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The United States, China, and Climate Change: An Analysis of the US-China Climate Pact and its Implications for International Climate Negotiations

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The United States, China, and Climate Change
An Analysis of the US-China Climate Pact and its Implications for
International Climate Negotiations

By
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of the requirement for
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Introduction

Climate change increasingly is becoming a major issue for the international community. It is contributing to rising global temperatures, rising sea levels, drought, natural disaster intensification, and ecological damage, amongst other things. A scientific consensus has emerged over recent years that implicates greenhouse gases, chief amongst them carbon dioxide, for causing global warming. Climate scientists overwhelmingly agree that the greenhouse gas effect has been caused in large part by the spike of human emissions since the dawn of the Industrial Revolution. To reverse the problem, the density of greenhouse gases in Earth's atmosphere, especially carbon dioxide, has to be reduced. Doing so necessitates a combined approach of reducing emissions at present and in the future, and removing greenhouse gases currently present in Earth's atmosphere.

This is easier said than done, though. Climate change is an international issue, and threatens the entire globe. However, there are some 200-odd countries in the world, all with very different domestic interests, political pressures, and energy industries. The great challenge for combating climate change will be whether or not all these very distinct countries with very disparate interests will be able to form a cohesive front to combat climate change. Indeed, climate change is a global problem with solutions that are at odds with local interests. The asymmetry of these interests complicates efforts to combat climate change.

In 1992, the 197 members of the United Nations ratified the United Nations Framework Convention on Climate Change (UNFCCC). Under the auspices of UNFCCC, the global community would immediately convene to try to move forward

with a broad multilateral agreement to combat climate change. However, initial efforts failed miserably. The first major failure occurred in Kyoto, Japan. Although all participating member states agreed to the framework agreement, it was not ratified in the United States, at the time the largest economy and greatest emitter in the world, because of domestic political reasons. The failure of the United States, the world's great polluter, to get onboard with the agreement would set back negotiations for years to come.

The second blunder came in Copenhagen, Denmark, in 2009. The newly emergent People's Republic of China had overtaken the United States as the world's largest polluter and largest economy despite still being in its development stages. It still seemed that neither the United States nor China was yet serious about addressing the climate change issue, and without the two biggest polluters on board, there was little reason for any other country to agree to a framework to reduce their own emissions. In addition, disagreements between developing and developed countries about negotiation approaches and goals plagued negotiations by creating an atmosphere of distrust. Clearly, if any success were to be made in multilateral negotiations, something would have to change.

The Administration of President Barak Obama, elected as the President of the United States in 2008, saw climate change as a hugely important issue. Thus, the administration decided to pursue bilateral negotiations with the Chinese to produce some sort of climate change agreement. A non-binding deal was struck in November of 2014 in which both countries promised to meet emissions-reductions targets by specific years. The US pledged an economy-wide target of reducing its emissions by 26%-28% below its 2005 level in 2025. The Chinese agreed to cap emissions growth by 2030. While

these targets would be insufficient to combat climate change alone, the greater goal was mobilizing the international community to finally complete substantial multilateral negotiations, specifically at the next (and maybe last) UNFCCC meeting in December of 2015 in Paris, France.

The deal was not easily struck. The Chinese were hesitant to agree to anything, but combined domestic pressures, especially an emerging public-health crisis caused by air pollution, and international pressure applied by the United States forced the Chinese hands. In the United States, President Obama had to move aggressively, with stiff resistance from the US Congress and special interest groups, to take executive action that would reduce emissions and improve renewable energy. However, after much deliberation, both sides came on board.

This agreement provided substantial momentum for UNFCCC COP XXI in Paris. It showed that the United States and China, the two great polluters, were serious about addressing climate change. Additionally, as both countries served the role of presumed leaders of the developed bloc and developing bloc respectively, this bilateral agreement helped bridge the gap and clear any mistrust between the two groups. A comprehensive agreement was made in Paris in which every member state of UNFCCC pledged to meet specific emission reduction targets. Additionally, the UNFCCC climate change regime would reconvene every five years to assess, and potentially improve upon, the pledges made in Paris. Initial scientific analysis widely came to the conclusion that if the pledges made in Paris are met, global temperatures will hold below a 4 degrees Celsius rise, widely regarded as a catastrophic red line.

There are a variety of reasons this new international climate change regime could fail. In the 2016 US presidential elections, a number of candidates are diametrically opposed to the progress made by the Obama Administration. The slowing Chinese economy will present a difficult policy challenge for the Chinese Communist Party going forward, and it is possible that they will backtrack on their pledges. Either of these outcomes could unravel this regime. While these negative developments are possible, one should remain cautiously optimistic. The pace of geo-engineering research and development will help governments reduce emissions without reducing energy consumption. More importantly, though, is the fact that the progress made in Paris is substantially greater than anything established before. Without the US-China Climate Pact of November 2014, this would not be the case.

In sum, global temperatures are rising and there is strong evidence that the greenhouse gas effect is the cause of the problem and there is a consensus that action needs to be taken. In recent years, the international community has begun taking steps to address the issue. This thesis will examine and analyze how climate change emerged as a political issue, what has been done about climate change thus far, and what the future might hold with regards to climate change. Specifically, this issue will be examined through the lenses of the United States and China, the two leading emitters of carbon dioxide and the two presumed leaders of the international system. Chapter I will provide a scientific explanation as to why climate change is occurring, evidence as to how humans are responsible for climate change, and possible solutions for climate change. Chapter II will examine climate change in the context of China, specifically its vulnerabilities, its responsibility for the issue, its past efforts to address the issue, and

its capabilities and motivations moving forward. Chapter III will focus on the United States, including its vulnerabilities to climate change how it contributed to the issue, but most importantly will argue that the United States has and should continue to be a leader in environmental issues. Chapter IV will explain and analyze the US-China Climate Pact in the context of past climate negotiations, and will argue that the Pact was an important step in alleviating past issues that caused political paralysis. Chapter V will show why the Pact was so important, specifically with regards to its role in the successful completion of international climate negotiations at the Conference of Parties XXI in December 2015 in Paris, France.

Chapter I: A Primer on Climate Change

Things are starting to heat up, and they are heating up fast. 2014 was the hottest year on record. According to NASA, the world's average annual temperature has been increasing since 1891, and shows no signs of slowing down. To be precise, the average temperature of 2014 was 1.1 degrees Fahrenheit above the average for the whole average of the 20th century.¹ This record-breaking year of rising temperatures was driven in part by massive spikes in temperatures in Europe, Australia, and western North America. Clearly, the world is getting hotter. Compounding the issue is that the Earth is heating up at an alarming rate. Fascinatingly, all of the ten hottest years on record have come since 1998. Additionally, the New York Times recently reported that 2015 is on pace to be even hotter than 2014. These statistics beg the question – what is behind this trend of rising temperatures?²

This chapter aims to provide an explanation as to why temperatures are rising so rapidly across the globe. There is a comprehensive body of scientific evidence linking greenhouse gases, and most importantly carbon dioxide (CO₂), to rising global temperatures. Additionally, the source of much of the CO₂ in Earth's atmosphere seems to be from an uptick in human emissions, especially since the Industrial Revolution. Moreover, this rise in global temperatures has caused many negative effects to Earth's climactic and ecological systems.

¹ Shaftel, Holly. "Facts: Global Temperature." *NASA*. Global Climate Change: Vital Signs of the Planet. 2 March 2016. Web.

² Gills, Justin. "2015 Likely to Be Hottest Year Ever Recorded." *The New York Times* (New York City). 21 October 2015. Web.

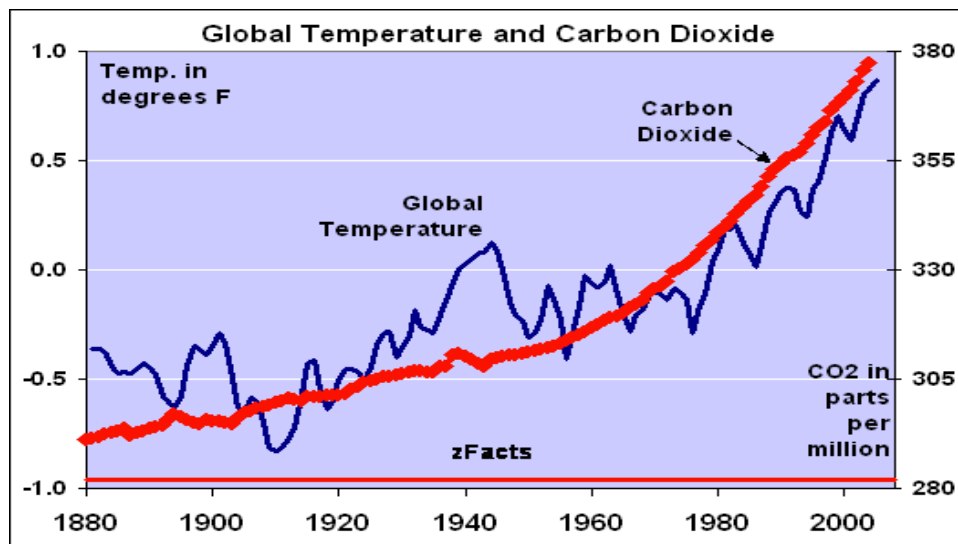
Carbon Dioxide and Temperature

Climate scientists have a plausible explanation for global warming. In 1861, John Tyndall published lab results that identified carbon dioxide as a greenhouse gas that absorbs heat rays. Tyndall invented the device now referred to as a spectrophotometer, which is used to measure the degree to which gases absorb heat. Tyndall's experiments showed that water vapor, carbon dioxide, and ozone all absorb heat radiation. At the time, Tyndall's research was significant because it provided an explanation for how the Earth's atmosphere retains heat. Now, though, Tyndall's conclusions have become the bedrock for explanations of the greenhouse gas effect – that is, an increase in the concentration of greenhouse gases in Earth's atmosphere increases Earth's temperature. His research, and the research of other important scientists, was reaffirmed and sharpened by the Swedish physicist Svante Arrhenius, who provided conclusive evidence in 1896 that carbon dioxide in Earth's atmosphere had an impact on temperature. Arrhenius concluded that the “temperature of the Arctic regions would rise about 8 or 9 degrees Celsius if the carbonic acid increased 2.5 to 3 times its present value.” Although newer climate models have come to different conclusions about the scale of an impact on Earth's temperature, what has not been overturned is Arrhenius' basic premise that an increase in atmospheric carbon dioxide would lead to an increase in the temperature on Earth's surface.³

According to climate scientists Joseph F. Dimento and Pamela Doughman, the field of modern climate science began in 1958 when Charles David Keeling, a professor of oceanography at the University of California, San Diego, began to collect a continuous

³ The Discovery of Global Warming: The Carbon Dioxide Greenhouse Gas Effect.” *American Institute of Physics*. March 2015. Web.

record of atmospheric carbon dioxide (an abundant greenhouse gas) concentrations from the Mauna Loa Observatory in Hawaii.⁴ Keeling's basic observation was that there had been a spike in the concentration of carbon dioxide (CO₂) in Earth's atmosphere over a fifty year period. Interestingly enough, this spike in carbon dioxide concentration coincided with an increase in global temperatures. Keeling's observations will be explored more in depth later – for right now, the important point is that there has been, since the beginning of Keeling's research, a correlation between a rise in carbon dioxide concentrations in Earth's atmosphere and a rise in global annual average temperatures. In fact, this correlation was present well before Keeling began doing research. The graph below shows the annual average global temperature (blue line) plotted against the carbon dioxide concentration in Earth's atmosphere in parts per million (ppm, red line):



Courtesy of Lon Hocker, a guest contributor to *Watts Up With That?*

⁴ DiMento, Joseph F. and Pamela Doughman. *Climate Change: What it Means for Us, Our Children, and Our Grandchildren*. Cambridge, Mass.: MIT Press, 2007. Print.

While temperature fluctuates in the short-term, in the long term it is on an upward trajectory in correlation with carbon dioxide. This correlation has become especially strong since 1960. Why, though, does carbon dioxide have an effect on temperature? Carbon dioxide is in a group of gases, known as greenhouse gases, that affect the way heat interacts with Earth's atmosphere.

Greenhouse Gases

While there is a clear correlation between carbon dioxide in Earth's atmosphere and global temperature, causation is much trickier to explain. There are a few prevailing schools of thought to explain the phenomenon. The first explanation, and the most popular, is that a spike in human emissions since the Industrial Revolution has caused an increase in the concentration of greenhouse gases in Earth's atmosphere; that this increase in greenhouse gases has caused an increase in global temperatures, commonly described by the phrase 'global warming'; and that this increase in global temperatures has had, and should continue to have, an effect on Earth's climate, an effect referred to as 'climate change.' The contrarians' take on things holds those climate variations are much like climate variations in the past; and that humans are probably not causing the climate variations today, or that there is insufficient evidence for an impetus to change. First, the latter argument will be examined in depth. Following the layout of the 'human caused climate change' argument will be the 'contrarians' take,' which is not an explanation as to why global temperatures are increasing so much as an explanation as to why the human caused climate change argument is wrong.

Joseph F. DiMento and Pamela Doughman explain a natural process in which Earth's atmosphere traps heat, heating Earth up enough to sustain life.⁴ There are two types of radiation responsible for heating Earth. The first is solar radiation, produced by the burning of gases on the Sun. The second is thermal radiation, heat given off by the Earth towards the atmosphere. According to DiMento and Doughman, greenhouse gases act as a "one way mirror" because they trap solar and thermal radiation within Earth's atmosphere. The strength of this 'mirror' is relative to the concentration of Earth's greenhouse gases. That is to say, the more concentrated Earth's gases are, the more radiation will be trapped. Life on Earth, this argument would hold, was created with a relatively stable level of greenhouse gas concentration. So, if greenhouse gas concentration is responsible for the temperature level of Earth, then a rise in the concentration of greenhouse gases could be responsible for a rise in Earth's temperature.⁴

Fortunately, the concentration of greenhouse gases (measured in parts per million, or ppm) over the course of history is measurable, DiMento and Doughman note. This is done through analysis of records in nature, for example in glaciers.⁴ But before delving into record analysis, it is important to understand what greenhouse gases are, how they are produced, and how they are eliminated.

There are many different greenhouse gases. In order of most abundant to least abundant, greenhouse gases in Earth's atmosphere are comprised of water vapor, carbon dioxide (CO₂), ozone, methane (CH₄), nitrous oxide (N₂O), chlorofluorocarbon (CFC), and carbon monoxide (CO). According to DiMento and Doughman, the different greenhouse gases have different levels of efficiency in absorbing heat. That is to say that some greenhouse gases have more of an impact on keeping heat in Earth's atmosphere.

The efficiency of certain greenhouse gases in absorbing heat is measured by the GWP index. The base unit for the GWP index is carbon, which is defined as one unit. Methane has a GWP index of twenty-one, so one unit of methane is equal to twenty-one units of the same mass of carbon. For many climate scientists, CO₂ remains the most important greenhouse gas in explaining human caused climate change. This is a product of its abundance, its efficiency, its duration in the atmosphere, and that it is the chief human emission. The duration of time a greenhouse gas is in Earth's atmosphere is significant because if the human caused climate change hypothesis is correct, reducing greenhouse gas concentration will depend on how long it takes for a greenhouse gas to be eliminated from the atmosphere. CO₂ stays in Earth's atmosphere for at least a couple of decades.

Human Activity and CO₂

So what human activities have an impact on CO₂ concentrations in Earth's atmosphere? There are two critical systems that impact carbon dioxide concentrations in Earth's atmosphere, as described by climate scientists Andrew Dessler and Edward Parson – *sources* and *sinks*.⁵ 'Sources' is a catchall phrase to describe any action that causes the emission of a greenhouse gas, (especially CO₂) into Earth's atmosphere. Sources include, but are not limited to, the burning of fossil fuels for manufacturing and automobile emissions. 'Sinks' are systems on Earth that absorb greenhouse gases out of the atmosphere. The chief sinks on Earth's surface are trees, but all floras on Earth play

⁵ Dessler, Andrew and Parson, Edward A. *The Science and Politics of Global Climate Change: A Guide to the Debate*. Cambridge, U.K.: Cambridge University Press, 2010. Print.

an important role in absorbing carbon from the atmosphere. Human-caused climate change hypotheses would hold that the coupling of an increase in CO₂ emissions stemming from the industrial revolution with the destruction of sinks through the process of deforestation have caused an intensification of the greenhouse gas effect to such a degree that it is causing our climate to change. Essentially, an increase in sources and a decrease in sinks that has systematically occurred since the 19th century have thrown off Earth's balance.

Human activity has undoubtedly contributed to an increase in greenhouse gases in Earth's atmosphere. Dessler and Parson describe this process succinctly:

Over the past two centuries, human activities have sharply increased the atmospheric abundance of several greenhouse gases. The most important increase has been CO₂, which is emitted from burning fossil-fuel energy sources – coal, oil, and natural gas – and from land clearing and deforestation. These CO₂ emissions from human activities are superimposed on a natural global carbon cycle...

Dessler and Parson's work confirms that CO₂ has been emitted into the atmosphere by human activity. The industrial revolution brought about a phase in human existence in which resource combustion for energy production, specifically the burning of fossil fuels (coal, oil, natural gas, and wood), has been a principal driver of the global economy. The adverse effects of energy usage are now becoming more and more clear as temperatures continue to rise, and the scientific link between CO₂ concentrations in Earth's atmosphere and temperature becomes better known.

CO₂ is the most important greenhouse gas for our purposes because it is efficient at absorbing heat, remains in Earth's atmosphere for a long time, and is the chief greenhouse gas emission from human activity. All greenhouse gases play an important role in heating the Earth, but CO₂ emissions are the principle culprit of global warming,

and humans have the most influence over CO₂ concentrations in Earth's atmosphere relative to other greenhouse gases.

Now a circle can be drawn back to Professor Keeling's research. Professor Keeling revealed that between 1958 and 2003, carbon concentration above his observatory in Hawaii increased from 316 ppm to 376 ppm, an increase of about 16% over 45 years. DiMento and Doughman posit that for 420,000 years, up until the Industrial Revolution, CO₂ levels hovered in-between 180 ppm and 280 ppm.⁴ This means that at the minimum, CO₂ levels have risen from the Industrial Revolution by about 34%. Moreover, DiMento and Doughman claim that CO₂ often takes decades to leave Earth's atmosphere.⁴ Accordingly, the upward slope in Hocker's graph would suggest that the sudden increase in CO₂ levels would stick around for decades to come, while additional cumulative CO₂ emissions would contribute to existing CO₂ in Earth's atmosphere.

It is significant to note that there has been nothing to disprove the hypothesis that climate change is a human-caused issue. In fact, it is a measurable fact that CO₂ concentrations have risen significantly with increases in human CO₂ emissions, and that global temperatures have risen at a steady pace in accordance with increases in CO₂ concentrations. This observable fact confirms a central argument in the human-caused climate change hypothesis.

Change in Temperature

The Intergovernmental Panel on Climate Change (IPCC) is a United Nations commissioned organization that studies climate change, its effects, and its potential

effects. The IPCC is makes short- and long-term projections on a variety of ecological topics. The IPCC is the main source for climate projections for many governments, and is often considered the most authoritative in the world. The IPCC 2013 executive summary concludes, “the projected change in global mean surface air temperature will *likely* be in the range of 0.3 to 0.7 degrees Celsius (.54 to 1.26 degrees Fahrenheit).”⁶ This prediction is described as being of ‘medium confidence’ and is barring any volcanic eruptions. The long-term projection is for global temperatures to increase over the next century to century and a half by 2 degrees Celsius (3.6 degrees Fahrenheit). The report notes that these temperature changes will vary by region, and the Arctic is the region of the world most susceptible to temperature increases. This is important because the Arctic is largely a massive block of ice, and the melting of this ice will raise sea levels. These changes in temperature would have a profound impact on Earth’s ecological systems.

Ecological Impact

One of the most serious issues today is a rising sea level. As argued in a 1987 article by Richard Monastersky, a writer for *Science News*, rising sea levels will have a major, and overwhelmingly negative, impact on Earth’s ecology. Monastersky, citing research by a group of British university biologists, posited that over the next forty years average sea level would rise by 4 to 8 centimeters.⁷ Monastersky’s predictions may have been confirmed by recent scientific research. Dashiell Hammet, a climate scientist,

⁶ Stocker, Thomas F; Qin, Dahe. “Climate Change 2013: The Physical Science Basis.” *United Nations Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press, 2013. Web.

⁷ Monastersky, Richard. “Rising Sea Levels: Predictions and Plans.” *Science News* 132.21(1987): 326.

confirms that for much of the 21st century, average sea levels have risen between 2.8 to 7.7 millimeters per year - meaning at the bare minimum, it would take three and a half years for average sea level to rise by 1 centimeter.⁸

According to Howard Friel, an independent author and scholar, the rise in sea levels is caused by a few factors, and these factors are unlikely to change anytime soon. In assigning responsibility for rising sea levels, Friel implicates the shrinking of land ice, releasing water into the ocean.⁹ DiMento and Doughman concur with Friel's assessment, and claim that as ocean temperatures rise, warm water expands. With nowhere to go, warm water goes up, increasing the potential for powerful storms and higher tides. Also, rising sea levels can cause saltwater intrusions that contaminate groundwater used for drinking and irrigation. Additionally, the ocean absorbs CO₂ from the atmosphere. With an increase of atmospheric CO₂, the ocean has been absorbing an unsustainable amount of CO₂, causing the acidity level of the oceans to rise. This has damaged the ecology of the ocean because acidity impairs the ability of coral reefs and shelled organisms to form skeletons and shells.⁴

Dessler and Parson argue that rising temperatures have profound effects beyond Earth's water. An increase in temperatures on the ground has increased permafrost melting, causing severe damage to local ecosystems and infrastructure. Earth's life systems are being negatively affected as well. Increasing temperature levels have forced many species to migrate to higher latitudes or risk extinction, Dessler and Parson claim.

⁸ Hammet, Dashiell. "Sea Level." *Real Climate: Climate Science from Climate Scientists*. 14 October 2012. Web.

⁹ Friel, Howard. "On Melting Glaciers and Rising Sea Levels." *The Lomborg Deception: Setting the Record Straight about Global Warming*. New Haven: Yale University Press (2010): 90-116.

There is a broad de-synchronization of life-cycle events, such as bird migrations, caused by increasing temperatures. Woodlands have been changing; as trees cannot survive in increasingly warm areas – this problem is also reducing the earth's sink systems.⁵

Humans have been negatively affected by climate change as well. Global warming has negatively impacted food production – rising temperatures have contributed to reduced yields, increased necessity of irrigation, planting and harvesting changes, decreased arability, and an increase in pests. A more pressing concern for today is not the threat to human life, but rather the costs that are incurred because of a changing climate. Sea level rises, floods, droughts, and wildfires all damage infrastructure and property – and most of the time taxpayers are the ones who foot the bill for repairs. Disruptions to daily life reduce productivity, impair trade, and reduce tourism, amongst other negative economic consequences. Global warming is increasing the number of ‘climate refugees’ – and although this is a slow-moving disaster, economic costs are inevitable.⁶

The Contrarian's Take

An overwhelming consensus is emerging on the matter. The scientific community increasingly supports human-caused climate change hypotheses. NASA cites 18 scientific associations, including scientific societies, scientific academies, intergovernmental bodies, and U.S. government agencies, as overwhelmingly supporting human-caused climate change hypotheses as scientifically verified.¹⁰ A Skeptical Science

¹⁰ “Scientific Consensus: Earth’s Climate is Warming.” *NASA*. Web. 1 November 2015
<http://climate.nasa.gov/scientific-consensus/>

peer reviewed survey found that of over 12,000 peer-reviewed abstracts written between 1991 and 2011 on the subject, 97% took a position agreeing with human-caused climate change hypotheses.¹¹ The consensus amongst scientists is becoming so overwhelming that it is to the point where the human-caused climate change hypothesis becomes as much of an understood scientific truth as evolution. However, counterarguments are not necessarily of malign intent, and they are worth evaluating.

One of the most common counterarguments to the human-caused climate change hypothesis is that global temperatures inexplicably stopped rising for a few years between 2007 and 2012. How, some argued, could CO₂ concentrations have an impact on global temperatures if carbon emissions increased, but global temperatures decreased. For a fleeting moment, this counterargument seemed to have some weight to it. However, two issues remain with this counterargument. The first is that it is false in the long-term. As is clearly shown in Hocker's graph, global temperatures have fluctuated up and down while CO₂ concentrations have increased, but as a general trend, global temperatures have increased substantially over the course of decades – *weather* is short-term, while *climate* is long-term. The second issue with this counterargument is that even as a shortsighted argument, it no longer carries weight because in recent years temperatures have shot up considerably in recent years.² To any impartial observer, a trend of upward temperature recordings is as clear as day. Any efforts to try to debunk human-caused climate change hypotheses by claiming that temperatures have not increased are wrong.

¹¹ “The 97% consensus on Global Warming.” *Skeptical Science*. 30 May 2014. Web. 1 November 2015. <https://www.skepticalscience.com/global-warming-scientific-consensus-intermediate.htm>

A much more compelling contrarian argument is that over the course of history global temperatures have varied widely regardless of the impact of humans. According to DiMento and Doughman, these arguments are based off of data obtained through proxy indicators, a term used to identify ‘natural’ recording systems of the past, such as sediments, ice cores, tree rings, and corals (37). The natural cycles argument is a very compelling one. For example, according to DiMento and Doughman, 50 million years ago temperature levels were estimated to have been 12 degrees Fahrenheit higher than they are now, with CO₂ levels approximately three times higher than they are today (38). To be sure, this phenomenon begs the question – how did CO₂ levels get so high without human activity? There is a flawed logic to using this as a counterexample of human-caused climate change hypotheses. To say that because there was a natural variation of temperature and CO₂ levels in past millennia discredits human-caused climate change hypotheses is a fallacious statement because these two phenomena are not exclusive of one another. Indeed, this historical anecdote may reinforce human-caused climate change hypotheses because it reinforces the linkage between CO₂ levels and temperature increases. A natural spike in CO₂ and temperature levels could be explained by massive natural disasters, such as meteor impact or massive deforestation by way of fire. What is clear is that something traumatic occurred that threw off the natural balance of sources and sinks on Earth, a trend that is not unlike what is being observed today. The only difference is that human-caused climate change hypotheses claim the external shock to Earth’s natural systems is the inorganic process of a spike in carbon emissions caused by human activity.

Another popular strategy for debating by the contrarian is to bring into question the science of climate change. They will argue that the scientific evidence is inconclusive, or will go as far as claiming that scientific research on the topic is alarmist and incorrect. So, how can one be so sure the science is correct?

How We Know Its Real

Naomi Oreskes, a scientists and historian at Harvard University, lays out a compelling argument as to why we can trust climate science.¹² Firstly, Oreskes argues that climate science, because of its highly political nature, is one of the most publicly debated and studied biological and geological sciences, and has been for some time. Since the late 1980s, Oreskes points out, scientists have taken great pains to examine, and to attempt to disprove, man-made climate change hypotheses.¹³ As has already been discussed, the result of this decade's long scientific debate has been the emergence of a scientific consensus – by some estimates 97% of peer-reviewed climate science publications support human-caused climate change hypotheses.

Oresken makes another important point – many of the predictions made by climate scientists over the years have come true. Chief among these predictions has been global warming. Climate scientists have predicted that global temperatures would rise, albeit to different degrees, and global temperatures have in fact risen. Oresken traces back global warming predictions (and accompanying sea level rise predictions) to 1965. Since then, Oresken points out that comprehensive computer-based climate change

¹² Oreskes, Naomi. “The Scientific Consensus on Climate Change: How Do We Know We’re Not Wrong?” *Climate Change: What It Means for Us, Our Children, and Our Grandchildren*. Boston: MIT Press (2014): 105-148.

models have been developed. These computer models, many of which were developed in the early 2000s, serve the basis for climate change predictions for various climate scientists and organizations, and continue to correctly, at least to a certain degree, predict the consequences of global warming.

While Oresken acknowledges that man-made climate change hypotheses, much like other scientific subjects, cannot be ‘proven.’ But a preponderance of evidence allows for inferences to the best explanation. The scientific community has overwhelmingly inferred that man-made climate change hypotheses are credible and reliable. Indeed, man-made climate change hypotheses over the course of scientific study have gone from being a possible explanation to a probable explanation.

The Cost-Benefit Burden

Climate change is not simply a scientific question, though. There is an economic and historical aspect to the issue as well. A set of complaints comes from rapidly industrializing countries like China and India. Although these industrializing countries tend to be the biggest source of CO₂ emissions in the world today, they argue that the developed world (for example, the United States, Europe, etc....) have been responsible for the great majority of emissions over the course of history, and therefore these countries are responsible for climate change experienced today, according to Bloomberg’s Reed Landberg and Natalie Obiko Pearson.¹⁴ There is a lot of truth to this argument. In fact, today’s industrialized countries *did* contribute to the issue today in

¹⁴ Landberg, Reed and Pearson, Natalie Obiko. “Modi Signals Indian Shift Toward Global Deal on Climate Change.” *Bloomberg Business* (New York City). 25 January 2015. Web.

much more substantial ways than developing countries. This is a simple reflection of the amount of time industrialized countries carelessly emitted CO₂. Now that the development stage is over for many of these industrialized countries, the economic and social costs of moving to a low-emissions economy is smaller relative to developing countries. It is a reasonable, though not necessarily morally proper, argument that if industrialized countries carelessly emitted to lift their massive populations out of poverty, then currently developing countries should have every right to do the same. Despite these disputes, industrializing countries have gone as far as acknowledging that the problem does exist, so much so that they are willing to enter into negotiations on the topic.

If the argument against acting on human-caused climate change from inside developing countries wasn't enough, there is also an argument against acting on human-caused climate change from inside industrialized countries. Organizations and think tanks like the Heritage Foundation argue that the economic costs to the American citizen of emission-reduction policies outweigh the potential benefits of those policies, and are therefore not worth pursuing.¹⁵ These same arguments can be applied to other industrialized countries. Moreover, some business groups like the U.S. Chamber of Commerce see U.S. pressure on developing countries to reduce CO₂ emissions as potentially harmful to U.S. trade. These arguments hold that imposing emission-reduction policies in developing countries will stunt growth, make exports from these

¹⁵ Loris, Nicolas. "Four Big Problems with the Obama Administration's Climate Change Regulations." *The Heritage Foundation*. 14 August 2015. Web.

countries more expensive, hold millions of people down under the poverty line, and reduce global economic growth.

Truth be told, there is validity to all of these arguments. Reducing emissions is not a costless process. So, if climate change is to be addressed, what are some economically viable ways to do so?

The Importance of Sinks, Geo-Engineering, and Renewable Technology

Simply reducing energy consumption is a difficult task. Every country relies on energy consumption for economic growth. Therefore, reducing energy consumption would necessarily impede economic growth. But there are ways to reduce emissions without reducing energy consumption.

Natural sinks and artificial sink technology could play a critical role in combating climate change for years to come. Barry V. Rolett, a biologist at the University of Hawaii, argues that deforestation has occurred throughout the history of the world in a major way, but that this is a reversible trend. Rolett claims that reforestation agendas would profoundly benefit the environment.¹⁶ Greenhouse gas absorption from natural reforestation can be supplemented by artificial sink technology. Marilyn Brown and Benjamin Sovacool, two co-authors and climate engineers, point out that advancements in CO₂ capture and sequestration technology are being made.¹⁷ Existing technology is able to capture emissions before they enter Earth's atmosphere and siphon them into

¹⁶ Rolett, Barry V. "Deforestation." *Encyclopedia of Islands*. Berkeley: University of California Press (2009): 221-224.

¹⁷ Brown, Marilyn; Sovacool, Benjamin. "Technologies for Mitigating Climate Change." *Climate Change and Global Energy Security: Technology and Policy Options*. Boston: MIT Press (2011): 65-124.

Earth's crust and mantle where they sit until they dissipate. Greenhouse gases under the Earth's surface have no impact on the greenhouse gas effect. Research and development will allow these 'carbon capture facilities' to be much more effective in the future.

Conclusion

Clearly, there is an issue. Global average temperatures are rising because of the greenhouse gas effect. The chief culprit of the greenhouse gas effect seems to be man-made CO₂ emissions, caused mostly by the spike in the burning of fossil fuels for energy production since the Industrial Revolution. Additionally, a group of developed countries seem to be responsible for the lion's share of emissions throughout history, while some developing countries have recently surpassed the developed countries in terms of annual emissions. There is an issue, and everyone is responsible, though some are more responsible for the problem than others.

The question then becomes – what can be done about this issue? In the next chapters, this question will be addressed through the lens of the two countries with the largest CO₂ emissions in the world, China and the United States. US and China struck an agreement in November of 2014 to curb and reduce CO₂ emissions. How this deal was struck, and whether its provisions are sufficient, and the goals of the agreement will be examined further.

The second chapter will focus on China. What are the effects and potential effects of climate change on China? Why is energy consumption so high in China? If possible, can CO₂ emissions be reduced? Why or why not is this possible? In the third

chapter, these same issues will be addressed, but instead they will be addressed in the context of the United States.

The fourth chapter will focus on climate negotiations between the two countries. How did these two countries come to the negotiating table? What were the goals on both sides during the negotiations? How did the negotiations play out? What will the effects be of the agreement, and are they sufficient in solving this problem?

The fifth chapter will put take the pact and put it in a larger context. How has the pact impacted international climate negotiations? Will the pact be significant enough to address this issue? Specifically, were both US and China successful at meeting their goals through negotiations? As has been established, climate change is a serious problem, and is likely not to solve itself. It is time for world powers to step up and take leadership on this issue. How does the US-China Climate Pact stack up?

Chapter II: China and Climate Change

Zhen Guogang, China's top meteorological official, recently remarked that climate change could have a "huge impact" on China, according to the BBC.¹⁸ Zhen warns that climate change could reduce crop yields, increase droughts, intensify rainstorms, raise temperatures, and prove disastrous to big infrastructure projects. This is a major admission from a Chinese Communist Party (CCP) official, and should serve as a huge red flag. However, things are not so simple. China is the one of the world's largest economies and has for the past decades been one of the world's manufacturing powerhouses. This has come at the price of being the top emitter of CO₂ in the world. All of this is in the context of rapid economic development that has lifted millions of people out of poverty.

The story of China's rapid economic ascent is intertwined with the exorbitant rise in its CO₂ emissions. An important question is China's willingness to deal with the problem. Equally as important is whether or not China is *capable* of dealing with the problem. What implications do China's willingness and capabilities have on the broader challenge of climate change?

Effects, and Potential Effects, of Climate Change on China

According to Elisa Chih-Yin Lai of the Wilson Center, since the 19th century surface air temperature has increased in China by 0.5-0.8 degrees Celsius (0.9-1.4

¹⁸ "Climate Change: China Officials Warn of 'Huge Impact'." *BBC News*. British Broadcasting Company. 22 March 2015. Web. 7 December 2015.

degrees Fahrenheit).¹⁹ This rise in temperatures has an impact on glaciers, causing them to melt. The melting of glaciers will have an especially profound impact on China because of its vast Pacific coastline and extensive network of lakes and rivers. According to Lai, glacial melting in China will cause flooding from glacial lakes into the upper reaches of the Yangtze River in the short-term, and a lower volume of water in the Yangtze's downstream areas in the long-term (because of depreciating water sources in the long-term). Glacial lake flooding causes large-scale flooding and mudslides in mountainous areas, especially in areas close to the southwest border with Nepal. Moreover, runoff water from glacial areas has supplied the Yangtze River and Yellow River with a steady source of water for centuries, but shrinking glaciers can no longer be relied upon to supply these rivers.



¹⁹ Lai, Elisa Chih-Yin. "Climate Change Impacts on China's Environment: Biophysical Impacts." *The Wilson Center*. Web. 7 July 2011. Web. 7 December 2015.

Scientists predict that one-third of crucial glacial areas will disappear by 2050, and half will disappear by 2090. Glacial shrinking poses a serious long-term threat to Chinese water sources and to the ecological systems connected to them, Lai argues.

If this wasn't enough, rising sea levels also threaten China. The average sea level along the Chinese coast has increased by 90 mm (3 inches) over the past 30 years.¹⁹ This sea level rise is in the context of a rapidly urbanizing population, especially in cities along China's coast. Cities oftentimes experience higher sea level rises because of the extraction of groundwater, decreasing the land's load carrying capacity and accelerating land sinking. These factors threaten major Chinese cities, such as Shanghai, Hong Kong, and Tianjin. These three cities combine to have almost 30 million people, close to the population of all of Canada. All of these cities have undergone major infrastructural makeovers in past decades, with the Chinese government and private investors dumping billions of dollars into building projects. Alas, rising sea levels threaten this critical infrastructure.

According to Lai, Chinese biodiversity is also threatened in a major way. The Intergovernmental Panel on Climate Change (IPCC) has assessed that if global temperatures were to raise 1.5-2.5 degrees Celsius (2.7-4.5 degrees Fahrenheit), around 20 to 30 percent of global species will face extinction.⁶ The threat to biodiversity in China is especially sharp with regards to China's primates, because rainfall in these species' natural habitats has decreased, causing a degradation of habitats and a reduction in food sources, chief among them bamboo. Additionally, rises in ocean temperatures and the change in pH values in seawaters threaten coral reefs in the South China Sea. CO₂ also causes acidification of coral reefs, slowing coral growth and causing coral

calcification. Coral reefs serve as a home to over 4,000 fish species. Damage to coral reefs seriously throws off the ecological balance of marine life.

Climate change is also causing an increase in natural disasters in China, and this trend can be expected to continue. The IPCC has concluded that climate change has contributed to a spike in heat waves, tropical cyclones, droughts, intense rainfall, thunderstorms, snow avalanches, and dust storms. The problem is especially acute on China's coast, where increases in sea temperatures result in more powerful tropic cyclones, causing extensive damage to property and threatening human life. Moreover, natural disasters are becoming more unpredictable and devastating, according to IPCC reports. Floods and droughts also disturb agricultural cycles. Drought is an especially thorny issue in China, because it is very difficult to feed an impoverished population of 1.357 billion people. Drought causes food scarcity and raises food prices, so there is not only less food to go around, but it also is becoming more expensive. According to the World Bank, 480 million Chinese (40% of its population) live in regions currently facing water scarcity issues. The U.N. and World Bank expect the severity of droughts in China to increase in the next fifty years.¹⁹

It is clear then, that climate change is having a profound impact on China. It is important to note is that China is the biggest contributor to the climate change problem today. It is by far the largest emitter of CO₂ in the world – granted, China in aggregate over history has not emitted nearly as much CO₂ as European countries or the US. With that being said, China has the most work to do in confronting the issue as most industrialized countries have taken great strides to reduce their CO₂ emissions. So, how big of an emitter is China, and why?

Economic History of China

According to the Center for Climate and Energy Solutions, China has been the largest greenhouse gas emitter since 2006.²⁰ Most of these greenhouse gas emissions are in the form of CO₂, the main emission from the burning of fossil fuels. China's high emission levels stem from the massive size, and massive growth level, of its economy.

According to the World Bank, China had an average growth rate of 10% between 2000 and 2011. Between 2011 and 2015, average growth hovered well above 7%. Even as China's economy is in 'slowdown' mode, it is still expected to see average growth of well over 5% for at least the next decade. China's economy is powered by a massive population of over 1.36 billion people, many of them moving to metro areas where labor is in high demand.²¹

The Chinese economy is an ever-evolving system. The Qing Dynasty fell in 1912 after decades of Western imperialism wreaked havoc on Chinese society. Following the collapse of the Qing, the Japanese took advantage of the power vacuum in China - in part by the desire to power its own economic engine with China's natural resources - and colonized the country until the end of World War II. After World War II, years of civil war followed, fought between the nationalist Guomindang government led by Chiang Kai-Shek and the communist insurgency led by Mao Zedong. Mao eventually defeated Chiang and banished his nationalist forces to the small coastal island of Taiwan and successfully established a permanent, sovereign state.

²⁰ "China's Climate and Energy Policies." *Center for Climate and Energy Solutions*. April 2015. Web.

²¹ "GDP Growth (annual %)." Data. *The World Bank*. Web.

Barry Naughton, a Chinese scholar and political economist, highlights three major eras of the modern Chinese economy.²² The first is described as the Socialist Era (1949-1978). This period involved heavy industrial development and a centrally planned economy. The second era is called the Market Transition Era, led by Deng Xiaoping, beginning in the late 1970s and early 1980s. In this period, CCP leadership led the Chinese economy in opening itself up to capital from other countries. While this period ended in 1993, it led directly to the Modern Era of the Chinese economy – and, importantly, the problem.

China's Energy Consumption

The present day Chinese economy is characterized by energy-intensive heavy industrial production for domestic use and export. The specifics of where energy resources are used in China's economy will be reviewed in a future section of this chapter. For right now, though, it is important to understand the basic generalities of what China's economy is.

China's economy is centered on production. The primary, and most energy-intensive sector of the economy is the production of materials for infrastructure, such as steel, iron, and cement.²² China's rapidly growing economy has required the development of a self-sustaining infrastructure material production sector. Additionally, economies of scale have allowed the infrastructural materials sector to become internationally competitive, and China has become one of the world's lead exporters of

²² Naughton, Barry. *The Chinese Economy: Transitions and Growth*. Cambridge, MA: The MIT Press, 2007. Print.

goods for infrastructure. Another major sector of China's economy has been as an assembly hub for popular technology products. Technology assembly is by nature more of a labor-intensive industry, but it also require a lot of electrical energy, which is powered by the burning of fossil fuels. Moreover, China has a booming automobile industry, both in terms of domestic supply and demand. More and more of China's 1.3 billion citizens are buying cars, and emissions from vehicles have a disastrous effect on climate change.²³

All of this is important, because one cannot expect China to cut emissions without reforming the sectors of the economy that are responsible for most of the energy consumption in the country. However, what first needs to be established is what kinds of resources power the Chinese economy. There are three principal sources of energy used in China – coal, oil, and natural gas.

The U.S. Energy Information Administration (EIA) has compiled a variety of statistics about energy consumption in China.²⁴ According to the EIA, in 2012 coal supplied almost 66% of total energy consumption. This amounted to around 80% of total CO₂ emissions from China. Coal is by far the dominant source of energy in China, a particularly problematic fact given that coal produces more CO₂ emissions per unit of energy produced than all other forms of energy, including oil and natural gas. To reduce its CO₂ emissions, China will need to wean itself off of coal and begin using more sustainable energy sources. This will be difficult, though. Coal is a tempting source of energy for the Chinese – it is an abundant domestic product with well-established

²³ “Cars and Global Warming.” *Union of Concerned Scientists*. U.S. Union of Concerned Scientists. Web. 7 December 2015.

²⁴ “China: International Energy Data and Analysis.” *EIA Beta*. U.S. Energy Information Administration. 14 May 2015. Web. 7 December 2015.

infrastructure for transportation. Simply stated, coal is so popular in China because it is cheap and easy to get. The coal industry also rests in a unique position in Chinese politics, and has repeatedly presented roadblocks to reform – this topic will be discussed in-depth later in the chapter. Essentially, the main source of China's emission woes is its overreliance on coal. Whether or not China is able to diversify its energy consumption in the future will decide the fate of China's climate change reform policies.²²

Oil accounts for almost 20% of total energy consumption in China.²⁴ China has vast offshore oil reserves, but is using up these reserves at an alarming rate. China's reserve-to-production ratio is 11, whereas the world average is 40.²² This means that for every unit of oil produced in China, there are 11 units of verified reserves. This statistic is calculated on an annual basis. Essentially, this statistic means that if no new oil reserves were discovered or verified, and China produced oil at a steady rate, it would run out of oil reserves in eleven years. While new oil reserves are constantly being discovered and verified, China's low reserve-to-production ratio relative to the global average is a major cause for concern. China's ratio has contributed to its reliance on coal because it impedes flexibility in energy diversification. Part of China's strategy to combat this issue has for its national oil companies (NOCs) to acquire overseas oil reserves. According to the IEA, NOCs have purchased assets in the Middle East, North America, Latin America, Africa, and Asia and invested an estimated \$73 billion between 2011 and 2013. One of the main problems of importing oil from NOC overseas assets, though, is it comes at a comparatively high cost relative to coal – again, for production firms in China, coal remains the most attractive source of energy. With that being said, plummeting oil prices may soon buck this trend.

Whereas oil is a decreasingly attractive alternative to coal for China, gas is becoming more and more attractive, Barry Naughton argues.²² Gas, like oil, is a low-emission fossil fuel relative to coal. Additionally, China has large natural gas reserves, and has a massive land border with Russia, the world's top natural gas producer. Moreover, China's natural gas industry is becoming more and more developed with time. China is the 6th largest gas producer in the world, and ranks 13th in natural gas reserves with 3.1 trillion cubic meters of verified reserves (compared to 48.7 trillion cubic meters in Russia, 9.86 trillion cubic meters in the U.S., and 1.798 trillion cubic meters in Kuwait). China produced 112 billion cubic meters of natural gas in 2013, so its natural gas reserve-to-production ratio is roughly 27, substantially higher than its oil reserve-to-production ratio. Moreover, it only imported 52 billion cubic meters of natural gas in 2013, less than half of its total domestic production, in stark contrast with oil production in which imports far outstrip exports.²² For China, the way forward for diversification may be in the realm of natural gas, as China hopes to double its total energy consumption from natural gas by 2020, from 5% to 10%.

That is, at least in the short-term – the long-term solution is in renewables and nuclear energy, industries in which China is underdeveloped. According to IEA statistics, renewables and nuclear energy account for only about 10% of total energy consumption in China (8% by hydro sources, 1% by renewables, and 1% by nuclear). While China can use its oil and natural gas reserves as a crutch for short-term energy diversification, the low reserve-to-production ratios for both of these resources means that domestic production cannot be solely relied upon to power China's economy. Moreover, oil and natural gas imports are not a long-term solution because their prices

will always be higher than domestic coal. Therefore, it is imperative that China develops its renewable and nuclear industries for long-term energy production.

Sources of Energy Consumption

There are three primary drivers of China's skyrocketing energy consumption. The good news is that none of these drivers are irreversible or unchangeable, and good policy can transform each industry. The bad news, though, is that given economic realities, reform will be extremely difficult and unlikely to be fully realized. So, what are these drivers of energy consumption increases in China?

The first major driver of energy consumption in China has been the major increase in car sales. Since the beginning of the 21st century, the accumulation of wealth in China has enabled millions of people to become car owners.²⁵ There are many positive effects of car ownership – car sales stimulate the national economy, transportation becomes easier and more affordable, and cross provincial trade is improved by the abundance of commercial vehicles. However, the major rise in the number of automobiles in China has led to an increase in CO₂ emissions in the country. Exhaust from the fuel that cars burn contributes to the atmosphere's collection of greenhouse gases. CO₂ is the primary emission from automobile exhaust – additionally, other greenhouse gases, such as methane, are emitted from vehicles.²³ To compound the issue of exhaust emissions, the production of cars also contributes to the issue. In China, a booming domestic automobile industry has increased the contribution of industrial production emissions in China, a topic that will be explored further briefly.

²⁵ "Vehicle Sales in China." *Statista*. Statista: The Statistics Portal. 2015. Web. 7 December 2015.

China's automobile market has exploded in recent years, the product of a massive population rising out of poverty at a stunning rate. According to Statista, since 2008, car sales in China have grown on average by more than 20% per year. There has been over a 150% increase in total car sales in China since 2008.²⁵ With more and more people in China buying cars, CO₂ emissions from automobile exhaust in the country have skyrocketed. This trend is not likely to change anytime soon. According to the Wall Street Journal, many foreign auto companies are taking steps to make their cars more abundantly available and cheaper in China. Lowering the price of automobiles will raise the number of cars demanded, and put more cars on the road. Moreover, more Chinese citizens are expected to want cars in the coming years, as China is expected to surpass the U.S. in the number of motor-vehicle drivers (set to pass the 300 million people mark) within the near future. In China, a country of 1.3 billion people, it is unlikely that the growth in the demand for automobiles will slow anytime soon.

The second major source in the spike for energy in China has come from the use of coal to heat households. While heating has historically been a priority for Chinese households, even before CO₂ emissions became a major problem in the country, this issue is being compounded by a few factors today. Essentially, rising incomes for Chinese households has led to increased spending on coal for household heating. In the past, households have had to ration energy consumption for heating because of income pressures. Additionally, because of a lack of purchasing power, households would often resort to supplying their own heating source – for example, households would chop their own wood. But rising incomes has given Chinese households more time for leisure as they have turned to purchases of coal for heating sources. Moreover, rising incomes

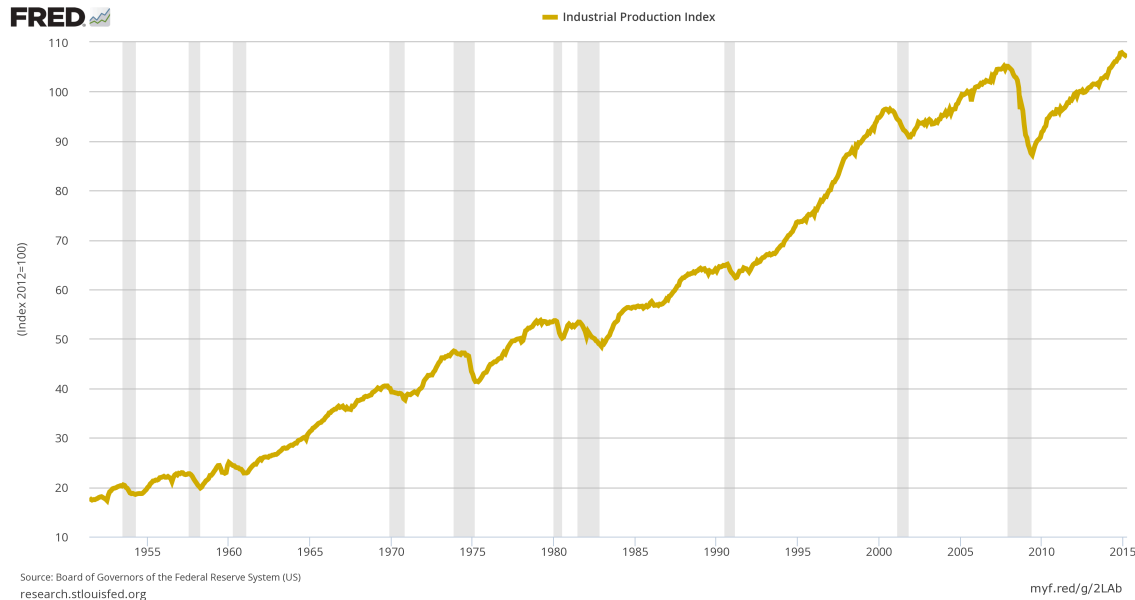
have also decreased rationing of burning coal – as incomes have risen, households have increased their discretionary spending on coal for heating houses, mostly because heat is a primary concern of households. While it would seem that switching to oil burning for household heating would be popular, this has not been the case thus far because, as has been thoroughly discussed, the low price of coal has maintained its steady use. For these reasons, household coal burning for heating has been a major factor in CO₂ use.²²

The final, and the most important, source in the rise in energy consumption in China has been the spike in industrial production – electricity generation and heavy-industry production. These energy demands have been driven by Chinese infrastructural development, demand for Chinese infrastructural exports, and the growth of Chinese factories. Additionally, these sectors are the most difficult for China to reform.

The Chinese Industrial Engine

The primary driver of the spike in energy consumption in China has been its astronomical rise as an industrial powerhouse. China's industrial sector, as measured by the Industrial Production Index (IPI), has boomed unlike any other country over the past century. The IPI is a measure of industrial output that includes manufacturing, mining, and utilities. China's IPI has had a magnificent surge, especially since Deng Xiaoping's market reforms of the 1980s, as shown on the next page courtesy of the Federal Reserve Bank of St. Louis.²⁶

²⁶ “Graph: Industrial Production Index.” *Economic Research*. Federal Reserve Bank of St. Louis. Web. 7 December 2015.



In this graph, the China's 2011 IPI is used as a baseline value of 100, and each year since 1950 is compared relative to that 2011 value. While services comprise most of the GDP of developed countries, industrial production has a unique place in China because of its place in the global manufacturing chain, and how that manufacturing is brought about. China hopes to transform itself into a services economy in the future – a serious cause for optimism about the prospects for it cutting its emissions. However, this task is easier said than done, and even if China were to cut down its manufacturing production, it would likely just shift to another area in the world. This, however, is a topic of discussion for another paper.

China became the manufacturing capital of the world during the 1980s because of a massive labor force, weak workplace regulations (especially wage laws), and a low valued currency. To power this manufacturing economy utilities services were demanded, especially electricity. Electricity in China, as we have already seen, has been and still is largely powered by the burning of coal. The first stage of Chinese manufacturing in the 1980s was relatively low-energy intensive, but as the Chinese

workforce has become more sophisticated, and the Chinese economy has developed, manufacturing in China has taken a high-tech, heavy industrial character. This is to say that at first, most Chinese manufacturing involved textiles. Since then, though, China has primarily manufactured goods to build infrastructure, such as cement and steel, and technologically advanced products, such as smartphones and automobiles. The main input in these processes are not human labor, as is the case in textile manufacturing, but rather raw goods.

Heavy industry is more energy intensive, requiring more mining. This has strengthened the coal sector in China – it has simultaneously increased the reliance of the Chinese economy on coal while increasing economies of scale for coal producers. Then, the changing character of Chinese manufacturing, in addition to the increase in Chinese manufacturing, has created a self-feeding cycle of an increasing IPI. Manufactures need more and more raw goods, and utilities companies need more and more energy sources. This strengthens the hand of coal producers, increasing profitability, improving economies of scale leading to a cheaper product, and allowing them to have a more powerful position in the Chinese economy, and therefore importantly a more powerful position in Chinese society. This point will be discussed shortly, but first it is worth discussing that while industrial production has increased, the efficiency of energy burning in China has been lackluster.

Exacerbating the issue in China is that it uses energy very inefficiently. This is to say that in China, it takes a lot of energy to produce each dollar's worth of GDP, especially relative to other countries. This probably has much to do with the combined factors of high industrial production and overwhelming coal usage. In China, it takes

0.24 kilograms of oil (KOE) to produce \$1 of GDP. This is compared to a value of 0.155 in Japan, 0.14 in the United Kingdom, and 0.23 in the United States. These values were produced by the International Monetary Fund and are based on data from 1995-2005. It would not seem, then, that China's situation is all too dire – their energy efficiency for oil burning is pretty much on par with the many developed countries. The problem is that China uses over 3 times more coal than the second highest global coal consumer, the United States. Additionally, China burns more coal than the next 49 coal consuming countries combined, according to 2011 statistics provided by the Europe's Energy Portal.²⁷ China's reliance on coal is dragging down China's economy, and at the same time producing more CO₂ emissions in a vicious cycle – coal is less efficient, so more of it has to be burned than other fossil fuels, producing more CO₂ than would be the case if oil was the predominant energy form.

While China may be moving towards a more efficient economy, there are some major causes for pessimism as to whether or not China will be able to reform. The first is that the major source of China's woes comes from its place on the international supply chain. China is a major industrial producer for much of the world. It will therefore be difficult for China's emissions to suddenly stop. Either China will have to continue to be a major industrial hub, with high emissions, hoping that geo-engineering will help put Band-Aids on the problem. Or, China will transform its economy to a services based economy, a stated goal of the Chinese Communist Party. While this might reduce Chinese emissions, it will not solve the problem – one must consider why China is such a major manufacturing hub. China is not producing so much in a vacuum; rather demand

²⁷ "Coal Consumption by Country." *Europe's Energy Portal*. December 2011. Web.

for high-tech goods from the developed world and infrastructure from all over the world creates the necessity for major suppliers. These suppliers will tend to be underdeveloped countries – Asian countries such as Bangladesh, Malaysia, and Indonesia; and African countries such as Nigeria and Mozambique. Will these countries be able to produce goods more efficiently and with less CO₂ emissions than China? So, it then seems that the world is stuck between a rock and a hard place – either China continues to be a major manufacturing hub, and hopes that technology helps to alleviate the problem, or it simply punts the issue to another country. Therein lies the major problem for the world. What, though, is the major problem for China? The answer is making Chairman Mao roll over in his grave.

An Authoritarian's Nightmare – Entrenched Coal Interests

The Chinese government has targeted the coal industry for reforms for a long time, and was hoping to reform the industry well before climate change became a pressing issue. Much of the coal resources in China are owned by township and village enterprises (TVEs), a form of state-ownership at the local level. In the 1990s, it was becoming clear that these TVEs were doing a poor job – workplace safety was a spot of international embarrassment, and the quality of coal that TVEs were producing was abhorrent, contributing to the pollution issue in urban areas. For this reason, in 1997 the Chinese central government attempted to enact a 'close the pits' initiative, in which the rights to coal mine production were shifted from TVEs to state-owned enterprises (SOEs). After shifting coalmines from TVEs to SOEs, the logic went, the central government would have flexibility to close mines it saw as unattractive, and to improve

the coal production process, making it safer and cleaner. Things, however, did not go as planned.

This initiative to switch ownership of coalmines from TVEs to SOEs hit two major roadblocks that prevented policy implementation. The first of these roadblocks was the sudden surge in the demand for energy caused by an unplanned spike in industrial output at the turn of the century. This phenomenon eliminated any flexibility that the central government had in reforming its energy industry because it suddenly needed copious amounts of energy to maintain soaring economic growth. The second factor that prevented the ‘close the pits’ policy was from local governments and populations who tried to block the central government’s policy. Localities stood to lose, or so they thought, substantially from any change in ownership of coalmines because they would lose direct ownership of the mines.

Behind the sudden spike in the demand for energy was China’s industrial boom. Just after the turn of the century, China’s economy underwent a sudden, unplanned change. Heavy industrial production in the country nearly tripled since the late 1999, and the growth of energy demand spiked to nearly 13% a year. So, the dramatic and sudden change in China’s economy from labor-intensiveness to energy-intensiveness caused a massive uptick in the demand for energy. Equally as important are China’s sources of energy. As has been previously mentioned, coal makes up nearly three-quarters of China’s energy consumption. In addition to rising demand for energy from industrial producers, the demand for energy to produce electricity, which has grown at a steadily high rate as China has developed, has stayed relatively high. Just as was the case for industrial energy sources, China has leaned on coal to produce electricity. Additionally,

households have increasingly increased coal consumption for heating their houses, heating their water, and cooking.

This sudden and unplanned increase in the demand for coal put serious pressure on the coal industry to meet output demands so the economy could keep growing. Reforming an industry like coal would take a massive amount of investment and time. Mines would need to be overhauled to meet safety standards. SOE coal producers have a more thorough refining process, meaning it takes longer for coal to go from mine to market. The pressure to meet demands for output seriously strained the central government's ability to enact major reforms; chief among them the changing of mine control from TVEs to SOEs.²⁸ If these factors weren't formidable enough, localities presented an equally as severe roadblock to reform.

Tim Wright, a political economist and expert on China, describes local constraints on policy implementation as 'recalcitrant socioeconomic circumstances.'²⁹ Wright explains this difficulty succinctly:

In this situation the central state found it difficult to control local actors. The greater the level of dependence of a particular area or group on the TVE mines, the greater the likely resistance to closing the pits. The greater the level of dependence of a particular area or group on the TVE mines, the greater the likely resistance to closing the pits. Larger economic or administrative units tended to be economically more diversified, so dependence was greatest lower down the administrative ladder, where coal made the greatest contribution to local income and employment... Despite widespread support for

²⁸ Elspeth, Thomson. "Reforming China's Coal Industry." *The China Quarterly*. 147 (1996): 726-750. Print.

²⁹ Wright, Tim. "The Political Economy of Coal Mine Disasters in China: 'Your Rice Bowl or Your Life.'" *The China Quarterly*. 179 (2004): 629-646. Print.

the policy at higher levels, local governments and populations in such areas had perverse incentives to block its implementation.

TVE coalmines were often started in poor areas, so they had an enormous effect in substantially raising local populations incomes. So, for these groups, the maintenance of control of these coalmines was quite literally a matter of their livelihood. It would seem self-evident that they would then put up substantial resistance to any reform policy that would take control of the coalmines out of their hands. It was not just coalminers who stood in opposition to policy reforms, though. Coal transportation was responsible for employment of massive amounts of people, sometimes more so than the mine itself. Coal remains a vital source of fuel for most of the homes in TVE coalmine areas. Moreover, coalmining and TVE added major amounts of revenue to the pocketbooks of local governments. All of these entrenched local interests presented the central government a unified roadblock to reform.

In principle, it would seem these local forces would be hesitant to express opposition to the authoritarian central government. That was not the case, though. Protests in local publications were common, along with warnings from local governments to the central governments that any change in policy would contribute to substantial social instability. Moreover, miners themselves would sometimes directly organize protests against policy reform.²⁹

Local interests are only one of a few major power players in China that are impeding reform, though. China's bureaucracy, and the competition within its bureaucracy, has caused a major reliance on coal.

Chinese Bureaucratic Competition – A Dirty Race to the Top

The Chinese Communist Party (CCP) is one of the most competitive, meritocratic institutions in the world. Elite college graduates vie for entry-level positions in the country's bureaucracy, and hope that in their decades of public service they could work their way up to controlling a state-owned enterprise, a county government, or even become a major figure in the CCP's central government apparatus. The CCP bureaucracy draws some of the best candidates from around China – and there is no shortage of competition. This impressive meritocratic system has a major downside, though.

The primary goal of the CCP in recent decades has been economic growth – Beijing has wanted China to sustain incredibly growth rates of nearly 10% for as long as possible. Chinese bureaucrats who can deliver on this goal are rewarded, and Chinese bureaucrats who cannot deliver are not considered for promotion, or are even sometimes demoted.

Imagine *XY*, a forty year old with one child living in Wuhan. *XY* has done very well – *XY* attended an elite public university and worked tirelessly; received an entry-level position with a major state-owned manufacturing company in Wuhan; and has worked up to the top of that company. There is now an open position as the director of manufacturing in the province of Hubei, and *XY* hopes to get the job. However, a competitor, *AB*, of the same position as *XY* in Tianjin, is producing 20 more units per day at the same cost. How is *AB* doing this? *AB* has a connection to a coal producer in Manchuria who has been selling him cheap, dirty coal. *AB* has been able to produce more units than *XY* because his overhead energy costs are lower, giving him more

discretionary spending flexibility on raw goods. *XY* has been purchasing oil from China's state-owned oil company, China National Petroleum Company, and it has cost him more than it has cost *AB* to produce one unit.

Its 2003 and the CCP has been prioritizing economic growth over all else for about a decade now. Pollution is bad, it is true, but poverty is worse, and the CCP wants to address the latter issue immediately. *XY* knows that the primary focus of the hiring board is how much a candidate has been able to produce, and at what cost. *XY* knows to make himself competitive; he must start using cheap, unprocessed coal immediately.

The competition between *AB* and *XY* is not isolated to the two of them. There are hundreds of bureaucrats at all sorts of top company-level positions who hope to be the director of manufacturing in Hubei. They all know that if one wants to reduce costs, one should look no further than coal from TVE mining – it is dirty; but it is cheap, and it is abundant. And when promotions are based on growth, environmental considerations take a backseat.

Now picture this scenario beyond manufacturing – coalmine directors vying for top positions in the CCP want to generate as much revenue as possible. Therefore, they process their coal less and less in order to reduce costs and to undercut the costs of their competitors. This same mindset of growth above all pervades throughout the Chinese economy. With business booming, and China as the envy of all developing countries, the CCP does not want the machine to slow down. Herein lies the problem of bureaucratic competition – the CCP's prioritization of growth above all destroyed any incentive that company directors might have to use cleaner alternatives to TVE coal. The widespread use of coal has had disastrous consequences not just to China's environment.

A Silver Lining in the Smog

The consequences of China's coal burning are not invisible. When people conceptualize the issue of CO₂ emissions, they think of it as a problem in the future – an imminent rise in sea levels; potential disastrous effects on ecological life; a slow-but-sure destruction of coastal properties. In reality, though, China's emissions from coal burning are having a deadly effect today. Air pollution in China is amongst the most deadly and most pressing public health issues in the world – and it is warranting serious attention from the CCP.

According to Berkeley Earth, a research group, air pollution is believed to kill more people worldwide than AIDS, malaria, breast cancer, or tuberculosis; causing between 3 and 7 million deaths per year by worsening cardiorespiratory disease.³⁰ Berkeley Earth estimates that 1.6 million deaths per year can be attributed to Chinese pollution killing Chinese citizens. This is equivalent to 4 thousand deaths per day, or 17% of all deaths in China. Cardiorespiratory deaths account for roughly 55% of all Chinese deaths compared to 42% in the US, despite much higher obesity rates. Air quality in Beijing is so poor, that spending a day outdoors in Beijing is as bad as smoking 40 cigarettes. While the researchers admit that making the link between pollution and mortality is difficult, and that their methods are potentially flawed in some ways, even with slight statistical corrections downwards in terms of mortality rates related to pollution, the numbers are still highly disturbing. Moreover, weather patterns in China make this a national issue. Although most emissions are from coal burning plants in coastal cities, wind moves air pollution throughout the Pacific coast, and towards

³⁰ Rohde, Robert A.; Muller, Richard A. "Air Pollution in China: Mapping of Concentrations and Sources." *Berkeley Earth*. Web.

northern parts of the country. No one is able to escape the detrimental effects of the smog – even if someone were to decide to forgo economic opportunity in large coastal cities for a healthier rural lifestyle, they would still be exposed to harmful air pollution no matter where they go, albeit at a lesser level.

According to *The Economist*, air pollution has become an unmitigated nightmare for the Chinese government.³¹ It is a national public health crisis that is straining the medical system, reducing workplace efficiency, and decimating the tourism industry. This has been, and is increasingly becoming, a serious strain on the legitimacy of the CCP. The CCP has long staked its legitimacy on improving standards of living for its people. It has done so in the recent past by shepherding the Chinese economy into one of the most impressive periods of sustained economic growth in the world's history. To do so, it has thrown whatever it can get its hands on into the fire pit, powering its massive economic surge mostly on dirty, cheap, and abundantly available coal. The national health crisis that is air pollution is now changing their calculus. The costs of limitless burning of coal are rising rapidly, while the benefits are slowly beginning to slow down. Chinese municipalities have begun keeping statistics on pollution levels for the first time. Even Chinese state media is beginning to decry the issue as a serious national crisis. The Chinese government has addressed the issue, but how will it go about solving it?

This issue ties into climate change because the source of the problem is consistent between the two issues. Air pollution and exorbitant CO₂ emissions both stem from uncontrolled burning of fossil fuels (mostly dirty coal from TVE mines). While the Chinese government is beginning to recognize climate change as an important

³¹ “Something in the Air?” *The Economist*. The Economist. 19 January 2013. Web. 7 December 2015.

international issue, it sees air pollution as a serious threat to its national legitimacy. This may be enough to force the CCP to act in a rapid and effective manner, to drop the hammer on the coal industry, and to reform its energy industry. Somewhere in all of the smog over Beijing, there is a silver lining.

Oil, Gas, and Coal Prices

Amid the growing angst over coal burning, a major development has occurred in energy markets – the sustained plummet of oil and natural gas prices across the globe. The drop in the prices of oil and natural gas prices are in part driven by excess supply, which may very well be fixed in the near future. Another factor contributing to the drop in prices, though, seems to be more of a permanent change than excess supply – the slowing of economies in emerging countries, especially China. Much of this has to do with China reconfiguring its economy from an industrial production focus to a services focus. China will not need as much energy in the future, and the decline in demand from China has caused oil prices to plummet. Oil prices are at an 11-year low, according to the Wall Street Journal. The Brent Crude Index, a measure of oil prices, has dropped to \$34.06 per barrel, the lowest level since 2004 – in 2011, the Brent Crude price averaged well over \$100 per barrel. Gasoline prices have plummeted as well, as gasoline futures are trading at their lowest level since 2009.³²

Despite the assumption that oil prices will rise in the short to mid term, the fall of prices for oil and natural gas provide China a window of opportunity to reduce reliance on coal. Low oil prices are making crude a much more competitive alternative to coal.

³² Friedman, Nicole. “Brent Crude Prices Fall to 11-Year Low.” *Wall Street Journal*. 6 January 2016.

Additionally, a switch from coal to oil will help ease the burden of air pollution in major cities – a hugely important domestic issue for the CCP.

How to Kill Two Birds with One Stone

Two great pressures are pressing down on the Chinese government. The first comes from within its own border, as air pollution is at its worst levels in the country's history. Air pollution is linked to more and more deaths every year, and the issue is challenging the legitimacy of the government. The second pressure comes internationally as the globe tries to cut CO₂ emissions to reduce the worst future effects of climate change. China, being the world's largest emitter, is under immense strain to combat this issue so it can be respected internationally as a responsible country.

To remedy these two issues, China needs to do one thing – reduce its reliance on coal. A convenient parallel of means to battle against two separate issues provides China ample impetus for action. Not only will reducing coal please climate diplomats from across the world, it will also cut down on poisonous smog hovering over Chinese cities.

Intentions and actions are two very different things, however. The CCP has a lot of work to do – combating domestic interest groups, overturning entrenched industrial methods, and raising awareness in households. This was the context when Chinese diplomats sat down with their American counterparts in 2014 to hammer out details of a bilateral agreement to reduce CO₂ emissions. What emerged from those negotiations is an ambitious and optimistic roadmap as to how China can reduce CO₂ emissions.

Conclusion

China finds itself in a sticky predicament. Its high emissions are ravaging the countries ecological systems through climate change; and are responsible for deadly health problems for millions of its citizens. However, initial attempts to rein in emissions, or at least make its energy burning more efficient, have ended in bluster. As the twin problems of climate change and air pollution intensify in China, the CCP will increasingly be faced with the necessity to reform its energy sector. Doing so may require a different approach than just closing the pits.

China's challenges complicate the global fight against climate change. The CCP is hesitant to take any action that might impede economic growth. Yet, comprehensive global action necessitates decisive and cooperative reform in China. The asymmetry of Chinese and global interests has major implications for any multilateral effort to combat climate change.

Specifically, China's reliance on CO₂ emissions for economic growth makes climate change negotiations with them much more difficult. This would not detract US, itself a high emitter of CO₂ and the presumed leader of the liberal institutional international community, from pursuing negotiations with the Chinese. Chinese stubbornness can only go so far, though – in the face of international pressure, and more importantly a crisis of air pollution, China seemingly would have to act sooner or later. The question, then, is how cooperative and committed the Chinese would be to multilateral negotiation efforts to combat climate change. Would the Chinese turn their back on international negotiations and chart their own course? Or would they be an active participant in a newly forming international regime to combat climate change?

Chapter III: The United States and Climate Change

When it comes to climate change, the United States is full of contradictions. US is the country in the world most able to affect action on the issue, yet for much of recent history it has been amongst the most hesitant countries to do so. Its geography is full of impressively wide ecological systems, but its population is most dense in its pockets of industrial havens and urban centers. It has a long history of conservationism, yet this component of environmental ideology always seems to be at odds, if not actively competing, with an impulse for economic growth harnessed by consuming its own natural resources. The constant tug-of-war of the American political system has sucked into its partisan vacuum the climate change issue, and this has major implications for the world.

This chapter sets out to paint a picture of a US political system that has through its history - and continues to this day – have a persistent debate about the balance of environmentalism and economic growth. Is there, a historical precedent of environmentalism in US political thought? How do existing institutions and ideologies in US stack up to the challenge of climate change, and what must be changed to compensate for their inadequacies? US is paying the price (and will continue to) for its history of cap less CO₂ emissions. Why are US emissions so high? How has the political system responded to this issue?

Effects, and Potential Effects of Climate Change on the U.S.

Climate change has had serious and overwhelmingly negative effects on the United States. Moreover, negative trends caused by climate change on the United States

are projected to continue, and in most cases get worse, in the future. The most negative aspects of climate change will disproportionately affect coastal ecosystems and societies. However, negative consequences of climate change will be felt throughout the United States.

The most vulnerable region of the United States to the effects of climate change is Alaska. According to the U.S. Global Change Research Program, Arctic summer sea ice is receding faster than previously projected and is expected to disappear before 2050.³³ This trend has caused multiple vulnerabilities, such as drier landscapes, more wildfires, altered wildlife habitat, increased cost of maintaining infrastructure, and has released greenhouse gases that contribute to climate change. Additionally, Alaska's marine fishery productivity is down – Alaska's fisheries have the highest commercial value amongst any state in the U.S. The state government of Alaska concurs, claiming that the existence of 160 communities along Alaska's coast is under serious threat due to sea ice retreat, permafrost melt, and coastal erosion.³⁴ The southwestern U.S. is also very susceptible to the negative consequences of climate change. According to the U.S. Global Change Research Program, the southwestern US produces more than half of the nation's high-value crops, but increased warming, drought, insect outbreaks, and wildfires caused by or linked to climate change will threaten crop production indefinitely. Moreover, coastal cities in California, home to more than 90% of the region's population, are under threat of flooding, especially caused by extreme high tides. The 2014 National Climate Assessment claims that, "Climate change poses a major challenge to U.S.

³³ "Alaska: Key Messages About Alaska from the National Climate Assessment." 2014 *National Climate Assessment*. US Global Change Research Program.

³⁴ "Climate Change in Alaska." State of Alaska 2011.

agriculture because of the critical dependence of the agricultural system on climate and because of the complex role agriculture plays in rural and national social and economic systems... It will also alter the stability of food supplies and create new food security challenges for the United States as the world seeks to feed nine billion people by 2050.”³⁵

Major cities and ecosystems on the Gulf of Mexico and Atlantic Coast will be seriously impacted by rising sea levels. According to PBS, damaging floods caused by global warming-induced storm surges could batter 3.7 million U.S. residents in 2,150 coastal areas.³⁶ Florida, New York, and New Jersey are amongst the states most vulnerable to hurricanes and flooding, and also are the most densely populated. There are numerous cities built on the coast – Houston, New Orleans, Miami, and New York City, Los Angeles, Boston, and Seattle, to name a few – and these major metropolitan areas are directly under threat of both major storm systems that batter the coast; and to the consistent rise in sea level.

While coastal areas have and are expected to continue to bare the brunt of the effects of climate change, the Midwest US is not immune to issues. Drought and food shortages especially will affect the many already dry areas of the country. Major urban areas like Chicago, Detroit, and Dallas rely on food imports from southwest farms.

There is a more compelling and optimistic narrative of what preventative actions would accomplish. According to an Environmental Protection Agency report, taking measures to reduce CO₂ emissions and investing in geo-engineering technology will save

³⁵ “Agriculture.” *2014 National Climate Assessment*. US Global Change Research Program.

³⁶ Jacobson, Rebecca. “Will Your City Be Underwater? There’s a Map for That.” *PBS Newshour* 14 March 2012.

millions of dollars, hundreds of ecosystems, and thousands of lives in the U.S. by 2050.³⁷ The EPA report estimates that at least 14,000 lives will be saved by 2050 because of improvements in air quality and reductions in extreme weather events. Additionally, the report estimates that by 2050 the American taxpayer will have saved \$43.57 billion because of reductions in infrastructural damage, labor costs, and ecological damage (including agriculture). According to a report by Tim McDonnell, a senior writer for *Mother Jones*, existing global policies to limit warming could benefit the economy by up to \$2 trillion by 2030.³⁸ The juxtaposition of these statistics is staggering - on the one side is inaction coupled with complete disaster; on the other is mega-savings coupled with thorough reform. While it is possible that these projections will end up being overestimates, it is worth noting them because they help frame the conversation as ‘what can happen, and what can we do,’ rather than ‘what is going to happen and why we are helpless.’

The human-caused climate change hypotheses discussed and embraced in Chapter One would certainly implicate US as a main culprit in climate change. In this way, US have helped sew its own fate with regards to the detrimental effects of climate change. But it did so unintentionally, and in the process became the strongest economy in the world. Additionally, there is a long strand of ideological conservationism that provides hope for US going forward. What differentiates the debate in US with China, though, is that in the US the debate between conservationism and ‘extractionism’ (the idea that

³⁷ “Climate Action Benefits: Key Findings.” *Environmental Protection Agency*.

³⁸ McDonnell, Tim. “Why Saving the World Is a Great Deal for America.” *Mother Jones* 5 November 2015.

humans should use Earth's resources for their development) has a particular moral and theoretical element to it.

Philosophy of Human and Nature

Industrialization began broadly throughout much of the world in the mid-to-late 1800s. In US, this development had a particularly manufacturing-based character, highlighted no better than by the development of the so-called 'Rust Belt,' a string of northeastern cities based on trade and manufacturing; and by the expansion of US economy westward. As has been discussed in Chapter One, the effects of the Industrial Revolution on the climate, particularly in causing a spike of CO₂ emissions, are just now becoming better known. But the debate over the relationship between industrialization and nature had always existed, and is pertinent to modern the modern climate change debate.

The late Carlo M. Cipolla, a world-renowned economic historian, argued in his landmark book *Before the Industrial Revolution* that for all of human history humans had been subservient to nature, and that in fact much of human existence had been an effort to survive nature. Cipolla argues that the Industrial Revolution changed this dynamic, making humans the masters of nature.³⁹ In Cipolla's view, humans began to *use* nature to power its own development. For example, Americans began major deforestation programs in the Northeast to gather the wood to be burnt to power industrial plants. Cipolla's thesis is largely based on a win-lose analysis of the relationship between humans and nature. The implication of this take for contemporary issues is that if

³⁹ Cipolla, Carlo M. *Before the Industrial Revolution: European Society and Economy 1000-1700*. New York City: WW Norton & Company, 1994.

humans are to fight climate change, they would need to reverse the relationship between humans and nature once again, or at least ‘cede’ ground to nature.

While Cipolla’s view highlights the negative effects of industrialization on nature, it is not nuanced enough to encapsulate the various elements of the relationship between humans and nature. Sara Pritchard, an environmental politics academic at Cornell University, and Thomas Zeller, a professor of history at the University of Maryland, offer a better take than Cipolla. Pritchard and Zeller argue that a different framework should be used in analyzing industrialization, and that the debate about industrialization should view industrialization as a *natural* process. Pritchard and Zeller claim is that there is no dichotomy between nature and humans, and that indeed humans are a part of nature – therefore their actions are ‘natural.’⁴⁰ While humans clearly are able to cause damage to the environment, humans are themselves a part of nature. In a way, humans burning fossil fuels for development is no different than a giraffe eating the leaves of a tree, albeit on a much larger scale.

The implication of this argument is that human action towards nature is indeed action towards itself. Conceptually this argument may be confusing, but when taken practically it is obvious – humans are suffering as a result of climate change. There is a link between human action and human suffering with regards to climate change. If Cipolla’s view were correct, humans would not suffer from environmental degradation because he uses a win-lose framework.

⁴⁰ Pritchard, Sara B.; Zeller, Thomas. “The Nature of Industrialization.” *The Illusory Boundary: Environment and Technology in History*. Charlottesville: University of Virginia Press (2010): 69-100.

This is all very abstract, though – practically speaking, what is the significance of these theories? Throughout the history of US, Pritchard and Zeller’s theory of the relationship between nature and industrialization is . From the first industrial revolution through contemporary times, there has been a constant give and take between conservationism and extractionism, reflecting the intricate interplay between humans and their natural habitat, especially given humans uniquely positioned to affect nature.

Theory in Practice: Teddy the Frontiersman

Probably no other politician in US history appreciated the link between human and nature than Theodore Roosevelt – or at least no other politician was in a significant enough position to turn this appreciation into major action. President Roosevelt took office in 1901, decades after the beginning of the Industrial Revolution in US. While President Roosevelt could not have been entirely aware of the effects of industrial greenhouse gas emissions on the environment, as the science at this stage was underdeveloped, he was acutely concerned with deforestation in US as a result of the Industrial Revolution.

Laura Lovett, a professor of history at the University of Massachusetts, argues that Roosevelt invariably considered conservation as an integral component of making a better future for the ‘American race.’ Lovett argues that for Roosevelt, ‘the management of natural resources’ was fused with ‘the management of the race.’⁴¹ For Roosevelt,

⁴¹ Lovett, Laura. “Men as Trees Walking: Theodore Roosevelt and the Conservation of the Race.” *Conceiving the Future: Pronatalism, Reproduction, and the Family in the United States, 1890-1938*. Chapel Hill: North Carolina University Press (2007): 109-130.

humans were only as prosperous as their environment, because Roosevelt believed that humans were a part of nature.

To be sure, up until the Roosevelt Administration, deforestation was a major issue facing US. According to Douglas W. MacCleery, a historian with the Forest History Society, industrialization and population growth had significantly contributed to deforestation in US. MacCleery claims that in many areas in US, particularly the in Northeastern states and Midwestern frontier states such as Indiana and Illinois, forest cover had fallen from about 70% to 20% in just five decades.⁴² Andrea Becker, a biologist and reporter on environmental issues, claims that prior to European settlement, US had about 46% forest cover – by 1907, the percentage of US covered by forest had been reduced to 33%.⁴³

Roosevelt was at his core an ardent conservationist, and believed that environment, society, and individual were all linked. For Roosevelt, the frontiersman spirit was imbued in the ‘American race,’ and this impulse for outdoorsman ship need be cultivated as a matter of social necessity. Lovett paints such a picture of Roosevelt (112):

Roosevelt was deeply dedicated to the Lamarckian idea that the environment could profoundly influence an organism and that the results of that environmental influence could be passed from generation to generation. The highly valued character of the frontiersman was as much a result of blood as breeding, that is, living in the frontier environment. The ability of the environment to shape the character of an individual, family or race was crucially important to Roosevelt because it allowed that altering the environment was a powerful and lasting means of social reform.

President Roosevelt thus saw the national character of America as linked to the strength of its ecology. His view that environmental protection was linked to American

⁴² MacCleery, Douglas W. “American Forests: A History of Resiliency and Recovery.” Durham: Forest Hill Society (2011).

⁴³ Becker, Andrea. “Rates of Deforestation and Reforestation in the U.S.” *Demand Media*. Web.

nationalism is based on the theory of humans as a part of nature. Putting aside Roosevelt's antiquated ideas of the 'American race' and 20th century nationalism, what was clear for Roosevelt was that America could only be as strong as its environment. Thus, deforestation would seem an incredible issue for him.

In 1905, President Roosevelt established the Bureau of Forestry. This would be the executive arm in reforesting US. Through the Bureau of Forestry, Roosevelt aggressively acted to reforest US. According to the US National Park Service, Roosevelt established 230 million acres of national parks, 150 million acres of which were national forests. Moreover, Roosevelt established 51 Federal Bird Reserves, and created 23 total National Park sites.⁴⁴

President Roosevelt was significant because he established a link in the American political psyche between prosperity and environment. Roosevelt created the precedent of seeing environmental protection as a component of maintaining national strength. This ideology fits Prichard and Zeller's theory of humans as a part of nature. Additionally, Roosevelt's reforestation efforts helped salvage US' natural sinks that now are responsible for significant reduction of CO₂ emissions – an unforeseen but important consequence of his policies. However, industrialization did not stop at the turn of the 20th century. Indeed, it expanded and evolved. Thus, the debate between conservationism and extractionism would continue, and as such the 'Roosevelt School' of conservationism would need to adapt to changing environmental conditions. The 'Roosevelt school' of conservationism is largely based on abstract ideas, metaphysical principles, and romantic ideas of American national character. Soon, this theoretical framework would evolve.

⁴⁴ US Department of the Interior. "Theodore Roosevelt and Conservation." *National Park Service*. Web.

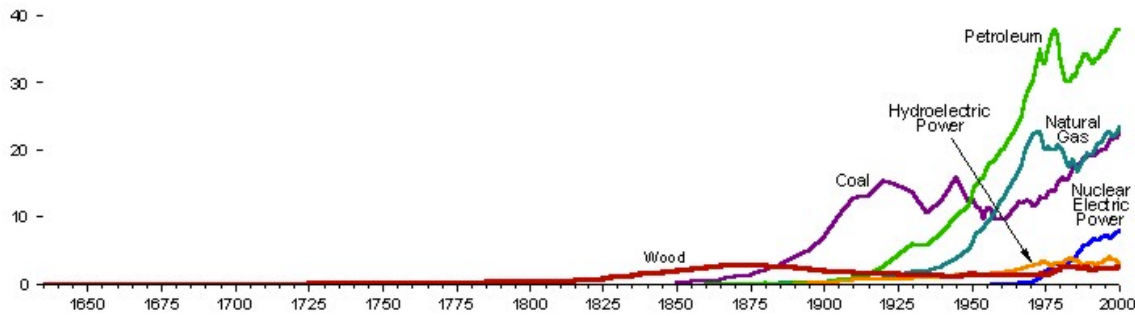
The Second Wave of Industrialization and Nixon's Energy Policy

After World War II, geopolitical and domestic dynamics were changing rapidly for US. The geographic isolation of US shielded it from much of the negative consequences of WWII, and New Deal economic reforms began to improve US' economic outlook. A bipolar world, in which US and the Soviet Union (USSR) were preeminent and adversarial, was quickly emerging.

Additionally, the economy of US was rapidly changing, and for that matter rapidly growing. According to US Bureau of Economic Analysis, between 1936 and 1950, the annualized GDP growth rate dipped below 20% only four times, exceeded 50% five times, including two years in which it exceeded 100%.⁴⁵ The growth of US economy at this time raised median incomes substantially, and a burgeoning middle class created a huge consumer-market. When one thinks of the post-WWII period, they conjure images of the rise of the nuclear family, suburbia America, and home ownership. With this development came a major spike in energy consumption that built upon the sustained uptick in energy consumption stemming from the beginning of the Industrial Revolution. The graph on the next page is based on figures provided by the Energy Information Administration, and was compiled by the physics department at the University of Western Oregon.⁴⁶ It shows energy consumption by source between 1650 and 2000:

⁴⁵ "Gross Domestic Product." *US Bureau of Economic Analysis*. Web.
<<http://www.bea.gov/national/index.htm#gdp>>

⁴⁶ "Historical Perspectives of Energy Consumption." *University of Western Oregon Department of Physics*. Web.
<<https://www.wou.edu/las/physci/GS361/electricity%20generation/HistoricalPerspectives.htm>>



These statistics are significant. In the post-WWII period, energy consumption skyrocketed. Behind this was an expansion of US manufacturing industry, the widespread use of automobiles, and the growth of home ownership.

At the time, not unlike the reforestation period of the T. Roosevelt Administration, the issue of CO₂ emissions and climate change was relatively unknown and obscure. But other environmental and energy issues emerged. Enter the Administration of Richard Nixon in 1969, and with it the new school of ‘technocratic environmentalism.’ The context of this new school was a particular geopolitical character of American energy policy caused by the role of US in the Cold War.

Rogers C.B. Morton, a former Secretary of the Interior and Secretary of Commerce for the Ford and Nixon Administrations, describes the Nixon Administration’s energy policy as a reaction to the challenge of changing global energy politics. Morton wrote in 1973 about Nixon’s energy policy:⁴⁷

A serious energy situation awaited the incoming Nixon administration in 1968. It stemmed from the fact that the nation was... in a period of transition from a long era of cheap and abundant indigenous energy and neglect of environmental consequences to one of scarcity of acceptable clean fuels, growing dependence on foreign energy imports, inadequate development of alternate clean energy sources and a growing interest in maintaining, or enhancing environmental values. Reacting to the challenge, the Nixon administration adopted an energy policy designed to ensure an adequate and dependable supply of energy to meet the country’s essential requirements and to assure its prosperity

⁴⁷ Morton, Rogers C.B. “The Nixon Administration Energy Policy.” *The Annals of the American Academy of Political and Social Science* 410 (1973): 65-74.

and security in ways which are consistent with the nation's environmental and social goals.

Essentially, Morton argued that President Nixon's energy policy aimed to achieve two goals. The first was improving US energy security - ensuring the supply of energy would not be impeded by various factors. This would ensure US economic prosperity, particularly vis-à-vis USSR. The second goal was to minimize adverse environmental effects of energy consumption.

To achieve energy security, according to Sec. Morton, Nixon followed a two-pronged strategy of developing a stable domestic energy sector, and of creating a geopolitical landscape that ensured strong relationships with energy exporters across the globe. On the domestic side, President Nixon, working with Congress and through executive branch agencies, dramatically expanded the scope of domestic energy production. This included promoting US domestic oil production through offshore drilling in the Gulf of Mexico and in Alaska, improving oil and natural gas pipeline infrastructure, and funding research and development in alternative energy sources such as hydropower, says Morton. Internationally, President Nixon moved to strengthen relations with major oil exporters, chief among them Saudi Arabia. According to Richard Mills, an energy sector analyst, President Nixon and King Faisal of Saudi Arabia agreed that all Saudi oil could only be purchased in US dollars, establishing the US dollar as the 'petrodollar.'⁴⁸ President Nixon was concerned about the value of the dollar after the elimination of the gold standard, and ensuring that Saudi oil could only be purchased in US dollars made global demand for US dollars seemingly permanent. King Faisal wanted to strengthen Saudi oil exports to US, at the time the largest economy in the

⁴⁸ Mills, Richard. "Nixon, Gold and Oil." *Ahead of the Herd*. Web.
<<http://aheadoftheherd.com/Newsletter/2012/Nixon-Gold-and-Oil.htm>>

world. By striking the agreement, a strong oil trade relationship between the two countries was established.

While President Nixon secured American energy sources, he also moved aggressively on the environmental front to ensure US energy consumption was sustainable. According to Sarah A. Vogel, a vice president of the Environmental Defense Fund, President Nixon faced a ‘toxicity crisis.’ Air and water pollution stemming from energy consumption, according to Vogel, began to take center stage as a public health crisis, mostly propelled by the release of multiple sets of landmark research linking chemical air pollution and cancer. Nixon’s first action to address this issue was to direct the Food and Drug Administration (FDA) to try to define and regulate these chemicals. It quickly became apparent that the FDA had inadequate regulatory authority to fulfill either of these tasks, particularly the latter.⁴⁹

President Nixon decided a more comprehensive regulatory agency was needed to specifically address air and water pollution. President Nixon, therefore, established the Environmental Protection Agency (EPA) to be the new frontlines organization to protect the environment. According to John R. Quarles, Jr., former Deputy Administrator of the Environmental Protection Agency, President Nixon saw EPA as an organization with specified legislative authority to create and enforce legal requirements related to pollution. In the past, various federal agencies served supervisory roles in researching pollution and its sources, but could only serve an advocacy role because of the lack of

⁴⁹ Vogel, Sarah. “The ‘Toxicity Crisis’ of the 1960s and 1970s.” *Is it Safe: BPA and the Struggle to Define the Safety of Chemicals*. Berkeley: University of California Press (2013): 43-77.

clear legal regulatory authority. EPA would be responsible for the entirety of the process of environmental regulation, from research to law.⁵⁰

This marked a dramatic evolution of the Roosevelt tradition. Roosevelt's environmental strategy was centered on maintaining natural environmental strength as a matter of national character. For Roosevelt, the importance of nature as a part of the American national identity meant that a central objective of environmental reform was the maintenance of wilderness. The emergence of pollution as a serious threat to American public health moved environmentalism from a metaphysical and nationalistic concept to a practical technocratic necessity. Additionally, the geopolitical aspects of energy policy created a new emphasis on security and sustainability. President Nixon, in establishing secure energy networks for US while simultaneously developing a coherent regulatory regime addressed the changing dynamics of the situation – indeed, the 'technocratic school' of environmentalism was a fusion of energy policy and environmental policy not seen before in US politics. The most significant outcome of the reign of 'technocratic school' environmentalism was the establishment of EPA, an agency whose importance only would increase over time, as will soon be shown.

'Technocratic school' environmentalism was not a departure from 'Roosevelt school' conservationism, though. Instead, it marked an evolution of Roosevelt's view of humans as a species inextricably linked to nature. President Nixon's strategy involved adapting environmentalism to a changing geopolitical system, especially given US' rising preeminence as a global power. Again, Nixon moved from conservationism as a matter of nationalist character to environmentalism as a matter of technical necessity. If humans

⁵⁰ Quarles, John R. "Functions of the Environmental Protection Agency." *Natural Resources Lawyer* 5.2 (1972): 330-337.

and nature were to survive in a changing and challenging world, government would have to take a central role in responsibly using its environment for the betterment of the country. Regulation, as opposed to reforestation, became the new medium for action given the new circumstances.

Much alike how the ‘technocratic school’ was born out of an adaptation to circumstances not addressed by ‘Roosevelt school’ conservationism, new developments in environmental science would quickly change the set of challenges facing the Nixon environmental regime. Soon, climate change would increasingly become a potent political issue in US. Scientific research would soon change the concept of air pollution, and the circumstances of the climate change issue would critically deteriorate efficacy of unilateral environmentalism.

Climate Change: A Global Threat, a US Failure

Climate change, for our purposes, became a major political issue during the Clinton Administration. President Clinton was the first US President to seriously address climate change as a political issue. Presidents Ronald Reagan and George H.W. Bush both invested time on environmental issues, but did not stray from the ‘technocratic school’ framework of environmentalism as a domestic pollution issue. Despite efforts by both President Clinton and President Bush to address climate change in their own way, neither was able to successfully create a new environmental regime to address the changing dimensions of environmental issues.

According to reporting by Tori DeAngelis, a freelance journalist, President Clinton first tried to address climate change in 1993. DeAngelis reports that on October

19, 1993, President Clinton released a 49-page plan designed to reduce greenhouse gas emissions to their 1990 levels by 2000. The plan, though, called for action through volunteerism by industry, accompanied by \$1.9 billion in federal spending to address the environmental effects of reform.⁵¹ In addition to President Clinton's domestic plan, he actively participated in international climate negotiations under the auspices of the United Nations Framework Convention on Climate Change. International negotiations under the Clinton Administration culminated in the signing of the 1997 Kyoto Protocol, the first effort at establishing a comprehensive global plan for action in combating climate change.

Both initiatives by the Clinton Administration wound up failing. The hope for volunteerism amongst industry to reduce domestic greenhouse gas emissions amounted to failure (although greater publicity of the issue certainly improved awareness). Partisanship prevented any hope for ratification of the Kyoto Protocol in US, so the Clinton Administration did not even attempt to send it to Congress.⁵² President Clinton's failures were the result of a few factors, to be discussed shortly.

Firstly, though the emergence of international negotiations was a new and significant development that must be discussed. When President Roosevelt decided to pursue a reforestation agenda, he did not consult the United Kingdom or France. When President Nixon set out to establish EPA, he did not call for UN negotiations. This is a reflection of a critical new challenge for environmentalism in the climate change era. During the Nixon Administration, the primary environmental challenge centered around

⁵¹ DeAngelis, Tori. "Clinton's Climate Change Action Plan." *Environmental Health Perspectives* 102.5 (1994): 448-449.

⁵² Sah, B.L.; Joshi, Divya U. "The Politics of Global Warming." *The Indian Journal of Political Science* 68.4 (2007): 769-780.

air and water pollution by toxic and often carcinogenic chemicals. Chemical pollution, then, was a local issue, and the technocratic school of environmentalism claimed the answer was the establishment of a local regulatory regime to combat hazardous air pollution. During the Clinton Administration, more compelling scientific evidence was being presented that air pollution, namely greenhouse gases (chief among them CO₂) was causing climate change, a global issue. Therefore, the emergence of climate change as a political issue *globalized* US environmentalism. Any evolution of the technocratic school of environmentalism would necessarily need to be enough of an adaptation to create a *globalized* solution.

President Clinton's failure to ratify the Kyoto Protocol as US law was chiefly a result of a hyper-partisan climate and a scandal-plagued administration. This excuse, though, does not belittle the fact that the Nixon environmental regime was inadequate to address climate change as a global issue. Moreover, President Clinton was unable to, unlike Presidents Roosevelt and Nixon, to create and evolve existing theories of environmentalism to the pertinent times. Indeed, in participating in Kyoto negotiations President Clinton tried to do just that, but he tried and failed.

President George W. Bush, for his part, took a step in the wrong direction from President Clinton's approach in that his administration refused to meaningfully participate in international climate negotiations. Frank Gaffney, Jr., writing for *National Review Online* in 2001, summarized the President's objections to international climate change negotiations as a refusal to cede sovereignty to any emerging international climate regimes. According to Gaffney, this was part of a broader rejection of multilateralism by the Bush Administration – a strategy that included his intention to “move beyond” the

1972 Anti-Ballistic Missile Treaty with or without Russian assent; a refusal to ratify the Treaty of Rome establishing an International Criminal Court; and refusal to agree to the Biological Weapons Convention; among other things.⁵³ President Bush's outright rejection of multilateralism obviously would mean that no new comprehensive global approach to climate change would be completed. Thus, President Bush failed at following the proud tradition of two Republican presidents in comprising a strategy to promote the prosperity of humans and their habitat.

Then-Senator Barack Obama ran a presidential campaign in 2008 expressly and explicitly calling for climate change action through domestic reform, and as importantly through multilateral diplomacy. His election victory provided a new glimmer of hope that a president would finally adapt the environmentalist ideology to the pressing concerns of the time. But time did not stand still during the Clinton and Bush Administrations, and inaction during those 16 years made the challenge the incoming Obama Administration faced all the more challenging. First of all, climate change's ascendance as a political issue, and the apparent requirement of emissions reductions, rallied interest groups to fight reform. Secondly, as US twiddled its thumbs, the problem was getting much, much worse.

The Emergence of the Fossil Fuel Industry as a Political Force

The fossil fuels industry is comprised of major oil, natural gas, and coal producers. The development of US economy, and with it an ever growing demand for energy, necessitated the development of major domestic energy producers, as has already

⁵³ Gaffney, Frank. "The Isolationist President? It's U.S. Sovereignty, Stupid." *National Review Online* 26 July 2001. Web.

been discussed. A strongly developed fossil fuel industry has positively affected the US economy in many respects, such as by reducing energy prices, creating jobs, and enhancing energy security. With that being said, an unforeseen consequence of a strong fossil fuel industry has been the aggregation of their interests as a lobbying force. This has become all the more pertinent (and in fact could have been in part caused by) the emergence of climate change as a serious political issue. To combat climate change would require a reduction of emissions of greenhouse gases, and given the current underdeveloped state of geo-engineering, therefore would require reducing national energy consumption. This would have adverse effects on the fossil fuels industry as a whole. As such, their lobbying efforts have a common goal – the preservation of fossil fuel consumption. In effect the entrance of climate change into national political discussion served as a rallying cry for the fossil fuel industry to begin substantial lobbying efforts.

According to Oil Change International, a political research group, the fossil fuel industry spent a grand total of \$326.2 million during the 113th congress (2013-14) in campaign contributions.⁵⁴ Open Secrets, a research group that focuses on political contributions, claim that oil and gas (not coal) interest group contributions neared \$288 million in 2013-14.⁵⁵ Moreover, according to Open Secrets, campaign contributions from the fossil fuel industry have dramatically increased in recent years as the climate change debate has intensified nationally – the past eight years have seen the highest levels of

⁵⁴ “Fossil Fuel Funding to Congress: Industry Influence in the US.” *Oil Change International*. Web. < <http://priceofoil.org/fossil-fuel-industry-influence-in-the-u-s/> >

⁵⁵ “Oil and Gas.” *Open Secrets*. Web. <<https://www.opensecrets.org/industries/indus.php?ind=e01>>

campaign contributions from the fossil fuel industry in over three decades. Additionally, Open Secrets highlights the partisan split in campaign contributions from the fossil fuel industry – the overwhelming majority of campaign contributions have gone to members of the Republican Party. In 2012, total campaign contributions to Republicans were more than quadruple the amount of total campaign contributions to Democrats, Open Secrets’ research indicates. This trend has not reversed. In 2015 and 2016, the top five recipients of campaign contributions were Republicans – Sen. Ted Cruz, Sen. Lisa Murkowski, Gov. Jeb Bush, Rep. John Boehner, and Rep. Kevin McCarthy, according to Open Secrets.

While environmental lobbying groups have formed together to try to counter the influence of fossil fuel lobbying, their resources are far less substantial than these entrenched industries. According to Open Secrets, 2009 was the peak year of campaign contributions by environmental groups, with the total reaching just north of \$24 million. Since then, environmental groups have contributed a total of about \$100 million, on average almost \$17 million per year.⁵⁶ Just as most of the fossil fuel industry’s contributions go to members of the Republican Party, most of environmental groups’ contributions go to members of the Democratic Party. The top five recipients of contributions from environmental groups are all Democrats – Sen. Brian Schatz, Sec. Hillary Clinton, Sen. Chuck Schumer, Sen. Michael F. Bennet, and Sen. Patty Murray.

Maybe the most significant issue caused by such exorbitant lobbying efforts has been that climate change has become an intensely partisan issue. Such substantial campaign contributions almost guarantee that most candidates for Republican political

⁵⁶ “Environment.” *Open Secrets*. Web.
<<http://www.opensecrets.org/industries/indus.php?ind=q11>>

office (at least the most deep-pocketed) will be opposed to reform. This has resulted in the muddying and rejection of scientific research in public debate, and will continue to have pervasive political effects going forward.

US Emissions: An Immense Issue

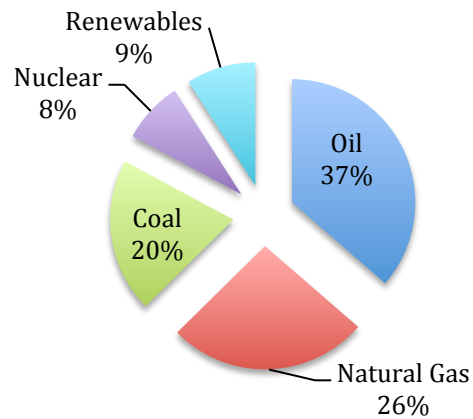
Today, US emissions are the second highest in the world, trailing behind only China. According to 2011 EPA Statistics, US are responsible for 16% of total global emissions. China is responsible for 28% of total global emissions, the European Union (EU) for 10%, India and Russia for 6% each, and Japan for 4%.⁵⁷ These statistics have probably been skewed in the nearly five years since this report was published, perhaps caused by a rise in China's percent of total global emissions.

The U.S. economy runs predominantly on fossil fuels, with a small percentage of energy production coming from renewables and nuclear energy. Together, fossil fuels account for nearly 65% of primary energy use in the U.S., with renewables and nuclear power (zero and low-carbon emitting energy sources) only accounting for about 17% of primary energy use. On the next page is a pie chart based on 2011 statistics from the Energy Information Administration (E.I.A.).⁵⁸

⁵⁷ "Global Greenhouse Gas Emissions Data." *United States Environmental Protection Agency*. Web.

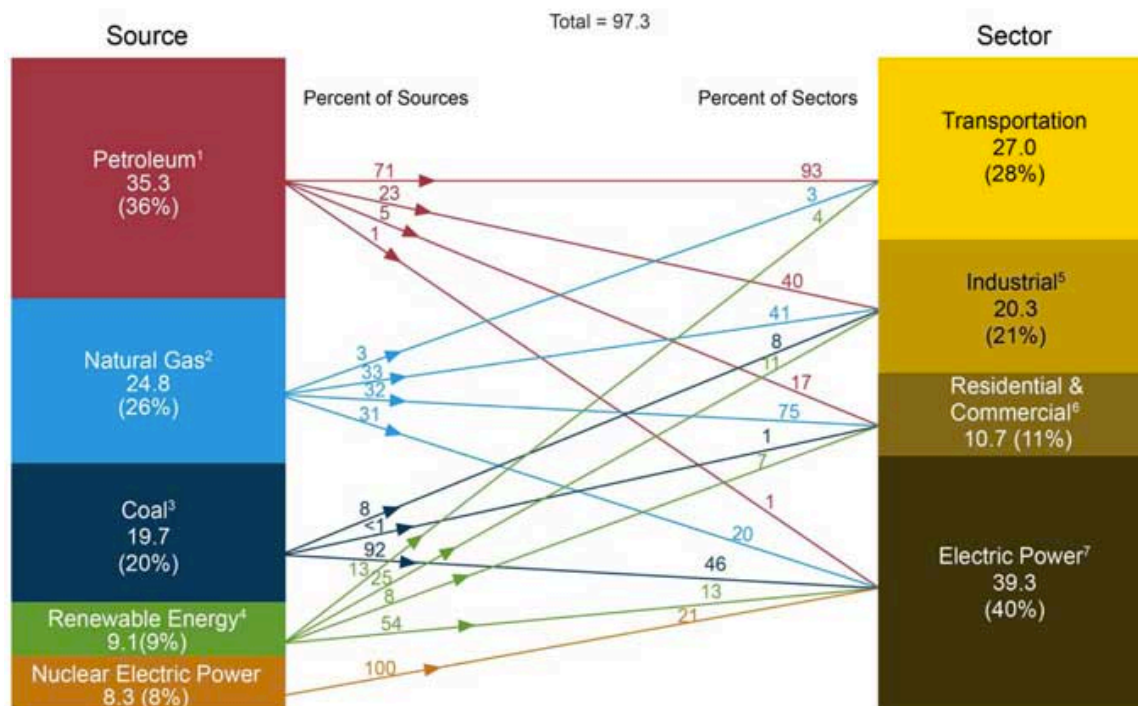
⁵⁸ "Primary Energy Consumption by Source and Sector, 2011." *Annual Energy Review*. *US Energy Information Administration*. Web.

Primary Energy Use By Source, 2011



The enormous market share advantage of the fossil fuel industry is compounded by the importance of energy consumption for economic growth. Undoubtedly, this strengthens the hand of fossil fuel industry lobbyists.

The E.I.A. also compiled a chart showing to which industries these energy sources go. The chart is on the next page – again, these statistics are based on a 2011 E.I.A. study and the chart was produced by the E.I.A. and made available on its website:⁵⁸



While it may initially look like the distribution above is fairly even, a few striking numbers pop out. 93% of energy for transportation comes from petroleum. Moreover, almost 90% of energy used for industrial purposes comes from fossil fuels. Electrical production uses up 92% of total coal supplies and 100% of total nuclear energy supplies.

Some time has passed since these EPA statistics were published. The Congressional Research Service produced a report in 2014 that comes to somewhat of a different conclusion.⁵⁹ According to the report, about 40% of energy consumed in the U.S. is supplied by oil; between 30% and 40% of consumption in the U.S. is natural gas. Additionally, according to the report, 93% of electricity generation is powered by coal. Renewables account for very little of total energy consumption in the U.S., the report finds. Seemingly, US has increased its use of oil and natural gas vis-à-vis coal, but still

⁵⁹ Ratner, Michael; Glover, Carol. "US Energy: Overview and Key Statistics." *Congressional Research Service*. 27 June 2014. Web.

relies on coal (even more so now than in 2011) on a major scale for electricity generation. The discrepancy between these figures is probably a function of the changing energy picture in US, especially considering the shale boom, and differences in accounting. What is clear, though, from both sets of statistics is that US remains completely reliant on fossil fuels to power its economy.

Especially striking is how poorly US does in its CO₂ emissions relative to similar economies. Take for example the European Union (EU). According to 2013 statistics provided by Europa, a EU government statistics agency, EU emits substantially less CO₂ than US industry-by-industry; and emits less per capita than US.⁶⁰

Clearly, the major issue for US going forward is whether or not it can wean itself off of fossil fuels. Assumedly, such a goal would require a strategy of reducing across the board energy consumption and improving renewable energy infrastructure. The challenge, given the entrenchment of US fossil fuels industry (both as a lobbying force and the predominant US domestic energy producer), is immense. A breakdown of the percentages of primary energy source by industry in both EU and US is provided in the table below, based on figures provided by EPA⁵⁸ and Europa. With these percentages, the total kilotons of CO₂ emissions per sector was estimated using 2013 total CO₂ emission by country statistics provided by Nick Evershed of *The Guardian*:⁶¹

	US as a percentage	EU as a percentage	US (kt CO ₂)	EU (kt CO ₂)
Industrial	27	17	1,440,180	580,550
Transportation	28	22	1,493,520	751,300
Residential	45	61	2,400,300	2,083,150

⁶⁰ “Greenhouse Gas Emissions, Analysis by Sector, EU-28, 1990 and 2013.” *Europa*. Eurostat: Statistics Explained 15 December 2015. Web.

⁶¹ Evershed, Nick. “World Carbon Dioxide Emissions by Country.” *The Guardian: Data Blog* 15 July 2013. Web.

‘Industrial’ includes the combustion of fuel for industrial use, whether it is agricultural or manufacturing. ‘Transportation’ includes combustion of fuel to power automobiles, trucks, ships, trains, and airplanes. ‘Residential’ includes the combustion of fuel for habitation, including home heating, cooking, and electricity generation. EPA and Europa do not use the same categorical breakdown by sector, so statistics have had to be synthesized into these three catchall, if imperfect categories. Despite this, these statistics do paint a picture of a much less inefficient economy in terms of emissions. According to World Bank statistics, in 2011 US CO₂ emissions as a ratio of kilograms per dollar of GDP was 0.3 – in EU the figure is a little less than 0.2.⁶² Moreover, US do worse than EU on a per capita basis in terms of CO₂ emissions. According to 2011 World Bank statistics, EU emitted 7.1 metric tons of CO₂ per capita, while US emitted 17 metric tons of CO₂ per capita.⁶³

US are lagging behind in a serious way. They emit more CO₂ than EU, a larger economy with a bigger population. President Bush’s successor would have a difficult time in two respects – reducing domestic CO₂ emissions substantially, while simultaneously attempting to organize an international climate change regime in the context of past failures by US presidents to do so.

⁶² “CO₂ Emissions (kg per PPP \$ of GDP).” *World Bank*. Data. Web.

⁶³ “CO₂ Emissions (metric tons per capita).” *World Bank*. Data. Web.

Conclusion

US reliance on fossil fuels has created a huge policy dilemma for its political leaders. There is an ideological, historical, and scientific impetus for action on climate change. Yet, without the burning of fossil fuels, US economic growth would stunt dramatically. Moreover, there is a different aspect to the climate change issue than other environmental issues for past US presidents. Climate change is truly a global issue, and given US' position in the world system, it must take on a leadership role to galvanize international action. Truly, the global aspect of climate change has made this issue as much of a foreign policy challenge as a domestic environmentalism challenge.

The big question posed to the incoming Obama Administration in 2009 was whether or not he would be able to successfully establish an international climate change regime effective enough to mitigate the worst effects of climate change. President Obama's environmental legacy would depend on whether or not he is able to accomplish these ends. Would he be able to succeed where his two predecessors failed? President Obama would need to establish a third-era school of environmentalism, a 'globalized school' of environmentalism.

The globalization of US environmental issues complicates the challenge for President Obama. Persistent problems, both domestic and international, have plagued multilateral climate negotiations thus far. The issue is as local as it is global – the effects of climate change have no boundaries. Tricky diplomatic and domestic hurdles would have to be overcome by President Obama if he were to succeed. Whereas Presidents Roosevelt and Nixon were able to address their environmental crises solely through domestic action, a globalized environmental challenge requires Presidential leadership on

the global stage. US is in the unique position of being the predominant source of the issue and country most able to affect positive change in combating climate change. It is the source of the issue because of its reliance on consumption, and emissions over history. It is in the best position to affect positive change because of its leadership role in the international system. The challenge for Obama would be whether or not he could affect change both at home and abroad.

The most obvious first step for President Obama would be to start off where his predecessor left off. President Bush, for his part, declined to take this approach, and as such international climate negotiations had not progressed since President Clinton's inability to clear the Kyoto Protocol through Congress. While climate change has moved on, international negotiations are stuck in the late 1990s. That seems a tough place to start for the President.

Chapter IV: International Climate Negotiations

The international climate change regime was in disarray when President Obama took office. Two decades of neglect by the US political system left the movement leaderless. Moreover, Chinese hesitancy for reform had threatened to derail multilateral efforts before they started. The old ghosts of past failures at multilateralism would haunt the Obama Administration's first efforts in Copenhagen in 2009. Whether or not he would be able to rectify these issues would be a telltale sign of whether or not establishing a comprehensive international climate change regime would be realistic.

International Climate Diplomacy: A Sustainable Failure

With global temperatures on the rise, and a growing, if not overwhelming, body of scientific evidence blaming man-made CO₂ emissions, climate change is clearly a major issue for the international community. The United States and China, the world's two largest CO₂ emitters, both realize this. However, the global nature of climate change necessitates an international response. This dynamic certainly complicates an already complicated issue.

Many states have long accepted the need for international diplomacy to combat climate change. The final round of negotiations on the United Nations Framework Convention on Climate Change (UNFCCC) was completed in 1992. This was supposed to be a watershed moment. Unfortunately, the short history of the UNFCCC has been mired with failure. It has yielded numerous summits in which the international community had been incapable of coming to a comprehensive international agreement to address the issue. The two most notorious failures of UNFCCC summits were the 1997

Conference of Parties (COP) III in Kyoto, Japan, and the 2009 COP XV in Copenhagen, Denmark.

COP III, also known as the Kyoto Protocol, was successful in creating a framework agreement that CO₂ emissions across the globe had to be reduced. However, given the political climate in the US, at the time the largest emitter in the world, the agreement was not worth much. According to Timothy Wirth, a former U.S. Senator, the Clinton Administration agreed to the framework in Kyoto, but quickly put it on the political backburner after congressional Republicans claimed that the Protocol was dead on arrival to the Senate.⁶⁴ There is not much the Clinton Administration could do at that point, as Republicans were in control of both chambers of U.S. Congress. Additionally, soon-to-come scandals certainly derailed any hope of bipartisanship. The Kyoto Protocol led to another COP summit in Prague, Czech Republic, in 2000. Then presidential candidate George W. Bush made a mistake with major repercussions on the campaign trail, according to Wirth. While on the campaign trail, Bush decried the Protocol as a threat to American sovereignty. While doing this, he also embraced emissions cuts, going as far as proposing to amend the Clean Air Act to require mandatory carbon emissions reductions from utilities companies. After Bush took office, a series of missteps spelt disaster for international climate diplomacy. The Administrator of the EPA Christine Todd Whitman publicly restated Bush's campaign desire to cut CO₂ emissions, putting the debate on the front burner of US politics, and galvanizing the natural gas industry to intensify lobbying efforts. Meanwhile Condoleezza Rice, then the administration's

⁶⁴ Wirth, Timothy. "Hot Air Over Kyoto: The United States and the Politics of Global Warming." *Harvard International Review* 23.4 (2002): 72-77.

national security advisor, told European ambassadors to consider Kyoto dead.⁶⁵ This had the effect of signaling to the international community that the Bush Administration had no intention of dealing with climate change through the UNFCCC. These public missteps, Wirth claims, doomed Kyoto, and along with it any international action on climate change for the remainder of the Bush Administration.

Without the Bush Administration's missteps, it would still have been unlikely that the climate change reform would have gone anywhere, though. President Clinton was unable overcome a Republican majority in Congress, and until the political landscape in the US shifted, it is unlikely any change would come about. Additionally, there were many initial flaws with the Kyoto Protocol – indeed, it was only a framework agreement and had no plan for implementation. The withdrawal of the world's largest economy and largest polluter from the process put the damper on any hopes of reform.

Fast forward to the end of the Bush presidency. The world at that point was a very, very different place. The Bush Administration had just gone through two faulty foreign ventures in Iraq and Afghanistan; and the global economy was crashing from the financial crisis. Senator Barack Obama was a surging figure in national politics. His campaign message of change was vaulting him towards the White House, and one of his principle goals was to bring climate change back as a crucial political issue. Obama won the presidential election in 2008, while carrying on his back enough Democratic congressional victories to earn a majority in both the House and the Senate. He promised to improve relations with the international community on a variety of diplomatic issues.

⁶⁵ Borger, Julian. "Bush Kills Global Warming Treaty." *The Guardian*. 29 March 2001. Web.

And with his election victory came a new hope – the revitalization of progress at UNFCCC.

Additionally, at this point the climate change landscape had also changed. China had overtaken the U.S. as the biggest emitter of CO₂ in the world in 2006. The US would no longer be able to single-handedly affect climate change negotiations with its involvement (or lack thereof). Any climate agreement necessitated the involvement of both China and the US. This new development complicated international efforts to combat climate change at the very moment when it seemed as though the political winds in the US were beginning to shift.

Despite this new wrinkle, the COP XV in December 2009 located in Copenhagen, Denmark, would be the Obama Administration's first crack at addressing climate change; and would highlight the US' renewed dedication to multilateral climate change diplomacy. The Obama Administration was riding a wave of popularity both at home and abroad, and hoped to seize the moment to get real results in Copenhagen, therein notching a major success early on in the Administration. However, much to the dismay of both the White House and the international community, COP XV was a resounding failure. It failed to produce any comprehensive framework, and even failed to achieve the same level of international commitment as the Kyoto Protocol.

Over the long course of negotiations during COP XV, no consensus text was even produced until the last minute. The Copenhagen Accord, a two and a half page document, only enabled UNFCCC to continue climate negotiations with a COP XVI. According to Navroz Dubash, a senior fellow for the Centre for Policy Research, the main source of disagreement that derailed COP XV from the start was a critical

disagreement between industrialized and developing countries.⁶⁶ This disagreement, according to Dubash, splintered the international community from the beginning. Industrialized countries wanted to approach the issue as a ‘techno-managerial’ process in which markets would be utilized to reduce emissions (for example through cap-and-trade, carbon tax, etc....) and to develop new geo-engineering technologies. Generally, the US and the EU led this bloc. The developing countries saw the issue in a different light – they believed the industrialized countries to be responsible for the large majority of CO₂ pollution over the course of history, and felt it their right to emit equal amounts of CO₂ unless developed countries provided financial aid and technological assistance to alleviate the economic effects of CO₂ emission reductions. China, now the world’s largest emitter, and a country growing rapidly because of heavy industrial manufacturing, was the leader of this bloc, along with other BRICs countries (Brazil, Russia, India, China, South Africa). This difference doomed COP XV from the start, according to Dubash, because neither side was able to work out their differences with the other, nor by the time heads of states began to arrive in Copenhagen to enter the ‘final stage’ of negotiations, no substantive progress had been made on the issue.

Martin Khor, executive director of South Centre, offers a partially different explanation for the failure at COP XV. According to Khor, western leaders attempted to hijack legitimate multilateral negotiations by producing their own accord in private, followed by an attempt to ram it through COP, giving developing countries little time to review, debate and amend the document. While the body of the UNFCCC worked on the Bali Action Plan, which were bottom-up negotiations focused on mitigation, adaptation,

⁶⁶ Dubash, Navroz K. “Copenhagen: Climate of Mistrust.” *Economic and Political Weekly* 44.52 (2009): 8-11. Web.

finance, technology, and a shared vision, a secluded group of western negotiators worked separately on their own Copenhagen Accord. Both ad-hoc and unofficial conferences collided on the 19th of December, according to Khor, and the wedge between the two bodies was too large to overcome in a short amount of time. Moreover, the divisions sowed at COP XV would continue to poison climate diplomacy.⁶⁷

While both Dubash and Khor are quick to assume that the failure of COP XV was the result of differences between two blocs, developing and industrialized countries, there is another potential explanation that focuses on local politics in the two major CO₂ emitting countries – the US and China. Paul G. Harris, a professor of Global and Environmental Studies at Hong Kong University, argues that the real flaw with COP XV was the ‘malignancy of the great polluters.’ Harris argues that neither the US nor China were seriously prepared to address their own exorbitant emissions in 2009, thereby dooming COP XV. If the US and China were unwilling to reduce their CO₂ emissions, and these two countries were primarily responsible for a large chunk of the annual emissions at the time, then why would other countries make any sacrifices?⁶⁸ Harris’ critique may be a little too harsh for the US – indeed, with the election of Barack Obama in 2008; it looked like the US domestic audience was poised for some sort of climate action. However, Harris is probably right about reluctance for action in Beijing, especially given the Communist Party’s (CCP) reliance on economic growth as a foundation of political legitimacy. This is not to say, though, that there was not a

⁶⁷ Khor, Martin. “The Real Tragedy of Copenhagen.” *Economic and Political Weekly* 45.1 (2010): 10-13.

⁶⁸ Harris, Paul G. *What’s Wrong With Climate Politics, and How to Fix It*. Cambridge: Polity Press. 2013. Print.

substantial portion of the US that was against climate change action in 2009, especially considering the size and influence of major fossil fuel lobbying groups throughout the US.

It is unfair to blame a single party for the failure of COP XV. It was an unrealistic expectation, especially given the economic context of 2009, for developed countries to take on the financial burden of combating climate change for the entire world. It was equally as unrealistic to expect developing countries to rubber-stamp a resolution hammered out in private by industrialized countries. Compounding the issue were the domestic pressures on the two largest CO₂ emitters in the world, US and China, to not reduce emissions. It may have just been the case that COP XV had too lofty of expectations at the wrong time. The COP in Copenhagen did make clear, though, that the diplomatic hurdles to a multilateral resolution were high and numerous, and the international community, if it were to revisit the issue, would have to change its strategy. COP XV in Copenhagen was the capstone of nearly a decade and a half of unsuccessful climate negotiations.

Starting from Scratch

There were two fundamental issues with negotiations up to 2009. The first issue was the chasm of difference between how developed countries and developing countries wanted to deal with the issue. The second was that the two big polluters, US and China, were unwilling to address their own CO₂ emissions in a serious way, mostly for domestic reasons. Moreover, the failure of COP XV left multilateral climate negotiations in a bad place. Mistrust was bred in developing nations towards industrialized nations. Any

progress that had been made in building an international coalition of both developed and developing states to combat climate change had been lost.

While momentum on the issue had stalled on the multilateral front, the Obama Administration did not want to give up. Obama, a liberal Democrat, saw climate change as a serious issue and hoped to move aggressively to address it. But the failure of Copenhagen must have been a seriously sobering moment for the newly elected president.

By the time Obama had taken office, bilateral relations with China were of significant importance. Climate change was an issue that the Chinese were not particularly interested in discussing too thoroughly, but the Obama Administration repeatedly made it a centerpiece issue whenever the two countries had formal and informal meetings. According to Jeffrey Bader, then the administration's senior director for Asian affairs on the National Security Council, states that Obama consistently and enthusiastically raised the issue of climate change every chance.⁶⁹ Indeed, Secretary of State Hillary Clinton made bilateral climate change negotiations a centerpiece of the widely publicized 'pivot' to Asia, Bader claims. Despite the energy with which the Obama Administration approached the issue, the Chinese remained unwilling to play ball with the US on CO₂ emission reductions. The Chinese were unwilling to address their CO₂ emissions at that time because of their delicate political situation on the domestic front. Obama's strategy of bilateral climate diplomacy focused on engagement and trust building, so the administration took what they could. In July 2009, representatives of the

⁶⁹ Bader, Jeffrey A., and Brookings Institution. *Obama and China's Rise: An Insider's Account of America's Asia Strategy*. Washington, D.C.: Brookings Institution Press, 2012. Print.

CCP signed a joint agreement with the US Department of Energy to develop the US-China Clean Energy Research Center (CERC). The announcement was a major step in the right direction for Obama – it built trust with the Chinese and it was a substantial investment by both countries in developing green technology to try to help combat climate change. It was also a signal to the rest of the world that both the Chinese and the US were now invested in the fight against climate change. Momentum continued in 2009 when it was announced at the US-China Presidential Summit in Beijing that both countries would continue to cooperate.⁷⁰

While bilateral research and development is well and good, the CERC agreement between the two countries only amounted to a piecemeal bandage. The Chinese were still avoiding the real hurdle that needed to be overcome, CO₂ emission reductions. Additionally, it is not as if the U.S. was aggressively moving to reduce emissions themselves. The Obama Administration was spending its political capital on other issues, namely health care reform, and Democrats lost control of the House of Representatives in the 2010 midterm elections, complicating any legislative efforts to combat climate change. In fact, Judith A Layzer, an environmental policy academic, argues that the Great Recession of 2008 prevented Obama from pursuing climate change reforms.⁷¹ Essentially, the dire straits of the economy were a more valuable political issue than climate change for a first-term president who faced reelection, argues Layzer. The

⁷⁰ “Engaging China on Clean Energy Cooperation”. “Engaging China on Clean Energy Cooperation”. *Green Innovation in China: China's Wind Power Industry and the Global Transition to a Low-carbon Economy*. Columbia University Press, 2013. 168–188.

⁷¹ Layzer, Judith A. “Cold Front: How the Recession Stalled Obama’s Clean-Energy Agenda.” *Reaching for a New Deal: Ambitious Governance, Economic Meltdown, and Polarized Politics in Obama’s First Two Years* 321-385. Russel Sage Foundation, 2011.

Administration was forced to spend their political capital on more immediately pressing political concerns that climate change. Additionally, there was to be a new leader in Beijing in 2012.

Regardless, the bilateral cooperation in 2009 was significant. The two biggest CO₂ emitters in the world, and the leaders of developing and developed countries, had made significant progress in their diplomatic efforts. Their progress was also more substantial than any progress made in Copenhagen. The bilateral cooperation between the two countries highlighted a potential new path for international climate diplomacy. The Obama Administration probably realized this, and they consciously decided to take the ball and run.

Xi the Realist

Obama's ambition to address climate change was clear. In both his 2008 and 2012 presidential campaigns, he ran on the promise of making America greener, and to lead the rest of the world to do the same. Losing the House of Representatives in 2010 was a major blow to the Obama Administration, effectively ruining any chance to pass climate change legislation. However, this would not dampen his resolve to do all he could, especially after his reelection in 2012.

The priorities of the Chinese were much different than the US, though. The illiberality of the regime in China put pressure on the government to keep people happy to avoid social unrest. Central to the CCP's strategy was ensuring that China's economy continued to grow rapidly, and to propel more and more of its citizens out of poverty. For decades economic success had been a central element of the CCP's legitimacy. The

core element of their economic development after the turn of the century had been their production of heavy industrial materials, such as cement and metals. The unintended consequence of this heavy-industry led economic growth, though, had been a massive uptick in CO₂ emissions. The environmental damage done by Chinese CO₂ emissions were substantial and unlikely to be reversed at any point soon. This was not much of a concern for the CCP at the time.

This calculus started to change in a serious way in 2012, though. Xi Jinping had been selected as the new president in 2012. His entry into the position was of great importance – he was the leader of a ‘risen’ China. The entrance of Xi Jinping into China’s top position also marked a serious turning point in how China approached climate change. As argued by Lichao He, a political scientist specializing in Chinese foreign policy, the Chinese approach to most international issues (especially with regards to climate change because of its link to economic production) had been an emphasis on its own national interest.⁷² Xi kept with these realist roots of Chinese politics, but the ‘national interest’ was no longer as simple as economic growth at any cost.

The issue of air pollution in China had increasingly become a hot political topic. Beijing was the host of the Summer Olympics in 2008 – this highlighted the air pollution issue to the international community, and was a cause of great embarrassment for the Chinese nation. The scientific community was increasingly examining links between smog from pollution and a growing number of cases of lung cancer, respiratory illness, and cardiovascular disease. Bringing China out of the smog, and to a developed, services-based, low carbon economy is critical to the new 21st century strategy of China.

⁷² He, Lichao. “China’s Climate-Change Policy from Kyoto to Copenhagen.” *Asian Perspectives*. 34.3 (2010) 5-33.

The problem of air pollution in China was caused by China's uncapped emissions. Interestingly enough, the domestic strategy to reduce deadly air pollution overlaps with the international strategy to combat climate change. Both issues necessitated a reduction in CO₂ emissions and investment in geo-engineering research and development. In the classical sense of the phrase, by reducing emissions and investing in research and development the Chinese could kill two birds with one stone.

Xi Jinping, following the typical Chinese foreign policy tenant of realism, made his number one foreign policy priority of pursuing the national interest on the international scene. This basic strategy had not changed. According to Wuqiriletu, a Chinese academic, what had changed was the national interest – tackling the now notorious air pollution issue had become almost as prominent of an issue as maintaining economic growth. Xi's duty as President was to shepherd his country from a rising power to a developed country. Improving the population's quality of life no longer was as simple as bringing people out of poverty – quality of life now also relied on quality of living conditions.⁷³

This shift by no means meant that China would suddenly become an activist player on the international climate diplomacy scene. But what was significant in terms of the prospects for bilateral negotiations is that China now seemed poised to address its CO₂ emissions in the near future. The new challenge for the Obama administration was to try to convince the incoming President Xi Jinping that it was in China's national interest to approach the issue bilaterally.

⁷³ Wuqiriletu. "Shared Air, Shared Destiny." *Shared Destiny*. 252-259. Canberra: Australian National University Press. 2015.

A Climate of Mistrust

Obama's reelection in 2012 seemed to be at least somewhat of an endorsement of his climate policy by the American public – at least enough to provide some renewed momentum to the issue. However, the campaign platform for Obama's reelection did not feature climate change prominently, at least relative to other issues. Obama's reelection seemed more of an endorsement for his health care, economic policies, social values and counterterrorism policies than his stance on CO₂ emissions. Regardless, the Obama Administration hoped to feature the issue of climate change prominently at its meetings with newly enshrined President Xi Jinping of China. In fact, prior to 2012 the Obama Administration had seen much more success in bilateral negotiations with China than at multilateral negotiations at COP summits.

Unfortunately, diplomacy is a limited resource. There is only so much territory two countries can cover in a meeting or summit. Much to the chagrin of the Obama Administration, the prominent issues featured at US-Chinese diplomatic sessions were widely unrelated to climate change. Obama and Xi had met on numerous occasions in the lead up to February of 2014. According Bonnie Glaser and Jacqueline Vitello of the Center for Strategic and International Studies, other major international issues squeezed out any progress to be made on climate change. Glaser and Vitello summarize bilateral diplomacy of being dominated by a variety of non-climate issues, such as maritime land disputes; Russia's seizure of Crimea; and North Korea's nuclear weapons; and cyber security issues.⁷⁴ These contemporary events all took place in a context of already

⁷⁴ Glaser, Bonnie; Vitello, Jacqueline. "US-China Relations: China's Maritime Disputes Top the Agenda." *Comparative Connections: A Triannual E-Journal On East Asian Bilateral Relations* 16.1 (2014) 29-43. *Political Science Complete*. Web.

seriously complicated bilateral relations between the US and China. The two intertwined giants of the world have for both of their modern histories been at philosophical odds, and seemingly in constant dispute over issues ranging from Japan to Taiwan. Given this context, bilateral negotiations between the two countries remained a difficult process. In fact, according to Glaser and Vitello, bilateral relations between the two countries can become so tense that meetings can culminate into shouting matches, as had happened between then Secretary of Defense Chuck Hagel and Defense Minister Chang Wanquan in April of 2014.

The hot button political issues of 2014 were sure to seriously pressure the relationship between the US and China, and for that matter Obama and Xi. If any bilateral action on climate change were to be accomplished, it would take an effort for both governments to compartmentalize unrelated issues and concentrate their efforts on a constructive cause. The year of 2014 would seriously test the leadership ability of both Obama and Xi.

Where there is a Will there is a Way

Given the nature of the foreign policy bureaucracies of both the US and China, compartmentalization of the climate change issue would not be impossible at the lower levels of the bureaucratic chain of command. In other words, specific organizations within diplomatic departments tasked with specific diplomatic issues would continue to explore resolution with minimal interference from other areas of the bureaucracy. In essence, Defense Secretary Chuck Hagel was not the US spearhead diplomat for international climate change issues. The challenge then is the approval of action by

lower-level bureaucrats by their superiors. Any diplomatic initiative would only be successful in so far as it successfully works its way up the bureaucratic chain of command.

In the beginning part of 2014, the point man on climate negotiations for the US Department of State was Todd Stern. According to Jeff Goodell, a reporter for Rolling Stone Magazine who was present at numerous climate negotiation meetings between the US and China in 2014, Stern made an exploratory call to his Chinese counterpart, Xie Zhenhua. At the time, Stern was due to meet with newly appointed Secretary of State John Kerry and top Chinese officials in a matter of days. According to Goodell, Stern had made the case to both Xie and Kerry that if any progress could be made between the two countries, it may help build momentum for the issue going into COP XXI in Paris the following year.

Goodell claims that while Xie was interested, there were two major roadblocks holding back the Chinese. The first was their status as a developing economy struggling with poverty. China felt at the time that they had bigger domestic issues in front of them than CO₂ emissions. Also holding the Chinese back was the issue of trust – according to Orville Schell, the head of the Center on US-China Relations at the Asia Society in New York, the Chinese were anxious that climate change could be used as a strategic issue by the US to hold back a rising China. According to John Podesta, a key aide to President Obama at the time, despite this context Obama gave the State Department the thumbs up to pursue negotiations with the Chinese when Kerry and Stern were in China to meet with

President Xi. Podesta claims that while Xi thought that the idea was interesting, he showed no interest in actually pursuing any sort of ‘deal.’⁷⁵

The Power of Persuasion

The Obama Administration may or may not have perceived mistrust as the source of difficulty in climate negotiations. Regardless, mistrust would have to be reduced if any progress were to be made. To help alleviate mistrust between the two countries, Obama personally sought to improve his relationship with his counterpart, President Xi. First, in mid-march, President Obama sent a personal letter to President Xi urging bilateral action to combat climate change.⁷⁶ In doing so, Obama was using his persona and relationship with President Xi to try to persuade China that the US was sincerely interested in focusing bilateral efforts on combating climate change solely for the benefit of the globe. This undoubtedly highlighted to Xi that Obama probably had an express desire to make political process on combating climate change. What it could not accomplish was giving China reassurance that the US was not pursuing negotiations as an effort to contain China.

Who could blame them? To that point, the US had not passed any serious climate change legislation, had been involved in the mangling of past multilateral efforts, and had been at odds with Beijing on a variety of issues of the past few years. What China really needed to see was that the US was willing to hurt itself economically in order to address the issue. This would show a seriousness that the US had lacked in the past.

⁷⁵ Goodell, Jeff. “The Secret Deal to Save the Planet.” *Rolling Stone*. 9 December 2014.

⁷⁶ Goldenberg, Suzanne. “Secret Talks and a Personal Letter: How the US-China Climate Deal was Done.” *The Guardian*. 12 November 2014. Web.

Enter the second term version of President Obama. While during Obama's first term, he was timid to make political moves that may contribute to attacks during his reelection campaign (one can envision Republican candidates decrying his 'economy-killing environmental policy'). Unbound by reelection pressures, Obama followed through in 2014 with aggressive new initiatives to combat climate change. Chief among these plans was the Climate Change Mitigation Action Plan, spearheaded by the EPA, which would role out new expansive regulations on emissions from a variety of sources.⁷⁷ He also implored the Department of Energy and Department of Transportation to implement new emissions standards. While these moves were implemented through executive action and lacked the bite that legislation would, the reforms were substantial enough to cause a litany of protest from interest groups, including an article published in the *Weekly Standard* by President and CEO of the US Chamber of Commerce Thomas J. Donohue.⁷⁸

Between personal correspondence and domestic reform, Obama was making clear to the international community, especially to China, that the US was serious about combating climate change, and that it would pursue unilateral climate change actions if it had to. Would this be enough to persuade the Chinese to enter negotiations?

Back to the Negotiating Table

A few weeks after the Obama Administration rolled out its new executive plan for domestic climate change action, US diplomats, including Sec. John Kerry, Secretary of

⁷⁷ US Environmental Protection Agency. "Climate Change Mitigation: EPA's Role in President Obama's Action Plan." 3 April 2014. Web.

⁷⁸ Donohue, Thomas J. "EPA's One-Two Knockout Punch." *Weekly Standard* 20.47 (2015): 18.

Energy Ernest Moniz, Podesta, and Stern, attended the Strategic and Economic Dialogue in Beijing. High-level counterparts in China, including Xie Zhenhua and Vice Premier Zhang Gaoli, would host the meeting. While no formal negotiations occurred related to climate change, reporter Jeff Goodell, who was attending the conference, said that US officials were seriously hopeful that progress would be made.

Things did not work out well, though. According to Goodell, the Chinese were unconvinced that they could make any promises until 2015, probably an allusion to the COP XXI conference in Paris in late 2015. The US diplomats left China in a ‘somber mood,’ Goodell claims.⁷⁵ During the second week of September, Obama sent a second letter to Xi suggesting that the two countries could make a significant announcement at the November Asia-Pacific Economic Cooperation forum in regards to a bilateral agreement to combat climate change.⁷⁶

Alas, it seemed personal correspondence was once again used to no avail. President Xi was notably absent from the UN Climate Summit in New York later that month. To the Obama Administration, this must have been completely disheartening. The Administration knew from the experience of COP XV in Copenhagen that without some sort of bilateral commitments between the US and China, COP XXI in Paris would be no different.

From Red Dragon to Green Dragon: Xi’s Change of Heart

These must have been very difficult times for President Xi. On the one hand, his country’s economy was booming, and had been for some time, propelling the nation to great power status. Meanwhile, the US seemed to be trying to counter China militarily

and diplomatically with regards to every issue, except for climate change, the one issue that cooperation would damage China's economy. On the other hand, his country was the leading CO₂ emitter in the world – this had the combined effect of creating international pressures to participate in multilateral climate diplomacy; while simultaneously having to deal with a horrific and deadly air pollution issue caused by the same sources emitting all of China's CO₂.

According to Lyle Goldstein, a professor at the US Naval War College and a China scholar, the degradation of China's ecology and its air pollution issue had become too big of a political issue for President Xi to ignore. Sometime in 2014, Xi must have come to the conclusion that a climate agreement with the US would accomplish the separate goals of pleasing the international community, and help reduce the effects of air pollution. However, any agreement needed to include some key caveats. The promises of any agreement could not be too burdensome or binding for China; the agreement must focus equally on geo-engineering and green technology research and development with CO₂ emission pledges; and the US must also show that it is serious about combating climate change. Most importantly, though, the Chinese must make emissions cuts on its own terms, and the US would need to do more relative to China in solving the problem because of the countries respective development statuses.⁷⁹ The latter point would be the greatest source of contention with the US.

⁷⁹ Goldstein, Lyle J. "Toxic Embrace: The Environment and US-China Relations." *Meeting China Halfway: How to Defuse the Emerging US-China Rivalry*. Washington, D.C.: Georgetown University Press, 2015.

Picking Battles, Winning Wars

President Xi's absence at the UN Climate Summit in New York was widely interpreted by observers as a snub to bilateral climate diplomacy to the US. Despite the initial doubts about a prospective US-Chinese agreement, the senior Chinese official attending the summit Vice Premier Zhang Gaoli reached out to President Obama and expressed President Xi's desire to announce an agreement at the aforementioned APEC Summit, according to Goodell.⁷⁵ This announcement marked the first simultaneous expression of interest by both parties to announce a coordinated, coherent agreement to combat climate change.

According to Goodell, both Podesta and Stern traveled to Beijing in late October. At this meeting, the Chinese put firm numbers on the negotiating table. First hand accounts provided to Goodell claim that the Chinese were willing to cap their CO₂ emissions by 2030. On the flip side, the US was willing to commit to cut net greenhouse gas emissions 26-28% below 2005 levels by 2025.⁸⁰ To do so, the US was promising that the Obama Administration would carry out its previously rolled out executive actions combating climate change, and to pursue further executive action by the end of his second term.

The fallout in the US was considerable. As recalled by Goodell, the initial reaction of the negotiators was negative. The US negotiators were not content with what they believed to be a somewhat lackluster Chinese proposition. They had hoped for 'sometime sooner than 2030,' according to Podesta. Podesta, adds that the Chinese had

⁸⁰ Office of the Press Secretary. "U.S.-China Joint Announcement on Climate Change and Clean Energy Cooperation." Fact Sheet. The White House. Washington, D.C. November, 11 2014. Web

claimed that the 2030 mark was the date cleared by the CCP Standing Committee. This implied that there was not to be negotiation on the Chinese figure, and that the US needed to simply approve or disapprove of the number.

While the US negotiators felt that the Chinese had promised a lighter figure than the US, they decided to accept the terms of the agreement and send them up to the President. The following evening, President Obama and President Xi met privately to discuss the negotiations. They both agreed to the deal, and promised to maintain a dialogue about this issue throughout the year towards Paris. The agreement was announced at the APEC Summit on November 11, 2014.

President Obama and President Xi jointly announced USCCP on November 12, 2014, at the APEC Summit in Beijing.⁸¹ According to a White House Press Release from the day of the announcement, US agreed to reduce its emissions by 26%-28% below its 2005 level by 2025.⁸² Based on EPA statistics, a 26%-28% cut of emissions based on 2005 statistics would amount to about reduction of 1,910-2,057 million metric tons of CO₂ emissions annually by 2025.⁸³ The Press Release also included an announcement that the Chinese had promised to cap the annual growth of emissions by 2030.

⁸¹ Landler, Mark. "U.S. and China Reach Climate Accord After Months of Talks." *New York Times*. 11 Nov 2014.

⁸² Office of the Press Secretary. "U.S.-China Joint Announcement on Climate Change and Clean Energy Cooperation." Fact Sheet. The White House. Washington, D.C. November, 11 2014. Web.

⁸³ "Climate Change Indicators in the United States." *Environmental Protection Agency*. 10 Nov 2015. <<http://www3.epa.gov/climatechange/science/indicators/ghg/us-ghg-emissions.html>>.

Additionally, the agreement introduces some new joint efforts by both countries to improve geo-engineering research and development.

What is especially notable about the White House Press Release is its language related to broader international climate diplomacy. Based on the text of the Press Release, it is immediately clear that the Obama Administration saw USCCP as a critical component of quickening the pace and progress of multilateral negotiations. Stated in section four of the Press Release is the joint ‘hope’ that target announcements would ‘inject momentum’ into multilateral climate negotiations. This provision will be discussed in more detail later.

Before diving into the USCCP in a larger context, the explicit targets by both countries must be analyzed. Specifically, how much is each country giving up, and is this enough? Moreover, while the spirit of this particular agreement is laudably non-confrontational, an agreement like this invariably will produce good and bad results for both sides of the negotiating table, especially when other bilateral issues of the US-China relationship are taken into account. Therefore, a critical analysis of the agreement as a stand-alone item is necessary.

The US and USCCP

Immediately after the announcement of the agreement, the Obama Administration got a wide range of feedback. Former Vice President and ardent environmentalist Al Gore was quick to praise the announcement, describing it as ‘groundbreaking.’ Sen. Mitch McConnell decried the agreement and claimed it requires the Chinese to do

‘nothing for 16 years’ while US environmental regulations were causing ‘havoc’ across the US.

Much of the criticism of the agreement was well founded. Jillian Melchior, a writer for *National Review*, was quick to point out one of the deal’s major flaws. Melchior argues that based on the terms of the agreement, serious and substantial progress by the Chinese is unlikely. Melchior believes that economic factors in China present a major hurdle for any hope of reform in China. The legitimacy of the CCP rests on economic development, and CO₂ emission reductions would probably slow China’s economy. Concern in Beijing for popular support may at any point derail the Chinese commitment from the USCCP.⁸⁴

While Melchior’s argument somewhat ignores the evolving calculus of the CCP as to what exactly what their ‘legitimacy’ rests on – specifically, the rising importance of non-economic factors involved in quality of life, especially in relation to air pollution – she highlights an important issue with the agreement. The agreement is completely voluntary, and either party can break their promise at any time without fear of formal repercussions. While Melchior’s critique focused on the wishy-washiness of the Chinese side, the non-binding nature of the agreement also has implications for US. The 2016 presidential election looms large over international climate negotiations. If a Republican candidate were elected to office (and followed up on campaign promises), the agreement would undoubtedly be shredded very early in 2017. This is an entirely possible outcome.

The agreement could not have been binding. The Chinese, at least in 2014, had no interest in sacrificing their much-cherished sovereignty. The US political landscape

⁸⁴ Melchior, Jillian Kay. “Obama’s Bogus Climate Deal with China.” *The National Review*. 12 November 2014. Web.

would have prevented any legally binding resolution, whether in Congress or elsewhere, so it was not even worth pursuing. These excuses, though, do not change the fact that this agreement has no legally binding teeth. It therefore amounts to a promise between two countries with their fingers crossed behind their backs. That is especially concerning considering the two countries being discussed have been notoriously half-hearted on climate change issues throughout most of the 21st century.

The lack of a legally binding provision can be chalked up as a loss for the US. While US itself did not pursue a legally binding provision, this decision was made because it was impossible, not because it was undesired. The Obama Administration, given its desire to fulfill a leadership position, would undoubtedly favor binding provisions (especially if the US themselves did not have to commit to said provisions) because it would make their job easier in that once an agreement was made, it could not be reneged, so continual pressure would not have to be applied to ensure a country voluntarily implemented such an agreement. The current administration would probably be in favor of permanent commitments by both sides, but the lack of such commitments highlights the weakness of the international climate diplomacy regime, and will remain a major liability for years to come.

As for the specific commitments made by US, a major criticism has been that they are inadequate. Henry Fountain and John Schwartz, writing for the *New York Times*, assert that US commitments are nothing new and amount to the US promise as a simple continuation of policies already in place. Moreover, they claim that climate experts overwhelmingly agree that the agreement is not nearly aggressive enough to ensure that global warming stays under 2 degrees Celsius, a widely adopted goal by the international

community and the UNFCCC.⁸⁵ If any larger multilateral effort to combat climate change were not accomplished, this deal would amount to a pebble-sized solution to a boulder-sized problem.

The agreement goes a long way in one important respect. Geo-engineering research and development will remain a pivotal component of any strategy to combat climate change going forward. USCCP establishes multiple provisions that expand cooperation between the US and China in geo-engineering research and development. Firstly, the agreement reaffirms the commitment by both countries to fund and utilize the jointly founded and operated Clean Energy Research Center. Secondly, the agreement establishes a new joint project to be based in China. The project is the construction of a major new carbon storage facility funded by a public-private consortium. This technology, already employed in small scales across the globe, involves CO₂ from power plants or industrial processes, then compressing the CO₂ and transporting it via pipeline to a facility that can then inject it into rock formations a mile or more under Earth's surface, where it is trapped. A carbon storage facility, if successful, would amount to CO₂ emission reductions without the negative economic consequences (the combustion product CO₂ would be captured before entering Earth's atmosphere). Moreover, the agreement calls for a variety of smaller measures, including the Climate-Smart City Initiative, which would give local leaders from across the world a forum for discussion about best practices.

Beyond investment in geo-engineering, USCCP as a stand-alone document seems a far cry from success for the US. Firstly, any commitments made are not commitments

⁸⁵ Fountain, Henry and Schwartz, John. "Climate Accord Relies on Environmental Policies Now In Place." *New York Times*. 12 November 2014. Web.

at all, rather promises from two world leaders who will not be in office when the target year for full implementation comes around. The agreement lacks any legally binding teeth, and can therefore be declared null and void by a new presidential administration of either country. Secondly, the non-commitment commitments made by the US are mostly insufficiently solving climate change without bolder international action, which based on past experience is a difficult task unto itself. Thirdly, despite the weakness of US commitments, the commitments from China are substantially weaker – from negotiations the US agreed to a pact that required much more of it than its counterpart. USCCP, then, seems a textbook example of a failure agreement for the US. That is, only if the larger context and implicit goals of the agreement are not considered.

China and USCCP

If the USCCP as a stand-alone document was a blundering dud of an agreement for US, it is a game-changing and overwhelmingly positive agreement for China. The international community largely saw China as having taken a responsible step. Moreover, China has agreed to start addressing the serious issue of coal burning as the majority source of energy in its country. But most importantly for the Chinese, they maintain flexibility and sovereignty of their climate change goals and strategies.

Bob Sussman of Brookings Institution argues that the deal for the Chinese is ‘not a free-ride,’ and indeed this is a good thing. The agreement is in itself a first step for the Chinese in addressing serious issues related to their reliance on coal burning, chief among them air pollution and climate change. In fact, Sussman argues, fulfilling the agreement will require immediate action and long-term planning by the Chinese government. This

is especially true as the Chinese set a goal for themselves to reach 20% of total energy production coming from non-emitting power sources (nuclear and renewables) – a particularly immediate challenge given that the current percentage of total energy production coming from nuclear and renewables is about 10%, and new construction of these energy source facilities will take years to complete and become operational.⁸⁶ To cap emissions growth by 2030, China will need to move aggressively to reduce its reliance on coal. Doing so would improve progress on combating climate change, and it would also help reduce deadly air pollution over major cities, an increasingly pesky issue for the CCP.

So for the Chinese, the agreements made in the USCCP are certainly a step in the right direction in addressing serious issues on the dashboard of the Chinese government. But what really makes this deal good for China is the fact that it is non-binding. Truthfully, it is almost certain the Chinese would have never have even considered signing an agreement with legally binding provisions. The voluntary nature of the agreement gives the Chinese flexibility to reform their emissions. They can pursue strategies that they see as fit to their situation. Moreover, if momentum for combating climate change fizzles and/or China no longer sees reducing emissions as a priority, they are free to take the lid off of emissions at any time. Given the USCCP, doing so would undoubtedly draw a major outcry from the international community – but pleasing the international community is not the main priority of the CCP. If anything, this non-binding agreement will continue to offer China much choice going forward. If China

⁸⁶ Sussman, Bob. “The U.S.-China Climate Deal: Not a Free-Ride for the Chinese.” *Brookings*. 25 November 2015. Web.

sees future action as worthwhile, they will pursue that course. If not, they have the option of pursuing a different strategy.

Given the outcome of negotiations, it would certainly seem that China came out in a better position than the US. However, this agreement was not signed in a vacuum, and further analysis must be put in the context of international climate diplomacy in the past, present, and future. The USCCP is a part of a larger context.

Beyond Targets

It is unfair to criticize the US based solely on the negotiations and text of the USCCP. Within the very text of the agreement that seems so bad for the US, the US expresses its interests as a part of a bigger picture. Section Four of The White House Press Release⁸² on USCCP reads:

The United States and China hope that by announcing these targets now, they can inject momentum into the global climate negotiations and inspire other countries to join in coming forward with ambitious actions as soon as possible, preferably by the first quarter of 2015. The two Presidents resolved to work closely together over the next year to address major impediments to reaching a successful global climate agreement in Paris.

This component of the USCCP is the articulation of the Administration's shift in climate negotiation strategy.

To review, there were a few reasons as to why previous attempts at multilateral climate negotiations failed – the chasm between developed and developing countries and the 'malignancy of the great polluters' chief among them. In completing the USCCP, US and China hoped to resolve these two issues. Firstly, both countries hoped to lead their respective blocs towards a settlement of the pervasive developed versus developing issue.

Secondly, both countries hoped the agreement would signal that the big polluters were now proactively engaged with the issue, as opposed to the past stance of disinterest.

Thus, the most important metric for evaluating USPPC is the level to which it successfully galvanized multilateral climate negotiation efforts after its announcement. Specifically, as is stated in the pact itself, COP XXI in Paris, France in December 2015 should result in substantial progress.

Conclusion

The success of the US-China Climate Pact of November 2014 will be judged based on the success of future multilateral negotiations. Specifically, both countries' representatives (especially the US) were negotiating while looking ahead to the COP XXI in Paris in late 2015. Additionally, any success in the future is not earned on a win-lose basis. Both parties to the agreement began negotiations with differing goals, but parallel interests - the resolution of those differences in order to satisfy both parties was a wise diplomatic move.

What makes the US-China Climate Pact (USCCP) so promising and unique is that it represents a change of strategy in international climate negotiations. The failure of Kyoto and Copenhagen highlighted major gaps between the developed countries and developing countries, and to move forward with multilateral negotiations, the supposed leaders of both blocs needed to lead their respective corners to the negotiating table. Most important are the results that the USCCP led to, or failed to lead to, to at COP XXI in Paris, France, in December 2015.

This negotiation not being a win-lose scenario does not protect the involved parties from failure. In the case of the US, President Obama hoped that the agreement would have serious implications going into COP XXI. Based on the initial disdain portrayed by the US negotiators, the President was probably not pleased with the specific numbers put up by the Chinese, but agreed to the USCCP anyway. He had already pursued domestic climate reform, at least to the degree to which it was possible, and hoped to have success on the multilateral front. Remembering the immense failure of Copenhagen, the President saw the USCCP as a critical step in consoling differences throughout the international community. In this context, the President will be judged by whether or not he is able to successfully lead the international community to its first substantial multilateral success to combat climate change.

For President Xi, there was undoubtedly a tremendous amount of pressure to act. He faced stiff international pressure (much of it applied by the Obama Administration) to participate in bilateral negotiations. Reducing air pollution from burning coal must have also been increasingly seen as an important goal to President Xi. It is easy to see President Xi as having come out in a good position from these negotiations – he took a positive step towards combating the issue in the eyes of the international community, while also maintaining a lot of time – 15 years to be specific - to cap CO₂ emissions. This will allow the CCP flexibility in the future to address air pollution in their way for the near future. President Xi may have lost some of this flexibility depending on the results of future climate change negotiations, but at least it provides him with options. Moreover, it is entirely conceivable that President Xi sees climate change as a serious international issue, and wants to be a part of addressing it.

The important question then becomes, how did climate diplomacy develop over the next year? Moreover, what goals are laid forth in the coming COP summits, and are these goals substantial enough to combat climate change?

Chapter V: Twenty-First Try is the Charm

On Monday, August 31, 2015, President Obama began a three-day trip across the state of Alaska – and importantly, he visited the quickly receding Arctic coastline, home to dozens of indigenous communities. While the scenery may have been breathtaking, the purpose the President had when he took this trip was to highlight the *present* effects of climate change to the American public. With civil war raging on in Syria and the Russian military incursion into Ukraine, amongst other hot-topic international issues, the President's trip to Alaska highlighted his personal devotion to the topic of climate change. On the same Monday as the President's trip to Alaska, the start of a the final round of minor negotiations was taking place in Bonn, Germany, to try to hammer out the fine details of how the ever important COP XXI in Paris, the next global climate summit would take place. The stage, quite literally, was set – and the results of COP XXI were likely to define Obama's climate change legacy.

Join the Club

Over a year separated the announcement of USCCP and COP XXI in Paris. The Obama Administration undoubtedly hoped to continue improving conditions going into COP XXI. Indeed, with 2016 being President Obama's final year in office, Paris seemed to be the Administration's final opportunity to complete meaningful multilateral negotiations. Now that strategy had formally changed, the critical issue for the Obama Administration moving forward was enhancing international conditions in a way that improved the chances of success in Paris. Reinforcing and executing the provisions of

the agreement with China, and perhaps adding to the agreement, would doubtless be a chief objective for the Administration.

Additionally, opening the agreement to others would be helpful. Scott Victor Valentine, a professor at the University of Hong Kong, argued in 2012 that for bilateral negotiations between the US and China to be meaningful in the fight against climate change, the same bilateral negotiations would have to happen throughout the international community, creating a network of agreements and commitments that multilateral negotiations could build on. While Valentine was skeptical in 2012 of the prospects of successful bilateral negotiations, he did make clear in his arguments in 2012 that an agreement between these two countries should be sufficiently significant to start the engine on the same style of negotiations elsewhere.⁸⁷ Behind Valentine's logic is the developed-developing divide. Until Paris, it would be unknown to the US and China if their bilateral agreement alone would be substantial enough to bridge this divide, so to enhance prospects it would be wise to seek similar agreements elsewhere.

The Obama Administration seemed to concur with Valentine's thoughts. There seemed to be no downside to pursuing similar agreements, and the upside would be added momentum for Paris. First, though, the US needed to find a developing country to play ball with.

A willing partner emerged in the summer of 2015. Brazilian President Dilma Rousseff, in a meeting with President Obama, expressed her desire to join the US and China in the bilateral (soon to be trilateral) commitment. The meeting with President

⁸⁷ Valentine, Scott Victor. "Enhancing Climate Change Mitigation Efforts through Sino-American Collaboration." *The Chinese Journal of International Politics* 6 (2013): 159-182. 21 December 2012.

Rousseff did not include the drawn out deliberations and fanfare of the US-China negotiations. Not unlike the US' commitments, it is likely that the commitments made by President Rousseff had already been in the pipeline. Regardless, the Obama Administration and President Xi were happy to include Brazil on their sides. President Rousseff agreed to pledge that Brazil would increase production of electricity from renewable sources to represent 20% of electricity production by 2030. President Obama surprisingly pledged the same with President Rousseff, adding to the previously described commitments in USCCP.⁸⁸ Additionally, Brazil agreed to restore 30 million acres of Amazon rain forest, an important source of sinks.⁸⁹ Despite the extension of new US pledges, the Chinese did not mirror the US, and stood pat on what they had already agreed to – undoubtedly a disappointing, but not unforeseen, stance to the Obama Administration.

USCCP seemed to have desired effects even before COP XXI, then. If the stated goal of the agreement was to reinvigorate international efforts, adding Brazil, at the time the tenth largest emitter of CO₂ in the world, certainly was a big step in the reinvigoration process. Brazil's addition to the USCCP was significant in another way – Brazil, a major developing economy and member of the BRICs club, struck an agreement with the US, a major developed economy. The prospect of bridging the gap between developed and developing countries before COP XXI seemed better after this announcement.

⁸⁸ Worland, Justin. "US, China and Brazil Commit to New Climate Change Goals." *Time Magazine*. 30 June 2015.

⁸⁹ Davenport, Coral. "Global Climate Pact Gains Momentum as China, US and Brazil Detail Plans." *New York Times*. 30 June 2015.

Which Way China?

An uncomfortable sense of uncertainty was pervasive in the beginning months of 2015. Such uncertainty was inevitable given the vagueness of the Chinese commitments and the lack of any specific policy direction laid out by the CCP. President Xi probably was aware of this, but that is not what mattered for him. The chief priority for President Xi is the domestic interest, almost invariably. President Xi and the CCP would only begin to implement reforms if they felt strongly enough about the pollution issue.

In mid-September of 2015, new clarity began entering the picture. President Xi announced a round of new reforms - most significant amongst them was an ambitious national emissions trading system (also known as cap and trade), to be launched in 2017.⁹⁰ Joshua P. Meltzer, a senior fellow at the Brookings Institution, argues that China's announcement was a huge boost of momentum for COP XXI in Paris. The announcement stressed the importance of an ambitious and successful outcome from Paris. Moreover, the proactivity of the announcement raised the prospects for further ambitious and impromptu announcements. In 2014, China agreed to do the bare minimum. In 2015, China began to move more boldly and voluntarily toward combatting climate change. As Meltzer argues, this was a momentous occasion.⁹¹ Additionally, one of the main sticking points in Copenhagen was how the international community should plan to fight climate change. The developed countries hoped to utilize market mechanisms, like the aforementioned cap-and-trade plan the Chinese announced in 2015. In Copenhagen, the community of developing countries outright refused the utility, or at

⁹⁰ Henderson, Geoffrey; et al. "US-China Climate Change Announcements Signals New Phase for Global Action." *World Resources Institute* 29 September 2015. Web.

⁹¹ Meltzer, Joshua P. "U.S.-China Joint Presidential Statement on Climate Change: The Road to Paris and Beyond." *Brookings Institution* 29 September 2015. Web.

least that they had any obligation, of pursuing such strategies. The announcement of the Chinese cap-and-trade plan was a significant derivation of such a previous stance. It would be entirely possible that this policy could become a model for other developing countries.

One can speculate that there may be another factor driving Chinese participation. China over the past decades has emerged as one of the world's great powers. It is one of the largest economies in the world; it has a rapidly developing society; it is increasing its military presence in the Pacific Ocean and elsewhere; and one can assume that it sees itself as a major player in international relations. It is entirely possible, if not probable, that the Chinese wanted to take this opportunity to be seen as a leader on the international stage. Whether this is an conscious or unconscious motivation (if it is actually a motivation at all) will remain unknown. Regardless of their motivations, though, the strides the Chinese took to present themselves as a serious party in combating climate change were crucial heading into Paris.

The Stage is Set

The context of climate negotiations had changed dramatically between Copenhagen and Paris. Firstly, the two great polluters, US and China, had agreed to a bilateral pledge that both countries would move to aggressively address their CO₂ emissions. This was a major shift. For the US, domestic politics had prevented any action on climate change from the failure of Kyoto up until the beginning of President Obama's second term in office. For China, a CO₂ emissions cap by 2030 and a soon-to-be-implemented cap-and-trade system signaled its seriousness in addressing air pollution.

Also, as argued by Sam Geall, a research fellow at the University of Sussex writing for *Foreign Policy*, these policies illuminate a turnaround in the Chinese economy from energy-intensive industries towards a services-based economy – indeed, argues Geall, China’s coal consumption fell by 2.9% between 2013 and 2015, and continues to fall, a major change from past tried and failed to wean off coal.⁹²

While the ‘malignancy of the great polluters’ issue seemed to have been resolved, there were two other substantial issues still under dispute. The first issue is finance. Specifically, according to Mythili Sampathkumar, a climate expert writing for *Foreign Policy*, the questions that still remained were which countries would fund a \$100 billion account to be replenished annually that would be used for damage mitigation by vulnerable developing countries.⁹³

Another point of contention going into the negotiations would be what the scale of emissions reductions for developing countries would be relative to developed countries; and how such goals would be implemented. These were some of the major sticking points in Copenhagen, and the issue reemerged in the run up to Paris.

Paris on Edge

In the run-up to Paris, the 195 countries to participate in COP XXI submitted preliminary CO₂ emissions reduction plans to UNFCCC. The goal of these initial submissions was to constitute a global plan that would keep average global temperatures 2 degrees Celsius below pre-industrial levels. This goal was adopted because it was the

⁹² Geall, Sam. “Beijing is Finally Getting Serious About Climate Change.” *Foreign Policy: China File*. 11 July 2015.

⁹³ Sampathkumar, Mythili. “Who is Going to Pay to Save the World?” *Foreign Policy*. 11 December 2015.

point at which more ‘catastrophic’ events were likely to occur, according to the scientific community.

While most heads of state of the 195 participating countries, including President Obama and President Xi, initially attended the opening ceremonies of COP XXI, they were quick to depart. As negotiations were underway, Ben Rhodes, deputy national security adviser for President Obama, told the *New York Times* that the French hosts did not want heads of state to reemerge because it would complicate the final rounds of negotiations, an issue with Copenhagen. Rhodes said that all the heads of state dropped off their negotiators and went on their merry way. The negotiators, then, would limit the publicity of their deliberations, and try to stay behind closed doors.⁹⁴

Initial disagreements were quick to form. The same split between developed and developing countries that poisoned Copenhagen reemerged. The first issue that took center stage was funding of the aforementioned goal of \$100 billion annual fund to mitigate the effects of climate change and to mitigate the effects of emissions reductions in developing countries. The second issue was who would bare the burden of the most substantial of emissions reductions.

To solve this issue, a soft compromise was made. The developed countries would promise to allocate the funds for developing countries efforts of adaptation and mitigation. However, this funding was not made legally binding because it would be impossible for US Congress to accept such a deal. Indeed, according to *New York Times* reports, Sec. John Kerry made clear to his counterparts that if the language of the agreement were not changed, specifically by replacing ‘shall’ with ‘should,’ the US could

⁹⁴ Revkin, Andrew C. “Tracking Views and News Out of the Paris Climate Change Talks.” *New York Times*. 30 November 2015.

not accept the deal. So, the funding section of the agreement was moved from the body of the agreement into the preamble section, and its language was changed from ‘shall’ to should.’⁹⁵

On the flip side, developed countries acknowledged that they bare the most responsibility for curbing emissions. According to Richi Ahuja, Jonathan Camuzeaux, Thomas Sterner, and Gernot Wagner, writing for *Foreign Affairs*, the justification for this acknowledgement was twofold. Firstly, the participants in the conference accepted the principle of ‘grandfathering’ – emissions quotas based on how much each country has released in the past. Since 1970, according to Ahuja et al, US accounts for 23% of CO₂ emissions, China accounts for 14%, EU accounts for 10%, and India accounts for 3%. Another factor was a per capita emissions rights system. The US emits 17 tons of CO₂ per capita, EU emits about 7 tons per capita, China releases just under 7 tons per capita, and India releases under 2 tons per capita, claim Ahuja et al. Grandfathering and per capita emissions would serve the basis of divvying up the emissions ‘pie.’⁹⁶

Developed countries would bare the brunt of climate change mitigation efforts by funding the adaptation and mitigation strategies of developing countries and slashing their emissions more rapidly than their counterparts. In exchange, developing countries agreed that such provisions would be non-binding. Developed countries would not want binding funding provisions because it provided them the flexibility to cut off the stream if they felt their money was being misallocated. On December 12th, 2015, the 195 nations participating in the conference agreed to the new accord. The final provisions included a

⁹⁵ “The Road to A Paris Climate Deal: At Climate Talks, a Few Letters that Almost Sank the Deal.” *New York Times*. 14 December 2015.

⁹⁶ Ahuja, Richi; Camuzeaux, Jonathan; Sterner, Thomas; Wagner, Gernot. “From Copenhagen to Paris.” *Foreign Affairs*. 25 November 2015.

few highlights. First, all nations pledged to hold temperatures below 2 degrees Celsius above pre-industrial levels. Second, all nations pledged to reduce deforestation and increase the role of conservation of sustainable management of forests. Third, developed countries would take the lead in mobilizing climate finance. Fourth, each country pledged to update their nationally determined contributions to the fight against climate change every five years. No provisions were made binding by the agreement.⁹⁷

Better than Nothing

UN Secretary General Ban Ki-Moon said in an interview after the agreement was struck that the agreement was an ‘historic moment,’ and that it was the first ‘truly universal agreement’ to combat climate change. Indeed, the agreement represented major progress from Copenhagen. However, the agreement was flawed in a few ways.

Keith Johnson, a senior reporter covering energy policy for *Foreign Policy*, argues that while the Paris agreement was an improvement from Kyoto, it alone is not substantial enough to hold temperatures below the 2 degrees Celsius target. In fact, by most estimates, the agreement will hold temperatures below 3 degrees Celsius higher than pre-industrial levels. While the agreement did not meet its stated goal, it did for the first time present a hard temperature rise cap. Moreover, this cap is under the 4 degrees Celsius cutoff that scientists have claimed will have disastrous and irreversible effects on Earth. Additionally, the provision stating that each country will revisit their pledges

⁹⁷ Davenport, Coral; Gillis, Justin; Chan, Sewell; Eddy, Melissa. “Inside the Paris Climate Deal.” *New York Times*. 12 December 2015.

every five years, starting in 2020, offers hope that the international community will one day be able to go below the 2 degrees Celsius benchmark.⁹⁸

Johnson also argues that another flaw of the agreement is that it is non-binding. Countries are free to renege on their pledges without any legal consequences. It is very likely, though, that a binding agreement was impossible. The same impediments that prevented USCCP from being binding were present throughout the globe, namely domestic considerations, and it may just be that the nature of the new international climate diplomacy regime will always be voluntary – hopefully the seriousness of the effects of climate change implicitly makes countries fulfill their promises. Additionally, even though the agreement is non-binding, it is not merely symbolic. If a country were to renege on their pledges, there would be implications for these countries beyond the climate change-negotiating table. Responsible actors in the regime would be able to try to hold irresponsible actors to a standard, using leverage from other issues. As Otto Von Bismark once remarked, “politics is the art of the possible.”

While the Paris agreement is flawed in certain aspects, it is clearly a substantial step forward from Kyoto and Copenhagen. As argued by Johnson, this is a truly global accord – Kyoto covered only 14% of the world’s CO₂ emissions (Copenhagen did not expand on this), while the Paris agreement covers 96% of global CO₂ emissions. Moreover, the Paris accord creates a forum for countries to regularly revisit their pledges, and potentially expand on them. Paris, then, can be considered the end of the beginning in the fight against climate change.

⁹⁸ Johnson, Keith. “Good COP, Bad COP on Global Climate Accord.” *Foreign Policy*. 14 December 2015.

USCCP Revisited

The main goal of USCCP was to provide momentum for COP XXI in Paris. It did just that. Firstly, though, the USCCP initially seemed a loss for the US – how did developments afterwards change that perspective? One of the main flaws of USCCP for the US was that it was not legally binding, so China could renege on their promises at any point. However, with the new seriousness of China in reforming their energy sector, and the announcement after USCCP that China would institute a cap-and-trade system in 2017, the non-binding nature of USCCP seemed less and less important. It decreasingly seemed necessary that China need be coerced to pursue a climate change agenda as they began to do so voluntarily. Additionally, if success were to be struck in Paris, the US strategy of losing the battle but winning the war would seem to be vindicated. The Paris agreement, seemingly a major success for the global community in fighting climate change, justifies this US strategy. After Paris, the USCCP seems to be not such a bad deal for the US, after all.

Between the announcement of USCCP and the beginning of COP XXI, China announced it would implement a cap-and-trade system. In Paris, they extended their USCCP promises, which looked all the more realistic given the implementation of cap-and-trade. So, not much had changed for the Chinese since their seeming success in USCCP negotiations, other than voluntary policy implementation. China's actions on the international stage are important, too. China, a new power in the world, played a critical role in leading the world towards establishing an effective regime to combat climate change. Without China's cooperation and leadership, little progress could have been made on the issue. China, in this case, took on an important global leadership role and

established itself as a powerful force in international diplomacy – an important step for a newly emergent great power.

It is safe to say that without USCCP, COP XXI would have been a failure. Firstly, if the US and China were to not have signaled beforehand that they were serious about combating climate change there would have been no incentive for lesser emitters to join the cause. This change in pace was initially seen when Brazil joined US and China. It culminated in Paris with 195 nations covering 96% of global CO₂ emissions establishing this new climate change regime.

Additionally, progress between the US and China probably helped eliminate some mistrust between developed and developing countries that formed in Copenhagen. While the degree to which bilateral cooperation between US and China helped move forward multilateral cooperation in Paris is unquantifiable, the compromise between the developed and developing countries in Paris was a far better outcome than the bickering of Copenhagen. While other factors may be responsible for this shift, such as the increasing vulnerability of developing countries to the effects of climate change, clearly something had changed the calculus for these two blocs and caused them to cooperate and compromise with one another.

While COP XXI falls short of meeting its 2 degrees Celsius target, it is clearly more substantial than any ‘agreement,’ if one can even call it that, made in Kyoto and Copenhagen. Centrally important is that COP XXI established a new international climate change regime, explicitly obligated to revisit emission-reduction goals every five years through the auspices of UNFCCC. Critical to the success of COP XXI was USCCP. More work clearly needs to be done on the issue, but COP XXI established a

new, and thus far fairly successful, international climate change regime. This could not have been accomplished without USCCP. For that reason, USCCP was a good deal, not just for US and China, but for the world.

A Fragile Regime

The new international climate regime established by the world community in Paris, December 2014, is a promising, comprehensive response to an issue of global proportions. The international regime constructed to combat climate change is pragmatic, realistic, and capable. However, for all its positive qualities, there are some glaring vulnerabilities within the newly established international climate change regime that raise the risk that the entire thing will fall in on itself. The newly established international climate change regime was accomplished in large part because of USCCP. USCCP put to rest two major issues ailing international climate negotiations – the malignancy of the great polluters and the developed-developing country divide. USCCP was a bandage applied, protecting the wounds of the international community suffered in Kyoto and Copenhagen. If USCCP fails – if the bandage is removed – then the international climate regime faces the serious threat of these wounds reemerging.

The first great risk lays in 2016 US elections. The newly elected president in 2016 will reassess much of the progressive reform efforts made by President Obama both domestically and internationally. It is increasingly likely the candidate representing the Republican Party would at least undermine efforts made by President Obama, if not fully repeal all executive action taken by President Obama. The three frontrunner candidates at the time of writing, Donald Trump, Sen. Ted Cruz, and Sen. Marco Rubio, all threaten

to repeal President Obama's climate change agenda, offer no alternative solutions, and go as far as denying climate change science altogether. Sec. Hillary Clinton, the likely Democratic Party candidate, and her challenger Sen. Bernie Sanders, have both made full-throated commitments to expanding on progress made by President Obama and establishing a new climate change agenda of their own.⁹⁹ While many remain hopeful that come the general election the Republican Party candidate will make an about-face on climate change, it seems unlikely.

Moreover, the US Supreme Court has halted much of the Obama Administration and EPA's climate change agenda pending further review. When the Court initially blocked these reforms, it seemed very likely that they would be struck down, but since then Justice Antonin Scalia, an archconservative on the court and a likely leader in arguments against the Obama Administration's plans, passed away. As reported by Eduardo Porter of *New York Times*, the Administration's plans, and therefore the international climate change regime, rests on who the next confirmed Supreme Court Justice is.¹⁰⁰ The Senate recently promised to block any nominee by the Obama Administration, meaning that this duty will rest with the next administration. It is entirely reasonable to assume that a Democratic president would nominate a Justice unlikely to unravel Obama Administration plans, and that a Republican president would nominate a Justice likely to unravel these plans. While it is entirely possible that a conservative justice could support the Administration's plans, and it is entirely possible

⁹⁹ Daly, Matthew. "Presidential Contenders Differ Sharply on Climate Change." *PBS Newshour* 27 November 2015.

¹⁰⁰ Porter, Eduardo. "Next Supreme Court Justice Will Be Crucial to Climate Change." *New York Times* 16 February 2016.

that a liberal justice could oppose the Administration's plans, the more likely outcome is that the next justice will reflect the opinions of the Administration.

The 2016 US elections seem then to hold the international climate regime in the balance. The election of a Democrat would likely usher in an expansive period of climate change regulation, while the election of a Republican would likely mean that both the executive branch and judicial branch would be opposed to climate change action. This is a clear and present danger to the international climate change regime, as Porter argues, because the pledges in Paris made by US are crucial to holding the international coalition together.¹⁰⁰ If US were to renege on its promises, the bandage covering the wound of great polluter malignancy would be removed, and it is likely that the international climate change regime would unravel.

The issue of 2016 US elections is both directly and indirectly connected to China. It is directly connected because if US commitments to China in USCCP were rolled back or cheated on, China would be freed of much of the international pressure that caused them to agree with it in the first place. Regardless of the outcome of US elections, though, China may or may not rollback reforms on its own. If reform seems to interfere with economic growth in a way that threatens the legitimacy of CCP, it is entirely likely that reforms would be at least somewhat rolled back. Such a move would likely be disincentive for other developing countries, such as Brazil and China, to participate in international climate negotiations. Additionally, with China being one of the great polluters, curtailing reform would add to the malignancy issue.

Clearly, then, the sustainability of the newly established international climate change regime has a pending status. 2016 US elections to be held in November, along

with other factors in China, could reaffirm this regime or completely destroy it. However, there are other non-political factors could affect international climate change progress.

Oil, Technology, and the Future of Climate Change

Firstly, the recent collapse in oil prices changes the dynamics of combating climate change in serious ways. Mitchell Anderson, citing scientific studies by Carbon Tracker, a UK-based non-profit organization, the world must limit additional emissions to below 900 gigatons, with about 360 of these 900 gigatons coming from oil.¹⁰¹ Basically, according to Anderson, if the worst effects of climate change are to be avoided, a lot of oil must stay in the ground. Reed Landberg, a reporter for Bloomberg Business, points out that a recent International Energy Agency study concludes low oil prices will be detrimental to the development of renewable energy and fuel-efficient products. According to Landberg, the IEA report projects that if oil remains near or below \$50 per barrel until 2020, about \$800 billion worth of efficiency improvements in cars, trucks, and airplanes would be lost. Moreover, as Landberg argues, low oil prices lower the demand for renewable energy sources.¹⁰² So, low oil prices increase the burning of oil (thereby decreasing the quantity of oil that stays in the ground) in the short-term, while also reducing incentive for efficiency investment.

Oil is not the only wild card, though. Geo-engineering technology will have a profound impact on emissions for years to come. Billionaire tech developer and

¹⁰¹ Anderson, Mitchell. "Why Cheap Oil is the Key to Beating Climate Change." *The Guardian* 11 December 2015.

¹⁰² Landberg, Reed. "Oil Price Drop Threatens Industries that Help Cut Global Warming." *Bloomberg Business* 9 November 2015.

philanthropist Bill Gates has become a chief lobbyist for the private sector to voluntarily become more involved in geo-engineering research and development. Gates told *The Atlantic* magazine that ‘we need an energy miracle,’ and he himself has pledged \$2 billion for private research and development, while getting other billionaires such as Virgin founder Richard Branson to join the cause. What Gates and his peers hope to accomplish is to create emissions-reduction and efficient energy technology able to compensate for the inefficacy of governments to deliver promises made in Paris (Gates was an active participant in a private-sector consortium that convened in Paris parallel to the COP XXI Conference).¹⁰³

Others, such as the Nobel Laureate economist Paul Krugman, argue that a slow-moving technological revolution has already made successfully combating climate change an entirely plausible goal. Krugman recently opined in the *New York Times* that dramatic reductions in the cost of electricity generated by wind and solar production sources, and reductions in the cost of energy storage, have made the renewables industry economically competitive with conventional energy industries. Krugman argues that the more important factor is the outcome of the presidential election, and that having a President who will have an adequate climate change agenda is more crucial than ‘moonshot’ geo-engineering developments.¹⁰⁴

Clearly, non-political factors, such as the price of oil and the pace of geo-engineering research and development will have a profound impact on the fight against climate change. While the outcome of political events, especially the 2016 US

¹⁰³ Bennet, James. “We Need an Energy Miracle.” *The Atlantic* November 2015.

¹⁰⁴ Krugman, Paul. “Planet on the Ballot. *The New York Times* 29 February 2016.

presidential election may have a larger impact, these non-political factors are obviously important.

Conclusion

Without USCCP, COP XXI in Paris was likely to go awry. Much of the success in completing negotiations is owed to the hard groundwork laid beforehand. While the agreement made in Paris is probably not enough, there is reason for hope. This agreement is not a one-off – the parties to the conference will regularly reconvene, and based on their serious approach the first time around, assumedly they will be equally serious going forward. Additionally, given the pace of technological development, the negotiators should be able to offer more substantial emission cuts targets in the future. These are all good reasons to believe that this new climate change regime will be able to address the issue.

There are some reasons for caution, obviously. Any regime comprised of nearly 200 countries will be complicated. Disparate interests will always water down the cohesion of such a wide range of countries. The ever-changing political landscape, both domestic and international, threatens to throw off cooperation. But these negative possibilities have yet come to pass.

The big question is where the international community goes from here. It should take advantage of the forum it has established every five years to update their plans based on the changing technological landscape. Doing so would help the international climate change regime meet their target of capping global temperature increase at 2 degrees Celsius above pre-industrial levels.

Conclusion

The most plausible explanation for rising temperatures is that man-made CO₂ emissions have caused or intensified a greenhouse gas effect. The greenhouse gases have trapped radiation from the sun in Earth's atmosphere, causing a slew of environmental effects, chief among them climate change. A scientific consensus has emerged around this hypothesis. Human CO₂ emissions are probably a result of industrialization, and the immense burning of fossil fuels by economies since the Industrial Revolution. Other factors may also be causing a rise in CO₂ levels in Earth's atmosphere, but any non-human factors would only intensify the need for action, and would not repudiate the link between human emissions and climate change. Developed countries are responsible for the lion's share of CO₂ emissions over the course of history, but every country plays a role in the problem, and a global consensus is necessary if the worst effects of climate change are to be mitigated.

China, the largest emitter on the globe today, finds itself in an awkward position. The Chinese economy relies on energy consumption to power its economic growth. This has broad implications for the Chinese – the CCP relies on economic growth for legitimacy, millions of people remain in impoverished conditions in China, and China is one of the main manufacturing-export markets in the world. However, a dangerous air pollution issue is increasingly being linked to the deaths of hundreds of thousands or more Chinese every year. Moreover, China's chief source of energy, coal, has been a problematic issue and an inefficient source of energy for the Chinese for a long time now. Despite efforts by the central government to reform the energy sector near the turn of the 21st century, entrenched interest groups prevented change in the past. Whether or not

China is able to grapple with its emissions going forward will have major implications for the global fight against climate change.

The United States is also major culprit of climate change. US is the second largest emitter on the globe today, and has been a major emitter since the industrial revolution took off in the 1800s. However, US is in the unique position today of global leadership, and is the country most capable of galvanizing the international community to address the issue. Conversely, inaction by US political leaders could, and indeed has, derailed past multilateral efforts. There is a political legacy of environmentalism throughout the history of US. The ideological and practical necessity of energy security and sustainability is a powerful strand of the American psyche. But climate change is not just a local issue; it is also a global issue. It is therefore a much greater challenge for US political leaders to address than past environmental issues. Whether President Obama would be able to accomplish energy reform domestically would not be enough – as the leader of the global community and an inheritor of an ideological and practical environmental impetus, President Obama's environmental legacy is staked on whether or not he would be able to galvanize the international community to act.

His first efforts failed miserably. Not unlike the failed Kyoto Accord negotiated (but not ratified) during the Clinton Administration, numerous issues plagued President Obama's international agenda from the start. He attempted to create a new international climate change regime in Copenhagen in 2009, but failed because of two major issues – the malignancy of the great polluters, namely China and US; and the wedge between developed and developing countries, in part caused by the failure of Kyoto. After the failure of Copenhagen, President Obama sought a change of strategy. He hoped to

establish a bilateral agreement with the Chinese before COP XXI in Paris. This would solve both of the issues that plagued Copenhagen – it would signal that both great polluters were serious about addressing the issue, and would be the first attempt to bridge the developed-developing country divide. The Chinese, for their part, were hesitant to make any agreement. However, the air pollution issue in many Chinese cities was becoming so severe that the CPP could no longer avoid it. So, to ease international pressure, the Chinese decided to negotiate with US. The outcome was a voluntary pact struck by both countries a year before COP XXI. The Chinese promised to cap emissions growth by 2030, and US promised to reduce CO₂ emissions by at least 20% by 2025. The most important goal of the agreement was not the explicit goal of emissions reductions, though. Indeed, these reductions alone would not come close to solving the issue. The implicit aim of creating new momentum for COP XXI was the real reason behind the agreement, especially on US side.

The buck did not stop there, though. Shortly after US and China struck their deal, Brazil decided to join in. Moreover, China extended their promise by announcing the implementation of a cap-and-trade system. It seemed like momentum was truly building for COP XXI. However, once the conference began, a few thorny issues about financing and whether or not any new international agreement would be binding emerged. These issues were not fully resolved, but compromises were struck, and a comprehensive, truly global COP agreement was announced, and with it, a new international regime to combat climate change. Undoubtedly, the US-China Climate Pact of November 2014 played an integral role in this.

There are many causes for pessimism, though. The new regime looks frail. The 2016 election in US could lead to the end of this regime. A slowdown in Chinese economic growth would make the CCP reevaluate their cap-and-trade system. New issues, or reemerging issues, could derail international negotiations.

These possibilities are yet to come to fruition, though. President Obama, President Xi, and the international community has for the first time successfully come together and started to seriously address climate change on a multilateral front. One should remain cautiously optimistic about the prospects of the global climate change regime. One should also remember the hard work that had to be done, and the hurdles that had to be overcome, in establishing this regime, and to appreciate just how great of a threat climate change is. Doing so will make world leaders all the more hesitant to do anything that would unravel it.

While the progress that has been made is significant, there is still much work to be done. The pledges made at COP XXI for the first time put a cap on rising global temperatures, but this cap is not low enough to prevent many negative effects of climate change. The new international climate change regime has work to do in making their pledged targets more aggressive. A provision is built into the agreement from COP XXI that establishes a regular reconvening of all the involved parties every five years. This should serve as an opportunity for the countries of the world to consistently improve upon their pledges. By most analyses, the agreements made in COP XXI will hold temperatures around 3 degrees Celsius rise since pre-industrial levels. This does not even meet the stated goal of the conference to keep temperature rise below 2 degrees Celsius.

The scheduled regularity with which the parties of UNFCCC will reconvene provides a forum for every country to improve upon their pledges. If the international climate change regime is to accomplish their goal of holding temperatures below a 2 degrees Celsius target, on aggregate the parties to the conference will need to act quickly. Simply pledging emissions reductions via energy consumption reductions is unrealistic, though. Technological developments in renewable energy, energy efficiency, and geo-engineering will help countries reduce emissions without reducing energy consumption. This will allow countries to maintain stable levels of economic growth while establishing sustainable energy sectors.

Improving Renewables and Efficiency Technology

The major issue with renewable energy today is that these fledgling industries are not yet competitive with fossil fuel industries – yet. Jeffrey Ball, a fellow at Stanford Law School, writing for *Foreign Affairs* criticizes governments, especially US, for leading an incomprehensible renewable energy strategy, appearing wishy-washy to renewable industry leaders, private investors, and taxpayers alike. Despite this, Ball argues, now is a better time than ever for governments to get their acts together as renewable energy industries have slowly established an entrenched infrastructure.¹⁰⁵ Ball describes a twofold strategy to take wind and solar power mainstream. First, large-scale storage equipment, such as massive batteries, need to be developed – a responsibility that falls mostly on the private sector. Secondly, governments need to overhaul their energy grids, creating ‘smart’ electrical-transmission grids that could tie together far-flung

¹⁰⁵ Ball, Jeffrey. “Tough Love for Renewable Energy: Making Wind and Solar Power Affordable.” *Foreign Affairs* 91.3 (2012): 122-133.

renewable power projects. These are not far-off projects, claims John A. Turner, a research fellow at the National Renewable Energy Laboratory. Writing in 1999, Turner described methods for storing and transporting energy from renewable sources already exist or are in the pipeline – all that needs to be done is installation.¹⁰⁶ Ball argues the goal for government should be to help make renewable energy firms profitable – then, Ball believes, private money will follow. Ball thinks that governments should provide tax incentives and subsidies for renewables firms and consumers hoping to utilize renewable energy. Importantly, governments should remain committed to their renewable energy strategies despite setbacks (for example, the bungled case of Solyndra in US). To investors, the appearance of commitment will reassure capital markets.

Ball is hesitant to paint a picture of a one hundred percent renewable energy powered economy anytime soon. In fact, Ball argues that ‘clean’ fossil fuels are critical to buttressing renewable energy production. When power from renewables is not available, energy from fossil fuels should ‘switch on’ to ensure energy is widely available. Making sure these sources of energy are produced, burned, and transported cleanly is important to the overall climate change picture. Additionally, reducing waste and improving energy efficiency is essential. Ball highlights the importance of improving energy efficiency in buildings, appliances, and industrial processes more efficient, a difficult process, but one that will reduce overhead costs for firms nonetheless.¹⁰⁵ This is already happening with and without government initiative. Firms are investing energy efficiency in buildings and appliances to reduce costs. Moreover,

¹⁰⁶ Turner, John A. “A Realizable Renewable Energy Future.” *Science* 285.5429 (1999): 687-689.

hybrid and electrical cars seem to be the wave of the future. These trends will intensify if oil and gas prices rise anytime in the future.

Burning without Emitting

Reducing emissions without reducing energy consumption is an entirely plausible strategy. The effectiveness of carbon capture and sequestration (or storage) facilities is well known. H. Jesse Smith, Julia Fahrenkamp-Uppenbrink, and Robert Coontz, writing for *Science*, claim that all that needs to be done is implementation. Facilities exist that capture flue gas of power plants and can transport these fumes to a storage facility. From these facilities, carbon dioxide is pumped under onshore geologic formations. Additionally, the authors express the possibility that carbon dioxide already in Earth's atmosphere can be removed.¹⁰⁷

Richard Sayre, a biologist and biofuel researcher, claims that microalgae are widely recognized as being amongst the most productive biological systems for capturing carbon dioxide. Sayre argues that algae is so efficient at capturing because of its ability to transport carbon dioxide into cells, allowing these cells to be captured and stored (if the carbon dioxide is not used for photosynthesis). Sayre also emphasizes that developing sufficient facilities across the globe is a manageable and realistic process that every government can incorporate as a part of a strategy to reduce emissions. Algae ponds could be used to dramatically reduce emissions.¹⁰⁸

¹⁰⁷ Smith, Jesse H.; Fahrenkamp-Uppenbrink, Julia; Coontz, Robert. "Introduction: Cleaning the Air." *Science* 325 (2009): 1641.

¹⁰⁸ Sayre, Richard. "Microalgae: The Potential for Carbon Capture." *BioScience* 60.9 (2010): 722-727.

Facilities for carbon dioxide sequestration should be implemented, as well as bio-engineered facilities to capture carbon dioxide (both before and after it enters the atmosphere) will help governments reduce emissions without reducing energy consumption.

Renewable energy, energy efficiency, and geo-engineering are all components of a larger concept. There are many ways to reduce emissions without interfering with economic growth. In fact, if they are more efficient economically, they will contribute to economic growth and create sustainable jobs in the process.

Finish the Job

Going forward, the parties to COP XXI will continue to have to grapple with a difficult task. Climate change is perceived as a big enough threat to necessitate aggressive action, but allocating emissions reductions through a country's economy is a difficult task. Renewable energy technology, energy efficiency technology, and carbon capture and sequestration technology could make this task much easier for governments, and it would be wise for governments worldwide to harness and develop these elements.

If and when governments begin to implement and benefit from these new developments, their task will become much easier. The international climate change regime will need to make their emissions reduction targets more aggressive at each of the conferences over the next decades if they are to hold temperature rises under 2 degrees Celsius. Given the pace of technological development, the seriousness with which the international community is addressing the problem, and the establishment of an

international climate change regime, one should remain optimistic about the prospects for Earth's climate.

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