

Climate axis of rotation – we all

[Business](#), [Industries](#)



Climate change initiative project - Nuclear Energy By: Abdul Robert, Fardeen and Matia Climate change- background info What is climate change? Climate is the average weather of a place varying from season to season. Like, for an example a place might be very hot and in summer but this same place could be very cold in the winter. Climate change is the change in these weather averages regionally and globally.

(3) What causes climate change? Natural factors: There are many natural factors which can influence earth's climate (All the world's climates combined), which causes climate change. There are 3 primary natural factors that cause climate change: Earth's orbital change and change in earth's axis of rotation - We all know that the earth orbits around the sun, and change in this orbit can cause climate change. As sometimes this orbit becomes more of an egg shape which makes it so that at times during its orbit the earth is closer and other times further from the sun. These orbital changes, change earth's climate (colder or hotter). Next, change in earth's axis of rotation can also cause climate change as over about 41 000 years earth's angle of rotation 21.

3 degrees to 24.5 degrees and then back again. As the angle increases summers get hotter and winters get colder. (1) Solar irradiance- or in other words the sun's energy output. Meaning if solar activity (sun's energy out) is increased it gets hotter and when decreased it gets colder. But satellite information show that solar irradiance is not the reason why we are facing current global warming trends as there has only been a slight drop in solar irradiance meaning this is not the reason for recent warming trends.

(1) Volcanic Eruptions - are another natural factor which causes climate

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change as major volcanic eruptions release gases such sulphur dioxide and carbon dioxide. When sulphur dioxide is in the stratosphere it converts to sulfuric acid which then condenses into sulfate aerosols.

Sulfate aerosol increases the reflection of radiation (sunlight) back in to space, thus cooling earth's lower atmosphere (troposphere). Next, carbon dioxide is a greenhouse gas which can increase global warming but these CO₂ emissions are nowhere near the amount humans put into the earth.

(4) Other natural factors that cause climate change are ocean currents, as ocean currents carry heat around the earth and when the direction of these currents is changed, different areas can become cooler or warmer. Little change in the earth's ocean current can cause a big effect on the earth and coastal climates. This happens because oceans can store a lot of heat. (1)

Human factors The greenhouse effect is a natural process and life on earth depends on it.

The greenhouse effect involves, sunlight a form of radiation passes through the earth's atmosphere (only about half passes through atmosphere), and hits the ground where most of it is absorbed and the rest is reflected back into the atmosphere where the greenhouse gases absorb about 90% of the reflected energy and radiate it back to earth which is warmed to 15 degrees Celsius which is ideal for life. But us humans ever since the industrial revolution have injected more greenhouse gases in the atmosphere thus increasing the greenhouse effect and causing climate (5). Some examples of these greenhouse gases are: Nitrous oxide- the source for this greenhouse gas is burning of fossil fuels (coal, oil, natural gas) and nitrogen based

fertilizers. The contribution of this greenhouse gas is 4%.

(3) Chlorofluorocarbons (CFCs) - These greenhouse gases are chemicals used in refrigerators, air conditioning, cleaning solvents, insulation and making of plastic foam. These chemicals contribute 11% to the overall total of greenhouse gases. (3) Carbon dioxide (CO₂) - This greenhouse gas is produced when fossil fuels are being burned such as coal, oil, and natural gas.

The contribution of this greenhouse gas is 60% which makes it the main greenhouse gas. One of the reasons for this is that we use fossil fuels on a daily basis, about 85% of the things we do require burning of fossil fuels.

(3) Methane (CH₄) - is the result of decomposition of organic matter, e.g. raising of livestock, dump sites. Methane contributes 14% to the total greenhouse gases.

(3) You can see by the trends of this graph that as CO₂ emissions increase, Earth's climate increases along side with it. EFFECTS OF CLIMATE CHANGE
Effect of climate change isn't simply about rising temperature and global warming, nor is it something that will happen in the far future: it is already happening. Effect of the climate change is larger in the Earth's poles (North and South poles). For example, population of 32,000 of Adélie penguins in Antarctica has fallen to 11,000 in 30 years, just because of climate change caused by humans, Dr. Bill Fraser says. Some expected effects of climate change include: 1.

Rise of sea levels between 18~59 cm by the end of the century. Melting north and south poles can rise 10~20 more centimetres. 2. Stronger hurricanes and storms. 3.

Drought to commonly occur. 4. Spread of disease due to increased population of many different types of mosquitoes. WHAT IS NUCLEAR ENERGY? In contrast to carbon dioxide being produced when anything is burnt, nuclear energy doesn't create carbon dioxide from the production of electricity. The fact that nuclear plants don't burn anything and produces much less carbon dioxide than other plants supports the idea that nuclear plants produce less carbon dioxide (fig. 4). Figure 4. Graph showing amount of greenhouse gas that will be created when each source is used.

In nuclear plants, energy is created by hot nuclear reactor boiling the water, which the steam turns the turbine. The main part of the nuclear plant is at a nuclear reactor. They use uranium 235 as their source. Fission (atomic splitting) happens when an atomic nucleus absorbs neutrons. And, while fission (atomic splitting) is happening, a tremendous amount of energy is created, and it is converted into heat energy in the nuclear reactor (fig. 5). Figure 5.

Creation of energy from atomic fission. Amount of electricity that can be created from atomic fission with one gram of uranium is equivalent to the amount of electricity that can be created by burning three tonnes of coals. Which, makes nuclear energy very beneficial to the environment as it reduces the amount of carbon dioxide emission and makes it look like it is efficient in monetary matters, as you need less amount of resources.

However, the cost to build, manage, and close down a nuclear plant is very expensive and it takes a long time. And, if the nuclear plant is damaged just like it did in Chernobyl (fig. 6) and Fukushima (fig. 7), it can cost hundreds of

human and animals' lives, and in extreme cases, the whole area within kilometers in radius from the accident spot might have to be restricted from accessing. Figure 6. Accident in Chernobyl nuclear power plant. (1986)

Figure 7.

Accident in Fukushima power plant. (2011) However, even with the danger of it, I think there should be more nuclear plants around the world, considering that effect of extreme climate change may result in hundreds of thousands of deaths, or it might wipe out the whole human race and animals and make the Earth into a non-livable planet. Greenhouse gases are mostly emitted from electricity production (40 percent), followed by transportation (34 percent) (fig. 8). This means that reduction of greenhouse gas production in electricity generation will cause much weaker climate change. And it is important to know that most of the electricity in the world is made by burning coal (40.2 percent), followed by natural gas (22.4 percent) (fig.

9). As presented above, amount of greenhouse gas emission largely affects the climate change, and construction of more nuclear plants will noticeably lower the greenhouse gas emission and thus be very beneficial to preventing climate change. Figure 8.

CO2 Emission rate in 2013. This graph is different from the graph in figure 4 because graph in figure 4 shows amount of carbon dioxide which will be produced when they are used, and this graph shows the sources of carbon dioxide in the atmosphere. Figure 9. Source for world electricity production in 2012. CONFLICT TO REPLACING ENERGY SOURCES TO NUCLEAR ENERGY: PEOPLE'S OPINION ABOUT NUCLEAR PLANTS Looking at the graph at the

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bottom (fig. 10) we note that 30 percent of people want to close down all nuclear power plants and 22 percent of people want to build new nuclear plants, while use existing plants but don't build new ones. People with opinion to build new nuclear plants only take up 22 percent of the world, while to not build new ones or to close down existing ones take up 69 percent of the world. In this situation, it is very difficult to replace all electricity source to nuclear energy.

I believe that this result was made because people don't understand the benefits of nuclear energy and thinks nuclear energy is only bad and very dangerous, judging from what they have seen from news. As a solution, we can let people understand information about effects of greenhouse gases and benefits of using nuclear energy. Figure 10. World's opinion about nuclear energy. CONFLICT TO REPLACING ENERGY SOURCES TO NUCLEAR ENERGY: MONEY ISSUES It costs a lot to build a nuclear plant (9 billion US dollars for 1/3 of a core), and it cost a lot to ntain and shut down the plant.

In 1985, Forbes said that the U. S. nuclear power is " the largest managerial disaster in business history." However, considering the economic loss that will be caused due to extreme climate change, monetary issue should not be a obstacle for preventing harsh climate change. Figure 11.

Cost for construction and maintenance of (part of) power plants. United States of America Nuclear Energy The United States of America produces the most amount of nuclear energy in the world. As of 2016, the United States has produced 805. 3 billion kilowatt hours utilizing this complex fuel source. Out of the top ten countries that produce the most nuclear energy,

the United States was responsible for about 38% of the nuclear energy produced.

However, the nuclear energy produced by the United States only amounted to 19.7% or about a fifth of their total energy produced in 2016. The U.

S. also made most of their energy by using the method of burning of fossil fuels and coal as in 2016, fossil fuels made up about 34% of their energy produced and coal made up 30% of their energy produced. This means 64% of the United States' energy was bad for the environment. Though, the U. S. are slowly producing more nuclear energy as there were total of 99 nuclear power plants with 34 being boiling water reactors and 65 pressurised water reactors. Also, companies that produce in the U.

S. " have partnered on a multiyear strategy to transform the industry and ensure its viability for consumers as well as its essential role in protecting the environment" 5. This plan is called " Delivering the Nuclear Promise" and it is to better the nuclear industry's pledge on making nuclear power as one of the best options for the U. S. to make energy. Furthermore, nuclear energy has helped the U. S. avoid emitting 320 to 578 million metric tonnes of carbon dioxide each year.

Also, the U. S. are developing new nuclear reactors that will be smaller, safer and cheaper than the reactors the U. S. have today. In addition, many american states depend on nuclear energy as New York almost gets 33% of their energy from nuclear and Connecticut gets almost 45% of their energy from nuclear. However, nuclear power in the U.

U.S. might not see growth in the near future according to the Wall Street Journal, "Nuclear power's electricity output in the U. S. has been nearly flat for the past decade but is projected to edge down as natural gas and renewables rise" 5. This is also further proven as the U.

U.S. have two nuclear reactors abandoned and the two new nuclear reactors that are planned on being built will not be able to run before 2021 and they would cost \$25 billion to make which is double than the predicted \$11.5 billion cost. In short, the U.

U.S. produces and uses a lot of nuclear energy, but they need to use more renewable sources such as nuclear, to lower their carbon footprint. Though, in the future, they might not pursue on investing more money into nuclear energy. Hopefully, the U. S.

understands that nuclear energy is a good source of income and good for the environment. Thereby creating more nuclear power plants and bettering society. France Nuclear Energy France produces the second most amount of nuclear energy in the world as they produced 384 billion kilowatthours in 2016. However, the difference between the United States and France is that 72.3% of their energy produced in 2016 was from nuclear energy. This would make France the country that relied on nuclear energy the most in the world. Out of the top ten countries that produced the most nuclear energy in 2016, France was responsible for 18% of the energy produced. In France, there are 58 nuclear reactors with 40 being pressurised water reactors and 18 being boiling water reactors.

However, France's reactors are slowly becoming older as " 15 of France's 58 reactors are over 35"9 with the average reactor currently over 30 years old. With the expected lifespan of a nuclear reactor in France being about 40 years old, France could see up to 17 nuclear power plants close by 2025. This would greatly impact their use of nuclear energy in their country as the 72. 3% produced nuclear energy would go down to about 50%. Though, many people are arguing if France should continue their dependence on nuclear power as their primary source of energy as despite nuclear energy being good for the environment, they cost a big amount of money and are dangerous. However, France is still postponing their target of decreasing the amount of nuclear energy they produce as Clercq and Rose state, " grid operator RTE warned it risked supply shortages after 2020 and could miss a goal to curb carbon emissions" 12. According to French junior environment minister Brune Poirson, she wants to reduce the share of nuclear power as soon as they can. Although Poirson did not plan a date, she still wants her plan to be as " realistic as possible" 12.

Also, a member of France's parliament Matthieu Orphelin, said that he everybody knew that they could not reach the 50% target by 2025 set by the previous government. Instead, he predicted that France would reach the target between 2025 and 2030. Orphelin continued to say that " France must irreversibly get on a path to use energy more efficiently, to use more renewable energy and thus mechanically reduce its reliance on nuclear energy" 12.

However, nuclear energy will have a big effect on France's economy and also, France will then rely on non-renewable sources such as natural gas and coal. In conclusion, France leads second in the world for the most nuclear energy produced and nuclear power produces almost 75% of France's energy. However, France is planning on shutting down up to 17 nuclear power plants as well as reducing the amount of nuclear energy they create.

Nuclear Power in Russia Amongst the many nations that utilize nuclear energy, one excels at it. This nation is the famous country of Russia.

Russia is a world leader in the usage of nuclear power, as they are the first nation on Earth to use a nuclear power plant for the purpose of generating electricity with staggering statistics to prove claim. Amongst this proof, is the fact that approximately 18% of Russia's electricity production utilizes a nuclear source. Prior to the usage of this source, Russia was one of the world leaders in emitting carbon dioxide into our atmosphere due to the people's high energy consumption.

When nuclear power plants for the purpose of electricity generation were introduced, the emission rates dropped drastically, but did not affect the lives of the Russian people too greatly as they could still consume the same amount of power. Shortly after the collapse of the USSR in 1991, Russia faced economic problems with forced them to cut their budget in the nuclear program. This caused the carbon emissions in Russia to return to the high rate it was at before. The program was soon restored and the Russian people found that their carbon emission had dropped over 22% to 466 million tons per year. Russia also has many nuclear power plants, in the mid-1980s when

other nations were pioneering the nuclear energy generation method within their homeland, Russia already possessed approximately 25 of them.

However a reform was put in place after the Chernobyl accident with exposed the nearby area of a power plant to be exposed to extremely high levels of radiation. This reform that the government put into ensured safety to the Russian people who were concerned about the accident.

After this moment, Russia commenced consuming high amounts of uranium, totaling to approximately 3800 tons of it consumed per year. Russia is also contributing to combating global warming by providing other nations such as Iran, India, Hungary and Nigeria with nuclear power capabilities. They hope to drastically reduce the effect humans are having on global warming by building 11 new power plants in these foreign nations. They are cooperating with America for this cause, putting aside their differences through the Iran nuclear deal, promising to lower Iran's yearly carbon emission through nuclear power plants. This proves that Russia is putting forward its best attempts to combat global warming. Nuclear Power in CanadaCanada is a nation attempting to rid of all fossil fuel waste emission into the Earth's atmosphere. The country's province of Ontario has cut all burning of fossil fuel and replaced it with other means of electricity generation. These include: hydroelectricity (24%), nuclear energy (60%) and many other forms including solar (about 1%) and wind (6%).

(Flannery, 2017) Nuclear energy is common in Canada with 15% of the nation's electricity being generated with this method, which totals to approximately 101 TWh of power per year being generated just by nuclear

energy. Canada often imports and exports materials required to create nuclear reactors in hopes of being able to spread nuclear energy all throughout the world. After nuclear energy was widely used, Canada saw a drastic drop of approximately 5 million metric tons per capita of carbon being emitted into the atmosphere, this drop commenced in the 1980s and is now at the lowest it's been in four decades. This rivaled other nations such as the United States, which have over 3 metric tons of carbon per capita when compared to Canada.

Other advantages of the creation of the program include the fact that the industry employs over 20 000 people and generated approximately 1.2 billion dollars in revenue for the government, as well as an approximately 2.7 billion dollars gain in importing and exporting. Canada is home to twenty-two nuclear reactors, this is comparable to other nuclear powered nations such as Russia and the US. The Canadian government has established a methodology of fossil fuel usage to reduce the amount of carbon emitted and to encourage nuclear power usage.

This involves the oil to be far more refined and to contain far less waste. The Athabasca Basin of Saskatchewan contains a high amount of uranium to be mined, the Canada government seized this opportunity to generate the majority of the nation's nuclear energy, as opposed to other nations who cause pollution by importing uranium (this is done by the vehicles that are used to transport the element which require large amounts of greenhouse gases to be emitted). In conclusion, Canada ensures that the energy generation done within the nation is always best for the environment,

between using domestic uranium to avoiding carbon emissions, Canada is seen a one of the world leader in this method of energy production.

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