Case Study Challenge Entry Form

Chapter Entry Information

Title of Case Study	The Global Struggle for Water
PTK Chapter Name	Beta Theta Omicron
Advisor Name	Christine L. Case
Advisor E-Mail Address	case@smcccd.edu
School Name	Skyline College
School City, State, Zip	San Bruno CA 94066

Case Study Title: The Global Struggle for Water

Article Information

With xeriscaping, grass needn't always be greener
Elizabeth Caldwell
July 16, 2007
Life
USA TODAY page number: 8D

Drought a drain in wine country
John Ritter
July 6, 2007
News
USA TODAY page number: 3A

Water limitations rain on enthusiasm for ethanol
Sue Kirchhoff
July 19, 2007
Money
USA TODAY page number: 2B

Anxiety rises as water level falls
Larry Copeland
November 2, 2007
News
USA TODAY page number: 6A

Drought persists in Southeast
Larry Copeland
February 12, 2008
News
USA TODAY page number: 3A

Summary Statement

Water is the most abundant molecule on Earth, covering 75% of the Earth. It occurs as a solid, liquid and gas. Each living organism is about 75% water, and this water is essential for moving nutrients into cells and for the multitude of chemical reactions in cells. Life depends on the continual recycling of water among oceans, continents, atmosphere, and living organisms.

There are over one billion cubic kilometers of water on Earth, but less than 2% is available freshwater. And the demand for water is growing due to a rising population and advances in agriculture and hygiene in developing countries.

Most people in developed countries are afforded the luxury of clean water for drinking, cleaning, and recreation. However, in many countries the only sources for water are far more polluted than is safe, or so rare that availability is severely restricted. One-quarter of the people in underdeveloped countries do not have access to clean water. Therefore, over three billion people suffer from water related diseases and three to five million people die from these diseases annually.

"Water everywhere, nor any drop to drink," from *Rime of the Ancient Mariner*, may be a fitting description for the future availability of water. More than one-third of the population lives in regions where water is scarce. China has 21% of the world's people but only 8% of its water. Pumping is depleting groundwater in many areas of the U.S. This has caused land to sink more than three meters in Texas and saltwater to intrude into wells in New York. In parts of the southeastern U.S. and Australia, the present droughts are so severe that garden watering is restricted to alternate days. Decreasing water in Lake Mead, the largest reservoir in the U.S., may leave Nevada and Arizona without water within five years.

Developing countries need sustainable water to improve their industry, agriculture, and socioeconomy. However, industrialization is restricted in drought-prone countries. In Jordan, water must be delivered using trucks, making rationing a way of life. Furthermore, global warming may decrease rainfall in drought prone areas. By 2035, 2.4 billion people in the Ganges and Yangtze river basins could experience floods followed by extensive drought as Himalayan glaciers melt.

Historically, civilizations have formed along bodies of water in recognition of its necessity. Mesopotamia, Persia, and ancient Egypt were built along rivers. When impossible to locate in close proximity to a freshwater source, water was obtained by diversion. The Roman Empire was sustained by major water diversions. The conflicts arising from water diversions led Mark Twain to say "Whiskey is for drinking, water is for fighting."

In the 1970s "hydropolitics" was coined to describe water wars. A century-long water war between California and neighboring states over the Colorado River was settled in 2007. A violent war over the Owens River (California) occurred in the 1930s. Population growth in the Middle East is depleting groundwater aquifers and water shortages threaten relations between Middle Eastern counties along the Jordan, Nile, Tigris, and Euphrates rivers.

Discussion Questions

1. Describe the process by which water from the ocean is returned to rivers. Is water a renewable resource? Is it sustainable in the 21st century?

2. Assume you live in a community that has grown beyond its available water resources. You know that household sewage can be treated, added to the municipal reservoir, and reused. Design an advertising campaign that will help the community understand and accept reusing their wastewater.

3. Assume a city has built a dam on a river to provide drinking water and power to a large city 100 miles away. Farmers downstream divert water from the same river to irrigate their crops 10 miles away. During a dry year, there is not enough water in the river for both uses and the upstream dam is diverting all the water to the city. Suggest ways the farmer and city can use less water.

Use these data from the Food and Agriculture Organization of the United Nations for questions 4 and 5.

Country	Average Daily Water Consumption (L/day*)
France	290
Haiti	5
Japan	350
Jordan	126
United States	350
*1 liter = 0.26 gallon	

4. Jordan's freshwater resources are 750 million kL/year and water use is over 1.3 billion kL/yr. The population is growing at about 3% per year. Long-term solutions include buying water from other countries and building a canal between the Red Sea and Dead Sea and desalinating Red Sea water. Why might this approach work for Jordan and not for Haiti? What are the disadvantages of importing water? Of desalinating water?

5. What is the source of your household drinking water? Is the water filtered? What is the purpose of filtration? How is the water disinfected? Look at your water bill, what is your household water consumption? What could you give up to live on Haiti's ration?

Future Implications

For 4000 years, humans have dealt with the cyclic nature of water resources by building dams to provide water. Egypt's Aswan Dam provides an example of the protections and perils of dams. Lake Nassar water irrigates thousands of acres of land, provides water during droughts, and supports a fishing industry. Additionally, the dam stopped flooding of the Nubian Valley that annually destroyed crops and generates enormous amounts of hydroelectricity, However, 10% of the stored water is lost to evaporation because of the large surface area of Lake Nassar. Decreased river flow is increasing the salinity of the Mediterranean Sea, fertilizers and pesticides from farmland are washed into the river, and nutrient-rich silt no longer flows to the Sea. Increased mosquito breeding in the lake has increased occurrence of mosquito-borne diseases.

Over the next 25 years, developing countries will increase water consumption by 14% to 32% as they improve sanitation and agriculture. Dams, buying water, and desalination are financially and ecologically expensive. The solution may be reusing water. Several communities around the world are already using some recycled wastewater for golf courses, agriculture, and industry. A clean, sustainable, and peaceful water supply may well depend on using water more than once.

Additional Resources

de Villiers, M. *Water: The fate of our most previous resource.* Boston MA: Houghton Mifflin, 2001.

Drought Information Center. National Oceanic & Atmospheric Administration, <http://www.drought.noaa.gov/>. Includes maps, predictions, and a drought calculator.

"Safeguarding Our Water." *Scientific American* 284 (2), February 2001. This issue includes four articles on water use and maintaining a water supply.

U.S. Geological Survey, <http://www.usgs.gov/>. Multidisciplinary information on water including current streamflow and water monitor.

Water. U.S. Environmental Protection Agency, <http://www.epa.gov/ow/>. National water programs, educational resources, and consumer advice.

World Water Day, <http://www.worldwaterday.net/>. Click on *Resources* for games, maps, and United Nations articles on the world water crisis.