
Water Supply And Pollution

Introduction

75% of the earth's surface is water, but only 3% of that is fresh water and more than 75% of that is frozen. Of the remaining unfrozen fresh water, 98% lies underground. This means that, in effect, less than one hundredth of one percent of the earth's water is easily available to support life.

In the twentieth century, the demand for water increased six fold, more than double the growth in the human population of the earth. At the same time, pollution of water supplies and over extraction of water has meant that supply cannot meet the demand in many regions of the world.

The worst affected areas are in semi arid regions of sub Saharan Africa and Asia. It is expected that by 2025 these regions will suffer severe water shortage for over 2.5 billion people. This will be due to a combination of lack of suitable water supply and unrestricted population growth.

Most water is used in the USA, about 70 times that used, per person, in Ghana. In the USA about 75% is used to irrigate crops, 20% is used for industry and only 5% for domestic use. In the UK a higher proportion is used for domestic purposes.

Per capita water consumption

Country	Average daily consumption (gals / day)
United States of America	177
Canada	209
Mexico	40
Argentina	45
India	14
Germany	46
France	77
United Kingdom	30
Uganda	5

Even where water supplies are plentiful they are increasingly at risk from pollution and rising populations.

Current urban and industrial development requires that water supplies are adequate not only for human consumption but also for industrial and agricultural use and for power generation.

Fresh water pollution

Surface water is polluted in a variety of ways :

- **industrial wastes**

Factories use enormous quantities of water to make consumer products. For example up to half a million litres of water can be used in the production of all the components to make a car. Most of the water used by industries is contaminated and then discharged into the sewage system. This places all sorts of chemical pollutants and heavy metal residues into the water supply.

- **untreated sewage**

Intensive animal farming produces large volumes of liquid animal manure. This is dumped into water courses where it finds its way into rivers where it contaminates the water.

- **agricultural fertilisers**

Up to 50% of the artificial fertilisers used by farmers today is washed out of the soil and into rivers. This badly affects aquatic life forms and contaminates drinking water supplies.

- **herbicides and pesticides**

Many agricultural herbicides and pesticides do not decompose after use. Some are washed off the land into drinking water supplies.

- **salt from roads**

Every winter, in some countries, millions of tonnes of salt are spread on roads to reduce the hazard caused by ice. Much of this salt is washed into streams and rivers where it harms plants and animals.

- **domestic rubbish**

Domestic rubbish is often placed in landfill sites. This reacts with the ground water and soluble pollutants can be carried through the ground into local river systems.

- **Acid rain**

The rain which falls from the sky is polluted by sulphur dioxide (SO₂), (which dissolves in the water to form sulphuric acid) and by various oxides of nitrogen (which dissolves in the water to form nitric acid). These gases are produced almost entirely from burning fossil fuels, mainly in power stations and road transport.

Pollution of the sea

The sea is the ultimate depository of waste. The polluted fresh water in rivers eventually makes its way into our seas and oceans. Enclosed seas are more endangered than open seas. The Aral Sea in Asia is effectively dead with little life remaining in it. The Mediterranean, Baltic and Black Sea are becoming increasingly polluted.

The effects of pollution are seen most where the water is slow moving such as at river deltas, estuaries, harbours and shallow coastal waters. The Nile delta, for example, has been a health hazard for centuries.

Pollution of the sea is caused in various ways :

- **discharge directly into the sea or via rivers - 45%**

85% of raw sewage from Britain's coastal towns is discharged into the sea. The greatest volume of petroleum products dumped into the ocean is carried there by rivers. It represents more than tree times the quantity coming from all tankers and other ships.

Oil and other petroleum products are discharged into rivers and the ocean by many industrial enterprises, including oil refineries and oil storage installations, The quantity of petroleum products dumped each year into the sewage network by gasoline stations twice exceeds the amount resulting from ship disasters.

- **fallout from air pollution, acid rain - 30%**

Acid rain not only causes pollution when it falls on land but also at sea.

- **discharge from shipping - 15 %**

Millions of metric tonnes of oil contaminate the sea every year. About 33% of this comes from ships deliberately washing out their tanks. Seagoing tankers carry 60% of all oil extracted. Pollution is caused when these ships flush their tanks with seawater. A smaller percentage comes from passenger ships and freighters draining water ballast from their fuel tanks.

- **deliberate dumping of waste at sea - 10%**

Radioactive and industrial wastes, sewage sludge, domestic waste and all kinds of garbage, ranging from fishing nets to rubbish from cargo ships have all been dumped at sea but are now regulated by international agreements.

Dealing with water shortage

Basically there are two ways of dealing with shortages of water:

- **find new water sources**

- **Rain water**

Only a small proportion of the water which falls as rain is collected and used. The rest evaporates or runs off into the sea. More of this rain water could, therefore be collected and used. However, this means that more land which could be needed for agriculture must be drowned beneath reservoirs.

In addition, this solution only applies where there is a plentiful supply of rain water. Often, however, water is needed in areas where annual rainfall is low.

- **Sea water**

Desalination of sea water is becoming cheaper but is still too expensive for most developing countries.

- **Ground water**

One of the strategies used since the 1970's is to drill wells to obtain water. In many parts of the world this has lead to a decline in the water table. The technological solution of drilling deeper and deeper wells has its limitations.

In addition, this ground water is becoming increasingly polluted by chemicals from industry and agriculture.

- **use water more efficiently**

- **Leakage**

In industrialised countries water is distributed via complex systems of pipes. Up to 20% of this water is lost before it reaches the consumer, leaking away through corroded or fractured pipes and badly fitting seals and joints.

- **Irrigation**

80% of the water used to irrigate crops is lost due to seepage and evaporation. A large amount of this lost water could be saved.

- **Industry**

Industry must become far less wasteful in its use of water, in addition it must be responsible for removing any pollutants added by the industrial process.

- **Domestic consumption**

Domestic consumers must become more economical in their use of water for bathing and washing clothes etc. Modern washing machines are becoming more efficient both in their consumption of water and electricity.

Challenges in the 21st century

Currently, the United Nations estimates that 1.2 billion people around the world lack access to a safe water supply and that about 2.5 billion are without proper sanitation. The absence of safe water and sanitation leads to a huge range of diseases.

These facilities are considered to be basic human rights to safeguard health and human dignity. It is expected that the lack of these facilities will kill over 12 million people per year.

The main challenge for the 21st century will be to learn how to manage fresh water resources in such a way as to achieve a balance between the needs of agricultural production and domestic use particularly drinking water supply.

This will require consideration of the following:

- determining a sustainable rate of extraction of ground water for agricultural use taking account of how long it takes for the ground water to be replenished
- methods of sustainable crop production
- methods for storing and conserving rain water
- surface treatment / planting of soil to ensure water enters the water table rather than running off into local water courses

In addition, other considerations include:

- ways of controlling the increase in population
- actively encouraging the efficient use of available water supplies
- reduction / prevention of contamination of water supplies

The problems of water shortage and contamination were one of the main considerations at the World Summit on Sustainable Development held in Johannesburg in August 2002.

For example, Uganda has set a goal of providing safe water and sanitation for 65% of its population by 2006 and for all its population by 2015.

Assessment

Water Supply And Pollution

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

1. What percentage of the Earth's water is easily available to support life?
A 75%
B 10%
C 3%
D less than 1%

2. In the 20th Century, the world-wide demand for water rose ?
A six fold
B five fold
C four fold
D three fold

3. What percentage of fertiliser is washed out of soils into the water supply ?
A 15%
B 35%
C 50%
D 65%

4. What percentage of raw sewage from Britain's coastal resorts is dumped straight into the sea?
A 85%
B 65%
C 50%
D 30%

5. In industrialised countries, what percentage of water is lost into the ground due to leakage ?
A Pre contract stage
B Construction phase
C Maintenance period
D Refurbishment period

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

6. i) 75% of the Earth's surface is water but only 8% is fresh water.
ii) It is expected that by 2025 the world's water supply problems will be solved.

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) Most agricultural herbicides and pesticides decompose quickly after use.
ii) The use of intensive animal farming reduces pollution of water supplies.

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) Over 3 million metric tonnes of oil pollute the sea every year.
ii) Acid rain only pollutes land, it does not pollute the sea.

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) Extracting water from deep wells does not affect the water table.
ii) Desalination is still too expensive for most developing countries.

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) Currently, the United Nations estimates that 1.2 billion people around the world lack access to a safe water supply.
ii) The problems of water shortage and contamination were one of the main considerations at the World Summit on Sustainable Development held in Johannesburg in August 2002.

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