

Forum: *United Nations Environment Programme (UNEP)*

Issue: *The transition from fossil-fuel based economies to economies based on renewable energy*

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Introduction

When having conversations about climate change, people often have predetermined perceptions toward the different global energy systems—labeling fossil fuels as harmful and renewable energy as beneficial. In actuality, the debate is not as simple as it seems; there are numerous factors that should be taken into consideration when establishing a stance. It is misguided to perceive the transition from fossil fuels to renewable energy as eliminating fossil fuel use entirely. Instead, the key to ameliorating the status quo is to find a balance between gradually lessening fossil fuel consumption and increasing that of renewable energy.

Countries have taken steps in an attempt to minimize fossil fuel use, fostering the transition from fossil-fuel based economies to economies based in renewable energy. The development of wind, geothermal, solar, and other renewable energy sources have allowed economies to slowly shift from pollution-emitting fossil fuels to those that are able to generate energy without emitting harmful gases.

Still, as of now, fossil fuel continues to be a major source of energy, as 80% of the demanded primary energy source and responsible for approximately 67% of the global carbon emissions. If this trend continues, the global average temperature would increase by more than 2°C—exceeding the temperature target established in the 2015 Paris Agreement. The consequences of this increase will have detrimental effects on the planet as well as human lives. Recognizing this, the United Nations Environment Programme has set to “take urgent action to combat climate change and its impacts” as stated in the United Nation’s 13th Sustainable Development Goal.

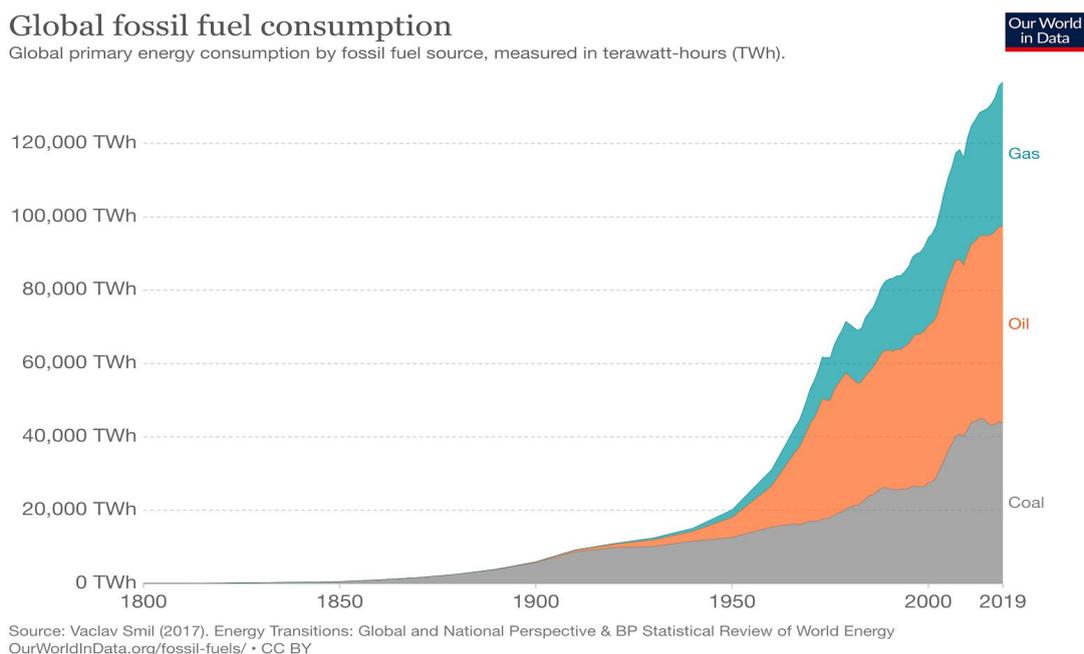
Definition of Key Terms

Biofuel

Biofuel is the burning of organic materials. The heat released by burning biomass can be converted to electricity with a steam turbine. Although biofuel may produce more greenhouse gas than fossil fuels, under the proper circumstances, it is considered a low-carbon option for energy sources.

Fossil Fuels

Fossil fuels are nonrenewable resources that are combusted to generate energy. Nonrenewable energy such as fossil fuels, coal, and gas, is generated through the usage of finite resources. The burning of nonrenewable sources contributes to global warming by producing greenhouse gases, including carbon dioxide (CO₂) and methane. Nonrenewable sources can only be found in specific places, allowing only certain countries to have access to them and become major export countries of fossil fuels. Thus, many countries become energy dependent on other countries for these resources.



Caption #1: Global fossil fuel consumption

Geothermal Energy

Geothermal energy is derived from the heat under the Earth's crust. Hot water underground is drilled and pumped through a turbine to create electricity. Geothermal energy generally has lower

emissions but may create instability of the land, which can lead to earthquakes. Countries such as New Zealand, Kenya, and Costa Rica use geothermal energy.

Global Warming

Global warming is the gradual increase in the overall temperature of the Earth's atmosphere. Global warming is caused by increased concentrations of greenhouse gases as a result of rapid industrialization. Major environmental consequences include rising sea levels, severe climate change, and extreme weather patterns. Recent examples of extremely powerful natural disasters are typhoon Hagibis and hurricane Dorian. One method for the prevention of any further damage and reduction of global warming is to stop using fossil fuels and convert to renewable energy as clean energy produce only a small amount of CO₂.

Hydroelectricity

Hydroelectricity uses the flow of water to produce electricity. Rapid waters turn the turbines, creating energy. It is mainly used in countries with a plentiful supply of moving water, like Iceland, Norway, and Albania. A frequently used form of hydropower is tidal power, which uses ocean tides to create electricity.

Intermittency

Renewable energy is derived from natural resources, which go through environmental and natural cycles, limiting its efficacy. Thus, renewable energy cannot produce energy continuously, a concept known as intermittency. Intermittency is a major obstacle for renewable energy. The most common example is solar energy, where it cannot produce electricity at night or in cloudy weather.

Renewable Energy Sources

Renewable energy sources, often referred to as clean energy, exist across the globe without limitations since they can be generated by replenishable natural sources. Although renewable resources are free, the required technology, such as generators and converters, is expensive, which is one of the primary obstacles countries encounter with renewable energy. Commonly used renewable energy include solar energy, wind energy, and hydroelectricity. As of 2020, renewable energy sources produce 26% of the world's electricity. The International Energy Agency (IEA) estimated that renewable energy sources will go on to generate 30% of the world's electricity before 2024.

Solar Energy

Solar energy is a type of renewable energy that uses sunlight to create power. Solar panels are used as platforms to gather sunlight and contain special substances. Photovoltaic (PV), or solar, cells are made of silicon or other materials that convert sunlight directly into electricity. Solar energy systems rarely produce air pollutants or greenhouse gases.

Wind Energy

Wind energy is a renewable energy source that utilizes wind to generate power. The wind turns the turbine's blades, powering the generator and producing electricity. It is considered as one of the cheapest and easy-to-use sources because wind is widely available, unlike sunlight or water, which may be hard to find in some countries or areas.

Background Information

The History of Fossil Fuel Use

Oil, or more specifically petroleum, has been used in civilizations for centuries. Without technology to retract petroleum from under the ground, people could only use the petroleum found on the ground's surface. Petroleum played a major role in the construction and waterproofing of infrastructures, as well as generating electricity.

Natural gas, another type of fossil fuels, has been in existence for millions of years. The commercialization of natural gas was facilitated by the British during the 19th century when natural gas was mainly used for lighting up streetlamps. When gas-lit lamps were slowly replaced by electric lights, Robert Bunsen's creation—the Bunsen burner, which yielded flames made from natural gas and air—allowed natural gas to be used in other ways. Natural gases also gained more popularity through the development of pipelines in the late 18th to 19th century.

Coal is the most abundant and, thus, most used of the three fossil fuels. Coal mining is most prominent in countries such as the United States, China, and India. While it was mostly burned to provide heat in houses, coal is now more commonly combusted to generate electricity.

The Industrial Revolution and the Rise of Imperialism

The Industrial Revolution started during the 1750s in Great Britain and marked a turning point in the way people use fossil fuels in their daily lives. Transportation for humans and of materials was facilitated by steamships and trains powered by steam engines, which requires the combustion of coal. Therefore, the number of factories consisting of machines that ran on fossil

fuels increased. In 1789, the impact that the Industrial Revolution had on the United States became apparent when the first textile factory was established in the country. Pressured by the growing economic activities in the west, Russia and Japan joined the revolution. The rise of more economically developed countries (MEDCs) led to imperialism where they colonized those less economically developed (LEDCs). As a result, the newly-gained land provided the country with more raw materials to be used. This disseminated the use of fossil fuels and fossil fuels became the foundation of the global economy.

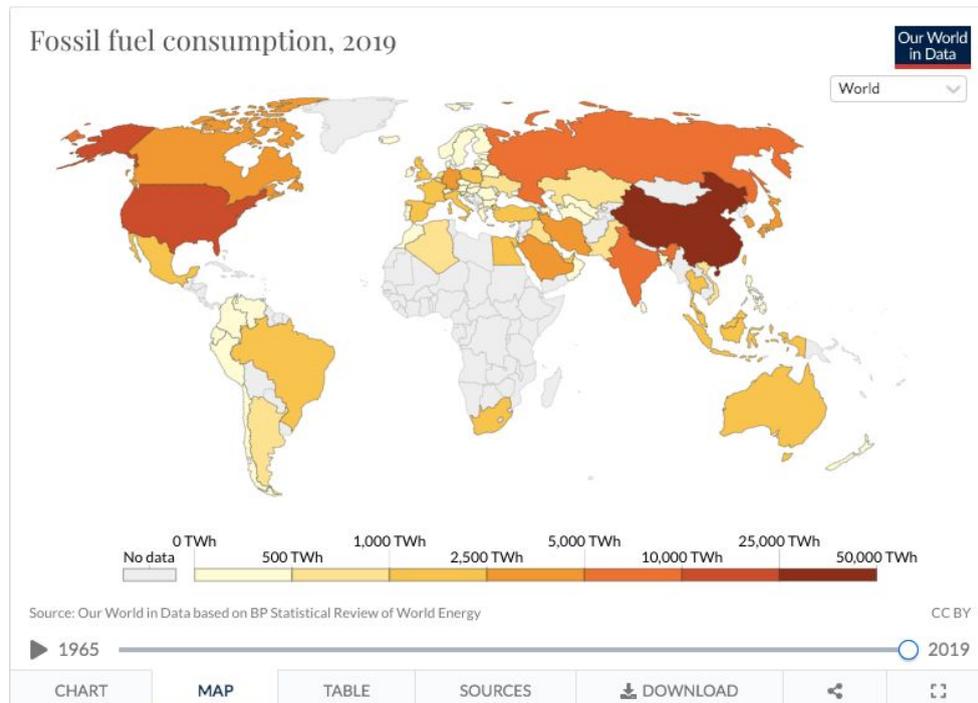
The Oil Industry

The oil industry began in 1859 when Edwin L. Drake decided to create an enterprise by drilling for oil., which was needed for kerosene lamps. However, with the invention of cars by Carl Benz and Henry Ford, oil became essential for the production of gasoline. Throughout the rest of the 19th century, major oil companies like the Standard Oil Company were established. During the two world wars, especially, the demand for oil spiked as it was needed to power automobiles such as trucks and tanks.

Modern-day Use of Fossil Fuels

As aforementioned, fossil fuels continue to be the primary source of energy. Nonrenewable global energy consumption maintains an upward trend. In 2018, the global energy consumed encountered a 2.9% growth rate. As of now, fossil fuels are mostly used to power factories world-wide and an increasing number of households have access to the electricity causing pollution to become a major issue.

There has always been a history of prominent fossil fuel usage in MEDCs than in LEDCs. However, as time progresses, MEDCs have been putting in effort to transition to more sustainable energy sources; meanwhile, LEDCs have been progressing to use more energy and have been encouraged to use those that are sustainable.



Caption #2: Fossil fuel consumption in 2019

The History of Renewable Energy

Hydroelectric and Kinetic Energy

Renewable energy sources can be found as early as 1200 B.C.E. when waterwheels were created in China. The concept behind the design is simple: using the kinetic energy of the water to generate mechanical energy. The US constructed Hoover Dam, a hydroelectric facility, in 1935. This facility generates power similar to the way of waterwheels. It utilizes the kinetic energy of water flow to create electricity. Since then, there have been countless renewable energy projects.

Early engineers in the Middle East then took this same idea and invented windmills that later grew in popularity in the Netherlands, and eventually led to the invention of those that generated electricity by Charles F. Brush in 1888 Ohio, USA. They were often located in rural areas. Eventually, in 1927, modern wind turbines were developed.

Solar Energy

In 1860, French inventor Augustin Mouchot developed the solar energy system to compensate for the potential depletion of coal. Modern solar panels consist of photovoltaic cells, which are cells that are able to transform sunlight into electricity. According to IRENA's 2018

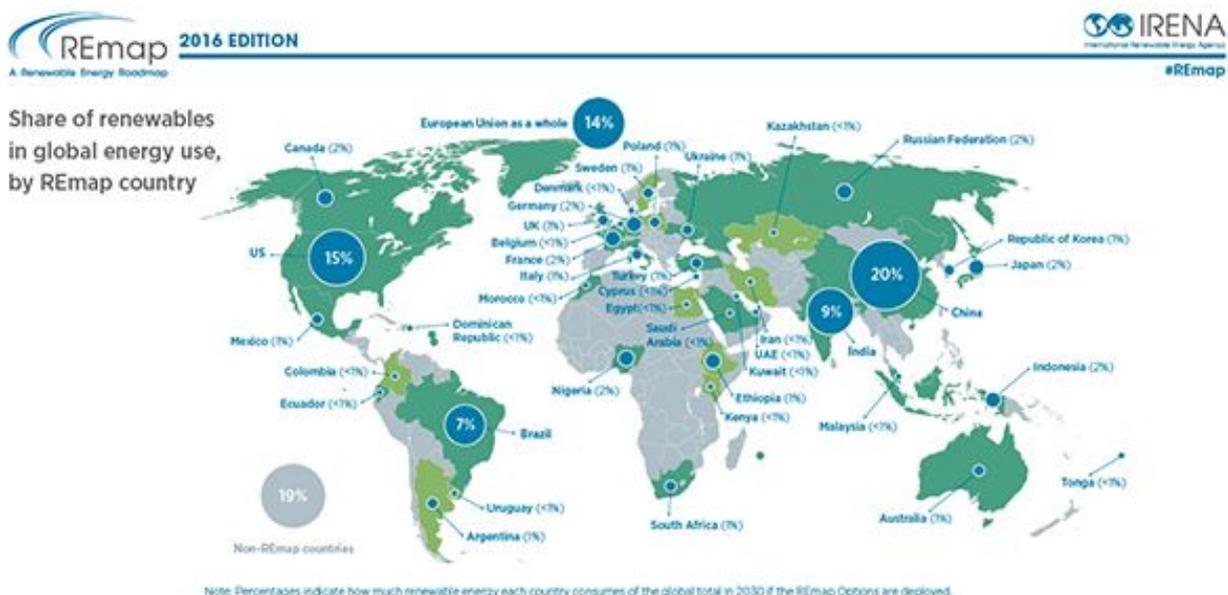
Country Rankings dashboard, solar energy is most prominent in China, Japan, and the United States.

Reasons Behind the Growing Use of Renewable Energy

The excessive use of fossil fuels has resulted in serious environmental consequences, such as global warming. Therefore, there has been a growing trend of energy transition. A major reason why renewable energy is such a feasible replacement for fossil fuels is that renewable energy sources will never be depleted. Technology takes resources directly from the environment to generate power in the instance of solar energy, hydroelectricity, and wind power. These energy sources are also easily accessible, unlike fossil fuels, where they are buried deep underground and difficult to obtain. Areas with long hours of sunlight could focus on generating energy with sunlight and solar panels; places with many rivers and strong currents could get their energy from hydroelectricity. The availability of resources will also decrease countries' reliance on imported oil or fossil fuels, allowing countries to become more independent, and expand energy supply.

Renewable Energy and the Economy

The utilization of renewable energy sources can create many jobs and increase economic development; for example, by creating new sectors. According to the International Renewable Energy Agency (IRENA), doubling renewables can “result in 24.4 million jobs in the renewable energy sector by 2030, compared to 9.2 million in 2014” and increase the global GDP (Gross Domestic Product) by \$1.3 trillion USD.



Caption #3: Share of renewable energy in global energy use

With the growing application of solar energy, the price of solar energy is expected to decrease by 15% to 35% by 2024, stimulating further growth of renewable energy over the decade.

The 2015 Paris Agreement

The Paris Agreement was created on December 12th, 2015, and has been in force since November 4th, 2016. According to the United Nations Framework Convention on Climate Change (UNFCCC), the purpose of the agreement is “to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels.” To achieve this, the agreement has emphasized the significance of ensuring a sturdy infrastructure, financial flows, and access to appropriate technology. Supposedly, all member nations are included in the Paris Agreement; yet, only 179 countries have ratified it.

Key Issues

Disadvantages of Fossil-fuel Based Economies

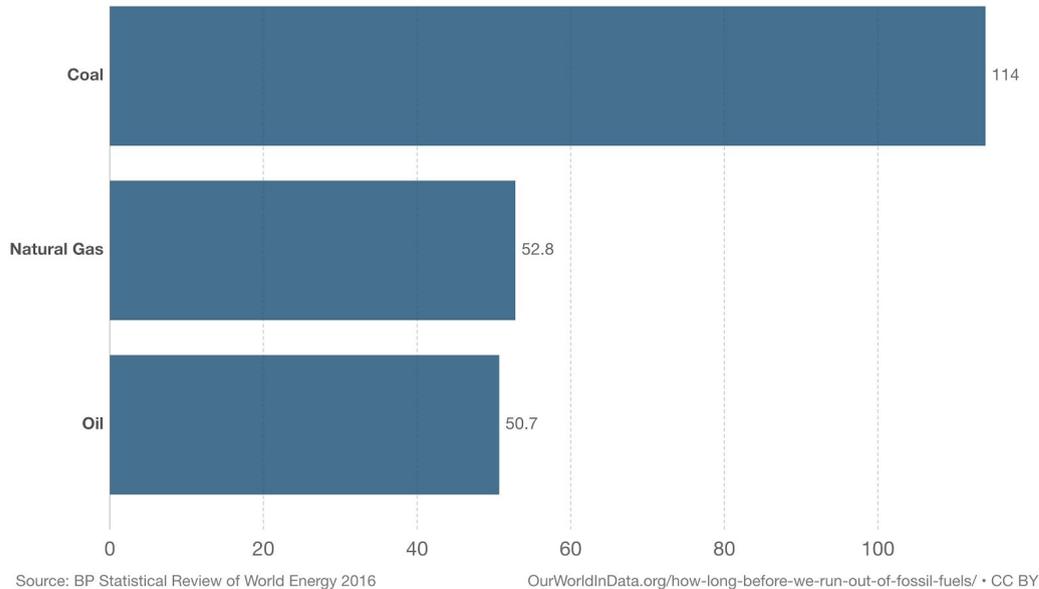
Utilizing fossil fuels has detrimental effects on the environment. However, many companies, corporations, and countries are still investing in nonrenewable energy because of.... According to Greenpeace, the “total global investment in [nonrenewable] energy added up to \$1.8 trillion in 2018, of which 35% (~\$630 billion) went towards low-carbon energy, and the remainder (~\$1.2 trillion) went to fossil fuels.”

Finite Resources

Renewable energy is highly encouraged by many countries nowadays because fossil fuels are finite, meaning that these resources will eventually be depleted. In 2052, about 30 years, current oil reserves will be used up. In 2060, natural gas will be depleted. Coal will last till 2090, around 70 years. If all remaining fossil fuels are used up, almost all of Antarctica will be melted, resulting in sea levels increased by almost 200 feet, enough to drown cities in continents.

Years of fossil fuel reserves left

Years of global coal, oil and natural gas left, reported as the reserves-to-product (R/P) ratio which measures the number of years of production left based on known reserves and annual production levels in 2015. Note that these values can change with time based on the discovery of new reserves, and changes in annual production



Caption #4: Years of fossil fuel reserves remaining from 2017

Public Health Problems

Air and water pollution by fossil fuels causes the most health concerns in people. “Burning fossil fuels generates localized air pollutants — such as soot (fine particulate matter, or PM2.5) and smog (ozone) — that increase the risk of death from stroke, heart disease, lung cancer, and respiratory illness among those exposed.” (Greenpeace) The harmful toxin released by the burning of fossil fuels heavily affects the world nowadays, especially in Less Economically Developed Countries (LEDCs) as they rely more on nonrenewable sources for energy. “Ambient air pollution alone caused some 4.2 million deaths in 2016, while household air pollution from cooking with polluting fuels and technologies caused an estimated 3.8 million deaths in the same period.” (WHO)

Detrimental Effects on Humans and the Environment

Digging up fossils greatly harms the environment and the health of coal miners. Underground coal mining often causes chronic health disorders in miners and workers and leads to many job site accidents and injuries. Moreover, mines can collapse and contaminate the surface or subsurface water around them. If active or deserted mines are left attended or untreated, water could flow through and become highly acidic and rich in heavy metals, which would be detrimental for animal, plant, and human life. Surface mining removes all soil and rock

over mineral deposits and destroys local environments with its extreme method of mountaintop removal, where all vegetation is removed for coal mining. This can result in frequent landslides and floods, and the chemical buildup can seep into local water sources. Offshore drilling for oil is when a wellbore extracts petroleum that is under the seabed. This severely disrupts the marine ecosystem and leads to more accidents and oil leaks. Transportation for these resources can cause extensive harm and increase risks of danger and contamination of toxic chemicals.

Global Warming

Global warming, which is exacerbated by the burning of coal, leads to extreme weather changes, such as unnatural temperature increases or decreases in specific areas. “In 2014, approximately 78% of US global warming emissions were energy-related emissions of carbon dioxide. Of this, approximately 42% was from oil and other liquids, 32% from coal, and 27% from natural gas.” (The Hidden Costs of Fossil Fuels)

Disadvantages of Renewable-energy Based Economies

Availability and Access

The greatest downside to using renewable energy is that it is not always available in all locations and at all times. For instance, the Earth is not exposed to constant sunlight, so there would be no solar energy produced at night or when it is cloudy. The wind is also not consistent as it comes in short bursts and cannot turn the turbine for long. The percentage of the time that wind and solar units produce electricity is much lower than those for other energy sources such as coal, gas, and nuclear energy. Specifically, these nonrenewable sources generate about 85–90% of the electricity, wind units are around 40% or less, and solar power is only about 30% or less. Because of the uncertain intermittency of certain renewable energies, backup power from fossil fuels is included, which defeats the purpose of transitioning to clean energy.

Cost of Facilities and Maintenance

Although the cost of renewable energy seems negligible, due to limited access to natural resources and low maintenance, the construction and installation of energy-producing facilities are expensive and take up a great amount of land. Wind power costs about twice as much as natural gas and solar energy is about three times that. High construction costs may be perceived as risky for companies. First, with fossil fuels, the production cost is cheap and customers pay the fee, but with renewable energies, companies have to pay for the required infrastructures before starting production. Second, while nonrenewable energies are centralized, meaning they rely on a few high-output power plants, renewable energy is decentralized, with many small engines

supplying power for a large area. Third, the production process of renewable energy facilities is expensive, requires a great number of materials, and is sometimes toxic to both the environment and to the people.

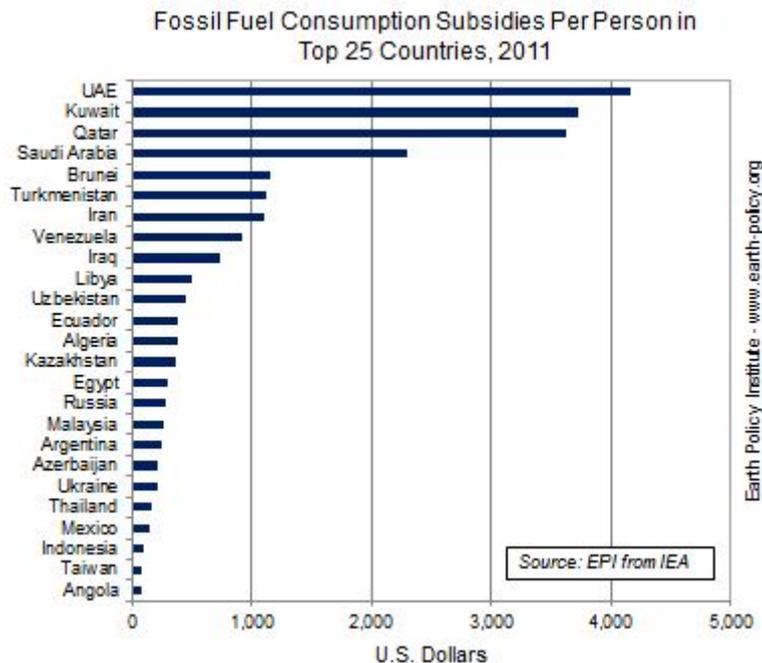
Ecological Harms of Required Facilities

Tools and facilities used for renewable energy also produce a lot of waste. The amount of waste generated from the recycling or decomposing of solar panel use is approximated 78 million metric tons worldwide by 2050. (Forbes) These facilities also greatly harm the environment. For example, wind turbines could hurt many birds and high heat surrounding the solar panels is also dangerous.

Instability and Investment

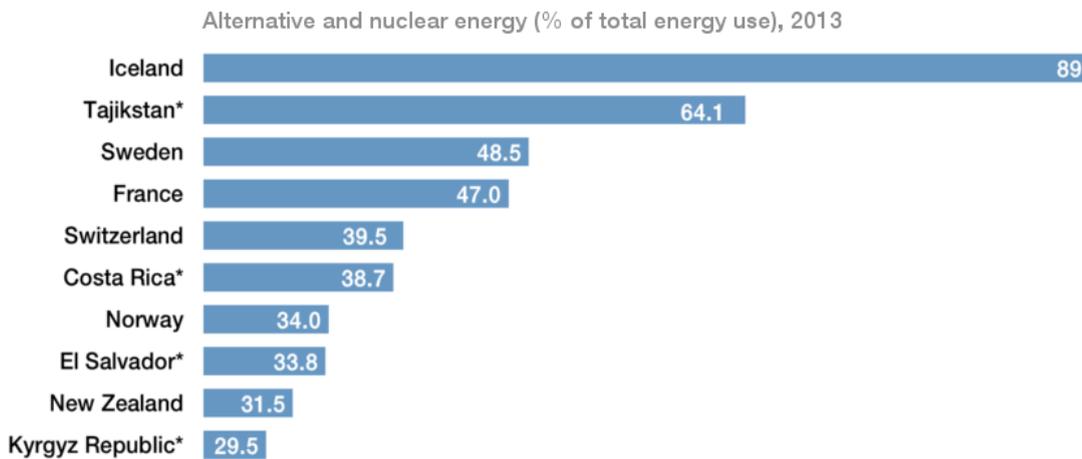
Another issue is the present technologies geared towards nonrenewable energy. Fewer investors would choose to invest in renewable energy because first, their market is not well developed or known yet, and second, they do not have enough high-quality facilities and the technology to ensure the stability of the energy production.

Major Parties Involved and Their Views



Caption #5: Fossil fuel consumption based on countries

Which countries use the most energy from non-fossil fuel sources?



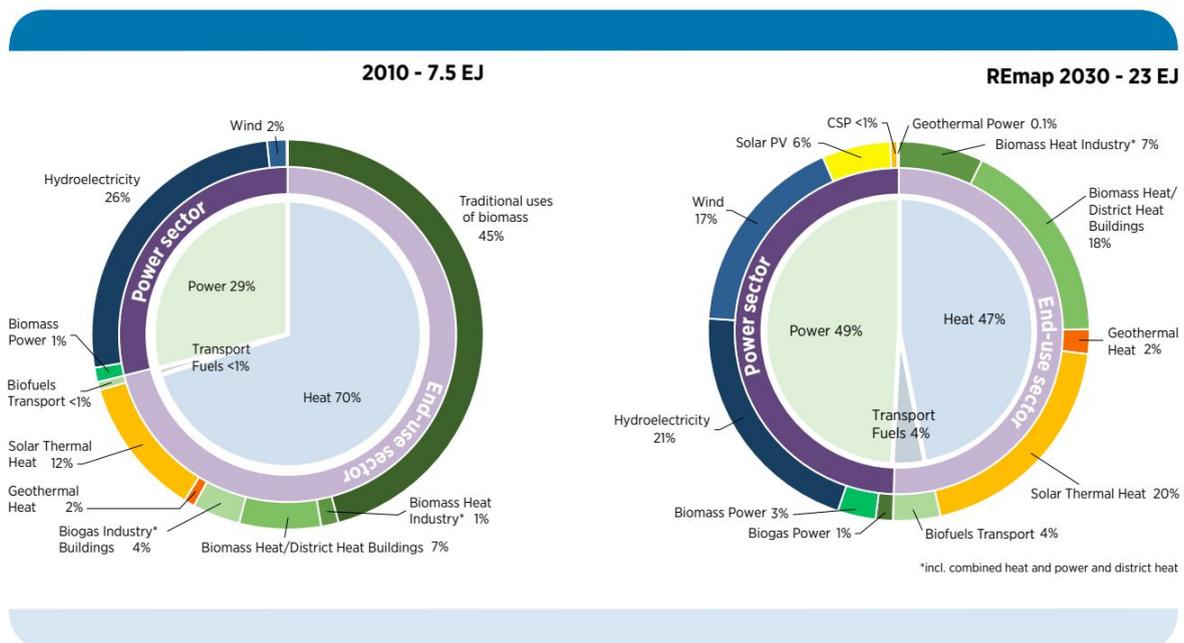
Source: World Bank

*2012 data

Caption #6: Renewable energy usage based on countries

China

In 2010, around 13% of energy production came from renewables, including an estimated 6% traditional use of biomass, and 7% modern renewables. Its goal is to reach 16% clean energy by 2030, but statistics and data show that China could reach 26% renewables by 2030.



Caption #7: Modern renewable energy share could increase four times between 2010 and 2030

France

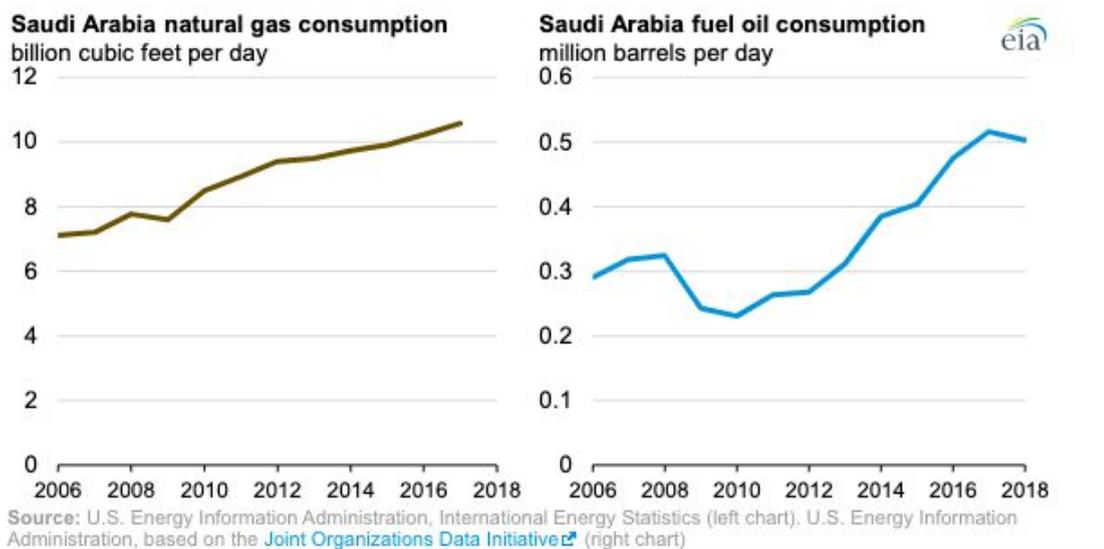
France aims to produce 23% of its electricity via renewable energy by 2020, but by 2014, only 14% was created through renewable energy. France opened Rance Tidal Power Station, the world's first tidal power station, in 1966. France relies heavily on nuclear energy, producing 75% of its power. France targets to reduce its use of nuclear energy to 50% by 2035.

Iceland

Iceland is the leading country in the world on renewable energy for electricity and heat. Fossil fuel-based power is only used as a backup source of power. 80% of the country's electricity comes from hydroelectricity, and up to 20% comes from geothermal energy. Iceland started using geothermal power in the 1940s. Around 90% of homes in Iceland employ geothermal water for heating. The government of Iceland estimates that by converting to clean energy, the country's total release of CO₂ is cut by nearly 40%. Glaciers cover 11% of the country, so seasonal melting feeds glacial rivers, which powers hydroelectricity.

Saudi Arabia

Saudi Arabia is one of the countries that rely mostly on fossil fuels for power generation with more than 90% produced by nonrenewable energy. In 2012, Saudi Arabia announced its goal to receive a third of its electricity usage from solar power by 2032. In order to expand and invest more in renewable energy, Saudi Arabia is preparing more than \$30 billion to supply its clean energy sector.



Caption #8: Saudi Arabia's consumption of fossil fuels [natural gas (left) and oil (right)]

Sweden

Sweden already achieved its 2020 goal of producing 50% of electricity via renewable energy in 2012. It aims to produce 100% of its electricity by renewable energy by 2040. Sweden mainly relies on biofuel and hydroelectricity because of its abundance of biomass, which is used for heating, and moving currents. According to the International Energy Agency (IEA), the amount of CO₂ that an average American releases through energy consumption annually is nearly four times more than that of an average Sweden.

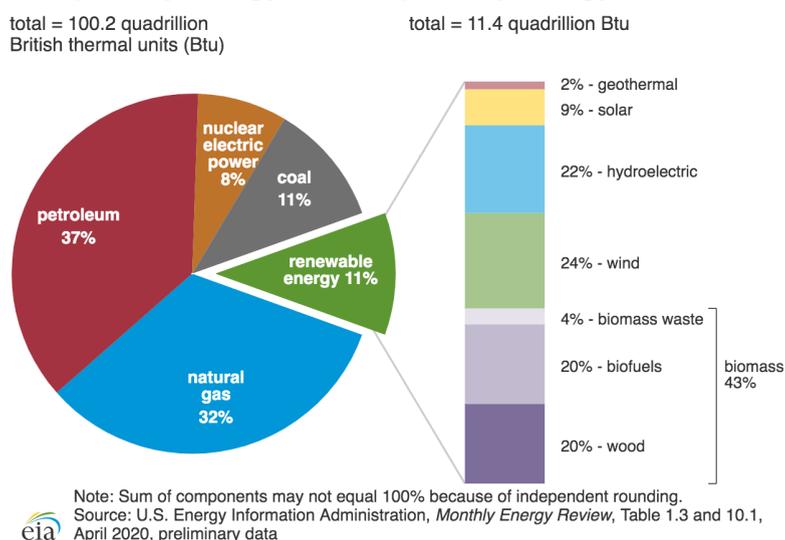
United Kingdom (UK)

Renewable energy produces more than 20% of the UK's electricity and aims to reach 30% by 2020. On and offshore wind is the biggest renewable source in the UK and produces 13% of electricity for the UK in 2017, generating enough energy to meet the demands of 7.25 million homes every year. Since 2015, the cost of new offshore wind has been reduced by half and is one of the cheapest new power. Currently, wind power produces 47% of the UK's electricity in 2020, compared to 39% contribution in 2019.

United States of America (USA)

In 2019, 37% of the energy consumed by the US was from petroleum, followed by 32% from natural gas. Renewable energy contributed to 11% of the amount of energy consumed, with biomass being the main renewable energy source. Statista states that during 2019 the energy consumed by the US produced “around 5.13 billion metric tons of CO₂ emissions.”

U.S. primary energy consumption by energy source, 2019



Caption #9: United States's energy consumption by energy source in 2019

Timeline of Relevant Resolutions, Treaties, and Events

Date	Description of event
1760	<p>The Industrial Revolution</p> <p>During the Industrial Revolution, the use of fossil fuels grew around the world.</p>
June 1972	<p>Formation of the United Nations Environment Programme (UNEP)</p> <p>The UNEP was formed under the United Nations in hopes of creating a branch that targets the environmental problems countries face today.</p>
February 1979	<p>First World Climate Conference</p> <p>Climate change was officially identified as a grave issue to be addressed.</p>
1985	<p>1985 Villach Conference</p> <p>This conference recognized the importance of decreasing greenhouse gas emissions as it could result in a rise in sea level and global temperature.</p>
1998	<p>Formation of the Intergovernmental Panel on Climate Change (IPCC)</p> <p>The IPCC was established to collect scientific data on climate change.</p>
1992	<p>Climate Change Convention</p> <p>In consensus to lessen the greenhouse gas emission levels by 2000, 154 member nations ratified the Climate Change Convention.</p>
March 21st, 1994	<p>Formation of the United Nations Framework Convention on Climate Change (UNFCCC)</p> <p>According to the International Union for Conservation of Nature (IUCN), the purpose of this convention is “to achieve the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system.”</p>
February 16th, 2005	<p>Kyoto Protocol</p> <p>Created on December 11th, 1997, the protocol became officially in effect during February of 2005. This protocol asks for its 192 member nations to endorse measures that restrict the amount of greenhouse gas emitted.</p>
November 4th, 2016	<p>The Paris Agreement</p> <p>The Paris Agreement was established by the UNFCCC.</p>

September 23rd, 2019	2019 Climate Action Summit This summit was founded by the United Nations Secretary-General António Guterres in an effort to increase climate action.
2019	Second warmest year The World Meteorological Organization has “ranked 2019 second warmest for the globe.”

Relevant UN Treaties and Events

- The future we want, 11 September 2012 (**A/RES/66/288***)
- Promotion of new and renewable sources of energy, 3 February 2015 (**A/RES/69/225**)
- Transforming our world: the 2030 Agenda for Sustainable Development, 21 October 2015 (**A/RES/70/1**)
- Ensuring access to affordable, reliable, sustainable, and modern energy for all, 15 January 2019 (**A/RES/73/236**)

Evaluation of Previous Attempts to Resolve the Issue

Acknowledging the consequences of fossil-fuel based economies, member states have taken attempts to lessen greenhouse gas emissions through agreements such as the Climate Change Convention, the Kyoto Protocol, and the Paris Agreement. Supposedly, nations have established targets and goals to be achieved by a certain year, such as increasing the use of renewable energy sources by 2012. However, data collected by the UN has shown that several countries have not been meeting their set goals and previously signed agreements have not been sufficiently effective.

One critical reason why these previous attempts have not significantly improved the situation is that because the countries' goals are overly-ambitious, countries are not legally bound to their pledges, and countries' proposals are not comprehensive. Also, with the lack of incentives, countries do not actively pursue their goals. With their goals that are too demanding, countries are not able to implement harsh policies. When it is not required for countries to follow their pledges by law, countries and their regulations become lenient. Without an exhaustive proposal, there is simply no clear plan or direction.

Possible Solutions

To mitigate the consequences of climate change, several steps must be taken. One way of doing so is to financially support the research and development of renewable energy. Climate change scientists have been attempting to generate hydrogen sustainably to power transportation and electricity. Others have been developing processes to generate and produce renewable energy more efficiently.

It should be noted that while developing new technologies is important, large amounts of CO₂ will still remain in the atmosphere. Restorations of forests and other plants or enforcing laws and restrictions on fossil fuel consumption can help decrease CO₂ levels.

Other ways to protect citizens include constructing infrastructures to take account of the possible impacts of climate change such as rising sea levels and extreme weather. Agricultural practices should also enhance land instead of worsening it. The government could educate people about the urgency to solve global warming and recommend citizens to support green energy instead of investing in nonrenewable energy.

Reflecting upon the previous attempts made, the United Nations should begin requiring all member nations to create detailed plans of how they would carry out climate actions to meet their goals. Incentives can be organized to encourage individual companies to transition to utilizing renewable energy instead of fossil fuels. Plans such as cap-and-trade authorizing companies to buy licenses to release more greenhouse gases if they surpassed the established level of emission should be abolished. By prohibiting these plans, countries can strengthen their policies on renewable energy and focus on achieving their set goals. Nations should strive to facilitate the transition of their fossil-fuel based economies to become one based on renewable energy.

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