

COMMONWEALTH OF AUSTRALIA

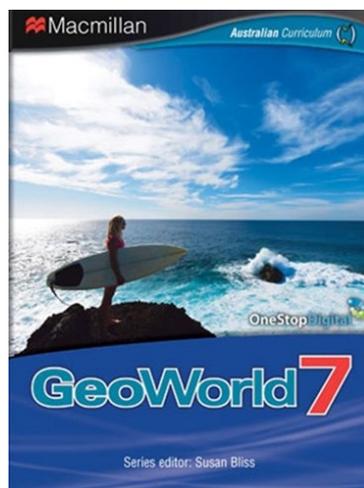
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Bliss, S., Chaffer, L. & Reid, G. (2013). GeoWorld7. South Yarra, Vic: Macmillan Education.



2.11 Water diseases in developing countries

Water, while essential to human and environmental health, can be a bearer of disease and death. Every eight seconds a child dies of a water-related disease and every year 5 million people die from unsafe drinking water. Dirty water is one of the causes of diarrhoea, which kills 2.2 million people each year. Fortunately, oral rehydration solutions (ORS) have saved 50 million children from dying from water-related diseases in the past 25 years.

Malaria, elephantiasis and schistosomiasis

About 50% of people living in developing countries suffer from diseases that are water borne, water washed, water based or water related:

- *Malaria* is transmitted by mosquitoes and is endemic in tropical climates, such as Central Africa. Approximately 700 000 people die from the disease each year as there is no completely effective vaccine. The Millennium Development Goals (2000–2015) aim to halt the spread of malaria by producing insecticide-treated mosquito nets and extending research on effective anti-malarial drugs.
- *Elephantiasis* is also transmitted by mosquitoes and affects over 120 million people living in Africa and South-East Asia, leaving many incapacitated and disfigured with huge swollen limbs. Daily washing in water can be an effective way to limit the symptoms. However, some types of the disease are caused by contact with red clays in water that are associated with volcanic activity. Medication aims to eliminate the disease by 2020.
- *Schistosomiasis* is the second most devastating parasitic tropical disease (after malaria), causing damage to internal organs. Humans become infected with parasitic worms while swimming or bathing in contaminated water. The worms mature and mate in the body. The eggs are then released from the bladder or bowel into water where the life cycle begins again.

Water borne

Poor sanitation (e.g. cholera and typhoid)

Water washed

Insufficient water to wash properly (e.g. scabies and leprosy)



Water related

Infection-carrying insects breed in water (e.g. malaria, elephantiasis, sleeping sickness and yellow fever)

Water based

Water part of lifestyle of infecting agent (e.g. schistosomiasis and guinea worm)

2.11.1 Types of water diseases

INITIAL RISK

Diarrhoea—causes dehydration in children or old people, the sick or pregnant

Cholera—causes severe diarrhoea, vomiting and organ failure; is spread in human faeces in areas with poor sanitation

Typhoid—causes diarrhoea, fever, headache, stomach cramps; is spread by contaminated food or water

Hepatitis A—causes flu-like symptoms and high fever; is passed on by contaminated food or water



WITHIN TWO WEEKS

Malaria—can cause death through anemia or clogging of capillaries; passed on by mosquitoes

Dengue fever—causes fever, joint and muscle pain and severe bleeding; passed on by mosquitoes

2.11.2 Disease risk in water

River blindness

Imagine your face covered with tiny parasitic worms. No, it is not a horror movie, it is a disease called river blindness, or onchocerciasis. It is transmitted by black flies living in running water in Africa, Latin America and the Arabian Peninsula.

During the 1970s, 30% of the villagers living along West African rivers went blind or had severe vision problems. People in these communities were forced to abandon their farms. In 1974, the Onchocerciasis Control Program applied weekly insecticides to rivers covering 48 000 km, and 7 million West Africans received ivermectin drugs to prevent future infection. Eventually the disease was controlled in 11 West African countries.

Way forward

The insecticide DDT initially controlled water-dwelling vectors of human diseases, however it also killed countless fish—an important protein in developing countries. The Bill and Melinda Gates Foundation is working

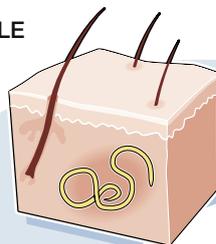
with drug companies to fight tropical diseases such as river blindness and parasitic elephantiasis, through drug treatment and nutritional rehabilitation to prevent re-infection.

Onchocerciasis, also known as river blindness, is a parasitic disease caused by tiny worms or 'microfilariae' and transmitted by flies. The disease affects an estimated 18 million people worldwide.

THE DISEASE CYCLE

2 Infection

The larvae enter the host's skin tissue, where they migrate and form nodules, and slowly mature into adult worms



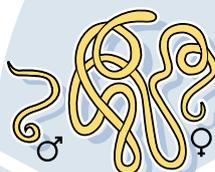
1 Parasitised

The insect takes a blood meal from a human. A pool of blood is pumped up into the fly, saliva passes into the pool, and infective *Onchocerca* larvae pass from the fly into the host's skin.



3 Proliferation

New worms form new nodules or find existing nodules and cluster together. Smaller male worms migrate between nodules to mate.



4 Reproduction

After mating, eggs form inside the female worm and develop into microfilariae. A female may produce 1000 microfilariae per day.



5 Transport

When the infected host is bitten by another fly, microfilariae are transferred from the host to the fly.



2.11.3 River blindness



Geoactivities 2.11

Knowledge and understanding

- 1 Explain the relationship between water and health.
- 2 Describe the life cycle of schistosomiasis.
- 3 Explain the impact of poor-quality water on people's wellbeing.
- 4 Suggest strategies to improve water quality.

Inquiry and skills

- 5 Refer to 2.11.1. Distinguish between diseases that are water borne, water washed, water based and water related, and their causes.
- 6 Refer to 2.11.2.
 - a When an area suffers a flood what are the impacts on the health of the local communities?
 - b Imagine you were caught in a flood. How could you reduce the chance of getting a disease spread by contaminated water?
- 7 Refer to 2.11.3.
 - a What is river blindness?
 - b Where does it occur?
 - c How is it spread?
 - d What are the symptoms?
- 8 Explain how river blindness was reduced in West Africa.
- 9 Discuss how the misuse of water decreases available drinking water.





2.12 Sanitation improves water quality

Imagine the indignity of life without a toilet—especially since every person excretes 50 g of bodily wastes each day. Fortunate people have access to a toilet to excrete bodily wastes, while 1.1 billion people are forced to defecate and urinate in the open.

Some 90% of the world's sewage ends up untreated in oceans, rivers and lakes. This waste impacts adversely on human health when untreated water is drunk. In India, 1.1 million L of raw sewage is dumped into the Ganges River every minute, causing the transmission of diseases, such as diarrhoea, cholera, dysentery, typhoid and hepatitis. In Australia, animal faeces and septic overflows are washed into rivers causing diarrhoea from cryptosporidium. Chlorine dioxide, ozone treatment and ultraviolet light treatment aim to destroy the cryptosporidium in the water.

Televisions preferred to toilets

Access to septic tanks, sewerage systems and sludge treatment plants are unavailable to 70% of people living in rural areas in developing countries. Regions struggling with low coverage of sanitation include southern Asia (41%) and sub-Saharan Africa (30%). Between countries, variations range from Australia (100%), India (72%) and Brazil (50%) to Senegal (8%).

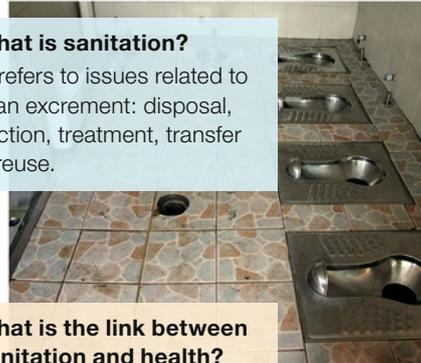
Building toilets is only part of the health problem. In India some communities preferred the money to be spent on televisions and mobile phones rather than on a toilet. Where sewerage facilities have been constructed, some communities use the toilets to house firewood or chickens. Other communities lack money to maintain the infrastructure. In Venezuela, 97% of sewage is disposed in the ground, eventually finding its way to water sources.

Stop the killer

Every four hours sewage-related diseases will kill the equivalent of two jumbo jets full of children,

1 What is sanitation?

This refers to issues related to human excrement: disposal, collection, treatment, transfer and reuse.



2 What is the link between sanitation and health?

Bacteria, viruses and parasites found in human waste are responsible for the transmission of infectious diseases, killing millions of people every year. About 1.5 billion people suffer from parasitic worm infections caused by human excrement. Lack of sanitation increases infant mortality rates and lowers life expectancy.



3 What is the biggest killer from lack of sanitation?

Diarrhoea is the second biggest killer of children under five years after pneumonia. It can be reduced through safe water, sanitation and hygiene education.



2.12.1 Inquiry questions on sanitation: What? Why? Who? How?

most living in developing countries. MDG7 aims to halve the proportion of people without access to safe drinking water and basic sanitation by 2015. Since 1990, 1.3 billion people have gained access to improved sanitation, yet by 2015 it is likely that the MDG7 goal will have fallen short by 1 billion people.

i Geoinfo

- In Africa, 115 people die every hour from diseases linked to poor sanitation and contaminated water.
- The average person visits the toilet 3000 times a year, about eight times a day.



4 Why is toilet close to home desirable?

In some cultures, women wait until dark to go to the toilet or they walk a long distance to find an isolated spot. This exposes them to the danger of sexual harassment, assault and animal attacks.

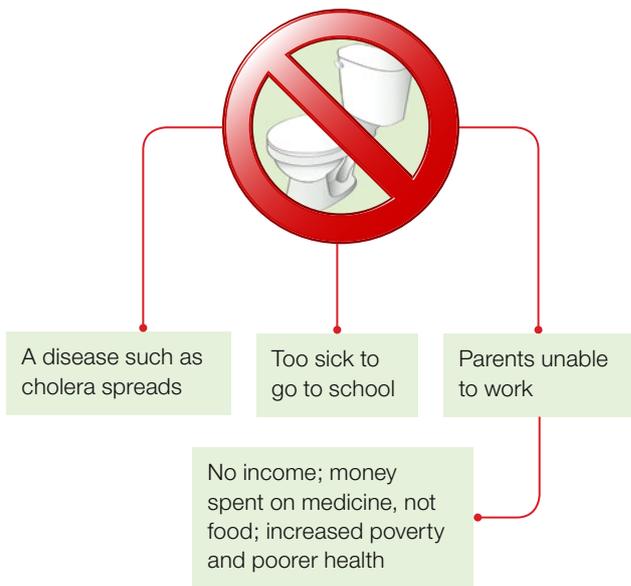
5 Who suffers most from poor sanitation?

Poor rural people suffer most, especially women and children living in developing countries. Refugees and people suffering from disasters (e.g. floods, cyclones, tsunamis or earthquakes) are also at risk.

6 How are organisations making a difference?

WaterAid promotes dry pit latrines; ventilated improved pit latrines with vent pipes to take smells and disease-carrying insects away from the latrines; pour flush latrines; and ecological sanitation (eco san) latrines, which safely renew human waste as compost.

Investing in sanitation improves the wellbeing of communities and countries. Every \$1 invested in improved sanitation brings a \$9 return on improved health, as people are more able to work and earn an income. To raise awareness of people without access to toilets and sanitation, the United Nations declared 2008 the International Year of Sanitation and November 19 as World Toilet Day.



2.12.2 The message of World Toilet Day

Geoactivities 2.12

Knowledge and understanding

- 1 What is sanitation?
- 2 Explain the link between sanitation and health.
- 3 Discuss the health problems suffered by people without access to adequate sanitation.
- 4 Why do you think toilets are economically and culturally unimportant in some countries?

Inquiry and skills

- 5 Refer to 2.12.1.
 - a What is the biggest killer from lack of sanitation?
 - b What group of people suffer the most from lack of sanitation?
 - c How do organisations make a difference for people living without sanitation?
- 6 Refer to 2.12.2.
 - a Explain the diagram and suggest how active, responsible citizens could make a difference.
 - b Design a poster for World Toilet Day.
- 7 Research the number of toilets in your home, friends' and relatives' homes, shopping centre and school. Discuss whether there are an adequate number of toilets for the number of people requiring use of the facilities. Present your report as a graph. Analyse the findings.
- 8 Imagine you do not have access to a toilet for one day. What would you do? How would you feel? Record your thoughts and share them with the class.
- 9 Propose explanations for the spatial distribution of sanitation around the world.