

## **Local Water Supply**

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### **Introduction**

Life on earth would be impossible without water. We depend on water for our survival: we drink it, cook with it, clean with it, and wash in it. Farmers use water to irrigate crops. Each day in Britain about 20 million cubic metres of water is used.

Industry and commerce consume considerable quantities of water each year, either supplied by the local water company through the mains water system or abstracted directly from rivers or boreholes.

- **industry**

Electricity generation accounts for about 35% of all water supply in the UK. It is used as a coolant and then returned to a river. It requires little treatment but care must be taken not to raise the temperature of the river to such an extent that flora and fauna are adversely affected. Other industries account for about 12% of water supply.

- **agriculture**

Agriculture accounts for only 1% of all water supply. However, this amount is increasing rapidly. It has more than doubled in the last 20 years. Climate forecasts expect summers to be drier with more rain in winter months. This means a greater demand for irrigation in summer months.

- **domestic**

Domestic use accounts for the remaining 52% of all water supply. This is abstracted from both surface and ground water. The average household in the UK uses about 500 litres of water per day.

Almost all water supplied to business is returned as trade effluent to a river or the sea by:

- direct discharge or
- via the sewer and the local sewage treatment works.

Rising demand for clean water combined with recent "drought" conditions in the UK is putting pressure on available water supplies. It is estimated that UK industry uses approximately 3,000 million tonnes of water each year and demand is predicted to rise by another 15% in the next 25 years.

Water pollution is the contamination of water by sewage, toxic chemicals, metals, oils, or other substances. It affects rivers, lakes, oceans, and the water beneath the earth's surface, called ground water.

Polluted water can cause illness and death. According to the World Health Organisation, about 5 million people die every year from drinking polluted water.

Impurities must be removed before such water can be used safely for drinking, cooking, washing, or laundering. Some industries even have to clean the water before it can be used in their manufacturing processes.

The basic approach of current UK environmental legislation is to prevent, minimise or otherwise render harmless pollution at source.

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## **Sources of water pollution**

Water pollution comes from businesses, farms, homes, industries, and other sources. It includes:

- **Sewage**

Sewage is waste water from toilets, washing machines, and showers. It contains human wastes, soaps, and detergents.

In the UK, most of the sewage is carried by underground pipes and sewers to treatment plants that kill the harmful bacteria and remove the solid waste before discharging the treated effluent into a watercourse.

However, at some British seaside resorts, raw (untreated sewage) is discharged into the sea. Although the point of discharge may be some way out to sea, the tides and the wind can bring the sewage back to the shore.

- **Industrial wastes**

Industries discharge many toxic chemical wastes directly into rivers and streams.

Many factories and power stations burn coal, oil, and other fuels for heat and power. The smoke from their chimneys contain a chemical called sulphur.

The sulphur dissolves in the moisture in the air and forms a weak acid. This falls to the ground as acid rain, which enters streams and lakes. Acid rain makes the water in rivers and lakes acidic. This kills the fish that live there.

Some industries use large quantities of water to cool equipment. Heat from the equipment makes the water hot. When discharged into a river or a lake, the hot water causes thermal pollution that can kill plant and animal life.

- **Agricultural wastes**

Many farmers spray their crops with pesticides to kill any insects living on them. However, the pesticides contain chemicals which can be harmful to humans and animals if they get into the food chain.

When sprayed on crops or in gardens, pesticides can be blown by the wind to other areas. They can also be washed by the rain water into nearby streams or can seep through the soil into ground water.

Pesticides pass from one organism to another. For example, when pesticides are present in a stream, small fish and other organisms can absorb them. Larger fish who eat these contaminated organisms build up even larger amounts of pesticides in their flesh.

Animal wastes also cause water pollution; much of their wastes runs off into nearby rivers and streams. The water used for irrigation may also be polluted by pesticides, and toxic chemicals on the soil surface before it flows back into the ground.

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## **Effects of water pollution**

### ▪ **Sewage**

In areas that lack modern sewage treatment works, water carrying human waste can flow into drinking water supplies. Water polluted with human and animal wastes can spread typhoid, cholera, dysentery, and other diseases.

Sometimes raw (untreated) sewage is poured into rivers. Aerobic bacteria use oxygen in the water when breaking down organic wastes. If the water contains too much organic waste, the bacteria will use up most of the oxygen in it.

Some fish, such as salmon and trout, will then be unable to live in the water. Fish that need less oxygen, such as carp, will replace them. If all the oxygen is used up, most aquatic life will be unable to survive.

### ▪ **Groundwater**

A lot of drinking water comes from sources under the ground. It is known as groundwater. Groundwater is formed when rain seeps through the soil and is held in water bearing rocks. An aquifer is a underground water bearing sand, gravel or rock layer from which ground water can be obtained from a well.

Many aquifers have been ruined by pollution. In rural areas, chemicals from pesticides and nitrates from fertilisers seep through the soil and into groundwater.

More pollution of groundwater occurs around landfill sites, the huge tips where we dump rubbish. The rubbish rots under ground, creating methane gas and many other chemicals. Rain and liquids in the landfill site mix with other chemicals to create a poisonous fluid called leachate. This can then seep through the soil into the water supply.

### ▪ **Rivers and Streams**

A lot of our drinking water also comes from rivers and streams, which are also polluted. In Poland, half the river water is too polluted even for industrial use. In Malaysia, forty major rivers are so contaminated that they have no fish or animals left in them.

Industry has been allowed to pollute the rivers and seas. The government assumed that if the waste materials were not very poisonous or if they were in small quantities, they would disperse harmlessly in the water.

However, some pollutants are concentrated in the food chain. Small water creatures eat minute amounts of pollutants, which are stored in their bodies.

Larger creatures eat the smaller ones, and the concentration gradually builds up until large fish or animals may contain enough to be poisonous. This process is known as bioconcentration.

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## **Effects of water pollution**

### ▪ **Seas and Oceans**

Every year, we pour 22 billion tonnes of pollution into the seas and oceans. Because of their size, the effects of pollution have been so far kept under control, but this cannot last forever. Pollution prevents people from using and enjoying water for recreation. For example, odours and floating debris make boating and swimming unpleasant, and the risk of disease makes polluted water unsafe.

Oil spilled from ships or from offshore oil wells may float to shore. The oil can cause serious pollution and kill water birds, shellfish, and other wildlife.

### ▪ **Radioactive waste**

Nuclear power stations are often built by the sea so they can use the water for cooling. The water used for cooling becomes slightly radioactive and is pumped back into the sea.

In the UK, the Sellafield nuclear plant pipes liquid nuclear water into the Irish Sea, making it the most radioactive sea in the world. Many fish have been found suffering from cancers and their young are born severely deformed.

Over 100,000 tonnes of radioactive waste have already been dumped in the oceans. It gradually loses its radioactivity over hundreds or thousands of years, but it is unlikely that its containers will remain leakproof that long.

### ▪ **Eutrophication**

Another problem is caused by the phosphates from washing powders and the nitrates from fertilisers. These are nutrients and act like fertilisers in the sea. They cause excessive growth of algae (a type of seaweed). As more algae grow, more also die.

When the algae die, they sink to the bottom and rot. Bacteria in the water use up large amounts of oxygen digesting the excess dead algae. The oxygen level of the water then drops, causing many aquatic plants and animals to die.

This process uses up a lot of oxygen - oxygen the fish and other plants need to live and grow. This over nourishment is called eutrophication. It kills many fish in the shallow waters off the coast and also affects rivers and lakes.

### ▪ **Thermal pollution**

Another form of water pollution is the heated water discharged by power stations into rivers. This heated water, called thermal pollution, reduce the amount of oxygen that dissolves in water and harms fish and aquatic plants.

In addition, the high temperature of the water can kill some kinds of plants and fish.

## **Control of water pollution**

The origin of water pollution is generally characterised as either being from nonpoint (diffuse) or point sources.

### ▪ **Nonpoint source pollution**

Nonpoint source pollution is caused by rainfall moving over and through the ground picking up and transporting natural and human made pollutants, and depositing them into lakes, rivers, coastal waters, and underground sources of drinking water.

Human activities that add to nonpoint source pollution in this way include:

- excess fertilisers, herbicides, and insecticides from agricultural lands
- improper disposal of pet wastes
- household products such as motor oil or solvents
- garden chemicals such as fertilisers and pesticides
- sediment from improperly managed construction sites
- bacteria and nutrients from livestock farming

The effects of nonpoint source pollutants on specific waters vary. However, we know that these pollutants have harmful effects on drinking water supplies, recreation, fisheries, and wildlife.

### ▪ **Point source pollution**

Point source pollution comes from sources that are concentrated and readily identifiable like discharges from wastewater treatment facilities, solid waste landfills, poultry farms, and factories.

Point source pollutants can include many different organic and inorganic substances, including human waste and toxic metals.

Point sources of pollution are more easily controlled and monitored so they have been the focus of most pollution controls to date. More recently, the control of nonpoint sources become a focal point for pollution reduction efforts.

Once pollutants are in the water, it is difficult to remove them. One way to solve this problem is by carefully controlling the disposal of chemicals.

**Note :** A good web site showing pollution sources is <http://www.protectingwater.com>

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## **Assessment**

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### **Local Water Supply**

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**Questions 1 to 5 - Select the correct response for the following questions :**

1. It is estimated that UK industry uses how many tonnes of water each year ?  
  
A approximately 3,000 million tonnes  
B approximately 4,000 million tonnes  
C approximately 5,000 million tonnes  
D approximately 6,000 million tonnes
  
2. By how much is this figure is expected to rise over the next 25 years?  
  
A 5%  
B 10%  
C 15%  
D 20%
  
3. Agriculture uses what % of the total water supply in the UK?  
  
A 10%  
B 52%  
C 1%  
D 35%
  
4. How many litres of eater are used per day by the average household in the UK ?  
  
A 800 litres  
B 500 litres  
C 300 litres  
D 100 litres
  
5. Which of the following is not a point source of water pollution?  
  
A discharge from a wastewater treatment plant  
B a solid waste landfill site  
C a factory  
D oil or solvents in household sewers

**Questions 6 to 10 - Decide whether each of these statements is True (T) or False (F).**

6. i) In the UK, most of the sewage is carried by underground pipes and sewers to treatment plants before discharging the treated effluent into a watercourse.  
ii) However, at some British seaside resorts, raw (untreated sewage) is discharged into the sea.

Which option best describes the two statements?

- A i) T ii) T  
B i) T ii) F  
C ii) F ii) T  
D ii) F ii) F

7. i) Industries do not discharge toxic chemical wastes directly into rivers and streams.  
ii) Some industries use large quantities of water to cool equipment. Heat from the equipment makes the water hot. When discharged into a river or a lake, the hot water causes thermal pollution that can kill plant and animal life.

Which option best describes the two statements?

- A i) T ii) T  
B i) T ii) F  
C i) F ii) T  
D i) F ii) F

8. i) When sprayed on crops or in gardens, pesticides can be washed by the rain water into nearby streams or can seep through the soil into ground water.  
ii) Water polluted with human and animal wastes cannot spread typhoid, cholera, dysentery, and other diseases.

Which option best describes the two statements?

- A i) T ii) T  
B i) T ii) F  
C i) F ii) T  
D i) F ii) F

9. i) Landfill sites, the huge tips where we dump rubbish, do not pollute ground water.  
ii) Pollution does not prevent people from using and enjoying water for recreation.

Which option best describes the two statements?

- A i) T ii) T  
B i) T ii) F  
C i) F ii) T  
D i) F ii) F

10. i) Nonpoint source pollution is caused by rainfall moving over and through the ground picking up and transporting natural and human made pollutants.  
ii) Point source pollution comes from sources that are concentrated and readily identifiable like factories.

Which option best describes the two statements?

- A i) T ii) T  
B i) T ii) F  
C i) F ii) T  
D i) F ii) F