

Water, Sanitation and Health in the Developing World

Dr Michael Templeton
Dept of Civil and Environmental Engineering
Imperial College London
m.templeton@imperial.ac.uk

The Scale of the Water Problem

- 1.1 billion people lack access to safe drinking water
- Water pollution and water scarcity are two of the biggest challenges for the 21st century
- Diarrheal diseases are the third leading cause of death worldwide and responsible for the stunted growth of $\frac{1}{4}$ of surviving children in the developing world
- 3.4 million people, 90% of whom are children under 5, die each year from preventable water-related illness

Water Contaminants and Household Treatment

- Common water contaminants of health relevance include microbial pathogens (viruses, bacteria, protozoa, algae) and toxic chemicals (e.g. arsenic) – natural or anthropogenic
- Water supply in the developing world is mainly ‘point-of-use’ and non-piped
- Treatment of water at household level is still relatively rare or minimal

Water Contaminants and Household Treatment

- The simplest form of water treatment is coverage of a storage vessel and allowing settling of particles
- Other forms of household treatment include simple filters (rags, sand, charcoal), chlorine and/or coagulant solutions, or solar disinfection
- Protecting the source of water is just as important as treatment!
- Hand-washing must be promoted simultaneously!

Non-Technical Factors

- Treatment technologies must be appropriate for the users – i.e. consider the cost, education levels of users, personal preferences, religious and gender issues, long-term maintenance and sustainability
- Health professionals (i.e. nurses) are often an effective way of disseminating water treatment materials and information

Non-Technical Factors

- Social marketing and community-led initiatives have been effective for motivating the public
- It is crucial to include women and children; women often have the responsibility for household water management

Don't forget Sanitation & Drainage!

- Most low-income countries are still far behind their 2015 MDG targets for sanitation coverage
- Managing stormwater and wastewater is a key step to improving quality of life in these communities

The Link between Sanitation and Waterborne Illness

- Waterborne illnesses include cholera and typhoid, transmitted via faecal-oral route
- Larvae of worms also transmitted when faeces are left on the ground
- Also, there are water-related (not waterborne) illness such as malaria and yellow fever; mosquitoes breed in poorly-drained areas and some prefer polluted waters

Sanitation & Drainage

Pit Latrines

- Pit latrines isolated human wastes and prevent passage into the community
- Water, urine, and liquids infiltrate to the ground
- Typically approximately 1 m in diameter and up to 3 m deep
- Require only 1-2 m² of space, so suitable for dense urban areas
- Ventilated improved pit (VIP) latrines overcome bad smells and insect nuisance

Sanitation & Drainage

Septic Systems

- Consist of a tank and drainage field
- Sludge accumulates at the bottom while liquid passes to the drainage field via a soakaway
- Minimum volume of 1 m³; usually must be “desludged” every 2-5 years
- Require more space and more expense than simple latrines, but are satisfactory in many cases, especially low-density housing areas

Sanitation & Drainage

Stormwater Flow Control

- Recommended approach is generally to direct stormwater using open channels (versus closed piped systems)
- Open channels are cheaper, easier to clean blockages, and allow easier access for control of mosquitoes
- Simple stone pitching can support the channel walls and allow some simultaneous infiltration
- Covered footpaths can prevent children or animals from coming in contact with high velocity and/or contaminated stormwater

Water and Sanitation

Summary: Starting an Upward Spiral

- A continuing challenge today and into the future...
- **If crucial basic services such as water supply and stormwater and wastewater management can be provided, the hope is that better public health will lead to an upward spiral of social and economic development, leading to increased productivity, higher standards of living, and ultimately improved quality of life.**

Information Resources

- WEDC, WELL, WHO, CAWST
- wedc.lboro.ac.uk
- lboro.ac.uk/well
- who.int/household_water/en
- cawst.org/index.php?id=26