



Welcome





**Environmental
and
Health impacts
of water pollution**



**Prof. Ahmed Mansour, Ph.D.
Professor of Pediatrics
Vice Dean
Mansoura Faculty of Medicine**



وَجَعَلْنَا مِنَ الْمَاءِ كُلَّ شَيْءٍ حَيٍّ
الأنبياء {30}

We made from water
Every living thing

Prophets {30}



Water covers **over 70%** of the Earth surface.

Water pollution affects **drinking water, rivers, lakes and oceans.**

This harms **human health and the natural environment.**





Clean water is absolutely essential for healthy living.

- **Adequate supply of fresh and clean drinking water is a basic need for all human.**
- **Yet millions of people worldwide are deprived of this.**



Difference between pollution and contamination?

- **Two concepts deals with the environment's capability to "support" an agent.**
- **Contamination supported by the environment without stopping the general chemical cycles and life cycles.**
- **Pollution agents or activities producing damage in the environment damage the entire ecosystem.**



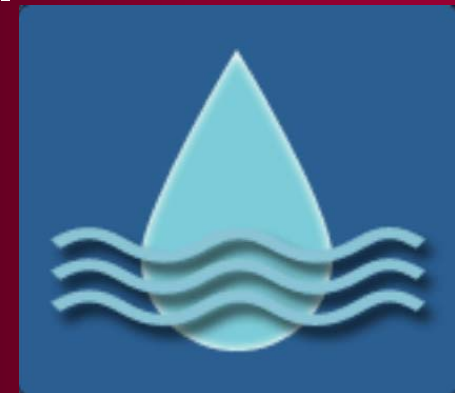
Types of Water Pollution

According to number of sources:

- **Point-source pollution: single source** (oil spill).
- **Non-point-source pollution: many sources.**

According to the site of affection:

- **Local pollution: affects immediate area**
- **Trans-boundary pollution: affects distant area**
(nuclear waste).



Types of Water Pollution

Surface
Water
Pollution



Oxygen Depleting

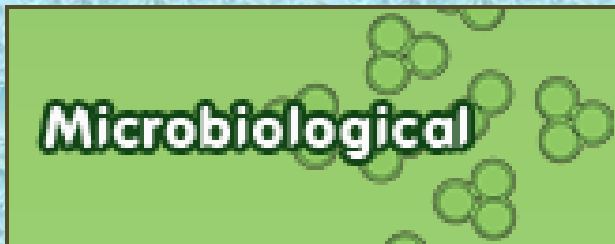
GroundWater



Nutrients



Microbiological



Suspended Matter



Chemical



**Surface
Water
Pollution**

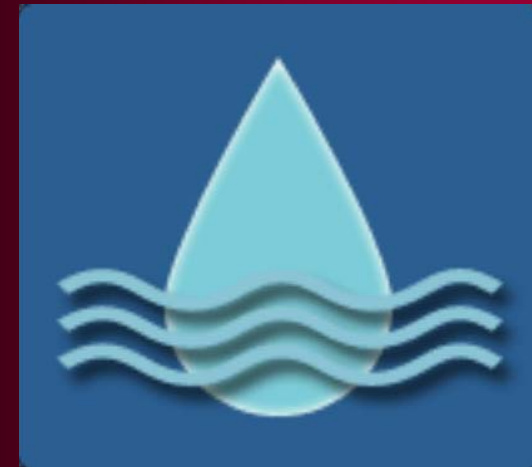


تلوث المياه السطحية

Is the pollution of the natural water resources of the Earth.

On the exterior of the Earths crust >>

- **Rivers**
- **Lakes**
- **Oceans**



GroundWater



المياه الجوفية

- Earth water found underground in soil or under rock structures called **aquifers**.
- Groundwater pollution:**
is the pollution of the water of aquifers.
- Caused by:** pesticide contamination

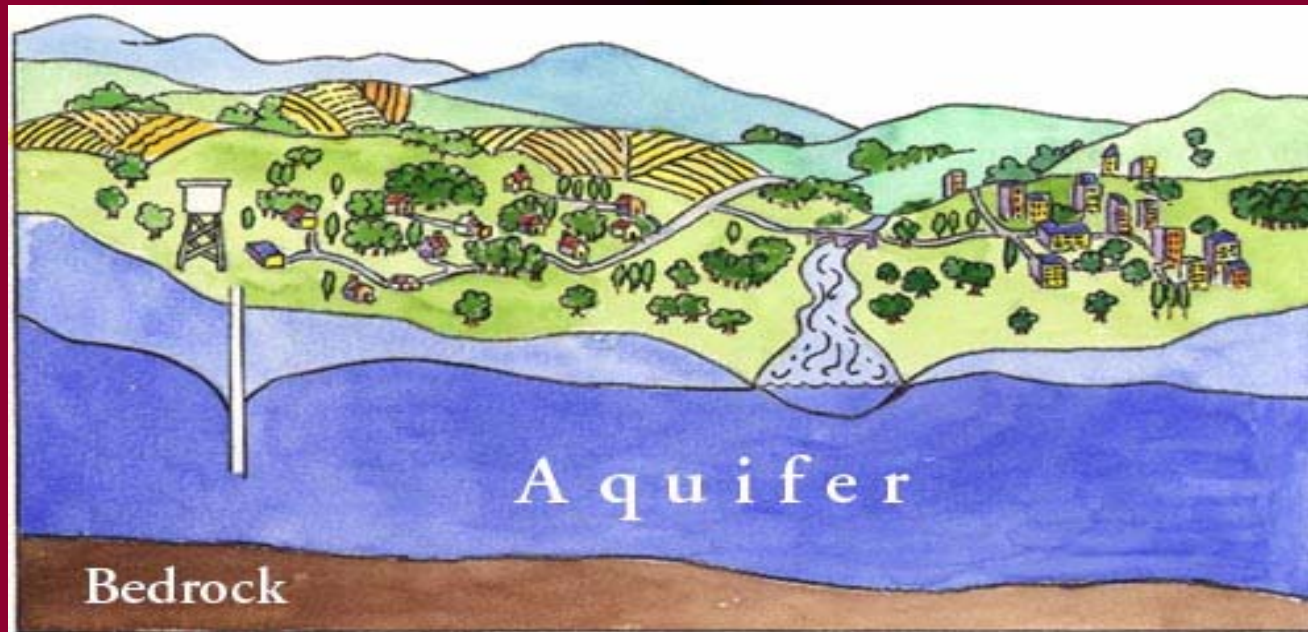




Aquifer (طبقة صخرية مائية)

In hydrology, rock layer that contains water and releases it in appreciable amounts.

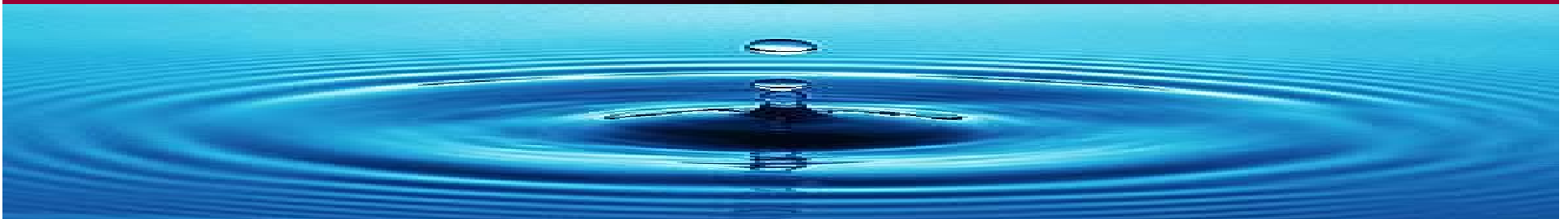
The rock contains water-filled pore spaces,
when the spaces are connected,
the water is able to flow through the rock.



A water well (بئر ماء)



A water well is an **artificial excavation** or structure put down by any method such as digging, driving, boring, or drilling for the purposes of withdrawing water from underground aquifers.



Oxygen Depleting

نضوب الأوكسجين

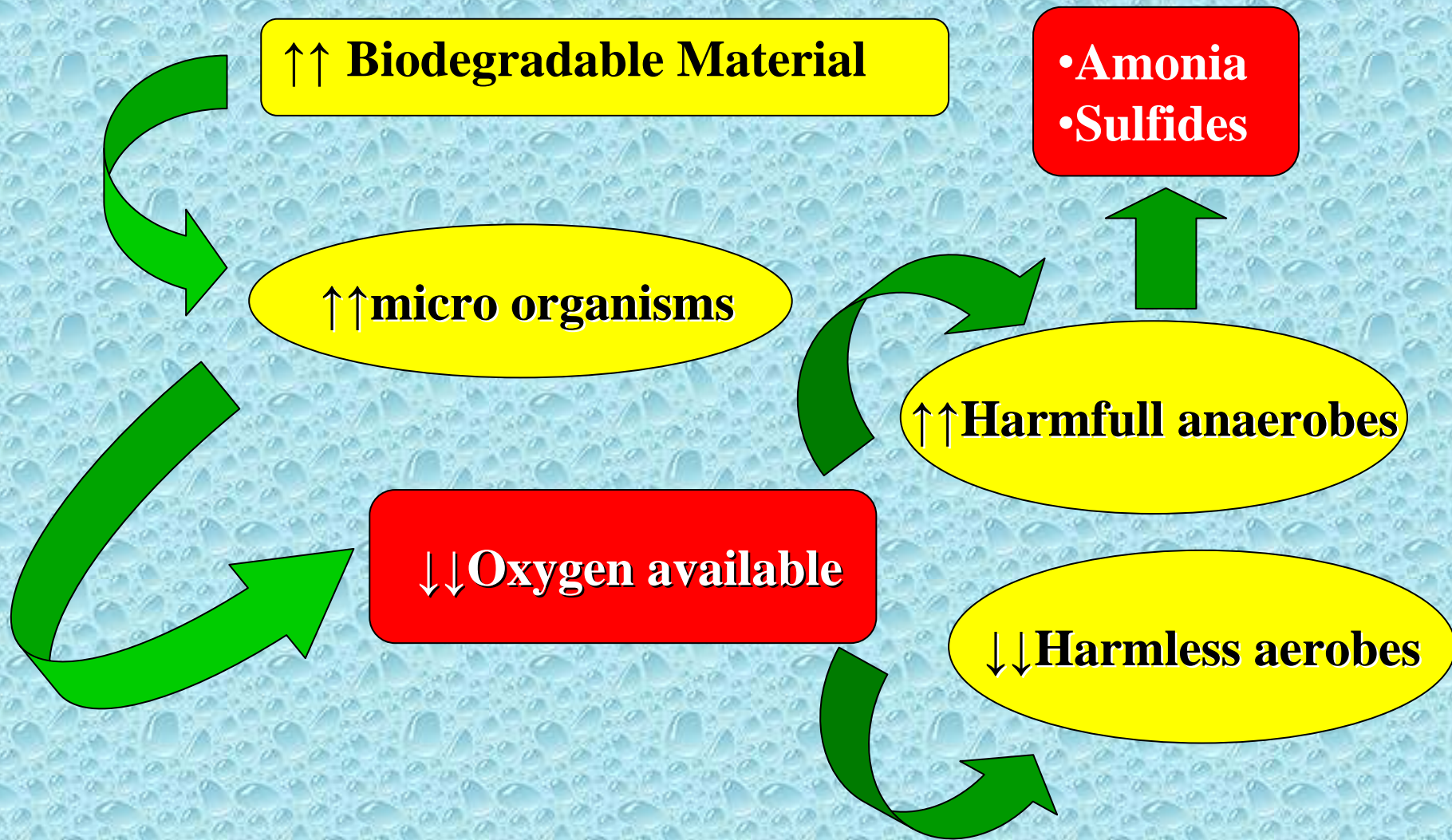


Microorganisms that live in water feed on biodegradable substances.

When too much biodegradable material **is added to water**, the **number of** microorganisms increase **and** use up the available oxygen. **This is called oxygen depletion.**

Oxygen depletion leads to
Dying of relatively harmless aerobic microorganisms
Increase of anaerobic microorganisms which may be **harmful to people, animals and the environment**, as **they produce harmful toxins such as ammonia and sulfides.**

Oxygen Depletion





Nutrients



المواد المغذية



Many nutrients are found in wastewater and fertilizers, and can cause **excess weed** and **algae growth**

This can contaminate **drinking water** and **clog filters**.

The algae use up the oxygen in the water, leaving none for the surrounding marine life.



Microbiological

التلوث بالكائنات المجهرية



Microorganisms such as:

Bacteria

Viruses

Protozoa

Causing fish, land animals and humans to become ill.

Example : cholera
poorer countries
not have the facilities to treat polluted water.



المواد المعلقة

Some pollutants do not dissolve in water as their molecules are too big to mix between the water molecules. This material is called particulate matter.

- **The suspended particles settle and cause a thick silt at the bottom which is harmful to marine life that lives on the floor of rivers or lakes.**

Suspended Matter either:

- **Biodegradable substances** which can cause problems by increasing the amount of anaerobic microorganisms.
- **Toxic chemicals** which can be harmful to the development and survival of aquatic life.

Suspended Matter

Molecules are too big to mix between the water molecules

**Toxic
chemicals**

**Biodegradable substance
Anaerobic microorganisms**

**Settled suspended particles
Thick silt**



Chemical



التلوث الكيميائي

Industrial

OR

Agricultural

• Metals and solvents from industrial work can pollute rivers and lakes.

- These are poisonous to aquatic life and may cause:
 - **slow their development**
 - **make them infertile**
 - **result in death.**

• Pesticides are used in farming to control weeds, insects and fungi can cause water pollution and poison aquatic life.



- **Petroleum** is another form of chemical pollutant that usually contaminates water through **oil spills when a ship ruptures.** >>> localized effect on wildlife.

The oil can cause:

Death of many fish.

Stick to the feathers of seabirds

>> unable to fly.



Causes of Water Pollution

Sewage
and
Wastewater



Marine
Dumping



Industrial
Waste



Radioactive
Waste



Oil
Pollution



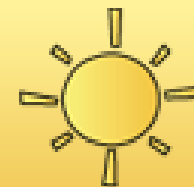
Underground
Storage
Leakages



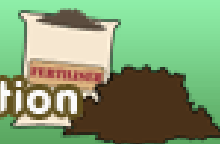
Atmospheric
Deposition



Global
Warming



Eutrophication



Sewage
and
Wastewater



المجاري و الصرف الصحي

Domestic
Industrial
Agricultural

Sewage wastewater that often contains faeces, urine and laundry waste.

In developing countries Sewage disposal is a major problem as many people in these areas don't have access to sanitary conditions and clean water.

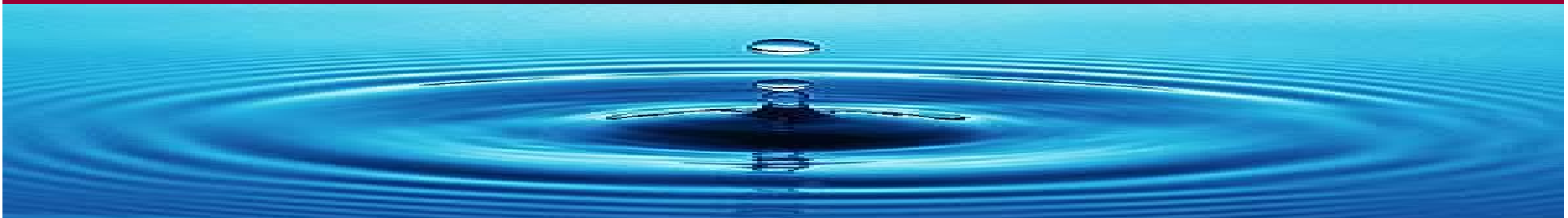
Untreated sewage water can infect the environment and cause diseases such as diarrhoea.



- **In developed countries** Sewage is carried away from the home quickly and hygienically through sewage pipes.

Sewage is treated in water treatment plants and the waste is often disposed into the sea.

- **In developed countries, sewage often causes problems when:**
 - people flush chemical and pharmaceutical substances down the toilet.**

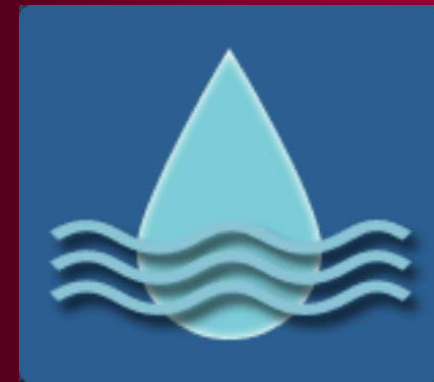




النفايات البحرية

Dumping of litter in the sea can cause huge problems.
Different items take different lengths of time to degrade in water:

- **Cardboard** – 2 weeks
- **Newspaper** – 6 weeks.
- **Photodegradable packaging** – 6 weeks.
- **Foam** – 50 years
- **Styrofoam** – 80 years
- **Aluminium** – 200 years.
- **Plastic packaging** – 400 years
- **Glass** – long life



**Industrial
Waste**



النفايات الصناعية

Industry is a huge source of water pollution.

It produces pollutants that are extremely

harmful to people and the environment.



Pollutants from industrial sources include:

Asbestos Asbestosis
 Mesothelioma
 lung cancer
 Intestinal cancer
 liver cancer



Lead – is harmful to the health of many animals, including humans, as it can **inhibit the action of bodily enzymes.**



Mercury - is harmful to animal health as it can cause illness through mercury poisoning.

Nitrates – The increased use of fertilizers >> nitrates from the soil and into rivers and lakes >> eutrophication >> harm marine life



- **Phosphates** - The increased use of **fertilizers** >> nitrates from the soil and into rivers and lakes >> **eutrophication** >> harmful for marine life
- **Sulphur** – This is a non-metallic substance that is harmful for marine life.
- **Oils** can stop marine plants receiving enough light for photosynthesis. It is also harmful for fish and marine birds.
- **Petrochemicals** – This is formed from gas or petrol and can be toxic to marine life.

Minamata: environmental contamination with methyl mercury

- **In Minamata**, Japan, **inorganic mercury** was used in the industrial production of **acetaldehyde**.
- It **was discharged** into the nearby bay as waste water and was ingested by organisms in the bottom sediments.
- **Fish** and other creatures in the sea were contaminated and **residents of this area** who consumed the fish suffered from **methyl mercury intoxication** (**Minamata disease**).
- The disease was **first detected in 1956** but the mercury emissions continued until 1968..

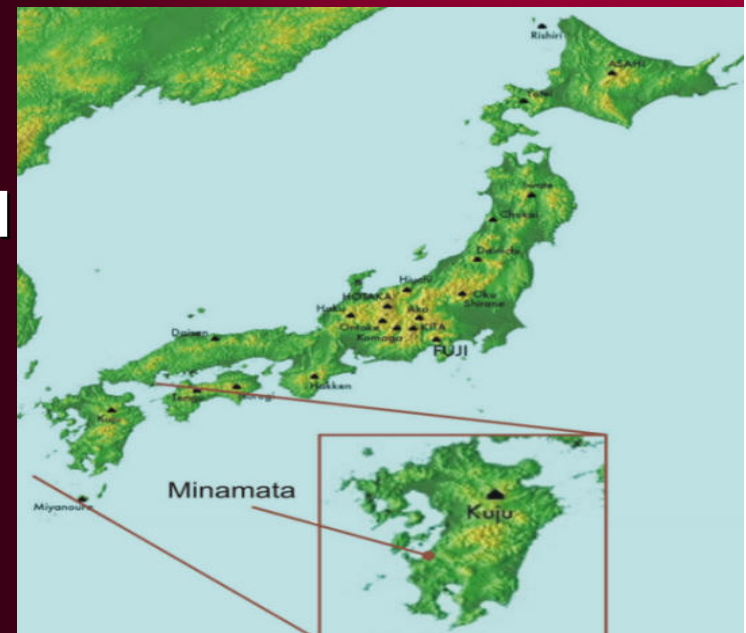
Various measures were taken to deal with this disease:

- **cessation** of the mercury process;
- **industrial effluent control**
- **environmental restoration** of the bay
- **restrictions on the intake** of fish from the bay.



The Minamata disease **proved a point** towards progress in environment protection measures.

This experience clearly showed that **health and environment considerations** must be integrated into the process of economic and industrial development from an early stage.





Children with Congenital Minamata Disease due to intrauterine methylmercury poisoning (Harada 1986).

Radioactive
Waste



النفايات الإشعاعية

**Nuclear waste is produced from industrial
medical
scientific processes**

Nuclear waste can have detrimental effects on marine habitats.

Nuclear waste sources:

• **Nuclear power stations** produce radioactive waste.

• **Nuclear-fuel reprocessing plants in Northern Europe** .

Radioactive traces from these plants have been found as far away as Greenland.



- Mining and refining of uranium and thorium are also causes of marine nuclear waste.
- Nuclear fuel cycle which is used in many industrial, medical and scientific processes.





التلوث بالبتروول

Oceans are polluted by oil on a daily basis from oil spills, routine shipping, run-offs and dumping.

تتلوث المحيطات بالبتروول بشكل يومي من التسرب البتروولي، أبحار السفن، القاء النفايات البتروولية

Oil spills make up about **12%** of the oil that enters the ocean.

The rest come from **shipping travel, drains and dumping.**

Oil spills **cause a very localized problem** but **can be**

catastrophic to local marine life such as **fish, birds** and **sea otters.**

Underground Storage Leakages



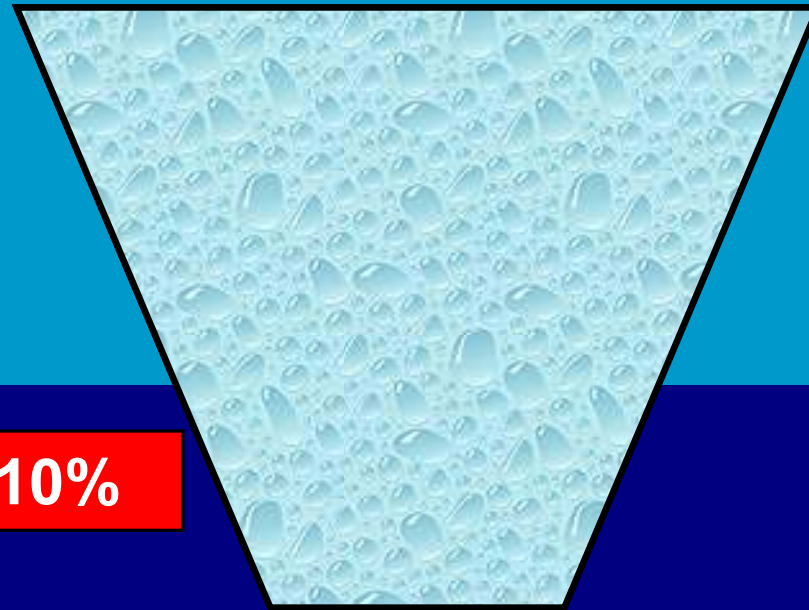
التسرب من خزانات تحت الأرض

A tank or piping network that has at least 10 percent of its volume underground is known as an **underground storage tank (UST)**.

They often store substances such as petroleum, that are harmful to the surrounding environment should it become contaminated.

Many UST's constructed before 1980 are made from steel pipes that are directly exposed to the environment. Over time the steel corrodes and causes leakages, affecting surrounding soil and groundwater.

Underground storage tank (UST)



More than 10%

الترسب الجوي

Atmospheric Deposition



Atmospheric deposition is the pollution of water caused by air pollution.

In the atmosphere, water particles mix with **carbon dioxide** , **sulphur dioxide** and **nitrogen oxides** >>> **weak acid.**

Air pollution means that water vapour absorbs more of these gases >>> more acidic.

When it rains the water is polluted with these gases, this is called **acid rain.**

When acid rain pollutes marine habitats such as rivers and lakes, aquatic life is harmed.





“Dad, what’s acid rain?”

Acid Rain Formation



Global
Warming



سخونة الأرض

Increase in water temperature >> death of aquatic organisms.

Rise in water temperatures >>>> coral bleaching of reefs.

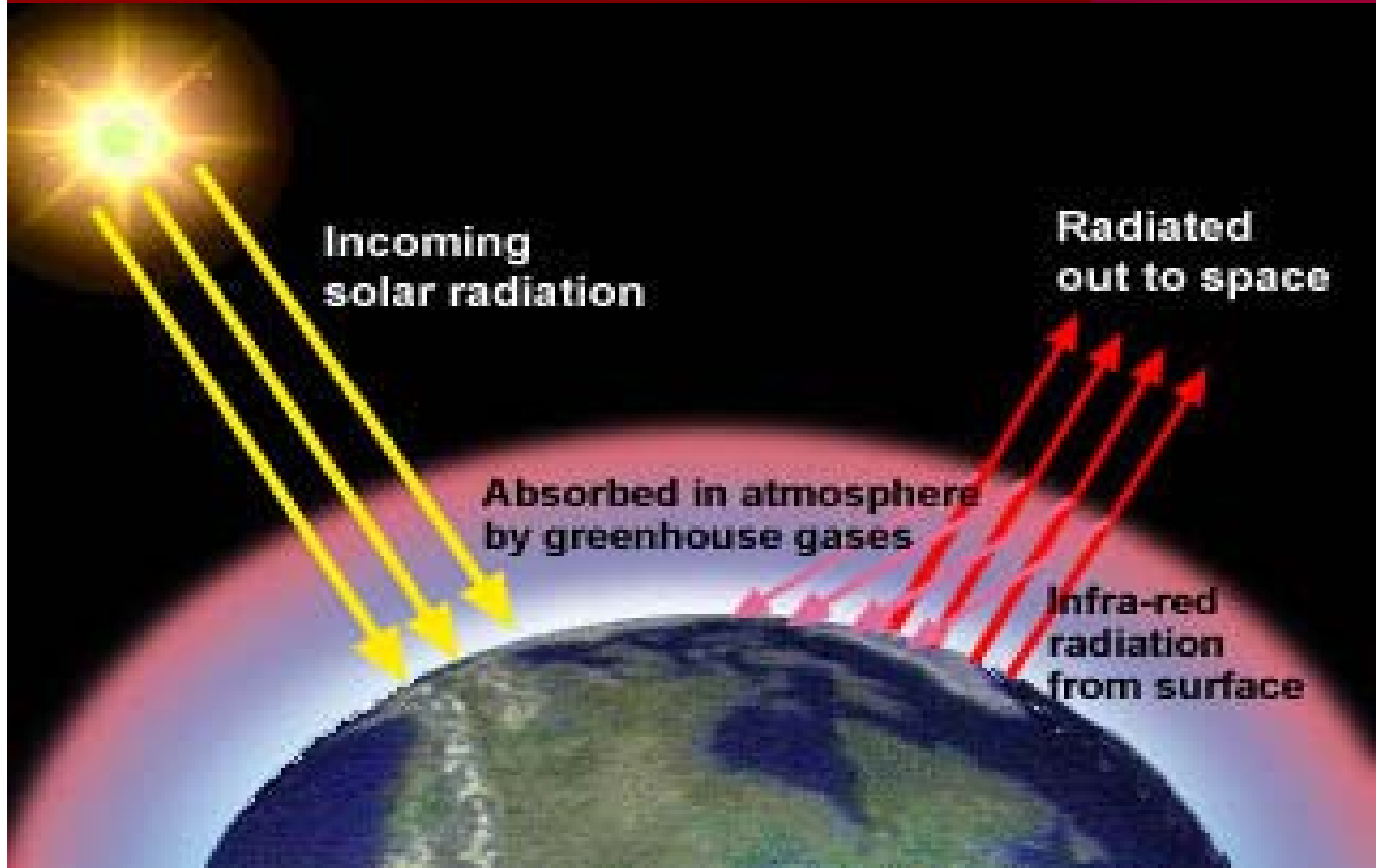
The coral expels the micro-organisms that it is dependent on.



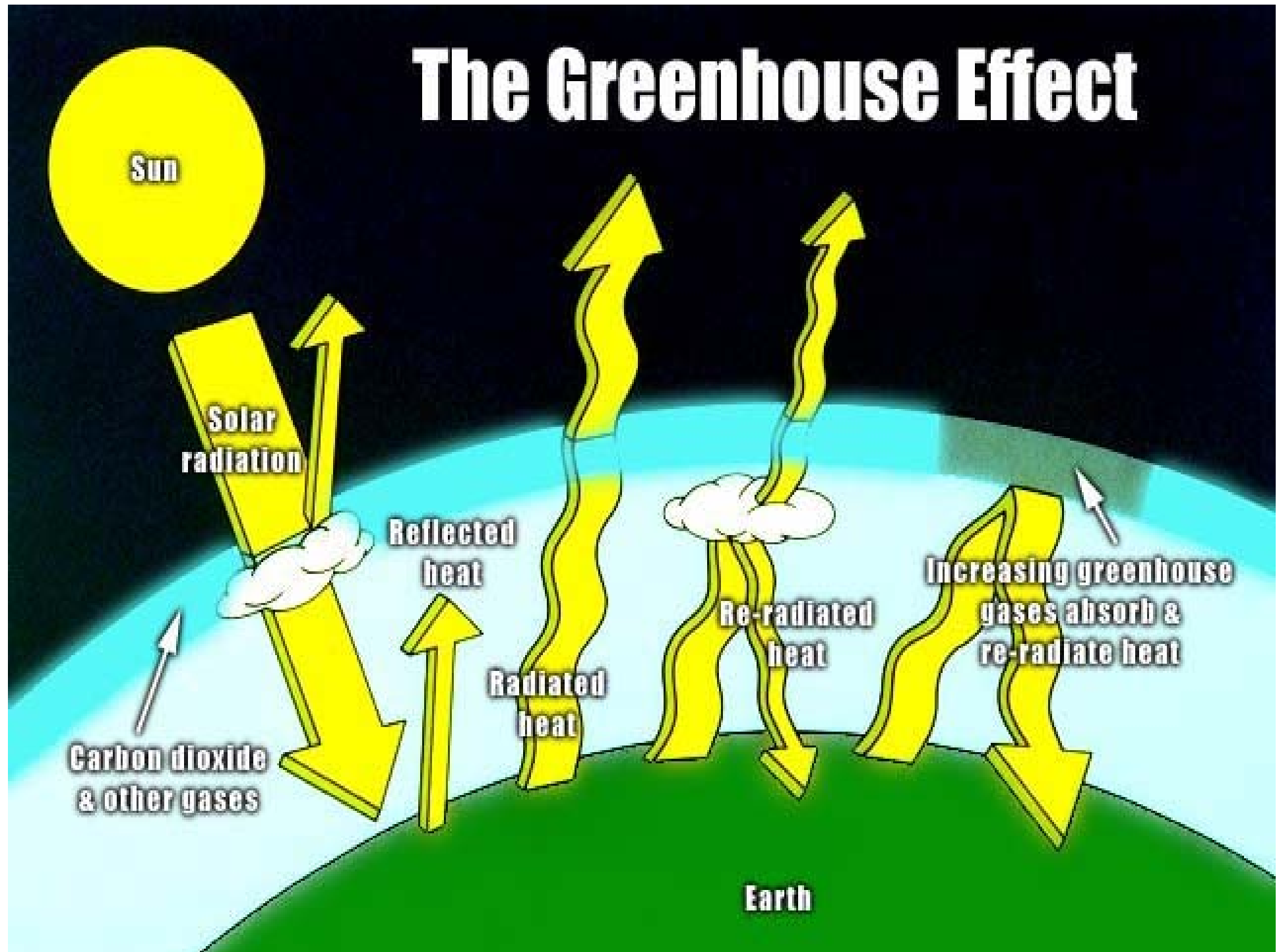


- The rise in the Earth's water temperature is caused by **global warming**.
- **Global warming**: the average global temperature increases due to the **greenhouse effect**.
- The **burning of fossil fuel** >>> **greenhouse gases (CO₂)**.
- Heat from the sun **get 'trapped'** in the Earth's atmosphere >> **Rise global temperature**.

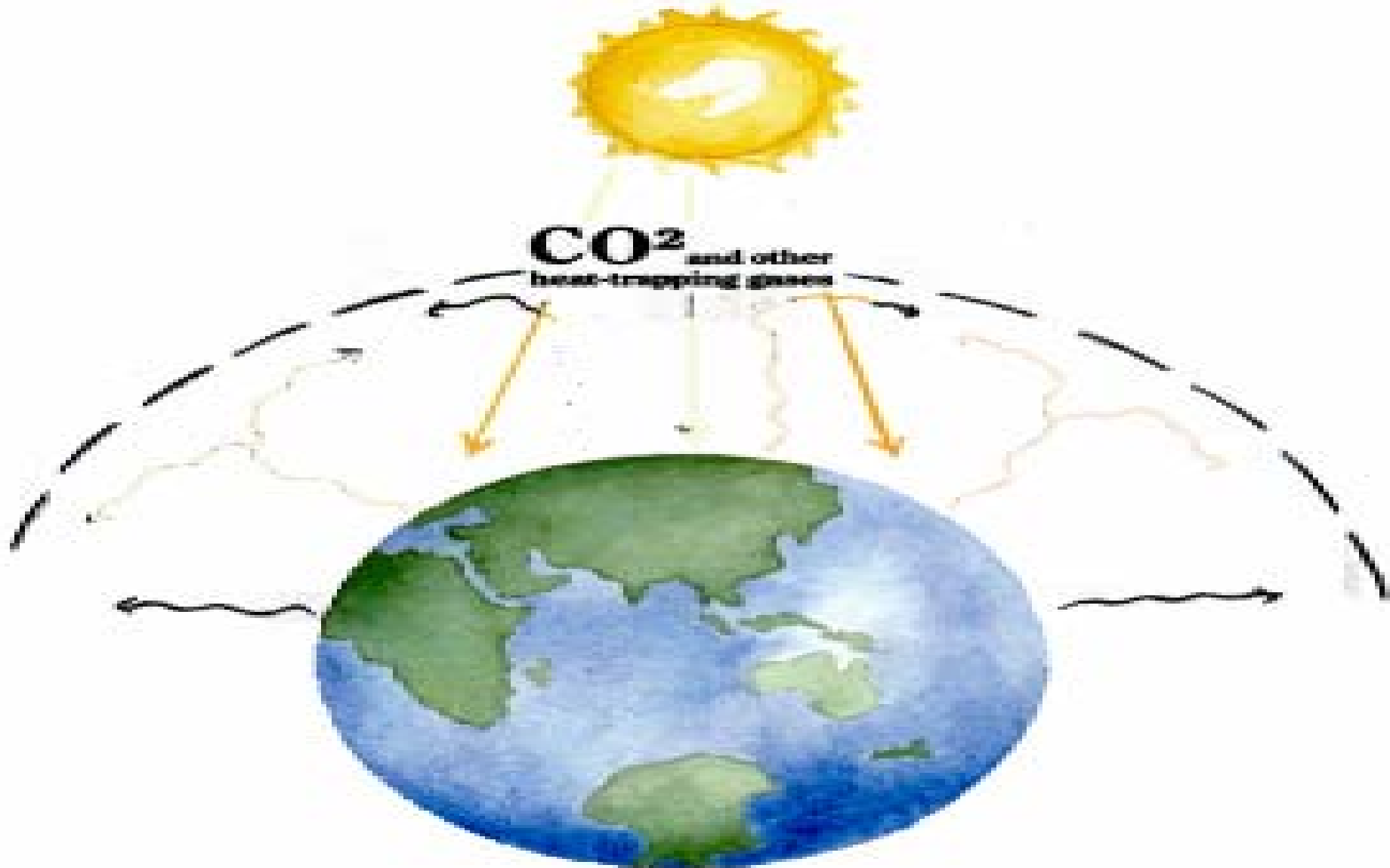
Global Warming



The Greenhouse Effect



Heat Trapping



Eutrophication



التلوث بالمواد المغذية

Eutrophication: The environment becomes enriched with nutrients. This can be a problem in **marine habitats (البيئة البحرية)** (lakes and rivers) >>> **algal blooms (ازهار الطحالب)**.

Fertilizers are often used in farming, run-off into nearby water >>> increase in nutrient levels.

Phytoplankton grow rapidly >>> in algal blooms >>> disrupts normal ecosystem.





- The algae use up the oxygen in the water >>> Death of aquatic organisms such as fish.
- The bloom of algae >>> block sunlight from photosynthetic marine plants under the water surface.
- Algae produce toxins that are harmful to higher forms of life >>> affect any animal that feeds on them.





How Can Water Pollution Affect Health??



Cattle drinking from contaminated waters

All types of water pollution are harmful to the health of humans and animals.

Water pollution damage our health immediately and after long term **exposure.**

Pollutants affect the health of animals as follow :

Heavy metals from industries accumulate in nearby lakes and rivers:

- **Toxic to marine fish and shellfishes, humans eating them.**
- **Birth defects**
- **Carcinogenic.**



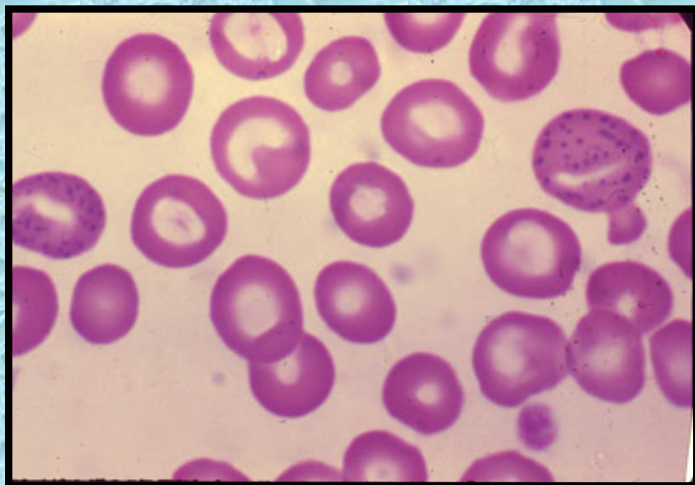
Fluorosis



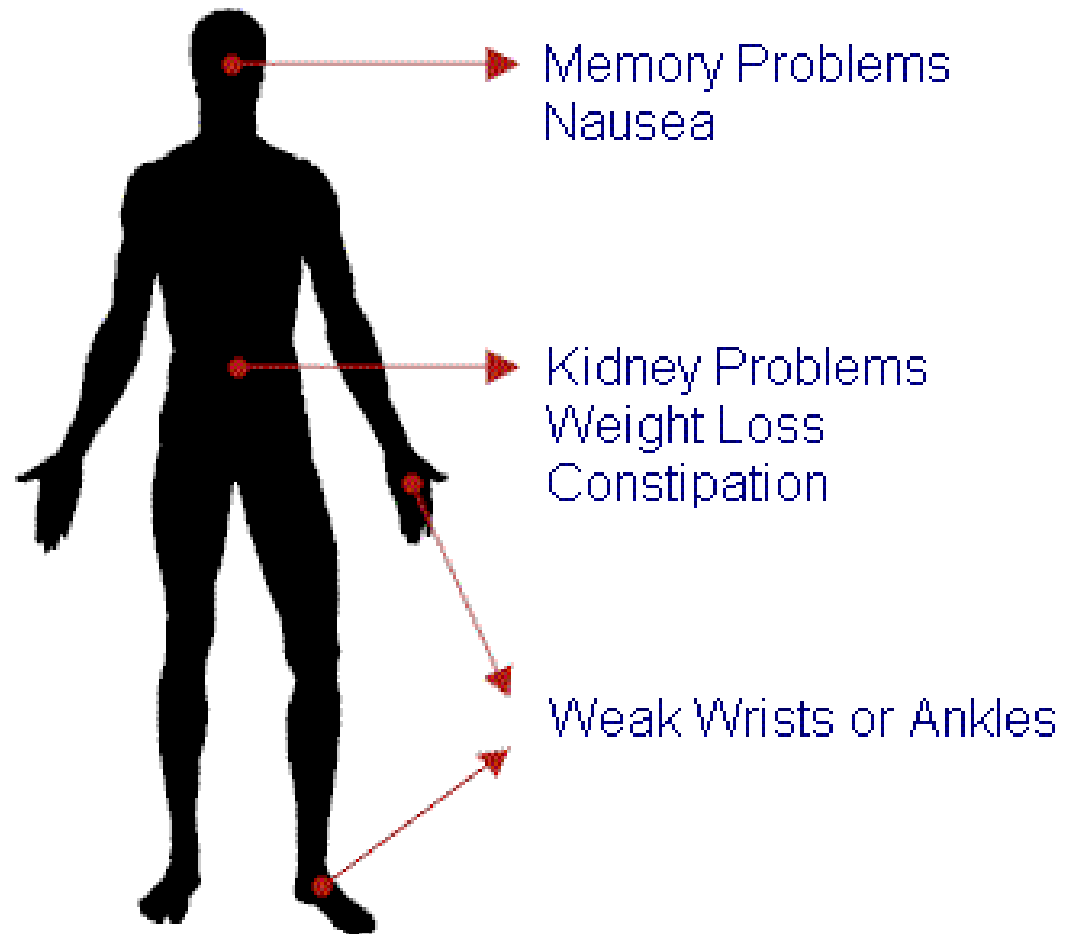
Arsenicosis



Lead poisoning



Later Symptoms of Lead Poisoning





Industrial waste contains many toxic compounds >>> damage the health of aquatic animals and those who eat them.

Some have a **mild effect**, other can be **fatal**.

Cause:

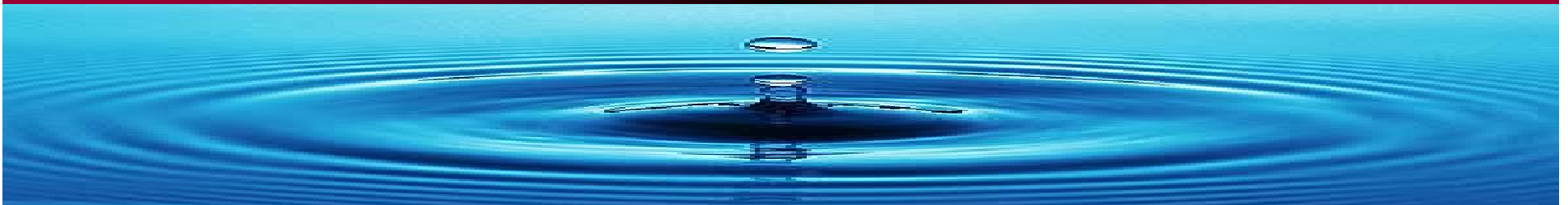
- **Immune suppression**
- **Reproductive failure**
 - **Acute poisoning.**



Microbial pollutants from sewage >>> infectious diseases >>> infect aquatic life and terrestrial life through drinking water.

- Cholera
- Typhoid fever
- Infant mortality.

**Organic matter and nutrients >>> increase in aerobic algae and depletes oxygen from the water.
>>> suffocation of fish and other aquatic organisms.**





- Sulfate particles from acid rain >>> harm the health of marine life >>> mortality.
- Suspended particles in freshwater >>> reduce:
 - The quality of drinking water for humans
 - The aquatic environment for marine life.
 - The amount of sunlight penetrating the water.
 - Disrupting the growth of photosynthetic organisms.

Treating Water Pollution

**Industrial
Treatment**



Denitrification



Septic Tanks



**Ozone
Wastewater
Treatment**



Industrial Treatment



Before raw sewage can be safely released back into the environment, it needs to be treated correctly in a water treatment plant.

In a water treatment plant, sewage goes through a number of chambers and chemical processes to reduce the amount and toxicity of the waste.





- The primary phase:

By mechanical filters

Suspended solid particles and inorganic material removed.

- The secondary phase:

By biological filters & **processes degrade the organic waste**

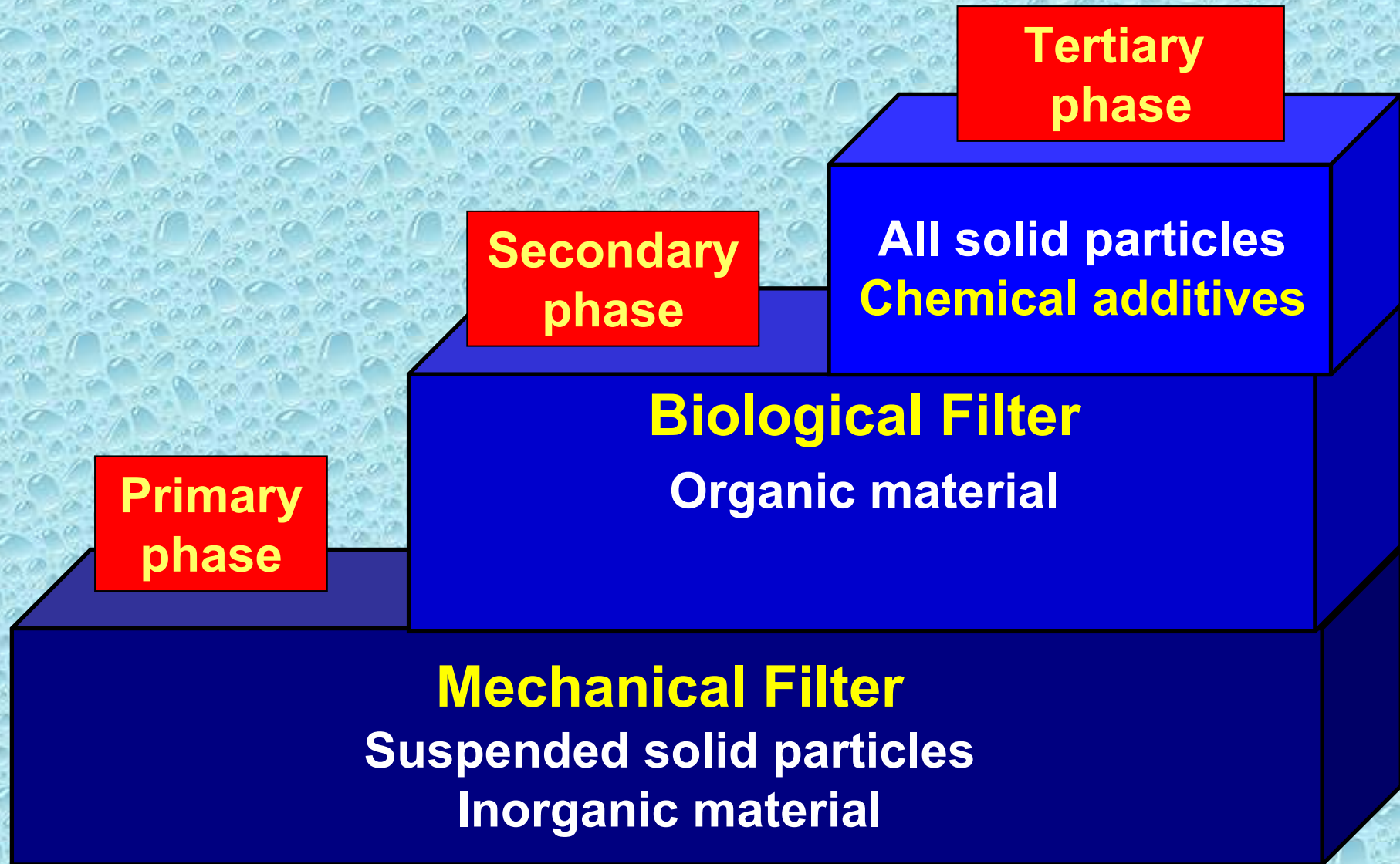
Organic matter is removed.

- The tertiary phase:

Almost all solid particles are removed

Chemical additives are supplied to get rid of any left-over impurities.

Industrial Treatment



Denitrification



Denitrification: an ecological approach to prevent the leaching of nitrates in soil, and stops ground water contamination with nutrients.

Fertilisers contain nitrogen and applied to crops to help plant growth.

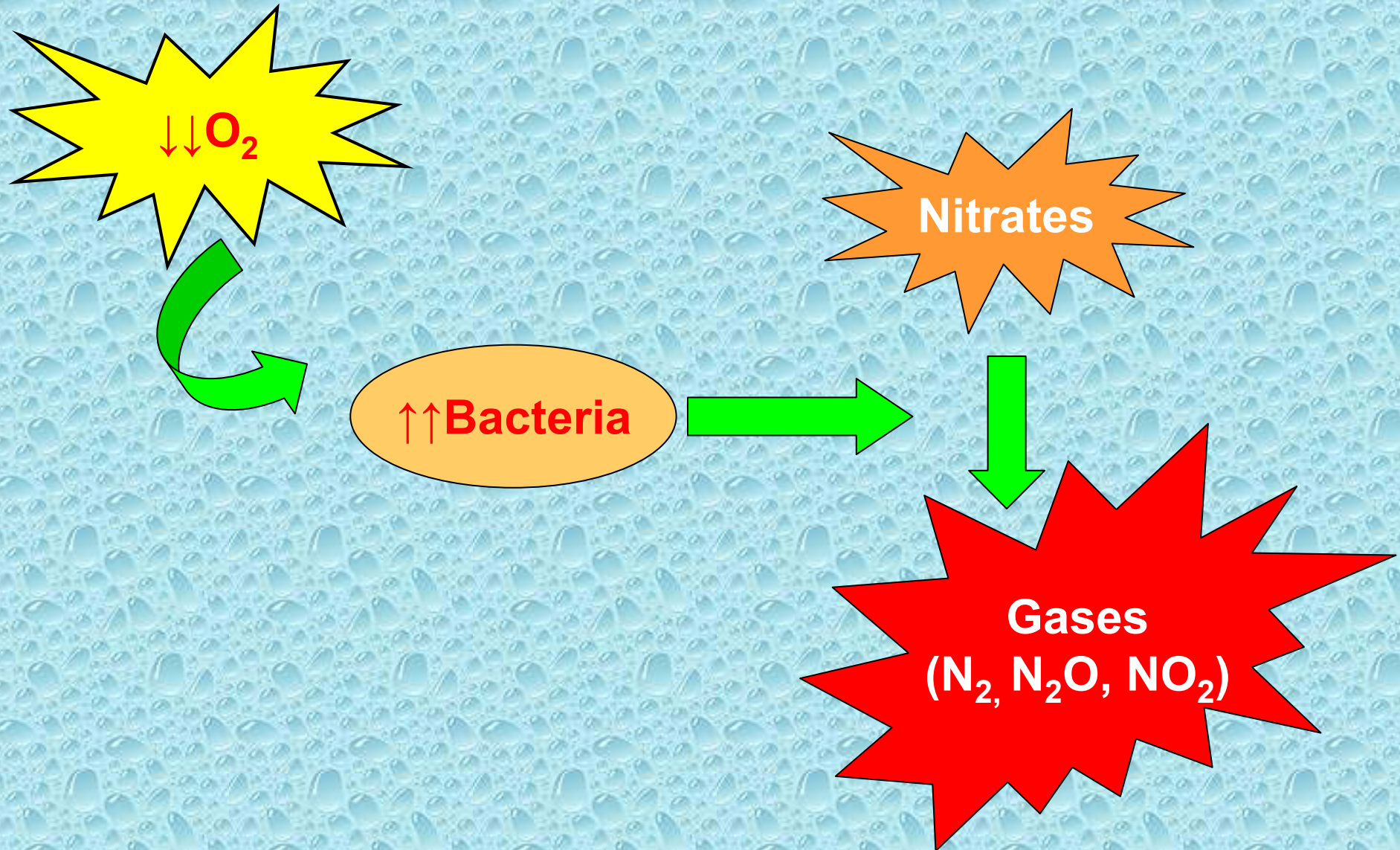
Bacteria in the soil convert the nitrogen in the fertilizer to nitrates, making it easier for the plants to absorb.





- Immobilization >>> the nitrates become part of the soil organic matter.
- When oxygen levels are low, another form of bacteria turns the nitrates into gases such as nitrogen, nitrous oxide and nitrogen dioxide (denitrification) >>> prevents nitrates from leaching into the soil and contaminating groundwater.

Denitrification

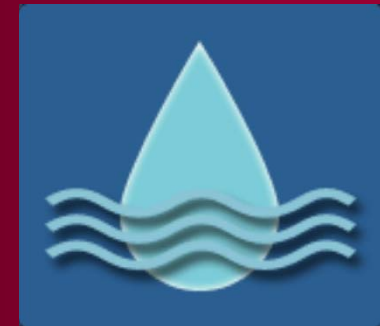


Septic Tanks



**Septic tanks treat sewage at the place where it is located.
And used to treat sewage from an individual building.**

Untreated sewage from a property flows into the septic tank and the solids are separated from the liquid.





- **Solid material is separated depending on their density:**
Heavier particles settle at the bottom of the tank
Lighter particles (soap scum) form a layer at the top of the tank.
- **Biological processes are used to degrade the solid matter.**
- **The liquid then flows out of the tank into a land drainage system.**
- **The remaining solids are filtered out.**

Ozone Wastewater Treatment



Ozone wastewater treatment becomes a popular method.

An ozone generator break down pollutants in the water source.

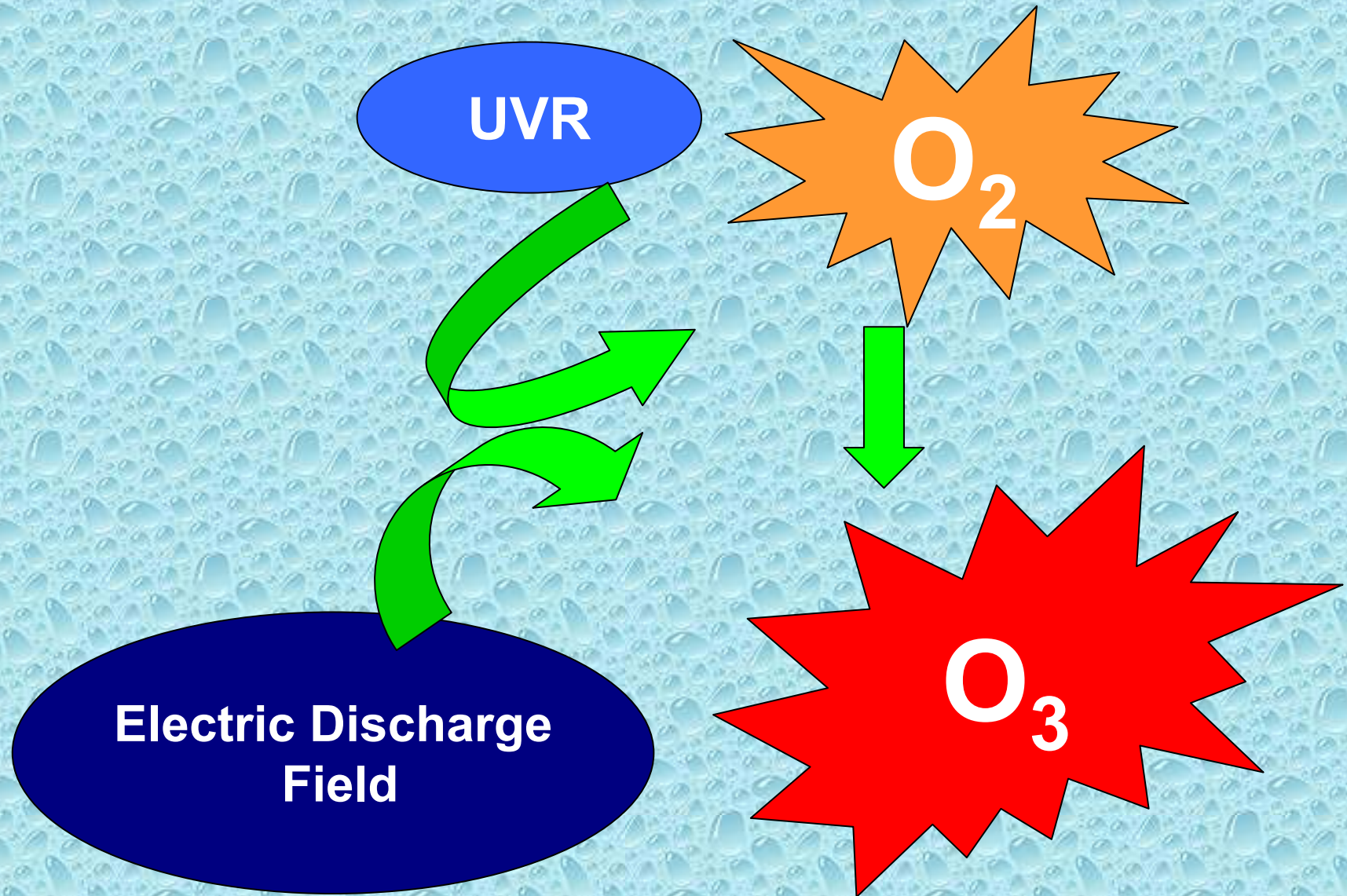
The generators convert oxygen into ozone using:

- Ultraviolet radiation
- Electric discharge field.

Ozone is a very reactive gas that can **oxidise bacteria, moulds, organic material** and **other pollutants** found in water.



Ozone Formation



Benefits of using ozone to treat wastewater:

- **Kills bacteria effectively.**
- **Oxidizes substances such as iron and sulphur >>> can be filtered out of the solution.**
- **No nasty odours or residues produced from the treatment.**
- **Ozone converts back into oxygen quickly, and leaves no trace.**





Disadvantages of using ozone to treat wastewater:

- Requires energy in the form of **electricity >>> cost money** and **cannot work when the power is lost.**
- Cannot remove dissolved minerals and salts.
- Produce by-products (**bromate**) >>> harm human health.

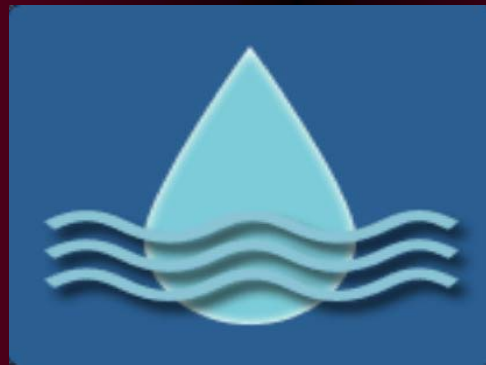


**What Can You
Do to
Prevent
Water Pollution?**



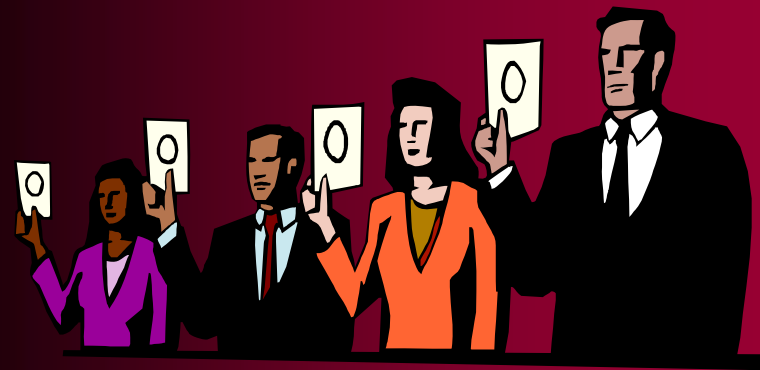
Guidelines to keep water clean:

- **Conserve water** by turning off the tap when running water is not necessary.
- **Be careful about what you throw down your sink or toilet.** Don't throw paints, oils or other forms of litter down the drain.





- Use **environmentally household products:**
Washing powder
Household cleaning agents
Toiletries.
- **Not to overuse pesticides and fertilizers.**

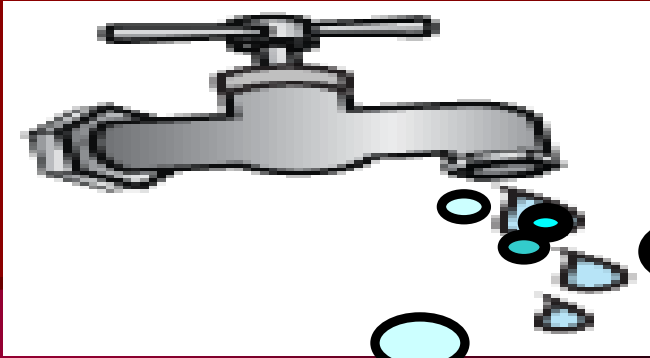




•Don't throw litter into rivers, lakes or oceans.

•Clean up any litter you see on beaches or in rivers and lakes and put it in a nearby dustbin.





**How does water
get from its
natural sources
into the taps in
your home?**

**How to save water
around the home
and in the garden?**

**How to detect a
water leak and
what to do if you
find a water leak?**

منه لا يموت مفادنا عطشا..
 حافظ على قطرة المياه..
 استخدموا المياه بـ كـمة..

الملافة

نملاء اناء صغير
 او موضع المغسلة



نرشك المياه
 ننتسج من الصنبور



شطف موضع دورة المياه

عند القاء الاوراق
 بداخل موضع
 دورة المياه



القاء الاوراق المنسفة
 في موضع دورة المياه
 و محاولة شطفها
 بسحب السيفون



غسيل الملابس

املء موضع الغسالة
 بعد اكتمال الحمولة
 من الملابس



املء موضع الغسالة
 لتنظيف كمية قليلة
 من الملابس



منه لا يموت مفادنا عطشا..
 حافظ على قطرة المياه..
 استخدموا المياه بـ كـمة..

ري حديقة المنزل

استخدام مرشاة خاصة



خرطوم المياه



غسيل الاواني

املء موضع المغسلة
 او اناء كبير



فتح صنبور المياه
 طوال فترة غسيل الاواني



الاستحمام

خمسة دقائق



١٠ الى ٢٠ دقيقة



جامعة المنصورة

قطاع شؤون خدمة المجتمع وتنمية البيئة

الحملة البيئية الأولى

للمحافظة على المياه

قطرة مياه = مياه

بالتعاون مع

مركز مشروعات المياه والصرف الصحي جامعة المنصورة

جمعية تكنولوجيا المياه



Thank You

