



Carbon Footprints & Sustainable Solutions

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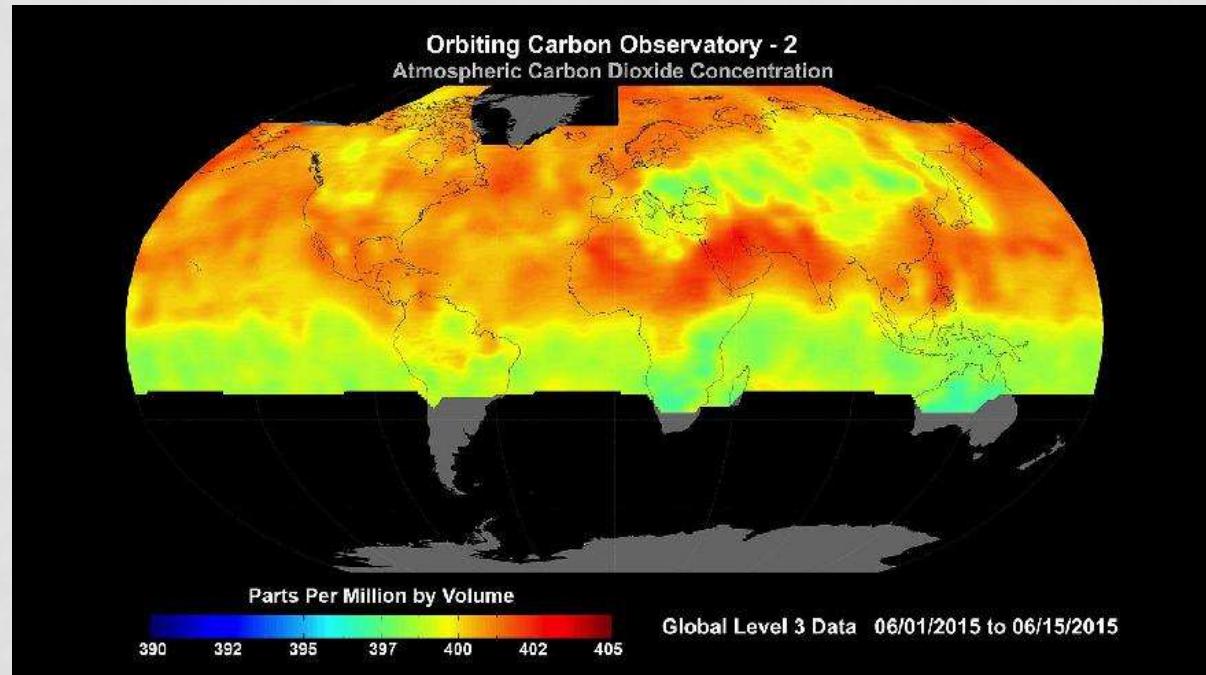
“If we could see CO₂ then maybe we’d have more incentive to do something about it.”

-Neil deGrasse Tyson, COSMOS

NASA: ORBITING CARBON OBSERVATORY

LAUNCHED JULY 2014

- “Watching the Earth breathe from space...”
- Measure carbon dioxide in the Earth's atmosphere every day
- Characterize CO₂ **sources and sinks** on regional scales



“Our goal is to get really good data so we can make informed decisions about how to manage carbon and carbon emissions in the future.”

-Annmarie Eldering, OCO-3 mission scientist at NASA's Jet Propulsion Laboratory

SESSION AGENDA

- Activity 1
Connecting Electrical Consumption to Coal & CO₂
- Activity 2
What is your carbon footprint?
- Activity 3
Secondary Carbon Footprints | Hidden energy
- Evaluation

<https://ie.unc.edu/cpes/resources/>

ACTIVITY 1: CONNECTING ELECTRICAL CONSUMPTION TO COAL AND CO₂

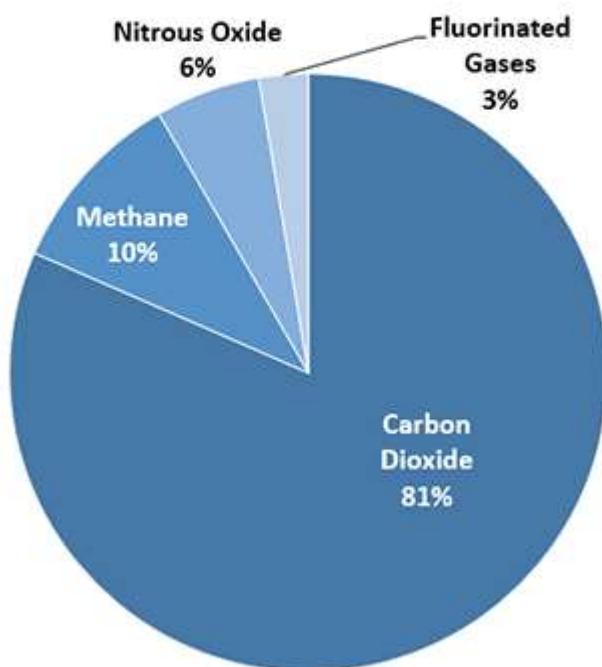


KILL A WATT DEVICE

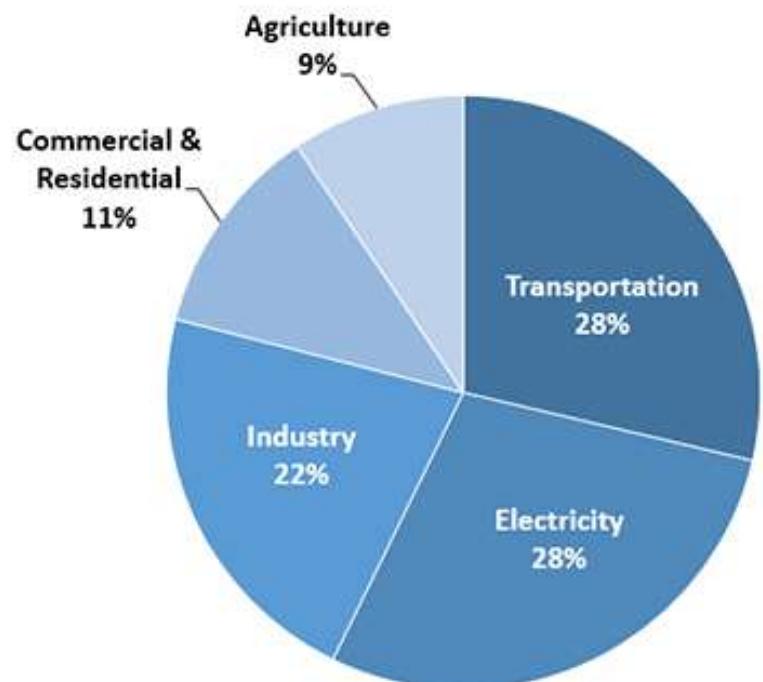


U.S. Inventory of Greenhouse Gases and Sources of Emissions, 1990-2016

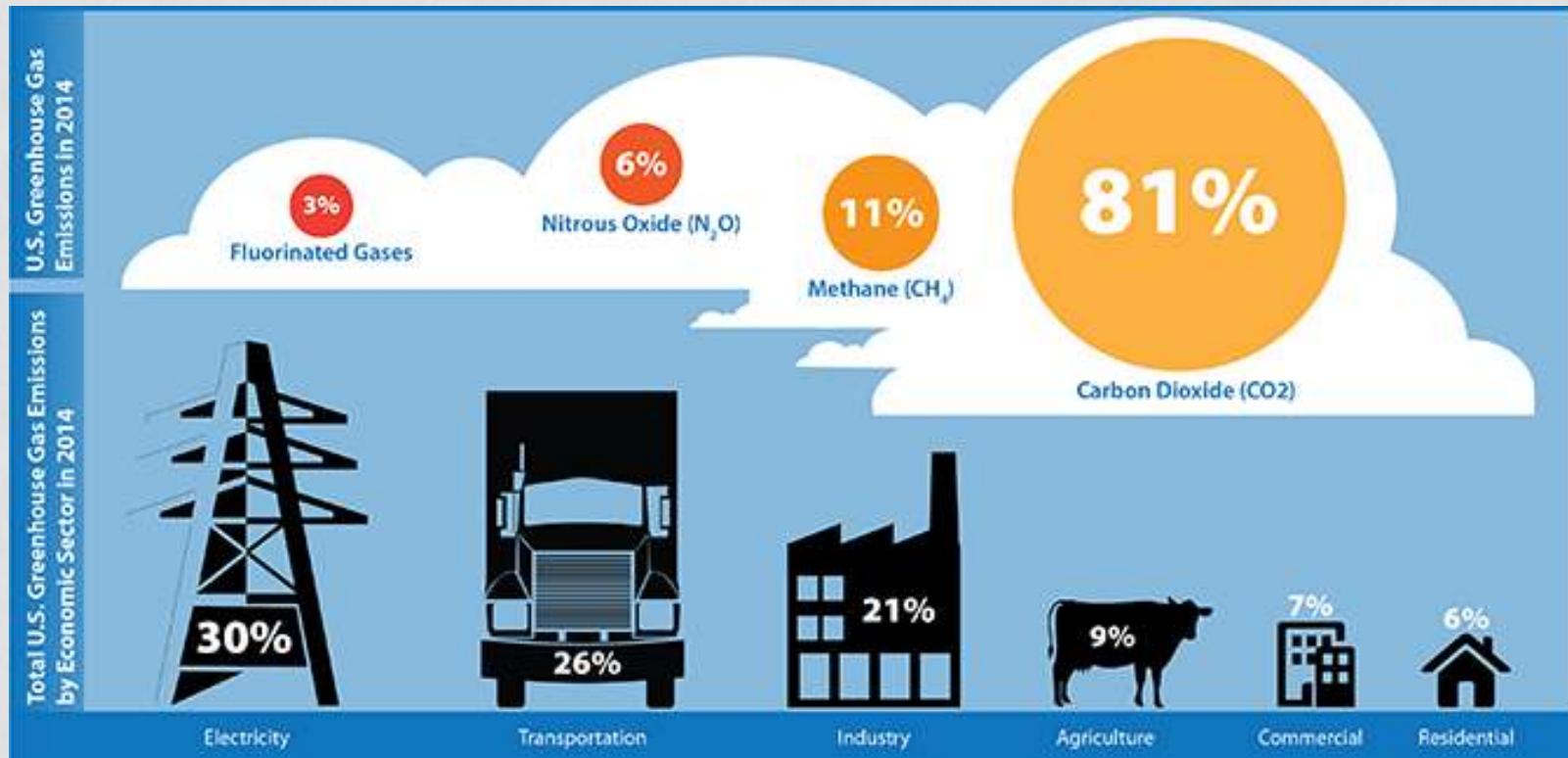
Overview of Greenhouse Gas Emissions in 2016



Sources of Greenhouse Gas Emissions in 2016

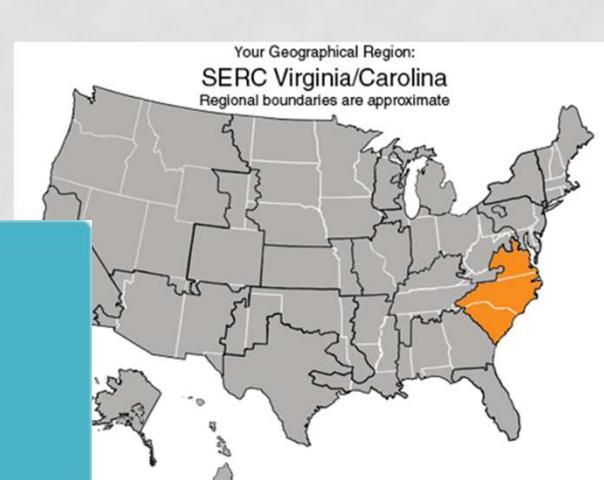
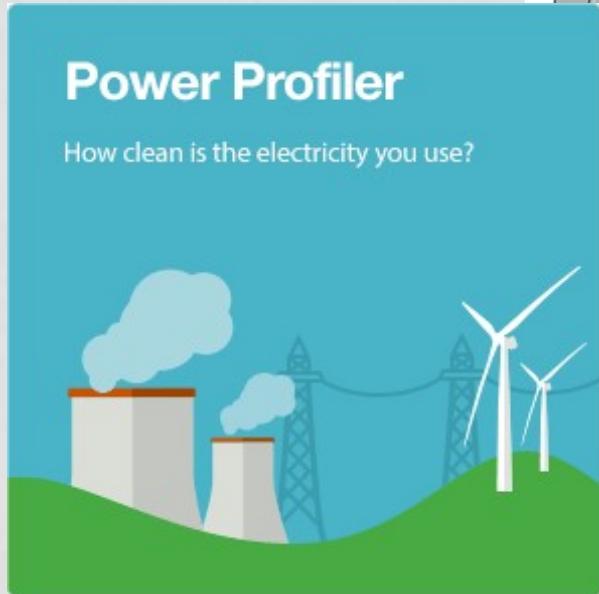


<https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>



<https://www3.epa.gov/climatechange/ghgemissions/inventoryexplorer/>

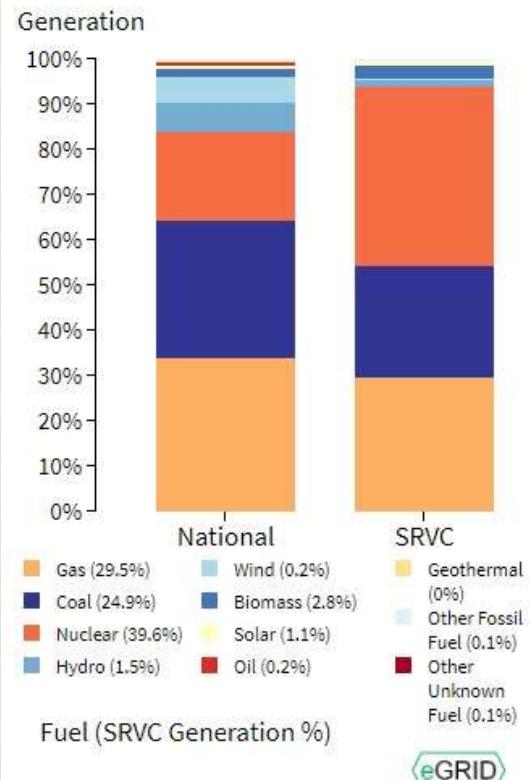
HOW CLEAN IS THE ELECTRICITY YOU USE?



In 2014 NC ranked 14th nationally in terms of its contribution of carbon dioxide emissions from the electricity sector. *US Energy Information Agency*

Fuel Mix

This chart compares fuel mix (%) of sources used to generate electricity in the selected [eGRID subregion](#) to the national fuel mix (%).



CARBON REDUCTION SOLUTIONS

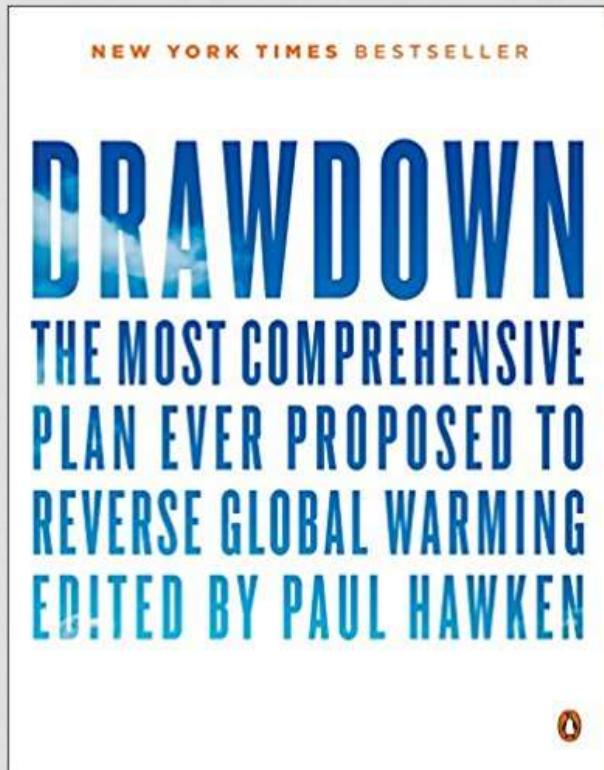
Reducing CO₂ emissions benefits:

- The Environment
- The Economy
- Society



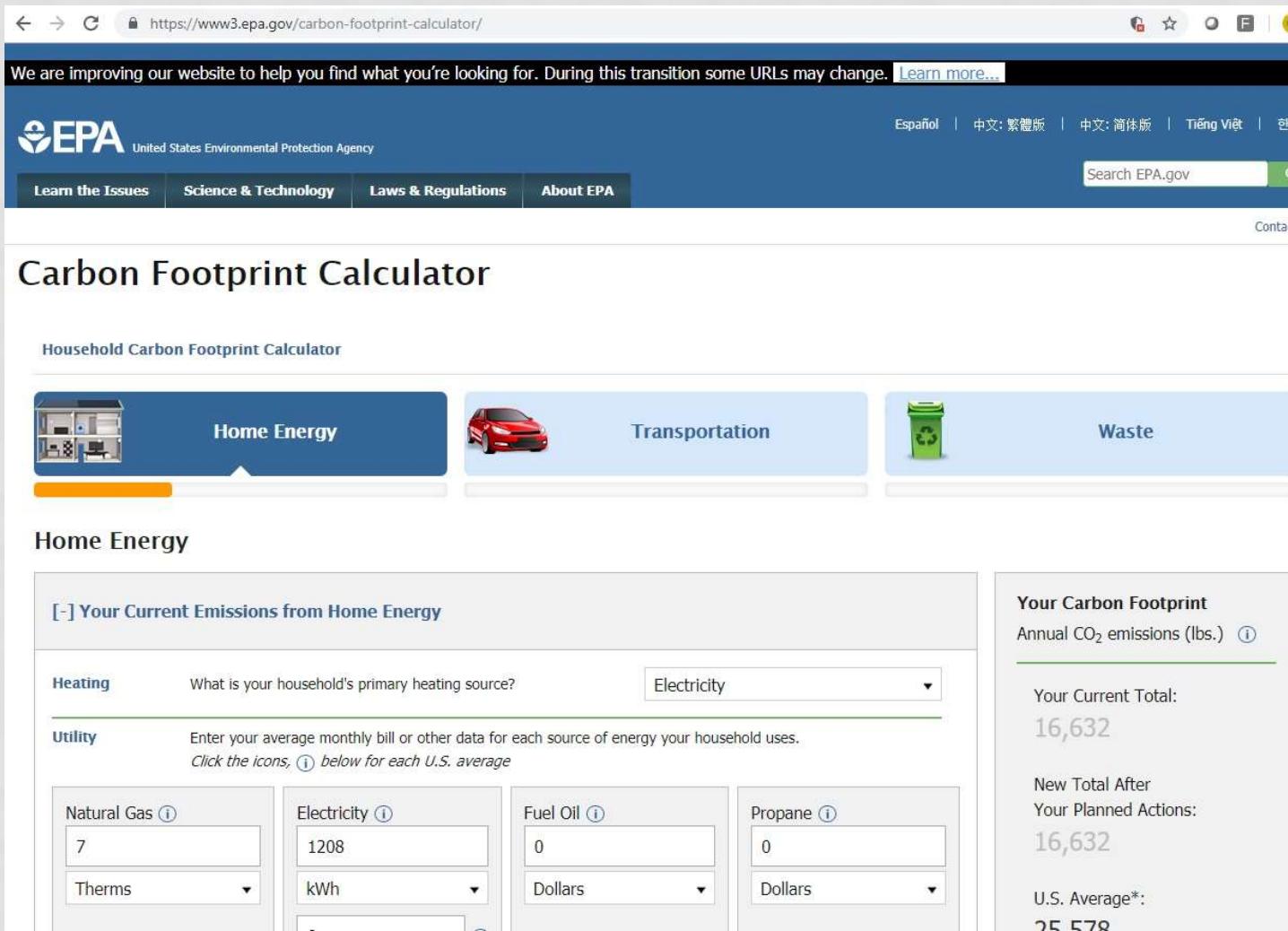
CARBON REDUCTION SOLUTIONS

Individual behaviors and consumer choices impact an individual's carbon footprint.



**Energy Conservation
Solid Waste Reduction
Transportation Choices
Civic Engagement**

ACTIVITY 2: CALCULATING YOUR CARBON FOOTPRINT



The screenshot shows the EPA Carbon Footprint Calculator website. At the top, a banner reads "We are improving our website to help you find what you're looking for. During this transition some URLs may change. [Learn more...](#)". The EPA logo and "United States Environmental Protection Agency" are on the left, with language links for "Español", "中文: 繁體版", "中文: 簡體版", "Tiếng Việt", and "한국어" on the right. A search bar is on the far right. Below the banner, the main title "Carbon Footprint Calculator" is displayed. A "Household Carbon Footprint Calculator" section is shown, with three categories: "Home Energy" (selected), "Transportation", and "Waste". The "Home Energy" section contains fields for "Heating" (set to "Electricity") and "Utility" (with a note to enter average monthly bills for Natural Gas, Electricity, Fuel Oil, and Propane). On the right, a summary box shows "Your Carbon Footprint: Annual CO₂ emissions (lbs.)" with a value of "16,632". It also shows "Your Current Total: 16,632", "New Total After Your Planned Actions: 16,632", and "U.S. Average*: 25,572".

We are improving our website to help you find what you're looking for. During this transition some URLs may change. [Learn more...](#)

EPA United States Environmental Protection Agency

Español | 中文: 繁體版 | 中文: 簡體版 | Tiếng Việt | 한국어

Search EPA.gov

Contact

Carbon Footprint Calculator

Household Carbon Footprint Calculator

Home Energy Transportation Waste

Home Energy

[-] Your Current Emissions from Home Energy

Heating What is your household's primary heating source? Electricity

Utility Enter your average monthly bill or other data for each source of energy your household uses. Click the icons, [\(i\)](#) below for each U.S. average

Natural Gas (i) 7 Therms	Electricity (i) 1208 kWh	Fuel Oil (i) 0 Dollars	Propane (i) 0 Dollars
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Your Carbon Footprint
Annual CO₂ emissions (lbs.) [\(i\)](#)

Your Current Total: 16,632

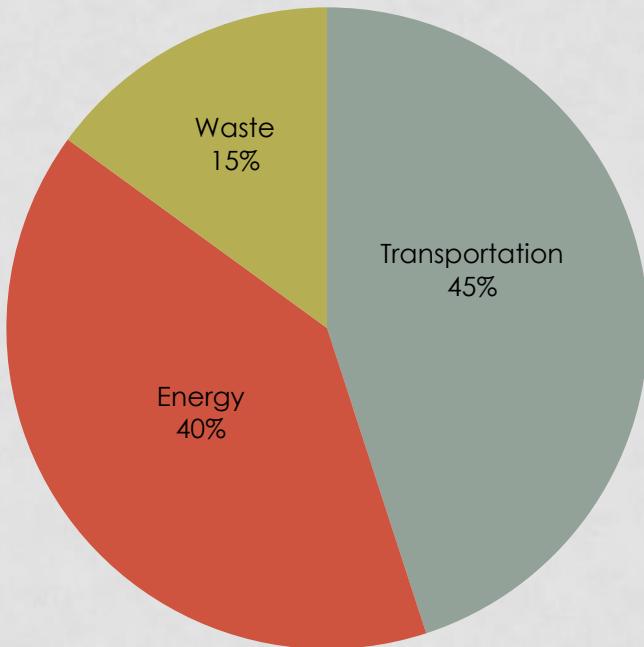
New Total After Your Planned Actions: 16,632

U.S. Average*: 25,572

ACTIVITY 2: CALCULATING YOUR CARBON FOOTPRINT

- **THINK-PAIR-SHARE:** Find a neighbor who has a different size footprint and discuss the reason(s) for the difference.
- What aspect(s) of your lifestyle were not taken into account by the EPA carbon calculator?
- How would your carbon footprint be altered if the online calculator took this into account? Would it be bigger or smaller?
- What can you do to reduce your carbon footprint?

WHAT IS YOUR “CARBON FOOTPRINT?”



Pie Chart

- On the back of your worksheet draw a pie chart that shows what proportion of your household's CO₂ emissions comes from transportation, energy, and waste.

ACTIVITY 3: SECONDARY CARBON FOOTPRINTS | HIDDEN ENERGY

- Consider the following as you observe this product:
 - Raw materials
 - Manufacturing
 - Packaging, transport, and storage
 - Marketing
 - Use/Lifespan
 - Disposal

HIDDEN ENERGY

- Finally, indicate the steps on your diagram that use energy and result in CO₂ emissions.



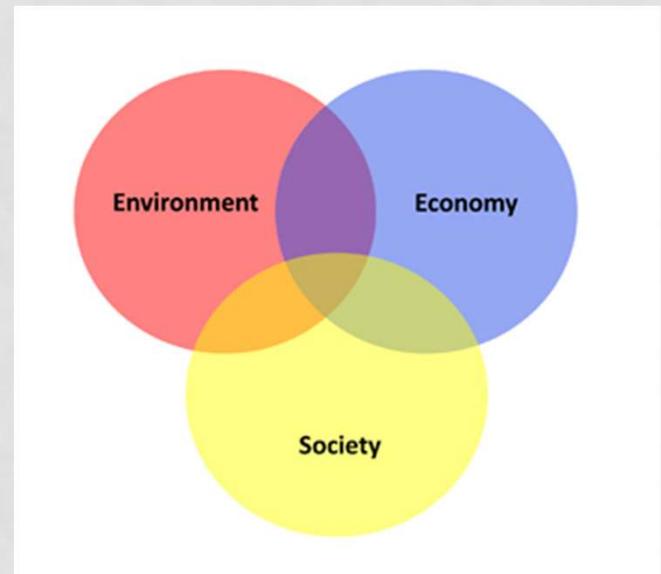
SINGLE-SERVE ORANGE JUICE



SUSTAINABILITY ANALYSIS | EXTENSION #1

For your item consider the following:

- **Environmental Impact**
 - Carbon footprint
 - Water footprint
 - Air and water pollution
 - Biodiversity
- **Societal (Human) Impact**
 - Workers
 - Consumers
- **Economic Impact**



SUSTAINABILITY SCALE

UNSUSTAINABLE



SUSTAINABILITY SCALE

UNSUSTAINABLE



SUSTAINABLE



SUSTAINABILITY ANALYSIS | EXTENSION #2

View your object **from the perspective of the manufacturer:**

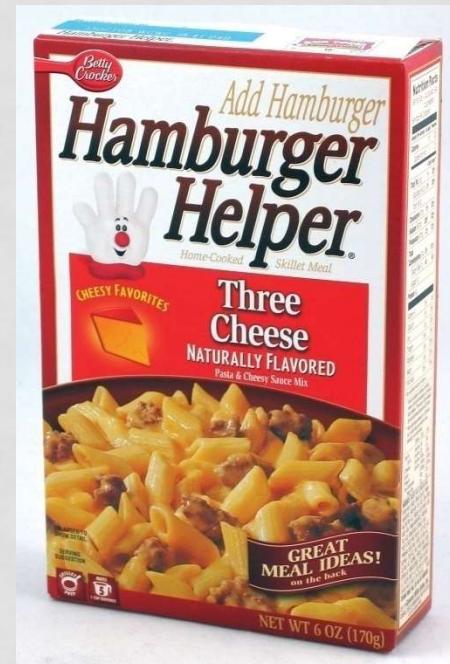
- How could the carbon footprint of your object be reduced?
- How could the object be produced and/or designed with sustainability in mind?
- What other positive benefits might result from these changes?
- What negative consequences might arise from these changes?

MANUFACTURERS: REDUCED PACKAGING



MANUFACTURERS: PRODUCT REDESIGN

- Saves 890,000 lbs/yr in paper fiber
- Reduces greenhouse gases by 11%
- Eliminates 500 trucks on the road each year.
- Increases shelf pack-out by 20%, allowing retailers to sell the same amount of product in less space.



“Compacting noodles proves profitable” <http://www.packworld.com/package-24567>

MANUFACTURERS: UPCYCLING

Terra Cycle uses packaging waste to make new products such as shower curtains, umbrellas, pencil cases, totes, lunchboxes and backpacks -- a process known as **upcycling**.



SUSTAINABILITY ANALYSIS | EXTENSION #3

View your object **from the perspective of the consumer:**

- Is this an item that you need or want?
- What actions could you take as a consumer to reduce the carbon footprint of this object?
- How could the object be utilized/consumed more sustainably?
- When presented with choices in brands when purchasing this type of item, what factors will influence which item (brand) you select?

CONSUMERS: REDUCE, REUSE, RECYCLE



CONSUMERS: CONSIDER ALTERNATIVES



CONSUMERS: CARBON LABELING



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