**AP Environmental Science**

**Survivor Island**

**Objective-** To create an island environment that is sustainable for a minimum of 8 generations based on the guidelines below. If you exceed your allotted # of beans, you have not created a sustainable environment.

**Procedure**

Count out the following for your group. Place them in your starter beaker. Reserve an empty beaker for beans that will be discarded during the game.

1. 70 beans to represent water supply
2. 40 different beans to represent land acreage that is farmed/cultivated
3. 40 different beans to represent energy supply
4. 4 different beans to represent the people originally on the island

***BEFORE*** you start EACH generation your group must decide what type(s) of energy your people will be using. You may use a mix of any of the following-

coal-fired electric utilities,

hydroelectric

nuclear

solar

geothermal

wind

Your group also must decide on what type(s) of employment the people of the island have. ¾ of the inhabitants must be employed in the following 3 sectors-

Industrial (assembly line, construction, day laborers, etc.)

Service industry (computers, banking, lawyers, etc.)

Farmers

Since every generation of people use water, land resources, and energy you will lose beans each generation while the number of people usually increases. After you have made your decision for the 1st generation and recorded it on your data table go through the rest of the table and separate any beans you need to use in a separate pile from your original stockpile.

***Hint- Read the following before you make energy/employment choices for your 1st generation.***

1. Each person uses 1 water bean per generation
2. 1 land bean and 1 water bean supports a maximum number of 10 people for their food supply
3. 1 land bean supports a maximum of 10 people for their housing
4. A coal-fired electric utility supports a maximum of 10 people for their household needs but uses up 1 energy bean, 2 land beans, and 1 water bean per generation. Each new group of 10 requires an additional ‘plant’, and therefore another round of those 3 types of beans
5. A hydroelectric plan supports a maximum of 5 people for their household needs but uses 1 energy bean and 1 land bean per generation
6. For every 2 hydroelectric plants started, 1 water bean is used
7. A nuclear power plant supports a maximum of 10 people for their household needs but uses up 1 energy bean, 1 land bean, and 1 water bean. Because of the necessity of storage for radioactive nuclear waste 1 extra water and 1 extra land bean is needed each 3 generations this plant is open
8. All other types of energy are lumped together as ‘alternative’. Each alternative source supports a maximum of 4 people for household needs. For every 3 alternative energy sources, 1 energy bean is used each generation.
9. Each industrial plant supports a maximum of 10 jobs but uses 2 land beans and 1 energy bean
10. Each service industry supports a maximum of 10 jobs but uses 1 land bean and 1 energy bean
11. Each farming operation supports a maximum of 4 jobs but uses 1 land bean, 1 energy bean.
12. Each farming operation covers 10 acres and there is a loss of 1 land bean for every 4 generations due to soil erosion.
13. 1 land bean supports a maximum of 20 people for their waste disposal needs in a landfill for a period of 5 generations. 1 energy bean is used in each generation for disposal equipment.
14. 1 land bean supports a maximum of 20 people for the treatment of their drinking water and wastewater treatment. 1 energy bean is used each generation for running the treatment plants.

Set aside all the beans needed for the lifestyles you chose for your 1st generation. Now

1. Since water is a renewable resource you may retrieve all but 2 of your water beans. The 2 that remain discarded are due to water evaporation (water that leaves the island through the air) and some contamination. However, you may retrieve 1 more of these discarded beans if you donate 1 energy bean per generation afterward- this is the energy needed for water conservation.
2. You may retrieve all but 2 of the land beans you discarded. The 2 that remain discarded are due to poor farming/construction that leads to soil erosion and sedimentation. You may retrieve 1 more of these discarded beans if you donate 1 energy bean per generation that would be used for land conservation. You may only use this extra-bean-land-conservation choice 3 times in the 8 generations.
3. Only energy beans used for alternative energy may be retrieved since most forms of energy cannot be returned to their once usable state (natural gas and coal). However, you may retrieve 3 of these energy beans per generation by your group implementing energy conservation methods- installing energy efficient lighting, regulating thermostats, recycling, etc. At the expense of 1 energy bean. You can only use the energy recovery options 3 times in the 8 generations.
4. Multiply the # of people by 1.75 to represent the increase in population due to births and immigration (round if it is not a whole number). Add that to your initial population number at the beginning of the generation.
5. Multiply the # of people by 0.2 to represent the decrease in population due to deaths and emigration (round if it is not a whole number). Subtract that from your initial population number at the beginning of the generation.
6. Any beans that remain in the used pile must now be discarded forever and cannot be retrieved again, so place them in your waste beaker.

***Before*** starting the 2nd generation you may change your type(s) of employment and energy. Record any changes you might make in the appropriate columns. Then go through the procedure again for your 2nd generation.

***Before*** starting the 3rd generation you may change your type(s) of employment and energy. Record any changes you might make in the appropriate columns. Then go through the procedure again to complete your 3rd generation.

***Before*** starting the 4th generation roll the die once. Record the number next to the generation on your data table. If you rolled a “6” then your population will remain the same throughout the upcoming generations (there is NO additional births but there still is the 20% deaths). If you rolled a “3” then your population will only increase by 1.35x the rate of the population, not 1.75x, with the usual 20% deaths. All other numbers rolled will continue with the 1.75x the rate of the population and 20% deaths. Then go through the procedure again to complete your 4th generation.

***Before*** starting the 5th, 6th, 7th, and 8th generations you may change your type(s) of employment and energy. (NO more rolling of the die) Record any changes you might make in the appropriate columns. Then go through the procedure to complete your generations.

If at any time you run out of any beans (you no longer have the correct # of beans to be able to discard them) your colony has died out due to lack of water, land resources, or energy needs. If that happens do NOT continue on to the next generation but write on your data table what item you ran out of and why.

Each person should turn in the following items:

- the data table

- one graph that shows the growth of population vs generations as well the use of water, land, and energy over those generations (use different symbols to signify each data group/line on your graph)

- A summary paragraph that explains your reasons for choosing the type(s) of employment and energy type(s) over the generations and the effectiveness of your choices. Include alterations you would do if you were to do this activity over again and why. In your paragraph, also discuss the necessity (or not) to regulate the resources available to the community.