**Global Dam & Reservoir Development**

*Reflection Questions & Teacher’s Guide*

The reflection questions below are designed to supplement the Science on a Sphere dataset of global dams, which shows dams constructed from 1800-2010. The questions can be presented before or after a visit to Science on a Sphere, or independently. The global dam data reflected in this lesson can also be accessed online:

<http://csdms.colorado.edu/wiki/Movie:World_dams>. (Animation of worldwide dams)

<http://csdms.colorado.edu/wiki/Movie:US_dams> (Animation of U.S. dams)

This material encourages students to think critically about humans’ impact on the environment and our use of natural resources. The questions can be answered in a variety of ways including group discussions, short responses, essays, debates, research projects, etc. For instance, students could do a research project on alternatives to damming rivers. This could provide them with the background for a supplementary activity such as a classroom debate on dam development.

The following science standards are addressed with this lesson: the water cycle, water as a renewable resource, control of the lack or abundance of water for human use, upstream-downstream feedbacks, and interaction between the hydrosphere and geosphere (delta sedimentation, coasts).

**Supplementary Materials:**

Science on a Sphere:

<http://sos.noaa.gov/What_is_SOS/index.html>

Animation of worldwide dam development since 1800: <http://csdms.colorado.edu/wiki/Movie:World_dams>

Animation of U.S. dam development since 1800: <http://csdms.colorado.edu/wiki/Movie:US_dams>

Additional Earth Science animations:

<http://csdms.colorado.edu/wiki/Movies_portal>

*Damocracy* documentary:

<http://www.internationalrivers.org/resources/damocracy-the-movie-7782>

*Damnation* documentary:

<http://damnationfilm.com/>

**Teacher’s Guide for Global Dam Reflection Questions**

**1. How do dams give humans greater control of the hydrological cycle?**

Dams enable humans to store large amounts of water and control its flow in rivers. The storage of water can dampen flood waves and thus help prevent rivers from flooding.

**2. A common reason dams are built is for storing water to use during the dry season of the year or times of drought. How else can people get water during times of drought?**

This question could offer an opportunity for students to do research online. Extracting groundwater (widely used) and desalinating ocean water (a more rare process used to take the salt out) are two methods used.

**3. Describe some advantages and disadvantages of dams. How can we balance them?**

As mentioned above, dams help control floods and store water for humans to use for consumption, recreation, agriculture, industry, and hydroelectricity. A disadvantage is that they trap sediment (clay, silt, & sand), which leads to greater erosion downstream. Dams also impact habitats by changing the flow of rivers, and by blocking the pathways of migration for certain fish species. The plants and animals that live in rivers are sensitive to these changes.

**4. One disadvantage of dams is that less sediment is transported to deltas, which are important habitats that many people and animals rely on. Explain why this is an issue and how we might solve it.**

When water is slowed down in large reservoirs, sediment settle out and get deposited behind dams. Consequently, deltas downstream shrink, making them more vulnerable to erosion and sea level rise. This can lead to flooding and the loss of coastal habitats.

Advanced engineered dams allow some sediment to pass through, which helps reduce this issue. Additionally, scientists can monitor deltas to determine the flow of water and sediment that is necessary to maintain them. This helps us make important decisions about controlling the amount of water that is stored and released.

**5. Compare and contrast the development of dams in the U.S. with the development of dams in China. Then, make an inference about the amount of dams that will be constructed in the next 10 years.**

The U.S. began constructing dams in the 1800s, and China began constructing them in the early 1900s. China experienced a large peak in dam construction in the 1960s and continued to see heavy development in the 1970s. The U.S. saw peaks in development in the 1937 (amongst others the Hoover dam was built at that time) and 1963. The number of dams being constructed has decreased in both countries since then. In China, the largest dam used for hydropower, the Three Gorges Dam on the Yangtze River, was completed as recently as 2012. In the next 10 years, greater economic development might lead to the production of more dams. However, there are already thousands of dams in place, and there is more awareness surrounding the environmental impact of dams. In the US Pacific Northwest, small dams are now being removed to restore the natural dynamics of the river systems. The Elwha River in Washington is one example. These factors will likely have an influence on further development.

**Global Dam Reflection Questions for Students**

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3. Describe some advantages and disadvantages of dams. How can we balance them?

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5. Compare and contrast the development of dams in the U.S. with the development of dams in China. Then, make an inference about the amount of dams that will be constructed in the next 10 years.