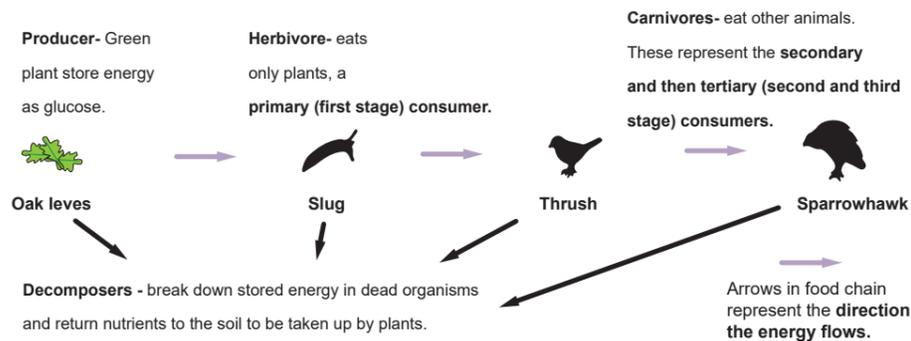


GCSE Biology 1.6 Ecosystems, nutrient cycles and human impact on the environment knowledge organiser

Energy flow

Energy from the sun is the source of energy for all life on earth. Green plants absorb about 1% of this energy during **photosynthesis**.



As energy is lost at each trophic level it is more energy efficient to eat the organisms nearer the start of the food chain.

Energy is used at each trophic (feeding) level in the chain (only around 10% is passed on) This limits the number of organisms in the chain.

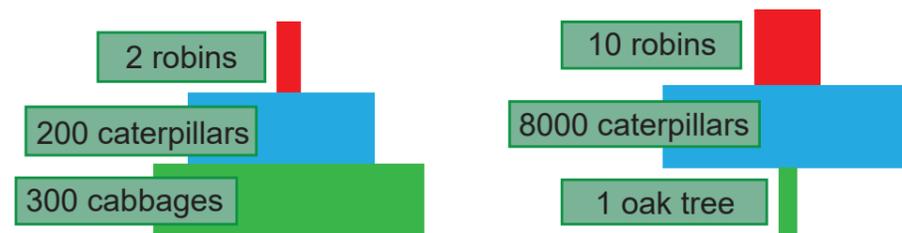
$$\text{Trophic efficiency} = \frac{\text{energy in later stage}}{\text{energy in earlier stage}} \times 100\%$$

Energy is used in repair and in the maintenance and growth of cells. Energy is lost in waste materials and respiration. Efficiency of each stage can be calculated by:

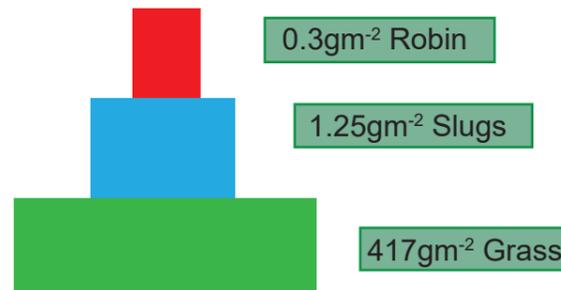
Pyramids of number/biomass

To build either pyramid start at the bottom with the producer and continue up the pyramid following the food chain.

Pyramids of number - show **how many** organisms are in each trophic level.



Pyramids of biomass show the **dry weight** of organisms at each trophic level.



Intensive farming

The increasing population means farming has changed to increase the yields of crops and meat produced.

This is done by:

- Using fertilisers and pesticides
- Battery farming
- Disease control

The disadvantages of these methods include:

- Excess use of antibiotics in farm animals for disease control could increase bacterial resistance and still be present in meat we eat.
- Battery methods show poor animal welfare and the duty of care to treat animals humanely.
- Other disadvantages

Eutrophication - Caused by:

- Fertilisers
- Untreated Sewage

If either of these substances is washed from the crops where farmers have placed them to increase growth of plants then:

- They can be washed into rivers, lakes, ponds.
- The nitrates in the sewage and fertilisers increase the growth of algae and water plants.
- When these die they are broken down by microbes, the increase in food for the microbes allows them to increase in number.
- Respiration of the now huge numbers of microbes use up the oxygen in the water and fish and other aquatic organisms suffocate and die.

Bioaccumulation - caused by:

- Pesticides
- Heavy metals (industrial waste)

These substances can be washed into soils and rivers. If they enter the food chain:

- They are persistent: do not break down in animal tissues and so
- They accumulate along the food chain until they reach toxic levels
- Causing reduced fertility or death in top predators.

Indicator species

A growing population means that more space is needed for:

- Housing
- Industry
- Agriculture
- These will have an environmental impact polluting and endangering species. Government agencies have an important role in monitoring, protecting and improving the environment.

Pollution can be measured in a few ways

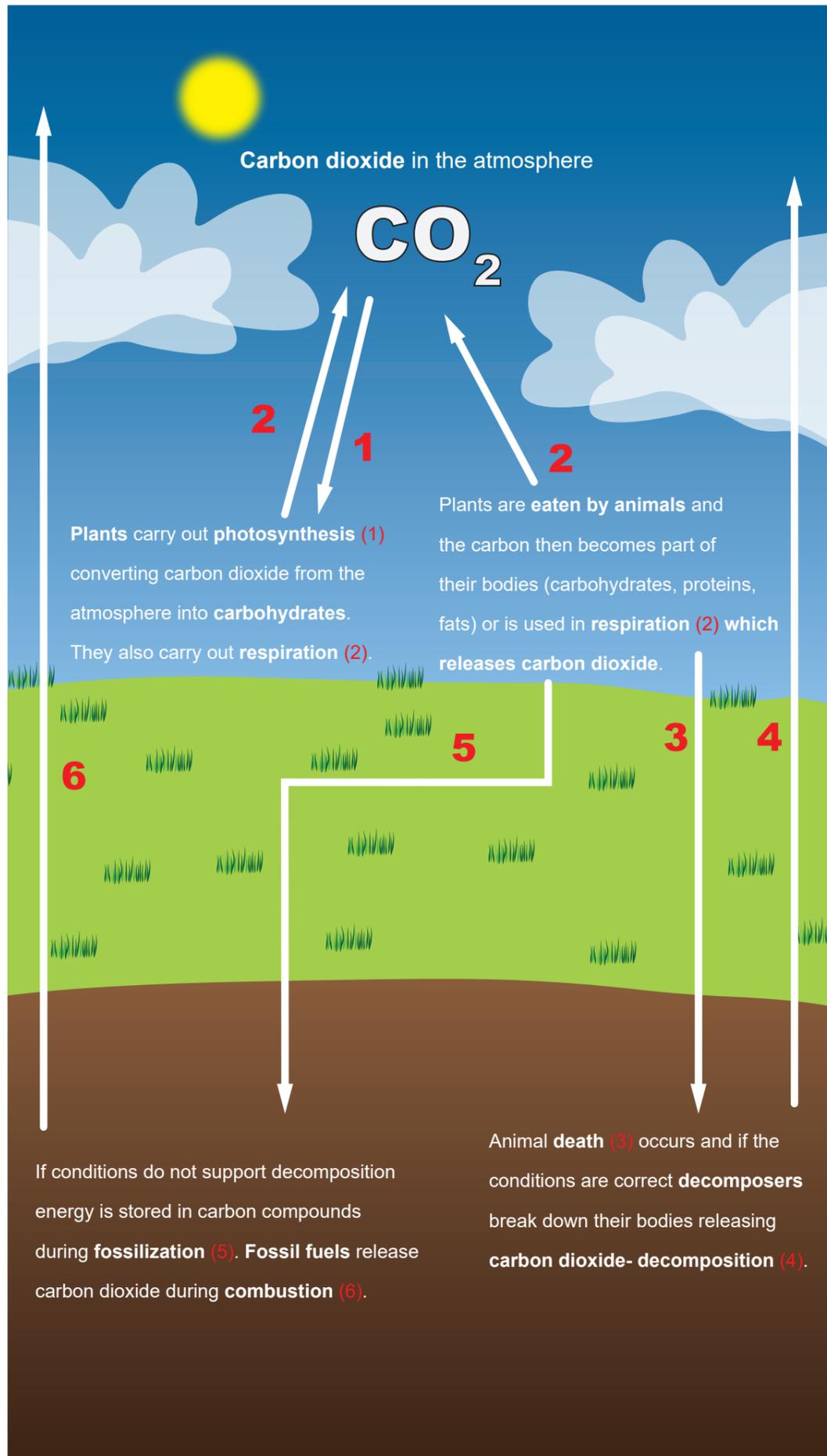
- Measure **oxygen levels** (less oxygen -more pollution)
- Measure **pH levels**

Lichens are used to indicate **air pollution** (sulphur dioxide in air). Some species will only grow in clean air, others can tolerate higher levels of pollution. Very high levels of pollution no species will grow.



Freshwater invertebrates – Some invertebrates can only live in very clean water; others can tolerate more pollution. Collecting samples of water and recording the invertebrates found can indicate the level of pollution.

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Decomposition

Waste and dead organisms are broken down into useful substances by the action of decomposers e.g. microbes (bacteria and fungi).

In a stable community the process which decomposes organic material returning nutrients (nitrates and phosphates) to the soil are balanced by those that remove these substances for use (plants).

During decomposition microbes respire (an enzyme dependent reaction) producing carbon dioxide. They therefore require:

- Adequate temperature
- Oxygen

They are also sensitive to:

- pH
- Heavy metals

When conditions prevent decay occurring energy remains locked in carbon compounds such as fossil fuels.

- Coal
- Oil
- Gas

The cycling of two useful substances in nature are shown here.

