The Costs of Climate Change

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The Costs of Climate Change

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Abstract. This research paper talks about the economic costs of climate change, as well as the costs involved in responding to climate change with alternative fuels. This paper seeks to show that climate change, although seemingly costly in the short run, will both save future generations trillions of dollars and serve as a good economic opportunity. Scientists have long argued that the fate of humanity depends on a shift towards renewable energy. However, this paper will make clear that there is also an economic struggle. By embracing alternative fuels, we will not only lessen the danger and the frequency of these natural disasters but also strengthen the world’s financial state. Although a common argument against responding to climate change is that it is too expensive to make the switch, this research shows that in the future, it will save millions of lives and trillions of dollars. The only question left for policymakers is whether they will grasp this energy source shift.

1. Introduction
Today, corporations thrive on the fossil-fuel industry. While doing so may help these corporate CEOs reap great profits, this reliance may also hurt the planet. Corporations gain by harming the Earth to produce the energy we rely on, and because we rely on this generated non-renewable energy so heavily, corporations in turn earn substantial revenue from this reliance. Today, we know that there are other energy alternatives that could save Earth, like solar and wind power. However, few businesses have embraced the idea of clean energy; this reluctance to switch suggests that switching from a coal driven industry to a clean one is perhaps not as simple as one might think. It is true that switching to clean energy would be a crucial and substantial step towards saving our earth from trajectories that would soon kill us. But at the same time, many political and private actors feel that jobs could be lost, and thus unemployment could rise. So how can we convince our leaders to step up and respond to climate change if they feel so entitled to defend their economy in accordance with these fears?
In order to do so, we need to demonstrate that great possible economic opportunities lie in store only if we respond to climate change.

2. Consequences of inactivity:
Firstly, we should recognize why climate change so urgently needs a response.
If our leaders decide not to respond to climate change, the climate will literally continue to drastically change. This changes will likely be palpably felt through “many heat waves, create more intense rainstorms and the disintegration of coral reefs” (Friedman, 2017) [1] in addition to the melting of huge ice sheets. As the ice sheets melt, the sea level will rise, which would thus increase the severity and occurrence of natural water-related disasters. According to NASA [2], the global average sea level has already risen by 86.4 millimeters [Figure 1] since 1993.
What does this mean for the economy? For starters, the infrastructure in coastal cities will be deeply damaged due to the increasing hurricanes – in both strength and size – caused by climate change. Governments in civilizations around the world will need to spend billions in order to simply repair the groundwork so many citizens rely on. What’s worse, the many countries whose coastal cities are in peril due to rising sea levels will also be unable to trade with other countries because they will have more pressing economic and survival priorities. Even then, the consequences to climate change do not stop there. From a human standpoint, climate change and natural disasters often lead to many unfortunate and unnecessary deaths around the world.

If we do not respond to climate change by cutting our carbon emissions, there are no other simple and cheap alternatives. If we do not reduce our carbon footprint, the next generation will have to pay up to $535 trillion to clean the atmosphere, according to a new study by Anthropocene [3]. These costs would include the removal of carbon dioxide emissions from the air using negative emission technologies to avoid only the worst consequences of climate change.

Simply by not responding to climate change, mankind will negatively impact important aspects of society such as the economy; mankind will also experience negative ramifications through severe losses of human life. From an economic standpoint, we would deeply damage the economy by not responding to climate change. In other words, it would be economically beneficial if we responded to climate change, especially given the consequences of inaction.

However, even if 97 percent of scientists agree that climate change is real and requires an urgent response, such facts and near-universal agreement within the scientific community have clearly not been enough to convince politicians to feel the same way. These “climate deniers” disregard climate change simply because they believe – or fear – that responding to climate change is harmful to the economy. Such fear is primarily founded on the structure of our two-party election system, which forces elected officials to take both their party’s platform and public opinion into account when seeking re-election. By providing evidence that responding to climate change will in fact strengthen the economy instead of draining it, politicians may find that there should be no reason to not respond. In fact, they should reframe their messaging to show that the economic boost from responding to climate change constitutes another incentive in addition to the environmental benefits.

3. Infinitesimal supply and high demand for renewable energy

The end goal of successfully responding to climate change is to reduce carbon dioxide emissions. And what better way is there to accomplish that reduction than by using renewable energy? By definition, renewable energy should be “infinite.” On the other hand, non-renewable energy is limited in supply.
and thus does not replenish in a short amount of time. For the most part, non-renewable fuel is the main factor in causing climate change, as it emits carbon dioxide when this fuel is burned. On the other hand, most renewable energy sources do not emit carbon dioxide, so as a result, alternative energy, or renewable energy that does not emit carbon dioxide, can act as a desirable substitute to fossil fuels.

There are two reasons why the switch to renewable energy is absolutely necessary. Firstly, the switch has an immediate benefit simply because by using alternative fuels, carbon dioxide emissions will fall and the effects of climate change may slow to a halt. Another reason involves the magnitude of the growth of the human population. For perspective and context, the world population has grown seven times since the 1800s [Figure 2], according to the United Nations Population Division. [4]

![Figure 2: World Population Growth Through History](source)

With so many people, each household today requires massive expenditures of energy to conduct daily operations. Currently, Earth’s population relies mostly on non-renewable energy, which is limited and not quickly replenished. Given high demand and the limitations of non-renewable energy, renewable energy sources need to be increased and contribute more to total energy generation, especially in the United States. Currently, renewables account for 10% [Figure 3] of the total energy generation for the United States. [5] If we do not make the switch to cleaner energy, the high demand for energy will mean continued emissions of large amounts of carbon dioxide, which will then contribute to climate change.

On the other hand, renewable energy is an infinite energy source that cannot be depleted. If we were to implement appropriate technology and infrastructure to capture and generate this renewable energy on a large scale, the economic and environmental benefits could be substantial. We have only scratched at the surface of the potential of renewable energy. Clearly, it is a new lucrative business simply because the source (renewable fuels) and the product (energy) are both infinite. Given that the high demand in
mind for such energy sources, it would make sense for us to capture the infinite supply that exists to feed that large population demand. As it stands, we currently have a high demand with an increasingly diminishing supply, while at the same time the effects of climate change increase.

Figure 3: U.S. energy consumption by energy source [5]

4. Steady job growth for renewable energy
An economy cannot run without its respective employees. These jobs fuel businesses, which in turn drive the economy. Jobs have also been the main assumed pretext for not responding to climate change; many have pointed out that coal jobs will be lost and thus the unemployment rate will soar. Because of renewable energy’s demonstrated potential, politicians are quite worried that renewable energy will become a replacement for non-renewable energy. Coal mining companies are especially worried that their own jobs will be replaced by solar and wind power. This dilemma could not have been more clearly demonstrated than in our current U.S. president Donald Trump’s campaign for office.
Donald Trump’s administration has promoted active falsehoods about the state of climate change. Specifically, his EPA administrator Scott Pruitt has lied about the jobs of the coal industry. According to Politifact [6], Pruitt claimed that 50,000 more coal mining jobs have been added since last year. Politifact rates this claim as “mostly false” [7]. In fact, the actual increase in coal jobs was 1,300 jobs [8]. However, the lies stem from political motivation; specifically, Donald Trump wants to revive the coal industry with coal jobs for people.
However, this is a near impossible feat. U.S.’s Coal Mining Employment, [9] has been at a steady decrease from 900,000 jobs in 1923 to 100,000 in 2016 [Figure 4].
There are numerous reasons for this, the drop in natural gas prices being the most paramount. The rise of renewable energy, as well as the advent of automated machines in place of human miners has contributed to the decrease. Given these and other reasons, there does not seem to be a need for coal miners anymore.
At the same time, renewable energy is on the rise. This kind of energy has become much cheaper in the last eight years. Solar energy’s costs have fallen 85 percent between 2008 and 2016 [Figure 5] and
wind costs have fell 36 percent [Figure 6] (Columbia, Houser) [10]. As a result, renewable energy has clearly emerged as a new potential market ready for international trade.

Figure 4: US Coal Mining Employment [9]

With such a profitable market, there must be jobs to support these developing businesses. There are currently 260,000 solar energy jobs across the country, twice as many jobs as the total coal jobs in the U.S. (Plumer, Vox article) [11]. As coal plants have closed in recent years, renewable energy could be a good energy replacement, especially because renewable sources are well-suited to responding to climate change by lowering carbon emissions. However, renewable energy jobs are not in the “right” locations. According to the Solar Foundation [12], West Virginia and Kentucky, states that still contain coal jobs, are ranked at the bottom ten states in solar jobs per capita. These coal jobs have not been replaced by renewable energy, simply because renewable energy jobs are not where coal once was.

Figure 5: Solar PV Module Costs and Generation [9]
However, renewable energy still possesses massive potential. With the costs decreasing and the jobs increasing, people should embrace renewable energy as a solution to climate change and a solution to replacing lost closed coal plant jobs.

Cents per kWh (Left Axis) and Billion kWh (Right Axis)

Figure 6: Wind Energy Costs and Generation [9]

5. Conclusion
As a result, there is no other alternative than to respond to climate change. Disregarding the proven facts will only exacerbate global warming, and as described above, likely will lead to a chain of natural disasters. Lowering carbon emissions is the only way to truly stop climate change and its impending disasters. Other solutions like negative emission technologies are very expensive and at the same time inefficient because they only prevent a small number of the many consequences climate change could entail.

On the bright side, responding to climate change leads to substantial benefits. By using renewable energy to power the world, it is possible to reduce carbon dioxide emissions and thus gradually stop climate change. It will not be a quick process to switch. But substantial efforts to transfer from one energy source to another are needed. Climate change requires an immediate call to action. Without a response, the human population will suffer under preventable yet terrible disasters. An energy-craven population relying on renewable energy is the best solution to lower carbon dioxide emissions and thus stop climate change. Given its economic benefits and effectiveness in combating climate change, it is important for the world to wholeheartedly embrace these renewable solutions. If the world can agree and cooperate with each other, the switch to renewable energy will be easier. Otherwise, without a switch, the world is set up for failure.

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