

Name:

Date:

Class:

# Net-Zero Ecological Building Design Worksheet

## Answer Key

### Investigating Questions:

- How can a building be part of its surrounding natural ecosystem?  
Many answers are possible, keeps water from absorbing, habitat destruction for space to build, landscaping & fertilizer use, carbon emissions due to fossil fuel use inside the building.
- What is required for a building to have zero carbon emissions?  
Many answers possible, this is just a place for students to think about what they already know.

### Part I: Knowledge Probe

**Instructions:** Use the following questions to help start your thinking about building a net-zero structure. Brainstorm with your group and record your responses in the space below.

1. What impacts do buildings have on the ecosystem in general?  
Answers vary

2. What do you know about how these impacts can be reduced?  
Answers vary

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3. Determine which group member will become the “expert” on the following topics. Write their name under their focus. (Note: Each group member takes one topic.) **Answers vary**
- a. Carbon cycle:
  
  
  
  
  
  
  
  
  
  
  - b. Nitrogen cycle:
  
  
  
  
  
  
  
  
  
  
  - c. Water cycle:
  
  
  
  
  
  
  
  
  
  
  - d. Energy sources:
  
  
  
  
  
  
  
  
  
  
  - 4. Decide what type of structure your group will create the blueprints for. Brainstorm things that need to be present in that type of structure so that the purpose of the structure can be met. Write your thoughts in the space below.

**Answers vary depending on building type.**

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### Part II: Expert group

1. Move to sit with your expert groups. Note: The expert cycles groups (e.g., water, carbon and nitrogen) should be small groups of 3-4 students - break into smaller groups as necessary. The energy sources expert group will be a large group of at least 6 students.
2. Each group member will receive their respective worksheets. Note: Every student needs to fill out their worksheet.
3. Follow the instructions on your expert worksheet and answer the questions.

### Part III – Bringing it Together

1. Return to your poster group.
2. Each person has 5-7 minutes to share what they learned in their expert group. Your role as the expert is to teach your group members what you learned about your topic and connect the information back to the blueprint design.
  - For the cycles, share the picture you drew and explain how the substance you focused on moves through the cycle. Also share your answers to the questions in #6.
  - For the energy source, share the data you learned about the six different alternative fuel sources and which one you recommend be used to fuel the heat in your building. (Remember that we are assuming the technology is in place for this fuel to be used in your building.) Also share the pros and cons of the types of energy that can be used to bring electricity into your building. State and explain the reasoning for the one that you recommend.
3. Make a rough draft of the blueprints for your building. Title the paper with the type of structure you are planning. Write the names of all group members on the back of the paper. The blueprints should show the following in the floorplan :
  - At least two doors
  - An entryway
  - A bathroom
  - A kitchen
  - An energy/maintenance room
  - All other rooms needed for the purpose of the structure (this depends on the type of structure that is being built)
  - The way the building will fit in with the water cycle should be drawn in blue and explained either on the poster or in an accompanying user manual.
  - The way the building will fit in with the carbon cycle should be drawn in brown and explained either on the poster or in an accompanying user manual.
  - The way the building will fit in with the nitrogen cycle should be drawn in red and explained either on the poster or in an accompanying user manual.
  - The energy sources going into the building should be drawn and explained either on the poster or in an accompanying user manual.
  - Any emissions going out of the building should be drawn and labeled.
  - Landscaping (outside)

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#### **Part IV – Peer Review**

1. All groups will rotate clockwise and observe another group's blueprints. The purpose of the peer review is to provide constructive, not destructive, comments to the designers. This feedback lets them know if all of the requirements are met and if the design they created is clear.

#### **Part V - Modification**

1. Return to your poster groups.
2. Review the feedback that was provided.
3. Make modifications to your poster as needed and design your final poster.

#### **Part VI – Mini Poster Presentation**

Each poster group will share their blueprints with the class

Include in the presentation:

- Name the type of building that your group made the blueprints for.
- Describe the different rooms and why they are organized the way you have them.

Each group member should discuss how their focus was included in the design:

- Describe how you designed the building to fit in with the cycle/energy source.
  - What are the inputs and outputs?
  - How does your design help the building meet the net-zero requirement?
- Did you have any challenges? How did you overcome them?
- What from your building would you like to see implemented in today's buildings? How could that be done? How would this addition be beneficial?