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An integrated system of CO_2 reduction policies for Environmental Liberals

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Introduction

In the last couple of decades, environmental change has become an increasing risk for society. Politicians, scientists, environmental philosophers and citizens from all over the world concern themselves with the challenges that we, as a species, will face[1]. There is a variety of researchers and activist groups addressing different environmental issues. The World Economic Forum (WEF) investigated the most important risks for society and summarized them in their Global Risks Report of 2019. The WEF claims that in terms of their likelihood and impact, the three biggest global risks are all environmental issues: natural disasters, extreme weather events, and failure of climate change mitigation and adaptation. All these risks are connected to climate change (WEF, 2019). The consensus among scientists is that human activity contributes to the changing climate, because emissions of greenhouse gases increase the temperature on earth (IPCC, 2014). The impact of every greenhouse gas is different, but the effects of each gas can be reduced to a CO_2 equivalent. For each greenhouse gas, this quantitative measure describes the amount of CO_2 that would have the same effect on global warming. The problems caused by climate change become more extensive with every additional amount of CO_2 that is released into the atmosphere. One of the reasons behind the excessive amount of CO_2 emissions is that the harm done by them is not always taken into account in the consideration of whether or not to emit CO_2. This is a form of market failure that will be discussed in chapter 1. For now, it suffices to state that the high amounts of human CO_2 emissions end up doing more harm than good, which makes them a problem that deserves our attention.

Excessive CO_2 emissions form a risk for society and many attempts have been made to reduce the amount of these emissions. However, the initiatives and measures taken so far have not been enough to limit the problems created by CO_2. Global emissions are still rising and policies to reduce them do not get the support they need. Most scientists agree that more should be done to reach the goal of limiting global warming to 2 degrees, as laid down in the Paris Agreement of 2015 (IPCC, 2019; Buendia et al., 2019). However, it is difficult to get political support. There is a gap between the indicated direction by science and what is politically feasible. One possible way to bring politics closer to scientific demands is investigating moral arguments based on political values that explain why and how emissions should be reduced.

Environmental philosophers ask themselves questions about the way we should respond to environmental problems. There is a variety of different positions that they could support. For example, deep ecology, coined by Arne Naess in 1973, is a philosophy that supports the idea that all objects and beings are equal in respect to their intrinsic value. Deep ecologists believe that the intrinsic value of nature should be respected by avoiding activities that are harmful to the environment. Shallow ecology is the opposing movement which is of the opinion that environmental problems should only be prevented because of their impact on humans (Naess, 1973). Not all environmental positions are compatible with every political ideology. For example, the environmental position that all of nature should be protected for its own sake, does not match with the ideology that only intelligent beings have intrinsic value. Political authorities only support positions that match with their political values. To have an impact on the political status quo, environmental concerns need to be reconciled with the prevailing political ideology.

[1] BBC (2019) COP25: Longest climate talks end with compromise deal, https://www.bbc.com/news/science-environment-50799905.

Liberal democracy is the dominant political system in western society. Therefore, to get more political support, environmental arguments for CO2 reduction policies need to be compatible with liberal-democratic values.

One of the difficulties in combining environmental concerns with liberal democracy is that policies to protect nature put limits on what people are allowed to do and thereby limit the individual liberty of citizens. Marcel Wissenburg is a political philosopher who combined the values of liberal democracy with environmentalism. He created a theoretical framework to categorise different positions within environmental theory and showed which positions can be reconciled with his interpretation of liberal-democratic values, resulting in what he has called Green Liberalism (Wissenburg, 1998). These liberal environmental positions can be used to investigate which CO2 reduction policies fit best with liberalism.

There are many types of CO2 reduction policies. In order to analyse them, I will use a categorisation derived from Coase (1960). He distinguishes three categories of policies that can respond to problems created by market failure. A policy can either be political, by making restrictive rules for all actors that indicate how much CO2 each is allowed to emit; It can be juridical, by making emitters liable in a court of law for the individual harm they have created, or it can be economic, by enforcing regulations on the market system. As further explained in later chapters, the focus of this thesis will be on economic measures to reduce CO2 emissions, because they are both in accordance with liberal values and practically feasible. I focus on the two most popular kinds of economic policy: CO2 emissions trading systems and CO2 excise taxes.

I will investigate whether the CO2 policies mentioned above are compatible with liberal democracy, based on the green liberal framework of Marcel Wissenburg. This is a relevant philosophical topic because it tests whether Green Liberalism as a theory can offer solutions for environmental problems in reality. Wissenburg argued that liberal-democratic values can be united with environmental concerns. Investigating how liberals can argue in favour of CO2 reduction policies will tell us more about their compatibility. This thesis aims to get a better understanding of the environmental reasons that liberal democrats can use to argue in favour or against specific CO2 reduction policies. The research question is: '*How can measures to abate CO2 emissions be supported by liberal-democratic positions on the environment, despite the emphasis on fundamental freedom and market arrangements?*'.

Before discussing policies that can fix the problems of CO2 pollution, I first need to establish why there is a problem. For liberal democrats, policies are only necessary when the market cannot provide a solution. The first chapter is about market failure. I will describe the difference between private and public goods and explain why the ability to emit CO2 is a public good. CO2 emissions create negative externalities, resulting in excessive emissions that decrease the total wealth in society. The CO2 market is affected by the externalities and cannot create an efficient amount of emissions. The second part is about a counterargument from Coase (1960) who showed that externalities do not necessarily decrease total utility. I will demonstrate that the theory of Coase does not apply to CO2 pollution.

Chapter 2 is about possible responses to market failure. I will explain why the political and legal responses are not suitable to counter externalities created by CO2 pollution. An economic response is the most efficient way to deal with them. I will discuss two kinds of economic policies: a CO2 emissions trading system and CO2 excise tax.

Chapter 3 contains a brief explanation of the three basic values of liberal democracy: liberty, equality and democracy. Here I explain that economic CO_2 policies are not only the most efficient but also desirable because they are the least restrictive on liberty. Even though economic policies still restrict individual liberty to some extent, they also prevent harm inflicted on third parties which is required from a liberal perspective.

Chapter 4 will describe six dimensions in environmental theory, derived from the theoretical framework of Marcel Wissenburg. Each dimension has different positions on how to understand and conceptualise nature. I will analyse which of those positions are compatible with liberalism and which CO_2 policy fits best with that position. This will provide a set of reasons to prefer either excise tax or emissions trading. In the end, I will conclude that democratic liberalism is most compatible with a combined system of both excise tax and emissions trading, based on the environmental positions that can be combined with liberal-democratic values.

Chapter 1: How market failure leads to excessive CO_2 emissions

1.1 Market forces

In this chapter, I will discuss the role that market failure has in the emissions of CO2. This is an important topic because it is the reason why a reduction policy is necessary in the first place. If a functioning market system would already lead to the optimal amount of CO2 emissions, there would be no need for a policy that influences that amount. Reduction policies are only required when the market fails. Therefore, it is necessary to establish that the market does not function properly regarding CO2 emissions and that it results in an excessive amount of these emissions. I will begin with a brief description of the mechanisms in a market system without market failure. At the end of this section, it will become clear why perfectly functioning market forces have the potential to create an optimal allocation of resources. In the following paragraphs, I will explain that this potential cannot be realised for CO2 emissions.

A market is formed by two parties: those that sell goods and those that buy them. When a buyer and a seller agree on a price, a transaction can take place in which the buyer pays a sum of money and receives the economic good in return. I will assume here that people sell economic goods when the money they receive for it exceeds the value that the good has for them. For example, when someone owns a beautiful gemstone, they may consider selling it, but only if the price is high enough to make them value the money more than the gemstone. Vice versa, people buy economic goods if they value that good more than the price they need to pay. When a person sells something, they lose the value that the economic good has to them. The loss in value can also be called a cost. Transactions only occur if both the selling and the buying actor believe that the benefits exceed the costs. This means that the incentive behind transactions is a force that increases wealth, because both parties benefit from it.

Both the demand and the supply of economic goods depend on its price. At a higher price, more people would like to sell because they get more money in return, while fewer people buy the economic good because it is more expensive. Vice versa, low prices result in low supply and high demand. The price functions as a mechanism that balances the supply and demand. If the price is too high, there is more supply than demand. At that point, some of the suppliers will leave the market, or agree to sell for a lower price, because they do not want to be left with unsaleable products. If the price is too low, there will be a shortage of the good, causing an increase in the price. These price mechanisms make sure that the demand and supply tend to balance at a price where the demand is met by the supply, which is called an equilibrium (Starr, 2011: 3).

In the absence of market failure, an equilibrium implies that goods are in the hands of people that value them the most, given the distribution of purchasing power. If someone else could make better use of the economic good, they would be willing to pay the necessary amount to convince the other to sell it. The equilibrium is a Pareto optimum, meaning that distributing economic goods in another manner cannot make any individual better off without making someone else worse off (Cornes & Sandler, 1996: 22-24). Everyone who owns the economic good values it as much or more than the price they have, since they would sell it otherwise. Everyone who does not own the economic good values it less than the price, because they would have bought it otherwise. This is the first fundamental theorem of welfare economics: a competitive equilibrium is Pareto efficient (Starr, 2011: 3).

Markets fail when the price mechanism does not lead to a Pareto efficient allocation of goods. When the market fails to reach a Pareto optimal equilibrium, economic goods are not in the hands of people who value them most. This means that a different allocation of goods could increase the aggregate wealth in society without making someone worse off. In that case, there is a potential to create more wealth for at least some people in society that cannot be realised through price mechanisms in the free market. Policies may then be used to increase wealth in society and move towards a more desirable allocation of resources (Keohane & Olmstead, 2016). Before investigating these policies in the second chapter, the following sections will first explain why the market sometimes fails in providing a Pareto optimal allocation of resources and argue that this is the case with CO_2 emissions.

1.2 Public and private goods

For some goods such as the aforementioned example of gemstones, the price mechanism can result in a Pareto optimum. Market forces are efficient for these goods, because there are no major obstacles that counteract the price mechanism. Ownership rights can be clearly defined, the transaction costs are relatively low compared to the price, and the transaction of a gemstone does not impose significant costs or benefits for third parties. Because there are no obstacles that prevent market forces from creating a Pareto optimal allocation, it can be traded efficiently in a private market.

Gemstones are an example of a pure private good, which is characterised by having both excludable and rivalrous benefits. Excludability means that an owner has the right and the possibility to prevent other people from using or benefiting from the good directly or indirectly. Rivalrous means that the benefits that a good has for one person limit the benefits for other people (Cornes & Sandler, 1996: 8). For example, a loaf of bread is an excludable good, because the owner can prevent other people from consuming it. It is also rivalrous, because when a person eats it, another person cannot use it anymore. Another, slightly different, example is a tool, such as a wrench. Unlike bread, a wrench can be used multiple times by different people without losing any of its value. However, it is a private good: It is rivalrous because when one person uses it, another cannot do so at the same time; It is also excludable because the owner can prevent other people from using it.

A pure public good is both non-excludable and non-rivalrous. An example is a dyke that protects the land behind it from flooding. It is non-excludable, because the owner of the dyke cannot prevent individuals from its protection. This makes it hard to raise enough resources to build and maintain them, because people will be protected whether they contribute or not. A dyke is also non-rivalrous, because the protection that it offers for one individual does not limit the level of protection for others. This means that even if exclusion were possible, it would not make sense to do so because the level of protection for others remains the same, whether they include them or not. The obstacles contract market forces and make it difficult and sometimes even impossible to create public goods in a free market system. Therefore, government policies are necessary to produce public goods.

Pure public goods are both non-excludable and non-rivalrous, but it is also possible that a good only meets one of the two criteria to a certain extent, which makes it an impure public good (Cornes & Sandler, 1996: 9). Goods that are non-excludable and rivalrous are called a common-pool resource. An example is the fish stock in the oceans. This stock is non-excludable to some extent, because it is difficult for the owners to prevent people from removing their fish

from the sea, especially since they swim across territorial borders. It is rivalrous, because catching fish reduces the amount of fish in the oceans which makes it more difficult for others to catch fish.

1.3 Externalities

A common-pool resource such as the fish stock content in the oceans is subject to market failure, because it is extractable by individuals who only bear a small percentage of the total costs that they create. Most of the costs are paid for by other people who are not responsible for creating them. The reduction in fish stocks increases the future costs of catching fish. These costs are spread out over the people who want to fish in the area, because they are all affected by the reduced fish stocks. However, the decision to extract a particular amount of fish is made by the individual fisherman and not by the collective. Individual fishermen have no incentive to consider the costs that they create for others. For individuals, it is beneficiary to take out more fish for as long as their individual profits increase, even if the associated costs for others are higher than their increased profits. The fishermen create costs incurred by third parties who were not involved in the decision-making process. This kind of cost is called an externality.

Just as fish stocks, the CO_2 content in the atmosphere is a common-pool resource, subject to problematic externalities. Although the CO_2 emissions of one person do not reduce the physical ability of others to emit CO_2, the atmospheric CO_2 content is a rivalrous good (Graves, 2013: 48). Nature can only absorb a certain amount of CO_2, and high concentrations in the atmosphere are undesirable. Therefore, the value of the atmospheric CO_2 content decreases when emissions are too high, just as the worth of the fish in the ocean decreases when there is too much fishing. Atmospheric levels of CO_2 are non-excludable, because it is almost impossible to exclude people from the consequences of increasing concentrations of CO_2 in the atmosphere. Atmospheric changes are not confined within specific borders but affect the entire planet. In the following section I will explain why market forces alone do not lead to a Pareto optimal amount of CO_2 emissions.

In order to determine the economic effects of externalities I will first elaborate on the meaning of this concept. Giving a definition of externalities has been a source of controversy in economic theory. James Buchanan and William Stubblebine wrote an article about it. They say that an externality is present when the utility of an individual depends on an activity that is under the control of someone else (Buchanan & Stubblebine, 1962: 372). In other words, the action of someone affects another party who did not choose to be affected by it. As pointed out by Cornes & Sandler (1996), this definition is rather broad. It includes cases such as an employer who uses his authority to fire an employee, or the determination of tax rates. These are not considered to be externalities, because they are based on authority and not on market failure. Arrow (1969) defines an externality as the absence of perfectly free competitive markets. The utility of an individual can depend on action A of someone else. If there is a competitive market where A can be bought and sold, it will result in a Pareto optimum.

For example, noise pollution could be an externality (Arrow, 1969: 513-4). Suppose a businessman starts a new construction project in the middle of a city. It will cause a lot of noise pollution for people in the neighbourhood. They did not control the action of the businessman and did not choose to be affected by it. However, the construction project did have an effect on their utility since they had to undergo the noise pollution. The decline in their utility is an

external effect of the project. Now suppose that the same project would move to the edge of town on the land of a farmer. This farmer suffers from the noise pollution just like the neighbourhood in the last example, but in this case the businessman needs to have a contract with the farmer that allows him to build on his land. Because the farmer entered into a contract with the businessman which allowed the latter to start building and thus causing noise pollution, there is no external effect present here. The farmer could have chosen to refuse it when he gave permission for the project. In Arrow's view, the noise pollution in the city is an externality, because there is no compatible market in cities where the absence of noise pollution can be traded. In rural areas where large acres of land are owned by one or a few farmers, such a market does exist, because potential noise polluters need to negotiate with farmers to be allowed to create noise pollution.

1.4 The Coase theorem

The previous section explained that externalities can create Pareto inefficient allocations of resources, because the costs and benefits imposed on third parties are not taken into account. For example, the owner of a coal-fired power plant will take the costs that he needs to pay for coal into account, but not the costs that CO_2 emissions impose on other people, resulting in higher emissions than would be desirable.

Ronald Coase opposes the analysis above. In his article The Problem of Social Costs, he claims that the distinction between the private costs (that of the coal) and the public costs (of increased CO_2 levels) is not enough to justify government interference (Coase, 1960: 1). He argues that externalities do not necessarily result in Pareto inefficiencies, provided that transaction costs are low and ownership rights well-defined. In 1961, Calabresi argued for a similar position: "The prices of goods [should] accurately reflect their full cost to society … [but] it actually does not matter who bears the loss initially" (505-506). This means that the distribution of income is irrelevant; as long as the costs of externalities are presented in the price, it would not matter if these costs are borne by third parties or by the people who caused them.

Coase argues that if transaction costs are sufficiently low enough, externalities do not affect the allocation of resources. If, for example, the production of a product requires contamination of a river, and the harmful effect of it is that fewer fish will be caught by one particular fisherman, than the production creates an externality. There are two options in this case; either the producer reduces his polluting activities, or he continues with them. Coase pointed out that the preferable option depends on the respective costs. If the profit that the producer would lose from reducing his production exceeds the losses of the fishermen, it is best that pollution continues and if not, it should be reduced. Despite the externality, a simple transaction between the two parties will automatically result in the optimal allocation of resources. If the pollution creates more costs for the fisherman than benefits for the producer, they both have an incentive to bargain and strike a deal that reduces the pollution. In order to stop or reduce the polluting activity, the fisherman can pay the producer a sum of money, which is less than the costs he would suffer from pollution and more than the producer would gain from his production. If the pollution creates less costs for the fisherman than benefits for the producer, there is no incentive nor is it desirable to stop with the pollution. The aim of any regulation should be to secure the optimum amount of economic activity, maximising the value of production (Coase, 1960: 42). In the example above, there is no need for regulation, since the

market incentives already lead to the desired amount. The following section explains why this does not apply to the externalities created by CO_2 emissions.

1.5 Transaction costs and ownership rights

The assumption Coase makes is that transaction costs are zero. He does not claim that there are no transaction costs in reality, but merely shows that these costs are the reason that externalities sometimes justify state regulation. To investigate whether a proposed policy is desirable, the outcome of the current system should be compared to the outcome of the proposed policy (Coase, 1960: 43). In the market for the CO_2 content in the atmosphere, the number of people affected by anyone who emits CO_2 is very high. The concentrations spread out over the entire planet, meaning that basically every human being is affected. When the number of people engaged in a transaction is large, the transaction costs are very high, because the number of possible interactions between individuals increases exponentially with the number of people involved, which makes it difficult to reach the optimal outcome (Coase, 1960: 17). For CO_2 pollution it means that every individual who emits CO_2 would have to negotiate transactions with all people living on earth. They then need to compare the amount that these people would pay to stop emissions to the amount that the individual would gain from it. Since that would be impossibly expensive and practically infeasible, government regulation is required to reach the desired outcome. Moreover, since CO_2 concentrations in the atmosphere spread out across boundaries, they cannot be defined in enforceable property rights. Thus, the current practice of CO_2 emissions is not Pareto efficient. Therefore, government policies are required to deal with externalities of CO_2 and reduce excessive emissions.

Chapter 2: Responses to market failures

2.1 Kaldor-Hicks efficiency

The previous chapter showed that externalities are losses suffered by third parties, as a result of the economic actions of other people. Government policies are only justified when it is not possible to trade these externalities in a free market system. This is the case with the CO2 content in the atmosphere, because of the high transaction costs and difficulties in enforcing property rights. Consequently, the free market fails with regard to CO2 and it does not lead to a Pareto optimal amount of CO2 emissions. The criterion of Pareto efficiency demonstrates that the distribution of CO2 emissions is suboptimal, given the current distribution of income. For that particular purpose Pareto efficiency is a good criterion; it indicates that improvement is possible. However, changes in the distribution does not need to be Pareto efficient to be morally desirable.

The criterion of Pareto efficiency requires that no one will be worse off. This entails that everyone who loses wealth because of a CO2 policy would need to be compensated for that loss. This requirement of making no one worse off only makes sense as a moral criterion if the initial distribution was just. Otherwise it only maintains a status quo that was unfair to begin with. Without a CO2 policy, emissions are not distributed fairly, since people could just emit CO2 without consent of harmed third parties. Therefore, the initial distribution of CO2 emissions is not a just reference point. Additionally, even though it may be theoretically possible to compensate everyone who is worse off, the transaction costs associated with such compensations are very high. Therefore, I will not use Pareto efficiency as a criterion to assess the preferability of CO2 policies.

Kaldor-Hicks efficiency is a different criterion in welfare economics which focuses on improving efficiency without referring to distributive complications. It requires that the people who will be better off, could hypothetically pay compensation to the people who will be worse off (Hicks, 2939: 712). For example, a CO2 policy would increase the welfare of a thousand people with € 20 each, and the welfare of fifty large emitters, suffering more from the restrictions, would decrease with €200 each. Collectively, the thousand people gain €20.000, so theoretically they could compensate the €10.000 loss of the large emitters and still be €10 better off than without the CO2 policy. Kaldor-Hicks efficiency does not require that actual compensation is paid, but only that the people who are better off would still benefit after paying the theoretical compensation (Coleman, 1979: 513). In the remainder of this thesis, I will use the Kaldor-Hicks criterion to assess whether CO2 policies are efficient or not.

2.2 Three responses to market failure

There are many ways in which a government can make policies that respond to market failures caused by externalities. In the remainder of this chapter, I will discuss three different categories and explain that economic policies such as excise tax and emissions trading are the best category to respond to excessive CO2 emissions. In the next chapter, it will become clear that economic policies are not only the most efficient way to deal with CO2, but also the most compatible with liberal-democratic values.

There are three types of reactions to the problem of externalities (Coase, 1960: 43). All these reactions are policies that need to be implemented by governments. The first category is legal policies. These are laws that make individuals who create an externality liable for the losses

that they caused. For example, a coal-fired power plant can sometimes emit graphite particles into the atmosphere. As a result, nearby cars can get dirty or damaged. The legal response to this externality would be to implement a law that makes the owner of the factory liable for the damage, forcing him to pay compensation to all the affected car owners every time graphite is released into the atmosphere.

The second category consists of political policies that restrict or prohibit certain activities that create externalities. For example, a government could stop renewal of the power plant license or oblige the plant management to use technology that reduces harmful emissions.

The last category consists of market-based policies that change market forces to create a more efficient distribution of resources. An example is the implementation of an excise tax per ton coal to internalise the negative externalities created by graphite particles in the atmosphere.

Legal policies are not a suitable solution to reduce excessive CO_2 emissions, because they only have an effect if they can make the producers of an externality liable in a court of law, for the costs they impose on others. [For example, when government policies specify fees that airlines must pay as compensation for delayed travellers.] This is only possible if it is clearly determinable which actors are responsible for an externality and who are affected by it, which is not the case for CO_2 emissions. The large number of people that emit CO_2 and the spreading of CO_2 particles make it impossible to determine exactly which individual emitter(s) can be held accountable for the consequences of CO_2 pollution. Furthermore, the transaction costs of such a liability-based legal system would be too high, because of the extensive number of people involved in CO_2 emissions.

The second category consists of political rules and licences that regulate the actions that create externalities. For example, when governments decide on a maximum height for buildings, because high buildings create externalities. Political policies either apply a set of criteria to all cases, or consider (some of) them individually, if the number of cases is small enough to do so. [The number of CO_2 emitters is too large to consider for every individual whether their ability to emit CO_2 is worthwhile.] The reasons to emit CO_2 are too diverse to make one set of exact rules that applies to everyone equally. It would require extreme regulations on the energy consumption of households prescribing how much energy usage is allowed for each individual, regulating how many kilometres they can drive in their cars, and it would require specifications for each organisation determining exactly how much CO_2 they can emit. It is true that some CO_2 emitting activities could be regulated by government policies. For example, it is possible to regulate the maximum amount of CO_2 per kilometre that cars can emit or require them to have a catalytic converter that minimises harmful emissions. These are both examples of a uniform rule that applies to everyone equally. But these rules cannot differentiate between the needs and desires of individuals. It only limits externalities to a certain extent. For example, uniform regulation of the number of kilometres that everyone is allowed to drive are not desirable because the differences between the preferences of individuals are too large to make such rules efficient. Therefore, political policies are only efficient in reducing excessive CO_2 emissions for some parts of the CO_2 emitting activities, but it is not a complete solution for excessive CO_2 emissions in general.

The last category of responses to externalities are market-based policies that intervene by influencing market forces to change economic incentives. There are two different ways in

which market-based policies can influence market mechanisms (Patt, 2017). They are discussed hereafter as two subcategories.

The first subcategory of market-based policies internalises the costs of externalities. For example, through the introduction of a tax rate that is equal to the negative externalities. The result is that the externality costs will be considered by individuals who cause them. Such an internalisation requires that the costs can be calculated and charged to the people concerned. In order to introduce a tax, the prize or rate of it needs to be standardised. Such an amount is efficient if the actions that create externalities are comparable. For noise pollution, it would be very hard to make a standard that internalizes the costs of externalities, because every form of noise pollution is different. The nature of noise pollution depends on a variety of variables that are different for every individual case: loudness, range, frequency, harmony, and duration. Moreover, even if the noise itself would be the same, the externality still varies depending on the place, the number of people in the affected area and what these people are doing at that time. It is almost impossible to make one standardised tax formula that takes all these factors into account, and even if an accurate formula could be defined, the costs to acquire the necessary information about all the variables in every individual case of noise pollution would be too high. Therefore, cost internalisation is not a suitable system to deal with noise pollution. CO2 emissions on the other hand are all homogenous in the sense that every individual particle of CO2 is identical, and unlike soundwaves it does not matter where CO2 is emitted, since the concentration spreads around the world. Therefore, market-based policies that internalise the costs of externalities are a suitable policy to reduce excessive CO2 emissions.

The second subcategory of market-based policies does not seek to internalise costs directly. Instead, these policies create new transferable property rights and facilitate a market system where these can be traded. The property rights are permits that allow the owner to perform activities that bring about externality costs. This system reduces excessive externalities by regulating the number of rights. Next, market forces will ensure an efficient allocation of these rights, as they will be bought by the people who are willing to pay the highest price. This system is efficient if the externality is homogenous and the group of people who buy and sell the rights is large enough. Again, for noise pollution such a system would not work, because the number of people who produce a significant amount of noise pollution at any given place and time is not extensive enough to create a competitive market. For CO_2 emissions however, it is an efficient policy because the demand for CO2 emission rights is high. There are many different people who need to emit CO2 for their production processes. Provided that the number of rights is scarce, the price will be competitive. Therefore, market-based policies that create tradable property rights are a suitable way to reduce excessive CO2 emissions.

2.3 CO_2 excise tax and CO_2 emissions trading

The previous section argued that market-based policies are the most efficient to reduce excessive CO2 emissions. There are two different subcategories of market-based policies that make an impact by either internalising externalities, or by creating tradable property rights. There are multiple policies that fall into one of these categories, as there are different ways to internalise costs and formulate property rights. Some examples of policies that internalise externalities are minimal prices for products that emit a lot of CO2, subsidies for CO2 reductions, additional fees for certain activities, taxation of CO2 emissions directly, increased or reduced sales taxes for specific products and so forth. For property rights, the differences are more subtle, and depend

mostly on their applicable branches of industries, the period for which they are valid, and the area in which they can be used. Also, additional conditions can apply to the rights, such as an annual reduction of the amount of CO2 that can be emitted per permit. In the section hereafter, I will discuss the effects of CO2 excise tax and the CO2 emission rights system, as they are the most relevant policies in political debate.

A CO2 excise tax is a price that needs to be paid per amount of CO2 emitted into the atmosphere. The price is determined by the externalities that are generated by the CO2 emissions. It internalises the external costs of emissions into the price. The person who emits CO2 is confronted with a price that reflects the damages that his emissions inflict on other people (Sandmo, 1975: 86). These kinds of taxes are sometimes criticised because they increase the division between the wealthy and the poor, as rich individuals can easily afford to pay higher prices for goods that involve high CO2 emissions, while others may no longer be able to afford for example the ownership of travelling by plane or owning a car (Schiffman, 2011: 105).

I agree that it is important that CO2 reduction policies do not increase the gap between the wealthy and the poor. However, I disagree with the argument that Schiffman uses, because it ignores a very important aspect of excise taxes: they do not only increase costs, but also raise tax income. Taxes are not a one-way transfer. In return, people receive all kinds of benefits from the projects funded by governments. It is not the tax rates themselves, but the ratio between tax-payments and received benefits that influences the gap between the wealthy and the poor. For example, taxing every citizen with an additional €1,000 independently of their income may seem unfair, but it all depends on how these tax revenues will be spend. If they are used to subsidise foodbanks, social housing, and second-hand shops, the tax could even decrease the wealthy-poor gap. Usually, regressive taxes could come from political interests to reduce the burden on wealthy citizens. It may seem pointless to first introduce heavier taxes on poor citizens, only to subside them afterwards. However, in the case of CO2 excise tax, doing so is efficient because the tax does not only influence the distribution of purchasing power, but it also internalises externalities and prevents excessive emissions of CO2.

Apart from the efficiency of excise tax, a second consideration can be the manner in which its revenues are spent. It determines the overall effect on the distribution of purchasing power. There are different ways to spend it: Compensating less wealthy individuals, or offering them alternatives for CO2 emissions such as public transportation; Paying off public debts or investing in public education, which is mostly favourable for future generations; Or investing in projects of climate change mitigation or adaptation, which is most favourable for people who live in areas that suffer most from climate change. In the end, the different ways to spend tax money determine which groups in society benefit from the CO2 excise tax, which is an important consideration. However, governmental expenses are determined by political decisions which do not relate to the general preferability of the excise tax or emissions trading system, which is the focus of this thesis.

CO2 emissions trading pertains to a system in which the right to emit CO2 can be bought and sold by individual actors. The government decides on the total amount of permits and distributes them. The total amount of CO2 emissions is regulated by the number of emission rights that are created, because it is not allowed to emit CO2 without the permit. The amount of CO2 that may be emitted per permit can be reduced in order to decrease the total amount of

CO2 emissions over time. Firms that hold more permits than they need can make a profit from selling the rights to other firms that want to increase their CO2 emissions. These transfers take place in a market system for CO2 in which the prices depend on demand and supply. Higher prices may encourage firms to innovate and reduce their emissions. These reductions will be performed by firms that can realise them at the lowest costs, because they can make the highest profit, making this a cost-efficient system. Like the previous objection against excise tax, an emission rights system can be unfair, based on who gets the emission rights in the first place (Schiffman, 2011: 106). It is possible to auction the permits, meaning that the initial price per permit is received by the government, but they could also be divided among all citizens equally, or based on the current CO2 emissions. The distribution of rights has an important impact on the distribution of income. Again, this is a reason to think carefully about the manner in which the permits will be distributed, but it would not make sense as an argument in the trade-off between a system of CO2 emission rights and any other CO2 reduction policy.

The key difference between the excise tax and CO2 emissions trading policies is that excise tax has fixed prices and a flexible amount of CO2 emissions, while a system with tradable permits has a flexible price per permit and a fixed amount of CO2 emissions. The advantage of a fixed price is that it can be based on the external effects, internalising externalities. The advantage of a fixed amount is that the total amount of CO2 emissions can be regulated so that they do not reach levels that are deemed unacceptable.

2.4 Incomplete information and CO_2 policies with two different aims

The previous section argued that emissions trading is a better policy to reach a fixed amount of CO2 emissions, while fixing the price of CO2 at a fair amount is best done by an excise tax system. However, in an ideal situation in which all knowledge is available without transaction costs, excise tax and emissions trading could both reach the exact same results in terms of price, as well as the total amount of CO2 emissions. Theoretically, tax rates could be constantly altered to reach one specific quantity of emissions, or the number of emission rights can be altered to reach one specific price. Nonetheless, there is a significant economic difference between the two policies in non-ideal theory where information is imperfect and transaction costs are high (Schmidtz, 2011: 777). In reality, it is expensive and difficult to predict exactly how many permits would need to be issued to reach one particular price. Conversely, it is costly and difficult to calculate the exact level of excise tax that is necessary to cause a specific reduction of CO2 emissions. Therefore, there is a significant difference between the two policies.

Moreover, even under the assumption of costless and perfect information, there is still a meaningful distinction that can be made between the aims of the two policies. The aim can either be to fix the upper level of emissions, or to internalise all costs in the production and consumption of goods that involve CO2 emissions. If the aim is to make sure that the CO2 emissions levels never exceed amount X, the obvious thing to do is creating X permits that can be traded in a system of emission rights. The other possibility of adjusting an excise tax rate to the level where people will not emit more than X CO2 would be cumbersome. In that method, every change in the economy requires adjustment of the tax rate. In technical terms, one could argue that this constantly adjusting tax rate is still an excise tax, but in terms of the aim and consequences, it is fundamentally different than an excise tax. Its primary function is not to internalise cost, but to make sure that the total of CO2 emissions does not exceed X. This contrived version of an excise tax behaves like an emission rights system. Therefore, if the excise

tax rate is constantly adjusted in order to realise one specific amount of total CO_2 emissions, it cannot be considered as an excise tax, without losing all significance of the classification. Whenever I talk about excise tax, it is implied that the price is fixed, and the total amount of CO_2 emissions is flexible. The same reasoning applies to emission rights systems that constantly adjust the amount of emission rights up until a level in which the price of a permit is equal to Y. The function of such a system would be identical to an excise tax rate of Y, making the classification of emission right policies insignificant. Therefore, CO_2 emission rights imply flexible prices and a fixed amount of emissions. Concluding, even though a CO_2 excise tax and an emissions trading system could theoretically lead to the same result, the distinction between them remains meaningful.

Chapter 3: Green liberalism

3.1 Three fundamental criteria for liberal democracy

In the previous chapter I have argued that CO_2 excise tax and emissions trading are efficient policies to deal with excessive CO_2 emissions. The analysis was based on efficiency, which is a factual criterion that does not necessarily imply that the policies are also desirable from a moral perspective. In order to have an impact on the political status quo, mere efficiency is not enough. Environmental policies also need to be reconciled with the prevailing political ideology. In the modern West, liberal democracy is the predominant political system. Therefore, it is important to investigate whether CO_2 excise tax and emissions trading are compatible with liberal-democratic values. The current section will explain three fundamental values of liberal democracy. Based on those values I will argue that market-based CO_2 policies, such as excise tax and emissions trading, are not only efficient policies, but also morally desirable from a liberal perspective.

According to Wissenburg, liberal democracy is a political system that turns desires and preferences of individual people into rights. This transformation uses principles of social justice and equal rights to recognise valid claims of individuals. Only valid claims are turned into formal rights or benefits (Wissenburg, 1998: 9). In other words, liberal democracy uses principles of social justice to test whether the claims of individuals are valid and turns those valid claims into formal rights. Individual preferences form the basis of a liberal democracy, but not every claim is valid. For example, the preference to physically harm others without a good reason or to enslave and exploit other people are no valid claims, because they infringe on the individual liberty of other people. There are three fundamental criteria for liberal democracy: liberty, equality (Kymlicka, 2002: 2-3), and democracy (Wissenburg, 1998: 11). Preferences that violate any of these three principles of social justice can never turn into formal rights. If an environmental policy violates either liberty, equality, or democracy, it conflicts with liberal-democratic values. Equality and democracy do not conflict with environmental values. There is no reason to think that environmental concerns would undermine democracy, and they do not require unequal treatment of human beings under the law. Liberty on the other hand is at odds with environmental concerns:

> *"The environment puts limits to what people can do – limits to waste production, limits to the use of resources, limits to survival. Recognising this and translating it into rights and policies, as happens increasingly in our days [...] directly implies that there will be new limits to liberty, to what people are allowed to do." (Wissenburg, 1998: 33)*

In the paragraph above, Wissenburg formulates quite clearly how environmental concerns directly limit the liberty and freedom of choice of individuals. These limits seem to create tension between democratic liberalism and environmentalism. To understand the nature of this conflict, it is necessary to distinguish between liberty itself and the value of liberty. Liberty itself can take many forms, including the freedom to hurt others without their consent. However, such an ability does not have positive value, because it is at the same time an infringement on the liberty of others. The liberty of one individual may increase if he gains the right to harm others, but the infringement on the rights of other people is more extensive. This entails that the total value of liberty is higher if people are not allowed to hurt other people. Therefore, it is legitimate to

introduce policies that restrict individuals from performing actions that violate the liberty of other citizens. According to Wissenburg, a conceptual redefinition of liberty itself will not help, since any policy that puts limits on what people are allowed to do is always a limitation of liberty. Overcoming the conflict between liberal democracy and environmentalism lies in the legitimation of the limitations that environmental concerns put on liberty (Wissenburg, 1998: 34). Concluding, it is not that environmental policies do not restrict individual liberty, but that the restriction of this liberty is legitimate because it prevents an even bigger violation of the liberty of other people. Namely, the fact that every emission of CO_2 harms all human beings on the planet who suffer from climate change.

3.2 Positive and negative liberty of CO_2 policies

The tension between environmental concerns and liberty can be clarified with the help of the classical distinction between positive and negative liberty. Essentially, the conflict is grounded in a different interpretation of the meaning of liberty. Negative liberty states that true freedom is freedom from interference, hindrance and coercion by others (Wissenburg, 1998: 34). For example, someone in handcuffs who is held hostage by a criminal is unfree. A CO_2 reduction policy that limits the ability to freely emit CO_2 is a violation of negative liberty. Positive liberty is about the ability and necessary means for a particular activity, rather than the absence of coercion (Berlin, 1990: 17-18). For example, people are only free to buy a house if they have enough resources to do so. A law that merely allows them to buy a house does not make them free. What counts is the actual ability and the resources that are available. A CO_2 reduction policy protects the resources that would otherwise be lost because of a high CO_2 content in the atmosphere, such as houses destroyed by flooding, crop failures and forest fires. Efficient reduction policies have a positive overall effect on the ability and necessary means to perform particular activities. In other words, CO_2 reduction increases the overall positive freedom in society.

Positive and negative freedom can be thought of as two separate concepts, but they can also be combined into a single approach. Wissenburg endorses this last view. He rejects the idea that there is a fundamental difference between positive and negative freedom, since they have little meaning without each other (Wissenburg, 1998: 36). Negative freedom has no value without the means needed to actually use that right. For example, "The negative right to vote [cannot] be taken seriously if there never are elections, if the ballot boxes are inaccessibly hidden, if there are no pencils, paper or computers to vote with" (Wissenburg, 1998: 36). The absence of obstruction is therefore not enough for freedom; it also requires the necessary means and ability to perform the desired activity. Vice versa, the necessary means and ability to perform the desired activity is not enough for positive freedom either, since those means are of little or no value when one person hinders the other and makes it impossible to use them. Concluding, the ability to perform a desired action requires both the presence of means and resources, and the absence of external impediments. It is therefore meaningless to distinguish between positive and negative liberty as two opposing concepts. Instead, they should be considered as two parts of a single concept of liberty (Carter, 1999).

When thinking about the impact that CO_2 reduction policies have on liberty, both positive and negative liberty should be considered. On the one hand, new rules restrict the ability of individuals to emit CO_2, but they also prevent the harm they inflict on others. In order to evaluate the effect that CO_2 reduction policies have on liberty, it is necessary to make a trade-

off between the positive and negative effects of these policies. Similar to other governmental restrictions like bans on private ownership of heavy weapons and dangerous substances, some restrictive policies ensure more liberty than they restrict. A CO2 reduction policy does limit individual liberty, but whenever it simultaneously prevents violations of liberty to an even larger extent, there is no reason to principally oppose that policy from a liberal-democratic point of view.

3.3 Quantitative and qualitative liberty

In order to compare the restrictive aspect of CO2 reduction policies with the extent to which it protects liberty of society in general, it is necessary to know how to evaluate liberty. In principle there are two different ways to value liberty. The first approach is quantitative and considers the amount of options that someone has. The second is a qualitative approach and takes into account the value of available options (Wissenburg, 1998: 37). The problem with the quantitative approach is that there can be many options, while none of them would be considered valuable. If someone can choose between ten houses that are all horrible, we probably would not say that he is more free than someone else who can choose between three houses that are all quite nice. The value of options needs to be compared because some options have more value than others.

Liberty is one of the three fundamental criteria of democratic liberalism. Environmental policies limit the number of options people have, meaning that they are at odds with quantitative liberty. However, the previous paragraph showed that some options are more valuable than others. This means that the formal question: "Does this policy limit the amount of options that individuals have?" is not the question a liberal should ask since the answer would not say anything about the value of those options. For liberals, among others, the more interesting question is normative in nature. It should concern the relative value for individuals; the liberal should compare all existing options without the environmental policy, versus the value of all existing options after the policy is implemented. Governments should not strive towards one perfect way, but instead enable valuable options so that individuals can choose the option they desire (Carter 1986: 107-9).

Despite the fact that CO2 reduction policies limit the number of options, the value of the remaining options may well be higher than the total value without the policy. For example, environmental policies may restrict people from transforming forests into agricultural land. The result is that people will have fewer options for places to farm, build and live, which reduces quantitative liberty. On the other hand, the qualitative value of most areas would be much higher because the policies also prevent environmental degradation. The policy will therefore ensure more stable rainfall, less forest fires, lower temperatures, decreased changes of flooding, and so on. CO2 reduction policies can prevent a deteriorating environment, which increases the value of the choices that people have. CO2 policies may limit the number of individual choices, but the value of the possible options is higher because of the improved climate conditions.

In conclusion, policies that reduce CO2 emissions can increase the total liberty in society, on the condition that they prevent more violations of liberty than they restrict free choices of individuals. In order to reconcile CO2 policies with liberal-democratic values, it is important that these policies minimize restrictions, while maximizing the prevention of excessive CO2 emissions. In chapter 2 it became clear that market-based CO2 policies are Kaldor-Hicks efficient in reducing excessive CO2 emissions.

Market-based policies are not only the most Kaldor-Hicks efficient, but also the least restrictive regarding individuals' freedom of choice. For this analysis, I will focus on the category of political rules and licences to regulate CO_2 emissions. As explained previously, legal policies are not possible because emitters of CO_2 cannot be made liable for the harm that they create. Market-based policies do not prohibit the emissions of CO_2. Governments do not decide for others whether their emissions of CO_2 are worthwhile, as is the case with political rules and licences. A market-based policy gives individuals who want to emit CO_2 a personal choice. They can make the trade-off between personal benefits and costs themselves. Therefore, market-based policy places fewer restrictions on individual liberty, which means this is the preferred category of CO_2 reduction policies from a liberal-democratic point of view.

The current chapter focused on the reconciliation of CO_2 policies with the values of a liberal democracy. The conclusion is that market-based policies are desirable, but further analysis is required to determine which specific policy is most preferable. So far, liberal values themselves do not result in direct reasons to favour either excise tax or emissions trading. Both CO_2 policies are efficient in reducing excessive emissions, and both policies leave the trade-off between the costs and benefits to the individual, instead of a government.

Another way to argue in favour of one policy over the other, is by using arguments based on environmental positions that fit best with liberal values. This is an indirect argument that will be discussed further in the next chapter. I will investigate how liberal democrats can use environmental positions to argue in favour or against CO_2 excise tax and CO_2 emissions trading.

Chapter 4: Green political theory

4.1 Dimensions and positions in green political theory

The current chapter analyses the complex relationship between three different concepts: liberal-democratic values, environmental positions, and market-based CO_2 policies. The aim is to formulate environmental arguments that indicate which CO_2 reduction policy is preferable from the perspective of liberal democrats. In the end, it will become clear that the best policy is formed by a combined system. In this first section, I will explain the argumentative structure that is used in the remainder of this chapter.

In order to analyse environmental theories systematically, I will use a categorisation derived from Marcel Wissenburg. In the second chapter of his book, he describes 24 different dimensions of green political theory. Each one concerns a different issue or question within environmental theory. One example is the dimension ′timespan′ that concerns the relevance of the impact that the environment has on future generations. Every dimension involves positions that refer to different views on the environment. The different positions of each dimension have implications for the desired approach of various environmental problems. For example, one of the positions in the dimension 'timespan' is that the interests of all present and future generations should be considered equally. Human CO_2 emissions have a long-lasting effect on the environment. Therefore, they do not only harm present generations but will also affect the lives of future generations. If we are morally obliged to take future harm into account as well, more demanding CO_2 policies are required than when interests of future generations are not considered at all, or at a discount rate. The dimension 'timespan' is an important factor in the determination of tax rates or the number of emission rights, but neither of the positions in this dimension give reason to prefer one policy over the other. Both policies can create more restrictions or less restrictions, depending on variations in the tax rate or the number of emission rights. Therefore, this dimension is not useful to distinguish between the preferability of excise tax and emissions trading.

Some of the other dimensions can be used to argue that one market-based CO_2 policy is better than another. That is the case if one position implies that CO_2 excise tax is the best policy and the other position implies that emissions trading is preferable. Additionally, dimensions are only relevant for this research if one of the positions fits liberal values better than the other one. Otherwise the dimension cannot indicate which CO_2 policy matches more with liberalism. Only 6 of the 24 dimensions meet both criteria and are therefore relevant for the argument made in this thesis. For each of these dimensions, the following argumentative structure will be used:

> Dimension 1 has two positions: A and B. Position A implies that CO_2 excise tax (or emissions trading) is the best policy. Also, position A fits best with liberal-democratic values. Therefore, liberals can argue in favour of excise tax (or emissions trading), based on the environmental position that fits best with their political values.

Each of the subsequent sections in this chapter discusses one of the six dimensions. In every section, I will discuss the two extreme positions of each dimension and explain which position fits best within the liberal-democratic values. Afterwards, I will explain whether that dimension corresponds best to CO_2 excise tax, or emissions trading. The argument indicates which of the two CO_2 policies is most compatible with liberal democracy, based on environmental theory.

The first part of the analysis in each section is used to determine which environmental position is compatible with democratic liberalism. Environmental positions that have a negative effect on liberty, equality or democracy conflict with liberal-democratic values. According to Wissenburg, "not all ideologies are equally compatible with ecological concern [and] not every form of human society is compatible with every view on human-nature relations" (Wissenburg, 1998: 59). This entails that we can make a distinction between positions that are compatible with a particular political theory such as democratic liberalism, and positions that are not. This method is used by Wissenburg in order to find environmental theories that are compatible with liberalism. For each individual position within every dimension he considered whether it is compatible with liberalism. This chapter builds on the analysis of Wissenburg to distinguish positions that are most compatible with liberalism.

In each of the next six sections, I will also argue which market-based CO_2 policy is most compatible with liberalism, based on the respective liberal environmental position. For example, one of the dimensions is about the relative importance of nature. It can either be of overall concern, or of restricted importance. In section 4.7, I first argue that liberalism is most compatible with the position that nature is of restricted importance. Thereafter, I argue that CO_2 excise tax is most compatible with this liberal environmental position, indicating that excise tax is the preferable CO_2 reduction policy, based on the positions in this dimension. For all six dimensions, this same analysis will be conducted. In the last section, I conclude what the preferable CO_2 policy is, according to the positions that are most compatible with democratic liberalism.

4.2 Dimension one: The composition of nature

The first dimension distinguishes two opposing environmental positions on the composition of nature. It concerns the way in which elements in nature cohere with each other. The first position is holism, which means that everything in nature is somehow connected to everything else in such a way that they form a whole: "Due to the interrelatedness of all parts of the universe, small changes in one area may have substantial consequences elsewhere, the 'where' being often unpredictable" (Wissenburg, 1998: 50). This implies that one part of nature cannot be saved without saving nature as a whole. Arne Naess is a supporter of this position on which he elaborates in his book *Ecology, Community and Lifestyle*. According to Naess, there is a unity between all aspects of nature: one where the whole is greater than the sum of its parts (Naess, 1989: 173). Nature consists of trees, plants, animals, rivers, mountains and more. All of these components are valuable together because they are a part of nature. According to holism, the whole is worth more than the aggregate of its separate parts. The parts cannot simply be substituted by something else with similar functionalities. Analogically, individual parts of the human body are valuable because all of them together form the body, and not merely because we can use our legs to walk and our fingers to grab things with. Even if we could use robots with similar functionalities, they could never fully substitute parts of the human body. Similarly, holists believe that the harm that is done to nature by human activities cannot be compensated by substituting the harmed parts of nature with something else. This implies that global warming cannot be compensated by building dykes, improving public healthcare, extinguishing forest fires, planting new trees and nursing harmed animals. Under holism, emissions should be reduced to a level that does no unacceptable harm to nature.

The second position is compartmentalism which reasons in terms of cause and effect. Changing one thing does not necessarily influence everything else. Every consequence must always have a cause, so if some of the effects in nature can be replicated by something else, they can be substituted for parts of nature that were harmed by humans. In compartmentalism, there is no reason to protect the environment if the inflicted harm on nature could be compensated by substituting it with things that have similar effects.

According to Wissenburg, there is no fundamental reason for liberal democrats to exclude one of the above positions: "[Holism] will demand a more cautious version of ecological modernisation than compartmentalism – but it will not change, invalidate or disprove the moral principles of liberal democracy" (Wissenburg, 1998: 68). According to the harm principle, the restriction of individual liberty is permitted under liberalism when it prevents harm to others. This means that potentially strict environmental policies under holism do not necessarily contradict liberal values. I therefore agree that, at least in theory, holism and compartmentalism could both fit with liberalism.

However, later in his book Wissenburg states that there is a pragmatic reason to prefer compartmentalism over holism. For a liberal democrat, the composition of nature itself does not matter. In Wissenburg's view of liberalism, something that does matter is how many plans of life could be tolerated and taken into account when making political decisions. Under holism however, theories of the good that involve the substitution of parts of nature would be disregarded as invalid and excluded from political decision-making. Compartmentalism is more inclusive, because it does not exclude the claims of holists. It just considers their beliefs as a preference that is equal to other preferences. "Because there are people for whom things can be substitutable, liberals are more likely to think of nature as made up of distinct elements ('compartmentalism') than as a whole" (Wissenburg, 1998: 209). The previous paragraph argued that neither of the positions conflict with basic liberal values. However, since compartmentalism is more inclusive, it is the preferable policy for a liberal democrat. The next section will explain which market-based CO_2 policy fits best with compartmentalism.

In the second chapter it became clear that the major difference between excise tax and emissions trading is that either the price or the total amount of CO_2 emissions is fixed, while the other is flexible. Compartmentalism fits best with fixed prices and a flexible amount of CO_2, implying that CO_2 excise tax is the preferable policy. It holds that parts of nature can be substituted with something else, meaning that harmful effects of increased CO_2 levels in the atmosphere can be compensated by other valuable objects. It is not bad to increase the CO_2 content in the atmosphere a bit further, as long as the damage is compensated by increasing the value of other things that are considered equally valuable. For example, the ability to emit CO_2 may enable humans to decrease other forms of environmental pollution, increase biodiversity, save more lives, or produce more luxurious goods. The exact criteria for the kind of thing that can compensate for CO_2 emissions depends on further environmental positions that will be discussed in subsequent sections. The important thing for now is not what can compensate for an increased CO_2 content, but that CO_2 pollution could, in theory, be compensated for by something else.

The possibility of compensation means that the preferable amount of CO_2 emissions depends on the extent to which emitters can compensate damages. Whenever someone can pay the required amount for the damages caused, emissions of CO_2 should be allowed. The ability

to pay compensation is not fixed, as it depends on the benefits created by CO_2 emissions which are likely to fluctuate, depending on the availability of alternatives, techniques, and preferences of consumers. Compartmentalism therefore implies that the total amount of CO_2 emissions should be flexible, depending on the willingness to pay compensation. Since excise tax involves a flexible amount of emissions, it is a preferable policy. Emissions trading is not preferable because the total amount of permits is fixed.

Another reason to prefer excise tax is that the price per amount of CO_2 is fixed. This means that the tax price can be equated with the amount of financial compensation that is required. This is not possible with emission rights, because the price is purely based on the demand and supply of permits. Emission rights are only preferable for holists, as they care about minimizing harmful emissions, involving a fixed amount of CO_2, instead of ensuring sufficient compensation per amount of CO_2. For compartmentalism, which is the position compatible with liberal values, CO_2 excise tax is the best system, because it results in a flexible total amount of CO_2 emissions that depends on fluctuations in the ability to pay a fixed price, equal to the amount necessary as financial compensation for the damages.

4.3 Dimension two: Equilibrium versus evolution

The second dimension concerns the 'natural' state of nature. The first position regards nature as an equilibrium, a harmonic natural state that balances all aspects. According to the other position, nature is in evolution, constantly changing in an evolving world (Wissenburg, 1998: 51). The reason to prefer one position over the other does not relate to liberal values in specific. Liberals, among most other theorists, must exclude the position that nature is in an equilibrium because of the undisputed physical evidence that nature is in a constantly changing state, even before human interference (Wissenburg, 1998: 209).

Striving to maintain a status quo in nature would be futile. The fact that the environment is in constant change is not problematic in itself, even if some of the changes are caused by humans. The question that needs to be asked is how nature changes and what the role of humanity should be. CO_2 pollution is a problem because it has a negative effect on human beings and other objects of value. The rising amount of CO_2 in the atmosphere is not bad in and of itself, but because of its effects.

To evaluate the effects of CO_2 pollution, we must consider the consequences of climate change, and make a trade-off between the positive effects of the ability to emit CO_2 and the negative consequences of climate change. In an emissions trading system, the trade-off between positive and negative effects only happens when a government determines the number of permits. After that decision, the total amount is fixed, meaning that the trade-off between positive and negative effects no longer influences the total amount of CO_2 emissions. Therefore, an emissions trading system would not be desirable. Excise tax on the other hand, does allow for constant changes in the amount of CO_2 emissions. The total amount depends on the ability of emitters to pay for the necessary compensation. When the positive effects of the ability to emit CO_2 changes, the ability to pay excise tax also changes, making total CO_2 emissions dependent on the trade-off between positive and negative effects of CO_2.

It should be clear that a flexible amount of CO_2 does not mean that we can think more lightly about the consequences of CO_2 pollution. It implies only that change is not necessarily a bad thing, as long as the damages are less than the benefits. In fact, there is a scenario where a flexible

amount of CO_2 leads to a greater reduction of CO_2 than a fixed amount would. Imagine that the costs for alternatives to CO_2 emissions will decrease over time. In a system of CO_2 emission rights, the demand for CO_2 permits would drop, but instead of decreasing emissions, the only result would be that it becomes cheaper to emit CO_2, even though the externality cost remains the same. Under excise tax, alternatives for CO_2 can become cheaper, but the tax rate stays the same. As a result, it is likely that more people will choose for CO_2 alternatives instead of paying the excise tax. Then, the total amount of emissions would drop. To conclude, based on the position that nature is a constantly changing and evolving world, liberals should prefer excise tax because it allows for a trade-off between the positive and negative effects of CO_2 emissions.

4.4 Dimension three: The object and hierarchy of value

The third dimension consists of two parts. It is about the objects to which intrinsic value can be assigned, and the possibility of hierarchy versus strict equality between those objects. The object and hierarchy of value are in fact two separate dimensions. However, I will discuss them together, because their respective compatibility with liberalism is interdependent.

According to Wissenburg, the object to which value is assigned is one of the fundamental topics of environmental ethics (Wissenburg, 1998: 52). It concerns the kind of things, or beings that are considered valuable. This dimension is of particular importance for CO_2 policies, since the inclusion of non-human species would require stricter limitations on human CO_2 emissions. Wissenburg distinguishes between six positions that all vary in their degree of inclusiveness. Anthropocentrism is the most exclusive. It only attributes value to human beings. Other objects that are in the interest of humans can still hold instrumental value, but they have no value in and of themselves. The most inclusive position is ecocentrism which attributes intrinsic value to all forms of nature. This includes not only all animals and all other forms of life, but also nature itself (Wissenburg, 1998: 53). It means that ecosystems, rivers and even mountains can be intrinsically valuable. Anthropocentrism and ecocentrism are two extremes within a spectrum of theories with lesser and greater inclusiveness. I will not discuss all positions within the spectrum separately. Distinctions are only relevant for this thesis if they result in different arguments for CO_2 reduction policies. The only distinction that needs to be made is between anthropocentrism, which only includes humans, and non-anthropocentrism which also includes other beings to some extent.

The two positions mentioned above can be either egalitarian or hierarchical, resulting in four possible combinations. First, I will discuss the compatibility of liberalism with hierarchical and egalitarian anthropocentrism. Thereafter, the compatibility with both versions of non-anthropocentrism will be discussed. Based on the environmental positions that are compatible with liberalism I will argue which CO_2 reduction policy is preferable.

Anthropocentrism

The compatibility of democratic liberalism with anthropocentrism depends on the way that value is attributed. Since one of the basic values of liberalism is equality, all humans must be equal in moral worth. Only egalitarian anthropocentrism meets that criterion. Hierarchical anthropocentrism is clearly incompatible with liberalism since it violates the principle of equality (Wissenburg, 1998: 67). The following two paragraphs are about the compatibility of egalitarian anthropocentrism with respectively CO_2 excise tax and emissions trading.

For the excise tax, the mechanism is to calculate and internalise the costs of externalities. In theory, this mechanism works fine. In practice however, calculating the exact externality costs can be difficult. It is hard to determine the exact value of objects, but this problem applies primarily to the more inclusive non-anthropocentric theories and only to a lesser degree to anthropocentrism. For example, we cannot determine the intrinsic value of one-celled organisms and weigh it against the positive effects of burning natural gas to warm human houses. First, we have no possible means to find out how one-celled organisms value the things in their life. Second, even if we could find out what things they value and how much they value them, we have no possible means to compare their interests to ours. Under anthropocentrism however, it can still be a challenge to determine these costs, but it is not impossible. We could calculate and compare the interests and the costs much more easily when only human beings are considered. The calculation will never be perfect, but it is possible to at least make a good estimate of the total costs. In fact, such studies have already been conducted, for example by Nordhaus (2016) and Pindyck (2019). It is true that some of these studies have been criticised for being inaccurate, and costs can vary depending on different methods and parameters. However, calculations do not need to be perfect to efficiently internalise externalities. As long as the calculated costs are a close estimate to the true cost of CO_2 emissions, internalisation of the costs will increase efficiency. Therefore, CO_2 excise tax is compatible with anthropocentrism.

Emissions trading is not based on calculating costs, but on determining an admissible amount of CO_2 emissions. It requires a moral and political analysis to assess what is acceptable, rather than economic calculations striving towards an equilibrium. From an anthropocentric perspective, the total amount of CO_2 should be dependent on the combined values of all individual human beings. Humans do not have to save other parts of nature for the sake of nature itself. Only the preferences and values of human individuals should be considered. When these preferences change over time, a CO_2 policy should be sensitive to that change. The following sections explain why emissions trading is less sensitive to changing human preferences than excise tax is. I will divide the changes of human preferences in two categories that both have different implications for the preferability of CO_2 reduction policies.

The first category concerns changes in the amount of CO_2 that individuals need to emit to realise their own individual plans of life. It is about the desire of an individual to emit CO_2. For example, when people want to drive in a Tesla rather than an SUV, then their plan of life requires less CO_2 emissions. When they want to go on holiday by plane instead of by bus, their plan of life requires more CO_2 emissions. In the previous section it was explained that the amount of environmental protection offered by CO_2 policies should be sensitive to the interests of human beings. However, under CO_2 emissions trading, the total number of emission rights is fixed, which means that the total of all CO_2 emissions cannot depend on changes in individual preferences. When people want to emit less, the price of emission rights will drop, and the total amount stays the same. Under nature as only externally valuable, the total amount of CO_2 should depend on human interests. Since that is not the case with emissions trading, it is not desirable.

The second category concerns changes in the total amount of harm that people experience from the CO_2 emissions of other people. It is about the total amount of CO_2 that individuals want other people to emit. This amount changes depending on the damage of CO_2 emissions to their own plans of life. For example, when people get older or become ill, they may suffer more from the consequences of CO_2 emissions than when they were younger. Also, when

people become more aware of the serious consequences of CO_2 emissions, they may consider it a bigger problem that needs to be stopped sooner rather than later. All CO_2 policies should be sensitive to the interests of human beings. When preferences shift and people want other people to emit less CO_2, the total amount of emissions should decrease. However, neither of the two CO_2 policies is directly sensitive to such changes. Nonetheless, excise tax is preferable. The tax rate is based on the damage done to other people's plans of life. So, when that damage significantly changes, the tax rate should be changed as well. In an emissions trading system, the price cannot be changed directly, but only by manipulating the number of permits. Doing so would undermine the essential function of an emissions trading system, which is to keep CO_2 emissions at one specific amount, not at a particular price. Also, it is difficult to predict the exact number of permits that is required to reach one specific price in a market where this price constantly changes depending on demand and supply.

In conclusion, anthropocentrism is more in line with excise tax than with emissions trading because it is more sensitive to changes in the preferences and individual plans of life. An emissions trading system would only be preferable if the aim is to protect certain aspects of nature, independent of the impact that a CO_2 emission cap has on human lives. However, the anthropocentric point of view implies that the interests of humans are the only intrinsic value concerned that needs to be protected. Therefore, CO_2 excise tax is preferable within anthropocentrism.

Non-anthropocentrism

I will now discuss the compatibility of liberalism with non-anthropocentric positions where non-humans can have intrinsically value. On the consistency of liberalism with non-anthropocentric positions, there are two points to be made. The first point is about the possibility for animals to have plans of life. The second point is about the moral relevance of subjects that do not have these plans. At the end of this section, it will become clear that liberalism is only compatible with narrow versions of non-anthropocentrism with such an extensive delimitation of the moral importance of non-human subjects, that the practical difference with anthropocentrism is too small to change the preferability of CO_2 excise tax.

The first point to be made is about the question whether animals can have a plan of life. I will explain that if some animals could have a plan of life, liberalism requires that humans treat them as equally worthy of moral concern.

Assuming that liberals believe that they matter themselves, there must be a reason why they matter: "Liberalism gives us two reasons: because man is an end in itself and because humans have plans of life" (Wissenburg, 1998: 109). According to Wissenburg, humans can only be ends in themselves because they have the ability for autonomy. For Wissenburg, the ability to be autonomous, includes people who are not actually autonomous due to their individual choices, circumstances or immaturity. Beings such as babies or people in a coma cannot choose the rules that they want to live by, but they can be ends in themselves because they have (had) the potential for autonomy, either in the future or in the past.

If humans would not be free, they would live under the law of something other than themselves, unable to choose their own goals. In that case they would be a mere means to those other goals, and not an end in themselves: "The notion of a plan of life with all its limitations is still the liberal ne plus ultra in the defence of humans as morally relevant subjects. Without even

so much as the possibility of autonomy, nothing would matter" (Wissenburg, 1998: 110). So, liberals can consider humans as morally relevant subjects because of their ability to form plans of life. If some animals would have plans of life as well, liberals would be obliged to consider them with equal moral concern.

To me, it is not clear whether Wissenburg believes that some animals could have plans of life. His point of view on this issue is not consistent. Sometimes he implies that animals cannot have a plan of life: "only humans, extra-terrestrial intelligent creatures and Kant's angels (Kant 1974) would qualify" (Wissenburg, 1998: 110). However, in other parts of his book, such as the following quote, he makes a "possible exception" for some animals:

> *"With the possible exception of some animals, it seems however, that non-human entity has anything remotely similar to a plan of life, nor the capacity to use the liberties of life, nor therefore anything that can serve to justify limits to human liberty." (68)*

Even though Wissenburg is not fully consistent in this matter, it is clear in both cases that he is reluctant in believing that animals could have plans of life. They either cannot have them at all, or the number of animals that could, would only be a fraction of all kinds of nature on earth. Even if some of them could, the preferability of CO_2 excise tax would still hold. If only a fraction of all animals would have plans of life, the harmful effect of CO_2 pollution to them could theoretically be included as a factor into the equation that calculates the externalities. Other beings without a plan of life (such as one-celled organisms, rivers and mountains) can never be included, but they would not have to be, since they do not meet the criterion for valuable subjects. In conclusion, the position that some animals can have plans of live does not affect the preferability of CO_2 excise tax.

The second point that needs to be addressed is about the relevance of subjects that do not have plans of life. In order to find out if liberals have reasons to treat non-human subjects as internally valuable, we first need to take a closer look at why they value themselves. As mentioned before, liberals say that having a plan of life is a sufficient reason to be morally relevant. A plan of life requires both consciousness and agency. Without consciousness, one cannot be aware of improvement or harm and therefore cannot order preferences and make a plan of life. Agency is the ability to act either physically or mentally. It creates the possibility to execute a plan of life. Without agency, one cannot ever perform any kind of mental or physical action. A plan of life does not have to be realistic to be a plan of life, but an entity that cannot ever execute any mental or physical plan, is motionless and therefore unable to ever form a plan of life. It is a mere passive entity (Wissenburg, 1998: 110-111). So, a plan of life requires both consciousness and agency.

Although having a plan of life is a sufficient condition for being a morally relevant subject, Wissenburg shows that it is not a necessary condition. He exemplifies this point with cases in which human beings have lost their consciousness or agency, but still seem to qualify as morally relevant subjects: "The difference between them and us is not relevant and the similarity is. They differ from us and cannot possibly be like us, but we can become like them and we would still feel that we matter" (Wissenburg 1998, 111). In other words, being a subject with either agency or consciousness can be sufficient for empathy and moral relevance. This entails that animals that have either agency or consciousness should be considered as morally relevant subjects. However, even though these subjects would have some moral relevance, the

differences in the capacity for agency and consciousness require unequal treatment between different species making liberalism only compatible with hierarchical non-anthropocentrism: "Only if humans are considered as mutually equal in worth and if humankind stands at the top of the ladder of concern can these types of environmental ethics be successfully blended with liberal democracy" (Wissenburg, 1998: 67). In this version of non-anthropocentrism, the preferability of CO_2 excise tax would remain unchanged. Even though subjects without a plan of life could still have value, the value of those subjects would be subordinate to the moral relevancy of beings that do have plans of life. When subjects have a greater degree of agency and consciousness, they have more ethical relevance, but it also becomes easier to compare them to human interests. The intrinsic value of objects such as one-celled organisms and mountains cannot be compared to human preferences, but since these objects have neither consciousness nor agency, there is no need to do so. Therefore, a CO_2 excise tax remains the preferable policy, provided that the harm done to animals with consciousness and agency is taken into account.

To conclude, liberalism is compatible with two positions on the object and hierarchy of value. The first is egalitarian anthropocentrism, and the second a limited version of hierarchical non-anthropocentrism in which humans take priority over other animals, and animals are taken into account to the degree of consciousness and agency that they have. Both these options match best with a CO_2 excise tax system, because it allows a constant trade-off between the costs and benefits of CO_2 emissions. Emissions trading would not be preferable because it protects nature independently of changes in the preferences of valuable subjects.

4.5 Dimension four: Intrinsic versus external value

The fourth dimension is about the nature of value. Wissenburg only uses two positions and thereby differs from the conceptualisation of Korsgaard. She describes two distinctions in value (or as she calls it: goodness). One distinction is between value for its own sake (final value) versus value for the sake of something else (instrumental value). The other distinction refers to "the location or source of the goodness rather than the way we value the thing" (Korsgaard, 1996: 250). Value can be derived from another external source (extrinsic value) or the value can be internal in the object itself (intrinsic value).

Wissenburg only distinguishes between two of the four combinations and seems to miss the other two. He uses the term intrinsic value for the position that the value of nature is both intrinsic and final. It is "value that is inherent to an object, act or situation regardless of whether it can benefit or harm an individual, regardless of whether an individual perceives value, regardless even of the presence of judging individuals" (Wissenburg, 1998: 92). For Wissenburg, external value is the combination of both extrinsic and instrumental value. It is derived from the relationship with other objects or beings, that cannot in any way depend on other entities (Wissenburg, 1998: 55). I will use this terminology of Wissenburg and only discuss intrinsic and external value.

A single object, such as a tree, could have both these values: the tree itself could be valued intrinsically, while also producing edible fruit for which it is valued externally. The total value is then partly dependent, and partly independent on other entities.

External value does not exist in and of itself but depends on other objects or situations. This dependency can be of two different kinds, but it always exists because of a relationship with another valuable object. The first option is that an object is externally valuable because it is a

part of something else that is valuable. For example, the leaves of a tree are valuable because they are part of that tree. The second option is that an object is externally valuable because it is a means to something else that is valuable. For example, the earth in which a tree grows has external value, because it is a means for the tree to collect the nutrients it needs. In both options the external value depends on the relationship with another object. Therefore, the reason to protect or preserve an object that is only externally valuable also depends on its relationship with the other object. There is never a direct obligation to protect or preserve externally valuable objects. There can only be indirect reasons to protect them. For example, the reason to preserve and protect the oxygen in the atmosphere, is that animals need it to breath. This obligation is indirect because the value of oxygen depends on the relationship between oxygen and animals. If animals no longer need it, there would be no reason to safeguard oxygen levels.

The concept of intrinsic value has been a matter of extensive philosophical debate, but I will focus mainly on reasons why liberals in specific should abandon the position that nature is intrinsically valuable. In Wissenburg's interpretation of a liberal democracy, individual plans of life are one of the highest standards of the good (Wissenburg, 1998: 101). Initially, all individual plans of life are considered equal in the sense that liberalism does not make a moral distinction between them. However, at the intersubjective level of collective decision-making, a standard is needed that can indicate which plans are better than others. For that purpose, liberal-democratic institutions use a hypothetical agreement: "One on which all those involved can or reasonably should agree [...] it should not only be acceptable for the present set of individuals with their present preferences, but in general be compatible with all the possible elements of the set of reasonable plans of life" (Wissenburg, 1998: 99). So, institutions must be impartial and leave room for all preferences and beliefs that individuals could possibly have. The value that institutions assign to nature should always be dependent on individuals and their plans of life. Liberals do not acknowledge the existence of any divine standard by which nature could be judged or said to have intrinsic value. Liberal-democratic institutions should only assign external value to nature.

The absence of intrinsic value implies that there is no direct obligation against damaging nature. Liberal-democratic institutions cannot assign intrinsic value to nature themselves. Valid reasons to protect it must be based on the value that individuals assign to nature. For example, liberal-democratic institutions themselves are not allowed to reason that dogs should be protected because they have intrinsic value. They can state that pet dogs should be protected because they have external value, as dogs generally contribute to the happiness of its owners. A policy that protects the lives of dogs, such as speed regulations that reduce car collisions, creates benefits for dog owners, and costs for car drivers. One could argue that the policy is the result of a trade-off between the external value of dog lives versus the benefits of higher speed limits. In case of CO_2 reductions, the previous dimension on the object of value already showed that CO_2 excise tax is better at making a trade-off between the positive and negative effects of CO_2 emissions. However, even though political institutions cannot assign intrinsic value to nature themselves, individuals are allowed to believe in the intrinsic value of nature.

The question that arises here is how liberal democrats should respond to people who consider nature as intrinsically valuable. Liberalism requires that everyone is free to determine their own conception of the good and some people consider nature as unsubstitutable. For them, it does not make sense to say that we can make a trade-off between positive and negative effects. For example, dog owners tend to not value their dog only because it makes them happy. Some

of them see their dog as a being that has internal value which should be protected independently of how the dog makes them feel: "As long as there are creatures for whom parts of nature are experienced as unsubstitutable, liberal democracy has a principal obligation to protect nature against any kind of destructive exploitation" (Wissenburg, 1998: 88). So, policies are required to protect nature as long as there are people for whom nature has intrinsic value: "Liberal democracy must be committed to an instrumental view of nature, that it can nevertheless respect the point of view of those who attribute intrinsic value to nature to a large degree" (Wissenburg, 1998: 98). So, even though policy makers cannot assign intrinsic value to nature themselves, they are required to protect nature because there are people for whom nature is unsubstitutable.

There are two things that need to be considered. For the trade-off between positive and negative effects of the ability to emit CO_2, the previous section already showed that excise tax is the preferable policy, as it is sensitive to changes in the amount of CO_2 emissions that individual plans of life require. The second consideration is how CO_2 emissions effect parts of nature that some individuals consider intrinsically valuable and unsubstitutable. For their sake, excise tax is not preferable, because it is not about a trade-off between positive and negative effects. What counts is the CO_2 reduction that is necessary to protect certain aspects of nature. This means that it is not the price that is important, but the amount of CO_2 emissions. Therefore, an emissions trading system is preferable, as it can fixate the amount of CO_2 emissions at a specific level. In conclusion, excise tax by itself is not sufficient. Liberals must take into account that some individuals consider nature as intrinsically valuable, and therefore combine the CO_2 excise tax with an emissions trading system. This combined system is explained further in section 4.8.

4.6 Dimension five: The scale of the environmental problem

The fifth dimension is about the scale of the environmental problem. Excluding the possibility that there is no environmental problem at all, there are two options. The first option is that there is an ecological crisis, in which the survival of humankind and life on earth is threatened. Distinctive for this position is the belief that environmental problems are interconnected and keep leading to new problems elsewhere. Partial solutions are not sufficient, because they do not stop the subsequent series of problems (Wissenburg, 1998: 58). The second option is the belief that there is no environmental crisis, but merely environmental problems. A problem is less extensive than a crisis and does not trigger an unforeseeable series of problems. These problems can be dealt with through partial solutions. It is possible to define the issue at stake, point out the consequences and restrict them.

An example of an individual problem is a factory that leaks chemicals into a small containable area. This problem can be managed with a partial solution. For instance, by permanently moving a small number of people who lived in the affected area. An example of a crisis is a factory that leaks chemicals into a large area, threatening the livelihood of an area that is considered too large to relocate to a different area. In that case, partial solutions are not sufficient. A crisis situation can only be dealt with satisfactorily by countering the source of the crisis. It must be an entire solution that stops the chemical leak. The major difference between an environmental problem and a crisis is that a problem can be dealt with through partial solutions and a crisis cannot. Even with the possibility of partial solutions, individual environmental problems may still be a risk for humankind:

> *"If it is, it is not a consequence of a fundamental crisis caused by interconnected problems but because one or more of several, not necessarily related, environmental problems threaten one or more necessary conditions for the survival of a section of nature" (Wissenburg, 1998: 58).*

In principle, liberalism is compatible with the position that nature is in an environmental crisis, as well as the position that there are only individual environmental problems. Neither of them causes a fundamental conflict with liberal values. Therefore, the compatibility of these positions with liberalism is not a theoretical matter, but a practical question that depends on the actuality in nature and society (Wissenburg, 1998: 66). Liberalism in itself has nothing to say about whether the environment suffers from a crisis, or just from environmental problems. In order to provide a definitive answer about the CO2 policy that is most in accordance with liberalism, the structure of the following argument will be slightly different than in previous dimensions. I will not determine which position fits better with liberalism but argue that liberalism must take both positions into account.

At one point in time there may be a crisis and at another point in time there may not be. Because the actuality of the scale of the environmental problem can vary over time, it is necessary to determine the best fitting CO2 policy for both a crisis and environmental problems. The following paragraphs will explain which CO2 policy works better to counter an environmental crisis, and which policy deals better with environmental problems. In the end, I will argue that the best policy is formed by a combined system of both excise tax and emissions trading.

Environmental crisis

Whenever there is risk of an environmental CO2 crisis, it is important that the implemented CO2 policy prevents or mitigates the crisis. As mentioned before, the distinctive feature of an environmental crisis is the interconnectivity of problems that lead to new problems, which makes partial solutions insufficient. An example: the problems of higher temperatures in summer cannot be countered by installing indoor air-conditioning systems, because the increasing temperatures outside also lead to crop failures, forest fires, and higher sea levels. The latter cannot be countered by bigger dykes alone, because it also leads to the death of coral reefs and ocean fish, and so on. In a typical environmental crisis, the list of problems is so extensive that the only solution to the crisis is to counter its primary cause. The primary cause of a CO2 crisis is high CO2 emissions which can only be prevented by reducing the emissions to a level where the environment is no longer in crisis. Both CO2 excise tax and emissions trading put a price on emissions which potentially decreases the total amount of CO2. However, there are two reasons why an excise tax is not the best system to counter a crisis. First, the price of CO2 emissions under excise tax is fixed, but the total amount of CO2 is variable. Economic models and calculations can approximate the optimal tax rate, but it is never certain that the exact amount of CO2 emissions will decrease to the specific amount that prevents a crisis. Second, excise tax can internalise externalities of individual problems, but for crisis situations it is difficult to internalise the costs. This difficulty lies in the interconnectivity of problems which makes consequences uncertain and difficult to predict. Also, with the existence of humankind at stake, it is hard to imagine which price would compensate for a threat of such magnitude. Emissions trading, on the other hand, can regulate the exact level of emissions by creating that

specific amount of rights. In that way, the amount of CO2 emissions can be regulated to prevent a crisis. Concluding, CO2 emissions trading is a better policy to counter an environmental crisis.

Environmental problems

The next topic to discuss is the CO2 policy that deals best with environmental problems. When there is no crisis, the total amount of CO2 in the atmosphere can still create problems that create costs for society. Both excise tax and emissions trading put a price on the emissions of CO2. There are two effects of such an increase in the price (explained hereafter). I will argue that to deal with environmental problems, CO2 excise tax is preferable because it optimises both effects.

a. Increased CO_2 prices

The first effect of a higher price for CO2 emissions is that it becomes less profitable to emit CO2, which will reduce the emissions. This reduction prevents some of the problems caused by high concentrations of CO2 in the atmosphere. Prevention is one of the options to deal with the consequences of CO2 pollution, but it will become clear that it is not necessarily the best option. It is possible that the costs of a CO2 reduction are greater than the problems it would prevent. If that is the case, a CO2 reduction would do more harm than good. The alternatives for CO2 emissions can damage people and the environment. An example: driving electric cars does not require CO2 emissions, but not everyone can afford them and the mining for materials to build new cars is both expensive and harmful to the environment as well. Another example: closing down CO2 emitting power plants reduces CO2 levels, but alternatives can be expensive and may take time. Without enough alternatives, the energy supply could destabilise which creates problems of its own. In conclusion, the problems created by CO2 emissions impose costs for society, but the ability to emit CO2 also creates opportunities that cannot be reduced without costs. This means that an endless reduction of human CO2 emissions is not necessarily the best way to deal with the problems of CO2 pollution. The benefits of the ability to emit CO2 need to be weighed against the harm done by it. If the benefits exceed the damage, CO2 emissions should be allowed, and when they do not, CO2 emissions should be reduced. A CO2 policy should weigh the benefits of emissions against the damage, resulting in an optimal amount of CO2.

Excise tax rates are constant, so they can be equated with the costs of CO2 pollution, internalising externalities. As a result, it is only profitable to emit CO2 when the benefits it creates are greater than the externalities of the pollution. While efficient CO2 emissions can continue, inefficient emissions become unprofitable and are therefore likely to stop. The result is that only efficient emissions remain, meaning that they create more benefits than harm. This makes excise tax a system that approximates the optimal amount of CO2 emissions.

Emissions trading on the other hand involves a fixed amount of CO2 permits. Political institutions could determine the initial number of permits based on a trade-off between positive and negative effects of CO2. At that point in time, the number of permits approximates the optimal amount of emissions. However, when the number of permits is determined, a trade-off between positive and negative effects of CO2 emissions will no longer influence the total amount of CO2 emissions. Therefore, excise tax is preferable.

b. Revenues of increased CO_2 prices

Besides the influence that a CO2 policy may have on the amount of emissions, a secondary effect is that the policies raise tax money per quantity of CO2 emissions. The revenue can be used for

a variety of purposes, but one of them is especially noteworthy as it implies that a fixed CO2 price is preferable: tax revenues could be used to substitute or compensate parts of nature that are damaged by CO2 pollution. From a liberal point of view, people should not be allowed to perform actions that harm others. Substituting or compensating valuable parts of nature is desirable, because it minimises the harm that CO2 emitters impose on other human beings.

In principle, activities that harm nature should be prevented. However, in some cases the reduction of CO2 creates more damage than it prevents. It is only in those cases that CO2 emissions are allowed to continue, provided that valuable parts of nature are substituted or compensated for. Notice here that the compensation exists next to the increased price for CO2 emissions. I will not discuss how the amount of compensation needs to be established. The calculation formula could be of various generosities, and take emotional damage, future generations, and animal lives into account, or do none of that. Most estimates vary somewhere between $100 and $300 per metric ton of CO2 (Pindyck, 2019). The point I want to make here is that it is necessary to compensate for problems created by CO2 pollution.

Since the aim is that CO2 emitters substitute or compensate the valuable parts of nature, a fixed price per amount of CO2 is preferable, because it can be adjusted to the amount of money that is necessary to compensate or substitute the value of nature. Under emissions trading however, the price of CO2 permits is flexible. It does not function as a monetary compensation, but only depends on the willingness to pay for emission rights and not on the amount of compensation that is necessary to substitute or compensate for the valuable parts of nature. Only excise tax can guarantee the necessary monetary compensation as the tax rate can be adjusted to that amount.

The excise tax revenues can be used to protect nature and society against the negative consequences of high CO2 emissions. Wissenburg uses the restraint principle to argue that nature should first be protected against negative influences. For example, by giving plants extra water if CO2 emissions lead to higher temperatures and less rain. If that fails, we should try to substitute damaged parts of nature with something equal, or similar. For example, planting a new tree of the same kind, or one of another kind with similar properties. When that is not possible, a compensation can be offered to those who suffer from the negative consequences of CO2 emissions. CO2 excise tax does not only lead to the desired amount of CO2 emissions, but it also ensures that the amount of tax revenues is sufficient to substitute or compensate for the harm that is done. Therefore, excise tax is the preferable system if nature is not in a crisis situation.

In conclusion, both the positions that the environment is in crisis and that there are only environmental problems are compatible with liberal-democratic values. The preferred CO2 policy for these two situations is different. Excise tax is best to deal with individual environmental problems. It does not only internalise costs, but also ensures that enough tax revenues are raised for the monetary compensation of harmed individuals. On the other hand, emissions trading is best to prevent an environmental crisis. Therefore, neither one of the two policies are preferable over the other independently of the actuality in nature and society. It is not the aim of this thesis to argue for one policy that is generally preferable, but to formulate a multitude of useful arguments that indicates why and how liberals should use CO2 reduction policies. At the end of this chapter, I have added a final section showing that both policies can

be adopted simultaneously, creating one preferable system that can deal with both environmental problems, and crisis situations.

4.7 Dimension six: The relative importance of nature and society

The sixth dimension is about the relative importance of nature and society. This dimension has two positions. The first position is that nature is of overall concern. It means that all we should do is adapt society to the needs of nature. The second position is that nature is of restricted importance, limited by other concerns in society and secondary to them (Wissenburg, 1998: 58). So, when political concerns dominate environmental concerns, nature is of restricted importance. As discussed previously, the three main values of liberalism are liberty, equality, and democracy. A liberal may consider these three values of primary importance, secondary to environmental concerns. If so, nature is of restricted importance. However, a liberal may also consider the value of nature as an overall concern: "Nature is a necessary precondition for human existence, and therefore for the existence and survival of liberal democracy" (Wissenburg, 1998: 66). In other words, nature is of primary importance because humans cannot exist without nature, and liberal democracy cannot exist without humans. This means that even though liberals may consider nature of restricted importance, they cannot disregard environmental concerns. Either way, it is necessary to protect nature against environmental issues that threaten the existence of humankind.

If nature is of overall concern, then the most important task of a CO2 policy is to reduce the amount of emissions up to point 'X' where the amount of CO2 in the atmosphere is no longer a threat for nature. In an emissions trading system, the total amount of CO2 emissions cannot exceed the number of permits. When the number of rights is equal to 'X', emissions trading will ensure that the threat of CO2 pollution is eliminated. Therefore, emissions trading is a good policy for liberals who consider the environment of overall concern. One might argue that a carefully calculated rate of CO2 excise tax could theoretically ensure the same reduction to ′X′ CO2 emissions. However, as discussed in section 2.4, the tax rate would need to be constantly adjusted, based on economic fluctuations. Additionally, there is no certainty that the calculated tax rate is the same as the actual tax rate where emissions would be reduced to the 'X' amount. Therefore, CO2 emissions trading is the best system when the environment is considered of overall concern.

If nature is only of restricted importance, a CO2 policy should take non-environmental values into account as well. Natural values such as clean air and stable temperatures could be overruled by societal values like a healthy economy and affordable transportation. As explained for previous dimensions, there needs to be a trade-off between values of nature and other values in society, which is done best by excise tax. It ensures a constant trade-off between the costs of CO2 emissions, represented by the excise tax, and the benefits of CO2 emissions, represented by the potential profit that could be made with CO2 emitting activities, balancing the values of nature and society.

However, even if nature is considered only of restricted importance, it is a precondition for the existence of human beings. Therefore, CO2 policies should at least reduce emissions to a 'Y' amount where nature is protected against threats that endanger the existence of human beings. Note that this benchmark is likely to be higher than the previous amount X where not only human beings, but all of nature needs to be protected. Even though the amount Y is a less demanding benchmark, CO2 policies still need to guarantee that emissions can never exceed it.

Similar to the previous section, excise tax is insufficient because total emissions are flexible. Only emissions trading can guarantee that emissions will be restricted at the specific amount Y. In conclusion, even if nature is of restricted importance, emissions trading is still necessary to protect nature against threats to humankind.

In this section I have argued that liberals may consider nature either of overall concern, or of restricted importance. A CO2 emissions trading system seems to be the best policy if nature is of overall concern. It can guarantee an X number of permits to protect nature sufficiently. If nature is considered of restricted importance, CO2 excise tax may seem a better system, because it allows for a trade-off between values of nature and society. However, CO2 emissions trading is still required to ensure that emissions will not exceed the Y amount that would threaten the existence of human beings. To conclude, while excise tax may be preferable, emissions trading is also necessary in order to guarantee the safety of humans. It is best to implement both CO2 policies: CO2 excise tax, as well as an emissions trading system. The excise tax will make sure that the values of nature and society are balanced. The emissions trading system ensures that total CO2 emissions do not exceed the X or the Y amount of total emissions. By adopting both policies at the same time, the best of both worlds would be achieved. The next section explains this system in further detail.

4.8 A combined system of both CO_2 excise tax and emissions trading

CO2 excise tax and a CO2 emissions trading system can be combined into one integrated system. This section argues that the combined system is preferable for all the versions of environmental philosophy that are compatible with democratic liberalism:

> (1) Nature is compartmentalised, so it can be understood in terms of cause and effect. (2) Nature is in state of evolution, so it constantly changes and evolves. (3) Liberalism is compatible with both egalitarian anthropocentrism and a delimited version of hierarchical non-anthropocentrism. (4) Liberal-democratic institutions should only assign extrinsic value to nature, but nevertheless respect people for whom it is intrinsically valuable. (5) Nature can either be in an environmental crisis or have mere environmental problems. (6) Liberals could consider the values in nature or the values in society of overall concern.

In the combined system of both policies, the excise tax rate remains equal to the externalities created by emissions. The number of emission rights should be based on acceptable risks in nature and society. I will discuss the mechanisms of this combined system based on two separate scenarios.

In the first scenario, the excise tax alone already reduces emissions to an acceptable level. This means that the demand for emission rights is less than the amount available, resulting in a surplus which reduces the price to near zero. Since emitters do not have to pay for the emission rights, they only pay excise tax. Therefore, the emissions trading system has no effect on either the price or the total amount of CO2 emissions. In this first scenario, the combined system would function just as an excise tax system.

In the second scenario, the excise tax rate is not enough to decrease emissions to an acceptable amount. The limited amount of emission rights ensures that CO2 emissions do not

exceed acceptable levels. The higher the demand for emission rights is, the higher the price becomes. The scarcity of rights makes them tradable in a market system in which supply and demand will determine the price. The total amount of emission rights is fixed at the estimated amount that prevents an environmental crisis and unacceptable damage to nature and society. So, even though there is an excise tax as well, the emissions trading system still prevents unacceptably high emission rates. Therefore, the combined system of both CO_2 excise tax and emissions trading prevents unacceptable emissions just as well as emissions trading alone.

In conclusion, the combined system is preferable in both these scenarios. It can deal with a crisis and protect nature and society when emissions tend to get too high. At the same time, it internalises externality costs and prevents excessive emissions. Whereas separate policies can only deal with one of the scenarios, the combined system deals with both, making it generally preferable.

Chapter 5: Conclusion

The initial issue that inspired my thesis concerns the gap between the global political action and the scientific prognosis that indicates that more should be done to prevent excessive CO2 emissions. Political actions have been insufficient in decreasing these emissions to an acceptable level. At the current pace and without further regulations, CO2 emissions will reach a level in which the rise in global temperature exceeds the maximum of 2 degrees laid down in the 2015 Paris Agreement. The consequences of such high rises in temperature are potentially catastrophic. As set out in the report of the WEF, the three biggest global risks are all connected to climate change. Natural disasters, extreme weather events, floods, crop failures, freshwater shortages, and forest fires are among the issues that will become more extensive and more likely to happen as temperatures rise. In order to get political support for measures that decrease CO2 emissions, it is important that reduction policies are compatible with the political status quo. In western society, the prevailing political system is democratic liberalism. This thesis provides environmental arguments that indicate which of the investigated CO2 policies fits better with democratic liberalism. The research question was as follows:

> *How can measures to abate CO2 emissions be supported by liberal-democratic positions about the environment, despite the emphasis on fundamental freedom and market arrangements?*

The analysis was divided into four chapters. The first chapter demonstrated that unregulated market forces lead to higher CO2 emissions than desirable. CO2 reduction policies have the potential to increase efficiency, because market forces are not efficient. In the second chapter it became clear that market-based policies such as CO2 emissions trading and CO2 excise tax are efficient in regulating emissions. The third chapter showed that market-based policies are not only efficient, but also desirable from a liberal-democratic perspective. In the fourth chapter I analysed environmental positions to indicate which of these two economic policies is preferable from a liberal perspective.

Chapter 1 confirmed the hypothesis that CO2 policies are necessary to counteract excessive CO2 emissions. This is a necessary precondition that had to be confirmed before I could start writing the subsequent chapters that analyse which of the CO2 policies shows a better fit with liberalism. Governmental policies are required because the free market for CO2 fails to reach efficient emissions. Individuals have no economic incentive to take externalities into account. As a consequence, there is an excessive amount of CO2 emitted into the atmosphere that destroys more wealth than it creates. Governmental policies are necessary to overcome this inefficient incentive that decreases the net wealth in society. Solutions in private transactions, as suggested by the Coase theorem do not apply to CO2 emissions. It would require transaction costs between each and every emitter and individual affected by CO2, which is too costly. Additionally, it is not possible to define and enforce ownership rights for the CO2 content in the atmosphere, making transactions impracticable. In conclusion, governmental policies are necessary to create a more efficient CO2 content in the atmosphere.

The next argument is that market-based policies are preferable to legal and political rules. There were two main factors leading to this conclusion. First, the extensive number of individuals that cause and suffer from CO2 emissions make liability-based policies unsuitable.

Secondly, the diversity in products and reasons to emit CO_2 makes general rules that determine the exact amount of emissions undesirable as an overall solution. Market-based policies are preferable because they can internalise externalities through excise tax or restrict CO_2 emissions through a trading system. The third chapter shows that even though CO_2 reduction policies restrict liberty of individuals, they also prevent bigger violations of liberty, making them morally desirable from a liberal-democratic point of view. Without CO_2 policies, excessive emissions will inflict harm on people without their consent, which is unacceptable from a liberal-democratic point of view. From the perspective of liberty, market-based policies are preferable over political rules, because they are less restrictive.

The first three chapters established that market-based policies are both efficient and desirable for liberals, but they didn't indicate which specific policy is preferable. The fourth chapter compares the desirability of excise tax and emissions trading, based on liberal environmental positions. The first three dimensions all indicate that democratic liberalism is most compatible with excise tax. Compartmentalism, evolutionism, and egalitarian anthropocentrism all fit better with a flexible amount of CO_2 emissions, because nature is considered substitutable and does not have to be protected for its own sake. However, the last three dimensions show that even though the protection of nature should depend on human beings, this does not mean that the amount of protection should be flexible. The preference for excise tax does not apply if: (a) the parts of nature are considered intrinsically valuable by (some) people; (b) emission levels pose a significant risk for a natural crisis; (c) nature is considered of overall concern, primary to other social needs. If either of these three conditions is met, CO_2 emissions trading is required.

Liberal positions in six dimensions of environmental theory do not definitively answer the general preferability of one policy over the other. However, during my research I did find another insight that piqued my interest even more than arguing for one best way, which I initially aimed for. As explained in section 4.8, the two policy mechanisms of excise tax and emissions trading can and should be combined in one integrated system. The price of CO_2 emissions remains fixed until the total amount of emissions reaches a benchmark above which further emissions are considered unacceptable. When that point is reached, the amount of emissions becomes fixed and prices will rise, depending on the demand. This integrated approach is realised by adopting both a CO_2 excise tax and an emissions trading system at the same time. The tax rate should be set equal to the calculated externalities. The number of emission rights should be equal to the amount at which the risk and impact of an environmental crisis is considered acceptable, and nature is protected sufficiently. My thesis demonstrates that adopting both policies simultaneously in one integrated approach will achieve the best of both worlds.

To elaborate on the applicability of my analysis, I should make some remarks on the scope of my research. I only discussed environmental positions, but there could be other reasons beyond environmentalism that influence the preferability of CO_2 policies. Therefore, the analysis cannot establish what the best CO_2 policy is. Nonetheless, my argument remains valid. I merely analyse the liberal implications of environmental philosophy, but I do not claim that the combined CO_2 policy is the best system by all liberal standards.

Another matter is that I only analysed two economic policies, while there are other options such as subsidisation, minimum prices for specific products and investments in CO_2

alternatives. This entails that the conclusions which are drawn only determine the best of two and not of all possible CO_2 policies. Although the scope of the thesis is narrow, my conclusions remain relevant because they compare the preferability of the two most discussed CO_2 policies, based on the predominant concern of environmentalism.

It would be interesting for future research to extend the analysis to other policy options and find out how they could contribute to the desirability of overall CO_2 reducing measures. It raises interesting questions about the manner in which for example subsidies or alternative distributions of emission rights could be used to supplement the integrated system of excise tax and emissions trading. I strongly suspect that CO_2 reduction policies that make alternatives for CO_2 cheaper, instead of making CO_2 emissions more expensive, could mitigate some of the negative consequences created by increased CO_2 prices and reductions in purchasing power. Also, they could increase the feasibility of more ambitious environmental goals. It would be interesting to investigate such options, as they could further increase support for CO_2 reduction policies.

This research aimed to bring the political debate closer to scientific estimates about global warming. Based on the analysis of environmental positions that are most compatible with democratic liberalism, it can be concluded that a combined system of excise tax and emissions trading can both internalise externality costs and guarantee that emissions will not exceed a specified acceptable benchmark. I have shown that environmentalism and liberal-democratic philosophy can be reconciled and used together to support and argue for an integrated environmental policy which should be endorsed by liberals, based on environmental theory.

In addition to the scientific relevance of the thesis, I formulated arguments that can be used in the political debate on climate change. Restrictions on CO_2 emissions should not be rejected by liberals just because they limit the liberty of individuals. They also enforce the right of third parties not to be harmed by the activity of these other individuals. Secondly, an increased price for CO_2 emissions does not only decrease the purchasing power of individuals. It also means that either the suffering caused by CO_2 emissions decreases, or that a sum of tax money becomes available when emissions are not reduced. Either way, the total utility in society increases. Lastly, CO_2 excise tax works best to internalise the cost of externalities, while emissions trading is better at preventing undesirable amounts of emissions. An emissions trading system, such as the European ETS, should not be criticised if the prices do not represent the true costs of CO_2 emissions, since its task is only to make sure that the sum total of emissions does not exceed a particular benchmark. Vice versa, excise tax systems such as tax rates on gas, should not be criticised for having too little effect on the total amount of emissions, since their task is only to make sure that externality costs are internalised.

Epilogue

As a final remark, I will comment on the recent 2019 United Nations Climate Change Conference in Madrid and demonstrate insights based on the conclusion of my thesis.

Arguments for excise tax and emissions trading should be separated, as the policies are meant for two different purposes. However, the current international political debate on climate

change focuses primarily on emissions trading[2]. An emissions trading system is only suitable to limit total emissions with a specified amount. The system is efficient because it distributes rights to the highest bidder, based on supply and demand. The NOS reports of the failure of the 2019 negotiations in Madrid, caused by countries that could not agree on the distribution of emission rights[3]. Most countries do not want to distribute emission rights to the highest bidder, because they feel that would be unfair. Less developed countries have emitted less in the past and would suffer more from restrictions. They want to be allowed to continue emitting CO_2 for a longer period of time, while more developed countries decrease their emissions first. This may seem like a fair argument, but it is problematic because it undermines the efficiency of the emissions trading system which is not suited to make distributions based on fairness. As a result, the pressure on developed countries to reduce their emissions is disproportionate. European countries aim to reduce their emissions to zero within the next thirty years, which costs extreme amounts of money. Reducing emissions in undeveloped countries is much more efficient because the labour, land and resources are cheaper, and they use primitive methods which lead to high pollution. For example, it is ridiculous to shut down brand-new high-performance coal factories and install heat pumps and triple glass in European houses, while people in third world countries still use petrol lamps, cook on open fires and cut down millions of trees. In that sense it is understandable that some countries consider withdrawing from the UN 2015 Paris Agreement.

I agree that developed countries should do more to reduce CO_2 emissions. However, I do not believe that emissions trading is a suitable system to solve this issue of fair distribution. As explained in section 4.6, in my opinion excise tax is a suitable system for compensation. Every country should be taxed equally for its CO_2 emissions, but the revenues can be distributed based on fairness. Undeveloped countries could receive a larger portion of the tax revenues which they can use to invest in alternatives for CO_2 emissions, or to compensate people with a great loss in purchasing power. One might think that the same could be achieved if poor countries would sell their emission rights to wealthy countries. However, such a system is less desirable because the fixed price of excise tax makes it more stable. Also, the excise tax ensures that the true costs of CO_2 emissions are paid, as it internalises externality costs. When a fair distribution of the tax revenues is established, an emissions trading system needs to be added to make sure that emissions will not exceed the benchmark of acceptable CO_2 emissions. The combined system would function better, because it separates the issue of fair cost allocation from the issue of reducing global warming. Instead of trying to solve two problems at once, questions about fair costs and compensation are confined to the debate on excise tax, while questions about the acceptability of global warming can be reserved for the debate on emissions trading.

[2] BBC (2019) COP25: Longest climate talks end with compromise deal, https://www.bbc.com/news/science-environment-50799905.

[3] NOS (2019) Minimaal akkoord op klimaattop Madrid, grootste probleem doorgeschoven https://nos.nl/artikel/2314840-minimaal-akkoord-op-klimaattop-madrid-grootste-probleem-doorgeschoven.html.

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