Chapter 12: Google Earth Exercise

Exercise 1
Visualizing the Three Gorges Dam Hydroelectric Project

The Three Gorges Dam was the largest infrastructure project in China since the Great Wall. Completed in 2006, it reached full operating capacity in 2012. In a growing, rapidly-urbanizing nation that relies primarily on fossil fuels for its energy demands, a hydroelectric project of this scale offers a significantly cleaner alternative. In addition to the social and environmental issues mentioned in the textbook, the rise in water levels has also brought with it decreased slope stability. The relocation program for the more than one million citizens living in the footprint of the reservoir may now be extended to a further 100,000 due to geological hazards like landslides.

The task: Using Google Earth, visit the Three Gorges Dam, examine the topography of the valley and create a water level layer to depict the growing reservoir. Make measurements of the affected area.

Step 1: Ensure you have the 3D buildings option checked in the "Layers" menu (bottom right of interface). Download Chapter12.1.kmz. Double click on the "Three Gorges Dam (Approach)" tour. This will provide you with a flyover view of the valley and end at the dam itself. Observe the eye altitude in the bottom right of the screen. As the camera descends to the ground the imagery changes.

You can manipulate the timeline to view the valley in its pre-construction state, with original stream width. As you zoom in, more recent imagery depicts the reservoir in its filled state.

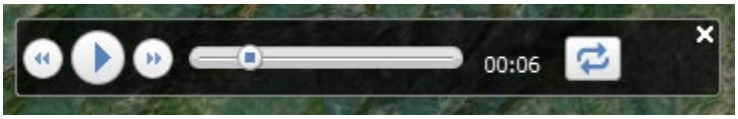

Figure 1: Tour timeline

Figure 2: Ruler tool (red), polygon tool (green)

Step 2: Use the ruler tool (Figure 2) to determine the width of the river at points A and B in both pre-damming and filled reservoir states.

- **Question 1:** After the reservoir was filled, how much wider did the channel become at both points?
- **Question 2:** How wide is the dam itself?

Step 3: We can visualize the rising water in the reservoir by creating a polygon layer (Figure 3) that covers the area of the valley. Create the polygon, then right click the shape in the "places" sidebar and select "**properties**." Navigate to the "altitude" tab. Switch from "clamped to ground" to "absolute."

- **Question 3:** Setting altitude in "absolute" mode determines the polygons' vertical positioning relative to what baseline?

Set the absolute altitude to 91m (Fig. 4), which most closely resembles pre-construction levels. Then move the slider up until the reservoir is flooded.

- **Question 4:** At what absolute height does your polygon match the water level from the satellite images? What is the actual water level in the reservoir at present time?

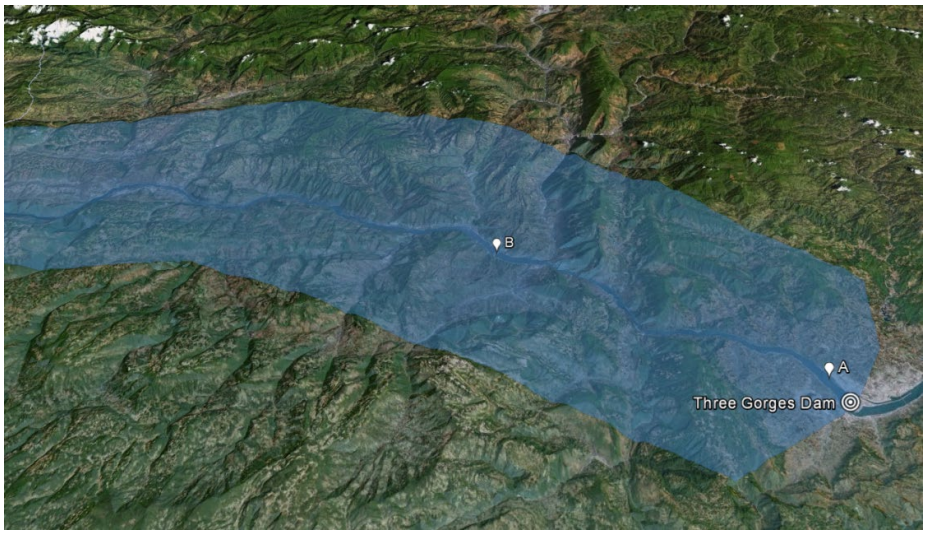

Figure 3: Water level layer example

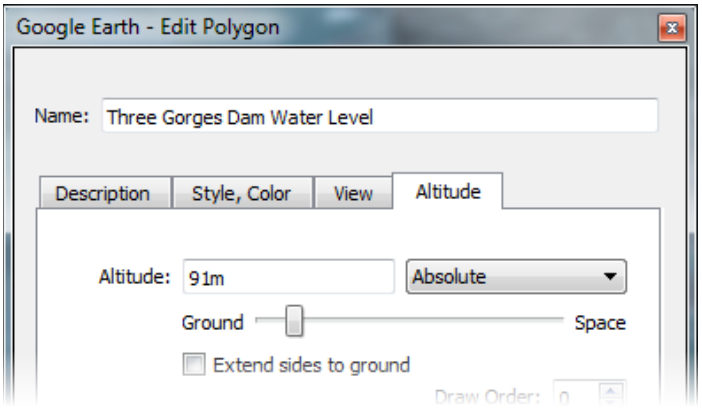

Figure 4: Absolute altitude window

Exercise 2
The Vanishing Sea: Tracking the disappearing Aral Sea

Straddled between northern Uzbekistan and southern Kazakhstan in Central Asia, the Aral Sea was once the world's fourth-largest inland sea. Two major rivers feed it: the Amu Darya to the south, and the Syr Darya to the north-east. Beginning in the 1960s, the former Soviet Union government wished to enhance cotton cultivation in the region and thus developed irrigation systems along the two river basins. While the Soviet's centrally-planned economy has since disintegrated, the effects on the Aral Sea have been dramatic and lasting: the sea is approximately *one-tenth* of its 1960s size. The vanishing sea is a dramatic illustration of the lasting impacts of human altercations on the environment. Depleted water levels decimated the ecosystem of the inland sea and led to a collapse of the fishing industry, and the region has suffered from an increase in toxic dust storms, soil contamination, and groundwater depletion. Life expectancy in the area surrounding the Sea is significantly lower than country averages.

The task: Using Google Earth, visit the Aral Sea, examine the topography of the surrounding region, and visualize and measure changes in the water basin.

Step 1: Use the search bar to locate the Aral Sea.

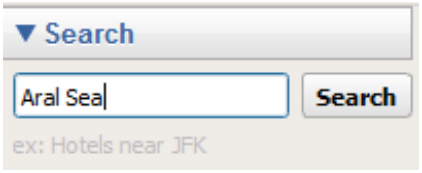

Figure 5: Search bar tool

Pan out to examine the topography of the area surrounding it.

- **Question 1:** What visual evidence indicates an arid climate?
- **Question 2:** What visual evidence indicates the presence of irrigation systems in the area surrounding the basin?

Step 2: By the twenty-first century, the Aral Sea had split into four distinct basins: the North Aral Sea, the eastern and western basins of the South Aral Sea, and a small lake situated between the western basin of the South Aral Sea and the North Aral Sea.

In the "Layers" sidebar of Google Earth, enable the "Global Awareness" layer. Find and enable the **UNEP Atlas of our Changing Environment** layer. Click on the UNEP icon visible on Google Earth.

Figure 2: UNEP icon

In the pop up window, click on the link “Overlay images in Google Earth.” In the “Places” sidebar a folder titled **Aral Sea, Kazakhstan** will appear containing Landsat images from 1973–2006. Enable this layer, selecting each year to visualize changes to the water basin over time.

Step 3: Use the ruler tool to measure the widest area of the Sea visible in the Landsat image of 1973.

Figure 6: Ruler tool

- **Question 3:** What was the widest area of the Aral Sea in 1973?
- **Question 4:** In which time period was the North Aral Sea severed from the South Aral Sea?
- **Question 5:** In which period did the island separating the east and west basins of the South Aral Sea become a peninsula?

[Please contact your instructor for the answers to these exercises]