

Energy Resources and Use Answer Key

Part 1: Constant Energy Consumption

Prediction

I think that **Student answers will vary** will have the most energy remaining after five years.
(Country Name)

Procedures for Constant Energy Consumption

1. Begin by removing 10 beads from your bag, two or three beads at a time until you reach 10.
2. Count how many beads (out of 10) were green and how many were black. Record for Year 1.
3. Put the green beads back into the bag (they can be replenished) and keep the black beads out of the bag (they can't be replenished).
4. Subtract the number of black beads pulled (out of 10) from 100 to determine the "Total energy beads remaining in bag." This is the number of beads (energy remaining) after your first year of consumption. Record for Year 1.
5. Repeat steps 1 – 4 until your data table is complete (four more years). Each year, be sure to subtract the number of black beads (out of 10) from "Total energy beads remaining in bag" from the year before (not from 100).
6. Share your data with the whole class as you fill out the "Whole Class – Constant Energy Consumption" data table (page 2).

Part 1 Data: Constant Energy Consumption

Your Country: **Mexico**

Your Group				
Year	Number of beads removed (consumed)	Renewable (green) energy beads consumed (out of 10)	Non-renewable (black) energy beads consumed (out of 10)	Total energy beads remaining in bag
1	10	3	7	93
2	10	1	9	84
3	10	2	8	76
4	10	1	9	67
5	10	4	6	61

Student answers will vary, sample data shown

Students share this number for whole class data →

Student answers will vary, sample data shown

Whole Class – Constant Energy Consumption		
	Energy Beads Remaining after 5 Years	
Sweden	88	85
United States	61	60
China	62	64
Mexico	67	61
Brazil	94	97
New Zealand	90	84
Canada	86	89

Part 1: Results

Student answers will vary

- Was your prediction correct? (circle one) Yes No
- Which country had the most energy available after five years? **Brazil** ← *This is usually the case*
 - % Renewable energy? **93** % Non-renewable energy? **7**
- Which country had the least energy available after five years? **United States** ← *This is often the case*
 - % Renewable energy? **13** % Non-renewable energy? **87**

Background: Types of Energy Production

Student answers may vary, possible answers shown

Type of Energy	Renewable / Non-renewable	Advantage	Disadvantage
Solar	Renewable	Can go on roofs	Depends on the weather
Wind	Renewable	Does not produce pollution	Can destroy habitat
Coal	Non-renewable	Inexpensive	Dangerous to mine
Natural Gas	Non-renewable	Very accessible in New Mexico	Millions of years to regenerate
Oil	Non-renewable	Inexpensive	Releases CO₂ to the atmosphere
Hydroelectric	Renewable	Can be generated based on need	Breeches can be dangerous
Geothermal	Renewable	Not weather dependent	Can be expensive to install

Part 2: Increasing Energy Consumption

Procedures for Increasing Energy Consumption

1. Begin by removing 10 beads from your bag, two or three beads at a time until you reach 10.
2. Count how many beads were green and how many were black. Record for Year 1.
3. Put the green beads back into the bag (they can be replenished) and keep the black beads out of the bag (they can't be replenished).
4. Subtract the number of black beads pulled from 100 to determine the "Total energy beads remaining in bag." This is the number of beads (energy remaining) after your first year of consumption. Record for Year 1.
5. Repeat steps 1 – 4 until your data table is complete (four more years). **Each year, you will increase the number of beads you remove from the bag by 10.** Be sure to subtract the number of black beads from "Total energy beads remaining in bag" from the year before (not from 100).
6. Share your data with the whole class as you fill out the "Whole Class – Increasing Energy Consumption" data table.

Part 2 Data: Increasing Energy Consumption

Your Group				
Year	Number of beads removed (consumed)	Renewable (green) energy beads consumed	Non-renewable (black) energy beads consumed	Total energy beads remaining in bag
1	10	0	10	90
2	20	5	15	75
3	30	3	27	48
4	40	16	24	24
5	50	----	----	----

Student answers will vary, sample data shown

Whole Class – Increasing Energy Consumption		
	Energy Beads Remaining after 5 Years	
Sweden	76	78
United States	16*	22*
China	26*	25*
Mexico	31*	24*
Brazil	93	95
New Zealand	83	81
Canada	75	77

Student answers will vary, sample data shown

Did not make 5 years, marked with asterisk

Part 2: Results

1. Compare the **Part 1: Whole Class Data** and **Part 2: Whole Class Data**. How did increased consumption impact the availability of energy resources after five years?

Increased consumption caused each of the countries to have less energy remaining after five years. There were even countries that did not make it to five years, like the United States, China and Mexico. At year five, the demand for energy was more than these countries could provide.

2. If we continued increasing our energy consumption for more than five years, consumption would eventually exceed the total amount of energy for every country, even those with high percentages of renewable energy. This tells us that switching to renewable energy is not the only solution to meet energy needs. What else must humans do to meet increasing global energy needs?

In addition to transitioning to renewable energy resources, we need to use less energy. With increasing population and increasing energy use per person, we are going to place even higher demands on energy production.

Conclusions

1. How does use of non-renewable resources contribute to global climate change?

Non-renewable resources, such as coal, oil and natural gas, emit greenhouse gases into our atmosphere. While greenhouse gases are natural in our atmosphere, too many of them cause an enhanced greenhouse effect, warming the planet.

2. What actions can you take to decrease the impact of using non-renewable resources as a primary energy source?

Switch to renewable energy; use alternative forms of transportation; teach other people about the impact of using non-renewable resources.