

The earth's ocean and coastal ecosystems play a crucial role in maintaining the global environmental equilibrium. Healthy and productive oceans provide essential services to human communities, supporting economic wellbeing, and human health. These include: providing food, shoreline protection, water quality maintenance, waste treatment, a source of non living resources for energy and trade, recreation and tourism, culture and playing a critical role in regulating the earth's climate. Human activities are putting the Blue World under increasing pressure. The resulting changes in the marine environment are occurring at a faster pace than anticipated, affecting especially the most vulnerable marine ecosystems. Through capacity development, assessment initiatives and innovative communication and facilitation tools and processes, the Marine Division promotes responsible and sustainable management of our oceans and coasts by addressing issues of sovereignty, natural resource management, coastal habitat conservation and a transition to a green economy.



World oceans, a cornucopia of goods and services



## The Marine Division activities are centred on four components

### The UNEP Shelf Programme: The Law Beneath the Waves

Under the United Nations Convention on the Law of the Sea (UNCLOS), States are entitled to certain exclusive economic rights on their legal continental shelf, a seabed area that can extend beyond countries' Exclusive Economic Zones. The UNEP Shelf Programme, coordinated by GRID-Arendal, responds to a mandate of the UN General Assembly and assists developing states with the delineation of the outer limits of the continental shelf using criteria detailed in Article 76 of UNCLOS.

### Sustainable Seas: Developing Today for the Oceans of Tomorrow

The oceans and seabed are a source of both living and non-living resources that contribute to human well-being. Building from the foundations of the UNEP Shelf Programme, the Sustainable Seas capacity development Programme of GRID-Arendal supports developing states working to apply an ecosystem approach to the management and sustainable development of natural resources in the marine environment. Starting with a needs-identification process, the Sustainable Seas Programme seeks to strengthen coastal states' capacities to assess, respond to and communicate priority and emerging issues in their respective maritime space.

### Blue Carbon and Coastal Ecosystem Services: They're All Connected

Coastal habitats such as mangrove forests, sea grass meadows and salt-water marshes provide a myriad of services to people including the provision of food and timber. They also support an important diversity of species, protect coastlines, filter water, and add interest to many tourism destinations. They are also very effective at capturing and storing atmospheric carbon, in biomass and sediment – the term Blue Carbon refers to this role. Blue Carbon habitats therefore make an important contribution to climate change mitigation and coastal livelihoods. Working at the community level and on the global scale, GRID-Arendal aims to promote the importance of Blue Carbon by bridging the gap between science, society and policy.

### Green Economy in a Blue World: Building on the Untapped Potential of Healthy Oceans and Coasts

Our relationship to our oceans needs to change and GRID-Arendal is working with developing coastal countries, Small Island Developing States (SIDS) and international partners to explore economic sustainability issues specific to the oceans, and promote a transition to a green economy approach for the Blue World. With the application of process and communication tools, ecosystem-based economic valuation assessments and specialised training designed to foster the co-development of Blue World solutions, GRID-Arendal seeks to strengthen the pathways undertaken by regions, countries and communities working to enable the future we want.

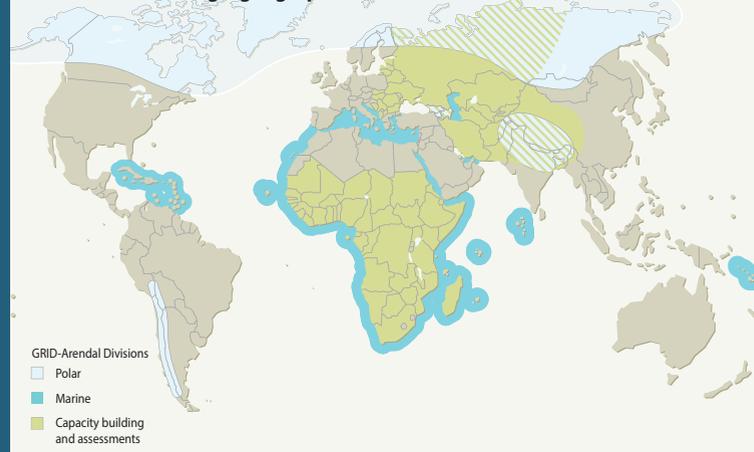
## Environmental Knowledge for Change

**GRID-Arendal is a collaborating centre of the United Nations Environment Programme (UNEP).**

Established in 1989 by the Government of Norway as a Norwegian Foundation, our mission is to communicate environmental information to policy-makers and facilitate environmental decision making for change. We are based in Arendal, Norway with an office in Ottawa, Canada and representation in Sydney, Australia.

GRID-Arendal's activities are organised under four Divisions (Marine, Polar, Capacity Building and Assessments, and Communications).

GRID-Arendal strategic geographic areas



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## Our Marine Competencies

- Marine Geology and Geophysics
- Oceanography
- Marine Ecology/Biology
- Blue Carbon and Marine Ecosystem Services
- Social-Ecological Economics
- Ecosystem-Based Management
- Spatial Analysis and Planning
- Data and Information Management
- Human Geography
- Environmental Sciences
- Facilitation and Capacity Development
- Cartography and Knowledge Visualization

## The Marine Team

The Marine Programme Team consists of 11 professionals with a broad range of expertise in natural and social sciences. Between us we have experience of living in 18 countries and more than 1500 days at sea. We have worked across all continents and in all major oceans, polar, tropical and temperate and speak 8 languages (Catalan, Danish, Dutch, English, French, German, Norwegian, Spanish and Swedish). Before working for UNEP/GRID-Arendal, we have been working in academia and research, consultancies, government and intergovernmental agencies and not for profit sector and private sector.

## What is Blue Carbon?

'Blue carbon' refers to the important role that some coastal habitats play in naturally storing greenhouse gases, thereby helping to mitigate climate change. Blue carbon ecosystems include mangrove forests, saltwater marshes and seagrass beds, and sequester and store atmospheric carbon in biomass and sediments, sometimes at rates higher than tropical rainforests. When these ecosystems are destroyed, buried carbon can be released into the atmosphere, contributing to global warming.

Blue carbon ecosystems also recognized for their natural beauty, and ability to filter pollution, house fish nurseries and buffer shorelines against storms. The sustainable management of these ecosystems can improve livelihoods, and help mitigate and increase resilience to climate change.

The concept and term "blue carbon" was essentially coined by the report *Blue Carbon: The Role of Healthy Oceans in Binding Carbon*, which was prepared for the United Nations Environment Programme by GRID-Arendal in 2009. Since the report's release the term has become part of today's climate change vocabulary - used by politicians, negotiators and scientists alike.

Photo: Steven Lutz

Photo: Kate Fuller (MarinePhotobank)

Photo: Martin Stock

### Seagrass Meadows



Photo: Steven Lutz



Photo: Christian Perthen (RUI/LLC)

### Mangroves



Photo: Robert Barnes



Photo: Garth Cripps, Blue Ventures

### Saltmarshes



Photo: Peter Prokosch



Photo: Peter Prokosch

### Seagrass Meadows

Seagrasses are submerged flowering plants with deep roots that are found in meadows along the shore of every continent except Antarctica. Carbon accumulates in seagrasses over time and is captured and stored in blades and in sediment, which has been measured up to four meters deep.

Per hectare, seagrasses are reported to store up to twice as much carbon as terrestrial forests. The global seagrass ecosystem organic carbon pool could be as high as 19.9 billion metric tons.

Seagrass meadows filter sediment and other nutrients from the water and are constantly building and securing sediment, which protects coasts from erosion and storms, and improves water quality. They are also important habitats for fisheries and threatened marine species, such as sea turtles and manatees.

Seagrasses are among the world's most threatened ecosystems, with annual global loss of around 1.5% and accelerating in recent decades. Globally, about 29% of Earth's seagrass ecosystems have been lost. Major threats to seagrasses include degradation of water quality due to poor land use, such as deforestation and dredging.

### Mangroves

Mangroves are a type of tropical forest, found at the edge of land and sea and flooded regularly by tidal salt water. Mangroves are among the most carbon-rich forests in the tropics.

It is estimated that the average annual carbon sequestration rate for mangroves are about two to four times greater than global rates observed in mature tropical forests. Mangroves provide many valuable ecosystem services, which include: supporting commercial and recreational fisheries by providing important habitat and spawning grounds; filtering coastal waters and contributing to healthy water quality; and protecting coastal communities against storms, floods and erosion.

Mangrove forests are threatened throughout their range. In the last 50 years, between 30 and 50% of mangroves have been lost globally and they continue to be lost at a rate of 2% each year. Major causes of mangrove loss include deforestation for construction of aquaculture ponds and other forms of unsustainable coastal development. Experts estimate that emissions from the degradation of mangroves can be as high as 10% of total emissions from deforestation globally, even though mangroves account for only 0.7% of tropical forest area.

### Saltmarshes (Tidal marshes)

Tidal salt marshes are coastal wetlands with deep soils that are built through the accumulation of sediment and organic material and repeatedly flooded with tidal salt water. Almost all of the carbon in tidal marsh ecosystems is found in the soil, which can be several meters deep. It is estimated that the average annual carbon sequestration rate for salt water marshes are about two to four times greater than those observed in mature tropical forests.

Tidal marshes filter water from the land and help maintain water quality in coastal areas. They provide critical habitat for many important marine species, and are considered essential for healthy fisheries and coastal marine ecosystems. Tidal marshes also serve as a buffer for coastal communities, absorbing energy from storms and floods and helping to prevent erosion.

Tidal marshes are threatened and are being lost at a rate of 1 to 2% per year. Major threats to tidal marsh ecosystems include draining for coastal development, conversion to agriculture, and rising sea levels.

For more information visit:  
[www.bluecarbonportal.org](http://www.bluecarbonportal.org)  
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