

Opinion: To Win Global Warming Fight or to Survive with a Contingency Plan

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Abstract Global warming is a "Tragedy of the Commons"; it has been damaging the climate rapidly in the last few decades and could render the Earth uninhabitable by the end of this century. By the end of 2100, the UN warns of an increase of up to 3.1 °C in the planet's temperature without greater action. The 3 °C increase is extremely devastating to humans, animals, plants, insects, and the Earth's health. In this paper, the global land average temperature anomalies in Celsius from 1955 to 2024 were used to project the increase of global land average temperature up to 2060 based on polynomial and linear models. Observed temperature data were obtained from the National Oceanic and Atmospheric Administration (NOAA). Based on our linear and polynomial analysis, we could see an alarming 2.5 °C or 3.5 °C by 2060, respectively. As the Earth's population increases, greenhouse gases due to human activities increase as well. Our projection of the average atmospheric carbon dioxide (CO₂) concentrations worldwide using data from 1960 to 2024 indicates that the CO₂ concentration could increase from the current 425 ppm to 475 ppm and 500 ppm by 2050 based on exponential and polynomial models, respectively. Our continuing reliance on burning fossil fuels for energy production, deforestation for lumber harvesting, unlimited production of gas-emitting vehicles, and environmentally harmful industrial practices are affecting the planet's health. Individuals and governments must investigate this alarming issue as the clock is ticking. Humanity should decrease greenhouse gas emissions to reduce global warming and maintain the Earth for future generations. Promoting sustainable practices and adopting new strategies can enhance our interaction with the environment by slowing down global warming. The international community's legislative measures limit harmful activities that feed global warming and could reverse the deterioration. At the same time, governments may consider developing collaborative contingency plans to ensure humanity's survival in case conventional solutions and mitigations fail. Such plans include initiatives for colonizing the Moon or Mars, constructing underground pilot solar cities, or developing hydrogen-fueled underwater model cities through water hydrolysis to serve as potential homes for future generations by the start of the next century. Current initiatives and ongoing efforts include, but are not limited to, SpaceX, Blue Origin, and Artemis programs, as well as Coober Pedy underground living, San Diego city's Zero Emissions plan by 2035, and Japan's Ocean SPIRAL concept.

Keywords Global warming, Save the Earth, Greenhouse gas emissions, Strategies to interact with the Environment

1. Introduction

Climate change, a global issue, has been a big problem affecting the Earth, but fixing it is increasingly essential. Billions of tons of ice melt each year, causing rising sea levels. Like a domino effect, climate change is not limited to one region, and what happens in one area affects other parts of the world [1-7]. For example, the deforestation of the Amazon Rainforest impacts its local biodiversity and causes a worldwide rise in carbon dioxide in the atmosphere. Making these connections is crucial for preserving public health and promoting a sustainable future for generations.

It should be remembered that there will be no Earth to live on if it is destroyed by global warming and climate change. The current and future impacts of climate change should be investigated with urgency. Most Arctic areas are melting, and widespread ignorance of them is a global problem.

Along with melting Arctic poles, deforestation lost about "346,000 ha of forest between 1988 and 2011" [3]. Deforestation releases carbon dioxide and pollution into the air. People see it as a distant threat that is not affecting their lives. However, climate change is warming the planet and is impacting "drought and sea levels" [1-2].

2. The Causes and Impact of Global Warming

As global temperatures rise, evaporation slowly increases,

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leading to drier conditions worldwide. The polar ice is melting and resulting in rising sea levels, thus affecting animals in coastal oceans, eroding natural habitats that nature cannot easily replace. Human activities like air pollution and global carbon emissions primarily drive climate change. The changes in climate due to the increase of greenhouse gases are caused by alarming changes in the radiative regime of the atmosphere [4]. Factories emit carbon dioxide into the air, polluting and affecting the planet and animals. They are helping to increase carbon dioxide in the air. Smog is polluting the air around cities and gradually taking over green spaces around towns. Smog harms the environment. As commonly understood, global warming is connected to human activities, notably the burning of fossil fuels and the high rate of deforestation" [3].

Most lives are driven by fossil fuels for gas and electricity. People fuel fossil fuels and deforestation primarily through various activities that reflect modern lifestyles and economic practices. Every time a person leaves the house, they use some transportation or resource that requires fossil fuels. People's lives are like the fuel feeding the fire of global warming, just like how we put fossil fuels in our vehicles. Everything a human does impacts the environment. Most homes and appliances are made of wood, and forests must be cut down to get wood. The more people on the Earth, the more destruction is done. All "greenhouse gases increase due to human activities," and therefore "the basic radiation balance is altered" [4]. CO₂ emission is one major factors of greenhouse gases that increased exponentially over the last few decades. Using currently available statistical data [8-9] and Excel extrapolations, the CO₂ emission could reach 500 ppm in 2050 if the current CO₂ emission trend is not mitigated (see Figure 2).



Figure 1. Global warming is taking over the planet, and due to greenhouse gas emissions (top right), it could make the earth uninhabitable (top right); legislative action from governments (bottom left) around the globe could overturn global warming (bottom right). The ChatGPT mobile app was used to create images

Humanity is the reason for global warming, but natural disasters also contribute to greenhouse gases. Volcanoes and solar cycles change the temperature of the Earth along with carbon. These natural disasters are small compared to all the greenhouse gases people emit. Alongside harmful carbon emissions, warming climates affect crops, putting "millions at risk of hunger resulting from climate change impacts on crops" [1-2]. Using the current data [10-11] and the extrapolated MS-EXCEL data (global land temperature rise shown in Figure 3), land temperature rise could hit above 2.5 °C by 2060. The impact of temperature change is summarized in Table 1 [12-13]. These consequences are not just statistics; they are a stark reality that people in cities may not realize at first, but when crops start to die, the country will have less food overall. Those growing the food will make less money, which raises concerns about whether they will be able to support themselves. The farmers will have less money to feed their families and fewer crops to feed livestock. Without livestock, cities' citizens would also start to go hungry. But most of all, those living in poverty will be the most affected because they cannot get enough food to begin with. Without "interventions designed to protect the most fragile ecosystems, desertification threatens the economies based on subsistence agriculture" [5]. Populations will undergo food insecurity and starvation when ecosystems start to decline. The economy relies on farmers' yearly crop production. The Earth does not get any bigger, so once regions have been destroyed beyond repair, people cannot create new land.

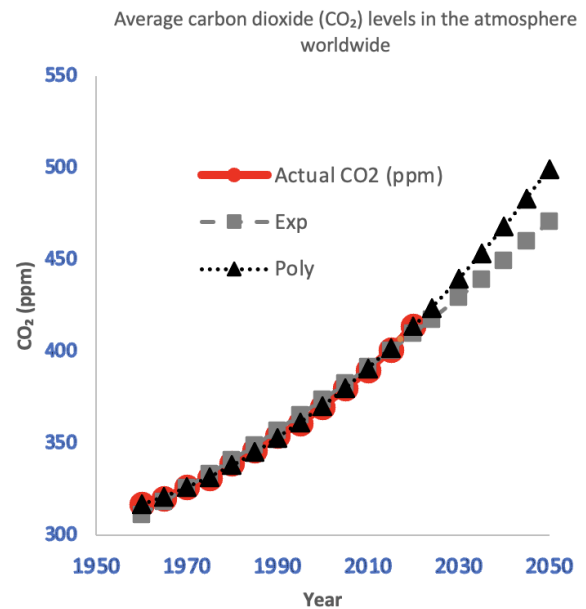


Figure 2. Average atmospheric carbon dioxide (CO₂) concentrations worldwide from 1960 to 2024, with projections to 2050 based on exponential and polynomial models. Observed CO₂ data were obtained from the National Oceanic and Atmospheric Administration [8-9] and extrapolated using MS EXCEL. Both models fit the historical data to forecast future CO₂ levels. The exponential and polynomial models accounted for 98% and 99% of the variance in CO₂ concentrations, respectively (adjusted R²= 0.98 and 0.994). Projections beyond 2024 are subject to model assumptions and uncertainties, indicating a continuing rise in atmospheric CO₂ levels

Once this happens, people will have to find more land, which will take a toll on the environment. Another health effect of global warming is increased deaths due to heat waves, which affect people and the environment. Global warming is causing heat waves that "produce excess mortality, even in developed countries" [5]. Heat waves are killing crops, which is taking a toll on human health. In regions where people do not have access to air conditioning or areas where they can cool off, heat waves also disrupt daily lives. Outdoor activities are uncomfortable, and people must change their daily activities due to the weather. Another concern is that outdoor jobs, such as construction, become less tolerable. High heat exposure can lead to a variety of health concerns. An example of a direct health issue is "urolithiasis," which can be attributed to "the physiological link between high heat exposure, sweat function, dehydration, and kidney function, with a consequent apparent increase in kidney stone incidence in hotter climates [5-6]. Kidney function is essential for people to live their lives. Tackling global warming requires a multifactorial approach. Focusing on decreasing greenhouse gas emissions and protecting the Earth from heat waves [12-13].

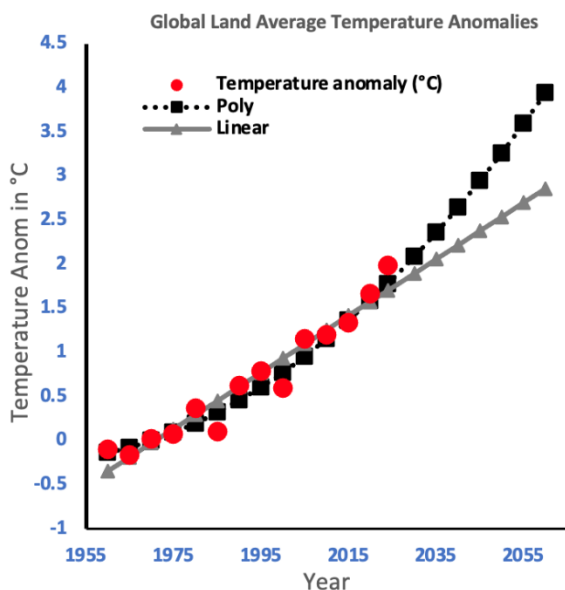


Figure 3. Global Land Average Temperature Anomalies (°C) from 1955 to 2024, with projections to 2060 based on polynomial and linear models. Observed temperature data were also obtained from the National Oceanic and Atmospheric Administration and extrapolated using Statistica software [10-11]. Both models fit the historical data to forecast future temperature anomalies. Anomalies represent deviations from the baseline average based on historical records. The polynomial and linear models explained 96% and 93% of the variance in temperature anomalies, respectively (adjusted $R^2 = 0.96$ and 0.93) based on MS-EXCEL. Projections beyond 2024 are subject to model assumptions and uncertainties, indicating a continuing rise in temperature levels consistent with global warming

3. Conventional Solutions to Compact Global Warming

The impact of global temperature increases of 1.5 °C and

2.0 °C is summarized in Table 1. The increased temperature deviation of 1.5 °C and 2.0 °C is expected to be reached in a few years based on extrapolation in Figure 3. By 2060, the impact should be more severe as extrapolated in Figure 3 using MS-EXCEL. People use energy daily, but most "energy is wasted or used inefficiently" [4-7]. People leave lights on in their homes and workplaces every day and even leave them on in phone chargers; they add up to a large amount of energy wasted. If every person leaves a charger plugged in, it adds up even more. When someone leaves the room, turn off the lights and unplug unnecessary devices and cords to help reduce the amount of wasted electricity and energy. Many studies have shown "improvements in energy efficiency of 30% or more" [4-7]. When building houses, construction puts improved insulation in place to save on heating, cooling, and energy required to keep these houses comfortable. While unplugging appliances is a great start, there are more economical ways to harness energy and power, such as using hydropower to make electricity rather than using fossil fuels and burning them for power. Today, much of the necessary technology is available for renewable energy sources, which can go a long way towards replacing energy from fossil fuels, to developing and implementing modes of energy such as solar energy, wind, and tidal energy [4-7].

Table 1. Projected impacts of extreme heat events, sea level rise, vertebrate loss, plant loss, fishery decline, insect loss, crop yield reduction, and coral reef decline associated with global temperature increases of 1.5 °C and 2.0 °C. The data illustrate the escalating consequences of rising global temperature anomalies [12-13]

Impact	1.5 °C	2.0 °C
Extreme heat Occurrence	Every 100 years	Every 10 years
Sea level rise	0.40 meters	0.46 meters
Vertebrate loss	4%	8%
Plant loss	8%	16%
Fishery annual Decrease	1.5 million tons	3 million tons
Insect Loss	6%	18%
Crop yield drop	3%	7%
Decline in coral reefs	70-90%	99%

People have come a long way and can use these better energy sources that keep people healthy and the environment. Individuals can do their part in the fight against global warming and protect our environment by taking a few small steps at a time. All communities can take part, no matter what. Everyone can help increase green spaces and water management. Starting with these small, additive actions will overall help improve human health and change the effects of heat waves on agriculture. Individuals can save the earth, but first, they need to know why and how they can help. History is the most important because it shows what is happening and what it is doing. We can all be the change by turning off a light, using less fossil fuel, and stopping deforestation. Additionally, the international community's legislative measures limit harmful activities that feed global warming, which could reverse the deterioration.

4. Collaborative Contingency Plans

Plan B is needed to save humanity in case the global government's legislative efforts fail. As shown in Figure 4 and Table 2, this plan includes, but is not limited to, building underground solar cities, underwater cities, eco-friendly homes and cities, or colonizing the Moon or Mars as the next generation's new homes by the start of the next century. Four written prompts describing what the ChatGPT mobile app needs to create images. Individuals, private investors, and governments may consider developing collaborative contingency plans to ensure humanity's survival and for future generations. Comparison between Conventional and Contingency potential solutions is summarized in Table 2. Some initiatives and ongoing efforts include SpaceX, Blue Origin, and Artemis programs, as well as Coober Pedy underground living as a module for the future, San Diego city's Zero Emissions plan by 2035, and Japan's Ocean SPIRAL concept [21-26]. Many cities and countries could develop their own plans as the rise of water could sink many cities by the start of the next century [27].

Table 2. Examples of Initiatives and projects to combat global warming. Conventional plans as well as contingency plans are included and referenced side by side

Global warming solutions	
Conventional plans	Contingency plans
Green energy transition solar & wind [14]	Underground solar cities [21] as in Coober Pedy in Australia
Individual Transportation Public buses, biking & electric cars, EVs [15]	Eco-friendly homes [22] as in San Diego eco-friendly city with 2035 zero emissions goals
Government's role: As in the Paris Agreement [16] Policies and regulations	
Combating deforestation [17]	Colonizing the Moon or Mars, as in SpaceX [23], Blue Origin [24], and the Artemis program [25], future mission plans to the Moon and Mars.
Cut CO ₂ and methane emissions [18] Engaging the private sector [19] Investing in new technologies [20]	Underwater cities [26] as in Japan's ocean Spiral concepts

5. Conclusions

Winning the fight against global warming is possible with international collaboration and global investments in environmentally friendly energy technologies. Alternatively, although it may seem dystopian, a contingency plan is urgently needed as conventional ways to serve the environment may fail to save the Earth. Based on our Figure 3 and based on the linear and polynomial analysis, we could see an alarming 2.5 °C or 3.5 °C by 2060, respectively. A UN report warns that an increase of 3.1 °C is inevitable by 2100 without greater action [28]. The 3 °C is extremely devastating to humans, animals, plants, and insects as well as to Earth's health [28].



Figure 4. Plan B is needed to save humanity in case the global government's legislative efforts fail [21-26]. This plan includes, but is not limited to, building underground solar cities (top left), underwater cities (top right), eco-friendly homes (bottom left), or colonizing the Moon or Mars (bottom right) as the next generation's new homes by the start of the next century. Four written prompts describing what the ChatGPT mobile app needs to create images

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