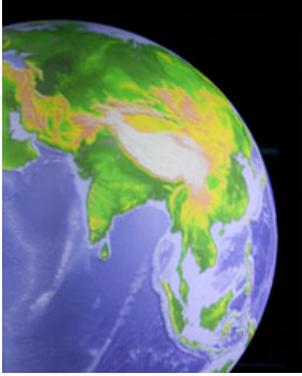


## Module 3: Energy and Climate Change

During this module, we have considered climate change, how this



phenomenon impacts the environment (biomes, flora, fauna), how energy interacts with climate change and how we need to examine our footprint in relation to all of this. In addition, we have considered how to mitigate 7 billion tons of carbon that is emitted into the atmosphere.

Now in this lab, we are going to examine science on a global scale, by investigating how systems act at a global level and some of the changes that may occur if we do nothing about climate change and our influence on this.

To accomplish this, we will look at a number of visualizations projected onto the sphere. As we do this, there are a number of key questions on this lab sheet that you need to complete. To answer the questions, you will need to move around the sphere and look at the globe from different perspectives; you will also need to get onto the Internet for some information and combined with your previous knowledge from the course answer the questions. Your answers can be in the form of short sentences and/or bullet points that make sense.

You will work in pairs to complete the lab sheet. Download the lab sheet from Blackboard.

Save the lab sheet on the desktop with your names on it.

Any questions?

**Names:**

1. The first visualization you see here is the **Blue Marble**, also known as planet Earth. Humans are becoming an increasing influence on the planet, but can we see this influence? (Blue Marble starts straight and then tilt)

To fully understand this, we may need to examine some aspects of the planet. Answer the questions by observing the visualizations on the sphere and visiting the listed websites.

2. We, as humans consume various amounts of energy for transport, heating, cooking, and lighting. The next visualization transitions us into **Night and Day**, created from imagery over a year and showing fires on various continents, fishing fleets and urban areas. This is followed by **Earth at Night**, which shows the major cities and areas of human development.

Take some time and make observations from this image based on these questions.

The following website can be helpful in answering the questions  
[http://visibleearth.nasa.gov/view\\_rec.php?id=1438](http://visibleearth.nasa.gov/view_rec.php?id=1438)

*What do the different lights represent?*

*How is the human population distributed across the planet?*

*Where are most of the urban centers located in different countries? Why?*

*Any other observations?*

*How is this type of information useful to scientists?*

<http://earthobservatory.nasa.gov/Study/Lights/>

3. If we stripped the oceans off the visualization, the planet looks something like this:

**Topography Earth Topography/Bathymetry (23.5)**

Topography and bathymetry basically describe the general shape of the surface of the earth; topography is generally used in association with land, bathymetry with the sea floor. Remember the maps that we looked at in Mendel on the 2<sup>nd</sup> floor.

*Describe some of the features you see on this image.*

Now watch the following visualizations and describe what you see.

**4. Tsunami 24 hours**

The Tsunami produced by the earthquake in 2004 certainly had a large local and regional impact; *but can local events have global impacts?*

This visualization shows sea surface elevation following the earthquake that produced the tsunami that occurred in December 2004. The waves that you see are ocean waves caused by the earthquake.

Use the following website to help you answer the questions:

<http://geology.com/articles/tsunami-map.shtml>

***What causes a tsunami?***

***Where did this earthquake occur and what was its magnitude?***

***Describe what you see happening in the visualization.***

***What was the human cost of the tsunami? Based on the visualization you have observed, why was it so high?***

**5. *Dynamic Earth*** This visualization is made of a series of real satellite images taken of the Earth over a twelve-month period. This is REAL!

***Describe what is occurring in this visualization.***

***What is happening at the different latitudes: 0, 30 and 60?***

***What is responsible for the observed pattern? Remember we studied this in class and on the maps on the wall in Mendel.***

**6. Next, watch the sea currents visualization.**

***Looking specifically at the Gulf of Mexico, describe what you see happening to the current.***

***Where does the current come from and where does it go?***

***What is the connection between the patterns observed in sea currents visualization and the Earth at Night? Does this current affect some areas more than others? Explain.***

Before the industrial revolution, explorers used sailing ships on their journeys around the world. The sea currents were important in determining the routes that ships could follow when they were dependent on currents and not steam. Check out the importance of the Gulf Stream in the settling of North America

(<http://www.teachersdomain.org/resources/ess05/sci/ess/watcyc/drifters/index.html>).

***Explain this importance.***

***What impact, do you think, the sea currents had on trade in the past? Consider slavery in the past (<http://www.maps.com/referenceProduct.aspx?pid=11318>) as an example.***

***How does the image of the routes used for slavery map onto the ocean currents visualization?***

***Where did the ships stop on the different continents?***

***Once the ships had dropped the slaves off in North America, the ships would have returned to Europe using what current? We have talked a lot about this!***

***What do you think the ships would bring back to Europe from the US? Companies would not want ships to sail empty. To find an answer, scroll down to 'How the Atlantic Slave Trade Operated' on this website***

<http://exploringafrica.matrix.msu.edu/students/curriculum/m7b/activity1.php>

**7. Conveyor Belt: Gulf Stream**

Watch this visualization. In addition to the Gulf Stream being important as a trade route, it is also important as a heat conductor for the countries in the northern latitudes. **Check out this website** [http://www.davidsuzuki.org/Climate\\_Change/Science/Conveyor.asp](http://www.davidsuzuki.org/Climate_Change/Science/Conveyor.asp) **and write down the benefit to Europe of this natural system.**

**8.** Hurricanes have been in the news quite a bit in the last few years. Hurricane Katrina was a very powerful hurricane that slammed into the Gulf States in 2005. **(Hurricanes Katrina and Rita with track on it; Hurricane Katrina real time data segment).**

**What are some of the results of Katrina hitting the area around the gulf?**

<http://www.katrina.noaa.gov/index.html>

**What was happening at the other side of the planet when Katrina was forming and hitting the US coast? (Check out the visualization. Look north of Australia towards Asia.)**

**9.** Given that rising sea surface temperatures and changes in precipitation may result in the ice caps melting, watch the visualization of **what happens if all the ice melts?**

**Describe what happens.**

**10.** Is human activity having an impact on the planet? The next 2 visualizations show how we are having an impact, by one of our transportation systems and our energy use.

Look at the visualization: **Air traffic in 24 hours.**

**What is the impact of contrails on pollution and dimming?**

**How do scientists think dimming impacts climate? List at least two different impacts on climate.**

Use the following website to help you with your answers.

[http://www.bbc.co.uk/sn/tvradio/programmes/horizon/dimming\\_prog\\_summary.shtml](http://www.bbc.co.uk/sn/tvradio/programmes/horizon/dimming_prog_summary.shtml)

**11.** Watch NASA's **Footprints video.**