

CLIMATE CHANGE AND FOOD: WHY A CHANGING CLIMATE MATTERS TO YOU



Module 7 Student Handouts

Instructions: It is easiest to print this document **double-sided, on the short-edge**. Print 1 copy for every 2 students in your class.





WEATHER

Tells you what to wear each day



CLIMATE

Tells you what types of clothes to have in your closet



NOAA National Centers for Environmental Information

www.ncei.noaa.gov

Taken from "What's the Difference Between Weather and Climate?" by National Centers for Environmental Information. <https://www.ncei.noaa.gov/news/weather-vs-climate>.

ACTIVITY #2: GREENHOUSE GAS EFFECTS – A CAR EXAMPLE



ACTIVITY #2: GREENHOUSE GAS EFFECTS – A CAR EXAMPLE

- Sunshine (solar energy) passes easily through the glass to heat objects in the car's interior -- remember how hot the car seat gets in summer?
- The car's interior absorbs the short-wave energy and heats up. When the seats heat up, they produce long-wave infrared radiation.
- Here's the tricky part: The glass in the car's windows now begins to act as a kind of one-way mirror. Short-wave solar energy continues to enter with no problem but much of the long-wave infrared radiation is blocked and prevented from leaving

On a much larger scale, this is what's happening to the earth:

- Energy from the sun hits the earth's atmosphere as solar radiation. Some of it is bounced back into space by the atmosphere, but most passes through the atmosphere to warm the surface of the earth.
- Once the earth has been warmed by the short-wave solar energy, excess heat is radiated back into the environment as long-wave infrared radiation.
- Some of the gases in earth's atmosphere act like the glass in the car windows. They let in solar energy and block or absorb infrared energy. As a result, the atmosphere gets warmer.

What does pollution have to do with it?

In all, 30 greenhouse gases have been discovered to date, including carbon dioxide (CO₂), water vapor, methane and ozone. But lately new gases are being added to the mix: Chlorofluorocarbons (CFCs). These are the harmful gases produced by cars and factories, and we humans are responsible!

CLIMATE IS WHAT YOU EXPECT, WEATHER IS WHAT YOU GET

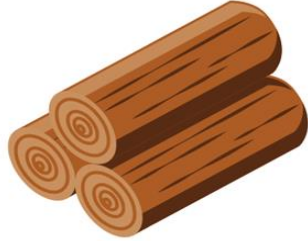
ACTIVITY #2: HUMAN ACTION CARDS

Humans



Drive Cars

Humans



Cut Down Trees

Humans



Plant Trees

Humans



Travel by Bus

Humans



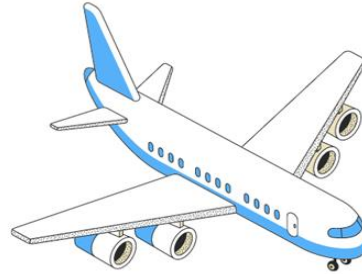
Recycle

Humans



Burn Trash

Humans



Travel by Plane

**Humans
Create**



**Energy-efficient
Technology**

ACTIVITY #2: HUMAN ACTION CARDS

Public transit has the potential to reduce CO₂ emissions by 37 million metric tons per year.¹

(Remove 2 CO₂ molecules)

Trees absorb the CO₂ from the atmosphere and release oxygen in exchange.

(Remove 4 CO₂ molecules)

Every year, Deforestation releasing more than 1.5 billion tons of CO₂ into the atmosphere.³

(Add 4 CO₂ molecules)

There are 1.45 billion cars in the world. The average driver emits ~ 4.6 metric tons of CO₂ per year.⁴

(Add 2 CO₂ molecules)

Increasing energy efficiency is extremely effective in cutting CO₂ emissions.²

(Remove 4 CO₂ molecules)

Aviation is responsible for around 5% of global warming and is rising.⁵

(Add 2 CO₂ molecules)

Burning garbage emits large amounts of CO₂ and toxic chemicals into the atmosphere.⁶

(Add 2 CO₂ molecules)

If the U.S. recycling levels reach 75%, the CO₂ impact would equate to removing 55 million cars from the roads each year.⁷

(Remove 2 CO₂ molecules)

ACTIVITY #3: DROUGHT

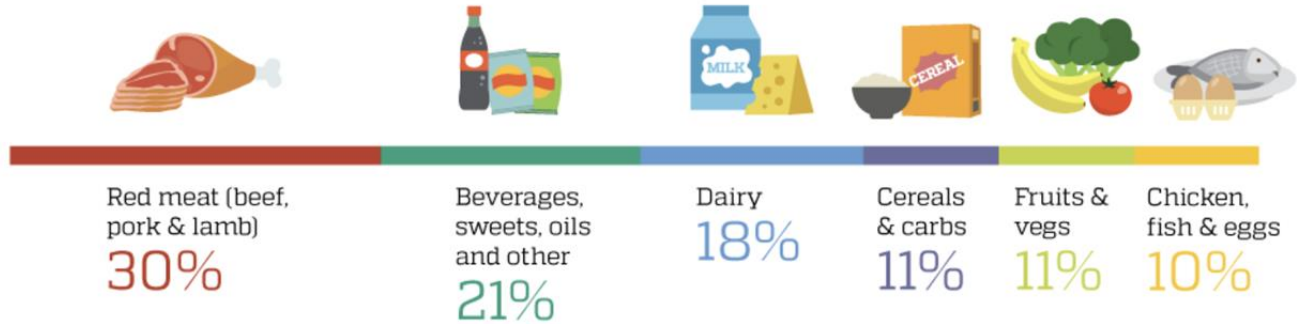


TWO THERMOMETERS GREENHOUSE EFFECT RECORDING SHEET

Time	Thermometer #1 (outside)	Thermometer #2 (inside vase or jar)
Baseline		
10 mins		
20 mins		
30 mins		
40 mins		
50 mins		
1 hour		

ACTIVITY #4: FOOD SYSTEM GREENHOUSE GAS EMISSIONS

GHG emissions by food type



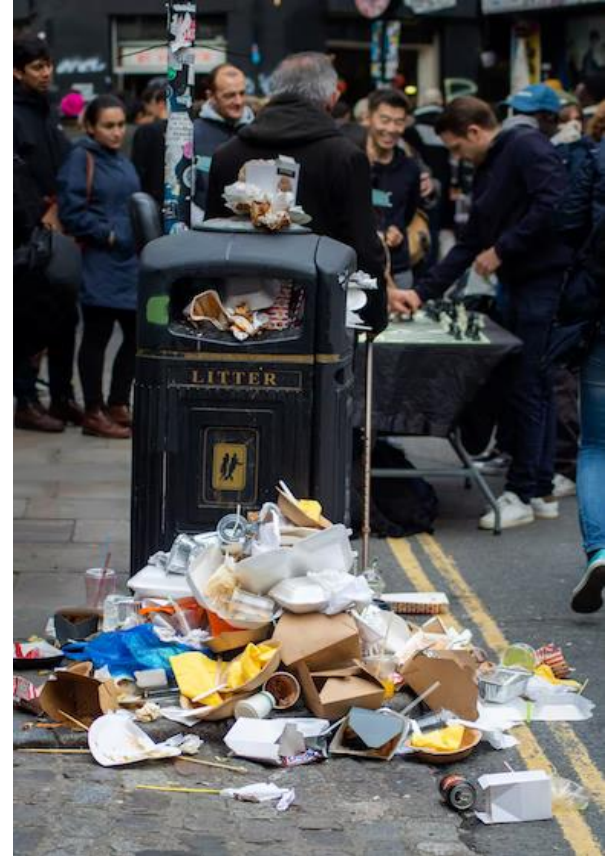
GHG emissions by supply chain stage



ACTIVITY #4: FOOD WASTE




Methane, a powerful greenhouse gas, is emitted into our atmosphere from the food waste in our landfills.



ACTIVITY #4: CLIMATE FOOD FLASHCARDS

Steak
Portion, fried (100g)




CO₂e
29
minutes driving

Emissions 4723 gCO₂e
Water 668 litres
Fibre 0 g
Calories 242 kCal
Protein 30 g

GGDOT

Sausage
Two small (100g)




CO₂e
6
minutes driving

Emissions 1035 gCO₂e
Water 424 litres
Fibre 6 g
Calories 259 kCal
Protein 14 g

GGDOT

Quorn
From frozen, portion (100g)




CO₂e
2
minutes driving

Emissions 379 gCO₂e
Water 200 litres
Fibre 11 g
Calories 196 kCal
Protein 13 g

GGDOT

Cod
Portion (100g)



CO₂e
4
minutes driving

Emissions 642 gCO₂e
Water 137 litres
Fibre 0 g
Calories 198 kCal
Protein 21 g

GGDOT

Lamb
Portion (100g)



CO₂e
27
minutes driving

Emissions 4430 gCO₂e
Water 350 litres
Fibre 0 g
Calories 249 kCal
Protein 30 g

GGDOT

Veggie sausage
Two small (100g)



CO₂e
2
minutes driving

Emissions 361 gCO₂e
Water 73 litres
Fibre 3 g
Calories 247 kCal
Protein 14 g

GGDOT

Salmon
Portion (100g)




CO₂e
5
minutes driving

Emissions 879 gCO₂e
Water 290 litres
Fibre 0 g
Calories 320 kCal
Protein 22 g

GGDOT

Chicken
Portion (100g)



CO₂e
6
minutes driving


Emissions 923 gCO₂e
Water 325 litres
Fibre 0 g
Calories 240 kCal
Protein 28 g

GGDOT

ACTIVITY #4: CLIMATE FOOD FLASHCARDS

Ham

Three slices (100g)




CO₂e
6
minutes driving

Emissions 1070 gCO₂e
Water 394 litres
Fibre 0 g
Calories 115 kCal
Protein 19 g

GGDOT

Pizza

Large slice (100g)




CO₂e
3
minutes driving

Emissions 477 gCO₂e
Water 108 litres
Fibre 6 g
Calories 272 kCal
Protein 12 g

GGDOT

Baked beans

From a can (200g)




CO₂e
3
minutes driving

Emissions 430 gCO₂e
Water 115 litres
Fibre 25 g
Calories 162 kCal
Protein 10 g

GGDOT

Lentils

Cooked at home (200g)



CO₂e
0.9
minutes driving

Emissions 151 gCO₂e
Water 179 litres
Fibre 29 g
Calories 176 kCal
Protein 12 g

GGDOT

Cheese

Three slices (100g)




CO₂e
10
minutes driving

Emissions 1590 gCO₂e
Water 139 litres
Fibre 0 g
Calories 416 kCal
Protein 25 g

GGDOT

Eggs

Two eggs (100g)



CO₂e
3
minutes driving

Emissions 470 gCO₂e
Water 139 litres
Fibre 0 g
Calories 143 kCal
Protein 14 g

GGDOT

Beans

Cooked at home (200g)




CO₂e
1
minutes driving

Emissions 206 gCO₂e
Water 115 litres
Fibre 25 g
Calories 186 kCal
Protein 14 g

GGDOT

Chickpeas

From a can (200g)



CO₂e
2
minutes driving

Emissions 393 gCO₂e
Water 168 litres
Fibre 27 g
Calories 230 kCal
Protein 14 g


GGDOT

ACTIVITY #4: CLIMATE FOOD FLASHCARDS

Almonds

Handful (30g)

0.4 CO₂e
minutes driving




Emissions 63 gCO₂e
Water 295 litres
Fibre 7 g
Calories 184 kCal
Protein 6 g

GGDOT

Peanut butter

Two tablespoons (30g)

0.8 CO₂e
minutes driving




Emissions 126 gCO₂e
Water 95 litres
Fibre 5 g
Calories 187 kCal
Protein 7 g

GGDOT

Milk

One cup (250ml)

3 CO₂e
minutes driving



Emissions 550 gCO₂e
Water 116 litres
Fibre 0 g
Calories 110 kCal
Protein 9 g

GGDOT

Oat milk

One cup (250ml)

0.7 CO₂e
minutes driving




Emissions 110 gCO₂e
Water 111 litres
Fibre 7 g
Calories 148 kCal
Protein 3 g

GGDOT

Peanuts

Handful (30g)

0.6 CO₂e
minutes driving




Emissions 96 gCO₂e
Water 95 litres
Fibre 6 g
Calories 181 kCal
Protein 7 g

GGDOT

Cream

Two tablespoons (28g)

0.8 CO₂e
minutes driving



Emissions 137 gCO₂e
Water 23 litres
Fibre 0 g
Calories 54 kCal
Protein 1 g

GGDOT

Soy milk

One cup (250ml)

2 CO₂e
minutes driving




Emissions 250 gCO₂e
Water 88 litres
Fibre 2 g
Calories 113 kCal
Protein 9 g

GGDOT

Cereal

Portion (30g) + milk (200g)

3 CO₂e
minutes driving



Emissions 519 gCO₂e
Water 121 litres
Fibre 2 g
Calories 202 kCal
Protein 9 g

GGDOT

ACTIVITY #4: CLIMATE FOOD FLASHCARDS

Porridge

With 200g water

 **0.6** CO₂e minutes driving



 Emissions 101 gCO₂e
 Water 106 litres
 Fibre 6 g
 Calories 110 kCal
 Protein 3 g

GGDOT

Veg spread

One tablespoon (14g)

 **0.1** CO₂e minutes driving



 Emissions 19 gCO₂e
 Water 29 litres
 Fibre 0 g
 Calories 77 kCal
 Protein 0 g

GGDOT

Yogurt

Small pot (100g)

 **1** CO₂e minutes driving





 Emissions 200 gCO₂e
 Water 49 litres
 Fibre 0 g
 Calories 97 kCal
 Protein 4 g






GGDOT

Bread

Two slices (80g)

 **0.4** CO₂e minutes driving



 Emissions 60 gCO₂e
 Water 30 litres
 Fibre 6 g
 Calories 190 kCal
 Protein 7 g

GGDOT

Butter

One tablespoon (14g)

 **0.7** CO₂e minutes driving



 Emissions 116 gCO₂e
 Water 34 litres
 Fibre 0 g
 Calories 104 kCal
 Protein 0 g

GGDOT

Vegetable oil

One tablespoon (14g)

 **0.3** CO₂e minutes driving



 Emissions 52 gCO₂e
 Water 28 litres
 Fibre 0 g
 Calories 126 kCal
 Protein 0 g

GGDOT

Soy yogurt

Small pot (100g)

 **0.5** CO₂e minutes driving





 Emissions 80 gCO₂e
 Water 41 litres
 Fibre 3 g
 Calories 45 kCal
 Protein 4 g






GGDOT

Toast

Two slices (64g)

 **0.5** CO₂e minutes driving




 Emissions 90 gCO₂e
 Water 30 litres
 Fibre 5 g
 Calories 190 kCal
 Protein 6 g

GGDOT

ACTIVITY #4: CLIMATE FOOD FLASHCARDS

Spaghetti

Portion (200g)




CO₂e
2
minutes driving

Emissions 332 gCO₂e
Water 33 litres
Fibre 10 g
Calories 282 kCal
Protein 9 g

GGDOT

Potato

Large (200g)




CO₂e
1
minutes driving

Emissions 240 gCO₂e
Water 16 litres
Fibre 7 g
Calories 148 kCal
Protein 4 g

GGDOT

Peas

Portion (80g)




CO₂e
1
minutes driving

Emissions 204 gCO₂e
Water 26 litres
Fibre 11 g
Calories 56 kCal
Protein 4 g

GGDOT

Asparagus

Seasonal, 5 spears (80g)



CO₂e
1
minutes driving

Emissions 160 gCO₂e
Water 169 litres
Fibre 2 g
Calories 10 kCal
Protein 1 g

GGDOT

Rice

Portion (200g)



CO₂e
5
minutes driving

Emissions 800 gCO₂e
Water 216 litres
Fibre 0 g
Calories 262 kCal
Protein 6 g

GGDOT

Chips

Oven cooked (200g)




CO₂e
4
minutes driving

Emissions 600 gCO₂e
Water 33 litres
Fibre 8 g
Calories 488 kCal
Protein 6 g

GGDOT

Broccoli

Portion (80g)



CO₂e
0.5
minutes driving

Emissions 82 gCO₂e
Water 17 litres
Fibre 7 g
Calories 27 kCal
Protein 3 g

GGDOT

Asparagus

By air, 5 spears (80g)



CO₂e
6
minutes driving


Emissions 1016 gCO₂e
Water 116 litres
Fibre 2 g
Calories 10 kCal
Protein 1 g

GGDOT

ACTIVITY #4: CLIMATE FOOD FLASHCARDS

French beans

By air (80g)



CO₂e
3
minutes driving

Emissions	477 gCO ₂ e
Water	26 litres
Fibre	7 g
Calories	21 kCal
Protein	2 g

GGDOT

Sweetcorn

From frozen (80g)




CO₂e
1
minutes driving

Emissions	182 gCO ₂ e
Water	75 litres
Fibre	7 g
Calories	54 kCal
Protein	3 g

GGDOT

Carrot

One, cooked (80g)




CO₂e
0.5
minutes driving

Emissions	90 gCO ₂ e
Water	2 litres
Fibre	6 g
Calories	27 kCal
Protein	0 g

GGDOT

Tomato

Seasonal, medium (80g)




CO₂e
0.1
minutes driving

Emissions	13 gCO ₂ e
Water	0.8 litres
Fibre	3 g
Calories	11 kCal
Protein	0 g

GGDOT

French beans

Seasonal (80g)




CO₂e
0.5
minutes driving

Emissions	88 gCO ₂ e
Water	26 litres
Fibre	7 g
Calories	21 kCal
Protein	2 g

GGDOT

Cabbage

Portion (80g)




CO₂e
0.3
minutes driving

Emissions	54 gCO ₂ e
Water	11 litres
Fibre	5 g
Calories	11 kCal
Protein	1 g

GGDOT

Tomato

Heated greenhouse (80g)



CO₂e
6
minutes driving

Emissions	1002 gCO ₂ e
Water	0.8 litres
Fibre	3 g
Calories	11 kCal
Protein	0 g

GGDOT

Lettuce

Seasonal (30g)



CO₂e
0.3
minutes driving


Emissions	44 gCO ₂ e
Water	4 litres
Fibre	1 g
Calories	3 kCal
Protein	0 g

GGDOT

ACTIVITY #4: CLIMATE FOOD FLASHCARDS

Avocado

One medium (80g)




CO₂e
1
minutes driving

Emissions	192 gCO ₂ e
Water	107 litres
Fibre	9 g
Calories	152 kCal
Protein	2 g

GGDOT

Banana

Small (80g)



CO₂e
0.3
minutes driving

Emissions	55 gCO ₂ e
Water	43 litres
Fibre	2 g
Calories	65 kCal
Protein	1 g

GGDOT

Raspberries

Seasonal, handful (80g)



CO₂e
1
minutes driving

Emissions	176 gCO ₂ e
Water	21 litres
Fibre	0 g
Calories	0 kCal
Protein	0 g

GGDOT

Strawberries

Seasonal, handful (80g)




CO₂e
1
minutes driving

Emissions	136 gCO ₂ e
Water	17 litres
Fibre	3 g
Calories	24 kCal
Protein	0 g

GGDOT

Apple

From storage, small (80g)



CO₂e
0.2
minutes driving

Emissions	40 gCO ₂ e
Water	35 litres
Fibre	3 g
Calories	41 kCal
Protein	0 g

GGDOT

Orange

Small (80g)



CO₂e
0.2
minutes driving

Emissions	32 gCO ₂ e
Water	32 litres
Fibre	5 g
Calories	29 kCal
Protein	1 g

GGDOT

Raspberries

By air, handful (80g)



✈️
CO₂e
3
minutes driving

Emissions	568 gCO ₂ e
Water	21 litres
Fibre	0 g
Calories	0 kCal
Protein	0 g

GGDOT

Strawberries

By air, handful (80g)



✈️
CO₂e
2
minutes driving


Emissions	408 gCO ₂ e
Water	14 litres
Fibre	3 g
Calories	24 kCal
Protein	0 g

GGDOT

ACTIVITY #4: CLIMATE FOOD FLASHCARDS

Orange juice

Small glass (200ml)




CO₂e
2
minutes driving

Emissions	400 gCO ₂ e
Water	146 litres
Fibre	1 g
Calories	72 kCal
Protein	2 g

GGDOT

Water

Plastic bottle (500ml)



CO₂e
0.8
minutes driving

Emissions	136 gCO ₂ e
Water	0.5 litres
Fibre	0 g
Calories	0 kCal
Protein	0 g

GGDOT

Sugar

One teaspoon (6g)




CO₂e
0.1
minutes driving

Emissions	15 gCO ₂ e
Water	6 litres
Fibre	0 g
Calories	24 kCal
Protein	0 g

GGDOT

Biscuit

One plain (13g)




CO₂e
0.1
minutes driving

Emissions	17 gCO ₂ e
Water	19 litres
Fibre	1 g
Calories	60 kCal
Protein	1 g

GGDOT

Tap water

Large glass (500ml)




CO₂e
0
minutes driving

Emissions	0 gCO ₂ e
Water	0.5 litres
Fibre	0 g
Calories	0 kCal
Protein	0 g

GGDOT

Fizzy drink

One can (330ml)



CO₂e
1
minutes driving

Emissions	158 gCO ₂ e
Water	50 litres
Fibre	0 g
Calories	205 kCal
Protein	0 g

GGDOT

Milk chocolate

Small bar (25g)




CO₂e
0.5
minutes driving

Emissions	88 gCO ₂ e
Water	182 litres
Fibre	1 g
Calories	130 kCal
Protein	2 g

GGDOT

Chocolate biscuit

One plain (13g)



CO₂e
0.1
minutes driving


Emissions	23 gCO ₂ e
Water	40 litres
Fibre	1 g
Calories	63 kCal
Protein	1 g

GGDOT

ACTIVITY #4: CLIMATE FOOD FLASHCARDS

Crisps

Small packet (25g)




CO₂e
0.3
minutes driving

Emissions	54	gCO ₂ e
Water	41	litres
Fibre	4	g
Calories	123	kCal
Protein	2	g

GGDOT

Latte

With 400ml milk




CO₂e
6
minutes driving

Emissions	1024	gCO ₂ e
Water	503	litres
Fibre	0	g
Calories	176	kCal
Protein	14	g

GGDOT

Coffee

Cup, with tbsp milk




CO₂e
0.6
minutes driving

Emissions	96	gCO ₂ e
Water	39	litres
Fibre	0	g
Calories	9	kCal
Protein	1	g

GGDOT

Tea

Cup, with tbsp milk



CO₂e
0.6
minutes driving

Emissions	94	gCO ₂ e
Water	9	litres
Fibre	0	g
Calories	7	kCal
Protein	1	g

GGDOT

REFERENCES

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Climate Food Flashcards can be downloaded [here](#).