
Climate change and Building Energy Efficiency

Reflective Writing

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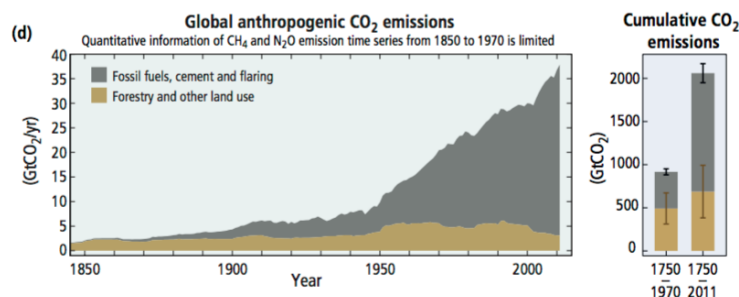


Introduction

We have been considering that how to improve the indoor environmental quality in this module. However, it is not enough for a Building Services Engineer. We should consider further and deeper not only about the building itself but also the environment surrounding. Nowadays, Climate Change becomes severer and severer but people still think that it is none of their business. Therefore, as a BSE student, I believe that it is critical to analyse the relationship between climate change and building energy efficiency.

History

The definition of the climate change is a long-term change in the earth's climate, especially a change due to an increase in the average atmospheric temperature (dictionary.com). The primary cause of the increasing temperature is because of the emission of the greenhouse gases(NASA, 2014). Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth as well as the fast urbanisation and building developments(Figure d). People had been over-combusting coal and oil and cause the greenhouse gases become higher than ever now. According to the NASA, human's industrial behaviour has caused to the highest atmospheric concentrations of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) in the last 800,000 years (2014). Their effects detected by the NASA climate systems are extremely likely to have been the pillar cause of the observed climate changing since the mid-20th century.



Consequences

For the environment, Global climate change has already had a lot of observable effects. Climate change not only simply raises the global temperature and the sea level, but also causes more frequent wildfires, longer periods of drought in some regions and an increase in the number, duration and intensity of tropical storms (NASA, 2014) (Figure k). Moreover, climate change would do harm to oceans. Following the chemical equation $\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3$ I learned in secondary school, a high atmospheric concentration of carbon dioxide might force oceans to absorb an amount of carbon dioxide and the acidity of seawater will be increased. It changes the chemical composition of the global oceans and lets the marine ecosystem facing a threat of collapse as well.



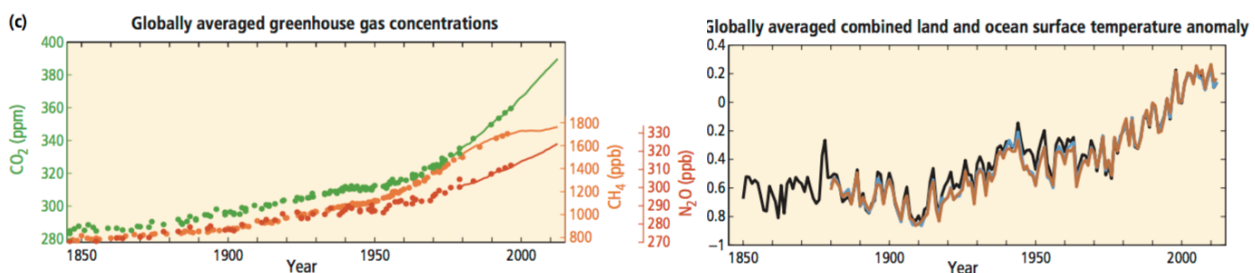
Figure k

Climate change also damages the global biodiversity because organisms would be influenced by the living environment changing. The global sea level rise would submerge many forests and thousands of the plants inside. Besides, the species in the cold areas may lose their living environment because the glaciers are melted at high temperatures and eventually not be able to adapt to the temperature rise and die, such as penguins, polar bears. Furthermore, natural ecosystems such as coral reefs, mangroves, tropical rainforests, grasslands, wetlands and other natural ecosystems are severely threatened.

Besides, climate change is associated with every person as well. It leads to frequent rainstorms and causes a high risk of flooding as well as dangerous landslides, threatening people's safety. Furthermore, because of the climate change, extreme weather will occur more and more frequently and it will also increase the risk of some climate-sensitive diseases. Other than the weather, climate change can affect food supply as well.

Trend

Nowadays, people still combust much oil and coal, which make the concentrations of the greenhouse gases in the air have been still getting increased(Figure c). With the growth of greenhouse gases, the globally averaged combined land and ocean surface temperature is getting higher and higher(Figure a).



Proceedings of the National Academy of Sciences reported that if people continue the current industrial operation and the level of the anthropogenic greenhouse gas emissions, glaciers in the Amundsen Sea will be completely melted. Cities like New York and Miami will be flooded by sea water, forcing millions of people to leave their home in thousands of years(2015).

Moreover, the Intergovernmental Panel on Climate Change (IPCC), an institute with more than 1,300 scientists, predicts a temperature rise of 2.5 to 10 degrees in next century.

In addition, the impact of climate change on individual areas will evolve over time and have the ability of different societal and environmental systems to mitigate or adapt to change(NASA, 2014).

Relationship with building energy efficiency

In order to slow the climate change, we must not only see the cause but also know clearly about its essence. The cause of the climate change is the emissions of the greenhouse gases. However, the reason why people discharge these greenhouse gases is because people used that amount of energy and its essence is that people have been using too much unnecessary energy in daily lives. With the knowledge of the essence of the climate change, one way we can slow the climate change is to reduce the unnecessary energy consumption in our daily lives. Otherwise, the speed of climate change would become faster and faster and finally uncontrollable.

In Hong Kong, buildings account for 60% of total energy demand (Dr. Hui, 2012) so that the potential for energy saving in buildings is colossal. As long as we can reduce the energy consumption in the building through increasing the building energy efficiency, we can reduce the total energy consumption in Hong Kong to a certain extent.

Through reducing the total energy costs, factories do not need to create that much electricity energy so that they can reduce the coal consumption and the emission of the greenhouse gases, slowing the global climate change eventually.

Ways to increase building energy efficiency

The definition of energy efficiency is "using less energy to provide the same service" (Lawrence Berkley National Laboratory, 2017). Assume I am a building services designer right now. With the knowledge we have learnt before, I will focus on two ways to increase building energy efficiency responding to the climate change — one is 'devices selection' and the another is 'sources control'.

Devices Selection

On the one hand, selecting some high energy efficiency devices instead of the lower ones is a good strategy to achieve greater building energy efficiency. For example, we can replace the incandescents with some LED tubes. Introduced by the guide in the last site visit at Smart Power Centre, LED tubes' luminous efficiency is much higher than incandescents. Through some high energy efficiency devices, we can use less energy to provide the same service then reduce the total energy costs in buildings. Eventually, it will lower the emission of the greenhouse gases, slowing the global climate change as I mentioned above.

On the other hand, we can also widely use the intelligent devices like intelligent plugs to minimise the standby power of devices. With the help of intelligent plugs, the

unnecessary energy consumption also would be saved, slowing the emission of greenhouse gases and climate change.

Sources Control

Controlling the sources which would costs energy to recover it can also save energy. For example, we can widely install low-emissivity glass whose solar heat gain coefficient is much lower than clear glass while the visible light transmission is close to that of normal ones. Through replacing the clear glass, lower the solar heat gain in summer and the energy consumption of HVAC systems, as well as the total energy costs, slowing the climate change in the end.

Conclusion

The climate change becomes a severe global problem nowadays. We must not hold an idea that it is none of my business, especially as a building services engineering student. Responding to the climate change, we must start from ourselves and reduce our unnecessary energy consumption in the daily lives. Besides, how to increase the building energy efficiency must become a critical topic for us in the future works. Starting to consider it earlier is good to our learning process. Through this assignment, I related the climate change to my knowledge learned in this field and thought about a plan to approach this issue in similar. I believe that this experience will become very helpful in my life.

Reference

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