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M.Sc. Thesis.

The EU ETS – Problems in the Construction and Transformation from Phase 1-4.

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27 November 2019



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The propensity to truck, barter and exchange one thing for another is common to all men, and to be found in no other race of animals.- Adam Smith

Declaration

I declare that this thesis is my own, unaided work. It is being submitted for the degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

SIGNATURE:



Christopher Humphries 596093

Wednesday, 27 November 2019

Abstract

21 years ago, the Kyoto Protocol created the backbone for market mechanisms to counteract pollution through the creation of an economic incentive for carbon abatement. The European Union Emissions Trading System (EU ETS) was introduced in 2005 as Europe's "cornerstone" emissions abatement tool. The EU ETS is the largest ETS worldwide, covering 45% of EU emissions across 31 EU member states. It operates as a cap-and-trade system where pollution caps are assigned to EU member states which are then subsequently traded in order to meet emissions obligations. Putting a price on carbon is fundamental to the EU ETS in order to encourage investment in new technologies and move away from business as usual carbon intense business models. However, the EU ETS has failed extensively in this regard. The EU ETS was meant to drive efficiency and cost effectiveness however, it has created an incentive for pollution as polluters receive carbon allowances for free, which are then sold and traded. Windfall profits from free allocation, carousel VAT fraud from a lack of policy synergy, and a focus on a true free market mechanism have been massive failures for the EU ETS. Therefore, many EU member states are pursuing more sovereign emissions policy controls to help stimulate carbon allowance prices, trade, and carbon abatement. The ETS has transformed significantly since piloting in phase 1 to the introduction of various policies and institutional interventions to stimulate effective market functioning in phase 4. The introduction of the market stability reserve (MSR) as a pure quantity based economic control mechanism as well as further fiscal intervention of price collars acknowledges that the market would fail without intervention. The EU ETS has had to develop through each phase in order to meet its own emissions reduction goals. Emissions trading systems across the world can learn from the EU ETS by making adaptations that move away from a true free market approach of controlling emissions. This thesis has shown that across the four phases, EU ETS has continuously made institutional changes in the carbon market to try to address challenges in the previous round. However, analysis of the EU ETS through a framework that combines Polanyi's understanding of the production of markets and creation of fictitious commodities, with current literature on the commodification of nature is key. It reveals that due to the inherent challenges in commodifying and creating a market for carbon as a fictitious commodity, it is unlikely that institutional changes will be able to achieve the stated goal of reducing carbon emissions.

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1. Introduction

As of 2013, global carbon emissions had reached more than 30 billion metric tonnes per annum due to current global fossil fuel dependent economic models (Boden, Marland, & Andres, 2011; Newell, Pizer, & Raimi, 2013; Pegels, 2013). This is an issue because of the perpetuation of anthropogenic climate change from carbon intensive development which affects, inter alia, ecosystem services, climate change, rising sea levels and global warming (Pegels, 2013). Carbon induced climate change is the single greatest threat to the environment (Bond, 2012). Major action is needed in order to mitigate the impacts of carbon dioxide emissions around the globe, and to move away from the business-as-usual (BAU) development models. Carbon market mechanisms, the main topic of study in this Master's thesis, were introduced as the foundation of the Kyoto Protocol. The Kyoto Protocol was adopted by the United Nations on the 11th of December 1997 as a part of the UN's efforts to counteract the negative effects of anthropogenic climate change. The Kyoto Protocol was built upon and extends the reach of the United Nations Framework Convention on Climate Change (UNFCCC) which created the legal framework with which State parties must cut their respective GHG emissions. The premise for the Kyoto Protocol is in its legally binding emissions reduction targets for Member States. The Kyoto Protocol was rooted in a commitment to market solutions to solving environmental problems. This issue of market solutions to solve environmental issues has been continually critiqued and contested since their promulgation in regions like the EU. The EU is comprised of 28-member states that are obligated to comply with the first Kyoto commitment period which was scheduled from 2008 – 2012. The Kyoto Protocol was further supported by the ratification of the Paris Agreement in 2015. This once again stimulated pressure on European Member States to find practical mechanisms to reduce their carbon footprint.

One such solution to addressing the EU's carbon footprint was to introduce a cap-and-trade market process known as carbon trading. Other solutions for ecological modernisation include joint implementation (JI), clean development mechanisms (CDM) and carbon taxes. Cap-and-trade as a carbon market mechanism not only incentivizes carbon emissions mitigation through low-carbon instruments, but also seeks to price polluters out of the limitless pollution of the global commons in the business as usual model of economic growth. This form of ecological

modernisation has been introduced to address national and supra-national emissions policies and policy obligations to reduce carbon emissions. The first directive of the EU ETS was adopted in 2003 and was finally implemented in its first pilot phase in 2005 after a significant debate between EU Member States regarding emissions allocations and actual implementation of the EU ETS (Ellerman & Buchner, 2007). The EU ETS is to date the biggest international carbon market for carbon and GHG emissions worldwide (Duscha, 2018; EC, 2011; Goulder, 2013). Theoretically, the EU ETS is underpinned by the idea of transitioning Europe to an economic zone that is significantly less carbon intense (Callon 2009; Newell, Pizer, & Raimi 2013). The EU ETS initially operated in all 28 EU member states and covered many sectors and businesses and aimed to contribute 40% towards the EU's emission targets by 2030.

Other carbon market mechanisms such as Joint Implementation (JI) and Clean Development Mechanism (CDMs) were introduced in the Kyoto Protocol as flexible market mechanisms aimed at reducing carbon below 1990 levels. Analyses of emissions trading systems are deeply divided. Yale (2008) argues that emissions trading has created the most viable long-term solution for business and government alike (Cole & Grossman, 1999; Yale, 2008). However, other scholars have made it clear that emissions trading is not a viable solution for the transition to a green economy due to the misconstruction of markets and their continual need for transformation with relation to price, risk, and meeting the sustainable development goals bound by the Kyoto Protocol (Bond, 2005; Christopher, 2014; 2015). This viewpoint is contextualised by geographers of markets who explain that "[m]arkets … are continually produced and constructed socially with the help of actors who are interlinked in dense and extensive webs of social relations" (Berndt & Boeckler, 2009: 536).

These market mechanisms are founded on the 21st-century economic notions of free-market logic[1] (Bachram, 2004; Callon, 2009). This free-marketism is meant to drive an economic model of creating a market whereby the right to exploit the environment (i.e. emit CO_2), is sold to companies and countries as they over emit on their emissions quotas as set by the Kyoto protocol.

[1] The system of private ownership of the means of production, the market economy, the competitive system, the profit-and-loss system, free enterprise, the system of economic freedom. Growth dependent on capital accumulation (Hazlittz, 1964)

However, the key element in every carbon market mechanism is that each mechanism has had to create a carbon dioxide commodity to allow for the preservation of the right to emit. This research project will critically engage in debates surrounding cap-and-trade, with particular reference to the EU ETS. The following research will present the literature and arguments surrounding carbon market mechanisms as a tool created by the market.

1.1. Problem statement

Scientists and economists alike agree on the notion that past economic models founded in the 20th century have substantially underestimated the risks of unmanaged climate change (Stern, 2007; 2013). Proponents of the EU-ETS argue that emissions trading can reduce climate change while maintaining economic growth and market-based economies (Dong *et al*, 2016). However, Bond (2008) as well as Boden *et al* (2011) question whether carbon markets are actually doing anything to solve the underlying environmental issue of carbon dioxide emissions through unsustainable developmental models. This point rationalizes this study and contextualizes the aims and objectives.

There are sharply contrasting opinions on the nature, purpose and effects of carbon markets and their implementation across the globe. Some argue that emissions trading markets are largely profitable for those polluters who participate in the market, yet not beneficial for anyone who doesn't participate in a carbon market (Bond, 2004; Cock, 2014). In other words, Bond (2012) would say that carbon markets only facilitate economic growth for those industries that are already the main culprits of CO_2 emissions. Others such as Charharbaghi & Lynch (1999), Ellerman (2010) and Brockington (2012), argue that a market policy aiming at a negative linear progression in carbon emissions give industries and countries a 'sustainable competitive advantage' and an incentive to minimise emissions (Charharbaghi & Lynch, 1999).

Stern (2013) believes that there has been a gross underestimation of risk in favour of economic gain in relation to carbon markets in general with the EU ETS in particular. There is contestation however, in terms of whether carbon markets are fulfilling their desired green

economic goals or just preserving the right to emit. This is something that is investigated in this thesis in order to clarify some of the positive and negative effects of carbon markets in Europe.

The key problem, then, pertains to whether carbon markets in general and the EU ETS in particular are meeting their goals, and if not, how this can be theorised and understood. As the ETS is entering its fourth phase in 2021, this becomes more important. Within this context it is important to reflect on what we have learned as carbon markets have been designed, implemented and transformed, and to identify the distinguishing features of emissions trading that lead to an ETS being the desired tool for the effective reduction of greenhouse gas emissions.

1.2. Aims, objectives & questions

1.2.1. Aims

This thesis aims to contribute to debates on the EU ETS by moving beyond analysis of whether it has succeeded or failed to explore the theoretical assumptions that implicitly and explicitly underpin it. This thesis also aims to identify and critically engage with the theoretical underpinnings of carbon market. Do these policies and economic mechanisms entrenched in the EU ETS solve the problem of CO_2 emissions, or do they further perpetuate environmental issues? This study aims to develop a thorough understanding of the various phases and problems in the EU ETS. This will be done because the EU ETS is the largest and most successful ETS that has been implemented worldwide. The relevance in researching this is founded upon the Kyoto Protocol, Paris Agreement and most recently, COP 17, all looking to achieve a common goal; the pragmatic and market-based approaches to minimizing carbon-based emissions from current developmental regimes.

1.2.2. Research Questions

- What have been the problems with the EU ETS?

- What theoretical perspectives can help us to better understand the creation and transformation of the EU ETS market?

1.2.3. Research objectives

In view of the above aim and research question, the following objectives will aid in setting out a map for my research.

a) To develop a better understanding of the theoretical underpinnings of carbon market mechanisms in the context of the EU ETS.
b) To understand what problems exist in the EU ETS and how various theoretical perspectives can help critique and understand the market.
c) To critically analyse the implementation and problems in the EU ETS and how this can be used as a lesson for implementation in other markets wishing to implement same.
d) What factors influence the construction and transformation of the EU ETS market, through its various phases?

1.3. Rationale

Three primary considerations underpin the rationale for this research project.

1) Given the strong reliance on these market mechanisms to address climate change, it is crucial to understand their flaws.
2) Not enough research has been done into the real-world problems of the EU ETS and how theoretical analysis can assist in illuminating these.
3) Given the lessons learnt in the EU ETS, there are significant learnings and opportunities for environmental policy and the consideration of market mechanisms the world over.

The question of quantifying the price of these carbon emissions comes into question, due to pricing being a fundamental link in the economic value chain of carbon dependent economies. How does one ascribe a cost to this pollution? Does one price pollution according to the cost of remedying

the damage of carbon emissions, or does one price carbon as a tradable unit that encourages sectors and countries to limit their emissions in an effort to price these stakeholders out of the ability to pollute? Global sentiment since the Kyoto Protocol in 1997 has directed the cost in terms of the latter (Duscha, 2018; Goulder, 2013; Newbery, 2016; Newell *et al*, 2013). The IPCC concluded in 2001 that "the present CO_2 concentration has not been exceeded during the past 420'000 years and likely not during the past 20 million years". The only accurate consensus is due to human industrial activity over the past 400 years (IPCC, 2011). In efforts to create an economically viable solution, emissions trading was set up under the Kyoto Protocol (Frondel *et al*, 2012). This was done in an effort to find a pragmatic economic solution to define countries and sectors as "polluters" and then have them agree to an emission target below their respective 1990 levels of carbon emissions. However, emissions trading created key issues in the global economy though, and can actually be a part of the problem due to the mechanism allowing and actually encouraging polluters to pollute for financial gain (Bachram, 2004; Bond, 2012; Lohmann, 2002).

Carbon markets are the largest determinant in European environmental economics due to it being the largest emissions market mechanism to be introduced the world over (Newell, Pizer & Raimi, 2013; European Commission, 2012a). This size of the EU ETS is not only determined in the amount of CO_2 traded, but also its market value which is debatably the same size as the global carbon market put together (Newell, Pizer & Raimi, 2013; World Bank, 2018).

1.4. Background

1.4.1. What is emissions trading?

Units of carbon dioxide (European Union Allowances - EUAs) have been most recently accepted into the European market under the guise of an emissions trading system. The idea for a carbon allowances as a tradable commodity has actually been around since the 1960's when Ronald Coase (1960) introduced the initial idea being the 'permitting system' (Bachram, 2004; Coase 1960; Dales, 1968; Newell, Pizer & Raimi 2012). Jacoby & Ellerman (2004) argue that a carbon allowance is essentially the right to transfer the right to emit/create pollution in an effort to bring down overall pollution (Coase, 1960; Jacoby & Ellerman, 2004). This, according the Jacoby &

Ellerman (2004) who point to neoclassical economics directing the policy of emissions trading world wide – a viewpoint to be drawn upon throughout the study. One could argue for example that this neoliberalism has allowed for technology like renewable energy to commodify access to the sun, wind and other ecosystem services as energy generators.

According to Goulder (2013) a cap-and-trade system must always be indirect. This means that it functions as a result of a policy and institutional mechanisms put in place in order to ensure the functioning of the emissions market. An emissions trade is a cap-and-trade whereby an amount of carbon emissions (the cap) is placed on a polluter. This 'cap' is allocated to various sectors, industries and countries based on their requirements for growth, and capacity to change. Each polluter can meet their respective absolute emissions cap or sell them to another over-polluter in a specified carbon market (figure 1). This works when a polluter has not emitted as much as they were allowed to; that polluter can sell the remaining 'cap' on the open market to those polluters that have over polluted (Yale, 2008; Tietenberg 1985). Paradoxically, however, cap-and-trade actually enriches both sides of the trade in carbon markets by creating an allowable economic transaction for the carbon dioxide (Bond, 2012).

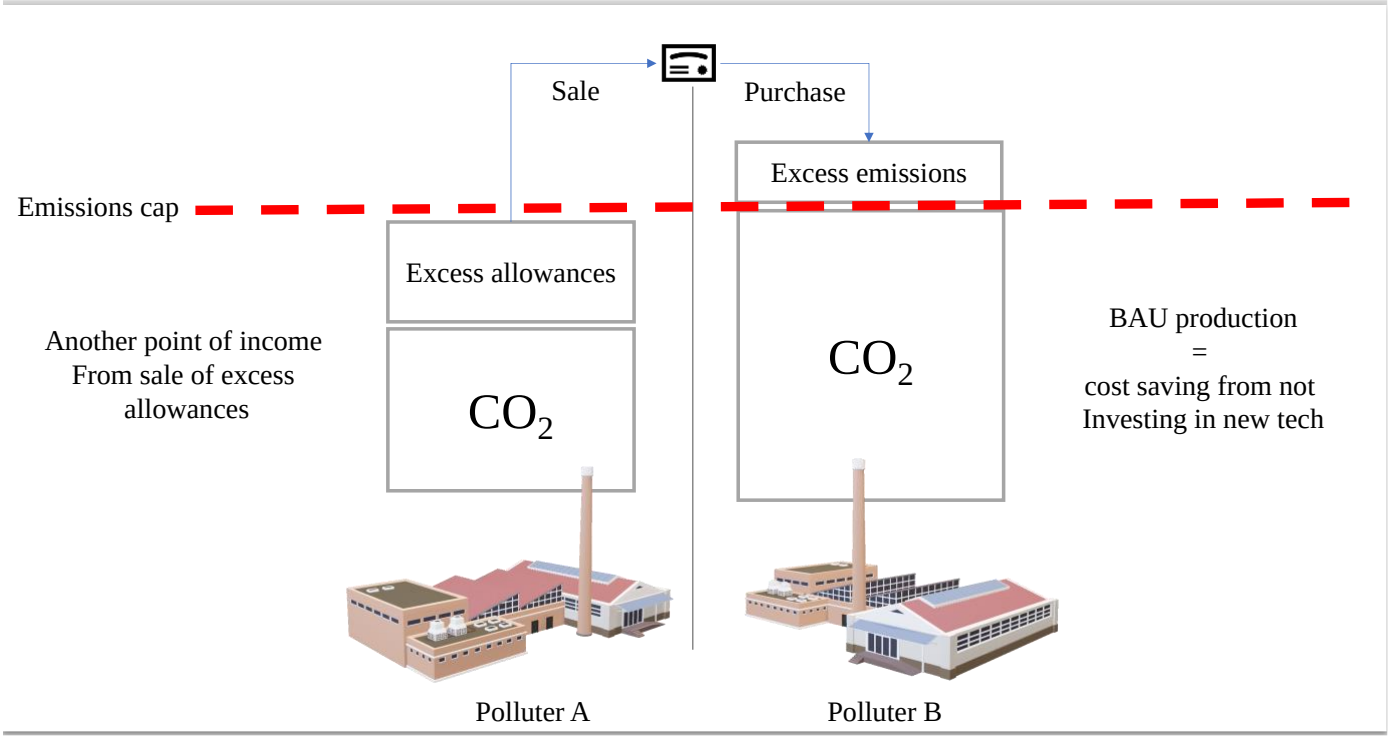


Figure 1: How a cap-and-trade system works. Humphries, C. 2018

1.4.2. Emissions trading in the EU ETS

The European Emissions Trading System (EU ETS) is the largest multi-country, multi-sector carbon emissions trading system in the world (Newell, Pizer & Raimi 2013). This ETS also has the most active participants due to the number of countries participating from the EU whom are signatories to the Kyoto Protocol in 1997 (Ellerman, Covery & de Perthius, 2010; Newell, Pizer & Raimi 2013). The EU ETS has proliferated in four phases (Figure 2):

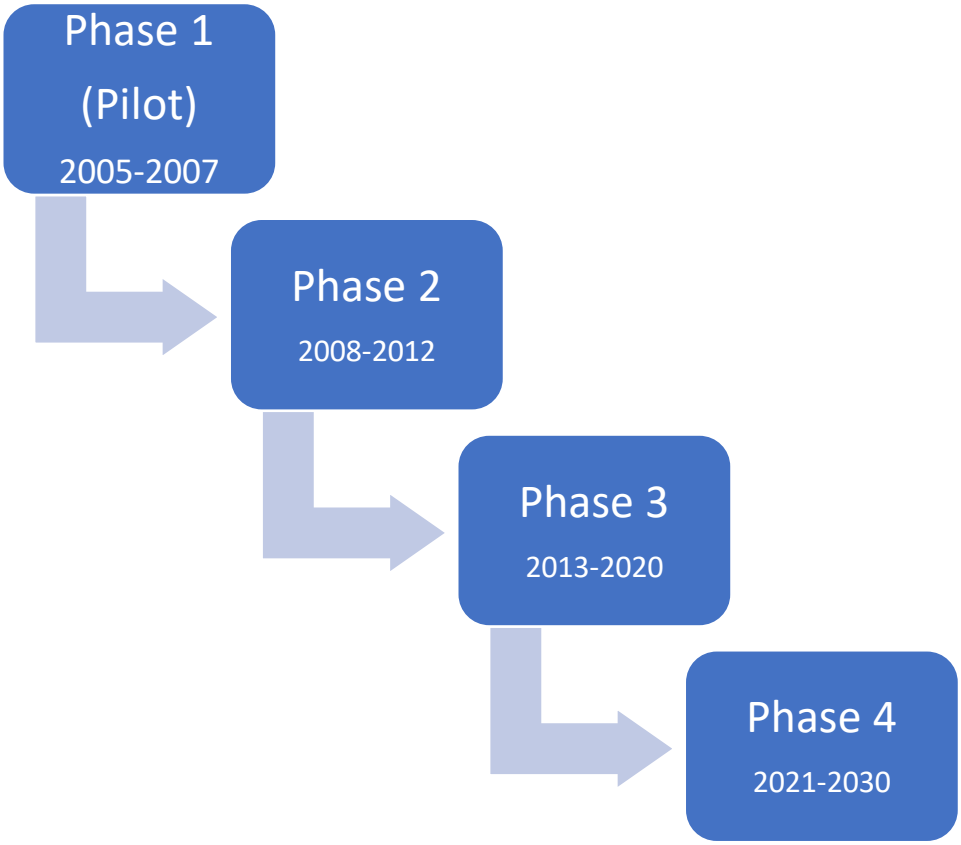


Figure 2: The four phases of the EU ETS. Humphries, C (2018)

a. Phase One

The EU ETS developed at an extremely fast pace during the pilot phase. This learning phase of the ETS saw trading volumes increase from 321 million allowances in 2005, to over 1,1 billion allowances in 2007 due to the increase in demand from traders in the ETS (Newell, Pizer & Raimi 2013). Resulting in an increase of 789 million tradable allowances in only two years. In light of this, the EU ETS became a super power in the international carbon market as a result of the incredible increase in EUAs changing hands (Ellerman, Convery & de Perthius, 2010; Newell, Pizer & Raimi 2013). However, the price of allowances crashed to zero in 2007 due to an oversupply of emissions allowances as well as price uncertainty at the end of phase 1.

b. Phase Two

The story is no different when phase two was introduced on the 1st of January 2008. This phase coincided with the first Commitment Period of the Kyoto Protocol. This overlap was good in that

the EU ETS had already developed significant momentum during the implementation of phase 1. Phase two saw each Member State developing a National Action Plan (NAP)[2] in accordance with the commitment period of the Kyoto Protocol from which allowance allocation could be calculated (Ellerman, Convery & de Perthius, 2010; Newell, Pizer & Raimi, 2013). This NAP was then submitted to the European Commission for review regarding EUA allocation.

c. Phase Three

Phase three is set to end in 2020 and should, in theory, distribute emission credits to different sectors in the EU ETS and comply with emissions targets set out in the Kyoto Protocol. As we are coming to the end of phase three, the EU have resolved on a number of issues and presented the way forward for phase four (2021 – 2030). This included increased harmonization in emissions rules across Europe, as well as addressing the supply and price issues of allowances.

d. *Phase Four*

Phase 4 has proposed to reduce emissions by 43% compared to 2005 level within the EU. This is to be done through a declining number in allowances as well as better institutional support to manage key problem areas for the ETS. Better institutional support mechanisms like the market stability reserve (MSR) (a quantity-based emissions control mechanism that seeks to indirectly control EUA prices) will be put in place in order to stimulate innovation and investment away from carbon intensive industries. Other support mechanisms include the development of two funds to promote investment in clean technology, namely the innovation fund and modernization fund.

1.5. Delimitations of the study

This study on emissions trading will use the EU ETS as a case study due to it being the most successful trading system in terms of size and reduction of emissions in accordance with the Kyoto Protocol (Ellerman, Covery & de Perthius, 2010; Newell, Pizer & Daniel, 2013). The study will analyse the EU ETS and emissions trading in the context of a Polanyian understanding of the

[2] Before the start of the phases 1 and 2 of the EU emissions trading system (EU ETS), each EU country decided on the allocation of their emission allowances. This was done through national allocation plans (NAPs). (www. https://ec.europa.eu/clima/policies/ets/pre2013/nap_en)

creation of markets and a Marxist perspective of the commodification of nature to critically evaluate the former.

Contemporary views about emissions trading systems in a global context are framed by a notion that on one hand lies the study of emissions trading in terms of being the key to a transition to the 'green economy' (Tietenberg, 1985; Yale, 2008). On the other hand, more Marxist studies of emissions trading which are considered as being a tool by which markets are commodifying natural resources under the veil of a neoliberal hegemonic ideology. This study aims to present the background that one cannot study emissions trading in the global or European context in terms of a fragmented/silo approach and should rather be approached in a broader multidisciplinary approach. The different theoretical perspective used to analyse the EU ETS will be discussed in the literature review. This study also aims to present the discourse around the EU ETS not achieving its goals through the preservation of the right to emit. This is a key element which was built upon in this thesis because it contextualises the various misgivings of the carbon market. The literature review will be structured by first highlighting the manner in which each theoretical framework has proliferated itself within the context of emissions trading in EU, then secondly be presented in terms of the theoretical approaches relevance in bringing different ideas to the fore when answering my research questions. The following literature review will be used to help illustrate the theoretical underpinnings of the nature of carbon markets and their forms of socio-technical organisation.

The remainder of this thesis is divided into five chapters. Chapter 2 discusses the literature and milieu surrounding the emissions trading arena. Chapter 3 discusses methodology used in this thesis including the limitations and various keys used to establish the nodes of information employed in the thesis. Chapter 4 discusses the evolution of the EU ETS cap-and-trade market, following which, chapter 5 argues that the EU ETS has created a platform where the right to emit has been preserved. Chapter 6 then concludes on the findings of the thesis.

2. Literature review

2.1. Introduction

This chapter presents a review of literature relevant to my research question. The remainder of the chapter is divided into seven sections. Section 2.1.1 focuses on the policy mechanism that allowed for cap-and-trade to become a mainstream attempt at resolving environmental issues. Section 2.2 through 2.5 present the literature on the green economy, commodification of nature and the theorization of markets. These sections aim to highlight the core components behind the establishment of the cap-and-trade market that aims to solve environmental issues. Finally, the literature review is wrapped up by presenting proponents and opponents of carbon markets in section 2.5. Following this, the thesis presents the conceptual framework employed, the remainder is followed by a conclusion to the literature review.

2.1.1. Kyoto's influence on emissions trading

The idea of a cap-and-trade system was pioneered by Ronald Coase (1960) which then was further refined by Crocker (1966), Dales (1968) and Montgomery (1972) (Goulder, 2013: 87). Due to these academic contributions, the framework and implementation of the cap-and-trade system began to make its way into policy in the mid-1970's. This happened when the United States Environmental Protection Agency (US EPA) began to allow companies to trade emissions between themselves, so long as the aggregated pollution levels did not exceed their emissions cap (Goulder, 2013). "However, it was only once the Kyoto Protocol had been signed and ratified that the idea of a cap-and-trade, and in later years more eloquently designed as an ETS did the system of trading emissions truly become a reality for companies and policy makers alike" (Goulder, 2013: 87).

The Kyoto Protocol set out the policy environment which allowed for emissions trading to be introduced to the global market place. In this system Clean Development Mechanisms (CDM), emissions trading (cap-and-trade) and joint implementation (JI) were based on free-market ideology, as their proponents hoped to create a green economic state encouraging

investment and stimulating innovation (Brockington, 2012; Ellermann, Convery & de Perthius, 2010; Newell, Pizer & Raimi 2013). Proponents of carbon markets, and those who believe in their role in reducing carbon emissions have agreed on the golden thread that studies have highlighted that "emissions trading is intended as a green market-based mechanism founded on consistent capitalistic and free-market logic, the driving paradigm of modern economies" (Wang & Chen, 2010: 40; Wang 2010; World Bank, 2012; Newell, Pizer & Raimi 2013; Leiter, Paolini & Winner, 2011). At a more granular level, CDMs have highlighted and reinforced this logic through the free market process of allowing annexure 1 countries (developed economies) to buy emissions allowances arising from projects/companies located in non-annex 1 countries that are under emitting on their quotas. This idea was first tested in terms of a CDM which classifies and allocates emissions based on developmental and sectoral CO_2 permits. [3]

Wang & Chen (2010), for example, illustrate the importance of the success and failures of CDMs when analysing the global policy arena surrounding carbon markets, due to the under-prioritization of CO_2 in markets as opposed to other Kyoto gases (Michaelowa & Jotzo, 2005; Wang & Chen 2010). The same argument was made about the over-prioritisation of CO_2 by the EU ETS during phase 1 and 2 (Ellerman, 2010; Duscha, 2018). These studies noted the high volatility of CO_2 in secondary markets – market which have previously used another financial instrument such as emission trading to buy and sell units of CO_2. The EU ETS is a primary market in that it provides that platform through which CO_2 is allocated and traded. This is also known as a compliance market (Newell *et al*, 2013; Leiter, Paolini & Winner, 2011). Bachram (2004) was notably critical of these types of market, so much so that Bachram (2004) labelled carbon markets as "carbon fraud" and "carbon colonialism" (Bachram, 2004; Newell *et al*, 2013; Toshiyuki *et al*, 1999). Newell *et al*, (2013) clarify that if a country, for example, emits the amount of CO_2 less than the quote assigned to it, then the shortfall may be sold off or traded. This shortfall is then sold to the open market for a market determined price per tonne of CO_2. Critics (Bachram, 2004; Bond, 2012; Lohmann, 2009) of this system have argued that this has created another economic system

[3] For further reading about CDMs see Wang & Chen, 2010.

for payment of ecosystem services, once again perpetuating environmental issues through so-called self-regulating economics.

Newell *et al* (2013) & Goulder (2013) argue that the Kyoto Protocol has created the economic environment in which an emission trading can operate. There are serious problems with the Kyoto Protocol however, mostly in terms of the enforcement capabilities and creative financial engineering (Frunza *et al*, 2010). The reason for this is due to the inability to find alignment in international agreements and policies with national climate and development policies (Frunza *et al*, 2010). According to Frunza *et al*, (2010), sovereign climate mitigation policies and supra authoritative international policies will always be at odds at some point. Newell *et al* (2013) agree with this and argue that the Kyoto protocol doesn't stipulate that an ETS is the only tool for emissions reductions. Rather, a cap-and trade can operate in synergy with domestic carbon abatement / pricing policies (Newell, Pizer & Raimi 2013). The preceding discussion on carbon markets has shown that there are various options to addressing climate change through the market. According to the Kyoto Protocol and Paris Agreement, there are several options that will allow price/market markets to help address climate change. The options include:

a. Clean development mechanisms (CDM)

A clean development mechanism allows for an emissions reduction project to be implemented in a country requiring development in order to satisfy emission reduction goals of a developed country. CDM's are an inherently flexible methodology for emissions reductions by generating certified emissions reductions (CER) which can then be trading in an emissions trading system. The aim of CDMs is twofold. To develop projects in developing countries, and by proxy, achieve emissions reductions for countries that fund the projects.

b. Carbon tax

A carbon tax imposes an external price on polluters in the hopes that they will reduce their emissions in line with emissions reductions requirements (Knopf *et al*, 2018). In economic terms this requires the tax to be at a high enough level to impose enough of a cost of pollution to

encourage emissions abatement (Knopf *et al,* 2018: 135). An ETS, as it was introduced in phase 1 of the EU-ETS is a purely quantity-based mechanism for reducing carbon emissions (Duscha, 2018; Tietenberg, 2003). The theory is that the price will naturally adjust according to supply and demand within the market.

Carbon tax is the method of placing a cost on carbon production and consumption. This cost is added by to any respective goods or services within a country. Carbon taxes are Pigouvian taxes in as far as carbon emissions being negative externalities in economic theory. Essentially, carbon taxing is meant to be the most efficient method of placing a cost on carbon emissions due to its simplicity and top down method of implementation, instead of allowing the market to control aspects intrinsic in a cap-and-trade (Goulder & Schein, 2013).

South Africa for example is battling and can't build an appropriate carbon reduction policy for the South African context (Alton *et al,* 2014). Only recently has South Africa implemented a carbon tax, but the South African experience around using the market to address environmental issues is limited. This isn't unique to South Africa though. Europe took the courageous step of implementing an ETS and will be the subject of the market mechanism of this thesis.

c. Emissions trading system (ETS)

An ETS was chosen by the European Commission because a carbon tax was deemed to pose too many hurdles in terms of harmonising a ubiquitous carbon tax structure across EU member states (Ellerman *et al*, 2010). In order for a tax to function optimally, and ensure that fraud and carbon leakage is mitigated, the same carbon tax would have had to been imposed across every member state in the EU. The EU tried a carbon tax in 1990's where it failed due to opposition from just a few member states in the EU (Ellerman *et al*, 2010). This was because of issues in fairness with regards to certain member state's needing to develop without a cost being imposed on them. A cap and trade was the primary option elected for implementation by the EU, and will thus be the focus of this thesis.

Emissions trading and the knowledge-policy and knowledge-legislation relationship has relied largely off a free market (Goulder, 2013; Stern, 2013). This capitalist/neo-liberal system is pursuant of capital accumulation and exploitation of global environmental commons (Bond, 2012). Emissions trading and the creation of market-based interventions exploit society's environmental rights. Following on from this, Stern (2013) believes that there has been a gross underestimation of risk in favour of economic gain (capital accumulation) in relation to carbon markets (Lohmann, 1999; Stern 2013). This political economic viewpoint is supported by Christophers' (2014) work on critiquing the way carbon markets function rather in terms of exclusion and exchange versus relations of production. This "techno-cultural" approach in terms of analysing the economy is incredibly effective when conglomerating the different theoretical approaches, whilst pulling strong themes through from the theorization of markets (Christophers 2014, 2015).

According to their proponents, ETS's drive the least cost in carbon abatement and therefore a better business case when lobbying business and other countries (Ellerman *et al*, 2010). The EU ETS has brought about significant cost reductions as opposed to regulatory approaches which could have been implemented at the time the ETS was introduced. ETS's and their associated carbon allowances create an opportunity cost for business / sectors. If they didn't take advantage of this then it would be counter intuitive in terms of a market economy. EUAs "represent a transfer of assets. The allowances could be used as an input" in a business's cost of production (Frondel *et al*, 2012: 2; Tietenberg, 2003). Alongside this lies Goulder's (2013) argument that an ETS is largely based off the economic cost being less than a carbon tax. This is because the firms & countries would face a lower marginal cost of GHG abatement and would have a large financial incentive to abate emissions. This results not only in another opportunity for a firm or country to profit, but also further drives technological development and prepare their respective organisations for a changing economy (I.e. electric cars).

2.2. The commodification of nature

The commodification of nature is a theoretical position that relies strongly on a Polanyian understanding of the production of fictitious commodities and markets. The reason for this is because of Polanyi's argument that markets exist due to the motivation of exchange, which

requires strong institutions in order to allow for the functioning of a market that trades a commodity. Polanyi also argues that this marketism moves to create a commodity out of something that doesn't exist in order for property rights, trade, capital formation, and division of labour to occur. This section discusses the commodification of nature in as far as the theoretical position being central to the motives behind market based environmental solutions. As Polanyi argues, a market can only exist if there is a tradable commodity which in this case is the commodification of nature. This commodification and recommodification set the table for the primary issue at hand with the commodification of nature in the context of carbon markets

Bond (2006) references the publishing of Gilbertson's *et al* (2009) "*Carbon trading"* in which Lohmann (2005) speaks about a genuine cut in emissions and the associated extraction of non-renewable resources. Lohmann (2005) argues that humans have commodified almost everything in nature, from the ground to the animals and humans that use and work the land. The industrial revolution had to ensure a transformation of a natural or human element into a "resource" – a commodity (Gilbertson *et al,* 2009). However, Bond (2006) and Gilbertson *et al* (2009) argue that carbon trading goes full circle in that manages to ensure the commodification of everything… by commodifying the air itself.

The commodification of nature is broadly defined to be a theoretical perspective within a critical study of the environment that is concerned with how natural resources (ecosystem services) are being turned into a commodity through the powers of the market (Bond, 2004; Cock, 2007; 2014). This process of turning ecosystem services into commodities through the market currently takes place under the veil of neoliberalism. It also rests on the assumption states new technological processes and macroeconomic circumstances will solve issues of previous market mechanisms entrenched in previous developmental models. However, if one ascribes the notion that the market and new technological mechanisms are commodifying nature then one would, in the same vein, be entirely skeptical of the manner in which emissions trading systems are being implemented across the globe, especially in the European context.

Academics such as Patrick Bond (2004; 2006, 2012) and Jacklyn Cock (2014) tend to support the engagement in debates surrounding the commodification of nature as a theoretical

framework. Bond (2006) & Cock (2012; 2014) favour a Marxist political ecologist approach (Bond, 2004; Cock, 2012; 2014; Osborne, 2015). This is due to their approach fundamentally engaging with power relations and social justice; key concepts in these approaches speak to the commodification of nature. Bond & Cock as well as other political economists such as Newell & Mulvaney (2013) argue that cap-and-trade is allowing for the cannibalisation of ecosystem services through markets (Lipman, 2013; Newell & Mulvaney, 2013). Academics (Brockington; 2012; Goulder, 2013) who support the implementation of new forms of technology in the guise of neoliberalism may seem to favour the market in order to support an elite cohort where the division of resources within society is further entrenched into a hegemonic ideal. However, Brockington (2012) and Goulder (2013) would argue that one must be quite the cynic to analyse modern-day neoliberalism as a 'depressive complicity' in this sense. They would argue that the commodification of nature is done through the inclusive means of modern capitalism and entrepreneurialism that is taking place the world over in the fourth industrial revolution (Callon, 2005, 2009; Brockington, 2012; Goulder, 2013; UBS, 2016).

The commodification of nature is an important theoretical perspective when analysing cap-and-trade. The healthy scepticism entrenched in the commodification of nature as a theoretical framework helps in an understanding the fictitious carbon commodity. All income must be derived from the sale of something, or an exchange of sorts. Markets don't just exist, they are stimulated and born in order to achieve the model of exchange and economic system which predominates within social systems (Polanyi, 1957). Markets are based on the motive of exchange. This motive is what fundamentally drives the EU ETS. The exchange is derived off the creation of a commodity to be used as an income generator, economic stimulant, technology driver and further of contemporary power relations.

Wang and Chen (2010) argue that emissions trading in the global marketplace has been characterised by the private public partnerships (PPPs) allowing for the implementation of renewable energies. These PPPs entrenched in contemporary power relations employ a more market-based mechanism for the implementation of the carbon allowances trading (Stern, 2007; Callon, 2009). Osborne (2015) challenges this as the correct way of implementing such a critical strategy to fixing the world's emissions conundrum. This is because power relations in cap-and-

trade market-based approaches to solving issues in emissions fundamentally create disempowerment. The disempowerment of ownership and access to the fictitious carbon commodity of emissions trading as well as the exclusions of the local communities' ability to interact with this kind of market-based approach (Cock 2012; 2014; Osborne, 2015).

This approach allows for a critical investigation into the role that resource exploitive industries have on social and ecological facets of a country (Bachram, 2004; Harvey, 2007). Harvey (2007) deliberates the commodification of nature in questioning how one would put a price on resources and economic growth from multinational corporations instead of on social justice and equitable access to a healthy environment. Cock (2007) establishes grounds on which to assimilate private companies and their unsustainable, unjust and unethical methods of accessible power relations and actor networks to that of colonial hegemony. Cock (2007) is critical of using markets in terms of its actor-networks that ensure the linkages of corporations with political interest. In light of this, Harvey (2007) argues that the further proliferation of markets used in the neoliberal project will aid in increasing harmful environmental degradation unless integrated power relations and policy protocols are put in place (Harvey, 2007). This essentially speaks to the changing of production and consumption patterns in the global economic marketplace in order to allow for renewable energy to be implemented in accordance with the roles entrenched in many energy policies globally or to implement demand-side measures to limit the energy requirement of global economies.

The commodification of nature as a theoretical approach effectively engages with debates around how knowledge is disseminated into policy and legislation (Keeley & Scoones, 2014). This is due to aspects such as the payment for ecosystem services (PES) being a fundamental aspect the Kyoto Protocol and Montreal Protocol (Keeley & Scoones, 2014; Tacconi, 2012). PES (essentially the commodification of ecosystem services) as argued by Gómez-Baggethun *et al* (2010) as well as Osborne (2013) is marginalising already marginalised members of the global South through neoliberal regimes that are 'green grabbing'- legitimising land dispossession from a green perspective (Osborne, 2013). This neoliberal market process of using the market to create commodities and ownership out of everything is the fundamental problem for Osborne (2015). The commodification of nature as a theoretical approach illustrates the importance of the relation

of ownership (political or private) and communities' access to land. Market-based carbon abatement mechanisms such as carbon storage and sequestration (planting trees etc.) as well as land to set up large-scale renewable energy infrastructure re-commoditises land and further disposes ownership (Kosoy & Corbera, 2010). This supports the notion that access to property and the determination of power is deeply entrenched in policy and legislation, which is implemented through institutional mandates in key sectors such as emissions trading (Newell, Pizer & Raimi 2013; Ellerman, Convery & de Perthius, 2010; Osborne, 2015; Bond, 2012).

Newell, Pizer & Raimi, (2013) argue that there has been increasing pressure on institutions involved in global economics to increase their influence and momentum behind the growth of carbon trading mechanisms (Newell, Pizer & Raimi, 2013). This growth in intuitional influence has seen the number of carbon pricing instruments increase from 20 to over 38 since January of 2012 (World Bank, 2015). Previous work in relation to China and their respective ETS has noted that the implementation of the ETS's have created major structural reforms in global developmental patterns, especially those in the developing world (Wang & Chen, 2010; Wang, 2010).

2.3. Theorization of markets

Markets and social embeddedness thrive off the commodification of various aspects of the natural and societal world in which we live. Whether the commodity is labour or the environment, a resource is valued and then regularised through the rules and processes of institutions set up by society for the purposes of economic gain. The theories of markets and the stakeholders who have influence over them are relevant to this study insofar as the theory of market providing rich conceptual frameworks in understanding market behaviours, amendments and direction. This form of a theoretical approach helps one better contextualise their data (Varman & Costa, 2008). This section has a strong focus on the writing of Polanyi (1957), with strong focuses on what neoliberal markets relied on, as well as an intricate look at the aspects that define a markets construction.

Writing within his historical context, Polanyi argues the following; markets do not exist outside the regularized rules and processes of institutions (Polanyi, 1957). These specific

institutional forms allow for the construction of markets within a certain theoretical framework. Polanyi (1957) argued that 20th century civilization and consequently markets are based upon four fundamental pillars, namely:

b) The self-regulating market

The market depends on trade, and trade depended on an international monetary system, which cannot function in civil unrest. Polanyi (1957: 3) then argues that the self-regulating market "could not exist for any length of time without annihilating the human and natural subsistence of society". Polanyi is clear in the argument that there is no such thing as a self-regulating market, as the market depends on state action to ensure its existence and functioning. To this day state regulation merely provides the framework in which an economy functions, and remains a key element of the top down nature of markets like the EU ETS (Machado, 2011)

c) The international gold standard

The international gold standard was a measure of a unit of value used in monetary systems that was based on a fixed amount of gold per unit. In essence, the value of exchange, regardless of currency is based on gold (an external value separable from the value of the FIAT currency). This measure of value was fundamental to the world's economy in the 19th century because it gave currencies value through the intrinsic value held in certain amount of gold. This gold standard allowed for an easier methodology of trading because market actors agreed on the same unit of value. With economic systems like the EU ETS and cryptocurrencies, for example, there is no linking of any intrinsic value. The value ascribed to EUAs and cryptocurrencies is largely only based on supply vs demand. Polanyi (1957) argues that the gold standard not only held a significant economic role, but also a strong political and social role. Polanyi argues that the abandonment of the gold standard is one of the key elements in the turning point away from the liberal state (Machado, 2011; Polanyi, 1957).

d) The balance of power system

The balance of power system was created in order to serve international peace. This peace is dependent on the embeddedness of an economy. This means that an economy is dependent on social relations, and the idea of the economy and society cannot be subdivided. Peace and international cooperation are dependent on political, social and economic factors that are fundamental drivers of international economies like the Eurozone and the EU ETS (Machado, 2011; Polanyi, 1957).

e) The liberal state

Polanyi argues that the liberal state is a political economic environment that would allow for the peaceful flow of capital and trade is crucial to the neoliberal project. This liberal state is not dependent on the concept of embeddedness, but rather on the influence of the state and the imposed regulation meant to control a market. During the 90's and 00's, the liberal state was implemented through pushing the further free market reforms like relaxing state control and allowing for new markets to be created (i.e. commodities boom[5]). However, the necessity for state control over the free market has proved key and cannot be overlooked in the theory of a market's functioning. Polanyi's assertion that the regularized processes of institutions and the embeddedness of society, economy and politics are fundamental in the governing of effective markets (Machado, 2011; Polanyi, 1957).

Although the context has changed in the past few decades the aspects that Polanyi (1957) identifies remain constant. The self-regulating market and a common medium of exchange (the Dollar) still define models of economic growth that have yet to be replicated. Peace and sufficient market collaboration still remain central to a healthy flow of capital to support projects around the world (regardless of their carbon intensity). The liberal state remains central to the world in which we live; albeit in different forms as modern democracy and technology become more egalitarian in their application (Ozkazanc & Clark Muntean, 2018).

[5] The 2000s commodities boom or the 'commodities super cycle was the rise, and fall, of many physical commodity prices (oil, metals, chemicals, fuels etc) during the early 21st century (2000–2014), following the Great Commodities Depression of the 1980s and 1990s.

2.3.1. What is a market?

According to Polanyi, proponents of a market economy believe that ,"a market economy is an economic system controlled, regulated, and directed by markets alone' and all transactions and exchange that functions within a market is left to the self-regulating mechanism' (Polanyi, 1957). Polanyi is clear that the idea of a self-regulating market is a myth. One of Polanyi's key contributions is to argue that the self-regulation that controls the operations of a market economy demands "nothing less than the institutional separation of society into an economic and political sphere" (Polanyi, 1994: 71). Markets are based on the motive of exchange, a motive which in itself created the institution of '*markets'* (Polanyi, 1957). Polanyi (1957) argues that society, the institution that enabled exchange is adjunct to the market where the two are inextricably linked. So much so that Polanyi (1957) goes further in stating that an economy functions due to the social relations embedded within the mechanisms of a market namely, exchange, gain, profit, and division of labour (Polanyi 1957).

Polanyi (1957: 57) states that "…a market economy can function only in a market society". This is an important statement when investigating the understanding of markets and their role in society and institutions. This is because markets are only created by societies on the basis of exchange. To the extent where isolated self-regulating markets are created in order to function within the broader market economy. Polanyi does argue however that the creation and transformation of isolated markets was not a 'natural outcome of the dispersion of markets' and rather a highly artificial series of social factors which were applied to meet a situation created by another socially constructed (artificial) phenomenon of the industrial revolution.

2.3.2. Markets – an Institutionalist perspective

Callon (1998a; 1998b; 1999; 2005) and Mitchell (2002) provide further critiques of markets in as far as the creation of the commodity and how the market operates. According to Callon (1999), markets require labour and an ongoing process of institutional intervention to create a commodity that can be traded. Callon (1999) argues that it is essentially ownership that is the issue. He further argues that markets have many different guises and that the direct operational behaviour of markets

is up to societal decisions about how the market should operate (Callon 1998a; 1998b; 1999). Essentially Callon argues that there are no fixed market laws and as a result society can dictate the markets operation (Callon & Muniesa, 2005). This directly contradict the Polanyian understanding of markets being underpinned by four fundamental pillars.

Callon (1998a; 1998b; 1999) argues that "economics does not describe an existing external 'economy' but brings that economy into being: economics performs the economy, creating the phenomena it describes" (Cochoy *et al*, 2010; MacKenzie & Millo, 2003: 108). Callon (1999) argues that economics allows for the creation of a new market and dictates the institutions to be set up in order to allow that market to function. These institutions fundamentally include monetary institutions as well as those set up to enable trade (Lohmann, 2003). Monetary institutions function due to a set number of economic beliefs about FIAT money which in turn control FIAT monetary institutions. Thus, swaying FIAT politics to fuel a self-fulfilling cycle. Lohmann (2003) defines a fiat institution as an institution whose credibility derives from a political cost. The political cost can often be constraining of policy which, as Lohmann argues, is an inherent trait of an institution. Lohmann (2003) writes in her paper "Why Institutions Matter" that politics enables the institutions at the time, where the prevailing economic theory allows for a market to be created.

2.3.3. Markets have to be created

All income must be derived from the sale of something, or an exchange of sorts. Polanyi (1957: 41) states that "the most startling peculiarity of the [market] system lies in the fact that, once it is established, it must be allowed to function without outside interference". Markets don't just exist, they are stimulated and born in order to achieve the model of exchange and economic system which predominates within social systems. Markets and private property illustrate that, (1) an isolated market would become most developed when under a system of mercantilism, (2) in as much as markets of distribution instead of exchange would predominate in a social system that saw collectivism as its primary economic system (Polanyi, 1957).

Mercantilism allowed for stronger support of the factors of production by government. This support by government took place via market methodologies like establishing a tax-free status as well as government bonds backing certain industries which often lead to the establishment of monopolies (Magnusson, 2019). The primary objective of mercantilism however was to support countries so that capital, labour and taxes are kept within sovereign control (Bresser-Pereira, 2018). In return, businesses funnel the riches from foreign expansion back to their governments. These taxes pay for increase national growth and sovereign political power (Hazlittz, 1964). Markets require for there to be an economic subject for there to be security and incentive for the producer and trader of a commodity (Hazlittz, 1964).

Institutions that are required to support the development of a market and ensure its development of economic activity rely on the following:

1) Property
    a. Property rights are essential with regards to the creation of incentives for production to transpire. This is central to Hazlittz's argument of private property and free markets (Hazlittz, 1964: 303).

    b. This creation of 'property' or the commodification of the global commons[6] is the largest and most fundamental issue with the EU ETS and carbon trading for critics of the creation of carbon markets. The reason for this is premised off the argument that air shouldn't be owned or privatised.

    c. Cap-and-trade is startling in how it functions within a free market yet manages to completely ignore the need for a sale in a physical commodity and the principles on which most markets function upon (Lohmann, 2005; Bond, 2009).

[6] International environmental law identifies four global commons, namely the High Seas, the Atmosphere, Antarctica and Outer Space & refers to resource domains or areas that lie outside of the political reach of any one nation State.

2) Free exchange
    a. This institution is also the basis of the market economy and is heavily predicated on the institution of property rights. Freedom of exchange allows for the exchange of property for other property or for money. Hazlittz (1964) argues that this is necessary in a market economy as it enables further production and consumption.

    b. Carbon markets are fundamentally based on this freedom to exchange the right to emit on the open market (Ellerman, 2010; Hazlittz, 1964). The problem with this is that this exchange doesn't enable further production or exchange, rather a preservation of business as usual emissions (Bond, 2009)

3) Competition
    a. There is no competition in the EU ETS because it uses political fiat and institutions to allow the market to function (Polanyi, 1957). Carbon markets function wholly on the condition of exchange of the same commodity between institutions (Hazlittz, 1964). This has no value add from the institutions themselves. Rather, an inherent financial incentivisation of global commons property rights and emissions preservation through the trade of emissions allowances.

4) Division of labour
    a. There is no labour element in carbon trading, rather a set of institutions supported by their own work force. These institutions determine the operations of the EU ETS and are divisible by only their mandate in supporting the ETS's functioning.

5) Social cooperation
    a. Peace in the EU is critical to ensuring stability in the functioning of the EU ETS as an economic mechanism.

"Political economists share with orthodox scholars an understanding of the market as a powerful and all-encompassing force". There remains one key difference according to Berndt & Boeckler (2009), and that is that notions of the market and concrete markets are distinct in the eyes of

neoclassical economics, but somewhat muddied by the Marxist political economist (Berndt & Boeckler, 2009; Berger, 2008). Callon (2009) believes that markets act as a function through which incentive is used to find solutions; solutions which directs efforts to meeting green economic goals (Brockington, 2012; Sathaye *et al*, 2011).

2.3.4. A new market direction - The green economy

The green economy is a "sustainable development path based on addressing the interdependence between economic growth, social protection and natural ecosystems" (Green Accord, 2011). Callon (2009) argues in the favour of the power of markets as a reproductive agent that is continually undergoing processes of dynamism and experimentation – a premise of the green economy (Brockington, 2012; Callon, 2009). South Africa's Green Accord's definition of the 'green economy' essentially conforms to Callon's (2009) arguments of the market as a reproductive agent as well. The reproductivity of the green economy lies in terms of a state of economic transition from an economy that is fossil fuel based and exploitive of natural resources, to one that reduces environmental and social risks, implements social justice, as well as sustainable development. Brockington (2012) goes further and argues that this could be accomplished through changing the ways in which economic modelling is conducted to counter the effects of anthropogenic climate change (Bond, 2012; Brockington, 2012; UNEP, 2011).

Sectors such as renewable energy and green economic practices like carbon trading illustrate opposing views that capitalism requires the notion that nature is just a resource and one that can be seen as a 'dumping ground' (Cock, 2014). Cock (2014) on the other hand is rather sceptical of the green economy and suggests that a green economy is essentially neoliberalism that has captured the green agenda. Cock (2014) argues that the green economy is trying to deceive society into solving issues caused by capital accumulation and free-markets, through the very same process, under the Trojan Horse of sustainability (Cock, 2014; Goodman & Salleh, 2013). Cock (2014) and other sceptics of the green economy argue that developmental models as followed in the past cannot be sustained in efforts to create a sustainable economy with an inclusion of social and environmental justice (Adams & Jeanrenaud, 2008; Bond, 2012; Brockington, 2012; Cock, 2014). Adams & Jeanrenaud, (2008: 19) state this in no uncertain terms; "… We face a future to

which the past is at best a poor guide" (Brockington, 2012). A green economy focuses discourse and implementation on strong sustainability models whereby economic growth and resource sustainability are mutually inclusive elements functioning in a strong societal and institutional context (Brockington, 2012; Hallegatte *et al*, 2011). Emissions trading is argued to operate within a green economic state by Newell *et al* (2013). Newell *et al* (2013) also argues that emissions trading is a fundamental part of developmental targets and regimes in a strong model of sustainability such as the Millennium Development Goals (MDG).

Newell *et al* (2013) maintain that a green economic state needs to be implemented at a rate that would ensure irreversible damage to the environment being mitigated through the implementation of clean technologies such as renewable energy. This fits in line with Brockington's (2012) argument with regards to the green economy in as far as green growth allows for jobs to be created, environment impacts to be minimised, and fundamentally negates the notion that economic growth and environmental degradation have a direct relationship (Brockington, 2012; Hallegatte, 2011). This developmental relationship within the green economy describes the salient nexus between development and environmental usage. The developmental relationship is also indicative of how the use of disruptive technology in the context of a green economy can use the environmental through its amenity value instead of its extractive value (O' Connor, 1988). This developmental nexus is met through sustainable emissions policy and legislation. As Brockington (2012) suggests, a green economy can only be created through an enabling environment in policy, legislation and institutional capacity in terms of markets in order to facilitate sectoral growth in developing business cases such as small-scale independent power producers (IPPs).

Brockington (2012: 412) argues that, "… a transition to a green economy through public spending and policy and pricing reforms would revitalize economies, create jobs and ensure that the global economy addresses poverty and does not destroy natural capital." The green economy is considered to be a necessary end-goal for the many developed countries due to massive amounts of 'green jobs', skills and entrepreneurialism that arise out of the establishment and support of a green economic transition (O' Connor, 1988). On the one hand, there are green economic policies that support renewables and 'cleantech' in the Europe (Pegels, 2013). On the other hand, institutional implementation and supra-authoritative policies from the likes of the World Bank and

EU can only add to the bureaucratic complexities (Newell, Pizer & Raimi 2013; Ellerman, Convery & de Perthius, 2010). This overlap of policies is especially evident in Europe and within the European emission trading sphere. However, the implementation of the EU ETS as a green economic process suggests that the EU supports the commodification of nature for an economic and social benefit.

2.4. Views on carbon markets

There's a very polarized debate on whether carbon markets and in particular an ETS helps in climate change mitigation through carbon abatement. Economists and political economists alike are divided as to whether an ETS can function in the real world (Bond, 2012). A key aspect of the debate relates to the problems that markets mechanisms have created through the creation of carbon as a commodity.

2.4.1. Proponents

Proponents of carbon markets primarily focus their arguments on the three pillars of sustainability, namely, economic & social growth and environmental protection (Lorek & Fuchs, 2013). The global support for an economic growth model that supports environmental protection came to fruition with the Kyoto Protocol which underpinned and empowered financial models that should, in theory, ensure a net carbon emissions reduction (Ellerman & Buchner, 2007). This financial modelling is underpinned by GHG cap setting, allocation, offsetting and trading methodology that aims to, inter alia, significantly reduce emissions performance gaps[7] (Ellerman & Joskow, 2008).

For example, Fan *et al* (2017) explains that "[A] cap event directly impacts the supply level of allowances. Generally speaking, boosting the cap means that there is an increase in the supply of allowances, and carbon prices would be expected to decrease; tightening the cap means that there is a decrease in the supply of allowances, which has an underlying impact of pushing

[7] The performance gap is a term commonly used to denote the disparity that is found between the energy use predicted in policy mechanisms and actual carbon emissions.

carbon prices" (Fan *et al*, 2017: 147). This is fundamental to the ETS directive, and effectual in the green economy (Brockington, 2012; Fan *et* al, 2017).

The EU ETS directive (2003) states the function of the EU ETS is to "promote reductions of greenhouse gas emissions in a cost-effective and economically efficient way". This would be done through a price on carbon at a level where the cost of abatement and investments into clean technology is more cost effective than buying allowances over and above the carbon cap that was allocated by the EU Commission (Goulder, 2013; Lohmann, 2010).

According to Ellerman (2010), the nature of cap-and-trade is founded on environmental accounting that is significantly more visible to decision/policy-makers (Lohmann, 2009). This is done by classifying environmental issues in terms of a "quantifiable relationship with commodities" or as economic objectives in themselves (Lohmann, 2009: 500). Lohmann (2009) states that "environmental accounting helps transform environmental objects into commercial 'goods and services' whose value can be 'discovered; in markets themselves. Trade itself becomes comparative valuation and environmentalist action" (Lohmann, 2009: 500; Sunstein, 2005, 129). (Lohmann is by no means a proponent of cap-and-trade, but Lohmann's explanation of a cap-and-trade is easily understood in this context).

Proponents have a fundamental assumption about cap-and-trade in the green economy. This assumption is that the total emissions cap will be met by member states so long as there is a reasonable enforcement mechanism to discourage over-emitting (Burtraw *et al*, 2010; Chameides, 2007; Lohmann, 2010; Newell *et al*, 2013). Chameides (2007) argues in favour of a cap-and-trade based on the fundamentals of a market economy. He argues that an ETS will do a better job of developing new technologies, as opposed to a carbon tax. The reason for this lies wholly in that and ETS provides an incentivised platform for companies as opposed to a restrictive based policy. (Chameides, 2007; Newbery, 2016).

An ETS policy has been favoured by policy makers in the EU based off the efficiency that is associated with the 'trade' in order to make profits (Yale, 2008). Yale (2008) argues this with reference to environmental economics that shows that a cap-and-trade system creates a more

cost-effective business environment than one in which a carbon tax is involved. The basis for this argument is extracted from Montgomery's (1972) paper as well as Tietenberg (1985) whose argument relies in the cost of carbon abatement in a tax versus an ETS. Yale (2008), using Montegomery (1972) and Tietenberg (1985), argues that the cost of carbon abatement for a company in an ETS is around 6 times cheaper than the cost of carbon abatement via a carbon tax.

Secondarily to the reduced cost of carbon abatement, the flexibility of a cap-and-trade system is also noted as a significant advantage as opposed to a carbon tax. Tietenberg (1985) is a proponent of this argument. In order to meet carbon emissions targets, there needs to be a "demand-reduction of emissions-intensive products, energy efficiency, avoiding deforestation and new low carbon technology, and insisted that carbon trading has a key role" (Bond *et al*, 2009: 18). The EU ETS is argued to function as one flexible policy mechanism as defined under Article 17 of the Kyoto Protocol. This article takes various issues into account including greenhouse gases as externalities during the cap-and-trade implementation in Europe. GHGs are negative externalities in economic theory. A negative externality is usually a cost or a negative effect that can be passed onto a third party; in this case the environment. The reason why GHG's are negative externalities to the environment is because pollution and carbon emissions create a cost for those who are outside of the direction production and consumption of fossil fuels (i.e. global warming) (Colman & Päster, 2009). Ackerman & Stewart (1985) argue that there are two key models in which you can quantify and price an externality (GHGs in this case): either through a mechanism of command-and-control through political fiat (i.e. a carbon tax), or through a market-based mechanism/policy (EU ETS) (Ackerman & Stewart, 1985; Tietenberg, 1985).

Proponents of a market-based policy are fervent about the problems with carbon taxing, even though many of these proponents regard a tax to be a simpler mechanism for reducing GHG emissions. Proponents to market-based policies argue that taxes don't allow for flexibility in terms of reducing their emissions. Essentially, taxes are used as a tool that broadly forgets that different installations and firms have different compliance options, with different associated cost implications. This is uncompetitive and can lead to further exclusion of SMEs and a developing sector of an economy. This market incentive also allows for the introduction of incentives for polluters that innovate their production / supply chain processes (Coase, 1990). These incentives

not only fuel investment in better technology but also allow for an injection of capital into a project to reduce carbon abatement costs for a firm.

2.4.2. Critics of emissions trading

Critics (Bond 2009; Callon, 1999; 2005; Cock, 2007, Lohmann, 2009) of emissions trading have an issue with the matter of a commodity being created in as far as having the right to pollute in the global atmospheric commons. The critique of emissions trading primarily falls under the institutional pillar of property rights as transacted upon under a market mechanism (Bond, 2006; 2009; 2012; Lohmann 2009). This issue is based upon who controls, and in turn benefits from the right to pollute. Academics like Patrick Bond (2009; 2012) believe that there is an intrinsic irony in that those entities who have a "legacy of emissions" are the same entities that financially benefit from emitting pollution, albeit less than in a business as usual scenario.

Bond (2009; 2012) relies strongly on the arguments created by Larry Lohmann (2006) in this regard. Bond (2009) references that ETS issues are largely centred around the allocation and distribution of carbon allowances to the biggest polluters based on historic emissions. Bond (2009) paraphrases and sums this up by stating that "the distribution of carbon allowances (a prerequisite for trading) to the biggest polluters presupposes "*one of the largest and most regressive schemes for creating property rights in history*". David Harvey (2003) also argues this fundamental notion and describes carbon trading as the new carbon colonialism that achieves "accumulation through dispossession". Harvey (2009) explains accumulation by dispossession through the idea of the spacio-temporal fix. The spacio-temporal fix argues that overaccumulation of capital is absorbed through the processes of investment in long-term capital projects that extent the amount of time before that over accumulated capital can be reinjected into circulation, as well as spatial displacements through the creation of new markets which trade on new or fictitious commodities, once again perpetuating overaccumulation due to market processes (Harvey, 2009). This creates a strong base for the production and consumption of a commodity that relies on financial and state institutional support to prop up and support a market functioning (Harvey, 2009: 65; Polanyi, 1975).

Another contestation of an ETS is that even under its own momentum, the market seems to continually fail despite its very short lifespan (Gilbertson, Reyes & Lohmann, 2009). This is not only in terms of the allocation, distribution and exchange of carbon allowances, but also the implementation of 'clean development mechanisms'. These CDMs allow for investment into carbon clean projects by entities with the historic track record of pollution (planting trees etc). As Bond *et al* (2009) state "you cannot reasonably claim to have swapped the carbon stored in coal or oil for carbon absorbed by trees". Carbon offsets create the illusions that entities and governments can continue polluting by allowing nature to resolve our own environmental developmental complacency. Not only does Bond (2012) argue that carbon offsets allow the continuation of pollution, but also give countries and companies very small reduction targets (Bond, 2006; 2009; 2012).

A key issue in emissions trading is that of the main polluters and governments trading in a market and enhancing the market power of pollution generating industry (Bond, 2012). Traditional polluters are the main winners in an emissions trading system, not only financially but also in promoting their business as usual model. According to Wang & Chen (2010), carbon market mechanisms do not in themselves reduce global emissions. Rather, they act as an 'offset mechanism allowing polluters with a greenhouse gas reduction obligation to invest in projects or buy (at a market related expense) carbons credits that reduce emissions in developing countries' (Wang & Chen 2010, pg. 1990).

The primary beneficiaries of ETS's however are the hedge funds, finance houses and energy traders due to them acting on the fundamentals of exchange without any goods or service being added to the value chain (Bond, 2009; Lohmann, 2006). Bond (2009) & Ellerman (2010) argue that carbon markets essentially cap the amount of carbon that polluters will be entitled to emit. However, as Ellerman (2010) states, the EU Commission and the respective ETS policy directives cannot fix the price at which carbon allowances are traded. Bond (2009) argues that this is an issue insofar as carbon price volatility could cross markets and disrupt broader economic functioning. Bond states that "taxes create needed certainty about prices, while markets in emissions quotes create unnecessary certainty about the short-term quantity of emissions" (Bond, 2009: 15).

Bond (2011; 2012) argues instead for a carbon tax but argued from a point of view that would favour market functioning and investment certainty. Bond's (2009) reasoning is simple in that a tax creates certainty in knowing what the cost of emissions will be for an entity, and what investors would then have to factor into their calculations for long-term investments (Bond, 2009: 15). Bond (2011: 699) believes that there needs to be efforts to "strengthen national environmental regulatory agencies" in a manner that restricts polluters instead of encouraging them to emit. Gar Lipow (2006) – A critic of emissions trading is congruent with Bond's (2009) sentiment towards emissions trading and argues that an emissions tax is as inefficient of a mechanism as an ETS in terms of reducing carbon emissions (Bond, 2009). In economic terms, fossil fuels as a commodity in a market economy are extremely price inelastic due to our economies being so dependent on the commodity.

Critics also critique the fact that a market-based mechanism isn't inclusionary in nature, and that there are no mandate/requirements for firms to take any specific action in reducing their emissions. Critics also argue that there is no specified manner of carbon emissions reductions that should be carried out, as long as their gross emissions are reducing.

In the book "The Economics of Welfare" written by English Economist, Arthur Cecil Pigou in 1920, Pigou introduced the concept of externality. This concept essentially argued that externality problems (a concept critical to environmental economics) could be somewhat corrected through the implementation of a tax (Pigouvian tax). Pigouvian tax is the theoretical underpinnings for the implementation of carbon taxes and creates a number of fundamental value adds such as social and economic benefits (Aldrich, 2019). However, according to Bond (2012), the green economy tends to overlook issues that are structurally entrenched in the 'market' insofar as issues in power relations and capital accumulation being central to cap-and-trade.

2.5. Conceptual framework

The conceptual framework focuses on Polanyi's analysis of the production of markets and commodification of nature. A market and its commodity are dependent on one another and is

therefore critical to fully understand the EU ETS. Studying emissions trading in the context of the role of the institutional make-up, market function and its problems requires one to understand how a commodity functions within a market. As such a Polanyian understanding of markets, and understanding the nexus of the tradable commodity that functions within the market is critical to understanding emissions trading. These have been discussed in detail above. These frameworks are of critical importance because understanding environmental markets are a real and necessary requirement in the quest for sustainable development in the fourth industrial revolution (UBS, 2016; Yuen, 2014). Proponents of emissions trading argue that it meets the needs of the present (allowing society to change its' production patterns without changing patterns of economic growth) whilst ensuring that future generation has the environment, society and economy kept in trust in order to meet their own needs (Brockington, 2012; UBS, 2016). Those in opposition to carbon markets argue that emissions trading is another methodology implemented by markets in the goal of further capital accumulation at the cost of the environment. In moving away from a silo approach of analysis of emissions trading, a more systematic approach needs to be adopted, especially in studying the context how a relatively new market functions (Keeley & Scoones, 2014).

2.6. Conclusion

This chapter presented two primary bodies of literature relevant to the study of EU-ETS: The theory of markets and the commodification of nature. The theoretical framework for the project combines a Polanyian understanding of markets and more recent work on the commodification of nature. This chapter also explored the various proponents of carbon markets, as well as those who oppose carbon markets. Chapter Three discusses the methodology employed to conduct the study.

3. Methodology

3.1. Introduction

In this chapter I explore the concept of methodology and what methodology was used to gather, qualify and analyse data to investigate my research goals. In this section I reflect on how my methodology helped to further explore my research objectives and questions, as well as the inherent limitations in my chosen methodology.

Methodology is the way in which a study will be designed, sampled, have data collected and then analysed in an effort to fully investigate the proposed academic aim, questions and hypothesis (Burns & Grove, 1997). In this thesis, I employed a documentary analysis of secondary data. This research approach involved the re-use of pre-existing qualitative data derived from previous research studies (Heaton, 2008: 34). Heaton (2008) argues that a secondary analysis is a useful methodology in as far as investigating new or additional research questions, or as a tool to verify previous research.

The tools used in the methodological process for gathering information towards answering the research objective were key to this study. Only previously published literature was used to effectively work towards the research objective (Bless & Higson-Smith, 2000; Burns & Grove, 1997). The research design and corresponding methodology was proposed to address the problem statement of the research, as well as to attain a broader understanding of the theoretical underpinnings of the EU ETS. This methodology was focused through a documentary analysis of previous studies and other literature as discussed further in the methodology.

3.2. Relevance to research aims and objectives

This methodology works in conjunction with the research objective because of the qualitative nature of the objectives. The documentary analysis was the best form of research due to the broad and almost all-encompassing types of literature on the EU ETS. The methodology employed in

the study served as an effective tool in investigating all the various debates around the forging of markets, as well as the broader dynamics of the EU ETS. This was analysed at a granular level in many policy documents published by the EU. Considering this, the research was designed around the collection, rapid appraisal and thematic analysis of the literature that pertains to the EU ETS.

3.3. Research design

This research was designed in terms of a systematic process of qualitative documentary analysis. I followed Heaton (2008) in outlining the methodology in terms of a supplementary analysis of published literature. This allowed me to position the study so that I could complete a more in-depth study of the emergent issues in carbon trading and EU ETS literature. Similar to a supra analysis, this form of methodology helped me to transcend issues identified in the primary published literature.

3.3.1. Scope of the study

The scope of the research was defined by the evolution of the EU ETS across its four phases. Phase one took place from 2005 to 2007, followed by phase two that started in 2008 and ended in 2012. These two phases defined the beginning of the EU ETS and many of the learnings in the EU ETS. Phase three started in 2013 and is set to end in 2020. Phase four is set to start immediately after phase three ends and end a decade later. The scope of this study into EU ETS is relevant in terms of analysing the global requirement to find a pragmatic solution to the global problem of anthropogenic climate change. This study did not look at any secondary quantitative data from the success/failure of the EU ETS, but rather the sentiment from actors involves in the EU ETS as well as external agents who have insight into the emissions trading and their functioning.

3.3.2. Sampling procedure

This desk study was conducted through the collection of previous studies, reports and data through desk research. This form of sampling depends on information already collected by others in the

field of research (agencies, institutions, researchers or individuals) (Babbie & Mouton, 2007; Welman *et al*, 2005). This literature formed an integral part of the literature review and was sourced through a network of people who aided in my study, including supervisors and mentors. Literature was also sourced from published annual reports, university and government publication, the internet, as well as other academically dependable sources (Babbie & Mouton, 2007; Field, 2009). Due to the research being completed in South Africa, most of the data collected was via the internet from countries including Germany, United Kingdom, China, and the greater European Union.

3.3.3. Data collection tools

A documentary analysis was carried out in order to have the work of others used as a proxy to prove or disprove the study (Beebe, 1995). The documentary analysis has been carried out in terms of a systematic review of the literature that discuss carbon markets. The documents looked at policies, previously conducted research, desktop studies, legislation, white papers, as well as institutional reports (CFA Society, EU Commission, World Bank). Referenced papers were used to extract further information pertaining to the research objectives and research question (Beebe, 1995). The different pieces of literature were systematically gathered by looking at factors such as the title, abstract and well as geographic constraints of each piece of literature in order to ensure that the documents collected are as congruent with my research question and objectives as possible.

The internet has been the primary source of documents for this research. All academic literature, policy documents, investment proposals and other emissions trading literature has been sourced via the internet and more specifically, Google and Google Scholar. More documents were collected as each paper referenced another person's work, which was extremely useful in gathering more information from a variety of theoretical perspectives. The research was done in order to discern the theoretical underpinnings of the EU ETS and then drawing on theory of markets, Polanyi in particular, and commodification of nature to interrogate the EU ETS. Specific authors have been taken into account in this regard, specifically those whose work explore the formation of markets (Bond, 2005; Bachram, 2004; Christophers, 2014, 2015; Harvey, 2005; Newell, *et al*, 2013; Polanyi, 1957; Vidal & Peck, 2012). These secondary documents were collected through

established contacts in the university and in my professional circles (Lipsey & Wilson, 2001). Professional actor networks from people acting in a supervisory role to this study were invaluable in terms of directing the collection of relevant literature.

3.4. Data analysis

Key data fields and proxy data fields were identified in previously published literature which allowed for themes to be identified for further analysis. A few key steps were implemented in the acquisition of literature. Firstly, the rapid appraisal of literature was done by identifying key words.

3.4.1. Rapid appraisal

Rapid appraisal is an approach in qualitative research methodologies that allows the researcher to draw on multiple methods to systematically collect data relating to the research in a short period of time (Beebe, 1995). This methodology functioned by assessing certain criteria of the literature sources via the assessment of topic, sector, publication, author, location of the study as well as topic or problem (Beebe, 1995). This form of documentary data analysis allowed me to develop an understanding of the mechanisms, goals, achievements, actor networks, policy and institutions that function as a part of the EU ETS. This research methodology allowed me to cover a broad range of literature and ensure that I align the thematic documentary analysis with my research question, objectives and problem statement (Beebe, 1995).

3.4.2. Thematic analysis

A thematic analysis was implemented in this research. This was done in order to "identify, analyse and report patterns (themes) within data" (Braun & Clarke, 2009). The process of allowing a thematic analysis to guide the data analysis was done by refining the textual data from the documentary analyses. The nodes of information identified in this form of data analysis created patterns that would contextualize emissions trading better in the green economy, commodification of nature, or both. A thematic analysis allowed me as the researcher to establish how the EU ETS

has been and will be best implemented as a policy lever through the primary and secondary coding and counting of codes in all of the text.

Steps for the thematic analysis of published literature included the following steps (Braun & Clarke, 2006):

1. Familiarising myself with the data. An essential step in the research because it allowed me to prepare my narrative and sift through a lot of reading and noting down initial ideas.
2. Generating initial codes. Codes were used to label interesting features of the research focus.
3. Searching for themes. Collating codes into themes, and gathering data relevant to each theme
4. Reviewing themes. Checking themes work in relation to data set, looking for additional themes.
5. Defining and naming themes. Ongoing analysis to refine each theme. Generating key definitions for each theme and title in the research
6. Finalising thesis write up. Finding compelling extracts. Final analysis. Relating analysis back to questions and objective or the previously reviewed literature.

Table 1: Phases of thematic analysis (adapted from Braun & Clarke, 2006)

- **Themes**	- **Categories**	- **Codes**
- Cap-and-trade	- Limitations - Opportunities - Problems	- EU ETS - Cap-and-trade - Over allocation in initial cap setting - Market stability reserve
- Carbon markets	- Commodification	- Creating a carbon commodity - Emissions rights

	- EU ETS governance	- Kyoto protocol
- Markets	- Europe - Environmental markets	- Phase 1 – 4 in the EU ETS - CDM - Joint implementation - Carbon tax - Externalities

3.5. Research period

This research-based master's was conducted over two years due to my registering as a part-time student. The proposal was developed between January 2017 and July 2017. Documentary analysis was conducted between July 2017 and February 2018. This took a fairly long period of time due to the sheer amount of literature that was read to thoroughly cover all aspects of the study's scope. A thematic content analysis was then conducted between February 2018 and June 2018 so that all literature was qualified in terms of addressing all aspects of the research objectives. Additional reading and writing of the report were carried out throughout the duration of the study because of the continuously evolving nature of research and implementation within the EU ETS and carbon markets in general. The final report was submitted on 27 November 2019.

3.6. Limitations

Experts and primary policy makers in this field are based in Europe. As I did not have funding for my degree or research, it was not feasible to conduct fieldwork. Analysis of secondary data can result in a problem of data fit. While this did affect my study, the relatively large body of research on the EU-ETS helped to mitigate this. This was, in fact, one reason why I chose to study the EU-ETS as an example of a trading system.

A review of secondary literature is fairly restrictive in that the results of the research will often lead to results that are fairly derivative in nature. This is because there is a fundamental reliance on the work of others, and their conclusions being premised on reliable data and methodology. Another key problem with documentary analysis of secondary data is the problem of data fit and whether published research and the data used to write the research properly fits the objectives of one's own research. This did present limitations for my research, but were considered acceptable because of the objective of studying the EU ETS.

3.7. Conclusion

This chapter presented the methodology and data analysis method used in this thesis. While reliance on secondary data sources create some limitations, due to the extensive research on carbon trading in general, and the EU ETS in particular, I was able to generate key themes out of a wide range of sources, and bring these into conversation with theoretical debates in order to answer my research questions. I begin this process in the following chapter 4 that discusses the evolution of the EU ETS, and what was required in order to create the tradable commodity of carbon dioxide. Chapter 5 then explores the problems identified in carbon trading, with a focus on the issues related to commodifying a fictitious commodity.

4. Evolution of the EU ETS market

4.1. Introduction

The process of commodification has intensified in the context of neoliberalism, with an increase in the number of fictitious commodities as the environment has emerged as an important site for capital accumulation (Harvey, 2009). Actor networks are key in the development of new markets (Callon, 1999; Law, 1992). Actor networks are a theoretical point of proposing that society, organisations, agents and machines are, in effect, established and rely on the inter-related patterns and interests between each other (Law, 1992). Actor networks and those with interests in developing certain markets have overseen this development in markets and its' functioning so that their interests are met (Callon, 1999).

These interests extend into the EU ETS where there has been significant evolution in the market due to market-based policies incorporating environmental justice and markets as a new forms of capital accumulation. This policy construction has been focused on creating an economic model that supports the environment and economy as equally important moving parts of a sustainable growth model (Boyd *et al*, 2011). Boyd (2011), drawing on Harvey (2003) argues that "carbon trading fits the rubric of 'accumulation by dispossession' that Harvey (2003) utilizes as an explanation for the desperate penetration of non-market spheres by capital under circumstances of both overaccumulation crisis and imperialist power. Several processes reflect this dispossession: a kind of "privatization of the air" through the allocation of pollution rights as property rights" (Bond, 2012. Pg. 687).

This chapter focuses on the governance underpinning the functioning of the EU ETS. This is laid out in order to investigate the foundations of carbon markets. This chapter also explores the various phases of the EU ETS in order to understand what problems exist in the EU ETS and how various theoretical perspectives can help critique and further understand the market. This chapter aims to lay the table for chapter 5 in which the fundamental issues and critiques of carbon markets are explored. This chapter was central to answering the objectives of this research by exploring

the governance behind the creation of the carbon commodity, how the EU ETS market was formed, as well as the EU ETS's institutional structuring.

4.2. Governance

The geography of marketisation is a fundamental notion in the governance surrounding carbon markets. Institutions, policy and legislation all form a key role in enabling the markets functioning. From the outset, a commodity needs to be created, and then regularised rules and processes need to follow so that the market functions and emissions are reduced. The following section will outline the various steps in governing the EU ETS market, as well as the various phases throughout the EU ETS. This section draws on Polanyi and institutional understandings of the creation of markets to explore how the EU ETS market was created. As the market could not exist if carbon was not turned into a commodity, this section focuses on the commodification of carbon emissions.

4.2.1. Creating the commodity

A commodity is a good or a service that is interchangeable with other commodities within a market. Polanyi's argument that markets exist due to the motivation of exchange is central to the creation of the commodity. Once the commodity has been created it requires strong institutions in order to allow for the functioning of a market that enables trade. Polanyi (1957) also argues that this marketism moves to create a commodity out of something that doesn't exist in order for property rights, trade, capital formation, and division of labour to occur

The industrial revolution[11] had to ensure the transformation of a natural or human element into a "resource" – a commodity (Gilbertson *et al,* 2009). However, Bond (2006) and Gilbertson *et al* (2009) argue that carbon trading goes even further in that it manages to ensure the commodification of everything… by commodifying the air itself.

[11] The Industrial Revolution - 1760 to 1840 which saw the development of new manufacturing processes in Europe and the USA. This saw the development of machinery, automation, commodity creation, power generation and further development of markets and investment of capital.

The carbon commodity was created in order to meet emissions targets in 2030. The sectors involved in the trade of the commodity need to reduce their cumulative emissions by 43% compared to their emissions in 2005 (EC, 2018). Goulder (2013) argues that this 43% reduction in emissions would be done in the EU ETS by encouraging technological change, innovation and movement of capital by sending price signals into an economy based off a unit of carbon dioxide. This could only be done using the backbone of the Kyoto Protocols market mechanisms if a commodity was created in order to enable the movement of capital to stimulate the trade and create a net reduction in emissions.

The relative advantage of setting the pollution cap as well as setting the price per unit of pollution depends on the nature of uncertainty of the market (Goulder, 2013; Weitzman, 1974). Allowing a government to select and respectively allocate the quantity of pollution and associated allowances through benchmarking is politically efficient due to this selection having a downstream effect from political and policy decisions into achieving an economic goal – transitioning from a fossil fuel-based economy (Goulder, 2013; Weitzman, 1974). Most countries favour a cap-and-trade system as evident in Europe where all 28 countries within the EU have signed up, as well as Iceland, Norway & Lichtenstein. There was a caveat for 8 of the 28-member states however. This caveat was something called 'optional derogation' which allowed the certain member states to still receives allowances for free during phase 3. The 8-member states included Bulgaria, Cyrus, Czech Republic, Estonia, Hungary, Lithuania, Poland & Romania. This operational derogation was a part of the EU-wide cap-and-trade mechanisms that allowed for countries who still have interest in fossil fuel intense sectors to neglect investment into new clean technologies and rather subsidise existing the fossil fuel sector. For example, countries and sectors with a high dependency on fossil fuel can benchmark a much higher emissions allocation cap. This is problematic in that benchmarking allows emitters to dictate their emissions and how much they want to reduce carbon emissions moving forward.

4.2.1.1. Compliance and Monitoring

Compliance is required in the establishment of a market. If compliance methodology is not implemented, then market actors have no incentive to comply with the market and its new tradable commodity. The unit used to measure a unit of carbon dioxide is known as an EUA, and it was hoped that EUAs would be less volatile than other tradable commodities. This would be done in terms of futures contracts for bankable permits which could be used in phase 2 and the remainder of the ETS phases. This aimed to create market certainty, allowing for investment and economic development (Ellerman, 2010). This is a central thread of an ETS cap-and-trade. The EU ETS auctions EUAs on the emissions trading market or allocates emissions allowances for free dependant on the means of production, industry or size of the institution (Ellerman, 2010). This is theoretically in line with the Polluter Pays Principle (PPP) as opposed to the Consumer Pays Principle (CPP).

Carbon penalties for non-compliance to pollution caps are around €100 per tonne of CO_2, where as the market price for allowances on auction rarely exceeded €15 per tonne. As a result, compliance was achieved but remained a core issue of the ETS (Duscha, 2018; Ellerman, 2010). The relatively low penalties for non-compliance of the market was not enough of an incentive relative to the actual price of carbon (Ellerman, 2010). Compliance and monitoring remain institutional week points for the ETS due to, inter alia, an uncertainty in emissions accounting (Ellerman, 2010). To date, the biggest fine for non-compliance to the EU ETS was over €350 000 due to non-surrender of EUAs (Flachsland *et al,* 2008). There were many other fines imposed on companies for non-compliance, but these penalties remain very low in comparison to the financial gain from the ETS.

4.2.2. Formation of the market

As discussed in Chapter 2, Polanyi (1957) argues that markets need to be created, institutionalised and enforced. In this section I explore how the market for carbon credits was created by the market and implemented through the enforcement of the EU ETS. The understanding of the formation of the market is key to understanding the reasons for the EU ETS's existence. In this section I explore the governance in the ETS market in as far as the creation of the commodity as well as the institutions that allow for the EU ETS to function. I then explore the various phases that have been

implemented in the EU ETS so that we can better understand what factors were behind any successes or failures during each phase.

Bond (2012), like many critics of carbon markets argues that the primary reason underpinning the existence of these markets is because of the market's need to further accumulate capital instead of changing the fundamentals of production. The EU ETS is creating new spheres of accumulation under neoliberalism which relate to Harvey's theory of accumulation by dispossession. Essentially, Harvey (2018) and Bond (2012) argue that environmental markets are created to further exploit the environment in order to create further capital accumulation. However, Anderson and Di Maria (2010) argue that "…the EU ETS is motivated by the economic theory that market-based policy tools encourage the development and adoption of pollution abatement technology or behaviour to enable emissions reductions more efficiently than command and control style regulation" (Anderson & Di Maria, 2010; Milliman & Prince 1989; Requate & Unold 2003). The EU ETS is fairly simple in terms of broad functionality, as well as the reasons for its existence (Ellerman, 2010). The very premise of the trading system according to Anderson and Di Maria (2010) is to reduce carbon emissions by determining an allowable emissions limit and then working backwards to achieve carbon and GHG abatement (Anderson & Di Maria, 2010; Ellerman, 2010). This is done through regulatory institutions and auction programmes which create a commodity and market in order to incentivise the reduction in emissions. This means that in theory, companies who see the need to over-emit on the determined allowable emissions limit (the cap) can then buy the allowances from other companies (trade) who have under-emitted on their determined emissions cap.

The EU ETS has experienced a change in the way market functions primarily during phase 3 and 4, managed by the institutions that have brought the emissions market to life (Ellerman, 2010). This continual mutation in the way the ETS market functions is due to problems arising in the freedom of exchange fundamental to markets. Each phase of the EU ETS has been defined by regularised rules and processes in order to ensure the functioning of the market. These rules and processes were created, adapted and implemented in each phase to address problems with the phase that came before it. For example, the functioning of the EU ETS as a market allowed

for the EU Commission to address the oversupply of allowances in phase 1 and 2 by ensuring EUAs were kept out of the market in both phase 3 and phase 4.

4.2.3. Creating the institutions

Drawing on a Polanyian understanding of markets helps us to understand the institutional makeup of the EU ETS. Lohmann (2003) argues that the EU ETS' institutions function with an audience-cost theory, where the traction of an institution is determined by the respective institutions having an audience that will accept or push the institutional agendas. In this case the audience would be the companies and countries that are legally obligated to comply with the EU ETS and then adapt to the way the market is set to function (Ellerman, 2010; Lohmann, 2003). Ellerman (2010: 7) supports this by stating that "cap setting, allocation, monitoring, reporting, verification, registries, and enforcement are all the responsibilities of the constituent Member States, albeit with varying degrees of guidance, review and approval by the European Commission. Among the most important issues is the role and identity of the centre in such systems" (Ellerman, 2010: 7).

European Parliament established and implemented Directive 2003/87/EC which sets out the framework for emissions trading with the EU Member States. As Ellerman elaborates, "[w]hile the Commission enjoys the power of initiative with respect to EU legislation and the duty to ensure that the existing EU laws are observed by Member States, the ultimate decision-making institution is the European Council of Ministers, which represents the governments of the Member Nations. In the end, the Commission is the agent of the whole [EU ETS] and its success depends on both the powers granted to it by the still sovereign Member States and the manner in which those powers are exercised" (Ellerman, 2010: 7).

The EU ETS functions within a strong institutional framework under the EU ETS Directive that was set up by the European Commission (Ellerman, 2010). This directive provisioned for the sectors that would be covered in the EU ETS and any other coverage arrangements that would be needed in the ETS to reduce carbon emissions from within the EU. Revisions to the directive included the inclusion of more gases to be covered in the EU ETS during phase 3 and 4, as well as the inclusion of carbon intense sectors, most notably the aviation sector

which was provisioned by the Commission in 2006 (Ellerman, 2009; Point Carbon, 2008). "The ETS Directive is unusual as an EU directive in endowing the Commission with specific and carefully circumscribed functions that are additional to its general powers as an executive agent under the European Treaties" (Ellerman, 2009: 7). This is specifically important when considering NAPs because the EU ETS has given the EU Commission the absolute power to reject NAPs if the Commission deems the emissions data submitted by the participating member states as being too high.

As stated in the Directive, the commission can adapt the annexures for each commitment period so that market functioning is optimised (Directive 2003/87/EC). This directive is an example of the Commissions executive power in determining the functioning of the EU ETS market. For example, article 22 of Directive 2003/87/EC states that "The Commission may amend Annex III, with the exception of criteria (1), (5) and (7), for the period from 2008 to 2012 in the light of the reports provided for in Article 21 and of the experience of the application of this Directive, in accordance with the procedure referred to in Article 23(2)."

Polanyi (1957) tells us this insofar as institutions continually being needed to support the functioning of a market, through the creation of private property and continual institutional support to prop up a market. Essentially Polanyi (1957) proves that there is no such thing as a free-market which can function without the support of soft and hard institutional support (Keeley and Scoones, 2014; Ellerman, 2010). Polanyi (1957) argues that the state, and in this case, the EU commission doesn't withdraw from the functioning of the market. Rather, and further supporting Polanyi's argument, the commission plays an active role in supporting the market. This form of roll forward neoliberalism is fundamental to supporting the structures of the state's role (Peck & Tickell, 2007).

4.2.4. Institutional structuring of the EU ETS

The only way that a 'free market' exists is due to policy and legal engineering of the market into existence through institutions which are set up to ensure the functioning of the market (Goldthau & Witte, 2010; Polanyi, 1957). The EU ETS is no different in this regard due to the requirement

of significantly more institutional interference than other markets due in part to the complexity and relative inexperience in cap-and-trade markets (Frondel *et al*, 2012).

Kruger *et al* (2007) argue that "the model of decentralization in the EU ETS has broken new ground in our experience with emissions trading regimes across multiple jurisdictions". Ellerman (2009) then argues that the internal accounting and management of CO emissions is the responsibility of the constituent Member States after which the European Commission begins its review process (Ellerman, 2009). This responsibility reinforces the spacio-temporal fix as argued by Harvey (2009), in which a sovereign interest in markets is propped up by a country / region trading a commodity for the purposes of capital accumulation. The accumulation has been purposefully structured into the EU ETS in order to further accumulate 'fictitious capital' as is the pervasive nature of capitalism (Bond, 2009; Christophers, 2014).

Phase 1 and 2 of the EU ETS were supported by the regulatory environment and framework developed in the Large Combustion Plant and Integrated Pollution Prevention and Control Directives (European Commission, 2000; Ellerman, 2009). ETS Directives are created by the EU Commission in order to address the needs of reaching emissions targets through the EU ETS. These directives include elements like various pollution controls during phase 1 and 2, but didn't create enough of a framework for the trading element in the EU ETS (Ellerman, 2010). The biggest institutional problem was the lack of data at specific installation level that was needed to determine the allowance allocation needed in setting appropriate CO_2 caps (Ellerman, 2009: 5).

In keeping with Polanyi's argument of institutional roles in controlling a market, the Directive includes a number of mechanisms and institutions required for the market to be produced and reproduced. There are a variety of critical institutions that must function in order for an ETS to operate. According to the Stern Review (2013: 272) these financial institutions that allow for the fluid functioning of the EU ETS include but are not limited to:

I. Corporate and project finance

a. The primary role of this stakeholder is the capability to finance investments in, for example, new renewable technologies instead of fossil fuel technologies. Corporate and project finance will not only be key for in-country investment, but also cross border investment in projects where new create financing methodology will be required (Stern, 2013).

II. MRV services (monitoring, reporting and verification)

a. This is a key part of the carbon market due to the requirement for measuring emission and performing EUA audits. This sector is critical to ensuring that when one tonne of carbon dioxide is emitted in one location, it can be accounted for, then traded or offset by another entity (Fruzna *et al*, 2010).

III. Brokers

a. Brokers will facilitate carbon and GHG permit trades between firms within the EU. Brokers will also aim to offer services to companies who are not covered by the EU ETS who can sell their project's emission reductions to companies involves in the EU ETS (Stern, 2013). This is known as project offsetting and brokers will be key to this process.

IV. Carbon asset management and strategy

a. Reducing carbon will be an incredibly complex process for companies to overcome, especially those companies who are heavily invested in fossil fuels. This presents new opportunities for consultancy services to advise on transitioning to green processes whilst trying to maintain bottom line profitability.

V. Registry services

a. Registry services manage registry accounts that hold allowances which will be allocated to the EU ETS regulator. This is necessary for the new quantity-based allowance mechanisms that the EU Commission will implement such as the Market Stability Reserve (Fan *et al*, 2017: 145).

VI. Legal services

a. Key to every market's functioning, and fundamental to the premise of Polanyi's argument of the requirement of continual interference in a market to engineers a level playing field for all market stakeholders. The legal services will not only deal with individual contractual relationships on a singular entity basis, but also monitoring and enforcing compliance to the EU ETS.

VII. Trading services

a. These trading services are premised on the traditional financial trading ecosystem where emissions futures and derivates can be traded between traders. However, this can also extend to include project financiers of green energy projects, where defined incomes can be set via power purchase agreements.

These institutions are common to all carbon markets and have played an important role in allowing for the continual reinvention of the EU ETS market to engineer success into the ETS. Each institution relies on each other institution to allow for carbon credits to be traded, value and monitored across various sectors.

4.3. Phases in the EU ETS

This section addresses the objective of highlighting the various phases of the EU ETS in order to at analyse what factors influence the construction and transformation of the EU ETS through its

various phases. This section also outlines the scope of the thesis in as far as analysing the various phases and what factors contributed to each phases's success or failure by looking at how the market had to continually adapt as new challenges arose. An analysis of each phase used Polanyi's (1957) understanding of the market to try better understand why each phase of the EU ETS had to adapt the way it did. Each of these critical phases are then futher drawn upon in chapter 5 where the primary problems during each of the four phases is addressed.

The EU Commission always planned for the EU ETS to be planned and implemented in phases. This was not only because it allowed the market to accept a new mechanism, but also that it had so many stakeholders and economies that a 'one size fits all' solution could never have been implemented (Ellerman, 2010). This was done so that the Commission could always be proactive to creating solutions to problems caused by the EU ETS rather than a reactionary approach of letting the problems necessitate changes. As a result, phase 1 was always considered to be a pilot phase by the EU Commission, afterwhich new phases could be implemented to resolve problems in the preceding phase.

4.3.1. Phase 1 (2005 – 2007)

Phase 1 was introduced as the EU's attempt at implementing a market mechanism aimed at reducing carbon emissions through financial incentivization (Ellerman, 2010: 4). Phase 1 was considered as the trial phase where experience was to be gained in order for holes in the system to be discovered (Ellerman, 2010). The European Commission (2000) supported this point of view from the very beginning of the EU ETS design, 'As emission trading is a new instrument for environmental protection within the EU, it is important to gain experience in its implementation before the international emissions trading scheme starts in 2008' (European Commission, 2000; Ellerman, 2010: 4).

The European Union saw phase 1 as the pilot phase for the EU ETS (Duscha, 2018). This pilot phase showed that policy makers and nations would attempt a market approach to carbon abatement through the participation and creation in a market that commodified pollution (Anderson & Di Maria, 2010; Ellerman, 2010). The EU ETS had to ensure the commodification

of carbon emissions in order for the EU to attempt a market approach to support their just transition of GHG emissions reductions (Ellerman, Convery & de Perthius, 2010; Newell, Pizer & Raimi 2013; Osborne, 2015). Phase 1 had nearly 100% free allocation of CO_2 emissions allowances through an allocation methodology known as grandfathering[12] (EC, 2011). These allocation caps were calculated based on historic emissions, detailed in their National Action Plans (NAPs). Hence, no reliable emissions data was recorded, yet emissions allocations caps were built upon the biased assumptions by the respective EU member states (Bond, 2012; Ellerman, 2010). Emissions allowances were distributed with an underlying value, essentially rewarding polluters with the highest pollution (Bond, 2012).

Research has shown that the pilot phase of the EU ETS was fraught with problems primarily due to initial allocation (Duscha, 2018; Frunza *et al*, 2010; Wach, 2016). Anderson and Di Maria (2010) state that "pilot phase (2005–2007) European Union Emissions Allowances were grandfathered freely to participating installations based on burden sharing obligations under the Kyoto Protocol, past emissions, and economic projections for the pilot phase trading period. According to Montgomery (1972), grandfathering should not interfere with the efficiency and performance of the system as well-defined property rights, and not the method of delivering those rights, should ensure an efficient outcome" (Anderson & Di Maria, 2010: 84). Based off this, I would argue that grandfathering was problematic during phase 1 in that it assumed a business as usual approach with an emissions cap and then having to reduce emissions after that cap has been set. Grandfathering allowed companies to overstate their emissions initially in order to only marginally minimize their change in production and investment into clean technologies in the future (Anderson & Di Maria, 2010; Ellerman, 2010; Goulder, 2013). Bond (2007) and Lohmann (2012) argue that this is a fundamental issue with the design of emissions trading system, and noticeably so in the EU ETS. This contestation was primarily based on the commoditisation of air to be traded and profited upon by those already in the business of polluting (Bond, 2009; 2012; Lohmann, 2011). Phase 1 was characterised by extreme price volatility (Wach, 2016). This price

[12] Emissions grandfathering maintains that prior emissions increase future emission entitlements. (Knight, 2013)

volatility led to an eventual crash in the market and prices nearing zero towards the end of phase 1 (EC, 2011; Wach, 2016). This crash in phase 1 was due to (Wach, 2016):

a. Management and institutional failures
b. Allocation failures
    - Grandfathering
    - Wrong data and assumptions for free allocations
c. Supply outweighing demand

A key principle of the EU ETS was that the European Commission had to ensure that the total 'amount of issued allowances was less than the predicted amount of CO_2 emitted under a business as usual scenario' (Frunza *et al*, 2010). European governments allowed their respective industries to emit as much CO_2 as they were able to, under a business as usual approach in order for a cap to be set (EC, 2011; Lohmann, 2008; Wach, 2016). Consequently, more allowances were issued in 2005 than actual emissions from industries and installations that were participating in the EU ETS. There was an over allocation of 152 $MtCO_2$ which worked out to a 4% higher number of allowances than actual CO_2 emissions – completely counter intuitive for the purposes of an ETS. This inherently speaks to issues that Bond (2012) argues as a critic of emissions trading. In this instance, the allocation and cap setting is fundamentally flawed in favour of an GHG emitting institution/country.

As demonstrated above, there was an over allocation of emission allowances in phase 1 which consequently, led to a sharp decline in the price of a tradable CO_2 unit on the open market (ICAP, 2018; Wach, 2016). As stated earlier, the EU was using inaccurate and insufficient data from specific industries, as well as specific companies during phase 1 (Duscha, 2018). The inaccurate data allowed for grandfathered carbon emissions estimates from each entity, subject to their own developmental goals and optimistic growth forecasts (Duscha, 2018). The mindset for carbon intensive industries was that carbon was the means through which economic development occurred and was not the proverbial carrot on a stick to change and innovate.

A key area of concern for the EU ETS during phase 1 was in the limited inclusion of companies from certain industries (e.g. exclusion of aviation sector). 12'000 installations were included in phase 1 of the EU ETS, and only focused on energy production, ferrous metal production, mineral industry, as well as pulp, paper and board (EC, 2011; ICAP, 2018). The EU ETS also only covered CO_2 emissions and didn't take any other GHG into consideration during phase 1 and 2 (ICAP, 2018). This was later changed to include all GHG's in the EU ETS. However, this did create some uncertainty with regards to pricing and what the allowances actually covered during transitions from phase 1 through 3 (Duscha, 2018; Wach, 2016). There was a total traded volume of allowances in 2005 of 362 $MtCO_2$ at a total value of €7.2 billion (EC, 2011; ICAP, 2018; Wach, 2016). This brought about some initial excitement and price fluctuations in the ETS as market speculators, and those involved in the carbon market thought that the commodification of carbon dioxide would realise the green economic objectives that were foundational in the EU ETS.

The end of phase 1 saw the price of emissions allowances align itself with supply and demand problems (Duscha, 2018; Wach, 2016). This saw the price drop to €0 as the supply significantly outweighed the demand (Hintermann, 2010; Wach, 2016). This issue was compounded by the inability of countries to bank allowances and the inability to transfer allowances for use in trade during the second phase (EC, 2011; Hintermann, 2010; Wach 2016; Hoffmann, 2007). This, once again, highlighting how the efforts to transform the EU to support the green economy was diminished by the lack of institutional and policy support. The price crash resulted because Industries, countries and companies found out that they could comply with the first pilot phase without using all their allowances, which left the leftover allowance useless as they could not be transferred to the next phase of the EU ETS, which almost overnight drove the price of the allocations to €0 (Ellerman *et al*, 2015).

Phase 1 had the problem of shifting the EUA costs onto the consumer instead of having the cost of carbon abatement being absorbed by the relevant entities. This was a natural part of free markets because market economics considers the EUAs as an opportunity cost. This created an issue for the EU Commission and consumers alike (Grubb, 2012; Wach, 2016). Phase 1 also wouldn't recognize carbon abatement strategies implemented by countries prior to 2008. Member

states had the aim of protecting their domestic industry which resulted in no actual CO_2 reductions. This seems fairly justifiable however, as a countries sovereign developmental agendas, GDP and genie coefficient are of crucial importance to political agendas and sovereign fiscal constraints (Goulder, 2013; Hoffmann, 2007). From this, I believe that a member state would favour their own fiscal or political stability rather than meet an obligation set out in an inter-regional environmental treaty at any cost. The United States has done this a number of times. The US signed the Basel Convention in 1990 but it was never ratified by the US Senate. Similarly, the United states initially signed the Kyoto Protocol,, but subsequently withdrew. This was done because of, inter alia, fears that China would be able to grow at a much faster rate than the US through exploiting carbon intense industries. Even though this hasn't happened in Europe yet, there is a distinct possibility that a member state could favour their own fiscal and political stability rather than adhering to compliance from the likes of the EU ETS.

"The trial period of the EU ETS has demonstrated once again that rehearsal for the real thing has merit. Although not envisaged as a feature of a global trading system, similarly constructed trial experiences would seem to be a desirable feature, particularly when questions exist concerning the institutional readiness of newly acceding nations" (Ellerman, 2009: 6). The pilot phase helped to create institutional preparation for newly participating east European Member States (Ellerman, 2009; Kruger *et al*, 2007). The institutional preparation was needed for those member states with less installation data to collect that data in readiness for trading and participation in a multi-jurisdiction emission trading system. This data was needed in order to be submitted to the European Commission for emissions caps to be set then allocated to the respective participating countries. According to Ellerman (2009: 5) the pilot phase showed significant promise for ease of adoption by new countries and participating businesses. Ellerman (2009) argues this on the basis that it only took a few years for the newly participating countries to participate in a multi-jurisdiction carbon trading system. This, even though these countries had lower institutional capacity to collect the data needed and set up the required institutions (Ellerman, 2009; Kruger *et al*, 2007; Zapfel, 2007).

4.3.2. Phase 2 (2008 – 2012)

Phase 2 took learning from the pilot phase and implemented these takeout's in phase 2. Elements were focused on to implement a green economic state where linear carbon emissions were places at the focal point instead of creating the market as happened during phase 1."It appears the European Commission learned its lesson during the pilot phase and amendments to the original EU ETS Directive were adopted by the European Commission in January 2008. The main changes in the EU ETS design are a clearly announced move towards increased auctioning of allowances, dismissal of NAPs, and a tightening of the overall cap from 2013 en route to a target of 21% reduction below 2005 verified EU ETS levels" (Anderson & Di Maria, 2010).

According to Ellerman (2009), phase 2 was similar to phase 1 but with the inclusion of more benchmarking. Benchmarking allowed for a move towards a PPP (polluter pays principle) rather than CPP (consumer pays principle) as was the result of phase 1 (Wach, 2016). Benchmarking is a process whereby the average of the best performing 10% of installations for a certain product / sector is then used as a benchmark for GHG emissions (Sartor *et al*, 2014). Installations that meet this benchmark will then have all their allowances allocated for free. Whereas installations that aren't as efficient will then have fewer allowances distributed to them relative to their allowance needs. The net effect of this is that an installation that is a net GHG over-emitter compared to the more efficient installations will have to reduce their emissions, buy additional allowances to cover their emissions, or a combination of the both (Hong *et al*, 2014).

The beginning of phase 2 saw the inclusion of 3 member states (Iceland, Liechtenstein and Norway). The scope of the EU ETS also changed in order to include nitrous oxide and all other greenhouse gases from all sectors in the EU ETS. Allocation for allowances provided a linear emissions reduction of 7% year-on-year in order to bring emissions below 2005 emissions. I argue that this process is fundamental in promoting a green economy where a limit is placed on one facet of production, but still allows for economic and social growth if emissions are reduced. More price stability was created from the start of phase 2 due to more control over allocation (a decrease in 10% from phase 1). Free allocation was decreased by around 10% because of verified annual emissions data from phase 1. This verified emissions data highlights the importance of phase 1 as a pilot, because the EU was then able to adjust emissions allowances based on actual emissions instead of just emissions assumptions. The EU also implemented a lower cap on allowances in

efforts to further encourage emissions reductions from member states. A union registry was also put in place so that an aggregated registry system could replace the national registries as was the case in phase 1.



Figure 3:Carbon pricing in phase 1 and phase 2 (Kill et al, 2011: 52)

These changes in EUA allocation amounts and cap sizes are indicative of the key issues that the EU ETS was experiencing in its pilot phase. Price crashes from over supply and inaccurate EAU allowances were fundamentally problematic during the ETS's early stages (Duscha, 2018). Ellerman (2010) and Kebede (2015) both argued that the EU commission must react quickly with proper policy intervention in order to correct the inadequacies and instability of the market. The reason for this according to Kebede (2015) include the loss of interest by investors in the EU ETS, as well as market critics increasing whilst the EU tries to promote market stability. The bear market environment is not a good position for investors and stakeholders alike. Interventions in the market were critical and included the penalty for non-compliance being increased to €100 per tonne of CO_2 over-emitted. Other interventions included benchmarks being introduced in reaction to high windfall profits, especially from the power generation sector. Free allocation based on grandfathering was also limited in favour of a benchmarking system of allocation (Duscha, 2018). This is significant because the evidence of market interventions aligns with Polanyi's assertions

that the market and in this case, phase 1 and 2 of the EU ETS cannot operate without strict guidelines and rules implemented by the EU Commission.

Phase 2 acknowledged the failures in the first phase of the ETS and almost immediately reacted through institutional and policy intervention as discussed above. This is important because it acknowledged that carbon abatement could only function with the involvement of many different stakeholder's in order to encourage investment and innovation. The EU suggested that market intervention by the Commission as well as strong support from many more stakeholders in the private sector was key in order to allow for a functional environmental market. Moving forward into phase 3, many of the learnings of phase 2 were considered and implemented so that the same mistakes weren't made.

4.3.3. Phase 3 (2013 – 2020)

The problems of phase 2 helped define the way forward for phase 3. Problems such as the inability to bank allowances, and a lack of EUA clarity in certain sectors were addressed. The European Commission stipulated that for the third trading period, all EUAs held by any European electricity producers, for example, had to be auctioned off as of 2013. This was a command-and-control interventional from the Commission to address the over-supply of EUAs from the previous two phases of the ETS. The auctioning process prior to the beginning of phase 3 allowed for the third trading period to start with a clean sheet. This process also stimulated trade in the market and investment into carbon abatement practices (Duscha, 2018). This intervention from the EU Commission demonstrates the need for institutional interference that can transform a market's functioning (Ellerman, 2010; Wetterstad, 2014).

Phase 3 stipulated that a single EU cap would be implemented instead of a nation-based cap per member state. This was further acknowledgement that implementing individual member state caps was too much of an institutional burden (Wetterstad, 2014). In order to make the market operate more efficiently, the single EU cap was implemented. Along with this, 300 million allowances were set aside to further fund investment into clean and renewable technology (EC,

2012). This green economic policy decision helped to stimulate investment into clean energy sectors due to the market incentivization (Brockington, 2012; Trück & Weron, 2016).

Auctioning was introduced at the beginning of phase 3 and become the key method of allocation for the commission (EC, 2012). 57 percent of allowances were to be auctioned between 2013 and 2020, however the remaining allowances were to be freely allocated amongst companies. The electricity sector, for example, were mandated to buy 100 percent of their respective allowances on auction since the beginning of the phase in 2013 (Goulder, 2013). This was due in part to consumers having had the cost of allowances being passed onto them during phase 1 and 2, despite the power generators having received the allowances for free. Forcing power generators to buy their allowances instead of allocating them for free was a strategy implemented by the European Commission to ensure that minimal windfall profits were created for power generators.

Phase 3 also took carbon leakage[13] into consideration to ensure that carbon emissions could be controlled within the EU (Löfgren *et al,* 2015). Power generators weren't really at risk of carbon leakage because of the inability to transport electricity. This allowed for policy to help address carbon abatement in the sector. There was a caveat for 8-member states. This caveat was something called 'optional derogation' which allowed the certain member states to still receives allowances for free during phase 3 (Löfgren *et al,* 2015). This is a market process, particularly functional within a green economy (Brockington, 2012). The derogation was used as an incentive-based mechanism which would require the eight participating Member States to implement investment plans to modernize and diversify their respective energy sectors. This could be done through investments in:

- retrofitting and upgrading power generation
- Distribution infrastructure
- Renewable (Hydro, PV, Thermal)
- IPPs support
- Green bonds

[13] Carbon leakage - the ease with which businesses can move their operations (transfer production to other countries with laxer emission constraints.

The 8-member states included Bulgaria, Cyrus, Czech Republic, Estonia, Hungary, Lithuania, Poland & Romania (Latvia and Malta elected not to use the optional derogation) (Löfgren *et al,* 2015). Optional derogation was only allowed if that member states had a GDP per capita of less than 60% of other EU Member States (Duscha, 2018; Wach, 2016). This, under Article 10c of the EU ETS Directive which allows for free allocation of allowances to member states contingent on the number of free allowances decreasing during the transitional period which ends in 2019. This highlighted the lack of synergy in national and supra national policy mechanisms where some countries have fewer emissions restrictions as opposed to other countries functioning within the Eurozone. This lack of synergy is the very reason why an EU-wide carbon tax would struggle in real-world implementation and why more policy intervention is required in a market system like the EU ETS. I argue that this shows the role of institutions in creating the market and intervening in order to increase the effectiveness of the market. Phase 3 provides a strong example of the role of institutions in creating and improving the effectiveness of the EU-ET market. This once again supports a Polanyian stance behind the role of institutions to support market functioning.

During phase 3 and according to Article 10c of the EU ETS Directive, the policy interventions and associated investments in the member states electricity sector must either match or exceed the intrinsic value of the allowances which had been allocated for free by the EU ETS (Hoffman, 2007; Wach, 2016). The issue is that certain industries had the power to move production and weren't tied down to production in a specific region whereas the electricity sector did not have the ability to implement carbon leakage (Branger *et al,* 2013; Hoffman, 2007). I would argue that this, compounded with freely allocated EUAs meant even more incentive for polluters to move their production and continue emitting.

Another foundation problem that had to be addressed during phase 3 was the accumulated oversupply of allowances during phase one and two in the ETS market. According the EU Commission, the solution was to back load the oversupply of allowances during phase 3. Once again, the EU Commission had to design and implement various institutions and mechanisms to prop up the market as Polanyi argues will always happen in a market. Back loading was another attempt to decrease the supply of allowances in the system in order to adjust the prices of an

allowances to a level that was more stable and re-encouraged trading and investment into newer technologies. Around 400 million allowances were banked by the European Commission in 2014 as a part of an anti-inflationary policy aimed at market stability by the Commission. A further 300 million allowances were then banked by the commission in 2015 and 200 million in 2016 in order to fully adjust market conditions towards favourable trade (EEA, 2015; Wach, 2016).

Back loading was then readapted and developed to function as a tool in phase 4 known as the Market Stability Reserve (MSR). The MSR started in 2019 and is labelled as a key figure of phase 4. The MSR will be introduced to limit the amount of free allowances circulating in the market, which in turn will reduce the over-supply of allowances and ensure price stability as the market moves into phase 4 (Duscha, 2018). The MSR as implemented in phase 3 does not take the cancellation of allowances into consideration, but rather forecasts a rejection of allowances within the reserve in the future. This helps limit over supply and ensures price stability in the immediate future, but eventually culminates in large amounts of allowances to be circulated in the market in the future, which might create another market crash, as seen at the end of phase I (Duscha, 2018, Macru & Elerbout, 2015).

The introduction of the New Entrants Reserve (NER)[14] implemented a strategy where allocation is no longer fixed for a specific period but rather dynamically adapts during production. The NER took new entrants, company closure, changes in capacity and changes in production into account. The NER limits allowance exposure to the market in the case of significant production decreases, which would limit over allocation. The NER kept 400 million allowances aside at a threshold value which has been set to limit to application of dynamic allocation in cases where there is a significant change in production (Duscha, 2018). Phase three showed how learnings from previous phases within a carbon market were used as a starting point from which the following phase of the ETS could make progress. Phase 4 should take a fair amount of consideration into account with regards to the learning from the errors and successes of the previous three phases.

[14] New Entrants Reserve (NER) constitutes a special-purpose, EU-wide pool of emission allowances set aside for new installations and installations that increase capacity, which are covered by the scope of the EU ETS Directive, and which are eligible for additional free allocation in phase 3 of the EU ETS (https://www.emissions-euets.com)

4.3.4. Phase 4 (2020 – 2030)

Phase 4 will be the key determinant of success for the EU ETS. This phase will enjoy its longest ever period of policy operation and will see many amendments in policy and institutional interference to help the market function more effectively (Macru & Elerbout, 2015; Wach, 2016). More up-to-date emissions data will be used in the calculation for EUAs during phase 4 (Macru & Elerbout, 2015). This will be done in order to increase the pace at which the EU can implement emissions cuts on an annualised basis. The need for an increased pace of emissions reductions saw two major amendments to the EU ETS directive which favours a stronger year-on-year reduction in emissions from previous phases. This included a linear reduction in overall emissions being decreased from 1,74% per year (phase 3 cap) to 2.2% for the duration of phase 4 (Macru & Elerbout, 2015). The ETS directive (2003/87/EC) is now able to meet a CO_2 emissions reductions of over 43% compared to 2005 emissions. The introduction of 'dynamic allocation' has been introduced for phase 4 and is a reaction, in part, to changes in production as well as prevent accumulation of surpluses and mitigate price elasticities when there are too many EUAs in circulation (Anderson & Di Maria, 2011). Allocation data from phase 3 was used to calculate the benchmark-based allocation in phase 4.

Carbon leakage rules will also better be defined during the transition to phase 4. Once again showing the commitment of the EU to learn from mistakes made in the previous 3 phases. For example, free allocation will be phased out completely for less exposed sectors at the beginning of 2026 until the end of phase 4 in 2030 (EC, 2012).

The EU ETS has moved towards an auction-based methodology from phase 3 as opposed to the free allocation methodology as previously implemented (Macru & Elerbout, 2015). This allocation methodology will continue into phase 4. The initial over allocation and price instability from phase 1 is still being felt to this day as market speculators don't see much market certainty over the fictitious carbon commodity (Goulder, 2013).

The way EUAs are distributed are once again noted as a primary issue during phase 4 (Goulder, 2013). This is because the EU ETS Commission can implement an auction or freely

award allowances, or a combination of the two at their own behest (Borkent *et al*, 2014). This creates market instability and many unknowns for investors and business owners alike. Economic theory suggests an easy solution in this regard. The uncertainty is normally overcome when allowances are traded on the open market due to supply and demand forces bringing the price into equilibrium. However, this can only function within a strong institutional and policy context in which supply is controlled and the market is free to trade as the market sees fit (Tacconi, 2012). This could only happen if property rights were established by the Commission, in which case the private market would do the rest. This Coase Theorem is a principle in free market economics and can quite easily absorb the negative externalities of GHG emissions.

Once again however, a problem exists with the implementation of the Coase Theorem in that one cannot provide property rights to commons (air and sea). The only way around this would be for government to set a price to GHG emissions and allow the market to trade. Even if the European Commission had set a price for carbon in order for trade to be encouraged, there would still have been the issue of how allowances were allocated in order to know how much carbon would need to have been abated from a business as usual scenario. This is where the current problem remains from phase 1 and 2 in which too many allowances were distributed in the first place (Skjærseth & Wetterstad, 2016). Economic policy makers who wish to make the most from a growing low carbon economy should focus on placing the environment first by means of an enforceable emissions cap. This will result in a more effective low carbon technological development, as well as enforce market security and confidence in in a defined number of tradable units.

Phase 4 has also seen the introduction of two further green economic market mechanisms, namely the innovation fund and the modernization fund (EC, 2012). Both funds are economic stimulus interventions that aim to further the success of the EU ETS. These EU commission acknowledged that only 43% percent of emissions were covered by the ETS as of 2015, and that further institutional and policy intervention was required in order to make it easier for energy and carbon intensive industries to transition to a low carbon economy. This is a market intervention that seeks to solve investment and innovation challenges in the industrial and power generating sectors of the EU ETS.

4.3.5. Market Stability Reserve (MSR)

"[A] cap event directly impacts the supply level of allowances. Generally speaking, boosting the cap means that there is an increase in the supply of allowances, and carbon prices would be expected to decrease; tightening the cap means that there is a decrease in the supply of allowances, which has an underlying impact of pushing carbon prices." (Fan *et al*, 2017: 145) The MSR is a fundamental regulatory update event implemented in the green economy as a market adaption. The MSR has been introduced into the EU ETS as a green economic response where a combination of political institutions allows for a market to run as efficiently as possible. The MSR has been implemented to address the surplus of emissions allowances in the ETS from previous phases. This surplus was largely as a result of an initial over supply of EUA's and the economic crisis in 2008 which saw no trade in allowances, and a subsequent price crash to €0. This surplus accounted for around €2 billion in allowances at the beginning of phase 3 (2013). This surplus was then reduced by around 300 million allowances in 2 years through back-loading during phase 3.

Banking of allowances is a response to uncertain prices of EUAs. Banking of allowances allows for a market to control prices in the trade of a commodity. Banking is a quantity control mechanism once again based on market principles entrenched in the green economy. However, the EU ETS fails to recognise the value of institutions and banking of allowances in the first couple stages of the EU ETS. This complete reliance on a market economy to regulate itself and the price of EUAs is the key failure that resulted in the price collapse during phase 1, as well as the uncertainty during phase 2.

Duscha (2018) provides evidence that the MSR and its contingency of 400 million allowances will be enough to meet the growing demand for EUA's for at least the next decade (Duscha, 2018: 409).MSR is a long-term economic strategy which is set to provide some stability to the heavily fluctuating EU ETS. The MSR was first suggested in January of 2014 and then later accepted for implementation in 2019 (start if phase 4) of the ETS by European Parliament in 2015, albeit with a few changes. The MSR functions through the fundamentals of supply and demand of EUAs in the EU ETS market. It plans to exclude the extra allowances during an oversupply of EUAs in the

market. These excess allowances are then kept in reserve to be used as and when needed for reinjection back into the market when required. This has a massive positive knock on effect with regards to price of EUAs in the market.

4.4. Conclusion

The various phases of the EU ETS were always planned by the Commission to have various amendments to try create successful emission reductions though the market. However, the lack of emissions reduction combined with several failures in the market tell us that something is fundamentally flawed in the ETS approach."… Since the establishment of the EU ETS in 2005, institutions and rules have been continuously updated to solve issues encountered in the market operation in order to improve market efficiency and integrity, to reduce information asymmetry and market distortion. These updates can be called "regulatory updates events" (Fan *et al*, 2017: 145). The EU ETS has continually reinvented itself through political, policy and institutional intervention to ensure the success of the market. Polanyi (1957) argues that this is exactly what happens within a self-regulating market, "The road to the free market was opened and kept open by an enormous increase in continuous, centrally organized and controlled interventionalism" (Polanyi, 2002 [1944], 144). Goulder (2013) argues that the EU ETS actually encouraged carbon leakage from phase 1– 3. This carbon leakage can encourage developing countries to stay out of a global emissions cap-and-trade system and allow for other entities to define how any respective developing country might allocate land or resources.

I argue that no accurate or fair price had been put on carbon emissions throughout the EU ETS, making the ETS a very unstable market within which to operate. The phases have defined various regulatory updates, but primarily in a reactionary manner in order to address the severity of problems that leave the EU ETS on a knife edge of failure as seen during phase 1 & 2. These problems will be further developed in the following chapter.

5. Preserving the right to emit

The process of commodification has intensified the role of neoliberalism, and their effect on the environment. It has emerged that the environment has become an even more important site for capital accumulation as more and more natural resources are commoditised. This most noteworthy is the very commodity at the core of this thesis; carbon dioxide. The market interest in capital accumulation are due to market-based policies incorporating economics at their core as opposed to fundamental notions of environmental justice to redress issues such as climate change.

This chapter focuses on the EU ETS throughout all phases and is focused on how the market has preserved the right to emit for companies and countries with vested interests in ensuring the productive capacity isn't reduced. This preservation of the right to emit is laid out in order to investigate the foundations of the problems intrinsic to carbon markets. This chapter also explores how each problem is contextualised in terms of various theoretical perspectives that help further understand the market. This chapter aims describe the fundamental issues and critiques of carbon markets, and in particular, the EU ETS. This chapter was central to answering the objectives of this research by exploring the problems behind the creation of the carbon commodity, how the EU ETS market was formed, as well as the EU ETS's institutional structuring. Firstly, I explore the problems with commodification with regards to carbon prices, over-allocation in original caps, grandfathering, unfair distribution and a lack of EU Harmonisation. I then explore how the EU ETS has had problematic implementation.

5.1. Problems with commodification

The EU ETS was meant to drive efficiency and sustainability, and although there might have been some improvements in emissions reductions along the way, many problems have arisen that illuminate the challenges in creating markets to solve environmental problems. I argue that problems with the commodification started from the moment the EUAs were allocated to the respective member states. Grandfathering was a key component to the creation of the market. From the outset, the very way the commodity was created allowed for the preservation to emit.

Bond (2012) and the Durban Group for Climate Justice (2008) argue that a key problem with carbon markets is the assumption that greenhouse gas emissions can be commoditised and consequently reduced through the creation of a commodity exchange relationship. Bond (2012) argues that the inverse of this assumption is in fact true. Bond (2012) argues that greenhouse gas emissions are incredibly complex in terms of their lifecycle and impacts. As such, the rising production of carbon emissions creates a non-linear impact on the environment, society and economy that cannot be simply reduced to a commodity exchange relationship (Bond, 2012).

5.1.1. Carbon prices

Carbon prices have been incredibly unstable since the EU ETS's inception. Prices crashed to zero in phase 1 and have been lying at €5 per tonne of CO_2. EUA prices should ideally hover around the €30 mark in order to encourage pollution abatement through investment in new technology (Sandor *et al*, 2014). The price of carbon in the EU ETS crashed by 50% in April 2006, and by another 66% in 2008. This was thought to be a resolvable issue during the end of phase 2, yet the carbon price crashed again. These constant market crashes outside of any macroeconomic actors proved that the idea of creating an effective and stable carbon market mechanism was somewhat ineffectual (Bond, 2012). According to Wood & Jotzo (2011), putting a price on carbon allows for private sector and institutional investors to direct their efforts towards investing in clean technology and addressing climate change through an economic incentive. This green economic approach is the foundation to the EU ETS, and prices having generally moved around the 5 Euro per tonne of CO_2 from phase 1-3, around 6 times lower than the 30 Euro per tonne that would have been required for a company to begin investing in carbon free technology (ICAP, 2018). Companies rely upon certainty with external expense or income factors in the macro business environment (emissions tax, VAT etc.). This creates certainty upon which income and expenditure models can be run and income and business viability can then be determined (Grubb, 2012; Wood & Jotzo, 2011). To date, the EU ETS has not created a stable CO_2 price on which investors could make decisions since the EUA price crash in phase 1 (Grubb, 2012). Therefore, I argue that investment into low carbon infrastructure was never properly economically incentivised, as was intended with the EU ETS.

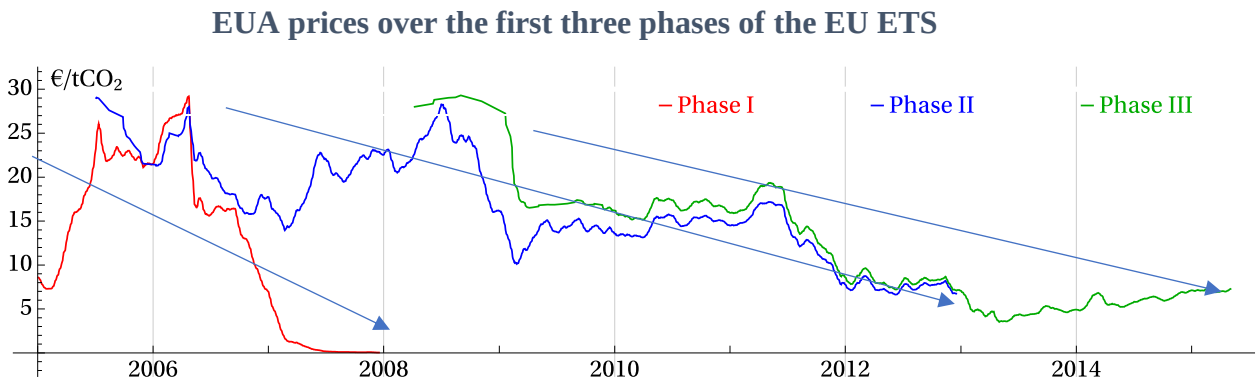


Figure 4: Carbon prices over the first three phases of the EU ETS (https://en.wikipedia.org/wiki/File:Co2price.pdf)

Figure 4 shows the continual downward trend of EUA prices. Figure 4 also illustrates how the price started off very well at the beginning of every phase, only after the EU Commission intervened through the implementation of each new phase of the EU ETS. However, even when the prices were relatively high at the beginning of each phase, allowances within the EU ETS could still have been bought relatively cheaply, which didn't promote the bottom-line incentive to invest in new technologies (Sandor *et al*, 2014: 49). The EU ETS has not created any certainty in this regard, and for the ETS to work, price certainty is fundamental. As Figures 3 and 4 above demonstrate, EU ETS saw the price crash to €0 in 2008 towards the end of phase 1 while the financial crisis hit the global economy. As shown in the graph above, the EUA price crashed to €0 as a result of the plummeting demand for EUA's as, inter alia, economic austerity took preference. This was mirrored in commodity prices of oil which the price fall from $147/barrel to $35/barrel in under a year (Sandor *et al*, 2014). A further factor was that a few countries (Holland, Czech Republic & France) released statements that their emissions were going to be below the amount of EUAs that were initially allocated to them which also drove EUA prices down.

Institutionalists suggested that carbon price stability can only be created through policy intervention even in different sectors that need different institutional logics (Lederer, 2012; Skjærseth & Wettestad, 2010; Wettestad, 2014). Brockington (2012) argues that some scholars of the green economy would oppose this and maintain that the market should be left to function with independence, however this has already shown considerable failures in the early phases (Brockington, 2012; Convery, 2009). Regulators can impose price ceilings and price floors to help

secure price certainty for the EU ETS market (Wettestad, 2014). A price ceiling would cap a maximum price at which allowances can be traded, and where initial allocation is set at an unlimited quantity but a certain price ceiling, and then traded afterwards (Sandor *et al,* 2014). Wood & Jotzo (2011: 2) argue that, "price ceilings are a widely recognised option to limit the risk that carbon price exceeds acceptable levels if constraining emissions turns out to be more expensive than expected, and so price greater certainty to emitters." Price floors on the other hand would prevent allowance prices from being valued below a certain level determined by regulators and the commission which therefore provides a certain insurance policy for traders in the market (Newell, Pizer & Raimi, 2013). A carbon price floor in the Netherlands is currently in discussion processes and is aimed to reach a price floor of €43 by 2030 (Newbery, Reiner, & Ritz, 2018). This is similar in the case of an auction price floor that banks allowances by removing them from a market until the minimum price floor is met by purchasers. This is not dissimilar mechanism from the Market Stability Reserve being implemented by the EU ETS in phase 4. This is because both the MSR and a carbon price floor are externally enforced quantity and price controlling mechanisms.

For example, the price floor implemented in the Regional Greenhouse Gas Initiative (RGGI) provided incentives for emissions reductions even though the actual emissions cap was not binding. This proved to be effective and set a fairly good precedent for the EU ETS and carbon markets around the world. In October of 2017 the Netherlands announced that they wished to establish a carbon price floor of €18 (Blume-Werry, *et al,* 2019). However, this was only the starting point as they wished to increase the floor to €43 by 2030. The UK currently has a carbon allowance price floor of £18, and other EU countries are considering implementing similar nation-based policies to stimulate an under-incentivising EU ETS. "Supporting these efforts, theoretical work has showed that price-like modifications within a cap-and-trade programme-ceilings and floors on the allowance price or otherwise adjusting the cap to accommodate cost shocks-can help to achieve the same outcomes as a carbon tax, where the cost is certain (Newell, Pizer & Zhang, 2005; Murray, Newell & Pizer, 2009: 135)." Ellerman and co-authors (2010) argue that price floors and price ceilings would help ensure political economic stability in pricing the fictitious commodity and helping to allow an ETS to achieve its emissions reduction goals.

Polanyi's analysis of fictitious commodities (Polanyi, 1944) apply a political economic analysis of the price instability in the market. Carbon price is determined through ownership, which in turn is determined by soft policy infrastructure laid out in the EU Commissions Directive regarding the EU ETS (Anderson & Di Maria, 2010; Ellerman, 2010; Goulder, 2013). Tietenberg (2003) clarifies that carbon price is not necessarily dependent on 'privatising the resource' but "rather on privatising the right to access the resource to a pre-specified degree" (Tietenberg, 2003: 408). This relates to the commodity traded on within a green economic system, because environmental markets exist for two primary reasons, (1) capital accumulation and, (2) to create a viable platform to reduce emissions (Duscha, 2018; Goulder, 2013; Tietenberg, 2003). Once must remember that carbon pricing in a market is a stimulant in efforts to achieve a green economy can only be achieved if the fundamental assumptions underlying the cost of CO_2 supports the overall policy goals (Goulder, 2013). Goulder (2013: 3) tells us that "Imposing a limit on total emissions and letting the market determine the price is not necessarily more efficient than imposing a price on emissions and letting the market determine the quantity". Drawing on a Polanyian analysis of the creation of the commodity to be used in the market, I argue that the carbon commodity price is failing in terms of the creation of ownership, monetary value or institutional management.

5.1.2. Over-allocation in original caps

The supply of EUAs depends on the EU ETS commission and relevant sovereign government policy decisions, illustrating the commissions roll forward neoliberalism in the ETS market. Shifts in demand can cause major price volatility, and although not a bad thing for short term market speculators, allowance prices remain tough to regulate and maintain a stable price on carbon which will need forecast in major economic developments (shift to renewables).

Over-allocation of allowances began in phase 1 of the EU ETS and raised serious concerns over accounting for emissions allowances, and determining an estimated future prediction of emissions necessary in determining an emissions cap. The over allocation based on sovereign developmental agendas in their National Action Plans (NAPs) which provided the foundations for the emissions caps and allowances from the European Commission. This resulted in about 13 billion EUAs being injected into the market in phase 1. This combined with very lean

carbon abatement goals resulted in the pilot phase failing to achieve any of its goals of reducing emissions and stimulating technological development.

5.1.3. Grandfathering

The creation and distribution of carbon allowances is founded on the creation of the carbon commodity. Without the creation of the carbon commodity, the proposed environmental market cannot function. In order to distribute allowances to the open market before a market value can be determined, allowances must be distributed for free (Pizer, 1999; Tietenberg, 2003). However, this form of allocation is certainly one of the most controversial aspects to the cap-and-trade system (Tietenberg, 2003). Distribution of allowances for free (grandfathering) is predominant in the EU ETS and bases distribution of emissions allowances on the historical emissions of an entity or country (Tietenberg, 2003).

According to Zetterberg (2012), grandfathering as a methodology inhibits innovation. This was evident during phase 1 and 2 when grandfathering was the method of allocation but was slowly reduced during phase 3 and 4. This allocation methodology based on historical emissions allowed for a status quo to be assumed for business and countries in order for linear reduction methods to be implemented and analysed moving forward. Grandfathering of EUAs means that allowances were allocated for free by the EU Commission to polluting industries (Frondel *et al*, 2012). Germany, France, the UK and the Netherlands accounted for around 40% of freely allocated allowances during 2016 (Duscha, 2018). These countries are also the largest emitters of carbon and other pollutants due primarily to the size of their economies (Duscha, 2018; EC, 2011). Ronald Coase (1960) argues that grandfathering leads to better efficiency in a marketplace. The reality proves somewhat differently because as Fischer (1996) and Bond, (2009; 2012) argue, grandfathering subsidises polluting industries and encourages them not to change their methods of production. This argument is also supported by Frondel *et al* (2012) who argues that 'cost-free allocation leads to an increase in electricity prices even when strong competition prevails in the market' (Frondel *et al*, 2012: 2).

EUAs were distributed based on historical emissions data with a linear reduction thereafter (Zetterberg, 2012). The fundamental issue with grandfathering as a distribution methodology is that an emissions trading platform favours the polluter (Bond, 2009; 2012). The polluter is favoured because high emitting companies have very little incentive to abate emissions due to them receiving fewer emissions allowances in the future (Anderson & Di Maria, 2010). The actual number of allowances can also be beside the point. The reason for this is that the highest emitting companies actually receive massive financial gain from the sale of their allowances into the open market (Bond, 2012; Zetterberg, 2012). It stands to reason that high emitting companies would also make the most money due to the large amount of allowances they'd receive relative to their massive carbon production (Anderson & Di Maria, 2010; Zetterberg, 2012).

Frondel and colleagues (2012) argue that cost-free allocation of EUAs will lead to the cost of pollution being passed onto the consumers instead of being an expense incurred by specific industries. Installations that are regarded to be exposed to risk of carbon leakage were still allowed to be issued with free allocations. This is the perfect example of where private companies and the market work against a system like an ETS and counter the good will and efforts of those in the system to contribute in the fights against climate change.

5.1.4. Unfair distribution

As mentioned previously, many companies were over allocated allowances in phase 1 and 2. This was compounded by the free distribution method of allocation in the ETS which resulted in massive windfall profits for the companies because they were able to sell the excess allowances on the open market at a substantial profit. These profits were earned only because of ineffectual allocation and not because of actual emissions reductions. This unfair distribution to high emitting industries preserved the status quo for emissions generation (Bond; 2012; Frondel *et al,* 2012). Profits from a culmination of grandfathering of allowances to industries that were unfairly allocated EUAs resulted in approximately €2,1 Billion in windfall profits between 2005 and 2007 in the coal-based energy sector alone (Frondel *et al,* 2012). Profits weren't earned because carbon abatement or change in technology which the ETS was meant to stimulate. Rather, profits were earned from free allocation of allowances that were then subsequently traded or used for offsets.

These companies were involved in the energy, aluminium, oil, steel and paper sectors and were primary opponents to the EU ETS during its promulgation. This opposition was based on the argument that the production costs would increase substantially, and that production would be moved into different territories – otherwise known as carbon leakage. Carbon leakage was a major bargaining tool for these polluting industries because it held the European Commission over a barrel due to fears in loss in EU profits, major job losses and decreased investment (Frondel *et al,*2012). Carbon leakage would still lead to a global carbon emissions problem because industry would simply just move their operations to a country where the cost of production was significantly lower and continue production on their business as usual model (Branger, 2014; Ellerman, 2010).

As a result, the European Commissions allocated 100% of the allowances for free to these industries which threatened the Commission with carbon leakage (Duscha, 2018). This form of allocation is tantamount to a government subsidy (Goulder *et al,* 1999). This begs the question, why not just tax carbon which would increase government income and eliminate windfall profits (Ellerman, 2010). I argue that as efficient as a tax might seem in theory, the EU has maintained their ideological commitment to the EU ETS instead of a command and control option of a carbon tax. I believe this should be taken on review because as time marches on, the global commons continue to be overly polluted whilst the EU Commission figure out how to effectively implement a carbon market.

The unfair distribution highlights issues markets and shows how a fictitious commodity can preserve the status quo of carbon intensive industries. It could be argued that this creates a perverse incentive to move into carbon intensive industries due to the allocation methodology being in favour of high carbon emitters. Sandbag (2016) states that from 2008-2014 the European cement industry received an extra 2,2 years of GHG allowances over and above their grandfathered allowance allocation. This allowed for more GHG emissions instead of carbon abatement. Not only does free allocation and over allocation stimulate carbon production but it also severely influences carbon prices within the EU ETS because as the amount of allowances in circulation exceeds demand, the price per unit will decrease. As stated earlier, the primary role of the EU ETS was to put a price to carbon, however the unfair and over allocation of allowances drove the carbon price to zero during phase 1. During phase one and phase two, there was an oversupply of 13bn

tonnes of carbon dioxide allowances during the first commitment period of the Kyoto Protocol (ICAP, 2018). This shows the true inefficiency of the ETS in that it can't achieve the goal it was implemented to achieve, but rather perpetuates capital accumulation without any actual carbon abatement in certain industries through inefficient management from the EU Commission.

5.2. Lack of EU Harmonisation

The formation of the EU required for ubiquity across certain points of regulation including barriers to internal trade within the EU (Frunza *et al*, 2010). This applied not only to trade and fiscal systems between participating member states, but also further command and control mechanisms like VAT and logistical intra-community trade (Frunza *et al*, 2010). One example of policy ubiquity regarding the EU ETS is related to the zero-rating on intra-EU transactions, an issue that will be brought to the fore in the following section.

5.2.1. Overlap with EU state policies

The EU ETS also only covers around 45% of the total GHG emissions within the EU despite it being the biggest ETS worldwide (ICAP, 2018). Part of the problem lies in domestic climate and economic policies tending to have conflicting scopes and compliance methodology which can be often be contradictory to emissions reduction goals in the EU ETS. This makes it even more difficult for industries in an EU member state to comply with both their countries domestic emissions mitigation policies. There remains to be a relative conflict in the nature of domestic environmental/energy policy with compliance to the low incentives in the EU ETS (Trück & Weron, 2016). The combination of the two conflicting policies results in reduced demand for EUAs, which in turn depresses the price of allowances one again.

There is also a noteworthy example as seen in certain EU member states. For example, Poland and Spain both subsidize their energy and coal sectors in order to prop up economic growth in these crucial sectors of the economy. However, this is fundamentally at odds with the EU ETS which aims to promote investment in technology that isn't coal based (Blanco & Rodrigues, 2008;

Ellerman *et al*, 2010). Poland and Spain have chosen to prioritise their economic and fiscal growth, instead of fully complying with a supranational policy such as the EU ETS (Ellerman *et al*, 2010). This is a perfect example of how the green economy is a difficult goal to achieve when economic growth is still placed before environmental conservation (Markandya & Pearce, 1991).

Emissions trading can allow for market capture of massive segments of investment in order to purchase Green bonds, and due to the ways in which emissions trading policy and legislation are being implemented in systems such as the EU ETS, disempowerment and commodification of so-called resources. "since the information contained in policy is prone to be released to the market to varying extent before the policy are made public, market participants may have formed expectation and cause possible ex ante impact" (Fan *et al*, 2017). Member states can be expected to form different policy decisions during each new policy amendments formation and release. This in itself can fluctuate participation, and carbon abatement reduction from various member states (Fan *et al*, 2017; Trück & Weron, 2016).

5.2.2. Fraud

There was a significant amount of fraud in the earlier stages of the EU ETS due to the immaturity of the carbon market. The fraud also occurred due to the intangibility of EUAs as a traded commodity (Branger, 2014; Ellerman *et al*, 2010). Branger (2014) argues that most fraud occurred with CER recycling, as well as the transferring of 'non-additional offset credits.' However, the most interesting form of fraud occurred from the large-scale fraudulent VAT transactions on sales of emissions allowances. This was largely as a result of the lack of harmonized EU tax structure (not flaws in the ETS itself). The fraudulent activity in VAT claims from traded allowances amounted to €67 million from member state carbon registries in January 2011. The fraud that was inherent in the market shows the problems of creating a new market based off a new commodity. As argued by Polanyi, markets like the EU ETS have had to reinvent mechanisms to prevent this type of fraud from happening, once again reaffirming the need for strong institutional links that prop up and support market functioning.

a. Missing trader fraud (MTF)

Fraud was a core problem at the heart of the EU ETS during its former phases. According to Frunza *et al* (2010) and Bieger (2018), fraud was easily engineered by the nefarious market actors through various factors. Adapted from Frunza *et al* (2010), these factors include a market that allows for:

i. Easy and inexpensive transport of a high value commodity in large tranches.

EUAs are high value commodities with no cost because allowances were electronically deposited via free allocation to each national registry for EU ETS participating member states.

ii. Zero rated VAT assigned to the trade of a commodity (EUAs) between certain borders (In this case the EU). Thus, allowing buyers of a commodity from one zero rated EU country.

Most of the member states had zero rated EUAs.

iii. These purchasers are then able to claim VAT from a revenue authority in the territory where VAT rates are charged and weren't a part of the initial transaction chain.

There were two main carbon registries operating in France and the Netherlands with VAT on trades. These registries incentivised the fraud because the claimed VAT was payed quickly by the carbon exchange as the trade was completed. Thus, making the fraud cycle a quick process.

These carbon market exchanges included:

- Netherlands - Climex
- France - Bluenext

iv. The EU doesn't want to impede the free flow of goods and commodities between member states. Meaning that verification and audit of zero-rated transactions happens

retrospectively, by which time the trader has since closed the company with the reclaimed VAT being paid out already.

"The MTF on the carbon market could have passed under the radar of market regulators for almost two years for the following three reasons. First the carbon allowances had a double status: financial instrument and basic commodity. Hence the financial regulators did not focus on this market from its inception. Second, the carbon allowances had different regulations across the UE countries and sometimes inside the same countries. Third, the fraud appeared during a global financial distress and market regulators were focused on credit and liquidity issues" (Fruzna *et al,* 2010: 5). These problems reiterate scepticism in carbon markets and reaffirms Patrick Bond's (2012) assertion that carbon markets are formalised in order to perpetuate the right to emit for large carbon intense industries. Bieger (2018) argues that VAT fraud occurred in the EU ETS because the trade of allowances between taxable entities was considered to be the supply of a service. This meant that the allowances were then taxed in the member state where the recipient of the trade was located. The location was of critical importance to those involved in fraud because trades within the EU were zero rated on VAT. However, the traders were able to claim VAT back on carbon registries in the Netherlands and in France which had VAT of the EUAs, resulting in VAT claims in those countries.

Quick action was taken in 2009 when the EU commission realised that sheer quantum of the VAT fraud (Bieger, 2018). Nethlands and France responded by removing VAT from EUAs. "As a consequence in June 2009 the governments of France and the Netherlands have removed the VAT from carbon permits" (Fruzna *et al,* 2010: 4).

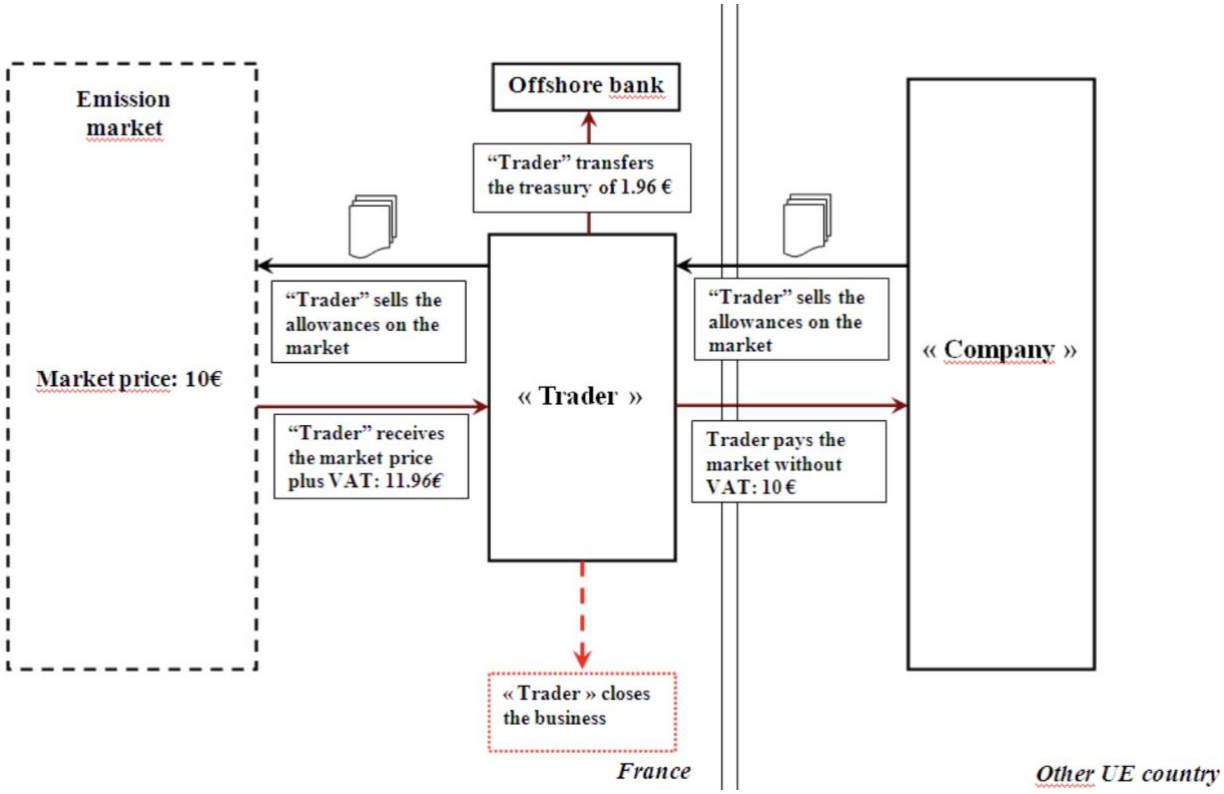


Figure 4: Missing Trader Fraud in the EU ETS (Frunza *et al*, 2010: 5)

The VAT revenue was never reported to the Dutch of French governments by the traders. Instead, traders would pocket the VAT revenue and then close the trading entity (Frunza, Guegan & Thiebaut, 2010). Companies buying tax free allowances and then claiming VAT refunds at the domestic tax rates. Companies would then go MIA and where exceptionally difficult to trace (Dunban & Heler, 2006). As of 2011, nearly 1,3bn euros were lost from various European tax revenues due to dubious trading of allowances between various states involved in the EU ETS (Frunza, Guegan & Thiebaut, 2010). The VAT fraud resulted from VAT refunds on international carbon trade where domestic tax rates and legislation differ from member state to member state.

The reason for fraud being such a key issue is foundational on Polanyi's argument of no actual commodity being for sale (i.e. a fictitious commodity). In other words, the lack of tangibility of the EUA's, and the stealth of the criminal activities involved in the trade undermined the EU ETS from the beginning. The fictitious commodity (Polanyi, 1957) of EUAs is based more on a proxy measure of whether pollution can be accounted for and how real carbon abatement values can be measured. Fern (2013) argues: "The problems faced by the EU ETS in relation to fraudulent

activity are yet another inherent weakness within any emissions trading systems that will forever leave it wide open to financial crimes. One key reason is the nature of the 'commodity' being traded. Carbon, unlike corn or oil- is not a tangible product. It is commoditized as the 'permission to pollute in the future' (permit); or 'Promise that pollution will not happen' (credit)" (Frunza *et al,* 2010).

Frunza *et al* (2010) continues by stating that MTF does not affect the European Union and de facto the European Commission, instead it affects the member states where the VAT is reclaimed after a respective transaction. "It is not a fraud against the Community itself and does not come about because of mismanagement by European institutions, but instead is an attack upon the measures Member States have introduced to promote cross- border trade in the Community" (Frunza *et al,* 2010: 3). The issue of fraud highlights how a supra-national policy environment is not always beneficial to individual member countries. MTF fraud is an example of how industry will exploit loopholes in policy and legislation unless ubiquity in enforcement is maintained throughout the Union (Bond, 2012; Frunza *et al,* 2010).

b. Consumer pays principle (CPP) vs polluter pays principle (PPP)

Fundamental to the EU ETS is that the cost of carbon abatement should not be passed onto the consumer, but rather have the abatement costs factored into the cost of production for companies and countries (Andrew & Seufert, 2012; Fern, 2013). However, it often happens that the cost of abatement is passed onto the consumer, which theoretically becomes the Consumer Pays Principle. This depends on the market structure, particularly of the energy and manufacturing sector (monopoly, oligopoly) (Andrew & Seufert, 2012; Kim, 2000; Pearson, 1994). The market structure of the EU ETS is such that the actor network controlling the decision-making powers ensures that power and capital is preserved by the current incumbents of the fossil fuel and manufacturing industries. This leads to lower EUAs prices in order to preserve current methods of production. This was confirmed by German companies participating in the EU ETS in a 2016 survey (KfW Research, 2016). These companies felt that the EU ETS is currently not effective in reaching the carbon abatement goals outlined in the Paris Agreement. These companies also felt that the weak incentives and weaker compliance provided for by the EU ETS would render the emissions targets

futile in the long run. The low EUA prices showed the large lack in repercussions for companies within the market. This was primarily due to fossil fuel dependent industries having a larger input on the carbon price through benchmarking rather than policy makers imposing a cost on emissions. Considering the incentives are low, the marginal increase in operational cost for businesses are almost directly passed onto consumers as a part of an opportunity cost (Andrew & Seufert, 2012). As a result, allowances and the market determine where the cost is carried and at what price. This instead of a top-town price being imposed on carbon.

Allowances carry a market determined value that can be monitored daily on global or regional exchanges such as the Leopzig Power Exchange, Bluenext or Climex (Frondel, Schmidt & Vance, 2012). Much like cryptocurrencies, the market determined EUA value is primarily based on the amount of EUAs in circulation/trade and isn't valued via any intrinsic value of an allowance. These allowances are always subject to a market value which can be traded at any point at a market agreed price (Tietenberg, 2003). The price that a company will then charge for its product or service can include the cost of production, as well as any opportunity cost, which in this case includes the value of allowances on the open market. In other words, EUA's are considered as opportunity costs where the cost is automatically passed onto the consumer so that there is no change in profits for the polluting companies.

By using an auction-based methodology, companies are rewarded due to the burden of the cost of carbon being shifted to consumers and away from companies. This has its pros and cons for the functioning of the market. For example, the electricity sector has a notoriously price inelastic demand (CO_2 prices passed onto consumers) (Goulder, 2013; Lise, Sijm, & Hobbs, 2010). The extent of passing on the opportunity cost to consumers is a function of supply and demand elasticities, "even in the case of perfect competition" (Frondel, Schmidt & Vance, 2012: 106). Reasons for the inelasticity based on an increase in the cost of production from carbon intense industries is because of there is no other substitute for fossil fuel-based energy at a competitive price as well as the price of the cost of carbon being passed onto the consumer. (Goulder, 2013).

The EU ETS was designed in a way which should include cost of emission reductions in an entities operational costing and long-term investment planning (Goulder, 2013). In essence, the EU ETS

market has proved that the cost of carbon abatement is often transferred onto consumers. Would this carry over of cost be any different if carbon tax was implemented instead? Goulder (2013) argues that an emissions tax leads to the cost of emission abatement or emission production being passed directly onto the consumer and along the supply chain as well. Fundamentally, I argue that the problem once again lies with the functioning of the emissions trading market.

Both a carbon tax and an ETS are inefficient ways of reducing carbon emissions because they are largely driven by fossil fuel consumption, and fossil fuel demand is extremely price inelastic (Goulder, 2013). Price inelasticity means that when there is an increase in the price per unit then there will be an increase in revenue for the polluters. Essentially the price inelasticity is passed onto the consumer regardless of a carbon tax or ETS. However, sentiment indicates that the relative increase in costs passed onto consumers will be higher if a tax is implemented versus an ETS (Goulder, 2013; Frondel, Lipow, 2006; Schmidt & Vance, 2012; Tietenberg, 2003).

Brockington (2012), as well as Anderson and Di Maria (2011) argue that the problem is not with the EU ETS or any ETS in general, but rather an intrinsic problem of the market. Markets rely on the creation and trade of commodities and are dependent on institutions in order to allow the market to function. Could the EU do something to prevent this? Not necessarily. However, the EU Commission could be more inclusive of all stakeholders in the direction of its policies, especially environmental policy pillars because they are so crucial in determining the conservation of the global commons. These stakeholders would include the likes of market critics as opposed to fossil fuel companies that become ultimate lobbyists in the creation of the likes of the EU ETS (Bond, 2012). As a result, the EU ETS is failing from an environmental justice perspective in as far as it is failing to ultimately reduce carbon emissions and protect the environment. The unfair distributive nature of an environmental market has come to fruition with the EU ETS where capital is preserved, accumulated and essentially exploits the environment whilst capital remains flowing between stakeholders with vested interests.

5.3. Problematic implementation - Carbon tax or ETS

Proponents of the green economy approach would argue that argue that the value of an ETS is that it brings about emissions reductions by capping environmental degradation whilst maintaining value for market economies. The facet of economic agents in facilitating socioeconomic inclusivity cannot be overlooked just to ensure the environment is kept intact. Governments need to reduce emissions from both an ethical and legal standpoint. Industries, however, want to pollute. Coase (1960) believes that the middle ground that can be achieved through a pollution cap set by government which is then complied by industry. It is theoretically sound within neoclassical theory but fails to work productively in reality. This has been perfectly illustrated since the implementation of the EU ETS, which has seen minimal actual reductions in carbon emissions (Wolf, 2015).

The EU ETS has done nothing to curb emissions, notes Peter Atherton of Citigroup Global Markets. It [EU ETS] benefits utilities, hedge funds and energy traders while constituting "a highly regressive tax falling mostly on poor people" (Bond, 2009: 9; Lohmann, 2008). As a result, there is a perpetuation of business as usual in favour of capital accumulation and favouring profit over investment into new technologies. As a result, Bond (2012) argues in favour of an emissions tax, especially when the relative cost of carbon abatement is low, and the cost of carbon monitoring systems are high. Lohmann (1999) does however state that when cost of abatement is high, and there are relatively low monitoring costs, then an ETS is favourable (Lohmann, 1999: 937). A cap-and-trade, and carbon tax aren't all too different in terms of fundamental economic principles. Both methodologies are used as a means to reduce overall carbon emission and impose a cost on production. Carbon tax and an ETS impose a marginal cost on each unit of carbon

5.3.1. Inflationary issues

Inflation is an increase in the general price level of goods and services. When there is inflation in an economy, the value of money decreases because a given amount will buy fewer goods and services than before. Inflation in an economy is calculated by examining a basket of goods and services and comparing the changes in the prices of that basket over time. In the case of carbon

tax, the tax will increase inflation and productivity at proportional rates. As a result, the reserve bank of a given country would have to respond to the associated increase in inflation by raising interest rates (Pizer, 1999) However, there tends to be more economic efficiency in a carbon tax as opposed to an ETS. This is due to the greater transparency in taxes and the ability to easily audit a tax in comparison to complex carbon auditing required in an ETS. Bond (2006, 2009) argues in favour of a carbon tax due to the tax creating security for investors and companies because the company will be able to factor the marginal cost of carbon abatement into their business assumptions. According to Bond, the inverse is true for an EU ETS in that the large amounts of carbon price uncertainty remain in an ETS and in particular the EU ETS. This creates large uncertainty for business, and although the ETS might be an opportunity for innovation and income, the actual opportunity is not set in stone.

5.4. Conclusion

Institutions in the EU ETS function as Lohmann would define as a '*partial bite'* set of institutions. This assumes institutions in the system are well-designed to start off with, which entails elements of "credibility and flexibility" (Lohmann, 2003). I believe that if the EU were to continue along its current path of allowing the market to control carbon abatement strategies, then it would be at best preserving the status quo in terms of business as usual emissions albeit with a slight reduction. As time marches on, developed economies (who have committed a vast majority of the world's pollution) and who signed up to the Kyoto Protocol, continue to propose and ratify policy directives and legislation to control economic processes and the associated excess pollution (Goulder, 2013). This imposes a limit on development on economies that still require carbon intense industries to develop their own economies. According to Polanyi (1957: 23), 'the root of any crisis is the threatening collapse of the international economic system'. The EU ETS in its very nature is an international economic system (covering 31-member states in the EU) that has shown the ability to collapse since its inception in its pilot phase without an external threat causing the collapse. I argue that the inherent problems in creating markets for fictitious commodities have led to problems that make it evident that the EI ETS is no longer a viable option for carbon abatement. Moving forward there will have to be clear decisions made by the EU Commission and its member states if there is going to be any real change realised in addressing the EU's position

regarding climate change. At best, the EU ETS has preserved the right for companies and countries to emit carbon dioxide. This might have allowed more countries to become more equitable in terms of the economic contribution to the EU, but the EU ETS has done little to nothing in reducing carbon emissions or setting an accurate price for carbon as a commodity.

6. - Conclusions

The EU ETS is premised on the commodification of the environment through the process of creating a market which then trades the commodity. The literature review relied primarily on these two fundamental theories; (1) the commodification of nature, and (2) the theory of markets where Polanyi was central to explaining the structure of environmental markets. Both theories were critical to explaining my research questions of the problems of the EU ETS, and its underlying theory because a commodity cannot exist without the simultaneous creation of the market. As a result, further exploring the relationship between the creation of a commodity and its relationship to markets were very useful. The methodology chapter then clarified the used of secondary documentary analysis and how I was able to contribute to the literature on carbon markets and the EU ETS by analysing the theoretical underpinnings.

The theoretical underpinning of the commodification of nature and the theory of markets helped to clarify the research questions and determine that the EU Commission maintains an ideological commitment to maintaining the status quo of capital accumulation and preserving the right to emit. The EU Commission has shown their commitment to interfering in a market to try engineer success into the market. This was attempted by allowing the market to determine the price at which carbon abatement would become acceptable instead of imposing a top down directive on the price that emitters would pay to emit. The EU ETS has shown how challenging it is to ensure market stability in a market that relies primarily on the tradability of a fictitious commodity. The EU Commission struggled to succeed in having an impact on emissions reductions until it took a stricter stance on reducing carbon emissions when designing environmental policies. This not only applies to the design, but also to amendments to the respective directives which saw, inter alia, banking of allowances being considered as an institutional mechanism of propping up the market.

The EU ETS has continually reinvented itself through political, policy and institutional intervention try engineer success of the market. Polanyi (1944) says that this is exactly what happens within markets, “The road to the free market was opened and kept open by an enormous increase in continuous, centrally organized and controlled interventionalism” (Polanyi, 2002 [1944], 144). There has had to be a continued intervention in order to try engineer success into the

EU ETS, exactly as Polanyi (1944) said when he argued that self-regulating markets don't exist outside the regularised rules determined by institutions and their soft infrastructure. As time has moved on, the EU ETS has become more efficient due to the introduction of member states nation based fiscal instruments working in conjunction with the ETS. However, this has done very little to curb actual emissions from member states.

The theory of markets, with particular reference to the green economy have highlighted that the EU ETS requires significant institutional support and revisions to keep it operational and effective. The EU has taken the policy decision to implement a market based ETS where commodification and putting a price on carbon should restrict companies from over emitting. This commodification of air was considered to be a very reasonable policy action by the EU Commission, however the commodification has largely failed in its implementation especially during its former stages since very little carbon abatement has resulted. The EU ETS was created in order to preserve an existing form of production in developed countries. Instead of placing a restriction on emissions, an incentive was created. This preserved business as usual emissions from traditional production methods, with minimal restrictions to reduce emissions past a country's own developmental agenda.

Polanyi and his understanding of markets helped contextualize my research questions and objectives in the EU ETS. This is due to most policies and legislation within the emissions trading arena having a strong institutional requirement in order to allow their effective implementation into a market. The policies and legislation in emissions trading systems are at odds with other environmental policies like the Paris Agreement and Kyoto Protocol. This is because environmental agreements like the Paris Agreement focus on absolute emissions reductions whereas an ETS encourages trading to further profits from emissions (Bond, 2012; Knopf *et al*, 2018). The primary goal of the ETS was not only to ensure a price on emissions but also a direct linear reduction of carbon emissions, which would indirectly encourage the economy to transition to less carbon intense technology. Both objectives of putting a price to carbon and ensuring emissions reductions were hardly achieved. EUA prices have been too low to encourage companies to invest into new technologies. Prices having generally moved around the 5 Euro per tonne of CO_2, around 6 times lower than the 30 Euro per tonne that would have been required for

a company to begin investing in carbon free technology. The EU ETS must consider major institutional and policy restructuring if it is to start meeting its own goals of massive carbon abatement. This needs to be done despite the MSR which is to be implemented in 2019. The intervention of a pure quantity-based mechanism MSR is crucial but does demonstrate difficulty of allowing a market to act as a 'free trade mechanism'. The market restructuring needs to entail EUA price caps and collars to ensure efficiency and certainty in the trading process.

Policy makers redesign institutions and their powers all the time. I would argue that this is exactly how institutions have shifted in order to allow for the creation and development of the EU ETS. Within a market economy, all income must be derived from the sale of something, or an exchange of sorts. Markets don't just exist, they are stimulated and born in order to achieve the model of exchange and economic system which predominates within social systems. Markets are based on the motive of exchange. This motive of exchange is what fundamentally drives the EU ETS. However, exchange will only be carried out if EUA prices and fair allocation are guaranteed.

An ETS and a carbon tax aren't too different in terms of both methodologies imposing a cost on production to reduce overall carbon emission. A carbon tax and an ETS impose a marginal cost on each unit of carbon emitted by an entity. Neither emissions trading nor GHG taxes are the most efficient way to reduce carbon emissions. Both emissions trading and carbon taxes are an inefficient way of reducing carbon emissions, because the income derived from a carbon tax or ETS depends on fossil fuel consumption [no matter how high the price goes by imposing a cost on production, the economy is largely dependent on this fossil fuel and will find it hard to cut consumption]. However, putting a price on carbon is an essential part of developing climate change policies in both the developed and developing economies. Ambitious cap-and-trade systems need to be implemented moving forwards. Combined with a stable reserve institution and mechanisms that can control supply and pricing.

In order to meet commitments made under the Kyoto Protocol to limit global warming to under 2 degree Celsius, more effort will have to be placed on keeping carbon pricing at a high and stable price. This was a core theme of the objectives of establishing an environmental market in the EU. The EU ETS needs further institutional and policy intervention to ensure price stabilization

including effective monitoring and accounting. The cap-and-trade market mechanism has managed to privatize air as another means to capital accumulation for polluters. The EU ETS has created a market where the right to emit is rewarded with financial incentives**.**

Understanding the theory of how the carbon commodity is created has helped in the better understanding the various angles from where to approach policy and institutional interference in carbon markets. Lessons can be learnt from failures in the green economic project that continually reworks and restructures the EU ETS. EU institutions are continually playing a crucial role in influencing how the EU ETS market functions. The Commission has indeed acknowledged the problem of climate change but making sense of the market seems to be increasing complex. The Commission will have to continue to make institutional changes to try and fix problems inherent in each phase. However, each institutional intervention is still predicated on the challenges inherent in the commodification of a fictitious commodity and the markets that govern them. Will these institutions be sufficient to address the problems in the markets?

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