ISSUES AND FACTS and what citizens can do individually.
Environmental Science is a huge field of upmost importance to the survival of humans.
Three of the main issues are pollution, global warming and biodiversity all interrelated.

Considering that postponing mowing to allow the bloom of clover and wildflowers feeds and promotes livelihood of honeybees which pollinate our other wanted plants. Dr. Doug Tallamy, author of Bringing Nature Home, why landscaping with native plants is the sustainable choice for birds, insects, and people. He suggests the best thing to do is Plant Oaks and native plants. 96% of North America's landbirds need insects to feed their young. Native plants produce four times as much insect biomass compared to non-native plants. If we want to continue to see birds in our yards and natural areas, we must provide the resources they need to reproduce.
Support your local birds by trading ornamental plants for natives. Plant an oak tree — oaks support over 500 species of butterflies and moths (aka baby bird food).

Suburban lawns made up of non-native grasses are almost as valuable to wildlife as a parking lot. In the United States, we have converted an estimated 32 to 40 million acres into suburban lawns. We mow, apply fertilizer and pesticides, and remove every "weed" that mars the monoculture of sterile lawn.
Share your lawn with wildlife — create a "wild" unmowed corner, incorporate native plants into your landscaping, or create a native hedgerow.

Habitat loss and fragmentation are the greatest threats to bird populations. Of our beloved Neotropical migrants, 127 species are in decline, with 60 species experiencing a severe decline. Help reverse these trends by providing a "convenience store" in your yard — a place for migrants to refuel on their long journey. Plant shrubs and trees that bloom early (red oak, willows, elm, hickory, red-osier dogwood) for spring and produce autumn berries (dogwood, red cedar, viburnum, elderberry) for fall. Birds and bats also eat millions of mosquitoes.

What are the best evergreen trees for birds?
The selection of conifers for feeding birds is quite broad. The seed-filled cones of **spruces**, firs, pines and many others appeal to nuthatches, finches, grosbeaks, chickadees and other seed-eating birds. Junipers and yews provide a feast of berrylike cones for species like waxwings, robins, bluebirds and sparrows. Norway spruce also produces the most oxygen and does so year around. Norway Spruce is second and both provide tremendous shelter especially to nesting birds. Birds love the thick stiff branches and prickly needles for concealing nests, providing safe roosting sites, and deterring predators. Spruce are a favorite nesting site for robins, magpies, several species of sparrow, and a variety of other birds. From nuthatches and woodpeckers to chickadees and titmice, a variety of birds liked to congregate within the Blue Spruce's branches. A host of other birds, including Eastern Towhees, Dark-eyed Juncos and White-throated Sparrows liked to feed on the ground beneath the tall trees. Pines produce the least oxygen and offer less protection for birds. Norway Spruce can also be easily reproduced from simple clippings. They also smell and look nice and provide shade, wind break and beauty year around.

pollution
Looking at history in the 1700s, the water was so pure one could see the bottom of Lake St Clair and the Detroit River. Now the lakes and ground water have been polluted and some Great lakes fish are unsafe to eat. Obviously, it is up to the regional and city water people to deal with these issues but citizens can also help by not releasing toxins into our sewers or ground. The air was pure in past centuries but now mainly due to industrial and private burning of fossil fuels emissions from gasoline and diesel automobiles must be dealt with. Some progress is being made. Volcanic eruptions and occasional forest fires happen. The latter is most now helped along by climate warming caused by CO_2 in the atmosphere. This often-caused drought making vegetation tinder boxes.
Warren citizens can refrain from outdoor burning, including using solar barbeques, use low emission cars of which the best is the Hydrogen fuel cell car next the electric charged by solar power or at least propane or natural gas-powered vehicles. Bicycles and trikes and walking are good health choices also.

Data sources Data from the global burden of disease 2019 study, observational fine particulate matter and population data from National Aeronautics and Space Administration (NASA) satellites, and atmospheric chemistry, aerosol, and relative risk modelling for 2019.
Results Globally, all cause excess **deaths due to fine particulate and ozone air pollution are estimated at 8.34 million** (95% confidence interval 5.63 to 11.19) deaths per year. Most (52%) of the mortality burden is related to cardiometabolic conditions, particularly ischaemic heart disease (30%). Stroke and chronic obstructive pulmonary disease both account for 16% of mortality burden. About 20% of all-cause mortality is undefined, with arterial hypertension and neurodegenerative diseases possibly implicated. An estimated 5.13 million (3.63 to 6.32) excess deaths per year globally are attributable to ambient air pollution from fossil fuel use and therefore could potentially be avoided by phasing out fossil fuels. This figure corresponds to 82% of the maximum number of air pollution deaths that could be averted by controlling all anthropogenic emissions. Smaller reductions, rather than a complete phase-out, indicate that the responses are not strongly non-linear. Reductions in emission related to fossil fuels at all levels of air pollution can decrease the number of attributable deaths substantially. Estimates of avoidable excess deaths are markedly higher in this study than most previous studies for these reasons: the new relative risk model has implications for high income (largely fossil fuel intensive) countries and for low and middle income countries where the use of fossil fuels is increasing; this study accounts for all-cause mortality in addition to disease specific mortality; and the large reduction in air pollution from a fossil fuel phase-out can greatly reduce exposure.
Conclusions Phasing out fossil fuels is deemed to be an effective intervention to improve health and save lives as part the United Nations' goal of climate neutrality by 2050. Ambient air pollution would no longer be a leading, environmental health risk factor if the use of fossil fuels were superseded by equitable access to clean sources of renewable energy.
Source BMJ is a global healthcare knowledge provider with a vision for a healthier world. We share knowledge and expertise to improve healthcare outcomes.
We publish [65 medical and allied science journals]
CCBYNC Research Air pollution deaths attributable to fossil fuels: observational and modelling study
BMJ 2023; 383 doi: https://doi.org/10.1136/bmj-2023-077784 (Published 29 November 2023)Cite this as: *BMJ* 2023;383:e077784 https://www.bmj.com/content/383/bmj-2023-077784#:~:text=Results%20Globally%2C%20all%20cause%20excess,ischaemic%20heart%20disease%20(30%25).

Global Warming is a crisis now causing millions of deaths yearly with the threat of the extinction of humans.
Earth is now having the hottest days ever, in thousands of years and hottest air and water temperatures triggering rapid acceleration in the huge release of methane from melting permafrost which is greatly increasing the heating effect, resulting in increasingly more severe storms, droughts, floods and glacier melt. This is now affecting almost everyone on this planet either directly or thru higher costs and shortages.
What are the 11 warmest years on record? 2010, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, and 2023. Most is caused by the greenhouse effect.

The greenhouse effect is the process through which heat is trapped near Earth's surface by substances known as 'greenhouse gases.' Imagine these gases as a cozy blanket enveloping our planet, helping to maintain a warmer temperature than it would have otherwise. Greenhouse gases consist of carbon dioxide, methane, ozone, nitrous oxide, chlorofluorocarbons, and water vapor. Water vapor, which reacts to temperature changes, is referred to as a 'feedback', because it amplifies the effect of forces that initially caused the warming.

Because there has been so much CO2 released into the atmosphere in the last 100 years the Earth's temperature has risen. During the day, the Sun shines through the atmosphere. Earth's surface warms up in the sunlight. At night, Earth's surface cools, releasing heat back into the air. But some of the heat is trapped by the greenhouse gases in the atmosphere. That's what keeps our Earth a warm and cozy 58 degrees Fahrenheit (14 degrees Celsius), on average.

The Earth's average surface temperature would be about −18 °C (−0.4 °F) without the greenhouse effect,[1][2] compared to Earth's 20th century average of about 14 °C (57 °F), or a more recent average of about 15 °C (59 °F).[3][4] In addition to naturally present greenhouse gases, burning of fossil fuels has increased amounts of carbon dioxide and methane in the atmosphere.[5][6] As a result, global warming of about 1.2 °C (2.2 °F) has occurred since the Industrial Revolution,[7] with the global average surface temperature increasing at a rate of 0.18 °C (0.32 °F) per decade since 1981.[8]

CO2 is produced by fossil fuel burning and other activities such as cement production and tropical deforestation.[37] Measurements of CO2 from the Mauna Loa Observatory show that concentrations have increased from about 313 parts per million (ppm)[38] in 1960, passing the 400 ppm milestone in 2013.[39] The current observed amount of CO2 exceeds the geological record maxima (≈300 ppm) from ice core data.[40]

Over the past 800,000 years,[41] ice core data shows that carbon dioxide has varied from values as low as 180 ppm to the pre-industrial level of 270 ppm.[42] Paleoclimatologists consider variations in carbon dioxide concentration to be a fundamental factor influencing climate variations over this time scale.[43][44] See Wikipedia for references.

What are the effects of global warming? Rising temperatures and changes in weather patterns are increasing the frequency and severity of heat waves, wildfires, droughts, floods, landslides, hurricanes, and other causes of injury and illness. Heat waves and extreme weather events have a big impact on health both directly and indirectly.

Since the Industrial Revolution, the global annual temperature has increased in total by a little more than 1 degree Celsius, or about 2 degrees Fahrenheit. Between 1880—the year that accurate recordkeeping began—and 1980, it rose on average by 0.07 degrees Celsius (0.13 degrees Fahrenheit) every 10 years. Since 1981, however, the rate of increase has more than doubled: For the last 40 years, we've seen the global annual temperature rise by 0.18 degrees Celsius, or 0.32 degrees Fahrenheit, per decade.

The result? A planet that has never been hotter. The 11 warmest years since 1880 have occurred since 2005. The impacts of global warming are already harming people around the world causing widespread deaths. Farmers can't farm, droughts, floods, and severe storms are killing people.

Now climate scientists have concluded that we must limit global warming to 1.5 degrees Celsius by 2040 if we are to avoid a future in which everyday life around the world is marked by its worst, most devastating effects: the extreme droughts, wildfires, floods, tropical storms, and other disasters that we refer to collectively as climate change. These effects are felt by all people in one way or another but are experienced most acutely by the underprivileged, the economically marginalized, and people of color, for whom climate change is often a key driver of poverty, displacement, hunger, and social unrest. And the scientists say we are near a tipping point of no return because the effects on melting permafrost and ocean warming will accelerate things at a rate that is impossible for mankind to reverse.

Evergreen trees such as spruce and firs produce oxygen year around and set above grass and are often cleared of snow by the wind so continue to produce oxygen while the grass is smothered under snow. Norway and Blue spruces actually have more leaf area than many broad-leaf trees. Leaf area is a big factor in oxygen production.

If we plant both grass and trees we get even more.

So cities need to create and maintain more parks with lots of grass and trees.

Also we can gradually replace sidewalks with tough walkable grass or other tough walkable plants like mosses. In damper areas two strips of asphalt separated by grass or tough walkable grass like cover could replace sidewalks. This would enable strollers and wagons and eliminates snow shoveling by substituting snow sweeping which is easier and can be automated. Also grass is much friendlier and healthier to human feet and body and for children. This would Increase oxygen production. Another benefit is in regions of winter snow the black asphalt often melts the snow or ice.

Trees store much of their carbon within their leaves and woody biomass, while grass stores most of its carbon underground. This means that when a tree catches fire, it releases its stores of carbon back into the atmosphere. But when a fire burns through grasslands, the carbon fixed underground tends to stay in the roots and soil.

How much CO2 does 1 acre of grass absorb?

An acre of grass, whether maintained or left alone to grow unmolested, will sequester approximately 3,600 pounds of greenhouse gas annually.

How much CO_2 do trees absorb per acre?
How Much Carbon Does an Acre of Trees Absorb? An acre of trees can absorb up to 2.6 tons of carbon dioxide each year based on a calculation that one average tree absorbs 48 pounds of CO_2.

Trees shelter birds better who eat insects.
Even one acre of trees plays an essential part in preventing unprecedented climate change.
One acre of trees takes in the same amount of CO_2 that a vehicle creates after driving 26,000 miles. This same acre of trees also takes in the amount of carbon dioxide that two vehicles create within a year.
Of the air that we breathe, oxygen is one-fifth of it. Annually, one acre of trees can produce enough air for 18 people.
Trees and other photosynthesizing plants are imperative for all animal lives, including human lives, on Earth. Otherwise, we would eventually be unable to breathe.
As trees emit life-giving O_2, they also take in carbon dioxide; clearly, trees have a deep impact on our environment.
Carbon dioxide is the primary cause of the greenhouse effect, which holds heat in our planet`s atmosphere. This makes Earth warmer and, ideally, a more tolerable place to live.
Trees hold carbon dioxide in their trunk fibers. This, in turn, purifies the air around them and minimizes the harmful effects of CO_2. This enhancement of air quality is especially beneficial in cities that have more pollutants than other areas.
The size of the leaf area also known as Specific leaf area SLA and Leaf Mass per Area LMA are major factors in determining how much Oxygen is produced and how much carbon is removed. See Wikipedia Specific Leaf area. Some plants have bigger leaves, but how many heaves are in an area of land or water is more important. Some plants produce more than others. The plant winner with the greatest leaf are per plant per land or water area are Evergreen Gymnosperm trees which include spruce and fir trees. Some like the Norway Spruce and Colorado Blue Spruce have a huge amount of leaves, grow world wide and also provide habitat for other animals while producing Oxygen and removing carbon year around.
Below are the trees that produce the least to the most amount of oxygen:
Least O_2: pines, which are coniferous (cone-bearing) and evergreen (stay green all year).
Average O_2: oaks and aspens, which are primarily deciduous (shed leaves).
Most O_2: maples, beeches, true firs, spruces, and Douglas-firs.
These trees are a mixture of deciduous, coniferous, and evergreen.
Regarding oxygen production, a mature silver maple tree, for instance, can emit enough O_2 in one day for two people.
On the same day, a silver maple can consume nearly 100 gallons of water from the soil and disperse it into the atmosphere.
Within a year, a silver maple can take in about 48 pounds of carbon dioxide.
In terms of oxygen production, a mature short-needled Norway spruce, for instance, can emit 58% more O_2 than a beech tree.
In fact, a Norway spruce can photosynthesize for 260 days per year while a beech can only photosynthesize for 176 days per year.
Maple and beech, are deciduous.
The three others, true fir, spruce, and Douglas-fir, are evergreen.
Again, neither one of these types of tree absolutely surpasses the other in oxygen production.
<b>Genetically engineered trees show promise of emitting high levels of O_2. Some of these trees have been recorded to grow at 35 feet each year, <b/> Investing more in these trees might have a significant effect on our atmosphere.
The world currently has over 3.1 trillion trees, according to Nature. While this is a stunning number, it`s below half the total number of trees that were on the planet prior to human impact.
Given that carbon dioxide has substantially increased during the last 50 years, it`s more important than ever to protect the tree population.
Trees are truly a treasure.
Along with their natural allure, they provide a heap of necessities that improve the health of Earth.
They enhance air quality, balance climate temperatures, raise the quality of soil, and offer food, shade, and shelter for people around the world.
Trees Reduce Harmful Effects Of Climate Change
The above are direct quotes from https://treejourney.com/what-trees-produce-the-most-oxygen-and-how-they-do-it/

We need to plant more trees. Great family project to do with children and communities to support.
Grass is also very important because it also generates our life saving oxygen.
By the way Lawns are an excellent producer of oxygen. A lawn area 50 ft x 50 ft produces enough oxygen for the daily needs of a family of four. An acre of grass will produce enough oxygen for 64 people a day. Reducing your carbon footprint begins right at home.
Source ScienTurfic Sod https://www.scienturficsod.com resources air-and-water

A lawn can produce significant amounts of oxygen, in fact, studies show that one 5,000 sq ft of grassland can produce enough oxygen for up to 35 people!
But how does this compare to trees? Does grass produce more oxygen than trees?
It`s a lesser-known fact that grass, the often-overlooked green foliage lining the Earth`s surfaces, plays a crucial role in producing oxygen for our environment. A lawn produces oxygen at a rate greater than trees! Studies show that while 5,000 sq ft of trees with full canopy coverage produces enough oxygen for between 8 and 18 people, the same area covered in grass produces enough for almost 35 people! That`s a significant difference.
Also the grass produces more oxygen if we cut it higher. Michigan State University states there is a direct relationship between cutting height and the amount of roots a grass plant can maintain. Lowering the mowing height reduces the root system. This restricts the ability of the plant to absorb water and nutrients... Current standards suggest between 2 and 3.75 inches. Higher cut lawn grasses are more stress tolerant. This is especially important during the summer heat period. Taller grass plants with higher density have a profound shading effect on the soil surface, which reduces germination of weed seeds, particularly crabgrass. This is an excellent way to reduce herbicide use, especially where the lawn is properly fertilized and watered to maintain vigor.

Greenhouse gasses

- **Carbon dioxide (CO_2)**: Carbon dioxide enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and other biological materials, and also as a result of certain chemical reactions (e.g., cement production). Carbon dioxide is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.
- **Methane (CH_4)**: Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, land use, and by the decay of organic waste in municipal solid waste landfills.
- **Nitrous oxide (N_2O)**: Nitrous oxide is emitted during agricultural, land use, and industrial activities; combustion of fossil fuels and solid waste; as well as during treatment of wastewater.
- **Fluorinated gases**: Hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride are synthetic, powerful greenhouse gases that are emitted from a variety of household, commercial, and industrial applications and processes. Fluorinated gases (especially hydrofluorocarbons) are sometimes used as substitutes for stratospheric ozone-depleting substances (e.g., chlorofluorocarbons, hydrochlorofluorocarbons, and halons). Fluorinated gases are typically emitted in smaller quantities than other greenhouse gases, but they are potent greenhouse gases. With global warming potentials (GWPs) that typically range from thousands to tens of thousands, they are sometimes referred to as high-GWP gases because, for a given amount of mass, they trap substantially more heat than CO_2.

Each gas's effect on climate change depends on three main factors:

How abundant are greenhouse gases in the atmosphere?

Concentration, or abundance, is the amount of a particular gas in the air. Larger emissions of greenhouse gases lead to higher concentrations in the atmosphere. Greenhouse gas concentrations are measured in parts per million, parts per billion, and even parts per trillion. One part per million is equivalent to one drop of water diluted into about 13 gallons of liquid (roughly the fuel tank of a compact car). To learn more about the increasing concentrations of greenhouse gases in the atmosphere, visit the Climate Change Indicators: Atmospheric Concentrations of Greenhouse Gases page.

How long do greenhouse gases stay in the atmosphere?

Each of these gases can remain in the atmosphere for different amounts of time, ranging from a few years to thousands of years. All of these gases remain in the atmosphere long enough to become well mixed, meaning that the amount that is measured in the atmosphere is roughly the same all over the world, regardless of the source of the emissions.

How strongly do greenhouse gases impact the atmosphere?

Some gases are more effective than others at making the planet warmer and "thickening the Earth's atmospheric blanket."

For each greenhouse gas, a Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, typically a 100-year time horizon, relative to the emissions of 1 ton of carbon dioxide (CO_2). Gases with a higher GWP absorb more energy, per ton emitted, than gases with a lower GWP, and thus contribute more to warming Earth.

Note: All emission estimates are from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*. The *Inventory* uses 100-year GWPs from IPCC's Fifth Assessment Report (AR5).

Carbon Dioxide Emissions

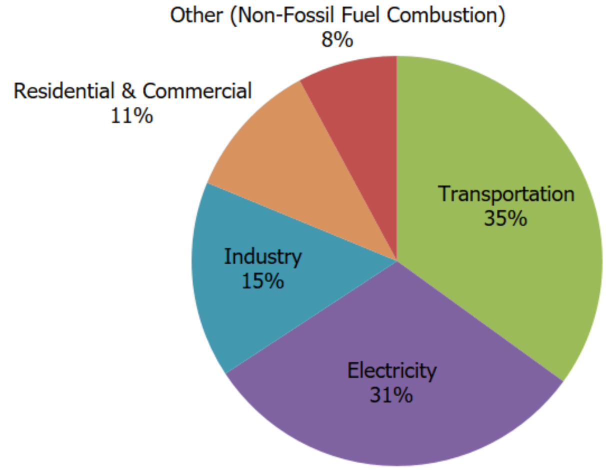
Properties of Carbon Dioxide

Chemical Formula: CO_2
Lifetime in Atmosphere: See below[1]
Global Warming Potential (100-year): 1

Carbon dioxide (CO_2) is the primary greenhouse gas emitted through human activities. In 2021, CO_2 accounted for 79% of all U.S. greenhouse gas emissions from human activities. Carbon dioxide is naturally present in the atmosphere as part of the Earth's carbon cycle (the natural circulation of carbon among the atmosphere, oceans, soil, plants, and animals). Human activities are altering the carbon cycle–both by adding more CO_2 to the atmosphere and by influencing the ability of natural sinks, like forests and soils, to remove and store CO_2 from the atmosphere. While CO_2 emissions come from a variety of natural sources, human-related emissions are responsible for the increase that has occurred in the atmosphere since the industrial revolution.[2]

U.S. Carbon Dioxide Emissions, by Economic Sector

Note: Total Emissions in 2021 are 6,340 Million Metric Tons of CO_2 equivalent. Percentages may not add up to 100% due to independent rounding. Greenhouse gas emissions from commercial and residential buildings increase substantially when emissions from electricity end-use are included (from 11% to 30%), due to the relatively large share of electricity use (e.g., heating, ventilation, and air conditioning; lighting; and appliances) in these sectors. Also, if emissions from electricity use are allocated to the industrial end-use sector, industrial activities account for a much larger share of U.S. greenhouse gas emissions. More information is also in the electricity end-use emissions section of this web area.



Land Use, Land-Use Change, and Forestry in the United States is a net sink and offsets 12% of these greenhouse gas emissions. This net sink is not shown in the above diagram. All emission estimates from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*.

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The main human activity that emits CO_2 is the combustion of fossil fuels (coal, natural gas, and oil) for energy and transportation. Certain industrial processes and land-use changes also emit CO_2. The main sources of CO_2 emissions in the United States are described below.

- **Transportation**. The combustion of fossil fuels such as gasoline and diesel to transport people and goods was the largest source of CO_2 emissions in 2021, accounting for 35% of total U.S. CO_2 emissions and 28% of total U.S. greenhouse gas emissions. This category includes domestic transportation sources such as highway and passenger vehicles, air travel, marine transportation, and rail.
- **Electricity**. Electricity is a key source of energy in the United States and is used to power homes, business, and industry. In 2021, the combustion of fossil fuels to generate electricity was the second largest source of CO_2 emissions in the nation, accounting for 31% of total U.S. CO_2 emissions and 24% of total U.S. greenhouse gas emissions. The types of fossil fuel used to generate electricity emit different amounts of CO_2. To produce a given amount of electricity, burning coal will produce more CO_2 than natural gas or oil.
- **Industry**. Many industrial processes emit CO_2 through fossil fuel consumption. Several processes also produce CO_2 emissions through chemical reactions that do not involve combustion, and examples include the production of mineral products such as cement, the production of metals such as iron and steel, and the production of chemicals. The fossil fuel combustion component of various industrial processes accounted for 15% of total U.S. CO_2 emissions and 12% of total U.S. greenhouse gas emissions in 2021. Many industrial processes also use electricity and therefore indirectly result in CO_2 emissions from electricity generation.

Carbon dioxide is constantly being exchanged among the atmosphere, ocean, and land surface as it is both produced and absorbed by many microorganisms, plants, and animals. Emissions and removals of CO_2 by these natural processes, however, tend to balance over time, absent anthropogenic impacts. Since the Industrial Revolution began around 1750, human activities have contributed substantially to climate change by adding CO_2 and other heat-trapping gases to the atmosphere.

In the United States, the management of forests and other land (e.g., cropland, grasslands, etc.) has acted as a net sink of CO_2, which means that more CO_2 is removed from the atmosphere, and stored in plants and trees, than is emitted. This carbon sink offset about 13% of total emissions in 2021. For more details, see the discussion in the Land Use, Land-Use Change, and Forestry section.

To find out more about the role of CO_2 in warming the atmosphere and its sources, visit the Climate Change Indicators page.

Trends

Carbon dioxide emissions in the United States decreased by 2% between 1990 and 2021. Since the combustion of fossil fuel is the largest source of greenhouse gas emissions in the United States, changes in emissions from fossil fuel combustion have historically been the dominant factor affecting total U.S. emission trends. Changes in CO_2 emissions from fossil fuel combustion are influenced by many long-term and short-term factors, including population growth, economic growth, changing energy prices, new technologies, changing behavior, and seasonal temperatures. In 2021, the increase in CO_2 emissions from fossil fuel combustion corresponded with an increase in energy use as a result of economic activity rebounding after the height of the COVID-19 pandemic, in addition to an increase in coal use in the electric power sector.

U.S. Carbon Dioxide Emissions, 1990-2021

Note: All emission estimates from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*.

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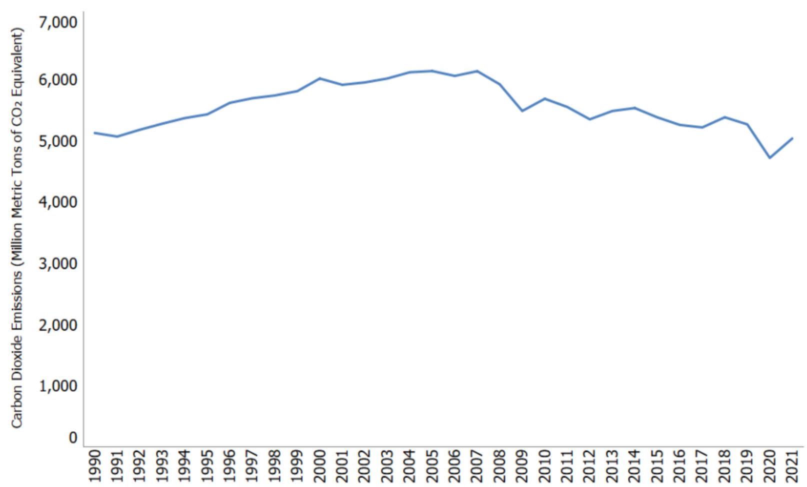

Reducing Carbon Dioxide Emissions

The most effective way to reduce CO_2 emissions is to reduce fossil fuel consumption. Many strategies for reducing CO_2 emissions from energy are cross-cutting and apply to homes, businesses, industry, and transportation.

Examples of Reduction Opportunities for Carbon Dioxide

Strategy	Examples of How Emissions Can be Reduced
Energy Efficiency	Improving the insulation of buildings, traveling in more fuel-efficient vehicles, and using more efficient electrical appliances are all ways to reduce energy use, and thus CO_2 emissions. • See EPA's ENERGY STAR® program for more information on energy-efficient appliances and ways to save at home and work. • See EPA's and DOE's fueleconomy.gov site for more information on fuel-efficient vehicles.

Examples of Reduction Opportunities for Carbon Dioxide	
Strategy	**Examples of How Emissions Can be Reduced**
	• Learn about EPA's motor vehicle standards that improve vehicle efficiency and save drivers money.
Energy Conservation	Reducing personal energy use by turning off lights and electronics when not in use reduces electricity demand. Reducing distance traveled in vehicles reduces petroleum consumption. Both are ways to reduce energy CO_2 emissions through conservation. Learn more about What You Can Do at Home, at School, in the Office, and on the Road to save energy and reduce your carbon footprint.
Fuel Switching	Producing more energy from renewable sources and using fuels with lower carbon contents are ways to reduce carbon emissions.
Carbon Capture and Sequestration (CCS)	Carbon dioxide capture and sequestration is a set of technologies that can potentially greatly reduce CO_2 emissions from new and existing coal- and gas-fired power plants, industrial processes, and other stationary sources of CO_2. For example, a CCS project might capture CO_2 from the stacks of a coal-fired power plant before it enters the atmosphere, transport the CO_2 via pipeline, and inject the CO_2 deep underground at a carefully selected and suitable subsurface geologic formation, such as a nearby abandoned oil field, where it is securely stored. Learn more about CCS.
Changes in Uses of Land and Land Management Practices	Learn more about Land Use, Land Use Change and Forestry Sector.

[1] Atmospheric CO_2 is part of the global carbon cycle, and therefore its fate is a complex function of geochemical and biological processes. Some of the excess carbon dioxide will be absorbed quickly (for example, by the ocean surface), but some will remain in the atmosphere for thousands of years, due in part to the very slow process by which carbon is transferred to ocean sediments.

[2] IPCC (2021). Climate Change 2021: The Physical Science Basis. *Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp.

Methane Emissions

Properties of Methane

Chemical Formula: CH_4
Lifetime in Atmosphere: 12 years
Global Warming Potential (100-year): 28[1]

In 2021, methane (CH_4) accounted for 12% of all U.S. greenhouse gas emissions from human activities. Human activities emitting methane include leaks from natural gas systems and the raising of livestock. Methane is also emitted by natural sources such as termites. In addition, natural processes in soil and chemical reactions in the atmosphere help remove CH_4 from the atmosphere. Methane's lifetime in the atmosphere is much shorter than carbon dioxide (CO_2), but CH_4 is more efficient at trapping radiation than CO_2. Pound for pound, the comparative impact of CH_4 is 28 times greater than CO_2 over a 100-year period.[1]

Globally, 50-65% of total CH_4 emissions come from human activities.[2] Methane is emitted from energy, industry, agriculture, land use, and waste management activities, described below.

U.S. Methane Emissions, By Source

Note: All emission estimates from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*.

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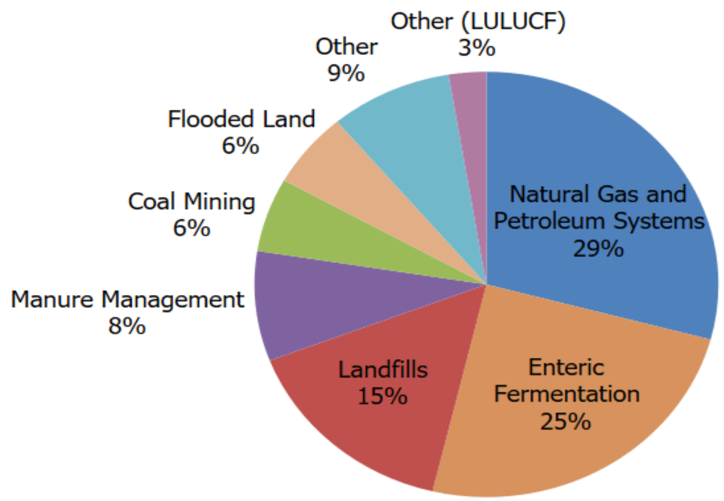

- **Agriculture**. Domestic livestock such as cattle, swine, sheep, and goats produce CH4 as part of their normal digestive process. Also, when animal manure is stored or managed in lagoons or holding tanks, CH_4 is produced. Because humans raise these animals for food and other products, the emissions are considered human-related. The Agriculture sector is the largest source of CH_4 emissions in the United States. For more information, see the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* Agriculture chapter.
- **LULUCF**: While not shown in the figure, emissions of CH_4 also occur as a result of land use and land management activities in the Land Use, Land-Use Change, and Forestry sector (e.g. forest and grassland fires, management of flooded lands such as reservoirs, decomposition of organic matter in coastal wetlands).
- **Energy and Industry**. Natural gas and petroleum systems are the second largest source of CH_4 emissions in the United States. Methane is emitted to the atmosphere during the production, processing, storage, transmission, distribution, and use of natural gas, and the production, refinement, transportation, and storage of crude oil. Coal mining is also a source of CH_4 emissions. For more information, see the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* sections on Natural Gas Systems and Petroleum Systems.
- **Waste from Homes and Businesses**. Methane is generated in landfills as waste decomposes and in the treatment of wastewater. Landfills are the third-largest source of CH_4 emissions in the United States. Methane is also generated from domestic and industrial wastewater treatment and from composting and anaerobic digestion. For more information, see the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* Waste chapter.

Methane is also emitted from a number of natural sources. Natural wetlands that are not managed or changed by human activity are the largest source, emitting CH_4 from bacteria that decompose organic materials in the absence of oxygen. Reservoirs and ponds with high organic matter and low oxygen levels also produce methane through the microbial breakdown of organic matter. Smaller sources include termites, oceans, sediments, volcanoes, and wildfires.

To find out more about the role of CH_4 in warming the atmosphere and its sources, visit the Climate Change Indicators page.

Trends

Methane emissions in the United States decreased by 16% between 1990 and 2021. During this time period, emissions increased from sources associated with agricultural activities, while emissions decreased from other sources including landfills and coal mining and from natural gas and petroleum systems.

U.S. Methane Emissions, 1990-2021

Note: All emission estimates from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021*. These estimates use a global warming potential for methane of 28, based on reporting requirements under the United Nations Framework Convention on Climate Change.

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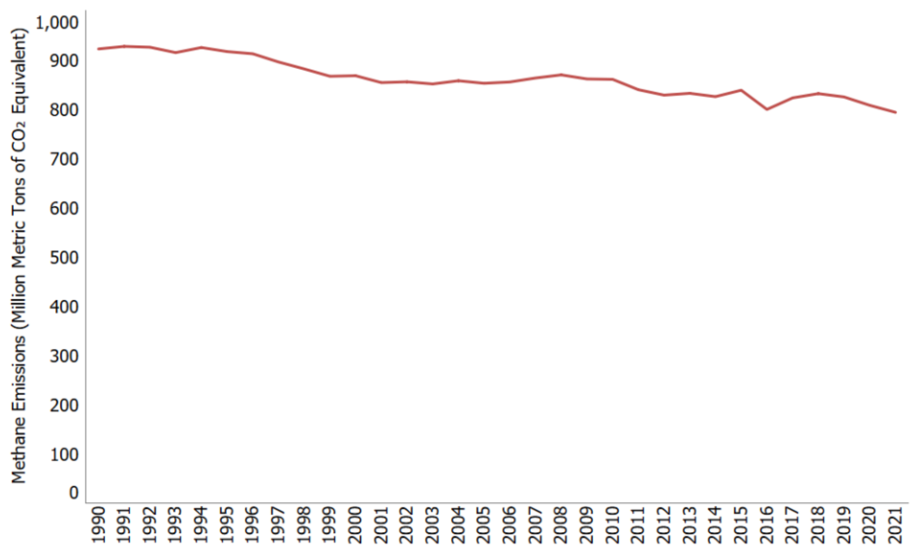

Reducing Methane Emissions

There are a number of ways to reduce CH_4 emissions. Some examples are discussed below. EPA has a series of voluntary programs for reducing CH_4 emissions, in addition to regulatory initiatives. EPA also supports the Global Methane Initiative, an international partnership encouraging global methane reduction strategies.

Examples of Reduction Opportunities for Methane

Emissions Source	How Emissions Can be Reduced
Industry	Upgrading the equipment used to produce, store, and transport oil and natural gas can reduce many of the leaks that contribute to CH_4 emissions. Methane from coal mines can also be captured and used for energy. Learn more about the EPA's Natural Gas STAR Program and Coalbed Methane Outreach Program.
Agriculture	Methane from manure management practices can be reduced and captured by altering manure management strategies. Additionally, modifications to animal feeding practices may reduce emissions from enteric fermentation. Learn more about improved manure management practices at EPA's AgSTAR Program.

Examples of Reduction Opportunities for Methane	
Emissions Source	**How Emissions Can be Reduced**
Waste from Homes and Businesses	Capturing landfill CH_4 for destruction in a flare or conversion to renewable energy are both effective emission reduction strategies. Learn more about these opportunities and the EPA's Landfill Methane Outreach Program. Additionally, managing waste at a higher tier on the waste management hierarchy can reduce CH_4 generation at landfills. Learn more about Sustainable Materials Management.

References

[1] IPCC (2013). Climate Change 2013: The Physical Science Basis. Contribution of Working *Group* I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. [Stocker, T.F., D. Qin, G.K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.

[2] IPCC (2021). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp.

Nitrous Oxide Emissions

Properties of Nitrous Oxide

Chemical Formula: N_2O
Lifetime in Atmosphere: 114 years
Global Warming Potential (100-year): 265[1]

In 2021, nitrous oxide (N_2O) accounted for 6% of all U.S. greenhouse gas emissions from human activities. Human activities such as agriculture, fuel combustion, wastewater management, and industrial processes are increasing the amount of N_2O in the atmosphere. Nitrous oxide is also naturally present in the atmosphere as part of the Earth's nitrogen cycle and has a variety of natural sources. Nitrous oxide molecules stay in the atmosphere for an average of 121 years before being removed by a sink or destroyed through chemical reactions. The impact of 1 pound of N_2O on warming the atmosphere is 265 times that of 1 pound of carbon dioxide.[1]

Globally, 40% of total N_2O emissions come from human activities.[2] Nitrous oxide is emitted from agriculture, land use, transportation, industry, and other activities, described below.

U.S. Nitrous Oxide Emissions, By Source

Note: All emission estimates from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*.

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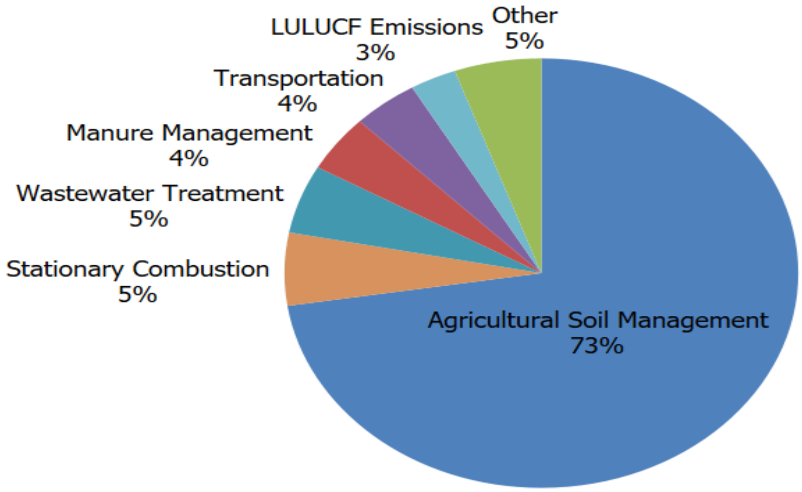

- **Agriculture.** Nitrous oxide can result from various agricultural soil management activities, such as application of synthetic and organic fertilizers and other cropping practices, the management of manure, or burning of agricultural residues. Agricultural soil management is the largest source of N_2O emissions in the United States, accounting for 75% of total U.S. N_2O emissions in 2021. While not shown in the figure and less significant, emissions of N_2O also occur as a result of land use and land management activities in the Land Use, Land-Use Change, and Forestry sector (e.g. forest and grassland fires, application of synthetic nitrogen fertilizers to urban soils (e.g., lawns, golf courses) and forest lands, etc.).
- **Fuel Combustion.** Nitrous oxide is emitted when fuels are burned. The amount of N_2O emitted from burning fuels depends on the type of fuel and combustion technology, maintenance, and operating practices.
- **Industry.** Nitrous oxide is generated as a byproduct during the production of chemicals such as nitric acid, which is used to make synthetic commercial fertilizer, and in the production of adipic acid, which is used to make fibers, like nylon, and other synthetic products. Nitrous oxide is also emitted from use in other applications such as anesthesia and semiconductor manufacturing.
- **Waste.** Nitrous oxide is also generated from treatment of domestic wastewater during nitrification and denitrification of the nitrogen present, usually in the form of urea, ammonia, and proteins.

Nitrous oxide emissions occur naturally through many sources associated with the nitrogen cycle, which is the natural circulation of nitrogen among the atmosphere, plants, animals, and microorganisms that live in soil and water. Nitrogen takes on a variety of chemical forms throughout the nitrogen cycle, including N_2O. Natural emissions of N_2O are mainly from bacteria breaking down nitrogen in soils and the oceans. Nitrous oxide is removed from the atmosphere when it is absorbed by certain types of bacteria or destroyed by ultraviolet radiation or chemical reactions.

To find out more about the sources of N_2O and its role in warming the atmosphere, visit the Climate Change Indicators page.

Trends

Nitrous oxide emissions in the United States decreased by 3% between 1990 and 2021. During this time, nitrous oxide emissions from mobile combustion decreased by 56% as a result of criteria pollutant emission standards for on-road vehicles. Nitrous oxide emissions from agricultural soils have varied during this period and were about the same in 2021 as in 1990.

U.S. Nitrous Oxide Emissions, 1990-2021

Note: All emission estimates from the *[Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021](#)*.

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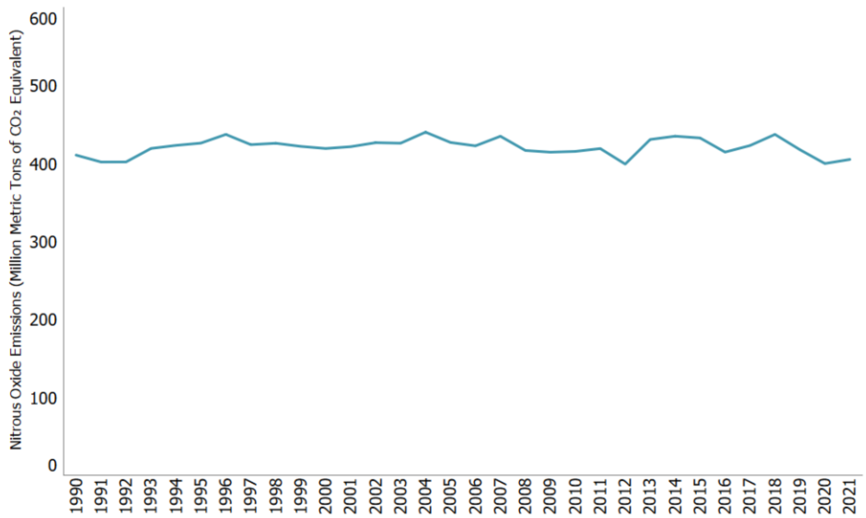


Reducing Nitrous Oxide Emissions

There are a number of ways to reduce emissions of N_2O, discussed below.

Examples of Reduction Opportunities for Nitrous Oxide Emissions

Emissions Source	Examples of How Emissions Can be Reduced
Agriculture	The application of nitrogen fertilizers accounts for the majority of N_2O emissions in the United States. Emissions can be reduced by reducing nitrogen-based fertilizer applications and applying these fertilizers more efficiently,[3] as well as modifying a farm's manure management practices.
Fuel Combustion	• Nitrous oxide is a byproduct of fuel combustion, so reducing fuel consumption in motor vehicles and secondary sources can reduce emissions. • Additionally, the introduction of pollution control technologies (e.g., catalytic converters to reduce exhaust pollutants from passenger cars) can also reduce emissions of N_2O.
Industry	• Nitrous oxide is generally emitted from industry through fossil fuel combustion, so technological upgrades and fuel switching are effective ways to reduce industry emissions of N_2O. • Production of nitric acid and adipic acid result in N_2O emissions that can be reduced through technological upgrades and use of abatement equipment.

References

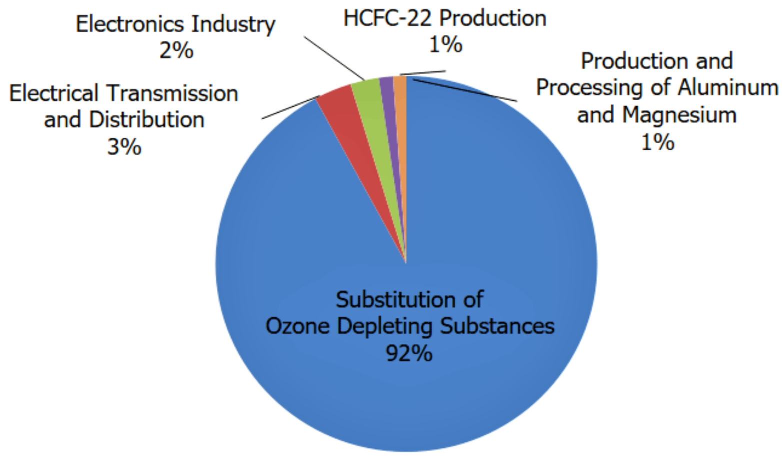
[1] [IPCC (2013). Climate Change 2013: The Physical Science Basis](#). Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. [Stocker, T.F., D. Qin, G.K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.
[2] IPCC (2021). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)].

Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp.
[3]EPA (2005). *Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture*. U.S. Environmental Protection Agency, Washington, DC, USA.

Emissions of Fluorinated Gases

Properties of F-gases

Chemical Formulas:
HFCs, PFCs, NF_3, SF_6
Lifetime in Atmosphere:
HFCs: up to 270 years
PFCs: 2,600–50,000 years
NF_3: 740 years
SF_6: 3,200 years
Global Warming Potential (100-year):[1]
HFCs: up to 12,400
PFCs: up to 11,100
NF_3: 16,100
SF_6: 23,500



Unlike many other greenhouse gases, fluorinated gases have no significant natural sources and come almost entirely from human-related activities. They are emitted through their use as substitutes for ozone-depleting substances (e.g., as refrigerants) and through a variety of industrial processes such as aluminum and semiconductor manufacturing. Many fluorinated gases have very high global warming potentials (GWPs) relative to other greenhouse gases, so small atmospheric concentrations can nevertheless have large effects on global temperatures. They can also have long atmospheric lifetimes—in some cases, lasting thousands of years. Like other long-lived greenhouse gases, most fluorinated gases are well-mixed in the atmosphere, spreading around the world after they are emitted. Many fluorinated gases are removed from the atmosphere only when they are destroyed by sunlight in the upper atmosphere. In general, fluorinated gases are the most potent and longest lasting type of greenhouse gases emitted by human activities.

There are four main categories of fluorinated gases—hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). The largest sources of fluorinated gas emissions are described below.

U.S. Fluorinated Gas Emissions, By Source

Note: All emission estimates from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*.

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- **Substitution for Ozone-Depleting Substances.** Hydrofluorocarbons are used as refrigerants, aerosol propellants, foam blowing agents, solvents, and fire retardants. The major emissions source of these compounds is their use as refrigerants—for example, in air conditioning systems in both vehicles and buildings. These chemicals were developed as a replacement for chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) because they do not deplete the stratospheric ozone layer. CFCs and HCFCs are also greenhouse gases; however, their contribution is not included here because they are being phased out under an international agreement called the Montreal Protocol. HFCs are potent greenhouse gases with high GWPs, and they are released into the atmosphere during manufacturing processes and through leaks, servicing, and disposal of equipment in which they are used. Newly developed hydrofluoroolefins (HFOs) are a subset of HFCs and are characterized by short atmospheric lifetimes and lower GWPs. HFOs are currently being introduced as refrigerants, aerosol propellants and foam blowing agents. The American Innovation and Manufacturing (AIM) Act of 2020 directs EPA to address HFCs by providing new authorities in three main areas: to phase down the production and consumption of listed HFCs in the United States by 85% over the next 15 years, manage these HFCs and their substitutes, and facilitate the transition to next-generation technologies that do not rely on HFCs.

- **Industry.** Perfluorocarbons are produced as a byproduct of aluminum production and are used in the manufacturing of semiconductors. PFCs generally have long atmospheric lifetimes and GWPs near 10,000. Sulfur hexafluoride is used in magnesium processing and semiconductor manufacturing, as well as a tracer gas for leak detection. Nitrogen trifluoride is used in semiconductor manufacturing. HFC-23 is produced as a byproduct of HCFC-22 production and is used in semiconductor manufacturing.
- **Transmission and Distribution of Electricity**. Sulfur hexafluoride is used as an insulating gas in electrical transmission equipment, including circuit breakers. The GWP of SF_6 is 23,500 making it the most potent greenhouse gas that the Intergovernmental Panel on Climate Change has evaluated.

To find out more about the role of fluorinated gases in warming the atmosphere and their sources, visit the Fluorinated Greenhouse Gas Emissions page.

Trends

Overall, fluorinated gas emissions in the United States have increased by 105% between 1990 and 2021. This increase has been driven by a 349% increase in emissions of hydrofluorocarbons (HFCs) since 1990, as they have been widely used as a substitute for ozone-depleting substances. Emissions of perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6) have declined during this time due to emission-reduction efforts in the aluminum production industry (PFCs) and the electrical transmission and distribution industry (SF_6).

U.S. Fluorinated Gas Emissions, 1990-2021

Note: All emission estimates from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*.

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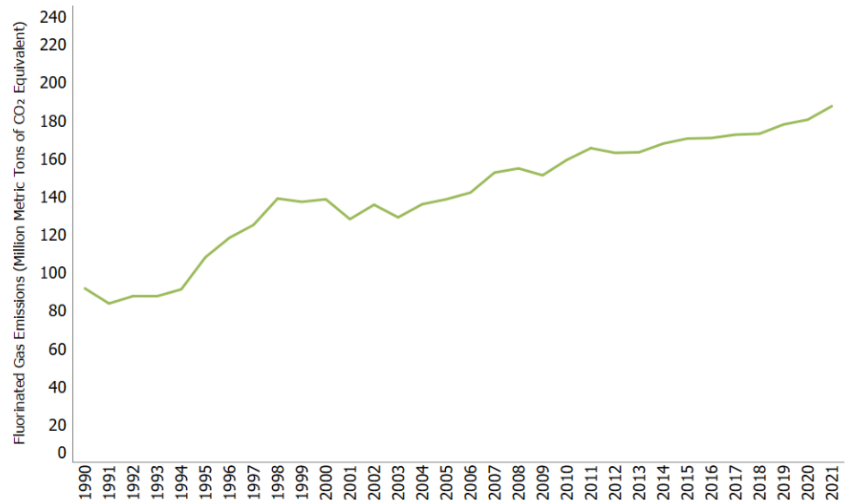
Reducing Fluorinated Gas Emissions

Because most fluorinated gases have a very long atmospheric lifetime, it will take many years to see a noticeable decline in current concentrations. There are, however, a number of ways to reduce emissions of fluorinated gases, described below.



Examples of Reduction Opportunities for Fluorinated Gases

Emissions Source	Examples of How Emissions Can be Reduced
Substitution of Ozone-Depleting Substances in Homes and Businesses	Refrigerants used by businesses and residences emit fluorinated gases. Emissions can be reduced by better handling of these gases and use of substitutes with lower global warming potentials and other technological improvements. Visit EPA's Ozone Layer Protection site and HFC Phasedown site to learn more about reduction opportunities in this sector.
Industry	Industrial emitters of fluorinated gases can reduce emissions by adopting fluorinated gas capture and destruction processes, optimizing production to minimize emissions, and replacing these gases with alternatives. EPA has experience with these gases in the following sectors: • Aluminum • Magnesium • Semiconductor
Electricity Transmission and Distribution	Sulfur hexafluoride is an extremely potent greenhouse gas that is used for several purposes when transmitting electricity through the power grid. EPA is working with industry to reduce emissions through the SF_6 Emission Reduction Partnership for Electric Power Systems, which promotes leak detection and repair, use of recycling equipment, and consideration of alternative technologies that do not use SF_6.
Transportation	Hydrofluorocarbons (HFCs) are released through the leakage of refrigerants used in vehicle air-conditioning systems. Leakage can be reduced through better system components and through the use of alternative refrigerants with lower global warming potentials than those presently used. EPA's light-duty and heavy-duty vehicle standards provided incentives for manufacturers to produce vehicles with lower HFC emissions.

References

[1] IPCC (2013) *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. [Stocker, T.F., D. Qin, G.K.

Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.

6,340 million metric tons of CO_2: What does that mean?

An explanation of units:

A million metric tons equals about 2.2 billion pounds, or 1 trillion grams. For comparison, a small car is likely to weigh a little more than 1 metric ton. Thus, a million metric tons is roughly the same mass as 1 million small cars!

The U.S. Inventory uses metric units for consistency and comparability with other countries. For reference, a metric ton is slightly more (approximately 10%) than a U.S. "short" ton.

GHG emissions are often measured in carbon dioxide (CO_2) equivalent. To convert emissions of a gas into CO_2 equivalent, its emissions are multiplied by the gas's Global Warming Potential (GWP). The GWP takes into account the fact that many gases are more effective at warming Earth than CO_2, per unit mass.

The GWP values appearing in the Overview of Greenhouse Gases and Sources of Greenhouse Gas web pages reflect the values used in the U.S. Inventory, which are drawn from the IPCC's Fifth Assessment Report (AR5). For further discussion of GWPs and an estimate of GHG emissions using updated GWPs, see Annex 6 of the U.S. Inventory and the IPCC's discussion on GWPs (PDF) (151 pp, 14.2MB).

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The following is the general Wikipedia article on **Environmental issues** are disruptions in the usual function of ecosystems.[1] Further, these issues can be caused by humans (human impact on the environment)[2] or they can be natural. These issues are considered serious when the ecosystem cannot recover in the present situation, and catastrophic if the ecosystem is projected to certainly collapse.

Environmental protection is the practice of protecting the natural environment on the individual, organizational or governmental levels, for the benefit of both the environment and humans. Environmentalism is a social and environmental movement that addresses environmental issues through advocacy, legislation education, and activism.[3]

Environment destruction caused by humans is a global, ongoing problem.[4] Water pollution also cause problems to marine life.[5] Most scholars think that the project peak global world population of between 9-10 billion people, could live sustainably within the earth's ecosystems if human society worked to live sustainably within planetary boundaries.[6][7][8] The bulk of environmental impacts are caused by excessive consumption of industrial goods by the world's wealthiest populations.[9][10][11] The UN Environmental Program, in its "Making Peace With Nature" Report in 2021, found addressing key planetary crises, like pollution, climate change and biodiversity loss, was achievable if parties work to address the Sustainable Development Goals.[12]

Types[edit]

Main articles: List of environmental issues and List of environmental disasters

Major current environmental issues may include climate change, pollution, environmental degradation, and resource depletion. The conservation movement lobbies for protection of endangered species and protection of any ecologically valuable natural areas, genetically modified foods and global warming. The UN system has adopted international frameworks for environmental issues in three key issues, which has been encoded as the "triple planetary crises": climate change, pollution, and biodiversity loss.[13]

Human impact[edit]

This section is an excerpt from [Human impact on the environment](#).[edit]

Human impact on the environment.

- Top-left: Satellite image of Southeast Asian haze.
- Top-right: IAEA experts investigate the Fukushima disaster.
- Middle-left: a picture from 1997 of industrial fishing, a practice that has led to overfishing.
- Middle-right: a seabird during an oil spill.
- Bottom-left: Acid mine drainage in the Rio Tinto.
- Bottom-right: depiction of deforestation of Brazil's Atlantic forest by Portuguese settlers, c. 1820–25.

Human impact on the environment (or anthropogenic environmental impact) refers to changes to biophysical environments[14] and to ecosystems, biodiversity, and natural resources[15] caused directly or indirectly by humans. Modifying the environment to fit the needs of society (as in the built environment) is causing severe effects[16][17] including global warming,[14][18][19] environmental degradation[14] (such as ocean acidification[14][20]), mass extinction and biodiversity loss,[21][22][23] ecological crisis, and ecological collapse. Some human activities that cause damage (either directly or indirectly) to the environment on a global scale include population growth,[24][25][26] neoliberal economic policies[27][28][29] and rapid economic growth,[30] overconsumption, overexploitation, pollution, and deforestation. Some of the problems, including global warming and biodiversity loss, have been proposed as representing catastrophic risks to the survival of the human species.[31][32]

The term *anthropogenic* designates an effect or object resulting from human activity. The term was first used in the technical sense by Russian geologist Alexey Pavlov, and it was first used in English by British ecologist Arthur Tansley in reference to human influences on climax plant communities.[33] The atmospheric scientist Paul Crutzen introduced the term "Anthropocene" in the mid-1970s.[34] The term is sometimes used in the context of pollution produced from human activity since the start of the Agricultural Revolution but also applies broadly to all major human impacts on the environment.[35][36][37] Many of the actions taken by humans that contribute to a heated environment stem from the burning of fossil fuel from a variety of sources, such as: electricity, cars, planes, space heating, manufacturing, or the destruction of forests.[38]

Degradation[edit]

This section is an excerpt from Environmental degradation.[edit]

Eighty-plus years after the abandonment of Wallaroo Mines (Kadina, South Australia), mosses remain the only vegetation at some spots of the site's grounds.

Environmental degradation is the deterioration of the environment through depletion of resources such as quality of air, water and soil; the destruction of ecosystems; habitat destruction; the extinction of wildlife; and pollution. It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable.[39]

Environmental concerns can be defined as the negative effects of any human activity on the environment. The biological as well as the physical features of the environment are included. Some of the primary environmental challenges that are causing great worry are air pollution, water pollution, natural environment pollution, rubbish pollution, and so on.[40]

Environmental degradation is one of the ten threats officially cautioned by the High-level Panel on Threats, Challenges and Change of the United Nations. The United Nations International Strategy for Disaster Reduction defines environmental degradation as "the reduction of the capacity of the environment to meet social and ecological objectives, and needs".[41] Environmental degradation comes in many types. When natural habitats are destroyed or natural resources are depleted, the environment is degraded. Efforts to counteract this problem include environmental protection and environmental resources management. Mismanagement that leads to degradation can also lead to environmental conflict where communities organize in opposition to the forces that mismanaged the environment.

Conflict[edit]

Hambach Forest protest against coal mine expansion

Environmental conflicts or ecological distribution conflicts (EDCs) are social conflicts caused by environmental degradation or by unequal distribution of environmental resources.[42][43][44] The Environmental Justice Atlas documented 3,100 environmental conflicts worldwide as of April 2020 and emphasised that many more conflicts remained undocumented.[42] Parties involved in these conflicts include locally affected communities, states, companies and investors, and social or environmental movements;[45][46] typically environmental defenders are protecting their homelands from resource extraction or hazardous waste disposal.[42] Resource extraction and hazardous waste activities often create resource scarcities (such as by overfishing or deforestation), pollute the environment, and degrade the living space for humans and nature, resulting in conflict.[47] A particular case of environmental conflicts are forestry conflicts, or forest conflicts which "are broadly viewed as struggles of varying intensity between interest groups, over values and issues related to forest policy and the use of forest resources".[48] In the last decades, a growing number of these have been identified globally.[49]

Frequently environmental conflicts focus on environmental justice issues, the rights of indigenous people, the rights of peasants, or threats to communities whose livelihoods are dependent on the ocean.[42] Outcomes of local conflicts are increasingly influenced by trans-national environmental justice networks that comprise the global environmental justice movement.[42][50]

Environmental conflict can complicate response to natural disaster or exacerbate existing conflicts – especially in the context of geopolitical disputes or where communities have been displaced to create environmental migrants.[51][44][47]

The terms socio-environmental conflict, environmental conflict, or EDCs are sometimes used interchangeably. The study of these conflicts is related to the fields of ecological economics, political ecology, and environmental justice.

Costs[edit]

See also: Cost of pollution and Cost of global warming

This section **needs expansion**. You can help by adding to it. *(October 2016)*

Action[edit]

Justice[edit]

This section is an excerpt from Environmental justice.[edit]

Environmental justice or eco-justice, is a social movement to address environmental injustice, which occurs when poor or marginalized communities are harmed by hazardous waste, resource extraction, and other land uses from which they do not benefit.[52] The movement has generated hundreds of studies showing that exposure to environmental harm is inequitably distributed.[53]

The movement began in the United States in the 1980s. It was heavily influenced by the American civil rights movement and focused on environmental racism within rich countries. The movement was later expanded to consider gender, international environmental injustice, and inequalities within marginised groups. As the movement achieved some success in rich countries, environmental burdens were shifted to the Global South (as for example through extractivism or the global waste trade). The movement for environmental justice has thus become more global, with some of its aims now being articulated by the United Nations. The movement overlaps with movements for Indigenous land rights and for the human right to a healthy environment.[54]

The goal of the environmental justice movement is to achieve agency for marginalised communities in making environmental decisions that affect their lives. The global environmental justice movement arises from local environmental conflicts in which environmental defenders frequently confront multi-national corporations in resource extraction or other industries. Local outcomes of these conflicts are increasingly influenced by trans-national environmental justice networks.[55][56]

Environmental justice scholars have produced a large interdisciplinary body of social science literature that includes contributions to political ecology, environmental law, and theories on justice and sustainability.[52][57][58]

Law[edit]

This section is an excerpt from Environmental law.[edit]

Environmental laws are laws that protect the environment.[59] Environmental law is the collection of laws, regulations, agreements and common law that governs how humans interact with their environment.[60] This includes environmental regulations; laws governing management of natural resources, such as forests, minerals, or fisheries; and related topics such as environmental impact assessments. Environmental law is seen as the body of laws concerned with the protection of living things (human beings inclusive) from the harm that human activity may immediately or eventually cause to them or their species, either directly or to the media and the habits on which they depend.[61]

Assessment[edit]

This section is an excerpt from Environmental impact assessment.[edit]

Environmental Impact assessment (EIA) is the assessment of the environmental consequences of a plan, policy, program, or actual projects prior to the decision to move forward with the proposed action. In this context, the term "environmental impact assessment" is usually used when applied to actual projects by individuals or companies and the term "strategic environmental assessment" (SEA) applies to policies, plans and programmes most often proposed by organs of state.[62][63] It is a tool of environmental management forming a part of project approval and decision-making.[64] Environmental assessments may be governed by rules of administrative procedure regarding public participation and documentation of decision making, and may be subject to judicial review.

The purpose of the assessment is to ensure that decision-makers consider the environmental impacts when deciding whether or not to proceed with a project. The International Association for Impact Assessment (IAIA) defines an environmental impact assessment as "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made".[65] EIAs are unique in that they do not require adherence to a predetermined environmental outcome, but rather they require decision-makers to account for environmental values in their decisions and to justify those decisions in light of detailed environmental studies and public comments on the potential environmental impacts.[66]

Movement[edit]

This section is an excerpt from Environmental movement.[edit]

Levels of air pollution rose during the Industrial Revolution, sparking the first modern environmental laws to be passed in the mid-19th century.

The environmental movement (sometimes referred to as the ecology movement), is a social movement that aims to protect the natural world from harmful environmental practices in order to create sustainable living.[67] Environmentalists advocate the just and sustainable management of resources and stewardship of the environment through changes in public policy and individual behavior.[68] In its recognition of humanity as a participant in (not an enemy of) ecosystems, the movement is centered on ecology, health, as well as human rights.

The environmental movement is an international movement, represented by a range of environmental organizations, from enterprises to grassroots and varies from country to country. Due to its large membership, varying and strong beliefs, and occasionally speculative nature, the environmental movement is not always united in its goals. At its broadest, the movement includes private citizens, professionals, religious devotees, politicians, scientists, nonprofit organizations, and individual advocates like former Wisconsin Senator Gaylord Nelson and Rachel Carson in the 20th century.

Organizations[edit]

Main article: Environmental organization

Environmental issues are addressed at a regional, national or international level by government organizations.

The largest international agency, set up in 1972, is the United Nations Environment Programme. The International Union for Conservation of Nature brings together 83 states, 108 government agencies, 766 Non-governmental organizations and 81 international organizations and about 10,000 experts, scientists from countries around the world.[69] International non-governmental organizations include Greenpeace, Friends of the Earth and World Wide Fund for Nature. Governments enact environmental policy and enforce environmental law and this is done to differing degrees around the world.

Film and television[edit]

Main article: Environmental issues in film and television

There are an increasing number of films being produced on environmental issues, especially on climate change and global warming. Al Gore's 2006 film *An Inconvenient Truth* gained commercial success and a high media profile.