EU ETS – broken beyond repair? An analysis based on FASTER principles

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ABSTRACT

The EU ETS is one of the main European climate policies, covering 45 percent of EU's greenhouse gas emissions. Its main goal is to limit emissions cost-effectively, and to trigger innovations using a strong price signal, making low-carbon technologies more competitive. While emissions reduction targets for 2020 have already been achieved, the exact role of the ETS in this success remains controversial. The assessment is crucial, as more and more countries and regions plan to adopt similar policies to achieve their targets expressed in the Intended Nationally Determined Contributions, communicated at the Paris Conference of the Parties. The EU ETS, as the longest running and largest carbon market in the world, will undoubtedly serve as a point of reference.
This paper attempts to provide a comprehensive analysis of the policy. First part outlines the historical development of emission trading systems, as well as the development of the EU ETS since its inception in 2005. Second part uses FASTER principles developed by the World Bank and the OECD to perform a multi-criteria, qualitative analysis of the EU ETS in its current form. Third part concentrates on the upcoming revision for the fourth phase, evaluating whether the proposals correctly address the policy's shortcomings. It also provides some alternative reform proposals.

KEY WORDS

Cap-and-trade, EU ETS, Market stability reserve, Carbon price.

JEL

H23, H87, Q56.

* This paper is based on the work of Pawel Wiejski for the Master in European Affairs programme of Sciences Po Paris, under the supervision of Xavier Timbeau.

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The Emission Trading System of the European Union (EU ETS) is one of the most important climate policies implemented by the EU. It is also the first and, as of today, the largest carbon market in the world. Its uniqueness draws attention of researchers, policy analysts and policymakers. As carbon pricing becomes more and more popular, regulators willing to implement emission trading are looking for models to follow. Thus, the importance of the EU ETS exceeds the Old Continent. The questions arising from the functioning of the system are therefore of the utmost importance.

In the view of growing importance of carbon pricing, and the central role that the EU ETS plays in this development, assessment of its functioning is imperative. The programme has been functioning for 12 years now, but to some extent it remains experimental, and is constantly changing in the spirit of "learning-by-doing". From the very beginning the system was plagued with issues and controversies. From initial overallocation, through the impact of the economic crisis, to VAT fraud scandal and lower-than-expected prices – the choice of this system as a primary tool of climate policy has frequently been called into question. Over the years, the EU ETS went through number of reforms. At the time of writing, a structural reform and a revision for the fourth phase (2021-2030) is being considered. It is an appropriate moment to look back at the functioning of the system so far, and to consider proposed reforms. This exercise serves to answer the research question, which may be formulated as follows:

Given the functioning of the system hitherto and the proposals for a structural reform currently under consideration, is the EU ETS as a policy aiming at reducing greenhouse gases emissions a model worth following?

The structure of this dissertation reflects the necessary steps to answer this question. The first part reconstructs the theoretical roots and historical developments of carbon pricing and trading. Growing importance of emissions trading is deeply rooted in the development of economic thought, particularly in the US. The first part explores how theory was turned into practice, and how emission trading was applied to greenhouse gases (GHG). Afterwards, the analytical framework for the subsequent part of the dissertation is established, based on the FASTER principles established by the World Bank and the OECD. Finally, to provide further context, the development of the EU ETS to this day is presented.

Second part consists of a multi-criteria, literature-based analysis of the EU ETS in its current form. The analysis of the ETS is oftentimes limited to its ability to deliver results in terms of emission reductions. This approach can be misleading. In the multitude of factors influencing emissions, it is difficult to isolate the influence of the ETS. Besides, the effects of the policy are not limited to emission reduction. It is necessary to consider the EU ETS from a broader perspective, taking into consideration issues concerning its fairness, integrity, stability, as well as its effects on innovativeness and long-term investments in low-carbon technology. FASTER principles framework is a useful tool to perform such multi-faceted analysis.

The issues revealed by the analysis in the second part of the dissertation will constitute a point of departure for the third. The most important proposals of reform currently discussed in the EU institutions will be analysed in order to assess to what extent do they address shortcomings of the EU ETS in specific areas exposed in the analysis. The final part will complete the analysis, giving enough information to attempt an answer to the research question.

1. Theoretical roots and historical developments of the EU ETS

Climate change has emerged as one of the greatest challenges the world is facing today. In recent years, an unprecedented global cooperation on the issue, led to ratification of the Paris Agreement on October 5th 2016. Nevertheless, a path to low-carbon future remains a turbulent one. Intended nationally determined contributions (INDCs) submitted by parties of the Paris agreement fall short of the agreed-upon goal of holding the increase in global average temperature to well below 2 °C above pre-industrial levels.

Transition will without a doubt be costly, both economically and politically. International Energy Agency estimated that in order to keep the pledges made in Paris, countries would have to invest 13.5 trillion dollars between 2015 and 2030 in the energy industry alone (International Energy Agency, 2015). It is necessary to underline that action outlined by INDCs will not be enough to limit global warming below 2 degrees. According to the UNFCC secretariat report on aggregate effect of INDCs, in order to do achieve this goal, countries will need to “scale up and accelerate efforts before and after 2030” (UNFCCC, 2015, p.14). This conclusion would suggest that countries taking climate change seriously have to be prepared to spend even more with time.

Facing such overwhelming costs policy-makers are eager to find cost-effective solutions. Current technological development, while an important factor, does not in itself provide sufficient potential for emission reduction. Price of fossil fuels remains low compared to sustainable energy sources. Producers have therefore little incentive to switch to alternative energy sources and to invest in innovative technologies. Burden of transformation to low-carbon economy is predominantly borne by governments. Economic policies, such as carbon pricing, are designed to achieve emission reduction goals at least price using market mechanisms. That is why around a 100 countries, representing 58 percent of emissions, included carbon pricing initiatives in their INDCs (World Bank, 2016).

Among these initiatives, the EU Emission Trading System may be considered unique. It was the first ETS for greenhouse gases and to this day remains the largest in terms of covered emissions (World Bank, 2016). It operates in 31 countries, covers over 11 000 installations and airlines operating flights between adherent countries, and has just entered its twelfth year of existence. Despite its singularities, it is necessary to consider EU ETS from a wider perspective. This part provides such context, outlining theoretical foundations of emission trading systems, and a brief history of trading systems put in practice. Further on, a set of criteria for assessment of the ETS is proposed, based on guidelines provided by the World Bank and OECD. Finally, the development of the EU ETS up to today is described.

1.1. Principles of carbon pricing

Carbon pricing is an economic policy aimed at reducing greenhouse gases emissions. Greenhouse gases, most importantly CO2, but also others (methane, nitrous oxide, ozone, CFCs), are uniformly mixed accumulative pollutants. It means that the location in which these gases are emitted does not impact their overall level in the atmosphere. It is also important to underline that they are accumulative – the assimilative capacity of the atmosphere is not sufficient to absorb them. Therefore, the total amount of these gases in the atmosphere increases with time (Tietenberg, 2006). In this case, traditional command-and-control policies, such as design standards or performance standards, are in principle neither efficient nor cost-effective. Marginal costs of reducing emissions differ greatly not only between, but even inside installations. For the regulator command-and-control policies would require a nearly unattainable level of information.

Economic policies allow for more flexibility when it comes to reducing emissions. There are two main types of these policies, drawing from two economic concepts on dealing with negative externalities. Carbon taxes (and subsidies) are based on Pigouvian approach to social cost. Greenhouse gas emissions create costs that are not borne by the emitter, but rather by humanity as a whole. Therefore, a market equilibrium is not equivalent to the socially desirable equilibrium. Pigouvian approach would require the regulator to apply taxes in order to force producers to internalize negative externalities. The value of said tax should be equal to the social cost created by the externality (Pigou, 1972). In practice, taxes are levied based on the desired outcome in emission reduction rather than on actual estimate of social cost.

Subsidy reform is another example of economic policy aimed at reducing emissions, strongly related to carbon taxes. Subsidies are common in the energy sector. On the consumption side, subsidies are given in order to reduce price paid by the consumer below supply cost. Subsidies on the production side are less significant, and consist in directly or indirectly increasing profitability via direct transfers, tax exemptions and other means. Since subsidies for producers affect prices for consumers, these two types of subsidies overlap. Some researchers and policy-makers include externalities of energy production in their estimates of subsidies. From this perspective, costs borne directly by governments (such as health care for people affected by air pollution, or adaptation costs connected to rising temperatures caused by greenhouse effect), as well as all other social costs are considered *post-tax subsidies.* Thus, Pigouvian carbon tax may actually be considered as subsidy reform – as it aims at making polluter pay for externalities resulting from his activity. According to the International Monetary Fund, pre-tax energy subsidies constitute a mere 0.4% of global GDP. But when post-tax subsidies are taken into account, this figure rises to 6.5%. Reducing either type of subsidies leads to fiscal benefits, but also to reduction of environmental impacts (Coady et al., 2015).

Carbon trading is substantially different from both carbon taxes and subsidies. Its theoretical roots can be traced back to an influential article "The problem of Social Cost" by Ronald Coase, criticising Pigouvian approach as too narrow. Coase argued that placing a tax on a polluter does not necessarily lead to desirable results. It would be preferable, he claimed, to treat externalities as any other factors of production, and thus as explicit and transferrable property rights. Corrective measures (such as Pigouvian taxes or command-and-control regulations) may be more costly than the "nuisance" resulting from economic activity of the polluter (Coase, 2013). Incorporating externalities as factors of production with appropriate cost would lead to an efficient, market-based allocation.

Idea proposed by Coase led J.H. Dales to develop theoretical foundations of emission trading system. Taking water waste as an example he argued that the government should take a decision on how much waste can be safely released in a given period during a given time, and put an appropriate amount of "pollution rights" for sale. Firms whose production process involves releasing waste into the water would have to buy these pollution rights. If their initial estimate of how much waste they will produce proves to be inaccurate, they may acquire additional rights, or sell ones that are superfluous. In order for the price to be positive, overall amount of pollution permits should be smaller than the amount of waste produced before introduction of the system (Dales, 1968).

Although theory of pollution rights trading evolved greatly in subsequent decades, incorporating air pollution and, most importantly, greenhouse gases, the basic scheme remains similar to the one proposed by Dales. In principle carbon trading allows for even more flexibility than other economic policies. It also addresses the main problem of carbon taxes: determining their level. These qualities were recognised initially by American policymakers, and led to experiments that introduced emission trading into the policy debate worldwide.

1.2. Historical development of emission trading systems

Emission trading was first introduced in the United States of America. In 1970 amendments to Clean Air Act set maximum standards for concentration of SO_2, CO, NO_2, lead, particulates and ozone. Compliance with these standards was mostly a role of the states. By 1975 it became clear that some regions will not be able to attain goals before deadlines foreseen by the Clean Air Act. In order not to hinder economic growth and to allow for establishment of new entities, in 1976 amendment was introduced, allowing companies to voluntarily reduce emissions in return for reduction credits, certified by the Environmental Protection Agency (EPA). These credits could be purchased by companies willing to create new sources of pollution. These companies needed to secure 120 percent worth of pollution credits for their foreseen emissions. That additional 20 percent allowed for an overall reduction in pollution in a given region. This innovation was known as the “offset policy” (Tietenberg, 2006)

The EPA used forms of tradeable pollution permits throughout the 1980’s. The phase-out of leaded gasoline was attained inter alia using a trading system. It is an interesting example for two reasons. Firstly, the policy targeted input material, rather than emissions themselves. Refineries received a number of quarterly permits for lead in gasoline depending on their historical production. Secondly, for the first time this type of policy resulted in a complete elimination of a pollutant (Kerr & Mare, 1998). Emission trading was also used to phase out ozone-depleting chlorofluorocarbons (CFC) in order to implement the Montreal Protocol (Staving, 1998).

A trading system on a far larger scale was introduced by 1990 Clean Air Act Amendment. Title IV of said legislative act introduced the US Acid Rain Program. Over a decade of environmental activism in this field led the US government to implement a comprehensive policy aimed at reducing primary causes for acid rain, that is SO_2 and NO_x (nitrous oxides) emissions. These emissions were attributable mostly to coal-fired power plants. Contrary to previous air pollution regulations, Acid Rain Program set a cap on aggregate emissions of SO_2, instead of dealing with emissions by individual sources. Trading was much more flexible than in any previous programs. Allowances were traded nationally, without need for approval on the part of EPA. Remarkably, individuals were able to buy allocations as well, in order to resell them, or retire them completely (Ellerman, 2000).

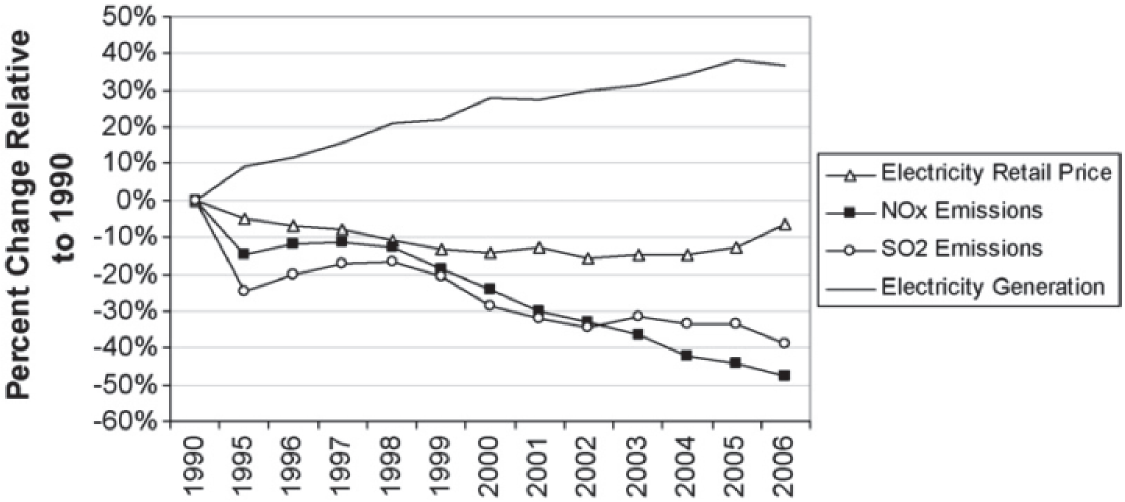

Figure 1. Trends in electricity generation, fossil energy use and emissions from the electric power industry, 1990-2006. (Napolitano et. al. 2007)

Sulphur Dioxide emission trading system is broadly considered a success (Staving, 1998; Ellerman, 2000; Tietenberg, 2006; Napolitano et al., 2007). The policy has led to a significant decrease of SO_2 and NO_x emissions and, in consequence, to a mitigation of acid rain. At the same time, total amount electricity generated increased, while electricity prices remained at more or less the same level.

1.3. Use of Emission Trading for GHG emissions

At the time the first Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC) took place, the United States already had sizeable experience with emission trading. Successful experiments, especially the Acid Rain Program, led the US representatives to advance proposals to include emission trading in the Kyoto Protocol. Emission trading was first mentioned during the third Ad Hoc Group on the Berlin Mandate meeting in March 1996. At the COP 2 later that year, the US representative linked his country's support for binding targets with the inclusion of emission trading. The proposal was initially opposed by G-77 countries and China, noting its complexity and the danger that it would transform emission reduction obligations into commercial transactions (Depledge, 2000). The EU also voiced its concerns, especially concerning the “hot air” problem. If for some countries targets set out in the Kyoto protocol were to be higher than business-as-usual emissions, these countries could sell emission rights without any effort to lower their emissions. The “hot air” problem considered especially countries in transition, such as Russia and Ukraine. Due to difficult economic situation, they were allowed a stabilization target. But the baseline for the target was the year 1990, and in the 1990’s these countries experienced a sharp economic decline, which led to a significant emission reduction. This emission gap was unlikely to be sealed before the Kyoto protocol would enter into force (Woerdman, 2005)

In the end, emission trading clause was adopted. At the time, United States were the biggest GHG emitter in the world, only to be surpassed by China in 2005.[2] Despite objections voiced by other countries, emission trading found its way to the Protocol in return for binding targets and participation of the US. Ironically, the US failed to ratify the Kyoto protocol. Nevertheless, after significant delay, Kyoto protocol entered into force in February 2005 (Depledge, 2005).

There are three mechanisms involving tradeable permits in the Kyoto Protocol. Targets for emission reductions are given as a “carbon budget” to each country included in Annex B – that is countries deemed developed enough to be given binding emission targets. These budgets are calculated in units called AAUs (Assigned Amount Units), each of which is equivalent to one tonne of CO_2e (CO_2 equivalent). Under article 17 of the Protocol, countries listed in Annex B may sell unused units to countries struggling to meet their own emission targets.

The second mechanism involving tradeable permits is the Joint Implementation. This one is also reserved for Annex B countries. A country struggling to meet its emission target may finance a project in another Annex B country, and obtain Emission Reduction Units (ERUs), which are equivalent to AAUs. It can either be a project aiming at reducing GHG emissions, or increasing carbon sinks – a removal of GHG gases from the atmosphere.

The third process involving tradeable permits is the CDM – Clean Development Mechanism. Contrary to the previous two, CDM requires participation of the non-annex B countries. A country can increase its carbon budget by investing in emission reduction project in a country that does not have a commitment under Kyoto protocol, in exchange for Certified Emission

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[2] WRI, CAIT. 2014. Climate Analysis Indicators Tool: WRI’s Climate Data Explorer. Washington, DC: World Resources Institute. Available at: http://cait2.wri.org.

Reductions (CERs), also equivalent to AAUs. In this case, carbon sinks projects are not acceptable (Tietenberg, 2006).

1.4. Current state of carbon pricing

Emission trading have seen considerable development since the Kyoto protocol negotiations. As of late 2016, 36 countries have implemented or scheduled for implementation some form of emission trading systems (of which 31 take part in the EU ETS). In addition, there have been 24 such initiatives on a subnational level. ETS are considered in many other countries, most notably in China. If Chinese ETS is indeed implemented, it will dethrone the EU ETS as the largest carbon market in the world, and increase the share of GHG emissions covered by carbon pricing initiatives from 13 percent to 20, or even 25 percent (World Bank, 2016).

Albeit popular, ETS is not the only economic policy aimed at reducing GHG emissions. Several countries have implemented carbon taxes, most of them in addition to ETS. With these policies often going in parallel, it is useful to consider them together when analysing the optimal price for carbon. Both carbon taxes and emission trading systems aim at making polluters pay for damage caused by GHG emissions. Carbon taxes allow the regulator to explicitly set carbon prices at a given level. By contrast, in the ETS prices are determined by market forces, and the regulator can only influence them by controlling the quantity of emission permits issued.

Most important difference between emission trading systems and carbon taxes is the method of establishing the price of emissions, and reaching a goal in terms of emission reduction. In the case of emission trading systems, the price of emission permits is beyond regulator's control, but the overall emission reduction remains fixed. It is important to note that it is fixed in both ways: if emission permits are overallocated and banking is permitted, firms will use the excess permits in later years. In other words, it is impossible to achieve higher level of reduction than the one projected in the design of the system, even if external situation changes, for example due to an economic downturn.

In the case of carbon taxes, the regulator only sets the carbon price, without being able to fully control the overall emissions reduction. There is no consensus when it comes to establishing the optimal rate of carbon tax. Two approaches can be distinguished. The first one concentrates on estimating the real damage caused by GHG emissions, taking into account healthcare costs, adaptation to higher temperatures or extreme weather events. It may be referred to as the Pigouvian approach. The second one estimates the optimal carbon price based on the desired policy outcome, for example emission reduction sufficient to limit global warming below certain level (functionalist approach). There is also no agreement among researchers whether or not the carbon price should be stable, or should it increase over time. As of 2016, a lower end estimate for optimal carbon price based on the Pigouvian approach suggests the benchmark price of 30€ per tonne of CO_2e (OECD, 2016).

Even considering this low estimate of carbon price, there are few countries that meet it. An OECD report covering 41 countries responsible for over 80 percent of global emissions found that 90 percent of carbon rates do not exceed 30€. If we exclude road transport, where specific taxes on energy are broadly applied and are usually significant, but seldom are motivated by climate policy, this figure rises to 96 percent (OECD, 2016). The EU ETS is no exception – currently, allowance prices oscillate around 5€ per tonne of CO_2e at the time of writing (see: Figure 2.).

1.5. Successful carbon pricing: FASTER principles

Low prices are hardly the only problem of economic policies aiming at mitigation of climate change. Many other issues will be discussed at length in the second part of this paper. Catalogue of difficulties includes overallocation, grandfathering of permits, fraudulent offset programs, carbon leakage and many others. In connection to the Paris COP 21, researchers of World Bank and OECD created FASTER principles of for successful carbon pricing – framework useful for both assessment of existing carbon pricing initiatives (carbon taxes and emission trading systems), and planning new ones (World Bank & OECD, 2015). It consists of six principles.

The first principle is fairness. Transition to low-carbon economy is costly, and carbon pricing initiatives should be designed in a way that reflects the "polluter pays" rule. Taxes and trading systems can lead to higher energy prices, potentially increasing levels of energy poverty. At least in the short term they may also have adverse effect on labour markets, it is therefore necessary to assist transition of jobs to emerging, low-carbon sectors.

Second principle is strongly connected with the first one. Alignment of policy and objectives relies on the conviction that carbon pricing is only one element in the broader policy mix, and cannot be taken out of context. Some policies may aid reduction of emissions, and help achieve sustainable, long-term solutions. Other may hinder emission reduction efforts – for example fossil fuel subsidies.

Carbon pricing initiatives should also be stable and productive. A point especially pertinent for the EU ETS; successful ETS and carbon taxes should send a stable and gradually increasing price signal to the economy, to allow companies and individuals to plan out deep and long-lasting transition processes.

Fourth principle – transparency – is important both for stakeholders and for general public. Stakeholders, such as companies subject to carbon pricing, should be informed early and comprehensively about the program even before its introduction. The process should be transparent also for the public, to assure trust and allow scrutiny.

Next principle – efficiency and cost-effectiveness – reflects the main goal of carbon pricing. Its flexible design is supposed to help achieve emission reductions at least cost. It is also important to take cost-effectiveness during the design phase. When it comes to coverage of carbon pricing, the more numerous and diverse the sources, the better. Efficiency can further be increased by productive use of revenues from taxes or emission trading. Cost-effectiveness can be increased by international cooperation, for example through linking of emission trading systems.

Finally, the sixth principle involves reliability and environmental integrity. This principle encompasses all previous ones. Ideal carbon pricing initiative should cover all the emission sources. Regulator should also ensure that a low-carbon alternative to existing modes of production is readily accessible, what brings us back to alignment of policy and objectives. Carefully designed carbon pricing initiatives can also contribute to other problems, helping reduce air pollution or improving energy independence of a given country.

Assessment of carbon pricing initiatives is not an easy task. Situation of each country or region deciding to introduce carbon tax or emission trading system is different. Economic policies are usually only elements of a broader policy mix. Emission levels can be influenced by many factors, often independent from policymakers, which was clearly demonstrated during the crisis of 2008. Judging a carbon-pricing policy just based on attainment of emission reduction targets is an oversimplification. FASTER framework allows for a more in-depth analysis of a functioning of carbon pricing initiatives. In addition, it does not differentiate between carbon taxes and emission trading, which allows researchers to compare these two distinctive approaches. That is why the analysis of the EU ETS presented in this paper will be based on FASTER principles.

1.6. History of the EU ETS.

Efforts of the EU regarding climate change mitigation go a long way back. But Europe was slow to accept Emission Trading as a method. It does not mean, however, that it didn't try to implement carbon pricing. EU institutions recognised climate change as a threat and recommended policy action even before the International Panel on Climate Change (IPCC) was created. First non-binding documents were released in the 1980s. First proposals to introduce a carbon tax surfaced in 1991 (Skjaerseth, 1994). The Commission was trying to gather support of the Council to propose a carbon tax to be implemented simultaneously by all OECD countries to avoid competitive advantage of free-riders. Due to extensive lobbying activities and fierce opposition to the idea by some Member States, the Commission failed not only to mention carbon tax during international negotiations at the UN Conference on Environment and Development in 1992, but also to implement any form of carbon taxation. In order to introduce fiscal measures at the EU level unanimity is required. The United Kingdom was firmly opposed to any such measures, and some poorer countries (Portugal, Ireland, Spain and Greece) demanded additional cohesion fund to recompense the resulting tax burden. The failure to introduce carbon tax went hand in hand with cuts to the budgets of existing programs aiming at reducing emissions – SAVE, concerning energy efficiency and ALTENER, promoting use of renewables. The idea of carbon tax was finally abandoned in the late nineties (Skjaerseth & Wettestad, 2009).

Kyoto Protocol marked a change of approach of the European Commission. Initially opposed to the idea of emission trading, the Commission embraced it shortly after the end of the Conference. Two political motives seem decisive. Firstly, failure of a union-wide carbon tax led to a realisation that any policy instrument involving fiscal measures (that is: requiring unanimity under the Maastricht Treaty) is unlikely, if not impossible, to pass. Secondly, negotiations in Kyoto, and US insistence on introducing trading mechanisms into the final text brought emission trading into the global discourse. Moreover, for the EU-15 there was already a binding target of 8 percent reduction of emissions compared to 1990 levels, provided by the Kyoto Protocol. In addition, after the US finally rejected Kyoto in 2001, the EU took leadership to assure ratification of the Protocol. In order to achieve that, at least 55 countries representing at least 55 percent of 1990 emissions needed to finalise their ratification processes. At the time the US was responsible for 34 percent of global emissions, which reveals the scale of this challenge. To convince Japan, Russia, Canada and many other countries, the EU needed to lead by example. As Frank J. Convery puts it: "(…) the EU ETS moved to centre stage as the core evidence that the European Union could be innovative, courageous and effective in ensuring that its own performance matched its rhetoric" (Convery, 2009, p.396).

Background of EU ETS implementation is crucial for understanding its further development. Emission trading was not a first-choice policy for the Commission. Its rise to prominence resulted from several factors – which is not surprising in the multi-level governance framework of the Community. Although Kyoto Protocol negotiations played a significant role, it would be an oversimplification to treat it as the only cause. Institutional setup of the EU, virtually disallowing fiscal measures as policy tools, combined with the will of Member States and lobbying efforts of industries – all of these factors need to be taken into account.

Shortly after Kyoto, in 1998, the Commission released a document in which it argued that the EU could introduce internal emission trading scheme before Kyoto protocol would enter into force in 2008. Starting the programme in 2005 would give the Community practical experience, streamlining of monitoring system and promote "the achievement of targets in a cost-effective way" (European Commission, 1998, p.20) It took two years to release a green paper, outlining details of the system.

Finally, the Directive 2003/87/EC of the European Parliament and the Council of 13 October 2003 establishing a scheme for greenhouse gas emissions trading within the Community came into effect. The initial phase was scheduled to begin in January 2005. The Directive gathered widespread support among Member States and in the European Parliament, as well as from some major environmental non-governmental organisations, such as World Wildlife Fund (WWF), or Foundation for International Environmental Law and Development (FIELD) (Convery, 2009).

The second piece of legislation crucial for the functioning of the ETS, concerning linking the European trading system to Kyoto protocol mechanisms (Joint Implementation and Clean Development Mechanism), was met with far stronger opposition both by Member States and NGOs. At the same time, representatives of the industries included in the ETS were strongly supporting unlimited access to international credits. Germany and the third sector voiced their concerns, arguing that opening the ETS for credits from Kyoto mechanisms will lead to a price collapse and will decrease the effectiveness of the system. Nevertheless, the legislation was adopted, leaving limiting access to JI and CDM to Member States, with oversight of the Commission (Convery, 2009).

The Directive 2003/87/EC outlined general rules for the first two phases of the ETS. First phase was designed to last three years, starting in 2005. In this pilot period, emission permits (European Union Allowances – EUAs) were distributed in decentralized way. Member States needed to present a national allocation plan (NAP), according to specific criteria outlined in Annex III of the directive. NAPs comprised allocations for the whole period of the ETS, and were to be presented to the Commission at least 18 months before the start of the period. The Commission would then evaluate the plan on the basis of criteria listed in Annex III, and then accept, or reject it – fully or partially. The Commission had a final say in the process. At least 95 percent of allocations were to be given for free ('grandfathered').

The ETS intentionally did not cover all the emissions. In order to limit monitoring costs, mostly large combustion installations were targeted. Initially, only CO_2 emissions were covered. The scope of the ETS accounted for about 50 percent of CO_2 emissions, coming from 11,500 installations in 27 Member States. Interestingly, article 24 introduced an opt-in clause – Member States could voluntary include additional installations in the ETS. These installations did not have to fulfil conditions outlined in Annex III of the directive. This possibility was used by Austria, Finland, Latvia, Slovenia and Sweden (Ellerman et al., 2010).

In order to monitor, report on and verify emissions, each Member State established a registry. National registries included data on creation, surrender and transfer of permits in a given country. Aside from national registries, a central log – the Community Independent Transaction Log (CITL) – was created. Its role was to register all transactions in the EU. National registries could not give the full picture of the market, because they did not take international transactions into account. A verification process was also set up, and independent verifiers had to certify the actual emissions level in each plant. Companies with emissions exceeding its permits at the end of the year had to buy deficit permits and was liable to a penalty of €40 per EUA. (Ellerman et al., 2010).

The first period was supposed to be a pilot one. The purpose was to establish institutional setup of the system, to put mechanism to a test before it was to be fully implemented as a Kyoto compliance tool. That is why EU cap was close to the business-as-usual scenario. The estimates were not only low, but also inaccurate. Member States did not have much time for an ambitious task of verifying levels of historical emissions in ETS sectors. The problem was even deeper in new Member States, where economic situation was still volatile shortly after structural transformation (Ellerman et al., 2010). In effect, EAUs were greatly overallocated, what led to a quick decline in prices. Banking over to the second phase of ETS was not permitted, causing the price to drop nearly to €0 towards the end of the first phase.

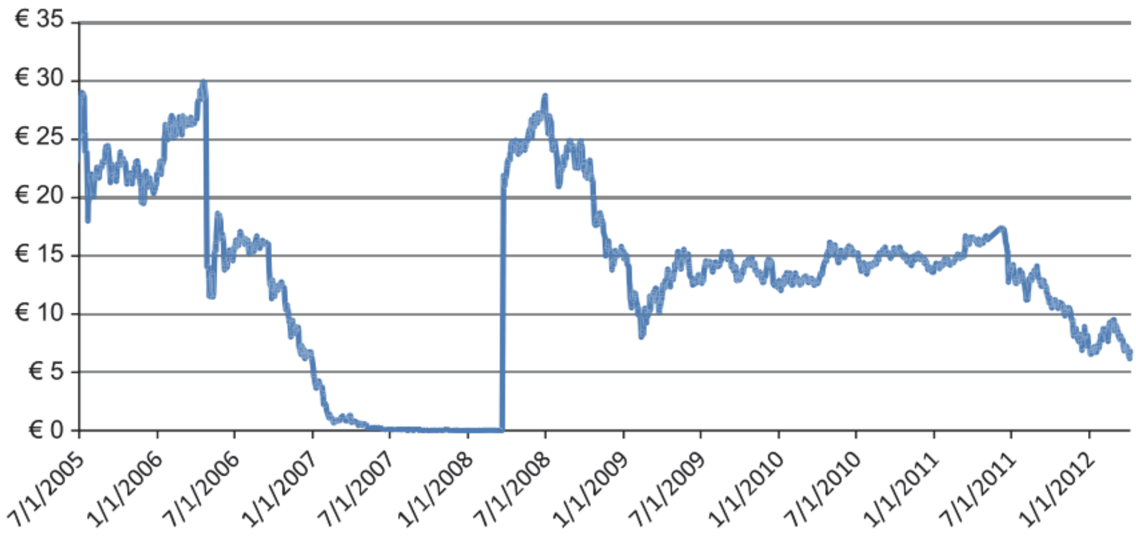

Figure 2. EAU price in the first two phases of the ETS (Venmans 2012)

The second period was planned over five years, starting in 2008, the year when Kyoto protocol entered into force. As the legal basis for the system remained the same, most of the institutional setup of the programme did not change. NAPs were still responsible for allocation of permits. Their initial allocation was higher than in the first phase, reaching 2325 million EUAs per year. The Commission review brought down this number by over 10 percent, or 245 million tonnes per year. The proportion of obligatory grandfathering was reduced to 90 percent of permits. As with the first phase, few Member States chose to organise auctions. Only 3.1 percent of EUAs were auctioned, most of them in Germany and the UK (Venmans, 2012)

As the Kyoto protocol came into force, offsetting mechanisms foreseen by this agreement – Clean Development Initiative and Joint Implementation – were introduced to the European ETS. In accordance with the Linking Directive, the NAPs determined maximum share of these so called 'Kyoto credits' for each sector. Unsurprisingly, the initial cap of 374 million credits proposed by the NACs was lowered by 100 million by the Commission. Still, the Kyoto credits constituted a significant part of permits in the EU, increasing total emission cap by over ten percent.

In order to prevent price drop from the pilot phase at the end of the five-year period, banking of permits was allowed. Unused allowances were permitted to be used in the third phase, starting in 2013. However, prices of EUAs continued to fall. From the highest point at €27, price decreased quickly to under €10 at the beginning of 2009. Naturally, the main reason for this price drop was the economic crisis of 2008, and overall reduced productivity. Afterwards, the price stabilised at around €15, to fall again in 2012 following the foreign debt crisis and VAT fraud breakdown (Venmans, 2012).

Besides the economic crisis, fraudulent activity also influenced the functioning of the ETS. Money laundering and VAT fraud committed via the missing trader system accounted for the majority of transactions on the emissions market. The scale of this criminal activity was overwhelming. Losses in tax revenues between 2008 and 2009 were estimated at 5 billion euros. After several countries implemented measures to prevent fraud using emission trading, market volume dropped by as much as 90 percent (Frunza, 2013). The scandal undermined the EU ETS' credibility. As the volumes on the spot market fell, the prices plunged even further, falling below 10€ in June 2011.

1.6.1. Inclusion of aviation

In 2012, aviation sector was partially included in the ETS. Aviation sector is under a slightly different regime than other ETS sectors. Directive 2008/101/EC introduces a new chapter to the ETS directive, For the first year, cap was set at 97 percent of the historical emissions (taking 2010 as reference year); 85 percent of permits were to be grandfathered. Aviation sector could use Kyoto credits to offset emissions, but unlike other sectors, the maximum percentage of offsets was set by the Commission. Limit for the first year was set at 15 percent; for subsequent years the Commission was obliged to publish the limit at least six months before the start of each period. Monitoring and enforcement was left to the Member States. Aviation is a highly internationalised sector, so clear rules concerning assignment of companies to Member States had to be established. For aircraft operators based in the EU, the country issuing the licence was determining the "nationality" of an airline.

Initially, all flights to and from European airports were included in the ETS. This triggered a fierce reaction from the international community, especially the US. Fearing potential losses to American aviation sector, the Congress passed the European Union Emissions Trading Scheme Prohibition Act in 2011. The US and other countries argued that the EU threatened their sovereignty by effectively taxing emissions resulting from activity effectuated over international waters and their territory. Succumbing to these pressures, as well as to protests on the part of industry, the EU regulator limited the scope of the ETS for aviation to flights between airports of the countries participating in the system from 2013 to 2016 (European Commission, 2015a). Development of EU policy concerning aviation has to be considered alongside negotiations inside the International Civil Aviation Organisation (ICAO). Failure to reach global agreement on limiting aviation emissions was an impulse that pushed the EU to take leadership in the matter. Current negotiations concerning implementation of a global market-based measure led the Commission to propose a continuation of current scope of ETS until 2021. The proposal is currently discussed in the parliamentary committee.[3]

1.6.2. Phase 3

Problems with overallocation, price volatility and fraud in the first two phases of the ETS led the Commission to introduce significant reforms in the third phase, as set out in the Directive 2009/29/EC. The scope of the system was broadened to include carbon capture and storage. The structure of the system has been centralised. A single, union-wide cap was implemented, replacing National Allocation Plans. Importantly, the cap was designed to decrease with time, by 1.74 percent per year. Base year was set in the middle of the second phase of the ETS: in 2010. A central registry replaced the Community Independent Transaction Log. This time, an online database held not only transaction logs, but also other information: the list of installations covered by the ETS in each country, accounts of companies and individuals holding allowances and verified CO_2 emissions. An account in the Union registry became indispensable to participate in the allowances market.

Auctioning became the main method of allowances assignment. The transition from the previous phases, during which free allocation was dominant, was to be progressive. Free allocation rules were the same for the whole Union. For the manufacturing sector, the system was designed to promote carbon-efficient installations. Technical benchmarks were developed, based on the 10 percent best-performing installations. In the manufacturing industry, these installations received all of their allowances for free. Others had to buy a proportion of their permits on public auctions. The exception was made for industries deemed at risk by carbon leakage – these received a higher proportion of allowances for free.

Allowances for the power generation sector in the third phase were supposed to be assigned uniquely by auctioning. An exception was set out in article 10c for some Member States, taking into account their economic performance, energy mix, and the degree of integration with European electricity network through the Union for the Coordination of Transmission of Electricity.

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[3] Proposal for a Regulation of the European Parliament and of the Council amending Directive 2003/87/EC to continue current limitations of scope for aviation activities and to prepare to implement a global market-based measure from 2021, 2017/0017 (COD)

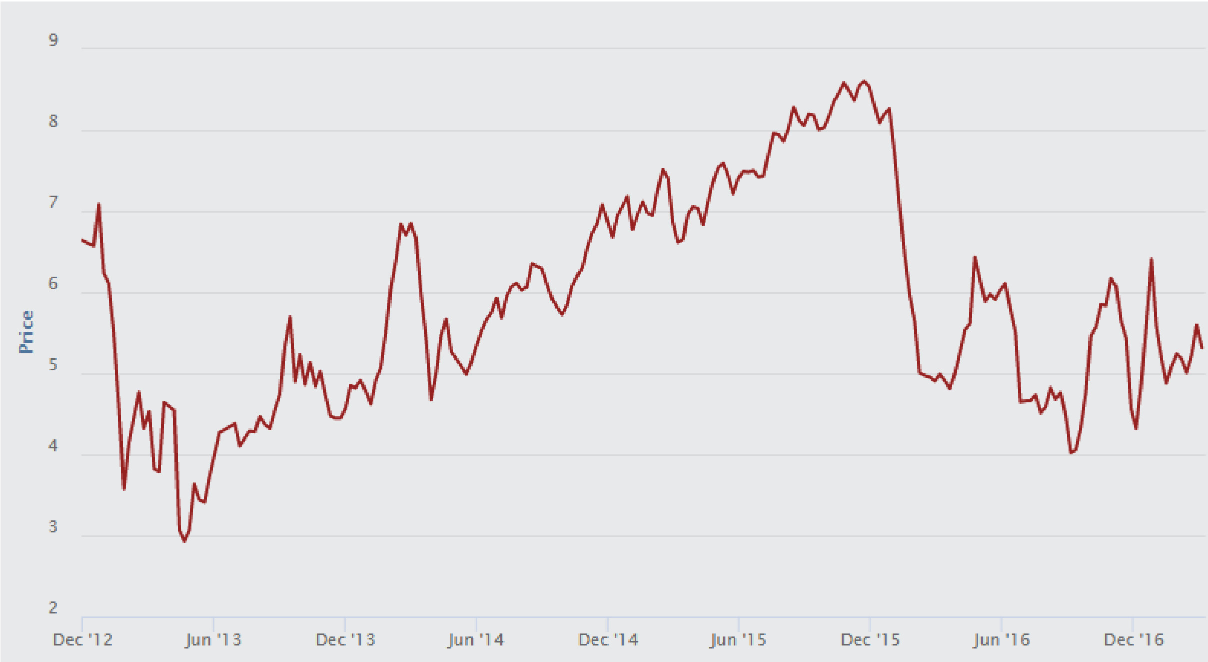

Figure 3. EU Emission Allowances, spot secondary market. Source: EEX

Reform of the ETS in the third phase did not solve all of the system's problems. In fact, prices did not increase after 2013, oscillating between 5€ and 8€, much lower than the minimal price of 30€ recommended by the OECD. This price was judged as too low not only for reasons concerning estimated social cost of emissions, but more importantly because of presumed lack of incentive for economic actors to invest in low-carbon technology. At the beginning of the third phase there was an estimated surplus of 2.1 billion allowances. According to European Commission, this surplus would grow to 2.3 billion (Erbach, 2014). That is why the Commission proposed two reforms in order to address this surplus. Firstly, in 2013, a 'backloading' amendment was introduced (after being initially rejected, and then significantly modified by the European Parliament), delaying the auctioning of 900 million allowances that was supposed to take place in 2014-2016 until the end of phase three.[4] Secondly, as a more systemic and long-term solution, the Commission proposed a Market Stability Reserve that would automatically and temporarily remove excess allowances from the market. This measure is being planned as an element of the ETS reform for phase four, and as such will be considered in detail in the third part of this paper.

[4] Commission Regulation No 176/2014 of 25 February 2014 amending Regulation (EU) No 1031/2010 in particular to determine the volumes of greenhouse gas emission allowances to be auctioned in 2013-20

2. Analysis based on FASTER principles

In the view of the European Commission, the EU ETS is considered to be a "cornerstone of the EU's policy to combat climate change" and a proof that "putting a price on carbon and trading in it can work".[5] While acknowledging its shortcomings (volatility of prices in particular), Commission upholds a view that the ETS serves it purpose. The Commission estimates that by 2020 the system will lead to a 21% decrease of emissions compared to 2005 in the covered sectors, thus fulfilling the intended target.

This assessment, however, does not seem sufficient. Reaching targets should be an important, but not the only factor taken into account while analysing an environmental policy. The ETS does not exist in a vacuum; there are several other factors influencing emissions, such as economic growth, technological developments, demography, and even other EU policies. Achievement of targets can be easily examined; determining the exact impact of the ETS on emission levels is an entirely different matter. It is also necessary to underline that emission reductions are not the only consequences of the trading system. Directly and indirectly, the ETS can affect and interact with inequalities, economic efficiency, competitiveness, labour market, energy policy – to name just a few.

With the ETS escaping simple, one-dimensional analysis, a different approach seems necessary. Researchers developed a great number of multi-criteria methods, and there is no consensus concerning the most appropriate method of assessment of environmental policies. International Panel on Climate Change combined most prevalent ideas to create a coherent, four-criteria method intended for policy-makers to choose optimal environmental policy, and to evaluate existing ones (Gupta et al., 2007). These criteria are: environmental effectiveness, cost-effectiveness, distributional considerations and institutional feasibility. Some researchers already used these criteria to assess the EU ETS (Venmans, 2012).

This study is based on the FASTER principles, outlined in the first part of the paper. It is an approach very closely related to the one proposed by the IPCC. Environmental effectiveness and cost-effectiveness are combined into one principle. Distributional considerations are present in several others, including reliability and environmental integrity, and fairness. FASTER principles also contain criteria absent from methodology proposed by the IPCC that are relevant to the analysis of the ETS. Most notably, issues of transparency, stability, and

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[5] *The EU Emissions Trading System (EU ETS)*, European Commission, Access: March 2016 https://ec.europa.eu/clima/policies/ets_en

alignment of policies and objectives, seem necessary to fully assess the EU ETS. The importance of institutional feasibility has been demonstrated in the first part. It will not by itself constitute a criteria for analysis in this chapter; it is more relevant for assessment of proposed carbon pricing mechanisms. Since the EU ETS is already in place, its institutional feasibility is incontestable.

The table below summarises the results of the analysis. The criteria of the analysis are qualitative. Assessment is a result of the analysis performed comparing criteria provided by the World Bank and the OECD with the functioning of the ETS. The last column – assessment – reflects in simple terms the informed opinion of the author on the results of the analysis.

Principle	Positive elements	Negative elements	Assessment
Fairness	Redistribution between countries, revenues used for climate and energy policy objectives	Low EUA prices, offsets, windfall profits, free allocation and carbon leakage rules, no revenues used for the most affected customers	**Mixed/Negative**
Alignment of policies and objectives	-	Cancelling out effects of renewable and efficiency targets. National policies undermining the ETS	**Negative**
Stability and predictability	-	Price volatility, surplus, ad-hoc policy fixes (backloading).	**Negative**
Transparency	Centralised Union Registry, clear monitoring, reporting and verification rules, market oversight development, transparency constantly improving	Excessive use of international credits, VAT fraud	**Positive**
Efficiency and cost-effectiveness	Some abatement, low operational costs – only large emitters covered, but in many countries	Abatement small compared to the effects of the crisis; cancelling out other policies outweighs the effectiveness; little to no proof regarding	**Mixed/Negative**

		inducing innovation	
Reliability and environmental integrity	Some positive effect on local air pollution	Use of doubtful international credits; instability and low effectiveness	**Mixed/Negative**

2.1. Fairness

The first principle suggested by the OECD and the World Bank for successful carbon pricing is also the most difficult to assess. It is based on the polluter-pays principle – a conviction that the costs of transformation should be primarily borne by entities responsible for emissions. In a sense, carbon pricing restores fairness: it annuls the competitive advantage of polluting industries which do not take into account costs they inflict onto the society. The problem is the most visible if we consider energy production. Let us take Germany as an example. At 3 percent discount rate, levelised cost of electricity production (LCOE) for a hard coal plant is estimated at 34.24 EUR/MWh. LCOE for an offshore wind plant is much larger: 71.38 EUR/MWh (IEA; NEA; OECD, 2015). At this price level there is hardly any incentive to invest in renewable energy. However, if we include a carbon price in our estimates of LCOE, the results are radically different. Even with lower-end estimate of 30€ mentioned in the first part of this paper, prices of these two energy sources converge.

It does not necessarily mean that carbon price should be equivalent to actual social cost caused by GHG emissions in order for the system to be fair. Especially emission trading systems do not fix carbon price at any level, concentrating instead on quantities of GHG emitted. It does not change the fact that successful carbon pricing initiatives should make polluting activities less profitable, as compared to low-emission or carbon-neutral activities.

Fairness of carbon pricing can also be understood as equitable cost distribution. Even though in the long run emission reduction, and thus climate change mitigation, may help avoid significant costs, in the short run transition costs are high, especially for sectors with high emissions levels. This translates into two effects. Firstly, considering that carbon pricing initiatives are not homogenous across the world, companies covered by such policies may face unfair competition from enterprises in other countries or regions, which do not have to bear the cost of carbon price. It creates an incentive for domestic companies to delocalise in order to avoid these costs. This phenomenon, known as *carbon leakage*, is especially pertinent for sectors that already are heavily traded and emission-intensive, such as steel or cement. On the other hand, this problem is nearly non-existent in the energy sector, where production is very difficult to delocalise. Secondly, in countries in which energy production is emission-intensive, carbon pricing may lead to higher prices for consumers. This may disproportionally impact lower-impact households; especially electricity and heating fuels price increase has a strongly regressive effect (Thomas & Flues, 2015).

Another issue concerning fairness of carbon pricing is linked to revenues from such policies. Not only carbon taxes bring revenues; in emission trading systems permits can be auctioned, also providing income for the budget. When permits are traded, they are usually treated as any other commodity, and thus they are susceptible to taxation, for instance via the value added tax. That creates several issues concerning fairness: from distribution and uses of these revenues, through grandfathering of permits for some companies in order to prevent carbon leakage, to issues connected with taxation of emission trading.

2.1.1. Polluter-pays principle

At the end of each year, installations covered by the ETS need to return a number of allowances equivalent to the amount of GHG they emitted. If their emissions exceed their allowances, they must purchase additional permits on the market. If they fail to do so as well, they have to face a fine of 100 €/tonne of CO_2e, adjusted by inflation since 2013. Additionally, the fine does not comprise emission permits costs; excess emissions are added to the target for the following year. Furthermore, producers and aircraft operators that fail to surrender appropriate amount of emission permits are subject to the "name-and-shame" sanction – Member States have to publicly disclose their names (Directive 2003/87/EC, Article 16).

It would appear that, at least in principle, polluter *does* pay in the sectors covered by the EU ETS. One way or another, emitting installations need to acquire enough allowances to cover their emissions. However, the EU ETS is not creating a level-playing field between polluting and non-polluting sectors due to its low price levels. In order to fully internalize the environmental externality, marginal cost of producing a unit of pollution should be equal to the marginal social damage it causes. Such level of prices would create incentives for producers to innovate and develop low-carbon technology (Nordhaus, 2011). Estimates of social cost of GHG emissions vary, but there can be no doubt that the current price of between 5€ and 8€ per tonne of CO_2e does not even come close to that level.

While due to low prices the "polluter" does pay, but not enough to foster innovation in low-carbon technologies, there are cases where polluters pay even less, or are not required to pay at all. Despite significant increase of the amount of allocations that are being auctioned, over the 2013-2020 period 43 percent of allocations are still distributed for free.[6] This is mostly explained by carbon leakage threat that will be discussed further on. But even producers that do not receive allocations for free do not necessarily have to pay the market price for them. Market participants may use international credits from the Kyoto protocol in the place of EUAs. These credits, theoretically representing offsets elsewhere on the Planet, were largely used especially during the second phase of the ETS, after the Commission announced that some of these offsets will no longer be accepted as of beginning of phase three. In the second phase, offsets from Kyoto protocol represented around 1 Gt of CO_2e. The price of these offsets was lower still than the price of EU allowances. Owing to the fact that the EU was the only major participant in the Kyoto offset market, price of international credits oscillated below 1€/tonne (de Perthuis & Trotignon, 2014).

2.1.2. Cost distribution

From the perspective of fairness, cost distribution in the EU ETS can be understood in two ways. Firstly, it concerns cost distribution between companies, both inside and outside of the EU. Secondly, it concerns cost distribution within the society.

The ETS purposely does not comprise all economic agents in the EU. Only the most GHG-intensive sectors are covered. Initially, the ETS included the power sector (combustion plants of over 20 MW) and parts of manufacturing industry, including oil refineries, coke ovens, glass, lime, ceramics, cement production, and iron and steel plants. From 2012 the aviation sector was added, but only for flights between participating countries. Phase three saw some other sectors covered, including aluminium, petrochemicals and CO_2 capture and storage. All that accounts for around 50 percent of GHG emissions in participating countries (European Commission, 2015a). Targeting the biggest and the most polluting installations makes oversight and management of the system much easier. It is unlikely that EU ETS will include many other sectors in the future.

Not all installations get equal treatment. As mentioned above, in the third phase a significant number of allowances is given out for free (grandfathered). Given that the EU ETS is by far the largest carbon pricing initiative in the world, companies could be incentivised to move their production to a region without such environmental policies in place. This potential

[6] *Free allocation,* European Commission, access: March 2017 https://ec.europa.eu/clima/policies/ets/allowances_en

problem affects some sectors more than others; energy production, for instance, is very difficult to move abroad.

Free allocation in the EU ETS is based on benchmarks, which are fixed for the whole third phase of the program. Benchmarks are defined in tonnes of CO_2 per 1000 tonnes produced (that is: how many tonnes of CO_2 is emitted while producing 1000 tonnes of product), and are based on 10 percent most carbon-efficient producers. In other words, the more carbon-efficient production process, the more allowances are allocated for free. In principle, electricity producers do not receive any free allowances, with an exception of 8 EU countries that joined the Union in 2004 and receive conditional free allowances for the modernisation of their energy sectors. Most other sectors receive some free allowances based on their carbon-efficiency. The proportion of free allowances is decreasing with time. In 2013 it was 80 percent of the benchmark; the proportion is decreasing linearly to reach 30 percent in 2030. Finally, some sectors, deemed particularly exposed to carbon leakage risks, receive 100 percent of the benchmark value for free. Current list of such sectors for the period of 2015-2019 is outlined in the Commission Decision of 27 October 2014[7], and is based on article 10a of the ETS Directive.[8]

Choice of the sectors exposed to carbon leakage is based on a set of seemingly objective criteria. Two factors are taken into account: direct and indirect costs borne by companies because of the participation in the ETS, and trade intensity with non-EU countries. However, these criteria are questionable and there are important doubts concerning the very existence of the ‘carbon leakage’ phenomenon. In particular, the costs of ETS participation for companies are calculated based on assumed carbon price of 30 €. The actual price of ETS allowances is several times lower, oscillating between5€ and 8€ at the time of writing (EEX Primary Auction Market, August 2017). Not to mention that even sectors absent from the carbon leakage list receive a proportion of their allowances for free. This price is justified in the Decision by a conviction that the price is going to increase in the future, given the ambitious target for emission reductions in the period between 2020 and 2030, and the proposed

[7] Commission Decision of 27 October 2014 determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage, for the period 2015 to 2019, 2014/746/EU
[8] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC

establishment of Market Stability Reserve. This argument is dubious as best, considering the current Decision only concerns the period of 2015-2019.[9]

Furthermore, researchers and analysts have called the importance of carbon leakage threat into question. A review of literature conducted by the OECD found no evidence of economically meaningful effects of carbon pricing initiatives on competitiveness. Some studies compared firms receiving preferential treatment to companies having to pay full rate, and found no difference in competitive position in either of these groups (Arlinghaus, 2015). It may be explained by low carbon price levels or by the importance of other factors influencing investment decisions, such as availability of capital and skilled workforce, quality of institutions or proximity to markets (World Bank & OECD, 2015). Regardless of the explanation, current carbon leakage rules raise many questions concerning fairness. In a sense, grandfathering of permits resembles tax expenditure, because potential revenues from auctioning are forgone (OECD, 2016). Thus, any decision concerning free allocation should be based on strong argumentation, which is clearly not the case in the EU ETS. Moreover, the sectors not included in the carbon leakage list are treated unfairly, given that they are the ones bearing the costs of continuously increasing proportion of auctioned allowances.

2.1.3. Costs for customers

When it comes to distributional effects of EU ETS, there is a great discrepancy between income groups. In the long run, poorer households benefit from climate policies, because they are the ones that are the most vulnerable to risks caused by negative externalities of GHG emissions: from local pollution to exposure to extreme weather events. Paradoxically, in the short run, these income groups are most likely to be negatively affected by climate policies. There is a non-negligible risk of carbon price being translated into higher energy cost (World Bank & OECD, 2015). Lower income groups spend the biggest share of their disposable income on energy, thus transition costs fall disproportionately on them. The extent of this disproportion varies across sectors; while transport fuel taxes in developed countries may have a proportional, or even progressive effect, taxes on heating fuels, and especially electricity taxes, tend to have a regressive effect (Thomas & Flues, 2015). Aside from distribution among income groups, the EU ETS faces a challenge of fair distribution among participating countries. Member States differ with regard to economic performance, energy mix and historical emissions.

[9] Commission Decision of 27 October 2014…

Due to low prices and widespread grandfathering, one may assume that costs for the customers, as for the countries, are negligible. Actual costs are difficult to quantify, and the issue requires further investigation, but there are reasons to expect the prices to increase even in sectors benefiting from free allocation. The effect of passing through the cost of allocations received for free is called "windfall profits". Energy generation is excluded from grandfathering, but there is evidence that indicates that low-carbon electricity producers (nuclear, for instance) also pass through the costs onto customers, profiting from competitive advantage induced by the ETS (Venmans, 2012).

Unfair cost distribution can be dealt with using revenues from auctioning. That is the case in several carbon pricing initiatives around the world. In the North-eastern US, the Regional Greenhouse Gas Initiative invests profits from its ETS into energy efficiency programs and direct rate relief for customers in need. British Columbia's carbon tax program foresees a tax credit for low-income households that is in fact greater than costs borne by these households due to carbon tax (World Bank & OECD, 2015)

The EU ETS does have a revenue distribution system in place, but it is targeting countries, rather than affected groups of population. The ETS Directive regulates the distribution of allowances to be auctioned by each member state. 88 percent of these allowances are allocated according to the amount of verified emissions at the beginning of the ETS, 10 percent is given to the least wealthy Member States for the purpose of solidarity and growth, and 2 percent constitute a bonus for these participating countries whose emissions in 2005 were at least 20 percent below their Kyoto emission targets. The use of revenues is determined by participating countries. However, at least 50 percent of revenues has to be used for policies related to climate and energy, specified in the Directive. Member States have to report on the amount raised from auctioning and the use of revenue in their yearly reports[10].

In 2015, for instance, Member States reported €4.9 billion of revenues from auctioning of emission allowances. Member States exceeded the required percentage of revenues to be used for climate related purposes, spending (or at least declaring to spend) 77 percent of revenue for such policies. Proportion of revenues spent on specific areas vary across the participating countries. On average, Member States choose mainly investments in renewable energy and energy efficiency (European Commission, 2016)

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[10] Article 17 of Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013

Revenues are, therefore, used for the purposes of climate change mitigation, which may prove profitable for the least wealthy households in the long run. They are also to some extent redistributed between countries according to their prosperity. On the other hand, the short-term issue of passing through the cost of ETS onto consumers, disproportionately affecting the lowest income groups, is not addressed on the EU level. There is also a question of limited size of these revenues, caused by both free allocation and low prices of allowances.

The question of revenues has to be juxtaposed with the issue of VAT fraud. According to some estimates, the possible losses of European taxpayers only between 2008 and 2009 may have reached € 6-8 billion, if we include over-the-counter transactions (Frunza & Guegan, 2011). Aside from dealing an enormous blow to credibility and integrity of the ETS, the missing trader fraud scheme costed more than yearly revenues from the ETS in its third phase. Not to mention that in previous phases (before 2013) revenues from auctioning were even smaller, as an even greater proportion of allocations was grandfathered. While after the breakdown of the VAT fraud scandal measures were implemented to prevent the phenomenon from repeating itself, such as reverse charge mechanism, a report of European Court of Auditors in 2015 found that in some countries such preventive measures were still not implemented. Therefore, the EU ETS is still at risk of VAT fraud (European Court of Auditors, 2015).

To conclude, the principle of fairness is multi-dimensional and difficult to assess. However, it would appear that in every aspect – polluter-pays principle, distribution of costs among participants and protection from disproportional effects on the least wealthy parts of the population – the EU ETS has its shortcomings.

2.2. Alignment of policies and objectives

The EU ETS is not the only climate policy of the European Union. Policies employed in the same domain interact with each other in various ways. Some complement the trading system, facilitating long-term investments in low-carbon technologies, increasing the impact of carbon pricing in the economy. Others have the opposite effect, directly or indirectly undermining the effectiveness and efficiency of the ETS. The case of the EU is particularly complex, because both energy and environmental policies are shared competences[11]. It means that not only other EU policies affect the ETS, but also the ones conducted by individual Member States.

[11] Articles 191 and 194 of the Treaty on the Functioning of the European Union

2.2.1. EU policies

Climate policy objectives in the EU are constructed around three targets: GHG emissions reductions, percentage of renewables in energy production and improvement in energy efficiency. Current targets for 2020 are conveniently set at 20 percent for each area. Targets for 2030 are set at 40 percent for GHG emissions reduction and at 27 percent for both share of renewable energy and improvement in energy efficiency. The latter targets are not yet confirmed by legislation, but the European leaders declared their commitment to them in European Council (European Council, 2014).

Consequentially, the EU Climate legislation can also be divided between three areas. Emission reduction is dealt with mostly by the ETS, and for the sectors not participating in emission trading – the effort sharing decision (ESD). The ESD outlines emission reduction targets for each individual member state, based on their relative wealth. Poorest countries are allowed to increase their emissions in these sectors, while the richest ones have to make additional efforts. The ESD only outlines the targets; it is for the Member States to implement policies in order to meet them.[12]

For the energy efficiency targets, the Member States do have some flexibility, but the EU legislation is far more strict. Most important piece of legislation, Energy Efficiency Directive[13], outlines specific measures that have to be implemented by Member States, such as energy savings made by energy distribution, increasing energy efficiency and thermal performance of publicly owned buildings, enabling citizens access to data on energy efficiency so that they can better manage consumption, and others. Every three years Member States have to draw up plans containing measures they want to implement, and every year they have to report the progress towards targets outlined in the directive. Energy Efficiency Directive is the main, but not the only legislative act influencing energy efficiency. Others include directives on Eco-design, energy labelling and energy performance of buildings.

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[12] Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

[13] Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance

The renewables directive[14] indicates national targets for the percentage of renewable energy, but leaves the attainment of these targets to the Member States. Additionally, it establishes procedures allowing countries to cooperate. Under statistical transfers mechanisms, countries that have exceeded their targets can "sell" the excess proportion to other countries. That way, countries with bigger potential for renewables, such as Spain with solar energy, are encouraged to invest despite having achieved their targets. Moreover, other countries can attain their targets in a cheaper way. Member States are also encouraged to engage in cooperative projects via Joint Projects and Joint Support Schemes mechanisms.

While the ESD may not have a direct impact on the ETS, because it concerns different sectors, other policies do influence the system in a major way. The list of policies interfering with the ETS is by no means complete. All in all, the outcome of these policies is an emission reduction, also in the ETS sectors. These emission reductions are putting a downward pressure on already low prices of allowances, and lead to accumulation of allowances, which, considering the possibility of banking these allowances, threatens to "lock-in" emission reductions for the future. Additionally, overlap of the ETS and other policies could be cancelling out some of the effects of the latter. Extent of the overlap is controversial. Höhne et. al. (2011) suggest that full implementation of renewable energy and efficiency legislation on themselves would lead to an emission reduction of 30 percent by 2020 (instead of 20 percent foreseen for that period). Morris (2013) estimates that between 2008 and 2020, the ETS cancels out 700 million tonnes of emission reductions delivered by other policies, making the ETS effectively an anti-climate policy.

2.2.2. National policies

The EU is active in the field of climate policies, but it does not stop some Member States from implementing their own measures. Such policies may have distortionary effects on the EU ETS. If one Member State implements a policy that would impose emission reduction for domestic companies, it causes an excess of EU allowances in that country. It can cause an internal "emission leakage" – companies would sell unused allowances to other countries, putting a downward pressure on allowance prices (Goulder, 2013). That was exactly the case when the UK implemented a carbon tax for energy production, independent from EU ETS. Since 2013 energy producers in the UK have to pay a "Climate Change Levy", depending on

[14] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

the carbon content of primary fuel. Essentially it creates a unilateral carbon price floor. While the policy should indeed decrease emissions in the UK, it will cause a further decrease in EUA's price, reduce the economic efficiency of the EU ETS and decrease revenue from auctioning for other Member States (Sartor & Berghmans, 2011).

Climate policies of individual Member States, such as the British carbon tax, distort the functioning of the ETS despite having similar goals. However, some countries implement policies that go directly against the goals of the ETS, leading to increased emissions. Fossil fuel subsidies are a good example. While fossil fuel subsidies in the EU are relatively small compared to other regions (Bárány & Grigonytė, 2015) they are not completely absent. ECOFYS report (Alberici et al., 2014) found that in 2012 support for fossil fuels (excluding transport) amounted to €16.3 billion, of which €9.7 billion went to coal and the rest to natural gas. The European Commission recognised the counterproductivity of fossil fuel subsidies in the view of emission reduction goals and is working to curb them, for example by limiting state aid for uncompetitive coal mines.[15]

Of all issues and weaknesses of the EU ETS, the alignment and policies and objectives is especially worrying. Despite having been adopted as a "climate and energy package", EU legislation on renewable subsidies, energy efficiency and emission trading is uncoordinated. Policy measures not only do not complement each other; there is evidence that indicates that to some extent they undermine each other's effectiveness. On the level of coordination of national policies the EU takes steps to curb fossil fuel subsidies and other harmful measures. At the same time, individual countries' climate policies are making a disservice to the entirety of ETS, contributing to problems already faced by the system.

2.3. Stability and predictability

The question of stability and predictability of carbon prices is a key issue for economic policies aimed at emissions reduction. The trade-off between price stability and flexibility is the key difference between carbon taxes and trading systems. Carbon taxes give the regulator complete control of carbon price. It does not, however, guarantee results in terms of quantities; emission reduction depends on various exogenous factors. Conversely, emission trading ensures the quantity of emissions reduction, but leaves the price to the market forces. Controlling quantities has a considerable advantage in situations in which marginal utility of

[15] Council Decision 2010/787/EU of 10 December 2010 on State aid to facilitate the closure of uncompetitive coal mines

an additional amount of pollution can change drastically after exceeding some critical point, as it may well be with GHG emissions. As Weitzman puts it in his pivotal paper *Prices Vs. Quantities*: "(…) Our intuitive feeling, which is confirmed by the formal analysis, is that it doesn't pay to 'fool around' with prices in such situations" (Weitzman, 1974, p.486).

It is not always optimal for the prices to be entirely market-based in emission trading systems. There are important arguments for a stable and gradually increasing carbon price. Such price promotes long-term investments in sustainable technologies, allowing both firms and consumers to adapt at least cost. It promotes innovation and increases social and business support for the system.

The EU ETS is a part of a larger framework with clearly set targets for emissions reduction. The EU-wide cap on emissions since the beginning of the third phase decreases by 1.74 percent every year, compared to the average cap during second phase. And yet, the carbon price is neither stable nor decreasing. Over the course of the functioning of the system the price has fallen and risen repeatedly, reaching almost € 30 in 2008 and falling to nearly € 3 in 2013 (see figures 2 and 3). Volatility of prices can be explained by a variety of factors. A regression analysis prepared by Koch et. al. (2014) proved a statistically significant relationship between EUA prices and economic performance, wind and solar energy deployment, and (to a lesser extent) amount of surrendered international credits and fuel prices. Still, the model only explained approximately 10 percent of variation of EUA prices.

2.3.1. Intermediate reforms

Price instability was recognised as a problem from the very beginning. After an EU-wide, decreasing cap introduced by the third phase failed to deliver a reliable and stable price increase, a temporary reform was introduced by the means of backloading. It was decided that between 2014 and 2016 auctioning of 900 million of allowances will be postponed. The Commission was hoping to increase the prices and to decrease the amount of surplus, which has accumulated to over 2 billion EUAs.

Figure 4. Emissions, allowances, surplus and prices in the EU ETS, 2005–2015 (EEA 2016)

Indeed, the surplus of allowances decreased for the first time as a result of backloading. Initially the EUA prices also increased, but only to return to the level of around € 5 at the beginning of 2016 (Figure 3). It is a logical consequence of backloading policy: market participants knew that allowances removed from the market will be returned between 2019 and 2020. It made sense to use accumulated allowances, with the perspective of restocking reserves in the near future.

2.3.2. Predictability

Backloading reform was intended to be a short-term solution. Regardless of its effectiveness, it is necessary to underline its impact on the predictability of the EU ETS. Backloading amendment came into force only a year after the beginning of the third phase of the ETS. A phase which brought major changes itself. Even though the reforms, due to the institutional decision-making process of the EU, take significant time between announcement and implementation, the legislative process in itself is a factor contributing to price volatility in the ETS, especially given the fact that the ETS is a highly contentious issue. Koch et. al. (2015) analysed market reactions to the legislative process behind backloading reform. Initial announcement of the Commission's proposal resulted in a modest price increase on the first day, followed by a drastic decrease in the following days. Afterwards, an unexpected vote of the European Parliament rejecting the first of Commission's backloading proposals led to a 43 percent decrease in EUA's futures price in only one day. On the other hand, when the backloading reform finally did get adopted, the price increase was negligible. Overall, the whole process did not increase level of prices, but contributed to volatility and further decreased predictability of the ETS.

Stability and predictability issues are inherent to the flexible design of an emission trading system. There are several instruments design to limit this problem, from price floors, ceilings or collars to market oversight bodies, able to intervene in the market but independent from political forces. The EU ETS reform foresees a long-term solution in the form of Market Stability Reserve. This policy choice will be assessed in the final part of this paper.

2.4. Transparency

Transparency and clarity are essential in the design of an ETS. Communication with stakeholders and their involvement in the consultations increases trust and allows for a smoother transition into the low-carbon economy. Market oversight and clear monitoring, reporting and verification (MRV) rules are necessary to avoid abuse and ensure a level-playing field for participants. The system should be easy to understand and all relative information should be made publicly available. All this does not only ensure support of stakeholders, such as affected companies, environmental organisations and business interest groups, but also provides foundations for a wider public support.

2.4.1. The Union Registry

The approach to registering allowances and transactions in the EU ETS evolved over time. During the first two phases the registering system was designed to match decentralised structure of the ETS. Emission caps were set on the country-level, and so were registries. Community Independent Transaction Log aggregated the data from national registries. With the introduction of an EU-wide cap, the system was centralised, and its scope was broadened. Today, the Union registry holds data on all allowances and transfers happening in the system. Every participant has to have an account – it concerns operators covered by the ETS, but also banks, brokers and individuals willing to participate in trading. While most of the trading is now dealt with on the European Energy Exchange (EEX), an exchange market, most shares ofwhich are held by a Deutsche Börse subsidiary, all transactions have to be approved by an automatic EU Transaction Log. In order to prevent fraudulent activities the system is frequently updated, and involves several security features, such as a two-step authentication and a pending period for transactions of allowances (Delbeke & Vis, 2015). The data from the registry is publicly available.[16]

The registry is connected to the International Transaction Log, which is a registry of international credits under the Kyoto protocol, and is managed by the UNFCCC Secretariat. Use of international credits causes problems for the EU ETS transparency and integrity, as verification of these credits is beyond the Union's control. With growing controversies about international credits, their use in the ETS has become more and more restricted. Environmental integrity concerns regarding international credits will be explained in the sixth chapter of this part.

2.4.2. Monitoring, reporting and verification

Similarly to the Union Registry, MRV rules underwent an evolution since the beginning of the ETS. The necessity to establish a stringent framework for MRV became apparent after the first phase (2005-2007). Initially, the allocation was based on historical emissions. The schedule for implementation of the ETS proved to be too ambitious for the Member States who did not previously gather such information to establish a dedicated legal authority. Therefore, emission data needed to be gathered in cooperation with the industry. Relatively few instances of fraudulent submissions were reported (Ellerman & Buchner, 2007). However, the data for the initial year of the functioning of the system does appear inflated when compared to the date for subsequent years. It is clear that there were incentives in the industry to report higher emissions in order to receive more allocations (Anderson & Di Maria, 2011).

In the third phase of the ETS auctioning became the default method of allocation and up to this day grandfathered allowances are based on performance benchmarks rather than on historical emissions. Still, accurate measurement of emissions remains necessary. Technical rules on monitoring and reporting of emissions are regulated by the Commission.[17] The EU ETS requires also an independent, third-party verification. Verifiers have to be accredited;

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[16] Climate Action, European Union Transaction Log, access: April 2017 http://ec.europa.eu/environment/ets/welcome.do?languageCode=en

[17] Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council

common rules apply in all participating countries when it comes to accreditation process and recognition of accreditation from other countries.[18]

2.4.3. Market oversight

Emission trading for greenhouse gasses is a relatively new policy and the EU ETS was one of the first of such schemes introduced in practice. In addition to the lack of previous experience, the unique, multi-level structure of the European Union added complication to the case. It comes as no surprise that so many rules were developed and changed between the phases of the ETS. It was not different when it comes to market oversight. On some levels the existing framework for financial instruments was sufficient to prevent fraud and money laundering. Most trade in the EUAs takes place on the "futures" market – where buyer acquires an emission permit that is delivered on a future fixed date. This market was sufficiently protected by pre-existing rules (Delbeke & Vis, 2015).

However, the spot market for emission permits was initially far less regulated. Emission permits have a double status: they may be treated as a commodity, or as a financial instrument (Frunza & Guegan, 2011). The VAT fraud, discussed above, was the result. Following the scandal more strict rules were introduced, including reverse charging for VAT and a centralised registry, allowing for a closer and more precise verification of transactions on the EUA market. Each year, the Commission has to report on the functioning of the carbon market (Delbeke & Vis, 2015) Market oversight over the ETS is still a work in progress. Measures preventing speculation, money loundering, and further improving transparency are to come into effect in 2018.[19]

Despite initial hurdles with historical emission data, the costly VAT fraud scandal, and questionable offset usage, the EU ETS has to be lauded for its transparency. Continuous efforts are made to make information full and accessible for all participants, as for general public. Monitoring, reporting and verification rules are consistent and clear, assuring a reliable information about emissions. Frequency of reforms, although damaging for stability and predictability, creates conditions for continuous improvements and learning-by-doing. Mistakes are made, but (at least in this field) they are being swiftly corrected.

[18] Commission Regulation (EU) No 600/2012 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council

[19] Ensuring the integrity of the European carbon market, European Commission, access: April 2017; https://ec.europa.eu/clima/policies/ets/oversight_en

2.5. Efficiency and cost-effectiveness

Cost-effectiveness is at the very core of carbon pricing initiatives, and of economic climate policies as a whole. The promise behind such policies is to deliver desired results cheaper than the command-and-control approach policies, using market forces. Aside from that, cost-effectiveness includes minimisation of administrative cost, for economic policies require less information than direct regulation. Revenues from carbon taxes or auctioning of emission permits, if used productively, can further decrease policy costs.

Cost-effectiveness of an emission trading system depends on a variety of factors. It can be amplified by increasing the number of sectors covered, increasing their heterogeneity, choosing the right method of allocation of allowances and ensuring international cooperation. But in principle, cost-effectiveness is about delivering results at least cost. Therefore, before engaging in an analysis of cost effectiveness, it is necessary to determine to what extent did the EU ETS contribute to emission reduction.

2.5.1. Efficiency

Targets for emission reduction for 2020 have already been exceeded in the European Union. As of 2014, GHG emissions decreased by 22.9 percent, or by 1 136 million tonnes of CO_2e, compared to the baseline year of 1990. It is unclear how much of this reduction can be attributed to emission trading. A review of (surprisingly scarce) literature performed by Laing et. al. (2014) shows about 40-80 million tonnes of emission reductions attributable to the ETS per year, but only for the first phase between 2005 and 2007. Afterwards, the abatement becomes even more difficult to approximate, given the immense impact of the economic crisis. Bel and Joseph (2015) attempt to evaluate abatement in the EU ETS in the first two phases (2005 – 2012), and to disentangle emission reduction resulting from the policy from those resulting from economic downturn. Using historical data and a dynamic regression model authors estimate that of 294.5 million tonnes CO_2e of recorded reductions, between 33.78 and 40.76 million tonnes may be attributed to the ETS. The authors note that the crisis had a much larger role in emission reductions in the examined period, and that ex-ante analyses of EU ETS grossly overestimated the reductions resulting from the policy. These emission reductions have to be juxtaposed with the potential cancellation of emissions resulting from other policies, particularly from renewable energy and efficiency targets. The issue requires more research, but if the data of UK-based think tank Sandbag is to be believed, the ETS will cancel out 700 million tonnes of CO_2e emissions resulting from other policies

(Morris, 2013). Even if this figure is overestimated, it is still much larger than even the most optimistic estimates of the emission reductions provided by the ETS.

Immediate emission reduction is the main goal of the EU ETS, but it is not the only one. In the long run, the ETS is supposed to incentivise agents to invest in low carbon technology. Investments could lead to innovation that would in turn decrease the overall cost of transformation to sustainable economy. As mentioned above (see part 2.1.), in order for an ETS to foster innovation, the carbon price should be equivalent to the social cost, to create level-playing field with polluting technologies. It is not the case in the EU ETS, where the price of allowances is several times lower than the lower-end estimate of social cost induced by GHG emissions. Empirical research so far is consistent with these observations. Once again, the impact of the economic crisis cannot be ignored; as a result of prolonged recession investment slumped across the continent. While there are anecdotic accounts of ETS influencing companies' decisions on investments in green technology, they are confirmed neither by econometric analysis, nor by larger scale firm surveys (Laing et al., 2014).

Questionable effects in the fields of environmental efficiency and fostering innovation are caused by overallocation. EUAs from the beginning were allocated excessively. In the first phase most of them were given out for free, based on historical data which was gathered by companies themselves, without strong supervision from Member States. In addition, the permits could not be banked over to the next phase, causing the price to fall nearly to zero towards the end of the programme (see Figure 2). Second phase coincided with the economic crisis. The system proved unable to react to external shocks, and prices fell again. This time banking was allowed, and while it prevented prices from dropping to zero, it allowed companies to start accumulating a significant surplus. Low prices continue to this day, despite backloading reform. Awaiting upcoming reform for the fourth phase it is necessary to conclude that the ETS in its current state is not an effective policy.

While there are several reasons for low prices of EUAs, from economic crisis, to renewable energy growth, to the use of international credits, it is clear that structural design of the system is largely to blame (Koch et al., 2014). To some extent, overallocation seems to be inherent in emission trading systems. It was the case in the US SO_2 trading program, as well as in the Kyoto trading system. It results from the fact that regulators tend to overestimate the emissions while setting a cap (de Perthuis & Trotignon, 2014). In the EU ETS this problem is particularly severe. It can be explained using the notion of a joint decision trap. Given that Member States' interests are frequently in conflict, the necessity to make decisions on an intergovernmental level with unanimity or qualified majority, policies – if they do end up being adopted – are often brought down to the lowest common denominator (Scharpf, 1988, 2006). According to Müller and Slominski (2013), in the case of the ETS, EU managed to escape the joint decision trap and finally adopt a far-reaching, binding policy using inter-temporal choice. More specifically it consisted of three mechanisms. Procrastination allowed the Commission to convince Member States to allow less stringent policy at the beginning, and oblige them to adopt stronger measures as a follow up. Temporary derogation made it possible to initially exclude some industries (by free allocation and carbon leakage rules) and countries (by special derogations for energy industry in some Member States) from the full implementation of the policy. Transitory compensation was implemented in a form of revenue division – 10 percent of allowances was supposed to be auctioned by the least wealthy Member States.

Müller and Slominski conclude that inter-temporal measures did help escape the joint decision trap and deem "the evolution of an increasingly ambitious, strict, centralized EU ETS" to be a "remarkable result" They do admit, however that the policy may not be enough to meet the challenges of climate change that it is not yet certain whether the ETS will develop into a sufficiently effective policy, and that "time-based mechanisms promoting exit from JDT situations come at a price" (Müller & Slominski, 2013, p.1439). Indeed, considering important doubts concerning the effectiveness of the ETS present in the literature, one may wonder if the price is not too elevated. Given the large surplus of allowances still present, even if the system becomes more stringent with time, it may still be too late. Especially considering that despite growing international cooperation, the world is still not on track to the +2°C target (UNFCCC, 2015). From the perspective of climate policy, now it is time to intensify the efforts, not procrastinate them.

2.5.2. Cost-effectiveness

The EU ETS was designed from the start to maximise cost-effectiveness. Many policy choices were motivated by this factor. A decision to only cover the biggest installations was dictated by concerns about monitoring and verification of emissions. At the same time, coverage of the ETS is still significant, because it is applicable in all EU countries. Such a large market allows for maximisation of cost-effectiveness, increasing the scope for optimisation. The EU ETS is also linked with countries from European Economic Area – Iceland, Norway and Liechtenstein. Linking is also negotiated with Switzerland (Delbeke & Vis, 2015).

The insistence on cost-effectiveness also led to some of the issues described in other parts of this paper. International credits were such an initiative, providing firms with even cheaper emission allowances. Due to environmental concerns, most of the international credits were forbidden from the ETS after phase two. In addition, their usage further lowered EUA prices and undermined the polluter-pays principle (see part 2.1.1.). Carbon leakage rules, designed to avoid costs linked with industry delocalising to regions without similar regulations, are also questionable due to unconfirmed scope of the phenomenon and the negative impact for competition inside of the EU.

Overall, possibilities of a cost-effectiveness analysis of the EU ETS are limited, due to questionable environmental efficiency, both in terms of reducing emissions reduction and in fostering innovation. At the same time, it is important to observe that cost-effectiveness concerns are behind some reasons of the EU ETS' underperformance. Grandfathering of permits and overallocation was motivated by a desire to put as little pressure as possible on the manufacturing sector. In consequence, the small burden that was put on the industry's shoulders resulted in a comparatively small achievements in terms of emissions reduction.

2.6. Reliability and environmental integrity

The sixth and final principle for successful carbon pricing draws heavily from previous ones. The question of reliability concerns the ability of the system to deliver desired results. To that extent, it overlaps with efficiency and environmental efficiency. Furthermore, reliable carbon pricing instrument requires a stable and consistent price signal, building trust among participants and fostering long-term investments in low-carbon technologies. In that part, it overlaps with alignment of policies and objectives, as well as with stability and predictability, and to some measure with transparency. Environmental integrity concerns side effects of the ETS, its potential benefits and threats. To avoid repetition, this part will concentrate on environmental integrity, especially the effects of the ETS on air pollution and questions of environmental integrity, before briefly summarising the reliability of the ETS using argumentation developed in previous principles.

2.6.1. Local benefits – impacts on air pollution

In order to fully assess the impact of the EU ETS it is necessary to go beyond emission reductions it provokes. Even more so if, as proven above, the ETS contribution to emission reductions is questionable. Potential environmental effects of a trading system may go beyond yearly emission reductions. There are local, positive externalities to reducing GHG emissions, like air pollution reduction or energy savings. These effects should not be overestimated in the context of the EU ETS. Firstly direct local policies can address these problems more effectively (World Bank & OECD, 2015). Secondly, the EU ETS concerns large emitters, while local problems such as air pollution are often caused by small-scale combustion, especially in transport sector, as well as commercial, institutional and individual buildings. Nevertheless, industry and energy production still contribute to a large part of some pollutant emissions, especially particulate matters (PM) and sulphur dioxide (SO_2) (EEA, 2016).

The EU ETS impact on air pollution is difficult to disentangle from other EU policies in this area. There is a correlation between the carbon price and the reduction of air pollutants, especially in oil refineries, but this correlation is weak, and could be partially explained by other EU policies implemented around the same time as the ETS (Fisher, 2012). The exact impact of the ETS on air pollution requires more research, but given the low carbon prices and higher effectiveness of directed policies aiming at reducing pollution, the impact of the ETS should not be overestimated.

2.6.2. International credits

Use of international credits in the EU ETS has had an impact on lowering the prices and accumulating surplus allowances. It also negatively impacted transparency of the system, as verification of the offsets was in the hands of neither EU institutions, nor Member States. From the point of view of environmental integrity, the excessive use of international credits caused two more problems. The amount of offsets not only further weakened the polluter-pays principle of the ETS, but also jeopardised some countries' compliance with international law. According to the Kyoto protocol, international credits may only constitute less than half of the reductions to meet Kyoto reduction targets. It was not the case with Poland and Slovenia, nor with EU-15 countries[20] (Morris, 2013).

GHG are uniformly mixed accumulative pollutants, therefore the geographical location of an emission reduction does not matter. This is a strong argument for international offsets: it allows for emission reductions at least cost. The problem with the Kyoto offset system is that due to the lack of transparency and weak monitoring and verification rules, there is no guarantee that emission reductions actually take place. The EU was well aware of the problem. It suffices to say that out of 1.1 billion credits surrounded in the EU ETS during the

[20] At the time of signing of the Kyoto protocol, all the then 15 Member States committed to one, common target (and, as a consequence, common offset use).

second phase (2008-2012), 85 percent came from projects that were subsequently blocked by the EU on the basis of environmental concerns (Morris, 2013).

Considering the relatively low impact on emission reductions, frequent reforms, low incentives for long-term investments and misalignment with other EU policies, it is safe to conclude that the ETS has a lot of shortcomings when it comes to reliability. It may have some effects on lowering air pollution, but they have to be further examined, and considering low allowances prices, they are not likely to be significant. International credits constitute a serious threat to environmental integrity of the system. Fortunately, the EU policymakers are aware of issues with international credits, and most of the least reliable ones have already been discontinued, and there is a possibility that they will no longer be used in the fourth phase of the ETS (see part 3.5.).

3. Revision for phase four: reform, not revolution

Final part of this paper is a practical application of the framework developed in the first and second part. After having understood the roots and developments of the EU ETS in its current form, and after having assessed it using FASTER principles, it convenes to consider the future of the programme. A structural reform is currently underway, with Market Stability Reserve already adopted and set to be operational from 1st of January 2019, and with an upcoming reform for the fourth phase from 2021 to 2030. For the latter, the legislative process closing towards the end, with the final Commission proposal submitted in July 2015, and with the European Parliament having adopted a resolution in the first reading. At the moment of writing, the legislative proposal entered the first reading in the Council. While exact details of the proposition are not yet determined, the Commission proposal and positions of the Parliament and the Council do give insight at least into the areas concerned by the reform.

This part is therefore trying to answer the question whether the upcoming reform can hope to improve the shortfalls of the system, in the categories outlined in part two, following the FASTER principles. As concluded in the previous part, the ETS' performance in the field of fairness, efficiency and cost-effectiveness, as well as reliability and environmental integrity is mixed at best, while when it comes to alignment of policies and objectives, and stability it requires deep changes. At the same time, achievements of the ETS in the field of transparency are commendable.

Structure of this part follows the main changes introduced by the reform: market stability reserve, growing rate of cap decrease, carbon leakage rules reform and new support mechanisms: innovation and modernisation funds. Each of these changes will be analysed in order to determine to what extent it will influence the functioning of the ETS. Later, the entirety of the proposed reform in its current shape will be assessed. Clearly, such *ex ante* analysis is limited, because the real effects of the reform will only be known after its implementation, therefore the analysis will concentrate on determining whether EU ETS problems are correctly identified and addressed by the reform. Finally, some alternative reform proposals present in the literature will be discussed.

3.1. Market Stability Reserve – a small step in a right direction

Introduction of a Market Stability Reserve is a natural continuation of backloading reform, which was mentioned in Part One. Backloading amendment to the ETS Auctioning Regulation.[21] As a result, 900 million EUAs that were supposed to be auctioned between 2014 to 2016, were temporarily removed from the market. Removal resulted in a slight decrease of the surplus of allowances, but did not have a lasting effect on prices (see Figures 3 and 4) In the initial amendment these allowances were supposed to be reintroduced to the market between 2019 and 2020, before the end of the third phase. Meanwhile, a supposedly long-term solution to low-prices problems – the MSR – was proposed, further postponing the reintroduction of backloaded allowances.

The MSR is a volume-based measure aimed at stabilising the price of EUAs by reducing their amount on the market when the surplus exceeds a certain point, namely 833 million tonnes of CO_2e. If it happens, a number of allowances equivalent to 12 percent of all the EUAs currently on the market is taken from the sum of EUAs that were supposed to be auctioned in a given year. Conversely, if the amount of allowances on the market falls under 400 million tonnes, 100 million tonnes are released from the reserve and auctioned. That way the system gains resilience, both from excessive surplus and from insufficient number of allowances on the market (should it ever occur). On the 1st of January 2019 the reserve will start functioning,

[21] Commission Regulation (EU) No 176/2014 of 25 February 2014 amending Regulation (EU) No 1031/2010 in particular to determine the volumes of greenhouse gas emission allowances to be auctioned in 2013-20 Text with EEA relevance

and will already contain the 900 million allowances removed from the market as a result of backloading.[22]

This measure will not only be a novelty for the EU ETS – in fact it has never been implemented before. While it is interfering with the functioning of the emission permits' market, it is not direct price intervention. Alternative approaches to the problem of oversupply of allocations involved some kind of intervention: whether it was a price floor, a price collar or a permanent removal of a certain number of allowances from the market (Fell, 2016)– all of these measures threaten to undermine the market-based cost-efficiency of the ETS. It would also mean transforming the ETS into a hybrid, price-quantity policy. Some price-controlling measures are still on the table, however. In the Council's position, an amendment adds a possibility (from 2024) of permanent removal of allowances from the MSR if the amount of allowances in the reserve exceeds the total number of allowances auctioned in the previous year (Council of the European Union, 2017).

As it is an innovative instrument, there is no consensus concerning its effectiveness. Its uniqueness brought on interest of researchers. A number of studies has been released, aiming to assess its potential effects on the ETS. According to the impact assessment accompanying the MSR decision, a "(…) market stability reserve is likely to smooth out the price pattern over time avoiding extremes" (European Comission, 2014, p.47). Some researchers hold different views. Perino and Wilner (2016) in an article tellingly entitled "Procrastinating reform: The impact of the market stability reserve on the EU ETS" find that MSR may have an upward impact on prices, but only temporarily, just as allowances are not permanently removed. This may have some positive effects on short-term low-carbon investments, but may negatively affect long-term ones. Richestein et. al. (2015) argue that the MSR may actually increase the EUA price volatility, because the system is too rigid and reacts with a delay. Fell (2016) compares MRS with other policy options, such as price collars and permanent reduction of the number of allowances. He finds that the MRS may be less effective than a price collar (or a price floor), but it may still be effective, and if a price collar is politically infeasible, then the MRS should be implemented.

Despite doubts to the actual effects of the MSR, the fact of implementation of this instrument proves that the Commission is well aware of the issues with the ETS. Growing surplus and

[22] Decision 2015/1814 of the European Parliament and of the Council of 6 October 2015 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and amending Directive 2003/87/EC

slumping prices negatively affect alignment of policies and objectives, and efficiency and cost-effectiveness. When it comes to stability, an automatic measure such as MSR is certainly more reassuring than backloading reform, which could undermine trust of the participants. Still, it is an experiment, and if it fails, we may expect another reform even before the subsequent phase of the ETS. Additionally, the MSR appears as a lowest common denominator policy, characteristic for a joint decision trap. Price collar would probably be more effective, and even temporary removal of allowances (which is the purpose of the MSR) could be done in a more flexible and dynamic way using a quasi-central bank, which would independently decide how many allowances should be auctioned in any given moment (de Perthuis & Trotignon, 2014).

3.2. Cap decrease picking up the pace

Remaining changes for phase four are much less complex and innovative than the Market Stability Reserve. The most straightforward change is the rate at which the cap decreases each year. During phase three it was 1.74 percent; phase four will see a 2.2 percent yearly decrease. The change was hardly unexpected – it is in line with emission reduction targets set for the EU in the 2030 perspective. An overall reduction of 40 percent compared to 1990 levels requires, according to Commission's estimates, a 43 percent decrease in the ETS sectors, compared to 2005 levels[23] (European Commission, 2015).

The change is expected to bring additional 556 million tonnes of CO_2e emission reductions over the period of 2021-2030 compared to the 1.74 percent cap decrease. Aside from consistency with long-term targets, this reform is motivated similarly to the MSR. The Commission acknowledges that while there is evidence that the ETS is responsible for some of the emission reductions, large investments in GHG efficiency "still remain the exception" (European Commission, 2015c, p.5).

More stringent cap is hoped to deliver higher carbon prices, increasing incentives of the industry to invest in low-carbon technologies. Given the size of the surplus, however, a short-term effect on prices is unlikely (Clò et al., 2013). Nevertheless, in the longer term it could be expected to put some upward pressure on prices.

Given the long-term targets of the European Union a quicker decline in the cap seems not only natural, but also necessary. It gives a clear and consistent signal to the companies

[23] The year 1990 is used for overall targets for emission reductions, while 2005 is used for the ETS. It results from the lack of data concerning ETS sectors in 1990.

regarding the future climate policies. Companies can expect the cap not only to decrease, but also to decrease at an increased rate with time. On the contrary, should the Union fail to implement policies consistent with previously agreed targets, it would create uncertainty and decrease trust.

Coming back to the FASTER principles, the more stringent cap is likely to address some of the issues regarding efficiency and cost-effectiveness, as well as reliability and environmental integrity. It is also crucial for stability and predictability. It does not, however, address the misalignment of policies and objectives. Fragments of explanatory memorandum accompanying Commission's ETS reform proposal show that this issue has not at all been considered. Quite the opposite: according to the Commission, both the renewables and energy efficiency policies "fully support the environmental effectiveness of the EU ETS, and the synergies between these policies and the EU ETS have been strengthened through the recently agreed Market Stability Reserve" (European Commission, 2015c). As shown in the second part of this paper, this position does not seem defendable.

3.3. Carbon leakage and free allocation reform

In the revision for phase 3, auctioning became the default method of allocation, and carbon leakage list was introduced. Current reform introduces much smaller changes. In the third phase, approximately 57 percent of allocations were auctioned. The Commission's proposal contains a provision that this proportion should remain the same over the period of 2021-2030. As in previous phases, free allocation does not concern the power sector (except for the least wealthy Member States), and for the industrial sectors is determined using benchmarks and carbon leakage list. Sectors not mentioned on the carbon leakage list will receive 30 percent of the benchmark value. Unlike the previous phase, this proportion will not decrease with time. On the other hand, benchmarks will be updated more frequently in order to reflect technological advancements – in general they will decrease by 0.5-1.5 percent per year.

Carbon leakage rules are to be made more specific, and concern smaller number of sectors. In the third phase, 97 percent of industrial production sectors were covered by carbon leakage rules. For 2014-2019 the list enumerates 175 sectors and subsectors. For the next period, the Commission proposes to reduce that number to around 50 and to focus on sectors facing the highest carbon leakage risk.[24] Both overall level of free allocation and carbon leakage list may still change during the negotiations.

Motivation for carbon leakage prevention in proposed form remains unclear, and it can be speculated that it is of a rather political nature. The proposal for a Directive states that "Experience gathered during the operation of the EU ETS confirmed that sectors and sub-sectors are at risk of carbon leakage to varying degrees, and that free allocation has prevented carbon leakage." (European Commission, 2015c, p.13) However, the Impact Assessment of that very Directive quotes a study from 2013, according to which "(…)no conclusive evidence of carbon leakage occurrence can be found." (European Commission, 2015b, p.13).

Compared to the reform for the third phase, which brought a significant change in the method of allocation, this revision's changes are rather cosmetic. They are unlikely to considerably increase auctioning revenues, nor to influence prices in any way. Without a doubt, political feasibility influenced the shape of the Commission's proposal in this field. The exact shape of reform is still being discussed at the moment, but it is difficult to imagine any radical changes coming from Parliament's and Council's amendments[25]. Thus, in terms of FASTER principles, this reform is not going to address any issues concerning method of allocation. Fairness is likely to remain one of the areas in which the EU ETS fares least well.

3.4. Revenues and new support mechanisms

In the area of revenue redistribution, the fourth phase represents continuity rather than change. Like in previous phases, 50 percent of the revenue needs to be used for goals concerning climate and energy policy. Three possible goals are added to the list: financial support for sectors or subsectors at risk from carbon leakage passed on through higher electricity prices (indirect carbon leakage), climate-related investments in third countries, and skill formation and reallocation of workers affected by the transition to low-carbon economy[26]. Distribution

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[24] *Revision for phase 4 (2021-2030),* European Commission, access: April 2017 https://ec.europa.eu/clima/policies/ets/revision_en

[25] While significant change of the ETS in the upcoming reform remains unlikely, there are some reasons to believe otherwise. In the first reading the Parliament adopted an amendment proposal to permanently remove 800 million permits from the MSR (see: http://www.europarl.europa.eu/sides/getDoc.do?type=TA&reference=P8-TA-2017-0035&language=EN&ring=A8-2017-0003). On the side of the Council, ambition is being presented especially by France. French Prime Minister Emmanuel Macron in his speech in Sorbonne mentioned a necessity of a carbon price greater than 25-30 € and explicitly mentioned a price floor to that end (see: http://www.elysee.fr/declarations/article/initiative-pour-l-europe-discours-d-emmanuel-macron-pour-une-europe-souveraine-unie-democratique/).

[26] Article 1 (4), Directive of the European Parliament and of the Council amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments

of auctioning revenues between Member States remains largely the same: 90 percent is allocated to Member States according to historical emissions and 10 percent is redistributed for the purposes of solidarity and growth. The 2 percent “bonus” for countries exceeding their Kyoto commitment is no longer applicable.

There are two new instruments that affect the redistribution of revenues. First one is Modernisation Fund. It is to be established from 2 percent of the total EU allowances (both auctioned and allocated) and its revenues are to be used to promote investments in modernisation of energy sectors of Member States with GDP below 60 percent of EU average. Contrary to the funds previously distributed for the purposes of solidarity and growth, this fund is to be governed independently from Member States. Modalities of the fund are likely to change during the legislative process, and details will be established by the Commission’s delegated acts. Nonetheless, it can be interpreted as an attempt to create a form of aid for the least wealthy countries that is more focused on promoting investments in low-carbon electricity production than previously existing tools.

Innovation fund is the second new instrument proposed by the Commission. It consists of 400 million tonnes of CO_2 allowances that are supposed to be made available for investments in low-carbon technology, carbon capture and storage (CCS), and renewable energy. The fund overlaps with existing EU funding for renewables and CCS, in particular the NER 300 programme, which was partially financed through auctioning of allowances for new entrants to the ETS.[27]

As with carbon leakage reform, revenue distribution will not see drastic changes under phase four. Some of fairness-related issues are tackled, especially concerning revenue redistribution. Innovation fund is an attempt to align policies and objectives, and to encourage more long-term investments. On the other hand, like other policies promoting renewable energy, it may contribute to downward pressure on EUA prices. Modernisation fund is a more reliable and transparent way of redistributing revenues between Member States, while ensuring their use for climate-related purposes. However, both funds do not replace previous instruments with the same purpose; they are an addition, creating unnecessary complications and adversely affecting transparency, which is the strongest feature of the EU ETS. The system may still be

[27] 2010/670/EU: Commission Decision of 3 November 2010 laying down criteria and measures for the financing of commercial demonstration projects that aim at the environmentally safe capture and geological storage of CO_2 as well as demonstration projects of innovative renewable energy technologies under the scheme for greenhouse gas emission allowance trading within the Community established by Directive 2003/87/EC of the European Parliament and of the Council

simplified during the legislative process, but in the shape put forward in the Commission proposal it is not likely to adequately address the flaws of the ETS.

3.5. Reform not sufficient to answer to challenges

Of the four major changes of the EU ETS for the fourth phase, there can be no doubt that the Market Stability Reserve is the most important one. It is significant that as a matter of fact the MSR precedes the actual revision of the system that it is introduced separately, and that it comes into force before the beginning of the next phase. It demonstrates both the relative audacity of the reform, deserving special treatment, and its urgency, requiring earlier implementation. All the same, the MSR may prove to fall short of expectations, especially in the long run. The allowances are only temporarily removed from the market, and rational market participants can expect them to be reintroduced.

As for other changes, it is safe to say that they will not fundamentally change the functioning of the ETS. A more rapidly decreasing cap was a necessity to keep in line with 2030 targets. More stringency gives hope for higher prices, but overlapping policies have not been taken into account. Besides, the existing surplus of allowances is likely to limit its effect on prices. Carbon leakage and free allowances rules see minor changes, especially compared to previous reforms. And while modernisation and innovation funds may have some positive effects on (respectively) fairness and long-term efficiency, they greatly increase the complexity of the system, making accounting more burdensome, and the system less transparent.

Paradoxically, one of the most important changes to the ETS is not even mentioned in the revision proposal. In 2020, the second commitment period of the Kyoto protocol will end. It means that rules concerning international credits will no longer apply, and will be replaced by a new system, based on the Paris agreement, which is still taking shape amid negotiations. But the previous system, mostly based on CDM and JI mechanisms, is going to be removed; it was based on the two-tiered scheme where only developed countries had reduction targets, which is no longer the case. The Paris Agreement encourages cooperation between countries with carbon pricing mechanisms in place. It also proposes the Sustainable Development Mechanism (SDM), which is supposed to aim at reducing overall emissions, and not only transferring it from one place to another (Kachi, 2017).

The use of carbon credits contributed to many issues of the EU ETS, including fairness, transparency, efficiency and environmental integrity. Shortcomings of international credit system were recognised by the EU; as mentioned above, a majority of carbon credits was successively prohibited by the EU due to environmental concerns. Still, a complete discontinuation of international credits will make the ETS fairer and more effective. Even if SDM will, in fact, become as problematic as its predecessor, it is possible that the EU will not even participate in the new mechanism. According to the Commission's website, the EU does not envisage to continue using international credits after the end of second commitment period of the Kyoto protocol.[28]

To sum up, the reform does to some extent address the most important issues facing the EU ETS that were outlined in the second part of this dissertation. However, solutions proposed by this reform do not go deep enough to turn the ETS into a fair, stable, reliable and effective policy, well aligned with other climate policies of the EU and its Member States. Some of the elements of the reform in its current form even threaten to undermine the elements of the system that can be positively appraised. New innovation and modernisation funds add unnecessary complexity to the revenue distribution, which worsens transparency. Additionally, innovation fund may lead to further misalignment of policies and objectives. At the same time, it is important to underline that all change may still be modified before the legislative act is adopted and comes into force.

3.6. Other reform proposals

At the time of writing, the negotiations of the ETS reform are still under way. As mentioned above, while details might change, it is highly unlikely that the basic features of the reform will be drastically altered. However, the analysis conducted in this part of the paper clearly indicates that these reforms fail to address fundamental flaws of the programme. Increasing rate at which the cap will decrease in the fourth phase will put a downward pressure on EUA prices, but its effect will be restrained by the existing surplus. The surplus itself is addressed by the Market Stability Reserve, but temporarily removing allowances from the market will only move the problem in time, in an effort which can only be described as procrastinating reform. Other elements of the reform are likely to bring mixed results, perhaps contributing to redistribution of transition costs at the price of decreased transparency.

The Commission's proposal proves that the European regulator is well aware of most of the problems with the ETS demonstrated in the second part of this paper. The reform in its current shape simply does not go far enough to mitigate these problems. However, there are

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[28] *Use of international credits*, European Commission, access: April 2017, https://ec.europa.eu/clima/policies/ets/credits_en#tab-0-0

alternative proposals for reform, coming from many sources: from the European Parliament, from some national governments, as well as from researchers and policy analysts. These proposals are numerous and varied, but can be grouped in three general types: permanent removal of allowances from the market, price control in the form of price floor or price collar, and introduction of independent market authority.

Permanent removal of allowances is not necessarily incompatible with the Market Stability Reserve. In fact, it was introduced as an amendment in the first reading in the EP, in which the Parliament proposed to permanently withdraw 800 million EUAs from the MSR on the 1st of January 2021.[29] This move would not affect the current surplus still present on the market; it would only concern allowances already retired from the market through backloading and automatic functioning of the MSR. It would, however, shape expectations of market participants and perhaps put downward pressure on prices. Within the current reform, any allowances removed from the market were to be re-introduced as soon as surplus would decrease below a certain level. The solution provided by the one-off removal does not create such expectations. On the flip side, it does contribute to the uncertainty and may increase price volatility. The purpose of the MSR was to create a clearly defined mechanism that would make one-off interventions like backloading unnecessary; one-off removal of EUAs goes directly against that goal.

Permanent removal of allowances could be implemented in a systematic way in the MSR. Allowances could be automatically annulled after a certain period in the reserve, or after reaching a certain number of allowances retired from the market. Aside from that, MSR would need other modifications to become effective. In its current form, the MSR only removes allowances from the market two years after it is observed that the surplus have reached the threshold of 833 million EUAs. It is far too late to effectively react to potential shocks. Another problem is posed by the potential release of the allowances held by the MSR, which may provoke a price collapse (Richstein et al., 2015).

Another group of solutions concerns prices and could be implemented independently of the MSR. A price floor aims at establishing a minimal price of emission allowances. It can be done by simply setting up a minimal price in the public auction. This solution would not directly affect secondary market, but as the demand for primary-market allowances would collapse, the increased demand on the secondary market would force prices up, eventually

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[29] See note 25.

reaching an equilibrium as surplus allowances deplete. In addition, a regulator could buy surplus allowances at a higher-than-market price to support the price floor on the secondary market. Price floor could increase with time in order to reach a desired outcome.

Price floor can be accompanied by a price ceiling (together forming a price collar). Price ceiling consists of automatically injecting additional allowances to the market in case price reaches a certain level. In the absence of exogenous shocks, however, this situation is highly unlikely, as demonstrated by Fell (2016) in his analysis; allowance price in his model tends to stay close to the price floor level. Fell concludes his analysis with a recommendation: "If the goal is to truly stabilize prices and remove some of the perceived over-allocation, results presented here suggest that a price collar, and in particular a price floor could achieve these goals at the lowest expected abatement costs" (Fell 2016, p. 68).

Price floor or collar would effectively turn the ETS into a hybrid between a carbon tax and a trading system, between price-based and quantity-based policy. While in terms of effects it could contribute to improving the EU ETS as a policy, it would be difficult to implement it. Even if the Member States would recognise price collar as a means of making the ETS effective, it would move the policy dangerously close to a fiscal measure, which requires unanimity in the Council to be approved. Some Member States which now oppose even the reform in its current form as too stringent, would certainly use this opportunity to undermine its legality.

In case the price floor is not feasible in institutional terms, another solution might be an independent authority tasked with management of the policy. An interesting proposal for such a body was made by de Perthuis and Trotignon (2014). Drawing from the Central Bank's role in monetary policy, authors propose an Independent Carbon Market Authority (ICMA). It would be a body much more sophisticated than the Market Stability Reserve. It would monitor the market, collecting and analysing data taken from national and European registries, and pursue price objectives controlling amount of allocations on primary market. In de Perthuis' and Trotignon's project it would not directly interfere with the secondary market, but of course, its mandate could take another form. The strong point of this solution is its flexibility: it could react to exogenous factors (such as a potential reintroduction of international credits), it could also ensure coordination between policies of the Union. It would also be politically easier to implement than the price floor.

Neither of the alternative solutions is going to solve all of the problems faced by the EU ETS. However, they do have an edge over the reform tabled by the European Commission in the revision for the fourth period of the programme, and can address at least some of the problems demonstrated by the analysis conducted in the second part of this paper.

Conclusion

Dynamically changing shape of the EU ETS makes it a very difficult policy to assess. First part of the dissertation was aimed at developing a solid base for the analysis. Carbon trading is a relatively new policy, but its roots can be traced back to the 1960's. It was developed by economists to finally be applied (with considerable success) to SO_2 emissions in the US, and then to other pollutants. Experience of US programmes led to implementation of emission trading for GHG emissions in the Kyoto protocol, despite initial opposition from the EU, China and developing countries. Finally, the EU embraced emissions trading, partially due to previous failed attempts to implement carbon tax. All of these developments influenced the current shape of the EU ETS.

The actual analysis was performed using a recent framework developed by the World Bank and the OECD: the FASTER principles for successful emission trading. This multi-dimensional approach allowed for an in-depth analysis of the many aspects of the policy. The results are mixed. Transparency is the only category for which the EU ETS can be praised. The Union Registry is well-functioning, monitoring, reporting and verification rules are clear and consistently applied. But even in this area the system is imperfect, with excessive use of international credits and VAT fraud scandal impairing its reputation. Still, especially in transparency, the EU ETS is constantly improving, exemplifying the learning-by-doing method.

In most of other principles, the ETS' performance can be assessed as mixed, leaning towards negative. Fairness is undermined by low allowance prices, windfall profits, free allocation and carbon leakage rules. However, there is some redistribution of revenues between Member States. When it comes to efficiency and cost-effectiveness, there is some evidence of emission reduction resulting from the EU ETS. On the other hand, there is little to no impact on innovativeness and investment in low-carbon technology. Impact on emissions is insignificant, when compared to the influence of the economic crisis and when juxtaposed with potential impediment of the effectiveness of other climate policies of the EU. Similarly, when it comes to reliability and environmental integrity, the EU ETS shows some promise with potential impact on local pollution. Nonetheless, reliability is undermined by lack of stability and frequent changes, as well as by low effectiveness in delivering emission reductions. Environmental integrity of the programme can be challenge on the basis of excessive use of questionable international credits.

In the other two principles – alignment of policies and objectives, and stability and predictability – evaluation of the EU ETS is overwhelmingly negative. The EU ETS coexists with other climate and energy policies of the EU and of its Member States. There is no synergy, however. There is evidence that the system, due to its overallocation and low prices, is impeding the effectiveness of renewables and energy efficiency polices. At the same time, the ETS is further destabilised by the policies of Member States. That brings us to the issue of stability. The EU ETS is an experimental policy, and as such it underwent many changes. Given the current shortcomings of the system, it is plausible that this situation will continue.

Overall functioning of the policy is therefore disappointing. EU ETS is unlikely to repeat the success of US programmes for emission trading. In many ways, it is broken. The currently negotiated structural reform is an attempt to fix it. And as demonstrated in the third part, the reform may fall short of its goal. Four main elements of the reform – Market Stability Reserve, increase of the pace of cap decline, carbon leakage and free allocation change, and modernisation and innovation funds – correctly identify failings of the ETS in its current form, but it is unlikely that they will drastically change the assessment of the system. Of course, it is necessary to refrain from decisive judgment as long as all details of the reform are not known.

This dissertation was an attempt to answer the question, whether the EU ETS is a model worth following. Taking into account the current functioning of the system, as well as proposed reforms, the answer to this question is negative. Unless the ETS undergoes a reform much deeper than the one currently negotiated, it should not serve as a model example of an economic climate policy.

The EU ETS is of great interest to researchers and policy analysts, but several areas remain where the research is still underdeveloped. More empirical exploration is needed, among others, in the areas of abatement, impact on innovations and interactions with other policies. The system is constantly changing, and it is a great challenge for the academia and for policymakers to closely follow and analyse the impact of each reform. Even if there are many voices critical of the very idea of emission trading, one fact remains undisputable: the popularity of this policy is growing nearly exponentially. Facing the existential threat of climate change, it is crucial to conceive a way to make emission trading as effective in reducing emissions as possible.

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ABOUT OFCE

The Paris-based Observatoire français des conjonctures économiques (OFCE), or French Economic Observatory is an independent and publicly-funded centre whose activities focus on economic research, forecasting and the evaluation of public policy.

Its 1981 founding charter established it as part of the French Fondation nationale des sciences politiques (Sciences Po), and gave it the mission is to "ensure that the fruits of scientific rigour and academic independence serve the public debate about the economy". The OFCE fulfils this mission by conducting theoretical and empirical studies, taking part in international scientific networks, and assuring a regular presence in the media through close cooperation with the French and European public authorities. The work of the OFCE covers most fields of economic analysis, from macroeconomics, growth, social welfare programmes, taxation and employment policy to sustainable development, competition, innovation and regulatory affairs..

ABOUT SCIENCES PO

Sciences Po is an institution of higher education and research in the humanities and social sciences. Its work in law, economics, history, political science and sociology is pursued through ten research units and several crosscutting programmes.
Its research community includes over two hundred twenty members and three hundred fifty PhD candidates. Recognized internationally, their work covers a wide range of topics including education, democracies, urban development, globalization and public health.
One of Sciences Po's key objectives is to make a significant contribution to methodological, epistemological and theoretical advances in the humanities and social sciences. Sciences Po's mission is also to share the results of its research with the international research community, students, and more broadly, society as a whole.

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