CE 331: Water Supply Engineering

Lecture 1

Instructor Autobiography

2003	***BSc. Engg***.(Civil Engineering), BUET (Major in Environmental Engineering)
2003-'05	Research Officer, ITN-BUET
2005	***MSc. Engg***.(Environmental Engineering), BUET
2011	***PhD***. (Environmental Engineering), Department of Civil & Environmental Engineering, Northeastern University, Massachusetts, USA
2012-2013	Assistant Professor, Department of Environmental Science and Management, North South University
Spring 2014 - present	Assistant Professor, Department of Civil Engineering, University of Asia Pacific
Research Interests	Water Quality Assessment and Control, Wastewater treatment and Management, Environment and Ecology

Overview of the course

- History and Development of Water Supply System, Bangladesh Scenario, Objectives and Elements of Water Supply.
- Water Demands, Fire Demands, Planning and Design Considerations.
- Hydrological Cycle, Sources of Water Supply, Surface Water, Ground Water, Rain Water and Grey Water.
- Surface Water: Conveyance of Water, Water Hammer, Pipe Laying, Valves, Fittings and Taps, Detection and Prevention of Waste and Meters.
- Ground Water: Groundwater Exploration, Aquifer Properties and Groundwater Flow, Well hydraulics, Water Well Design, Construction and Maintenance, Recharge of Ground Water.
- Water Treatment: Water Quality and Its Standard, Plain Sedimentation, Coagulation and Flocculation, Filtration, Disinfection, Arsenic, Iron and Hardness Removal Processes.
- Analysis and Design of Distribution Systems.
- Pumps and Pumping Machineries.
- Water Supply Management: User Community, Water Source Management, Institutional Aspects, Water Ethics and Pricing, Water Use and Reuse, Technological Options for Rural and Low Income Urban Communities

Course References

- **Water Supply and Sanitation**

  M. Feroze Ahmed & Md. Mujibur Rahman

  (ITN-Bangladesh)
- **Water Supply Engineering**

  M. A. Aziz

Lecture 1

- What is Environmental Engineering?
- What is Water Supply Engineering
- History and development of water supply
- Bangladesh scenario
- Objectives of water supply
- Elements of water supply system
- Planning and design considerations

What is Environmental Engineering

- BY THE ENGINEER - MAY, 22ND 2014

Environmental engineering is the sister field of civil engineering and involves integrating engineering principles and science to improve natural environment and to protect it while providing potable water, clean air and sustainable life for humans and other organisms. Another crucial task tackled by environmental engineering is that of cleaning up polluted areas/sites. It also deals with tackling issues that are being faced by public.

http://wonderfulengineering.com/what-is-environmental-engineering/

http://wonderfulengineering.com/what-is-environmental-engineering/

Environmental Engineering ….the link

Environmental Reservoirs

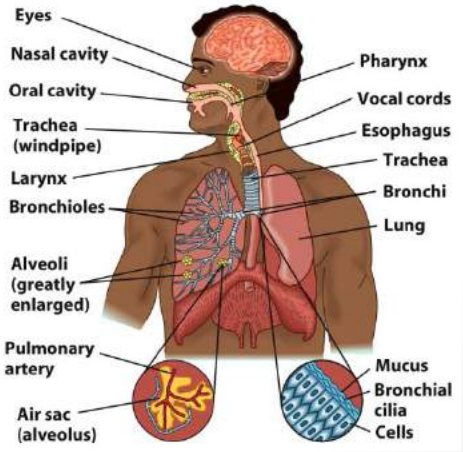
Water, Air and Soil

Pollution control

Waste treatment and disposal

Hazard Management

Impact on Humans



Why there is always a need for Environmental Engineer

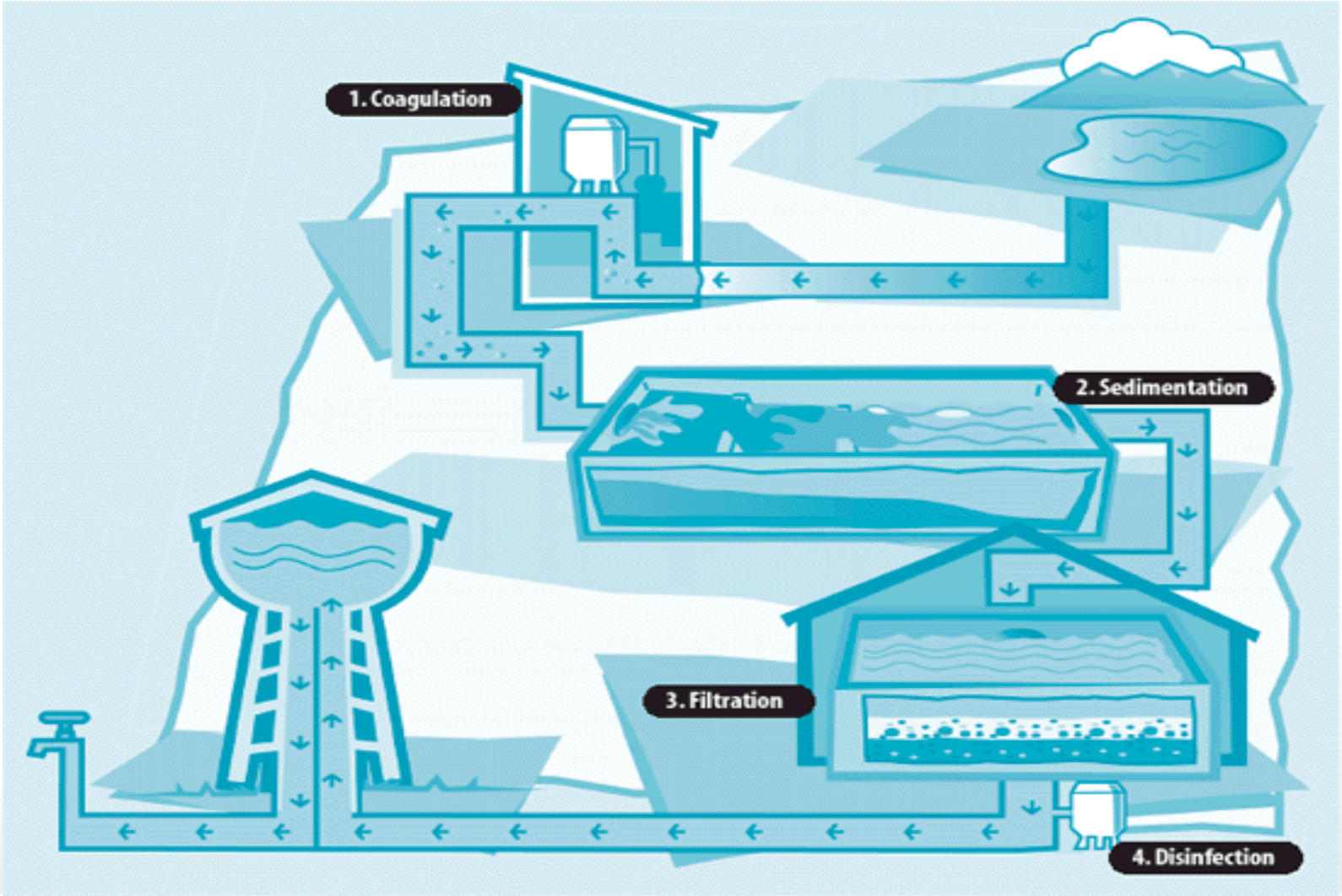
- We always need clean water to drink
- We always have wastes to treat and dispose
- We always need clean air to breathe

We always …want cheaper and better ways to improve all of the above….

…….Ensures Job Security !!!!!!!

Excerpt from a presentation by Dr. Annalisa Onnis-Hayden, Assistant Academic Specialist, Department of Civil and Environmental Engineering, Northeastern University, Boston, USA

What is Water Supply Engineering



What is Water Supply Engineering

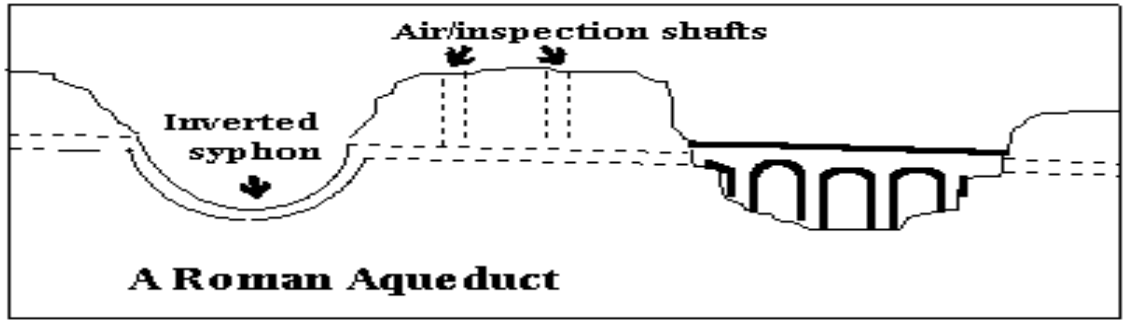
A branch of civil engineering concerned with the development of sources of supply, transmission, distribution, and treatment of water. The term is used most frequently in regard to municipal water works, but applies also to water systems for industry, irrigation, and other purposes.

History and Development of Water Supply

- Waterworks structures – excavations
- large tanks excavated on minor drainage lines
- structures of water supply, drainage , sewerage and swimming pools of Mohenjodaro civilianization in the Indus Valley. Also Egypt, Babilonia and Assyria-flat countries used open canals with large storage basins
- Wells were also used in many countries in ancient times to utilize underground water
- Italy, Greece , India and Egyptian used wells in 2100 BC. Artesian wells were sunk in China in early times.

History and Development of Water Supply

- Lake Mories in Egypt – built in 2000 BC – Supplied water for 20,000,000 people
- Numerous conduits – water supply in ancient Jerusalem – 600 to 900 BC
- Water supply in Rome – Surrounding aqueducts and hills – 616 km
- London – at end of 16th century- first modern city to use lead pipe for conveyance of water
- European countries - Wood pipes bored out of logs



Purification attempts of the supplied water

- John Gibb -first water filter at Paisley in Scotland, **UK in 1804**.
- James P. Kirkwood -also designed the first sizeable water filter (New York, in **1871**).
- In **1849 Dr. John Snow**, a medical researcher in England demonstrated the role of faecal pollution of drinking water in the epidermicity of cholera.
- From **1857 onward** Dr. William Budd investigated the water-borne diseases.

Public Water Supply Schemes

- Water borne diseases - warranted treatment – sedimentation
- Theory of water filtration – early 19th century
- Inadequate and contaminated water – cholera, diarrhoea, dysentry, typhoid

Purification of water in house, industries and public places

Bangladesh Scenario

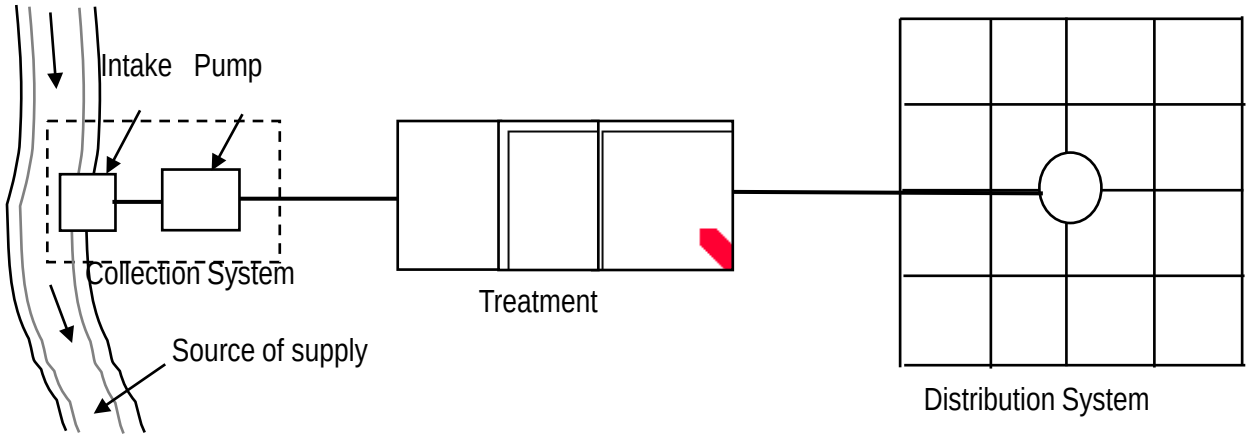
- First water works of water supply - DWW – 1874
- The water works was completed in Calcutta in **1870** and those of Bombay, madras and Poona 1875, 1880 and 1890 respectively
- Since, 1928 about 3 to 4 million hand tube wells in Bangladesh have been sunk to provide drinking water to 97% of the rural population
- In the context of very high prevalence of diarrheal diseases in Bangladesh, groundwater being usually free from disease producing micro-organisms, received priority as a source of water supply

Objectives of Water Supply

- Supply water in adequate quantity
- Supply safe and wholesome water to the consumers
- Make water easily available to consumers

Elements of Water Supply

- Source of supply
- Collection system
- Treatment and
- Distribution system.



Source of Supply

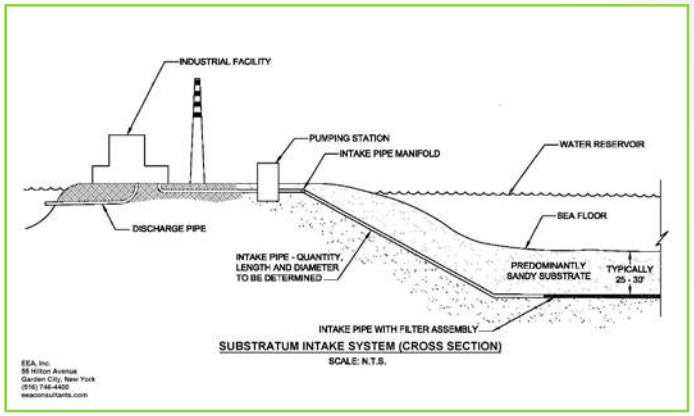
- Surface water
- Ground water
- Rainwater

Selection of source depends on –

- Quantity
- Quality
- Cost

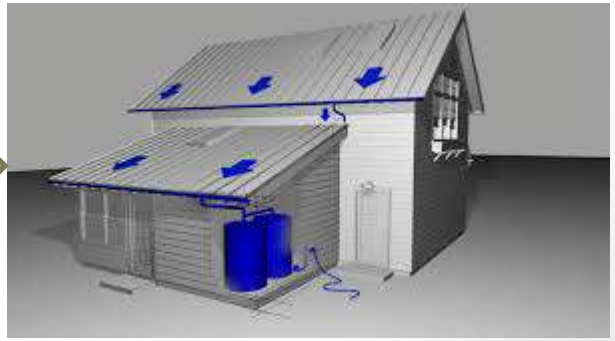
Collection system

- Surface water – Intake with pumping facility required



- Ground water – Dugwells or tube wells are common devices

- Rainwater – A permanent roof or uncontaminated ground surface



Treatment

- Surface water
  - Turbidity
  - Color
  - Taste
  - Odour
  - Pathogens
- Ground water
  - Mineral substances
  - Iron
  - Arsenic
  - Fluoride
  - hardness

Methods:

- **Screening**
- **Sedimentation**
- **Aeration**
- **Chemical treatment**
- **filtration**
- **demineralization**
- **Disinfection**

Distribution System

- Urban - Piped Water supply
  - Storage reservoirs
  - Pumping devices
  - Standposts
  - Valves
  - Other appurtenances
- Rural - Unpiped Water supply – manually operated tubewells
  - Location
  - Accessibility
  - Serving distance and extent

Planning and Design Considerations

- Quality of water should not deteriorate below WHO standard
- Water in adequate quantity in convenient location
- Traditional sources should be selected for water supply development
- Construction, operation, maintenance and repair should be within reach of the available skills
- The equipment should be robust, reliable and locally available
- Construction and operation cost should be minimum
- Use of pumping and chemicals should be minimum
- System should be planned together with the community
- Women should be involved and consulted to address their needs

Planning and Design Considerations

- In built system for monitoring of performance
- Provision for preventing deterioration of water quality
- Sustainability should be preferred in planning, designing and pricing the water supply