

# BE THE WAVE AR FRIG Y DON

## Ecosystems Services

### Lesson Plan



cadwch keep  
gymru'n wales  
daclus tidy

**MARINE  
CONSERVATION  
SOCIETY**



UNDEB EWROPEAIDD  
EUROPEAN UNION



Llywodraeth Cymru  
Welsh Government

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## Ecosystem services

Ecosystem services are defined as the benefits people derive from ecosystems. We rely heavily on the sea to provide us with food, water and oxygen, to regulate our climate and to provide transport, to name a few services. Our ocean provides us with extensive economic, environmental, ecological and cultural benefits. Welsh seas support thousands of jobs in numerous different industries and provide us with many of the resources we use daily.

For centuries humans have taken nature for granted and assumed its resources are limitless. Our actions are having a devastating effect on ecosystems on land and in the ocean. We need to understand that these damaging activities not only affect biodiversity, but also the services these ecosystems provide, and therefore affect humans too. To learn more about the impact humans are having on our oceans, take a look at our [‘Threats to the Ocean’](#) resource pack.

Protecting our seas will help to ensure that we can continue to enjoy and benefit from them. One way to reduce threats and protect an ecosystem is through marine protected areas (MPAs), where threatening activities are banned. It is estimated that, within Europe, for every euro invested into MPAs there could be a return of €3.19 due to the value of the services they provide. This is one of the driving forces behind nations across the world committing to protect 30% of the sea by 2030.

There are three main categories of services we gain from ecosystems.

### **1. Provisioning services /direct services – include harvestable goods**

**Food** - Millions of people around the world consume fish, making it an incredibly important food source. As the population grows, so will the demand for food, putting fish stocks at risk. The fishing industry in Wales accounts for around 800 full time jobs. The aquaculture industry (seafood farming) is currently small in Wales and largely includes the cultivation of mussels. This industry currently provides around £3.5 million to GVA and there is research into the possibility of increasing aquaculture in Wales.

**Minerals & sediment** - The ocean provides us with many valuable resources including oil, gas, sediments and minerals. In Wales there are two important oil and gas bases in Milford Haven and Point of Ayr. Around 20 million tonnes of marine sediment is removed each year in the UK, with 48% of sand and gravel sold in Wales coming from our ocean.

**Medicines** - Medicines are largely derived from natural sources, many terrestrial but some from marine flora and fauna. It is thought that with the ever-growing demand for new products, marine species could provide sources for new medicines.

### **Regulating / indirect services**

**Oxygen** - Plants, algae and even some bacteria in the ocean photosynthesise, and therefore produce oxygen. One litre of seawater can contain thousands of microscopic algae known as phytoplankton. Even smaller still is a species of cyanobacteria called Prochlorococcus, which is the smallest and probably most abundant photosynthetic organism on earth. Prochlorococcus produces around 20% of the oxygen in our atmosphere.



**Blue Carbon** - Carbon that is removed from the atmosphere and then stored by ocean ecosystems is referred to as blue carbon. Habitats such as seagrass beds, salt marshes and kelp beds found in the UK, and mangrove forests in tropical waters, are particularly good at absorbing carbon dioxide from the atmosphere through photosynthesis. These habitats take up and store more carbon per metre than forests on land.

Phytoplankton also take up carbon, which is then transferred up the food chain to larger fish species. When marine animals die, and when plankton that isn't eaten dies, their bodies might sink down to the sea floor where much of the carbon stored in their bodies is eventually stored and buried in deep ocean sediments. Damaging activities such as dredging can release the carbon that has been sequestered over time, along with methane and nitrous oxide, which has a negative effect on our climate.

**Water cycle** - The ocean covers 70% of the earth's surface and holds 97% of the total water on the planet, playing a major role in water cycle. As well as storing water, the ocean also circulates water, nutrients and heat around the globe through ocean currents. The ocean provides moisture to the atmosphere as evaporated water, and due to its size accounts for most of earth's evaporation.

**Climate** - The ocean plays a key role in regulating the earth's climate. Ocean currents transport water around the globe, cold water from the poles and warm water from the tropics. This mixing of sea temperatures helps to regulate the climate and avoid extreme climate conditions in many areas of the globe. Evaporation from the sea surface then helps with the movement of heat in the atmosphere.

**Coastal Protection** - Many coastal areas struggle with erosion. Climate change is expected to lead to a rapid increase in erosion. The UK spends millions a year on manmade coastal defences, but many ecosystems such as kelp beds, seagrass meadows and saltmarshes act as natural coastal barriers. Although these habitats don't provide as comprehensive protection as manmade defences, they still provide a valuable service in reducing wave energy. Protecting these ecosystems will help to reduce the amount of money spent on manmade defences.

**Reduce Pollution** - Some coastal Ecosystems such as seagrass beds, saltmarsh, oyster beds and mussel beds can help to reduce pollution by filtering water. One oyster can filter 180 litres of water a day. Water filtration helps to reduce the level of land-based nutrients entering the open ocean, thereby improving water quality in coastal areas. However too much pollution will harm these ecosystems, making them unable to provide this valuable service.

#### **Cultural services or ethical, spiritual and aesthetic services**

Our beautiful coastline and beaches attract huge numbers of tourists from all over Wales and beyond. Coastal tourism contributes more than £700 million to the Welsh economy. In addition, 60% of the population of Wales live around the coast. With so many people enjoying coastal scenery and activities, healthy seas are vital for our health and wellbeing.



### **Supporting services**

Underpinning all the services that ecosystems provide humans are the supporting services, the services that support biodiversity and maintain ocean life cycles. These services include the processes of photosynthesis, primary production and nutrient cycling.

### **Other benefits our ocean provides**

There are several other human benefits gained from the ocean that do not directly rely on healthy ecosystems.

**Telecommunication cabling** along the seabed is estimated to contribute £260 million to Wales GVA.

**Ocean transportation** through both commercial shipping and ferries is a huge ocean industry. There are seven major ports in Wales. The 5 main ports in South Wales employ approximately 15,000 staff. In 2015 these ports handled 54.6 million tons of cargo.

**Renewable energy** in the form of wind, waves and tides. In 2018 50% of Wales electricity consumption was met using renewable energy and the Welsh Government have set targets to increase this to 70% by 2030.



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