





Today you are an Environmental Impact Assessment (EIA) consultant. You have been asked to report on the impact of an oil tanker spill at sea.

Teacher information

Gallery visited	 Ecology
Suitable for	 Key Stage 4 (ages 14 to 16)
Curriculum links	Organisms and health, Environment, Earth and universe.
Example page	www.nhm.ac.uk/ecosystems-ks4
Pre-visit preparation	<p>Vocabulary: ozone, different types of electro-magnetic radiation, biomass.</p> <p>Concepts: greenhouse effect, trophic level, carbon cycle and nitrogen cycles.</p>
Post-visit work	Pupils can combine information gathered from the gallery with their own research work to complete the Final report task at the end of this guide.

1 Sunlight and the greenhouse effect

The sun is the primary source of energy for life on Earth.

Notes on the sun should include some of the following ideas: the sun is a massive nuclear reactor, it is our powerhouse, it produces light, heat and other rays, some of which can be harmful.

Notes on the atmosphere should include some of the following ideas: it is a moving skin of gases, which is not uniform, (the atmosphere is not the same all the way up) and contains some protective layers. It absorbs ultraviolet rays and shields us from their harmful effects, it is also a shield against a rain of meteors.

Discussion on why the sun and the atmosphere are so important for life on Earth: main points include that an energy source is needed to drive life processes and for many organisms this energy is provided by the sun. The atmosphere is a protective layer that prevents some of the sun's harmful radiation affecting organisms. There is a thin layer of ozone high up in the atmosphere that absorbs much of the sun's ultra-violet radiation. The oxygen and nitrogen in the atmosphere absorb much of the sun's gamma and X-ray radiation. Pupils may also note that the atmosphere has changed over the millennia as our planet changed and this has been partly as a result of the effects of early life-forms. These changes have then enabled other life-forms to flourish.

Discussion point on the evidence which can be used to prove the age of the Earth
Answers will vary, but should mention that meteorites, which are debris from the formation of the solar system, are the same age as the Earth. Meteorites have not melted since their formation, so they can be dated to reveal the age of the Earth.

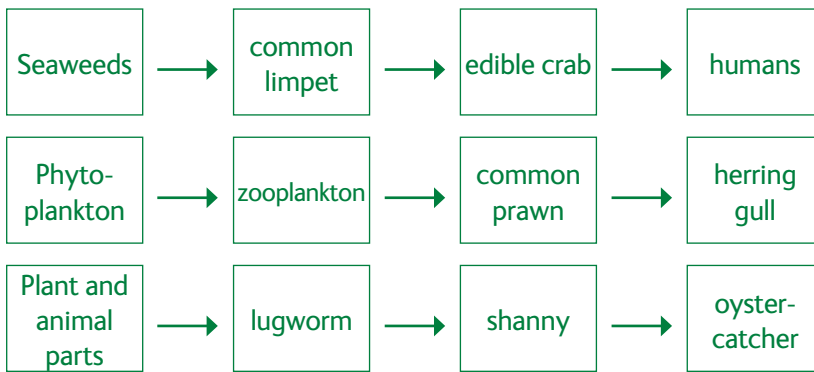
The greenhouse effect

The sun's rays warm the Earth but much of this energy is radiated back out to space. Greenhouse gases absorb some of the heat that would be lost, so the atmosphere stays warm enough for life to flourish.

Humans are affecting it by activities that increase greenhouse gases, such as burning forests, using cars and other petrol-driven machinery, increasing cattle populations (methane producers) and using coal-fired power stations. Students may also mention that the atmosphere is trapping more and more of the sun's energy and warming the Earth.

2 How food chains work

There are many possibilities of food chains from the display, here are some examples:



Energy and raw materials are passed along each food chain.

3 Why food chains don't go on forever

Plants fix (trap) energy from the sun.

Plants use energy for life processes such as growth, repair, reproduction. Plants also store energy in leaves, stems, twigs and roots for later use.
Herbivores and carnivores use energy for movement, growth, repair and reproduction, and can often store energy, too.

The energy that is fixed (trapped) is ultimately converted to heat.

Estimation of numbers at each trophic level of the pyramid
Since there is no information on numbers from the display, pupils need only consider which numbers might be sensible and to ensure they decrease as they go up the food chain.

4 How food chains link to form food webs

In this web, seaweeds and phytoplankton fix (trap) the sun's energy.

The common limpet, edible sea urchin and thick-lipped grey mullet are herbivores. Students may also mention the lugworm and common mussel, as they are omnivores.

The top carnivores might be the common seal, herring gull, oystercatcher and humans.

In comparing a food chain to a food web, pupils should mention that food webs are made up of a variety of interlinking chains, are more complex and include a greater variety of organisms.

The food webs drawn by pupils should start with phytoplankton or seaweed and show suitable herbivores, etc.

5 The impact of an oil spill on a marine food web

Plants such as phytoplankton need sunlight and their raw materials so they can live and grow.

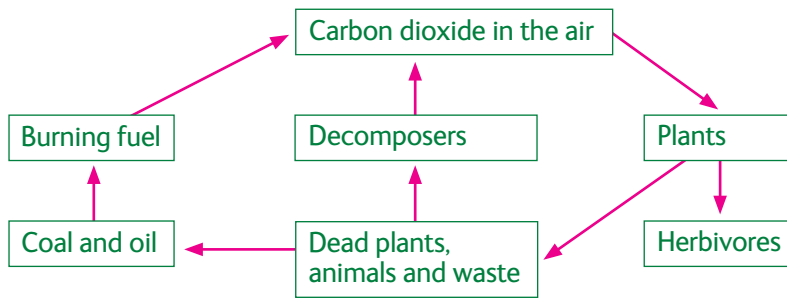
Answers about what would happen to phytoplankton if there was an oil spill should refer to the oil slicks blocking sunlight, which would result in many phytoplankton being unable to photosynthesise and so dying.

Herring gull	Shanny	Common prawn
Human	Pollock	Common mussel
Common lobster	Oystercatcher	Those in phytoplankton
Edible sea urchin	Thick-lipped grey mullet	Those in phytoplankton

Answers about which animals and plants would not be affected may vary, but are likely to include the thick-lipped grey mullet, edible sea urchin (possibly also the lugworm and common limpet). These animals are not in any of the chains that begin with phytoplankton. However, since these animals rely on seaweeds, they probably would be affected since any condition that eliminates phytoplankton would also have a negative effect on seaweeds.

Lugworms, feeding on dead plant and animal remains, may at first have extra food, though when this was exhausted they, too, would suffer if there were no more plants photosynthesising. Students may also note that animals with multiple sources of food, such as humans, may be less affected than others because of the possibility of locating other food sources.

6 How the carbon and nitrogen cycles work



Carbon is so important for life on Earth because it is a raw material for plants – they use it to make new plant material. It then becomes absorbed by animals that eat these plants.

