PEOPLE, PLANTS, AND THE PLANET

LESSON 1

NOTICE AND WONDER

What I *Notice*

What I *Wonder*
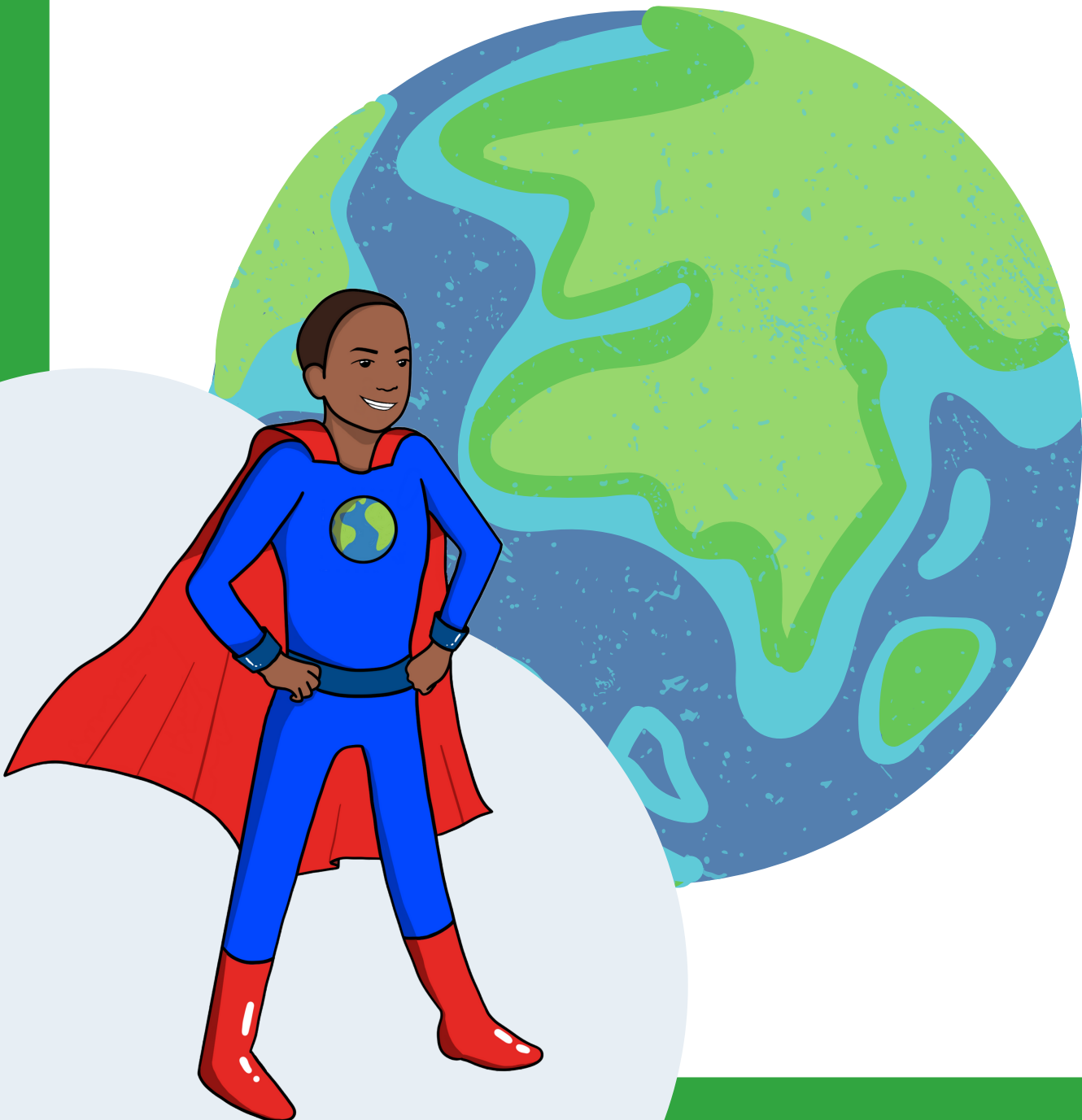
VIDEO GUIDE

Using the worksheet, answer the following questions.

1- What does climate mean?

_____

_____

_____

2- What makes up the atmosphere?

_____

_____

_____

3- What are greenhouse gases?

_____

_____

_____

4- 2 questions I have are:

_____

_____

_____

Essential Earth Knowledge:
Atmosphere, Greenhouse Gases, and the Climate

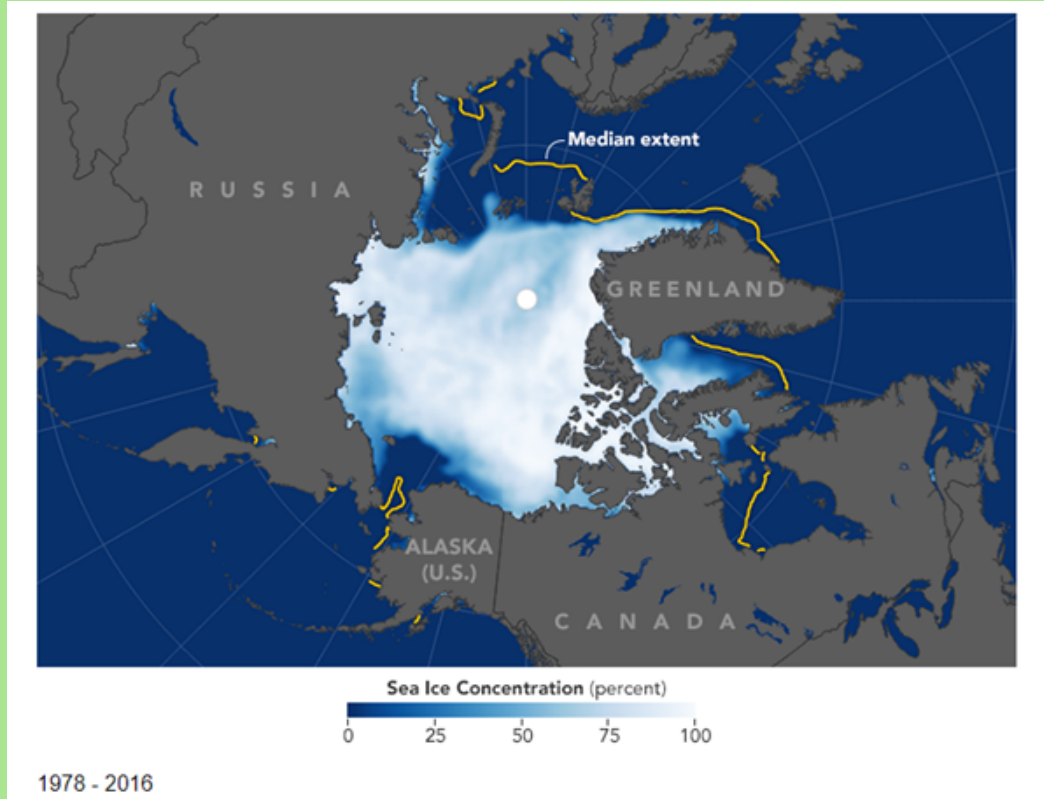## Sea Ice at the Arctic Circle is Changing
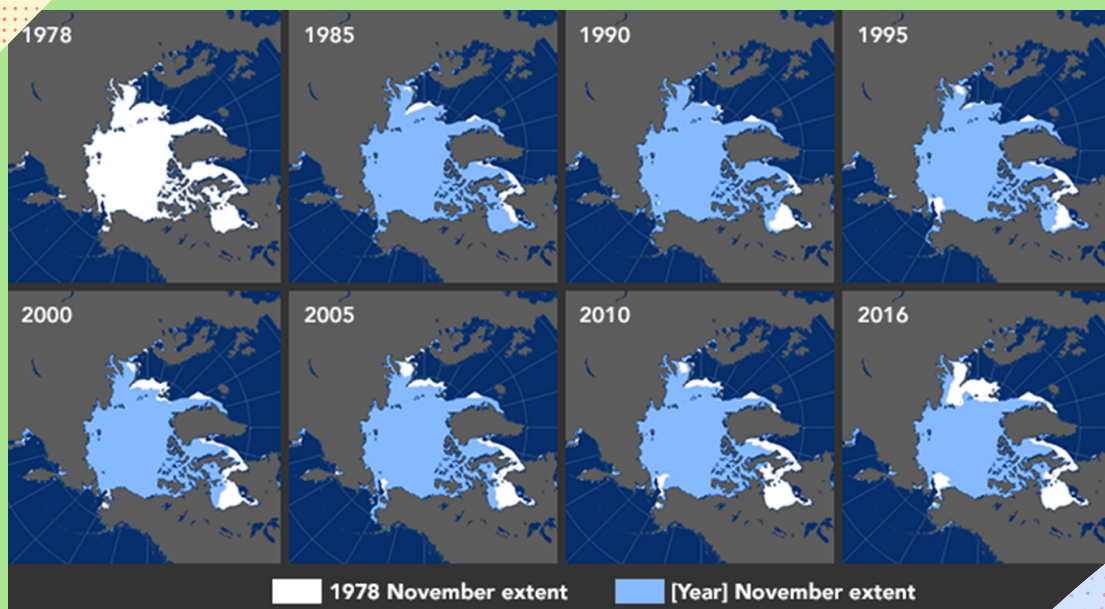

Figure 1a

NASA, 2016

Figure 1b

NASA, 2016

Essential Earth Knowledge: Atmosphere, Greenhouse Gases, and the Climate

Using the figure, work with your group or a partner to answer the following questions.

1. What is the white color indicating in the images compared to the light blue or dark blue colors? Use Figure 1a to help you.

_____

_____

2. How did sea ice change between 1978 and 1985?

_____

_____

3. What do you think may have caused this change in the amount of sea ice?

_____

_____

4. How has the sea ice extent, or amount, changed between 2000 and 2016?

_____

_____

5. Write down a question or idea that comes to mind from this figure.

_____

_____

Essential Earth Knowledge: Atmosphere, Greenhouse Gases, and the Climate
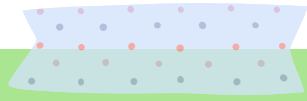
Amount of Carbon Dioxide in Earth's Atmosphere

This is the **amount** of carbon dioxide in the air

Scripps Institution of Oceanography
NOAA Earth System Research Laboratory

PARTS PER MILLION

400

380

360

340

320

1960   1970   1980   1990   2000   2010   2020

YEAR

March 2019

NOAA

Figure 2

NOAA, 2019

Essential Earth Knowledge: Atmosphere, Greenhouse Gases, and the Climate

Using the figure, work with your group or a partner to answer the following questions.

1. What is the time period shown in this figure? How many years of data does that provide us with?

_____

_____

2. On the vertical line, the unit is Parts Per Million of Carbon Dioxide in Earth's Atmosphere. Use the data in the figure to determine how much the carbon dioxide in Earth's atmosphere increased from 1965 to 1980? _____ parts per million

_____

_____

3. What do you think has caused the amount of carbon dioxide in Earth's atmosphere to continue increasing during the time period in this figure?
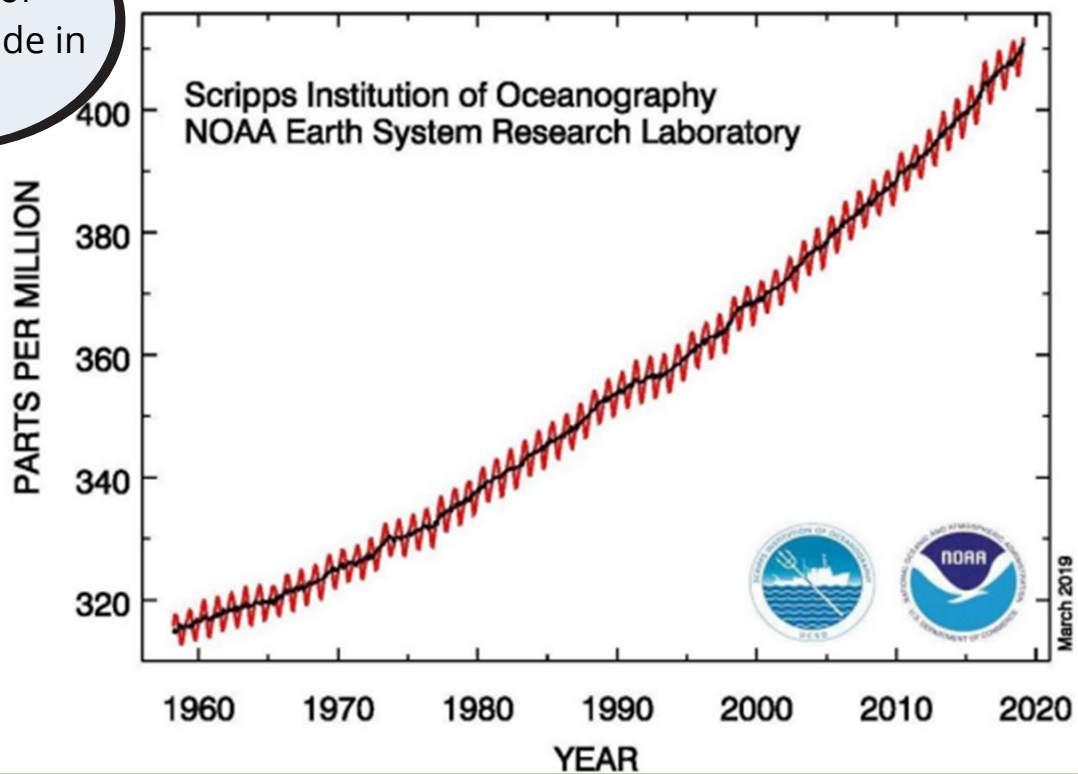
_____

_____

4. Write down a question or idea that comes to mind from this figure.

_____

_____

Essential Earth Knowledge: Atmosphere, Greenhouse Gases, and the Climate

Sources are activities that add GHGs to the atmosphere. Sinks are things that remove them.

NJ Greenhouse Gas Sources & Sinks

NJ GREENHOUSE GAS SOURCES & SINKS 2018

TRANSPORTATION 42%

ELECTRICITY GENERATION 19%

COMMERCIAL & INDUSTRIAL 17%

RESIDENTIAL 16%

HIGHLY WARMING GASES 8%

WASTE MANAGEMENT 5%

LAND CLEARING 1%

TERRESTRIAL CARBON SEQUESTRATION -8%

Figure 3.5. New Jersey Greenhouse Gas Sources and Sinks by Sector. This figure shows the distribution of Greenhouse Gas emission sources and sinks by sectoral distribution in 2018 (NJDEP 2019a).

Terrestrial carbon sequestration is when carbon is removed from the atmosphere.

Figure 3   NJDEP, 2019

Essential Earth Knowledge: Atmosphere, Greenhouse Gases, and the Climate

Using the figure, work with your group or a partner to answer the following questions.

1. What category of activities is contributing the highest percent of total greenhouse gas emissions in New Jersey? What is an example of an activity in that category?

_____

_____

2. Give an example of something that does not add to greenhouse gas emissions, but instead subtracts from it? What is the percentage of that activity in New Jersey for the year 2018? (Hint: it will have a – sign in front of it because it subtracts emissions.)

_____

_____

3. What kinds of activities do you think are creating emissions in the "Residential" category? Or the "Waste Management" Category?

_____

_____

4. Pick one of the categories and think of ways Government or Business Leaders can cut emissions in that category.

_____

_____

5. Write down a question or idea that comes to mind from this figure.

_____

_____

Essential Earth Knowledge:
Atmosphere, Greenhouse Gases, and the Climate

GHG Emissions Across the Supply Chain

Food: greenhouse gas emissions across the supply chain

Land Use Change	Farm	Animal Feed	Processing	Transport	Retail	Packaging
Aboveground changes in biomass from deforestation, and belowground changes in soil carbon	Methane emissions from cows, methane from rice, emissions from fertilizers, manure, and farm machinery	On-farm emissions from crop production and its processing into feed for livestock	Emissions from energy use in the process of converting raw agricultural products into final food items	Emissions from energy use in the transport of food items in-country and internationally	Emissions from energy use in refrigeration and other retail processes	Emissions from the production of packaging materials, material transport and end-of-life disposal

Beef (beef herd) — 60
Lamb & Mutton — 24
Cheese — 21
Beef (dairy herd) — 21
Chocolate — 19
Coffee — 17
Prawns (farmed) — 12
Palm Oil — 8
Pig Meat — 7
Poultry Meat — 6
Olive Oil — 6
Fish (farmed) — 5
Eggs — 4.5
Rice — 4
Fish (wild catch) — 3
Milk — 3
Cane Sugar — 3
Groundnuts — 2.5
Wheat & Rye — 1.4
Tomatoes — 1.4
Maize (Corn) — 1.0
Cassava — 1.0
Soymilk — 0.9
Peas — 0.9
Bananas — 0.7
Root Vegetables — 0.4
Apples — 0.4
Citrus Fruit — 0.3
Nuts — 0.3

Nuts have a negative land use change figure because nut trees are currently replacing croplands; carbon is stored in the trees.

Greenhouse gas emissions per kilogram of food product
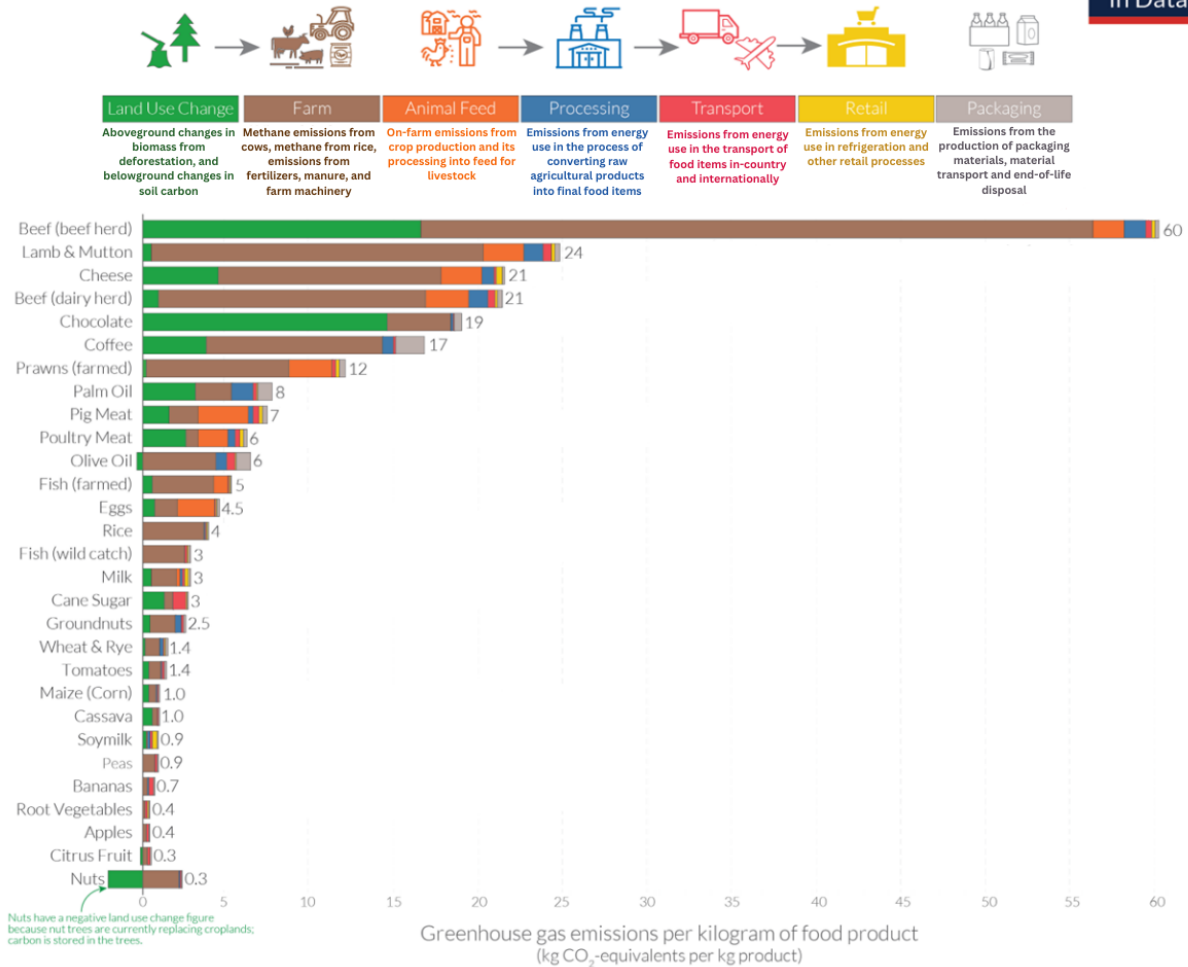(kg CO_2-equivalents per kg product)

Figure 4

Our World In Data

Essential Earth Knowledge: Atmosphere, Greenhouse Gases, and the Climate

Using the figure, work with your group or a partner to answer the following questions.

1. Review each of the 7 parts of the food supply chain at the top and then do the following:

   - List the different parts of the food supply chain:

   _____

   - Give an example of an activity from 2 of the 7 parts (e.g., what is an example of something that happens with Land Use Change that has to do with food or farming?).

   _____

2. Now look at the horizontal bar graph. Identify one food that creates a lot of greenhouse gases in the "Packaging" part of the food supply chain.

_____

_____

3. Identify two foods that create a small amount of greenhouse gases compared to other foods.

_____

_____

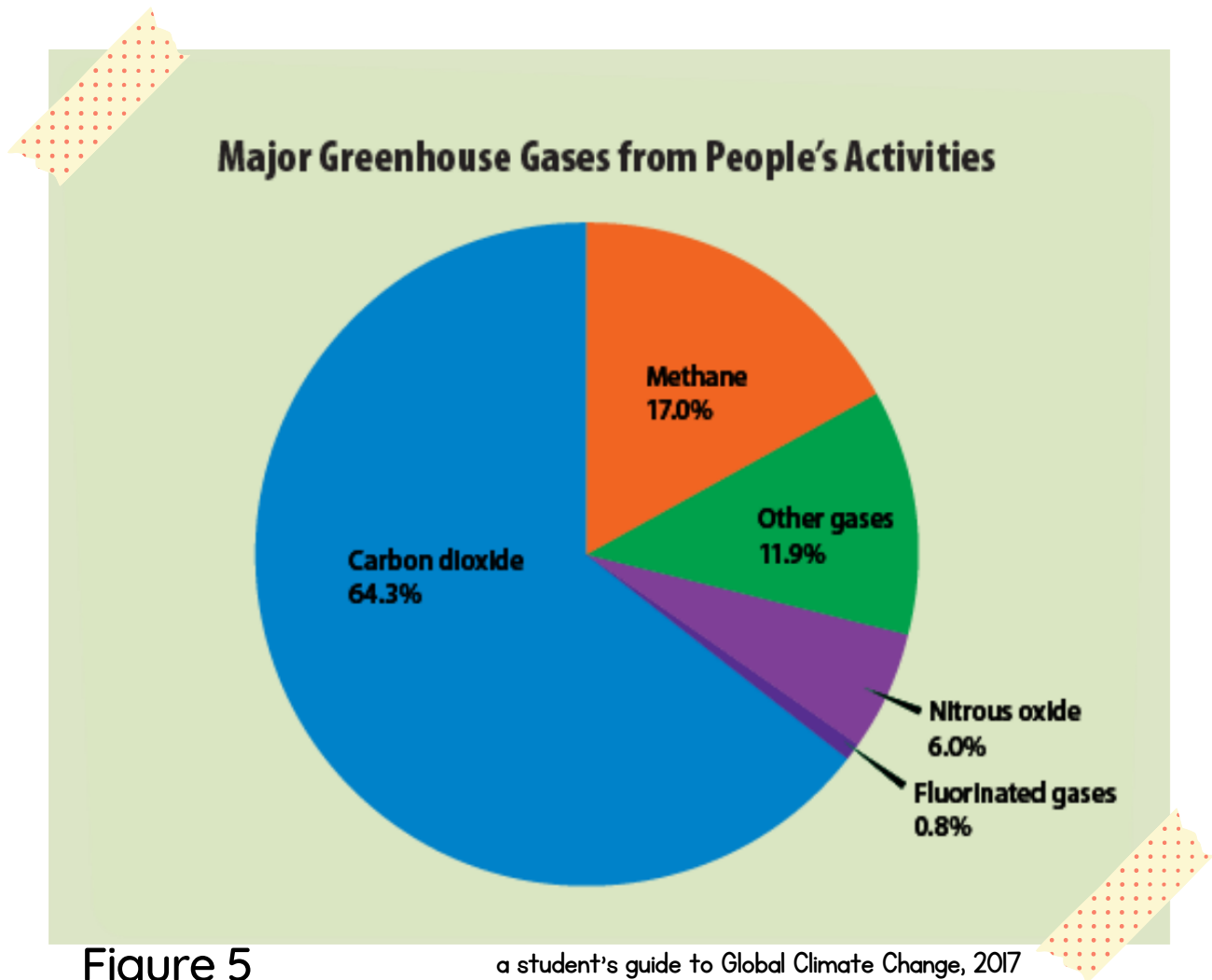4. Which food creates more greenhouse gases: Pig meat or eggs?

_____

_____

5. Write down one thing about this figure that surprised you.

_____

_____

Essential Earth Knowledge: Atmosphere, Greenhouse Gases, and the Climate

Major Greenhouse Gases from People's Activities

Methane
17.0%

Other gases
11.9%

Carbon dioxide
64.3%

Nitrous oxide
6.0%

Fluorinated gases
0.8%

Figure 5

a student's guide to Global Climate Change, 2017

Essential Earth Knowledge: Atmosphere, Greenhouse Gases, and the Climate

Using the figure, work with your group or a partner to answer the following questions.

1. Which of these greenhouse gases are familiar to you? Have you heard of them before? What do you know about them? Write down some words that come to mind about one or more of these gases.

_____

_____

2. Which greenhouse gas does human activity create the most of?

_____

_____

3. What are some human activities that generate (or result in) carbon dioxide emissions? Write down at least three of those activities below.

_____

_____

4. Do you know of anything that people do that generates methane gas? You may need to look this up on a .GOV or .ORG website to learn more.

_____

_____

5. Record the position (yes, or no, and why) of each member of your group on the following: Do you think that all types of greenhouse gases are equal in power, meaning, do they all trap the same amount of heat energy from the sun? Why or why not?

_____

_____

Essential Earth Knowledge: Atmosphere, Greenhouse Gases, and the Climate

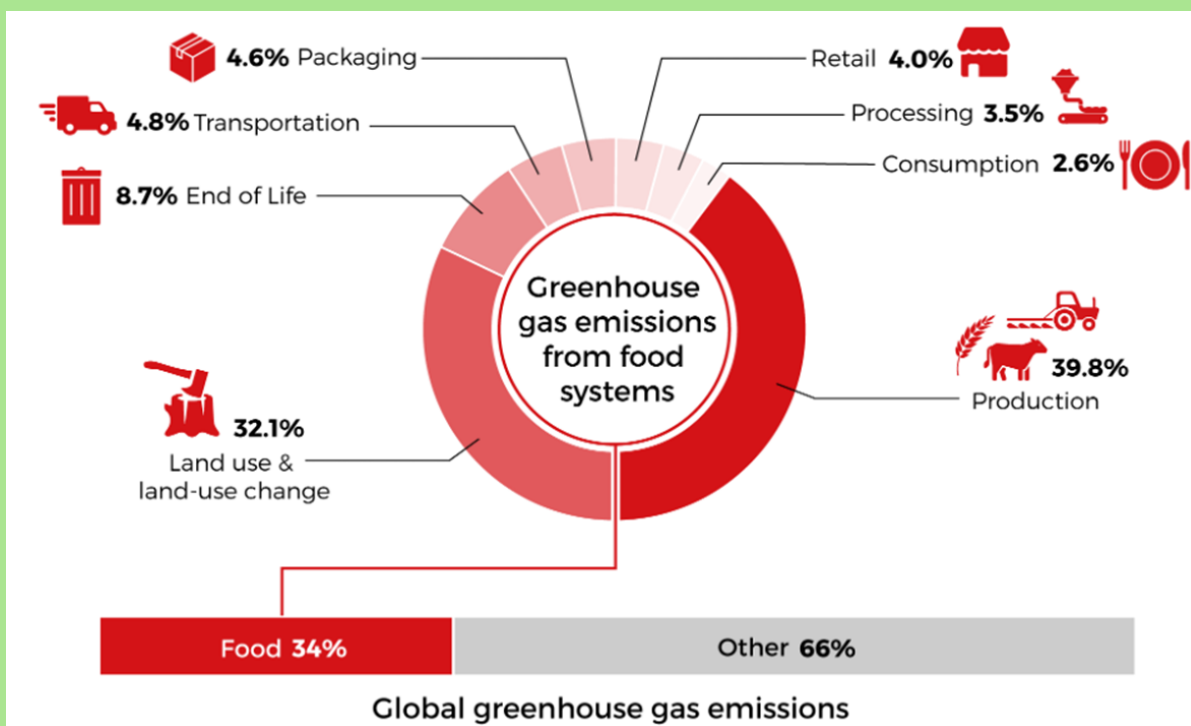Greenhouse Gas Emissions from Food Systems

Figure 6

NJDEP, 2019

Essential Earth Knowledge: Atmosphere, Greenhouse Gases, and the Climate

Using the figure, work with your group or a partner to answer the following questions.

1. In the figure, what percentage of emissions come from changing of the land? What are some reasons why forests or grasslands might need to be cut down or cleared away to produce food? Write down your ideas on the lines below.

_____

_____

2. What are some things that people do with food at the "end of its life"? How many people in your group have heard of composting food waste? Where does food go when it is thrown in the trash?

_____

_____

3. Which part of this food and farming process generates the greatest amount of greenhouse gas emissions? Write down two examples of activities that might occur at this part of the process which generate greenhouse gases.

_____

_____

_____

_____

4. Which two parts of this process do you think are the most connected? Explain.

_____

_____