USA's Policies on Fracking

Supervisor: Prof. Vishwas Satgar

Bulbul Shrivastava
433959

Declaration of Authenticity

I, Bulbul Shrivastava, student number 433959

the undersigned, declare that this MA Research Report, titled: "USA's Policies on Fracking", is my original work, gathered and utilized specially to fulfil the purposes and objectives of this Masters of Arts Programme at the University of the Witwatersrand, and has not been previously submitted to any other university for a higher degree. I also declare that the publications cited in this work have been consulted and referenced accordingly.

_____ Signature of Candidate

Bulbul Shrivastava Name in Block

_____ Date

Table of contents

Acknowledgements

The journey of my MA course has been one of many phases. To name a few, excitement, happiness, pride and tumultuous emotions. Nonetheless, completing this journey of my tertiary education could not have been possible without the important and understanding people in my life and work. To all of you, thank you for your constant motivation, patience and unfailing support – throughout my years of study and through the process of researching and writing this research report. This accomplishment started with you, and ends with you.

- To my spiritual teacher, my Guru, His Holiness, Sri Sri Ravi Shankar, thank you for your constant blessings and guidance.
- My very profound gratitude to my late father, my mother and brother. Thank you for tolerating me, my unusual silence, moods and restraints. I have been honoured by having you as the basic foundation of my life.
- To all my friends, regardless of those who proofread and edited drafts of this research report, or not; you continuously made sure I made a success of it and met the high academic standards of the University of the Witwatersrand.
- To my mentors, I may not have been interacting with you as regularly as I should have, but thank you for your words of academic wisdom and eagerness to help me – especially with my last-minute deadline panics.
- I would like to acknowledge Dr. Chief Moshoeshoe of the Department of International Relations at the University of the Witwatersrand as the second reader of this thesis, and I am gratefully indebted to you for your very valuable external comments on this research report.
- To my research supervisor Prof. Vishwas Satgar of the Department of International Relations at the University of the Witwatersrand, you may be regarded as the one who has had the most amount of patience with this student of yours. You consistently allowed this paper to be my own work, but advised accordingly whenever you thought I needed it. My full appreciation goes to you for allowing me to stretch my capabilities. I could not have done this without your passionate participation and input. Thank you for not giving up.

- And to the University of the Witwatersrand. Thank you for letting me be part of a prestigious university.

Thank you.

Bulbul Shrivastava

Abstract

In the past decade, the United States' oil and gas industry experienced an extraordinary boom, due to shale gas. Shale gas accounted for only 1.6% of total US natural gas production in 2000, 4.1% by 2005, and an astonishing 23.1% by 2010. This remarkable growth has spurred interest in exploring for shale gas resources elsewhere. The purpose of the study is how the rise of fracking in the USA has impacted its foreign policy towards climate change. An exploratory qualitative method, known as process-tracing was used, with the aim of providing evidence-based literature in order to explore the change in the USA's domestic energy and climate policies; as well to see the change in its stance on climate change on the international platform. Some of the key concluding findings relate to the Obama Administration's championing of the Clean Energy Act.

Chapter 1: Introduction

1.1) Purpose of this study

The reason for this study is because the hydraulic fracturing technology for extracting natural gas and oil from shale rock formations, has generated heated debate. Among other concerns, primarily questions have been raised over the amounts of water consumed during the process and the possible contamination of groundwater supplies (Nadis, 2013). Even though the environmental controversy is far from settled, the technology is steadily rising in the United States, and the attendant surge in shale gas production over the past decade has created a shock to natural gas on the energy markets (Nadis, 2013).

1.2) Context of the study

In 2007, Energy companies first began to realise that the United States of America (hereon referred to as the United States, America, US or USA) contained large reserves of natural gas trapped in underground shale-rock formations, which is an easily-breakable soft rock that is formed from the compaction of silt and clay-size mineral particles, commonly known as mud (Minerals Education Coalitions, 2017). This composition of the rock categorises it as a sedimentary rock, known as mudstones. The rock is fissile (made up of fine grains of sedimentary rocks that allows it to break easily) and laminated (made up of this layers) (Minerals Education Coalitions, 2017). It occurs in a wide range of colours, including red, green, brown, grey and black. Black shale-rocks contain organic material that sometimes breaks down to form natural gas or oil. Other shale-rocks can be crushed and mixed with water to produce clays that can be made into a variety of useful objects (Geology.com. 2017).

These shale-rock formations could be accessed through new hydraulic fracturing and horizontal drilling techniques. Environmentalists (whether it be individuals or groups) hailed this as a major green breakthrough. "After all, natural gas is much cleaner than coal, which had been America's dominant power source for decades. Burning gas for electricity instead of coal leads

to fewer particulates in the air, less smog, and less planet-warming carbon dioxide. Robert F. Kennedy touted shale gas as key to ending the nation's 'deadly coal addiction'" (Plumer, 2015).

Briefly, hydraulic fracturing, commonly known as fracking, is the process of injecting liquid at high pressures into underground rocks so as to force open existing fissures and extract oil or gas. The use of fracking since then has been continuously rising, specifically in Texas, Pennsylvania, and Arkansas. As a result, US natural gas production has spiked, with many electric utilities changing from coal to cheaper natural gas. The Sierra Club, the largest and most influential grassroots environmental organisation in the USA, launched a highly successful campaign to convince utility regulators to retire many of the now-uneconomical coal plants (Sierra Club, 2017). USA's carbon dioxide emissions have been reduced by 10% since 2005 (though shale gas only deserves part of the credit for that) (Parry, 2013).

Environmentalists were however also beginning to react negatively to the fracking boom. There was growing concern that the process could contaminate nearby fresh drinking water supplies. Green groups, like 350.org, among others, also worried that the methane leaks from fracking operations could partly or even totally undermine the climate benefits from switching to gas. Therefore, awareness of the environmental effects of fracking is constantly being raised by environmental organisations (Plumer, 2015). "As of recent times, it is tough to find an environmental group that supports fracking. Many groups now favour outright bans on the practice – a stance that New York State adopted last fall. The Environmental Defense Fund (EDF) has argued that it's better to focus on improving oversight and patching those methane leaks. But if anything, EDF is an outlier" (Plumer, 2015).

According to a number of studies, even though natural gas – a fossil fuel – is cleaner than coal, fracking alone, does not fix climate change. Ultimately, in order to avoid global warming, cleaner sources of energy need to be looked into, something which politicians like Jeb Bush missed when they suggested that fracking alone can be a solution to climate change. However, the large reserves of shale gas can be used to pave the way for climate policies that gradually reduce emissions over time and help nurture even cleaner sources (Plumer, 2015). Arguably, it

is no doubt that the fracking boom had made it much easier for the Obama Administration to design the forthcoming EPA rules to reduce carbon dioxide emissions from power plants, as the availability of shale gas makes compliance cheaper. In addition, the fracking boom has sharply eroded the political power of coal companies, which have long been a major opponent of climate policies (Plumer, 2015). It is to be noted that this study is primarily focused on the Bush and Obama Administrations, however the Trump Administration has taken over since November 2016.

1.3) Key research questions

The key research question posed for the study was: How has the rise of fracking impacted USA foreign policy towards climate change?

Other research questions that were also posed for the study were:

What are the reasons for the limited success of the Kyoto Protocol?
How does the 2015 Paris Agreement differ from the Kyoto Protocol?
What lessons can be learnt from the experience of the Kyoto Protocol?
In particular, why is the role of the US critical to ensuring the success of the 2015 Paris Agreement?
Given the energy sector trends in the US, what is the likelihood of the US meeting the greenhouse gas emission targets for a low carbon future?

1.4) Structure of the report

This paper will aim to address how the United States of America's energy policy has been able to foster the fracking industry; the impact on the global oil supply; the social and ecological impacts, and how it feeds into the climate crisis.

- The theory and literature review are addressed in chapter 2. The theoretical perspective is based on Green International Political Economy, with a Neo-Gramscian approach to the theory – this is done in order to address the social forces that shape IPE.
- This is followed by chapter 3, the methodology chapter that sets out how the research questions were answered, information sourced, and some of the challenges that were faced whilst writing up the paper.
- With the theoretical perspective and methodology of the paper explained, chapter 4, titled USA's Fossil Fuel Industry and Fracking, attempts to provide the following:
  - A brief historical background to the USA's fossil fuel industry and the rise of fracking.
  - Explain what fracking is, discuss its advantages and disadvantages, why it is surrounded by controversy, and the water storage issue.
- USA's domestic fossil fuel industry and the international climate policy is explained in chapter 5, which is aimed at:
  - Locating the power of the domestic fossil industry, in the sense who owns, controls and drives it, as well as how powerful the federal government is, and what is the link to the fossil fuel industry.
  - The Kyoto Protocol, its limitations and Pledge and Review (that is, what are they, what role did the US play, and how the domestic forces share the US's approach to this) has traced these.
  - An explanation as to what the impact of these domestic forces had on parties, public discourse, and how did the ruling elites respond to these pressures (if any). That is how Clinton, Bush Junior and Obama reacted to the domestic pressures and international policy engagements.
- Chapter 6, the final chapter titled, USA's Domestic Fossil Fuel Industry and Domestic Climate policy, covers the following:
  - It aims to set out the shifts in the fossil fuel industry with a rise of renewables.
  - It then looks at state shifts and Obama's attempts to use the Clean Air Act, such that how he had been blocked in Congress, how things were changing, where fracking fits into this and whether it was transitionary.

Chapter 2: Theory and Literature Review

2.1) Green IPE

Green International Political Economy (Green IPE, which is also referred to as GIPE) emerged in the 1970s onwards, due to an increased interest in the sub-field of International Relations that was concerned with international environmental cooperation, and the key focus of this is the management of common pool resources (examples of this would be oceans, major river systems and the atmosphere) (Paterson, 2013). This, in turn, has grown to cover a broader spectrum of topics, such as climate change, the thinning of the ozone layer, erosion of biodiversity, emergence of other uniquely global ecological problems, and global ecological economic interdependence (Paterson, 2013).

"Just as feminist discourses from outside the discipline of IR have exposed the gender blindness of much IR theory, green IR theory, drawing on more radical green discourses from outside the discipline of IR theory, has helped to expose what might be called the ecological blindness of IR theory" (Eckersley, 2013:267). Evolving from critiques of mainstream theoretical approaches like structural or neo-realism, and neoliberalism, the theory has critically revised and extended on neo-Marxism's concept of international political economy, and normative IR theories of a cosmopolitan orientation (Vogler, 2011).

The modern ecological crisis occurred towards the end of the twentieth century. Specifically, the 1960s were marked by the birth of environment movements, as after the World War II, "rapid economic growth, the proliferation of new technologies, and rising population in this period generated increasing energy and resource consumption, new sources (and rising levels) of pollution and waste production, and the rapid erosion of the earth's biodiversity" (Eckersley, 2013: 268). Towards the end of the 20th Century, the global environmental assessment remained unfavourable and incomplete, even though some environmental indicators had improved in some countries. As per the United Nations Environment Program's (UNEP) Millennium Ecosystem Assessment that was completed in March 2005, 60% of the ecosystem

services studied were either being degraded at a rapid speed or used unsustainably (Millennium Ecosystem Assessment, 2005: 1).

By the 1980s, a green social and political theory had emerged that explained interrelated concerns, such as the environment, peace, anti-nuclear, and women's rights among others. It not only formed the bases of new green parties, but also shaped green politics at the local, national and regional levels. Green IPE is based on four pillars; namely, ecological responsibility, grass-roots democracy, non-violence, and social justice (Vogler, 2011). "Green politics is the only new global political discourse and practice to emerge in opposition to neoliberal globalization" (Eckersley, 2013: 269).

Green IPE had gained much recognition by the 1990s as a new political tradition that the most decisive influence on theories, like liberalism and socialism. Similar to liberalism and socialism, green IPE has a normative branch and a political economy branch. The normative branch focuses on questions of justice, rights, democracy, citizenship, the state, and the environment; whereas, the political economy branch focuses on understanding the relationship between the state, the economy and the environment (Vogler, 2011).

The emergence of the theory till the end of the 20th century marked the first wave of green political theory, and it highlighted the ecological irrationality of key social institutions. The second wave of the theory highlights critical thinking (and in some cases, rethinking), and transnationalising the scope of many core political concepts and institutions with keeping environmental problems in mind (Steans, Pettiford & Diez, 2005). The first wave was able to create a critique of industrialism that broadly re-examined the ideas surrounding the progress of modernization through enlightenment. The theory has pointed out the ecological, social and psychological costs of the modernization process. "They have criticized humanity's increasingly instrumental relationship with non-human nature, along with the subjugation of indigenous peoples and many traditional forms of agriculture" (Eckersley, 2013: 269). The theory has done so by rejecting anthropocentrism (regarding humankind as the central or most important

element of existence) and seeks to accept and respect all forms of life, not only those that are of instrumental value to humans (Steans, Pettiford & Diez, 2005).

The second wave was concerned with exploring the relationship between environmental justice and environmental democracy. According to the theory environmental injustices arise "when unaccountable social agents 'externalize' the environmental costs of their decisions and practices to innocent third parties – particularly vulnerable communities in the Global South – in circumstances where the affected parties (or their representatives) have no knowledge of, or input in, the ecological risk-generating decisions and practices" (Eckersley, 2013: 271). It can also occur when developed or first-world countries create a rather large ecological footprint. Therefore, the mission of the theory is to reduce the ecological risks and prevent unequal externalisation and displacement on the innocent third parties (Steans, Pettiford & Diez, 2005).

It is then to be noted that in order to ensure environmental justice, five key steps need to be taken (Paterson, 2013). The first being that there needs to be mutual recognition of the community being affected by ecological risks. The second is that the citizens affected by the ecological risks need to participate and critically deliberate all environmental decision-making; which includes policy-making, legislating, treaty-making, administration, monitoring enforcement, and adjudication. The third is that a precautionary approach needs to be taken to ensure that the risks are minimised. The fourth, the risks are fairly distributed that are reflectively acceptable via the democratic process and includes the stance of the affected parties. And the fifth step is compensation for the affected parties (Paterson, 2013).

As it is already known, neorealism and neoliberalism are the two dominant rationalist theories that have approached environmental issues as a new area that is engaged into their already existing theoretical frameworks, rather than addressing it as a new normative challenging concept. The political and normative branch of the theory has critiqued these rationalist approaches on four levels. Firstly, the normative purposes served by the rationalist theories implicitly expose the environmental assumptions, problems and ethical values (Eckersley, 2013: 274). On the second level, the analytical frameworks and explanatory powers of the rationalist

– as well as the positivist – theories (for example: neoliberalists predict that inter-state environmental cooperation is highly unlikely unless it can be coerced by a hegemonic state, and that such cooperation will always remain vulnerable to shifts in the distribution of power) (Eckersley, 2013: 275).

Thirdly, according to the discussed theory, critical attention has been focused on "the social agents and social structures that have systematically blocked the negotiation of more ecologically enlightened regimes. These critical analyses have been applied not only to ineffective regimes, but also to the relationship between overlapping regimes and to global governance structures in general" (Eckersley, 2013: 276). And finally, the theory has explored a wide range of role of non-state forms of deterritorialised governance, ranging from transitional initiatives of environmental NGOs to private governance practices of industrial and financial corporations (Eckersley, 2013: 276).

As GIPE has its roots embedded in neoliberalism, which is the idea of a convergence of the liberal desire to expand and intensify market forces and environmentally sustainable development for the global South. "The phrase was coined by sociologist Michael Goldman to help explain how these two seemingly conflicting projects/ideologies have become institutionalized by global governing institutions, particularly – but not limited to – the World Bank. The implementation of green neoliberal strategies has led to "environmental states" that open themselves to market forces and the (self-) governance of subjects along neoliberal lines. Although still relatively new, the phrase has been applied to new areas of global environmental governance, including investigations of the Montreal Protocol" (Gareau, 2011).

In an additional subtheme of green IPE, the anthropocentric view from the perspective of environmental justice, ecological systems are at the centre of all value, and that human systems are embedded in and mirror ecological systems. Contrary to this, anthropocentric view – as mentioned above – places human systems above or outside ecological systems and considers it a source of all value. Ecological systems are considered to be of only instrumental, aesthetic, or utilitarian value.

2.2) Connecting Green IPE and Neo-Gramscian Theory

An easy way of understanding the complex theoretical neo-Gramscian construction is through the concept of hegemony. According to the neo-realist hegemonic stability theory, international order may exist provided it rests on one powerful state, which dominates all other states through its superiority in military and economic capabilities (Bieler & Morton, 2003). In contrast, the neo-Gramscian perspective that was developed by Robert Cox broadens the domain of hegemony, emphasising that it becomes more than simply state dominance (Bieler & Morton, 2003). A scenario for hegemony may exist within a world order "based on a coherent conjunction or fit between a configuration of material power, the prevalent collective image of world order (including certain norms) and a set of institutions which administer the order with a certain semblance of universality" (Cox, 1981:139). Therefore, hegemony can be seen as a form of dominance, but it refers more to a consensual order so that "dominance by a powerful state may be a necessary but not a sufficient condition of hegemony" (Cox, 1981: 139). (Bieler & Morton, 2003).

Within a historical structure, hegemony is constituted through three spheres of activity. The first sphere is that the social relations of production are the starting point for analysing the operations and mechanisms of hegemony (Cox, 1987: 1-9). In this context, production is understood in a broad sense and "covers the production and reproduction of knowledge and of the social relations, morals and institutions that are prerequisites to the production of physical goods" (Cox 1989: 39). These patterns are referred to as modes of social relations of production, which engender social forces as the most important collective actors (Bieler & Morton, 2003). By discerning the different modes of social relations of production, it is possible to consider how changing production relations gives rise to particular social forces that become the bases of power within and across states, as well as within a specific world order (Cox, 1987: 4). The wider understanding of production provides assurance that social forces are not reduced to material aspects. As Cox mentions: "'Non-class' issues – peace, ecology, and

feminism – are not to be set aside but given a firm and conscious basis in the social realities shaped through the production process" (Cox, 1987: 353).

The second sphere of activity is the forms of state. State power rests on the underlying structures of social forces. Therefore, rather than taking the state as a given or pre-constituted institutional category, consideration is given to the historical construction of various forms of state and the social context of political struggle. This is accomplished by drawing upon the concept of a historical bloc (the way in which leading social forces within a specific national context establish a relationship over contending social forces) and by widening the theory of the state to include relations within civil society (Bieler & Morton, 2003). It is more than simply just a political alliance between social forces represented by classes or groups of classes (Bieler & Morton, 2003). According to Gramsci (Hoare & Smith, 1971: 181-182), it indicates the integration of a variety of different class interests that are propagated throughout society "bringing about not only a unison of economic and political aims, but also intellectual and moral unity on a 'universal' plane". Different forms of state are considered as the expression of particular historical blocs. Furthermore, for Gramsci, the state should be understood not just as an apparatus of the government operating within the 'public' sphere (government, political parties, military) but also as part of the 'private' sphere of civil society (church, media, education) through which hegemony functions (Hoare & Smith, 1971: 261). "It can therefore be argued that the state in this conception is understood as a social relation. The state is not unquestioningly taken as a distinct institutional category, or thing in itself, but conceived as a form of social relations through which capitalism and hegemony are expressed" (Bieler & Morton, 2003).

The third sphere of activity is that world orders not only represent phases of stability and conflict but also permit scope for thinking about how alternative forms of world order might emerge (Cox, 1981: 135-8). Creating a historical bloc cannot exist without a hegemonic social class and is therefore a national phenomenon (Cox, 1983: 168, 174). Yet once consolidated domestically, hegemony may expand beyond a particular social order to move outward on a world scale through the international expansion of a particular mode of social relations of

production, which can further be supported by mechanisms of international organisation (Cox, 1983: 171 & Cox, 1987: 149-150).

It is to be noted that "within each of the three main spheres it is argued that three further elements reciprocally combine to constitute an historical structure: ideas, understood as intersubjective meanings as well as collective images of world order; material capabilities, referring to accumulated resources; and institutions, which are amalgams of the previous two elements and are means of stabilising a particular order" (Bieler & Morton, 2003). Over time, the main aim is to break down the coherent historical structures that consist of different patterns of social relations of production, forms of state and world order; and has existed within the capitalist mode of production (Cox, 1987: 396-8). As social forces operate within and across all spheres of activity, through the rise of contending social forces, linked to changes in production, there may occur mutually reinforcing transformations in forms of state and world order (Bieler & Morton, 2003).

The expansive collection of neo-Gramscian work shares a common commitment to social change. As Stephen Gill has argued, the Gramscian approach differs from the prevailing orthodoxy in that it "insists upon an ethical dimension to analysis" in stark contrast to the concerns of political order and the pragmatic need for systems management that dominate the orthodoxy (Ayers, 2013: 3). "Neo-Gramscian theorists have argued for a conception of history as dialectical, seeking to highlight the internal contradictions of prevailing social relations that might form the basis for progressive social change" (Ayers, 2013: 3). They further challenge the widespread tendency that occurs within orthodox IR/IPE theories "to use transhistorical theorisations based upon sets of a priori categories which appear to take on an ontological autonomy" (Ayers, 2013: 3). Although, orthodox theoretical approaches may be practically adequate (meaning being socially effective in that they inform the construction of the social world and certain policy initiatives at any moment), but they fail at providing an adequate scientific explanation (Ayers, 2013: 3).

The international system is to be understood as an articulation of three spheres of activity to which the 'method' of historical structures is then applied. The spheres of activity are: social forces (particularly those engendered through the production process); the forms of states (that are derived from analysis of state-society complexes); and world orders (that are understood as particular configurations of forces that define relations between the ensemble of states) (Ayers, 2013: 3-4). In contrast with the privileging of state power and dominance within realist IR theory, relative stability, known as hegemony, arises from "a coherent conjunction or fit between a configuration of material power, the prevalent collective image of world order (including certain norms) and a set of institutions which administer the order with a certain semblance of universality" (Ayers, 2013: 3-4). The explanation of how and why this fit occurs and unravels is said to lie in the realm of social forces shaped by production relations, provided through a political-economy perspective of the world (Ayers, 2013: 3-4).

The hallmark of neo-Gramscian IR/IPE, the concept of hegemony is said to provide the means to overcome structural determinism by taking practices of ideology and subjectivity as causal within the production and reproduction of world order. The combinations of the two theoretical perspectives were important for the research as GIPE fails to understand the structure and agency dynamics of change, among others. Thus this is where the Neo-Gramscian approach is able to explain the social forces that are shaping the issue of fracking.

2.3) Climate Justice

The term climate justice is usually used to frame the subject of global warming as an ethical and political issue rather than one that is purely environmental or physical in nature (Huntjens & Zhang, 2016). Furthermore, it occasionally refers to actual legal action taken on climate change issues. This is done by relating the effects of climate change to concepts of justice, particularly environmental justice and social justice and by examining issues such as equality, human rights, collective rights and the responsibilities for and against climate change (Huntjens & Zhang, 2016). A fundamental proposition of climate justice is that those who are least responsible for

climate change suffer its gravest consequences (Koch, 2011), as shown in the film based on the book, This Changes Everything, by Naomi Klein.

The ability of populations to mitigate and adapt to the negative consequences of climate change are shaped by factors such as income, race, class, gender, capital and political representation. As low-income communities and communities of colour possess few if any adaptive resources, they are particularly vulnerable to climate change (Mohai, Pellow & Roberts, 2009). People living in poverty or in precarious circumstances tend to have neither the resources nor the insurance cover necessary to bounce back from environmental disasters. On top of that, such populations often receive an unequal share of disaster relief and recovery assistance (Mohai, Pellow & Roberts, 2009).

Much of the education available on how to tackle climate change has been primarily focused on individual and household actions, however without any structural and systemic changes, they are limited on how to lower their greenhouse gas emissions. Therefore, the main industries and infrastructure need to be re-examined as a political and collective one (Klein, 2012: 9). Furthermore, one of the central challenges for climate mobilization efforts relates to the need to integrate calls for individual action within their wider structural contexts. Such integration must consider how to galvanize both personal 'green behaviour' and collective action in support of public policy changes that can enhance quality of life and reduce GHG emissions (Klein, 2012: 9). Issues of fairness and justice must also be effectively addressed in the design of climate mitigation policies (Klein, 2012: 9).

Confronting the climate crisis represents a new industrial revolution as the global trade regime fuels the extraction and use of coal and, from a climate justice perspective, constitutes one of the main causes for the emissions increase and, in consequence, for the current climate crisis (Edenhofer, Luderer, Flachsland & Füssel, 2008). Embracing climate justice means developing industrial and employment strategies for all sectors of the economy (Edenhofer, Luderer, Flachsland & Füssel, 2008). The challenge is to focus on what matters – reducing inequality, enhancing the quality of life, ending poverty, low unemployment and good jobs, hard caps on

GHG emissions that lower steadily over time, and limitations on the extraction of natural resources to ensure sustainability and protect biodiversity. Perhaps the result will be slow or even result in zero GDP growth in the short term (Edenhofer, Luderer, Flachsland & Füssel, 2008). Governments should no longer be judged on the basis of the GDP record under their watch, but rather, on the basis of how well they accomplish the higher-order tasks (Edenhofer, Luderer, Flachsland & Füssel, 2008). Clearly, there is an ecological imperative with which progressive economists must fulsomely grapple. Ecological limits necessitate that a drop in material throughput, waste and emissions. But this may or may not necessarily result in a drop in GDP (Edenhofer, Luderer, Flachsland & Füssel, 2008).

If the climate policies are not perceived as being fair, sustainable public support will not be gained, leading to a decline in political will and determination (United Nations Department of Economic and Social Affairs, 2008). In turn, poverty and inequality will be exacerbated by climate policy unless the action is explicitly taken into account (United Nations Department of Economic and Social Affairs, 2008). Almost all climate policies implemented have the effect of increasing prices, with a regressive distributional impact (United Nations Department of Economic and Social Affairs, 2008). This is not a reason to not proceed; but rather, it means that redistribution measures – both domestically and globally – must be core to climate action agendas. The focus of climate policy and communications ought rightly to be on structural changes, through the lens of equity, and on building a vibrant movement and collective action (United Nations Department of Economic and Social Affairs, 2008).

The link between green IPE and climate justice is that climate change initiatives and governance approaches have tended to be driven from the global scale. While the development of international agreements has witnessed a progressive step of global political action, the governance of climate change issue may be unable to provide adequate flexibility for specific national conditions (Tanner & Allouche, 2011). Besides, from the development perspective of view, the issue of equity and global environmental justice would require a fair international regime within which the impact of climate change and poverty could be simultaneously prevented. In this context, climate change is not only a global crisis that needs the presence of

international politics, but also a challenge for national governments (Tanner & Allouche, 2011). The understanding of the political economy of climate change could explain the formulation and translation of international initiatives to specific national policy context, which provides an important perspective to tackle climate change and achieve climate justice (Tanner & Allouche, 2011).

In addition, there have been a number of developments of financing mechanisms in the area of climate change. On the basis of equity and climate justice, climate change resource flows are increasingly called on developed world according to the culpability for damages (Tanner & Allouche, 2011). As a result, it is inevitable to change the governance structures so as for developing countries to break the traditional donor-recipient relationships. Within these contexts, the understanding of the political economy processes of financial flows in climate change arena would be crucial to effectively govern the resource transfer and to tackle the climate change (Tanner & Allouche, 2011).

Some of the climate justice organisations that exist in the USA are: Indigenous Peoples Movements, Environmental Justice Communities and Coalitions, 350.org, Right to the City Alliance, Grassroots Global Justice Alliance, Just Transition Alliance, Greenpeace. Regarding the strength of the climate justice movement in the USA, some companies are able to seep through to the government, whereas some are not able to. Nonetheless, many citizens are able to see the effects of fracking in their surroundings (such as the lack of water supply and the storage of the water used in the fracking process).

2.4) Fracking

"Though basic fracking techniques have been available for decades, technological breakthroughs in the 1990s paved the way for newfound commercial viability in the shale sector" (McBride & Sergie, 2015). According to the US Energy Information Administration, net imports had decreased by a third between 2011 and 2013, and by 2014, foreign petroleum imports had dropped by 40% (McBride & Sergie, 2015). The 2014 outlook report showed that

natural gas reserves (a group of resources that have been established to be economical to extract under present conditions) increased by 10% in 2013 to 354 trillion cubic feet, while the more inclusive measure of 'technically recoverable reserves' amounted to a tenth of the global supply, which is over 600 trillion cubic feet (McBride & Sergie, 2015). EIA projects shale gas production to continue rising until 2040, however making such projects are dependent on factors such as the viability of deposits, "the future of energy prices, global demand, and technological developments" (McBride & Sergie, 2015).

The impact of fracking on climate change can be debated, particularly relating to the amount of methane released by the process. A study conducted in 2013 (Allen, Torres, Thomas, Sullivan, Harrison, Hendler, Herndoc, Kolb, Fraser, Hill, Lamb, Miskimins, Sawyer & Seinfeldi, 2013) found that the volume of escaped methane gas through fracking was lower than government estimates. Contrary to this, a study conducted in 2014 (Schneising, Burrows, Dickerson, Buchwitz, Reuter & Bovensmann, 2014), found that the amount of methane gas produced may be higher than expected and previously thought.

The combined emissions associated with extraction, combustion, and methane and carbon dioxide releases, suggests that fracked gas can be as dirty as coal. Fracking releases large amounts of natural gas directly into the atmosphere. In fact, fracking wells leak 40% to 60% more methane than conventional natural gas wells. This occurs when water is forced down into a fracking well to fracture the rock formations. Methane flows up the well and is released into the atmosphere before it can be captured. The leaked methane is called "fugitive methane" and has been detected using infrared videos. It is identified as different from naturally occurring methane. Methane in particular is a very powerful greenhouse gas (Fischetti, 2012).

Chapter 3: Methodology

A single case study of the US was chosen for the paper. The reason for this is because it has become the second-largest oil producer in the world under Obama's first term as president. Furthermore, the number of shale gas shafts have drastically increased as well, which has impacted the climate.

As the study only focused on the case of the USA, process-tracing was used. Process-tracing was used due to the study only focusing on the case of the USA. Process-tracing is a mode of causal inference based on concatenation. By relying on within-case analysis, process tracing privileges internal validity over external validity; in return for this constraint on generality, process-tracing has the potential to generate relatively complex explanations (Walder, 2012:67). Process-tracing provides micro-level evidence that decisions made by the USA directly influenced the environmental policy decisions globally. In this study, the method was firstly used for looking at the process of fracking, followed by its regulatory policies. Thereafter, USA's foreign policies surrounding energy and climate change during Bush's and Obama's administration.

The primary objective of the research was to trace the successes and failures of the Kyoto Protocol to draw up a list of lessons learnt, which was achieved through an extensive review of existing literature on Climate Change and Green IPE. These lessons were then applied to the proposed 2015 Paris agreement, which is currently being ratified by member countries of the UNFCC, to critically analyze the possibilities of successes and failure in reducing global greenhouse emissions.

The secondary focus of the research, the paper examined the role of the US in the success of a global environmental treaty. For this purpose, the paper examined regulatory policies related to the fracking industry in the US; it outlined the growth of fracking in the US oil and gas sector in the past decade; the impact of fracking on oil supply domestically and globally; and the potential impact of these trends on global emission targets.

As the research report aims to look at the rise of fracking in the USA and the impact the activity has had on the USA's foreign policy towards climate change, green IPE was chosen as it defies the Anthropocene approach hence is not concerned with the effects on the environment. However, as it can be noted the Obama Administration was attempting to shift toward policies that emit less greenhouse gases and will preserve the environment.

As information was retrieved using process-tracing primarily from books, journal articles written in the past decade, and newspaper articles. In addition, reports by the International Energy Agency (World Energy Outlook Special Report on Energy and Climate Change, and the World Energy Outlook series); the U.S. Energy Information Administration (EIA) (Greenhouse Gas Emissions Overview, Carbon Dioxide Emission Factors for Coal, Annual Energy Review reports), United Nations Environmental Programme Reports (Gas fracking); and US Environmental Protection Agency was looked at. Information was also sourced from the website of the US Department of Energy. Important sources of information were books written by Timothy Mitchell (Carbon Democracy); Naomi Klein (This Changes Everything); Michael Klare (The Race for What's Left: The Global Scramble for the World's Last Resources); and Andrew McKillop and Sheila Newman (The Final Energy Crisis).

Some of the challenges faced during the research and write-up of the paper were that some journal and newspaper articles were not easily accessible due to security reasons, such that access to these articles was not permitted to everyone. Another challenge was that of finding an electronic version of the books, as the ordering a hard copy online was not feasible due to time constraints. Also, the platforms that the hard copy version of the books were available on did not import to South Africa.

Chapter 4: USA's Fossil Fuel Industry and Fracking

The purpose of this chapter is to provide a brief historical background to the USA's fossil fuel industry and how the fracking process (and industry) continued to increasingly dominate USA's fossil fuel industry. This will be achieved by explaining what fracking is, discuss its advantages and disadvantages, why it is surrounded by controversy, and the water storage issue. Related to the paper's theory and literature review, the chapter primarily relates to Green IPE in general.

4.1) Historical background to USA's Fossil Fuel Industry: From Coal to Petroleum to the current state

Fossil fuels can be defined as the organic matter that is made from the remains of flora and fauna, which are subjected to immense pressure and heat deep within the Earth over millions of years (Mitsubishi Heavy Industries, 2016). Petroleum, coal, and natural gas are major fossil fuels (Mitsubishi Heavy Industries, 2016). The Federal Government of the US's involvement in fossil fuel resources began in the early 1900s (U.S. Department of Energy, 2016).

Surface coal mining and household usage of coal can be dated back to 3490 BC, China. Small mining operations began to spread throughout Europe during the Middle Ages to supply forges, smithies, and breweries. In the 1400s, when the British were running out of firewood to burn, the invention of fire bricks made chimneys cheap to build. Thus, the market for coal was created. (Moore, 2016).

As the availability of coal decreased, coal miners began digging beneath the Earth's surface, thereby creating coal mines. These coal mines, once dug out, were filled with water. Thomas Newcomen created a steam engine – known as the Newcomen steam engine – in 1712 that pumped water out of coal mines, combining the previous efforts of Thomas Savery and Denis Papin. Even though there were a number of the Newcomen steam engines that were constructed throughout the 18th Century, the engine also required a large amount of energy to repeatedly cool and reheat the cylinder. James Watt improved the power and cost-efficiency,

as well as approximately doubling the fuel efficiency of the steam engine by adding a separate condenser. Invention and finding a way to use fossil fuels for energy purposes is what led to the Industrial Revolution. (Moore, 2016).

As the Industrial Revolution spread to the United States during the first half of the 1800s, the use of coal became more widespread. It replaced low-energy firewood and became the leading source to power steam locomotives and machinery. "Rails and steam engines combined to build railroads, furthering the need for coal. It didn't take long for utility companies to discover they could burn coal to generate electricity and charge consumers for it." (Moore, 2016).

The development of drilling technology in the mid-1800s led to mass-consumption of petroleum as a fuel (Moore, 2016). Edwin Drake drilled the first rock oil well in Pennsylvania in 1859, thereby replacing whale oil in lighting (Moore, 2016). The invention of the first high-speed automobile engine by Gottlieb Daimler further pushed the use of petroleum into a place of prominence in the early 1900s (Moore, 2016). Energy has always been a major concern for the government (U.S. Department of Energy, 2016). It had not even been 50 years to the birth of the nation's oil industry, when the federal government's leaders were already worried about an impending oil shortage. By 1909, the Navy had converted from powering their ships with sails and coal to 'black oil' (that is, unrefined crude oil) (U.S. Department of Energy, 2016). However, the uncertainty surrounding the long-term future of oil supplies in the United States was still of great concern.

As many of the nation's large oil fields had not yet been discovered, therefore in order "to ensure sufficient fuel for the fleet, the Government began withdrawing probable oil-bearing lands from the public domain" (U.S. Department of Energy, 2016). Between 1909 and 1924, various areas in California, Utah, and Wyoming were set aside, and were known as the Naval Petroleum and Oil Shale Reserves. These reserves are the oldest component of the current Fossil Energy organisation (U.S. Department of Energy, 2016). By 1916 the center of the nation's oil activity had shifted westward. The U.S. Bureau of Mines, which was established in 1910 in the Department of the Interior, saw the need to learn more about oil extraction methods and

thus began the search for a place to locate a petroleum experiment station, Oklahoma. In 1917, large oil reserves were found in the Osage Indian Nation. This confirmed that the nation's oil industry hub was indeed firmly implanted in the Midwest. The government's petroleum research program was initiated when the Bartlesville experiment station opened in 1918 (U.S. Department of Energy, 2016).

During the Great Depression, fossil fuels usage increased; especially the use of coal, tar, and oil, as these were being turned into industrial chemicals (Moore, 2016). With the Wright Brothers initiating oil-fueled aviation, fertilizer and oil-powered tractors were also being invented (Moore, 2016). The use of fossil fuels continued to grow until 1929, to the extent that there was an overproduction. When the severe worldwide economic collapse began, consumerism was invented to soak up all the excess (Moore, 2016).

During World War II, oil could be seen as the primary reason for the USA's – as well as Japan's and Germany's – interests and actions (U.S. Department of Energy, 2016). For Japan, the prospects of finding large oil reserves in Indonesia was for them an attempt to conquer Southeast Asia (U.S. Department of Energy, 2016). Similarly, in Germany, the lack of oil supply but abundant reserves of coal supply led its war machines to develop synthetic substitutes for petroleum (U.S. Department of Energy, 2016). German scientists then developed technological ways to change these abundant coal supplies into liquid fuels, typically using high-pressure 'brute-force' processes (U.S. Department of Energy, 2016).

As the US also possessed abundant reserves of coal supply, it showed interest in the German technological advancements towards the latter stages of the war, when the scientists and technical documents were captured. Therefore, in case the US's natural oil supplies begin to decline, the Federal Government began investigating possible coal-based synthetic alternatives. "The Synthetic Liquid Fuels Act of 1944 began the first concentrated effort to study future ways to use the Nation's abundant coal supplies" (U.S. Department of Energy, 2016).

When many of the OPEC (Organisation for Petroleum Exporting Countries) member states temporarily ceased the oil shipments to the USA in 1973, and by doing so causing a sharp spike in world oil prices, US policymakers realised that energy and security of oil was no longer a matter that should be taken lightly (U.S. Department of Energy, 2016). The Energy Reorganisation Act of 1974 created two new agencies: The Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission. The ERDA was mandated to carry out a more energy-aggressive development program, as well as oversee the Nation's nuclear weapons and naval reactor programs. Whereas the Nuclear Regulatory Commission was created to regulate the nuclear power industry. (U.S. Department of Energy, 2016).

The abovementioned oil embargo of 1973 not only led to the reorganisation of federal energy functions, but it also allowed the government to pay attention to the need for an emergency stockpile of crude oil. "Unlike the federal oil tracts set aside in the early part of the century, the government needed a reserve that could pump emergency oil into the market much faster than any oil field. Such a stockpile of crude oil had been discussed in the Eisenhower Administration but never implemented" (U.S. Department of Energy, 2016). However, due to the oil shortage, President Gerald Ford signed the Energy Policy and Conservation Act on 22 December 1975. This in turn, allowed an extension of oil price controls, authorising the creation of an emergency oil reserve. This has resulted in today's Fossil Energy organisation, the U.S. Strategic Petroleum Reserve (U.S. Department of Energy, 2016).

The USA experienced more energy shocks from there onwards. A shortage of natural gas in the most severe winter of 1977, caused many factories and schools to close, together with the threat of a cut-off of supply to residential customers (U.S. Department of Energy, 2016). Meanwhile, as the unrest in the Middle East grew due to the region being the world's dominant supplier of crude oil, Islamic fundamentalism was on the rise in Iran and elsewhere, and within two years, the Shah of Iran (one of the world's most prolific exporters of crude oil) was overthrown (U.S. Department of Energy, 2016).

The U.S. Department of Energy was activated in October 1977 and was mandated to focus on federal energy programs. "In the original Energy Department organisation, Fossil Energy programmes were managed as a division under the Assistant Secretary for Energy Technology. On October 1, 1979, many of the Department's energy research functions were recognised, and the Fossil Energy program was elevated to its current Assistant Secretary-level status" (U.S. Department of Energy, 2016).

In his book, Carbon Democracy: Political Power in the Age of Oil, Timothy Mitchell (2011) challenges the widespread view that political systems are primarily shaped by attitudes and ideas. He explains how the development of the coal industry, and the dependence on the energy derived from coal, enabled a novel democratization of politics (Bagic, 2014). Coal miners and other workers were able to make their demands heard and attended to because they were in a position to have effects on the flow of energy, which, in numerous ways, could be interrupted (Mitchell, 2011). The subsequent turn to oil was in response to this democratization. First, oil was pursued as a successor to coal, in part to disable workers' existing power with respect to coal (Mitchell, 2011). Second, it was physically organized in such a fashion as to make interruptions more difficult (Mitchell, 2011).

Governments and the elite as a response to the threat of the strikes looked to other energy sources, particularly oil (Mitchell, 2011). Compared to coal which is highly concentrated, hard to transport, oil is less centralised, international, requires less workers and can be pumped and transported easier. There are less points of vulnerability for strikes with oil than with coal. The vulnerability is also lower with oil because there are two alternatives: coal and oil. Using oil worked to de-democratise the system (Mitchell, 2011).

Oil companies are vulnerable to competition from other companies globally. This is because oil is easy to transport. The same happened locally with coal. In order to overcome the problem of competition with coal, coal companies entered into a cartel agreement with neighbouring mines to fix the coal price. The oil companies wanted to do the same thing, and hence organised cartels, forming monopolies of greater scales, and in turn resulting in the large

multinational oil companies. These multinational oil companies brought up oil exploration rights to limit supply in order to keep prices high. They also deliberately did not pump oil to maintain high prices and high profits. The major Western oil companies worked to keep the Soviet Union, which had large oil reserves, out of the world oil market to limit supply. The other way of maintaining high oil prices was to increase consumption. For example, motorcars with large engines. Oil companies brought up public transport companies that used electric trams and putting them out of business. (Mitchell, 2011).

Mitchell primarily emphasised that it was the socio-technical systems erected around carbon (rather than the resource itself) which permitted this agency (Mitchell, 2011:42). He thus contributes to a growing literature on 'technopolitics' – recently defined as 'the strategic practice of designing or using technology to enact political goals' – which examines how power can be derived from the control of technical knowledge and practices (Mitchell, 2011).

The collapse of the post-1945 system placed the weakened carbon democracies of the West into a new relationship with the oil states of the Middle East, while motivating the political right to promote the 'market' as an alternative technology of rule. Mitchell's relative straightforward account of how the vulnerabilities of coal production related to democratic claims is heavily contrasted with the complex networks of oil, as the post-crisis 'neoliberal laws of market' also weakened the powers of labour by further 'placing parts of the world beyond the reach of democratic contestation' (Mitchell, 2011:173).

4.2) About Fracking

4.2.1) What is Fracking?

Hydraulic fracturing, which is more commonly known as fracking, is "a technology that is used to enhance the flow of energy from a well once the drilling is done and the rig and derrick are removed from the scene" (Energy In Depth, 2016). It is a technique that accesses the oil in shale and other tight-rock formations by drilling approximately a mile or more below the surface of

the earth and then gradually turning to drill horizontal which allows to continue the drilling process to continue several feet below. This also allows for a number of fracking wells to be created at a single fracking sight. Once the drill has been cemented, small perforations are made to the area of the well where it was horizontally drilled into. The perforation mixture (also known as fracking fluid) is comprised of 90% water, 9.5% sand and 0.5% additives.

It is pumped at high pressures to create micro-fractures in the rock that are held open by the grains of sand (EnergyFromShale.org, 2016), thus the name hydraulic fracturing. "Additives play a number of roles, including helping to reduce friction (thereby reducing the amount of pumping pressure from diesel-powered sources, which reduces air emissions) and prevent pipe corrosion, which in turn help protect the environment and boost well efficiency" (EnergyFromShale.org, 2016). The process, on average, takes about three to five days to complete from start to finish. "Once the fracturing operation is done, the well is considered to be 'completed', and is now ready to produce oil and/or natural gas for years, even decades, to come" (Energy In Depth, 2016).

4.2.2) History

Fracking can be traced back to the battle of Fredericksburg, Virginia, which lasted for 4 days from 11 to 15 December 1862. During the battle civil war veteran Col. Edward A.L. Roberts experimented with the idea of firing explosive artillery into a narrow canal that clogged the battlefield. The process was described as superincumbent fluid tamping. In April 1865, Col. Roberts received his first patent to improve the process, which was followed by him being awarded the patent, numbered 59 936 and known as 'Exploding Torpedo' (Manfreda, 2015). "This extraction method was implemented by packing a torpedo in an iron case that contained 15-20 pounds of powder. The case was then lowered into the oil well, at a spot closest to the oil. From there, they would explode the torpedo by connecting the top of the shell with wire to the surface, and then filling the borehole with water" (Manfreda, 2015). Within a week of the implementation of the new patent, oil production in the USA increased by 1200%, which in turn led to Col. Roberts finding the Roberts Petroleum Torpedo Company. The company charged

US$100 - US$200 per rocket, with an additional royalty of a fifteenth of the profits generated from the product (Manfreda, 2015).

Fracking innovation only began in the 1930s when workers used acid, a substitute of non-explosive liquid, instead of nitroglycerin. This marked the introduction of modern day fracking as it is known today (Manfreda, 2015). An experiment carried out in 1947 by Floyd Farris studied the relationship between oil and gas production output, and the amount of pressurised treatment being used on each well. The experiment was not successful in determining a positive relationship as it injected gelled gasoline and sand into a gas-producing limestone formation 2 400 feet deep which was followed by a gel breaker. As further experiments were conducted, and positive results were gradually shown, fracking quickly became commercialised (Manfreda, 2015). In his 1975 State of the Union speech and as part of his overall energy plan, President Gerald Ford promoted the development of shale oil resources as a means of reducing foreign oil imports. The process of fracking as it is known today, only began in the 1990s by businessman, George P. Mitchell when he combined horizontal drilling with hydraulic fracturing (Manfreda, 2015).

4.2.3) Advantages and Disadvantages to Fracking

"Ask the most hardcore of pro-fracking boosters for their take, and they'll describe the modern miracle of America's new-found energy independence, a reality almost inconceivable just a decade ago. For them, the oil and gas boom around the U.S. has helped to reboot the economy at a time of great need. Prices at the pump have plummeted. Sure, they may acknowledge, there are a few safety issues to be worked out and techniques yet to be perfected, but just look at the big picture" (Wihbey, 2015).

The advantages and disadvantages of fracking can be produced under five key issues. The first issue is that fracking is changing the USA's role in the energy segment and this has consequences on the air quality, health and the energy policies (Wihbey, 2015). The advantage of this is that as the dependence from coal shifts to natural gas for electricity generation,

natural gas emits less harmful particles in the air. In 2008, coal made up 50% of the USA's electricity generation, which then decreased to 37% by 2012. During the same period, natural gas increased from 20% to 30%. The shift also shows the reduction in nitrogen oxide and sulphur dioxide emissions (Wihbey, 2015).

The disadvantages to this are that firstly, a new natural gas facility will displace coal. Therefore, fracking is no sure guarantee for the improvement of regional air quality. Secondly, due to the volatile organic compounds (VOCs) released during the gas drilling process being extremely toxic, the dynamics of air quality concerning around fracking operations are not fully understood, and the cumulative health impacts of fracking for residents near fracking sites and workers are largely negative (Physicians for Social Responsibility, 2016). Thirdly, natural gas cannot be regarded as a clean and renewable source of energy production, and thus it cannot be seen as the answer to truly cleaning up the air. It could however, put a much-needed and well-thought transition to wind, solar, geothermal, and other sources that produce fewer or no harmful airborne fine particulates (Wihbey, 2015).

The second key issue is that the extraction method results in the leakage of greenhouse gases. The advantage to this is that natural gas produced at the power plant level, is approximately between 44% and 50% of the greenhouse gas emissions compared to burning of coal. Research conducted by Howarth, Santoro and Ingraffea (2011) claims that methane over a use of 20 years can be harmful; but over a 100-year timeline – which is generally the time period used to measure global warming potential – methane is not nearly as harmful as claimed. Thus, methane's impact is potent but relatively brief compared with impacts of increased carbon dioxide emissions. A larger threat to the atmosphere currently is reliance on coal, and priority must be placed on reducing this reliance (Howarth, Santoro & Ingraffea, 2011). Technology development is underway to report accurate emission leakage rates and further narrow the gap. Moreover, research-based modelling suggests that even if energy consumption increases overall, the United States still will reap greenhouse benefits as a result of fracking (Newell & Raimi, 2014).

The disadvantage of this issue is that Howarth, Santoro and Ingraffea (2011) suggested that methane leaked from wells nullifies any greenhouse gas benefits of natural gas derived from fracking as there are further leaks at transmission and distribution phases. The price decrease of natural gas only encourages more energy usage, negating any benefits. Also, "there is no question that the embrace of cheap natural gas will undercut incentives to invest in solar, wind, and other renewables" (Wihbey, 2015). Over the next few decades, humans are now placed with the responsibility to reduce the risk of 'tipping points' and catastrophic melting of the glaciers. "Natural gas is often seen as a 'bridge', but it is likely a bridge too far, beyond the point where scientists believe we can go in terms of greenhouse gas levels in the atmosphere" (Wihbey, 2015).

The third key issue is the threat to human health that fracking causes by contaminating drinking water supplies. The advantage is that because drinking water and the deposits of oil and gas are at two different levels in the ground, it is highly unlikely that well-run drilling operations, are creating cracks that allow chemicals to reach relatively shallow aquifers and surface water supplies. The responsibility lies with the government to ensure that fracking companies pay equal to more attention to the surface (including 500 to 1 000 feet of piping) operations in order to contain problems contaminating drinkable water. However, this precaution is only a matter of making sure that the casing is not leaking and that the cement around it does not have cracks. As for the flammable water, it is highly flammable in some areas and severe in a minority of cases, "but it is unlikely and it is often the result of leaks from activities other than fracking. In terms of disclosure, many of the chemicals are listed on data sheets available to first-responders: 'The information is disclosed to relevant authorities'" (Wihbey, 2015).

The disadvantage of this issue is that a major study (Considine, Watson, Considine, & Martin, 2013) confirmed that fracking conducted at high volumes can contaminate drinking water. Numerous citizens in the USA have filed reports regarding fouled tap water; it is a fact that some of the tap water has even turned bubbly and flammable, as a result of increased methane. The companies involved cannot be trusted regarding disclosure of their chemicals, as roughly one in five chemicals involved in the fracking process are still classified as trade secrets

(Jackson, Vengosh, Carey, Davies, Darrah, O'Sullivan & Pétron, 2014). Even well-meaning disclosure efforts by environmental organisations are not able to provide sufficient information. And additionally, it is known that there are many who try taking a short cut in the field, regardless of the federal or state regulations that are attempted at imposing. They already receive dozens of violation notices at sites, with little effect.

Fourthly, at times, fracking operations take place near and around populated areas, which affects the locally built and natural environments. The advantage is that the water intensity is lower for fracking than other fossil fuels and nuclear, in the sense that coal, nuclear and oil extraction respectively use approximately two, three, and ten times water compared to fracking per energy unit, and corn ethanol may use a thousand times more if the plants are irrigated. The operations are targeted and have a definite time limit, together with the productivity of the wells, there is a steady increase of more valuable output (U.S. Energy Information Agency, 2014).

The disadvantage is that many civilians have experienced fracking operations being conducted within a mile radius of their homes. Yet it means that a small proportion of people shoulder the burden and downsides, with no real compensation for this intrusive new industrial presence (Kille, 2014). As it is mentioned above, fracking requires large amounts of water, making it a water-intensive task. A fracking well is able to use up to 20 million gallons of water per fracking, thereby impacting local water sources (Wihbey, 2015). In addition, due to the constant trips to and from the fracking sites, the water-bearing trucks deteriorate roads quicker (Kille, 2014). This in turn means that local budgets need to be revised and allocated to road infrastructure, rather than on other infrastructure development projects that may be more pressing. "Finally, it is also the case that relatively low impact fees are being charged and relatively little funding is being set aside to mitigate future problems as wells age and further clean-up is necessary. It is the opposite of a sustainable solution, as well production tends to drop sharply after initial fracking" (Wihbey, 2015).

Lastly, fracking wells require drilling to happen thousands of feet below the earth's surface, which negatively changes the geology of the planet, leading to earthquakes. The advantage to this is that earthquakes are a naturally occurring phenomenon. There have been many wells that have been drilled numerous times over the years, yet there are none operations-induced seismic effects which has impacted citizens. There is research available to suggest that the potential for earthquakes can be mitigated through safeguards (Zoback, 2012).

The disadvantage to this that groups and individuals are only just beginning to understand what the impact of fracking on the local geologies is. According to the 2014 Annual Reviews of Environment and Resources, "between 1967 and 2000, geologists observed a steady background rate of 21 earthquakes of 3.0 Mw or greater in the central United States per year. Starting in 2001, when shale gas and other unconventional energy sources began to grow, the rate rose steadily to [approximately] 100 such earthquakes annually, with 188 in 2011 alone" (Jackson, Vengosh, Carey, Davies, Darrah, O'Sullivan & Pétron, 2014). New research on seismology suggests risky and unknown changes. It is not strategically advised to go headlong first – at massive scale – and only later discover the consequences (Wihbey, 2015).

According to a new study by the University of Texas (UT), the USA government's estimates of the amount of natural gas that can be extracted by fracking may be far too optimistic. In 2013, the US Energy Information Administration issued a report saying that, according to its analysis, shale wells, which require fracking to release their gas, would be productive at current levels till at least until 2040. However, researchers from UT's Department of Petroleum and Geosystems Engineering say shale gas production may peak 20 years earlier, followed by a rapid decline in output. (Tully, 2014).

The problem, according to the UT researchers, goes far beyond merely running out of natural gas. The researchers warn that the USA and many other countries, relying on a long-term availability of inexpensive gas, are investing billions of dollars in vehicles, factories and power plants that depend on gas. Major proponents of fracking are President Obama in the USA and Prime Minister David Cameron in Britain. Obama had boasted that their supply of natural gas

would be available for one hundred years and was a big factor in drawing jobs back into the country. Whereas Cameron has dismissed fracking opponents as being rather irrational. (Tully, 2014). Following Trump's inauguration as the president of USA, his administration confirmed its intentions to reverse Barack Obama's climate change policies, boost fracking for oil and gas, and lift current restrictions affecting the coal mining sector (Jamasmie, 2017).

But, should the UT scientists be right and gas production begins to fall off around 2020, all those billions of dollars invested into gas-based vehicles and infrastructure will have been wasted. The researchers conducted their own analyses of natural gas production at the four leading US shale gas formations: The Barnett in Texas; the Fayetteville in Arkansas, the Haynesville in Louisiana, Arkansas and Texas; and the Marcellus in and around the Appalachian Basin. These four formations provide two-thirds of US gas production. Their conclusion based on their findings was that not only will gas production peak in 2020, output will be halved by 2030. (Tully, 2014).

4.2.4) Why is it controversial?

Shale gas production is highly controversial, in part because of environmental concerns. During the Bush Administration, Vice President, Dick Cheney proposed an Energy Task Force that recommended energy policy goals that were designed to help the private sector, and also – as necessary and appropriate – state and local governments to promote dependable, affordable, and environmentally sound production and distribution of energy for the future (National Energy Policy Development Group, 2001). A recommendation of the Energy Task Force was that the Congress should exempt fracking from the regulations of the Safe Drinking Water Act. This was followed by the implementation of the National Energy Policy Act of 2005.

By 2009, an introduction of a proposed legislation (two identical bills were introduced) was seen as there were many concerns from many quarters in both, the House and Senate. The Fractured Responsibility and Awareness of Chemicals (FRAC) Act required the amendment of the Safe Drinking Water Act thereby allowing the Environmental Protection Agency (EPA) the

authority to regulate fracking and to require disclosure of fracking chemicals (Congress.gov, 2016). Opponents argued that enough detail of chemicals was already disclosed in the Material Safety Data Sheets (MSDS) required by the Occupational Safety and Health Administration (OSHA). When the congressional session was concluded without any actions on the bills, the matter was silenced.

The controversy behind fracking did not end with the close of the 111th Congress. "The Fiscal Year 2010 Budget Report of the House Appropriation Conference Committee called upon the EPA to study the relationship between hydraulic fracturing and drinking water contamination" (Rahm, 2011: 2977). The EPA during the Obama Administration reversed the stand taken by it during the Bush Administration and agreed to undertake the study. While the EPA actively investigates fracking and its impacts on drinking water resources, there is currently little federal regulatory understanding of the drilling practices. The regulations that do exist, rest primarily with the states, but due to the many concerns associated with the practice, the EPA indicated that as part of its National Enforcement Initiatives, it will make sure that the energy extraction sector is in compliance with the nation's environmental laws (Rahm, 2011: 2977).

However, some alternative signals are coming for the federal government. In 2010, the Department of Interior held a forum in November on the use of hydraulic fracturing on federal lands. The stated position of Interior is that they encourage the safe and environmentally sustainable extraction of natural gas on federal lands (Rahm, 2011: 2977). In addition, the Obama Administration entered into partnerships, one with China and another with Poland, to encourage those nations to develop their shale gas reserves.

4.2.5) Water storage

Most of the water that is used in the fracking process comes from surface water sources, such as lakes, rivers and municipal supplies. However, groundwater – where it is available in sufficient quantities – can also be used to enhance surface water supplies. In some states, the water used for fracturing is controlled by a river basin commission or water resources board,

such as the Susquahana River Basin Commission (SRBC) in Pennsylvania or the Delaware River Basin Commission (DRBC) in New York. Whereas in other places, water is owned by private individuals who can allocate it at their discretion. (FracFocus, 2016).

Water and sand make up more than 99.5% of the fracking fluid used to hydraulically fracture a well. Water acts as the primary carrier fluid in the fracking process. Because of the multi-stage fracturing of a single horizontal shale gas well can use several million gallons of water, it is critical that large quantities of relatively fresh water be reasonably, and perhaps be continuously available. The quality of the water is also very important because impurities can reduce the efficiency of the additives used in the process. (FracFocus, 2016).

The amount of water used in fracking, particularly for the natural gas trapped in shale gas formations, may appear substantial, but it is small when compared to other water uses such as agriculture, manufacturing and municipal water supply. For example, electric generation uses nearly 150 million gallons a day in the Susquehanna River Basin, while the projected total demand for peak Marcellus Shale activity in the same area is 8.4 million gallons per day (FracFocus, 2016).

A solution that promises a truly comprehensive approach to integrating all aspects of fresh water and wastewater management in shale oil and gas production, while optimising the utilisation of water resources throughout the entire lifecycle of well production, is a centralised approach to the treatment and reuse of wastewater. (Easton, 2016)

Centralisation not only provides treatment and reuse of flow back wastewater from a large number of wellheads when the wells are fracked, but also provides treatment and reuse of the produced wastewaters for the long-term, full lifecycle of the wells – which represent the vast majority of wastewater flowing from wellheads. Furthermore, a centralised system can be more easily accessed and use alternative water sources, such as from municipal wastewater facilities, which otherwise would be highly unlikely to be accessed. (Easton, 2016)

Inherently, wellheads providing shale oil and gas production are long-term processes, typically exceeding 20 year terms, but conventional solutions in play for handling fresh water resources and wastewater are geared towards the short-term. Impounding wastewater for evaporation in surface ponds, trucking water over long distances to deep-well injection sites, and treating flow back wastewater for reuse at the wellhead are all short-term options which do not address critical long-term issues impacting of the industry – such as diminished water sources, increasing regulations limiting wastewater disposal, and growing safety and environmental concerns from government and the public. (Easton, 2016)

The centralised wastewater management concept is gaining momentum. In North America, more than a dozen centralised wastewater treatment facilities servicing shale oil and gas drilling are now either up and producing, or in development. (Easton, 2016)

In conclusion, as the purpose of the chapter was to provide a brief historical background to the USA's fossil fuel industry and how the fracking process (and industry) continued to increasingly dominate USA's fossil fuel industry, it can be seen that in relation to Green IPE, the controversy of fracking. As US Vice President Dick Cheney had proposed an Energy Task Force to recommend energy policies, which in turn, recommended the Congress to exempt fracking from the Safe Drinking Water Act regulations. Therefore, in relation to the theory, US fracking policies disregard the conservation of the environment. However, there can be seen in the shift in environmental conservation policies during the Obama Administration which will be discussed in the next chapter.

Chapter 5: USA's Domestic Fossil Fuel Industry and International Climate Policy

The chapter will explain and discuss USA's domestic fossil fuel industry and the international climate policy. This will be done by locating the power of the domestic fossil industry, in the sense who owns, controls and drives it, as well as how powerful the federal government is, and what is the link to the fossil fuel industry. Followed by explaining the Kyoto Protocol, its limitations and Pledge and Review (that is, what are they, what role did the US play, and how the domestic forces share the US's approach to this) has traced these. In addition, an explanation as to what the impact of these domestic forces had on parties, public discourse, and how did the ruling elites respond to these pressures (if any). That is how Clinton, Bush Junior and Obama reacted to the domestic pressures and international policy engagements. In relation to the theoretical perspective of the paper, the chapter relates to Neo-Gramscian theory and Green IPE.

5.1) The Energy Sector within the USA

The US energy sector and its policies is determined by federal, state, and local entities, which address issues of energy production, distribution, and consumption, such as building codes and gas mileage standards. Legislation, international treaties, subsidies and incentives to investment, guidelines for energy conservation, taxation and other public policy techniques are all examples of energy policies. (Kirkici & Bernstein, 2010). Obama's Administration had long considered climate change a national security threat. According to the White House, Obama had signed a directive instructing the offices to develop a "centralised climate and national security working group" that was aimed at "identifying the U.S. national security priorities related to climate change and national security, and develop methods to share climate science and intelligence information to inform national security policies and plans," according to the White House (Henry, 2016).

Over the years, numerous mandates have been proposed, but no wide-ranging long-term energy policy has been proposed to date (Walker & Swift, 2015). This fact has been criticized

and concern is discernable regarding this obvious failure. Three Energy Policy Acts have been passed in the years 1992, 2005, and 2007 (Walker & Swift, 2015). These include many provisions dealing with the matter of conservation, such as the Energy Star program, and energy development, with grants and tax incentives for both renewable energy and non-renewable energy (Walker & Swift, 2015).

Many people believe that due to the first oil shock in 1973, federal energy policies have been influenced by crisis-mentality thinking or in other words, policies have been reactive to the crises (Davis & Turpin, 2015). There is a promotion of expensive quick fixes and single-shot solutions that ignore the truths of the market and technology. Instead of providing stable rules that support basic research while leaving plenty of scope for American entrepreneurship and innovation, congresses and presidents have repeatedly supported policies which promise solutions that are politically self-serving, but whose prospects are doubtful, without adequate consideration of the financial costs, environmental costs, or national security costs of their actions (Davis & Turpin, 2015). There seems to be more importance given to short term solutions than long term ones. State-specific energy-efficiency incentive programs also play a substantial role in the overall energy policy of the United States, such as fracking (Davis & Turpin, 2015).

As of July 2014, Oil Change International estimates United States' fossil fuel subsidies at US$37.5 billion annually, including US$21 billion in production and exploration subsidies (Oil Change International, 2017). Other credible estimates of annual United States fossil fuel subsidies range from US$10 billion to US$52 billion annually, however it does not include the costs incurred by taxpayers related to the climate, local environmental, and health impacts of the fossil fuel industry (Oil Change International, 2017).

Fossil fuel subsidies in the United States include massive military expenditures to gain and defend fossil fuel interests around the world, and infrastructure spending. There is related maintenance which is needed as well and it is based on an antiquated energy system built on large, remote power plants and cheap electricity (Oil Change International, 2017). Through

2013, fossil fuel subsidies linked to production actually increased under President Barack Obama's Administration, largely as a result of an "All of the Above" energy strategy promoting oil and gas industry expansion. At a federal level, production and exploration subsidies – some of the most inefficient and least defensible subsidies – rose from US$12.5 billion in 2009 to US$18.5 billion in 2013 (Lin, 2014).

The US oil and gas industry is one of the most influential industries on Capitol Hill. But quantifying that influence is not always direct. Oil Change International, strongly believes that the influence of the fossil fuel industry is the major challenge to a clean energy transition. In order to quantify the influence, two major measures should be traced. Firstly, the campaign contributions that the industry makes to elect the relative representatives, and secondly, look at the amount the industry spends on lobbying. (Oil Change International, 2017).

These measures leave out at least two major ways that the industry wields its influence; which are advertising and unregulated spending. Due to there being limited transparency on these measures, they are not regularly traced either or monitored. Nonetheless, tracing the campaign contributions is a reliable indicator of whether or not a particular representative will vote to support the fossil fuel industry or a clean energy future. It is important to be noted that influence can often be much subtler and less easily quantified. The well-known and documented 'revolving door' between the industry and government regulatory agencies is a very significant factor in setting policies that affect the industry. (Oil Change International, 2017).

Even though the Bush Administration had rejected the Kyoto protocol, the Obama Administration had attempted to adopt some Kyoto Protocol goals on a local basis. In 2015, carbon dioxide (CO_2) emissions measured 1 925 million metric tons, or about 37% of the total U.S. energy-related CO_2 emissions of 5 271 million metric tons (U.S. Energy Information Administration, 2016).

Since the early 2000s, shale gas has had a significant impact on the global energy market, especially its contribution on the USA's energy production. "As of April 2013, US crude production was at a more than twenty-year high, at nearly 7.2 million barrels per day, with shale oil from the seven most productive shale-producing regions of the country accounting for 95 percent of oil production growth from 2011 to 2013" (Shrivastava & Stefanick, 2015). It is often debated that regulatory requirements were compromised to allow the rapid growth of the fracking industry in the US, with the global temperature passing 1 degree compared to pre-industrial levels due to greenhouse emissions, in particular due to carbon emissions of fossil fuels. It is estimated in the USA, that in the next 20 years' methane will make up 44% of its greenhouse gas emissions. (United States Environmental Protection Agency, 2016)

Along with contributing to global warming pollution, methane leaks kill plants and trees, contribute to ozone formation, and cause natural disasters, especially earthquakes (Fischetti, 2015). Shale gas also contains ethane. Looking at ethane and methane together, shale gas and oil extraction were found to be easily the dominant source giving leak rates of 0.18%-2.8% even before the gas was distributed to users. Some active drilling areas were notable super-emitters. Ethane from shale gas and oil extraction is bringing its own problems. Ethane can remain in the air for around two months, making it a global pollutant. Ethane measured from the top of the Swiss Alps has been rising since the start of large scale US shale gas extraction in 2009, indicating an increase in the global methane leakage from natural gas (Fuller, 2016). As one of the world's biggest economies, the USA has harmed and continues to harm the environment more than smaller developing countries, and in doing so, its ratification of a legally binding emissions reduction accord is essential (Hiatt, 2015).

5.2) Climate Change

"In a nutshell, climate change occurs when long-term weather patterns are altered — for example, through human activity. Global warming is one measure of climate change, and is a rise in the average global temperature" (David Suzuki Foundation, 2016). The reason that climate change matters is because the greenhouse gases trap heat within the atmosphere,

which can have a range of effects on ecosystems such as rising sea levels (due to the melting of the polar ice caps and contributing to greater storm damage); severe weather events (associated with warming ocean temperatures, which leads to additional rainfall and flooding, and also droughts that render landscapes more susceptible to wildfires, which in turn, threatens habitats, homes, and lives); and heat waves (which contribute to human and animal deaths, wild fires, and disruption of agricultural cycles, among other things) (United States Environmental Protection Agency, 2016).

Climate change relates to green international political economy. By the cross-sectoral nature of the topic, climate change usually fits into various sectors, which means that the integration of climate change policies into other policy areas is frequently called for (OECD, 2009). Consequently, this has resulted in the high complexity of the issue, as the problem needs to be addressed from multiple scales with diverse actors involved in the complex governance process (Rabe, 2007). The interaction of these facets leads to the political processes with multiple and overlapping conceptualisation, negotiation and governance issues, which requires the understanding of political economy processes (Tanner & Allouche, 2011). The understanding of the political economy of climate change could explain the formulation and translation of international initiatives to specific national and sub-national policy context, which provides an important perspective to tackle climate change and achieve environmental justice (Tanner & Allouche, 2011).

According to Joshua Goldstein, climate change is the most important issue in International Relations (IR) yet it receives minimal scholarly attention (Goldstein, 2015). Climate matters should be discussed not only for practical reasons, but also as the core of what IR is, which is power residing primarily in sovereign states whose individual rational decisions often lead to negative outcomes. In the context of the shale oil energy policy, each IR actor's economy benefits from burning fossil fuels, with potential consequences, yet no single actor can affect the overall outcome alone (Goldstein, 2015).

As Mizan Khan (2016) points out that "climate change is the poster child of global diplomacy today"; it is to be further noted that global diplomacy often ignores the intrinsic complexity of this phenomenon as a policy problem. Furthermore, Simon Dalby (2016) explains that the term 'environment' has different understandings to actors in both the Global North and the South. The role of science in major international events during and after the Cold War demonstrates the important role that the environment has when prompting international action of any kind.

There are a number of national and international policies for the mitigation and the prevention of the devastating impact of global climate change. Under the United Nations Framework Convention on Climate Change (UNFCC), the Kyoto Protocol was adopted in 1997 to legally bind developed country parties to CO_2 emission reduction targets. Despite 192 countries signing the Kyoto Protocol, the two largest greenhouse gas emitters – USA and China – did not ratify the treaty. Consequently, the impact of the Protocol has been a mixed bag of some successes in the reduction of energy consumption in the developed world, but large failures to address the global escalation of CO_2 emissions, which have risen by 51% since 1990, 41% of which is contributed by China and the US (Jones, 2015).

According to Vishwas Satgar (2016), the current COP 21 negotiations could be seen as leading to an increase of 3-4 degrees in the global temperature. The ratchet up mechanism in the COP 21 agreement is filled with uncertainties as there are very little changes made to the conditions of the domestic political economy countries, geopolitical calculations of fossil fuel producers and the lack of resourcing to address climate debt by rich countries. As the 2015 COP 21 summit was unable to challenge the extraction methods of fossil fuels, it could be said that the summit is not about systemic change; and that the discourse of the COP 21 negotiations is unable to address the unequal divide of responsibilities and impacts of climate change within the idea of the Anthropocene. It fails to appreciate that rich countries, powerful corporations and ruling classes are the problem but yet poor countries, the hungry, and landless and working class will suffer the most. COP 21 reproduces a power framework that is the problem and it fails to address corporate and ultimately capitalist-induced climate change (Satgar, 2016).

5.3) The Kyoto Protocol

The Kyoto Protocol is an international treaty that was negotiated in December 1997 at the city of Kyoto, Japan. It came into force on 16 February, 2005; and is regarded as the first legally binding agreement between nations to mandate country-by-country reductions in greenhouse-gas emissions (International Institute for Sustainable Development, 2009). The protocol is the result of the UN Framework Convention on Climate Change (UNFCCC), which was signed in 1992. Briefly, the Convention was aimed at stabilising greenhouse-gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system (International Institute for Sustainable Development, 2009).

Under the Protocol, 37 countries have committed themselves to a reduction of four greenhouse gases (GHG) (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride) and two groups of gases (hydrofluorocarbons and perfluorocarbons) produced by them, and all member countries give general commitments. Annex I countries agreed to reduce their collective greenhouse gas emissions by 5.2% from the 1990 level. Emission limits do not include emissions by international aviation and shipping, but are in addition to the industrial gases, chlorofluorocarbons, or CFCs, which are dealt with under the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer (United Nations Framework Convention on Climate Change, 2016).

The benchmark 1990 emission levels accepted by the Conference of the Parties of the UNFCCC (decision based on two-thirds of the Conference of the Parties votes) were the values of "global warming potential" calculated for the IPCC Second Assessment Report. These figures are used for converting the various greenhouse gas emissions into comparable CO_2 equivalents (CO_2-eq) when computing overall sources and sinks (United Nations Framework Convention on Climate Change, 2016).

The Protocol allows for several 'flexible mechanisms', such as emissions trading, the clean development mechanism (CDM) and joint implementation to allow Annex I countries to meet

their GHG emission limitations by purchasing GHG emission reductions credits from elsewhere, through financial exchanges, projects that reduce emissions in non-Annex I countries, from other Annex I countries, or from Annex I countries with excess allowances (United Nations Framework Convention on Climate Change, 2016).

Under the UNFCCC and the Kyoto Protocol, each Annex I country is required to submit an annual report of inventories of all anthropogenic greenhouse gas emissions from sources and removals from sinks (United Nations Framework Convention on Climate Change, 2016). These countries nominate a person, known as the designated national authority to create and manage its greenhouse gas inventory. Virtually all of the non-Annex I countries have also established a designated national authority to manage its Kyoto obligations, more specifically, the CDM process that determines which GHG projects they wish to propose for accreditation by the CDM Executive Board (United Nations Framework Convention on Climate Change, 2016). Even if Annex I Parties succeed in meeting their first-round commitments, much greater emission reductions will be required in future to stabilize atmospheric GHG concentrations (United Nations Framework Convention on Climate Change, 2016).

In 2001, the detailed rules for the implementation of the Protocol were adopted at the COP 7, which was held in Marrakesh, and are thus referred to as the Marrakesh Accords (United Nations Framework Convention on Climate Change, 2016). Its first commitment period started in 2008 and ended in 2012. The Doha Round in 2012 was known as the Doha Amendment of the Kyoto Protocol (United Nations Framework Convention on Climate Change, 2016). The Protocol established a structure of rolling emission reduction commitment periods, with negotiations on second period commitments that were scheduled to start in 2005 (United Nations Framework Convention on Climate Change, 2016).

An important aspect of the protocol is that the causes of the global warming are hard to fight – including the disposal of industrial waste – throughout the world, and in turn requires a budget of millions of dollars. It is for this purpose that the developed world is contributing millions of dollars to provide machinery to its members to control carbon emissions. The cap and trade

system contained in Kyoto imposes caps on the Annex I countries to stop global warming by cutting down carbon discharge in the air (United Nations Framework Convention on Climate Change, 2016). These caps are regarded as commitments at the national level in order to stop greenhouse emission up to 5.2% in the coming years. If the enforcement compliance committee feels that the member countries are not conforming to emission limitation, then that member country has to make up for 30% extra along with regular limitation (United Nations Framework Convention on Climate Change, 2016). The position of member countries who are working well with this protocol are Australia ranking at top position followed by Canada, China, the European Union, Germany, United Kingdom, France, Norway, India, Pakistan and Russia. (United Nations Framework Convention on Climate Change, 2016).

5.3.1) Accomplishments and Failures

The major accomplishment of the Kyoto Protocol is bringing awareness to the fact that greenhouse gas emissions need to be reduced in order to protect the environment. The Protocol is integrating the world to work together to protect the planet, much like the world banded together to remedy the Ozone Hole calamity. It showed that many countries are serious about environmental protection and focus on what is really important: the protection of Earth. (Diniz, 2007)

Some of the reasons why the Kyoto Protocol was a failure were because it was finalised halfway through its 10-year life; the United States till date refuse to ratify it; and there is an absence of binding targets for developing nations. (Diniz, 2007)

The United States are the largest total emitter and largest emitter per capita in the world and unfortunately without the United States, the treaty is not as successful. The reason the United States would not ratify it, was due to the absence of binding targets for developing nations (Diniz, 2007). Both India and China's emissions have increased dramatically; 103% and 150% respectively. Without binding targets for developing nations, they will only increase their emissions and it will be harder to reduce them in the future. Furthermore, When Al Gore and

Bill Clinton came to Kyoto to take part in the negotiations, they had already given up hope of achieving an agreement that would be acceptable to the Senate. Gore, who led the negotiations for the Americans, knew that he would not be able to get the minimum 67 of the 100 senators needed to support ratification. (Diniz, 2007).

According to some US delegates to Kyoto, the US negotiators believed it was possible to get the Senate's support for an agreement that committed the US to a zero percent increase in emissions from 1990 to 2012. But when Al Gore arrived at the table, he said the USA had to give more, and consequently the delegation ended up committing the Americans to a seven percent reduction in emissions. Gore knew that US legislators would not accept this since the Senate had just unanimously approved a resolution that was contradictory to it. (Diniz, 2007).

5.3.2) Lessons Learnt

As mentioned above, the protocol consists of a set of explicit reduction commitments by developed countries, including programmes related to incentivise the increase of removals by sinks and the transfer of cleaner technologies from developed-to-developed countries (Joint Implementation – JI) and developed-to-developing countries (Clean Development Mechanism – CDM) (Diniz, 2007). An investment that produces properly certified emission reductions in developed or developing countries implies that the investor has reduced the emissions of his own country. The same elements of the Convention and the bulk of the Brazilian proposal on the CDF are included in the Kyoto Protocol (Diniz, 2007).

More attention is given to the role of private investment in the transfer of technology. In the case of environmental problems, data cited in for the period 1990-1997 showed the growing importance of private-sector transfers from foreign direct investment: nearly US$ 250 billion against US$ 5.25 billion from Global Environment Facility (Forsyth, 1999). The CDM was inspired by the Brazilian proposal of a CDF (whose nature changed). The CDF was conceived as a non-compliance mechanism that imposed a penalty on developed countries that failed to perform at least as well as the proposed commitments. Whereas, the CDM has a function to help

developed countries to achieve their commitments, and the CDF was a punitive device, and the CDM an additional instrument. (Diniz, 2007).

The key lessons from the CDM include: (1) the cost-effectiveness and quality of the projects may be reduced due to the necessary resources to obtain project approval; (2) the need to ensure the credibility of emission reductions presents a significant regulatory challenge; and (3) due to the trade-offs with offsets, the use of such programs may be, at best, a temporary solution. (Diniz, 2007).

Some problems of the Kyoto Protocol must be discussed (Diniz, 2007):

a) The use of removals by sinks as a form to mitigate climate change is controversial. Some argue that reforestation projects do not address the main causes of greenhouse gas emissions (industrialisation and energy use). Another argument against this is that projects have primarily focused on sinks rather than on the transfer of environmentally sound technologies because the former are cheaper. The cherrypicking problem arises when investors from developed countries tend to invest in the cheaper projects, leaving the more expensive ones to governments or international agencies. On the other hand, the impact of each measure is differentiated and the implicit trade-off can be useful for policy purposes.
b) There are no side payments as an incentive for developing countries to assume commitments, as these commitments are only set for developed countries. This problem contributes to a smaller fall of emissions at a higher cost.
c) Due to the leakages from developed countries, developing countries may additionally increase their emissions. This in turn means that investors may favour developing countries because of a less stringent environmental law and absence of environmental commitments. Absence of a leakage prevention mechanism in the form of sanctions and trade restrictions between countries is a potential problem in a protocol if there is not an almost total adhesion.
d) The so-called 'baseline problem' is that emission reductions cannot be precisely measured, which then makes it relevant to question the effectiveness of the

environmental investments for climate change mitigation. Therefore, it is suggested to establish a methodology to measure liquid gains in GHGs emissions that has a consensus between researchers in the field. The task of establishing baselines in order to measure the liquid gains should be given to an independent body like the International Organization for Standardization (ISO). As of recent times, methodologies submitted to the Executive Board of the CDM are referred by independent researchers and may be approved or not.

e) Emission commitments are temporary (2008-2012), fixed at 5% below the 1990 levels, and amendments are possible. This factor may undermine the long run results of the protocol if there is no voluntary adhesion to the cleaner standard after this period. Post-Kyoto period (after 2012) discussions have revealed another problem: the lack of a mechanism to extend the compromise to other periods. This would lower the cost of implementation of measures to curb emissions and could produce long run results.
f) The minimum participation clause, which is that 55 developed countries responsible for 55% of carbon dioxide emissions, acts to deter free-riding until this limit is reached. From this point on there is no incentive to adhesion and the countries shall have the benefits without cost.
g) There is no mechanism to enforce compliance of the commitments. The initial Brazilian proposal of CDF would work to enforce compliance, with incentives in the form of emissions trading and punishment in the form of a monetary contribution to a fund proportional to the difference between actual data and commitments. In the CDM system, there are stimuli but no sanctions.

5.4) The IPCC

Briefly, the Intergovernmental Panel on Climate Change (IPCC) is the international body for assessing the science related to climate change. The IPCC was set up in 1988 by the World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) to provide policymakers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation (IPCC, 2016).

The IPCC works by assessing published literature. It does not conduct its own scientific research. For all findings, author teams use defined language to characterize their degree of certainty in assessment conclusions (IPCC, 2016). IPCC assessments point to areas of well-established knowledge and of evolving understanding, as well as where multiple perspectives exist in the literature (IPCC, 2016).

IPCC assessments provide a scientific basis for governments at all levels to develop climate-related policies, and they underlie negotiations at the UN Climate Conference – the United Nations Framework Convention on Climate Change (UNFCCC) (IPCC, 2016). The assessments are policy-relevant but not policy-prescriptive, that is, they may present projections of future climate change based on different scenarios and the risks that climate change poses and discuss the implications of response options, but they do not tell policymakers what actions to take (IPCC, 2016).

It embodies a unique opportunity to provide rigorous and balanced scientific information to decision-makers because of its scientific and intergovernmental nature. Participation in the IPCC is open to all member countries of the WMO and United Nations (IPCC, 2016). It currently has 195 members. The Panel, made up of representatives of the member states, meets in plenary sessions to take major decisions (IPCC, 2016). The IPCC Bureau, elected by member governments, provides guidance to the Panel on the scientific and technical aspects of the Panel's work and advises the Panel on related management and strategic issues (IPCC, 2016).

5.5) Kyoto protocol implementation: Bush Jnr. Administration

The USA has now made a pact with many Asian countries called the Asian Pacific Partnership on Clean Development and Climate. Participants want to implement an alternative strategy to tackle climate change (Lenntech, 2016). This is a technological operation to make fossil fuels cleaner by introducing clean coal and nuclear power. It also promotes the application and introduction of carbon sinks to reduce carbon dioxide emissions (Lenntech, 2016). Unlike Kyoto,

it does not focus on emission reduction in a certain target year. The alternative to Kyoto now involves the USA, Australia, China, Japan, India and South-Korea (Lenntech, 2016).

This new USA strategy is in line with its earlier comments on the Kyoto Protocol, namely that battling global warming should be achieved by voluntary effort rather than by mandatory emission reductions (Lenntech, 2016). The USA mentions that this new agreement does not challenge the Kyoto Protocol and that the participating countries have either signed Kyoto or were not even involved in Kyoto in the first place (Lenntech, 2016). The USA government notes that investing in cleaner technologies not only meets national emissions reductions. It also reduces poverty and promotes economic development (Lenntech, 2016). This new alternative to Kyoto is widely debated because many countries still feel American president George W. Bush should have ratified the Kyoto Protocol because according to some, nothing can be achieved where climate change is concerned, without actual greenhouse gas emission reduction targets (Lenntech, 2016).

The enormity of the Koch fortune is no mystery. Brothers Charles and David are each worth more than US$40 billion; and their hunger for growth is insatiable. The Kochs are the US's homegrown oligarchs; have managed to corner the market on Republican politics and are attempting to buy Congress and the White House. Since 1960, the value of the Koch Industries has grown by 4 200-fold, outpacing the Standard & Poor's index by nearly 30 times. On average, Koch projects double the company's revenue every six years (Dickinson, 2014). The company is now a key player in the fracking boom that's allowing the United States to surpass Saudi Arabia as the world's top oil producer, even if it means to endanger America's groundwater (Dickinson, 2014). "In 2012, a subsidiary of the company opened a pipeline capable of carrying 250,000 barrels a day of fracked crude from South Texas to Corpus Christi, where the company owns a refinery complex, and it has announced plans to further expand its Texas pipeline operations. In a recent acquisition, Koch bought Frac-Chem, a top provider of hydraulic fracturing chemicals to drillers. Thanks to the Bush Administration's anti-regulatory agenda – which the Koch Industries helped craft – Frac-Chem's chemical cocktails, injected deep under the nation's aquifers, are almost entirely exempt from the Safe Drinking Water Act" (Dickinson, 2014). The Koch brothers

get richer at the costs of the US citizens' ill health, foul water and a global climate crisis that threatens life (Dickinson, 2014).

The continuous debates and efforts around combatting global warming has been existent in the United States for almost two decades. It is very often described as an attempt by the companies of the fossil fuel industry to hinder government regulations on their activities. "While emphasizing this dimension of the US climate denial movement, two additional factors which have been instrumental in blocking strong climate action. First, climate denial stems from the strong ideological commitment of small-government conservatives and libertarians to laisser-faire and their strong opposition to regulation. Second, in order to disarm their opponents, US climate deniers often rest their case on the defense of the way of life, defined by high consumption and ever-expanding material prosperity. Therefore, US climate denial movement is best understood as a combination of these two trends". (Collomb, 2014:1).

"Climate science in the United States has been uniquely politicized, which has caused considerable confusion among the general public regarding the climate change issue. Right-wing politicians and think tanks have used the legacy of climate research strategically to deny the current crisis by falsely depicting greenhouse science as uncertain and contradictory. The corporate media has largely accepted this frame of the issue. This history helps account for the success of the carbon interests and the politicians who work for them and the lack of political action against global warming in the United States" (Armitage, 2005: 417).

5.6) Kyoto protocol implementation: Obama Administration

There have been arguments over how to differentiate between wealthy and underprivileged which remain, but China's climate pact with the USA is evidence that powerful developing countries realise they have to contribute (Climate Home, 2016). Speaking at the 2014 UN climate summit in New York, President Barack Obama picked up the baton from Bill Clinton, backing a new global pact, but adding it needed to have worldwide buy-in (Climate Home, 2016).

Even while Barack Obama was in the White House; a president who had placed climate issues high on the agenda and who had a solid Democratic majority in both houses of Congress up until the mid-term elections in autumn 2010; the interests of the states continued to take precedence over party affiliation for some Democrats on the climate issue (The Research Council of Norway, 2016). As a result, President Obama had been unsuccessful in gaining approval for climate legislation that would have paved the way for the USA to sign a new climate agreement (The Research Council of Norway, 2016).

5.7) The Paris Agreement 2015

The Paris Agreement is an agreement within the UNFCCC that addresses greenhouse gases emissions mitigation, adaptation and finance, commencing in the year 2020. The language of the agreement was negotiated by representatives of 195 countries at the 21st Conference of the Parties of the UNFCC, held in Paris. It was adopted by consensus on 12 December 2015 (United Nations Framework Convention on Climate Change, 2016). It was opened for signature on 22 April 2016 – which is also known as Earth day – in a ceremony in New York City (United Nations Framework Convention on Climate Change, 2016). As of November 2016, 193 UNFCCC members have signed the treaty, 110 of which have ratified it. After the European Union ratified the agreement in October 2016, there were enough countries that had ratified the agreement that produce enough of the world's greenhouse gases for the agreement to enter into force. The agreement went into effect on 4 November 2016 (United Nations Framework Convention on Climate Change, 2016).

More recently, the 2015 Paris Agreement was adopted under the UNFCC to chart a new international response to climate change (United Nations Framework Convention on Climate Change, 2015). This paper will examine the main tenants of the 2015 Paris Agreement; highlight the similarities and differences with the Kyoto Protocol; and outline some of the lessons learnt from the limited success of the Kyoto Protocol (United Nations Framework Convention on Climate Change, 2015). A secondary focus of the research will be to examine the role of the

United States in these international climate change treaties by analysing the domestic policies, politics, and greenhouse gas emission trends within the US. In this regard, special attention will be paid to the role of the energy sector, particularly since the US is has recently re-emerged as the largest producer of crude oil in the world (United Nations Framework Convention on Climate Change, 2015).

At the recent COP 21 held in Paris in December, governments from nearly 200 countries signed a universal agreement that set ambitious goals to limit temperature rises by cutting greenhouse gas emissions, and to avoid the most dangerous effects of climate change, and to hold governments to account for reaching those targets (Goldenberg, Vidal, Taylor, Vaughan & Harvey, 2015). Despite this, there was no outcome on the process of fracking even though there was a strong urge by participants to reach out to governments and the United Nations (Vermont Law School, 2015). Furthermore, developing countries (including oil-exporting countries) were unhappy and unconvinced with the major industrialists who were ruining the planet, and getting the development outcome. And they were suddenly being asked to cut back their energy usage, but were not yet 'caught up' (United Nations Framework Convention on Climate Change, 2015).

According to UNEP, the emission cut targets in November 2016 will result in temperature rise by 3C above pre-industrial levels, far above the 2°C of the Paris climate agreement. Agreement came into force in November 2016 (United Nations Framework Convention on Climate Change, 2015). Al Gore stated that "no agreement is perfect, and this one must be strengthened over time, but groups across every sector of society will now begin to reduce dangerous carbon pollution through the framework of this agreement" (United Nations Framework Convention on Climate Change, 2015). According to a study published in Nature – *a* British interdisciplinary scientific journal on June 2016, current country pledges are too low to lead to a temperature rise below the Paris Agreement temperature limit of "well below 2 °C" (United Nations Framework Convention on Climate Change, 2015).

Institutional asset owners associations and think-tanks such as the World Pensions Council (WPC) have observed that the stated objectives of the Paris Agreement are implicitly based on the assumption that United Nations member states (including high polluters which generate more than half the world's greenhouse gas emissions), "will somehow drive down their carbon pollution voluntarily and assiduously without any binding enforcement mechanism to measure and control CO_2 emissions at any level from factory to state, and without any specific penalty gradation or fiscal pressure (for example a carbon tax) to discourage bad behaviour." This, according to academics is an example of circular logic, which is an agreement or argument that is formulated in advance as to what it wants to achieve (United Nations Framework Convention on Climate Change, 2015).

It is possible to draw four key comparisons between the Kyoto Protocol and the Paris Agreement of 2015. Firstly, the Kyoto Protocol:

1) The GHG emission coverage of the Kyoto Protocol was insufficient to stop the growth of global GHG emissions. Thus, expanding the coverage is a priority. The Kyoto Protocol included rules tailored for specific sectors' or countries' contexts that helped ensure their participation. In that perspective, it can be strategic to implement specific rules as long as it does not jeopardize the global environmental integrity. (Morel & Shishlov, 2015).
2) The Kyoto Protocol is presented as an internationally binding agreement on GHG emissions. However, its binding nature is rather limited and virtual in practice. Extensive negotiations and resources were dedicated in demarcating the boundaries of compliance and dedicated tools that in some instances were not really used by countries. Dedicating significant negotiation resources and time, as it has been the case until now, on emissions reduction commitments and their legally binding nature may thus not be the most efficient approach. (Morel & Shishlov, 2015).
3) Implementing Monitoring, Reporting and Verification (MRV) procedures is essential to build trust among countries and to recognise various domestic policies implemented. Therefore, it is an essential characteristic for any global agreement on climate change. The Kyoto Protocol initiated the development and implementation of several MRV

frameworks providing reliable and transparent information on GHG emissions and emission reductions. (Morel & Shishlov, 2015).

4) Flexibility should be integrated both in the adoption process and the agreement itself. Similar to the Kyoto Protocol, a new treaty could be adopted in two steps: a framework agreement in Paris and eventually the detailed rules and mechanisms in the following years. (Morel & Shishlov, 2015).

The Paris Agreement:

1) The goal of the Paris Agreement is to limit the temperature rise to two degrees Celsius from pre-industrial levels. (Morel & Shishlov, 2015).
2) Enforcement: The Paris Agreement aims to achieve collaboration and individual responsibility to meet the ultimate goal. (Morel & Shishlov, 2015).
3) The focus of the Paris Agreement is primarily on switching to renewable energy. (Morel & Shishlov, 2015).
4) There was not much emphasis on technology transfer and international collaboration in R&D in Kyoto Protocol, while the Paris Agreement clearly mentions the collaboration between countries to develop environment-friendly technologies. (Morel & Shishlov, 2015).

The Paris Agreement also provided some support systems to achieve effective implementation (Fan, 2016). The first support system is the financial mechanism, where developed countries are being obliged to create a Green Climate Fund of about US$ 100 billion to help developing countries to achieve their goals (Fan, 2016). The second is that of international collaboration. It also mentions of international collaboration to develop environment-friendly technologies, besides technology transfer to developing countries. It further mentions of undertaking joint projects to achieve goals (Fan, 2016).

5.8) USA's role in implementing the Paris Agreement

The Paris Agreement was, in part, structured to avoid the need for Senate ratification. Instead, the procedurally oriented provisions within the agreement will be legally binding within the United Nations Framework Convention on Climate Change (UNFCCC), a treaty which the USA ratified in 1992 (Lewis, 2016). Under COP21, the USA will establish its own, national commitment to reduce emissions and to report on the country's progress. How the USA, or other countries, choose to reduce emissions will be entirely determined by the participating nations (Lewis, 2016).

Even before an agreement was reached in Paris, some members of the Congress expressed opposition to both the COP21, and the Obama Administration's approach to negotiations (Lewis, 2016). It remains to be seen whether and to what extent the Congress would cooperate in enacting legislation aimed at achieving the summit's agenda (Lewis, 2016). However, the Paris agreement is not a treaty; accordingly, it will not have a binding effect on all future presidents, and subsequent administrations may back away from the commitments made in Paris by the current administration (Lewis, 2016). Consequently, the long-term durability of the Paris agreement in the USA will largely depend on national will and international pressure (Lewis, 2016).

In some respects, from the perspective of the USA, the Paris summit could be seen as a reflection of the Obama Administration's commitment and policy agenda toward reducing greenhouse gases and promoting renewable energy (Lewis, 2016). This policy agenda could be seen early in the Obama presidency with the passage of the American Recovery and Reinvestment Act (ARRA) in February 2009 (Lewis, 2016). After being subject to the robust partisan debate, the ARRA provided benefits to subsidize investments in green energy, including projects related to wind, solar and biomass electricity generation facilities (Lewis, 2016). One of these benefits included a cash grant in lieu of an investment tax credit for certain renewable projects, which assisted in replacing the use of such tax credits during the recession (Lewis, 2016).

Barack Obama's commitment to addressing climate change had also been reflected in a number of rule-making decisions of the Environmental Protection Agency (Lewis, 2016). For example, on October 30, 2009, the EPA published a rule mandating the reporting of greenhouse gases from sources that emit significant amounts of carbon dioxide per year in the USA. This greenhouse gas reporting rule affects an estimated 8,000 facilities, including large stationary sources that produce roughly 85% to 90% of the total greenhouse gas emissions in the country (Lewis, 2016). The reporting program collects data from 41 source categories, targeting the oil and gas industry as well as solid waste landfills. The rule was amended in January of this year to streamline the reporting process, but it is unclear whether this update will affect a legal challenge currently pending before the D.C. Circuit (Lewis, 2016).

More recently, in August 2015, the Obama Administration published the Clean Power Plan (CPP), which established the first-ever national standards to address carbon dioxide pollution from existing power plants (United States Environmental Protection Agency, 2016). The CPP included interim and final statewide goals for carbon dioxide emissions. Uncertainty surrounding the CPP does persist, however, in large part due to the USA Supreme Court's decision in February to stay implementation of the program pending legal challenges (United States Environmental Protection Agency, 2016). Nevertheless, the EPA had previously imposed an emissions limit on new, modified and reconstructed fossil fuel-fired power plants, and this rule has not been affected by the Supreme Court's ruling (United States Environmental Protection Agency, 2016).

The USA's Department of the Interior has played a role in seeking to reduce the country's carbon emissions, In addition to efforts by the EPA. In January 2016, the secretary of the interior declared a three-year standstill on coal leases on federal land (Jones Day, 2016). During this time, the agency will review the federal coal program, assessing what it charges as royalties as well as the program's overall effect on climate change. This marks a significant development because roughly 40% of coal in the United States is mined on federal land (Jones Day, 2016).

Despite certain public congressional opposition to the COP21, Congress, too, has played a role in supporting green initiatives (Jones Day, 2016). In December 2015, Congress stretched the production tax credit (PTC) and the investment tax credit (ITC), thereby promoting and incentivising the development and production of wind and solar energy (Jones Day, 2016). One initial estimate by Bloomberg New Energy Finance suggested that the net result of the extensions could be to spur on US$ 73 billion in new investments and to provide access to renewable energy to more than 8 million additional households (Jones Day, 2016).

Even with uncertainty in the implementation of the Paris Agreement and continued challenges regarding federal programs, such as those directed at the CPP, there have been significant indications that various states and businesses of the USA have begun to taken their own approach. In doing so, states and business activities have furthered many of the same goals and aspirations reflected by the Paris agreement (United Nations Secretary-General, 2016). States continue to push ahead with renewable portfolio standards to encourage the development of renewable energy (United Nations Secretary-General, 2016). For example, the Oregon Legislature passed a bill that is aimed at phasing out coal-fired power in the state by the end of 2035 and also require that by 2040, half of the state's electricity come from renewable sources (United Nations Secretary-General, 2016). In 2015, California and Hawaii passed legislation that continues to ratchet up their renewables mandates. Similarly, New York Governor, Andrew Cuomo pledged that the state would eliminate use of coal-based power completely by 2020 (United Nations Secretary-General, 2016).

Meanwhile, the business community has shown its promise to fund efforts to challenge climate change (Renewables Now, 2016). Green bonds, which fund projects specifically to produce environmental or climate-related benefits, have seen a rapid increase in use since 2013. According to the Climate Bond Initiative, in 2015, US$41.8 billion of green bonds were issued, up from the US$4 billion figure in 2010 cited in a World Bank report on green bonds. Reflecting a growth in demand from investors, this trend appears to be continuing, as in the first two months of 2016, US$11.83 billion of green bonds have already been issued (Renewables Now, 2016). Apple issued its first-ever green bond, a US$1.5 billion offering issued in February 2016,

which would be used to finance renewable energy, energy storage and energy efficiency, as well as green buildings and resource conversation efforts (Renewables Now, 2016).

Taken as a whole, there is evidence that the USA, whether via federal regulation, state action or industry efforts, is on a path to address many of the same issues that the Paris summit seeks to affect (Worland, 2016). Whether the Paris agreement has a long-term effect on the United States and how aggressively these green trends continue will depend largely on the political realities of the time. Without waiting for the political winds of change, the Obama Administration had already worked to implement some elements of the Paris agreement. On March 10 2016, Obama and Canadian Prime Minister Justin Trudeau agreed on measures to curb methane emissions from the oil and gas industry, and the EPA followed suit by pledging regulation of such measures (Worland, 2016). It is hard to imagine, however, a long-term commitment to climate change without significant congressional support, even if the Paris Agreement did not require it (Worland, 2016). Nevertheless, businesses in the USA seem poised to continue to act in a new and sustainable way, in part because businesses anticipate further constraints on emissions and because corporate social responsibility continues to grow in importance to consumers, shareholders and investors (Worland, 2016).

5.8.1) Obama's ratchet up mechanism

A top-down approach along the main features of the Kyoto Protocol was supported by the European Union (EU) in the run-up to the Copenhagen conference of 2009, but it wanted the Annex I/non-Annex I opposition to be overcome (United Nations Framework Convention on Climate Change, 2016). However, a fully-fledged top down approach as described above currently does not have sufficient support among governments to be seriously considered for international mitigation policy. This is due to a general reluctance to accept stringent mitigation commitments and control of their accomplishment by an international institution. Key developing and industrialised countries alike are wary to take legally binding emissions commitments (United Nations Framework Convention on Climate Change, 2016).

Given the post-2009 fatigue with top-down mitigation policies, bottom-up approaches have become more fashionable. They can take various forms inside and outside the UNFCCC (Climate Policy Info Hub, 2016). Generally, they will be based on unilateral pledges of mitigation action as well as introduce domestic mitigation policy instruments which can subsequently be linked among various jurisdictions (Climate Policy Info Hub, 2016). Such approaches could tackle a number of specific issues, for example the unilateral and then coordinated removal of fossil fuel subsidies. 'Mitigation clubs' could form that provide incentives for compliance with their declared mitigation engagement through trade-related policies, for example in the framework of the Organisation for Economic Co-operation and Development (OECD), Group of 7 (G7) or Group of 20 (G20) (Climate Policy Info Hub, 2016). The Copenhagen Accord of 2009 is an example for a bottom-up approach. The pledges made in Copenhagen (and thereafter) take several forms, ranging from absolute targets with different base years over intensity and technology targets to sectoral mitigation activities (Climate Policy Info Hub, 2016).

The key challenge with bottom-up approaches is how to generate a dynamic strategy that leads to significant mitigation compared to a business-as-usual emissions pathway. So far, there is no empirical evidence that bottom-up approaches achieved such mitigation (Spak, 2010). The pledges under the Copenhagen Accord, for example, are not consistent with a lowest global cost mitigation path, and would likely lead to at least a 3°C warming by the end of the century (Spak, 2010). The inconsistency of the pledges with an emissions path respecting the internationally agreed below 2°C target has also been emphasized in the annual 'emissions gap' reports by the United Nations Environment Programme (UNEP) (Spak, 2010).

Experience with these types of bottom-up pledging exists in domestic policy-making, where voluntary agreements between governments and industries have been used to reduce GHG emissions from the sectors in question (Åhman, Nilsson & Johansson, 2016). According to studies, results have shown that a majority of such agreements do not go further than business as usual activities by the companies involved, unless there is a strong regulatory threat from the government, or a cultural element that makes companies accountable to public pressure

(Åhman, Nilsson & Johansson, 2016). This demonstrates the potential weakness of using a bottom-up approach for the international climate regime (Åhman, Nilsson & Johansson, 2016).

A key feature of a hybrid approach is the combination of top-down and bottom-up elements. Already during the negotiations of the UNFCCC, a 'pledge and review' system was proposed by Japan and the United States but did not find agreement in the UNFCCC or Kyoto Protocol negotiations (Sampson & Chambers, 2008). After the Copenhagen failure, this idea was resuscitated and was likely to inform the design of the 2015 agreement. Key characteristics of a hybrid approach were seen as the competency of a multilateral institution when it came to reviewing the mitigation proposals that were made by various governments. If the review is just a 'rubber-stamping', then there is a fundamental bottom-up system (Sampson & Chambers, 2008). If, however, the review leads to a public evaluation, this could have consequences, at the very least by providing transparency that is akin to a 'naming and shaming' of governments with a weak proposed mitigation pledge. Resulting international pressure could lead to an enhanced pledge (Sampson & Chambers, 2008). Combined with strong MRV and credible accounting procedures, such a system would be closer to a top-down approach (Sampson & Chambers, 2008). The only remaining difference would be that the commitments are not negotiated simultaneously as would be the case in a pure top down system (Sampson & Chambers, 2008).

The United States is a crucial player in the Paris Agreement, not only because it is the world's second largest emitter of GHGs but also because it has a special role to play in terms of triggering action from other countries. As described above, the Agreement relies inherently on vagueness in its specification of commitments, compliance requirements and the ratcheting-up mechanism (Yeo, 2016). While such vagueness was necessary diplomacy for forging the Agreement itself and attract broad participation, it locks success to reliance on key countries to go first and set the stage for a snowball effect (or race to the top). As argued by Underdal (1994: 179-180), "the more complex the negotiation setting (that is, the larger the number of actors and the number and 'intricacy' of issues), the more likely that some actors will emerge as

leaders and others as followers…, and the more critical leadership becomes as a determinant of success".

Arguably, the United States must play an important role in such leadership for at least two reasons. First, as the largest economy in the world and the second largest carbon emitter the United States is often pointed to as a key actor (and thus influencer) because of its major historical responsibilities for the climate change problem (World Resources Institute, 2016). What happens with U.S. climate policy has an effect for the entire world. Second, in the history of international climate negotiations the United States has often played the role as crucial laggard, blaming lack of participation by all major emitters and flawed treaty design for its own non-participation – for instance in the case of the Kyoto Protocol (Harvey, 2015). Experience thus indicates that for any comprehensive international climate agreement to work, it is imperative that the world's most powerful country shows interest in participation and compliance with its pledges (Harvey, 2015). If a pivotal actor like the United States should fail to implement its commitments, it will likely adversely affect other parties' incentives to adopt and implement ambitious NDCs (Harvey, 2015).

The dynamic between domestic politics and international negotiation positions is important in order to understand the scope for acceptance of international commitments in all countries. In the USA's case this is influenced by the separation of powers in the political system that gives the president great freedoms in international negotiations, but allows the Senate decisive powers in issues of treaty ratification and funding of new policy programs. Hence, the interaction between the executive and legislative branches of government defines the scope for USA's pledge at Paris, as well as the prospects to fulfil them. It helps explain why the United States can come to play an important role for the success of the Paris Agreement if it engages in a role as first mover (in a race to the top), but can also explain why in a difficult collaboration problem, like climate change, the United States may have difficulties in taking on such leadership. (Yeo, 2016).

In Paris, USA's diplomacy and personal engagement by President Barack Obama and Secretary of State John Kerry helped craft compromises that were necessary for the adoption of the Agreement. Importantly, Obama engaged with China's President Xi Jinping through crucial bilateral contact in the months before the Paris meeting, paving the way for support of the Agreement by both countries (Goldenberg, 2014; Henderson, 2015). At the Paris meeting, President Obama said: "I've come here personally, as the leader of the world's largest economy and the second-largest emitter, to say that the United States of America not only recognises our role in creating this problem, we embrace our responsibility to do something about it" (White House, 2015). The Obama Administration acknowledged that the United States can play a key role in inspiring and convincing other countries to address their GHG emissions, and committed to reducing U.S. GHG emissions 26%-28% below 2005 levels by 2025, premised on numerous domestic policy measures that had been or were to be implemented (Bang & Schreurs, 2016). Ambitious domestic investments in clean energy, energy efficiency programs, and new federal regulations limiting carbon emissions from power plants are among the climate policies initiated by the Obama Administration. (Yeo, 2016).

The Obama Administration had fought hard for changes in domestic climate policy. At the outset of his first term, President Obama pushed for the Congress to pass climate legislation. Several bills were debated, and in June 2009 Congressmen Waxman and Markey's American Clean Energy and Security Act narrowly passed a vote in the House yet later died in the Senate (Bang & Skodvin, 2014). Voting on this controversial bill largely followed party lines, reflecting deep and bitter polarisation between the Republicans and Democrats (Skocpol, 2013). No climate bill has been debated in the Congress since, and with Republican majorities in both, the House and the Senate after the 2012 elections, climate legislation was no longer on the congressional agenda. In his second term, therefore, President Obama decided to use executive powers to circumvent the congressional gridlock on climate policy. (Yeo, 2016).

Acting on the Supreme Court's ruling from 2009, which identified carbon emissions as a pollutant causing risks to the health and welfare of citizens, Obama ordered the Environmental Protection Agency to develop regulations under the Clean Air Act (CAA) to cut CO_2 emissions in

the power sector by 32% by 2030 (Bang, 2015). The EPA worked with stakeholders and state-level regulators over two years (2013–2015) to set up regulations (i.e. the Clean Power Plan) that engaged states to design individual plans for cutting carbon emissions from power plants. States were assigned individual emissions reduction targets, and were encouraged to find policy solutions adapted to local circumstances to minimize negative effects on industry and consumers (EPA, 2015).

The Clean Power Plan (CPP) was extremely controversial among policymakers at both the federal and the state levels. The controversy centred on whether the Clean Air Act gave the president and the EPA the authority to introduce wide-ranging regulations for CO_2 emissions without involving the Congress. Opponents at the federal and state levels had sought to put up barriers. Republican leaders in Congress have vowed to cancel the CPP at the first opportunity. Senate Majority Leader Mitch McConnell (Republican from Kentucky) encouraged states not to start developing plans, arguing that they would be wasting resources since the CPP would likely be removed either through congressional action by the Republican majority or through the courts (Cama, 2016). Several votes in Congress in 2013–2015 tried to remove the EPA's authority on the issue; however, those bills that passed were vetoed by the president.

In October 2015, a coalition of 26 states – many of which depended heavily on coal for power generation – brought litigation against the EPA, arguing that the CPP represented a 'power grab' by the federal government over state-level electricity systems that would be excessively burdensome for the states' economies (Bang & Schreurs, 2016). A significant blow to the Obama Administration's climate policy came in February 2016 when a 5-4 decision in the Supreme Court stayed implementation of the CPP until judicial review of its legality. The Court's decision illustrated the fragility of the Obama Administration's climate policy and the significant role of judicial review when executive power was used to impose policy in a controversial field. If the Supreme Court decided to hear the case, its ruling might have influenced the future of the CPP as well as the USA's ability to fulfil its commitment in the Paris Agreement.

Many of USA's states had put on hold any effort to develop state implementation plans for adhering to the CPP, while other states were pursuing climate action regardless of the uncertainty surrounding the plan's future (U.S. Environmental protection Agency, 2017). Deep polarisation in USA climate policy has affected its ability to live up to the promises it made in Paris. "Without a firm domestic policy strategy, like the CPP or some other federal climate policy, investors and business owners will have weak incentives to make long-term business decisions that include a pathway to a low carbon economy. Moreover, the U.S. NDC under the Paris Agreement will be less credible. U.S. political parties greatly disagree on the importance of climate policy action. Most Democrats accept that climate change is a serious problem that requires political action to reduce emissions. Most Republicans, on the other hand, are not committed to addressing the climate change problem, because they do not believe in the science or because they think it is premature to risk the potential economic hardship that climate action might bring" (U.S. Environmental protection Agency, 2017).

These different views regarding the need for climate policy action conveyed the level of willingness to recognise the Paris Agreement as a priority for the United States. While President Obama and a clear majority in the Democratic Party were fully committed, Republican leaders reacted very differently to the Agreement's adoption. The immediate reaction of leading Republicans after COP 21 indicated a looming fight over the commitment to the Paris Agreement. Senate Majority Leader Mitch McConnell said, "Obama is making promises he can't keep" and should remember that the Agreement "is subject to being shredded" after the 2016 election. With reference to the presidential election, McConnell said the Agreement could be reversed if the Republicans won the White House (U.S. Environmental protection Agency, 2017). Republicans argued that the deal is simply politically binding, not judicially binding, and hence barely worth any serious attention. Congressman Ed Whitfield (Republican from Kentucky) described the Paris Agreement as merely a 'signal' of the Obama Administration's preferences rather than a treaty. He said: "While some may claim the resulting deal is a grand triumph, the bottom line is that this was a nonbinding political document that does not impose any new obligation on the United States". He added that Obama "misled the international community in Paris" (U.S. Environmental protection Agency, 2017).

"The international climate change negotiations leading to and including the Copenhagen and Cancun Conferences of the Parties in 2009 and 2010 have shown a very different balance of power from those of the 1997 Kyoto round. This new world dis(order) was characterized by insecurity of the United States in the face of economic and political decline vis-a`-vis China; fragmentation of the Group of 77 developing nations negotiating bloc; and weakening of the European Union, which was cut out entirely from the group negotiating the Copenhagen Accord. In addition to old alignments of developing countries based on solidarity, negotiating blocs have fractured along lines of responsibility for climate change, capability to address it, and national vulnerability to climate risks." The US's recent unwillingness to discuss climate change is due to its insecurity about its unability to provide jobs for its workers in the future, where emerging economies, like China and India, are growing at an exponential rate. (Roberts, 2011: 776).

This explains the contradictory nature of Obama's foreign policy on climate and domestic policy on energy: the USA's insecurity over its global hegemonic power, the findings of the shale gas exploration activities, and in addition, the remaining after effects of the 2008 global financial crisis. The powerful domestic social forces shaping his commitment to fracking would primarily be attributed to the USA's Energy Information Agency and its findings. The social forces that were pushing Obama to honour his commitment to climate change can primarily be attributed to the Paris Agreement, and his ratchet mechanism. (Roberts, 2011).

The Republican Party Convention in 2016 adopted a political platform that explicitly rejected any form of federal carbon price, and pledged to disengage the United States from any further involvement with the 'non-binding' Paris Agreement. The Democratic Party Convention in 2016 supported both, a carbon tax, continuation of Obama's climate policy programs, and fulfilment of pledges made in Paris. Presidential candidates Donald Trump and Hillary Clinton mirrored their party's opposing views, hence representing starkly different ways forward for U.S. climate policy. (Roberts, 2011).

In sum, deep political polarisation over climate change prevents the United States from sending a clear signal to other countries that it is ready to address carbon emissions seriously and to lead the international process envisioned by the Paris Agreement. Potentially, the 2016 presidential election could upset Obama's climate leadership and put the United States back in a position where no credible federal climate policy initiatives exist. For the time being, therefore, the potential and willingness for the United States to lead is unclear. In relation to Green IPE and Neo-Gramscian theory, it can therefore be concluded that the US oil and gas industry is the most influential industries in the USA. This relates to the social relations described in Neo-Gramscian theory, such that the industry makes to elect relative representatives that will assist in furthering the goals of the industry, and secondly, a large amount of the national budget is provided to the industry for lobbying reasons.

Chapter 6: USA's Domestic Fossil Fuel Industry and Domestic Climate policy

The chapter aims to discuss the shifts in the fossil fuel industry with a rise of renewables. This is followed by discussing the state shifts and Obama's attempts to use the Clean Air Act, such that how he had been blocked in Congress, how things were changing, where fracking fits into this and whether it was transitionary. In relation to the theoretical perspective of the paper, the chapter relates to climate justice.

As mentioned above, the United States is considered a leader in the production and supply of energy, and is one of the world's largest energy consumers. U.S. energy companies produce oil, natural gas, coal, renewable fuels, as well as electricity from clean energy sources such as wind, solar, and nuclear power (U.S. Energy Information Administration. 2016). U.S. energy companies further transmit, distribute, and store energy through complex infrastructure networks that are supported by emerging products and services such as smart grid technologies. Growing consumer demand and world class innovation – combined with a competitive workforce and supply chain capable of building, installing, and servicing all energy technologies – make the United States the world's most attractive market in the US$6 trillion global energy market. (U.S. Energy Information Administration. 2016).

Renewable Energy: The United States is home to a thriving renewable energy industry, with globally competitive firms in all technology subsectors, including wind, solar, geothermal, hydropower, biomass, and biofuels. The United States currently produces more geothermal energy than any other country (2 640MW); more biomass power than any other country (15 407MW); enjoys the second largest wind industry (73 751MW); the third largest hydropower industry (79 298MW); and the fourth largest solar industry (27 810MW) (International Trade Administration, 2016). According to the International Renewable Energy Agency (IRENA), by 2030, the share of renewables in the total U.S. energy mix could reach 27%. This would mean an increase from 134 GW of renewable energy in 2010 to over 700GW in just two decades (International Trade Administration, 2016). Even with less optimistic scenarios, the capacity is expected to double by 2030. On this trajectory, the United States already had the second

highest investment in the world in 2015, with nearly 16GW of new renewable energy capacity and US$ 91 billion in clean energy transactions (World Nuclear Association. 2016). In 2015, while clean energy investments slumped in Europe and Brazil, the United States increased by 8% and accounted for 17% of the world's total new renewable energy investment (World Nuclear Association. 2016).

Renewable Fuels: In order to serve the overseas market and with access to abundant natural resources, the pellet and ethanol industries are also increasing their capacity (World Nuclear Association. 2016). The USA's ethanol industry is considered to be the largest and most efficient in the world, incorporating technological innovations to produce nearly 15 billion gallons of ethanol annually. In addition, the industry is expanding to new markets (World Nuclear Association. 2016). During 2015, the U.S. ethanol industry exported an estimated 850 million gallons of ethanol (About 6% of its total production) to markets around the world (International Trade Administration, 2016). Investment opportunities also exist for the development of advanced biofuels utilizing new technologies and feedstocks, particularly in the aviation sector. U.S. wood pellet manufacturers can now produce nearly 20 billion metric tons of pellets annually. In recent years, much of the production has been added to export to Europe. In 2015, over 4.5 million metric tons were exported and new pellet mills have been brought online to meet the growing demand. (International Trade Administration, 2016).

Finding sustainable ways to obtain natural gas and oil is seen as the next option. Although fracking is by far the cheapest way to produce natural gas, there are companies that are trying to create natural gas from renewable sources (Kiger, 2014). Wastewater is placed in large glass containers filled with nanoparticles and CO_2. When the sun hits the nanoparticles, they react with the wastewater to create hydrogen, which then bonds with the CO_2 to make methane. The methane can then be piped away to houses that use the natural gas for heating (Kiger, 2014). In addition, this process purifies the wastewater without the use of chemicals. The process relies entirely on photosynthesis, so no energy is used to create more energy. The process still needs to be perfected before it receives enough funding to become a viable option (Kiger, 2014).

Oil and Gas: The United States remain a major source of growth in oil and gas exploration and development, especially in shale and ultra-deep water resources, regardless of the low crude oil and natural gas global prices. U.S. companies have developed various advanced and cost-competitive techniques for extracting hydrocarbons from shale and hard to reach offshore oil and gas deposits. As a result, many producers are able to remain competitive, in turn, making the United States the world's swing producer. As global oil and gas prices rise, production from U.S. shale formations is projected to increase substantially. In addition to shale, offshore oil and gas resources in the U.S. Gulf of Mexico and Alaska are part of a five-year leasing program under the U.S. Outer Continental Shelf Oil and Gas Leasing Program for 2017-2022. The leasing program has been developed by the Bureau of Ocean Energy Management within the U.S. Department of Interior. "Exporting crude oil from the United States has made the sector even more competitive, following the removal of crude oil export restrictions in December 2015. U.S. produced crude oil can now reach global markets and compete with other major oil and gas producing countries." (International Trade Administration, 2016)

Coal: The United States holds the world's largest estimated recoverable reserves of coal and is a net exporter of coal (World Nuclear Association. 2016). In 2014, 79% of coal production originated in seven states: Wyoming, West Virginia, Kentucky, Pennsylvania, Illinois, Montana, and Texas (International Trade Administration, 2016). Coal is used to generate 33% of the electricity in the United States, and is also used for industrial applications such as cement making, and conversion to coke for the smelting of iron ore at blast furnaces to make steel (World Nuclear Association. 2016). The United States is also developing carbon capture and sequestration technologies with the goal of capturing 90% of CO_2 emissions from coal to help allow coal to remain a strategic fuel for the nation while enhancing environmental protection (World Nuclear Association. 2016).

Nuclear Energy: The United States operates the most nuclear reactors, has the largest installed nuclear power capacity, and generates the most nuclear power in the world. Nearly 20% of U.S. electricity is produced at 99 nuclear reactors in 31 states (World Nuclear Association. 2016). In 2016, the first of 24 new nuclear reactors were expected to come on line. Subsectors of the civil

nuclear industry are represented by companies that produce nuclear components (reactors, nuclear monitoring instruments, boilers, heat exchangers, industrial valves, instrument modules, insulation, economizers for boilers, pumps and other reactor parts), nuclear fuel (uranium mining, conversion, enrichment, fuel assembly fabrication, and spent fuel storage), nuclear engineering and construction (site preparation, materials and equipment procurement, and construction), and nuclear advisory services (consulting on nuclear-related regulatory policies, human resources, and infrastructure; legal services; and operations and program management services). The international civil nuclear marketplace is estimated at more than US$500 - US$740 billion during the next decade and has the potential to generate more than US$100 billion in U.S. exports and thousands of new jobs. (World Nuclear Association. 2016).

Energy Efficiency: The market and demand to achieve greater energy efficiency in the United States is large and growing. Combined financing and investment in building, industrial, and supply side energy efficiency doubled in 2012, exceeding US$ 15 billion in funds (International Trade Administration, 2016). "Existing policies, such as Federal appliance standards, along with other Federal and State policies, and market forces are drivers of energy efficiency in the United States. For example, in 2013, President Obama had announced the goal to double energy productivity, measured by gross domestic product per unit of energy use, from the 2010 level by 2030. A roadmap to achieving this goal was published in September 2015 and it is expected that an additional US$ 166 billion will need to be invested annually in building improvements, energy efficient vehicles and industrial equipment, and energy savings transportation systems to achieve this goal" (International Trade Administration, 2016).

Smart Grid: The United States is an international leader in the development and deployment of smart grid technologies and services. The smart grid subsector is defined by the electric grid equipment and services required for the modernization of distribution and transmission systems, as well as the information and communication technologies (ICT) (a sector that is steadily gaining renewed focus on investment) that support a fully networked grid and enable two-way communications and electric flows (International Trade Administration, 2016). Some of the reasons for increased investment are reliability enhancement, connecting to renewables,

demand shifts, cost increases, and market reforms that create more options for independent generators and as such require new connections to transmission systems (International Trade Administration, 2016).

This includes a strong interest from national utilities to address the potential effects of distributed energy resources. Since 2009, investment in the modernisation of the national electricity infrastructure has increased dramatically. This is in large part due to the Smart Grid Investment Grant projects, which involves more than 200 electric utilities, and costing approximately US$8 billion in 99 public-private partnerships (PPP). "These projects have helped push the deployment of smart meters to more than 40% of the country's 144.51 million electricity consumers. In addition to public-private programs like the SGIG, investor-owned utility investment in grid modernization continues to rise. For example, since 2001 investor-owned utility transmission system investment grew at a compound annual growth rate of over 20% reaching almost US$ 20 billion" (International Trade Administration, 2016).

6.1) Impact on the growth of the USA energy sector on the environment

The environmental impact on the energy industry is diverse. Energy has been harnessed by human beings for millennia. Initially it was with the use of fire for light, heat, cooking and for safety, and its use can be traced back at least 1.9 million years. In recent years there has been a trend towards the increased commercialisation of various renewable energy sources. (Bowman, Balch, Artaxo, Bond, Carlson, Cochrane, D'Antonio, DeFries, Doyle, Harrison, Johnston, Keeley, Krawchuk, Kull, Marston, Moritz, Prentice, Roos, Scott, Swetnam, van der Werf & Pyne, 2009).

Consumption of fossil fuel resources leads to global warming and climate change. In most parts of the world little change is being made to slow these changes. If the peak oil theory proves true, and more explorations of viable alternative energy sources are made, the human impact could be less hostile to the environment. Rapidly advancing technologies can achieve a transition of energy generation, water and waste management, and food production towards better environmental and energy usage practices using methods of systems ecology and

industrial energy. (Bowman, Balch, Artaxo, Bond, Carlson, Cochrane, D'Antonio, DeFries, Doyle, Harrison, Johnston, Keeley, Krawchuk, Kull, Marston, Moritz, Prentice, Roos, Scott, Swetnam, van der Werf & Pyne, 2009).

6.2) The growth of fracking in the USA and its impact on the environment

The environmental impact of fracking affects land use and water consumption, methane emissions, air emissions, water contamination, noise pollution, and health. Water and air pollution are the biggest risks to human health from hydraulic fracturing (Clark, Burnham, Harto & Horner, 2013). Research is underway to determine if human health has been affected, and rigorous adherence to regulation and safety procedures is required to avoid harm. Noise from hydraulic fracturing and associated transport can also affect residents and local wildlife (Clark, Burnham, Harto & Horner, 2013).

Hydraulic fracturing fluids include proppants and other substances, which may include toxic chemicals. In the United States, such additives may be treated as trade secrets by companies who use them (Clark, Burnham, Harto & Horner, 2013). Lack of knowledge about specific chemicals has complicated efforts to develop risk management policies and to study health effects (Clark, Burnham, Harto & Horner, 2013). In other jurisdictions, such as the United Kingdom, these chemicals must be made public and their applications are required to be nonhazardous (Clark, Burnham, Harto & Horner, 2013).

Water usage by hydraulic fracturing can be a problem in areas that experience water shortage. Surface water may be contaminated through spillage and improperly built and maintained waste pits, in jurisdictions where these are permitted (Clark, Burnham, Harto & Horner, 2013). Further, ground water can be contaminated if fluid is able to escape during fracking. Produced water, the water that returns to the surface after fracking, is managed by underground injection, municipal and commercial wastewater treatment, and reuse in future wells (Clark, Burnham, Harto & Horner, 2013). There is potential for methane to leak into ground water and

the air, though escape of methane is a bigger problem in older wells than in those built under more recent legislation (Clark, Burnham, Harto & Horner, 2013).

Hydraulic fracturing causes induced seismicity called micro-seismic events or micro-earthquakes. The magnitude of these events is too small to be detected at the surface, being of magnitude M-3 to M-1 usually (Clark, Burnham, Harto & Horner, 2013). However, fluid disposal wells (which are often used in the USA to dispose of polluted waste from several industries) have been responsible for earthquakes up to 5.6M in Oklahoma and other states (Clark, Burnham, Harto & Horner, 2013).

Governments worldwide are developing regulatory frameworks to assess and manage environmental and associated health risks, working under pressure from industry on the one hand, and from anti-fracking groups on the other (Lechtenbömer, Altmann, Capito, Matra, Weindorf & Zittel, 2011). In comparison, some countries like France has a precautionary approach that has been favored and hydraulic fracturing has been banned. Some countries such as the USA have adopted the approach of identifying risks before regulating (Lechtenbömer, Altmann, Capito, Matra, Weindorf & Zittel, 2011). The United Kingdom's regulatory framework is based on the conclusion that the risks associated with hydraulic fracturing are manageable if carried out under effective regulation and if operational best practices are implemented (Lechtenbömer, Altmann, Capito, Matra, Weindorf & Zittel, 2011).

Environmental impact of hydraulic fracturing in the United States has been an issue of public concern, and includes the potential contamination of ground and surface water, methane emissions, air pollution, migration of gases and hydraulic fracturing chemicals and radionuclides to the surface, the potential mishandling of solid waste, drill cuttings, increased seismicity and associated effects on human and ecosystem health. A number of instances with groundwater contamination have been documented, however opponents of water safety regulation claim hydraulic fracturing has never caused any drinking water contamination.

As early as 1987, researchers at the EPA expressed concern that hydraulic fracturing might contaminate groundwater (van der Walt, 2016). With the growth of hydraulic fracturing in the United States in the following years, concern grew (van der Walt, 2016). It was not until 2010 that Congress asked the EPA to conduct a full study of the environmental impact of fracking (van der Walt, 2016). The study is ongoing, but the EPA released a progress report in December 2012 and released a final draft assessment report for peer review and comment in June 2015 (van der Walt, 2016).

6.2.1) Obama's Clean Air Act

Although many hoped that years of inaction against greenhouse gas emissions by the United States was nearing to an end, however President Obama soon found himself facing a Congress quick to oppose his initiatives across a spectrum of issues, and climate change seemed to take a back seat to other important concerns, and it was only in his second term that his administration was able to renew its focus on climate change (Outka, 2016). In June 2013, the president announced a new Climate Action Plan at Georgetown University, which aimed to cut carbon pollution; protect the country from the impacts of climate change; and to lead the world in a coordinated assault on a changing climate (Outka, 2016). He acknowledged that as the world's largest economy and second largest carbon emitter, the USA had a 'unique responsibility' to fulfil (Outka, 2016).

The Clean Air Act (CAA) was a single statute that provided critical executive authority for advancing the former president's climate change goals (Outka, 2016). The Clean Air Act of 1970 was the first comprehensive federal environmental regulatory program. Today, it remains the primary federal environmental law that controls air pollution from mobile sources, like cars and trucks, and from stationary sources, like factories, refineries, and power plants (Outka, 2016).

Under the UNFCCC, the US and nearly every other nation in the world has declared a common goal and shared commitment to averting catastrophic climate change. The complicated history of the US's role in this treaty and its implementation forms an important backdrop to the

administration's second-term approach to domestic climate action (Outka, 2016). This approach had been multi-faceted, combining regulatory action by federal agencies with executive orders and bilateral talks that were pivotal to the domestic and international aspects of the administration's climate mitigation strategy. Understanding the Clean Air Act's role is especially important now that all eyes are on the U.S. and other major emitting countries to achieve the goals outlined in a new international agreement penned at the close of 2015 in Paris, France by the 21st Conference of the Parties (COP21) to the Framework Convention (Outka, 2016).

The U.S. was among the first nations to sign the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, marking a landmark international agreement to reduce greenhouse gas (GHG) emissions to mitigate global climate change. For every U.S. president following President George H.W. Bush, who signed the Convention, the UNFCC has provided the formal structure for international dialogue and policy negotiations on climate change. (Outka, 2016).

The Kyoto Protocol's structural emphasis on developed nations' obligations became politically divisive in the U.S. Despite significant involvement with the Protocol's design under the Clinton Administration, the U.S. ultimately declined to ratify it under President George W. Bush, due to fears that the U.S. would suffer economically if targets did not apply to polluting developing countries, namely China and India. This was seen as a major setback to the success of the Kyoto Protocol. The Protocol eventually went into effect after a struggle to secure sufficient signatories to account for the U.S.'s absence, and as a result the U.S. leadership position in climate change negotiations was seriously undercut. Throughout the second Bush Administration, although the U.S. maintained its official posture of commitment to the shared aims of the UNFCCC, the U.S. was widely regarded as a blocking agent, no longer a facilitator, of international climate progress. (Outka, 2016).

When Barack Obama was elected, a renewed commitment to climate change mitigation was among his stated priorities. Domestically, many thought that nationwide climate change legislation would be imminently forthcoming in his first term after the House of Representatives

passed a comprehensive climate bill; but it did not pass in the Senate. In 2009, on the international stage, President Obama pledged the U.S. would cut GHG emissions by 17% below 2005 levels by the year 2020. Yet his first major public foray into climate change negotiations, at the 2009 Conference of the Parties in Copenhagen, Denmark, ended in frustration, protests, and few notable successes. The Obama Administration's subsequent role internationally on climate issues, at least for the remainder of his first term, had a lower profile. (Outka, 2016).

Facing intense political opposition on a range of other priorities, the congressional gridlock on domestic climate change policy did not speak well for the Administration's prospects with new international commitments. The experience of the Clinton-Gore White House during the Kyoto Protocol negotiations was a cautionary tale. Seeing no near-term potential for meaningful climate legislation, President Obama turned his attention to the potential for climate progress under existing statutory authority. Reflecting this reorientation toward executive action, the Clean Air Act had been the focal point of the Obama Administration's efforts to achieve climate change mitigation goals, particularly in the second term. (Outka, 2016).

However, the origins of the CAA's centrality to domestic climate mitigation traces to before President Obama's election to the 2007 landmark Supreme Court decision, Massachusetts v. EPA. In that case, the EPA under the second Bush Administration rejected petitions to regulate carbon dioxide emissions from motor vehicles. In its 5-4 decision, however, the Court held that the EPA did have statutory authority to regulate GHGs under § 202 of the CAA and that the EPA's avoidance of GHG regulation was arbitrary. According to the Court, the statute required the agency to justify its position, if it could, with a reasoned Endangerment Finding – essentially, a determination of whether GHGs endanger public health and welfare. (Outka, 2016).

The authority recognised by the case provided the foundation for the Obama Administration's substantive CAA regulatory agenda pertaining to GHGs. It was President Obama's new EPA Administrator, Lisa Jackson who issued the affirmative Endangerment Finding for GHGs from mobile sources. The administration followed this finding, as the CAA requires, with new regulations of vehicle emissions and fuel economy standards; but soon after, its regulatory focus

expanded to include an even more significant source of GHGs within the energy sector: electric power plants. (Outka, 2016).

The administration's CAA work was significant in several other key respects, however, separate and apart from how the Clean Power Plan litigation resolves. First, the CAA rule-making eroded the perception that congressional gridlock was an impervious barrier to climate progress. There are indications now across the economy that a low carbon turn is increasingly being seen as inevitable. In the months leading up to COP 21, major companies across a range of industries made public statements in support of a binding climate agreement in Paris. These rules were undoubtedly a shift that could be a powerful force behind the technological innovation some have argued for as a primary response to climate change. (Outka, 2016).

Second, proceeding with rulemaking for greenhouse gases under the CAA avoided a gap that might have been created post-Mass. v. EPA in the absence of agency action. The 2011 Supreme Court Case American Electric Power v. Connecticut made clear that the effect of Mass. v. EPA was to pre-empt federal common law litigation relating to greenhouse gas emissions. In American Electric Power, a case initiated before the ruling in Mass. v. EPA, a coalition of eight states, New York City, and three land trusts sued the nation's biggest utilities under public nuisance theories, seeking to enjoin emissions reductions. There, the Supreme Court ruled unanimously that although the EPA had not yet exercised its authority to regulate greenhouse gases, recognition of that authority by the Court in Mass. v. EPA was sufficient to pre-empt the claims. Without the administration's subsequent rulemaking, the impact of American Electric Power's pre-emption ruling would have been a more consequential limitation on common law in the climate context. (Outka, 2016).

Third, the administration's CAA agenda carried significance in the Framework Convention context and for the U.S. posture approaching COP21. This was reflected in the preamble to the Clean Power Plan final rule, released within months of the Conference, which explained that the "rule establishes the foundation for longer term GHG emission reduction strategies necessary to address climate change and, in so doing, confirms the international leadership of the U.S. in the

global effort to address climate change." Taken together, the CAA rules were central to the President's effort to reassert an effective and credible leadership role for the U.S. in international climate negotiations. Further, this work provided a basis for the President to pursue bilateral climate agreements with China, India, and Brazil, widely viewed as important to shifting the dynamic that prevented U.S. participation in the Kyoto Protocol. (Outka, 2016).

The statement in the Clean Power Plan preamble also reflected recognition that climate change would require further decarbonization than this rule alone could achieve. Policy critiques of this centerpiece regulation predictably ranged from assertions that the rule was too aggressive, to worries that the rule did not do enough. Among those arguing the Clean Power Plan was too aggressive were coal companies and states who filed lawsuits challenging the rule even before it was final, hoping for (but failing to obtain) preliminary injunctions on the rule-making. (Outka, 2016).

The force of the administration's CAA agenda would be an important aspect of Obama's climate legacy, but it would not be the only factor shaping perspectives on the president's commitment to the UNFCCC's core aspiration. Seemingly mixed messages from the administration had been hard for observers to reconcile with the commitment that seemed to underlie the CAA rules. Three controversial issues in particular had troubled advocates of strong climate policy during the Obama Presidency, and only in the following months had they begun to resolve. (Outka, 2016).

The president's domestic climate action used existing law and does, at minimum, two things relative to the international law context. First, it fulfilled the longstanding obligation for 'national policies' under the Convention, and second, it made efforts to lead on the international stage more credible. A third function, particularly applicable to the CAA regulatory agenda, may have been to provide a basis for the president to enter in a new binding climate agreement. According to international law Professor David Wirth, laws that were already in place domestically, including those "undertaken by the executive branch unilaterally," provided "sufficient firm legal footing that the president could confidently make parallel legally binding

international commitments that tracked those domestic undertakings." Likewise, Professor Daniel Bodansky concludes that: "depending on its contents, the president might have been able to join the Paris Agreement on the basis of existing constitutional, statutory, and treaty authority, without submitting it to the Senate or Congress for approval." In these ways, the Obama Administration's Clean Air Act rule-making was central to the climate change legacy that would emerge in time, as well as to the present and future U.S. negotiating posture and ability to meet international obligations for climate change mitigation. (Outka, 2016).

The White House, under Obama's Administration announced a new plan to crack down on the oil and gas industry's emissions of methane, a potent greenhouse gas. The move was the last major piece of President Obama's domestic climate agenda, following in the footsteps of tougher standards for vehicle emissions and a sweeping plan to curb CO_2 emissions from power plants. (Outka, 2016).

Like the power plant plan, the methane standards would rely on the Environmental Protection Agency's authority to regulate pollution under the Clean Air Act. The new rules would regulate the amount of methane that oil and gas producers were allowed to vent or leak from their wells, pipelines, and other equipment. Ultimately, according to the White House, the rules would aim to cut methane emissions by 40%-45% by 2025. The proposal was intended to be finalised before Obama left office, but it was certain to take a battering along the way from congressional Republicans and fossil fuel interest groups. (Outka, 2016).

Methane makes up a much smaller portion of America's greenhouse gas footprint than carbon dioxide – the volume of methane released in a year is roughly 10 times smaller than the volume of CO_2 – so the proposal might have seemed like a small issue. Whereas on the contrary, it is quite the opposite for a few reasons. (Outka, 2016).

Locking in climate protection: An underlying assumption of Obama's carbon emissions plan was that many power plants would switch from burning coal to burning natural gas. But methane, the principal emission of natural gas consumption, is 20 times more powerful than

CO_2 over a 100-year timespan. The problem is less with natural gas-burning power plants themselves than with the infrastructure (pipes, and compressors, among others) needed to get gas from where it's drilled to where it's burned – and also with venting, the burning of excess gas from wells. So far, those bits and pieces have proved exceptionally leaky – some studies have found up to 7.9% of the methane from natural gas production simply escapes into the air. (Bulman-Pozen & Metzger, 2016).

Saving money and energy: Methane leaks are not only bad for the climate, but are also bad for business. According to a recent analysis conducted by New York University, between 1 and 3% of all U.S. natural gas production is lost to leaks and venting, enough to heat more than 6 million homes. A separate study from the World Resources Institute estimated a loss of gas at $1.5 billion per year. Plugging leaks and limiting venting from drilling sites would keep more gas on the market. (Bulman-Pozen & Metzger, 2016).

Cleaning up fracking: Behind any conversation about natural gas is always the specter of fracking. Of course, there are many concerns about fracking that have nothing to do with methane emissions: Public health issues related to water contamination, for example, or earthquakes. But stringent methane rules could alleviate some of the climate-related concerns about the fracking boom and could help refocus the debate around local pollution and land rights issues. (Bulman-Pozen & Metzger, 2016).

In relation to climate justice, it can be concluded that the Obama Administration was a leader in preventing climate change. Although Obama was not able to have much influence in the Congress during first term, this however changed in his second term as president. The administration aimed to crack down on its oil and gas industry, by implementing the Clean Air Act and regulating the methane emissions, as well as aim to meet the international obligations for climate change.

Conclusion

From the paper, it can be seen that Green IPE focuses on the power of the fossil fuel industry. Whereas Neo-Gramscian theory relates to hegemony and the structural power within a state. And climate justice focuses on the policies of the fossil fuel industries. Therefore, with regards to the key research question posed for the study, it can be concluded that fracking is not a sustainable way to obtain natural gas and oil even though it makes us, the U.S., less dependent on foreign oil and gas (McBride & Sergie, 2015). Not only do the disadvantages outweigh the advantages, but the process of fracking breaks the laws of climate justice and sustainability.

Even though fracking gives the economy revenue, provides jobs and makes the U.S. less dependent on foreign oil it is not worth making the earth sick through environmental damage and people sick through exposure to unknown chemical mixtures in their water and air pollutants (Anderson, 2014.). Also, if the environment deteriorates or the resources that are finite, which are needed in the fracking process are used up because fracking continues on at the rate it is going then over time hydraulic fracturing would have to cease because these resources would be severely depleted, to the extent that the fracking industry would not be able to continue as it has been doing currently (Taskinsoy, 2013: 16).

The rise of the fracking industry bolsters the nation's geopolitical status in many ways. Firstly, it provides low-cost hydrocarbons for energy-intensive industries like cement manufacturing and aluminium smelting, thus sparking a 'new industrial revolution' and strengthening the US economy. It is also to be noted that it helps liberate the US from constrictive ties to foreign heads of states (Klare, 2014). Furthermore, it advances the US's national security by rendering the it as being less vulnerable to political and security-related disruptions of its energy supply. In terms of power relations, former national security adviser to President Obama, Tom Donilon, mentioned that America's new energy independent position allows it to engage from a position of greater strength (Klare, 2014). Increasing US energy supplies act as a cushion that helps reduce its vulnerability to global supply disruptions and price shocks. It also allows the US to have an upper hand in pursuing and implementing its international security goals. (Klare, 2014).

Finding sustainable ways to obtain natural gas and oil is seen as the next option. Although fracking is by far the cheapest way to produce natural gas, there are companies that are trying to create natural gas from renewable sources. The process still needs to be perfected before it receives enough funding to become a viable option. In addition, there is research being done on 'gas fracking' as an alternative to hydraulic fracking (Mcelroy & Lu, 2013). In gas fracking, a thick propane gel is pumped into the ground instead of water. The gel contains the same materials as the water that keeps the shale open so gas can be collected (Mcelroy & Lu, 2013). However, the gel itself vaporizes, and returns to the surface to be collected and reused, with none of the contaminants that water brings up (Mcelroy & Lu, 2013). Although the gel is more expensive, it allows more gas to be extracted, and costs less in truck trips because there is no need to get more water (Mcelroy & Lu, 2013). More caution must be used because the gel is explosive, but it still seems to be a viable alternative for the future (Mcelroy & Lu, 2013).

It is important to realize that fracking is such a new industry that there are many unknown things, such as the full impacts that fracking can have on the environment, humans or the economy (McBride & Sergie, 2015). All that can be done is hypothesise from the research that has been given. Furthermore, it's still uncertain whether more sustainable ways of fracking will work out or prove to be just as controversial as the current way. (McBride & Sergie, 2015).

To build an effective climate agreement and to strengthen it over time, states might rely on two main types of factors—norms and incentives. An ideal agreement would ensure that both norms and incentives push the parties to make serious efforts to reduce emissions and to gradually reinforce those efforts. (McBride & Sergie, 2015).

The Paris Agreement currently relies disproportionately on norms, while doing little to restructure states' incentives so as to deter free riding. Norms and incentives thus pull in opposite directions, meaning that the outcome will depend on the force of each factor (United Nations Framework Convention on Climate Change, 2016). Because virtually all economic

activity entails emissions of GHGs, the incentive to free ride is much stronger in the context of climate change than in the context of other international environmental cooperation (United Nations Framework Convention on Climate Change, 2016). Unsurprisingly, therefore, the historical record of climate change cooperation suggests that the force of incentives has thus far outweighed that of norms. Judged by this record, the Paris Agreement may well suffer a fate similar to Kyoto's. Kyoto, too, aimed for a series of 5-year periods with new and more ambitious commitments in every period. Yet already by the end of the first period, this architecture was clearly not viable. (United Nations Framework Convention on Climate Change, 2016).

On a more optimistic note, norms can change. For example, the Paris Agreement shows that today's interpretation of the common-but-differentiated responsibilities norm differs from that of the 1990s and 2000s (Mitchell, 2015). Consequently, the cards are now stacked somewhat less in favour of incentives than they were then. Domestic and international norms may well continue to develop such that it becomes increasingly difficult for individuals, firms, and states to ignore pleas to limit and reduce their carbon footprints (Mitchell, 2015). In addition, technological progress may gradually lessen abatement costs. Such developments would further favour norms over incentives (Mitchell, 2015). Finally, if major emitters such as the United States prove able and willing to take the lead, it might further strengthen cooperative norms and limit other countries' costs of compliance. Such developments might ultimately pave the way for a transformation from a logic of consequences to a logic of appropriateness in the field of climate change (Mitchell, 2015).

The powerful domestic forces that shaped Obama's commitment to fracking were based on the findings of the exploration activities and the 2008 global financial crisis. If the US follows through with announced policies, it is predicted that there will be a reduction of emissions by 16% to 32% of 2005 levels by 2025 (Dlouhy, 2016). So if the Paris goals are to be met, additional measures to cut greenhouse gases are necessary. Achievement of these goals have major international importance. Jeffery Greenblatt, a climate researcher at the Lawrence Berkeley National Laboratory, said: "if the United States is successful it's very likely that a number of other countries will follow suit and re-strengthen their own commitments" (Potenza, 2016).

Unfortunately, between the historical political climate and the uncertainty and volatility surrounding Trump's Administration, bold action may be difficult for the US to accomplish. It is evident that the hegemonic powers of the US have been shaken by the rise of China and India's growth on the international platform which has led to the insecurity regarding its hegemonic status. (Potenza, 2016).

For two decades now, the US has repeatedly been against any type of progress that was being delicately arranged towards combatting climate change. It has not been alone in compromising the negotiations, but its intransigence has provided a shield behind which, many other nations can conveniently hide (Roberts, 2011: 781). The US government's unwillingness to take active steps to address this looming global crisis is exactly the kind of failure of leadership among hegemons that leads to their decline. The US's fear of job loss to China lay behind the July 1997 Byrd-Hagel Resolution that arguably sunk the Kyoto Protocol, tying the Clinton Administration's hands the summer before the COP 3 in that Japanese city (Roberts, 2011: 781). The US's obstinacy in the climate negotiations is driven by fear of job loss and competitiveness to specifically, China and India, among others. In turn, China and other rapidly developing nations fear the treaty being used by the US and others to dampen their growth (Roberts, 2011: 781). From this, it can be seen that the policies of fracking does undermine the US's hegemonic role in climate negotiations on the global platform. Drawing on the neo-Gramscian perspective, should the domestic hegemon be weak, then this has implications for extending hegemony to the global level. However, in the case of this study, fracking operations are able to continue despite environmental movements aimed combatting climate change.

So far, however, deep political polarisation has represented a significant barrier to the U.S. leadership on climate change. Thus, while the Paris Agreement could become the start of a race to the top that sets the world on a path towards solving the climate change problem, it might also end as a failure, much like the Kyoto Protocol. The latter outcome is particularly plausible if the United States and other major emitters prove unable or unwilling to lead. However, as mentioned above, and newly-elected President Donald Trump's decision to exit from the Paris Agreement signifies that the fracking industry has a large impact on the USA's foreign policy

towards climate change – a disregard for the impact of climate change. This will ensure that climate change occurs with even greater fury than previously assumed, posing an intensified threat to the safety and survival of US cities, farms, forests and coastlines. No other challenge we face even comes close in severity, scale and proximity. (Klare, 2014).

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