# AFF

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**Resolved: The United States ought to eliminate subsidies for fossil fuels.**

**I stand in firm affirmation of the resolution.**

**My Value is Social Progress. As defined in the Harvard Business School Social Progress Index, Social Progress is the capacity of a society to meet the basic human needs of its citizens, establish the building blocks that allow citizens and communities to enhance and sustain the quality of their lives, and create the conditions for all individuals to reach their full potential.**

**My Value Criterion is Optimizing Resources.** In respect to the resolution, optimizing resources would be redirecting our federal capital towards more useful and efficient pursuits. Some of which I will go into later in my speech.

Before I lay out my contentions, there are some terms I’d like to define:

A fossil fuel is defined as a substance containing carbon and was formed as a result of geologic processes acting on the remains of organic matter.

Now on to my contentions:

Contention 1: Subsidizing Fossil Fuels is expensive

Subpoint A. We spend a lot on subsidizing fossil fuels

According to a report from the IMF from 2019: “In absolute terms, China was still, by far, the largest subsidizer in 2015 (at $1.4 trillion), followed by the United States ($649 billion)”

SIC: the United States spends 649 Billion dollars a year on subsidies.

Subpoint B. There is a price to pay for using fossil fuels that goes beyond just subsidizing them.

Union of Concerned Scientists updated in (2019)

all fossil fuels emit carbon dioxide and other harmful air pollutants when burned. These emissions lead to a variety of public health and environmental costs that are borne at the local, regional, national, and global levels.

Sulfur dioxide emissions, the result of burning coal, contribute to acid rain and SO2 emissions can exacerbate respiratory ailments, including asthma, nasal congestion, and pulmonary inflammation

(NOx) emissions, a byproduct of all fossil fuel combustion, contribute to acid rain and ground-level ozone (smog), which can burn lung tissue and can make people more susceptible to asthma, bronchitis, and other chronic respiratory diseases.

Coal-fired power plants are the largest source of mercury emissions in the United States. As mercury settles onto the ground, it washes into bodies of water where it accumulates in fish, and passes through the food chain. The consumption of mercury-laden fish by pregnant women has been associated with neurological effects in infants.

If coal contains high levels of sulfur it must be cleaned and refined. This process involves crushing and washing the coal, leaving behind coal slurry, a watery waste that contains arsenic, mercury, chromium, cadmium, and other heavy metals. As much as 50 percent of pre-processed coal materials can end up as highly toxic waste

Contention 2: Climate Change is expensive and dangerous

Subpoint A. Climate change is real

**Nuccitelli 16**

Authors of seven previous climate consensus studies co-authored a new paper that should settle this question once and for all. The conclusions from the paper are:

1) Depending on exactly how you measure the expert consensus, it’s between 90% and 100% that agree humans are responsible for climate change, with most of our studies finding 97%

2) The greater the climate expertise, the higher the consensus on human-caused global warming.

Subpoint B. Climate Change is expensive

A report released by congressman John Yarmuth, Chairman on the committee of the budget in 2019 states the following:

Two major assessments, have estimated significant climate damages across industries such as health, labor, coastal property, agriculture, and energy. They independently concluded that, if we continue business as usual with high emissions and limited resilience efforts, annual losses will likely grow to exceed $500 billion, or roughly 3 percent of national GDP, by the end of the century – and that is just in the examined sectors.

Subpoint C. Fossil Fuels cause climate change

Ocko 2019

The research falls into independently studied, but physically related, lines of evidence:

Simple chemistry – when we burn carbon-based materials, carbon dioxide (CO2) is emitted

Measuring CO2 in the atmosphere to find that it's increasing, with levels higher than anything we've seen in hundreds of thousands of years

Chemical analysis of the atmospheric CO2 that reveals the increase is coming from burning fossil fuels

Basic physics that shows us that CO2 absorbs heat

Monitoring climate conditions to find that recent warming of the Earth is correlated to and follows rising CO2 emissions

Ruling out natural factors that can influence climate like the sun and ocean cycles

End quote

Contention 3: The opportunity cost of climate change and fossil fuel subsidies

By spending hundreds of billions on supporting an industry that is causing environmental catastrophe that will soon cost us additional hundreds of billions, we miss our opportunity at switching to less harmful sources of energy.

Subpoint A. Paying for the transition to Renewables

Carrington. (2019)

quote

new analysis shows how redirecting some of the fossil fuel subsidies could tip the balance in favor of green energy, making it the cheapest electricity

“Almost everywhere, renewables are so close to being competitive that [a 10-30% subsidy swap] tips the balance, and turns them from a technology that is slowly growing to one that is instantly the most viable

Endquote

Subpoint B.

#### Subsidy phase-out frees up funds for helping developing countries meet emission targets

Spratt and Ashford 11

the removal of **all** fossil fuel subsidies in both developed and developing countries by 2020 would reduce atmospheric GHGs by 20% (cited June 2010 Oil Change). Building on these commitments, countries could further agree to redirect the significant public funds freed up to **financing mitigation** (clean technology) **and adaptation** activities **in developing countries.**29 How much would the removal of fossil fuel subsidies raise? Global subsidies for the production and consumption of fossil fuels are estimated at $700 billion per year. Phasing out of fossil fuel subsidies and their redirection to climate finance could **plug an important gap in** the **revenues** needed to fulfil the climate-finance obligations of developed countries To ensure the principles of ‘common but differentiated responsibilities’ are upheld, a ‘global sequencing and linkage’ process is proposed

## Value + Value Criterion + Definitions

**Value: Social Progress**

Harvard Business School Social Progress Index (2019) Social Progress Index - Institute For Strategy And Competitiveness - Harvard Business School. Retrieved November 11, 2019, from https://www.isc.hbs.edu/research-areas/Pages/social-progress-index.aspx

Social progress is defined as the capacity of a society to meet the basic human needs of its citizens, establish the building blocks that allow citizens and communities to enhance and sustain the quality of their lives, and create the conditions for all individuals to reach their full potential.

#### **How does you criterion achieve your value?**

In order for any society to create a society of growth and achievement, it must use its resources efficiently and to the benefit of its citizens. As stated in my contention, fossil fuels have negative impacts on the environment, our health. By more efficiently using federal money, we could end public-funding of this menace to society and use the funds on better ventures such as space travel and cleaner energy production.

**Value Criterion: Optimizing resources**

In respect to the resolution, optimizing resources would be redirecting our federal capital towards more useful and efficient pursuits. Some of which I will go into later in my speech.

#### Fossil Fuel Definition

[Otto C. Kopp](https://www.britannica.com/contributor/Otto-C-Kopp/1632) (2019) fossil fuel | Meaning, Types, & Uses | Britannica.com. Retrieved November 10, 2019, from https://www.britannica.com/science/fossil-fuel

Fossil fuels include [coal](https://www.britannica.com/science/coal-fossil-fuel), [petroleum](https://www.britannica.com/science/petroleum), [natural gas](https://www.britannica.com/science/natural-gas), [oil shales](https://www.britannica.com/science/oil-shale), [bitumens](https://www.britannica.com/science/bitumen), [tar sands](https://www.britannica.com/science/tar-sand), and [heavy oils](https://www.britannica.com/science/heavy-oil). All contain [carbon](https://www.britannica.com/science/carbon-chemical-element) and were formed as a result of geologic processes acting on the remains of organic matter

#### Subsidy Definition, IMF

[David Coady](https://www.imf.org/en/Publications/Publications-By-Author?author=David++Coady&name=David%20%20Coady) ; [Ian Parry](https://www.imf.org/en/Publications/Publications-By-Author?author=Ian++Parry&name=Ian%20%20Parry) ; [Nghia-Piotr Le](https://www.imf.org/en/Publications/Publications-By-Author?author=Nghia-Piotr++Le&name=Nghia-Piotr%20%20Le) ; [Baoping Shang](https://www.imf.org/en/Publications/Publications-By-Author?author=Baoping++Shang&name=Baoping%20%20Shang) May 2019, International Monetary Fund https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509

It is helpful to distinguish two different notions of fossil fuel subsidies. One is a narrow measure, termed pre-tax subsidies, reflecting differences between the amount consumers actually pay for fuel use and the corresponding opportunity cost of supplying the fuel. In contrast, a broader measure, termed post-tax subsidies, reflects differences between actual consumer fuel prices and how much consumers would pay if prices fully reflected supply costs plus the taxes needed to reflect environmental costs and revenue requirements.12 The post-tax measure therefore corresponds to the definition of subsidies used in this paper, although the international debate (e.g., at the 2009 G20 meeting in Pittsburg) typically focuses on the narrower notion of pre-tax subsidies. Where prices exceed supply costs or efficient prices, then pre-tax and post-tax subsidies respectively are counted here as zero (rather than negative), given our focus on underpricing. The discussion is primarily about consumer price distortions, but producer subsidies also arise when firms receive direct or indirect support (e.g., prices above supply costs, preferential tax treatment, direct government budget transfers, or paying input prices below supply costs) that is not passed forward to lower consumer prices (OECD, 2018). Producer subsidies are included in pre-tax subsidies below, but they are relatively small. Subsidies for non-fossil fuels are excluded from our calculations.

## Contention 1. Subsidizing Fossil Fuels is expensive

### Subpoint A. We spend a lot on subsidizing fossil fuels

#### IMF report on cost

[David Coady](https://www.imf.org/en/Publications/Publications-By-Author?author=David++Coady&name=David%20%20Coady) ; [Ian Parry](https://www.imf.org/en/Publications/Publications-By-Author?author=Ian++Parry&name=Ian%20%20Parry) ; [Nghia-Piotr Le](https://www.imf.org/en/Publications/Publications-By-Author?author=Nghia-Piotr++Le&name=Nghia-Piotr%20%20Le) ; [Baoping Shang](https://www.imf.org/en/Publications/Publications-By-Author?author=Baoping++Shang&name=Baoping%20%20Shang) May 2019, International Monetary Fund https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509

Underpricing of fossil fuels remains pervasive and substantial. For example, country-level coal prices were typically well below half of their fully efficient levels in 2015. Undercharging for road fuels is also pervasive with prices frequently falling short of their efficient levels by over 20 percent.  At the global level, energy subsidies are estimated at $4.7 trillion6 (6.3 percent of world GDP) in 2015 and $5.2 trillion (6.5 percent of GDP) in 2017. At the aggregate level, the moderately smaller global figure for 2015 compared to previous estimates is mainly due to lower externality estimates (e.g., lower air pollution emission rates in China) and lower (than previously projected) fuel consumption, reflecting mostly updated data and regulatory policy changes. At the product and country level, there are numerous other, often offsetting, factors significantly changing energy subsidy estimates. The impact of recent energy (and carbon) pricing reform at the global level is limited. In absolute terms, China was still, by far, the largest subsidizer in 2015 (at $1.4 trillion), followed by the United States ($649 billion), Russia ($551 billion), European Union ($289 billion), and India ($209 billion). By region, Emerging/Developing Asia accounts for nearly 40 percent of global energy subsidies, followed by Advanced Economies (27 percent), Commonwealth of Independent States (15 percent), Middle East, North Africa, Afghanistan, and Pakistan (9 percent), Latin America/Caribbean (5 percent), Emerging/Developing Europe (3 percent), and Sub-Sahara Africa (2 percent).  By component, underpricing for local air pollution is still the largest source (48 percent in 2015), while that for global warming is similar to earlier estimates (24 percent), followed by broader environmental costs of road fuels (15 percent), undercharging for general consumption taxes (7 percent) and for supply costs (7 percent). Energy pricing reform therefore remains largely in countries own interest, given that about three quarters of the benefits are local.  By fuel, coal remains the largest source of subsidies (44 percent), followed by petroleum (41 percent), natural gas (10 percent), and electricity output (4 percent).  If fuel prices had been set at fully efficient levels in 2015, estimated global CO2 emissions would have been 28 percent lower, fossil fuel air pollution deaths 46 percent lower, tax

### Subpoint B. Burning Fossil Fuels externalities

#### The Externalities

Union of Concerned Scientists updated in (2019) The Hidden Costs of Fossil Fuels | Union of Concerned Scientists. Retrieved November 07, 2019, from https://www.ucsusa.org/resources/hidden-costs-fossil-fuels

We’ve all paid a utility bill or purchased gasoline. Those represent the direct costs of fossil fuels; money paid out of pocket for energy from coal, natural gas, and oil.

But those expenses don’t reflect the total cost of fossil fuels to each of us individually or to society as a whole. Known as externalities, the hidden costs of fossil fuels aren’t represented in their market price, despite serious impacts to our health and environment.

Externalities are sometimes easy to see, such as pollution and land degradation, and sometimes less obvious, such as the costs of asthma and cancer, or the impacts of sea level rise. Many consequences are far removed from our daily lives and may only affect a minority or marginalized subset of the population.

Costs accrue at every point of the fossil fuel supply chain. Extraction processes can generate air and water pollution, and harm local communities. Transporting fuels from the mine or well can cause air pollution and lead to serious accidents and spills. When the fuels are burned, they emit toxins and global warming emissions. Even the waste products are hazardous to public health and the environment.

Understanding these impacts is critical for evaluating the true cost of fossil fuels—and for informing our choices around the future of energy production.

What are fossil fuels?

Fossil fuels are rock-like, gas, or liquid resources that are burned to generate power. They include coal, natural gas, and oil, and are used as an energy source in the [electricity](https://www.ucsusa.org/node/345) and [transportation](https://www.ucsusa.org/node/331) sectors. They’re also a [leading source](https://www.ucsusa.org/sites/default/files/legacy/clean_energy/our-energy-choices/coal-and-other-fossil-fuels#.V6Dl8vkrLBQ) of the world’s global warming pollution.

Extracting fossil fuels

There are two main methods for removing fossil fuels from the ground: mining and drilling. Mining is used to extract solid fossil fuels, such as coal, by digging, scraping, or otherwise exposing buried resources. Drilling methods help extract liquid or gaseous fossil fuels that can be forced to flow to the surface, such as conventional oil and natural gas. Both processes carry serious health and environmental impacts.

Coal mining

Over the past several decades, there has been a gradual shift from underground coal mining to surface mining in the United States. Surface mining, which is only effective for shallow deposits, often employs highly invasive techniques, including area strip mining and mountaintop removal.

Underground mining

The most obvious and severe cost of underground coal mining is the threat it poses to the health and safety of coal miners. Many coal miners are injured, sometimes fatally, on the job each year; according to the Mine Safety and Health Administration, fatalities at underground coal mine sites in the United States totaled 77 from 2010 to 2013, including a 2010 explosion at the Upper Big Branch coal mine in West Virginia that killed 29 miners [[1](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#1), [2](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#2)].

In addition to job site accidents, coal mining can lead to chronic health disorders. Black lung disease (pneumoconiosis) continues to be a common ailment among coal miners. The disease was responsible for the deaths of approximately 10,000 former miners between 1990 and 2000, and continues today [[3](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#3)].

Adverse impacts to the environment are another significant cost of underground coal mining. Mines can collapse or gradually subside, affecting surface and subsurface water flows. Mine fires also occur, particularly in abandoned mines. And acid mine drainage at underground coal mines can be a long term environmental management issue; according to the US Environmental Protection Agency (EPA), if active and abandoned coal mines are not properly managed, water can sometimes flow through the mine and become highly acidic and rich in heavy metals. The resulting drainage water is detrimental to human, plant, and animal life [[4](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#4)].

Surface mining

Surface mining involves removing the overlaying soil to access the coal below, devastating local environments. Mountaintop removal, a particularly destructive form of surface mining, involves stripping all trees and other vegetation from peaks and hilltops, and then blasting away hundreds of feet of the earth below with explosives.

More than 500 mountaintop removal sites exist throughout the Appalachia region, impacting nearly 1.4 million acres of land [[5](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#5)].

The process results in both short- and long-term environmental impacts. In the short term, huge volumes of excess rock and soil are typically dumped into adjacent valleys and streams, altering their ecosystems and diverting the natural flow of streams.

In the long term, coal removal sites are left with poor soil that typically only supports exotic grasses. Buried valleys are similarly slow to rebound. The EPA reports that as of 2010, mountaintop removal coal extraction had buried nearly 2,000 miles of Appalachian headwater streams, some of the most biologically diverse streams in the country [[6](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#6)].

Surface mining can also directly impact the health and safety of surrounding communities. Mudslides, landslides, and flashfloods may become more common. And depending on the chemical makeup of the coal deposit, mines can pollute local drinking water sources with toxic chemicals like selenium, arsenic, manganese, lead, iron, and hydrogen sulfide [[7](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#7)].

A Harvard University study, which assessed the life cycle costs and public health effects of coal from 1997 to 2005, found a link to lung, cardiovascular, and kidney diseases—such as diabetes and hypertension—and an elevated occurrence of low birth rate and preterm births associated with surface mining practices. The total cost? An estimated $74.6 billion every year, equivalent to4.36 cents per kilowatt-hour of electricity produced—about one-third of the average electricity rate for a typical US home [[8](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#8)].

Oil and gas drilling

The environmental and health costs of onshore and offshore oil and gas drilling are also significant, and often unseen. The impacts of unconventional extraction methods, such as natural gas hydraulic fracturing (commonly called fracking) have received much attention, but all methods of oil and gas extraction carry hidden costs.

Water impact

When oil and gas are extracted, water that had been trapped in the geologic formation is brought to the surface. This “produced water” can carry with it naturally-occurring dissolved solids, heavy metals, hydrocarbons, and radioactive materials in concentrations that make it unsuitable for human consumption and difficult to dispose of safely [[9](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#9)].

When hydraulic fracturing methods are used, the total amount of waste water is amplified by the large volume of water and chemicals involved in the process. Drilling and fracking shale gas formations (like the Marcellus Shale) typically requires 3 to 6 million gallons of water per well, and an additional 15,000-60,000 gallons of chemicals, many of which are undisclosed to Federal regulators [[10](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#10), [11](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#11)]. One government-sponsored report found that, from 2005 to 2009, 14 oil and gas companies used 780 million gallons of hydraulic fracturing products containing 750 chemicals and other components [[12](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#12)]. Another study identified 632 chemicals contained in fracking products used in shale gas extraction.

Researchers could track only 353 chemicals from that larger list and found that 25 percent of those chemicals cause cancer or other mutations, and about half could severely damage neurological, cardiovascular, endocrine, and immune systems [[13](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#13)].

Land use

A large amount of land is disturbed by the drilling wells, access roads, processing facilities, and pipelines associated with oil and gas drilling operations. In particular, noise and habitat fragmentation can harm wildlife populations. For example: one study found an 82 percent decline in the population of Powder River Basin sage grouse between 2001 and 2005, which was directly linked to the area’s coal bed methane production [[14](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#14)].

The advent of horizontal drilling technology, used extensively in unconventional gas production, has greatly reduced the surface footprint of drilling operations by allowing multiple wells to be drilled from a single well pad. However, much of the development of the US shale gas resources is occurring in locations where oil and gas production has not previously taken place (in some cases in wilderness areas), requiring extensive infrastructure development and land degradation [[15](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#15)].

Global warming emissions

Natural gas’s climate emissions are not only generated when it’s burned as a fuel at power plants or in our homes. The full global warming impact of natural gas also includes methane emissions from drilling wells and pipeline transportation.

Methane, the main component of natural gas, is a much more potent greenhouse gas than carbon dioxide—some 34 times more effective at trapping heat over a 100-year timescale and 86 times more effective over a 20-year timescale [[16](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#16)]. Preliminary studies and field measurements show that these so-called “fugitive” emissions range from 1 to 9 percent of total natural gas lifecycle emissions. Methane losses must be kept below 3.2 percent for natural gas power plants to have lower lifecycle greenhouse gas emissions than coal [[17](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#17)].

Oil drilling can also produce methane. Although it can be captured and used as an energy source, the gas is often either vented (released) or flared (burned). Vented methane contributes greatly to global warming, and poses a serious safety hazard. Flaring the gas converts it from methane to carbon dioxide, which reduces its impact but still releases additional greenhouse gases to into the atmosphere. The World Bank estimates that 5.3 trillion cubic feet of natural gas, the equivalent of 25 percent of total US consumption, is flared annually worldwide, generating some 400 million tons of unnecessary carbon dioxide emissions [[18](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#18)].

Offshore drilling

Offshore oil and gas drilling poses many of the same risks as onshore drilling; however, these risks are amplified due to the remote location of offshore drilling sites and the complicated engineering required. In 2010, an explosion at the Deepwater Horizon offshore oil rig in the Gulf of Mexico killed 11 workers and led to the release of approximately 4.9 million barrels of oil over 87 days [[19](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#19)]. The accident was unique in terms of its scale, but environmental and safety incidents are common in the offshore oil and gas industries. Between 2008 and 2012, offshore drilling rigs experienced 34 fatalities, 1,436 injuries, and 60 oils spills of more than 50 barrels each [[20](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#20)].

Unconventional sources

As easily-accessed sources of oil dry up, so-called “new” sources of oil are introducing new problems. For example, [tar sands](https://www.ucsusa.org/node/2283)—an extremely viscous oil with the consistency of peanut butter—requires significantly more energy to mine and refine, emitting up to three times more greenhouse gas emissions than conventional oil in the process. These and other additional emissions mean that the dirtiest sources of oil can add as much as an extra ton of pollution per year for the average car.

Transporting fossil fuels

Depending on where fossil fuels are extracted and used, the resource itself may need to travel across long distances—but transporting fuel can generate its own pollution, and increase the potential for catastrophic accidents.

Coal

In most cases, coal is transported from mines to power plants. In 2014, approximately 68 percent of the coal used for electric power in the US was transported by rail: 13 percent was transported on river barge and another 11 percent by truck [[21](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#21)]. Train cars, barges, and trucks all run on diesel fuel, a major source of nitrogen dioxide and soot, which carry substantial human health risks [[22](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#22)]. Transporting coal can also produce coal dust, which presents serious cardiovascular and respiratory risks for communities near transportation routes [[23](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#23)].

Natural gas

Natural gas is transported over long distances by transmission pipelines, while distribution pipelines deliver gas locally to homes and businesses. But natural gas is also highly flammable, making the process of transporting it from wellhead to homes and businesses dangerous. Between 2008 and 2015, there were 5,065 significant safety incidents related to natural gas pipeline transmission and distribution, leading to 108 fatalities and 531 injuries [[24](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#24)].

In addition to safety concerns, natural gas leaks from transmission and distribution pipelines are a significant source of methane emissions. A recent study, which mapped urban pipeline leaks in Boston, found 3,356 separate leaks under the city streets. The study noted that Boston is not unique; other cities, like New York and Washington DC, have aging natural gas distribution infrastructures, and similar methane leaks are likely widespread [[25](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#25)].

Large leaks from natural gas infrastructure also occur. Beginning in 2015, the Southern California Gas Company's Aliso Canyon natural gas storage facility was the site of the largest methane leak in US history, with a total of 94,500 tons of methane was released between October 23, 2015 and February 11, 2016 [[26](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#26), [27](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#27)].

Liquefied Natural Gas (LNG) is natural gas that has been cooled and condensed into a liquid form. As of 2016, there were 13 LNG import/export terminals in the United States [[28](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#28)]. The growth in LNG shipments has provoked safety concerns, particularly where LNG terminals are situated near densely settled areas. In the wake of the Sept. 11, 2001, terrorist attacks, LNG deliveries have faced tight security and stricter regulations as policy makers have debated the risks of an attack on LNG facilities or ships [[29](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#29)].

Oil

Oil is transported across the ocean in supertankers, and it is moved over land by pipeline, rail, and truck. In every case, the risk of oil spills poses a serious environmental threat.

The infamous 1989 Exxon Valdez oil spill released 262,000 barrels of oil into the Prince Williams Sound in Alaska, but was only the 35th largest marine oil tanker spill since 1967. While major oil spills have decreased, they still occur: three large oil spills released more than 5,000 barrels of oil each in 2013 alone [[30](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#30), [31](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#31)].

Spills and leaks from onshore oil pipelines also continue to be a major risk. Examples of recent pipeline spills in the US include the 2010 Enbridge spill that released approximately 20,100 barrels into Michigan’s Kalamazoo River and the 2011 ExxonMobil spill that released some 1,000 barrels of oil into Montana’s Yellowstone River [[32](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#32), [33](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#33)].

Burning fossil fuels

Some of the most significant hidden costs of fossil fuels are from the air emissions that occur when they are burned. Unlike the extraction and transport stages, in which coal, oil, and natural gas can have very different types of impacts, all fossil fuels emit carbon dioxide and other harmful air pollutants when burned. These emissions lead to a wide variety of public health and environmental costs that are borne at the local, regional, national, and global levels.

Global warming emissions

Of the many environmental and public health risks associated with burning fossil fuels, the most serious in terms of its universal and potentially irreversible consequences is global warming. In 2014, approximately 78 percent of US global warming emissions were energy-related emissions of carbon dioxide. Of this, approximately 42 percent was from oil and other liquids, 32 percent from coal, and 27 percent from natural gas [[34](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#34)].

Non-fossil fuel energy generation technologies, like wind, solar, and geothermal, contributed less than 1 percent of the total energy related global warming emissions. Even when considering the full lifecycle carbon emissions of all energy sources, coal, oil, and natural gas clearly stand out with significantly higher greenhouse gas emissions [[35](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#35)].

The use of fossil fuels in transportation contributes almost 30 percent of all US global warming emissions, rivalling—and likely to surpass—the power sector [[36](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#36)].

Air pollution

Burning fossil fuels emits a number of air pollutants that are harmful to both the environment and public health.

Sulfur dioxide (SO2) emissions, primarily the result of burning coal, contribute to acid rain and the formation of harmful particulate matter. In addition, SO2 emissions can exacerbate respiratory ailments, including asthma, nasal congestion, and pulmonary inflammation [[37](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#37)]. In 2014, fossil fuel combustion at power plants accounted for 64 percent of US SO2 emissions [[38](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#38)].

Nitrogen oxides (NOx) emissions, a byproduct of all fossil fuel combustion, contribute to acid rain and ground-level ozone (smog), which can burn lung tissue and can make people more susceptible to asthma, bronchitis, and other chronic respiratory diseases. Fossil fuel-powered transportation is the primary contributor to US NOx emissions [[39](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#39)].

Acid rain is formed when sulfur dioxide and nitrogen oxides mix with water, oxygen, and other chemicals in the atmosphere, leading to rain and other precipitation that is mildly acidic. Acidic precipitation increases the acidity of lakes and streams, which can be harmful to fish and other aquatic organisms. It can also damage trees and weaken forest ecosystems [[40](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#40)].

Particulate matter (soot) emissions produce haze and can cause chronic bronchitis, aggravated asthma, and elevated occurrence of premature death. In 2010, it is estimated that fine particle pollution from US coal plants resulted in 13,200 deaths, 9,700 hospitalizations, and 20,000 heart attacks. The impacts are particularly severe among the young, the elderly, and those who suffer from respiratory disease. The total health cost was estimated to be more than $100 billion per year [[41](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#41)].

Coal-fired power plants are the largest source of mercury emissions to the air in the United States [[42](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#42), [43](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#43)]. As airborne mercury settles onto the ground, it washes into bodies of water where it accumulates in fish, and subsequently passes through the food chain to birds and other animals. The consumption of mercury-laden fish by pregnant women has been associated with neurological and neurobehavioral effects in infants. Young children are also at risk [[44](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#44)].

A number of studies have sought to quantify the health costs associated with fossil fuel-related air pollution. The National Academy of Sciences assessed the costs of SO2, NOx, and particulate matter air pollution from coal and reported an annual cost of $62 billion for 2005 —approximately 3.2 cents per kilowatt-hour (kWh) [[45](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#45)]. A separate study estimated that the pollution costs from coal combustion, including the effects of volatile organic compounds (VOCs) and ozone, was approximately $187 billion annually, or 9.3 cents per kWh [[46](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#46)].

A 2013 study also assessed the economic impacts of fossil fuel use, including illnesses, premature mortality, workdays lost, and direct costs to the healthcare system associated with emissions of particulates, NOx, and SO2. This study found an average economic cost (or “public health added cost”) of 32 cents per kWh for coal, 13 cents per kWh for oil, and 2 cents per kWh for natural gas [[47](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#47)]. While cost estimates vary depending on each study’s scope and assumptions, together they demonstrate the significant and real economic costs that unpriced air emissions impose on society.

Fossil fuel transportation emissions represent the largest single source of toxic air pollution in the U.S., accounting for over a third of carbon monoxide (CO) and NOx emissions.

Water use

Across the United States, the demand for electricity is colliding with the need for healthy and abundant freshwater. Nationwide, fossil fuel and nuclear power plants have been found to withdraw as much water as all farms and more than four times as much as all residences. More than 80 percent of this power plant cooling water originates in lakes and rivers, directly impacting local ecosystems and often competing with other uses, such as agriculture and recreation. As of 2008, about 20 percent of U.S. watersheds were experiencing water-supply stress. Power plants substantially contributed to the water stress in one-fifth of these watersheds [[48](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#48)].

Power plants that return water to nearby rivers, lakes, or the ocean can harm wildlife through what is known as “thermal pollution.” Thermal pollution occurs due to the degradation of water quality resulting from changes in water temperature. Some power plants have large impacts on the temperature of nearby water sources, particularly coal plants with once-through cooling systems. For a typical 600-megawatt once-through system, 70 to 180 billion gallons of water cycle through the power plant before being released back into a nearby source. This water is much hotter (by up to 25°F) than when the water was initially withdrawn. Because this heated water contains lower levels of dissolved oxygen, its reintroduction to aquatic ecosystems can stress native wildlife, increasing heart rates in fish and decreasing fish fertility.

Fossil fuel waste

Although fossil fuels contain large amounts of energy, they’re rarely found in a pure, unadulterated state. Instead, they are typically refined and purified into a usable form, leaving excess waste material that requires disposal. The handling and disposal of this waste results in costly environmental and community health challenges.

Coal waste

Coal is known for being a dirty fuel, not just because of its high carbon content compared with other fossil fuels but also because it contains a large amount of toxic heavy metals and other chemicals.

If the coal contains high levels of sulfur—as does most coal from the eastern US—it must be cleaned and refined before it’s burned in a power plant. This process involves crushing and washing the coal to remove waste materials. The purified coal is then transported to its final destination, leaving behind coal slurry, a watery waste that contains arsenic, mercury, chromium, cadmium, and other heavy metals. As much as 50 percent of pre-processed coal materials can end up as highly toxic waste [[49](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#49)].

Others harmful materials remain as excess waste when the coal is burned. After combustion, the material left behind is known as coal ash, consisting of fly ash and bottom ash. Fly ash is the material that is captured by pollution control equipment in the coal plant’s smokestacks. If the plant does not have pollution control equipment, this waste is emitted directly as air pollution. Bottom ash is the substance that remains at the bottom of the furnace. Both fly ash and bottom ash contain large amounts of toxic heavy metals and require careful—and costly—disposal.

Coal slurry (pre-combustion waste) and coal ash (post-combustion waste) are stored in large reservoir impoundments. There are over a thousand coal slurry impoundments and coal ash waste sites in the US, many of which contain hundreds of millions of gallons of waste [[50](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#50), [51](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#51)].

If the reservoirs are unlined (as are at least 42 percent of US coal combustion waste ponds and landfills) or if lined reservoirs are not properly maintained, harmful chemicals can leach into surface and groundwater supplies. The presence of toxic heavy metals in drinking water has been found to cause cancer, birth defects, reproductive disorders, neurological damage, learning disabilities, and kidney disease [[52](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#52)].

The EPA has identified 53 coal ash ponds that are classified as a “high hazard”, meaning that a failure at one of these impoundments would cause serious property damage, injuries, illness, and death [[53](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#53)]. Over the last several decades, there have been several dozen spills at such reservoirs in Appalachia, including the 2000 Martin County Coal Company spill, the 2008 Tennessee Valley Authority spill, and the 2014 Duke Energy Dan River Spill [[54](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#54)].

Oil and gas wastewater

When oil and gas are extracted, water previously trapped within geologic formations is brought to the surface. This “produced water” can carry with it dissolved solids, heavy metals, hydrocarbons, and naturally occurring radioactive materials in quantities that make it unsuitable for human consumption and difficult to dispose of safely [[55](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#55)]. Extraction companies often temporarily store this water in open-air pits with impermeable liners to avoid seepage, but heavy rain can cause these pits to overflow. Covered holding tanks offer a more secure temporary storage option [[56](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#56)].

Oil and gas wastewater can also impact aquatic wildlife. Oil and grease leaked into water systems can adhere to fish and waterfowl and destroy algae and plankton, disrupting the primary food sources of fragile aquatic ecosystems. And heavy metals in the wastewater can be toxic to fish, even in low concentrations, and may be passed through the food chain, adversely affecting humans and larger animals [[57](https://www.ucsusa.org/resources/hidden-costs-fossil-fuels#57)].

The future of energy

Burning coal, oil, and natural gas has serious and long-standing negative impacts on public health, local communities and ecosystems, and the global climate. Yet the majority of fossil fuel impacts are far removed from the fuels and electricity we purchase, hidden within public and private health expenditures, military budgets, emergency relief funds, and the degradation of sensitive ecosystems. We don’t pay for the cost of cancer, or the loss of fragile wetlands, when we pay our electricity bill—but the costs are real.

Renewable energy—such as wind and solar power—carries far fewer negative impacts at increasingly competitive prices. The Union of Concerned Scientists has worked for decades on transforming the electricity and transportation sectors, and is committed to policies and practices that encourage clean energy.

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## Contention 2. Climate Change is expensive and dangerous

### Subpoint A. Climate change is real

#### There’s an unquestionable scientific consensus about warming.

Nuccitelli 16 — Dana Nuccitelli, Climate Writer for the *Guardian*, Environmental Scientist at Tetra Tech—a private environmental consulting firm, holds an M.A. in Physics from the University of California-Davis and a B.A. in Astrophysics from the University of California-Berkeley, 2016 (“It’s settled: 90–100% of climate experts agree on human-caused global warming,” *Climate Consensus – The 97%*—a *Guardian* blog about climate change, April 13th, Available Online at <https://www.theguardian.com/environment/climate-consensus-97-per-cent/2016/apr/13/its-settled-90100-of-climate-experts-agree-on-human-caused-global-warming>, Accessed 07-15-2016)

There is an overwhelming expert scientific consensus on human-caused global warming.

Authors of seven previous climate consensus studies — including Naomi Oreskes, Peter Doran, William Anderegg, Bart Verheggen, Ed Maibach, J. Stuart Carlton, John Cook, myself, and six of our colleagues — have co-authored a new paper that should settle this question once and for all. The two key conclusions from the paper are:

1) Depending on exactly how you measure the expert consensus, it’s somewhere between 90% and 100% that agree humans are responsible for climate change, with most of our studies finding 97% consensus among publishing climate scientists.

2) The greater the climate expertise among those surveyed, the higher the consensus on human-caused global warming.

[Graphic Omitted]

Expert consensus is a powerful thing. People know we don’t have the time or capacity to learn about everything, and so we frequently defer to the conclusions of experts. It’s why we visit doctors when we’re ill. The same is true of climate change: most people defer to the expert consensus of climate scientists. Crucially, as we note in our paper:

Public perception of the scientific consensus has been found to be a gateway belief, affecting other climate beliefs and attitudes including policy support.

That’s why those who oppose taking action to curb climate change have engaged in a misinformation campaign to deny the existence of the expert consensus. They’ve been largely successful, as the public badly underestimate the expert consensus, in what we call the “consensus gap.” Only 12% of Americans realize that the consensus is above 90%.

[Video Omitted]

Consensus misrepresentations

Our latest paper was written in response to a critique published by Richard Tol in Environmental Research Letters, commenting on the 2013 paper published in the same journal by John Cook, myself, and colleagues finding a 97% consensus on human-caused global warming in the peer-reviewed literature.

Tol argues that when considering results from previous consensus studies, the Cook 97% figure is an outlier, which he claims is much higher than most other climate consensus estimates. He makes this argument by looking at sub-samples from previous surveys. For example, Doran’s 2009 study broke down the survey data by profession – the consensus was 47% among economic geologists, 64% among meteorologists, 82% among all Earth scientists, and 97% among publishing climate scientists. The lower the climate expertise in each group, the lower the consensus.

[Graph Omitted]

Like several of these consensus surveys, Doran cast a wide net and included responses from many non-experts, but among the experts, the consensus is consistently between 90% and 100%. However, by including the non-expert samples, it’s possible to find low “consensus” values.

The flaw in this approach is especially clear when we consider the most ridiculous sub-sample included in Tol’s critique: Verheggen’s 2015 study included a grouping of predominantly non-experts who were “unconvinced” by human-caused global warming, among whom the consensus was 7%. The only surprising thing about this number is that more than zero of those “unconvinced” by human-caused global warming agree that humans are the main cause of global warming. In his paper, Tol included this 7% “unconvinced,” non-expert sub-sample as a data point in his argument that the 97% consensus result is unusually high.

By breaking out all of these sub-samples of non-experts, the critique thus misrepresented a number of previous consensus studies in an effort to paint our 97% result as an outlier. The authors of those misrepresented studies were not impressed with this approach, denouncing the misrepresentations of their work in no uncertain terms.

We subsequently collaborated with those authors in this newly-published scholarly response, bringing together an all-star lineup of climate consensus experts. The following quote from the paper sums up our feelings about the critique’s treatment of our research:

Tol’s (2016) conflation of unrepresentative non-expert sub-samples and samples of climate experts is a misrepresentation of the results of previous studies, including those published by a number of coauthors of this paper.

Consensus on consensus

In our paper, we show that including non-experts is the only way to argue for a consensus below 90–100%. The greater the climate expertise among those included in the survey sample, the higher the consensus on human-caused global warming. Similarly, if you want to know if you need open heart surgery, you’ll get much more consistent answers (higher consensus) if you only ask cardiologists than if you also survey podiatrists, neurologists, and dentists.

That’s because, as we all know, expertise matters. It’s easy to manufacture a smaller non-expert “consensus” number and argue that it contradicts the 97% figure. As our new paper shows, when you ask the climate experts, the consensus on human-caused global warming is between 90% and 100%, with several studies finding 97% consensus among publishing climate scientists.

There’s some variation in the percentage, depending on exactly how the survey is done and how the question is worded, but ultimately it’s still true that there’s a 97% consensus in the peer-reviewed scientific literature on human-caused global warming. In fact, even Richard Tol has agreed:

The consensus is of course in the high nineties.

Is the consensus 97% or 99.9%?

In fact, some believe our 97% consensus estimate was too low. These claims are usually based on an analysis done by James Powell, and the difference simply boils down to how “consensus” is defined. Powell evaluated the percentage of papers that don’t explicitly reject human-caused global warming in their abstracts. That includes 99.83% of papers published between 1991 and 2012, and 99.96% of papers published in 2013.

In short, 97% of peer-reviewed climate research that states a position on human-caused warming endorses the consensus, and about 99.9% of the total climate research doesn’t explicitly reject human-caused global warming. Our two analyses simply answer different questions. The percentage of experts and their research that endorse the theory is a better description of “consensus.” However, Powell’s analysis is useful in showing how few peer-reviewed scientific papers explicitly reject human-caused global warming.

In any case, there’s really no question that humans are the driving force causing global warming. The experts are almost universally convinced because the scientific evidence is overwhelming. Denying the consensus by misrepresenting the research won’t change that reality.

With all of the consensus authors teaming up to show the 90–100% expert consensus on human-caused global warming, and most finding 97% consensus among publishing climate scientists, this paper should be the final word on the subject.

#### Cost of Climate Change

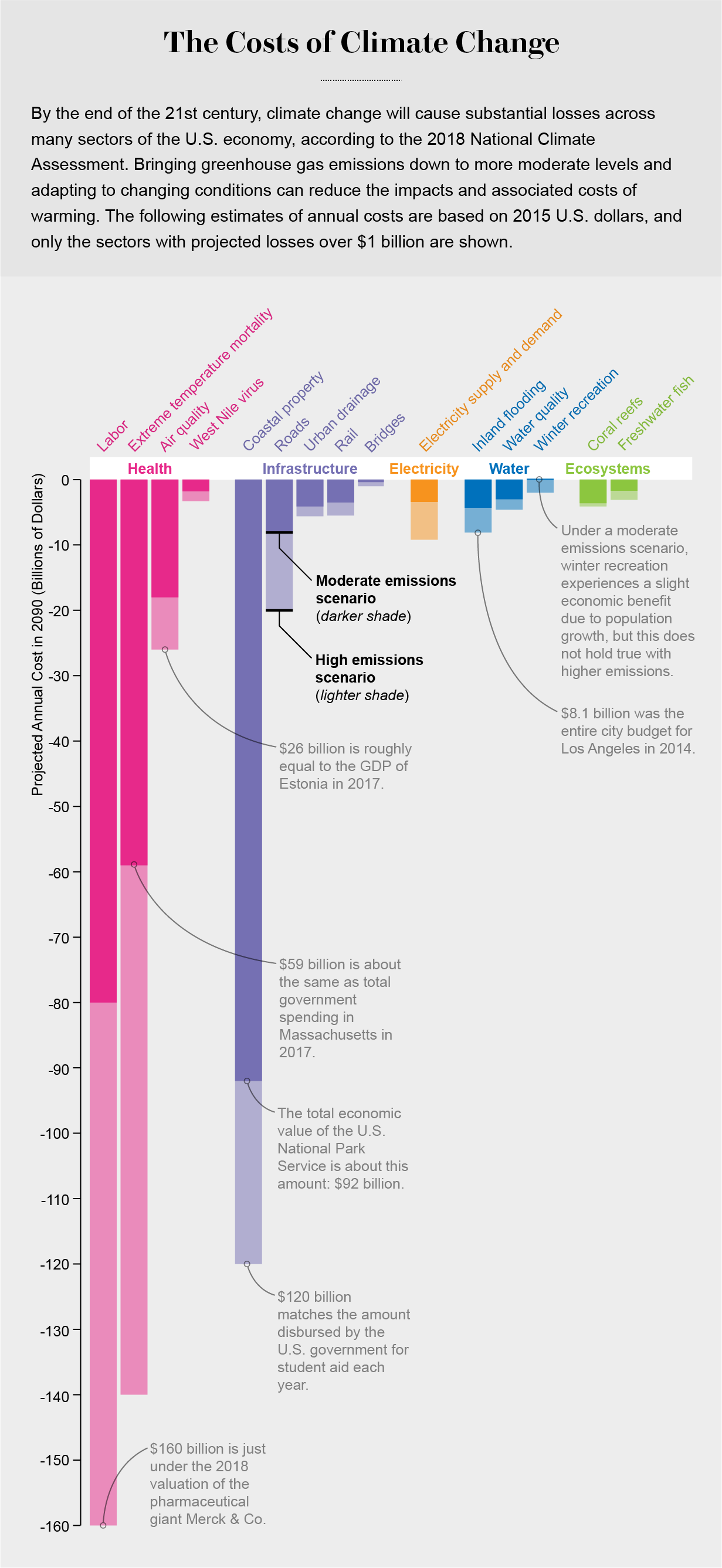
Andrea Thompson. –Master degree in earth and atmospheric sciences (2019) Here's How Much Climate Change Could Cost the U.S. - Scientific American. Retrieved November 07, 2019, from https://www.scientificamerican.com/article/heres-how-much-climate-change-could-cost-the-u-s/

Climate change comes with a hefty bill. The United States stands to experience major economic losses over the 21st century as sea levels rise, heat waves become more frequent and rains fall in heavier bursts, according to the recently released [National Climate Assessment](https://nca2018.globalchange.gov/) (NCA). Sources of the costs range from damaged and abandoned coastal properties, to wages lost when it is too hot to work outdoors, to premature deaths caused by increased air pollution and disease exposure.

The report is put together by 13 federal agencies and includes input from hundreds of scientists, including many who work at academic institutions. Released every four years by Congressional mandate (this year’s NCA weighs in at 1,656 pages), it uses projections of climate change based on varying levels of greenhouse gas emissions—and figures in expected population changes—to estimate the toll a changing climate may exact on various sectors of the country’s economy. In the graphic below, Scientific American focuses on the sectors subject to the biggest impacts and compares the projected losses to current economic activity. Even for sectors in which the overall numbers seem relatively small, those involved can be hit hard. For example, losses in freshwater fishing would be felt disproportionately by small communities that depend on fishing-related tourism.

The NCA estimates are not intended to be exact predictions for specific years. Rather, they provide a sense of the scale of damage climate change may cause by the end of the century—and they show the major difference that reducing greenhouse gas emissions and adapting to changes can make in the losses sustained. When it comes to lost hours of labor, for example, reducing emissions could cut the costs in half. And lowered emissions, combined with adaptations such as bolstering protective wetlands and buying out precarious properties, could avoid 90 percent of the costs that could be incurred by coastal areas.

The loss estimates should also be considered conservative because they do not factor in every way climate change might cause damage, according to the [Environmental Protection Agency analysis](https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=OAP&dirEntryId=335095) the NCA drew from. For example, the costs of air pollution in this year’s report only included premature deaths linked to increased ozone, leaving out other pollutants.



#### Climate Change will cost 224 Billion per year

Dana Nuccitelli (2019) Climate change could cost U.S. economy billions » Yale Climate Connections. Retrieved October 16, 2019, from <https://www.yaleclimateconnections.org/2019/04/climate-change-could-cost-u-s-economy-billions/>

Nuccitelli 19

A newly-published peer-reviewed analysis of climate change impacts across broad sectors of the U.S. economy provides what may be the most comprehensive economic assessment to date of those costs.

The [April report](https://www.nature.com/articles/s41558-019-0444-6) in the journal Nature Climate Change is a condensed version of the Environmental Protection Agency’s [2017 Climate Change Impacts and Risk Analysis report](https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=OAP&dirEntryId=335095). That analysis was used to help inform the [Fourth National Climate Assessment Report](https://nca2018.globalchange.gov/) published in late 2018.

Written by two EPA professional staffers – but with the standard caveat that it represents their views, and not necessarily those of the agency – the research addressed in the April report considers two global warming scenarios: Representative Concentration Pathway (RCP) 4.5 and 8.5, numbered to correspond to the global energy imbalance (in Watts per square meter) created by the increased greenhouse effect in the two scenarios.

RCP4.5 would lead to about 2.8°C (5°F) warming of global surface temperatures above pre-industrial levels by the year 2100. Limiting global warming to that degree would require more aggressive international climate policies than are in place today, but would nevertheless miss the 2015 Paris climate agreement targets of 2, and ideally of 1.5, degrees C. Continuing emission under the RCP8.5 approach would lead to about 4.5°C (8°F) warming by the end of the century, which is close to a worst-case scenario in which international policies do not slow global fossil fuel use and carbon pollution.

The Nature Climate Change analysis – by EPA scientists Jeremy Martinich and Allison Crimmins – examines 22 different climate economic impacts related to health, infrastructure, electricity, water resources, agriculture, and ecosystems. The bottom line conclusion: by the year 2090, impacts on those 22 economic sectors in the U.S. would cost about $224 billion more per year if we follow the RCP8.5 pathway than if we achieve the RCP4.5 pathway. The authors’ report comes with an important caveat:

only a small portion of the impacts of climate change are estimated, and therefore this Technical Report captures just a fraction of the potential risks and damages that may be avoided or reduced when comparing the alternative scenarios.

Asked to comment on the new research, economist Frank Ackerman, who was not involved with writing the report, said it is “entirely consistent with the broader hypothesis that climate change, if unmitigated, will have large negative impacts throughout the economy before the end of the century.” Impressed with the large number of impacts analyzed, Ackerman, formerly with Tufts University and now principal economist at Synapse Energy Economics, in Cambridge, Ma., said the report would have benefited had the authors been able to use a consistent base year and discount rate in evaluating all of the different impacts.

How much do we value life?

Health impacts account for about three-quarters of the $224 billion per year total cost difference between the two scenarios. More than one-third of that total is attributed to an increase in heat-related deaths.

To estimate the increased health effects costs, the authors reviewed research detailing extreme heat deaths in 49 American cities that account for about one-third of the U.S. population.

In the high-emissions RCP8.5 scenario, about 9,300 more people in those 49 cities would die each year as a result of increased heat. With adaptation efforts like installing extensive and costly air conditioning, the number of deaths could be limited to 4,300.

In the lower-emissions RCP4.5 scenario, heat-related deaths would increase by about 3,900 per year (5,400 fewer than in RCP8.5), but could be limited to 1,300 with adaptation (3,000 fewer than in RCP8.5).

Those findings raise a thorny question: How to quantify the value and the cost of those lost lives?

The researchers, in their April report, address that question by incorporating the “value of a statistical life” (VSL), which EPA describes in [a 2010 guidelines document](https://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0568-52.pdf/$file/EE-0568-52.pdf) as follows:

VSL is a summary measure for the dollar value of small changes in mortality risk experienced by a large number of people. VSL estimates are derived from aggregated estimates of individual values for small changes in mortality risks. For example, if 10,000 individuals are each willing to pay $500 for a reduction in risk of 1/10,000, then the value of saving one statistical life equals $500 times 10,000 – or $5 million. Note that this does not mean that any single identifiable life is valued at this amount. Rather, the aggregate value of reducing a collection of small individual risks is, in this case, worth $5 million.

EPA currently uses a VSL of $10 million, which this study’s authors adjust to $15.2 million for 2090. Their report thus estimates that saving 5,400 lives per year in 2090 in RCP4.5 as compared RCP8.5 is valued at $82 billion per year. Including adaptation efforts such as installation of extensive air conditioning, the difference of 3,000 lives yields an additional $46 billion cost for RCP8.5 as compared to RCP4.5, plus the added costs such as those associated with installing the necessary infrastructure like city-wide air conditioning.

Of course, any estimate of the value of life is ethically fraught. The challenge is that humans tend to most easily visualize and focus on economic impacts, but it’s difficult to quantify the costs of many climate change consequences like lost health and lives, trauma and suffering, or species extinctions and reduced biodiversity.

That dilemma brings to mind for some a comment that [Robert F. Kennedy made](https://www.jfklibrary.org/learn/about-jfk/the-kennedy-family/robert-f-kennedy/robert-f-kennedy-speeches/remarks-at-the-university-of-kansas-march-18-1968) in 1968 about the metric of Gross National Product: “It measures everything in short, except that which makes life worthwhile.”

Health, infrastructure, and other costs

The projected warming will lead also to 910 million more lost labor hours per year in 2090 in RCP8.5 than in RCP4.5 – a difference worth about $75 billion per year. This impact is highest in the Southeast ($24 billion in additional annual lost labor), Midwest ($16 billion), and Southwest ($11 billion), where temperatures are hottest.

[Every U.S. region will suffer the economic impacts of climate change, a new study finds. Click To Tweet](https://twitter.com/intent/tweet?url=https://www.yaleclimateconnections.org/2019/04/climate-change-could-cost-u-s-economy-billions/&text=Every%20U.S.%20region%20will%20suffer%20the%20economic%20impacts%20of%20climate%20change%2C%20a%20new%20study%20finds.&via=CC_Yale&related=CC_Yale)

Infrastructure is the second-costliest category of climate impacts. Under high-emissions scenario RCP8.5, an additional $26 billion of American coastal property would be lost annually toward the end of the century. That contrasts with the lower-emissions RCP4.5, plus an extra $12 billion per year in road damages. Higher electricity demand for cooling will cost an extra $5.8 billion per year. Flooding will cost an extra $3.8 billion per year, and an additional $2.2 billion in winter sports recreation will be lost in the high-emissions scenario. Lost freshwater fishing will cost another $1.4 billion annually.

One interesting aspect of the April analysis is that the economic impact on the agricultural sector is relatively small, with a nationwide cost difference estimated at $1.3 million per year more in 2090 under scenario RCP8.5 than under RCP4.5.

The Martinich-Crimmins report does not take into consideration impacts of worsening extreme weather events on crops, and it therefore underestimates agricultural losses. The research anticipates that although yields will decline for most staple crops – especially for barley, corn, cotton, and rice, but with the exception of wheat – farmers will adapt by using more farmland, changing the crops they grow, and increasing prices. As a result, most of the climate change impacts on the agricultural sector would be passed on to food consumers, in effect, to everybody.

“There are no regions that escape some mix of adverse impacts,” the authors conclude in their analysis. “Lower emissions, and adaptation in relevant sectors, would result in substantial economic benefits.”

Their study shows that limiting global warming to less than 5°F by the end of the century would save the United States a total of about $10 trillion from these 22 climate impacts as compared to an unabated 8°F warming, in addition to saving hundreds of thousands of American lives over those decades.

Big numbers those, dwarfing the billions that one-time Illinois Republican Senator Everett Dirksen is perhaps mistakenly said to have called “real money.” And that is in the context of the authors’ reminder that “this Technical Report captures just a fraction of the potential risks and damages that may be avoided or reduced” when comparing the two climate change growth scenarios … neither of which would achieve the higher of the two higher temperature global surface temperature averages that are at the heart of the 2015 Paris Climate Agreement agreed to by nearly 200 countries worldwide

### Subpoint B. CC is expensive

#### House Report on the fiscal cost of Climate Change-PreMeeting report

Chairman john Yarmuth 2019, chairman on the committee of the budget

responsibility and good governance call for action on climate change The consequences of climate change are real, they are already affecting communities across the country, and they are only going to get worse for future generations. If Congress does nothing to address the threat of climate change, growing economic risks across industries and regions will impose a high cost on Americans, businesses, the economy, and the federal budget. On June 11th, t he House Budget Committee will hear testimony from four expert witnesses on the current and projected costs of climate change and the impending fiscal risks to the federal government and the taxpayer. The changing climate will increasingly harm people’s lives, homes, and prosperity— The Fourth National Climate Assessment concluded that “the evidence of human-caused climate change is overwhelming,” the consequences of climate change are intensifying, and without substantial global mitigation and regional adaptation efforts, “climate change is projected to impose substantial damages on the U.S. economy, human health, and the environment.” The country is already seeing increases in temperatures, sea level, heat waves, wildfires, intense hurricanes and storms, and heavy rainfall events, as well as shifts in precipitation patterns and growing seasons. In fact, over the last three years, the U.S. has experienced disaster costs exceeding $150 billion per year, compared with approximately $16 billion per year (adjusted for inflation) 30 years ago. These changes will become more severe over the coming decades, with communities suffering from more widespread coastal and inland flooding, storm damages, and infrastructure stresses; decreasing agricultural productivity; and the health impacts of extreme heat, reduced air quality, and increased disease exposure. The economic damages will be large and will span across industries — Two major assessments, from the Climate Impact Lab and EPA’s Climate Change Impacts and Risk Analysis project, have estimated significant climate damages across industries such as health, labor, coastal property, agriculture, and energy. They independently concluded that, if we continue business as usual with high emissions and limited resilience efforts, annual losses will likely grow to exceed $500 billion, or roughly 3 percent of national GDP, by the end of the century – and that is just in the examined sectors. The largest impacts would be from reduced labor productivity, damaged coastal property, and lost lives (more than 10,000 additional deaths per year), with further losses associated with energy use, agricultural productivity, air quality, and transportation infrastructure. Almost two billion labor hours could be lost annually due to temperature extremes. Further work is underway to refine these assessments, but the trends and magnitudes clearly demonstrate the risks. The private sector is also beginning to take notice. For example,

House Budget Committee Staff June 6, 2019Page 2 BlackRock, a global investment management company, estimates that the median risk of commercial properties being hit by a category 4 or 5 hurricane has increased by 137 percent since 1980 and that this increase could further rise to 275 percent by 2050, with major implications for commercial mortgage-backed securities.Every region of the United States is at risk, especially for the poorest and most vulnerable—The combined economic effects of climate change are largest in the Southeast and Midwest, primarily due to coastal property damage and declining crop yields, but they extend across the country. (Nearly 2.5 million coastal properties, valued at over $1 trillion today, are projected to be at risk of chronic flooding by 2100.) This could exacerbate existing economic disparities – for example, by the late 21st century, the poorest third of U.S. counties could experience damages up to 20 percent of total personal income, compared with 7 percent for the wealthiest counties. The long-term fiscal health of the federal government is also at risk— Change climate will increase costs in multiple ways across many federal programs, both directly and indirectly. The Government Accountability Office (GAO) includes the federal government’s fiscal exposure to climate change on its high-risk list. Federal disaster response and relief costs will increase as hurricanes, flooding, wildfires, and other climate-related natural disasters become more frequent and intense. Flood insurance and flood prevention costs will grow due to increasing flood risk. Crop insurance costs will grow due to decreasing agricultural yield and increasing variability – potentially increasing approximately $4 billion (or 40 percent) by 2080. Federal facilities, as well as federally managed lands, infrastructure, and waterways, are at risk. The Department of Defense alone operates more than half a million facilities worldwide, valued at about $1 trillion – and of 79 mission assurance priority installations, roughly two-thirds are vulnerable to climate impacts. Public health, national security, and infrastructure impacts are also likely to affect federal spending, although less directly. And reduced productivity and economic activity would result in commensurate decreases in federal revenues. Fiscal responsibility and good governance call for action on climate change — To avoid significant and preventable costs to the economy and taxpayers, we need to take action now and focus our efforts in areas such as clean energy, resilience, and improved planning for climate risk. Unfortunately, the Trump Administration is acting to reverse the initial progress we have made. The Budget Committee will learn more about the costs and risks of climate change to the United States and the federal budget at this upcoming hearing. Expert witnesses who will inform our discussion are: •Katharine Hayhoe, Ph.D. (Professor and Director of the Climate Science Center, Texas Tech University)•Solomon Hsiang, Ph.D. (Chancellor's Professor of Public Policy, University of California, Berkeley; and Gloria and Richard Kushel Visiting Scholar, Stanford University) •J. Alfredo Gómez (Director, Natural Resources and Environment, U.S. Government Accountability Office) •Oren Cass (Senior Fellow, Manhattan Institute)

#### Climate Change has already cost money

Stephen Leahy (2019) Hidden Costs of Climate Change Running Hundreds of Billions a Year. Retrieved October 20, 2019, from https://www.nationalgeographic.com/news/2017/09/climate-change-costs-us-economy-billions-report/

“We want to paint a picture for Americans to illustrate the fact that the costs of not acting on climate change are very significant,” Watson, the former chair of the Intergovernmental Panel on Climate Change, told National Geographic.

Watson is quick to point out that extreme weather events, including heat waves, hurricanes, wildfires, and droughts, are not caused by climate change. However, there is no question their intensity and frequency in many cases has been made worse by the fact the entire planet is now 1.8 degrees F (1 degree C) hotter, he said in an interview.

While a 1.8 degree F (1 degree C) increase may seem small, it’s having a major economic impact on the U.S. According to data provided by the National Oceanic and Atmospheric Administration (NOAA), the number of extreme weather events causing at least $1 billion in economic losses has increased more than 400 percent since the 1980s. Some of that increase is due to increased amounts of housing and commercial infrastructure along coastlines. “However that doesn’t account for big increases in the last decade,” Watson said.

And much more global warming is coming—3.6 degrees F (2 degrees C) temperature by 2050 and even greater warming beyond that—unless bigger cuts in fossil-fuel emissions are made than those promised in the 2015 [Paris Climate Agreement](http://unfccc.int/paris_agreement/items/9485.php), said Watson. “The impacts of climate change are certainly going to get more than twice as bad,” he said. ([Learn more about why this hurricane season has been so catastrophic](http://news.nationalgeographic.com/2017/09/hurricane-irma-harvey-season-climate-change-weather/).)

Seeking Solutions

The report also looks at low-carbon solutions that can cut emissions and air pollution and benefit the U.S. economy. For instance, doubling the current share of renewable energy could create 500,000 new jobs while substantially cutting the amount of electricity currently generated using coal—improving air quality and reducing health costs.

Renewable energy, even when subsidized, will save America billions of dollars, according to the [first national study](http://iopscience.iop.org/article/10.1088/1748-9326/aa87bd) of the future costs and benefits of [renewable portfolio standards](http://news.nationalgeographic.com/news/2010/05/100505-energy-colorado-renewable-power/) (RPS). Twenty-nine states have RPS—regulations requiring increased production of energy from renewable energy sources.

If existing RPS programs continue unchanged from now until 2050 they’d generate about 40 percent of U.S. electricity and save $97 billion in air pollution health costs and $161 billion in climate damage reductions, the Assessing the Costs and Benefits of U.S. Renewable Portfolio Standards study found. But if all states meet their [Clean Power Plan](http://news.nationalgeographic.com/energy/2015/08/150802-clean-power-plan-myths/) obligations solely with renewables they’d generate 35 percent of U.S. electricity by 2030 and 49 percent by 2050.

The health benefit savings and climate impact cost reductions in this scenario would be over $1.1 trillion. However, the Trump Administration signed an Executive Order calling for a review of the Clean Power Plan last March and the new head of the EPA has [told states](https://www.epa.gov/newsreleases/epa-administrator-sends-clean-power-plan-guidance-letter-governors-0) they no longer have to comply.

RPS policies do increase electric system costs and may increase rates in some states but the overall costs are far less than the health benefits and cost reductions, said lead author Ryan Wiser, a senior scientist at Lawrence Berkeley National Laboratory.

“RPS programs provide a big social benefit to all Americans,” Wiser said in an interview. However, RPS policies are not the most efficient way to reduce fossil fuel use, he added.

“Pretty well every economist will tell you that a [carbon tax](http://channel.nationalgeographic.com/before-the-flood/articles/whats-a-carbon-tax-and-how-does-it-reduce-emissions/) or [cap and trade](http://news.nationalgeographic.com/news/news/energy/2010/11/101103-chicago-climate-exchange-cap-and-trade-election/) are better.”

In the 1980s acid rain air pollution was [curbed through a cap and trad](https://www.forbes.com/sites/justingerdes/2012/02/13/cap-and-trade-curbed-acid-rain-7-reasons-why-it-can-do-the-same-for-climate-change/#5de083fa943a)e program championed by George H.W. Bush. It was the first such program in the world and worked quite well, said Wiser.

Renewable Energy 101

Additional Benefits to Tackling Emissions

Switching to renewables will also save enormous amounts of freshwater. Electricity generation is the nation’s biggest water user because coal and gas boil large amounts of water to make electricity. If 35 percent of this generation was renewable it would reduce water use enough to meet the needs of 1.9 million homes, according to Wiser’s study. However, the cost benefits of this water savings is not included in the report, nor are other environmental costs and health benefits.

The Economic Case for Climate Action report also doesn’t include a number of climate-related losses such as reduced crop yields from drought. Those amounted to [$56 billion since 2012](https://www.ncdc.noaa.gov/billions). Nor does it include economic losses from health impacts of heat waves or impacts on ecosystems and water resources.

“Our report is an under estimate of the real costs of continued use of fossil fuels,” Watson said.

“Anything we estimate now is an underestimate,” said Amir Jina of the University of Chicago and co-author of yet another new study looking at impacts of climate change on the U.S. “Climate change is not isolated to small increases in global temperature, but to local impacts to our health and well-being that could be enormous.”

Boat rescue traffic on the flooded Jimmy Johnson Road in Port Arthur, Texas, on August 30.Photograph by Marcus Yam, Los Angeles Times, Getty Images

Evacuees wait at Woodrow Wilson Middle School for word about what shelter they will be sent to after they were evacuated from the flooding of Hurricane Harvey on August 30, 2017 in Port Arthur, Texas. Harvey, which made landfall north of Corpus Christi late Friday evening, is expected to dump upwards to 40 inches of rain in Texas over the next couple of days.Photograph by Joe Raedle, Getty Images

A highway stands immersed in floodwaters from Hurricane Harvey in this aerial photograph taken above West Columbia, Texas on August 30.Photograph by Luke Sharrett, Bloomberg, Getty Images

Evacuees sit on a boat after being rescued from flooding from Hurricane Harvey on August 30 in Port Arthur, Texas. Photograph by Joe Raedle, Getty Images

Recreational vehicles sit on their sides in flood water in the wake of Hurricane Harvey on August 29 in Houston, Texas.

Photograph by Marcus Yam, Los Angeles Times, Getty Images

Residential neighborhoods near the Interstate 10 sit in floodwater in the wake of Hurricane Harvey on August 29 in Houston, Texas.

Photograph by Marcus Yam, Los Angeles Times, Getty Images

Texas Army National Guard members Sergio Esquivel, left, and Ernest Barmore carry 81-year-old Ramona Bennett after she and other residents were rescued from their Pine Forest Village neighborhood due to high water from Hurricane Harvey on August 29.Photograph by Erich Schlegel, Getty Images

People take shelter at the George R. Brown Convention Center after flood waters from Hurricane Harvey inundated the city of Houston on August 29.Photograph by Joe Raedle, Getty Images

Mark Ocosta and his baby Aubrey Ocosta take shelter at the George R. Brown Convention Center.Photograph by Joe Raedle, Getty Images

People walk to a Harris County Sheriff air boat while escaping a flooded neighborhood during the aftermath of Hurricane Harvey in Houston, Texas on August 29.Photograph by Brendan Smialowski, AFP, Getty Images

Rescuers in boats help trapped residents escape rising floodwaters due to Hurricane Harvey in Spring, Texas on August 28.Photograph by Luke Sharrett, Bloomberg, Getty Images

Shardea Harrison looks on at her 3 week old baby Sarai Harrison who is being held by Dean Mize. Mize and Jason Legnon used his airboat to rescue Shardea and her daughter from their home after the area was inundated with flooding from Hurricane Harvey on August 28.Photograph by Joe Raedle, Getty Images

People walk down a flooded street as they evacuate their homes after the area was inundated with flooding from Hurricane Harvey in Houston, Texas on August 28.Photograph by Joe Raedle, Getty Images

People use a inflatated mattress to evacuate their homes after the area was inundated with flooding from Hurricane Harvey on August 28.Photograph by Joe Raedle, Getty Images

Firefighters put out a fire during the aftermath of Hurricane Harvey on August 28.Photograph by Brendan Smialowski, Getty Images

Flood victims are seen at a shelter in the George R. Brown Convention Center during the aftermath of Hurricane Harvey in Houston on August 28.Photograph by Brendan Smialowski, Getty Images

Stranded vehicles sit where they got stuck in high water from Hurricane Harvey in Houston, Texas on August 28.Photograph by Erich Schlegel, Getty Images

Abandoned cars sit on Interstate highway 45 near downtown Houston, Texas after it was flooded due to rain from Hurricane Harvey.Photograph by Richard Carson, Reuters

Andrew White, left, helps a neighbor down a street after rescuing her from her home in his boat in the River Oaks neighborhood after it was inundated with flooding from Hurricane Harvey on August 27 in Houston, Texas.Photograph by Scott Olson, Getty

A resident walks down a flooded street in the River Oaks neighborhood after it was inundated with water from Hurricane Harvey on August 27 in Houston, Texas.Photograph by Scott Olson, Getty

Volunteers and officers from the neighborhood security patrol help to rescue residents in the River Oaks neighborhood after it was inundated with flooding from Hurricane Harvey on August 27 in Houston, Texas.Photograph by Scott Olson, Getty

People are rescued from flood waters from Hurricane Harvey in an armored police mine-resistant ambush protected (MRAP) vehicle in Dickinson, Texas.Photograph by Rick Wilking, Reuters

Stewart Adams, of San Marcos, Texas, plays in the winds from Hurricane Harvey in Corpus Christi, Texas on August 25.Photograph by Adrees Latif, Reuters

[Estimating Economic Damage from Climate Change in the United States](http://science.sciencemag.org/content/356/6345/1362) is a state-of-the-art analysis that projects future costs and benefits county by county based on current and past data. It found counties in states in the South and lower Midwest would be the hardest hit economically without strong action to curb climate change.

“The Gulf Coast will take a massive hit. Its exposure to sea-level rise—made worse by potentially stronger hurricanes—poses a major risk to its communities. Increasingly extreme heat will drive up violent crime, slow down workers, amp up air conditioning costs,” said co-author Robert Kopp, director of the Institute of Earth, Ocean, and Atmospheric Sciences at Rutgers University.

Programs like federal flood insurance insulate coastal communities from some of these risks but it means citizens a long way from the coast bear the financial costs. The same applies to disaster relief.

Billions of local, state and federal taxpayer dollars will rightly go towards the recovery efforts from the devastating impacts of Hurricanes Harvey, Irma, and Maria. However, those monies could have gone elsewhere to grow our economy and that affects every American, said Jina. "What would we have done with this rebuilding money if we didn't have to use it to rebuild?"

The study shows that these big storms lower the long-run growth of the U.S. economy and that their economic and human impacts ripple through the country for up to two decades. New Orleans hasn’t fully recovered from Hurricane Katrina in 2005. Many [small businesses](https://academic.oup.com/joeg/article/4093904) never bounced back. Ten years after the storm the unemployment rate was [still highe](https://www.usnews.com/news/articles/2015/08/28/new-orleans-economic-resurgence-after-hurricane-katrina)r than pre-Katrina levels. Research shows that after most hurricanes more people tend to [rely heavily on unemployment insurance and Medicaid](http://www.nber.org/papers/w22272), increasing the strain on those publicly funded programs, Jina said.

"The 'hidden costs' of carbon dioxide emissions are no longer hidden, since now we can see them clearly in the data,” he said.

### Subpoint C. Fossil Fuels Cause Climate Change

#### Climate change caused by greenhouse gases like Carbon Dioxide

Causes | Facts – Climate Change: Vital Signs of the Planet. (2019) Retrieved October 31, 2019, from <https://climate.nasa.gov/causes/>

Water vapor. The most abundant greenhouse gas, but importantly, it acts as a feedback to the climate. Water vapor increases as the Earth's atmosphere warms, but so does the possibility of clouds and precipitation, making these some of the most important feedback mechanisms to the greenhouse effect.

Carbon dioxide (CO2). A minor but very important component of the atmosphere, carbon dioxide is released through natural processes such as respiration and volcano eruptions and through human activities such as deforestation, land use changes, and burning fossil fuels. Humans have increased atmospheric CO2 concentration by more than a third since the Industrial Revolution began. This is the most important long-lived "forcing" of climate change.

Methane. A hydrocarbon gas produced both through natural sources and human activities, including the decomposition of wastes in landfills, agriculture, and especially rice cultivation, as well as ruminant digestion and manure management associated with domestic livestock. On a molecule-for-molecule basis, methane is a far more active greenhouse gas than carbon dioxide, but also one which is much less abundant in the atmosphere.

Nitrous oxide. A powerful greenhouse gas produced by soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.

Chlorofluorocarbons (CFCs). Synthetic compounds entirely of industrial origin used in a number of applications, but now largely regulated in production and release to the atmosphere by international agreement for their ability to contribute to destruction of the ozone layer. They are also greenhouse gases.

#### The Chain

[Ilissa Ocko](https://www.edf.org/people/ilissa-ocko) (2019) 9 ways we know humans triggered climate change | Environmental Defense Fund. Retrieved November 10, 2019, from <https://www.edf.org/climate/9-ways-we-know-humans-triggered-climate-change>

[Ocko](https://www.edf.org/people/ilissa-ocko) (2019)

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9 ways we know humans triggered climate change

Most Americans recognize climate change, but some are still unsure about its causes.

Tens of thousands of scientists in more than a hundred nations have amassed an overwhelming amount of evidence pointing to a clear conclusion: Humans are the main cause.

We're the ones who burn fossil fuels and clear trees that absorb carbon dioxide, sending heat-trapping gases into the atmosphere.

It's like the smoking-cancer link

No one questions the link between smoking and cancer, because the science was settled in the 1960s after more than 50 years of research.

We can think of the state of human activities and climate change as no different than smoking and cancer.

In fact, we are as confident that humans cause climate change than that smoking causes cancer.

The research falls into nine independently studied, but physically related, lines of evidence:

Simple chemistry – when we burn carbon-based materials, carbon dioxide (CO2) is emitted [(research beginning in 1900s)](https://www.americanscientist.org/article/carbon-dioxide-and-the-climate)

Basic accounting of what we burn, and therefore how much CO2 we emit [(data collection beginning in 1970s)](https://www.eia.gov/about/legislative_timeline.php)

Measuring CO2 in the atmosphere and trapped in ice to find that it's increasing, with levels higher than anything we've seen in hundreds of thousands of years [(measurements beginning in 1950s)](http://www.climatecentral.org/gallery/graphics/keeling_curve)

Chemical analysis of the atmospheric CO2 that reveals the increase is coming from burning fossil fuels [(research beginning in 1950s)](http://uscentrist.org/platform/positions/environment/context-environment/docs/Revelle-Suess1957.pdf)

Basic physics that shows us that CO2 absorbs heat [(research beginning in 1820s)](https://www.americanscientist.org/article/carbon-dioxide-and-the-climate)

Monitoring climate conditions to find that recent warming of the Earth is correlated to and follows rising CO2 emissions [(research beginning in 1930s)](http://www.ipcc.ch/publications_and_data/ar4/wg1/en/figure-1-3.html)

Ruling out natural factors that can influence climate like the sun and ocean cycles [(research beginning in 1830s)](http://academic.emporia.edu/aberjame/histgeol/agassiz/agassiz.htm)

Employing computer models to run experiments of natural versus human-influenced simulations of Earth [(research beginning in 1960s)](https://www.gfdl.noaa.gov/brief-history-of-global-atmospheric-modeling-at-gfdl/)

Consensus among scientists who consider all previous lines of evidence and make their own conclusions [(polling beginning in 1990s)](http://iopscience.iop.org/article/10.1088/1748-9326/11/4/048002)

## Contention 3. The opportunity cost of climate change and fossil fuel subsidies

### Subpoint A. Paying for the transition to Renewables

#### Only 10-30% of fossil fuel subsidies could pay for transition to clean energy

Damian Carrington. (2019) Just 10% of fossil fuel subsidy cash 'could pay for green transition' | Environment | The Guardian. Retrieved October 28, 2019, from https://www.theguardian.com/environment/2019/aug/01/fossil-fuel-subsidy-cash-pay-green-energy-transition

Switching just some of the huge subsidies supporting fossil fuels to renewables would unleash a runaway clean energy revolution, according to a new report, significantly cutting the carbon emissions that are driving the climate crisis.

Coal, oil and gas get more than $370bn (£305bn) a year in support, compared with $100bn for renewables, the International Institute for Sustainable Development (IISD) [report](https://www.iisd.org/gsi/news-events/reforming-subsidies-could-pay-clean-energy-revolution-report) found. Just 10-30% of the fossil fuel subsidies would pay for a global transition to clean energy, the IISD said.

Ending fossil fuel subsidies has long been seen as vital to tackling the climate emergency, with the G20 nations pledging in 2009 to phase them out, but progress has been limited. In May, the UN secretary general, António Guterres, [attacked](https://uk.reuters.com/article/global-climatechange-energy/fossil-fuel-subsidies-are-wrecking-the-world-says-u-n-chief-idUKL8N2345F6) subsidies, saying: “What we are doing is using taxpayers’ money – which means our money – to boost hurricanes, to spread droughts, to melt glaciers, to bleach corals. In one word: to destroy the world.”

The new analysis shows how redirecting some of the fossil fuel subsidies could decisively tip the balance in favour of green energy, making it the cheapest electricity available and instigating a rapid global rollout.

“Almost everywhere, renewables are so close to being competitive that [a 10-30% subsidy swap] tips the balance, and turns them from a technology that is slowly growing to one that is instantly the most viable and can replace really large amounts of generation,” said Richard Bridle of the IISD. “It goes from being marginal to an absolute no-brainer.”

The transition from polluting fossil fuels to clean energy is already under way. Annual investment in renewables has been greater than that in fossil fuel electricity generation since 2008 and new renewable capacity has exceeded fossil fuel power each year since 2014.

But progress is slow compared with the urgency required, said Bridle. “There is no question that renewables can power the energy system,” he said. “The question now is can we transition quickly enough away from fuels like coal, and subsidy reform is a very obvious step towards that.” Very few ways of cutting emissions actually save governments money, he said.

“Taking away subsidies from fossil fuels and channelling them towards clean energy would boost their development at a much faster pace, and help secure our climate goals,” said Ipek Gençsü of the Overseas Development Institute. An added bonus is the social and economic benefits, such as reduced air pollution and health spending, she said.

“A key breakthrough [in the energy transition] could occur if countries cut their fossil fuel subsidies, which are propping up dirty energy,” said Rana Adib, the executive secretary of the global sustainable energy network REN21. A [recent REN21 report](https://www.ren21.net/wp-content/uploads/2019/05/gsr_2019_full_report_en.pdf) found 112 nations subsidised fossil fuel prices.

Reform of fossil fuel subsidies could have a significant impact on global heating. An earlier IISD study of 20 countries with large fossil fuel subsidies found that a 30% swap to renewables would lead to emissions reductions of between 11% and 18%.

Most experts define fossil fuel subsidies as financial or tax support for those buying fuel or the companies producing it. The IMF also includes the cost of the damage fossil fuel burning causes to climate and health, leading to an [estimate](https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509) of $5.2tn of fossil fuel subsidies in 2017, or [$10m a minute](https://www.theguardian.com/environment/2015/may/18/fossil-fuel-companies-getting-10m-a-minute-in-subsidies-says-imf). Ending the subsidies would cut global emissions by about a quarter, the IMF estimates, and halve the number of early deaths from fossil fuel air pollution.

Bridle said funding fossil fuel subsidies was “madness”, but said ending them could cause short-term price rises and political difficulties, as the benefits of lower costs in the future and reduced air pollution are less obvious.

“There are political problems but it is worth persevering because the prize is so big,” he said. “You have to bring people along with you.” Gençsü said governments must ensure that the most vulnerable people were not adversely affected by changes.

Fossil fuel subsidies are most prominent in oil-producing nations such as Saudi Arabia, which subsidises petrol, and some coal-using countries such as Indonesia, which caps the cost of the fuel at 75% of the market rate. Some nations are making progress, with India cutting petrol subsidies by about 75% since 2014, according to the IISD.

### ALT- subpoint B. Climate Finance

#### Subsidy phase-out frees up funds for helping developing countries meet emission targets

Spratt and Ashford 11

Stephen Spratt (Research Fellow in the Globalisation Team at IDS; Head of the Sustainable Markets Group at IIED, Research Director at the New Economics Foundation and a Lecturer in international finance and development at the University of Reading; Senior Investment analyst with Global Asset Management Limited and a Visiting Fellow in the Global Research Department at State Street Bank & Trust) and

Christina Ashford (Policy and Communications Officer at Stamp Out Poverty; BSc in Geography from Nottingham University and MSC in Globalisation and Development Studies from SOAS). “Climate Finance: A tool-kit for assessing climate mitigation and adaptation funding mechanisms.” Institute of Development Studies. December 2011. JDN. <https://unfccc.int/sites/default/files/climate_finance_and_the_financial_transaction_tax.pdf>

Redirecting fossil fuel subsidies – **phasing out subsidies** to free up substantial amounts of public funds to be redirected to climate finance At the 2009 G20 Summit in Pittsburgh, Heads of States committed to phasing out harmful fossil fuel subsidies which encourage wasteful consumption. Subsidy reform would prove an **extremely effective** mitigation strategy. According to a G20 commissioned report, the removal of **all** fossil fuel subsidies in both developed and developing countries by 2020 would reduce atmospheric GHGs by 20% (cited June 2010 Oil Change). Building on these commitments, countries could further agree to redirect the significant public funds freed up to **financing mitigation** (clean technology) **and adaptation** activities **in developing countries.**29 How much would the removal of fossil fuel subsidies raise? Global subsidies for the production and consumption of fossil fuels are estimated at $700 billion per year. According to the International Energy Agency, consumption subsidies in developing countries were approximately $560 billion in 2008. Subsidies from developed countries are harder to estimate and vary considerably (Clifton, 2010). According to the Organisation for Economic Cooperation and Development (OECD) the global total could be as much as US $100 billion per year whereas Oil Change International (2010) give a more conservative estimate of $57 billion, $10 billion of which is in the US alone. A significant proportion of both these estimates represent transfers from Northern governments to companies involved in fossil fuel extraction, processing and distribution. Phasing out of fossil fuel subsidies and their redirection to climate finance could **plug an important gap in** the **revenues** needed to fulfil the climate-finance obligations of developed countries (Friends of the Earth, 2010). To ensure the principles of ‘common but differentiated responsibilities’ are upheld, a ‘global sequencing and linkage’ process is proposed, i.e. gradually decreasing the level of support, and differentiated in time and by country income level (Oil Change International, 2010): z Annex I countries commit to phasing out subsidies completely by 2020 – redirecting funds to climate finance. A credible and conservative estimate of fossil fuel subsidies in Annex I countries amounts to $57 billion annually. z Middle income and developing countries would start to phase out later (after having benefited from financial and technology transfers for mitigation) and over a longer period.

### Subpoint B. Human Progress

#### Space Elevator

Scott Snowden (2019) A colossal elevator to space could be going up sooner than you ever imagined. Retrieved October 31, 2019, from https://www.nbcnews.com/mach/science/colossal-elevator-space-could-be-going-sooner-you-ever-imagined-ncna915421

For more than half a century, rockets have been the only way to go to space. But in the not-too-distant future, we may have another option for sending up people and payloads: a [colossal elevator extending from Earth’s surface](https://www.nbcnews.com/video/taking-an-elevator-to-space-is-one-step-closer-to-reality-850738243715?v=railb&) up to an altitude of 22,000 miles, where geosynchronous satellites orbit.

NASA says the [basic concept of a space elevator is sound](http://www.niac.usra.edu/files/studies/final_report/472Edwards.pdf), and researchers around the world are optimistic that one can be built. The Obayashi Corp., a global construction firm based in Tokyo, [has said it will build one by 2050](https://www.obayashi.co.jp/en/news/detail/the_space_elevator_construction_concept.html), and [China wants to build one as soon as 2045](https://www.yicaiglobal.com/news/china-shoots-stars-plans-build-space-elevator-2045). Now an experiment to be conducted soon aboard the International Space Station will help determine the real-world feasibility of a space elevator.

“The space elevator is the Holy Grail of space exploration,” says [Michio Kaku](https://www.nbcnews.com/mach/science/michio-kaku-sees-amazing-things-our-future-except-those-scary-ncna851226), a professor of physics at City College of New York and a noted futurist. “Imagine pushing the ‘up’ button of an elevator and taking a ride into the heavens. It could open up space to the average person.”

Kaku isn’t exaggerating. A space elevator would be the single largest engineering project ever undertaken and could cost close to $10 billion to build. But it could reduce the cost of putting things into orbit from roughly $3,500 per pound today to as little as $25 per pound, says Peter Swan, president of International Space Elevator Consortium (ISEC), based in Santa Ana, California.

The idea for a space elevator was [first dreamed up in 1895 by Konstantin Tsiolkovsky](https://science.nasa.gov/science-news/science-at-nasa/2000/ast07sep_1), a Russian scientist who did pioneering work in rocketry. As commonly conceived today, a space elevator would consist of motorized elevator pods that are [powered up and down a ground-to-space tether](https://www.nbcnews.com/video/space-elevator-closer-to-liftoff-with-new-cable-220310595766?v=railb&). The tether would stretch from a spaceport at the equator to a space station in geosynchronous orbit overhead. Centrifugal forces caused by the Earth’s rotation would hold the tether aloft.

Special cars powered by magnetic linear motors would ride 22,000 miles up and down the tether.Pat Rawlings / NASA

The ISS experiment, dubbed Space Tethered Autonomous Robotic Satellite–Mini elevator, or STARS-Me, was devised by physicists from Japan’s Shizuoka University. It will simulate on a small scale the conditions that the components of such a system would encounter. Cameras will examine the movement of a pair of tiny “cubesats” along a 10-meter tether in a weightless environment.

"It's going to be the [world's first experiment to test elevator movement in space](https://phys.org/news/2018-09-japan-mini-space-elevator.html)," a spokesman from the university told Agence France-Presse.

The steel tether to be used in the experiment is too heavy to be used as a full-sized space elevator, which must, of course, extend for tens of thousands of miles. But a growing number of scientists, including Kaku, now believe that an [ultra-strong carbon-based material known as graphene](https://www.nbcnews.com/mach/innovation/ultralight-super-material-10-times-stronger-steel-n705411) could be just the material needed. “On paper, it has the tensile strength to keep the space elevator anchored to the ground,” Kaku says of graphene, which ounce for ounce is 200 times stronger than steel.

Small lengths of graphene are commercially available, but they’re too short to be used to make a space elevator tether. “What we really need is graphene produced in very long lengths of continuous sheet,” says Adrian Nixon, director of Nixor, a firm in Manchester, England, that is working to develop such a product. That can’t be done yet, he says, adding that “it will be possible in the very near future.

Of course, making a suitable tether is just one hurdle that must be overcome. Another is [space debris](https://www.nbcnews.com/mach/science/space-junk-huge-problem-high-tech-satellite-net-just-might-ncna913426) — bits and pieces of rockets and spacecraft that orbit Earth and could damage or destroy a space elevator if they smash into it.

“Avoiding space debris is not like playing dodgeball,” says Michael Fitzgerald, director and chair for architectures at ISEC. “There isn’t a member of our team that doesn’t wonder about the problem,” he adds.

Scientists remain optimistic, however. "With proper knowledge and good operational procedures, the threat of space debris is not a show-stopper by any means,” Swan said. And efforts are now underway to find [ways to reduce the amount of space debris](https://www.nbcnews.com/mach/space/scientists-have-some-pretty-wild-ideas-preventing-space-junk-armageddon-n752641), which includes more than 500,000 pieces of junk that are now being tracked by the Defense Department.

Later this year, members of ISEC will meet with U.S. military and trade officials to discuss how space elevator trips could be carefully planned to avoid orbiting debris.

#### Colonize the Moon

Grush. (2019) NASA administrator says it will cost an extra $20 to $30 billion to send astronauts back to the Moon - The Verge. Retrieved November 04, 2019, from https://www.theverge.com/2019/6/14/18678565/nasa-administrator-artemis-moon-return-cost-estimate-20-30-billion-dollars-bridenstine

This is the first time that anyone at NASA has revealed the full cost for the plan to put people on the lunar surface again — a program the agency has recently dubbed Artemis. NASA is aiming to put a crew on the Moon by 2024, [after being challenged by Vice President Mike Pence](https://www.theverge.com/2019/3/26/18282598/nasa-mike-pence-vice-president-space-policy-lunar-landings-2024-gateway-sls-orion) to expedite the mission. During that initial landing, the agency plans to make history by having the first woman set foot on the lunar surface.

This is the first time that anyone at NASA has revealed the full cost for the plan

To jump-start the Artemis program, the White House has requested an additional $1.6 billion during fiscal year 2020, on top of the $21 billion budget that the president requested for the rest of NASA next year. However, Bridenstine has been clear that this initial budget is just a “down payment” for the program. NASA officials, including Bridenstine, have repeatedly dodged questions about what the full five-year program is going to cost. And representatives from Congress have [expressed frustration over not having the entire price tag up front](https://science.house.gov/news/press-releases/chairwomen-johnson-and-horn-question-funding-plan-for-nasas-accelerated-moon-landing-program).

Based on this estimate given to CNN, NASA is going to need an additional $5 to $6 billion each year for the next five years to make this Moon landing a possibility. Bridenstine didn’t go into details about how that money would be spent exactly, but NASA has been clear about the architecture it wants to build for Artemis. NASA is finishing up the development of a massive new rocket, called the Space Launch System, as well as a new crew capsule called Orion, both of which will carry people to the vicinity of the Moon. Additionally, the agency wants to create a new space station around the Moon called the Gateway, where astronauts can live for short periods of time and then travel down to the lunar surface. NASA has already awarded a contract to an aerospace company called Maxar to build the first module for the Gateway.And of course, NASA is going to need a very crucial piece of hardware: a landing system that can safely transport people away from the Gateway, touch down on the surface, and then take people back to the station. Over the next few months, NASA plans to put out a final call for lunar lander designs and then pick companies to create the system over the next couple of years.

Artemis’ success [hinges on Congress approving the extra funding for the program](https://www.theverge.com/2019/5/15/18622884/nasa-moon-artemis-program-bridenstine-congress-money-budget), and it’s unclear if that will happen. The White House called on taking the initial $1.6 billion investment for NASA from the Pell Grant fund, which provides scholarships for low-income students, and that didn’t sit well with many lawmakers. Meanwhile, the most recent budget proposed by the House Appropriations Committee for 2020 gives NASA a boost in funding, but did not address any extra funding for Artemis.

Without a budget increase, it’s possible NASA will resort to cutting money from other programs to achieve their goal. When the White House asked for extra money for Artemis in a budget amendment, the request also [included language that would allow the administrator to move funds from other projects](https://www.theverge.com/2019/5/17/18627839/nasa-administrator-jim-bridenstine-artemis-moon-program-budget-amendment) within NASA to fund the Moon program. NASA officials are already bracing themselves for tough cuts ahead.

“I don’t think we’re going to be able to get the entire budget as new money,” Bill Gerstenmaier, NASA’s associate administrator for human exploration, [said during a recent meeting of the NASA Advisory Council](https://arstechnica.com/science/2019/06/nasa-spaceflight-chief-warns-of-internal-cuts-needed-for-moon-program/). “We’re going to have to look for some efficiencies and make some cuts internally to the agency, and that’s where it’s gonna be hard.” Lawmakers like Rep. Eddie Bernice Johnson (D-TX), chair of the House Science Committee, [expressed concern over this sentiment](https://spacenews.com/scientists-fear-cuts-to-nasa-science-to-pay-for-artemis/) and worried that science programs might suffer as a result.

Bridenstine claims that he will not “cannibalize” other programs in NASA to get people to the Moon. Still, getting an extra $20 to $30 billion from Congress over the next five years may be a big feat. NASA’s budget got a big boost during the Apollo program in the 1960s, but that was during the height of the Cold War, and the political climate has changed significantly since then.

NASA will have a better idea of where Congress stands as the budget for next year is finalized. But if the agency doesn’t even get the extra $1.6 billion it requested for Artemis for 2020, NASA’s dreams of landing people on the Moon in the next five years may not come true.

## Blocks

### No Environmental Impact- Fossil Fuel Subsidies have no affect on fighting climate change

#### Zero Emissions + Carbon tax good

Nathan Rott (2019) Can Clean Energy Goals Help Slow Climate Change? : NPR. Retrieved November 10, 2019, from <https://www.npr.org/2019/06/18/724343789/going-zero-carbon-is-all-the-rage-but-will-it-slow-climate-change>

The warnings come with unsettling regularity:

Climate change [threatens](https://www.npr.org/2019/05/06/720654249/1-million-animal-and-plant-species-face-extinction-risk-u-n-report-says) 1 million plant and animal species.

Warmer oceans could [lose one-sixth of their fish and other marine life](https://www.pnas.org/content/early/2019/06/10/1900194116.short?rss=1) by the end of the century.

Global warming is a major risk to the [economy](https://www.npr.org/2018/11/26/670812889/what-you-need-to-know-about-the-new-u-s-climate-assessment).

The world's leading scientists have made it clear that to prevent the worst effects of climate change, there needs to be "[rapid, far-reaching and unprecedented](https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/)" changes to our energy systems. In simpler terms: We need to stop adding carbon dioxide to the atmosphere.

Federal action to curb greenhouse gas emissions in the U.S. seems unlikely in the near future. The Trump administration is going the other way, rolling back regulations to cut emissions.

Defining Zero Carbon

Cities, states and companies use different language for their climate goals, and subtle differences can mean vastly different things. Here's a guide to some of the terminology:

Carbon free means no carbon dioxide emissions. A state would be getting all of its electricity from renewable or clean sources like solar, wind or nuclear.

Carbon neutral means that a city or state is removing as much carbon dioxide from the atmosphere as it's putting in. The net amount of carbon emissions is zero. This can be achieved through carbon offsets like carbon sequestration or planting trees.

Renewable energy means that the energy is coming from strictly renewable sources. Think solar, wind, geothermal or tidal.

Clean energy encompasses all renewable energy and more. It can also include nuclear energy and fossil fuel consumption with carbon-capture technology.

But a growing number of cities, states, electric utilities and businesses are recognizing the risk presented by climate change and making their own pledges to reduce emissions.

Just in the past year, three states — including California, the world's fifth-largest economy — plus the District of Columbia and Puerto Rico made commitments to get all of their electricity from carbon-free or carbon-neutral sources in the next few decades. More than 100 cities and counties have signed similar pledges, and at least three presidential candidates are proposing climate plans that call for the U.S. to become carbon-neutral by 2050.

"It feels to me like we're headed toward a decarbonized energy system," says Rolf Nordstrom, president of the Great Plains Institute, a nonprofit energy research group. "Now it's just down to how fast and what that energy mix looks like."

Despite the growing push to reach "zero carbon," there are big questions around whether these goals are possible and how much they would actually slow climate change. Here's an attempt to answer some of them.

Who's doing it?

Four states — Hawaii, New Mexico, California and Washington — as well as Puerto Rico and Washington, D.C., are leading the decarbonization charge. All of those places have enacted legislation requiring that they get all of their electricity from renewable or clean sources by 2050 at the latest.

Nevada and Colorado went one step short of that, establishing a goal, not requirement, of 100% carbon-free energy by 2050.

At least 9 other states have proposed similar mandates or goals, according to EQ Research, a renewable energy consulting firm.

[Don't see the graphic above? Click here.](https://apps.npr.org/dailygraphics/graphics/zero-carbon-map-20190614/child.html?mode=childlink&utm_source=nprnews&utm_medium=app&utm_campaign=storyredirect)

In the meantime, local governments in those states and others are taking action on their own.

More than 100 localities across the country — from Buncombe County, N.C., to Spokane, Wash. — have committed to getting all of their electricity from clean or renewable sources. The Sierra Club has a nifty [list of cities](https://www.sierraclub.org/ready-for-100/commitments) making similar pledges.

Electric utilities, responding to customer demand (and eager to have support for new infrastructure), are getting in on the action, too. Xcel Energy, which serves eight U.S. states, announced its own 100% clean energy goal by 2050. A handful of other utilities have followed suit.

In California's Mojave Desert sits First Solar Inc.'s Desert Sunlight Solar Farm. California is among the states leading the decarbonization charge.

Tim Rue/Bloomberg via Getty Images

Business is also pushing for clean energy. The group RE100 says that [about 180 private companies](http://there100.org/companies), including giants like Google, Nike, Facebook and Johnson & Johnson, have committed to 100% renewable goals.

Why are they doing it?

Climate change not only poses a risk to human health and life, but it could cost the U.S. economy [hundreds of billions of dollars](https://www.yaleclimateconnections.org/2019/04/climate-change-could-cost-u-s-economy-billions/). State, city and business leaders aren't blind to that fact.

For more on what's at stake, see the [United Nations' Intergovernmental Panel on Climate Change report](https://www.npr.org/2018/10/08/655360909/grim-forecast-from-u-n-on-global-climate-change). The threat is real.

Shortly before signing [her state's carbon-free goal](https://www.npr.org/2019/03/13/702877664/in-midst-of-an-oil-boom-new-mexico-sets-bold-new-climate-goals) earlier this year, New Mexico Gov. Michelle Lujan Grisham pointed to that report, which said greenhouse gas emissions need to be sharply reduced by 2030 to avoid the worst effects of climate change.

"We are clear that we have basically a decade to begin to turn things around, and New Mexico needs [to] and will do its part," she said.

[Don't see the graphic above? Click here.](https://apps.npr.org/dailygraphics/graphics/rising-carbon-20190612?mode=childlink&utm_source=nprnews&utm_medium=app&utm_campaign=storyredirect)

But the need to address emissions is hardly the only factor driving the wider shift toward renewable energy sources.

It's a convergence of social, economic, technological and political factors.

The latter being fueled, in no small part, by the inaction at the national level.

"There's the complete abdication of responsibility and leadership at the federal level, within the Trump administration and other leaders in Congress," says Jeff Deyette, the director of state policy in the climate and energy program at the Union of Concerned Scientists. He says cities and states are stepping up to fill that void and, in some cases, score political points.

The "blue wave" of last year's midterms saw cities and states elect lawmakers who vowed to take action on climate change. Environmental groups have been focusing their efforts on the state and local level.

Renewable energy is also becoming more affordable and more popular than fossil fuels in some places. A survey by [Consumer Reports last year](https://www.consumerreports.org/alternative-energy/majority-of-americans-want-cleaner-energy-from-renewable-sources/) found that roughly three-quarters of respondents felt that increasing renewable energy is a worthwhile goal.

On the technical side of things, advancements are being made in energy storage and energy efficiency, making an eventual renewable energy grid more realistic.

Is "zero carbon" even possible?

This depends on whom you ask.

There are some energy analysts and academics, like Mark Jacobson, director of the Atmosphere and Energy Program at Stanford University, who say the answer is a resounding yes.

Jacobson drew up plans for [139 countries](https://web.stanford.edu/group/efmh/jacobson/Articles/I/CountriesWWS.pdf), showing how they could move to 100% [renewable](https://www.pnas.org/content/112/49/15060.abstract) energy sources by 2050. He has done the same for [all 50 U.S. states](https://thesolutionsproject.org/why-clean-energy/#/map/states/).

"It's technologically and economically possible," he says. "But there are social and political barriers."

Jacobson says it would cost the U.S. about $9.5 trillion to transition the country's entire energy economy — transportation, electricity, agriculture and industry — to carbon-free sources.

That may seem like a lot, he says, "but if you actually transitioned to clean, renewable energy for everything, you eliminate the health and climate costs [associated with fossil fuels]." In the long run, he argues, the country would be saving money.

Other energy analysts and academics aren't so sure that it's feasible to reach zero carbon, using only renewable energy, on an economywide scale. It's theoretically possible, [they argue](https://www.pnas.org/content/114/26/6722.full), but the challenges to get there are many.

Most cities, states and businesses are taking a narrower focus, aiming to just get all of their electricity from carbon-free sources (electric generation being only one piece of the greater emissions pie).

[Don't see the graphic above? Click here.](https://apps.npr.org/dailygraphics/graphics/energy-production-20190613?mode=childlink&utm_source=nprnews&utm_medium=app&utm_campaign=storyredirect)

But that's not without challenges too.

Powering an entire state like California, with its nearly 40 million residents, with renewable or clean energy would require huge amounts of energy storage and massive infrastructure projects, which [don't always have local support](https://www.latimes.com/business/la-fi-san-bernardino-solar-renewable-energy-20190228-story.html).

For cities or counties making renewable commitments, "many of them don't really have the tools to implement their vision," says Leah Stokes, an assistant professor of political science at the University of California, Santa Barbara. "Utilities often work at the state level, not the local level."

Atlanta is [a good example of this](https://www.npr.org/2019/05/29/724985884/cities-are-making-big-climate-promises-keeping-them-can-be-tough).

Are 'zero carbon' goals the most effective way to cut greenhouse gases?

"All evidence points to no," says Sanya Carley, an associate professor at Indiana University's School of Public and Environmental Affairs. "The most efficient and cost-effective way to reduce carbon emissions would be directly pricing carbon and putting a price tag on the cost of those emissions."

In other words, something like a carbon tax would bake the environmental and health costs of greenhouse gas emissions into the existing market economy. It would be a rapid, large-scale way to incentivize reductions across all sectors.

A [2018 study](http://news.mit.edu/2018/carbon-taxes-could-make-significant-dent-climate-change-0406) by the Massachusetts Institute of Technology found that putting a price on carbon and returning the revenue from it to the public would reduce greenhouse gas emissions. The higher the cost, the greater the reductions.

Renewable energy goals or zero-carbon commitments are "less efficient, less cost-effective, but usually more politically feasible," Carley says.

That's why we're seeing more of them.

But they should still help slow climate change, right?

Every little bit helps.

But remember that most of these efforts are focused on cutting greenhouse gas emissions from the electric sector, and electricity generation accounts for less than a third of the country's total emissions. Transportation is now a larger source.

The other problem is scale.

"[Climate change] is a global problem, so that's the scale at which you'd want your solution," says Noah Kaufman, an economist at Columbia University's Center on Global Energy Policy. "In lieu of that, second best would be at the national level, but we've pretty much failed to pass any serious climate policy."

A piecemeal approach won't do it, he says.

The overall trends aren't great either. Greenhouse gas emissions [continue to rise globally](https://www.npr.org/2018/12/05/673821051/carbon-dioxide-emissions-are-up-again-what-now-climate). In the U.S., carbon dioxide emissions [are increasing as well](https://www.npr.org/2019/01/08/683258294/u-s-carbon-dioxide-emissions-are-once-again-on-the-rise), after several years of decline.

An annual statistical review from energy giant BP, [released last week](https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html), found that global carbon emissions rose by 2 percent in 2018, the fastest growth in seven years.

"My guess is that when our successors look back at Statistical Reviews from around this period, they will observe a world in which there was growing societal awareness and demands for urgent action on climate change, but where the actual energy data continued to move stubbornly in the wrong direction," wrote Spencer Dale, BP's chief economist in [a review of the findings](https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/news-and-insights/speeches/bp-stats-review-2019-spencer-dale-speech.pdf).

He described it as "a growing mismatch between hopes and reality."

### Reverse spending *–* Big budget savings will be diverted to the military, high military spending bad.

 --US military reports show that they’ll need more money to combat starvation, terrorism, climate refugees, and a collapsing US infrastructure if we don’t curb climate change, so which one is worse, more spending because of disaster or collapse, or having a choice of changing where we should spend our money, because in the case of disasters ,we have no choice but to spend money on disaster relief, on the alternative, the aff, we have that choice.

--if we don’t mitigate, there’ll be a price to pay in health, infrastructure, refugees, and disaster relief, removing the subsidies not only free up money that we can use in whichever way possible, but will help mitigate disasters on a scale unprecedented.

### US insignificant, US going zero emissions won’t solve climate change

#### Top US leadership is 'missing ingredient'

[Carolyn Beeler](https://www.pri.org/people/carolyn-beeler) (2019) Top US leadership is 'missing ingredient' in climate change action. Retrieved October 30, 2019, from <https://www.pri.org/stories/2019-09-18/top-us-leadership-missing-ingredient-climate-change-action>

World leaders will meet in New York next week for the United Nations Climate Summit, an event called by the Secretary-General to push for more and faster cuts to global greenhouse gas emissions.

Notably missing at the summit: American leadership.

Five years ago, a joint climate policy announcement from the US and China paved the way for the Paris climate accord to come to fruition after decades of failed attempts at an international climate pact.

Then in June 2017, President Donald Trump announced that he would withdraw the US from the very same agreement his country had helped broker just a few years before. Under the rules of the accord, countries can announce the intention to leave, but must wait two years before being allowed to do so.

Two years later, what impact has this policy whiplash had on the climate?

Inside the US, that answer is relatively simple to quantify.

Across the country, some 4,000 state and local governments, institutions and businesses have declared that, though the federal government intends to withdraw from the Paris climate agreement, [they’re still on board with cutting emissions](https://www.americaspledgeonclimate.com/).

One of those local governments is in Arlington, Massachusetts, where the town hall was illuminated green after Trump’s 2017 Paris withdrawal announcement.

“We’ve come to the realization that if the federal government’s not going to do it, it’s going to fall to the local level,” said Adam Chapdelaine, Arlington’s town manager. “Somebody has to step up and be a leader.”

Even before the Paris Agreement, the town has long worked to reduce its greenhouse gas emissions, from switching its street lights to LED bulbs to buying electric vehicles for its official fleet. Residents can opt-in to 100% renewable energy in their homes and the town is advocating for all-electric heating and cooling systems.

Since the US federal government reversed its climate change policies, Arlington has gotten perhaps more ambitious: The town’s new high school is being designed to run on geothermal and solar energy and the whole town aims to go carbon-neutral by 2050.

These state and local actions are being highlighted as “answering the global call to combat the climate crisis” by a coalition of sub-national actors formed by New York Mayor Michael Bloomberg and former California Gov. Jerry Brown.

But these actions have only partly counteracted sweeping federal changes under the Trump administration.

Trump has slashed regulations on emissions from [power plants](https://www.nytimes.com/2018/08/21/climate/epa-coal-pollution-deaths.html), [air conditioners and refrigerators](https://insideclimatenews.org/news/27062018/hfcs-global-warming-climate-pollution-lawsuit-trump-epa-regulations-kigali-amendment), and [oil and gas drilling](https://www.nytimes.com/2018/09/18/climate/trump-methane-rollback.html) nationwide.

He [moved to revoke](https://www.cnn.com/2019/09/18/politics/epa-trump-california/index.html) California’s ability to set its own strict vehicle emission rules on Wednesday, highlighting the limits of state-based action on climate change.

So how does the emissions balance sheet tally up today, two years after the US backed away from the Paris agreement?

Kate Larsen, a director at the independent research firm the Rhodium Group, said US carbon emissions are a few percentage points higher than they would have been if former President Barack Obama-era policies were in place.

Projected forward five years, [that gap will just grow](https://rhg.com/research/taking-stock-2019/).

“Under the current set of Trump administration policies, the US is on track to achieve only about 14 to 17% emission reductions below 2005 levels in 2025,” Larsen said.

That’s about half of the 26 to 28% emission reductions that the US promised in the climate accord.

“[It's] a long way from the commitment that Obama reached in Paris,” Larsen said.

Scientists say that to limit warming to 1.5 degrees Celsius and avoid the worst impacts of climate change, [global emissions must be cut nearly in half](https://www.pri.org/stories/2019-09-17/why-2020-key-year-climate-action) by 2030.

Inside the US, local action is partly, but not wholly, counteracting federal policies.

The bigger question is how much global ambition to tackle the climate crisis will flag if the world’s largest historic emitter is no longer leading the push.

Will countries, seeing the US doing less on climate change, do the same themselves?

Under Obama, the US put its full diplomatic muscle into getting countries signed on to the Paris Agreement.

“If you were a head of state from India, from China, or from anywhere and you were going to meet with the United States, you knew that you'd have to be prepared to speak about climate change and the Paris Agreement,” said Elan Strait, a former climate negotiator on the Paris Agreement who now works at the World Wildlife Foundation.

By 2020, countries are requested to announce new carbon cuts as part of the Paris process. Those cuts have to be more ambitious if countries hope to meet the Paris Agreement goal of keeping warming “well below” 2 degrees Celsius and pursue efforts to limit warming to the scientist-recommended 1.5 degree Celsius.

QUOTE: “I completely believe that the missing ingredient this time around is the United States leadership driving climate as a head-of-state agenda,” Strait said.

Only when those 2020 climate pledges start rolling in will the international community start to see the full impact of the US climate policy reversal.

### Energy price spikes – Eliminating subsidies causes energy price spikes

#### No price hikes—subsidies are just a drop in the oil barrel

Allaire and Brown 9

Maura Allaire (research assistant at RFF) and Stephen Brown (nonresident fellow at RFF). “Eliminating Subsidies for Fossil Fuel Production: Implications for U.S. Oil and Natural Gas Markets.” Resources for the Future. Issue Brief 09‐10. December 2009. JDN. <https://www.wyofile.com/wp-content/uploads/2011/05/OilSubsidiesCost.pdf>

The estimated effects on U.S. oil markets of **eliminating tax advantages** for U.S. oil and natural gas production are **quite small**—primarily because the oil and gas company tax advantages that would be eliminated are relatively small in comparison to the projected **world oil prices.** At some projected world oil prices in excess of $100 per barrel, the additional tax revenue is **less than one dollar** per barrel. Our best estimate is that eliminating these tax preferences would boost the world oil price by an amount that escalates from $0.063 [six cents] above the baseline in 2011 to $0.104 [ten cents] in 2030. Two factors contribute to the relatively small impact on consumer prices: the changes in taxes are small, and oil prices are determined on an international market in which the United States’ production accounts for a relatively small share. The increase in world oil prices translates into increases in refined product prices that escalate from $0.0018 per gallon above the baseline in 2011 to $0.0029 in 2030. As a result of price increases and changes in consumption, the average U.S. consumer would spend an estimated $2.17 more on total petroleum product consumption **each year.**

### Nuclear power bad – More nuclear power is bad (accidents, radiation , etc)

#### Wrong, Nuclear Power much safer than the alternative

Kharecha, Hansen, 2013 Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power, <https://pubs.acs.org/doi/abs/10.1021/es3051197?source=cen>

Pushker-has a PHD and is a climate scientist

Hansen- has a PHD in physics, worked at Goddard space institute

  In the aftermath of the March 2011 accident at Japan’s Fukushima Daiichi nuclear power plant, the future contribution of nuclearpower to the global energy supply has become somewhat uncertain. Becausenuclear power is an abundant, low-carbon source of base-load power, it could make a large contribution to mitigation of global climate change and airpollution. Using historical production data, we calculate that global nuclearpower has prevented an average of 1.84 million air pollution-related deaths and 64 gigatonnes of CO2-equivalent (GtCO2-eq) greenhouse gas (GHG)emissions that would have resulted from fossil fuel burning. On the basis ofglobal projection data that take into account the effects of the Fukushima accident, we find that nuclear power could additionally prevent an average of420 000−7.04 million deaths and 80−240 GtCO2-eq emissions due to fossilfuels by midcentury, depending on which fuel it replaces. By contrast, we assess that large-scale expansion of unconstrained natural gas use would not mitigate the climate problem and would cause farmore deaths than expansion of nuclear power.

### Politics – Political Capital & Elections

--Throughout history, using real-politick and pragmatism as an excuse for bad behavior has led us down dangerous roads. At the end of the day, we shouldn’t argue against doing the wrong thing because its impractical or requires too much political willpower. We shouldn’t do it because its easy, we should do it because it’s the right thing to do.

### Oil dependence — Reduced subsidies means more international imports of coal and oil, dependence on these is bad

### Carbon Capture with limited fossil fuels

#### Carbon Capture not enough

Steve Skerlos: PHD professor (2019) Climate change: Why removing CO2 from the air won’t be enough | University of Michigan News. Retrieved October 30, 2019, from https://news.umich.edu/climate-change-why-removing-co2-from-the-air-wont-be-enough/

ANN ARBOR—Pulling carbon dioxide out of the air using a technology called “direct air capture,” or DAC, will not be the silver bullet for curbing climate change that some hoped it would be, according to new research from the University of Michigan.

A more aggressive and early move toward renewable energy will be less expensive in the long run, as nations aim to keep global temperatures from exceeding a 1.5-to-2-degree Celsius increase over pre-industrial times. The researchers estimate that each day the U.S. electricity sector fails to take more aggressive steps toward renewables, it adds $100 million to its future tab for stalling the 2-degree limit.

“DAC is inherently more expensive than if we started an immediate transition to renewable energy on a larger scale,” said Steve Skerlos, an Arthur F. Thurnau Professor and professor of mechanical engineering at U-M.

In order to stay below the 2-degree mark, all sectors must reduce emissions by 70%. This study looks at a 70% reduction in the electricity sector. The study makes clear that if the U.S. electricity sector waits more than a decade, it will have no choice but to rely in part on direct air capture to meet its share of the emissions budget that the 2-degree limit implies.

Too many policymakers think that if we wait, carbon capture and sequestration technology will get better and cheaper, and cheap enough to address the problem.

*Steve Skerlos*

“Too many policymakers think that if we wait, carbon capture and sequestration technology will get better and cheaper, and cheap enough to address the problem,” said Skerlos, who is also a professor of civil and environmental engineering.

“They’re wrong.”

If electricity providers maintain their “business as usual” approach, they will disproportionately push Earth past the point where it can stop the 2-degree increase as early as 2030. The U.S. electricity sector is responsible for roughly 4% of all greenhouse gases generated annually on Earth.

DAC pulls carbon dioxide from the air, concentrating the gas so it can be stored underground. The technology has garnered plenty of media attention in recent years with its potential impacts being debated in the scientific community.

U-M’s team developed a computer model that can project the cost of installing, operating, and replacing utility-scale electricity technologies. Based on existing infrastructure in the U.S., the model estimates the optimal scale and timing of technology transitions, early retirements, capacity expansions and DAC deployment that results in the least overall cost to reduce emissions by 70% and meet the 2-degree mandate.

They found that even a high-efficiency, low-cost version of DAC that’s ready to be scaled up would still cost much more than speeding up the switch to renewables.

“Our results are conservative, as we stacked our assumptions into an optimistic picture of ‘business as usual,'” said Tae Lim, a graduate student in mechanical engineering. “We also did not consider other sectors of the U.S. economy such as transportation, buildings and industry. It’s generally more expensive to find low carbon alternatives in those sectors than in the electric sector.”

We’re now building new natural gas plants to replace coal plants. But those same gas plants, which produce large quantities of carbon dioxide, will need to be retired in 10 or 15 years to hit the climate targets. So those relatively new plants will have to be paid off over time and then retired early in favor of renewable energy sources like wind and solar.

*Steve Skerlos*

The $100-million-a-day figure U-M’s team cites encompasses a variety of costs, not the least of which is the reshuffling of power sources over the next two decades.

“We’re now building new natural gas plants to replace coal plants,” Skerlos said. “But those same gas plants, which produce large quantities of carbon dioxide, will need to be retired in 10 or 15 years to hit the climate targets. So those relatively new plants will have to be paid off over time and then retired early in favor of renewable energy sources like wind and solar.”

“That’s an incredibly inefficient use of resources. It’s cheaper to build out more wind and solar now.”

The study, which appears in Environmental Research Letters, was funded by the U-M Energy Institute.

#### Carbon Captures faces economic challenges

https://fivethirtyeight.com/features/why-carbon-capture-hasnt-saved-us-from-climate-change-yet/

### “5-20 Billion a year”

#### List of all subsidies

Clayton Coleman and Emma Dietz (2019) Fact Sheet: Fossil Fuel Subsidies: A Closer Look at Tax Breaks and Societal Costs | White Papers | EESI. Retrieved October 19, 2019, from https://www.eesi.org/papers/view/fact-sheet-fossil-fuel-subsidies-a-closer-look-at-tax-breaks-and-societal-costs

There is a long history of government intervention in energy markets. Numerous energy subsidies exist in the U.S. tax code to promote or subsidize the production of cheap and abundant fossil energy. Some of these subsidies have been around for a century, and while the United States has enjoyed unparalleled economic growth over the past 100 years—thanks in no small part to cheap energy—in many cases, the circumstances relevant at the time subsidies were implemented no longer exist. Today, the domestic fossil fuel industries (namely, coal, oil and natural gas) are mature and generally highly profitable. Additionally, numerous clean and renewable alternatives exist, which have become increasingly price-competitive with traditional fossil fuels.

The 116th Congress is weighing potential policy mechanisms to reduce the impact of climate change and cap global warming to an internationally agreed upon target of no more than 2 degrees Celsius (3.6 degrees Fahrenheit). As a result, fossil fuel tax subsidies, as well as other mechanisms of support, have received additional scrutiny from lawmakers and the public regarding their current suitability, scale and effectiveness. Indeed, the subsidies undermine policy goals of reducing greenhouse gas emissions from fossil fuels.

A [recent analysis](https://www.earthtrack.net/document/effect-subsidies-fossil-fuel-companies-united-states-crude-oil-production) published in Nature Energy found that continuing current fossil fuel subsidies would make it profitable to extract half of all domestic oil reserves. This could increase U.S. oil production by 17 billion barrels over the next few decades and emit an additional 6 billion tons of carbon dioxide.

The United States provides a number of tax subsidies to the fossil fuel industry as a means of encouraging domestic energy production. These include both direct subsidies to corporations, as well as other tax benefits to the fossil fuel industry. Conservative estimates put U.S. direct subsidies to the fossil fuel industry at roughly $20 billion per year; with 20 percent currently allocated to coal and 80 percent to natural gas and crude oil. European Union subsidies are estimated to total 55 billion euros annually.

Historically, subsidies granted to the fossil fuel industry were designed to lower the cost of fossil fuel production and incentivize new domestic energy sources. Today, U.S. taxpayer dollars continue to fund many fossil fuel subsidies that are outdated, but remain embedded within the tax code. At a time when renewable energy technology is increasingly cost-competitive with fossil power generation, and a coordinated strategy must be developed to mitigate climate change, the broader utility of fossil fuel subsidies is being questioned.

There are many kinds of costs associated with fossil fuel use in the form of greenhouse gas emissions and other pollution resulting from the extraction and burning of fossil fuels. These negative externalities have adverse environmental, climate, and public health impacts, and are estimated to have totaled $5.3 trillion globally in 2015 alone.

Subsidizing an industry with such large, negative impacts is difficult to justify. Public subsidies should be consistent with an overarching, coordinated, and coherent energy policy that not only considers the supply of affordable, reliable power, but also public health impacts, climate change, and environmental degradation. While both Democratic and Republican administrations and lawmakers have discussed repealing fossil fuel subsidies, no significant action has been taken to-date.

Several international institutions, including the G20, the International Energy Agency, and the Organization of Economic Cooperation and Development (OECD), have called for the phase-out of fossil fuel subsidies. The European Union has also called for such a phase-out but has not yet taken concrete actions.

But rather than being phased out, fossil fuel subsidies are actually increasing. The latest International Monetary Fund (IMF) report estimates 6.5 percent of global GDP ($5.2 trillion) was spent on fossil fuel subsidies in 2017, a half trillion dollar increase since 2015. The largest subsidizers are China ($1.4 trillion in 2015), the United States ($649 billion) and Russia ($551 billion). According to the IMF, "fossil fuels account for 85 percent of all global subsidies," and reducing these subsidies "would have lowered global carbon emissions by 28 percent and fossil fuel air pollution deaths by 46 percent, and increased government revenue by 3.8 percent of GDP." An Overseas Development Institute study found that subsidies for coal-fired power increased almost three-fold, to $47.3 billion per year, from 2014 to 2017.

U.S. Tax Subsidies to the Fossil Fuel Industry

*The federal government provides numerous subsidies, both direct and indirect, to the fossil fuel industry. Special provisions in the U.S. tax code designed to specifically support and reward domestic fossil fuel‐related production are direct subsidies. Other provisions in the tax code aimed at businesses in general create indirect subsidies that are not exclusive to the fossil fuels industry. In certain cases, quantifying these subsidies is fairly simple. In the case of indirect subsidies, establishing an amount associated with these subsidies is more challenging. While not covered in this fact sheet, another source of federal aid to the fossil fuel industry is the discounted cost of leasing federal lands for fossil fuel extraction. Some fossil fuel subsidies provide public assistance, such as the Low Income Home Energy Assistance Program (LIHEAP), which assists low-income households with heating costs.*

*In May 2019, the UN Environment Programme (UNEP) published a report detailing an internationally accepted methodology that will help countries make their fossil fuel subsidies more transparent.*

Direct Subsidies

--Direct Subsidies include Intangible Drilling Costs Deduction, Percentage Depletion, and the Credit for Clean Coal Investment. Indirect Subsidies include —SIC FROM ARTICLE, NOT DIRECT QUOTE

Intangible Drilling Costs Deduction (26 U.S. Code § 263. Active). This provision allows companies to deduct a majority of the costs incurred from drilling new wells domestically. In its analysis of President Trump’s Fiscal Year 2017 Budget Proposal, the Joint Committee on Taxation (JCT) estimated that eliminating tax breaks for intangible drilling costs would generate $1.59 billion in revenue in 2017, or $13 billion in the next ten years.

Percentage Depletion (26 U.S. Code § 613. Active). Depletion is an accounting method that works much like depreciation, allowing businesses to deduct a certain amount from their taxable income as a reflection of declining production from a reserve over time. However, with standard cost depletion, if a firm were to extract 10 percent of recoverable oil from a property, the depletion expense would be ten percent of capital costs. In contrast, percentage depletion allows firms to deduct a set percentage from their taxable income. Because percentage depletion is not based on capital costs, total deductions can exceed capital costs. This provision is limited to independent producers and royalty owners. In its analysis of the President’s Fiscal Year 2017 Budget Proposal, the JCT estimated that eliminating percentage depletion for coal, oil and natural gas would generate $12.9 billion in the next ten years.

Credit for Clean Coal InvestmentInternal Revenue Code § 48A (Active) and 48B (Inactive). These subsidies create a series of tax credits for energy investments, particularly for coal. In 2005, Congress authorized $1.5 billion in credits for integrated gasification combined cycle properties, with $800 million of this amount reserved specifically for coal projects. In 2008, additional incentives for carbon sequestration were added toIRC § 48B and 48A. These included 30 percent investment credits, which were made available for gasification projects that sequester 75 percent of carbon emissions, as well as advanced coal projects that sequester 65 percent of carbon emissions. Eliminating credits for investment in these projects would save $1 billion between 2017 and 2026.

Nonconventional Fuels Tax Credit (Internal Revenue Code § 45. Inactive). Sunsetted in 2014, this tax credit was created by the*Crude Oil Windfall Profit Tax Act* of 1980 to promote domestic energy production and reduce dependence on foreign oil. Although amendments to the act limited the list of qualifying fuel sources, this credit provided $12.2 billion to the coal industry from 2002-2010.

Indirect Subsidies

Last In, First Out Accounting(26 U.S. Code § 472. Active). The Last In, First Out accounting method (LIFO) allows oil and gas companies to sell the fuel most recently added to their reserves first, as opposed to selling older reserves first under the traditional First In, First Out (FIFO) method. This allows the most expensive reserves to be sold first, reducing the value of their inventory for taxation purposes.

Foreign Tax Credit (26 U.S. Code § 901.Active).Typically, when firms operating in foreign countries pay royalties abroad they can deduct these expenses from their taxable income. Instead of claiming royalty payments as deductions, oil and gas companies are able to treat them as fully deductible foreign income tax. In 2016, the JCT estimated that closing this loophole for all American businesses operating in countries that do not tax corporate income would generate $12.7 billion in tax revenue over the course of the following decade.

Master Limited Partnerships(Internal Revenue Code § 7704. Indirect. Active). Many oil and gas companies are structured as Master Limited Partnerships (MLPs). This structure combines the investment advantages of publicly traded corporations with the tax benefits of partnerships. While shareholders still pay personal income tax, the MLP itself is exempt from corporate income taxes. More than three-quarters of MLPs are fossil fuel companies. This provision is not available to renewable energy companies.

Domestic Manufacturing Deduction (IRC§199. Indirect. Inactive). Put in place in 2004, this subsidy supported a range of companies by decreasing their effective corporate tax rate. While this deduction was available to domestic manufacturers, it nevertheless benefitted fossil fuel companies by allowing “oil producers to claim a tax break intended for U.S. manufacturers to prevent job outsourcing”. The Office of Management and Budget estimated that repealing this deduction for coal and other hard mineral fossil fuels would have saved $173 million between 2012 and 2016. This subsidy was repealed by the *Tax Cuts and Jobs Act* (P.L. 115 – 97) starting fiscal year 2018.

Recent Efforts to Reform and Repeal Fossil Fuel Subsidies in Congress

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| --- |
| “Let’s look at the oil and gas subsidies, let’s take them away. Let’s let them compete just like everyone else at the same level. We can do that with the tax code to take those special provisions away.”  **— Rep. Fred Upton (R-MI)** |

**Fossil Fuel Research, Development, and Deployment**

The fossil fuel industry receives substantial government funding for research and development. Federal funding for fossil fuels is largely administered by the Department of Energy (DOE) through three initiatives: the Office of Advanced Fossil Energy R&D, the Loan Guarantee Program, and the National Energy Technology Lab. Annual appropriations and grants directed toward the fossil fuel industry can also be considered direct subsidies, as they are directly related to maintaining the competitiveness of the industry.Efforts to make coal more economical and cleaner—despite declining natural gas and renewable energy prices—have been a particular focus of the federal government’s funding, as has Carbon Capture and Storage (CCS). CCS technologies capture carbon dioxide from power and industrial sectors and store it deep underground in geological formations, or turn it into useable products, such as fuels or chemicals.

The American Recovery and Reinvestment Act (Inactive). The American Recovery and Reinvestment Act of 2009 was an economic stimulus package of $787 billion. As part of this package, the Office of Fossil Energy received $3.4 billion toward fossil fuel research and development between 2009 and 2011. The funds primarily supported R&D of carbon capture and storage technologies.

DOE Advanced Fossil Loan Programs Office (Active). The Department of Energy’s Loan Programs Office (DOE LPO) was created in 2005 to provide loans to innovative energy, tribal energy, and advanced auto manufacturing projects. While the DOE LPO is primarily focused on financing first-of-kind renewable and efficiency technologies, it has also designated $8 billion for loans to advanced fossil fuel projects that aim to avoid or sequester greenhouse gases. Originally, the program was aimed solely at coal technologies and was later expanded to include any fossil fuel. The first two loan solicitations did not result in any loan guarantees, largely because falling natural gas prices have made new coal projects uneconomical.

In December 2016, the LPO made its first fossil award to the Lake Charles Methanol Project, which received an initial commitment of $2 billion. The project would have produced methanol from the gasification of petcoke, a product of petroleum refining. However, projected costs increased following tariffs on Chinese imports, and the project has stalled. As of September 2018, construction had not begun.

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| **DOE Office of Fossil Energy R&D FY2019 Funding (Select Examples)** | |
| **Coal Carbon Capture and Storage (CCS) and Power Systems** | $25 million |
| **Carbon Storage (CCS retrofits at coal and natural gas facilities)** | $30 million |
| **Advanced Energy Systems: efficiency, reliability & flexible operations** | $37 million |
| **National Energy Technology Laboratory Coal Research and Development** | $18 million |
| **Unconventional Fossil Energy Technologies (unconventional gas & oil)** | $13.5 million |

DOE Fossil Energy Research & Development Office (Active). Historically, DOE’s advanced fossil energy R&D focused on reducing harmful emissions from coal-fired power plants, such as those responsible for acid rain. Today, the office is focused on advanced power generation, power plant efficiency, water management, and carbon capture and storage technologies (CCS), as well as the development of unconventional oil and gas resources.

In examining DOE’s fossil energy portfolio, the dollars directed towards preserving coal as a viable power source warrant closer examination. Between 2010 and 2017, the Department of Energy provided $2.66 billion to support 794 advanced fossil energy research and development projects: 785 of these were R&D projects, and the remaining nine were demonstration projects to evaluate the commercial readiness of carbon capture and storage technologies, mostly for coal. These projects received between $13 million and $284 million. Of the 785 remaining projects, 89 percent focused on coal research and development, including for coal gasification, where coal is converted to synthesis gas (“syngas”) that may be used for generating electricity and other purposes. During this same seven-year period, 91 percent of total fossil R&D money ($1.4 billion) was spent on coal-related research. For fiscal year 2019, Congress appropriated $740 million for Fossil Energy Research and Development, with continued emphasis on the continued use of coal-fired power.

**Coal-Fired Power & Carbon Dioxide Removal**

Despite significant federal investment, Carbon Capture and Storage technology is unlikely to sustain the domestic use of coal power.

There is a scientific consensus that carbon dioxide removal technologies, such as Carbon Capture and Storage (CCS) and Direct Air Capture (DAC), will be required to stabilize atmospheric concentrations of CO2 over the coming decades. The majority of 1.5°C and even 2°C warming scenarios, as reported by the Intergovernmental Panel on Climate Change (IPCC), rely heavily on such carbon dioxide utilization and storage (CCUS) strategies to manage atmospheric concentrations of CO2.

However, CCS technologies are still not widely commercialized. In the United States, there are only 10 carbon capture facilities, and only one of these is at a coal plant. Given both the current negative economics of coal for power generation, and the energy intensity of carbon capture and storage, CCS is very unlikely to sustain the domestic use of coal power.Instead, the most promising avenues for CCS applications include energy-intensive industrial sectors, direct air capture of CO2, carbon utilization, and carbon capture in natural gas power plants. To reach ambitious climate targets as quickly and cost-effectively as possible, phasing out coal’s use as a source of energy will remain necessary.

Financing Fossil Fuel Projects Abroad

*In addition to research and development projects funded through Department of Energy programs, the fossil fuel industry receives federal funding in the form of project loans, grants, and guarantees from the Overseas Private Investment Corporation (OPIC) and the United States Export-Import Bank (EXIM). These sources of funding are meant to provide capital and fiscal security for investments in emerging markets overseas, but in many cases serve to subsidize the expansion of the mature and highly profitable fossil fuel industry. This can result in increased greenhouse gas emissions from projects in countries with weaker environmental regulations.*

Overseas Private Investment Corporation (OPIC). OPIC is the U.S. Government’s development finance institution, which supports American businesses in emerging markets abroad. OPIC provides “investors with financing, political risk insurance, and support for private equity funds." Between 2010 and 2015, OPIC committed more than $6 billion in financing to renewable energy projects, and in 2008 set a target to reduce greenhouse gas emissions from new projects by 50 percent by 2023. While OPIC has dramatically increased its funding for renewable energy projects, it continues to support fossil energy, as well. Some examples of OPIC funded projects include:

* The revitalization of the aging Palagua oil field in Colombia. In 2004, OPIC gave a $3.8 million loan to Joshi Technologies to support this project, which enabled the company to extract more than 4,000 barrels of oil per day for over a decade.
* In 2017, OPIC committed $250 million for a natural gas project in Jordan, which is expected to emit the equivalent of 617,000 tons of carbon dioxide per year.
* In 2018, Kosovo government officials sought out OPIC to help them finance a new coal-fired power plant that had lost its loan guarantee from the World Bank, after the Bank chose to halt financing for new coal projects.

United States Export-Import Bank (EXIM).EXIM is the credit agency of the United States government, providing credit to facilitate the export of American goods and services. While President Obama’s 2013 Climate Action Plan called for an end to government funding for overseas coal-fired power plants (with limited exceptions where no viable alternatives exist or where CCS technology is utilized), EXIM continues to fund fossil energy development overseas. Over the past 15 years, EXIM has lent or issued billions in grants to fossil fuel projects. They include:

* $14.8 billion dollars in grants and loans for 78 projects in the petroleum sector (2001 – 2018).
* Financing $900 million in U.S. mining exports (2010).
* Lending $4.5 billion to the power sector in 2009, much of which went to the coal and petroleum sectors. This included the construction of a liquefied natural gas (LNG) project in Mozambique in 2016. The project is estimated to produce 5.2 million tons of carbon dioxide per year.

Externalities and Social Costs of Fossil Fuels

*Ultimately, the true price of carbon and other pollutants are not reflected in the actual cost of fossil fuels and fossil-derived products. Economists refer to such discrepancies as externalities. Fossil fuel externalities, including societal costs, environmental costs, and health costs, are largely overlooked in the process of incentivizing fossil fuel production through policy mechanisms. The undervaluation of fossil fuel externalities disproportionately affects communities that are the most vulnerable to the health and environmental impacts of fossil fuel combustion and extraction, namely minority and low-income populations that are more likely to live near facilities that produce high amounts of pollutants, such as ports, airports, highways, and petrochemical refineries. Addressing fossil fuel externalities could save taxpayers billions of dollars in societal costs and improve the health and quality of life for many people. Below is an outline of some major costs to consider.*

**Social Cost of Carbon (SCC)**:

The Social Cost of Carbon reflects the negative societal impacts of climate change (including the spread of diseases, decreased food security, coastal vulnerabilities, and public health costs), which is caused by manmade carbon emissions. The SCC is used as a metric to inform federal decision-making on environmental policies, as well as a factor to consider in cost-benefit analyses of such policies. A federal Interagency Working Group created an estimate for the SCC in 2010 which considered the costs of carbon on a global scale. The Trump administration is seeking to revalue the SCC by shifting from a global valuation to a national valuation, in which only the effects on the lower 48 states are considered, and by altering the discount rate (used to convert future outcomes into present dollars). Increasing the discount rate discounts the impacts on future generations.

Under the original framework, the SCC in 2015 was $36 per metric ton of CO2 at a 3 percent discount rate. This is still viewed as a conservative estimate, since there is insufficient data to fully quantify all the externalities resulting from global CO2 emissions. With the Trump administration's proposed changes, that valuation falls to $6 per metric ton (at a 3 percent discount rate) and $1 at a 7 percent discount rate.

**Health Externalities:**

|  |
| --- |
| ***Figure 1:*** Data from “The Health Costs of Inaction with Respect to Air Pollution,” by Pascale Scapecchi, Organization for Economic Cooperation and Development, Environmental Working Papers No. 2. |

Burning fossil fuels creates air pollutants such as particulate matter, carbon monoxide, sulfur dioxide, ozone, and mercury. These pollutants lead to health impacts including asthma, lung disease, bronchitis, and other chronic respiratory diseases that may lead to premature death. Air pollutants from fossil fuels also contribute to the development of lung and other cancers; lung cancer accounts for 30 percent of cancer-related deaths each year. Air pollutants, such as those released from vehicles and power plants that rely on the combustion of fossil fuels, cause 200,000 premature deaths each year.

Taking into account the coal power sector alone, it is estimated that fine particulate matter from U.S. coal plants resulted in 13,200 deaths, 9,700 hospitalizations, and 20,000 heart attacks in 2010. Coal-fired power plants are also the largest source of airborne mercury emissions in the United States. Mercury can move through the food chain and accumulate in the flesh of fish, posing the greatest risk to pregnant women.

**Environmental Externalities:**

Extraction and refining of fossil fuel may result in a host of negative outcomes including landscape degradation, risk for spills, and other unintentional environmental damage. Coal mining operations have the potential to cause pollution across the supply chain, from extraction to burning. In the United States, coal is often extracted using mountaintop removal and strip mining, which involves clearing the vegetation, soil, and rock above coal deposits. This leads to permanent damage of landscapes and the creation of massive amounts of mine wastes. Strip mining is used in roughly 65 percent of American coal production.

After coal is burned, it leaves behind coal ash, a combustion byproduct containing heavy metals like arsenic, mercury, and chromium, which are considered toxic. Coal ash is one of the largest sources of industrial waste in the United States, and a 2018 analysis of industry data found that 95 percent of coal ash storage sites have contaminated groundwater at levels deemed unsafe by the EPA. In the flooding that followed Hurricane Florence, several coal ash storage sites in North Carolina overflowed or were damaged, spilling contaminated water into surrounding areas.

Oil spills are perhaps the best known fossil fuel-related environmental dangers. The 1989 Exxon Valdez oil spill polluted 1,300 miles of shore and cost about $2 billion to clean up. The 2010 Deepwater Horizon oil spill, the largest ever, released 3.19 million barrels of crude oil into the Gulf of Mexico and cost BP (the company responsible) $61.6 billion. That same year, the 2010 Enbridge spill in southwest Michigan released more than 20,100 barrels of tar sands oil into the Kalamazoo River, creating one of the largest inland oil spills in U.S. history. The ongoing Taylor oil spill is on track to become the largest in American history, having released tens of thousands of gallons every day into the Gulf of Mexico for more than 14 years.

Conclusion  
In seeking fiscal reforms that have the potential to save taxpayer dollars while simultaneously addressing greenhouse gas emissions, phasing out subsidies for the fossil fuel industry should be a priority for federal policymakers. These subsidies aid an industry that is mature, well-established, and with an abundant private financing stream. Reducing the subsidies fossil fuel stakeholders receive can help correct inefficient economic interventions into energy markets, save billions of taxpayer dollars, and reduce negative social and environmental impacts.

### Removal Hurts the poor

Not if we implement it correctly.

#### How can fossil fuel subsidy reform be successfully implemented?

Franziska Funke , [Laura Merrill](https://www.iisd.org/about/people/laura-merrill/all) (2019) How Reforming Fossil Fuel Subsidies Can Go Wrong: A lesson from Ecuador | GSI. Retrieved November 23, 2019, from <https://www.iisd.org/gsi/subsidy-watch-blog/how-reforming-fossil-fuel-subsidies-can-go-wrong-lesson-ecuador>

Merrill is a economist with an MBA

1. Create visible and effective compensation packages

Most importantly, governments must prepare for reforms by first organizing and implementing social welfare programs that compensate for the impending hike in energy prices and can be targeted at those who need them most. Social welfare systems already in place can be supplemented to further cushion the effects.

A [major review](http://documents.worldbank.org/curated/en/745311489054655283/pdf/113262-PUB-PUBLIC-PUBDATE-3-22-17.pdf) of the political economy of subsidy reforms highlights that improvements in social protection systems are critical to the success of reforms. In order to harness public support for the phasing out of fossil fuel subsidies, social compensation programs should be implemented alongside or even prior to reforms. This might have been one of the faults of President Moreno’s reform package for Ecuador, which [promised welfare payments](https://www.washingtonpost.com/politics/2019/10/14/heres-why-raising-gas-prices-leads-violent-protests-like-ecuadors/) for the poor but did not deliver these in time to get people on board with the reform and cushion the effects for vulnerable populations. In the context of carbon pricing, [recent research from Nature Climate Change](https://www.nature.com/articles/s41558-018-0201-2) suggests that it is important to design compensation mechanisms such that they concentrate benefits on key constituencies, as this can help increase public support. Targeted transfers can turn groups that would likely oppose the removal of subsidies into constituents who are more likely to ensure that reforms go smoothly and stay in place over the long run.

There are many examples of countries implementing fossil fuel reforms successfully by employing effective compensation packages. The [Philippines](https://www.iisd.org/sites/default/files/publications/lessons-learned-ffs-energy-sector-reform-philippines.pdf) managed to smooth the transition away from fossil fuel subsidies by using targeted cash transfers to help build a national safety net alongside lifeline tariffs to protect the poor in the process of reforms. Indonesia’s first large-scale unconditional cash transfer system was created in [only six months](https://www.iisd.org/sites/default/files/publications/compensation-mechanisms-fuel-subsidy-removal-nigeria.pdf) in order to compensate for subsidy reforms. The country used a [basket of social protection policies](https://www.iisd.org/sites/default/files/publications/financing-development-with-fossil-fuel-subsidies-indonesia.pdf) covering education, health insurance, food subsidies, cash transfers and infrastructure programs. [Ghana](https://www.iisd.org/library/compensation-mechanisms-fuel-subsidy-removal-nigeria)’s reform of subsidies to gas and diesel was accompanied by a livelihoods program to support families. [Morocco](http://norden.diva-portal.org/smash/record.jsf?pid=diva2%3A1044432&dswid=9969) expanded a national conditional cash transfer as well as education and health insurance schemes at the same time as reforming.

2. The importance of social dialogue

In the context of the gilets jaunes protests in France, the Global Subsidies Initiative has [highlighted](https://www.iisd.org/gsi/subsidy-watch-blog/yellow-vest-protests) the role that social dialogue and citizen engagement play in getting the public on board with reforms. In the early stages of now successful reforms in [Ghana](https://oxfamblogs.org/fp2p/if-fossil-fuel-subsidies-are-so-bad-why-cant-we-get-rid-of-them-time-for-some-politics/) and [Indonesia](https://www.iisd.org/sites/default/files/publications/stories-g20-indonesia-en.pdf), governments consulted with labour unions, consumer associations and other stakeholder groups. Listening to citizens can help policy-makers understand their needs and positions and adjust reform plans to reflect their concerns.  In addition, targeted communication campaigns can help to get across the rationale and benefits of phasing out fossil fuel subsidies. In Indonesia, for example, President Joko Widodo made the subsidy reform a topic of his election campaign, explaining all the benefits that budgetary savings could unlock. Indonesia [freed up USD 15.6 billion and increased its budgetary expenditure by a similar magnitude](https://www.iisd.org/library/financing-development-fossil-fuel-subsidies-reallocation-indonesias-gasoline-and-diesel) in safety nets, transport, infrastructure and transfers to villages.

3. Change is good, but not all at once

In the case of Ecuador, a large part of the nation’s discontent may be traced back to the sheer force with which the reform hit its citizens. Ecuadorian policy-makers would likely have been better served with a more careful and gradual removal of fuel subsidies, which the [International Monetary Fund](https://www.imf.org/en/News/Articles/2019/03/11/ecuador-pr1972-imf-executive-board-approves-eff-for-ecuador) had also advised. Small price increases are easier to swallow and made it possible for citizens to adapt to the new price situation over time.

[Research by Jordan Kyle](https://www.washingtonpost.com/politics/2019/10/14/heres-why-raising-gas-prices-leads-violent-protests-like-ecuadors/) at Columbia University further highlights that a phased approach is advised in environments marked by political mistrust and corruption. Citizens tend to be on board with fossil fuel subsidy reforms only when the government can credibly demonstrate that they will also deliver on social compensation promises. Implementing reforms step-by-step allows citizens more time to start trusting that governmental compensation schemes will indeed reach them. According to [Kyle](https://journals.sagepub.com/doi/10.1177/0010414018758755), Indonesia’s success in reforming fossil fuel subsidies can in part be traced back to the trust-building and phased nature of its reform approach.

What’s next for Ecuador?

There is hope that a second attempt at reforms in Ecuador will be successful. In his statement on the repeal of the reform, President Moreno [announced](https://elpais.com/internacional/2019/10/14/america/1571017066_691583.html) “the Government will replace Decree 883 with a new one that contains mechanisms to focus resources on those who need them most.” This time around, Moreno [vowed to work](https://www.nytimes.com/2019/10/13/world/americas/ecuador-protests-lenin-moreno.html?auth=login-email&login=email) with the Indigenous movement to design a convincing reform package. Chances are, citizens won’t judge this package by its ability to reduce the fiscal deficit but by its potential to make their lives better. What matters in the end is that public funds are reallocated to serve societal welfare more effectively and equitably.

# Extensions

### Free Market

#### Climate change isn’t caused by capitalism but a lack of it—subsidy elimination is key to reinvigorate free market competition

Lenferna 16

Alex Lenferna (Endeavour Research Fellow at the University of New South Wales Practical Justice Initiative Climate Justice Research Stream; South African Fulbright Scholar and PhD Candidate in the Department of Philosophy, University of Washington). “Vast subsidies keeping the fossil fuel industry afloat should be put to better use.” Phys. 16 July 2016. JDN. <https://phys.org/news/2019-07-vast-subsidies-fossil-fuel-industry.html>

Often central within the capitalism versus the climate framing is the idea that the heart of capitalist ideology—free market fundamentalism—has fueled the climate crisis. But this line of argument often glosses over the fact that energy markets are not free from government intervention. In fact, the fossil fuel industry is **deeply and increasingly reliant on government support** to survive. In a forthcoming book chapter, I detail case studies from the world's worst climate polluting countries. I show that the fossil fuel industry depends on an egregious amount of government support, which makes the public foot the bill for a harmful—and increasingly uncompetitive—industry. In my chapter, I show that governments the world over favor fossil fuel interests through public financing, financial **subsidies**, and bailouts. In addition, the fossil fuel industry is helped by corrupt governance systems. Together this forms what I call a system of fossil fuel welfare and protectionism. To hide this reality, the fossil fuel industry has invested in a massive public relations scheme (read: propaganda campaign) to paint itself as the defender of the free market. In the US, the fossil fuel industry has even, quite successfully, duped Evangelicals into associating the fossil fuel industry with free markets, and free markets with God's will. Thus, attacks on the fossil fuel industry become attacks on God's will. But if God's will was really aligned with the free market, then the fossil fuel industry would be doing the devil's work. Take South Africa, for example, the biggest carbon polluter on the African continent. It used to be home to **the world's fastest growing renewable** energy **sector,** but government intervention to protect polluting coal interests set back these advances. Under President Cyril Ramaphosa the government is now taking steps to allow small amounts of new renewable energy into the market. But government actions continue to slow the immense potential South Africa has for a low-cost, renewable energy revolution. A recent study reported that South Africa subsidizes coal by R56,6 billion per year—propping up a polluting industry with taxpayer money. South Africa continues to subsidize coal despite studies showing that renewable energy was helping to prevent energy blackouts, was saving South Africa billions on energy and that a renewable energy future is the country's lowest cost energy pathway. On the other side of the Atlantic, a recent International Monetary Fund (IMF) study showed that the US, the world's largest historic greenhouse gas emitter, gives **ten times more** to fossil fuel subsidies than it does to education. Without such subsidies half of future oil production in the US would be unprofitable. As for coal, even the Wall Street Journal admits that US coal simply can't compete on a level playing field, and is losing out despite its major subsidies. Studies reveal that without regulation to shield them from market forces, about **half of** the **coal plants** in the US **would be going bankrupt.** The fossil fuel industry is increasingly relying on the heavy hand of the government to protect fossil fuels from competition. Subsidies and protective policies shield fossil fuels from the reality that **renewable energy has become the cheapest energy source worldwide.** Global fossil fuel subsidies are so large, that if redirected, enough money would be available for investments in clean energy and energy efficiency needed to meet the Paris Climate Agreement targets. The IMF estimates that **eliminating fossil fuel subsidies** could free up US$2.9 trillion in government revenue annually. That amount is more than double the annual investment of US$1.25 trillion the International Energy Agency estimates is needed by 2035 in clean energy and energy efficiency to stop the world from warming by 2°C. To meet the much safer target of keeping warming to 1.5°C, would only require an additional $460 billion per year in clean energy and energy efficiency investments. Far from climate action being too expensive, the polluting status quo is costing the world more than a clean energy future, even if we only look at the subsidies given to the fossil fuel industry and ignore the staggering amounts of harm fossil fuels cause. It's time we rid ourselves of the notion that what underpins the climate crisis is the operation of free markets. The markets that drive the climate crisis are far from free. Rather, the heavy hand of government is driving the world towards the brink of climate chaos and will also be needed to avert further climate destabilization. Instead of free market capitalism versus the climate, we have **fossil fuel welfare** versus the climate. And if we reinvested that fossil fuel welfare into social and ecological welfare, we could create a much more socially and ecologically prosperous future.

# Workshop

#### DOD report—Climate change bad

DOD report- January 2019, <https://climateandsecurity.files.wordpress.com/2019/01/sec_335_ndaa-report_effects_of_a_changing_climate_to_dod.pdf>

The effects of a changing climate are a national security issue with potential impacts to Department of Defense (DoD or the Department) missions, operational plans, and installations. Our 2018 National Defense Strategy prioritizes long-term strategic competition with great power competitors by focusing the Department’s efforts and resources to:

1) build a more lethal force

2) strengthen alliances and attract new partners,

And 3) reform the Department’s processes.

END quote

Some the climate related events that the DOD lists include

Climate-Related Events

•Recurrent Flooding

•Drought

•Desertification

•Wildfires

•Thawing Permafrost

#### CC will hurt the poor

Carmin Chappell. (2019) Climate change will hurt poor people the most: Federal report. Retrieved November 13, 2019, from <https://www.cnbc.com/2018/11/26/climate-change-will-hurt-poor-people-the-most-federal-report.html>

Climate change will hit low-income communities the hardest as it takes a toll on the U.S. in general, says a blockbuster government report released on Friday.

Low-income communities in both urban and rural areas will be disproportionately impacted by climate change relative to other communities, according to the assessment, which was created by a team of over 300 experts from the government and the private sector to analyze the impact of climate change on the country.

Those communities already have higher rates of many adverse health conditions, are more exposed to environmental hazards and take longer to bounce back from natural disasters. These existing inequalities will only be exacerbated due to climate change, according to the report, which is known as the Fourth National Climate Assessment.

The report made waves in Washington despite being released the day after Thanksgiving, which prompted speculation that the Trump administration was trying to bury the findings. The assessment is at odds with the views of President Donald Trump, who has historically denied evidence of climate change. Last year, he announced that the U.S. would withdraw from the Paris Agreement, which aims to reduce global greenhouse gas emissions. Earlier this month, he tweeted, “Brutal and Extended Cold Blast could shatter ALL RECORDS – Whatever happened to Global Warming?”

On Monday, Trump rejected the report’s findings about climate change’s economic impact. “I don’t believe it,” he told reporters on the White House South Lawn, as he was departing to hold campaign rallies in Mississippi.

Several politicians seized on the report’s release as an opportunity to promote their own plans for mitigating climate change. On Twitter, Alexandria Ocasio-Cortez, a Democrat who was elected to represent part of New York City in Congress, touted her Green New Deal proposal, which aims to create a committee in the House that would develop a plan to generate all of the country’s electricity from renewable energy.

“People are going to die if we don’t start addressing climate change ASAP,” she said in the tweet.

Sen. Elizabeth Warren, a potential 2020 Democratic presidential candidate, also tweeted about the Climate Risk Disclosure Act she introduced in September, which would require publicly traded companies to disclose their greenhouse gas emissions.

Health and jobs at risk

Heart and lung disease, heat stroke and bacterial infections are just a few of the health consequences associated with climate change. Low-income populations “typically have less access to information, resources, institutions, and other factors to prepare for and avoid the health risks of climate change,” the report says, leaving them especially vulnerable. Lack of health insurance among the poor will also intensify the risks of illnesses caused by climate change.

In urban areas, which produce 80 percent of greenhouse gas emissions in North America, the poor “live in neighborhoods with the greatest exposure to climate and extreme weather events,” the report says. This includes living near pollution sites and in housing developments without sufficient insulation or air conditioning. Additionally, disruptions to infrastructure during natural disasters can have an outsized impact on city residents who rely on public transportation.

Rural areas often have agriculture-dependent economies, so the livelihoods of low-income residents are more vulnerable to changing environmental conditions.

Many rural households also suffer from energy poverty, the report states, meaning they “are not able to adequately heat or provide other required energy services in their homes at affordable cost.” As average temperatures continue to rise, people who cannot affordably cool their houses will continue to feel financial strains.

Disasters and ‘green gentrification’

Recent storms like Hurricane Florence and Hurricane Harvey, which brought record levels of flooding to coastal areas, also exposed inequities in disaster preparedness as poorer communities struggled to rebuild.

“Some property owners can afford to modify their homes to withstand current and projected flooding and erosion impacts,” write the report’s authors. “Others who cannot afford to do so are becoming financially tied to houses that are at greater risk of annual flooding.”

Even climate change prevention efforts can reflect existing inequalities, according to the assessment. “Better-resourced communities have created climate offices and programs, while response has lagged in smaller or poorer communities,” the report says.

Infrastructure improvements to protect against climate change can lead to what the report calls “green gentrification,” in which property values rise and low-income residents are pushed out.

To combat these inequalities, the report emphasizes the need for government officials to involve residents when developing solutions to climate change.

“Decisions about where to prioritize physical protections, install green infrastructure, locate cooling centers, or route public transportation,” should be made with low-income communities in mind, according to the report.

# Thing

My opponent said in the beginning of his constructive that in this debate, the negative should only have to prove that subsidies had some use in some situations. That was the framework he laid out for today’s debate. I refuted exactly that as asked. I proved exactly that, to give this round to my opponent because I did what he asked of me is ridiculous. The fact of the matter is that, when it came to my case he repeated his own points. When talking about the affect CC has on the U.S. economy, his rebute was that the benefit outweigh the costs of CC and FFS. When it came to my values, he restated the fact that FFS helps people and removing them woud hurt people. I obviously refuted this by saying that successful subsidies reform helps people as seen in other countries. By refuting his case, his attacks on mine don’t stand.

Of course it supports your case, it’s the same value. FFS also drain trillians per year, cause massive public health issues, and will lead an environmental catastrophe that will cost the economy trillians of dollars.

He never addressed the fact that if the US used its full diplomatic muscle, we could lead the world to a greener future.

He never addressed the fact that successful subsidy reform would actually help people.

IGNORING EVIDENCE DOESN’T MAKE IT NOT TRUE.

Judge, here’s the thing, as many benefits the fossil fuel industry may provide to the US, the fact is that it causes massive environmental catastrophe for the world that will outweigh any benefit it has the US. My opponent used weighing the cost-benefit analysis to attack my case. I’d like to do the same. The benefits are that of GDP, jobs, and money. Removing FFS would be the first step to solving CC, and free up half a trillan of GDP, and create a better future. So that’s the weighs. Obviously any short term gain named is just an excuse to nothing and watch the world burn. Please vote AFf.

# NEG

# 1NC

**Resolved: The United States ought to eliminate subsidies for fossil fuels.**

**I stand in firmly against this resolution.**

My value for this debate is Quality of life, defined as the standard of health, comfort, and happiness experienced by an individual or group.

My Value Criterion is optimizing resources. With respect to the resolution and my Value, it would be keeping Fossil Fuel subsidies since eliminating them would hurt the quality of life due to inefficiently using our resources.

A fossil fuel is defined as a substance containing carbon and was formed as a result of geologic processes acting on the remains of organic matter.

Contention 1. Removing Fossil Fuel subsidies hurts people

This is seen in Nigeria, Cantore et al. 12

Quote

Once the announcement to **end subsidies** was made, the price of gas in Nigeria **doubled overnight**, sparking huge protests nationwide, as citizens who relied on fuel for their livelihood found themselves **paying twice as much per gallon** for fuel. The **vast majority** of citizens are **very price sensitive**From a theoretical point of view, the removal of fossil fuel subsidies is an appropriate policy tool. But the **reality is much more complex** than this. The removal of fossil fuel subsidies was announced suddenly, with no attempt to **introduce change gradually.** It seems that government policy was motivated overnight, by panic over the budget rather than by a real commitment to channel funds towards pro-poor policies (if the latter were the case, pro-poor spending needed to precede subsidy removal). People were not adequately prepared for the removal of fossil fuel subsidies through appropriate awareness campaigns.

End quote

This is also seen in Ecuado, Woods 19

Quote

In Ecuador, people are **putting their lives at risk** to reinstate them. . After eleven days of unrest, seven dead, and thousands injured, the government met with protesters and negotiated the reinstatement of fossil fuel subsidies in Ecuador. What went wrong in Ecuador? The third of October is the first day the effect of eliminating government fuel subsidies shattered Ecuador's population: fuel **prices rose by 25-75 percent overnight.**  For the **vast majority** of Ecuadorians, these buses are the only way to navigate The subsidy cut resulted in fares as high as 40 cents for a single journey. Overnight **millions** of people **could not get to work or school,** the price of goods and food rose with it, as the cost of freight spiked.

End Quote

Contention 2. Removing Fossil Fuel subsidies has little to no environmental impact

Subpoint A. No environmental Impact

Jewell 2018 in the abstract of a scientific study.

Quote

However, whether the removal of subsidies, even if implemented worldwide, would have a large impact on climate change mitigation has not been systematically explored. Here we show that removing fossil fuel subsidies would have an unexpectedly small impact on global energy demand and carbon dioxide emissions and would not increase renewable energy use by 2030. In some regions global subsidy removal may actually lead to an increase in emissions.

End Quote

Meyer, 2010

Quote

. In both the world’s richest and poorest countries, canceling fossil-fuel subsidies would neither significantly reduce carbon-dioxide pollution nor increase the amount of investment in renewable energy between now and 2030.

Only in countries in a sort of middle tier—moderately wealthy places that export vast amounts of oil and gas, like Russia, Venezuela, or Saudi Arabia—would cutting subsidies lead to major declines in emissions.

Most governments spend most of their subsidy money on the consumption side—that is, they help poor and middle-class people buy fossil fuels. Cutting that support can be ethically and environmentally tricky. In India, for example, cutting the subsidies sometimes led to increases in greenhouse-gas emissions—because the country’s poorest citizens, unable to afford kerosene, started burning even dirtier fuels like firewood or charcoal.

the federal government spends about $4 billion every year on tax breaks for fossil fuels. If the United States or Europe were to kill their subsidies, she argues, then an oil- or gas-exporting country would just increase their production.

End Quote

That is all for my arguments, now I will move on to my opponents arguments.

## Value + Value Criterion

My value for this debate is Quality of life, defined as the standard of health, comfort, and happiness experienced by an individual or group.

My Value Criterion is optimizing resources. With respect to the resolution and my Value, it would be keeping Fossil Fuel subsidies since eliminating them would hurt the quality of life due to inefficiently using our resources.

#### Why?

If we eliminate fossil fuel subsidies, people will suffer, because of this fact, there is no way that eliminating fossil fuel subsidies is efficient and it does not improve the quality of life. If it was efficient, it would have only positive maximum impact.

## Contention 1. A cut off hurts people

#### Rushing subsidy reduction causes devastating economic impacts—Nigeria proves

Cantore et al. 12

Nicola Cantore (United Nations Industrial Development Organization), Alessandro Antimiani (Institute of Agricultural Economics, Rome), and Paulo Rui Anciaes (University College London). “Energy price shocks Sweet and sour consequences for developing countries.” Overseas Development Institute. Working Paper 355. 2012. JDN. <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/7794.pdf>

Once the announcement to **end subsidies** was made, on 1 January 2012, the price of gasoline at the pump in Nigeria essentially **doubled overnight**, sparking huge protests and discontent nationwide, as citizens who relied on cars or fuel for their livelihood found themselves **paying twice as much per gallon** for fuel. The **vast majority** of citizens in Nigeria are **very price sensitive**, and the rise in gas from $1.70 to $3.50 a gallon had major effects. After protests and turmoil following the decision, the president announced that the government would subsidise gasoline prices to a lesser extent, which immediately reduced the price to around $2.27 a gallon. From a theoretical point of view, the removal of fossil fuel subsidies is an appropriate policy tool. A subsidy distorts the market and a country could better spend the money on growth-enhancing measures, including for the poorest (this was promised in Nigeria, of course, but people doubted the intent). Subsidy removal is also better for the environment. But the **reality is much more complex** than this. The European Report on Development 2012 focuses on different circumstances under which fossil fuel subsidies can be removed successfully: 1) The removal of fossil fuel subsidies must be credible and must be grounded in a long-term commitment delinked to the political debate and the electoral cycle. 2) Ideally, specific independent authorities must be created to manage the energy sector and prices. As emphasised by the UNIDO Industrial Development Report 2011, these agencies need a well-defined mandate, strong technical skills and a secure source of funding. Their role would cover information dissemination, implementing technical and policy measures, coordinating engagement of players in policy formulation and implementation and serving as a focal point for economic actors. 3) Awareness campaigns are crucial to explain to the public the advantages of removing fossil fuel subsidies, such as the ability to use the funds to implement alternative pro-poor policies. 4) The credibility and anti-corruption policies of the government are key to convince the public that savings from fossil fuel subsidies will be used to combat poverty and fight social exclusion. According to the Center for Public Policies Alternatives (2011), the cost of corruption to the Nigerian government is $75 billion, about 40% of GDP a year. 5) Removing subsidies gradually may help to increase acceptance. For Nigeria, many of these points are of crucial importance. The removal of fossil fuel subsidies was announced suddenly, with no attempt to **introduce change gradually.** It seems that government policy was motivated overnight, by panic over the budget rather than by a real commitment to channel funds towards pro-poor policies (if the latter were the case, pro-poor spending needed to precede subsidy removal). People were not adequately prepared for the removal of fossil fuel subsidies through appropriate awareness campaigns.

#### Subsidies Not Always Bad

Robinson Meyer, 6-13-2010, "The World Spends $400 Billion Propping Up Oil Companies. Is That Bad?," Atlantic, https://www.theatlantic.com/science/archive/2018/02/maybe-cutting-fossil-fuel-subsidies-wouldnt-do-much-good/552668/

In the thrilling world of multinational industrial policy, it’s about as high-stakes a fight as you can get.

Every year, the world’s governments spend hundreds of billions of dollars making it cheaper to extract and burn fossil fuels. Almost as regularly, their representatives get together and beg everyone else to stop doing that. Then they go home and keep doing it themselves.

The pattern has worn on for more than two decades. Way back in 1997, the Kyoto Protocol—the first international treaty aimed at fixing global warning—[called for governments to stop subsidizing](https://unfccc.int/resource/docs/convkp/kpeng.html) all “greenhouse-gas-emitting sectors.” That didn’t happen, so, in 2009, the leaders of [the G20 nations](http://g20.org.tr/about-g20/g20-members/) resolved anew to “phase out ... inefficient fossil-fuel subsidies.” Three years later, [President Obama declared](https://obamawhitehouse.archives.gov/the-press-office/2012/02/23/remarks-president-energy)that “a century of subsidies to the oil companies is long enough.” In 2016, when G20 leaders met in China, they again “reaffirmed” the need to end subsidies.

Somehow, all those affirmations didn’t get the job done. Governments are still subsidizing oil extraction today, to the tune of about $400 billion per year. And climate advocates continue issuing unheeded proposals to cut those subsidies as a way of reducing greenhouse-gas pollution.

[LINDA POON](https://www.theatlantic.com/author/linda-poon/)

But maybe all the rigamarole isn’t worth it. A new study, [published this week in the journal Nature](http://nature.com/articles/doi:10.1038/nature25467), argues that withdrawing subsidies wouldn’t have as large an effect as anticipated. In both the world’s richest and poorest countries, canceling fossil-fuel subsidies would neither significantly reduce carbon-dioxide pollution nor increase the amount of investment in renewable energy between now and 2030.

Only in countries in a sort of middle tier—moderately wealthy places that export vast amounts of oil and gas, like Russia, Venezuela, or Saudi Arabia—would cutting subsidies lead to major declines in emissions.

And even on a global scale, slashing fossil-fuel subsidies would do less to help the climate than would universal adoption of the Paris Agreement on climate change, the study argues. That accord—which would only hold global warming [to about 3 degrees Celsius](https://www.vox.com/2015/12/12/9981020/paris-climate-deal), failing to hold off [environmental devastation](https://theconversation.com/why-is-climate-changes-2-degrees-celsius-of-warming-limit-so-important-82058) or [dangerous sea-level rise](https://e360.yale.edu/features/abrupt_sea_level_rise_realistic_greenland_antarctica)—would nonetheless avert between four and eight gigatons of carbon-dioxide pollution every year. Killing subsidies would only prevent 0.5 to two gigatons of pollution annually.

“We’re not advocating keeping subsidies. We’re just advocating a more regionally differentiated discussion of them,” said [Jessica Jewell](http://www.iiasa.ac.at/staff/staff.php?type=auto&visibility=visible&search=true&login=jewell), an author of the paper and a political-economy researcher at the International Institute for Applied Systems Analysis in Austria.

“A lot [of attention] has been focused on subsidy removal in [[developed] OECD countries](http://www.oecd.org/about/), whereas when you look at our results, the discussion politically should be on focusing on subsidy removal in oil- and gas-exporting regions,” she told me.

This finding is, she admits, diplomatically challenging. Countries in North America and Western Europe—except for the United States—have historically pushed for a more aggressive global climate policy. But it’s in the countries most resistant to reducing emissions—Russia, Saudi Arabia, Venezuela, and others near them—that slashing subsidies would have the biggest effect.

The new paper provides a useful global context for arguments happening in many world capitals. Most governments spend most of their subsidy money on the consumption side—that is, they help poor and middle-class people buy fossil fuels. Cutting that support can be ethically and environmentally tricky. In India, for example, cutting the subsidies sometimes led to increases in greenhouse-gas emissions—because the country’s poorest citizens, unable to afford kerosene, started burning even dirtier fuels like firewood or charcoal.

The situation isn’t any simpler in rich countries. Take the debate over subsidies in the United States.

In America, it’s not clear how much the public pays to cushion oil, gas, and coal companies. The Council on Foreign Relations, a nonpartisan think tank, [estimated in 2016](https://www.cfr.org/report/impact-removing-tax-preferences-us-oil-and-gas-production?cid=otr-marketing_use-TaxPreferencesPaper/) that the federal government spends about $4 billion every year on tax breaks for fossil fuels. But Oil Change International, a progressive environmental group, looked at a broader set of federal and state policies last year and put the cost to taxpayers [at $20.5 billion](http://priceofoil.org/2017/10/03/dirty-energy-dominance-us-subsidies/). (And even this number leaves out some subsidies, like the federal program [that helps families pay their heating bills](https://www.acf.hhs.gov/ocs/programs/liheap).)

No matter how you estimate them, would cutting these subsidies do any good? There, again, it also depends on whom you ask—and what assumptions they make. Gilbert Metcalf, the economist who arrived at the $4-billion figure, found that ditching the federal tax subsidies would only [raise global oil prices by about 1 percent](https://www.nytimes.com/2016/08/06/upshot/do-oil-companies-really-need-4-billion-per-year-of-taxpayers-money.html)—the equivalent of at most two additional cents per every gallon of gasoline at the pump.

As such, he concluded the subsidies were a waste of money, because they didn’t make gas or electricity much cheaper for Americans. Their effect on global oil prices was just too small. But by the same token, he didn’t think canceling them would reduce greenhouse-gas emissions, either.

[A paper published last year in Nature Energy](https://www.nature.com/articles/s41560-017-0009-8) arrived at a totally different conclusion. Though it mostly agreed with Metcalf about the domestic effects of oil subsidies, it looked at how their consequences accumulated over time. (Metcalf focused on their annual effects.) Suddenly, the subsidies seemed to have a gargantuan climate footprint: By 2050, the United States will have underwritten the drilling of an extra 17 billion barrels of oil, enough to emit over 6 billion tons of carbon dioxide.

Both papers, in other words, thought America should trash its subsidies—they just had different reasons why. They also had different ideas about how the world would respond to the change. The Nature Energy paper believes that killing U.S. subsidies would decrease emissions worldwide. Metcalf argues that other countries will just fill the hole that America left in the market.

Looking at the world as a whole in her new paper, Jewell takes the same view as Metcalf. If the United States or Europe were to kill their subsidies, she argues, then an oil- or gas-exporting country would just increase their production. “When you think about it, it makes sense because we’re operating on a globally liberalized market,” she told me.

Therefore, she proposes that climate advocates target killing subsidies in oil-exporting nations. “These countries are already facing budgetary pressures because oil prices are low,” she said. “In a place like Saudi Arabia, there’s an opportunity now. For them to decrease subsidies is kind of a win-win.”

[Peter Erickson](http://sei-us.org/about/staff_person/6), a U.S.-based senior scientist at the Stockholm Environment Institute and one of the authors of the Nature Energy paper, said “their suggestion to focus on high-income countries is a good one, and is just good policy design if one is concerned about equity or simply efficiency.” But he takes issue with the idea that fossil-fuel subsidies don’t hurt the climate, even in the United States.

“Their conclusion that subsidy removal could reduce global carbon-dioxide emissions by 1 to 4 percent is substantial, and underscores why subsidy removal is an important climate solution,” he told me in an email. “One to 4 percent is only ‘small’ compared to the massive scale of the climate challenge at hand, a task that necessarily involves many complementary policy solutions.”

He also thought it was silly to compare killing subsidies to the Paris treaty. The national commitments “are generally economy-wide pledges that are designed to be attained through many individual policies and actions, including (in some cases) but not at all limited to subsidy removal,” he said.

Or maybe all the numbers are way too small. The International Monetary Fund calculates that fossil-fuel subsidies cost the world [about $5.3 trillion in 2015](https://www.sciencedirect.com/science/article/pii/S0305750X16304867#!)—a number 13 times the size of Jewell’s $400 billion estimate and equal to about 6.5 percent of annual world economic output. But that study takes an especially magnanimous view of subsidies, including the global burden of air pollution and the future cost of climate change as well as the cost of specific government programs. “If you use that number, you get a totally different result,” Jewell said. “You get something totally different from what we got.”

They ignored that estimate for a reason. Jewell and her colleagues chose to calculate only the policies that governments already have in place—like tax breaks or drilling subsidies—and not include every possible cost to the public.

Ultimately, Jewell say her study should prompt environmental groups to be pickier about the kind of political fights they seek.

“A lot of the advocacy is coming not from governments, but from nongovernmental organizations, and there’s not a focus on this regional differentiation. It’s just a global message of subsidy removal for everyone,” she said. “Climate advocacy occurs at different levels, and climate advocates of course have to evaluate what makes sense for their context.”

“But what kind of political animal are you going up against?” she asked. By focusing on all subsidies everywhere, advocates may be stumbling into disaster—unintentionally targeting “a poor person who will wind up on the cover of a magazine because they can’t afford heating oil.”

#### Recent attempts to cut subsidies in Ecuador show the potential for price spikes and dangerous backlash

Woods 19

Lucy EJ Woods (freelance journalist in Quito specializing in on-the-ground environmental reporting). “How not to eliminate fossil fuel subsidies.” The Ecologist. 21 October 2019. JDN. https://theecologist.org/2019/oct/21/how-not-eliminate-fossil-fuel-subsidies

Across Europe, and many other places, people are laying their bodies down, facing arrest, calling for government action on environmental policies, including cutting fossil fuel subsidies. In Ecuador, people are **putting their lives at risk** to reinstate them. The protests were successful. After eleven days of unrest, seven dead, hundreds arrested and thousands injured, the government met with protesters for peace talks, and negotiated the reinstatement of fossil fuel subsidies in Ecuador. On Monday 14 October, people cleared concrete debris and stones from makeshift road blockades and swept the black ash that lined the streets from protest fires. Transport services resumed, and schools, shops and offices reopened. The nation returning to peace. Price rise What went wrong in Ecuador? The third of October is the first day the effect of eliminating government fuel subsidies shattered Ecuador's population: fuel **prices rose by 25-75 percent overnight.**  The protests began with a transport strike, as the immediate rise in gasoline and diesel prices forced bus operators and taxis to hike up fares. With only a handful of tourist trains in the country, the primary form of transport in Ecuador is public bus. Quito is gaining a metro, but construction is delayed; it will not open till next summer at the earliest. Until it opens, grime covered red and blue buses spew trails of toxic black clouds, zooming through the valleys of Quito – home for more than two million people. For the **vast majority** of Ecuadorians, these buses are the only way to navigate the cities looping, dangerous tunnels and overhead highways. A single fair on one of these (often) overcrowded, questionably driven buses - that would never meet European safety standards - is 25 US cents. The subsidy cut resulted in fares as high as 40 US cents for a single journey. Overnight **millions** of people **could not get to work or school,** the price of goods and food rose with it, as the cost of freight spiked.

## Contention 2. Little/no environmental impact

#### Limited impact, not in exporting regions

Jewell, J., McCollum, D., Emmerling, J. *et al.* 2018. Limited emission reductions from fuel subsidy removal except in energy-exporting regions. *Nature* **554,** 229–233 (2018) doi:10.1038/nature25467, <https://www.nature.com/articles/nature25467#citeas>

Jewell 2018

Hopes are high that removing fossil fuel subsidies could help to mitigate climate change by discouraging inefficient energy consumption and levelling the playing field for renewable energy[1](https://www.nature.com/articles/nature25467#ref-CR1),[2](https://www.nature.com/articles/nature25467#ref-CR2),[3](https://www.nature.com/articles/nature25467#ref-CR3). In September 2016, the G20 countries re-affirmed their 2009 commitment (at the G20 Leaders’ Summit) to phase out fossil fuel subsidies[4](https://www.nature.com/articles/nature25467#ref-CR4),[5](https://www.nature.com/articles/nature25467#ref-CR5) and many national governments are using today’s low oil prices as an opportunity to do so[6](https://www.nature.com/articles/nature25467#ref-CR6),[7](https://www.nature.com/articles/nature25467#ref-CR7),[8](https://www.nature.com/articles/nature25467#ref-CR8),[9](https://www.nature.com/articles/nature25467#ref-CR9). In practical terms, this means abandoning policies that decrease the price of fossil fuels and electricity generated from fossil fuels to below normal market prices[10](https://www.nature.com/articles/nature25467#ref-CR10),[11](https://www.nature.com/articles/nature25467#ref-CR11). However, whether the removal of subsidies, even if implemented worldwide, would have a large impact on climate change mitigation has not been systematically explored. Here we show that removing fossil fuel subsidies would have an unexpectedly small impact on global energy demand and carbon dioxide emissions and would not increase renewable energy use by 2030. Subsidy removal would reduce the carbon price necessary to stabilize greenhouse gas concentration at 550 parts per million by only 2–12 per cent under low oil prices. Removing subsidies in most regions would deliver smaller emission reductions than the Paris Agreement (2015) climate pledges and in some regions global subsidy removal may actually lead to an increase in emissions, owing to either coal replacing subsidized oil and natural gas or natural-gas use shifting from subsidizing, energy-exporting regions to non-subsidizing, importing regions. Our results show that subsidy removal would result in the largest CO2 emission reductions in high-income oil- and gas-exporting regions, where the reductions would exceed the climate pledges of these regions and where subsidy removal would affect fewer people living below the poverty line than in lower-income regions.

#### Zero Emissions + Carbon tax good

Nathan Rott (2019) Can Clean Energy Goals Help Slow Climate Change? : NPR. Retrieved November 10, 2019, from <https://www.npr.org/2019/06/18/724343789/going-zero-carbon-is-all-the-rage-but-will-it-slow-climate-change>

The warnings come with unsettling regularity:

Climate change [threatens](https://www.npr.org/2019/05/06/720654249/1-million-animal-and-plant-species-face-extinction-risk-u-n-report-says) 1 million plant and animal species.

Warmer oceans could [lose one-sixth of their fish and other marine life](https://www.pnas.org/content/early/2019/06/10/1900194116.short?rss=1) by the end of the century.

Global warming is a major risk to the [economy](https://www.npr.org/2018/11/26/670812889/what-you-need-to-know-about-the-new-u-s-climate-assessment).

The world's leading scientists have made it clear that to prevent the worst effects of climate change, there needs to be "[rapid, far-reaching and unprecedented](https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/)" changes to our energy systems. In simpler terms: We need to stop adding carbon dioxide to the atmosphere.

Federal action to curb greenhouse gas emissions in the U.S. seems unlikely in the near future. The Trump administration is going the other way, rolling back regulations to cut emissions.

Defining Zero Carbon

Cities, states and companies use different language for their climate goals, and subtle differences can mean vastly different things. Here's a guide to some of the terminology:

Carbon free means no carbon dioxide emissions. A state would be getting all of its electricity from renewable or clean sources like solar, wind or nuclear.

Carbon neutral means that a city or state is removing as much carbon dioxide from the atmosphere as it's putting in. The net amount of carbon emissions is zero. This can be achieved through carbon offsets like carbon sequestration or planting trees.

Renewable energy means that the energy is coming from strictly renewable sources. Think solar, wind, geothermal or tidal.

Clean energy encompasses all renewable energy and more. It can also include nuclear energy and fossil fuel consumption with carbon-capture technology.

But a growing number of cities, states, electric utilities and businesses are recognizing the risk presented by climate change and making their own pledges to reduce emissions.

Just in the past year, three states — including California, the world's fifth-largest economy — plus the District of Columbia and Puerto Rico made commitments to get all of their electricity from carbon-free or carbon-neutral sources in the next few decades. More than 100 cities and counties have signed similar pledges, and at least three presidential candidates are proposing climate plans that call for the U.S. to become carbon-neutral by 2050.

"It feels to me like we're headed toward a decarbonized energy system," says Rolf Nordstrom, president of the Great Plains Institute, a nonprofit energy research group. "Now it's just down to how fast and what that energy mix looks like."

Despite the growing push to reach "zero carbon," there are big questions around whether these goals are possible and how much they would actually slow climate change. Here's an attempt to answer some of them.

Who's doing it?

Four states — Hawaii, New Mexico, California and Washington — as well as Puerto Rico and Washington, D.C., are leading the decarbonization charge. All of those places have enacted legislation requiring that they get all of their electricity from renewable or clean sources by 2050 at the latest.

Nevada and Colorado went one step short of that, establishing a goal, not requirement, of 100% carbon-free energy by 2050.

At least 9 other states have proposed similar mandates or goals, according to EQ Research, a renewable energy consulting firm.

[Don't see the graphic above? Click here.](https://apps.npr.org/dailygraphics/graphics/zero-carbon-map-20190614/child.html?mode=childlink&utm_source=nprnews&utm_medium=app&utm_campaign=storyredirect)

In the meantime, local governments in those states and others are taking action on their own.

More than 100 localities across the country — from Buncombe County, N.C., to Spokane, Wash. — have committed to getting all of their electricity from clean or renewable sources. The Sierra Club has a nifty [list of cities](https://www.sierraclub.org/ready-for-100/commitments) making similar pledges.

Electric utilities, responding to customer demand (and eager to have support for new infrastructure), are getting in on the action, too. Xcel Energy, which serves eight U.S. states, announced its own 100% clean energy goal by 2050. A handful of other utilities have followed suit.

In California's Mojave Desert sits First Solar Inc.'s Desert Sunlight Solar Farm. California is among the states leading the decarbonization charge.

Tim Rue/Bloomberg via Getty Images

Business is also pushing for clean energy. The group RE100 says that [about 180 private companies](http://there100.org/companies), including giants like Google, Nike, Facebook and Johnson & Johnson, have committed to 100% renewable goals.

Why are they doing it?

Climate change not only poses a risk to human health and life, but it could cost the U.S. economy [hundreds of billions of dollars](https://www.yaleclimateconnections.org/2019/04/climate-change-could-cost-u-s-economy-billions/). State, city and business leaders aren't blind to that fact.

For more on what's at stake, see the [United Nations' Intergovernmental Panel on Climate Change report](https://www.npr.org/2018/10/08/655360909/grim-forecast-from-u-n-on-global-climate-change). The threat is real.

Shortly before signing [her state's carbon-free goal](https://www.npr.org/2019/03/13/702877664/in-midst-of-an-oil-boom-new-mexico-sets-bold-new-climate-goals) earlier this year, New Mexico Gov. Michelle Lujan Grisham pointed to that report, which said greenhouse gas emissions need to be sharply reduced by 2030 to avoid the worst effects of climate change.

"We are clear that we have basically a decade to begin to turn things around, and New Mexico needs [to] and will do its part," she said.

[Don't see the graphic above? Click here.](https://apps.npr.org/dailygraphics/graphics/rising-carbon-20190612?mode=childlink&utm_source=nprnews&utm_medium=app&utm_campaign=storyredirect)

But the need to address emissions is hardly the only factor driving the wider shift toward renewable energy sources.

It's a convergence of social, economic, technological and political factors.

The latter being fueled, in no small part, by the inaction at the national level.

"There's the complete abdication of responsibility and leadership at the federal level, within the Trump administration and other leaders in Congress," says Jeff Deyette, the director of state policy in the climate and energy program at the Union of Concerned Scientists. He says cities and states are stepping up to fill that void and, in some cases, score political points.

The "blue wave" of last year's midterms saw cities and states elect lawmakers who vowed to take action on climate change. Environmental groups have been focusing their efforts on the state and local level.

Renewable energy is also becoming more affordable and more popular than fossil fuels in some places. A survey by [Consumer Reports last year](https://www.consumerreports.org/alternative-energy/majority-of-americans-want-cleaner-energy-from-renewable-sources/) found that roughly three-quarters of respondents felt that increasing renewable energy is a worthwhile goal.

On the technical side of things, advancements are being made in energy storage and energy efficiency, making an eventual renewable energy grid more realistic.

Is "zero carbon" even possible?

This depends on whom you ask.

There are some energy analysts and academics, like Mark Jacobson, director of the Atmosphere and Energy Program at Stanford University, who say the answer is a resounding yes.

Jacobson drew up plans for [139 countries](https://web.stanford.edu/group/efmh/jacobson/Articles/I/CountriesWWS.pdf), showing how they could move to 100% [renewable](https://www.pnas.org/content/112/49/15060.abstract) energy sources by 2050. He has done the same for [all 50 U.S. states](https://thesolutionsproject.org/why-clean-energy/#/map/states/).

"It's technologically and economically possible," he says. "But there are social and political barriers."

Jacobson says it would cost the U.S. about $9.5 trillion to transition the country's entire energy economy — transportation, electricity, agriculture and industry — to carbon-free sources.

That may seem like a lot, he says, "but if you actually transitioned to clean, renewable energy for everything, you eliminate the health and climate costs [associated with fossil fuels]." In the long run, he argues, the country would be saving money.

Other energy analysts and academics aren't so sure that it's feasible to reach zero carbon, using only renewable energy, on an economywide scale. It's theoretically possible, [they argue](https://www.pnas.org/content/114/26/6722.full), but the challenges to get there are many.

Most cities, states and businesses are taking a narrower focus, aiming to just get all of their electricity from carbon-free sources (electric generation being only one piece of the greater emissions pie).

[Don't see the graphic above? Click here.](https://apps.npr.org/dailygraphics/graphics/energy-production-20190613?mode=childlink&utm_source=nprnews&utm_medium=app&utm_campaign=storyredirect)

But that's not without challenges too.

Powering an entire state like California, with its nearly 40 million residents, with renewable or clean energy would require huge amounts of energy storage and massive infrastructure projects, which [don't always have local support](https://www.latimes.com/business/la-fi-san-bernardino-solar-renewable-energy-20190228-story.html).

For cities or counties making renewable commitments, "many of them don't really have the tools to implement their vision," says Leah Stokes, an assistant professor of political science at the University of California, Santa Barbara. "Utilities often work at the state level, not the local level."

Atlanta is [a good example of this](https://www.npr.org/2019/05/29/724985884/cities-are-making-big-climate-promises-keeping-them-can-be-tough).

Are 'zero carbon' goals the most effective way to cut greenhouse gases?

"All evidence points to no," says Sanya Carley, an associate professor at Indiana University's School of Public and Environmental Affairs. "The most efficient and cost-effective way to reduce carbon emissions would be directly pricing carbon and putting a price tag on the cost of those emissions."

In other words, something like a carbon tax would bake the environmental and health costs of greenhouse gas emissions into the existing market economy. It would be a rapid, large-scale way to incentivize reductions across all sectors.

A [2018 study](http://news.mit.edu/2018/carbon-taxes-could-make-significant-dent-climate-change-0406) by the Massachusetts Institute of Technology found that putting a price on carbon and returning the revenue from it to the public would reduce greenhouse gas emissions. The higher the cost, the greater the reductions.

Renewable energy goals or zero-carbon commitments are "less efficient, less cost-effective, but usually more politically feasible," Carley says.

That's why we're seeing more of them.

But they should still help slow climate change, right?

Every little bit helps.

But remember that most of these efforts are focused on cutting greenhouse gas emissions from the electric sector, and electricity generation accounts for less than a third of the country's total emissions. Transportation is now a larger source.

The other problem is scale.

"[Climate change] is a global problem, so that's the scale at which you'd want your solution," says Noah Kaufman, an economist at Columbia University's Center on Global Energy Policy. "In lieu of that, second best would be at the national level, but we've pretty much failed to pass any serious climate policy."

A piecemeal approach won't do it, he says.

The overall trends aren't great either. Greenhouse gas emissions [continue to rise globally](https://www.npr.org/2018/12/05/673821051/carbon-dioxide-emissions-are-up-again-what-now-climate). In the U.S., carbon dioxide emissions [are increasing as well](https://www.npr.org/2019/01/08/683258294/u-s-carbon-dioxide-emissions-are-once-again-on-the-rise), after several years of decline.

An annual statistical review from energy giant BP, [released last week](https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html), found that global carbon emissions rose by 2 percent in 2018, the fastest growth in seven years.

"My guess is that when our successors look back at Statistical Reviews from around this period, they will observe a world in which there was growing societal awareness and demands for urgent action on climate change, but where the actual energy data continued to move stubbornly in the wrong direction," wrote Spencer Dale, BP's chief economist in [a review of the findings](https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/news-and-insights/speeches/bp-stats-review-2019-spencer-dale-speech.pdf).

He described it as "a growing mismatch between hopes and reality."

# Blocks

#### Status Quo good

Saizman 19

Avi Saizman (senior writer at Barron's). “The Path to 100% Renewable Power Is Looking More Achievable.” Barrons. 15 October 2019. JDN. https://www.barrons.com/articles/renewable-energy-stocks-51571148477

As countries announce ambitious plans to wean their economies from fossil fuels, their efforts to shift how they generate electricity will determine whether they can hit those goals. The International Renewable Energy Agency (IRENA), which helps governments come up with plans to shift to renewables, has estimated that **86% of electricity** can be generated with **renewable**s by 2050. That number might seem high, but more data is now supporting the potential for an aggressive shift in power generation. In **a new report**, Bernstein analyst Meike Becker examined how countries can get to 100% renewable electricity generation by 2050, and the analysis has some good news about the potential for renewable generation. The analysis underscores investor optimism about areas like solar and wind. The Invesco Solar ETF (ticker: TAN) is up 59% this year, while the First Trust Nasdaq Clean Edge Green Energy ETF (QCLN) is up 20%. Becker’s report found that countries will take widely different paths to renewable generation, based on their natural resources. If coal and oil deposits determined a country’s fate in the 20th century, the force of its rivers and strength of its sunshine will likely determine its path in the 21st. Countries that generate hydroelectric power are way ahead in terms of producing clean power. Norway generates 98% of its electricity from renewable sources, largely because of hydro power. As of 2015, Brazil got 75% of its power from hydro sources. Canada relies on renewables for 67% of its electricity. But even in countries without rushing water generating much electricity, Becker sees a feasible path to renewable generation. In Belgium, for instance, hydro accounts for just 7% of generation. What’s more, Belgium depends on nuclear power for about 30% of its electricity, and the country plans to phase nuclear out by 2025. Nonetheless, Becker expects Belgium can generate at least 75% of its electricity with renewables by 2050 by relying on solar, wind and a variety of other technologies, including so-called “combined cycle gas turbines” that use gas and steam for power. The key to doing this is being able to generate and store power at times when the sun isn’t shining and the wind isn’t blowing, using batteries and technologies that can use other fuels more efficiently. The chances that countries can generate all their electricity with renewables by 2050 are “at this point **very close to 100%** for countries with good resources and a bit further away if conditions are less favourable,” she wrote in an email to Barron’s. Nonetheless, countries without the same resources can still generate “very high share, and usually higher than what most people currently think, I would say.”

#### More effective ways to combat CC

--find card

#### Utilitarianism can’t motivate action on collective action problems like climate change

Sandler 10

Ronald Sandler (Northeastern University, Philosophy and Religion, Faculty Member). “Ethical Theory and the Problem of Inconsequentialism: Why Environmental Ethicists Should be Virtue Oriented Ethicists.” Journal of Agricultural and Environmental Ethics (23:1-2) pp. 167-83, 2010. JDN. <https://www.academia.edu/10464539/Ethical_Theory_and_the_Problem_of_Inconsequentialism_Why_Environmental_Ethicists_Should_be_Virtue_Oriented_Ethicists>

According to act utilitarianism, an action is right to the extent that it brings about the best (or good enough) consequences of all the courses of action available to the agent.3 Act utilitarian reasoning provides the clearest formulation of the problem of inconsequentialism. Almost any action performed by almost any agent will have a **vanishingly small effect** on longitudinal collective action environmental problems.4 Many of these same actions will have burdens for the agent and those close to her (i.e. family and friends), in terms of, for example, time, economic costs, social costs, and professional costs. In such cases the local utility of actions that contribute to longitudinal **collective action problems** (or that fail to address the problems) will outweigh the inconsequential global utility of those actions. Therefore, act utilitarianism cannot explain why we ought to act or live in ways responsive to longitudinal collective action problems when doing so has costs or sacrifices associated with it. This suggests two features that a normative theory well resourced for addressing the problem of inconsequentialism will exhibit: 1. That discrete actions are not evaluated entirely on the basis of the outcomes (or likely outcomes) of the action. 2. That it evaluate on the basis of patterns of behavior or activities throughout a person’s life or patterns among people or communities. Advocates of act utilitarianism might respond to the claim that act utilitarian reasoning gives rise to the problem of inconsequentialism by arguing that it trades on a mistaken version of the theory. It is not the consequences forecasted by agents that are relevant to the rightness of actions, but the action’s actual consequences (or, perhaps, what they are in fact likely to be). Therefore, it is open to act utilitarians to argue that while many agents might believe that their actions to address longitudinal collective action environmental problems have high local costs (and low local and global benefits) often this is not the case. That is, they might offer versions of appeal to agent benefit or amplifying effects responses. However, both these types of responses have significant limitations in the context of act utilitarian theory. For appeal to agent benefits responses, the key limit is that the local (dis)utilities associated with the effort made by an individual to address some environmental problem are likely to be related to her particular perspectives. A person who does not care much about the environmental problem is not likely to feel good (a local utility) about having made an effort to address the problem. A materialistic person who lives a high consumption lifestyle is more likely to feel constrained (a local disutility) by lower levels of consumption. **Act util**itarianism **has difficulty overcoming this limitation** because it does not evaluate the appropriateness of an agent’s perspectives or have such evaluations inform evaluations of the rightness of action. This suggests that a normative theory resourced for supporting appeal to agent benefit responses to the problem of inconsequentialism will have the following features: 3. That its evaluative focal points (i.e. what it directly evaluates) include attitudes or perspectives of people. 4. That evaluation of attitudes and perspectives bear on evaluation of actions. Appeal to amplifying effects responses--e.g. that by moving others to act or setting a habit/trajectory in one’s own life a person’s actions are not really inconsequential to longitudinal collective action environmental problems--are also limited within act utilitarianism. With respect to effects on others, it often will not be the case that what a single person does in a single act will impact the actions of others or be crucial to bringing about systematic reform, particular in situations where others are not already acting responsively or motivated to do so. With respect to the cumulative effects over a person’s lifetime, even a person’s entire lifetime impacts on any longitudinal collective action problem is likely to still be inconsequential. Moreover, refocusing evaluation from individual acts to lifetimes requires moving to a non-act version of utilitarianism. In addition, and more important for present purposes, act utilitarian appeals to amplifying effects responses fail to explain why one should make the effort to address the problem even if others are not (or are not likely) to do so. Act utilitarianism, since it evaluates discreet actions indexed to a particular time, place, and context, is not able to decouple the rightness of action from **what others are doing** (or are likely to do). If act evaluation is not indexed to the actual world or possible worlds relevantly similar to the actual world, act utilitarianism sacrifices its intuitive plausibility, which rests on the idea that the right action is the one that would bring about the best consequences of those available to the agent at this time and place. It is for this reason--i.e. that rightness of action is tied to what others do or are likely to do--that act utilitarianism does not support well several of the duty-oriented responses to the problem of inconsequentialism--e.g. that one should do one’s fair share even if others do not do theirs. On act utilitarianism, what one agent ought to do often heavily depends on what other agents are doing (or are likely to do). This limitation suggests an additional feature that a normative theory well resourced for addressing the problem of inconsequentialism will have: 5. That evaluation of an agent’s actions is not overly contingent on the actions of others.

#### Deontology can’t justify environmentalism—the harms are unintended, and no one is used as a mere means

Sandler 10

Ronald Sandler (Northeastern University, Philosophy and Religion, Faculty Member). “Ethical Theory and the Problem of Inconsequentialism: Why Environmental Ethicists Should be Virtue Oriented Ethicists.” Journal of Agricultural and Environmental Ethics (23:1-2) pp. 167-83, 2010. JDN. <https://www.academia.edu/10464539/Ethical_Theory_and_the_Problem_of_Inconsequentialism_Why_Environmental_Ethicists_Should_be_Virtue_Oriented_Ethicists>

However, Kantian ethics struggles with a different dimension of longitudinal collective action environmental problems: that the problems often result from unintended byproducts of activities, where those byproducts are not a necessary means to the ends sought. Consider, for example, global warming. The continuing build up of greenhouse gases in the atmosphere is not sought by those whose actions contribute to it, nor is it **a means to any end** that is sought. Carbon dioxide emissions are not a means to producing energy; it is a byproduct of the fossil fuel energy production process. If the process did not produce carbon dioxide, it would make no difference to the point of the process or to whether its aims are achieved. Moreover, when a person contributes, through her consumption, to the amount of greenhouse gases in the atmosphere, those who are affected by the resultant climactic and environmental changes do not stand as a means to the consumer’s ends--e.g. health, convenience, comfort, recreation, or status. If the emissions did not occur, did not contribute to global climate change, or did not result in ecological and social problems, the consumptive actions and practices would still have the same intended ends and means of accomplishing them. Because longitudinal **collective action environmental problems** are a by-product of activities that have other intended ends and do not stand as means to those ends, **Kantian ethics has difficulty explaining what is wrong** with the actions or practices that give rise to them. If one buys a terribly inefficient vehicle to take the kids to soccer practice, to raise one’s status, or just because one likes driving it there is no person (or animal or plant, for that matter) treated as a mere means in one’s doing so. It does not violate or offend the value of other human beings (or animals or plants). There is **no contradiction** in willing the maxim as one appropriate for anyone (or everyone) else. The same is true of having children and population growth. The ecological challenges associated with global population increases are not a sought end or a means to any sought end of those who choose to have children.6 Therefore, those ecological challenges do not inform the maxim (or principle) that is evaluated. This suggests a crucial feature that a normative theory well resourced to respond to the problem of inconsequentialism will exhibit: 6. That evaluation of actions is sensitive to the significance of consequences, even when those consequences are unintended byproducts of actions.

#### 2NR or 1NC: if opponent uses CC and change

My opponents bases their case on the fact that we must do something, something to change the status quo, however, I have a piece of evidence that states that eliminating fossil fuels to combat climate change is unnecessary because the status quo already does that.

From

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Quote

The International Renewable Energy Agency (IRENA), which helps governments come up with plans to shift to renewables, has estimated that **86% of electricity** can be generated with **renewable**s by 2050. That number might seem high, but more data is now supporting the potential for an aggressive shift in power generation. In **a new report**, Bernstein analyst Meike Becker examined how countries can get to 100% renewable Belgium can generate at least 75% of its electricity with renewables by 2050 by relying on solar, wind and a variety of other technologies, including so-called “combined cycle gas turbines” that use gas and steam for power. The chances that countries can generate all their electricity with renewables by 2050 are **very close to 100%** for countries with good resources.

Essentially, Removing Subsidies has little to no effect on climate change and in some studies and implementations, actually worsens climate change. However, even if there was some benefit, which there is not, it doesn’t change the fact that a transition to renewables is already possible, and a change in the status quo is unnecessary.