



Encouragement Award

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Global Warming is still so important - what is new in the field?

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The long-lasting climate and weather conditions on Earth are always changing and adapting, primarily influenced by the ocean and atmosphere. We call this climate change; a variation in weather conditions lasting longer than standard climate abnormalities (AAS 2013). This process may have previously been natural although currently, data has suggested that there is over a 95% chance that this modern alteration is anthropogenic. However, multiple human activities are definitively known to industriously contribute to this, including deforestation, utilisation of fossil fuels, rapid urbanisation, agriculture, and transport (WWF 2015). Whilst this directly does not change the temperatures and weather of our Earth, these factors produce 'greenhouse gases', mainly carbon dioxide, water vapour, nitrous oxide and methane. When short-wave radiation from space penetrates the atmosphere, a portion of it is absorbed into the ground, emitting longer-wavelength radiation back towards space. However, these gases absorb infrared radiation, rebounding it in all directions, including back to the surface, trapping additional heat on our planet (NASA 2021). This proposes multiple short-term and long-term impacts on both the environment and society, forcing action and innovation to be seen, despite the lack of action by authority.

The topic of climate change is not that of a new one, debated whether true or not, yet when observing the short-term impacts it has already imposed, it cannot be disputed. One evident impact of climate change on our communities is the housing and safety of individuals. With a rising climate and in turn higher sea levels, multitudinous coastal residents have been forced to move, in fear of their houses being submerged or at risk of tsunamis (increased intensity in natural disasters and weather patterns) (Muggah 2019). We can already observe a lowered availability of agricultural produce and water in certain areas due to this alteration of weather conditions, more specifically reduction in water availability through changes in precipitation patterns and extreme weather occurrences (US EPA 2012). And although it may seem like we have decades to fix our contributions to polluting the planet, an impact on the economy of developing countries has emerged, rupturing job opportunities in the agriculture, forestry and tourism industries. Not only does it impact humans however, but animals in addition. Over 700 species of birds and mammals are threatened by a loss of habitat as a result of global warming (The Independent 2017). With climate change proposed as a major issue for future generations, our current society and ecosystems face immediate impacts as well.

Besides the current and short-term impacts, the topic of climate change fosters an illimitable list of forthcoming issues. Mentioned frequently throughout the media, rising sea levels, which despite hosting controversy surrounding the legitimacy of it, will be a prevalent issue for millions, if not billions of citizens in decades to come. Already in the past 150 years, global sea levels have risen by an average of 22 centimetres across the globe, not to mention a majority of this occurring in the past 50 years (NOAA 2021). According to a study conducted and recorded by Proceedings of the National Academy of Sciences of the United States of America (PNAS), relative to the sea level of the year 2000, thawing of permafrost and arctic environments will contribute to almost 70 centimetres of increase in oceanic water levels, displacing approximately 187 million individuals in the next 80 years (Bamber *et al.* 2019). It must be held into consideration however that melting of ice under sea level does not increase water levels yet just displace it from these arctic reservoirs. Despite this, the process of thawing permafrost above sea level not only releases water into the oceans but reemerges large quantities of carbon dioxide previously absorbed or around 1500 gigatons of carbon dioxide (almost double that of what is currently in the atmosphere) (Cho 2018). While the influences of climate change do not conclude there, it continues with parallel issues such as biodiversity loss, poorer air quality, desertification and an increase in abnormal weather patterns.

Moving forward as a society, how we function and perform daily tasks must mold around the necessity to eradicate and mitigate the effects of climate change on our planet. In 1992, international policies were established regarding climate change as subject by the United Nations Framework Convention on Climate Change, agreed upon by 192 nations. It states an end goal of "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" as directly quoted by them. A standard agreed upon by a majority of meteorologists

promotes no higher than a 2°C increase in global temperature in order to prevent further long-term damage. As calculations assume, this would require stabilisation and lowering of greenhouse gases in the atmosphere by anywhere from 50% to 80% compared to 1990 recordings by 2050 (*OpenMind 2011*). This may be approached by utilising renewable sources of energy such as solar panels and wind turbines. While this alone is not able to completely solve the ever-growing matter, 25% of carbon emissions are generated through energy production and according to a research paper, 134% of Australia's residential energy consumptions could be met if each household rooftop featured solar panels (*Brass 2013*). Another proposed and required approach towards lowering our carbon footprint is decreasing meat consumption, which requires tens of thousands of litres of water per kilogram of meat and in effect, reducing water waste (*The Guardian 2013*). In relation, urbanisation supports a plethora of issues concerning deforestation and endangerment of animal and plant species. This practice is incomprehensibly unsustainable, destroying around 10 million hectares of land yearly, housing one of the largest impacts, with only one solution: planting new forestland in place of it (*Ritchie & Roser 2021*). Transportation, contributing to 29% of all emissions in the US in 2019, is another major factor in our global footprint (*US EPA 2015*). This may be greener transportation methods whether it be electric vehicles or petrol efficient engines or even eradicating a need for cars, focusing on other forms of transport as seen in Copenhagen (62% of the population commuting on bicycles) (*Cortright 2019*).

Despite the history of human activities and intervention resulting in environmental harm, innovation paves the way for a greener future, promising action against our number one issue. These 'human activities' can be exhibited through methane leakages, enabling this invisible and odourless greenhouse gas to seep into the atmosphere for multiple months before identification. This already sounds concerning, yet methane is capable of confining over 80 times more heat than carbon dioxide although with a shortened 'lifespan', contributing to 25% of global warming occurring today. To combat this, a collaboration of scientists are dedicated to sending a satellite into orbit, locating where leaks are located and potentially reducing emissions from industry practice by up to 50% (*McCarthy 2018*). Whilst not a new technology by any standards, silvopasture, as the name suggests, is the process of integrating forestry and pasture with the livestock industry providing numerous mutual benefits. We can already observe this practice on approximately 350 million acres of fertile land. The key component to this is soil which provides an opportunity for carbon sequestration by both organisms above and below the surface up to 5 to 10 times more efficiently than pastures without fauna. Project Drawdown calculates that by expanding this silvopasture land to 554 million acres, not only can \$700 billion USD be saved in a plausible situation but also a reduction of 31.19 gigatons of carbon dioxide generated by the agriculture industry by 2050 (*Green America 2017*).

As innovation still has a requirement of development and experimentation that the time crunch of climate change limits, a 'stopgap' in order to allow for longer-term ideas to come to fruition has been proposed, even if somewhat controversial. This tactic regarded as 'Solar Radiation Management' or SRM describes a possibility of stimulating weather patterns or natural events such as volcanic activity at higher altitudes or cloud-cover over oceanic regions. The Marine Cloud Brightening Project states that a major catch of this concept is the lack of technology or global effort to estimate where to place this technology, in addition to the requirement of a clean power source (*Zichermann 2019*).

Taking everything into consideration, it may be perceived that climate change is inevitable and we as a society are to blame and whilst it may be true that we initiated it, we too can stop it. When analysing the short-term impacts already evident in our society and planet such as a loss of housing for hundreds of thousands of individuals and economic influence it seems it's too late to solve yet by paving the way with innovation and contribution, we can fix this. By the unification of 192 nations under the UNFCCC, a clear path has been dedicated to providing goals and schemes to prevent further damage or intensification of long-term impacts. Climate change may be the most intense issue of our generation but we can solve it one step at a time.

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