

# Contamination of Water

## Part C: Anthropogenic related pollution

*The material presented here has been prepared by Samuel Addison in April 2021, with input from Dr. Laura Richards and Prof. David Polya of the Department of Earth & Environmental Sciences, The University of Manchester, and other sources as acknowledged. The associated video recordings have been made by Samuel Addison.*

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This lesson will investigate how human actions can lead to contamination of drinking water and also look at key contaminants that are of concern to human health.

This lesson will develop on knowledge learnt in “Part A: What is contamination?”

- To gain familiarity with some types of water pollutants which are typically associated with human activity
- To be able to discuss how different types of contaminants can result from different types of actions

# FAECAL CONTAMINATION

- Improper wastewater management or discharge
- Tube wells, dug wells and springs
  - Latrines uphill or close to the source and animal access to sources can lead to contamination [1]
- Rain water harvesting tanks
  - Animals can access tanks and lead to faecal contamination [2]
- Piped systems
  - Improperly sealed piped systems can be contaminated.
  - Open defecation near tap stands also leads to contamination [2]

- Household water storage can contribute to drinking-water contamination [1]
- “Water stored in homes is often faecally contaminated at levels far above the contamination level at the source” [1]

- There are multiple reasons water quality can deteriorate during the storage and transport of water:
  - Household practices
  - poor hygiene knowledge prevents people from taking basic steps to minimize contamination
  - inadequate household latrines, hand-washing facilities
  - commonly used transport and storage containers are easily contaminated [1]



# **CHEMICAL CONTAMINATION FROM AGRICULTURAL ACTIVITIES**

- “Most chemicals used in agriculture are either pesticides or fertilizers” [1].
- “Contamination of drinking-water resources may result following land application or from improper disposal” [1].
- Pesticides and fertilizers are examples of some types of emerging organic contaminants which are the subject of increasing attention and research (e.g. [2])

- “When nitrogen fertilizer is applied to crops, nitrate can filter into shallow aquifers or be washed into surface waters” [1]
- Since nitrate is used in most fertilizers, contamination of water resources is common [1].
- But nitrate and nitrite can come from other sources not necessarily linked to agriculture such as from human waste [2]

- Pesticides enter water primarily as runoff, inappropriate disposal or accidental release [1]
- “The potential of a pesticide to contaminate drinking water is affected by its solubility and biodegradability; the method of application; and environmental factors such as soil, weather, season and proximity to water resources” [1]

# **CHEMICAL CONTAMINATION FROM INDUSTRIAL SOURCES AND HUMAN DWELLINGS**

- “Localized contamination of drinking-water resources can occur when chemicals are used in industries or in private households” [1]
- “Heavy metals, petroleum products, and chlorinated organic solvents are the main types of chemicals used in both of these settings” [1].

- “Cadmium is used in the steel industry, in plastics and batteries” [1].
- “It is carcinogenic when inhaled, but there is no evidence that ingestion through drinking water can cause cancer” [2].
- “The WHO Guideline value is set to protect against kidney damage” [2]
- This is an example of where provisional standards are put in place.

- Cyanide can occur naturally in some foods, but is rarely found in drinking water except due to industrial contamination where large spills may occur [1]
- “Cyanide is acutely toxic” [1]
- Occurs in drinking-water at concentrations well below those of health concern, so does not have a guideline [1]



- “Mercury is used in the electrolytic production of chlorine; in electrical appliances such as dry-cell batteries, fluorescent light bulbs and switches; and in thermometers” [1]
- “Natural contamination can also occur in groundwater, but is rare” [1]

**POTENTIAL CHEMICAL  
CONTAMINATION ASSOCIATED  
WITH TREATMENT OR  
DISTRIBUTION SYSTEMS**

- Disinfectants such as chlorine are commonly used to reduce pathogenic risk in drinking supplies [1]
- However, disinfectants have the potential to produce by-products that may be of health concern, such as chlorination disinfection by-products [1].
- It is important to ensure that disinfection efficiency is not compromised when attempting to control concentrations of disinfection by-product [2].

- Some organic compounds and/or heavy metals potentially may be present in pipes and fittings which can leach into drinking water during distribution [1]
- Natural waters and treated drinking water usually contain almost no lead, but older distribution systems can be made of lead and contaminate drinking water [1]
- Lead can lead to numerous health concerns [2]

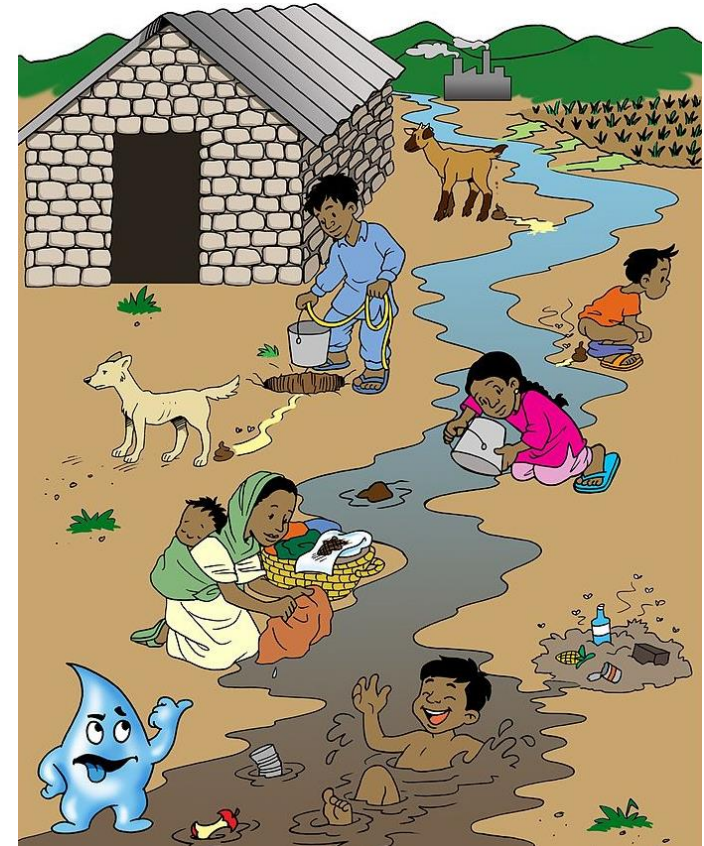
# SUMMARY

- There are a range of human actions that lead to contamination of water
- Some chemicals can contaminate water by both natural and human actions, whilst some chemicals only contaminate water due to human actions
- Different types of activities (e.g. agricultural) can be associated with specific types of pollutants

# LEARNING EXERCISE

# Learning exercises

- In this image there are numerous activities that are leading to contamination of water.
- Try to identify the source of the pollution and what type of contamination it will lead to (e.g., microbial or chemical)



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# **REFERENCES & FURTHER RESOURCES**

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