

**Title of Assignment: NIMBY – “Not in my backyard”**

**Course: General Biology I (Biology 111)**

Learning Outcomes from the course:

- Reasoning: Identify and solve problems.
- Quantitative Analysis: Analyze, interpret and apply numerical, graphical, and statistical data and concepts.
- Scientific Awareness: Understand and apply the scientific method of inquiry.
- Demonstrate knowledge of common biological terms, facts and principals through exams, discussion, and written assignments.
- Use acquired knowledge of the “scientific method” in laboratory experiments and written responses to problems and interpretations of data.
- Demonstrate knowledge of the nature and methodology of science as a point of view about the physical world.
- Demonstrate the ability to read and listen with comprehension, and to write effectively.

Learning Outcomes from the assignment:

- To develop a greater understanding of social justice.
- To become more ecologically literate.
- To develop critical thinking skills.
- To develop research skills.
- To enhance written communication skills.

**Relevance to Biology 111 and use in the course:**

In Biology 111, there are units addressing energy, mitosis (cancer), and genetics. Unlike Biology 112, there is not a unit dedicated specifically to ecology or sustainability. This makes it even more important to be able to integrate assignments dealing with sustainability. The department has integrated a lab that addresses the ecological component of sustainability as students learn about their ecological footprint. However, there is no assignment that focuses on social justice.

This assignment will build on the ecological footprint lab by allowing the students to see the ecological impact of their energy usage. In addition, students will learn that their energy usage comes at a cost to the groups of people living near the production facilities and this will help address the component of social justice. The hope is to raise awareness to the fact that many power plants are located in areas of lower economic class or areas with minorities. Raising awareness about social justice will hopefully encourage students to become more involved in social justice issues. I plan on using this assignment the next time I teach a full section of Biology 111, which will be in the Spring 2013.

## **Student view of assignment**

### **Title: NIMBY – Not In My Backyard**

#### **Background:**

In Unit III, we discussed fossil fuels and you completed Lab 10 (Ecological Footprint) and reflected on your Ecological Footprint. One of the ideas that may have resonated with you is that the reserves of fossil fuels (coal, oil and natural gas) are being depleted rapidly across the globe and those fossil fuels cannot be regenerated once gone. It is the burning of these fossil fuels that contributes significantly to your Ecological Footprint. In the U.S., there has been a large push to continue to deplete the coal that is available within the U.S. instead of importing energy resources from areas such as the Middle East. You may have seen advertisements from organizations like America's Power pushing for the use of coal to provide electricity within the U.S. claiming it is readily available. According to British Petroleum (BP), the U.S. has 28.9% of the world's proven coal reserves as of the end of 2009<sup>1</sup>. Given the amount of coal that is recoverable, it is important to keep in mind that while coal is fairly abundant in the U.S., coal is also a fossil fuel which can produce a great deal of environmental pollution when burned to produce electricity. While there are a lot of advertisements indicating that Clean Coal Technology significantly reduces the dangerous emissions of burning coal, others will argue that there is no such thing as "clean coal." Even if emissions are reduced, pollutants are still added to the environment.

In Unit IV, you learned about cancer and its relationship to mitosis. You also learned that an individual's genetics can predispose an individual to developing cancer or other diseases like heart disease (ex. proto-onco genes, tumor suppressor genes and BRCA genes). While genetics are important, you also learned that genetics are not the only factor that can affect the development of disease. As shown in the tobacco seed lab, the environment can play a role in determining the development of an individual's phenotype. Disease can result from genetics alone, the environment alone, or a combination of the two.

Coal-fired power plants are of concern to humans because of the emissions they produce. A report released by the American Lung Association in 2011 indicated that coal-fired power plants are responsible for producing more hazardous air pollution in the U.S. than any other source of industrial pollution<sup>2</sup>. Such pollutants have been linked to diseases such as cancer and cardiopulmonary diseases such as lung cancer and asthma. In addition, coal-fired power plants are responsible for emitting mercury and arsenic pollution. Both mercury and arsenic are considered neurotoxins. Neurotoxins have damaging effects on the nervous system.

In this assignment you will be exploring the relationship between disease and the environment with a focus on the impact of coal-fired power plants. One of the intentions of this assignment is for you to learn about social justice. The principle of social justice is a component of sustainability. Merriam-Webster defines social justice as "a state or doctrine of egalitarianism." Egalitarianism is defined as "a belief in human equality especially with

respect to social, political, and economic factors.” Keep social justice in mind as you complete this assignment.

### **Part I: The Impact of Coal-Fired Power Plants – Group Exercise**

For this portion, you will be working in a group of 4 students. Your group will choose an Illinois coal-fired power plant from a list provided by the instructor. For this facility, you will start by researching the location of the facility. You will need to address the population statistics for the area immediately surrounding the facility (look at factors including race and economic status). The group will also need to research the impact of the facility on the environment. This will entail finding sources that detail the ecological impacts of coal-fired power plants in general and potentially ones specific to the power plant you selected. Lastly, your group will collect data on reports of health concerns that have been associated with the power facility. If you have difficulty finding this information for your particular power plant, you will be given the opportunity to select a different power plant.

The research you complete will be used to produce a poster that details the impact of your power plant. The group will design a poster that addresses these components. The assessment portion for the poster details the components you need to have on the poster to earn full credit for this portion.

### **Part II. A Coal-Fired Power Plant in Your Town? – Individual Exercise**

For this portion, students will work independently. In Part I you learned about the impact of coal-fired power plants on the environment and one’s health. Now, I want you to reflect on the impact of a power plant in your own city/town. You will propose a site for building of a coal-fired power plant and then explore the potential economic, ecological, and social implications of that site. After looking at all these implications, students will write a persuasive paper (in the form of a letter to either the mayor or town council members) in support or against building the facility explaining why you are for or against it (using the social, economic, and ecological implications). Be sure to defend your point of view thoroughly and use your research to back up your claims.

### **Part III: Reflection – Individual Exercise**

For this portion, you will reflect on what you learned as you worked on the poster as a group and created the letter to your city/township leader. For full credit, this portion must be at least one page and you need to be thorough and thoughtful in your reflection. There are a few key points you need to reflect on (listed below) to earn full credit but feel free to add any other thoughts you have.

- Chicago Mayor Rahm Emanuel recently announced the closure of Crawford and Fisk Coal-fired Power Plants in Cook County. These facilities provide electricity to areas outside of Illinois. Based on what you have learned about coal-fired power plants, do you think this is a justified move and why or why not?

- Furthermore, reflect on what you have discovered in this project regarding social justice as it relates to the locations of power plants. Is it socially just for you to have the abundant access to energy and excessive waste disposal if it comes with the cost of damaging the environment of others and why or why not? Is it socially just that some people are burdened with an increased risk of cancer and cardiopulmonary disease simply due to their race or economic status?

- Depending on your electric company, you may be purchasing electricity produced from coal-fired power plants. When you completed your Ecological Footprint, you should have come up with ways to reduce electricity consumption in order to reduce carbon dioxide emissions and decrease your contribution to global climate change. Does adding the health component make you feel more strongly about reducing your electricity consumption?

- What does social justice mean to you? Do you believe in the principle of social justice?

- It may not be possible for you to change the energy company that you use, but there are other ways that you can fight social injustice. Discuss some ways that you can get involved in fighting social injustice (you can use coal-fired power plants but I also encourage you to diverge into other areas of social injustice as well).

### **References:**

1. BP Statistical Review of World Energy 2010

[http://www.bp.com/liveassets/bp\\_internet/globalbp/globalbp\\_uk\\_english/reports\\_and\\_publications/statistical\\_energy\\_review\\_2008/STAGING/local\\_assets/2010\\_downloads/statistical\\_review\\_of\\_world\\_energy\\_full\\_report\\_2010.pdf](http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2008/STAGING/local_assets/2010_downloads/statistical_review_of_world_energy_full_report_2010.pdf)

2. Toxic Air: The case of cleaning up coal-fired power plants.

<http://www.lung.org/assets/documents/healthy-air/toxic-air-report.pdf>

3. Merriam-Webster Online

<http://www.merriam-webster.com/dictionary/>

**Assessment – 50 points (Further breakdown of points TBD)**

**Part I (25 points): The poster will be completed on a 3'x 4' poster board. For full credit, the poster must:**

- 1. Include the name of the power plant**
- 2. Include the location of the facility**
- 3. Detail the socioeconomic data for the population in the area surrounding the facility**
- 4. Detail the ecological impacts of the facility (be sure to include the types of pollutants emitted by the plant and their effects)**
- 5. Provide the health concerns associated with the power plant (be thorough and specific and provide statistics)**
- 6. Include text (neat handwriting or typewritten) in addition to photos/visual images**
- 7. Be organized in the presentation of the information**

8. Include a list of references needs to be included on the poster (use MLA citation).

**Part II (15 points): Full credit will be awarded provided that the student:**

1. Provides a properly formatted letter
2. Details the student's position on the matter
3. Provides support (in the form of data) to support the student's position
4. Composes a letter that is at least one page double spaced (2 page double spaced maximum; 11-12 point font)
5. Provides a list of references (MLA citation)

**Part III (10 points): Full credit will be awarded provided that the student:**

1. Reflects thoughtfully and in detail on the topic of social justice (inequality)
2. Reflects on all questions described in Part III
3. Uses complete sentences and proper formatting (typewritten and double-spaced in 11-12 point font).