

# Why the sea?

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## Opinion

Water covers more than 70 percent of the Earth's, with the largest body of water, the Pacific Ocean, taking up more than one-third of the planet's surface. All of the oceans on Earth are estimated to have a volume of 0.3 billion cubic miles (1.332 billion cubic kilometers) and an average depth of 12,080.7 feet (3,682.2 meters). But the various bodies of water that make up this total ocean area have their own unique characteristics and range in size from the sprawling Pacific to the self-contained Mediterranean (Table 1). The sea is a source of energy and other resources, although the cost of exploiting them is high: offshore deposits accounted for more than 10% of world oil production in 1960, in 2010 it was 30%. This rise is likely to continue. In addition, the exploitation of non-energy related minerals in the deep oceans is one of the sector's most promising markets, as illustrated in particular by the latest rare earth discoveries on the Pacific seabed (estimated at 90 billion tonnes, against land-based reserves currently estimated at around 110 million tonnes). In the past five years the prices of some metals have risen more than 300%.

After a short-lived drop during the crisis of 2008, prices have risen steadily again, paving the way for sea bed exploitation. A recent study by DCNS puts annual turnover in the world maritime economy at €1,500 billion. €190 billion comes from sectors that didn't exist ten years ago (for example: deep offshore oil and gas, sea bed minerals, sea water desalination, commercial fish and algae farming, marine renewable energy (MRE) and related services). These new maritime activities could represent 500 billion dollars by 2020 and will be comparable to the volume of the world's luxury goods industry or air transport: 400 billion for the first and 600 for the second. Finally it is predicted that the number of containers (TEU) being shipped over the major ocean transport routes will reach 184 million by 2015 and a recent report by the OECD entitled "Strategic Transport Infrastructure Needs to 2030" estimates that the number of containers shipped is likely quadruple by 2030. The oceans cover more than 70% of the surface of the globe and play a crucial role in atmospheric exchange and climate. The oceans absorb 80% of the heat and 20% of the carbon emissions produced by human activity. Crucial for life on earth, conservation of the marine environment is also essential to improve competitiveness, long-term growth and employment in the European Union of marine fauna and flora are known, hence the importance of oceanographic research and observation. Sustainable development and rational exploitation of the sea's resources (fish, energy, minerals...) are therefore a necessity.

It is estimated that 75% of marine pollution originates on land, from sources such as contaminated waste water in rivers, air pollution by industry, etc. Sea transport is today the most environmentally friendly method of transport. It only accounts for a very small part of the pollution in seas and oceans and less than 3% of air pollution. It emits 5 times less CO<sub>2</sub> than road transport and 13 times less than air transport. In 15 years, sea transport has reduced its environmental impact considerably, despite a massive increase in world trade carried by sea. The number of hydrocarbon pollution incidents has fallen by

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90%. Throughout history humans have been directly or indirectly influenced by the oceans. Ocean waters serve as a source of food and valuable minerals, as a vast highway for commerce and provide a place for both recreation and waste disposal. Increasingly, people are turning to the oceans for their food supply either by direct consumption or indirectly by harvesting fish that is then processed for livestock feed. It has been estimated that as much as 10% of human protein intake comes from the oceans. Nevertheless, the food-producing potential of the oceans is only partly realized. Other biological products of the oceans are also commercially used. For example, pearls taken from oysters are used in jewelry and shells and coral have been widely used as a source of building material.

## Marine recreational areas

The shallow continental shelves have been exploited as a source of sands and gravels. In addition, extensive deposits of petroleum-bearing sands have been exploited in offshore areas, particularly along the Gulf and California coasts of the United States and in the Persian Gulf. On the deep ocean floor manganese nodules, formed by the precipitation of manganese oxides and other metallic salts around a nucleus of rock or shell, represent a potentially rich and extensive resource. Research is currently being conducted to explore nodule mining and metallic extraction techniques. Ocean water itself could prove to be a limitless source of energy in the event that nuclear fusion reactors are developed, since the oceans contain great quantities of deuterium. The oceans also are important for recreational use, as each year more people are attracted to the sports of swimming, fishing, scuba diving, boating and waterskiing. Ocean pollution, meantime, has escalated dramatically as those who use the oceans for recreational and commercial purposes, as well as those who live nearby, have disposed of more and more wastes there.

## Food and sea

Recent information indicates that the total amount of seafood (including fresh-water species and aquatic plants) is about 140 million

metric tons annually. Over 20 percent of the total comes from aquatic plants (mostly seaweeds). Marine fish account for only 2 percent of the total. Mollusks (clams, oysters, abalone, scallops and mussels) represent the most important species cultured in marine waters. Seaweeds (brown, red and green) are a close second. While most people do not think that they eat much (or any) seaweed, extracts from seaweeds can be found in everything from toothpaste and ice cream to automobile tires. Seaweeds themselves are dried and used directly as human food in many parts of the world. Crustaceans include shrimp, crabs, lobsters and crayfish. While shrimp culture has become a major industry in Asia and Latin American since the early 1980s, global

production is far less than that of mollusks and seaweeds. Marine fish production is even smaller. Top finfish groups include Atlantic salmon, milkfish, sea bream, sea bass, red drum, yellowtail, striped bass and hybrid striped bass. Research shows that the sound of waves alters wave patterns in the brain lulling you into a deeply relaxed state. Relaxing in this way can help rejuvenate the mind and body. Also, floating in water means blood is diverted around from our lower limbs and pumped towards our abdominal region the part of the body near the heart - because we are no longer standing upright. Fresh blood being pumped around the body brings more oxygen to our brain which makes us more alert and active.

**Table 1** World Ten- Largest Oceans and Seas

S. No.	Ocean	Area	Average depth	Maximum depth	Deepest point
1	Pacific Ocean	60,060,700	13,215	36,198	Mariana Trench
2	Atlantic Ocean	29,637,900	12,880	30,246	Puerto Rico Trench
3	Indian Ocean	26,469,500	13,002	24,460	Sunda Trench
4	Arctic Ocean	5,427,000	3,953	18,456	77°45'n; 175°W
5	South China Sea	895,400	5,419	16,456	West of Luzon
6	Caribbean Sea	1,049,500	8,685	22,788	Off Cayman Islands
7	Mediterranean Sea	1,144,800	4,688	15,197	Off Cape Matapan, Greece
8	Bering Sea	884,900	5,075	15,659	Off Buldir Island
9	Sea Of Okhotsk	613,800	2,749	12,001	146°10'e; 46°50'n
10	Gulf Of Mexico	615,000	4,874	12,425	Sigsbee Deep

### Transportation petroleum and drinking water

The Langed Pipeline project, spearheaded by Exxon Mobil, Stat Oil and Royal Dutch Shell, was undertaken to exploit one of the world's largest reservoirs of natural gas in Norway's Ormen Lange (in Norse mythology: "Giant Serpent") field, located on the Norwegian Continental Shelf. The project included the construction of a new gas terminal at Nyhamna to process the gas coming from Ormen Lange. A consortium now exports natural gas from Nyhamna to Easington on the east coast of England through this state of the art marine pipeline. The pipeline has a length of 1,166 km (745 miles) and delivers 26 billion cubic meters (900 billion cubic feet) of natural gas to the UK National Transmission System each year; the price tag came in at 1.7 billion pounds (\$2.8 billion). At the time of completion it was longest sub-sea pipeline ever built.

### Undersea Crossing-Suspension System

The project, first of its kind in the world, will supply 75,000,000 m<sup>3</sup> of drinking and irrigation water to the Turkish Republic of Northern Cyprus annually. Starting at Anamur, Mersin, Turkey, the project terminates at Geçitköy, TRNC (Turkish Republic of Northern Cyprus) after crossing across the sea at a depth of 280 m as well as via a suspension system having an overall length of approximately 80 km with a Ø 1600 mm diameter HDPE pipeline (Figure 1). Learning about marine life is more interactive, interesting and worth enjoying in a real life situation. It instills a sense of respect toward the marine environment and inculcates an understanding of the importance of the marine in the life of mankind. Visitors and students can have glimpse of what lies beneath of the waves. The first hand experience of the wonders of the ocean life in the marine aquarium and the message that they carry promote love for the seas and its rich biodiversity for the sake of the earth, for us and for future generations. Arrangements inside the marine aquarium section display ecosystems as complex communities of marine organisms interacting in their environment for unique learning experience. The most ideal educational tools develop an understanding of the interconnectedness of all living organisms and awareness that the sea is an integral part of our existence needing protection.



**Figure 1** Undersea Crossing -Suspension System.

The marine aquarium and museum were established:

- To facilitate an interactive, fascinating and worthwhile teaching and learning experience related to marine life in a conducive environment.
- To create public awareness on the importance of marine ecosystems that cool instill a sense of respect towards marine environment.
- To inculcate a clear understanding of the importance of marine world in life of mankind and of the consequences irresponsible actions.
- To facilitate research of marine aquariums live-feed production and nutrition ,aquatic animals health,life support system and to train public and students resources in marine aquarium management.

### Seas and Oceans are very vital source of drugs

This is the medicine chest of the next millennium teetering mounds of agar-filled dishes smothered with fuzzy greenish growths, flasks full of brown nutrient broth layered with gray mold, beakers sporting pale, flabby eruptions like omelettes cooking in hell's kitchen. What's brewing in these potent pots? Stews of bugs--fungi and bacteria that

once lived in ocean sediments, rotting driftwood, weeds, coral, sponges and grasses. Although unappealing, any one of these containers might harbor a brand-new kick-ass cancer drug or a compound to wipe out some of the scariest viruses known to humankind. 2008's year's Nobel Prize in Chemistry rewards the initial discovery of GFP and a series of important developments which have led to its use as a tagging tool in bioscience. By using DNA technology, researchers can now connect GFP to other interesting, but otherwise invisible, proteins. This glowing marker allows them to watch the movements, positions and interactions of the tagged proteins. Researchers can also follow the fate of various cells with the help of GFP: nerve cell damage during Alzheimer's disease or how insulin-producing beta cells are created in the pancreas of a growing embryo. In one spectacular experiment, researchers succeeded in tagging different nerve cells in the brain of a mouse with a kaleidoscope of colours.

The story behind the discovery of GFP is one with the three Nobel Prize Laureates in the leading roles: Osamu Shimomura first isolated GFP from the jellyfish *Aequorea victoria*, which drifts with the currents off the west coast of North America. He discovered that this protein glowed bright green under ultraviolet light. Martin Chalfie demonstrated the value of GFP as a luminous genetic tag for various biological phenomena. In one of his first experiments, he coloured six individual cells in the transparent roundworm *Caenorhabditis elegans* with the aid of GFP. Roger Y. Tsien contributed to our general understanding of how GFP fluoresces. He also extended the colour palette beyond green allowing researchers to give various proteins and cells different colours. This enables scientists to follow several different biological processes at the same time. The ocean and the seas are studied by separating it into different, though interrelated, scientific disciplines. To fully understand life in the sea we must consider the big picture: marine life and its interaction with its environment, as well as other life, including humans. The following sections will provide you with an overview of Marine Biology in terms of the physical, chemical and biological marine environment.<sup>1-19</sup>

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## Conflicts of interest

None.

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