



## ورشة عمل

# How to Calculate and Reduce the Amount of Carbon Dioxide Emissions to achieve Sustainability Goals

١٦ - نيسان - ٢٠٢٣

اعداد

المدرس الدكتور هاله حسن محمود

مركز الحاسبة - وحدة ضمان الجودة وتقويم الاداء

# *Sustainable Development*

*Sustainable development* is an organizing principle for meeting human development goals while simultaneously sustaining the ability of natural systems to provide the natural resources and ecosystem services on which the economy and society depend.

The desired result is a state of society where living conditions and resources are used to continue to meet human needs without undermining the integrity and stability of the natural system. Sustainable development can be defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs

# Sustainable Development Goals (SDG)



# SUSTAINABLE DEVELOPMENT GOALS (SDG)



# Sustainable Development Goals (SDG)

1. *End poverty* in all its forms everywhere
2. *End hunger*, achieve food security and improved nutrition and promote sustainable agriculture
3. *Ensure healthy* lives and promote well-being for all at all ages
4. *Ensure inclusive and equitable quality* education and promote lifelong learning opportunities for all
5. *Achieve gender equality* and empower all women and girls
6. *Ensure availability and sustainable* management of water and sanitation for all

# SUSTAINABLE DEVELOPMENT GOALS (SDG)

7. *Ensure access to affordable*, reliable, sustainable and modern energy for all
8. *Promote sustained*, inclusive and sustainable economic growth, full and productive employment and decent work for all
9. *Build resilient infrastructure*, promote inclusive and sustainable industrialization and foster innovation
10. *Reduce inequality* within and among countries
11. *Make cities and human settlements* inclusive, safe, resilient and sustainable
12. *Ensure sustainable consumption* and production patterns
13. *Take urgent action* to combat climate change and its impacts\*



# Sustainable Development Goals (SDG)

- 14. Conserve and sustainably** use the oceans, seas and marine resources for sustainable development
- 15. Protect, restore and promote** sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- 16. Promote peaceful** and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- 17. Strengthen the means of implementation** and revitalize the global partnership for sustainable development





## *Why should you care?*

The world's seven billion people consume varying amounts of the planet's resources. According to the United Nations' predictions, global population could reach 9.7 billion people by 2050, and over 11 billion by 2100. Growing populations drive up emissions and deplete the planet's resources.

Increased greenhouse gas emissions have a direct impact on global warming. It accelerates climate change with disastrous effects on our planet. All of us can contribute to fighting global warming by making climate-friendly choices in our daily lives.

## *How to limit your carbon footprint?*

Understanding your carbon footprint can help limit the impact of your consumption on the environment. There are different online solutions to help you estimate your carbon footprint.

Small changes can make a big difference in the long run, for example when it comes to transportation, food, clothing, waste, etc. Here are some tips:

When you drive your car, buy a pair of sneakers or grill a steak, you contribute to the emission of carbon dioxide and other greenhouse gases into the atmosphere. It's your carbon footprint. Many countries, institutions and companies have committed to reduce their emissions

Greenhouse gases are emitted through the production and consumption of goods and services. Carbon footprint is a concept used to quantify the impact of an activity, a person or a country on climate change.

How much carbon is emitted to produce your t-shirt, meal or phone? The amount will depend on production and consumption choices. If we take the example of transport, [taking the plane emits 285g of carbon per kilometre, compared to 104g for a car and 14g for a train.](#) The same goes for the type of meat or fish you eat or the type of jeans you buy.

# 35 WAYS TO REDUCE YOUR CARBON FOOTPRINT

## *How to Reduce Your Carbon Footprint Through Transportation*

### *1. Drive less*

Driving a car is a [major source of greenhouse gasses](#). Cutting down on the miles you drive is one of the best things you can do for reducing carbon emissions. Organize shopping trips to get more done on each outing, walk or bike when distances are shorter, and use public transportation as much as possible.

### *2. Go easy on the acceleration and brakes*

How much you drive is not the only factor to consider. [Acceleration burns more fuel](#), so applying the brakes and speeding up is less fuel efficient than maintaining a smooth, even speed.

### *3. Regularly service your car and keep tires properly inflated*

When your car runs efficiently, it [uses less energy](#). Clean oil and belts and timing gears that are perfectly adjusted will help you get the most out of every gallon of fuel. Also, when properly inflated, tires require less energy to achieve and maintain speed while driving. If the pressure is too low, your car is sluggish and burns more gasoline than necessary.

# 35 WAYS TO REDUCE YOUR CARBON FOOTPRINT

## *How to Reduce Your Carbon Footprint Through Transportation*

### **4. *Carpool***

Sharing a ride to work every day or going shopping can reduce your carbon footprint by about 2,000 pounds of CO<sub>2</sub>e every year.

### **5. *Use cruise control***

You may not realize how much your speed varies when you are driving. We tend to speed up in certain conditions and slow down in others. Using cruise control allows your car's computer to accelerate smoothly and carefully maintain an even speed.

### **6. *Cut down on air conditioning***

Cut usage of the most power-intensive appliance in your car. Running your air conditioning less frequently or raising the temperature so that your system does not work as hard will reduce your carbon footprint.

# 35 WAYS TO REDUCE YOUR CARBON FOOTPRINT

## *How to Reduce Your Carbon Footprint Through Transportation*

### *7. Consider purchasing a hybrid or electric vehicle*

It is easy to tell people to drive less, but that might not be possible in your situation. Driving an electric vehicle and doing your [electric car charging at home](#) can help eliminate the greenhouse gasses that your conventional car produces. Not all homes are wired for an electric car charging station. Rewiring may be expensive. Another option is to [find an electric car charging station](#) and power up there.

### *8. Avoid flying if possible*

Traveling by air spews [more greenhouse gas](#) than traveling by car. To help put this in perspective, a single round-trip flight across the U.S. produces [roughly 2 tons of carbon dioxide per person](#), which equals about 10 percent of a U.S. citizen's annual carbon footprint. If you can fly less often, it's an effective way to reduce your carbon footprint.

### *9. If you must, fly nonstop*

Taking off and landing burns more jet fuel than simply cruising at altitude. You can reduce your carbon footprint by avoiding multiple stops and plane changes on your journey. You will also reduce the wear and tear of travel on you

# 35 WAYS TO REDUCE YOUR CARBON FOOTPRINT

## *How to Reduce Your Carbon Footprint Through Food*

### ***10. Eat less meat and stick with fruits, veggies, grains and beans***

Raising animals [requires more energy](#) than growing plants. When you consider using power to produce and ship their food, then ship them to processing and eventually to market, you are talking about a sizable carbon footprint. One of the delicious and healthy ways to reduce your carbon footprint is to switch to [high-protein vegetables and certain grains](#) for some of your meals.

### ***11. Choose organic and local foods that are in season***

It takes energy to plant, cultivate and harvest food. It takes even more to transport it for processing, storage and then distributing it to markets. If you choose , you eliminate that part of the energy use.

### ***12. Reduce your food waste***

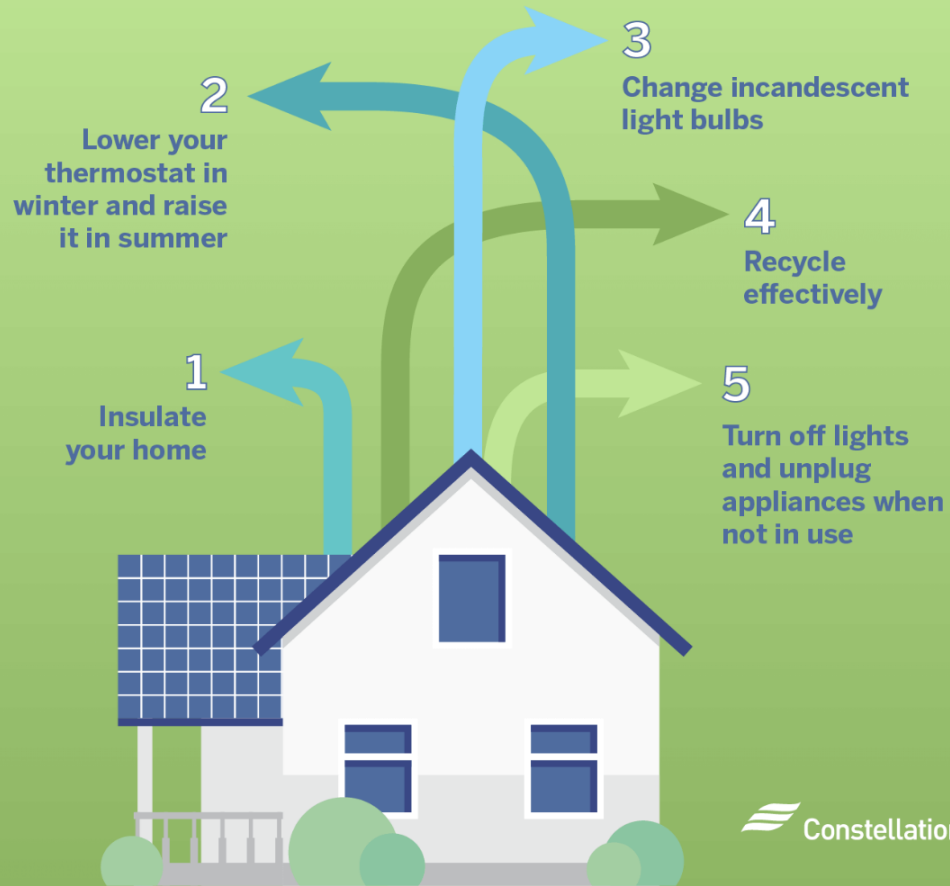
Buying more food than you need and throwing it away wastes the food item itself, along with all the resources used to get it to you.

### ***13. Compost***

Dealing with waste consumes energy. A garbage truck needs to pick it up from your



# How to Reduce Your Carbon Footprint at Home



 Constellation.

15. Turn down your water heater to 120°F

Another area to look for ways to reduce your carbon footprint is by changing habits at home. Most people find that when they turn down their water heater to 120°F, they don't notice the difference when taking a shower or bath.

16. Lower your thermostat in winter and raise it in summer

When it comes to indoor temperatures, accepting a wider range is one thing you can do to reduce your carbon footprint. If you [adjust your thermostat](#) to allow your home to be five degrees colder in the winter and five degrees warmer in the summer, you will cut your energy usage.

17. Turn off lights and unplug appliances when not in use

Many people waste energy by leaving unused lights on for hours. Another common energy-wasting habit is leaving appliances plugged in when not in use. Modern appliances in stand-by mode draw small amounts of power all the time. When you [unplug appliances](#), you can save energy.

18. Change incandescent light bulbs

Incandescent light bulbs produce more heat than light. Switching to [LED or CFL bulbs](#) eliminates this waste, while providing a longer useful life. The result is that you replace them less frequently and send less waste to landfills. CFL bulbs are made

How to reduce your carbon footprint when shopping

26. Buy only what you need

We live in a time of abundance, so it is easy to fall into the habit of buying things on a whim that you may end up not really needing. Be mindful when shopping to avoid wasteful purchases that could drive up your carbon footprint.

27. Bring a reusable bag

Plastic bags are made from fossil fuels and add to pollution of the planet—particularly in our oceans. Reusable bags are an easy way to eliminate this waste.

28. Invest in quality products that last

Buying cheap, disposable items, from furniture to clothing to kitchen equipment, might seem like a way to economize. You may end up having to replace these items often as they break and wear out. It is better to spend a bit more for lasting quality. That means less energy used in manufacturing and less waste for landfills.

29. Don't buy fast fashion

Fast fashion is inexpensive clothing items that follow the latest trends. Retailers can bring them to the market in weeks, but at a cost. Fast fashion uses [more water and energy](#) for manufacturing and shipping, plus the products typically don't last as long.

30. Buy vintage or recycled clothing

In addition to donating used clothing and furnishings, you can help by participating on the other side of the transaction. Buy things people are donating and recycling. Oftentimes, you can find one-of-a-kind items at a fraction of the cost of new.

31. Support and buy from companies that are environmentally responsible and sustainable

Do business with companies that are sourcing materials and manufacturing products in an energy-efficient, resource-aware way. [Companies committed to sustainability](#) are doing their part, as you do your part, in reducing carbon footprints. For example, Constellation is the leading carbon-free energy supplier in the country and is working towards becoming 100 percent carbon-free by the year 2040.

How to reduce your carbon footprint by taking action

32. Purchase carbon offsets

A carbon offset is a certificate you can trade to fund ways for reducing carbon emissions that you cannot do yourself. You are offsetting your use of energy with energy-saving spending. Many power companies offer [renewable energy certificates](#) that make the purchase easy.

33. Talk to family and friends about climate change issues and carbon footprints

While no one wants to be lectured or scolded, sharing tips for reducing carbon footprints can magnify the impact you make in reducing energy consumption. You could be helping them save money, too.

34. Find local climate action groups

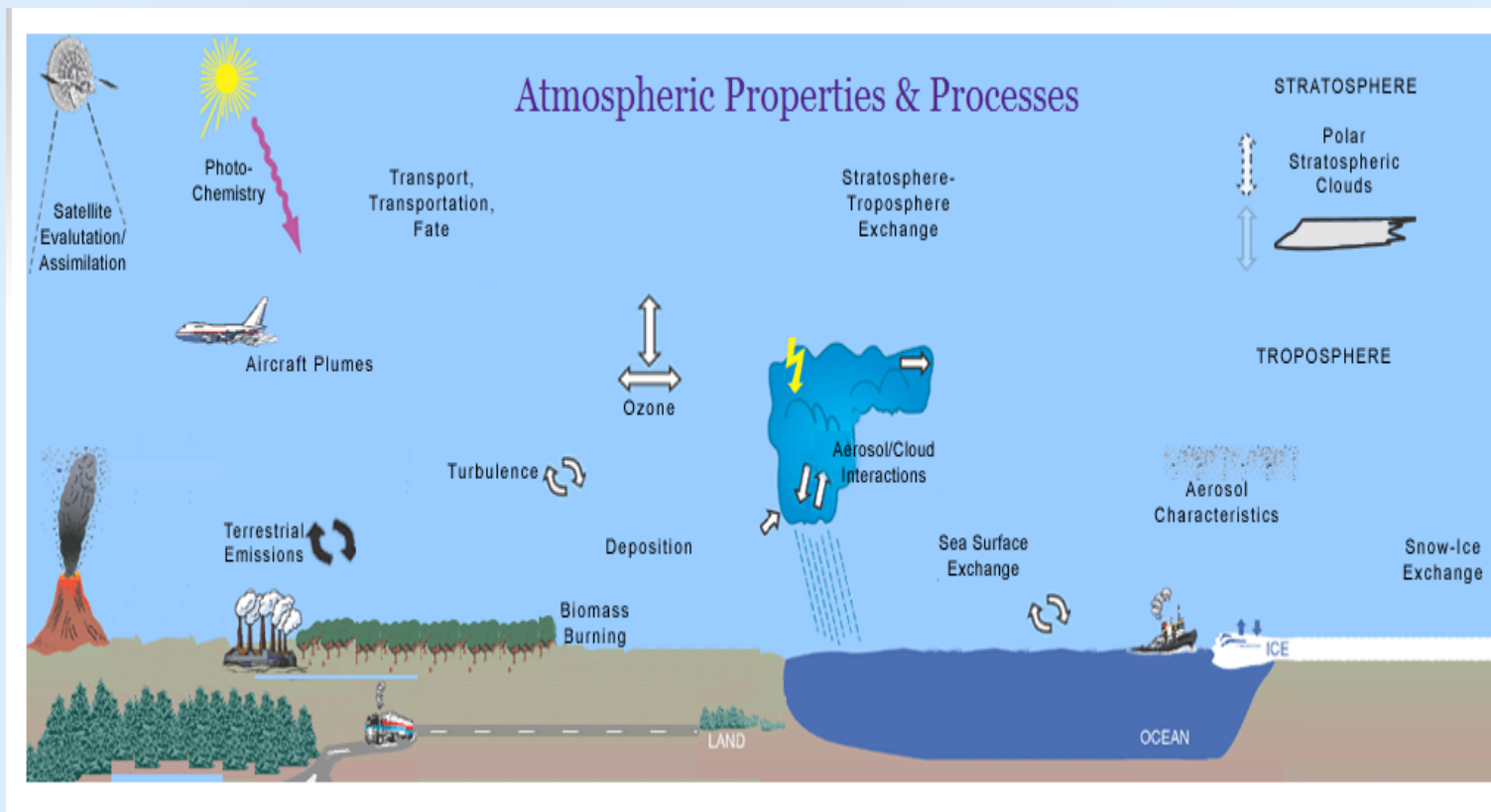
Networking with like-minded people is a way to share ideas and form grassroots groups for more ways to reduce your carbon footprint. Working together, you will be able to raise awareness, explaining why reducing your carbon footprint is important.

35. Speak to your local representatives and vote on policies that protect the environment

Get involved with the government to influence regulation and encourage adopting policies and practices that protect the environment in your community.

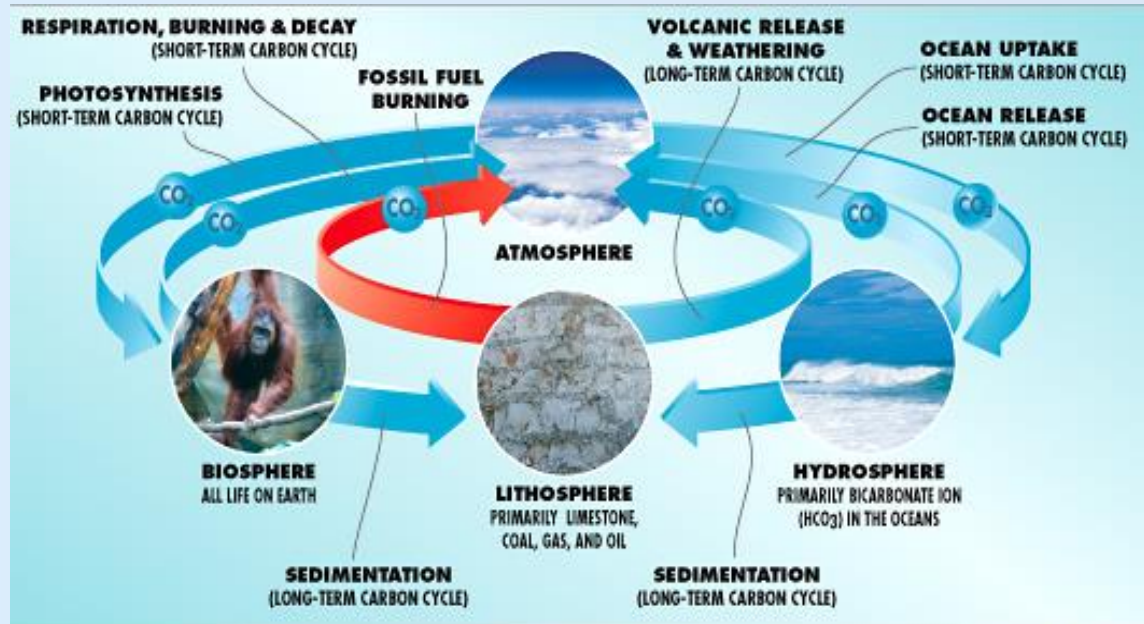
# REDUCING YOUR CARBON FOOTPRINT

## Atmospheric Properties & Processes





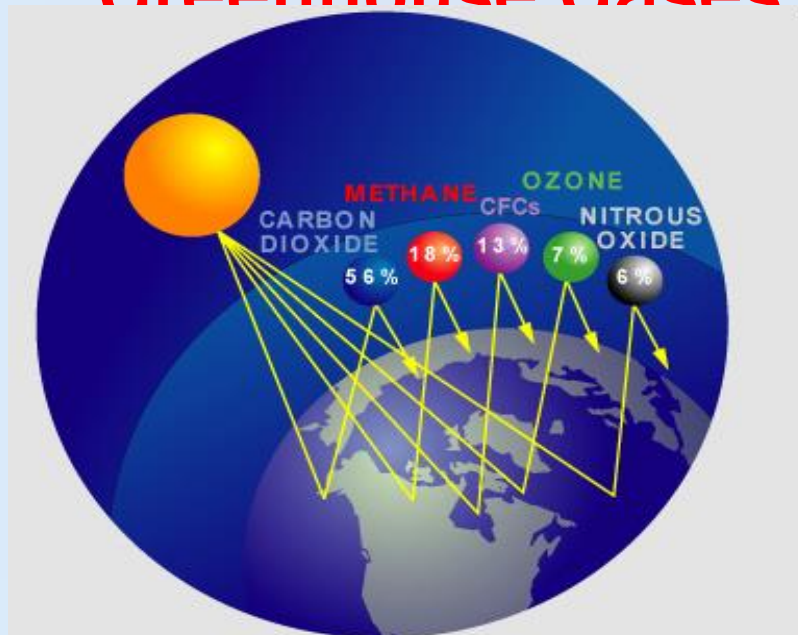
# Human Impact on the Carbon Cycle



“The red arrow, representing rapid fossil fuel burning, indicates the main way in which humans affect the natural carbon cycle. Carbon dioxide ( $\text{CO}_2$ ) levels are increasing because the natural system cannot keep pace with this new emission source. The natural processes that permanently remove this additional carbon - ocean uptake and sedimentation - work extremely slowly.”



# Major Human-Produced Greenhouse Gases



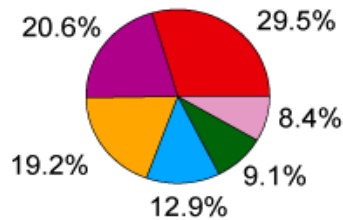
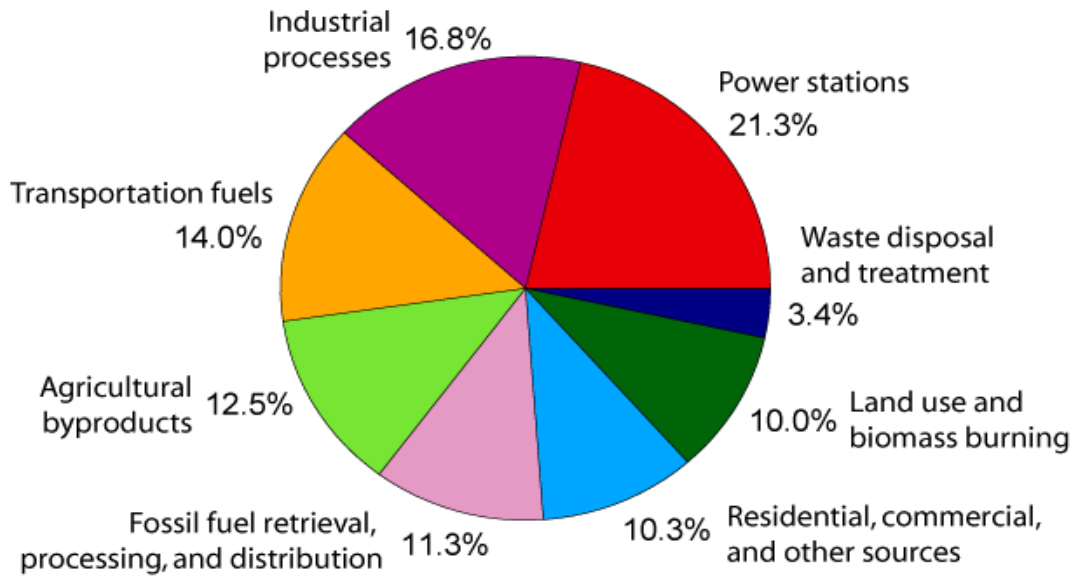
“Many natural and human-made gases contribute to the greenhouse effect that warms the Earth's surface. Water vapor ( $\text{H}_2\text{O}$ ) is the most important, followed by: Carbon Dioxide ( $\text{CO}_2$ ), Methane ( $\text{CH}_4$ ), and Chlorofluorocarbons (CFCs).

This diagram shows the relative importance of the major human-produced greenhouse gases to current warming.  $\text{CO}_2$  is the most important followed in descending order by  $\text{CH}_4$ , CFCs, Ozone ( $\text{O}_3$ ), and Nitrous Oxide ( $\text{N}_2\text{O}$ ).”

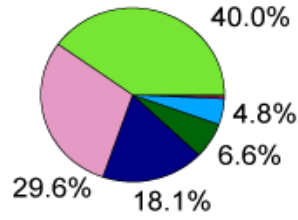


# Human Activity and Greenhouse Gases – Estimation Using 2000 Data

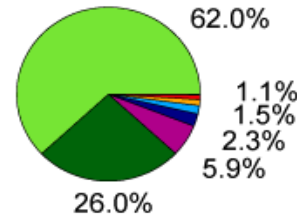
## Annual Greenhouse Gas Emissions by Sector



**Carbon Dioxide**  
(72% of total)



**Methane**  
(18% of total)



**Nitrous Oxide**  
(9% of total)

# What You Can Do to Reduce Your Footprint

Whether you are at home, buying food, on the road or at work, the energy you use in your daily life has an impact on climate change.



# Take Action - At the Office



- Recycle glass, paper, aluminum and plastics.
- Buy recycled paper products and supplies.
- Telecommute if possible.
- Turn down the air conditioning.
- Shutting off your computer at closing time will reduce its carbon dioxide emissions by 83%.
- Install a programmable light timer that reduces light usage during off-peak hours.
- Install a programmable thermostat

## Take Action - Inside the Home

Get a home energy audit to find out if your home is poorly insulated or energy efficient. Many utility companies offer this service for free.

- Replace a regular incandescent light bulb with a compact fluorescent bulb (CFL). Check for possible rebates from your utility company.
- Move your thermostat down 2° in the winter and up 2° in the summer.
- Clean or replace filters on your furnace and air conditioner.
- Install window shading.
- Install a programmable thermostat.



# Take Action - Inside the Home



- Use less hot water, by installing a low flow showerhead and washing your clothes in cold or warm water, instead of hot water.
- Turn off and unplug appliances not in use. Avoid using your appliances during peak hours, from 4pm to 6pm.
- Turn down the thermostat on the water heater and wrap your older model with a water heater blanket.
- Switch to Green Power.

# Take Action - In the Kitchen



- Mind the tap. Conserve water in the kitchen and around the house and garden.
- Buy fresh foods instead of frozen. Frozen food uses 10 times more energy to produce and deliver.
- Avoid heavily packaged products and cut down on your garbage. Give back that extra napkin or sugar packet. Carry the gallon of milk by the handle instead of using a bag.
- Buy organic foods. Organic soils capture and store carbon dioxide at much higher levels than soils from conventional farms.
- BYOB, Bring Your Own Bag, when you visit the grocery store.
- Clean your refrigerator's coils and give it some breath

# Take Action – On the Road

- Cut back on driving by walking, biking or taking public transportation.
- Start a carpool with your coworkers, classmates or friends.
- Keep your car tuned up and your tires properly inflated. Giving your engine a tune-up can improve gas mileage by more than 4%. Replacing a clogged air filter can boost efficiency by 10%. And keeping your tires properly inflated can improve gas mileage by more than 3%.
- When purchasing a car, choose a fuel efficient vehicle.
- Fly less and purchase "Carbon Offsets" to balance out your travel.
- Travel Green. When going on vacation or on a business trip, take your "green principles" with you.





# What's the Size of Your Personal Footprint?

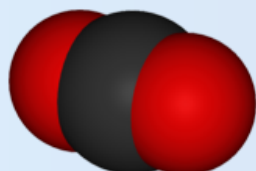


Earth Day Network Footprint Calculator  
[www.earthday.net/footprint/index.html](http://www.earthday.net/footprint/index.html)

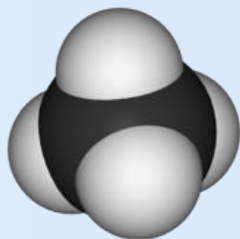
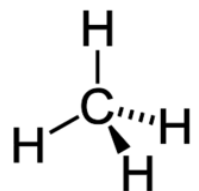
How much land area does it take to support your lifestyle?

Find out your Footprint, discover your biggest areas of resource consumption, and learn what you can do to tread more lightly on the earth.

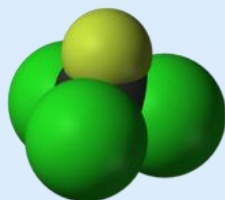
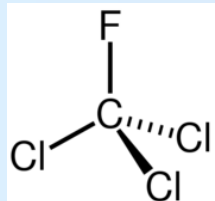
# LEARN MORE ABOUT MOLECULES - GREENHOUSE GASES



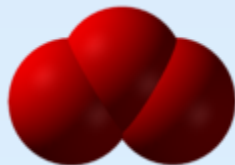
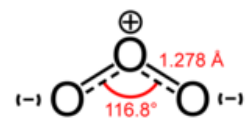
*Carbon Dioxide (CO<sub>2</sub>)*



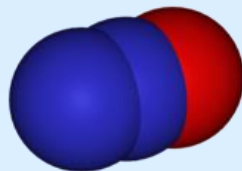
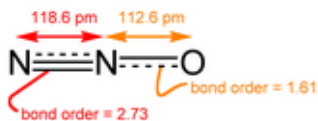
*Methane (CH<sub>4</sub>)*



*Chlorofluorocarbons (CFCs)  
(example:  
Trichlorofluoromethane)*



*Ozone (O<sub>3</sub>)*



*Nitrous Oxide (N<sub>2</sub>O)*

## Carbon dioxide (CO<sub>2</sub>)

Carbon dioxide (CO<sub>2</sub>) is the primary greenhouse gas emitted through human activities.

## Green house and human

Human emissions of carbon dioxide and other greenhouse gases – are a primary driver of climate change – and present one of the world's most pressing challenges. This link between global temperatures and greenhouse gas concentrations – especially CO<sub>2</sub> – has been true throughout Earth's history.

# GREENHOUSE GAS EQUIVALENCIES CALCULATOR

The Greenhouse Gas Equivalencies calculator allows you to *convert emissions or energy data to the equivalent amount of carbon dioxide (CO<sub>2</sub>) emissions from using that amount.*

The calculator helps you translate abstract measurements into concrete terms you can understand, such as the annual emissions from cars, households, or power plants.

This calculator may be useful in communicating your greenhouse gas reduction strategy, reduction targets, or other initiatives aimed at reducing greenhouse gas emissions.

<https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>



# STEP 1 - ENTER AND CONVERT DATA

Select data to convert: ⓘ

Energy data ⓘ

Emissions data

Enter data:

Unit

Amount

Gallons of gasoline

Gasoline-powered passenger vehicles ⓘ

Kilowatt-hours avoided ⓘ

Kilowatt-hours used ⓘ

MCF of natural gas

Therms of natural gas

122

Convert data

Clear Fields

There are two options for entering data into this calculator: **energy data** or **emissions data**. When you enter energy data, the calculator converts these values into carbon dioxide-equivalent greenhouse gas emissions based on emission factors for energy consumption or electricity reductions. Then, it provides equivalent ways to express those emissions. When you enter emissions data, the calculator provides equivalent ways to express those emissions.

## Step 1 - Enter and convert data

### Select data to convert:

- Energy data
- Emissions data

# ENERGY DATA

## unit

- Gallons of gasoline
- Gasoline-powered passenger vehicles
- Kilowatt-hours avoided
- Kilowatt-hours used
- MCF of natural gas
- Therms of natural gas



# STEP 2 - VIEW RESULTS

## Step 2 - View results

1.1 Metric Tons of Carbon Dioxide (CO<sub>2</sub>) equivalent

This is equivalent to greenhouse gas emissions from:

0.237 gasoline-powered passenger vehicles driven for one year ?



2,730 miles driven by an average gasoline-powered passenger vehicle ?



This is equivalent to CO<sub>2</sub> emissions from:

124 gallons of gasoline consumed ?



108 gallons of diesel consumed ?



1,217 pounds of coal burned ?



0.015 tanker trucks' worth of gasoline ?



0.139 homes' energy use for one year ?



0.214 homes' electricity use for one year ?



0.006 railcars' worth of coal burned ?



2.5 barrels of oil consumed ?



44.9 propane cylinders used for home barbeques ?



0 coal-fired power plants in one year ?



0 natural gas-fired power plants in one year ?



133,807 number of smartphones charged ?





**Save energy at home**



**Walk, bike, or take public transport**



**Eat more vegetables**



**Consider your travel**



**Reduce, reuse, repair, recycle**



**Change your home's source of energy**



**Switch to an electric vehicle**



**Make your money count**