



## Teacher's Guide The Fight Against Climate Change

### Introduction: The Threat We are Facing

- In January 2002, 3,250 km<sup>2</sup> of Antarctica's Larsen B Ice Shelf ( an ice shelf is a large floating platform of ice that forms where a glacier or ice sheet flows down to a coastline and onto the ocean surface) collapsed in less than two months, shocking many scientists. The ice shelf, which formed about 10,000 to 15,000 years ago, had started melting rapidly during the 100 years following the Industrial Revolution, and it finally collapsed. This is one of the most striking examples that clearly illustrates the tremendous impact global warming has on the ecosystem.

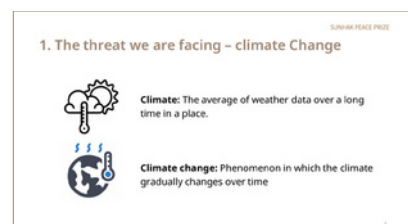
 <https://www.youtube.com/watch?v=H2a3Oemo1e4>

- In 2007, the Arctic sea ice that had remained frozen for the past thousands of years started melting. Its surface area shrank to a quarter of what it was before. It is a widely known fact that many species including the polar bear are at risk of extinction due to such changes in the Arctic Ocean. But is global warming only a problem for polar bears? (Ask the question so that students can empathize with the issue of climate change)



### 1. The Threat We are Facing – Climate Change

- **Climate:** The average of variables like precipitation, temperature, etc., that have occurred over a long time in a given place. It is the mean value of weather data, which changes daily and even hourly.
- **Climate change:** Refers to a phenomenon in which the climate gradually changes over time. The typical elements of climate such as precipitation, temperature, and wind change over a long period of time.



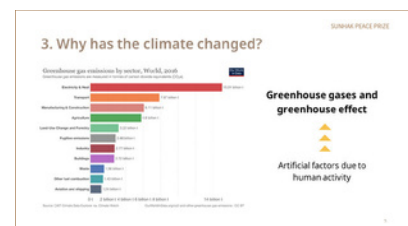
## 2. How has the climate changed?

- Global warming, a dramatic change in the past 100 years:** For the past century, the Earth has become hotter at a faster pace than ever before. For 10,000 years before the last century, the Earth's temperature had never changed by more than 1 degree Celsius, but over the 100 years after the Industrial Revolution, the temperature of the Earth has risen by 1°C. (The temperature of the atmosphere in the Antarctic Peninsula has risen by 6°C over the past 100 years. This rise in temperature led to a sea level rise of 20 centimeters compared to 1870, as the glaciers in both the South and North melted.) This phenomenon in which the Earth becomes overly hot is called global warming.
- Other changes that occur along with global warming:** Winters are becoming shorter while spring and summer are becoming longer. The number of icebergs in the Northern Hemisphere is decreasing and sea levels have risen by 10 to 25 cm. As the amount of seawater increases, typhoons and heavy rains become more frequent while some areas suffer from drought.



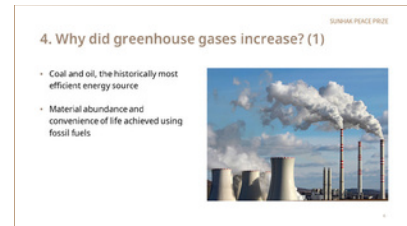
## 3. Why has the climate changed?

- Human activity:** Although climate change occurs due to natural causes, it has been accelerated artificially by human activity during the last 100 years.
- Greenhouse gases and greenhouse effect:** 99% of the Earth's atmosphere is made up of nitrogen and oxygen. The other 1% is composed of carbon dioxide, methane, water vapor and other gases that are collectively called greenhouse gases. The greenhouse gases keep the Earth warm creating a suitable temperature for humans to live in. Over the last century, the amount of greenhouse gases has increased making the Earth hotter.



#### 4. Why did greenhouse gases increase? (1)

- **Coal and oil:** The biggest cause of greenhouse gases is fossil fuels such as coal and oil. Fossil fuels, which have been stored underground for a very long time, have been actively utilized by humankind since the Industrial Revolution. More than 90 percent of the energy used on Earth today is coal and oil. fossil fuels are used in thermal power plants that make electricity, factories that mass-produce various things needed in daily life, and transportation methods such as cars and trains.
- Although the use of fossil fuels has given humankind material abundance and convenience of life, it is destroying the Earth's ecosystem.



#### 4. Why did greenhouse gases increase? (2)

- **Methane emitted by livestock:** About 20% of all greenhouse gases are emitted by livestock. Surprisingly, livestock emit more greenhouse gases than cars.
- **Excessive meat consumption:** Methane emitted by livestock raised for human consumption, especially cattle, has 30 times more global warming potential than carbon dioxide. Excessive meat consumption by human beings in the modern day pose a threat to both human health and the environment.



#### 4. Why did greenhouse gases increase? (3)

- **Huge increase of garbage:** Garbage also produces greenhouse gases and the amount of garbage has increased tremendously since industrialization. A large amount of methane, a potent greenhouse gas, is produced during the process of breaking down the huge amount of waste that is generated every day.
- **Indiscriminate deforestation:** Forests around the world, including the Amazon rainforest popularly known as the lungs of Earth, are shrinking significantly due to indiscriminate development. When forests shrink, nature's ability to absorb greenhouse gases is also reduced, which further speeds up global warming.



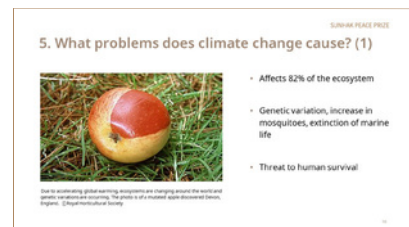
**(Brainstorming – Climate change in our daily lives)**

- Discuss the effects of climate change that students have personally experienced.
- **Discuss the evidence of climate change in our surroundings:** Changes in season, heavy rainfall, typhoon, drying up of valleys, mosquitoes that do not die in the winter, changes in the distribution of sea fishing grounds, soaring food prices due to unstable weather, pandemics such as the COVID-19, news of island countries being submerged underwater, and people wandering around as refugees due to natural disasters



**5. What problems does climate change cause? (1)**

- **Affects 82% of the ecosystem:** Global warming is changing not only the climate but also the entire ecosystem. Climate change destroys the ecosystem and causes great changes in the lives of humans, who are at the very top of the food chain.
- **Genetic variation:** Climate change is changing the size of living organisms and causing many types of physiological phenomena that are different from before. For example, plants such as apricot trees and kiwis that can withstand high temperatures are emerging indicating that fundamental changes are taking place in the global ecosystem.
- **Increase in mosquitoes:** The ecosystem of animals is also changing. As the temperature increases, the number of mosquitoes which thrive in warm weather is especially increasing at a rapid pace. The spread of mosquitoes leads to spread of infectious diseases and diseases such as malaria are likely to spread further.
- **Extinction of marine life:** Due to rising water temperatures and acidification of the ocean, overall marine life extinction is accelerating.
- **Threat to human survival:** Climate change is no longer a problem only for polar bears. It is directly tied to human survival. The seriousness of the situation needs to be made aware and alarm should be raised.



## 5. What problems does climate change cause? (2)

- **Increase in natural disasters:** Global warming has caused the average temperature of the Earth to rise steadily. The sea is storing more heat than the atmosphere, and the heated atmosphere and sea change the humidity and wind flow throughout the Earth causing changes in weather. Frequent floods, typhoons, droughts, landslides, and forest fires cause human and property damage and loss of homes.
- **Threat to humanity's health:** As high temperature persists, an environment more favorable for germs and pests to be active is created. In addition, the possibility of disease has increased as water sources become contaminated following the occurrence of various natural disasters. (Increasing incidence of diseases with high infection rates such as cholera, diarrhea, malaria, bacterial dysentery, etc.)



## 5. What problems does climate change cause? (3)

- **Water shortage:** Global warming also has a significant impact on precipitation. The change in the flow of the sea and air causes heavy rain on one side of the Earth and drought on the other. This causes water shortage or pollution further leading to many other problems.
- **Desertification:** Changes in precipitation and rising temperatures caused by global warming are turning land in many parts of the globe into deserts and are leading to loss of arable land due to floods and forest fires. Consequently, various species are losing their homes and becoming extinct and crop yields are significantly decreasing.
- **Food crisis:** Food shortages caused by climate change are leading to food wars and food crises.



## 5. What problems does climate change cause? (4)

- **The poor are more vulnerable to climate change:** The number of people who are losing their homes and whose survival is at risk due to destruction of the ecosystem caused by climate change is increasing. Due to rising sea levels caused by global warming, island nations in the South Pacific are being submerged underwater and its residents



are losing their homes overnight. By 2050, it is estimated that over 140 million people will become climate refugees unable to respond to climate change.

- **Acceleration of global inequality:** All the problems caused by climate change have greater impact on the poor than the rich. The majority of people whose basic human rights are at risk of being violated due to climate change are those who live in poor countries. Climate change is a major factor that further exacerbates the problems of poverty and inequality.
- **Watch video about environmental refugees:**

 [https://www.youtube.com/watch?v=-MxZNr1j\\_gg](https://www.youtube.com/watch?v=-MxZNr1j_gg)

### (Raising awareness – the seriousness of climate change and why it cannot be neglected any longer)

- **Now is the time to take action:** Even if the amount of greenhouse gases produced is reduced right now, the problem will not be solved. It will take at least 100 to 300 years for the amount of carbon dioxide in the atmosphere to return to the previous normal level. This is why global warming, which is already taking effect, is a very serious issue. Awareness needs to be raised about the seriousness and action needs to be taken now. (The earth is changing at a much faster rate than we can understand or control.)
- **Earth's temperature will rise by 6 °C by 2100:** Climatologists warn that if we don't take active action right now, the average temperature could rise by 6°C over the next 100 years.
- For every 1°C increase in temperature, mortality rate increases by 3% and the risk of malaria increases by up to 20%.



### 6. How can we stop climate change?

- The amount of greenhouse gases produced need to be decreased by half by 2030. (Reduce the use of petroleum, coal and gas, which are fossil fuels)
- Almost eliminate all greenhouse gas emission into the atmosphere by 2050, in order to overcome global warming.
- **Need for global cooperation:** The climate environment

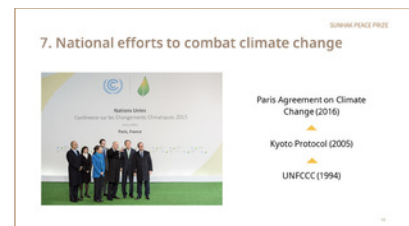




is a public good that all nations on Earth enjoy together. Therefore, it is impossible for one nation or individual to take responsibility for climate change. Developed nations that have already industrialized need to take the lead and support the climate change response of the developing nations to relieve the gap among nations. Policy development and implementation on a national level and individual effort in daily lives are also important.

## 7. National efforts to combat climate change

- There have been longtime international cooperation and effort to stop climate change. The international society has been taking global measures to reduce the overall greenhouse emissions.
- **United Nations Framework Convention on Climate Change (UNFCCC):** To actively respond to climate change, the international society formed the Intergovernmental Panel on Climate Change (IPCC) under the Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) following the decision of the UN General Assembly in 1988, and signed the United Nations Framework Convention on Climate Change (UNFCCC) in June of 1992, promising to address climate change. The key point of the UNFCCC treaty is for all signatory parties to participate in stabilizing global warming and for the developed nations, who historically have responsibility over greenhouse gas emissions, to take greater responsibility. All signatory parties are to submit annually a national report to the UN about their measures to limit the Earth's global warming and their nation's greenhouse gas emission statistics.
- **Kyoto Protocol:** It is an international convention with legally binding force. The 38 developed nations with historical responsibility for greenhouse gas emissions through active industrial revolutions resolved to reduce greenhouse gas emissions by 5.2% from 1990 levels from 2008 to 2012.
- **Paris Agreement on Climate Change:** Replacing the Kyoto Protocol that expires in 2020, the Paris Agreement is an agreement on climate change to be applicable starting January of 2021. The Paris Agreement's long-term goal is

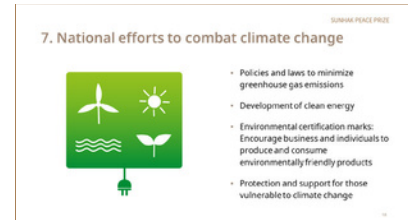


Kyoto Protocol		Goal	Paris Agreement
Reduction of greenhouse gas emission (1.1% to 5.2% from 1990)		Target of 2°C, efforts to reach 1.5°C	
Focus on reduction of greenhouse gases	Breadth	Reduction of greenhouse gases as well as application of clean technology transfer, capacity building, transparency, etc.	
Mainly developed countries	Who	All signatory parties	

to keep the increase of global average temperature to well below 2 °C (3.6 °F) above pre-industrial levels and to pursue efforts to limit the increase to 1.5 °C (2.7 °F).

## 7. National efforts to combat climate change

- Nations are developing policies and laws to minimize greenhouse gas emissions.
- Clean energy development: Nations are researching and developing clean energy methods that can help the environment and use less fossil fuels.
- **Environmental certification marks:** Prepare various policies related to business and personal production and consumption and encourage the production and consumption of environmentally friendly products. Designate environmental certification marks on products and promote consumption of these products.
- **Protection and support for those vulnerable to climate change:** Protection and support aimed at residents of farming and fishing areas (people who work in the primary industry to make a living) who are more severely impacted by climate change, people living in poverty who are vulnerable to natural disasters or infectious diseases, and residents living in low-lying coastal areas.



## 7. Individual action for climate change

- Remind the students that individual action is just as important as international and national efforts and guide them to brainstorm about actions that they can take in daily life.
- **Conservation of energy and resources:** If we lower heating by 1 degree Celsius, 231kg of carbon dioxide can be saved annually per household. Energy can be saved by keeping winter season heating to under 20°C and summer season indoor temperature to between 26~28°C. If we save 1 minute of shower time, this will reduce the carbon dioxide produced by 7kg. Install water saving shower heads and water efficient toilets, turn off the faucet while brushing teeth, do laundry after your clothes have collected.
- **Using public transportation and bicycles:** We can improve





our health and the health of the Earth by taking the bus, subway and walking. By walking or riding the bicycle, carpooling and using energy-efficient cars, we can reduce carbon dioxide emissions.

- **Using environmentally friendly products:** When considering products with the same function, consider using a product that is more environmentally friendly and produce less environmental pollution. Select products that are energy-efficient or produce less waste.
- **Planting trees:** Trees absorb carbon dioxide. A pine tree absorbs 5kg of carbon dioxide per year. Northern Europe, which is heavily forested, have greater absorption level of carbon dioxide and face less pressure of reducing greenhouse gases. Efforts should be made to conserve forests and plant new trees.

### (Taking action - Need for global solidarity and effort)

- Help the students realize that climate change is a threat to the entire Earth and that in order to resolve the issue of climate change, the cooperation of all members of the world's humanity are needed.



## 8. People fighting against climate change (1) - Greta Thunberg

- **Greta Thunberg:** Swedish-born environmental activist born in 2003. In August of 2018, she missed school and held a one-person strike in front of the Swedish parliament building calling for action by the Swedish government to address climate change. Her protest led to the Fridays for Future movement by millions of students worldwide.
- On September 23, 2019, Greta Thunberg sailed across the Atlantic Ocean on a solar yacht in order to attend and give a speech at the UN Climate Action Summit in New York, U.S.A. In her speech, she said, "You have stolen my dreams and my childhood with your empty words," urging the adults to deal seriously with climate change.



## 8. People fighting against climate change (2) - Anote Tong

- Anote Tong:** Politician and the 5th president of the island country Kiribati in the South Pacific. He actively raised the international community's awareness about the threat Kiribati and other Pacific island nations are facing of being submerged underwater due to rising sea levels caused by climate change. In 2015, he was awarded the Sunhak Peace Prize for his efforts. He also has also been mentioned as a candidate for the Nobel Prize.
- More than anyone else, former President Anote Tong actively responded to the impact that Kiribati was experiencing due to rising sea level. In order to protect the ocean, he made the decision to ban fishing rights in his own country's ocean. Also, he proposed the Pacific Oceanscape framework, a network of 23 Pacific island nations, to collaboratively manage the Pacific Rim and led the effort for it to be endorsed by the Pacific Islands Forum. Furthermore, he continuously advocated the issue of advocated for the human rights of his citizens who will be forced to leave their home due to rising sea level and came up with realistic measures to protect their livelihood.



## 9. Organizations fighting against climate change

- Intergovernmental Panel on Climate Change (IPCC):** The IPCC was established in 1988. It is an intergovernmental body of the United Nations composed of experts to assess comprehensive measures to mitigate climate change through objective, scientific information. It aims to understand the natural and social impacts with the ultimate goal of passing a treaty to prevent global warming of the Earth.
- Greenpeace:** Greenpeace is an international non-governmental environmental protection organization formed in 1971, to protest the United States nuclear testing in the Pacific. Its headquarters is in Amsterdam, Netherlands. Operating with donations from 3 million members worldwide, it is the most influential environmental organization. It campaigns to stop global warming and climate change and protect humanity.



**(Last slide – Thinking about the threat of climate change change)**

- After showing the students the video of Greta Thunberg’s speech, lead the students to think about the risks of climate change and reflect on how our own actions affect climate change. (The photo is of Greta Thunberg sailing on a solar-powered yacht to attend the UN summit. Discuss the inspiration that Greta Thunberg gives in her novel way of traveling in order to persuasively deliver her message about the threat of climate despite the challenging conditions.)

- **Video:** Watch the video of Greta Thunber’s speech at the Untied Nations Climate Action Summit

▶ <https://www.youtube.com/watch?v=u9KxE4Kv9A8&feature=youtu.be&app=desktop>

- Distribute the activity sheets to the students to reflect on the lesson.

