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**Taking measures to decrease global dependancy
on fossil fuels**



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Introduction

One of the most pressing issues of modern day, one that endangers the lives of every inhabitant of our planet, is the issue of global warming. Common knowledge is that the processing of fossil fuels emits greenhouse gases, which harm the environment. For millennia before us, the amount of carbon dioxide has not reached above the 300 parts per million. Since 1950 however, the percentage rose significantly, up until the 420 parts per million point that we are currently at.¹ With the rising temperature comes many issues that put lives across the globe at risk.

Humans have made use of fossil fuels ever since history started. Ancient Chinese civilizations used surface oil for fire and heat. The more societies started to develop, the more ingenious the usage of fuels became. Since the 18th and 19th centuries, the industry in large parts of the globe started to expand, requiring more efficient energy production to keep up with the growing demand. Fossil fuels were discovered way earlier, but were through this period put in to use a lot more. After the Second Industrial Revolution, more and more countries joined the international market of fossil fuels. In 1960 in Baghdad, Iraq, the first five members of the Organisation of Petroleum Exporting Countries (OPEC) agreed to coordinate their petroleum policies and create international unity. As of today the organization stands at 13 member countries.² Another issue that came with the expansion of fossil fuel usage was the environmental aspect, where on multiple occasions, oil stations were damaged and millions of gallons of oil leaked into oceans, rivers and on land. In the 70s of last century, the world coped with two oil crises. First of which was caused by an embargo of oil exportation by the Arab countries in the OPEC, whom collectively decided not to transport oil to for example the USA, the UK, Canada, Japan and the Netherlands. Starting in October of 1973 and ending in March of 1974, the embargo caused a quadruplication of the global oil prices. In

¹ (NASA, credit: Credit: Luthi, D., et al. 2008; Etheridge, D.M., et al. 2010; Vostok ice core data/J.R. Petit et al.; NOAA Mauna Loa CO₂ record.)

² (OPEC.org)



1979 a second oil crisis arose, as the Iranian Revolution cut the worldwide production with 4%. Prices once again skyrocketed, and economies suffered regression. Afterwards, the price of oil started to decline, only to reach the pre-crisis level in the mid 1980s.

Definition of Key Terms

Biomass

The usage of plant- or animal waste to gain energy. Plant waste can be burned to heat water, which creates steam, which has the power to move a dynamo, which then produces electricity. Animal waste, when put together, gets processed by bacteria which discharges methane. When burned, methane produces heat, with which the same system can be applied to produce energy as with animal waste.³

Fossil fuel

Material formed by natural processes, for example by natural material that has been put under high pressure for extended periods of time. When combusted, these materials release energy. Fuels can directly be used to power vehicles, or the fuels can be processed to release energy that can be used in households and companies.

“A natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.” (Lexico by Oxford University)

Greenhouse Gas

Water Vapor, Carbon Dioxide, Nitrous Oxide, Methane and Chlorofluorocarbons are the 5 main gasses in the earth’s atmosphere. These gasses let sunlight onto the surface of the planet but absorb the heat that the surface then reflects. Much like the glass on a greenhouse, it creates a thicker blanket around the earth, which keeps the heat inside.

Hydraulic Fracturing (Fracking)

This technique uses water or sand injections to enlarge fractures in the ground and create new fractures. This makes it easier for oil/natural gas to come out of the ground, which is beneficial to the economy. On the other hand, it makes the ground less stable, therefore increasing the possibilities for earthquakes.⁴

Methane

³ (UTECH Contenidos, 2019)

⁴ (USGS)



Methane gas is emitted by bacteria whilst processing animal waste but is also packed below the seafloor. It is a potent greenhouse gas, as it can be made into energy. The process, however, is very complicated and when done incorrectly will ruin the environment.⁵

Runaway Climate Change

Climate change will soon get caught in a loop of positive feedback, where the extra emission of greenhouse gasses enlarges the effects of global warming. These extra floods and droughts cause people to use more fuels, which emits new gases, which again increases the effects. This way, the climate change will exponentially 'grow' and start running away, out of human control.⁶

Syngas

“Syngas is an abbreviation for synthesis gas, which is a mixture of carbon monoxide, carbon dioxide, and hydrogen. The syngas is produced by gasification of a carbon containing fuel to a gaseous product that has some heating value. Some of the examples of syngas production include gasification of coal emissions, waste emissions to energy gasification, and steam reforming of coke.” (BioFuel⁷)

General Overview

As for the matter of fossil fuels, it is important to understand why the usage of them pose a threat to the world. Only by knowing the importance of making a change, member states will actually get motivated to support the movement. Understanding the source and current usage of fossil fuels, as well as its sustainable alternative makes it easier to come up with valid solutions.

Why reduce Fossil Fuel dependency?

Fossil fuels are directly causing global warming, which is possibly the most pressing issue of modern day. Since the Second Industrial Revolution in the 1950s, the carbon dioxide parts per million in the atmosphere have reached a point they have not been at in millions of years. The UN Secretary General António Guterres pointed out a dozen of examples in which climate change caused hundreds of deaths. He pointed out many alternative solutions to fossil fuels, complimenting oil-rich countries like Saudi-Arabia and Norway on their

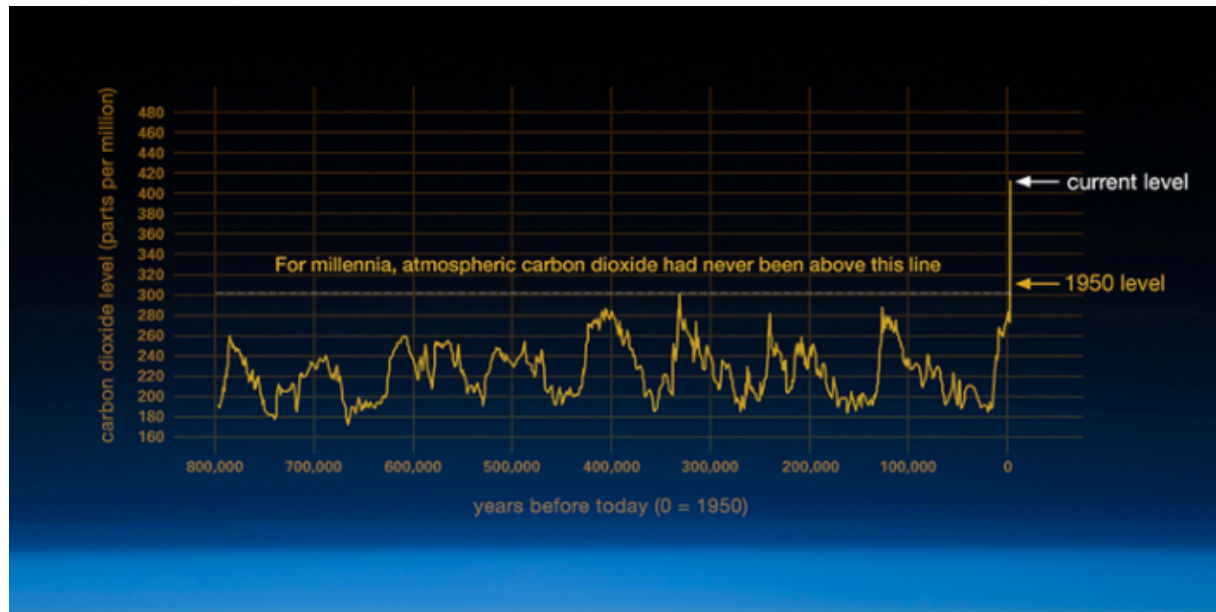
⁵ (Encyclopædia Britannica)

⁶ (Russell, n.d.)

⁷ (BioFuel)



investments in renewable energy. Also, he pointed out several projects led by China and Morocco, amongst others.⁸



Graph 1: NASA report on Carbon Dioxide levels in the air. (Retrieved from: climate.nasa.gov)

Sources of fossil fuel

Fossil fuels are divided in three main sorts. The first is petroleum, or crude oil, known for its thick structure and deep dark colour. The liquid can be used in fuels like kerosene or gasoline. It is rather clean-burning and easy to transport through pipelines. Then there is natural gas, odourless and highly inflammable, which is found in wells about a mile to 6 miles below the ground. It is inexpensive and the least polluting of the three. Coal, the last fossil fuel, can be found in beds about 2 to 3 hundred metres below the surface. It is the cheapest fuel but is highly polluting when burned.⁹

Usage of fossil fuels¹⁰

Oil is known for the many things it can be used for, like transportation as well as heating. It is a big factor in the world's economy, as countries who possess oil can highly benefit from the rising prices of oil on the global market. It is extracted from rock layers by drilling. 63% of the world's oil reservoirs can be found in the Middle East. Oil is usually directly used in fuels for transportation, like in cars, trains, boats and airplanes. In order to apply the oil in machines, a complicated refinery process is

⁸ (the Guardian, 11 Sep 2017)

⁹ (Metcalf, 2019)

¹⁰ (Beck, 2018)



needed to turn crude oil into useful materials like liquified petroleum gas (LPG), kerosine, gasoline and diesel oil. Another use of oil is to produce plastic, a material that can not be thought out of daily life.¹¹

Natural gas has over the years become controversial mostly due to the way it is extracted from the ground. Taking the material from the ground makes the surface less solid, therefore risking what is called hydraulic fracturing. The gas is used by many sectors, for the largest part to account for temperature regulation within homes. Also, the industrial sector uses the gas for heat and power systems. A small part of the natural gas is used for transportation purposes.¹²

Coal is a cheap, energy dense material, which is mostly used to produce electricity. It was first used around 1000 BC in China, but today it is mostly used for heating and electricity. By burning coal, water is heated, the created steam then electricity is generated from high speed dynamos. Coal can also be used to produce steel, through burning the coal in furnaces to create coal coke. Iron ore is then melted into iron. Coal can be turned into synthetic gas and – liquid, both used as fuel. Underdeveloped areas still use coal for cooking and heating in their homes.¹³

The biggest advantage of using fossil fuels is in their price-quality ratio. The material is rather easy to obtain, either within a country or on the global market. The energy density of the fossil fuels is also very high, making it profitable and convenient.

The issue with fossil fuels

There are, however, many issues with the use of fossil fuels. As they were developed millions of years ago, it is not possible to create new material now. That means that at some point, the world will run low on their leftover amount of fossil fuel, increasing the price of electricity and gas. This will harm the economy of countries that depend on their oil/gas reservoirs. It will hit poor people and inhabitants of LEDC's, as they will not be able to afford heating, let alone luxuries such as driving a car. At some point, the reservoirs will be empty, leaving the world with no fossil fuels, and thus no electricity. Unless, of course, we find an alternative.¹⁴

Oil is expected to run out by 2050, gas by 2060 and coal by 2080. However, to keep global warming underneath the desired 1.5 degrees Celsius, 80% or more of the fossil fuels will have to remain below the earth's surface. Considering that renewable

¹¹ (Appendix VI)

¹² (Energy Information Administration, 2019)

¹³ (Byjus)

¹⁴ (Ecotricity)



energy sources currently account for less than 3% of the world's energy supply, humanity will not survive the day it runs out of fossil fuel.

Even though we are not currently talking about the issue of global warming, it is important to mention the broad range of risks that pollution of greenhouse gases brings. Firstly, as the higher temperature makes for longer summers, there will be more frequent and heavier droughts. On the other hand, as ice worldwide will melt, there will be more floods in coastal areas. The general weather will change, causing heavier storms and snowfall. Crops will have a harder time growing, as well as animals and other sources of food. With the increasing amount of people on earth, there will be more and more hunger around the world. Another issue, especially in big cities, is the pollution, especially the ozone gas, that forms smog in big cities. Under high temperatures, the ozone expands. This can cause asthma, lung cancer and heart disease.¹⁵

Sustainable energy

As decided upon in the Sustainable Development Goals of the United Nations, fossil-fuel dependency shall be reduced.

Goal 12. Ensure sustainable consumption and production patterns

Target 12.c: Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities

- **Indicator 12.c.1:** Amount of fossil-fuel subsidies per unit of GDP (production and consumption) and as a proportion of total national expenditure on fossil fuels

Figure 2: United Nations SDG 12.c. plus indicator 12.c.1. (Retrieved from unstats.un.org)

Sources of sustainable energy

There are ways to gain energy, even without emitting any greenhouse gases into the atmosphere. These include solar energy, which uses panels on rooftops and open areas to catch the energy of the sun and concentrate it to produce electricity. Wind energy is produced by dynamos in wind turbines in the so-called windfarms. Geothermal power uses the internal heat of the earth to heat water, which through steam can be turned into electricity or can directly be applied in households. Biomass is the natural waste of farms and households, which can be burned to heat water to produce electricity. Lastly, hydroelectricity

¹⁵ (National Geographic, 2017)



or hydropower uses the power of streaming water to speed dynamos and produce electricity.¹⁶

Source	Advantage	Disadvantage
Solar energy	- Concentrating solar power (CSP)	- Bad aesthetic
	- Thermal energy for heat	
	- Can be put on buildings	
Wind energy	- Very cheap	- Horizon disturbance
	- Lot of power in the wind	- Noisy
	- Off – shore parks	- Dangerous to flying wildlife
		- Not always enough wind
Geothermal power	- Earth’s internal heat	- Rotten egg smell
	- Always available	- Needs to be managed
	- Electricity as well as heat	- Poisonous gas leakage
Biomass	- Turns waste into useful material	- Methane gas
		- Transportation
Hydroelectricity	- Always available	- Drought sensitive
	- Tidal and wave energy projects are innovating	- Dams are dangerous for people and animals
	- Dense electricity	- Methane gas emitted when organic material decays in reservoirs.

Advantages of sustainable energy sources

The biggest advantage of sustainable energy sources compared to fossil energy sources, is that sustainable sources will be available until the end of days. There will never be an end to the sunshine, to the flood of water, or the heat of the earth. Therefore, there does not have to be an alternative once it runs out.

Another big advantage of renewable energy is that it (barely) harms the environment. As stated in the table above, some techniques do have a counter side to them. Wildlife and

¹⁶ (Nunez, 2019)



ecosystems possibly get disrupted by implementing some of these techniques, which is why it is important to carefully decide which technique can be applied in which area.

By supporting a change in the view on electricity, a general mind switch is boosted. In the world, it is not only fossil fuels that will harm the environment, but also other consumer items, for example but not limited to plastic waste.

Economically speaking, changing to renewable energy sources has many advantages as well. It makes electricity more available for LEDCs, which improves their general wellbeing as well as their position in the world economy. Also, by creating new technologies and support projects of sustainability, jobs will become available in many different sectors. This will boost the entire economy.

Fossil fuels in a sustainable energy system

As stated by the United Nations, fossil fuels cannot be eliminated from our system. The discussion is not as straightforward as saying 'Renewable energy is good and fossil fuels are bad'. There will have to be a balance between the both of them.¹⁷ Fossil fuel might still be implemented in some sort of transportation, especially during a transitioning period. It would however, be ideal to live without any dependency on fossil fuels whatsoever. The question remains how realistic that is and how we can achieve that.

The difficulty

In conclusion it can well be said that sustainable sources are a way better way of collecting energy than fossil fuels. Even though some of these sustainable technologies have been available for quite some time however, there has not nearly been as much change as there could have been. Many countries are still 100% dependent on fossil fuels to supply for their energy usage.¹⁸ What makes it so hard for these countries to implement sustainable alternatives?

Due to the economic situation of many countries, implementing new technologies is a nearly impossible task. Blocking even a small part of their energy supply will destroy the bigger part of their economy. These countries often also have a lack of knowledge on both the importance of renewable energy, as well as ways to use renewable energy sources. Lastly, an issue is the current implementation of fossil fuels, as our entire society relies upon this energy supply for jobs, transport, housing, food and drinks, healthcare and many more essential parts of life. Making a change will therefore not be simple.

¹⁷ Appendix II

¹⁸ (Dillinger, 2017)



Major Parties Involved

Australia

Second-largest exporter of natural gas, world's leading export of coal and in the top 10 of largest fossil fuels extractors worldwide. The government of Australia actively supports coal production, for example by improving transport, subsidizing over 12 million Australian dollars a year, and reducing the requirements for coal producers.¹⁹

China

China is today's largest producer of coal, nearly half of the global production comes from this nation. Also, it is generally the largest emitter of greenhouse gasses and therefore responsible for a large percentage of the changing climate. However, research²⁰ shows that the estimated emissions of China have been largely overestimated. Their actual emissions are possibly 14% lower than the estimated amounts. Even though that does not mean the country has no further improvements to make, it does show that the government possibly implemented some of the UN suggestions already.²¹

European Union

Not only was the Paris Climate Agreement, drafted in 2015, hosted by European countries in the name of the UN Framework Convention of Climate Change (UNFCCC). The European Union has set multiple legal frameworks as well as recommendations within their territory. Agreeing to invest millions of euros in member states to decrease their dependency on fossil fuels, allowing renewable energy sources to be boosted within the union.²²

India

After the USA, Russia and China being the largest consumer of electricity in the world, India has a vulnerable position when fossil fuels start to run out. As the country is subject to modernization and their population quickly moves to the cities, their old tradition of using biomass for energy will go to waste. Instead, their demand for 'fast energy', for example retrieved from fossil fuels, grows vastly.²³

Norway

¹⁹ (Christoff, 2019)

²⁰ (Liu et al., 2015)

²¹ (Friedman, 2015)

²² (European Council)

²³ (Dunn, 2014)



In 2019, Norway's parliament has given permission for more than \$13bn of investments in fossil fuels to be dropped. This move affected about eight coal companies and hit over 150 oil producers. Whilst decreasing the power of fossil fuel companies, the money was then invested in renewable energy projects, like the developed markets of solar power as well as wind turbines.²⁴

Saudi Arabia

Within the country, the government largely subsidizes fossil fuels. In their belief, investing in domestic energy sources will gain economic growth. However, in reality, the adverse effects largely overrule the advantages. Due to the low prices, the consumption of the Kingdom's citizens is higher than anywhere in the world, still growing around 7% per year. This makes the national reservoirs run out quicker, soon forcing the government to start importing oil. As of right now, Saudi Arabian market mainly functions due to their part in the world oil market. However, as soon as their reservoirs run out, their economic situation will soon decline. Opposite to the intention, the cheap oil prices mostly benefit the rich instead of the poor. The subsidies of oil are made at the cost of investing in education, healthcare and social welfare. About 10% of the GDP was invested on oil, which is more than on education (about 3%) and healthcare (about 6%) together.²⁵

Shell

Shell, as one of the world's leading oil companies, may suffer largely from the shift from fossil fuels. However, just like other oil companies, creative business allows them to make the best of it. They have backed multiple climate agreements that demand large decreases in fossil fuel usage. An example is the agreement mentioned in Appendix III, which notes that even though it will not be easy, it is technically and economically possible to base our energy supply on renewable sources for nearly 100% in MEDCs by 2035. Shell has found economic benefits, as well as social and environmental advantages, to outweigh their current business earnings.²⁶ Though it has to be noted that apart from Shell, many other oil companies have their say in the global debate. For this report is decided to take Shell as an example of a company that takes minor steps in the right direction. Further research can be done in companies like BP, Exxon, Gazprom, Aramco and more.

UNEP

The United Nations has on multiple occasions expressed their worries and concerns about the fossil fuel industry. Acknowledging that the world, by investing in this market, drifts

²⁴ (Ambrose, 2019)

²⁵ (Pitsuwan, 2014)

²⁶ (Evans, 2017)



further away from meeting the goals of the Paris Climate Agreement. The United Nations Environmental Programme (UNEP) is responsible for measuring and monitoring the decrease or increase of fossil fuel production, consumption and the emission of greenhouse gasses. The indicators of the Sustainable Development Goals were agreed upon in September of 2018. It is now up to UNEP to track the phasing out of fossil fuels.²⁷

USA

The USA is the world's largest producer of gas and oil, and the second largest contributor to the international market of coal. With an annual growth in the energy consumption, as well as incomes from fossil fuels, the States grandly depend on fossil fuels.²⁸ One of America's major safes during the last oil price collapse in 2014 was the Permian Basin in Texas and New Mexico. The field has offered the States a change to become a large exporter on the world market, putting them out of the vulnerable position they had. Today, the field produces 4 million barrels of crude oil a day, making it the largest producer worldwide.²⁹

Timeline of Key Events

Date	Event	Explanation
Before 1500	Natural sources	Before the discovery of fossil fuels, nature has always been a source of energy, for example through the flow of rivers and the heat of fire.
1590	Windmills	The Dutch start to apply wind power in their mills for making flour and other heavy tasks.
1712	Steam machine	Great Britain developed the first steam machine to gain coal from mines, as coal started to become a prominent source of energy.
1821	US Natural Gas	The first natural gas well in New York, USA, was drilled.
1830	Coal as common source	Especially as a fuel for locomotives, coal replaced wood
1838	Hydrogen Fuel Cell	William Robert Grove created electricity by combining nitric acid with a zinc electrode.

²⁷ (Aeree Kim, 2018)

²⁸ (EIA, 2016)

²⁹ (NYTimes, 2019)



1860	First solar power system	Augustine Mouchat, in fear of running out of fossil fuel, developed the first solar power system for steam production in France.
1870	Petroleum main energy source in the US	After the American Civil war, John D. Rockefeller set petroleum to be the new main source of energy, as it had so much potential.
1908	Ford Model-T	The first flex-fuel car goes into mass production.
1924	Oil Pollution Control Act	USA first legal limitation of polluting whilst producing oil.
1946	Atomic Energy Commission	To manage atomic energy sources as a result from the atomic bomb attacks in Japan.
1950	Industrial Revolution	This revolution largely boosted the use of fossil fuels, giving rise to a wave bigger than ever.
1960	OPEC	The Organization of Petroleum Exporting Countries was founded in Baghdad, organizing a collaboration between Iraq, Iran, Venezuela, Kuwait and Saudi Arabia.
1969	Santa Barbara oil spills	Creating a slick of 800 miles, these spills drew the attention of the entire world.
1973	First oil shock	In 1973, President Nixon got the USA off the Gold standard, causing the value of the dollar to crash down. OPEC countries suffered significant consequences, as they relied on the petrodollar for the value of their product. When military aid was requested of Israel by the USA, OPEC put an embargo on export to the USA and Israeli allies. The USA, already in a weak position, sank lower economically, taking the world economy with it.
1978	First Solar Powered town	Tohono O'odham Reservation in Arizona, USA, is the first solar powered village.
1979	Second oil shock	With the Iranian Revolution, the world oil production was cut 4%, creating a huge scare and with that enormous rise of oil prices. The 1980 Iran-Iraq war also cut large parts of Iraq's production, leaving the world thirsty for oil. The prices only got back to their stable pre-crisis level in the mid 1980s.



1986	Chernobyl	26 Apr 1986 destroys a nuclear power station in Ukraine, former Soviet Union, releasing highly radioactive material and making the grounds uninhabitable for years following.
1991	Persian Gulf War	In 1990, Iraqi leader Saddam Hussein accused Kuwait of siphoning oil and when the country did not want to let of Iraqi debts, Hussein ordered an invasion. The UN quickly took action and in 1991 activated Operation Desert Storm, led by the USA, starting over 40 days of heavy conflict, attacking oil refineries, air defenses and communication lines. Bush reported cease fire on 28 Feb 1991.
2007	IPCC Report	The Intergovernmental Panel on Climate Change reports that Climate Change is real and is mostly caused by human actions.
2010	BP oil leak	In April 2010 the British Petroleum Deepwater Horizon oil rig in the Gulf of Mexico exploded, which leaked 30 million gallons of oil by 27 May.
2014	Fossil Fuel divestment	Starting around this time, worldwide arises a trend of fossil fuel divestments.
2016	Paris Climate Agreement	Signed in 2016 in France by 196 member states of the UN, the agreement sets a framework for limiting fossil fuel consumption and production to protect the ecosystem and prevent runaway climate change.
2017	Reversal of Clean Power Plan	Obama's 2015 Clean Power Plan is in 2016 reversed by president Trump.
2020	Drop in demand	Fuel demand drops as the COVID-19 pandemic forces people worldwide to stay home.

UN involvement, Relevant Resolutions, Treaties and Events

- Minimum principles for the exploration and production of hydrocarbons (such as shale gas) using high-volume hydraulic fracturing, 22 Jan 2014 (Recommendation 2014/70/EU)
- Work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development, 10 July 2017 (A/RES/71/313)



Possible Solutions

If the world has to decrease their dependency on fossil fuels, there has to be an alternative. One that does not have the disadvantages of fossil fuels: limitedness, environmental issues and health issues. Renewable energy sources such as but not limited to solar power, hydroelectricity and biomass might give a solution. When implemented on a large scale, these technologies can supply for a large part of the world's thirst for electricity.

LEDC's have difficulty in ridding themselves of fossil fuels, as it supports their economy and they have no knowledge of alternatives. In order for them to decrease their dependency on fossil fuels, they will need economical support.

Many governments still subsidize the production of fossil fuels, making it ever so attractive for producers to keep doing their job. The market is overflowing with fossil fuels, which makes it attractive to implement them more and more. Taking measures against these subsidies is therefore essential. On the other hand, supporting projects that offer alternatives to fossil fuels helps to decrease the world's dependency.

By setting up large scale projects on renewable energy, a large amount of electricity can be gained. By having an alternative that meets up to the standards of human consumption, it will be easier to make a change and therefore depend on fossil fuels in quickly reducing amounts.

Lastly, as this debate is partially also about climate, the greenhouse gasses currently in our atmosphere need to be taken out to protect our ecosystem. It is not a solution to the issue we are discussing, but feel free to implement it in your resolution.

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Appendix or Appendices

- I. The full list of Sustainable Development Goals can be found here: <https://sustainabledevelopment.un.org/?menu=1300>.



- II. The full UN report on fossil fuels in a sustainable energy circuit can be found here: <https://www.un.org/en/chronicle/article/role-fossil-fuels-sustainable-energy-system>.
- III. Energy Transitions Commission's elaboration on meeting the Paris Climate Agreement: <https://www.carbonbrief.org/cut-fossil-fuel-dramatically-to-meet-climate-goals-shell-backed-report>.
- IV. Find data on your countries fossil fuel production and consumption here: https://stats.oecd.org/Index.aspx?DataSetCode=FFS_USA
- V. Graph 1: https://climate.nasa.gov/climate_resources/24/graphic-the-relentless-rise-of-carbon-dioxide/
- VI. How oil becomes plastic: <https://inbound.teampi.com/blog/oil-to-plastic-a-lesson-on-how-plastic-is-made>
- VII. Information on the Persian Gulf War:
 - a. Video: https://www.youtube.com/watch?v=xl_lctDXHuQ
 - b. Page: <https://www.history.com/topics/middle-east/persian-gulf-war>

