

# Learning Activity 1A | Energy

## Embodied Energy

### Targeted Learning Objectives

- 1.2 Understand the impact from consumption of non-renewable energy and anthropogenic inputs on the global carbon cycle.
- 1.16 Modern society is dependent on energy, but not dependent on increased use of energy.
- 2.4 Be able to create viable solutions to meet the energy demand with consideration of local resources, cultural conditions, economic constraints, etc.
- 3.2 Relate the environmental, social, cultural, political, and economic issues and pressures on a region to energy consumption.
- 4.3 Describe the perspective of the global population that lives in areas not equally served by global energy resources, and discuss the challenges experienced by people living in these areas.
- 4.4 Understand the connection between human energy consumption and its relation to human behavior.
- 5.4 Care about populations that are not equally served by global energy resources.
- 6.1 Familiarize oneself with library and Internet resources related to local and global issues associated with energy topics and issues.

### Activity

The Happy Planet Index (HPI), <http://www.happyplanetindex.org/>, is one of many such indices used to measure the well being of a country with respect to various parameters.

- 1 | Describe some of the ways in which the three “happiest” countries have attained that status.
- 2 | Discuss the assorted parameters which attribute to the measurement of this index and compare those values to researched findings of these countries’ energy consumptions.
- 3 | Also, use your answers to confirm the idea that increasing a country’s consumption doesn’t necessarily improve its citizens’ quality of life, compare top “happiest” countries with lower ranking countries (developed and developing

Objectives	Criterion	Standards
1.2, 1.16, 2.4, 3.2, 4.3-4, 5.4, and 6.1	Foundational Knowledge, Human Dimension, Caring	5 PROFICIENT Includes a thorough analysis the top three “happiest” countries and expands from their own knowledge reasons why the measured parameters enabled these countries to obtain such status. Properly addresses energy and its relation to consumption and quality of life.  3-4 DEVELOPING Develops some discussion about comparing countries of the HPI, but lacks examples or supporting information to build a good , concise answer.  0-2 BELLOW EXPECTATIONS Insufficiently addresses the question and gives no comparisons or expansion on the implications of the HPI.

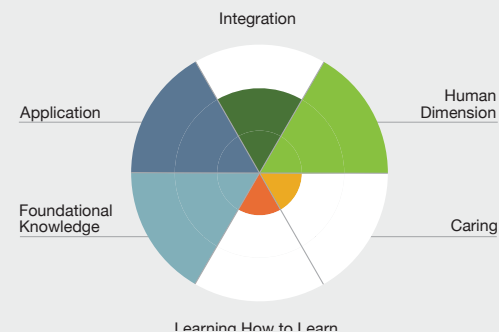
#### Active Learning Profile

information source: direct / indirect  
 experience: doing / observing  
 reflection: individual / group

#### Time Investment Profile

individual: 30-90 minutes reading  
 group: 15-20 minutes discussion

#### Development Profile



#### Notes to Faculty

This activity is best completed, initially, by reading the paper for an out-of-class assignment. However, the activity produces an opportunity for a great an in-class group discussion by comparing the impacts of embodied energy the students have developed for the water treatment process. The goal is to have students think about this water treatment process, its products, and how those are linked to consumption, energy use, and embodied energy. It could be feasible to have students work in groups on the project either from the beginning stages or simply for the final class discussion. Here they could compare answers and make a combined list of impacts to share with the rest of the group.



# Learning Activity 1B | Energy

## Unlimited Renewable Energy

### Targeted Learning Objectives

- 1.4 Identify strengths and limitations associated with the different renewable energy technologies.
- 1.11 Realize that the energy problem cannot be solved by technology alone and by only one technology.
- 1.12 Realize that integration of different renewable energy technologies could provide a more sustainable solution.
- 1.13 Understand that renewable energy technology can impact the environment in an unsustainable way.
- 1.14 Realize that the consumption rate of renewable energy should be less than the regeneration rate in order for it to be sustainable.
- 2.1 Evaluate the disadvantages of renewable energy and recognize the renewable technologies that are appropriate for the intended purpose.
- 2.6 Be able to evaluate the environmental and social impacts of renewable and nonrenewable energy use.
- 2.7 Identify critical environmental, social, and economic factors that determine which renewable technology is better.
- 3.3 Find the connection between renewable energy and sustainability.
- 4.4 Understand the connection between human energy consumption and its relation to human behavior.
- 5.4 Care about populations that are not equally served by global energy resources.

### Activity

Take a look at the Energy Information Administration's (EIA) website: <http://www.eia.doe.gov/> Evaluate the portion of the United State's total consumption which is accounted for by renewable energy. **1** | What is the percentage portion and what are the factors which cause it to be so small compared to the other energy sources? What are the limitations to renewable energy? **2** | What conditions must be met for an energy to remain renewable/unlimited? **3** | Imagine that there was an unlimited source of renewable energy available for use and that it was possible to overcome the limitations previously mentioned. What kind of environmental, social, and economic implications might this situation have in developed vs. developing countries?

#### Objectives

1.1, 1.4, 1.11-14, 2.1, 2.6-7, 3.3, 4.4, and 5.4

#### Criterion

Foundational Knowledge, Application

#### Standards

5 PROFICIENT Finds proper data from the EIA website while also targeting an understanding of the limitations to renewable energy. Develops insightful responses to the implications of vast amounts of renewable energy use in developed vs. developing countries.

3-4 DEVELOPING Does not address all parameters and does not show a full understanding of how renewable energy could have negative impacts if implemented unsustainably, without consideration of social, economic, environmental effects.

0-2 BELOW EXPECTATIONS Does not sufficiently demonstrate an understanding of renewable energy with respect to sustainability and lacks insight with respect to social, environmental, and economic factors and the consideration of any other countries.

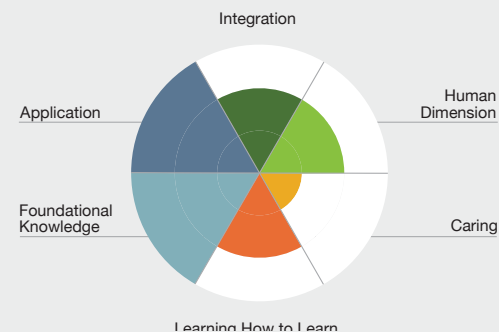
#### Active Learning Profile

information source: direct / indirect  
 experience: doing / observing  
 reflection: individual / group

#### Time Investment Profile

individual: 90-120 minutes reading  
 group: 40-60 minutes discussion

#### Development Profile



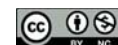
#### Notes to Faculty

This activity may be done both in groups or individually, and can be managed as an in-class work assignment if time allows. Furthermore, it is encouraged that students expand their findings and draw valid conclusions concerning social and economic implications of renewable energy sources.

Group Discussion encourages students to share their ideas on renewable energy in developing vs. developed countries, and can help students develop a greater appreciation for the views of others.

In many cases, there will not be “right” and “wrong” answers. In all cases, design choices have consequences, intended and unintended. Helping students to articulate both potential intended and unintended consequences helps promote systems thinking.

It also helps them to make explicit the values-based decision process that each person is going through implicitly. That is, it helps the to see the normally invisible processes underlying peoples' choices.



# Learning Activity 1C | Energy

## Energy Consumption

### Targeted Learning Objectives

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- 2.4 Be able to create viable solutions to meet the energy demand with consideration of local resources, cultural conditions, economic constraints, etc.
- 3.2 Relate the environmental, social, cultural, political, and economic issues and pressures on a region to energy consumption.
- 4.3 Describe the perspective of the global population that lives in areas not equally served by global energy resources, and discuss the challenges experienced by people living in these areas.
- 4.4 Understand the connection between human energy consumption and its relation to human behavior.
- 5.4 Care about populations that are not equally served by global energy resources.
- 6.1 Familiarize oneself with library and Internet resources related to local and global issues associated with energy topics and issues.

### Activity

The Happy Planet Index (HPI), <http://www.happyplanetindex.org/>, is one of many such indices used to measure the well being of a country with respect to various parameters.

- 1 | Describe some of the ways in which the three “happiest” countries have attained that status.
- 2 | Discuss the assorted parameters which attribute to the measurement of this index and compare those values to researched findings of these countries’ energy consumptions.
- 3 | Also, use your answers to confirm the idea that increasing a country’s consumption doesn’t necessarily improve its citizens’ quality of life, compare top “happiest” countries with lower ranking countries (developed and developing countries).

Objectives	Criterion	Standards
1.2, 1.16, 2.4, 3.2, 4.3-4, 5.4, and 6.1	Foundational Knowledge, Human Dimension, Caring	5 PROFICIENT Includes a thorough analysis the top three “happiest” countries and expands from their own knowledge reasons why the measured parameters enabled these countries to obtain such status. Properly addresses energy and its relation to consumption and quality of life.  3-4 DEVELOPING Develops some discussion about comparing countries of the HPI, but lacks examples or supporting information to build a good , concise answer.  0-2 BELLOW EXPECTATIONS Insufficiently addresses the question and gives no comparisons or expansion on the implications of the HPI.

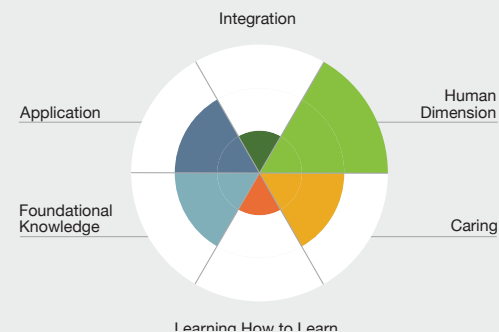
#### Active Learning Profile

information source: direct / indirect  
 experience: doing / observing  
 reflection: individual / group

#### Time Investment Profile

individual: 90-120 minutes reading  
 group: 40-60 minutes discussion

#### Development Profile



#### Notes to Faculty

This activity is best completed, as an out-of-class assignment. There are, however, sufficient ways to incorporate this into a class discussion. Students should come to class prepared to compare and contrast the top three countries of the HPI. Additionally, this learning activity should really focus on the students’ understanding that increased energy consumption (or most any other type of consumption) does not always correlate with a higher quality of life for its citizens.

