Change Reading: Resilience and Ecosystem Services Reading: Adaptive Evolution in a Key Phytoplankton Species Reading: Ocean Atlas - Invasive Species
Reading: Biodiversity and the Impacts of Marine Invasive Species Reading: Invasive Alien Species – Growing Threat in Regional Seas Reading: Spread of the Pacific Oyster in the Wadden Sea. Reading: Marine and Coastal Ecosystem-Based Management Reading: Climate Change and Distribution Shifts in Marine Fishes
Reading: Online Portal for Marine Litter Reading: Marine Anthropogenic Litter Reading: Distribution of Litter and Microplastic
Reading: Better Alternatives 2.0 Reading: Prevention of Ocean Litter Video: Precious Plastic Reading: International Pellet Watch
Reading: United Nations Audiovisual Library of International Law Video: Tribunal for the Law of the Sea Reading: Sharks and Mantra Rays Video: Polar Environment Explained Reading: Arctic Resilience Report

MODULE 4: FISHERIES AND AQUACULTURE

Module Introduction



About this Module

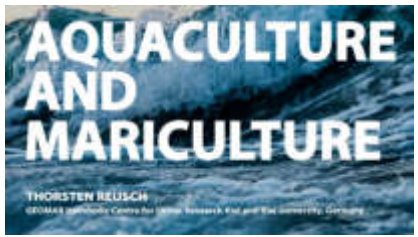
In this module, explore how humans interact with the coasts. Start by learning what characterizes coasts, and reflecting on the ocean as a common heritage for humankind. Then look at how coasts are influenced by human activities on land and by the ocean. Subsequently, some possible solutions are presented and you are asked to think about how you would like your coast to look in the future.

Lectures

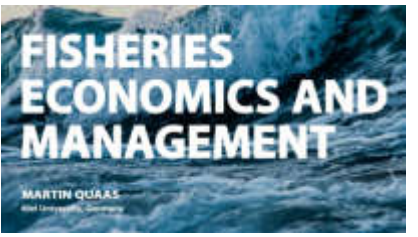
Unit 4.1.
Marine Food Chains
Prof. Thorsten Reusch



Unit 4.2.
Aquaculture and Mariculture
Prof. Thorsten Reusch



Unit 4.3.
Fisheries Economics and Management
Prof. Martin Quaas



Unit 4.4.
Sustainable Management of Fisheries
Prof. Martin Quaas



Unit 4.5.
From Attitude to Action
Prof. Jörn Schmidt



Accessory Material

Video: Antarctic Marine Food Webs
Reading: Food Web Structure
Assignment: Marine Food Web

Reading: The State of the World Fisheries and Aquaculture
Reading: FishEthoBase
Video: How I Fell in Love with a Fish
Reading: Sustainable Seafood Guides
Assignment: My Sea Food

Reading: The Future of Fish – The Fisheries of the Future
Video: Save the Oceans, Feed the World!
Video: Global Fishing Watch
Reading: The Economics of Fishing the High Seas
Assignment: EcoOcean Online Game

Reading: Natural Capital Project
Reading: Plenty More Fish in the Sea?
Reading: Getting Stock Management Right
Reading: Exploiting a Living Resource - Fisheries

Reading: Sustainability Values, Attitudes, and Behaviors
Reading: Keeping Humans in the Ecosystem
Reading: Environmental Citizenship - Towards Sustainable Development

MODULE 5: MARINE LIFE AND MINERALS

Module Introduction



About this Module

In this module embark on a trip to the past, more precisely 4.3 billion years ago, to when all began. You will learn how both marine life and minerals evolved and how they have been interconnected through eons of time. You will learn about the potential of these resources for the future, how and if we can access them and the legal implications of doing so. Enjoy your time travel!

Lectures

Unit 5.1.

Ocean Evolution

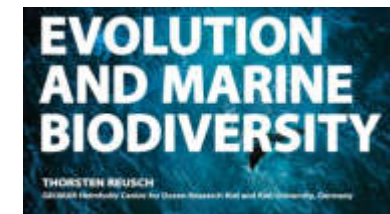
Prof. Thorsten Reusch



Unit 5.2.

Evolution and Marine Diversity

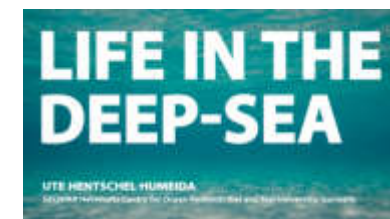
Prof. Thorsten Reusch



Unit 5.3.

Life in the Deep Sea

Prof. Ute Hentschel Humeida

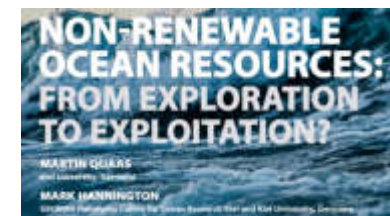


Unit 5.4.

Non-Renewable Ocean Resources

Prof. Martin Quaas

Prof. Mark Hannington



Unit 5.5.

Sea Floor Resources: Energy and Mineral Resources

Prof. Mark Hannington



Unit 5.6.

Ocean Exploration and Sustainable Use of Marine Resources

Prof. Nele Matz-Lück



Accessory Material

Video: The Evolution of Life on Earth

Reading: Evolution - Out of the Sea

Reading: Great Oxygenation Event

Reading: UNESCO Fact Sheet on Marine Biodiversity

Reading: Census of Marine Life

Reading: Marine Biodiversity

Reading: Sustaining Life on Earth

Reading: Ocean Life - Past, Present and Future

Reading: Census of Marine Life layer in Google Earth

Video: Counting Creatures

Assignment: Extinction

Reading: Searching for Cures for Cancer in the Deep Sea

Reading: Medical Knowledge from the Sea

Reading: Why Can't We Find New Antibiotics?

Reading: Deep Ocean Creatures

Reading: Deep-sea Ecosystems

Reading: Marine Snow - A Staple of the Deep

Video: Black Smokers - Ore Factories of the Deep

Video: The Anglerfish - The Original Approach to Deep-sea Fishing

Reading: Sand, Rarer than One Thinks - Why is this Issue Important?

Reading: MIDAS (Managing Impacts of Deep-Sea Resource Exploitation)

Reading: Deep Sea Minerals

Reading: Blue Mining

Reading: Marine Minerals

Reading: Energy: Methane Hydrates

Reading: The Changing Face of Hydrothermalism

Video: Hydrothermal Vents

Reading: InterRidge Vents Database

Reading: WOR3 - Marine Resources - Opportunities and Risks

Reading: News from the Seabed

Reading: Hydrothermal Processes

Reading: Drugs From the Deep?

Video: Marine Genetic Resources

Assignment Deep Sea Exploitation

Video: Submarine Volcanoes and Hydrothermal Vents

Video: Hydrothermal Vent Creatures

Reading: Hydrothermal Vent Life

Reading: Hydrothermal Vent Boiling Points

MODULE 6: OCEAN AND CLIMATE

Module Introduction



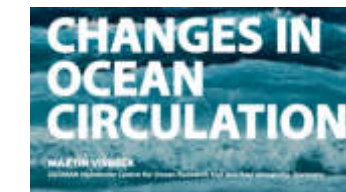
About this Module

The vital link between the ocean and the climate of our planet is the subject of this module. How does this work? How can understanding changes in ocean circulation, expected alterations in the ocean's biology and the carbon cycle give us an understanding of the rate, time scales and direction of change in the future? What are possible options to minimise climate change impacts for humans, and should these be implemented on large scales?

Unit 6.1.
Human Influences on the Ocean
Prof. Moji Latif



Unit 6.2.
Changes in Ocean Circulation
Prof. Martin Visbeck



Unit 6.3.
Ocean Prediction
Prof. Martin Visbeck
Prof. Mojib Latif



Unit 6.4.
Ocean Heat Storage and Sea-Level
Prof. Martin Visbeck



Unit 6.5.
The Ocean's Biological Pump
Prof. Ulf Riebesell



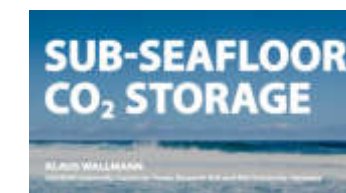
Unit 6.6.
Ocean Change: A Mix of Interacting Stressors
Prof. Ulf Riebesell



Unit 6.7.
Climate Engineering
Prof. Andreas Oschlies



Unit 6.8.
Sub-Seafloor CO₂ Storage
Prof. Klaus Wallmann



Accessory Material

- Video: Ocean Acidification - An Ecosystem Facing Dissolution
- Reading: IPCC, Knowledge and Observations on the Climate System
- Video: Climate Change for the Lay Person
- Video: IPCC on the Physical Science Basis of Climate Change
- Video: If CO₂ Emissions were Visible
- Video: New York City's Greenhouse Gas Emissions
- Video: Global CO₂ Emissions
- Assignment: Global Warming and Carbon Footprint

Reading: Great Ocean Currents
Reading: The Great Ocean Currents - The Climate Engine
Video: Ocean Stratification
Reading: Observing and Modelling the Global Ocean
Reading: Ocean Circulation and Climate - A 21st Century Perspective
Video: The Ocean – A Driving Force for Weather and Climate (NASA)
Assignment: Kitchen Oceanography

Reading: Ocean Observation
Reading: Scientists discuss how to Improve Climate Models
Reading: The History of Climate Modelling

Reading: New Estimate of Ocean Heat Finds More Warming
Infographic: Sea-Level Rise Sets Baseline for Storm Surges
Video: Global vs. Local Sea Level
Reading: Ocean Observation
Assignment: Ocean Heat Uptake

Video: Marine Elemental Cycles

Reading: The Power of Plankton

Reading: Warming Oceans Produce Less Phytoplankton

Reading: Satellite Observations of Ocean Color

Reading: The Global Carbon Project

Video: Studying Ice Cores in Antarctica

Assignment: Planktonportal

- Reading: How Climate Change Alters Ocean Chemistry
- Reading: Climate Change Impacts on Marine Ecosystems
- Reading: Impacts of Climate Change on the Oceans
- Reading: Mix and Match - How Climate Selects Phytoplankton
- Reading: BIOACID
- Reading: Ocean Acidification

- Video: Climate Engineering - No Easy Fix
- Reading: Negative Emission Technologies
- Reading: Ocean-artUP
- Reading: Research to Evaluate Climate Engineering
- Reading: Assessing the Potential of Calcium-based Artificial Ocean Alkalinization
- Reading: IPCC Geoengineering
- Reading: Potential Climate Engineering Effectiveness and Side Effects
- Reading: Geoengineering - It Could be a Money-making Opportunity for Business

Reading: The ECO₂ Project

Reading: Indian Firm 'Carbonclean'

Reading: Will Carbon Capture and Storage Ever Work?

Reading: Special report on Carbon Capture and Storage (IPCC)

APPENDIX

General Reading



Ocean Atlas *Understanding the threats to our marine ecosystems*

The Ocean Atlas 2017 delivers, with 18 contributions and 50 graphics, relevant facts and figures about the ocean.



World Ocean Review 1 *Living with the oceans*

A report on the state of the world's oceans, 240 pages, with numerous figures and illustrations



World Ocean Review 2 *The Future of Fish*

The Fisheries of the Future, 150 pages, with numerous figures and illustrations



World Ocean Review 3 *Marine Resources*

Opportunities and Risks, 165 pages, with numerous figures and illustrations



World Ocean Review 4 *Sustainable Use of Our Oceans*

Making Ideas Work, 152 pages, with numerous figures and illustrations

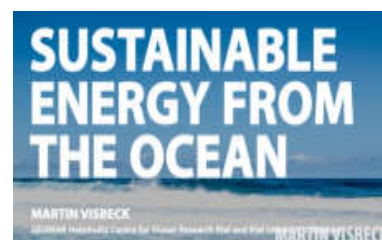
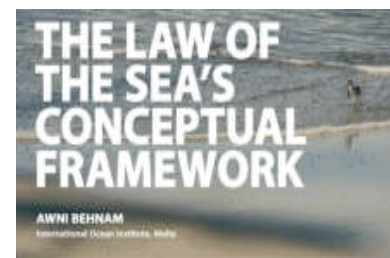
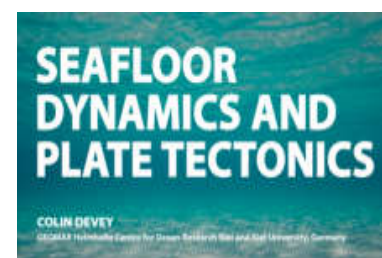
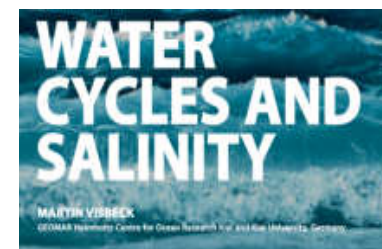


World Ocean Review 5 *Coasts*

A virtual habitat under pressure, 208 pages, with numerous figures and illustrations

More MOOC Videos

Here are links to MOOC Videos that we used for the broadcast in 2016:



Feedback from Participants

"This course provided me with enough knowledge to better understand the concepts that are used in my profession as it is not a background that I am familiar with."

"What I enjoyed most about the course was the overview about the current state of the ocean without losing hope/belief that we still might have a chance to stop or reduce the irreversible consequences {of human activities}"

"The course was successful in giving me a chance to get to know about current worldwide scenario of ocean management and protection, and the chance to interact with scientists and students worldwide. The lectures being in the form of animation and videos were effective in explaining the concepts, and inputs from eminent scientists was very helpful. The course made me think of all the aspects of ocean sustainability, like economic matters, geographical differences and the side effects and consequences of solutions for problems we face today."

"My expectation was to gain more insights in current issues facing our oceans and in each module I indeed gained knowledge that I didn't have before. Especially within the governance of the high seas."

About Us

GEOMAR Helmholtz Centre for Ocean Research Kiel is one of the world's leading institutes in the field of marine sciences. The institute investigates the chemical, physical, biological and geological processes of the sea-floor, oceans and ocean margins and their interactions with the atmosphere. Additionally, the centre has successfully bridged the gap between basic and applied science in a number of research areas.

Kiel University is Germany's northernmost State University and the scientific centre of Schleswig-Holstein. It hosts Centre for Interdisciplinary Marine Science (Kiel Marine Science) as one of its four priority research areas. Within KMS 39 working groups cover expertise from areas such as climate research, coastal research, physical chemistry, botany, microbiology, maths and informatics, economics as well as law and social sciences.

The Cluster of Excellence "The Future Ocean" at Kiel University pursues a research approach that is unique in Germany: marine researchers, geologists and economists join forces with mathematicians, computing, medical, legal, and social scientists to investigate ocean and climate change from a multidisciplinary perspective.

The International Ocean Institute (IOI) is a world-leading, independent, non-governmental non-profit organisation conducting training and capacity building in Ocean Governance globally. It trains young and mid-career practitioners in contemporary approaches to coastal and ocean management, with an emphasis on the moral, ethical and legal values in Ocean Governance (equity and peaceful uses of the ocean).

The SDG Academy works together with the world's greatest experts on sustainable development – including health, education, climate change, agriculture and other related fields – to offer a comprehensive core curriculum, equipping the next generation of "Sustainable Development Practitioners" to take on the complex challenges facing our planet.

More information on the lecturers can be found here (with hyperlink to the "People" page of the Ocean MOOC website).

Contact

We look forward to your comments, suggestions and feedback at oceanmooc@gmail.com.