

UNEP

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Research report

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Student Officer: Quinten Papen & Chris Wolfs
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LMUNA

Lorentz Lyceum
Model United Nations
Arnhem

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Introduction

Changes in the climate have been happening for hundreds of thousands of years, and until recent centuries, most of these changes were naturally occurring – for instance, because of ice-ages and then post-glacial periods. The present-day is not the first time carbon dioxide (CO₂) and other greenhouse gas levels in the atmosphere have been high.

Starting with the Industrial Revolution of the 19th century until today, changes in the climate have been mainly the result of human activity. (This is a 95% certainty according to the Intergovernmental Panel on Climate Change or IPCC.) The Industrial Revolution meant a shift from human labour to machinery, and kickstarted the era of combustion engines – including the automobile – and, as a result, the excessive burning of fossil fuels.

The burning of fossil fuels releases pollutants including greenhouse gases. Over the past century, human activities have released large amounts of heat-retaining greenhouse gases into the atmosphere, which in turn causes the global surface temperature to rise.

And the rate of warming in Canada is double that of the global average. Between 1950 and 2010, average temperature over land in Canada has increased by 1.5°C. Over the next 100 years temperature is projected to rise another ~1 to 5°C.

What causes global warming

-First of all, **fossil fuels**. The Intergovernmental Panel on Climate Change (IPCC) has found that emissions from fossil fuels are the dominant cause of global warming. In 2018, 89% of global CO₂ emissions came from fossil fuels and industry. **Coal** is the dirtiest of the fossil fuels and responsible for over 0.3C of the 1C increase in global average temperatures – making it the single largest source of global temperature rise. **Oil** releases a huge amount of carbon when burned - approximately a third of the world's total carbon emissions. There have also been a number of oil spills in recent years that have a devastating impact on our ocean's ecosystem. **Natural gas** is often promoted as a cleaner energy source than coal and oil. However, it is still a fossil fuel and accounts for a fifth of the world's total carbon emission.

An important thing to note is that these are all non-renewable energy sources. We've become dependent on this limited resource, and studies show we are exhausting our supply. Globally, every year we consume the equivalent of over 11 billion tons of oil in fossil fuels. Crude oil reserves are vanishing at the rate of 4 billion tons a year – if we carry on at this rate without any increase for our growing population or aspirations, our known oil deposits will be gone by 2052.

-**Agriculture contributes** a significant share of the **greenhouse gas (GHG)** emissions that are causing climate change – 17% directly through agricultural activities and an additional 7-14%

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through changes in land use. It is therefore both part of the problem – and potentially an important part of the solution. The main direct agricultural GHG emissions are nitrous oxide (N₂O) emissions from soils, fertilisers, manure and urine from grazing animals; and methane (CH₄) production by ruminant animals and from paddy rice cultivation. Both of these gases have a significantly higher global warming potential than carbon dioxide (CO₂).

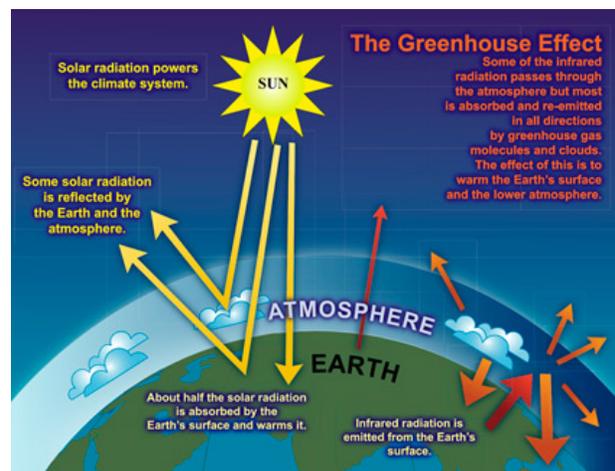
-Deforestation. Tropical forest trees, like all green plants, take in carbon dioxide and release oxygen during photosynthesis. Plants also carry out the opposite process—known as respiration—in which they emit carbon dioxide, but generally in smaller amounts than they take in during photosynthesis. The surplus carbon is stored in the plant, helping it to grow. When trees are cut down and burned or allowed to rot, their **stored carbon** is released into the air as carbon dioxide. And this is how deforestation and forest degradation contribute to global warming. According to the best current estimate, deforestation is responsible for about 10% of all global warming emissions.

Saving forests won't only reduce carbon dioxide emission, it will also **save many species** from going extinct. Animals such as the jaguar risk extinction if we do not act to protect their tropical forest habitat. In addition, tropical forests are crucial sources of food, medicine, and clean drinking water for people in developing countries. Tropical forests help regulate regional rainfall and prevent both floods and droughts. Reducing deforestation is not only a beneficial action against global warming—it also can make important contributions to saving biodiversity and supporting sustainable development.

Greenhouse effect

The Greenhouse Effect is a naturally occurring and essential process that is regulated by nature. It enables the Earth to be a liveable planet by moderating the Earth's temperature. However, due to the burning of fossil fuels and other activities, humans are adding more GHGs into the atmosphere than are needed, throwing off the natural balance, resulting in an enhanced Greenhouse Effect.

The Earth is warmed directly by energy from the sun and re-radiates that energy into the atmosphere. Greenhouse gases act like a blanket around Earth, trapping some of the sun's energy in the atmosphere, causing the atmosphere to warm. Some GHGs have a lifespan in the atmosphere for centuries; this is important because the warming will continue



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for decades even if we curb our behaviour tomorrow.

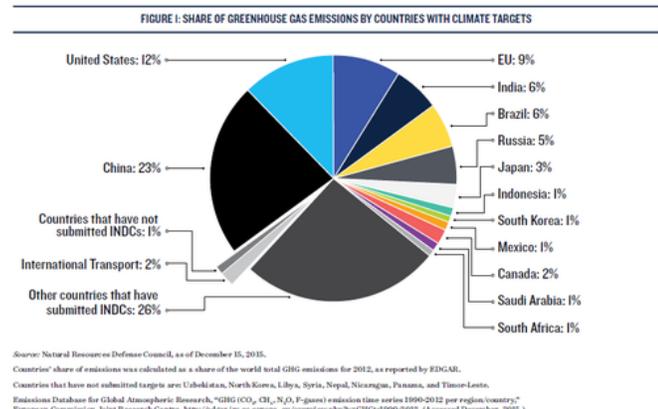
International action

The United Nations Environment Programme (UNEP) is a U.N. body that focuses on promoting the environment, providing environmental program assistance to developing nations, issues reports on a wide range of environmental issues, and works to create international conventions and protocols that protect the environment.

The United Nations Framework Convention on Climate Change (UNFCCC) states that the environment is a resource utilised by all nations and it is the responsibility of each nation to protect it. The convention was introduced in 1992 and came into effect on March 21, 1994, when it was ratified by a majority of member states. The convention specified that governments should work together to minimise the environmental damage caused by fossil fuels and look for alternative energy sources. Importantly, the convention also pressured developed nations to reduce their own emissions, as developed countries cause the majority of greenhouse gas emissions. Although many member states ratified (UNFCCC) the convention was not being upheld to the fullest and air pollution continues.

On December 11, 1997, the **Kyoto Protocol** was introduced. The Kyoto Protocol is an amendment to UNFCCC, which includes legally binding environmental goals for countries to meet from 2008-2012. If the member states meet the requirement, it would cut greenhouse gas emissions by 5% from the 1990 level. The Kyoto Protocol also included emissions trading. This allows countries that have surpassed their emission allotment to purchase emission credit from countries that stay below their limits. Emissions trading allows for underdeveloped countries to benefit financially from cutting their emissions. However, the Kyoto Protocol has run into some issues, as the United States, and China, which are amongst world's largest users of fossil fuels will not sign on to the Protocol which diminishes the legitimacy of the protocol in many nations' eyes.

There are multiple governmental and nongovernmental organisations that are working toward employing more environmentally friendly renewable energies versus the fossil fuels currently being used. **The United Nations Environment Programme (UNEP)** is an example of such an organisation. The UNEP's Risoe Center on Energy Climate and Sustainable Development (URC) works, particularly with developing nations, to promote the development and use of renewable energies. One current nongovernmental organisation that focuses on renewable energy is the Renewable Energy Agency (REA). The REA was founded in 2003 with the goal of protecting the environment by using renewable energies, informing the public on the use of



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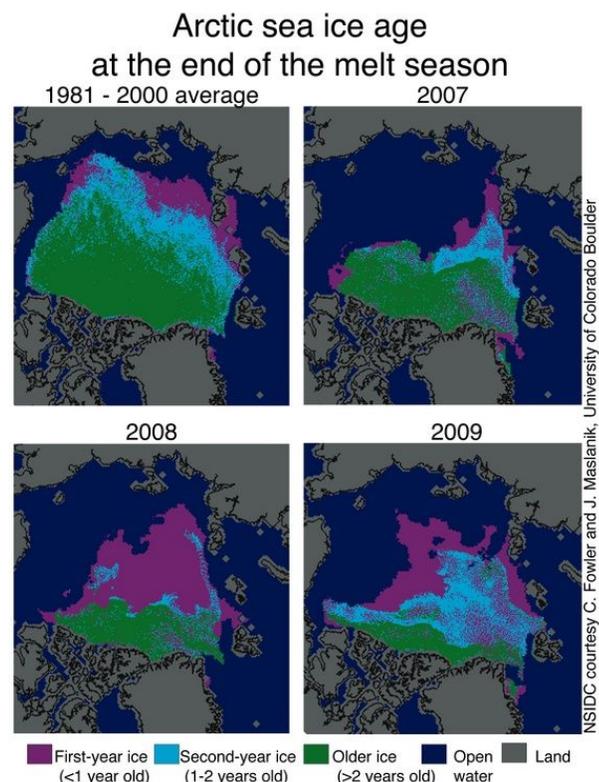
renewable resources, and promoting research on the issue. REA works with international organisations and governments to promote the research and implementation of renewable energy. **The Paris Agreement** is a landmark international accord that was adopted by nearly every nation in 2015 to address climate change and its negative impacts. The agreement aims to substantially reduce global greenhouse gas emissions in an effort to limit the global temperature increase in this century to 2 degrees Celsius above pre industrial levels, while pursuing the means to limit the increase to 1.5 degrees. To reach this goal they mainly focused on; limit global temperature rise by reducing greenhouse gas emissions, Provide a framework for transparency, accountability, and the achievement of more ambitious targets, Mobilise support for climate change mitigation and adaptation in developing nations.

What consequences does global warming have

One of the most immediate and obvious effects of global warming is the **increase in temperatures** around the world. The average global temperature has increased by about 1.4 degrees Fahrenheit (0.8 degrees Celsius) over the past 100 years, according to the National Oceanic and Atmospheric Administration (NOAA).

Since record keeping began in 1895, the hottest year on record worldwide was 2016, according to NOAA and NASA data. That year Earth's surface temperature was 1.78 degrees F (0.99 degrees C) warmer than the average across the entire 20th century. Before 2016, 2015 was the warmest year on record, globally. And before 2015? Yep, 2014. In fact, 16 of the 17 warmest years on record have happened since 2001, according to NASA.

Extreme weather is another effect of global warming. Global warming may also lead to extreme weather other than cold or heat extremes. For example, **hurricane** formations will change. Though this is still a subject of active scientific research, current computer models of the atmosphere indicate that hurricanes are more likely to become less frequent on a global basis, though the hurricanes that do form may be more intense. Scientists project that extreme weather events, such as **heat waves, droughts, blizzards and rainstorms** will continue to occur more often and with greater intensity due to global warming, according to Climate Central. Climate models forecast that global warming will cause climate patterns worldwide to experience significant changes. These changes will likely



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include major shifts in wind patterns, annual precipitation and seasonal temperatures variations.

One of the primary manifestations of climate change so far is melt. North America, Europe and Asia have all seen a trend toward less snow cover between 1960 and 2015, according to 2016 research published in the journal *Current Climate Change Reports*. According to the National Snow and Ice Data Centre, there is now 10 percent less permafrost, or permanently frozen ground, in the Northern Hemisphere than there was in the early 1900s. The thawing of permafrost can cause landslides and other sudden land collapses. It can also release long-buried microbes, as in a 2016 case when a cache of buried reindeer carcasses thawed and caused an outbreak of anthrax. One of the most dramatic effects of global warming is the reduction in Arctic sea ice. Sea ice hit record-low extents in both the fall and winter of 2015 and 2016, meaning that at the time when the ice is supposed to be at its peak, it was lagging. The melt means there is less thick sea ice that persists for multiple years. That means less heat is reflected back into the atmosphere by the shiny surface of the ice and more is absorbed by the comparatively darker ocean, creating a feedback loop that causes even more melt, according to NASA's Operation IceBridge.

In general, as ice melts, **sea levels rise**. In 2014, the World Meteorological Organisation reported that sea-level rise accelerated 0.12 inches (3 millimetres) per year on average worldwide. This is around double the average annual rise of 0.07 in. (1.6 mm) in the 20th century. Melting polar ice in the Arctic and Antarctic regions, coupled with melting ice sheets and glaciers across Greenland, North America, South America, Europe and Asia, are expected to raise sea levels significantly. Researchers project that by 2100, average sea levels will be 2.3 feet (.7 metres) higher in New York City, 2.9 feet (0.88 m) higher at Hampton Roads, Virginia, and 3.5 feet (1.06 m) higher at Galveston, Texas, the EPA reports. According to an IPCC report, if greenhouse gas emissions remain unchecked, global sea levels could rise by as much as 3 feet (0.9 metres) by 2100. That estimate is an increase from the estimated 0.9 to 2.7 feet (0.3 to 0.8 metres) that was predicted in the 2007 IPCC report for future sea-level rise.

Sea level isn't the only thing changing for the oceans due to global warming. As levels of CO₂ increase, the oceans absorb some of that gas, which **increases the acidity of seawater**. Werne explains it this way: "When you dissolve CO₂ in water, you get carbonic acid. This is the same exact thing that happens in cans of soda. When you pop the top on a can of Dr Pepper, the pH is 2 — quite acidic." Since the Industrial Revolution began in the early 1700s, the acidity of the oceans has increased about 25 percent, according to the EPA. "This is a problem in the oceans, in large part, because many marine organisms make shells out of calcium carbonate (think corals, oysters), and their shells dissolve in acid solution," said Werne. "So as we add more and more CO₂ to the ocean, it gets more and more acidic, dissolving more and more shells of sea creatures.

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It goes without saying that this is not good for their health." If current ocean acidification trends continue, coral reefs are expected to become increasingly rare in areas where they are now common, including most U.S. waters, the EPA reports. In 2016 and 2017, portions of the Great Barrier Reef in Australia were hit with bleaching, a phenomenon in which coral eject their symbiotic algae. Bleaching is a sign of stress from too-warm waters, unbalanced pH or pollution; coral can recover from bleaching, but back-to-back episodes make recovery less likely.

The effects of global warming on the **Earth's ecosystems** are expected to be profound and widespread. Many species of plants and animals are already moving their range northward or to higher altitudes as a result of warming temperatures, according to a report from the National Academy of Sciences. Warmer temperatures will also expand the range of many disease-causing pathogens that were once confined to tropical and subtropical areas, killing off plant and animal species that formerly were protected from disease.

Agricultural systems will likely be dealt a crippling blow. Though growing seasons in some areas will expand, the combined impacts of drought, severe weather, lack of accumulated snowmelt, greater number and diversity of pests, lower groundwater tables and a loss of arable land could cause severe crop failures and livestock shortages worldwide. This loss of food security may, in turn, create havoc in international food markets and could spark famines, food riots, political instability and civil unrest worldwide, according to a number of analyses from sources as diverse as the U.S Department of Defence, the Centre for American Progress and the Woodrow Wilson International Centre for Scholars.

Do not forget the enormous influences all these changes would have on the **economy** of many individual countries and the international trade market. Third world countries can't run without cops and many countries will flood.

Major parties involved

As the Paris agreement has been ratified by 197 countries, everyone partakes. The USA recently re-joined after Trump left in 2020. Only Eritrea, Iran, Iraq, Libya, Turkey and Yemen have not yet ratified. These are major oil export countries.

Possible solutions

Solar and Wind: India, for example, is rated the top producer of solar energy in the world. A third of India's energy comes from renewable sources. In Brazil, wind power is one of the

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fastest growing sources of energy. Although the costs of renewable energy are rising, the government remains committed to developing wind power and other sources of renewable energy.

Hydropower: The country of Zimbabwe built mini-hydropower plants to provide energy for citizens living in rural areas, resulting in less environmental degradation. The Republic of Korea is building tidal power plants all along its coasts. The country is investing more than \$1 billion over the next couple years to build plants.

Nuclear Energy: The government of the Philippines is considering reviving a nuclear power plant to help the country with its energy needs, but it is stirring local and international protest.

Take on the problems stated earlier in this report.

Think of addressing big polluting factories.

The goal is mostly to help LEDC's, so try to think of a way to cooperate with these countries!

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