



Smithsonian

**SCIENCE**  
*for Global Goals*

# CLIMATE ACTION!



**Part 4:**

**Human  
Impacts  
on Climate**

**SUSTAINABLE  
DEVELOPMENT GOALS**

developed by



**Smithsonian**  
*Science Education Center*

in collaboration with

**iap** **SCIENCE  
HEALTH  
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Figure 4.2 - Winter landscape: ox-carts on the road,  
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Figure 4.3 - Landscape (windmill), Smithsonian  
American Art Museum, Bequest of Ruth Felton  
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Figure 4.4 - Grain Elevator, Kansas, Smithsonian  
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Figure 4.14 - Smithsonian Science Education Center

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## PART 4: HUMAN IMPACTS ON CLIMATE

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### **Find out More!**

For additional resources and activities, please visit the *Climate Action!* StoryMap at [bit.ly/CLIMATEACTION2030](https://bit.ly/CLIMATEACTION2030).





## Planner

<u>Activity</u>	<u>Description</u>	<u>Materials and Technology</u>	<u>Additional Materials</u>	<u>Approximate Timing</u>	<u>Page Number</u>
<b>Task 1: How has humanity changed its lifestyles over time?</b>					
<b>Discover</b>	Observe and think about how human life has changed over the last thousand years.	<ul style="list-style-type: none"> <li>• Paper</li> <li>• Pen or pencil</li> <li>• Paints and brushes (optional)</li> </ul>	<u>My Research Area</u> map	45 minutes	126
<b>Understand</b>	Identify the sources of greenhouse gas additions in your community.	<ul style="list-style-type: none"> <li>• Paper</li> <li>• Pen or pencil</li> <li>• Audio/video recording device (optional)</li> </ul>	<u>My Research Area</u> map	60 minutes	131
<b>Act</b>	Imagine how your community's greenhouse gas additions might change.	<ul style="list-style-type: none"> <li>• Paper</li> <li>• Pen or pencil</li> </ul>	<u>Community Greenhouse Gas Emissions</u>	45 minutes	134
<b>Task 2: How do human lifestyles connect to greenhouse gas additions?</b>					
<b>Discover</b>	Identify the elements of your lifestyle that are related to greenhouse gas additions.	<ul style="list-style-type: none"> <li>• Pen or pencil</li> <li>• Paper</li> </ul>		60 minutes	138
<b>Understand</b>	Explore what influences human lifestyle choices in your community.	<ul style="list-style-type: none"> <li>• Pen or pencil</li> <li>• Paper</li> </ul>		40 minutes	140
<b>Act</b>	Imagine the lifestyle choices you would like to see in the future.	<ul style="list-style-type: none"> <li>• Pen or pencil</li> <li>• Paper</li> <li>• Picture or drawing of you and community members</li> <li>• Scissors</li> <li>• Tape or glue</li> </ul>		60 minutes	143



## Meet Your Research Mentor, Jianhui Yan

Meet Jianhui Yan. Jianhui (pronounced Gee-ahn Hway) will be your research mentor to help you learn more about human impacts on the climate.

Jianhui is the innovative designer behind Jianhui London, a fashion brand known for transforming recycled materials into stylish and elegant clothing and accessories. He tries to make fashion that respects both aesthetics and the importance of harmony between human creations and nature.

Growing up in a financially disadvantaged village in rural China, Jianhui's early experiences shaped his understanding of hardship and the beauty of the natural world. Despite facing challenges in accessing education, he taught in China and later earned an MBA in the United Kingdom. Jianhui's work is driven by a mission to promote sustainability and create fashion that is not only environmentally responsible but also bold, playful, and visually stunning. Since Jianhui is now working with you, it is important to understand who he is.

### Jianhui's Identity Map

Designer and owner of fashion brand Jianhui London

Is interested in history, politics, and current affairs

Is a partner to his other half

Received an MBA from Hull University in the UK

51-year-old male

Lives in the United Kingdom

Chinese

The UK and China are important places to him

Is interested in art and literature

Is a kind, thoughtful, animal lover

Is short, with black hair, black eyes, and wears glasses

Enjoys making things with his hands

Enjoys walking to antique stores, museums, and gardening

Loves music, especially classical music



## Task 1: How has humanity changed its lifestyles over time?

Over the past thousand years, the way people have lived has had a big effect on the atmosphere, which is like a protective bubble around our planet. Just as our actions can change things around us, the things we've been doing over time have also changed the atmosphere. From times long ago to the globally connected world we live in now, the choices we make can affect the air we breathe. In this part, you will take action to understand the changes in human lifestyles and the impacts on the atmosphere that have resulted from these changes over time and space.

Before you begin the rest of Part 4, think quietly to yourself about Jianhui's identity map and compare it to your *Identity Map*.

- Are there things you have in common with Jianhui?
- Are there ways in which you are different from Jianhui?
- Can you see anything about Jianhui's identity that relates to understanding climate action?

Throughout Part 4 you will notice Jianhui sharing ideas and experiences with you. He may help you understand better ways to do your research or share some of the research he has done.

In this task you will first **discover** more about how human life has changed over the past thousand years. You will then **understand** what and where the sources of greenhouse gas additions are in your community today. Finally, you will **act** by outlining how you would like to see your community's greenhouse gas additions change into the future.





**Discover:** *How has human life changed over the past thousand years?*

Over the past one thousand years, elements of daily life have changed for many humans on the planet. There are also many elements of life that have not changed very much. Understanding the elements of daily human life that have changed can be helpful for understanding the relationship between these lifestyle changes and changes scientists are measuring in the atmosphere.

1. Make a data table like the one shown in Figure 4.1.
2. Examine the paintings in *At the Smithsonian*. Figures 4.2, 4.3, and 4.4 show elements of transportation, agriculture, electric power, industry, and commercial and residential life in different centuries. The captions tell you in what century the painting was made. Write what you notice about each element in the columns showing the painting’s century. If you do not notice any elements, just leave that box blank. It may help to display the PDF digitally and zoom in on the figures. The images can also be found on the StoryMap at <https://bit.ly/CLIMATEACTION2030>.

<b>Addition Categories</b>	<b>12th Century Figure 4.2</b>	<b>17th Century Figure 4.3</b>	<b>20th Century Figure 4.4</b>	<b>Today</b>
Transportation				
Agriculture				
Electric Power				
Industry				
Commercial and Residential life				

Figure 4.1: Data table.





## At the Smithsonian



Figure 4.2: 12th century: *Winter Landscape: Ox carts on the Road*, ink and color on silk, National Museum of Asian Art, Freer Gallery of Art.



Figure 4.3: 17th century: *Unidentified (Dutch), Landscape (Windmill)*, oil on canvas, Smithsonian American Art Museum.







Figure 4.4: 20th century: Robert Johnson, *Grain Elevator, Kansas*, watercolor, Smithsonian American Art Museum.

The Smithsonian National Museum of Asian Art and the Smithsonian American Art Museum show off art from Asia, the Americas, and beyond. Figures 4.2, 4.3, and 4.4 show art from the Smithsonian National Museum of Asian Art and the Smithsonian American Art Museum. The museums showcase art from Asia, the Americas, and beyond.

For more than 100 years, the National Museum of Asian Art has been famous for its huge collection of Asian art, hosting big art shows, and taking care of important artworks. Now they want to help people understand Asian culture even better by working with others to protect art from all over the world, talk about what art means, and learn about different cultures.

The Smithsonian American Art Museum is like a history book of American life through art. It is the first museum to collect art made by Americans. It tells the story of America through art over the past 300 years, including everything from photographs and folk art to African American and Latino art, and even video game art. Recently, they've been adding modern art that uses new technologies, showing how art is changing and growing, just like America itself.

3. Take out a piece of paper or open a digital document. Paint or draw a picture of some element of human life in your community today that is within your research site. Remember you determined the boundary of your research site in Part 3, task 2, Act. Include some technological elements in the painting or drawing that are used in your research site today.



4. Add details about your drawing to the *Today* column on your data table.
5. Examine the images in *Jianhui shows . . .* of elements of Jianhui's life today. Think about how he and his team use elements of the past to make something new for the future.

### *Jianhui shows . . .*



*Figure 4.5: The recycled fabric Jianhui's team gathered to create new clothes and bags.*



*Figure 4.6: Clothes made by Jianhui's team from the recycled fabric.*





Figure 4.7: Bags made by Jianhui's team from the recycled fabric.

6. Compare the elements in your painting or drawing with the paintings and photos from the 12th, 17th, 20th and 21st centuries.
  - a. Using data from the paintings and photos, how has life changed over time?
  - b. Using data from the paintings and photos, how have energy sources changed over time?
  - c. Using data from the paintings and photos, how have technologies changed over time?
7. Using the graph in Figure 4.8, identify and compare the approximate population of the world when each painting, including yours, was made.

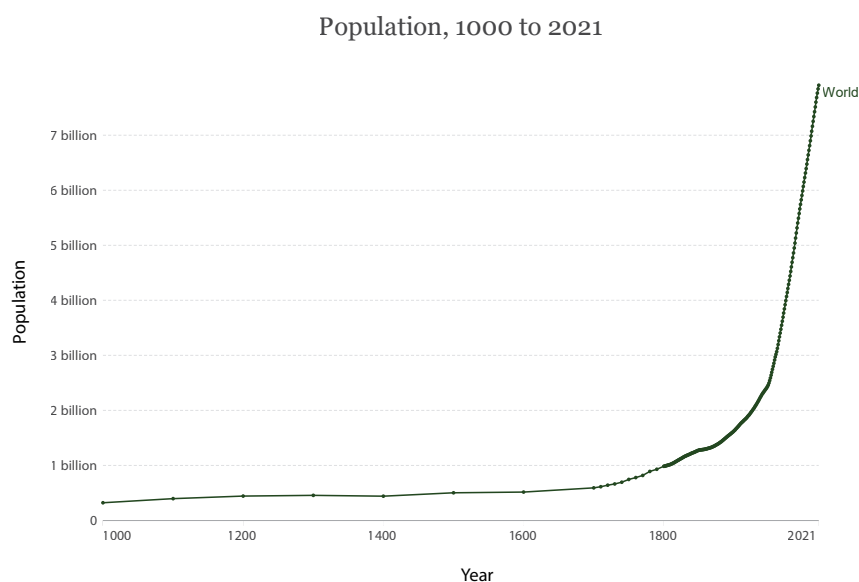


Figure 4.8: Global population, 1000 to 2021.<sup>1</sup>



- Think about and discuss how changes in the global population may have changed life around the world.
- Using the graph in Figure 4.9, identify and compare the approximate amount of CO<sub>2</sub> (carbon dioxide) in the atmosphere when each painting, including yours, was made.

Atmospheric CO<sub>2</sub> over the last 1000 years

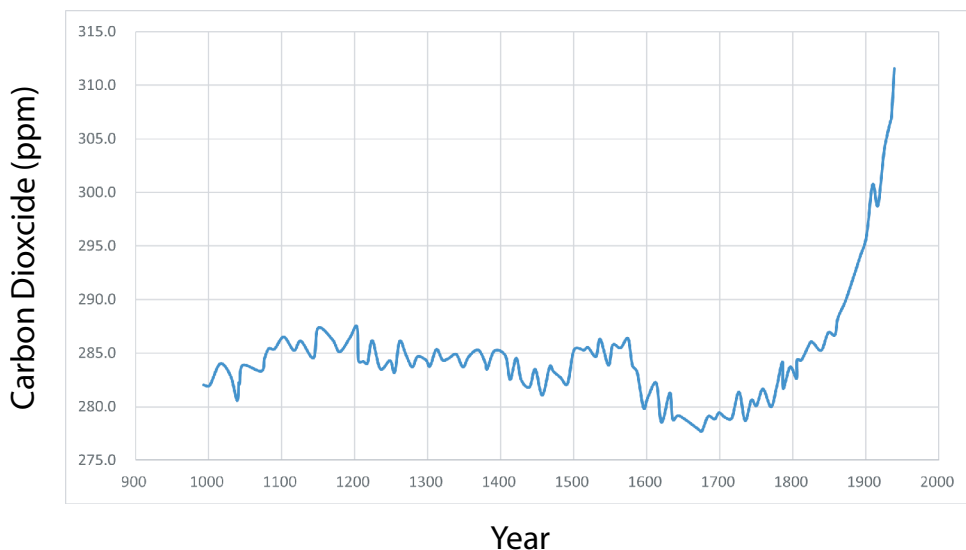


Figure 4.9: Atmospheric CO<sub>2</sub> over the past 1,000 years: A high-resolution record from the West Antarctic Ice Sheet (WAIS) Divide ice core.<sup>2</sup>

- Based on all the data you have analyzed, discuss any possible connections between population, CO<sub>2</sub> amounts, and the production, transport, and consumption of goods around the world.



**Understand:** What are the sources of greenhouse gas additions in your community?

As you learned in Part 3, there are many global human activities that add greenhouse gases into the atmosphere. Researching and understanding the sources of these gases in your local community can help you think about appropriate actions to take in the future.

- Think to yourself, who is the oldest person you know in your community? What year were they born?





2. Using the graph in Figure 4.10 to answer the following questions. The graph shows **cumulative** CO<sub>2</sub> emissions. That means the total over time.
  - a. Identify the approximate cumulative world CO<sub>2</sub> emissions (additions) the year they were born.
  - b. Identify the approximate cumulative world CO<sub>2</sub> emissions (additions) today.
3. Calculate the difference in world CO<sub>2</sub> emissions between today and when your community member was born.

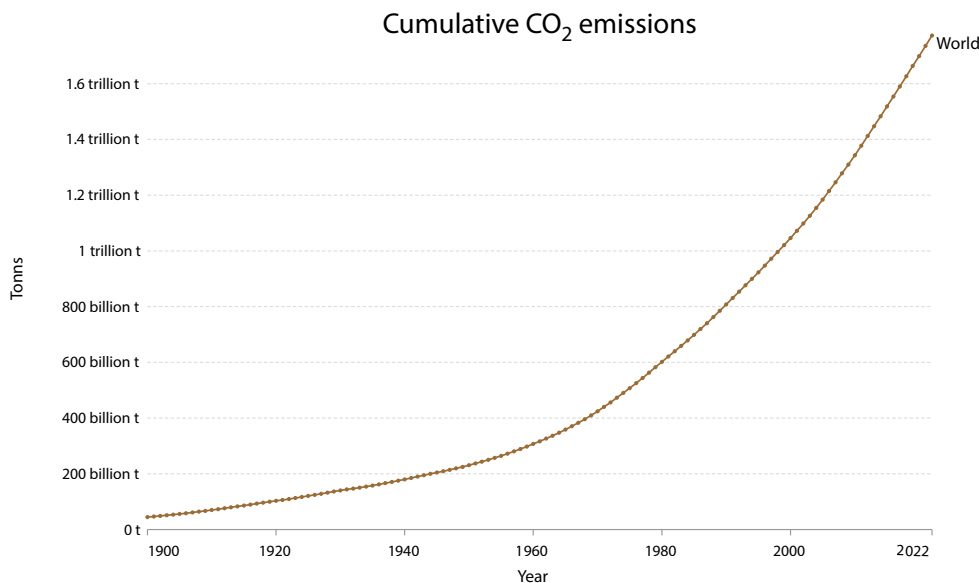


Figure 4.10: Cumulative CO<sub>2</sub> emissions globally.<sup>3</sup>

4. Read *Community Greenhouse Gas Additions* and do the activity.

### **Community Greenhouse Gas Additions**

In this activity, you will collect data in two different ways about additions of greenhouse gases in the system of your research site. Take out a piece of paper and title it “Community Greenhouse Gas Additions.” Create a table like the one shown in Figure 4.11 and use it to record your data.

- a. Community member: Talk with the person you identified at the beginning of the Understand section. Ask them to describe any greenhouse gas additions they have observed throughout their lifetime within the community. Write their responses in the data table.



- b. Observations: Make direct observations for each category within the boundary of your research site. If possible, try to observe your site at different times of the day and on different days of the week.

<b>Greenhouse Gas Additions</b>	<b>Community Member</b>	<b>Observations</b>
Agriculture: livestock, crops		
Electric power generation and use: power plants, power lines, energy use in the home		
Industry or industrial processes: factories, manufacturing, refineries		
Transportation: roads, traffic, public transportation, construction		
Commercial: restaurants, shopping centers, businesses, construction		
Residential: cooking, technology in the home, construction		

Figure 4.11: *Community Greenhouse Gas Additions data table.*

11. Think to yourself:

- How have the additions of greenhouse gases changed over time in your community?
- How do the additions of greenhouse gases change across your research site?
- Do any areas of your research site have a higher or lower concentration of additions?





**Act:** How might your community's greenhouse gas additions change in the future?

Understanding the past can help you understand the present. Understanding the past and present can help you imagine the future. Thinking about and imagining future possibilities is an important step to take when thinking about taking action.

1. Turn to a partner and discuss:
  - a. When you hear the words “the future,” what do you think of?
  - b. What is going to happen in the next minute? Day? Week? Year? Decade? Century? Millennia?
  - c. When you hear the word “prediction,” what do you think of?
  - d. How do you already use “future predictions” in your daily lives?
2. Read *Predicting the Future* and complete the activity.

### *Predicting the Future*

- a. Share the following story starter.

**The wind swirled around me. I heard a big crashing sound outside, and the electricity in the house went out. . . .**

- b. Have each team member write down their answers to these questions on a piece of paper.
  - How do you predict the story is going to end?
  - How would you like to see it end?
  - How might it end instead?
- c. Put this prediction paper away until later.
- d. Have the team sit in a circle.
- e. Return to the story starter and go around the circle, with each person adding the next element to tell a group version of the story.



- f. Use the data table in Figure 4.12 to document each new element added to the story by different team members.
- g. Make sure every team member has an opportunity to share an addition to the story.

The wind swirled around me. I heard a big crashing sound outside, and the electricity in the house went out. . . .

Figure 4.12: *Predicting the Future* data table.

- h. When everyone had added to the group story, have team members share their written predictions.
- i. Compare and contrast the predictions with how the story played out in your group.
- j. Reflect on your own feelings about how the story developed, ended, and compared with your predictions.
- k. How did the predictions compare across the team members?

### 3. Read *Characteristics of Change*.

#### *Characteristics of Change*

When we try to make predictions about future changes, it can be helpful to think about the following.

- a. What do you predict will be the **sources** of the change? Examples:
  - Natural: rising sea levels, drought, extreme heat, storms
  - Human: advocacy and activism, voting, personal decisions to change behaviors (such as driving less), boycotting certain products and companies





- b. What specific **elements and relationships** do you predict might change in the future system? Examples:
  - Elements: a person, family, school system, the government, a company, a community space (park, market)
  - Relationships: changes between people, changes between people and other elements in the system, such as between species or the environment
- c. What is the **time horizon** over which your predicted changes may take place?
  - Hours, days, weeks, years, decades, centuries, millennia?
- d. What **rate** do you predict the future system may change?
  - Will the changes happen slowly and evenly throughout the time horizon?
  - Will the changes happen suddenly at a particular point within the time horizon?

4. Using your *Predicting the Future* data table (which is based on the story you created as a group), make a table like the one shown in Figure 4.13. Use it to identify characteristics of the changes that occurred in the story. Fill in the information in the column in the right.

<b>The wind swirled around me. I heard a big crashing sound outside, and the electricity in the house went out. . . .</b>	
What were the <b>sources</b> of the changes in the story?	
What were some specific <b>elements</b> that were affected or changed in the story?	
What were specific <b>relationships</b> between elements that were affected or changed in the story?	
What was the approximate <b>time horizon</b> over which the story took place?	
At what <b>rate</b> did changes happen throughout the story?	

Figure 4.13: *Characteristics of Change table.*



5. Take out your Community Greenhouse Gas Additions table, like the one shown in Figure 4.11.
6. Based on the community data you collected, develop some future predictions about changes you want to happen. Use a table like the one shown in Figure 4.14 to collect your ideas.

<b>In the future, I want to see my community's greenhouse gas additions change to ...</b>	
What <b>sources</b> do you think could cause your predicted change?	
What community <b>elements</b> do you predict will change?	
What community <b>relationships</b> between elements do you predict will change?	
What is the <b>time horizon</b> of your predicted change?	
At what <b>rate</b> do you see your predicted change happening?	

Figure 4.14: Future Predictions table.



## Task 2: How do human lifestyles connect to greenhouse gas additions?

In this task you will first **discover** more about the elements of your lifestyle that are related to greenhouse gas additions. You will then **understand** what influences human lifestyle choices in your community. Finally, you will **act** by starting a conversation with your future self and your community about the lifestyle changes you would like to see in the future to mitigate impacts on the atmosphere.



**Discover:** *What elements of your lifestyle are related to greenhouse gas additions?*

Have you ever wondered why it’s important to know about the things in our daily lives that connect to greenhouse gases? Well, let’s break it down. Greenhouse gases, like carbon dioxide and methane, are like blankets around our planet, trapping heat and causing the Earth to get warmer. This warming can lead to problems such as different weather patterns and rising sea levels. It turns out, a lot of the stuff we do, like using energy and transportation, adds these gases to the atmosphere. By understanding how our lifestyle choices affect greenhouse gases, we can make smarter choices to help keep our planet healthier and happier for future generations.

1. Think about the things you do in your daily life. Use that information to complete the *Additions from Lifestyle Calculator* in Figure 4.15.

### Additions from Lifestyle Calculator

- |   |          |       |
|---|----------|-------|
| 1. How do you get to school?                |          |       |
| a. walk                                     | a. 0     | _____ |
| b. human-powered bicycle                    | b. 0     | _____ |
| c. car                                      | c. 1,115 | _____ |
| d. bus                                      | d. 131   | _____ |
| e. carpool                                  | e. 459   | _____ |
| 2. Do you eat mostly ...                    |          |       |
| a. prepared food from a store or restaurant | a. 4,818 | _____ |
| b. home-cooked food                         | b. 629   | _____ |

Figure 4.15: Additions from Lifestyle Calculator.<sup>4</sup> (Continued)



3. Do you eat mostly ...		
a. vegetables/fruits	a. 153	_____
b. meat	b. 644	_____
c. bread and pasta	c. 364	_____
4. Do you turn off the lights when you leave a room?		
a. yes	a. 133	_____
b. no	b. 268	_____
5. Do you unplug appliances and chargers when not in use?		
a. yes	a. 9	_____
b. no	b. 18	_____
6. How do you dry clothes?		
a. hang to dry	a. 0	_____
b. dryer	b. 750	_____
c. both	c. 375	_____
7. Do you turn off the water when brushing your teeth?		
a. yes	a. 34	_____
b. no	b. 274	_____
8. Do you turn off the TV when you're not watching it?		
a. yes	a. 47	_____
b. no	b. 140	_____
9. Do you turn off your video game system when you're not using it?		
a. yes	a. 29	_____
b. no	b. 90	_____
c. don't have/use one	c. 0	_____
10. Do you recycle? (Select all that apply)		
a. magazines	a. -15	_____
b. newspapers	b. -90	_____
c. glass	c. -7	_____
d. plastic	d. -19	_____
e. aluminum and steel cans	e. -86	_____

**Add together all the values in the far right column. TOTAL \_\_\_\_\_**

This total is your greenhouse gas additions per year. The lower the number, the fewer greenhouse gases you are adding into the atmosphere. Remember, it is not possible to have zero greenhouse gas emissions.

Figure 4.15: (Continued)





2. Calculate the average additions per year for your entire team.
3. Discuss how this data could be useful when thinking about changes we can make to reduce greenhouse gas additions to the atmosphere.
4. Read what Jianhui has to say about the elements of the fashion industry and human lifestyles that impact the atmosphere.

### *Jianhui says . . .*



The biggest challenge is how to make fast fashion companies care less about profit and put more attention on the pollution caused by the fashion industry. The fashion industry must face the fact that it takes enormous energy to make new materials, and that it also has an enormous negative impact on our planet, both environmentally and socially. While they are doing their best to make a profit, they also should give themselves time to think about how future generations are going to live.

In the West, we are richer than most other nations, so we consume much more. Especially when it comes to fast fashion—some people just buy, buy, buy. Every time I walk into a fast fashion store I see people with five to 10 pieces in their hands in the queue waiting to pay. How long will these pieces last? Some may last for a month, some may last for just a week. Some might be thrown away before they are even worn. To stop the climate crisis or slow it down and buy us more time, individuals have to act and work together. I believe in “together, stronger.” If everyone does something small, then the world can be a different place. Big changes can come in small steps.



### **Understand:** *What influences human lifestyle choices in my community?*

As you learned in the Discover activity, there are many different elements of human lifestyles that add greenhouse gases to the atmosphere. Remember, it is not currently possible to have zero additions. The basic requirements for life mean we will all be



connected to some greenhouse gas additions to the atmosphere. Finding a balance between additions and quality of life is an important part of sustainable solutions.

1. Think: How do you define a good quality of life?
2. Consider categories of things in your life that are important to your quality of life—for example, family, health, relaxation, education.
3. As a team, combine your categories into a list.
4. With your team, use a piece of paper or a board to create a Choice Influence Profile chart like the one in Figure 4.16.
  - a. Place the categories from your quality-of-life list around the edges of the profile chart, as shown in the example.

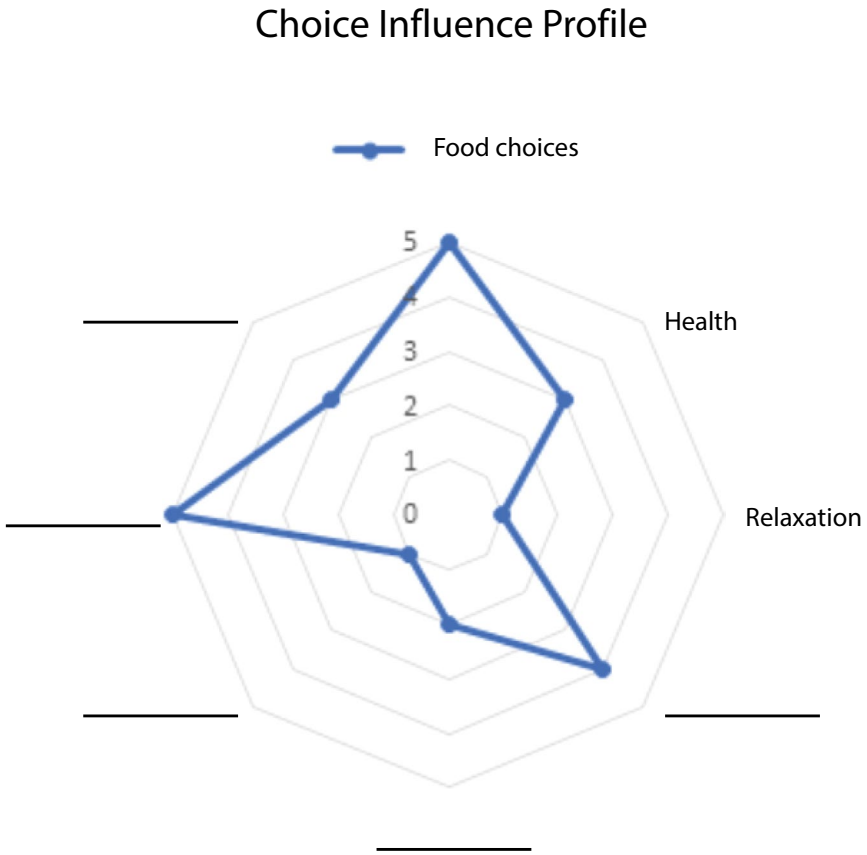


Figure 4.16: Choice Influence Profile.

5. By yourself, create a Choice Influence Profile for each of the following elements you make choices about in your life: food, clothing, technology, transportation.
6. For each choice, rank the influences for the choice from no influence (0) to high influence (5) for each quality-of-life category around the edges of the Choice Influence Profile. Draw a dot at that number along the line.



7. Connect the dots between the lines for each choice.
8. Share your *Choice Influence Profile* with your team.
9. Examine your teammates' *Choice Influence Profiles*. What do you notice?
10. Discuss with your team:
  - a. For which choices do you see the most similarities and differences?
  - b. Which choices are influenced by many different qualities of life?
  - c. Which choices are influenced by only a few qualities of life?
11. Use the data from your team to make predictions.
  - a. Based on the data, which choices would you predict might be more difficult to influence someone to change? Why?
  - b. Based on the data, which choices would you predict might be easier to influence someone to change? Why?
12. Consider using this *Choice Influence Profile* process to gather more data with other people in the research site outside of the team. If able, include this data in a further analysis of the community.
13. Read Jianhui's thoughts about how lifestyle choices and solutions are different in different places.

### *Jianhui says . . .*



People in different regions and with different levels of wealth have different consumption and buying behaviors. This causes them to contribute differently to climate change. So the solutions to address the choices made by people in different places should be different. For example, in the UK, around 1.75 million tons of clothing and textile waste is created each year and 1.2 million tons of it ends up in landfills. But in a poor country like Indonesia, things are very different. So using the same solution across the world won't work.





**Act:** *What lifestyle choices would you like to see in the future?*

Imagining the future is an important action anyone can take today. Taking time to explore and understand what you would like to see in your community's future can help you communicate with yourself and others about what actions we need to take.

1. Read Jianhui's ideas about the future and your choices today.

**Jianhui says . . .**



When we do sustainable fashion, we don't just use recycled or sustainable materials, but we also make our designs last for many years or even generations into the future. We never follow trends. We don't have new designs every season. Our Pashmina Collection was launched in 2009. Fourteen years on we are still selling it, and it's still one of our bestsellers. As Vivian Westwood said, "Buy less, choose well, make it last." We believe if we "make it best," people will make it last and buy less. That's not just the relationship between fashion designers/makers and consumers, but also the relationship between fashion and climate change into the future.

2. Take or draw a picture that includes you and some members of your community that you have relationships with.
3. Cut yourself and your community members out of the picture and place it on another piece of paper.
4. Stick the cutouts onto new pieces of paper and secure them so they do not move. See Figure 4.17 for an example.
5. Label the cut-out picture of your community members "Future Community." Label the cutout "Future Self."



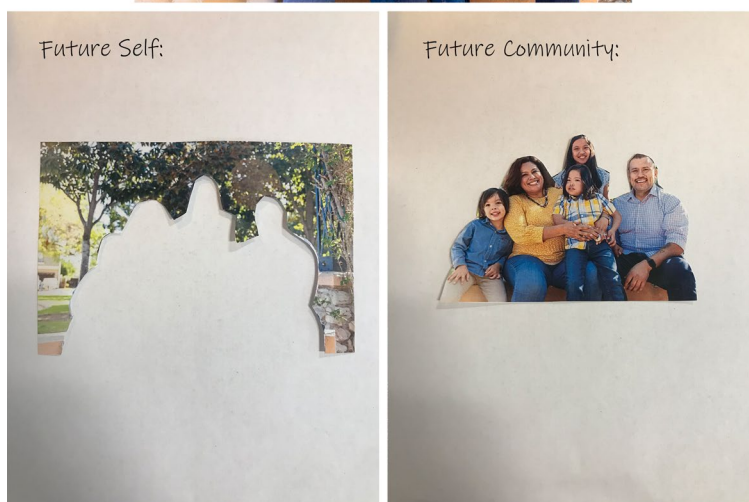


Figure 4.17: Example of your Future Self and Future Community pictures.

6. On the Future Self picture, in the blank space write a note to your future self. Include the following in the note:
- What specific **elements** (objects) of your lifestyle would you like to see change to reduce your greenhouse gas additions in the future?
  - What specific **relationships** (behaviors) with elements in your lifestyle choices would you like to see change to reduce your greenhouse gas additions in the future? For example, you might choose to ride public transportation or a bicycle to places around the community where you used to drive a car.
  - What is the **source** of why you hope to see these changes? What personal values and beliefs are guiding the reason for the change?
  - What is the **time horizon** of this change—one day, one month, one year?
  - What is the **rate** at which you hope to make these changes within the time horizon? Do you want to make the change slowly throughout the time horizon? Do you want to make the change suddenly at a certain point within the time horizon?





7. On the *Future Community* picture, in the space around the cutout, write a note to your future community members. Include the following in the note:
  - a. What specific **elements** (objects) related to community lifestyle choices would you like to see change to reduce greenhouse gas additions in the future?
  - b. What specific **relationships** (behaviors) with elements in your community's lifestyle would you like to see change to reduce greenhouse gas additions in the future?
  - c. What is the **source** of why you hope to see these changes? What personal values and beliefs are guiding the reason for the change?
  - d. What is the **time horizon** of this change—one day, one month, one year?
  - e. What is the **rate** at which you hope to see these changes within the time horizon? Do you want to see the change happen slowly throughout the time horizon? Do you want to see the change happen suddenly at a certain point within the time horizon?
8. Put the two pictures in a safe place where you can find them later.
9. Open and read the notes at the future time you indicated on your time horizon.
  - a. At that future time, reflect on the changes you wrote about and the current time.
  - b. What has remained the same and what has changed?
  - c. If something has not changed, how can you revise your note to work toward a new future?
10. Acknowledge: Take a moment and recognize that you took more actions in this guide. Understanding human impacts to the atmosphere is an essential action. You are part of a human system. Humans are complex social animals. To effectively act on human impacts to the atmosphere, such as climate change, you must understand and respect the system.



# Congratulations!

## You have finished Part 4.

### *Find out More!*

For additional resources and activities, please visit the *Climate Action!* StoryMap at <https://bit.ly/CLIMATEACTION2030>.



## References

1. Ritchie, Hannah et al., "Population Growth," Our World in Data, 2024, <https://ourworldindata.org/population-growth>
2. "NOAA/WDS Paleoclimatology—West Antarctic Ice Sheet (WAIS) Ice Core WDC-05A 1000 Year CO<sub>2</sub> Data," NOAA National Center for Environmental Information, September 1, 2023, <https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=noaa-icecore-12949>
3. "Cumulative CO<sub>2</sub> Emissions," Our World in Data, 2023, <https://ourworldindata.org/grapher/cumulative-co-emissions>
4. "Integrated Teaching and Learning Program, College of Engineering, University of Colorado Boulder," <https://itlp.colorado.edu/>



## Glossary

This glossary can help you understand words you may not know. You can add drawings, your own definitions, or anything else that will help. Add other words to the glossary if you would like.

**Cumulative:** The total over time

**Rate:** A quantity, amount, or degree of something measured per unit of something else

**Relationship:** How two or more elements in a system are connected to or affect one another

**Source:** A place, person, or thing from which something comes or can be obtained

**Time Horizon:** A point in the future when certain processes are evaluated or assumed to end

