1. Introduction

1. RELEVANCE OF EMISSIONS TRADING

Not that long ago, hardly anyone would have thought that greenhouse gas emissions could, and would, be an object of trade and that such a process would help to reduce these emissions. Despite fierce criticisms directed at emissions trading, the system is in full operation in the context of climate change, and it is spreading around the globe. Emissions trading was first employed in the United States (US) and was then embraced by the United Nations Framework Convention on Climate Change (UNFCCC). Emissions trading systems were then created in a few countries in Europe before being adopted by the European Union (EU), and have recently also been introduced in Oceania and Asia.

Seen from a proliferation perspective, emissions trading is a great success, having been created and crafted from nothing more than the virtual world of economic and legal ideas. Emissions trading systems can, of course, be used in other contexts to reduce other gases – such as sulphur dioxide (SO₂) (which causes acid rain) or mono-nitrogen oxides (NOx) (which cause smog and acid rain) – but in this book we concentrate on climate change as its most prominent area of application at present. Gases responsible for climate change are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), and two groups of gases, hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

Emissions trading is one of several policy instruments that policy makers can use to achieve environmental objectives. Emissions trading is a ‘market based’ instrument that allows polluters (installations that emit greenhouse gases, generally referred to as emitters) to decide for themselves who should undertake greenhouse gas abatement activities. Under an emissions trading scheme, emissions that formerly involved no cost now have a price. The emitter with the lowest abatement costs will sell its abatement efforts in the form of emission allowances to polluters who have higher abatement costs. Since emitters with the lowest abatement costs will undertake the abatement efforts, it is a cost-effective means of reducing emissions. Because emissions trading attributes a larger role to
entrepreneurial decision making than does traditional ‘command and control’ regulation – while avoiding the negative stigma of taxation – it is expanding rapidly.

2. HISTORY OF EMISSIONS TRADING

Emissions trading was first proposed in 1968 by the North American scientist, J.H. Dales, in his book *Pollution, Property and Prices: An Essay in Policy-Making and Economics*. In 1975 the US Environment Protection Agency (EPA) began to experiment with forms of emissions trading to control air pollution. Since then the instrument has been used in various other US programmes, for instance, to reduce ozone-depleting substances under the Montreal Protocol of 1989.1 But probably the most well-known successful early example of emissions trading is the US sulphur dioxide (SO$_2$) emissions trading program for electricity producers which started in 1995.

From there, discussions on emissions trading went to the United Nations (UN). In December 1997 the Kyoto Protocol was signed by which industrialized countries committed themselves to reduce six greenhouse gases during the period 2008–12, on average by 5 per cent per year, to limit greenhouse gas emissions below 1990 levels.2 These commitments to reduce greenhouse gas emissions were legally binding.

States that accepted a binding emissions reduction target were referred to as ‘Annex I countries’. The Kyoto Protocol could enter into force on 16 February 2005, when two conditions were met. At least 55 states to the UNFCCC (which incorporated the Annex I countries) had to ratify the Protocol and these countries had to account for at least 55 per cent of the total carbon dioxide emissions for 1990 of the parties included in Annex I. The first of the two conditions, the ‘55 parties’ clause, was met in May 2002 when Iceland ratified the Protocol. The ratification by Russia on 18 November 2004 satisfied the ‘55 per cent’ clause and (after 90 days) brought the Convention into force.

The Kyoto Protocol also introduced two project based mechanisms: the Clean Development Mechanism (CDM) and the Joint Implementation mechanism. The CDM3 allows parties listed in Annex I of the Kyoto

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2 Kyoto Protocol, Art. 17.
3 Ibid., Art. 12.
Protocol to finance emission reduction projects in countries which are not listed in Annex I. Annex I parties are awarded certified emission reductions (CERs) for doing so. CDM projects assist non-Annex I parties in pursuing sustainable development policies and in contributing to the ultimate objective of the Convention, and assist Annex I parties in meeting their emissions targets. The Joint Implementation (JI) mechanism, by contrast, allows parties listed in Annex I of the Kyoto Protocol to receive emission reduction units (ERUs) for co-financing projects that reduce net emissions in an Annex I country. Parties are awarded ERUs from JI projects. Excessive use of these flexibility instruments is intended to be curtailed by the supplementarity requirement of the Marrakech Accords. Supplementarity is defined as a mechanism the use of which is to be ‘supplemental to domestic action and that domestic action shall thus constitute a significant element of the effort made by each Party included in Annex I to meet its quantified emission limitation and reduction commitments under Article 3, paragraph 1’. Even though the Kyoto Protocol was not embraced by the United States – which, at that time, was the largest emitter of greenhouse gases – in the EU emissions trading was still seen as an appealing policy tool. After Denmark and the United Kingdom started to adopt emissions trading, the EU decided, in 2003, to implement a similar system. Since EU law supersedes national law in the area of climate change and the EU dominates this field of law, these national schemes had to comply with the new requirements. The European Emissions Trading Scheme (the EU ETS) was, to a large extent, inspired by the US SO2 trading system. The EU ETS started in 2005 as a multi-jurisdictional attempt to reduce CO2 emissions from four broad sectors:

- energy (electric power, oil refineries and related industries);
- the production and processing of ferrous metals (iron and steel);
- minerals (cement, glass, ceramics); and
- pulp and paper.

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5 Marrakech Accords (2001). These accords describe the rules for meeting the targets of the Kyoto Protocol.


8 See Zwingmann (2007), pp. 117ff.

The EU ETS now covers 31 countries (all 28 EU Member States and the three European Economic Area countries: Iceland, Liechtenstein and Norway) and also includes the aviation sector. It sets a cap on approximately 40 per cent of the European Union’s greenhouse gas emissions.

The EU ETS was implemented over several trading phases: Phase 1 ran from 2005 to 2007, Phase 2 from 2008 to 2012, and Phase 3 runs from 2013 to 2020. The first trading period was described as a ‘learning by doing’ phase. The system suffered from over-allocation, which – when it became public knowledge – led to a crash in the emission allowance price from €28 to ultimately €0.10 in 2007. Over-allocation is partly attributable to data problems and to over-optimistic company growth expectations. An attempt can be made to explain it by successful lobbying and the understanding of Member States that a more generous allocation to domestic installations would help them to retain competitiveness in the international market.

Moreover, politically unacceptable ‘windfall profits’ were created. They stemmed from the ability of the electricity sector to pass on cost increases to customers. The learning process still continued beyond the first trading phase. Despite the amendments made to the National Allocation Plans of the EU Member States by the European Commission, an oversupply situation arose again in the second trading phase (2008–12) for which there were no adequate systemic safeguards. This oversupply is still a problem in the third trading phase (2013–20) and, among other factors, is attributable to the economic downturn in 2009. To a lesser extent it is also attributable to the increased use of Kyoto offsets and to the sale of new entry reserves that came onto the market in 2012. As a result of this situation, the EU allowance prices dropped in Phase 2 and still remain at levels that are too low to incentivize investment in greenhouse gas emission abatement and innovation. Currently the price of a European Union allowance (EUA) is €3.50. Technological innovation is one of the (sub) policy objectives listed in the EU ETS.

10 The electricity sector, in particular, faces ‘inelastic demand’. This means that as prices increase, consumers only marginally change their consumption behaviour. Energy companies were thus able to pass on large parts of their production cost increases to consumers even though they had received allowances for free. This was perceived as ‘unfair’ by consumers and politicians alike. See Woerdman, E., O. Couwenberg and A. Nentjes (2009).
Directive.\textsuperscript{13} It should be mentioned, however, that these problems do not undermine the system’s effectiveness to achieve emission reductions at low costs.

Because of their cost-saving potential for society, emissions trading systems remain attractive to policy makers around the world. Other systems have emerged in Europe (Switzerland, for example), and also in North America (the Regional Greenhouse Gas Initiative (RGGI) and the Western Climate Initiative (WCI)). Emissions trading systems are operating in New Zealand and Australia, and also in Japan (for example, the scheme set up by the Tokyo Metropolitan Government (TMG)) and in Kazakhstan. Six pilot schemes are currently been set up in China, and South Korea is also developing a scheme. India Thailand, Vietnam and Mexico are also reported to be considering the introduction of a system of emissions trading.

Given the current developments and the spread of emissions trading, it is likely, although not certain, that more countries will follow in adopting emissions trading as a cost-effective instrument for environmental policy. It is also possible, but again not certain, that countries will link their emissions trading schemes in order to create markets of higher density with more efficient abatement opportunities, even though this would necessitate overcoming various political, legal and economic barriers. Given the continuing spread around the globe, the relevance of emissions trading, as well as of the various possibilities for design choices, gains more importance.

3. ASPECTS OF EMISSIONS TRADING DESIGN

Emissions trading is one of several – and is probably one of the most important and efficient – policy tools that can be chosen to address climate change. As is the case with any tool, it can be used to achieve a goal: a hammer is used to hammer; a greenhouse gas emissions trading system is used to reduce greenhouse gases.

A policy maker wishing to address climate change will look into an instrument tool box and determine which instrument will work best for the desired objective. The instrument options (command-and-control regulation, liability rules, taxation and emissions trading) and their merits are discussed further in this book. As important as the tool itself are its particular design features. These design features crucially depend on

\textsuperscript{13} Directive 2009/29/EC, recital 8.
what precisely the tool is intended to do and on the context in which it needs to operate.

Policy makers who consider the adoption of an emissions trading system should therefore consider first the particular context in which the scheme will be operating and decide what the instrument is supposed to achieve. There are many objectives that policy makers would like to see realized, but not everything can be achieved at the same time – and certainly not with every emissions trading design. An example from the EU ETS is illustrative. The system was originally designed to reduce greenhouse gas emissions at the lowest possible cost and, at a later point in time, it was also required to incentivize technological innovation. The system, however, is not designed to deliver high emission allowance prices at times of economic downturn. This inability has given rise to severe criticism of emissions trading in general and the EU ETS in particular, while it is evident that the system is doing precisely what it was designed to do and that it cannot deliver something it was not designed to achieve. Emissions trading designers are therefore well advised to have a clear list of what they would like to achieve before starting work on designing such a system.

4. PURPOSE OF THE BOOK

Emissions trading design is clearly important. The purpose of this book is to provide a critical overview of these design issues. The central questions therefore are: (i) how to design an emissions trading scheme; (ii) what are the potential implementation problems; and (iii) how can they be addressed?

The following sub-questions are addressed:

- What are the main advantages and disadvantages of emissions trading in general?
- What needs to be considered in designing an emissions trading system?
- What are the main implementation problems of emissions trading?
- How should those implementation problems be addressed in an effective, efficient and acceptable way?

In order to address these questions the structure of the book will follow four simple questions relevant for emissions trading designers: why, how, what, and with whom?
Next to the design choices that policy-makers need to make in order to reach their policy objectives, we focus on the main implementation problems of emissions trading. These are the issues surrounding the initial allocation of emission rights, the secondary markets for these rights, compliance with emissions trading rules, and lawsuits resulting from emissions trading schemes. Some of these implementation issues we elucidate by taking the European Union Emissions Trading Scheme (EU ETS) as an example – not because it is the best system that exists, but rather because it offers useful examples of issues that system designers would like to avoid. Also addressed is the timely issue of linking emissions trading schemes. Negotiations to establish unilateral links between Australia and the EU ETS on one side and bilateral links between the EU ETS and the Swiss system are well under way. It would be useful to look at these links-in-the-making and pick up some lessons on design.

Economists like to emphasize that ‘the devil is in the detail’ – which is true. Details can matter a great deal for the performance of emissions trading schemes. Some of these details will be highlighted and analysed, especially in relation to the EU, which is our home base and primary field of expertise. However, in a book such as this it is impossible to go into every detail of all relevant laws and regulations for the various emissions trading schemes in multiple jurisdictions. This would take away the focus from the most salient issues that our overview intends to provide.

Emissions trading systems are being set up in many jurisdictions around the world, but all policy makers face similar design challenges. In outlining these challenges, this book is unique. There is much scientific literature on emissions trading that deals with very specific questions, but an up-to-date and easily accessible book presenting and critically reflecting on how to design such a system and which implementation challenges will be encountered is missing. Moreover, the current literature typically focuses on the environmental, legal and economic aspects of emissions trading and pays far less attention to practical policy problems, from initial allocation to compliance and lawsuits. Our book addresses this niche by targeting policy makers, managers, consultants, practitioners and graduate students, as well as an audience that needs to familiarize itself with emissions trading design in a comprehensive and time-efficient way, with an approach that takes the multiple policy objectives of ETS designers as a central element.

Following this introductory chapter, Chapter 2 reviews the merits and demerits of emissions trading by comparing these schemes with other policy instruments that could be selected to achieve the goal of reducing
greenhouse gas emissions. In this way we focus on the reasons ‘why’, and in which circumstances emissions trading can be considered an effective policy choice. We pay particular attention to efficiency, environmental effectiveness, acceptability, and present some points for consideration for emissions trading designers.

Chapters 3 and 4 address the question of ‘how’ emissions trading systems can be designed and the factors that policy makers should bear in mind. We will take a look at a policy maker’s goals and the wider framework that must be considered when designing an emissions trading system, highlighting the important trade-offs that policy makers face. Chapter 4 presents emissions trading systems in various countries and shows the richness of design solutions that are employed in practice.

Chapters 5 to 8 address ‘what’ are the special issues in designing an emissions trading system that can pose challenges for its operation. Chapter 5 addresses the initial allocation of emission allowances. Chapter 6 deals with secondary markets, fraud and oversight issues. Chapter 7 deals with operational issues, which include monitoring, verification and enforcement; it also addresses issues related to emissions trading transaction logs. Chapter 8 reviews the case law that has arisen in the context of climate change and emissions trading systems, and seeks to draw the awareness of designers to the legal issues. This is particularly crucial since any policy instrument will ultimately need to operate within a regulatory, and therefore, legal framework.

Chapter 9 looks at the possibilities of expanding the benefits of an emissions trading system by linking it to similar systems. Since design features may determine the ability to link systems, this chapter addresses the question of ‘with whom’ to establish a trading system. Chapter 10 summarizes the main findings.

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Research for this book ended in the beginning of the year 2013. More recent developments have therefore not been taken into account. There are, however, three developments that should be mentioned:

1. The back loading proposal of the European Commission has been accepted by the European Parliament on the 3rd of July 2013 and the Council reached an agreement on the 8th of November 2013. As a result, legislation for back loading may be adopted before April 2014.

2. The Chinese emissions trading pilots in Beijing and Shanghai have commenced operations in November 2013.

3. After defeating the Labour Party in the recent Australian federal election, the National Coalition-led government proposed to scrap the CPM. Given that the ruling party lacks a majority in the Senate, it is not yet certain if the proposal will succeed.