

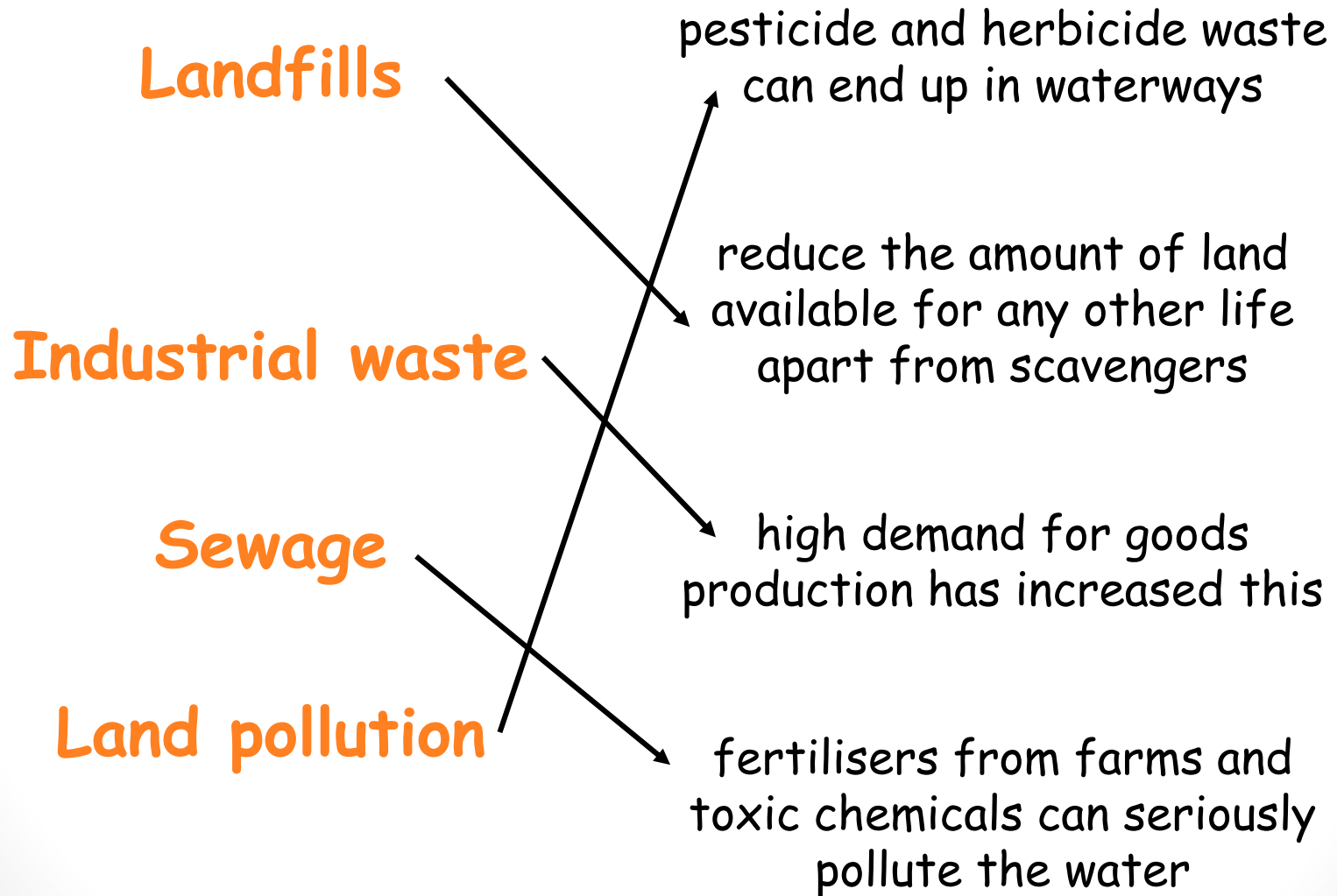
# Human population growth

- For thousands of years people have lived on Earth in quite small numbers, our activity didn't have much affect on the environment
- In the past 200 years the human population has grown very quickly, reaching 7 billion people
- Usually if this occurs, nature restores the balance as the species runs out of food...but we learnt how to overcome this problem!

Two main things have massively increased the amount of waste:

1. Population growth
2. Increase in the standard of living

# Issues with waste



# Air pollution

Acid rain **directly** damages environment by:

- Killing leaves
- Damaging roots of trees if absorbed in soil

Acid rain **indirectly** damages environment by:

- Falling into lakes, rivers and streams making them slightly acidic
- If the concentration gets too high, plants and animals will die and the water becomes 'dead'

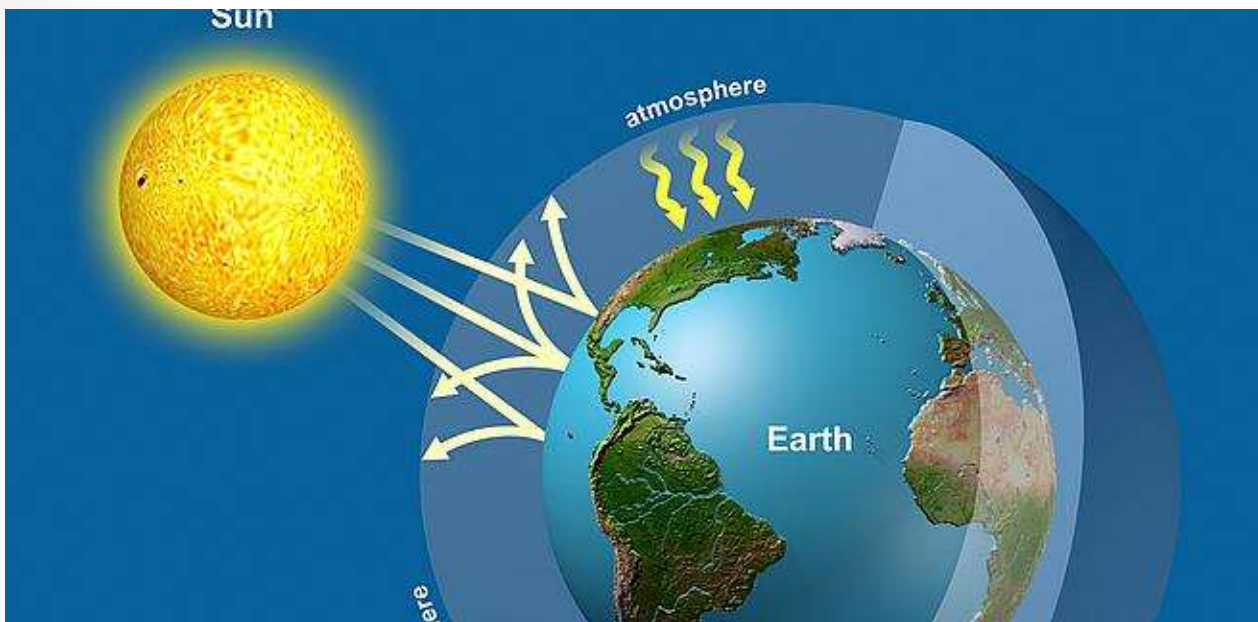
Hard to control, worst effects not often felt by country that is releasing pollution as it's carried by wind.

## Reducing air pollution

- Catalytic convertors added to remove nitrogen oxides
- Low-sulphur petrol and diesel
- More electricity generated by nuclear power
- Systems fitted to 'clean' pollution

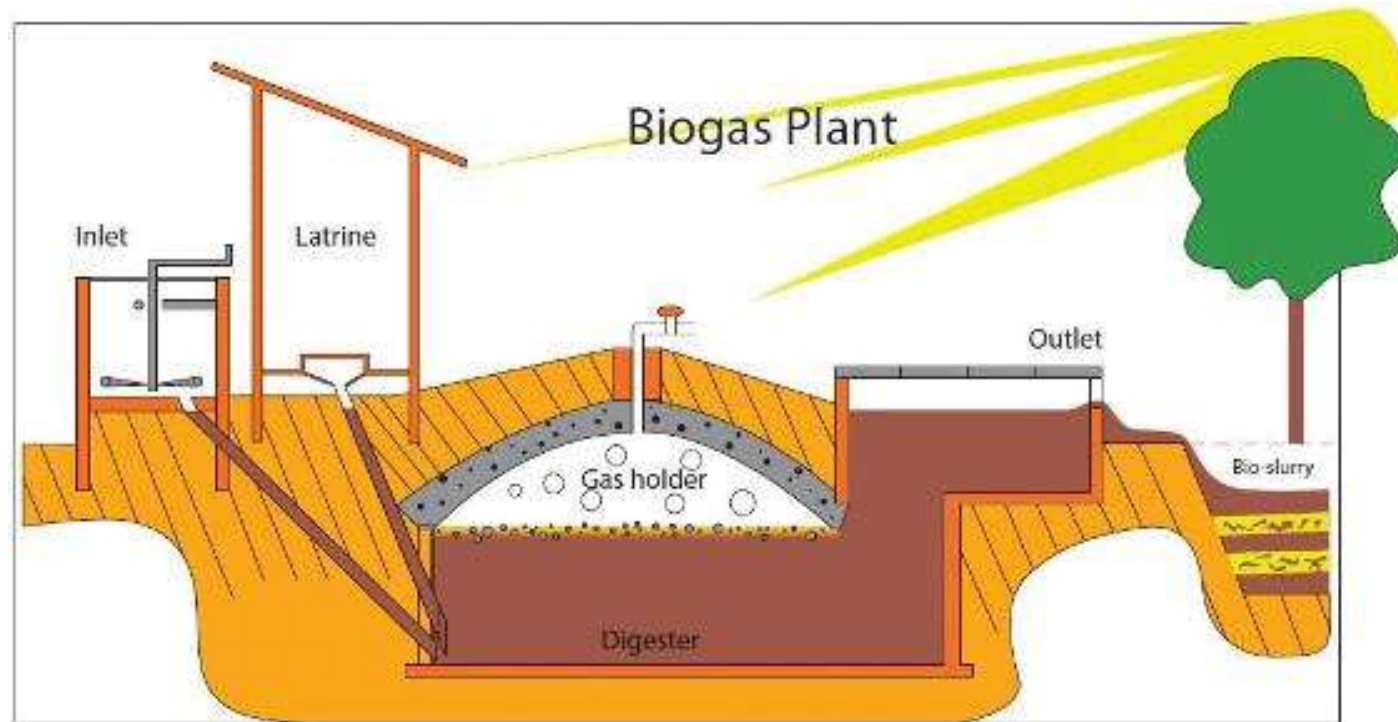
# Global warming

- Careful balance of carbon dioxide being released and added to the atmosphere for millions of years
- Plants, oceans, lakes and rivers are known as carbon dioxide sinks
- All organisms respire and release carbon dioxide into the atmosphere
- Due to deforestation not as many plants are around to absorb carbon dioxide
- Along with this, methane is being released by cows and growing rice
- Therefore carbon dioxide and methane levels are increasing



- Methane and carbon dioxide absorb heat energy so it can't escape.
- This allows life to grow on Earth as it keeps the planet warm. This is the **greenhouse effect**.
- However as these gases build up, the planet is becoming warmer and warmer.
- Since the 1970s the planet has warmed up  $0.55^{\circ}$ . Even a few degrees could cause massive changes.

# How it works



- Inlet pipe, animal waste and plant matter added
- Outlet pipe for biogases
- Secondary outlet pipe
- Slurry collected, can be used as fertiliser

# Biogas

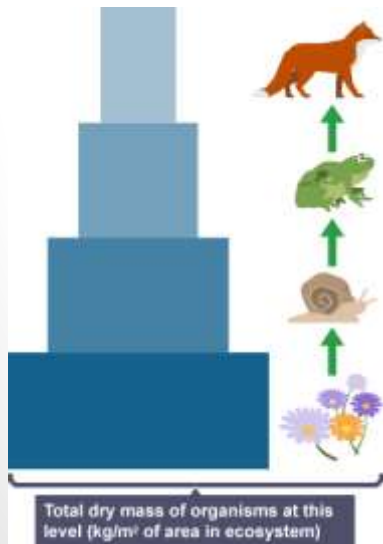
- Biogas is a biofuel made from a mixture of flammable gases. It is formed when bacteria break down plant material or waste products of animals in anaerobic conditions. Biogas is mainly methane but the composition of the mixture varies, depending on what the bacteria are decomposing.
- Both animal and plant matter contain carbohydrates, a great sources of energy. When bacteria decompose waste material in anaerobic conditions they produce methane which is flammable. It can be used for cooking and heating and to produce electricity or as a fuel for cars.
- The bacteria work best at 30 degrees, so in hot countries. For this process to work energy needs to be added to start things off.

# Food production

In some cases we even feed animals to animals. Ground up fish is often part of commercial pig and chicken feed.

Algae → Fish → Pig → Human

Adding in an extra level and causing even more loss of energy by the time we eat the meat.



- Pyramids of biomass show us that each level contains less mass and therefore less energy
- By the time food reaches us, there often isn't much energy left from the original source



# Improving efficiency of a food chain

- Limiting the movement of animals by keeping them indoors or in small pens  
uses less energy in movement
- Regulating the temperature of their surroundings  
uses less energy to keep cool or warm

# Fishy tales

- People have fished throughout human history
- In the past 60 years commercial fishing fleets of large factory ships have built up
- These are capable of taking huge quantities of fish on a regular basis
- Because of this stocks of fish are becoming dangerously low, all of the breeding fish are getting caught



# How can we make fishing more sustainable? Why is this important?

- Although people have been warned for years about the danger of this it has still continued
- Finally serious restrictions have been put in place. These include:
  - Controlling the size of holes in the nets so only the biggest fish are caught
  - Bans on fishing during breeding season
  - Strict quotas being place on fisherman, limiting the amount and type of fish they can catch
- Hopefully this will conserve the fish stocks for the future

# It's all about the Fusarium

- Mycoprotein literally means 'protein from fungus'
- It is produced by the fungus Fusarium which grows rapidly on relatively cheap sugar syrup
- In the right conditions it can double its mass in only 5 hours!



Without flavouring and colouring, Quorn is pale yellow with a faint taste of mushrooms.

If it can be given a range of textures, flavours and colours to make it similar to many familiar foods.