

# Water

## Foundational Knowledge

### **Key information:**

- 1.1 | Understand that water is both available and contaminated through the hydrological cycle.
- 1.2 | Understand the difference between consumptive and non-consumptive water use.
- 1.3 | Identify the major physical, chemical and biological constituents found in raw or natural water (natural organic matter, synthetic organic matter, pathogens, and inorganic particles).
- 1.4 | The purpose of water treatment processes is to remove particulate matter and pathogens.

### **Key ideas or concepts:**

- 1.5 | Major consumption and pollution of water occurs through economic activities of the industrial-era.
- 1.6 | Water quality and availability is linked to the local, regional and global systemic conditions caused by the economic activities of the industrial-era.
- 1.7 | Water is a limited natural resource that is not distributed equally in the world.
- 1.8 | Water and embodied energy are intrinsically linked.
- 1.9 | Water is embodied in all materials, products, and services.
- 1.10 | The quantity of embodied water can be estimated through a method called Water Footprint, which is a metric that is inherently limited, like all quantification methods.
- 1.11 | Government water quality standards are established in the U.S. without a complete knowledge of how contaminants' affect living beings, through balancing health risks with public cost of water treatment.

## Application

### **Critical thinking:**

- 2.1 | Evaluate issues of water scarcity, stress, and conflict on the global population and their potential effect to human well-being.

### **Creative thinking:**

- 2.2 | Be able to conceptualize alternative ways to meet the water demand with consideration of local resources, cultural conditions, and economic constraints.

### **Practical thinking:**

- 2.3 | Describe functional requirements of a treatment processes to improve water sources that is appropriate for different given situations.

### **Skills:**

- 2.4 | Use the causal loop diagram to depict the interaction between water quantity, use, pollution, quality, and energy.
- 2.5 | Use the causal loop diagram to depict relationships between population, consumption, technology, and water scarcity and demand.
- 2.6 | Use the water footprint method to consider the implications of different manufacturing and agricultural activities in a particular area.

## Integration

- 3.1 | Understand that engineering design decisions can have both positive and negative global impacts through stressors on water, energy and ecosystems.
- 3.2 | Articulate how you, as an engineer, can help achieve more equitable distribution of water resources in your community and around the world.
- 3.3 | Understand the segments of existing and future populations that are at a greater risk of water stress and demand due to environmental, social, cultural, political, and economic issues and pressures.
- 3.4 | Explain how the engineer's creed relates to the wider global community goals, such as the United Nations Millennium Development Goals.

## Human Dimension

- 4.1 | Understand that your daily actions affect the local, regional, and global well-being of others.

## Caring

- 5.1 | Value water as a precious resource.
- 5.2 | Care about all equally serving all human welfare through global water resources and sanitation.
- 5.3 | Feel that you, as an engineer, can help achieve more sustainable management of water resources in your region and globally through your own decisions and actions.

## Learning How to Learn

- 6.1 | Recognize the limits of one's knowledge around water issues.
- 6.2 | Formulate questions that would need to be answered to address an issue involving water.
- 6.3 | Design and execute a plan for self-directed learning.

**What impact do I want this module experience to have on students, which will still be there a year or more after the course is over?**

# Fink Taxonomy of Significant Learning

