

Legal Regulation of Aircraft Engine Emissions in the Age of Climate Change

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I, Jin Liu confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Abstract

Although the contribution of international civil aviation to climate change seems small (with a global share of just 3.5 percent of emissions of CO₂), the projected growth in air traffic means that it is highly significant. There is thus an urgent need to explore legal regulations for limiting and/or reducing the adverse impacts of aircraft emissions on the environment. This thesis examines the progress which has been made on international aviation emissions abatement and provides an analysis of the reasons for delay. It concludes that the contribution of aviation to climate change is a multi-scalar problem and as such neither conventional top-down international legal regimes, nor any single regulatory instrument can solve it. The research question for this thesis is how to break the deadlock of conventional legal approaches and overcome the barriers to international aviation greenhouse gas emissions abatement. New governance theory provides the theory within which the future of aviation emissions regulation has been explored. Drawing on the scholarly literature on new governance, this thesis argues for a multi-scalar regulatory architecture which simultaneously engages multi-level governance, and a multi-party and multi-instrument approach to the problem. First, multi-level governance includes an international sectoral target on reducing aviation emissions, national efforts in allocating and implementing reduction targets on aircraft operators, and regional cooperation in between, as well as sub-state level governance although this is not a feature of this thesis. Second, a multi-party approach requires efforts from both public and private actors (international organisations such as the UNFCCC and ICAO, nation states, the airline industry and IATA). Finally, a combined use of multiple regulatory instruments (conventional command and control type mechanisms and multiple market-based instruments) should be included. The failure of the UNFCCC to regulate international aviation emissions means that the problem has remained largely unaddressed. Recognizing climate change as a multi-scalar problem that needs multi-scalar regulatory approaches would allow the international aviation emission problem to move beyond the deadlock of conventional inter-state approaches.

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Abbreviations

AETS	Australian Emissions Trading Scheme
ANC	Air Navigation Commission
APD	Air Passenger Duty
ASEAN	Association of Southeast Asian Nations
AWG-KP	Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol
AWG-LCA	Ad Hoc Working Group on Long-Term Cooperative Action under the Convention
CAEP	Committee on Aviation Environmental Protection
CBDR	Common but Differentiated Responsibility
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
COP	Conference of the Parties
ECJ	European Court of Justice
EM	ecological modernisation
EMT	ecological modernisation theory
EPA	Environmental Protection Agency
ETS	Emissions Trading Scheme
GHG	Greenhouse gas
GLOBE	Global Legislators Organisation for a Balanced Environment
GWP	global warming potential
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IGO	intergovernmental organisation
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
MBIs	Market-based Instruments
MOU	Memoranda of Understanding
MRV	measurement, reporting and verification
NGO	non-governmental organisation
OMC	Open Method of Coordination
RGGI	Regional Greenhouse Gas Initiative
SARPs	Standards and Recommended Practices
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
USAP	Universal Security Audit Programme
USOAP	Universal Safety Oversight Audit Programme
WMO	World Meteorological Organisation

Chapter 1. Introduction

This thesis addresses the challenge of regulating the climate change effects of international civil aviation emissions. It argues that the legal regulation of international civil aviation emissions should be developed in a multi-scalar architecture, which simultaneously engages a multi-level governance approach to the problem, multiple parties and multiple instruments. The preferred response to the contribution of international aviation to climate change would be to agree an international sectoral target on reducing aviation emissions. A burden sharing system would require multiple parties at multiple levels of governance to contribute to the sectoral mitigation target. If such burden sharing is difficult to agree in practice, this thesis argues for a global emissions trading system as an alternative form of allocation of the sectoral mitigation target. As a second best response, in the absence of international agreement, the multiple levels, parties and instruments take on a more central role.

This chapter provides an introduction. Section 1 sets out the research questions addressed and the “thesis” argued in the following chapters. Section 2 describes the thesis and the sequencing of the chapters which follow and how they contribute to the thesis. This section also sets out the scope of the thesis. Section 3 addresses methodology.

1. The Thesis

This thesis starts with the assumption, explored further in Chapter 2, that the contribution of civil aviation to climate change is significant¹ and there is an urgent

¹ The aviation sector represents approximately 3.5 percent of the global anthropogenic radiative forcing (a measure of warming). Radiative forcing “is a measure of the importance of a potential climate change mechanism.” It “expresses the perturbation or change to the energy balance of the

need to identify effective legal regulation of international aviation emissions.² The legal literature on climate change emissions from aviation concentrates overwhelmingly on the need for global agreement, within the framework of the UNFCCC (the United Nation's Framework on Climate Change) and/or ICAO (the International Civil Aviation Organisation). By contrast, my thesis is that the legal regulation of international civil aviation emissions should be developed in a multi-scalar architecture. Curbing the growth of aviation emissions should focus not only on traditional top-down, international-level approaches grounded in international organisations, but on a multi-level, multi-party, multi-instrument approach. Drawing out this multi-scalar architecture is a challenging task, requiring the development of a complex and dense regulatory framework, and demanding expertise in a range of legal and policy areas.

As is discussed and argued in Chapters 3 and 4, the current approach to regulating international aviation emissions is largely failing. Therefore, the research question for this thesis is how to break the deadlock of conventional legal approaches and overcome the barriers to international aviation greenhouse gas emissions abatement. Focusing on the need for improved energy intensity in the aviation sector, but also considering some measures to encourage less flying, I explore alternatives that take seriously the multi-scalar nature of the aviation emissions problem. This allows me to develop an innovative way of developing legal regulation to curb the

Earth-atmosphere system in watts per square meter (Wm⁻²).” Joyce E. Penner et al. (eds.), *Aviation and the Global Atmosphere: Special Report of the International Panel on Climate Change* (Cambridge University Press, Cambridge 1999), (IPCC 1999 Report), p. 3; For a more general explanation of climate concepts and metrics, see David S. Lee, ‘Aviation and Climate Change: The Science’ in Stefan Gössling & Paul Upham (eds.) *Climate Change and Aviation: Issues, Challenges and Solutions* (Edward Elgar, London 2009), pp. 31-32.

Many pieces of research have been carried out since the IPCC 1999 Report to further estimate the effects of aviation on climate, see for example, Guy P. Brasseur (ed.), ‘A report on the way forward based on the research gaps and priorities’ (Aviation Climate Change Research Initiative, 2008) Sponsored by the Environmental Working Group of the US NextGen Joint Planning and Development Office, available online at <www.faa.gov/about/office_org/headquarters_offices/aep/aviation_climate/> last accessed 23.02.10.

Total aviation radiative forcing was still 3.5 percent as updated in 2005 for 2000 by Sausen et al, see Robert Sausen et al., ‘Aviation radiative forcing in 2000: An update on IPCC (1999)’ (2005) 14/4 *Meteorologische Zeitschrift* 555.

² The primary driver of the aviation industry's growth has been the growth of international flights. See ICAO, *Annual Report of the Council* (ICAO, Canada, 1991 to 2008) and International Air Transport Association (IATA), *World Air Transport Statistics* (54th ed., IATA, Canada, 2010).

growth of aviation emissions. However, it is supported by the burgeoning new governance literature that has engaged with the complexities of regulatory scale and the appropriate role of traditional top-down and alternative approaches. My thesis accepts the idea that aviation emissions is a global issue which needs global solutions, but argues that conventional international agreements cannot be the whole answer to curbing the growth of international aviation emissions. The impact of aviation emissions on climate change is not only an international problem, but is also a local, national and regional problem. As such, effective legal regulation should not be limited to conventional inter-state approaches. This requires a re-scaling of the legal regulation of aviation emissions. New governance provides the theoretical foundation upon which the failure of traditional regulatory approaches will be analyzed and the future of regulating aviation emissions will be explored. Drawing on the scholarly literature on new governance theory, this thesis explores multi-scalar regulatory approach to climate change associated with aviation, which simultaneously engages multi-level governance, and a multi-party and multi-instrument approach to the problem. I argue that regulating aviation emissions should involve a range of parties, including both public and private actors (international organisations such as the United Nation's Framework on Climate Change (UNFCCC) and the International Civil Aviation Organisation (ICAO), nation states, the airline industry and IATA). It should involve multiple regulatory instruments, including conventional command and control type regulatory mechanisms (a sectoral mitigation target and technology-based standards) and market-based instruments (fuel taxes and emissions trading). And it should involve different scales. For example, an international sectoral target on reducing aviation emissions in the UNFCCC system, multi-level burden sharing in applying a sectoral target to the aviation sector, nation states' efforts to implement reduction targets through introducing fuel taxes, regional efforts on emission trading and some sub-state level governance (although the local level is not a feature of this thesis).

Put simply, the best solution would be to agree an international sectoral target on reducing aviation emission through the UNFCCC-led climate change negotiations.

Achieving the sectoral mitigation target requires nation states' efforts to implement reduction targets through introducing fuel taxes and regional efforts on emission trading. If the application of a multi-level burden sharing is difficult in practice, a global emissions trading system could provide an alternative form of allocation of the sectoral mitigation target on international aviation emissions. And if a sectoral target cannot be agreed, non-traditional approaches, incorporating multiple parties and multiple instruments, including industry voluntary guidelines and market-based instruments at a regional and national level provide a secondary solution. In this way, the international aviation emissions problem should move beyond the deadlock of conventional inter-state approaches and recognise climate change as a multi-scalar problem that needs multi-scalar regulatory approaches.

2. Description of the Thesis

This thesis examines the complexity of the international aviation emissions problem, the limitations of existing legal regulations, and the opportunities for designing an innovative regulatory architecture to address this problem. A core argument of this thesis and a core requirement in any future regulatory regime is a multi-scalar approach (as described in Chapter 7) relying on multiple levels of governance, multiple public and private parties and multiple instruments of regulation. My preferred option would be for an international sectoral target on reducing aviation emissions. A burden sharing system would require multiple parties at multiple levels of governance to contribute to the sectoral mitigation target. However, in the absence of international agreement, the multiple levels, parties and instruments take on a more central role.

The first step in problem solving is to recognise the nature of the problem. Thus, Chapter 2 discusses the nexus between climate change and aviation emissions and analyses the difficulty of regulating aviation emissions at an international level. Legal

regulations on aviation emissions should encourage technical measures to improve energy intensity in the aviation sector. International air transport should continue to serve the human community in a way that does not threaten the global climate.

This thesis focuses only on aircraft emissions from international flights, which means flights passing through the air space over the territory of more than one nation state.³ International and domestic aviation emissions are dealt with separately because of the nature of international transport and the UNFCCC/Kyoto greenhouse gas (GHG) accounting framework.⁴ Under the climate change regime (the United Nations Framework Convention on Climate Change (UNFCCC)⁵ and the Kyoto Protocol⁶ to it), emissions are attributable to a country if they result directly from activities that occur within its territory.⁷ However, international transport involves movement between countries, creating difficulties for allocating emissions to specific countries. Much of the fuel that is used in international transport occurs in or over the territory of countries that have no direct involvement in the relevant transport movement (e.g. when planes transit through a country's airspace or fly over high seas).

³ The scope of this research covers only international civil aircrafts, which means it does not cover military aircraft emissions and domestic air traffic.

⁴ Andrew Macintosh, 'Overcoming the Barriers to International Aviation Greenhouse Gas Emissions Abatement' (2008) 33/6 *Air. & Sp. L.* 403.

⁵ *United Nations Framework Convention on Climate Change*, 9 May 1992, 1771 U.N.T.S. 107 (entered into force 21 March 1994), (UNFCCC).

⁶ *Protocol to the United Nations Framework Convention on Climate Change*, 11 December 1997, U.N.Doc. FCCC/CP/1997/7/Add. 1 at 7, (Kyoto Protocol).

⁷ IPCC guidelines require that "The IPCC methodology subtracts the quantities delivered to and consumed by ships or aircraft for international transport from the fuel supply to the country. In this manner, the CO₂ emissions arising from the use of international bunkers are not included in the national total. To simplify the preparation of global estimates, these emissions should be brought together in a separate table." (IPCC, *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual* (IPCC, 1996), pp.1.9-1.10)

The IPCC guidelines were first accepted in 1994 and published in 1995. UNFCCC COP3 held in 1997 in Kyoto reaffirmed that the *Revised 1996 Guidelines for National Greenhouse Gas Inventories* should be used as "methodologies for estimating anthropogenic emissions by sources and removals by sinks of greenhouse gases" in calculation of legally-binding targets during the first commitment period. See UNFCCC, 'Kyoto Protocol Reference Manual on Accounting of Emissions and Assigned Amount' (2008), p. 26.

Accordingly, emissions from domestic flights are considered to be part of the national inventory of the country within which the flights occur. IPCC guidelines require international aviation emissions to be estimated by the country where the fuel is sold, although such emissions are not to be included in that country's total emissions. However, to date, there has been no agreement among parties to the UNFCCC on any specific measure to allocate the emissions from international aviation bunker fuels to national inventories. Thus, emissions from international flights are excluded from the quantified national mitigation targets on Annex I countries of the Kyoto Protocol. See IPCC 1999 Report, (n. 7), section 10.2.

Under the Kyoto Protocol, the limitation or reduction of greenhouse gas emissions from international civil aviation is to be achieved by working through the International Civil Aviation Organisation (ICAO).⁸ “Placing international transport in a separate category and transferring responsibility for these emissions to separate UN bodies was seen as a convenient solution to a difficult problem.”⁹ However, the long delay in implementing any effective regulation of this sector creates a serious regulatory gap in the task of combating climate change.

Aviation has recently received the attention of politicians, legal scholars and the broader public as a significant sector in respect of climate change. Academic debates have largely been limited to promoting international negotiations or ICAO’s role in a top-down regulatory system¹⁰ or the legality of the EU’s inclusion of international flights in the European Union’s Emissions Trading Scheme (EU ETS).¹¹ However, aviation’s contribution to climate change is too complex to be solved either by conventional top-down legal regimes, or by any single regulatory instrument. This thesis places aviation in the context of the burgeoning new governance literature that has engaged with the complexities of regulatory scale and the appropriate role of traditional top-down and multiple levels approaches. The governance of aviation emissions needs to be developed in an innovative way, moving towards a multi-scalar regulatory architecture.

Chapters 3 to 6 examine current efforts to seek global solutions to aviation emissions. It always makes sense to learn from history, but these chapters challenge the conventional wisdom on this subject, analysing the advantages and limitations in existing international law in a way that explains the need for an innovative regulatory architecture, and identifies how it should look. The findings of these chapters contribute to the introduction of multi-scalar regulation to be discussed in

⁸ Kyoto Protocol, (n. 6), art.2.2.

⁹ Andrew Macintosh, (n. 4).

¹⁰ Allen Pei-Jan Tsai & Annie Petsonk, ‘Tracking the Skies: An Airline-based System for Limiting Greenhouse Gas Emissions From International Civil Aviation’ (1999-2000) 6 *Envtl. Law.* 763; Ruwantissa Abeyratne, ‘ICAO: Some Recent Developments in Aviation and Environmental Protection Regulation’ (2001) 32/1 *Environmental Policy and Law* 32; Andrew Macintosh, *ibid.*

¹¹ Petersen, Malte, ‘The Legality of the EU’s Stand-Alone Approach to the Climate Impact of Aviation: The Express Role Given to the ICAO by the Kyoto Protocol’ (2008) 17/2 *RECIEL* 196.

Chapter 7.

Chapter 3 explores the obstacles in the existing international climate change law regime to reducing aviation emissions. It provides some possible explanations for the slow path towards an international agreement on an effective climate policy in the aviation sector. Following a discussion of the legal obstacles to reducing aviation emissions in the current regime, especially the division between Annex I/non-Annex I countries in burden sharing under the common but differentiated responsibility (CBDR) principle, Chapter 3 examines the potential of a sectoral approach to international aviation in the UNFCCC system, new approaches on burden sharing in respect of aviation emissions, and the adequacy of the UNFCCC system. This chapter identifies a sectoral approach as the preferred option in regulating aviation emissions.

ICAO, which is the subject of Chapter 4, has been granted authority under the Kyoto Protocol over international civil aviation greenhouse gas emissions. However, the organisation has failed to deliver effective regulation. This chapter examines the reasons for delegation to ICAO in the Kyoto Protocol. It explores the limitations of ICAO in terms of its aims and its rule-making function, which might explain ICAO's failure in the past. Finally, this chapter contributes to the repositioning of ICAO's role in the future. Although ICAO is not suitable as the sole regulator of the aviation emissions problem, I argue that the organisation should continue to play a key role on the technical front and it may also have a role regarding performance monitoring, reporting methods and auditing processes. ICAO's technology-based standards and its international governance capacity are its most important contributions to the development of legal regulations on aviation emissions. The role of ICAO identified in Chapter 4 provides partial illustration of the need for multiple parties in regulating aviation emissions, as discussed in Chapter 7; the potential for ICAO-inspired technology-based standards provides partial illustration of, as discussed in Chapter 3 and 4, the need for multiple regulatory instruments.

This thesis focuses on the UNFCCC/ICAO legal framework. Other legal frameworks inevitably feature in this area. First, the Montreal Protocol on Substances

that Deplete the Ozone Layer¹² has emerged as a significant mechanism for the international regulation and phase-out of certain greenhouse gases. The primary objective of the Montreal Protocol is to phase-out the consumption and production of nearly 100 chemicals known as “ozone depleting substances” (ODS).¹³ These ozone-depleting industrial gases were excluded from the UNFCCC and the Kyoto Protocol.¹⁴ However, this thesis focuses on the very considerable proportion of aviation emissions that are not regulated by the Montreal Protocol.

Secondly, international aviation is not the only sector that was excluded from the targets set by the Kyoto Protocol. International shipping¹⁵ was also excluded from the Kyoto emissions accounting system.¹⁶ As with aviation, GHG emissions from international shipping cannot be easily attributed to any particular national economy due to the global scale and complex operation of the shipping industry.¹⁷ The Protocol requires the countries listed in Annex I to the UNFCCC to pursue the limitation or reduction of GHG emissions from marine bunker fuels, working through International Maritime Organisation (IMO),¹⁸ paralleling the role of ICAO in aviation. As with ICAO, there has not yet been any agreement within the IMO on a scheme for

¹² Ad Hoc Working Group of Legal and Technical Experts, First Session, UNEP/WG 151/L4 (1986); Second Session, UNEP/WG 167/2 (1987); Third Session, UNEP/WG 172/2 (1987). See Richard Elliot Benedick, *Ozone Diplomacy* (2nd ed., Harvard University Press; Cambridge, Mass.; London 1998); UNEP Ozone Secretariat, *Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer* (7th ed., Nairobi 2006).

¹³ The Montreal Protocol, (n. 12), art. 2.

¹⁴ IPCC guidelines, (n. 7).

¹⁵ International shipping was estimated to have emitted 870 million tones or about 2.7% of the global man-made emissions of CO₂ in 2007. This data comes from the *Second IMO GHG Study 2009*, which is the most comprehensive and authoritative assessment of the level of GHG emitted by ships. See IMO, *Second IMO GHG Study* (IMO; London 2009).

¹⁶ Article 2.2 of the Protocol stated that “The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization and the International Maritime Organization, respectively.”

¹⁷ In Decision 2/CP.3 the December 1997 Conference of the Parties to the UNFCCC, recalling the 1996 Revised Guidelines for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change which state that emissions based upon fuel sold to ships engaged in international transport are not to be included in national totals but reported separately, urged the Conference’s Subsidiary Body for Scientific and Technological Advice (SBSTA) to further elaborate on the inclusion of emissions from international bunker fuels in the overall inventories of Parties to the UNFCCC.

¹⁸ IMO is an agency of the United Nations which has been formed to promote maritime safety. It was formally established by an international conference in Geneva in 1948, and became active in 1958 when the IMO Convention entered into force (the original name was the Inter-Governmental Maritime Consultative Organisation, or IMCO, but the name was changed in 1982 to IMO). For a review on the role of IMO in general, see Patricia Birnie, Alan Boyle, Catherine Redgwell, *International Law and the Environment* (3rd ed., Oxford University Press; Oxford 2009), pp.75-77.

capping global shipping emissions.

This thesis focuses on aviation rather than shipping, and so there will be no detailed discussion of IMO's role in climate change. However, a few words on some of the similarities between the challenges faced by ICAO and IMO are worthwhile at this point. So far, no mandatory energy efficiency standard or mandatory energy efficiency management plan regarding GHG emissions from international shipping have been agreed.¹⁹ An expert group is to report to the Marine Environmental Protection Committee (MEPC) of IMO on the feasibility of market-based mechanisms in international shipping in July 2011.²⁰ Like ICAO, IMO is open to the criticism that it cannot on its own provide effective regulation for shipping emissions. No emissions target has been identified by IMO. In the most recent IMO MEPC meeting in October 2010, there was little consensus on proposals to cut emissions.²¹ Although environmental protection is one of the objectives of IMO²² (by contrast with ICAO), the organisation has been waiting for a mitigation target or timetable to be decided through the UNFCCC-led international negotiations.²³ This preliminary review suggests that the work of IMO is unlikely to provide a good model for regulating aviation emissions. Given the complexity of the different legal regulatory systems of aviation law and maritime law, comparing the role of ICAO and IMO in more detail is

¹⁹ IMO ship pollution rules are contained in the International Convention for the Prevention of Pollution from Ships (MARPOL 1973/1978). Detailed anti-pollution regulations are given in the annexes to this Convention, as adopted or amended by the IMO's Marine Environmental Protection Committee (MEPC). In 1997, the MARPOL Convention was amended to include Annex VI, titled "Regulations for the Prevention of Air Pollution from Ships," setting limits on NO_x and SO_x emissions from ship exhausts and prohibiting deliberate emissions of ozone depleting substances. However, Annex VI does not cover the emission of GHGs from ships. To amend Annex VI in including energy efficiency regulations on GHG emissions from shipping has been considered under the MEPC, but it seems difficult to achieve an agreement to create mandatory energy efficiency standards or an energy efficiency management plan among its member States. See Note submitted by the International Maritime Organisation to the thirty-third session of the Subsidiary Body for Scientific and Technical Advice (SBSTA 33), Agenda item 6. (a) Emissions from fuel used for international aviation and maritime transport, Outcome of the sixty-first session of IMO's Marine Environment Protection Committee Further progress made on technical, operational and market-based measures, 4 November 2010, (IMO submission at Cancun).

²⁰ See IMO website at <http://www.imo.org/OurWork/Environment/PollutionPrevention/AirPollution/Pages/GHG-Emissions.aspx>.

²¹ IMO submissions at Cancun. (n. 19). The committee will hold another meeting from March 28 to April 1 2011 to discuss a market-based mechanism for lowering emissions.

²² IMO Resolution A.1011(26), Assembly 16th session Agenda item 8, adopted on 16 November 2009.

²³ See Note submitted by the International Maritime Organisation to the thirty-third session of the Subsidiary Body for Scientific and Technical Advice (SBSTA 33), Agenda item 6, (n. 19), para. 46.

beyond the scope of this thesis, which focuses in detail on aviation. Nevertheless, given the similarly challenging international nature of these two industries, further research would be valuable in the future.

The issue of climate change is not part of the WTO's ongoing work programme and there are no WTO rules specific to climate change. However, the WTO is relevant because climate change measures may have an impact on international trade and may be subject to WTO rules and procedures.²⁴ In principle, the General Agreement on Trade in Services (GATS) applies to air transport. The Air Transport Service Annex of the GATS excludes the application of the GATS from traffic rights,²⁵ meaning that (again, in principle) air transport is regulated independently of the WTO. However, if it is accepted that the rules relating to "products" apply to a measure such as a fuel tax, then, broadly speaking, WTO rules that relate generally to environmental issues (including the General Agreement on Tariffs and Trade (GATT) Article XX, the processes and production methods issue and the definition of a "like product") are relevant.²⁶ The design of climate change regulations and the pursuit of international cooperation in aviation will need to take into account the potential trade impact of these measures.²⁷ But, it is still very unclear how the WTO "tool box" of rules (WTO rules and jurisprudence) relates to aviation, particularly given the clear effort to exclude air transport from WTO disciplines in the GATS. Given the likely scale of the debate around the application of WTO rules to climate change related aviation measures, and the focus of this thesis, the WTO is not discussed here in any detail.

²⁴ WTO, The multilateral trading system and climate change, online available at <http://www.wto.org/english/tratop_e/envir_e/climate_change_e.pdf> last accessed 28.02.11.

²⁵ Annex on Air Transport Services, para. 2. Traffic rights mean "the right for scheduled and non-scheduled services to operate and/or to carry passengers, cargo and mail for remuneration or hire from, to, within, or over the territory of a Member, including points to be served, routes to be operated, types of traffic to be carried, capacity to be provided, tariffs to be charged and their conditions, and criteria for designation of airlines, including such criteria as number, ownership, and control." para. 6 (d).

²⁶ Christopher Tran, 'Using GATT, Art XX to justify climate change measures in claims under the WTO Agreements' (2010) 27 *EPLJ* 346.

²⁷ See Peter Van den Bossche, *The Law and Policy of the World Trade Organization* (2nd ed. Cambridge University Press; Cambridge 2008), chapter 4. Eckhard Pache, 'On the compatibility with international legal provisions of including greenhouse gas emissions from international aviation in the EU emission allowance trading scheme as a result of the proposed changes to the EU emission allowance trading directive' (15.04.2008) Legal opinion commissioned by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, online available at <http://www.bmu.de/english/emissions_trading/doc/42364.php> last accessed 15.03.11.

Turning back to the contents of the thesis, the exemption of international aviation from a fuel tax, which has an undeniable impact on the development of legal regulation of aviation emissions, is the focus of Chapter 5. This chapter first discusses the positive value of a fuel tax as a price-based market-based instrument (MBI) in environmental law. It treats a fuel tax primarily as a way of influencing demand, but also as a way of providing incentives for innovation. It then examines the legal, policy and practical barriers to introducing a fuel tax on international flights. Finally, this chapter gives suggestions on how to overcome these barriers. A fuel tax cannot be a stand-alone solution. However, its effect on demand and on incentives for innovation is potentially important. The implementation of an aviation fuel tax by nation states additionally contributes to re-scaling the legal regulation of aviation emissions as discussed in Chapter 7.

In Chapter 6, I explore the role of emissions trading as a quantity-based MBI in environmental law on two levels: the role of regional emissions trading and the role of a proposed global emissions trading scheme. After a brief discussion on the pros and cons of emissions trading in general, I explore the role of regional emissions trading, taking the EU emissions trading scheme (EU ETS) as an example. I examine the key elements of the EU ETS and the legality of including international airlines in the EU ETS. I argue that regional emissions trading can contribute to the mitigation of greenhouse gas emissions by incentivising the airline industry to improve energy intensity. I also argue that multiple regional emissions tradings may provide an example of regional level's efforts to regulating aviation emissions, which is especially valuable if a sectoral target cannot be agreed under the UNFCCC system. As well as analysing this regional scheme, I propose a global emissions trading scheme. The sectoral target discussed in Chapter 3 provides a cap for the global emissions trading. Airlines are the participants in the trading system. The initial allocation of allowances is undertaken by IATA through full auctioning. ICAO takes the role of verification and monitoring. This is only a sectoral emissions trading system for international aviation unless and until a more comprehensive global emissions trading scheme can be agreed. Such a global emissions trading

scheme for aviation could be a tool to allocate carbon allowances if a comprehensive multi-level burden sharing system does not happen under the UNFCCC's sectoral approach on aviation emissions. It could also be a tool to mitigate aviation emissions through incentivising the airline industry to improve energy intensity.

The discussion in Chapters 3 to 6 of different aspects of substantive law or legal regulatory tools paves the way to Chapter 7 which turns more explicitly to the re-scaling of legal regulation of international aviation emissions. Building on the earlier analysis of the complexity of the aviation emissions problem, Chapter 7 argues that a proper regulatory architecture on aviation emissions should be multi-scalar, that it should simultaneously engage in multi-level governance, and a multi-party and multi-instrument approach to the problem. The discussions in this chapter are based on the literature on new governance.

New governance theory is an emerging theory which has many consequences for various dimensions and spheres of social policy, including environmental protection.²⁸ Seeking or stipulating a particular definition of new governance is a hard task, partly because it is a growing academic field. Although a large number of attempts have been made to define or describe the new governance phenomenon,²⁹ it “remains [a] relatively bland and imprecise descriptor of this family of governance

²⁸ See e.g., Joanne Scott (ed.), *Environmental Protection: European Law and Governance*, (Oxford University Press, Oxford 2009); the special issue of the *European Law Journal* (Volume 8, 2002) on “law and new approaches to EU governance”; Grainne de Búrca, ‘The Constitutional Challenge of New Governance’ (2003) 28 *ELR* 814; Michael C. Dorf & Charles F. Sabel, ‘A Constitution of Democratic Experimentalism’ (1998) 98 *Columbia L. Rev.* 267; Daniel J. Fiorino, ‘Rethinking Environmental Regulation: Perspectives on Law and Governance’ (1999) 23 *Harv. Envtl. L. Rev.* 441; Jody Freeman, ‘Collaborative Governance in the Administrative State’ (1997) 45 *UCLA L. Rev.* 1; Eric W. Orts, ‘Reflexive Environmental Law’ (1995) 89 *Nw. U. L. Rev.* 1227; Charles Sabel et al., ‘Beyond Backyard Environmentalism’ in Joshua Cohen & Joel Rogers (eds.) *Beyond Backyard Environmentalism* (Beacon Press, Boston 2000), p. 3; Neil Gunningham, ‘The New Collaborative Environmental Government: The Localization of Regulation’ (2009) 36/1 *Journal of Law and Society* 145. New Governance also develops in many other areas of public policy, see Bradley C. Karkkainen, ‘“New Governance” in Legal Thought and in the World: Some Splitting as Antidote to Overzealous Lumping’ (2004) 89 *Minn. L. Rev.* 471.

²⁹ See for the work on defying new governance in the European Union, e.g., the research have been done at <www.eu-newgov.org> and <www.connex-network.org>; Kenneth Armstrong & Claire Kilpatrick, ‘Law, Governance, or New Governance? The Changing Open Method of Coordination’ (2006-2007) 13 *Colum. J. Eur. L.* 649.

innovations.”³⁰ The notion is generally defined “by what it is not, more than by what it is,”³¹ as it rejects “uniform one-size-fits-all rules” associated with conventional prescriptive regulation.³² It covers “a broad family of innovative modes of public governance” occurring within the European Union, the United States and elsewhere.³³ We should know that the affix “new” cannot specifically distinguish between governance and what is referred to as new governance.³⁴ Scholars have warned that the affix “new” should not be used to overstate “the disjuncture between supposedly traditional regulatory methods and more experimental approaches” and especially that it should not be used to conceal the continuities between them.³⁵ In fact, the term “new” is used in a broad way to include different approaches in “a shift away from a certain traditional mode of governing associated with government”³⁶ to a system of governance which is “intensely fractured” as “[p]ower is shared among a multiplicity of actors, operating at different levels of government, in the private and public sphere.”³⁷ As such, the affix “new” may be better used to refer to the “governance turn” as it was called by Kohler-Koch and Rittberger,³⁸ rather than as necessarily entailing a claim of

³⁰ Bradley C. Karkkainen, (n. 28), p. 473.

³¹ Neil Gunningham, (n. 28), p. 146; See also, Joanne Scott & David M. Trubek, ‘Mind the Gap: Law and New Approaches to Governance in the European Union’ (2002) 8/1 *Eur. L.J.* 1.

³² Bradley C. Karkkainen, (n. 28), p. 474; Orly Lobel, ‘The Renew Deal: The Fall of Regulation and the Rise of Governance in Contemporary Legal Thought’ (2004) 89 *Minn. L. Rev.* 342. New Governance is often referred by contrast to traditional forms of regulation. See Julia Black, ‘Decentering Regulation: Understanding the Role of Regulation and Self-Regulation in a “Post-Regulatory” World’ (2001) 54 *Current Legal Problems* 103, 105; Grainne de Búrca & Joanne Scott, ‘Introduction: New Governance, Law and Constitutionalism’ in Grainne de Búrca & Joanne Scott (eds.), *Law and New Governance in the EU and the US* (Hart, Oxford 2006), pp. 1, 2-3; David M. Trubek & Louise G. Trubek, ‘New Governance and Legal Regulation: Complementarity, Rivalry, and Transformation’ (2007) 13 *Colum. J. Eur. L.* 539, pp. 542-43.

³³ Bradley C. Karkkainen, (n. 28), p. 472. De Búrca and Scott explained that New Governance “is a construct which has been developed to explain a range of processes and practices that have a normative dimension but do not operate primarily or at all through the formal mechanism of traditional command-and-control-type legal institutions.” Grainne de Búrca & Joanne Scott, *ibid.*, p. 2.

³⁴ Grainne de Búrca & Joanne Scott, (n. 32); Jeremy Wilson, ‘“New” and “Old” Modes of Environmental Governance: The Evolution of the North American Waterfowl Bird Policy Regime’ (2006) Paper presented at the Western Political Science Association Conference, online available at: <<http://web.uvic.ca/polisci/wilson/articles/westernpolisciassociation.doc>> last accessed 30.03.10. Oliver Treib, Holger Bähr & Gerda Falkner, ‘Modes of Governance: A Note towards Conceptual Clarification’ (November 17, 2005) European Governance Papers, Paper No. N-05-52, online available at: <<http://www.connex-network.org/eurogov/pdf/egp-newgov-N-05-02.pdf>> last accessed 20.03.10.

³⁵ Grainne de Búrca & Joanne Scott, (n. 32), pp. 2-3.

³⁶ Kenneth Armstrong & Claire Kilpatrick, (n. 29), p. 651.

³⁷ Joanne Scott, (n. 28), pp. vii.

³⁸ Beate Kohler-Koch & Berthold Rittberger, ‘Review Article: The ‘Governance Turn’ in EU Studies’

originality,³⁹ or even reference to a time horizon.⁴⁰

What is more, there have been different academic contributions to identifying the characteristics of new governance. For example, Scott and Trubek clearly identify the following key characteristics of new governance: participation and power-sharing; multi-level interaction; diversity and decentralization; deliberation; flexibility and revisability; and experimentation and knowledge-creation.⁴¹ Orly Lobel has synthesized the literature on new governance and related approaches to regulation and has identified eight “organizing principles”: participation and partnership; collaboration; diversity and competition; decentralization and subsidiarity; integration of policy domains; flexibility and lack of coerciveness (or softness-in-law); fallibility, adaptability and dynamic learning; law as competence and orchestration.⁴² Gunningham has identified that new governance in the context of environmental protection has the following characteristics: “participatory dialogue and deliberation, devolved decision-making, flexibility rather than uniformity, inclusiveness, transparency, institutionalized consensus-building practices, and a shift from hierarchy to heterarchy.”⁴³ Importantly, he has pointed out that not all of these characteristics necessarily have to be present for a particular case to fall within new governance theory, but “the more characteristics that are present, and the stronger the form in which they are present, the greater is the claim to be regarded as falling within this category.”⁴⁴

Although there is no specific definition or uniform description of the theory, new governance has become increasingly important both nationally and trans-nationally. The rise of new governance in the U.S. has been found in the use of

(2006) 44 *J. Common Mkt. Stud.* 27.

³⁹ B. Guy Peters, ‘Governance: A Garbage Can Perspective’ (2002) Institute for Advanced Studies, Vienna, Working Paper, online available at <http://www.ihs.ac.at/publications/pol/wp_84.pdf> last accessed 30.03.10.

⁴⁰ Oliver Treib, Holger Bähr & Gerda Falkner, ‘Modes of Governance: A Note towards Conceptual Clarification’ (November 17, 2005) European Governance Papers, Paper No. N-05-52, online available at: <<http://www.connex-network.org/eurogov/pdf/egp-newgov-N-05-02.pdf>> last accessed 20.03.10.

⁴¹ Joanne Scott & David M. Trubek, (n. 31).

⁴² Orly Lobel, (n. 32).

⁴³ Neil Gunningham, (n.28), p. 146.

⁴⁴ *Ibid.*

litigation, e.g. in Habitat Conservation Plans under the Endangered Species Act and in the Chesapeake Bay and San Francisco Bay Delta Programmes;⁴⁵ and in increased public-private partnerships and the emergence of new managerial technologies.⁴⁶ A range of important developments in EU environmental law over the last decade are emblematic of new governance.⁴⁷ On the international level, the book *Governance without Government*⁴⁸ showed that “[g]overnance has become a pervasive form of political steering.”⁴⁹ New governance has been adopted by a number industrialized countries, e.g. through government-industry pollution control agreements.⁵⁰

Taken a step further on to a theoretical level, three different kinds of explanatory accounts of the development of new governance have been provided by de Búrca and Scott together with other scholars,⁵¹ and provides some initial insight into why new governance is helpful in addressing aviation related climate change. The first is that the absence of a conventional governmental framework or pre-existing blueprint necessitates a degree of experimentation with different kinds of public policy-making strategies.⁵² The second is that the changing patterns and modes of domestic regulatory practices have resulted in a growth in the role of private actors and networks in governing.⁵³ The third is the dissatisfaction with traditional forms of

⁴⁵ Bradley C. Karkkainen, ‘Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism’ (2001-2002) 21 *Virginia Environmental Law Journal* 189; J. Freeman & D. Farber, ‘Modular Environmental Regulation’ (2005) 54 *Duke Law Journal* 795.

⁴⁶ Louise G. Trubek, ‘New Governance and Soft Law in Health Care Reform’ (2006) 3 *Ind. Health L. Rev.* 140, 151.

⁴⁷ See general Ingmar von Homeyer, ‘The Evolution of EU Environmental Governance’ in Joanne Scott, (n. 28), p. 1; for some of examples of new governance in EU environmental law, see Maria Lee, ‘Law and Governance of Water Protection Policy’; Joanne Scott, ‘REACH: Combining Harmonization and Dynamism in the Regulation of Chemicals’, in the same book.

⁴⁸ James N. Rosenau & Ernst-Otto Czempiel, *Governance without Government: order and change in world politics* (Cambridge University Press, Cambridge; New York 1992).

⁴⁹ Renate Mayntz, ‘From Government to Governance: Political Steering in Modern Societies’, Speech on International Summer Academy, (September 7-11, 2003).

⁵⁰ Kenneth W. Abbott & Duncan Snidal, ‘Strengthening International Regulation Through “Transnational New Governance”’ (2008) online available at: <http://works.bepress.com/kenneth_abbott/1/> last accessed 30.03.10.

⁵¹ Gráinne de Búrca & Joanne Scott, ‘Introduction’ (2006-2007) 13 *Colum. J. Eur. L.* 513. See also discussions on the reasons of increasing use of new governance in the EU in Joanne Scott & David M. Trubek, (n. 31).

⁵² See also Special Issue 8 *Eur. L. J.* (2002) and Gráinne de Búrca & Joanne Scott (eds.), *Law and New Governance in the EU and the US* (2006); Bradley C. Karkkainen, (n. 28); Jody Freeman & Laura I. Langbein, ‘Regulatory Negotiation and the Legitimacy Benefit’ (2000) 9 *N.Y.U. Envtl. L. J.* 60, p. 63; Jody Freeman, (n. 28), p. 6.

⁵³ See also R.A.W. Rhodes, *Understanding Governance: policy networks, governance, reflexivity, and accountability* (Open University Press, Maidenhead 1997). For discussions of New Governance from a

command-and-control regulation for public policies.⁵⁴ All of these three reasons point to the essence of new governance as providing “a new model of collaborative, multi-party, multi-level, adaptive, problem-solving.”⁵⁵ The emergence of new governance may in part be attributed to very complex problems which are hard to solve, on which we have limited experience,⁵⁶ and where familiar approaches fall short. This includes climate change and aviation emissions.⁵⁷ Given the failure of traditional international regulation of aviation emissions problem, regulatory design needs to break the barriers of a traditional international treaty-based approach and introduce innovative ideas. New governance theory provides a response to the failure of the current approach to aviation’s contribution to climate change, grounded in both a realistic analysis of the nature of the problem, and a solid theoretical framework. The value of new governance for regulating international aviation emissions will be discussed in Chapter 7.

Chapter 7 argues that we should regulate aviation emissions in the following way: a full range of parties should be involved, including both public and private parties (international organisations such as the UNFCCC and ICAO, nation states, the airline industry, IATA and NGOs); multiple regulatory instruments should be involved, including conventional command and control type regulatory mechanisms (a sectoral mitigation target and technology-based standards) and market-based instruments (fuel taxes and emissions trading); and multiple parties should be involved on different scales. This chapter picks up the arguments from previous chapters in identifying that the best solution is to agree an international sectoral target on reducing aviation emission through the UNFCCC-led climate change negotiations. Under the sectoral target, burden sharing in respect of aviation

public administration perspective, see Lester M. Salamon (ed.) *The Tools of Government: A Guide to the New Governance* (Oxford University Press, New York 2001).

⁵⁴ See also Marius Aalders & Ton Wilthaagen, ‘Moving Beyond Common-and-Control: Reflexivity in the Regulation of Occupational Safety and Health and the Environment’ (1997) 19 *Law & Soc. Pol.* 415; Khatarina Holzinger, Christoph Knill & Ansgar Schafer, ‘Rhetoric or Reality? New Governance in EU Environmental Policy’ (2006) 12 *Eur. L. J.* 403.

⁵⁵ Bradley C. Karkkainen, (n. 28), p. 473.

⁵⁶ David M. Trubek & Louise G. Trubek, (n. 32), p. 542.

⁵⁷ The value of new governance in solving climate change issue has been discussed, see Joanne Scott, ‘The Multi-level Governance of Climate Change’, in Paul Craig & Gráinne de Burca (eds.), *The Evolution of EU Law* (Oxford University Press, Oxford, 2010).

emissions should not be solely by nationality but through a multi-level approach. The developed/developing country dichotomy should be broken by considering changing contribution to the expansion of international aviation, and changing capacity for the provision of cleaner facilities for international aviation, as proposed in Chapter 3. Mitigation efforts will be made at multiple levels, by multiple parties, using multiple tools, as discussed in Chapters 4, 5 and 6. Chapter 7 also identifies a secondary approach based on the non-hierarchical decision-making of new governance. If a sectoral approach cannot be achieved, the multiple levels, parties and instruments take on a more central role. In this way, the international aviation emissions problem should move beyond the deadlock of conventional inter-state approaches and might recognise climate change as a multi-scalar problem that needs multi-scalar regulatory approaches.

3. Research Methodology

This thesis is based on doctrinal and theoretical legal analysis. It demands exhaustive analysis of the literature.

First, analysis of primary and secondary legal materials leads to the development of a clear thesis on the legal position with respect to aviation emissions. The international climate change agreements⁵⁸ and the Chicago Convention on Air Transportation⁵⁹ are the main primary sources. The UN Framework Convention on

⁵⁸ The international climate change law regime includes the provisions of the 1992 United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol of 1997, the Copenhagen Accord of 2009, the Cancun Agreements 2010, and the wealth of Party decisions and implementation activities occurring within the framework of those agreements. See Patricia Birnie, Alan Boyle & Catherine Redgwell, (n. 18) Chapter 6, pp. 356-377; Roda Verheyen, *Climate Change Damage and International law: prevention, duties and state responsibility*, (Martinus Nijhoff Publishers, Leiden, Boston, 2005), p. 43; Joanna Depledge, 'Crafting the Copenhagen Consensus: Some Reflections' (2008) 17/2 *RECIEL* 154; Lavanya Rajamani, 'From Berlin to Bali and beyond: killing Kyoto softly?' (2008) 57/4 *ICLQ* 909; Chris Spence, Kati Kulovesi, & María Gutiérrez, 'Great Expectations: Understanding Bali and the Climate Change Negotiations Process' (2008) 17/2 *RECIEL* 142; Anita M. Halvorsen, 'Global Response to Climate Change – From Stockholm to Copenhagen' (2007-2008) 85 *Denv. U. L. Rev.* 841.

⁵⁹ *Convention on International Civil Aviation* (adopted 7 December 1944, entered into force 4 April 1947) 15 UNTS 295 (Chicago Convention).

Climate Change⁶⁰ and the Kyoto Protocol⁶¹ are the starting point, together with international progress on a post-2012 climate change framework in the Copenhagen Accord⁶² and Cancun Agreements⁶³.

Secondly, I analyse the scholarly literature in a number of different legal fields. There is a limited literature explicitly addressing the linkage between aviation and climate change, but clearly that is the starting point. This thesis crosses disciplines within law, demanding analysis of scholarly literature in a number of fields. It is not possible to outline all of the scholarship here, but briefly, in the area of climate change regulation, the extensive literature on the UNFCCC climate change negotiations, the principle of CBDR and market-based mechanisms will be most significant. In aviation law, the literature on ICAO's international standards and recommended practices (SARPs), the rule-making function of ICAO and environmental auditing will be analysed for its relevance to the potential of ICAO to control aviation emissions. Literature on the EU ETS, including on the legality of its application to international aviation is needed in identifying the role of a single regulatory mechanism and efforts on regional level in regulating aviation emissions. Wider literature on international environmental law, e.g. monitoring, reporting and compliance (MRV), non-governmental organisations (NGOs) and economic instruments, is also necessary.

Thirdly, this thesis uses new governance theory as its theoretical framework. Given the failure of traditional international regulation of aviation emissions, regulatory design needs to break the barriers of a traditional top-down approach, moving beyond a complete reliance on international treaty making and introducing innovative ideas. New governance theory provides the idea of introducing "a governance turn"⁶⁴, away from traditional ways of governing, towards approaches that rely on a range of public and private actors at different levels of governance. So, new

⁶⁰ UNFCCC, (n. 5).

⁶¹ Kyoto Protocol, (n. 6).

⁶² *Copenhagen Accord*, Decision -/CP.15, found in Decisions adopted by COP 15, online available at <http://unfccc.int/meetings/cop_15/items/5257.php>, (Copenhagen Accord).

⁶³ The Cancun Agreements include decisions under both the sixteenth session of the Conference of the Parties (COP 16) to the UNFCCC (Decision -/CP.16), and the sixth Conference of the Parties serving the Meeting of the Parties to the Kyoto Protocol (COP/CMP 6) (Decision -/CMP.6), online available at <http://unfccc.int/meetings/cop_16/items/5571.php>, (Cancun Agreements).

⁶⁴ Beate Kohler-Koch & Berthold Rittberger, (n. 38).

governance provides the theoretical foundation upon which the failure of traditional regulatory approaches can be analyzed and the future of regulating aviation emissions can be explored. This theory also provides a response to the failure of the international approach to aviation's contribution to climate change, grounded in both a realistic analysis of the nature of the problem, and a solid theoretical framework. Drawing on new governance literature, I approach aviation emissions' impact on climate change through a scalar lens. The impact of international aviation emissions on climate change is not solely an international problem, but rather it is a multi-scalar one that deserves multi-scalar regulations. Introducing new governance theory in regulating aviation emissions aims to provide a theoretical overlay to the failure of traditional regulatory approaches; and to use the story of aviation emissions as a means of testing the ability of new governance theory to account in a "real life situation" for the failure of traditional, top-down regulation and to provide a solution. As such, the function of introducing new governance theory is two fold, both to challenge existing paradigms and to provide a solution.

This thesis attempts to state the law as at March 2011.

Chapter 2. Climate Change and Aviation

1. Introduction

In this chapter, I explore possible reasons, arising from the nature of the contribution of international aviation to climate change, that might begin to explain the difficulty of regulating aviation. After a brief introduction to the topic of climate change generally, this chapter examines aviation's contribution to climate change and analyses the particular difficulties faced in respect of international aviation. These include the difficulty of identifying the quantity of emissions involved in any flight and their atmospheric impacts; the difficulty in the balancing of any potential trade-off effects in environmental protection, aviation safety and air transport efficiency terms; and the difficulty in identifying who should take the mitigation responsibility. This analysis is crucial because only with a full understanding of the unique nature of aviation emissions can we tackle the complexity of designing legal regulations on the aviation climate change issue.

The focus of this thesis and the suggested priority of the legal regime should be on technical measures and technological innovations to improve energy intensity in the aviation sector. However, one of the challenges of the climate change impact of aviation is that the increase in aircraft emissions attributable to the anticipated growing demand for air travel is unlikely to be offset by any reductions in emissions achieved through technological improvements. As such, whilst it is not a focus of this thesis, I return to this briefly in my discussion of tax in Chapter 5, measures to alter demand, and encourage behaviour change towards a lifestyle with less flying will be necessary. This chapter focuses on recognizing the nature of the problem. The following chapters will explore the design of regulation in order to ensure that aviation continues to serve the human community in a way that does not threaten the global climate.

2. Climate Change

Climate change is now widely accepted as a real human-caused problem and a major threat to the worldwide human and natural environment. The climate change crisis (also known as global warming) results from anthropogenic “greenhouse gases” (GHGs) in the upper atmosphere and the harms of climate change have wide-ranging impacts on ecosystems which differ from many other environmental challenges.¹ Scientific warnings on this urgent problem are becoming clearer. The phenomenon of climate change has now moved from being a scientific question to the political stage.² This section examines the scientific understanding of climate change and the resulting need for policymakers to understand the significance of emissions control.

Scientific discussion of the climate change problem has a history going back more than a hundred years,³ although an international scientific and legal framework for dealing with climate change was only established in the 1990s.⁴ There are many scientific studies addressing the climate change problem. Among them, the most authoritative source on the consolidation of scientific data on climate change is the Intergovernmental Panel on Climate Change (IPCC).⁵ The IPCC was established by the World Meteorological Organisation (WMO) and the United

¹ See IPCC, *Fourth Assessment Report: Climate Change 2007*, online available at <http://www.ipcc.ch/publications_and_data/publications_and_data_reports.htm#1 > last accessed 22.02.10, (IPCC Fourth Assessment Report).

² See general, Dieter Helm (ed.), *Climate-change Policy* (Oxford University Press, Oxford 2005). It is beyond the scope of this chapter to neither identify the extent of the impact of climate change nor discuss the climate skepticism. See general, Mike Hulme, *Why We Disagree about Climate Change* (Cambridge University Press, Cambridge 2009).

³ Svante Arrhenius, ‘On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground’ (1896) 41/5 *London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science* 237; Roger Revelle & Hans E Suess, ‘Carbon Dioxide Exchange between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO₂ During the Past Decades’ (1957) 9 *Tellus* 18; James Hansen et al., ‘Climate Impacts of Increasing Carbon Dioxide’ (1980) 213 *Science* 957; Roger Revelle, ‘Carbon Dioxide and World Climate’ (1982) 247/2 *Scientific American* 35.

⁴ On the scientific aspect, the Intergovernmental Panel on Climate Change (IPCC) was established in 1988. It works on scientific assessments of climate change risk and impacts. On the legal aspect, the United Nations Framework Convention on Climate Change (UNFCCC) opened for signature on 9 May 1992, and entered into force on 21 March 1994.

⁵ *Ibid.* For the role of IPCC played as “policy-relevant” in ensuring a credible climate change regime, see Dagmar Lohan & Claudio Forner, ‘Science-Policy Interaction: Challenges for Ensuring a Credible Climate Change Regime’ (2005) 16 *Yearbook of International Environmental Law* 155.

Nations Environment Program (UNEP) to provide “decision-makers and others interested in climate change with an objective source of information about climate change.”⁶ The role of the IPCC is to “assess on a comprehensive, objective, open and transparent basis the latest scientific, technical and socio-economic literature produced worldwide” concerning human-caused climate change.⁷ The IPCC produces climate change assessments and technical papers which are underpinned by the contributions of climate scientists and other experts from around the world. Those assessments and papers are regularly cited by policymakers.

The IPCC has now produced four comprehensive climate change assessments which have expanded its statistical analysis over time.⁸ Its latest report released in 2007 (IPCC Fourth Assessment Report),⁹ is based on reports by the three Working Groups, which addressed the physical science basis of climate change, the impacts (including adaptation and vulnerability) of climate change and the mitigation of climate change.¹⁰ The Fourth Assessment Report declares that evidence of the warming of the climate system is “unequivocal” and this warming is “very likely”¹¹ due to the observed increase in anthropogenic GHG concentrations. The IPCC has warned that global warming of more than two degrees Celsius (2 °C) above 1990-2000 levels would have a variety of severe impacts, such as “increases in human mortality, loss of glaciers, increases in the frequency and/or intensity of extreme events,” “widespread loss of biodiversity, decreasing global agricultural productivity and commitment to widespread deglaciation of the Greenland and West Antarctic ice sheets.”¹²

Limiting temperature rise to 2 °C above pre-industrial levels means stabilizing

⁶ IPCC website, ‘about IPCC’, online available at <<http://www1.ipcc.ch/about/index.htm>> last accessed 22.02.10.

⁷ Ibid.

⁸ The first three reports were published in 1990, 1995 and 2001. IPCC decided to prepare a Fifth Assessment Report at its 28th Panel Sessions in April 2008. By the time of writing this thesis, IPCC has been seeking the widest selection of experts nominated from governments and participating organizations. The nomination period was opened on 15 January and closed on 12 March 2010. For the progress of the Fifth Assessment Report, see IPCC website at <<http://www.ipcc.ch/activities/activities.htm>> last accessed 06.10.10.

⁹ IPCC Fourth Assessment Report, (n. 1).

¹⁰ IPCC Working Groups Reports are available online at <www1.ipcc.ch/ipccreports/assessments-reports.htm> last accessed 06.10.10.

¹¹ IPCC, *Climate Change 2007: the physical science basis*, Contribution of Working Group I to the Fourth Assessment Report of IPCC, *ibid*, p. 10. “Very likely” is used to indicate a greater than 90 percent probability.

¹² Stephen H Schneider, Serguei Semenov & Anand Patwardhan, ‘Assessing Key Vulnerabilities and the Risk from Climate Change’ in IPCC, *Climate Change 2007: Impacts Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of IPCC, (n. 10), p. 781.

greenhouse gas emissions at 350 parts per million (ppm) CO₂ equivalent (CO₂-eq) at most.¹³ The total CO₂-eq concentration of all long-lived GHGs was estimated by the IPCC in 2007 to be about 455 ppm CO₂-eq.¹⁴ To achieve a 350 CO₂ ppm atmosphere, atmospheric CO₂ concentrations need to “be reduced quickly.”¹⁵ The IPCC report emphasized that if the world stopped emitting CO₂ today, the stock of CO₂ in the atmosphere in 2107 would remain at about 90 percent of what it is in 2007.¹⁶ As such, stabilization at 350 ppm CO₂ requires a substantial reduction of CO₂ concentrations in the atmosphere.

Policymakers are called on to “forestall climate change and to cope with its impacts.”¹⁷ Over the last two decades, climate change has matured into an issue of significant political concern and “has led to a profusion of legal developments that together coalesce to form the new body of law dubbed ‘climate change law’.”¹⁸ As a “new generation” issue characterised by diffuse sources and widespread effects,¹⁹ climate change represents challenges to conventional governance and regulatory systems.²⁰ Chapter 3 will identify those challenges in exploring the international climate change law regime and explain why it is difficult to achieve efficient,

¹³ CO₂eq is a unit of measurement used to compare the climate effect of all greenhouse gases in relation to each other. See H-Holger Rogner et al., Introduction, in IPCC, *Climate Change 2007: Mitigation of Climate Change*, Contribution of Working Group III to the Fourth Assessment Report of IPCC, (n. 10), p. 100. Aiming to stabilize greenhouse gases at 350 ppm CO₂-eq would reduce the mean probability of overshooting at a 2°C temperature rise to 7 percent. See Matt Vespa, ‘Why 350? Climate Policy Must Aim to Stabilize Greenhouse Gases at the Level Necessary to Minimize the Risk of Catastrophic Outcomes’ (2009) 36 *Ecology L. Currents* 185; Malte Meinshausen, ‘What Does a 2°C Target Mean for Greenhouse Gas Concentrations? A Brief Analysis Based on Multi-Gas Emission Pathways and Several Climate Sensitivity Uncertainty Estimates’ in Hans Joachim Schellnhuber (ed.), *Avoiding Dangerous Climate Change* (Cambridge University Press, Cambridge 2006), p. 268; James Hansen et al., ‘Target Atmospheric CO₂: Where Should Humanity Aim?’ (2008) 2 *Open Atmospheric Sci. J.* 217.

¹⁴ H-Holger Rogner et al., *ibid.*

¹⁵ Matt Vespa, (n. 13).

¹⁶ See IPCC Working Group I Report, (n. 11), FAQ 10.3. Hansen and his colleagues have also warned that “if the world continues on a business-as-usual path for even another decade without initiating phase-out of unconstrained coal use, prospects for avoiding a dangerously large, extended overshoot of the 350 ppm level will be dim.” James Hansen et al., (n. 13), p. 227.

¹⁷ Jonathan B. Wiener, ‘Radiative Forcing: Climate Policy to Break the Logjam in Environmental Law’ (2008-2009) 17 *N.Y.U. Envtl. L. J.* 210, 210; see also IPCC Working Group I Report, (n. 11), pp. 2-5.

¹⁸ Jacqueline Peel, ‘Climate Change Law: The Emergence of A New Legal Discipline’ (2008) 32 *Melb. U. L. Rev.* 922, 925. See also John C. Dernbach & Seema Kakade, ‘Climate Change Law: An Introduction’ (2008) 29 *Energy L. J.* 1.

¹⁹ Neil Gunningham & Darren Sinclair, ‘New Generation Environmental Policy: Environmental Management Systems and Regulatory Reform’ (1998) 22 *Melb. U. L. Rev.* 592.

²⁰ Jacqueline Peel, (n. 18).

effective and just regulations²¹ to reduce GHG emissions. In the next section, I will examine aviation's contribution to climate change and analyse the particular difficulties faced in respect of regulating international aviation emissions.²²

3. Aviation and Climate Change

International aviation has been experiencing fast growth, and is associated with a number of social and economic benefits and environmental harms, including impact on climate change. In climate change treaties,²³ international aviation is distinguished from other industry sectors and its effect on the climate has become an extremely difficult problem because of the sector's unique nature. This section sets out to provide an introduction to international aviation's contribution to climate change and to identify what makes the aviation sector unique in relation to climate change regulation. It concludes that technical measures are not likely to deal with the whole problem, legal regulations on aviation emissions should encourage measures to improve energy intensity in the aviation sector, and also (although as mentioned above, this is not a focus of this thesis) encourage less flying.

3.1. Effects of Aviation on Climate

Efficient approaches to counteracting increases in international aviation emissions rely on a clear understanding of the contribution of aircraft emissions to climate change. Published reports on the contribution of aircraft emissions to global warming started since the 1990s.²⁴ In 1999, the Intergovernmental Panel on Climate Change (IPCC) published a Special Report on *Aviation and the Global Atmosphere*

²¹ William Nordhaus & Joseph Boyer, *Warming the World* (MIT Press, Cambridge, Cambridge, Mass.; London 2000), p.76.

²² As noted in the introduction, the scope of this research covers only international civil aircrafts, which means it does not cover military aircraft emissions and domestic air traffic.

²³ See discussions in chapter 3, section 2.

²⁴ Anu Vedantham & Michael Oppenheimer, 'Aircraft Emissions and the Global Atmosphere' (Environmental Defense Fund, 1994) pp. 58-59, online available at <www.works.bepress.com/anu/3> last accessed 23.02.10.

(IPCC 1999 Report).²⁵ It represents “the most comprehensive assessment available of the effects of aviation on the global atmosphere.”²⁶ Even over a decade later, it still remains “a valuable referent point.”²⁷

The Report recognised the complexities of the science of aviation emissions and highlined some essential scientific understanding of aviation emissions, including that the aviation sector represents approximately 3.5 percent of the global anthropogenic radiative forcing (a measure of warming),²⁸ this was the result of a group of GHGs emitted from aircraft engines (including mainly CO₂, and NO_x, water vapour, sulphate aerosols and soot);²⁹ this was estimated to increase to 5 percent in 2050.³⁰ Many pieces of research have been carried out since the IPCC 1999 Report to further estimate the effects of aviation on climate.³¹ Total aviation radiative forcing was still 3.5 percent as updated in 2005 for 2000 by Sausen et al.³² Aviation emissions are projected to increase due to the expected growth in air travel.³³ The questions have shifted from “what is the magnitude of the (various) effects?” to “how can we reduce the (various) effects?” and “with what sort of metrics should we compare effects for mitigation?” and “what are the technological and atmospheric trade-offs in mitigation?”³⁴

3.5 percent of the total radiative forcing seems like a small number. In fact, it

²⁵ Joyce E. Penner et al. (eds.), *Aviation and the Global Atmosphere: Special Report of the International Panel on Climate Change* (Cambridge University Press, Cambridge 1999), (IPCC 1999 Report).

²⁶ *Ibid.*, back cover.

²⁷ David S. Lee, ‘Aviation and Climate Change: The Science’ in Stefan Gössling & Paul Upham (eds.) *Climate Change and Aviation: Issues, Challenges and Solutions* (Edward Elgar, London 2009), p. 28.

²⁸ Radiative forcing “is a measure of the importance of a potential climate change mechanism.” It “expresses the perturbation or change to the energy balance of the Earth-atmosphere system in watts per square meter (Wm⁻²).” IPCC 1999 Report, (n. 25), p. 3; For a more general explanation of climate concepts and metrics, see David S. Lee, *ibid.*, pp. 31-32.

²⁹ IPCC 1999 Report, *ibid.*, p. 21.

³⁰ *Ibid.*, p. 8.

³¹ For example, Guy P. Brasseur (ed.), ‘A report on the way forward based on the research gaps and priorities’ (Aviation Climate Change Research Initiative, 2008) Sponsored by the Environmental Working Group of the US NextGen Joint Planning and Development Office, available online at <www.faa.gov/about/office_org/headquarters_offices/aep/aviation_climate/> last accessed 23.02.10; David S. Lee et al. ‘Aviation and global climate change in the 21st century’ (2009) 30 *Atmospheric Environment* 1.

³² Total aviation radiative forcing in 2005 was still 3.5% (excluding induced cirrus) or 4.9% (including induced cirrus) of total anthropogenic forcing. Robert Sausen et al., ‘Aviation radiative forcing in 2000: An update on IPCC (1999)’ (2005) 14/4 *Meteorologische Zeitschrift* 555. See also David S. Lee et al., *ibid.*

³³ David S. Lee et al., (n. 31); Anu Vedantham & Michael Oppenheimer, ‘Aircraft Emissions and the Global Atmosphere’ (Environmental Defense Fund, 1994), pp. 58-59, online available at <www.works.bepress.com/anu/3> last accessed 23.02.10.

³⁴ David S. Lee, (n. 27), pp. 28-29.

is comparable with the entire impact of Canada's CO₂ emissions from all sources.³⁵ If this is still not impressive, the severity of the aviation emissions issue may be explained by considering the following three perspectives. First of all, the aircraft emissions are injected directly into the upper troposphere and the lower stratosphere. The impact of burning fossil fuels at altitude is about double that of burning the same fuels at ground level.³⁶ Second, the impact from the mix of emissions from aircraft goes far beyond the radiative effects of CO₂ alone. Such a mixture of exhaust species was estimated as being two to four times more than if the exhaust were CO₂ alone from aircraft causing radiative forcing.³⁷ Third, the aviation sector has been growing rapidly and is expected to continue to grow as the globalisation of industry and commerce has increased.³⁸ The most recent IPCC Fourth Assessment Report estimated that total air transport CO₂ emissions were 280 Mt in 2000 and 282 Mt in 2005. The report predicted that such emissions will be up to 584 Mt in 2010, 860 Mt in 2020, 1262 Mt in 2030 and 2377 Mt in 2050.³⁹ There is always some uncertainty in projections, and the industry experienced some publicized downturn after events such as the 11 September 2001 World Trade Centre attack and SARS (severe acute respiratory syndrome) outbreak and the recent widespread economic recession. According to the reports from the International Air Transport Association (IATA), released in June 2010, air travel and freight volumes are above

³⁵ John Whitelegg, *Aviation: the social, economic and environmental impact of flying* (Ashden Trust, London 2000) section 4.2. Impacts of Emissions.

³⁶ *Ibid.* See also Joosung J. Lee et al., 'Historical and Future Trends in Aircraft Performance, Cost, and Emissions' (2001) 26 *Annu. Rev. Energy Environ.* 167. This is taken into account in the 3.5% figure; however, it still means that a reduction of carbon emissions from aircraft is more effective than an equivalent reduction at ground level.

³⁷ IPCC 1999 Report, (n. 25).

³⁸ Andrew Macintosh & Lailey Wallace, 'International aviation emissions to 2025: Can emissions be stabilized without restricting demand?' (2008) CCLP Working Paper Series 2008/1, ANU Centre for Climate Law and Policy; UK Royal Commission on Environmental Pollution, 'The Environmental Effects of Civil Aircraft in Flight' (November 2002) online available at <<http://www.rcep.org.uk/reports/index.htm>>; Heather L. Miller, 'Civil Aircraft Emissions and International Treaty Law' (1997-1998) 63 *J. Air L. & Com.* 697. See also Laurie Michaelis, OECD, Special Issues in Carbon/Energy Taxation: Carbon Charges on Aviation Fuels, 'Policies and Measures for Common Action' Working Paper 12, Annex I Expert Group on the UNFCCC, Supported by the Organization for Economic Cooperation and Development and the International Energy Agency, p. 5 (March 1997); David S. Lee, (n. 27), Emissions trends from 1970 to 2005 in Figure 2.1, p.30.

³⁹ Working Group III, IPCC, (n. 13), pp. 334-335.

pre-recession levels⁴⁰ and airlines are expecting to have 16 billion travellers and handle 400 million tonnes of cargo in 2050 (a strong growth from 2.4 billion passengers and 43 million tonnes of cargo now).⁴¹ The recovery of the industry indicates that the civil aviation industry is resilient and the growth of aviation has continued.⁴² From these three perspectives, per-unit reduction in aviation emissions may be relatively more effective and urgent as a way of combating climate change than equivalent emissions from ground sources.

3.2. Challenges of Regulating Aviation Emissions

Much of the growth in aviation can be attributed to growth in international flights.⁴³ Curbing the growth in international aviation emissions raises a number of difficult legal issues, particularly in relation to the potential of international negotiation to share reduction obligations among countries and the ability of countries to impose carbon prices on aviation (to be discussed in Chapter 3 to 6). The challenges rest on the unique characteristics of international air transportation and its emissions.

First of all, there is a fundamental difficulty in identifying the quantity of emissions involved in any flight and their atmospheric impacts evolved. For example, we could refer to the average CO₂ emissions per passenger km (pkm), which vary in different flights, because the occupancy rate, distance flown, take-off weight, atmospheric conditions and operational conditions all have significant impacts on energy use and emissions.⁴⁴ As most medium and long distance flights carry both passengers and freight, assessing the emissions for both of them is

⁴⁰ IATA, 'Airlines Financial Monitor' (May-June 2010), online available at <<http://www.iata.org/whatwedo/Documents/economics/AirlinesFinancialMonitorJune10.pdf>> last accessed 30.06.10.

⁴¹ Giovanni Bisignani, 'State of the Air Transport Industry' (7 June 2010) Director General and CEO of IATA, speech on the 66th IATA Annual General Meeting and World Air Transport Summit, Berlin, Germany, online available at <<http://www.iata.org/pressroom/speeches/Pages/2010-06-07-01.aspx>> last accessed 30.06.10.

⁴² David S. Lee, (n. 27).

⁴³ See ICAO, Annual Report of the Council (ICAO, Canada, 1991 to 2008) and International Air Transport Association (IATA), World Air Transport Statistics (54th ed., IATA, Canada, 2010).

⁴⁴ Paul Peeters & Victoria Williams, 'Calculating Emissions and Radiative Forcing' in Stefan Gössling and Paul Upham, (n. 27), p. 69.

extremely difficult.⁴⁵ What is more, aircraft have different energy intensities depending on the aircraft type and flight distance. For example, a Boeing MD81 has 44 percent higher emissions than a Boeing 737- 800 for a same distance flight.⁴⁶ For the same aircraft, the most energy efficient flight exists at medium distances,⁴⁷ because the energy-intensive take-off and climb sections comprise a relatively large share at a short distance, while the amount of fuel carried at take-off and climb-out requires extra energy on a long distance flight.⁴⁸ In addition, the impact of non-CO₂ emissions is dependent on the altitude and location of emissions.⁴⁹ It is currently not possible to use a radiative forcing index to compare different GHG emissions.⁵⁰

Second, regulation of aviation emissions as of any economic activity has to take notice of some trade-offs between different policy goals. For instance, focusing attention on reducing aircraft emissions of CO₂ may increase NO_x emissions.⁵¹ A wide range of objectives, including safety, reliability, noise, emissions and fuel efficiency are challenging aircraft engine design. Some of these objectives, unfortunately, are in conflict.⁵² More importantly, policymakers have to balance the environmental requirements and economic or social contributions of aviation. While the environmental impacts of air transport have been well recognised, it is worth noting the benefits of air transport, including its effect on international trade, international business and tourism.⁵³ An industry report said that:

“Air transport is an innovative industry that drives economic and social progress. It connects people, countries and culture; provides access

⁴⁵ Ibid., pp. 72-73.

⁴⁶ Ibid., p. 74. See also SAS Group, ‘Emission Calculator’ (2004) online available at <www.sasems.port.se/emissioncalc.cfm?sid=Calculate> last accessed 24.02.10.

⁴⁷ According to UK Royal Commission on Environmental Pollution’s report, the most fuel-efficient flight distance is around 2,300 nautical miles (4,300 km or 2,700 miles). In this thesis, short haul flight means flights are less than 1,000 nautical miles, long distance flights are more than 5,000 nautical miles, the distances in between are treated as medium distances. See UK Royal Commission on Environmental Pollution, (n. 38).

⁴⁸ Ibid., p. 73.

⁴⁹ IPCC 1999 Report, (n. 25), p. 199.

⁵⁰ Piers M. de F. Forster, Keith P. Shine, & Nicola Stuber, ‘It is premature to include non-CO₂ effects of aviation in emission trading schemes’ (2006) 40 *Atmospheric Environment* 1117; Andrew Macintosh & Lailey Wallace, (n. 38).

⁵¹ Paul Peeters & Victoria Williams, (n. 44), p. 82; Heather L. Miller, (n. 38); David S. Lee et al., (n. 31).

Nitrogen oxides (NO_x) comprise nitric oxide (NO) and nitrogen dioxide (NO₂). NO_x emissions have warming when they result in the production of ozone (O₃) in the troposphere or cooling effects when chemical reactions associated with NO_x remove methane (CH₄) from the atmosphere. Robert Sausen et al, (n. 32).

⁵² Heather L. Miller, *ibid*; David S. Lee et al., *ibid.*; see also Paul Page, ‘U.S. Wants Airline Emissions Studied by Global Panel on Aviation Environment’ (December 11, 1995) *Traffic World*, p. 39.

⁵³ Laurie Michaelis, (n. 38); Heather L. Miller, (n. 38).

to global markets and generates trade and tourism. It also forges links between developed and developing nations. benefits [of air transport] including the creation of jobs; contribution to gross domestic product (GDP) and tourism development; and the provision of humanitarian aid and medical assistance.”⁵⁴

The aviation industry has brought many economic benefits to society, including directly generating employment and wealth, and indirectly impacting on the performance of other industries. The economic contribution of aviation industry to the domestic economy has been used as a source of information for making domestic policies on the future development of air transport.⁵⁵ Especially, the indirect economic benefits of air transport, known as the “catalytic” or “spin-off” benefits of air transport,⁵⁶ affect industries “across the whole spectrum of economic activity” including facilitating world trade, being indispensable for tourism, and improving productivity by “encouraging investment and innovation, improving business operations and efficiency; and allowing companies to attract high quality employees.”⁵⁷ The economic benefits attributable to any industry are always contentious. However, the recent event of six days without aviation in large parts of the European continent as a result of the ash plume from an Icelandic volcano has shown clearly how the global economy would lose without aviation. Bisignani has said that

“April gave us a vivid picture of life without aviation. Ten million people were stranded. Hotels and convention centers were empty. Seafood and flowers rotted. And just-in-time production was delayed. The volcano cost the global economy \$5 billion – far more than the \$1.8 billion of lost airline revenue. The volcano’s eruption was a wake-up call. It reminded us that without air connectivity, modern life is not possible.”⁵⁸

⁵⁴ Air Transport Action Group (ATAG), ‘The Economic and Social Benefits of Air Transport 2008’ (2008) online available at <http://www.iata.org/pressroom/Documents/atag_economic_social_benefits_2008.pdf> last accessed 11.05.10.

⁵⁵ There are two studies on the economic impact of air transport taken by the consultancy Oxford Economic Forecasting (OEF) have been used by the UK policymakers on the development of UK air transport. One is that ‘The Contribution of the Aviation Industry to the UK Economy’ (1999) was used as a source of economic information in ‘The Future of Air Transport White Paper.’ Another is that ‘The Economic Contribution of the Aviation Industry in the UK’ (October 2006) was used as a source in the ‘Air Transport White Paper Progress Report 2006’ See OEF website on <www.oef.com>.

⁵⁶ ATAG, (n. 54), p. 6.

⁵⁷ Ibid. See also Ryan Tam & R. John Hansman, ‘Impact of Air Transportation on Regional Economic and Social Connectivity in the United States’ (2002), AIAA Aircraft Technology, Integration, and Operations Forum, Los Angeles, CA, October 2002.

⁵⁸ The figure is uncertain because that IATA represents the airline industry interest. However, it is very likely that the global economy would lose without aviation. IATA Press Releases, ‘Four Cornerstones of Change – IATA Launches Vision 2050’ (7 June 2010), online available at <<http://www.iata.org/pressroom/pr/Pages/2010-06-07-02.aspx>> last accessed 30.06.10.

Apart from the economic activity it generates or facilitates, air transport also has social benefits, which include at least:

- “- making foreign travel and a wider range of holidays available;
- increasing understanding of different cultures and nationalities;
- supporting the development of multicultural societies;
- and improving living standards by widening choice”⁵⁹

The public “had been enthusiastic about aviation” for about a hundred years.⁶⁰ It was regarded as “amazing and chic” in its incipiency.⁶¹ When flying is no longer such a luxury, more and more people have been enjoying the social benefits of air transport. Now, the flights of travellers to visit their family and friends are called “love miles.”⁶² “It is hardly thinkable that aviation could be eliminated,” even now that the “unintended adverse consequences” of air flying have been recognised.⁶³ In distributional terms, the relative affordability of air transport today seems to mean that the middle classes fly more,⁶⁴ although others argue that “the broadening of the collective horizon is likely to benefit society generally, even though the proportion of the global population who are able to travel in this way remains small.”⁶⁵ For policymakers, the economic and social benefits of air transport provide enough reasons to develop policies to support the industry. “Job creation and economic growth” and “positive social consequences in terms of enhanced opportunities and choices” are the most obvious benefits of international aviation.⁶⁶ Although it is difficult to quantify such benefits, air travel, at least, takes less time and has less risk of accidents than other transportation modes.⁶⁷ As such, regulations on international aviation emissions should be established in the tension between mitigating the environmental impact of air transport and preserving and enhancing its economic and social benefits. There is no single solution which will satisfy all of the social,

⁵⁹ Air Transport Action Group, (n. 54), p. 11.

⁶⁰ Daniel M. Warner, ‘Commercial Aviation: An Unsustainable Technology’ (2009) 74 *J. Air L. & Com.* 553, 554; See also Joseph J. Corn, *The Winged Gospel*, (Oxford University Press, Oxford 1983).

⁶¹ Daniel M. Warner, *ibid.*, p. 592.

⁶² *Ibid.*, See also George Monbiot, *Heat: How to Stop the Planet from Burning* (Penguin, London 2007) p. 177.

⁶³ Daniel M. Warner, (n. 60), p. 553.

⁶⁴ Sally Cairns & Carey Newson, *Predict and decide: Aviation, climate change and UK policy* (Oxford University Press, Oxford 2006).

⁶⁵ UK Royal Commission on Environmental Pollution, (n. 38), p. 6.

⁶⁶ Robert Caves, ‘The Social and Economic Benefits of Aviation’ in Stefan Gössling and Paul Upham (eds.) *Climate Change and Aviation: Issues, Challenges and Solutions* (Edward Elgar, London 2009), p. 36.

⁶⁷ *Ibid.*

economic and environmental concerns of flying.

Third, the international nature and complex structure of air transport sector has confused regulators in identifying who should take the mitigation responsibility. This is in part about allocating responsibilities to states. While the industry has been experiencing worldwide cooperation in providing “seamless” service on air travel,⁶⁸ it is difficult to identify the emitters in a single journey. One of the major forms of cooperation between airlines from different countries is code sharing. In essence, this is an agreement between two airlines by which airlines offer a flight under two different codes. This means that one aircraft is flown but the non-operating airline can sell the flight as its own. Code sharing has become a common practice worldwide which may “involve the entire network or selected parallel and/or connecting routes of two or more large airlines, or a large airline sharing its code with a smaller or regional airline.”⁶⁹ For example, on a one-way flight from London to Shanghai, a passenger may have bought a ticket from Lufthansa Airline, started the journey with a Boeing 747 from London to Frankfurt, changed to an Airbus A380 and continued the journey to Beijing, and changed again to an Air China service flight to Shanghai to finish the journey. This trip includes both international travel and domestic travel with different airlines and different aircrafts. From a legal perspective, no single jurisdiction can be identified. Thus, a technical difficulty facing regulators seeking to address international aviation emissions is how to identify who “owns” the emissions. What is more, the aviation industry is not a homogeneous sector. The structure of this business involves “a highly heterogeneous array of actors.”⁷⁰ Meersman and his colleagues have examined the structure of the relationships between all the actors in the air cargo business case.⁷¹ The major actors, as they have identified, include airline companies, shippers, agents, forwarders, terminal operating companies (handling and storage) and hinterland

⁶⁸ IATA, ‘Simplifying the Business’ see IATA website at <<http://www.iata.org/whatwedo/stb/Pages/index.aspx>> last accessed 13.05.10.

⁶⁹ Adrianus D. Groenewege, *Compendium of International Civil Aviation*, (2nd edition, IADC, Montreal 1998/1999), p. 438; see also Ian Humphreys, ‘Organizational and growth trends in air transport’ in Stefan Gössling & Paul Upham, (n. 27), pp.26-28.

⁷⁰ Rosário Macário & Eddy Van de Voorde, ‘The Impact of the Economic Crisis on the EU Air Transport Sector’ (2009) Directorate General for Internal Policies, Policy Department B: Structural and Cohesion Policies, The European Parliament’s Committee on Transport and Tourism, p. 9, online available at <www.europarl.europa.eu/studies> last accessed 13.05.10.

⁷¹ Hilde Meersman, Eddy Van de Voorde & Thierry Vanelslander, ‘The Air Transport Sector after 2010: A Modified Market and Ownership Structure’ (2008) 8/2 *European Journal of Transport and Infrastructure Research* 71, p. 77.

transport companies.⁷² A similar structure can be shown for the case of air passengers and the integrator of business. From the environmental responsibility perspective, it is not important to know who provides which services to whom, but the extent to which these actors are dependent upon each other shows how difficult it is to distribute emissions mitigation responsibility. Since “each company operating in the air transport business may have committed to different types of agreement with different players,”⁷³ cooperation between subsectors in the air transport industry is in different structures. The different kinds of links between the various actors indicate the complexity to identify every actor’s specific responsibility to combat climate change. In the international system, thus, allocation of responsibilities to states is difficult. Much of the fuel that is used in international transport occurs in or over the territory of countries that have no direct involvement in the relevant transport movement.

Apart from the above three points, some of the other characteristics of air transport which challenge regulatory design on aviation emissions will be discussed in the following chapters. For example, the facts that development of low-cost airlines boosts artificial demand for air transport, and that there is no realistic alternative transport mode for long distance flight will be discussed in Chapter 5. These challenges to the regulation of aviation emissions are not fatal, but all of these considerations mean that international aviation must be singled out from other service sectors in terms of designing regulations on GHG emissions.

3.3. Regulating Aviation Emissions

From the above discussion, it is clear that there is no single solution to reduce air transport emissions without negative side effects. Climate change has become a condition⁷⁴ under which policymakers value the air transportation and decide what to do about its increasing emissions. This section identifies that legal regulations should prioritise the encouragement of measures to improve energy intensity in the

⁷² Other service providers include cargo handlers, customs brokers and air traffic Control Customs, Airplane maintenance, Catering services, Fuel providers. Ibid.

⁷³ Ibid., p. 76.

⁷⁴ Climate change is more than an issue which needs to be solved. It “is changing the way we think, feel and act.” See Mike Hulme, (n. 2), especially chapter 4 ‘The Endowment of Value.’

aviation sector. Because this is unlikely to suffice, well balanced regulations need to be designed to manage demand for more aviation service.

There are two kinds of technical measures to improve energy intensity in the aviation sector. Neither is likely to curb the growth of aviation emissions without also cutting demand. One kind of technical measures is reducing emissions from source through technological improvements on fuel efficiency of aircraft, including aerodynamic changes, weight reductions, more fuel-efficient engines, and increased operational efficiency.⁷⁵ Some efficiency gains have come about through phasing-out of older aircraft, introducing improved airframe aerodynamics and material changes that have reduced weight, and improving air traffic management. For example, the introduction of turbofans on aircraft improved fuel efficiency by more than 60% than jet aircraft.⁷⁶ Fuel efficiency of aircraft may also be improved through replacing fossil fuels with alternative fuels to kerosene in the longer-term. However, these technological improvements usually impose challenges. For example, design changes of aircraft in improving engine fuel efficiency have trade-offs between noise and emissions performance and requires testing to ensure compliance with safety and reliability requirements.⁷⁷ Air traffic management systems provide “a one-off saving and not one that could be incrementally further improved upon.”⁷⁸ Biofuels may be technically available for civil aviation, but there are concerns that they are not commercially practical and trigger land-usage conflicts between food and fuel production.⁷⁹ The International Civil Aviation Organisation (ICAO) initiated the development of a Global Framework for Aviation Alternative Fuels in 2009, but it recognised that it may be premature to use alternative fuels to solve the aviation emissions problem.⁸⁰ Each technological

⁷⁵ David S. Lee et al. (n. 31); Stefan Krüger Nielsen, ‘Air travel, life-style, energy use and environmental impact’ (2001) Danish National Research Database, BYG Report, online available at <[http://forskningsdatabasen.dk/Search.external?operation=search&search-query=au:"Nielsen+Stefan%20Kruger"](http://forskningsdatabasen.dk/Search.external?operation=search&search-query=au:)> last accessed 23.02.10.

⁷⁶ David S. Lee et al., *ibid.*

⁷⁷ *Ibid.*

⁷⁸ *Ibid.*

⁷⁹ *Ibid.*

⁸⁰ See ICAO, ‘Conference on Aviation and Alternative Fuels’ Rio de Janeiro, Brazil, 16 to 18 November 2009, Global Framework for Aviation Alternative Fuels, ICAO working paper

improvement requires a large investment with no guaranteed result.⁸¹ As such, technological improvements on fuel efficiency of aircraft should be encouraged, but it is not a stand-alone solution to reduce aviation emissions.

Another kind of technical measures is to counteract the effects of changes in atmospheric chemistry through large-scale engineering of our environment.⁸² These are actions that might qualify as geoengineering – a modern concept taken to mean proposals to deliberately manipulate the Earth’s climate so as to counteract the effects of climate change from greenhouse gas emissions. It is a matter of “using technology to try to slow the global temperature rise by either removing carbon dioxide (CO₂) directly from the atmosphere or reflecting solar radiation back into space.”⁸³ Given that geoengineering of the Earth’s climate is “very likely to be technically possible,”⁸⁴ it offers a hope of temporarily reversing some aspects of climate change and taking early and effective action to preserve the natural climate whilst greenhouse gas emissions (including the emissions from air transport) are brought under control and removed from the atmosphere by natural or artificial processes. As such, geoengineering strategies can be regarded as part of the technical measures proposed by scientists and engineers rather than an alternative to emissions control.⁸⁵ In 2009, the Royal Society published the findings of a wide

CAAF/09-WP/23, 18/11/09, online available at

<http://www.icao.int/CAAF2009/Docs/CAAF-09_WP023_en.pdf> last accessed 15.05.10.

⁸¹ Paul Peeters, Victoria Williams & Alexander de Haan, ‘Technical and Management Reduction Potentials’; Paul Upham, Julia Tomei and Philip Boucher, ‘Biofuels, Aviation and Sustainability: Prospects and Limits’ in Stefan Gössling & Paul Upham, (n. 27).

⁸² The Royal Society, *Geoengineering the Climate: Science, Governance and Uncertainty* (The Royal Society, UK September 2009) Report 10/09 RS 1636. Some other notable organisations, such as NASA and the Institution of Mechanical Engineers, have also held studies aimed at discovering and evaluating current knowledge of the geoengineering. See Lee Lane et. al., ‘Workshop Report on Managing Solar Radiation’ NASA/CP – 2007 – 214558, online available at

<<http://event.arc.nasa.gov/main/home/reports/SolarRadiationCP.pdf>>; Tim Fox et. al., ‘Climate Change: Have We Lost the Battle’ (November 2009) Institution of Mechanical Engineers, online available at: <http://www.imeche.org/NR/rdonlyres/77CDE5E4-CE41-4F2C-A706-A630569EE486/0/IMEchE_MAG_Report.PDF> last accessed 13.05.10; Tim Fox et. al., ‘Geo-Engineering Giving Us the Time to Act’ (August 2009) Institution of Mechanical Engineers, online available at <<http://www.imeche.org/NR/rdonlyres/448C8083-F00D-426B-B086-565AA17CB703/0/IMEchEGeoengineeringReport.pdf>> last accessed 13.05.10.

⁸³ Tim Fox et. al., ‘Climate Change: Have We Lost the Battle’, *ibid.*

⁸⁴ The Royal Society, (n. 82).

⁸⁵ T.M.L. Wigley, ‘A Combined Mitigation/Geoengineering Approach to Climate Stabilization’ (2006) 314/5798 *Science* 452. See also, Alex Steffen, ‘Geoengineering and the New Climate Denialism’ (2009) online available at <<http://www.worldchanging.com/archives/009784.html>> last accessed 13.05.10.

ranging study into geoengineering schemes, including “carbon dioxide removal” and “solar radiation management” approaches.⁸⁶ The report evaluated geoengineering in terms of its effectiveness, affordability, timeliness and safety and it recommended that geoengineering be pursued as part of a wider package of options for addressing climate change.⁸⁷ The Royal Society also recommended that “Parties to the UNFCCC should make increased efforts towards mitigating and adapting to climate change, and in particular to agreeing to global emissions reductions”, and that “[nothing] now known about geoengineering options gives any reason to diminish these efforts.”⁸⁸ So far, there is no general consensus that geoengineering is an appropriate or effective solution to combating climate change, but it should be researched.⁸⁹ Many environmental groups and campaigners are reluctant to endorse geoengineering. For example, Friends of the Earth and Greenpeace have typically been reluctant to advocate geoengineering for fear of weakening the fragile political consensus to cut greenhouse gas emissions.⁹⁰ Geoengineering is one category of the technical measures that need to accompany emissions control technical methods that may contribute to reducing the climate impacts of greenhouse gas emissions. Legal regulations should support research and development, improving our understanding

⁸⁶ The Royal Society, (n. 82). Similarly to the Royal Society report, Lenton and Vaughan also divided geoengineering into “carbon dioxide removal” and “solar radiation management” approaches that respectively address longwave and shortwave radiation. See T.M. Lenton & N.E. Vaughan, ‘The Radiative Forcing Potential of Different Climate Geoengineering Options’ (2009) 9 *Atmos. Chem. Phys.* 5539.

⁸⁷ The Royal Society, *ibid.*

⁸⁸ *Ibid.*, p. ix; There are various criticisms have been made of geoengineering. See for example, ‘AMS Policy Statement on Geoengineering the Climate System’ A Policy Statement of the American Meteorological Society, adopted by the AMS Council on 20 July 2009, online available at <http://www.ametsoc.org/policy/2009geoengineeringclimate_amsstatement.pdf> last accessed 13.05.10.

⁸⁹ See Sarah Polborn & Felix Tintelnot, ‘How Geoengineering May Encourage Carbon Dioxide Abatement’ (May 2009) online available at <<http://ssrn.com/abstract=1413106>>; Gareth Davies, ‘Law and Policy Issues of Unilateral Geoengineering: Moving to a Managed World’ (January 2009) online available at <<http://ssrn.com/abstract=1334625>> last accessed 13.05.10.

⁹⁰ David Adam, ‘Extreme and risky action the only way to tackle global warming, say scientists’ (1 September 2008) *Guardian Newspaper* (London), online available at <<http://www.guardian.co.uk/environment/2008/sep/01/climatechange.scienceofclimatechange2>>; Doug Parr, ‘Geo-engineering is no solution to climate change’ (23 May, 2009) *Guardian Newspaper* (London) online available at <<http://www.guardian.co.uk/environment/2008/sep/01/climatechange.scienceofclimatechange1>>; Royal Geographical Society website at <<http://www.21stcenturychallenges.org/focus/geo-engineering/>> last accessed 13.05.10.

and encouraging the implementation of geoengineering.⁹¹

The deep uncertainty around both categories of technical measures addressed above, together with continued projected growth in aviation, suggests that aviation emissions cannot be stabilised without addressing demand. The effectiveness of technical measures is hampered by two obstacles. First, any new and different technology, in general, would take “several decades to develop and be certified and another three decades to be introduced into the whole fleet.”⁹² And in any event, international aircraft have relatively long commercial lifetimes (15 – 35 years),⁹³ and so regulatory intervention is necessary to promote the deployment of state of the green technology at a faster rate⁹⁴ and of demand control at the same time. Second, technological and operational developments are estimated as likely to offset no more than a third of total emissions growth,⁹⁵ as aviation demand is estimated as likely to increase by 150-800 percent by 2050.⁹⁶ A recent analysis addressed that “[a] traffic growth rate of 5% per annum carried through to 2050, along with the current fuel efficiency improvements of 1% per annum and a high-end estimate reduction of 80% in CO₂ emissions through use of alternative fuels would still result in aviation CO₂ levels similar to those of today.”⁹⁷ In other words, the increase in aircraft emissions attributable to the expected growing demand for air travel is unlikely to be offset by reductions in emissions achieved through technological improvements. So, if significant reductions are to be achieved, the development of lifestyles with less reliance on flying must also be involved.⁹⁸ Cutting demand requires aggressive regulations to promote behaviour change, includes encouraging use of internet conference to replace part of business travelling, promoting domestic holidays to

⁹¹ See Robert W. Hahn, ‘Climate Policy: Separating Fact from Fantasy’ (2009) 33 *Harv. Envtl. L. Rev.* 557; David G. Victor, ‘On the Regulation of Geoengineering’ (2008) 24/2 *Oxford Review of Economic Policy* 322.

⁹² Paul Peeters, Victoria Williams & Alexander de Haan, (n. 81), p.304.

⁹³ ICAO, ‘ICAO Environmental Report 2007’, online available at <http://www.icao.int/icao/en/env/pubs/Env_Report_07.pdf> last accessed 13.05.10.

⁹⁴ Andrew Macintosh & Lailey Wallace, (n. 38).

⁹⁵ Joosung J. Lee et al., (n. 36).

⁹⁶ Paul Peeters, Victoria Williams & Alexander de Haan, ‘Technical and Management Reduction Potentials’ in Stefan Gössling & Paul Upham, (n. 27), p. 304.

⁹⁷ Chris Lyle, ‘Aviation after Copenhagen: ICAO must now develop a bold strategic vision’ (2010) online available at <<http://www.centreforaviation.com/news/2010/02/10/aviation-after-copenhagen-icao-must-now-develop-a-bold-strategic-vision/page1>> last accessed 15.05.10.

⁹⁸ Daniel M. Warner, ‘Commercial Aviation: An Unsustainable Technology’ (2009) 74 *J. Air L. & Com.* 553; John Whitelegg, ‘The Case for ‘No Growth’’ in Stefan Gössling & Paul Upham, (n. 27), p. 237; Andrew Macintosh & Lailey Wallace, (n. 38); UK Royal Commission on Environmental Pollution, (n. 38), pp.3, 31-38.

reduce international air travel, and encouraging take high-speed train on short distance travels etc. Whilst demand management is not a key element of this thesis, Chapters 5 and 6 on market-based instruments will touch on these issues.

4. Conclusion

The analysis of the complexity of the nature of aviation's contribution to climate change is fundamental to explaining the difficulty of regulating aviation at an international level and to identifying opportunities to overcome obstacles in combating aviation emissions with an innovative legal architecture. This chapter argues that three things make the contributions of aviation to climate change particularly serious and three things make it legally challenging. So in terms of severity: aircraft emissions are injected directly into the upper troposphere and the lower stratosphere; the impact from the mixture of emissions from aircraft goes far beyond the radiative effects of CO₂ alone; and the rapid growth of air transport is driving the increase in aircraft emissions. These three issues suggest that per-unit reduction in aviation emissions may be relatively more effective and urgent as a way of combating climate change than equivalent emissions from ground sources. In terms of challenge: it is difficult to identify the quantity of emissions involved in any flight and their atmospheric impact; it is difficult to balance potential trade-off effects in environmental protection, aviation safety and air transport efficiency terms; and it is difficult to identify who should take the mitigation responsibility. These three challenges are not fatal, but they represent key difficulties resting on the unique characteristics of air transportation and its emissions. The analysis of these challenges explains why international aviation must be singled out from other service sectors in terms of regulating greenhouse gas emissions. Only with a full understanding of the unique nature of aviation emissions can we tackle the complexity of designing legal regulations on the aviation climate change issue.

Within a limited time scale, legal regulation needs new ideas to decide what to

do about aviation's increasing emissions. In this context, curbing aviation emissions represents a bigger challenge than do climate concerns from other sectors. The increase in aircraft emissions attributable to the expected growing demand for air travel is unlikely to be offset by reductions in emissions achieved through technological improvements. I argue in this chapter that legal regulation of aviation emission should encourage the improvement of energy intensity through technical measures in the aviation sector and encourage behaviour change towards a lifestyle with less flying. The following chapters will explore how to design legal regulations on aviation emission in order to ensure that aviation continues to serve the human community in a way that does not threaten the global climate.

Chapter 3. Aviation Emissions in International Law

1. Introduction

In this chapter, I explore the obstacles to reducing aviation emissions in the existing international climate change law regime. Such obstacles might explain why the path towards an international climate change agreement that covers the aviation sector is proving slow. I argue that aviation emissions are best addressed through a sectoral approach rather than within general mitigation targets. This means that a comprehensive climate change law regime should identify a mitigation target on the aviation sector at the international level. I argue that the best approach is an international allocation of mitigation responsibilities by the UNFCCC system through a sophisticated burden sharing arrangement. There are however difficulties in practice, and an alternative form of allocation through a global emission trading scheme will be explored in Chapter 6.

After a brief review of the development of the international climate change law regime, this chapter examines two legal obstacles to reducing aviation emissions: the vague objective and the inadequate mitigation targets in the existing climate change agreements led by the UNFCCC. First of all, I explain why the vagueness of the “ultimate objective” as set out in Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC),¹ is a barrier to progress from two perspectives: the standards provided by the “ultimate objective” and its arguable legal status.

Then, I examine the current mitigation targets in three parts. First, I examine the mitigation commitments of Annex I countries of the Kyoto Protocol,² under the

¹ *United Nations Framework Convention on Climate Change*, 9 May 1992, 1771 U.N.T.S. 107 (entered into force 21 March 1994), (UNFCCC).

² *Protocol to the United Nations Framework Convention on Climate Change*, 11 December 1997, U.N. Doc. FCCC/CP/1997/7/Add. 1 at 7, (Kyoto Protocol).

Kyoto Protocol, Copenhagen Accord³ and the Cancun Agreements⁴, and explain why they are too weak to curb the growth of global emissions. Second, I explain why the absence of quantitative mitigation commitments from non-Annex I countries, and the failure of the Copenhagen⁵ and Cancun⁶ to require mitigation commitments from developing countries, is a mistake. Third, I examine the reasons for the division between Annex I and non-Annex I countries in the burden sharing principle, which might explain the barriers to reaching agreement on adequate mitigation targets. To this end, I examine the principle of common but differentiated responsibility (CBDR), identify the role of the CBDR principle in the structuring of the climate regime and analyse the basis of differential treatment. I argue that simplistic and uncertain understandings of the CBDR principle are a barrier to reaching agreement on reducing aviation emissions, and more generally.

The final section discusses aviation more specifically. I argue that aviation emissions are best addressed through a sectoral approach rather than within general mitigation targets. A mitigation target on the aviation sector should be identified at the international level in the UNFCCC system. Burden sharing in respect of aviation emissions should not be by nationality but through a multi-level approach. It should also break the developed/developing country dichotomy. Differential treatment should consider the contribution to the expansion of international aviation at the regional, and city level as well as at the national level; consider countries' changing contributions to aviation emissions; and consider their changing capacity for the provision of cleaner facilities for international aviation. This would allow the international target for international aviation to be shared between state Parties in an

³ *Copenhagen Accord*, Decision -/CP.15, found in Decisions adopted by COP 15, online available at <http://unfccc.int/meetings/cop_15/items/5257.php>, (Copenhagen Accord).

⁴ The Cancun Agreements include decisions under both the sixteenth session of the Conference of the Parties (COP 16) to the UNFCCC (Decision -/CP.16), and the sixth Conference of the Parties serving the Meeting of the Parties to the Kyoto Protocol (COP/CMP 6) (Decision -/CMP.6), online available at <http://unfccc.int/meetings/cop_16/items/5571.php>, (Cancun Agreements).

⁵ The UN Climate Change Conference in Copenhagen, Denmark from 7 to 18 December 2009, including the fifteenth session of the Conference of the Parties (COP 15) to the UNFCCC, and the fifth Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/CMP 5).

⁶ The conference included the sixteenth session of the Conference of the Parties (COP 16) to the United Nations Framework Convention on Climate Change (UNFCCC) and the sixth session of Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/CMP 6).

international agreement. Although I prefer an international allocation of mitigation responsibilities through a burden sharing system in the aviation sector, this is difficult in practice. An alternative form of allocation through a global emissions trading scheme will be explored in Chapter 6.

2. The Development of the International Regime

The various gases and particles that are emitted by aircraft are part of the general anthropogenic emissions from one of the transportation sectors and can be regulated as such under the climate regime led by the UNFCCC.⁷ This section begins the chapter with some background on the development of the international climate change law regime.

The international climate change law regime includes the provisions of the 1992 United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol of 1997, the Copenhagen Accord of 2009, the Cancun Agreements of 2010 and the wealth of Party decisions and implementation activities occurring within the framework of those agreements.⁸ This climate negotiation process started in the 1980s, with the establishment of the Intergovernmental Panel on Climate Change (IPCC).⁹ In 1992, the UNFCCC was adopted and this has since become the centre piece of the international community's efforts to combat the serious climate

⁷ Aviation emissions may also be approached as an industry specific issue, the regulation of which falls within the International Civil Aviation Organization's (ICAO) regulation. Chapter 4 of this thesis will discuss the failure of the ICAO's regulation.

⁸ Patricia Birnie, Alan Boyle & Catherine Redgwell, *International Law and Environment* (3rd ed., Oxford University Press, Oxford 2009) Chapter 6, pp. 356-377; Roda Verheyen, *Climate Change Damage and International law: prevention, duties and state responsibility*, (Martinus Nijhoff Publishers, Leiden, Boston, 2005), p. 43; Joanna Depledge, 'Crafting the Copenhagen Consensus: Some Reflections' (2008) 17/2 *RECIEL* 154; Lavanya Rajamani, 'From Berlin to Bali and beyond: killing Kyoto softly?' (2008) 57/4 *ICLQ* 909; Chris Spence, Kati Kulovesi, & María Gutiérrez, 'Great Expectations: Understanding Bali and the Climate Change Negotiations Process' (2008) 17/2 *RECIEL* 142; Anita M. Halvorsen, 'Global Response to Climate Change – From Stockholm to Copenhagen' (2007-2008) 85 *Denv. U. L. Rev.* 841.

⁹ Chris Spence, Kati Kulovesi, & María Gutiérrez. *ibid.* See chapter 2 of this thesis for more details of the scientific understanding of climate change.

change challenge.¹⁰ This convention aims “to achieve... the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”¹¹ To meet this aim, in 1997 the Kyoto Protocol was signed, with commitments from the industrialized countries to reduce their overall emissions “by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.”¹² The rules for the implementation of the Kyoto Protocol were detailed in the Marrakesh Accords in 2001.¹³ Both the Protocol and the Accords were adopted in 2005. Since the Kyoto Protocol entered into force in 2005, the attention of the world has shifted to the design of the post-2012 climate regime. In 2007, the Bali Action Plan,¹⁴ the outcome of the 2007 Bali Climate Conference,¹⁵ recognised the seriousness of the climate change situation¹⁶ and provided a two year mandate to negotiate a final agreement on the post-2012 regime by the 15th Conference of the Parties (COP 15) in Copenhagen.¹⁷ In other words, the Bali Action Plan sets a deadline of 2009, with a final agreement to be presented to the Copenhagen conference. However, the Copenhagen conference failed to achieve that. In January 2010, Yvo de Boer, the Executive Secretary of the UNFCCC, addressed the media, saying that the fact that

¹⁰ Peter D. Cameron, ‘The Kyoto Process: Past, Present and Future’ in Peter D. Cameron & Donald Zillman (eds.), *Kyoto: from Principles to Practice* (Kluwer Law International, The Hague 2001) 3, p. 8.

¹¹ UNFCCC (n. 1), art. 2.

¹² Kyoto Protocol, (n. 2), art. 3 (1).

¹³ The Marrakesh Accords were agreed in 2001 but formally adopted as decisions by COP/MOP 1 in Montreal, Canada, 28 November – 9 December 2005. The decisions include 1/CMP.1 through 36/CMP.1, in FCCC/KP/CMP/2005/8/Add. 1-4, 30 March 2006.

¹⁴ Bali Action Plan (Decision 1/CP. 13), found in Report of the Conference of the Parties on its Thirteenth Session, held in Bali from 3 to 15 December 2007 (FCCC/CP/2007/6/Add.1, 14 March 2008), Addendum. Part Two: Action taken by the Conference of the Parties at its Thirteenth Session.

¹⁵ The UN Climate Change Conference in Bali comprised several related meetings, including the thirteenth session of the Conference of the Parties (COP 13) to the UNFCCC, the third Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/CMP 3), the twenty-eighth session of the Subsidiary Body for Implementation (SBI) and the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the fourth meeting of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol.

¹⁶ The Bali Action Plan referred directly to the IPCC’s Fourth Assessment Report which stated that “warming of the climate system is unequivocal, and that delay in reducing emissions significantly constrains opportunities to achieve lower stabilization levels and increases the risk of more severe climate change impacts.” Bali Action Plan, (n. 14); see also IPCC, *Climate Change 2007: Synthesis Report*, Summary for Policymakers, online available at <www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf> last accessed 22.02.10, (IPCC Fourth Assessment Report).

¹⁷ COP 15, (n. 5).

“Copenhagen did not deliver the full agreement the world needs to address climate change just makes the task more urgent.”¹⁸ The Copenhagen conference resulted only in a political agreement, the Copenhagen Accord,¹⁹ which was negotiated by a small group of Parties in the form of “friends of the chair”, because it was “unthinkable” that leaders would “return home empty handed.”²⁰ The UN Climate Change Conference,²¹ held in Cancun, Mexico, from 29 November to 11 December 2010, restored faith in the multilateral climate change process under the UNFCCC and provided a package of outcomes designed to secure long-term cooperation to combat climate change. The Cancun Agreements contain provisions on mitigation, adaptation, financing, technology, reducing emissions from deforestation and forest degradation in developing countries (REDD+). The Agreements are not legally binding, but received support from all but one of the Convention’s 194 Parties.²² Cancun is widely perceived as “a stepping stone toward a future agreement”,²³ although not it falls substantially short of a global agreement that will prevent dangerous climate. Given the absence of agreement on the second commitment period under the Kyoto Protocol, the legal form of the post-2012 climate change framework is still pending.²⁴

Regarding the issue of aviation emissions, as part of the whole transportation sector, the UNFCCC stipulates the necessity and possibility of regulating its climate impact in Article 4(1). All Parties will

“...promote and cooperate in the development, application and diffusion, including the transfer of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all relevant sectors, including the energy, *transport*...sectors.”²⁵

¹⁸ UNFCCC Press Briefing on the outcome of Copenhagen and the way forward in 2010, online available < <http://unfccc.int/2860.php>> last accessed 25.01.10.

¹⁹ Copenhagen Accord, (n. 3).

²⁰ Benito Müller, ‘Copenhagen 2009: Failure or final wake-up call for our leaders?’ Oxford Institute for energy Studies EV 49 (February 2010) p. i, online available at <www.oxfordenergy.org/pdfs/EV49.pdf> last accessed 12.01.2010.

²¹ Cancun Conference, (n. 6).

²² Bolivia, the only opposition, complained that the deal was being pushed through without consensus.

²³ ‘Summary of the Cancun Climate Change Conference’ 12/498 *Earth Negotiations Bulletin*, p. 28.

²⁴ Options for a post-2012 “agreed outcome” could be a legally binding agreement as an amendment to the UNFCCC or Kyoto, or a protocol to take the place of the Kyoto Protocol or subsequent to it; Conference of Parties Decisions which have a legal effect; or a non-binding agreement.

²⁵ UNFCCC, (n. 1), emphasis added.

The Kyoto Protocol provides that Annex I Parties shall adopt joint measures to mitigate the climate impact of multiple sectors, including transport.²⁶ In addition, the Protocol refers to the climate impact of aviation more precisely than the UNFCCC. Article 2(2) of the Kyoto Protocol states that the Parties

“shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation ... *working through the International Civil Aviation Organization*...”²⁷

So far, the crucial point with respect to regulating aircraft engine emissions is the explicit mandate given to ICAO by the Protocol. This was not changed at the Copenhagen summit and in this respect the outcome of the Copenhagen negotiations – with no agreement on whether UNFCCC or ICAO should be in charge of cutting aviation emissions nor the level of cuts required – was described as “extremely disappointing.”²⁸ The issue of how to limit and reduce emissions from aviation was on the agenda for Cancun conference held at the end of 2010,²⁹ but no progress was forthcoming. The next sections will examine the legal obstacles in reducing aviation emissions in the UNFCCC system from two perspectives: the vague objective in the UNFCCC and the inadequate mitigation targets in the Kyoto Protocol, the Copenhagen Accord, and the Cancun Agreements.

3. The Vagueness of the Ultimate Objective

In this section, I argue that vagueness of the “ultimate objective” as set out in

²⁶ Kyoto Protocol, (n. 2), art. 2 (1).

²⁷ Ibid, art. 2 (2).

²⁸ Transport and Environment, ‘Analysis: Aviation and Shipping Emissions after Copenhagen’ (January 04, 2010), online available at <www.transportenvironment.org> last accessed 12.01.2010.; GreenAir, ‘Copenhagen’s failure to deliver an aviation emissions deal leaves sector facing an uncertain future’ 22 Dec 2009, online available at <www.greenaironline.com> last accessed 11.01.2010; GreenAir, ‘Bunker fuels and Copenhagen – the disappointing outcome that leaves the aviation industry adrift on GHG emissions’ 19 Jan. 2010, online available at <www.greenaironline.com> last accessed 20.01.2010.

²⁹ The chair of the AWG-LCA tabled a text to facilitate negotiations among Parties. See *Ad Hoc Working Group on Long-term Cooperative Action under the Convention Tenth session, Bonn, 1-11 June 2010*, UNFCCC/AWGLCA/2010/6 (May 17, 2010), Preparation of an outcome to be presented to the Conference of the Parties for adoption at its sixteenth session to enable the full, effective and sustained implementation of the Convention through long-term cooperative action now, up to and beyond 2012, item 20, online available at <<http://unfccc.int/resource/docs/2010/awglca10/eng/06.pdf>> last accessed 02/07/10.

Article 2 of the UNFCCC is a barrier to progress in regulating climate change. The “ultimate objective,” as contained in Article 2 of the Convention, is to *stabilize* all greenhouse gas concentrations in the atmosphere at a certain level in order to *prevent dangerous anthropogenic interference* with the climate system.³⁰ This objective, as Article 2 goes on to note, is “to be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change” and “to enable economic development to proceed in a sustainable manner.”³¹ The two emphasized parts of this article — “stabilization” and “prevent[ing] dangerous anthropogenic interference” — imply that the actual objective of the Convention is the stabilization of the climate itself at safe levels.³²

As a framework approach to climate change regulation, the Convention does not provide specific mitigation targets, partly because of the limited knowledge of climate change when the Convention was drafted.³³ At the very early stage of regulating climate change, Article 2 of the Convention “acknowledges climate change as a problem and helps legitimize it as a matter of international concern.”³⁴ However, it is unclear whether the objective of the Convention is only to acknowledge climate change as a risk or whether it aims to reduce the risk to certain level. The Convention itself and negotiations afterward have not provided any clarified or quantified standard on the “ultimate objective of the Convention” written in its Article 2. It is far from assisting the lawmaking process more than “amidst great uncertainty.”³⁵

One possibility is that the objective of the Convention can be specified as being, rather than imposing a specific target, to establish “a mechanism for more

³⁰ UNFCCC, (n.1), art. 2. Emphasis added.

³¹ Ibid.

³² Roda Verheven, (n. 8), p. 55.

³³ Bodansky discussed whether the UNFCCC is the framework vs. substantive approach and concluded that the Convention lies somewhere between a framework and a substantive convention. See Daniel Bodansky, ‘The United Nations Framework Convention on Climate Change: A Commentary’ (1993) 18 *Yale J. Int’l L.* 451, pp.493-96.

³⁴ Ibid., p. 500.

³⁵ David D. Caron, ‘Protection of the Stratospheric Ozone Layer and the Structure of International Environmental Lawmaking’ (1991) 14 *Hastings Int’l & Comp. L. Rev.* 755, according to Daniel Bodansky, *ibid.*, p. 494.

specific steps to be taken over time as scientific evidence evolves.”³⁶ The threshold for dangerous climate change is derived from an interpretation “based on the available science” and “informed by value judgements.”³⁷ Given that the scientific argument has been developing, the ultimate objective of the Convention may have a different meaning from time to time; thus, the climate negotiations have been plagued by the issue of how much warming we need to avoid.³⁸ As was mentioned in Chapter 2, the IPCC Fourth Report provided an updated scientific view and it warned that global warming should not be more than two degrees Celsius (2 °C) above pre-industrial levels, which means stabilizing greenhouse gases emissions at 350 parts per million (ppm) CO₂ equivalent (CO₂-eq) at most.³⁹ The Copenhagen Accord referred to the IPCC Fourth Report and it recognised that “the increase in global temperature should be below 2 degrees Celsius”.⁴⁰ But it falls short of providing a benchmark and with no mention of the maximum concentration of GHG emissions that would ensure that the 2°C target can be met.⁴¹ In the Cancun Agreements, the Parties have agreed to reduce emissions and to the need to a maximum overall 2°C rise. In compromise language, however, they have also recognised a need to consider strengthening this long-term global goal “including in relation to a global average temperature rise of 1.5 degree Celsius”.⁴² To this end,

³⁶ Albert Mumma & David Hodas, ‘Designing a Global Post-Kyoto Climate Change Protocol that Advances Human Development’ (2008) 20 *The Georgetown Int’l Envtl. Law Review* 619, 622.

³⁷ Andrew Macintosh & Lailey Wallace, ‘International aviation emissions to 2025: Can emissions be stabilized without restricting demand?’ ANU Centre for Climate Law and Policy, CCLP Working Paper Series 2008/1, p.8.

³⁸ There are a great diversity of views on how to define an adequate objective in combating climate change after Kyoto. See Bill Hare & Malte Meinshausen, ‘How Much Warming are we Committed to and How Much can be Avoided?’ (2006) 75/1-2 *Climate Change* 111.

³⁹ See Chapter 2, section 2.

⁴⁰ Copenhagen Accord, (n. 3), para 1.

⁴¹ In fact, among country Parties in the negotiations, there is diversity of views on this objective. Despite the majority view of 2°C as an appropriate maximum, small island states and many African nations argued that 2°C was inadequate to protect the most vulnerable nations from the worst effects of climate change, and that 1.5°C was a more appropriate target. The efforts of pushing for 1.5°C resulted in a review provision at the end of the Accord to assess the implementation of the Accord and its adequacy by 2015, including the need to consider the 1.5°C global average temperature limit based on the available science at that time. Copenhagen Accord, (n. 3), para. 12.

⁴² Decision 1/CP.16, *The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention*, FCCC/CP/2010/7/Add.1, online available at <<http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=2>>, para. 4. Decision 1/CP.16 includes the outcome of work by the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA) and covers the main elements of the Bali Road Map.

the Parties decided to periodically review the adequacy of the long-term global goal based on best available scientific knowledge. The first review should start in 2013 and should be concluded by 2015.⁴³

Furthermore, the exact legal status of the ultimate objective of “stabilization” is arguable. Article 2 is characterized as an “objective” or “aim”⁴⁴ of the Convention, but it does not fall under the category of an “objective and purpose” contained in the Vienna Convention on the Law of Treaties,⁴⁵ as the Convention may not be able to be interpreted in the light of such a vague objective. “Stabilization” of the climate at safe levels has actually been treated as a long-term global mitigation target or should be better called as “a collective commitment.”⁴⁶ In what may have been an attempt to distinguish this “collective commitment” from an “objective and purpose” in the Vienna Convention, the UNFCCC adds the qualification “ultimate” and addresses its detailed commitments in its Article 4. Such an “ultimate” “collective commitment” cannot help to explain what level of greenhouse gas concentrations is safe to stabilize the climate. The arguable legal status of an “ultimate objective” of stabilization leads to difficulties in agreeing a specific long-term mitigation target in the subsequent negotiations.

Although the UNFCCC has proved useful in establishing the importance of climate change and providing a forum for its negotiation, it has not provided a useful objective and a target for ongoing detailed negotiations. Without a specific objective, it is not surprising that climate change negotiations afterwards have faced an ongoing “difficult and controversial issue”⁴⁷ on what objectives are appropriate and how to share mitigation targets among the parties to the UNFCCC. But it would

⁴³ Ibid., para. 138, 139

⁴⁴ Lavanya Rajamani, ‘The Nature, Promise, and Limits of Differential Treatment in the Climate Regime’ (2007) 16 *Yearbook of International Environmental Law* 81, p. 92.

⁴⁵ *Vienna Convention on the Law of Treaties*, May 23, 1969, art. 18, 31(1), 1155 U.N.T.S. 331, 340, 8 I.L.M. 679. See also Daniel Bodansky, (n. 33).

⁴⁶ The term “objective” only appears on the title of Article 2. Bodansky has argued that the legal status of Convention’s stabilization objective “may be the subject of future discussion.” He has mentioned “some early proposals relating to the objective phrased it as a collective commitment.” See Daniel Bodansky, (n. 33), p. 500.

⁴⁷ Meinhard Doelle, ‘The Legacy of the Climate Talks in Copenhagen: Hopenhagen or Brokenhagen?’ (January 12, 2010). Online available at SSRN: <<http://ssrn.com/abstract=1535669>> last accessed 09.03.10.

have been impossible to set a clear numerical target. The conventional top-down UNFCCC system cannot be the whole answer to curbing the growth of aviation emissions, which is a subject I will return in Chapter 7.

4. The Inadequacy of the Mitigation Targets

This section argues that the mitigation targets in the climate change regime are inadequate to curb the growth of global emissions. First, I examine the mitigation commitments given by Annex I countries in the Kyoto Protocol, in Copenhagen and in the Cancun Agreements, and explain why they are too weak. Then, I examine the absence of quantitative mitigation commitments from non-Annex I countries in the Kyoto Protocol and the failure of Copenhagen and Cancun in requiring mitigation commitments from developing countries. Finally, I explore why there is a division between Annex I and non-Annex I countries in examining the burden sharing principle. I argue that simplistic and uncertain understandings of the CBDR principle are a barrier to reaching agreement on an adequate mitigation target.

4.1. Annex I countries

The Kyoto Protocol commits its Annex I countries (including 37 industrialized countries and the European Union) to “ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex I do not exceed their assigned amounts,”⁴⁸ while the UNFCCC encouraged them to stabilize greenhouse gas emissions. Since the Protocol, these countries’ collective reduction commitments represent short-term mitigation targets in the climate change regime. Following the Copenhagen conference, Annex I countries offered their reduction commitments for the period of 2012 to 2020. In the Cancun Agreements,

⁴⁸ The Kyoto Protocol, (n. 2), art. 3.

the Decision on nationally appropriate mitigation commitments or actions by developed countries, takes note of the quantified economy-wide emission reduction targets as communicated pursuant to the Copenhagen Accord.⁴⁹ Cancun now formally puts those pledges into the UNFCCC documents. I argue in this section that the Annex I countries' mitigation targets, from the Kyoto Protocol to Cancun, are too weak to curb the growth of global emissions.

The Kyoto Protocol represents only a first small step in regulating climate change. It sets out binding targets in for its Annex I countries for reducing greenhouse gas emissions in Article 3. This article requires an overall anthropogenic GHG emissions from developed countries for the commitment period 2008 to 2012, on average, will be approximately 5 percent lower than 1990 GHG emissions.⁵⁰ However, the targets stated in the Protocol are too weak because they still allow global emissions to grow substantially until 2012.⁵¹ A deep cut in GHGs was not required in the Kyoto Protocol.

In 2005, the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) was established to negotiate further commitments beyond 2012 for such Annex I countries.⁵² Then, in Copenhagen and Cancun, it was agreed that “deep cuts” in global emissions were needed, but their content not agreed.⁵³ According to the IPCC's figures, developed countries need to reduce their emissions by 25-40% below 1990 levels by 2020 and 80-95% below 1990 levels by 2050 in order to keep the rise in temperature to 2 degrees Celsius above pre-industrial levels.⁵⁴ The views and positions of individual countries are different⁵⁵ but collectively the reduction targets of all countries submitted after

⁴⁹ Decision 1/CP.16, (n. 42), para. 36.

⁵⁰ Ibid.

⁵¹ Roda Verheyen, (n. 8), p. 111.

⁵² For the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWF-KP), see UNFCCC website at < http://unfccc.int/kyoto_protocol/items/4577.php> last accessed 14.05.10.

⁵³ Copenhagen Accord, (n. 3), para. 2. Decision 1/CP.16, (n. 42), para 36.

⁵⁴ Bert Metz et. al., (eds), *Climate Change 2007: Mitigation of Climate Change*, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, Cambridge, UK, New York, NY, USA 2007) section 13.3.1 Evaluations of existing climate change agreements, Box 13.7, p. 776.

⁵⁵ See Meinhard Doelle, (n. 47).

Copenhagen⁵⁶ “leave the world heading for a global warming of over 3°C above pre-industrial levels by 2100,” according to an independent science-based assessment.⁵⁷ The developed countries as Annex I Parties, according to paragraph 4 of the Copenhagen Accord, “commit to implement individually or jointly the quantified economy-wide emissions targets for 2020, to be submitted in the format given in Appendix I by Annex I Parties to the secretariat by 31 January 2010.”⁵⁸ The reduction targets offered by the developed countries as a whole are estimated to bring the effective reductions in industrial GHG emissions to about 7 – 14% below 1990 levels by 2020.⁵⁹ This indicates that developed countries have not offered adequate mitigation targets. In the Cancun Agreements, the decision on nationally appropriate mitigation commitments or actions by developed countries did not provide further commitments.⁶⁰ Cancun called for countries to list under the UNFCCC the emission reduction targets which they announced in 2010. These targets form “the collective basis for the largest mitigation effort the world has ever seen”, however, UN estimates show, if all these targets are fully implemented, “they could deliver only 60 percent of the emission reductions that science says will be needed to stay below the agreed two degree rise in average temperatures”.⁶¹ Further commitments from Annex I Parties under the Kyoto Protocol are still required and higher emissions cuts are necessary after Cancun.⁶²

⁵⁶ Information provided by Parties to the Convention relating to the Copenhagen Accord, online available at < <http://unfccc.int/home/items/5262.php>> last accessed 14.05.10.

⁵⁷ Climate Action Tracker, ‘Ambition of only two developed countries sufficiently stringent for 2°C’ (2 February 2010) online available at <www.climateactiontracker.org> last accessed 10.03.10; ‘Climate Action Tracker Update: Little progress – Countries still heading for over 3°C warming’ (10 June 2010) online available at <http://www.climateactiontracker.org/pr_2010_06_10_en.pdf> last accessed 02.07.10.

⁵⁸ Copenhagen Accord, (n. 3), para. 4.

⁵⁹ Climate Action Tracker, ‘Developed countries aggregate reductions 7-14% below 1990 levels by 2020’, (n. 57).

⁶⁰ Decision 1/CP.16, (n. 42), para. 36.

⁶¹ ‘UNFCCC Chief says Cancun must be followed by higher global emission cuts and rapid launch of new climate bodies and funds’, UNFCCC Press Release Bonn, 20 December 2010.

⁶² See UNFCCC, Report of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol on its twelfth session, held in Bonn from 1 to 11 June 2010, online available at <[http://unfccc.int/documentation/documents/advanced_search/items/3594.php?rec=j&preref=600005896&data=&title=&author=&keywords="commitments"&symbol=&meeting=&mo_from=&year_from=&mo_to=&year_to=&last_days=&anf=0&sorted=date_sort&dir=DESC&seite=1#beg](http://unfccc.int/documentation/documents/advanced_search/items/3594.php?rec=j&preref=600005896&data=&title=&author=&keywords=)> last accessed 02/07/10; ‘UNFCCC Chief says Cancun must be followed by higher global emission cuts and rapid

It is not clear to what extent the AWG-KP may introduce a stricter emission reduction targets for Annex I countries in the post-2012 period. This is partly because of “the different views on the scope of necessary amendments to the Kyoto Protocol for the post-2012 period,”⁶³ in the two track structure of the negotiating process, which is a subject to which I return in section 4.2. The AWG-KP, at its twelfth session in 2010, has identified various legal options available to ensure that there is no gap between the first and subsequent commitments periods in amending the Kyoto Protocol:⁶⁴

“There are various options which could be used to extend the first commitment period. For example, the same QELROs (quantified emission limitation or reduction commitment) to be applied to an extended first commitment period (e.g. until 2014) or the same QELROs to be applied in a specific time period immediately following the first commitment period (e.g. from 2013 to 2014) in order to bridge any gap and provide for continuity to assist Parties in meeting their QELROs for the subsequent commitment period.”⁶⁵

An extension to the first commitment period was identified as “provisionally applied” because “[t]he provisional application clause could be included either in the amendment to the Kyoto Protocol itself or in a CMP (the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol) decision.”⁶⁶ However, the same QELROs to be applied to an extended period certainly would not be sufficient target in terms of combating climate change. To what extent the AWG-KP may introduce a stricter emission reduction targets for Annex I countries in the post-2012 period would depend on whether, and how, Parties decide to extend the first commitment period. At Cancun, the Parties agreed that the AWG-KP will keep working to ensure that there is no gap between the first and second

launch of new climate bodies and funds’, *Ibid.*

⁶³ Kati Kulovesi & María Gutiérrez, ‘Climate Change Negotiations Update: Process and Prospects for a Copenhagen Agreed Outcome in December 2009’ (2009) 18/3 *RECIEL* 229.

⁶⁴ ‘Legal considerations relating to a possible gap between the first and subsequent commitment periods’ FCCC/KP/AWG/2010/10, Distr. General 20 July 2010, Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol, Thirteenth session, Bonn, 2 – 6 August 2010.

⁶⁵ *Ibid.*, para. 24, p. 8.

⁶⁶ *Ibid.*, para. 26, p. 8.

commitment periods.⁶⁷ They also agreed to take note of existing quantified economy-wide emission reduction targets.⁶⁸ Developed countries need to raise the level of ambition of the emissions reductions to be achieved individually or jointly, with a view to reducing their aggregate level of emissions of greenhouse gases in accordance with the range indicated by the IPCC's Fourth Assessment Report.⁶⁹ The Parties have achieved an agreement on the base year for a second commitment period to be 1990, although, in addition, a reference year may be used by a Party on an optional basis for its own purposes to express its quantified emission limitations and reduction objectives.⁷⁰ However, the question of whether country Parties will sign up for a second, legally binding, commitment period to cut emissions beyond 2012 remains to be seen. Decisions on the future of the Kyoto Protocol were deferred until South Africa in 2011 and the work of the AWG-KP will continue.

We can conclude very simply that the mitigation targets offered by Annex I countries in the Kyoto Protocol, in Copenhagen and in the Cancun Agreements are too weak. Adequate targets have not been agreed in the post-Kyoto negotiations by the time of writing.

4.2. Non-Annex I countries

Non-Annex I countries are developing countries. They have not been pushed to commit any quantitative mitigation target from Kyoto to Cancun. I argue that the absence of developing countries, especially those with strong and growing economies, on the list of those submitting to binding quantitative commitments contributes to the inadequacy of the mitigation targets in the climate change regime.

A problem that comes from non-Annex I countries Parties is that the unlimited

⁶⁷ Decision 1/CMP.6, *The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its fifteenth session*, FCCC/KP/CMP/2010/12/Add.1, online available at <http://unfccc.int/resource/docs/2010/cmp6/eng/12a01.pdf#page=3>, para.1.

⁶⁸ *Ibid.*, para.3.

⁶⁹ IPCC Fourth Assessment Report, (n. 16).

⁷⁰ Decision 1/CMP.6, (n. 67), para. 6(a).

emissions they may produce would weaken the overall reduction efforts made by developed countries. Then, the short-term mitigation targets achieved among developed countries might be meaningless for the stabilization of the climate. It has been argued that without the developing countries' participation in the quantitative international greenhouse gas target, global emissions might be likely to rise even faster than business as usual path, due to the problem of leakage.⁷¹ Leakage of emissions could happen by relocating carbon-intensive industries from Annex I countries to non-Annex I countries, or by increased consumption of fossil fuels by non-Annex I countries in response to declines in world oil and coal prices. There are different estimates of the damage in tons of increased emissions for every ton abated in an industrialized country. IPCC in its 2001 reports concludes that "leakage rates in the range 5 to 20 percent are common."⁷² Another survey in 2005 reports a range of global leakage rates between 25 to 130 percent.⁷³ In the most recent IPCC report published in 2007, it concludes that "the ambiguous results of the empirical studies in both positive and negative spillovers warrant further research in this field."⁷⁴ As such, although the leakage rates are arguable, it is generally accepted that the overall mitigation target is inadequate to curb the growth of greenhouse gas emissions without commitments by developing countries.

Probably the most serious shortcoming of the mitigation target is the absence of commitments for the strong economies among non-Annex I countries. The fastest-growing emitters, like China, India and Brazil, have no binding quantitative mitigation commitments. These strong economies have been the source of the big increases in emissions. Since "they will represent up to two-thirds of global emissions over the course of this century vastly exceeding the expected contribution of the Organisation of Economic Co-operation and Development (OECD) of

⁷¹ Jeffrey Frankel, 'Formulas for quantitative emission targets' in Joseph E. Aldy & Robert N. Stavins (eds.), *Architectures for Agreement: Addressing Global Climate Change in the Post-Kyoto World* (Cambridge University Press, Cambridge 2007), p. 31.

⁷² IPCC, *Climate Change 2001: Mitigation* (Cambridge University Press, Cambridge 2001), pp. 536 – 544.

⁷³ A study by Babiker in 2005 is cited in IPCC Fourth Assessment Report: *Climate Change 2007, Group III*, <http://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch11s11-7-2-1.html>.

⁷⁴ IPCC, *ibid.*, p. 179.

roughly one-quarter of global emissions,” it has been argued that “emissions abatement by industrialized countries will not do much to mitigate global climate change” in the absence of major developing countries within the mitigation target.⁷⁵

I argue that requiring developing countries to take mitigation commitments is blocked by the two track negotiating structure that was established by the Bali Action Plan. The Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA) was to enhance international action, mainly from non-Annex I countries on climate change, including mitigation, adaptation, technology and capacity building, and finance – to develop an “agreed outcome” under the UNFCCC at COP-15.⁷⁶ Since then, the negotiations in respect of mitigation targets are proceeding in two distinct tracks: AWG-LCA and AWG-KP. The two track structure of the negotiating process has continued after Cancun. So far, the two AWGs have held their meetings in parallel with little substantive cooperation and coordination in between.⁷⁷ Although several developed countries have called for close cooperation between the two AWGs, the developing countries have been insisting on “the firewall between Annex I and non-Annex I parties.”⁷⁸ The separated two tracks of the negotiating process challenges the expected comprehensive outcome for the post 2012 climate regime. The Copenhagen Accord represents “a tortuous compromise” with respect to developing country commitments. “As with developed country emissions targets, it establishes a bottom-up process by which developing countries will submit their mitigation actions in a defined format, for compilation by the UNFCCC secretariat (including both autonomous and supported mitigation actions) Non-Annex I parties ‘will implement’ these actions.”⁷⁹ From the Copenhagen Accord text, it is not clear whether the mitigation actions of developing countries will be conditional on the

⁷⁵ Jeffrey Frankel, (n. 71), p. 32.

⁷⁶ Bali Action Plan, (n. 14).

⁷⁷ Daniel Bodansky, ‘The Copenhagen Climate Change Conference: A Post-Mortem’ (February 12, 2010) online available at <<http://ssrn.com/abstract=1553167>> last accessed 10.03.10; See also the most recent negotiation agenda for AWG-KP 14 and AWG-LCA 12 on UNFCCC website at <<http://unfccc.int/2860.php>> last accessed 03.09.10.

⁷⁸ Ibid., p. 4.

⁷⁹ Ibid., pp.6-7. See also Copenhagen Accord, (n. 3), para. 5.

available levels of support or whether all developing countries will carry out mitigation actions. The Accord only states that the least developed countries and small island developing states will be eligible for support.⁸⁰ In Cancun, the Parties have agreed that developing country Parties would take nationally appropriate mitigation actions (NAMAs) in the context of sustainable development in order to achieve a deviation in emissions relative to business-as-usual by 2020.⁸¹ These actions will be supported by technology and financing and capacity-building provided by developed countries. A registry will be set up to record NAMAs seeking international support and to facilitate matching of finance, technology and capacity-building support to these NAMAs.⁸² Developing countries are invited to voluntarily inform the Conference of the Parties (COP) of their intention to implement NAMAs via the UNFCCC secretariat.⁸³ The Secretariat will organise workshops, to understand the diversity of mitigation actions submitted, underlying assumptions, and any support needed for implementation of these NAMAs.⁸⁴ There remains no cap as emissions from even the economically sharp developing countries, and even the question of quantitative reduction below business as usual remains open.

The absence of quantitative mitigation commitment from non-Annex I countries, especially the strongest economies, weakens the overall reduction efforts made by developed countries. Even worse, it may lead to more global GHG emissions rather than less, because of leakage from those economies that impose sharp constraint on their industries. The next section will explore the reasons for the division of Annex I/non-Annex I countries in the burden sharing principle of common but differentiated responsibility.

⁸⁰ Copenhagen Accord, *ibid.*, para 5. Benito Müller, (n. 20).

⁸¹ Decision 1/CP.16, (n. 42), para. 48.

⁸² *Ibid.*, para. 53.

⁸³ *Ibid.*, para. 50.

⁸⁴ *Ibid.*, para. 51.

4.3. Burden Sharing

This section examines the principle of common but differentiated responsibility (CBDR) as one of the underlying themes⁸⁵ that wield influence in the design of an international climate change regime, especially the division of Annex I/non-Annex I countries in sharing mitigation targets. I examine the role of CBDR in climate change treaties, analyse the nature of CBDR and especially the different approaches to the differential responsibilities. I argue that the principle of CBDR was aimed to encourage the participation of both developed and developing countries in combating climate change rather than to form a fixed division of Annex I/non-Annex I countries. Given that there is no fixed meaning of CBDR, states have various interpretations on differentiated responsibilities to suit their self-interest and policy priorities. These analyses are crucial in arguing that the current approach to CBDR in the climate change regime is an obstacle to reaching agreement on an adequate mitigation target to combat climate change. In particular, the developed/developing country dichotomy that has emerged in the climate change regime is too crude to be helpful in addressing aviation.

4.3.1. The Role of CBDR in the Climate Change Regime

CBDR is one of the key guiding principles set out by the UNFCCC international climate change regulations for the ongoing operation and adaptation of the climate change regime. It also affects the design of a legal architecture for international aviation emissions. Before discussing the nature of CBDR, it is necessary first to outline the role of CBDR in the climate change regime in order to identify the aim of applying differentiated treatment in sharing greenhouse gas mitigation responsibilities.

Article 3 of the UNFCCC sets down the principle of CBDR as:

⁸⁵ Many other themes may relate to the development of climate change law, e.g. the possible human rights dimensions of the climate change problem.

“In their actions to achieve the objective of the Convention and to implement its provisions, the Parties *shall* be *guided*, inter alia, by the following:

1. The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities

2. The specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change”⁸⁶

It seems like this article uses vague language in introducing the CBDR principle, as the term “shall” gives a strong impression of command but the word “guide” is very soft.⁸⁷ However, the CBDR principle certainly now governs all the negotiations in the climate change law regime⁸⁸ in terms of “form[ing] the legal and philosophical basis for the interpretation of existing obligations and the elaboration of future international legal obligations within the context of the existing instruments in the ongoing regime-building process.”⁸⁹ First of all, the principle of CBDR guides the future implementation of the Framework Convention as it provides “a set of standards by which the behaviour of Parties may be measured by other Parties, NGOs and the rest of the international community.”⁹⁰ For example, the principle of CBDR requires taking into account the needs of certain categories of states, particularly developing countries, as Article 3 provides that developing country Parties “are particularly vulnerable to the adverse effects of climate

⁸⁶ UNFCCC, (n. 1), art. 3, emphasized added.

⁸⁷ There is a debate on the legal status of the CBDR principle in the climate change regime, as it may not technically be termed as principle; but it generally accepted that CBDR governs all the negotiations in the climate change law regime. See Lavanya Rajamani, ‘The Principle of Common but Differentiated Responsibility and the Balance of Commitments under the Climate Regime’ (2000) 9 *RECIEL* 120; Daniel Bodansky (1993), (n. 33), pp. 501-02; Philippe Cullet, ‘Differential Treatment in International Law: Towards a New Paradigm of Inter-state Relations’ (1999) 10/3 *EJIL* 549, p. 579.

⁸⁸ David Freestone, ‘The Road from Rio: International Environmental Law after the Earth Summit’ (1994) 6/2 *JEL* 193, p. 216. Edith Brown Weiss said that “[t]hough nonbinding, CDR has significantly affected international legal discourse.” Edith Brown Weiss, ‘Common but Differentiated Responsibilities in Perspective’ (2002) 96 *ASIL Proc.* 366, p. 366.

⁸⁹ Lavanya Rajamani (2000), (n.87), p. 124; Duncan French, ‘Developing States and International Environmental Law: The Importance of Differentiated Responsibilities’ (2000) 49 *Int’l & Comp. L. Q.* 35.

⁹⁰ Donald M. Goldberg, ‘Negotiating the Framework Convention on Climate Change’ (1993) 4 *Touro J. Trans. L.* 149, p. 161.

change.”⁹¹ Then, Article 4.8 applies the CBDR principle in the implementation of the commitments and requires as that:

“the Parties shall give full consideration to what actions are necessary under the Convention...to meet the specific needs and concerns of developing country Parties arising from the adverse effects of climate change and/or the impact of implementation of response measures,”⁹²

Indeed, Article 3 of the Framework Convention which sets down the CBDR principle provides “a written constitution, which the Conference of the Parties is duty bound to apply when fulfilling its obligations under the Convention.”⁹³

Second, the CBDR principle guides the subsequent development of future climate change deals. In fact, the principle was put into operation in the subsequent Kyoto Protocol and post-Kyoto negotiations in terms of both differential commitments and resource redistribution.⁹⁴ As discussed above, the Kyoto Protocol sets different mitigation obligations on developed and developing countries – the Annex I Parties (developed countries) are obligated to reduce their total GHG emissions to at least 5 percent below 1990 levels by 2008-2012, while the non-Annex I countries (developing countries) have no reduction obligations.⁹⁵ Within the Annex I Parties, each country Party agreed to an individual emission reduction target as “appropriate burden sharing.”⁹⁶ It means that differentiated responsibilities not only applied between developed and developing countries but also applied between developed countries. Then, the Copenhagen Accord “continues to reflect”⁹⁷ the principle of CBDR in a more subtle manner than in Kyoto.⁹⁸ It addresses the need for “deep cuts” in global emissions, while “recognizing that the time frame for peaking will be longer in developing countries and bearing in mind

⁹¹ UNFCCC, (n. 1), art. 3.

⁹² Ibid., art. 4.8, emphasis added.

⁹³ Duncan French, (n. 89), p. 41.

⁹⁴ The Kyoto mechanisms, Joint Implementation, the Clean Development Mechanism and Emissions Trading may also be regarded as forms of differential treatment. See Tuula Honkonen, ‘The Principle of Common But Differentiated Responsibility in Post-2012 Climate Negotiations’ (2009) 18/3 *RECIEL* 257.

⁹⁵ Kyoto Protocol, (n. 2), art. 3 (5)-(6).

⁹⁶ UNFCCC, (n.1), art. 4(3); Kyoto Protocol, *ibid.*, art. 11(2).

⁹⁷ Daniel Bodansky, (n. 78), p. 10.

⁹⁸ *Ibid.* Bodansky has argued that the Copenhagen Accords reflect the principle of CBDR “in a very different manner than in Kyoto.”, p. 10.

that social and economic development and poverty eradication are the first and overriding priorities of developing countries.”⁹⁹ So developed countries have different economy-wide emissions “targets,” which will be subject to international measurement, reporting and verification (MRV); and developing countries “will implement mitigation actions” which will be subject to international MRV only if a mitigation action receives international support and to national MRV otherwise.¹⁰⁰ Provisions regarding the provision by developed countries of financial resources and transfer of technology to developing countries or some developing countries (least developed countries and small island developing countries in the case the Copenhagen Accord) have been included in all of the agreements.¹⁰¹ Most recently, the Cancun Agreements emphasise that deep cuts in global greenhouse gas emissions are required, while acknowledging common but differentiated responsibilities and respective capabilities, and the historical responsibility of developed countries for the largest share of historical global emissions.¹⁰² In order to support to the developing world, the Cancun Agreements have made progress on setting up new funding channels and technology transfer mechanism to help developing countries access low carbon technology, adapt to climate change, and preserve and protect its forests.¹⁰³ The CBDR principle is very likely to continue to guide the post-2012 negotiations in designing an equitable burden sharing arrangement.

⁹⁹ Copenhagen Accord, (n. 3), para. 2.

¹⁰⁰ Copenhagen Accord, *ibid.*, para. 4, 5.

¹⁰¹ UNFCCC, (n. 1), art.4 (7) provides “The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology”; The Kyoto Protocol, (n. 2), art. 11(2) provides “...the developed country Parties and other Parties and other developed Parties included in Annex II to the Convention shall: (a) Provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in advancing the implementation of existing commitments(b) Also provide such financial resources, including for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of advancing the implementation of existing commitments....”; Copenhagen Accord, *ibid.*, para. 5 provides “...Nationally appropriate mitigation actions seeking international support will be recorded in a registry along with relevant technology, finance and capacity building support.”

¹⁰² Cancun. Decision 1/CP. 16, (n. 42), para.1 and 4.

¹⁰³ The Agreements take note of the “fast-start finance” agreed in Copenhagen and established a Green Climate Fund. The technology mechanism includes a Technology Executive Committee (TEC) and a Climate Technology Centre and Network (CTCN). In addition, a REDD+ framework was agreed at Cancun. Decision 1/CP. 16, (n. 42), para. 95, 102, 114, 68.

The principle of CBDR is clearly “a significant force” within the climate change regime, although it “cannot be characterized as a substantive legal obligation in itself.”¹⁰⁴ The application of CBDR principle in the climate change regime reflects the developed/developing world dichotomy in taking mitigation responsibilities.¹⁰⁵ However, it is important to recognise that differentiated responsibility is linked to the common responsibility in the principle of CBDR. It is a subject to which I will return in the next section. I argue that the aim of introducing differential treatment in sharing greenhouse gas mitigation responsibilities is to encourage the participation of both developed and developing countries, rather than to form a fixed division of Annex I/non-Annex I countries in the climate change regime. Differentiated treatment was expected to constitute “a useful tool to ensure universal participation and effective implementation of international environmental accords.”¹⁰⁶ This can be realized by concretely giving participating states different obligations or allocations of financial assistance and transfer of technology. As French made clear, differentiated treatment has been “an essential component in negotiating a successful treaty,”¹⁰⁷ but does not have a fixed content which drives the development of climate change regime in the developed/developing world dichotomy. The lack of fixed meaning on differential treatment will receive closer attention in the next section. I will argue that simplistic and uncertain understandings of CBDR are an obstacle to the development of climate change regime in examining the various interpretations on the differential responsibilities in section 4.3.3.

4.3.2. The Nature of CBDR

Before discussing how the current approach on CBDR principle becomes an obstacle to the development of climate change regime, it is necessary at this stage to

¹⁰⁴ Lavanya Rajamani (2007), (n.44), p. 102.

¹⁰⁵ UNFCCC , (n. 1), art. 3 (1) and 4 (1).

¹⁰⁶ Lavanya Rajamani (2000), (n.87), p. 124.

¹⁰⁷ Duncan French, (n. 89), p. 124.

discuss the nature of CBDR, especially the philosophical basis of the differential treatment in the following paragraphs. It is crucial to understand the principle in order to analyse the various approaches on differential treatment.

The principle of CBDR is widely recognised in international law.¹⁰⁸ It addresses the idea that all countries should “cooperate in a spirit of global partnership”¹⁰⁹ in protecting global resources, like the atmosphere, as common good in which human society has a common interest; but not all countries should contribute equally in sharing the obligation to protect them.¹¹⁰

There are two key elements in CBDR: “common” responsibilities and “differentiated responsibilities.” “Common” has a shared understanding with such international law expressions as “common heritage” and “common concern of mankind.”¹¹¹ Both developed and developing countries have recognised a common responsibility for solving global environmental issues, but common responsibilities do not equal common obligations. Different treatment recognises the differences between states from historical, economic, political and other perspectives; and it responds to such differences by “instituting different standards for different states or groups of states.”¹¹² It is “the essence of the compact between industrial and developing countries with respect to international environmental protection.”¹¹³ Common responsibilities and differentiated responsibilities contribute differently to global environmental protection. The common responsibilities ensure the

¹⁰⁸ See Patricia Birnie, Alan Boyle & Catherine Redgwell, (n. 8); Philippe Sands, *Principles of International Environmental Law* (2nd ed. Manchester University Press, Manchester; New York 2003) pp. 225-28; Daniel Barstow Magraw, ‘Legal Treatment of Developing Countries: Differential, Contextual, and Absolute Norms’ (1990) 1 *Colo. J. Int’l Envtl. L. & Pol’y* 69; Anita M. Halvorsen, *Equality between Unequals in International Environmental Law* (Westview Press, Boulder, CO 1999); Duncan French, (n. 89); Lavanya Rajamani, (2000), (n. 87); Philippe Cullet, *Differential Treatment in International Environmental Law* (Ashgate, Aldershot 2003); Christopher D. Stone, ‘Common but Differentiated Responsibilities in International Law’ (2004) 98 *Am. J. Int’l L.* 276; Lavanya Rajamani, *Differential Treatment in International Environmental Law* (Oxford University Press, Oxford 2006).

¹⁰⁹ *Report of the World Summit on Sustainable Development*, chapter 1, part 2, Annex, para. 81, UN Doc. A/CONF. 199/20 (2002) online available at <http://www.johannesburgsummit.org/html/documents/summit_docs/131302_wssd_report_reissued.pdf>, revised by UN Doc. A/CONF. 199/20/Corr. 1 (2003) (Johannesburg Declaration); See also Christopher D. Stone, *ibid.*

¹¹⁰ Christopher D. Stone, *ibid.*; Duncan French, (n. 89).

¹¹¹ UNFCCC, (n. 1).

¹¹² Lavanya Rajamani (2007), (n. 44), p. 81.

¹¹³ *Ibid.*

participation of all states in international environmental law which provide the basis for international action; but the differentiated obligations make international environmental law politically acceptable which it is hoped will promote the efficacy of the international action.¹¹⁴

The nature of differential treatment in the climate change regime is distinctive because of its various dimensions and its linkage to the idea of common responsibility. First, the term “differentiated” has several dimensions in multilateral agreements.¹¹⁵ As Stone said, “[a]n agreement can make differential substantive requirements; subject some parties to a more favourable compliance timetable; permit special defences; make noncompliance, if not forgiven, overlooked; or afford qualified nations financial and technical contributions, either to absorb the costs of compliance, or as a precondition for their own participation.”¹¹⁶ These dimensions can be divided into three categories: differentiation between industrial and developing countries with respect to central obligations, implementation methods, or financial assistance and technology transfer.¹¹⁷ All of them can be found in the climate change framework.¹¹⁸

Second, there is a linkage between the “common” and “differentiated” responsibilities¹¹⁹ as provided in Article 4(7) of the UNFCCC that “[t]he extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology ...”¹²⁰ The Copenhagen Accord “fails to

¹¹⁴ Philippe Sands, ‘International Law in the Field of Sustainable Development’ (1994) *LXV BYIL* 344; Duncan French, (n. 89); Patricia Birnie, Alan Boyle & Catherine Redgwell, (n. 8).

¹¹⁵ Christopher D. Stone, (n. 108). There are five environmental treaties that include differential treatment: the 1985 Vienna Convention of Protection of the Ozone Layer, the 1987 Montreal Protocol on Substances That Deplete the Ozone Layer (Montreal Protocol), the 1992 Convention on Biological Diversity, the 1992 UN Framework Convention on Climate Change (UNFCCC), and the 1994 Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa. For a detailed compare between these treaties in terms of differential treatment, see Lavanya Rajamani (2007), (n. 44), table 1 pp. 82-83.

¹¹⁶ Christopher D. Stone, *ibid.*, pp. 277-278.

¹¹⁷ Lavanya Rajamani (2007), (n. 44), pp. 86-88.

¹¹⁸ *Ibid.*

¹¹⁹ *Ibid.*

¹²⁰ UNFCCC, (n. 1), art. 4 (7).

mention the idea that the mitigation ambitions of developing countries are conditional on the available levels of support.”¹²¹ Instead, its paragraph 5 provides that “[l]east developed countries and small island developing States may undertake actions voluntarily and on the basis of support.”¹²² It inherits the understanding that the differentiated responsibilities of countries should link to their common responsibilities. More importantly, it implies that the difference between developing countries should be considered. I will return to this below in examining the different approaches on differential responsibilities.

With regard to the basis of the differential treatment, what we know from Article 3 of the UNFCCC together with its Preamble is that: seeking to achieve “justice and substantive equity” and “effective implementation of international environmental agreements,”¹²³ the differentiation is based on each country’s different “historical” contribution to global degradation, the “respective capabilities” of the two categories of country and “the legitimate priority needs of developing countries for the achievement of sustained economic growth and the eradication of poverty.”¹²⁴ It is in this context that the philosophical basis of the principle of CBDR can be traced to the notions of justice and equity. The concept of equity has been given an important place in the climate change arena, as it almost “axiomatic that an effective international agreement to limit greenhouse gases will not be undertaken unless it is perceived as fair.”¹²⁵

From the point of view of an analysis of climate change justice, two of the stated reasons for the existence of differentiation – the historical responsibility of the industrialized countries for current environmental degradation and their present capability to remedy such problems – have been explained from a corrective justice and a distributive justice perspective.¹²⁶ Because the existing stock of GHGs owes a

¹²¹ Benito Müller, (n. 20), p. 4.

¹²² Copenhagen Accord, (n. 3), para. 5.

¹²³ Tuula Honkonen, (n. 94), p. 257.

¹²⁴ UNFCCC, (n. 1), preamble; see Duncan French, *International Law and Policy of Sustainable Development* (Manchester University Press, Manchester 2005), pp. 89-91.

¹²⁵ Dallas Burtraw & Michael A. Toman, ‘Equity and International Agreements for CO2 Constraints’ (1992) 118/2 *Journal of Energy Engineering* 122, 122.

¹²⁶ Seth Johnson, ‘Climate Change and Global Justice: Crafting Fair Solutions for Nations and

great deal to past contributions, corrective justice seems to require that the industrialized countries “pay damages to those who are hurt.”¹²⁷ When the damages are not calculated according to tort law, the industrialized countries may pay by mitigation efforts as well as financing support. The argument from corrective justice refers to the equity that the measure of historical responsibility within the principle of CBDR aims to achieve. The basic idea is that the industrialized countries created the inequality as a result of the industrialization process that led to the accumulation of GHGs in the atmosphere, yet the costs are borne by everyone, including especially the poor countries “contrary to their interests and, presumably, without their consent.”¹²⁸ So, the industrialized countries should take mitigation efforts in combating climate change in order to restore equality. As Chowdhury make clear, “contribution to global degradation being unequal, responsibility has to be unequal and commensurate with the differential contribution to such degradation.”¹²⁹ The argument from corrective justice is complemented by an argument from distributive justice: the rich should be required to reduce its GHGs “beyond the point that is justified by its own self-interest” as resources should be redistributed from the rich to the poor.¹³⁰ This refers to the equity which requires that “[a]ll the relevant circumstances are to be considered and balanced.”¹³¹ In the climate change context, it requires us to consider the characteristics of developing countries,¹³² the unequal levels of economic development and different capacities to tackle climate change when we decide on levels of commitments for different countries.

Peoples’ (2009) 33 *Harv. Envtl. L. Rev.* 297. This is a summary of a diverse group of professors and practitioners’ discussions on the issue of global climate change and justice in a symposium entitled “Climate Change and Global Justice: Crafting Fair Solutions for Nations and People”, hosted by the Harvard Environmental Law Review on March 3, 2009. For arguments against the CBDR in the context of climate change justice, see Eric A. Posner & Cass R. Sunstein, ‘Climate Change Justice’ (2008) 96 *Geo. L. J.* 1565.

¹²⁷ Eric A. Posner & Cass R. Sunstein, *ibid.*, p. 2.

¹²⁸ Henry Shue, ‘Global Environment and International Inequality’ (July 1999) 75/3 *International Affairs*, p. 533.

¹²⁹ Subrata Chowdhury, ‘Common but Differentiated Responsibility in International Environmental Law: from Stockhom (1972) to Rio (1992)’ in Konrad Ginther et al. (eds.), *Sustainable Development and Good Governance* (Martinus Nijhoff Publishers, London 1995), p. 333.

¹³⁰ *Ibid.* This refers to a narrow conception of distributive justice as mentioned in chapter 1 of the thesis.

¹³¹ Judge E. I. Jimenez de Arechaga in an individual opinion in the Tunisia – Libya Case, 1982 I.C.J. pp. 106, 109. According to Daniel Barstow Magraw, (n. 108), p. 78.

¹³² Daniel Barstow Magraw, *ibid.*

A third point, with regard to the basis of the differential treatment, is that CBDR should encourage cooperation between developed and developing countries, rather than their separations. The existence of differentiation is to achieve effective implementation of the agreement. Implementing the climate change convention requires the involvement of all states in taking mitigation responsibilities. Differentiated responsibility is a tool to encourage the participation of both developed and developing countries in climate change convention. The flexibility inherent in CBDR allows the consideration of many factors (including countries' different historical contributions of emissions and different capabilities) in the implementation of the climate change convention. However, the differentiated obligations are apparently universally applicable to all states as the benefits of differential treatment are for both developed and developing countries. The developing countries benefit from differentiated obligations in the form of transfers of financial resources and environmentally sound technology, as well as lower standards for mitigation responsibilities. The developed countries also benefit from differentiated obligations, as they "hope to generate international consensus on an environmental issue as to prevent future environmental harm to their own societies."¹³³ The existence of differentiated responsibilities provides an "inducement" to all the states to participate in the climate change agreements.¹³⁴

The above discussion identifies two key elements of CBDR principle – "common" responsibility and "differentiated" responsibility. The differential treatment in the climate change regime is distinctive but linked to common responsibility. There are three dimensions of the differential treatment: the historical responsibility of countries' contribution to environmental degradation, countries' capability to remedy such problems and cooperation between developed and developing countries in order to achieve effective implementation of the agreement. Differentiated treatment should focus on the enhancement of substantive equity and international cooperation among countries.

¹³³ Duncan French, (n. 89), p. 58.

¹³⁴ *Ibid.*, p. 46.

4.3.3. Various Approaches on Differential Treatment

In the previous sections, it has been argued that the aim of the CBDR principle is to encourage the participation of both developed and developing countries rather than to fix a division between developed and developing countries in sharing greenhouse gas mitigation responsibilities. However, although CBDR is in principle a positive aspect of international law, I argue that simplistic and uncertain understandings of the CBDR principle are an obstacle to the development of global partnership in combating climate change. Each country is able to develop its own understanding of CBDR. This understanding can reflect the self interest of those countries. In this section, I explore the perspective of the U.S. and of China. The U.S. argues that CBDR is about capacity to mitigate only,¹³⁵ largely because of its own internal cost and benefit analysis approach. China argues that CBDR is about historical contribution and capacity,¹³⁶ largely because of its sharp prioritisation of economic growth over environmental protection. These divergent approaches to CBDR support the more general approach to climate change in each country, which has been downplay their own responsibilities.

Before discussing the various approaches on the CBDR principle, it is necessary to explain the reason for dispute. Although the CBDR principle has been applied for a long time in the climate change negotiations, it has been criticised for

¹³⁵ In the U.S. view, the principle of CBDR required that every nation make a commitment, and the “level and timing of each country’s commitments must be commensurate with its national abilities and level of development. Balance and fairness must be maintained.” Statement of Timothy Wirth, Under Sec’y of State for Global Affairs, 1997 WL 631222, *Global Climate Change: Hearing Before the Subcomm. on Int’l Econ. Policy, Export and Trade Promotion of the S. Foreign Rel. Comm.*, 105th Cong. (1997), p. 7. See also, Paul G. Harris, (n. 139); Christopher D. Stone, (n. 108).

¹³⁶ In China’s view, “Due to the difference in historical responsibility, level and stage of development, capabilities and ways of contribution, developed countries should be responsible for their historical accumulated emissions and current high per-capita emissions, and take the lead in reducing emissions, in addition to providing financial support and transferring technologies to developing countries. The developing countries, while pursuing economic development and poverty eradication, should actively adopt adaptation and mitigation measures, control greenhouse gas emissions and contribute to the common efforts of addressing climate change.” Information Office of the State Council of the People’s Republic of China, *China’s Policies and Actions for Addressing Climate Change*, (2008), p. 14.

being “over-argued; and ... [it] breeds laziness in the negotiating process.”¹³⁷ Disputes over the scope of CBDR have been argued as being “a primary cause” of the collapse of the climate change regime in the still warming world.¹³⁸ In particular, this differentiation led to the difficulty to extract reduction commitments from China and India, which was part of the reasons for the United States’ withdrawal from the Kyoto Protocol and therefore from much of the following negotiation progress.¹³⁹ Indeed, in the climate change regime, CBDR comes with some serious problems and difficulties for the parties because of its lack of “a strictly fixed content.”¹⁴⁰

The content of the differentiated responsibility is discussed above in section 4.3.2. There are at least three dimensions to CBDR in the UNFCCC – the historical contribution to global degradation, respective capabilities of the two categories of country and the effective implementation of international environmental agreements. During the climate change negotiations, the industrialized countries and the developing countries held different interpretations of differentiated responsibility, even though they both supported the principle that “developed country Parties should take the lead in combating climate change and the adverse effects thereof.”¹⁴¹ The developing countries argued that the industrialized countries had historically born the “main responsibility” for the climate change problem; while the developed countries opposed this, but agreed to take the lead because of their greater financial and technical capabilities.¹⁴² The disagreement between developed and developing countries is whether the differentiated responsibility is about contribution to climate

¹³⁷ Susan Biniarz, Remarks (on common but differentiated responsibility), 96 ASIL Proc. 359, 361 (2002).

¹³⁸ Christopher D. Stone, (n. 108).

¹³⁹ President George W. Bush repudiated the Kyoto Protocol partly because “it exempts 80 percent of the world, including major population centres such as China and India, from compliance, and would cause serious harm to the U.S. economy.” Letter from President George W. Bush to Senators Hagel, Helms, Craig, and Roberts (March 13, 2001), online available at <www.whitehouse.gov/news/releases/2001/03/20010314.html> last accessed 16.02.10. See also Paul G. Harris, ‘Common but Differentiated Responsibility: The Kyoto Protocol and United States Policy’ (1999) 7 *N.Y.U. Envtl. L. J.* 27.

¹⁴⁰ Tuula Honkonen, (n. 94), p.158; Lavanya Rajamani also commented that “the nature and extent of differential treatment offered to developing countries in the climate regime remains a bone of contention between industrial and developing countries – a bone, however, that will assume increasing significances as countries move towards the post-2012 phase....” in Lavanya Rajamani (2007), (n. 44), p. 86.

¹⁴¹ Daniel Bodansky, (n. 33), pp. 502-03.

¹⁴² *Ibid.*

change or capacity to mitigate.

If the differentiated responsibility is about contribution, the question of applying corrective justice to the climate change problem would make the climate change regime very complex. Posner and Sunstein have pointed out the difficulty regarding applying the concepts of corrective justice and purely individual fault in the climate change context in arguing that the corrective justice model does not suit the climate change issue.¹⁴³ They have made the point that “a crude state-to-state remediation scheme results in innocents being punished and non-victims being compensated,” because “[t]he current stock of greenhouse gases in the atmosphere is due to the behaviour of people living in the past....people who are dead.”¹⁴⁴ Daniel Farber agrees that applying corrective justice to the climate change problem is complex, but he disagrees with Posner and Sunstein. He has examined the contributions of living Americans to the climate change problem, based on the data from 1950, and has argued that “to think of harmful CO₂ emissions as only a historical phenomenon, unconnected with the lives of current-day Americans, is clearly mistaken.”¹⁴⁵ The questions for implying the principle of CBDR may include how to identify the victim and injurer in the climate change context, how to protect poor people in rich countries,¹⁴⁶ and how to design “a compensation system that is reasonably well targeted to address the needs of climate change victims.”¹⁴⁷

There is also a need to distinguish between “current responsibility” and “conceptual responsibility.”¹⁴⁸ French has argued that “it should not be presumed

¹⁴³ Eric A. Posner & Cass R. Sunstein, (n. 126).

¹⁴⁴ *Ibid.*, p. 22.

¹⁴⁵ Daniel A. Farber, ‘The Case for Climate Compensation: Justice for Climate Change Victims in a Complex World’ (2008) 2008 *Utah L. Rev.* 377, 396.

¹⁴⁶ Eric A. Posner & Cass R. Sunstein, (n. 126).

¹⁴⁷ Daniel A. Farber, (n. 145), p. 397.

¹⁴⁸ Duncan French, (n. 89), p. 49. I borrow the words from French. He has provided that “current responsibility” refers to the present state of affairs at the end of the twentieth century when developed States are the largest contributors to global environmental degradation. “Current responsibility” is different from “conceptual responsibility”, which “sets out the general principle that responsibility is dependent upon a State’s contribution to environmental problems. This general principle is unqualified by the present situation and leaves open the possibility that it will not necessarily always be the case that it is developed States which are responsible for the greater part of global environmental damage.” pp. 49-50.

that primary responsibility will inevitably always fall upon developed States.”¹⁴⁹ Current responsibility refers to the present state of affairs as developed countries are the largest contributors to global environmental degradation. However, the general principle should set a state’s conceptual responsibility, which is different from current responsibility. For example, given the bigger share of population, land mass and areas still not industrialised, developing countries may cause more damage to the environment in the future and to be responsible for the greater part of global environmental damage.¹⁵⁰ According to the Framework Convention, the burden sharing principle requires international community to consider the basic conceptual justification for differentiation. However, the principle of CBDR that sets out the conceptual contribution is “unqualified by the present situation.”¹⁵¹ Regulatory design may need to prepare for the possibility that developing countries will be required to take greater responsibility for climate change as their contribution to the problem increases.

If the differential responsibility is based on different capacity to mitigate, there is again a need to considering changing capacities of countries, especially the big developing countries. For example, China’s capacity in terms of reducing greenhouse gas emissions is growing quickly.¹⁵² China is already the leading renewable energy producer in the world in terms of installed generating capacity,¹⁵³ and it ranked second for the absolute Dollar amount investment in renewable energy in 2007.¹⁵⁴ China is already a leading manufacturer of solar photovoltaic technology.¹⁵⁵ China is also introducing measures to limit oil consumption from its growing motor vehicle fleet, implementing fuel efficiency standards for cars 40%

¹⁴⁹ Ibid.

¹⁵⁰ Ibid.

¹⁵¹ Ibid.

¹⁵² The Climate Group, ‘China’s Clean Revolution’ (2009) online available at <http://www.theclimategroup.org/_assets/files/Chinas_Clean_Revolution.pdf> last accessed 15.09.10.

¹⁵³ Ibid., Renewable Energy Policy Network for the 21st Century (REN21), ‘Renewables 2007 Global Status Report’ (2008), online available at <www.ren21.net/pdf/RE2007_Global_Status_Report.pdf> last accessed 15.09.10.

¹⁵⁴ The Climate Group, *ibid.*

¹⁵⁵ Ibid.; Janet Sawin, ‘Another Sunny Year for Solar Power’ Worldwatch Institute (May 2008).

higher than those in the U.S.¹⁵⁶ As such, in the move to a low carbon economy, “China will no longer be a developing country following where others have led, but a pioneer leading the way.”¹⁵⁷ Regulatory design may need to consider the possibility that some developing countries will be required to take greater responsibility for climate change as their capability to solve the problem increase.

Crucially, in respect of both contribution and capacity, we need to be aware of the evolving nature of CBDR. As there is no fixed meaning of the differential treatment, states tend to have different understandings of CBDR principle and place emphasis on different elements to suit their self-interest. My position is that the current approach to CBDR is an obstacle to the development of global partnership in combating climate change. This is clear from an explanation of the positions of the U.S. and China in the climate change negotiations and their simplistic and uncertain understandings of the CBDR principle.¹⁵⁸ There are several points that explain why I choose these two countries here. The U.S. has long been leading the world’s GHG emissions and China has now surpassed the U.S.¹⁵⁹ But the two leading emitters have independently refused to take binding reduction commitments in climate change negotiations.¹⁶⁰ The exit of these two countries is a significant impediment to the effectiveness of the climate change regime. The emissions from these two largest emitters “threaten to impose serious losses on other nations and regions,

¹⁵⁶ The Climate Group, *ibid.*; International Council on Clean Transportation (ICCT), ‘Passenger Vehicle Greenhouse Gas and Fuel Economy Standards: A Global Update’ (2007).

¹⁵⁷ The Climate Group, *ibid.*, p. 2.

¹⁵⁸ Cass R. Sunstein, ‘The World vs. the United States and China? The Complex Climate Change Incentives of the Leading Greenhouse Gas Emitters’ (2007-2008) 55 *UCLA L. Rev.* 1675; Eric A. Posner & Cass R. Sunstein, (n. 126).

¹⁵⁹ Roger Collier, ‘China About to Pass U.S. as World’s Top Generator of Green House Gases’ *S.F. CHRON.* (March 5, 2007) at A1; Elisabeth Rosenthal, ‘China Increases Lead as Biggest Carbon Dioxide Emitter’ *N.Y. Times* (14 June, 2008), online available at <<http://www.nytimes.com/2008/06/14/world/asia/14china.html>> last accessed 16.02.10; Press Release, Neth. Evtl. Assessment Agency, ‘China Contributing Two Thirds to Increase in CO2 Emissions’ (13 June, 2008), online available at <<http://www.planbureauvoordeleefomgeving.nl/en/news/pressreleases/2008/20080613ChinacontributingtwothirdstoincreaseinCO2emissions.html>> last accessed 16.02.10; Audra Ang, ‘China Overtakes U.S. as Top CO2 Emitter’ (21 June, 2007) Associated Press Online.

¹⁶⁰ Scott Barret, *Environment and Statecraft: the strategy of environmental treaty-making* (Oxford University Press, Oxford 2003) for an overview of the US’s position; National Development and Reform Commission, People’s Republic of China, *China’s National Climate Change Programme* (June 2007), for an overview of the Chinese position, full text is online available at <<http://en.ndrc.gov.cn/newsrelease/P020070604561191006823.pdf>>.

including Europe but above all India and Africa.”¹⁶¹ Without the U.S. and China, half of the global emissions are not be covered by a legal agreement.¹⁶² These two countries have been identified as “a real obstacle to an international agreement to control greenhouse gases.”¹⁶³ From a legal perspective, it is their different approaches on CBDR that block the development of the climate change regime.

Both China and the U.S. refuse to accept binding reduction commitments and hold different opinions on the content of CBDR. China, as a developing country, has been emphasizing its relative poverty, its low per capita emissions and the fact that the existing stock of GHGs was produced by the industrialized nations.¹⁶⁴ It has been standing together with other developing countries and resisted all efforts to include them in any quantitative mitigation obligations under the climate change regime.¹⁶⁵ Although China did make some offers at Copenhagen,¹⁶⁶ along with other developing countries, it “view[s] the quid pro quo between them and developed countries not as, ‘action for action’, but as ‘action for action plus

¹⁶¹ Eric A. Posner & Cass R. Sunstein, (n. 126), p. 142; see also William Nordhaus & Joseph Boyer, *Warming the World* (MIT Press, Cambridge, Cambridge, Mass.; London 2000), p. 91.

¹⁶² Enrica De Cian & Alice Favero, ‘Fairness, Credibility and Effectiveness in the Copenhagen Accord: An Economic Assessment’ (March 11, 2010) FEEM Working Paper No. 21.2010, online available at SSRN: <<http://ssrn.com/sbstract=1568815>> last accessed 24.05.10.

¹⁶³ Cass R. Sunstein, (n. 158), p. 1688.

¹⁶⁴ Jiahua Pan, ‘Common but Differentiated Commitments: A Practical Approach to Engaging Large Developing Emitters Under L20’ (2004), Commissioned Briefing Notes for the CIGI/CFGS L20 Project, p. 3, online available at <http://www.l20.org/publications/6_5c_climate_pan1.pdf> last accessed 16.02.10.

¹⁶⁵ The G-77, a coalition of 132 developing countries at the UN, and China has consistently maintained that “developing countries would not accept new commitments under any guise.” ‘Summary of the Meetings of the UNFCCC Subsidiary Bodies’ (2-12 June 1998) 12/86 *Earth Negotiations Bulletin* 7; G-77/China Proposal, Doc. COP-11/MOP-1 (2005) according to Bettina Wittneben et al., *In From the Cold: The Climate Conference in Montreal Breathes New Life into the Kyoto Protocol* (2006) online available at

<http://www.lne.be/themas/klimaatverandering/klimaatconferentie/vlaamseklimateconferentie/werkgroepen-1/strategie/eerste-vervolgtraject-opvolging-werkgroepen-strategie/Wuppertal_Inst_COP11MOP1-report.pdf> last accessed 16.02.10, p. 18. See more literature reviews, Paul G. Harris, (n. 139), p. 34; Albert Mumma & David Hodas, (n. 36). For a repeat of developing countries’ view, see a description by Yvo de Boer, the Executive Secretary of the UNFCCC Secretariat, as the “consensus of the international community”, in Office of Nat’l Coord. Comm. On Climate Change (China), ‘Common But Differentiated Responsibilities – Basis for Tackling Climate Change’, online available at <www.ccchina.gov.cn/en/NewsInfo.asp?NewsID=10077> last accessed 26.02.10.

¹⁶⁶ Rutgers, ‘China says achieved goal in Copenhagen climate deal’ (Jan 9, 2010) online available at <<http://www.reuters.com/article/idUSTRE6080GZ20100109>> last accessed 24.05.10; see also Elizabeth Burleson, ‘China in Context: Energy, Water, and Climate Cooperation’ (2010) 36/3 *William Mitchell Law Review*; FSU College of Law, Public Law Research Paper No. 442, online available at SSRN <<http://ssrn.com/abstract=1592005>> last accessed 24.05.10.

support’.”¹⁶⁷ The U.S. opposed exempting developing countries from GHG mitigation obligations in negotiations.¹⁶⁸ In the U.S. view, the CBDR principle requires that every nation make a commitment, and the “level and timing of each country’s commitments must be commensurate with its national abilities and level of development. Balance and fairness must be maintained.”¹⁶⁹ The U.S. is against the exemption of developing countries from binding obligations, arguing that climate change is not created solely by the developed countries.¹⁷⁰ Even prior to its rejection of the Kyoto Protocol, the U.S. had argued that it would not assume binding obligations until the regime contained “meaningful participation from key developing nations.”¹⁷¹ By looking at China and the U.S., we see now states can interpret the principle of CBDR in a simplistic way to suit their self-interest.

It is not difficult to find that the U.S.’s stance on climate change negotiations and burden sharing in particular, in fact, against the spirit of CBDR, especially the common responsibilities. As discussed earlier in this section, the common responsibilities are binding unconditionally on all states because global climate is treated as “common good”, “common interest” and “common concern of humankind.”¹⁷² Although CBDR lacks a common interpretation, we know that both developed and developing nations have a common responsibility for protecting global climate stabilization. Importantly, each country’s commitment to reduce GHG emissions does not need to take another country’s commitment as a condition. Otherwise, the common responsibilities would not ensure the participation of all states in international climate change regime. So, that the U.S. takes developing countries’ mitigation commitments as a condition for its own share of the common

¹⁶⁷ Jan von der Goltz, ‘High Stakes in a Complex Game: A Snapshot of the Climate Change Negotiating Positions of Major Developing Country Emitters’ Center for Global Development, Working Paper Number 177 (August 2009), p. 8, online available at SSRN <<http://ssrn.com/abstract=1473506>> last accessed 24.05.10.

¹⁶⁸ See statement of Timothy With, Under Sec’y of State for Global Affairs, according to ‘Global Climate Change: Hearing Before the Subcomm.’ on Int’l Econ. Policy, Export and Trade Promotion of the S. Foreign Rel. Comm., 105th Cong. (1997), 1997 WL 631222, pp. 4-7; Paul G. Harris, (n. 139).

¹⁶⁹ *Ibid.* p. 7.

¹⁷⁰ Ambassador Stuart Eizenstat, ‘The U.S. Role in Solving Climate Change: Green Growth Policies can enable Leadership despite the Economic Downturn’ (2009) 30 *Energy L. J.* 1.

¹⁷¹ ‘Summary of the Meeting of the UNFCCC Subsidiary Bodies’, (20-31 October, 1997) 12/66 *Earth Negotiations Bulletin* 3.

¹⁷² Duncan French, (n. 89), pp. 45-46.

responsibilities is actually against the spirit of CBDR principle.

The U.S.'s approach on CBDR is simplistic as it over emphasises domestic cost-benefit analysis. Some U.S. scholars have argued that the U.S.'s domestic costs of GHG emission limitations would exceed the benefits.¹⁷³ As Sunstein has argued, in terms of the U.S.'s domestic self-interest, the U.S. might not “perceive the optimal agreement from the global standpoint” as in its interest, simply because it seems “to have disproportionately little to lose from climate change and disproportionately much to lose from emissions reductions.”¹⁷⁴ Cost issues are a big part of the political debate in the U.S. as elsewhere.¹⁷⁵ From the U.S. perspective, it is found that the U.S. would have to spend over \$300 billion to comply with the requirements of the Kyoto Protocol, while its monetized benefits would be about 4 percent of that amount.¹⁷⁶ It is worth noting that this is the economic calculation being made by U.S. experts to the government for policy making. The accuracy of the assumptions is highly contentious and the assumptions are arguably too narrow.¹⁷⁷ This calculation is controversial on both sides of the equation: both in terms of the costs of mitigation and in terms of the costs of climate change. The U.S. believed that the costs of mitigation are high because taking a reduction commitment would “result in serious harm to the United States economy, including significant job loss, trade disadvantages, increased energy and consumer costs, or any combination thereof.”¹⁷⁸ Posner and Sunstein have argued that if the U.S. has to help the poor, just because it is a wealthy country, it might better help them in a way

¹⁷³ Eric A. Posner & Cass R., (n. 126). See also, Enrica De Cian & Alice Favero, (n. 162).

¹⁷⁴ Cass R. Sunstein, (n. 158), p. 1689. There are disagreements with Sunstein, see general: Daniel A. Farber, (n. 108); CPR Member Scholars, ‘Reinvigorating Protection of Health, Safety, and the Environment: The Choices Facing Cass Sunstein’ (January 2009) CPR White Paper number 901, online available at <<http://www.progressivereform.org/articles/SunsteinOIRA901.pdf>> last accessed 24.05.10. However, it worth noticing that Professor Sunstein’s work has been contributed a long track record on the U.S. regulatory issues in practical ways and including the time during the Obama Administration.

¹⁷⁵ Ambassador Stuart Eizenstat, (n. 170).

¹⁷⁶ Cass R. Sunstein, *Worst-Case Scenarios* (Harvard University Press, Cambridge, Mass.; London 2007), p. 95. The costs of the Kyoto Protocol for the U.S. would be much greater than the corresponding costs for any other signatory nation. See William Nordhaus & Joseph Boyer, (n. 161), p. 168; Nordhaus estimated that the US would have borne about two-thirds of the cost. See William Nordhaus, ‘After Kyoto: Alternative Mechanisms to Control Global Warming’ (2002) p. 24, online available at <www.econ.yale.edu/~nordhaus/homepage/PostKyoto_v4.pdf> last accessed 27.02.10.

¹⁷⁷ CPR Member Scholars, (n. 174).

¹⁷⁸ S. Res. 98, 105th Cong. (1997);

which would not hurt the U.S., such as “help to protect India and Africa or some other region from an asteroid or a tsunami.”¹⁷⁹ However, the Stern Review has provided a reasonable conclusion as the benefits of strong and early mitigation action on climate change considerably outweigh the costs.¹⁸⁰ In terms of the costs of climate change, the U.S.’s calculation is controversial as well. The U.S., as with some other wealthy nations, is in a better position in terms of the climate change crisis, considering its adaptive capacity and its cooler higher latitudes.¹⁸¹ Climate change may initially have limited negative effects or even small positive effects for the U.S., but it is likely to be very damaging for the much higher temperature increases expected under business-as-usual scenarios as Stern reviewed.¹⁸² Therefore, the U.S.’s domestic cost-benefit calculation of climate change and mitigation is highly contentious. In sum, the U.S.’s approach on CBDR responds to its own understanding of its self-interest.

Although the climate has been acknowledged as common good and needs common efforts from all the countries to mitigate GHG emissions, the U.S. takes developing countries’ mitigation commitments as a condition for its own share of the common responsibilities and places emphasis on its domestic cost-benefit analysis to suit its self-interest. The absence of a fixed meaning of the CBDR principle enables the U.S. to take its own interpretation which becomes one of the reasons for the continued delay in climate change negotiation. As such, I argue that the U.S.’s approach on the CBDR principle is simplistic and is an obstacle to the global partnership in developing the climate change regime.

¹⁷⁹ Eric A. Posner & Cass R. Sunstein, (n. 126), p. 36.

¹⁸⁰ There is no answer to which nations would suffer most from climate change, but generally agreed that the poorest nations would be the biggest losers. See Nicholas Stern, *The Economics of Climate Change: the Stern review*, (Cambridge University Press, Cambridge 2007), pp. 106-14, 138-58; William R. Cline, *Global Warming and Agriculture: Impact Estimates by Country* (Centre for Global Development: Peterson Institute for International Economics, Washington, DC 2007); Daniel Farber, ‘Modeling Climate Change and Its Impacts: Law, Policy, and Science’, (2008) Univ. of Chicago Law & Politics Workshop, Working Paper; Richard Tol, ‘Estimates of the Damage Costs of Climate Change’ (2002) 21 *Environmental and Resource Economics* 135; For how the climate change harms are likely to vary across nations and regions, see William Nordhaus & Joseph Boyer, *Warming the World* (MIT Press, Cambridge, Mass.; London 2000) p. 91.

¹⁸¹ Nicholas Stern, *ibid.*, p. 139. See also Cass R. Sunstein, *ibid.*; William R. Cline, *ibid.*; Frank Ackerman & Ian Finlayson, ‘The Economics of Inaction on Climate Change: A Sensitivity Analysis’ (2006) Global Dev. & Env’t Inst., Working Paper No. 06-07, 2006.

¹⁸² Nicholas Stern, *ibid.*

The same argument comes from China's interpretation on CBDR as well. China's approach on CBDR is simplistic. It has overemphasised the need for leadership from developed countries in cutting GHG emissions, but played down the spirit of global common responsibilities in interpreting the CBDR principle. China believes that differential treatment is mainly based on developed countries' high contribution to climate change, which includes both historical and current contribution. China has argued that the historical emissions of the developed countries cause their obligation to provide financial assistance and to transfer technology to enhance the capacity of developing economies to address climate change.¹⁸³ Since they are responsible for the greatest share of emissions, developed countries should use their wealth to help poor countries in the context of combating climate change.¹⁸⁴ In terms of current contribution, China has emphasized the high contribution from developed countries in referring to the measure of per capita greenhouse gas emissions. It claims that any international agreement should consider that China's per capita emissions rate is not high.¹⁸⁵ Although China's annual CO₂ emissions have now surpassed those of the U.S., the U.S. has still been the world's largest emitter of GHGs in terms of per capita energy consumption, which is twice as high as in Western Europe and eight times higher than that in China.¹⁸⁶

China has also emphasized that any of its actions regarding climate change will be "within its capability based on its actual situation."¹⁸⁷ It appears that China has agreed to apply differentiated responsibilities based on capability. However, on

¹⁸³ China's National Climate Change Programme, (n. 160).

¹⁸⁴ Ibid., pp.2, 5-6.

¹⁸⁵ Ibid., p. 58.

¹⁸⁶ U.S. Dep't of Energy, Energy Info. Admin., International Energy Annual 2005, tbl. E.1c, World Per Capita Total Primary Energy Consumption (Million Btu), 1980-2005 (2007), online available at <www.eia.doe.gov/pub/international/iealf/tablee1c.xls> last accessed 26.02.10.

This approach has been repeated by India, in its new Action Plan, which states that "India is determined that its per capita greenhouse gas emissions will at no point exceed that of developed countries even as we pursue our development objectives." Government of India, 'National Action Plan on Climate Change' (20 June, 2008), online available at <www.pmindia.nic.in/Pg01-52.pdf> last accessed 16.02.10.

¹⁸⁷ Liu Jiang, Vice-Chairman, National Development and Reform Commission of China, Keynote Speech on the Round Table Meeting of Energy and Environment Ministers from Twenty Nations (2005) online available at <www.ccchina.gov.cn/en/> last accessed 27-02.10; China's National Climate Change Programme, (n. 160).

this point, its interpretation of CBDR is also an obstacle to developing an international climate change regime. This is because that China treats domestic economic growth as a key standard to measure its capability in taking mitigation responsibilities. Invoking the principle of CBDR, China has argued that developing countries, including China, should be bound only to take account of environmental issues as they continue to ensure that their economies grow.¹⁸⁸ China holds the opinion that economic growth, which leads to benefits through raising the standard of living for its citizens, takes priority over any other social and environmental concerns.¹⁸⁹

China's prioritisations of economic growth over environmental protection is highly controversial. The potential for harmonisation between economic growth and environment protection has been generally accepted in the debate of ecological modernization theory (EMT).¹⁹⁰ This theory was originally aiming to "analyze how contemporary industrialized societies deal with environmental crises,"¹⁹¹ and argued that continued industrial development provides the best option for escaping from the global environmental crisis.¹⁹² Linking this to the impact of globalization on

¹⁸⁸ Liu Jiang, *ibid.*; see also China's National Climate Change Programme, (n. 160).

¹⁸⁹ *Ibid.* See also Joanna Lewis, 'China's Strategic Priorities in International Climate Change Negotiations' (2007) 31/1 *The Washington Quarterly* 155.

Additionally, China has made gains in reducing energy intensity, which is also aimed to contribute the country's economic development and to satisfy higher level of living standards for its citizens. Pew Center on Global Climate Change & Asia Society, 'Common Challenge, Collaborative Response: A Roadmap for U.S. – China Cooperation on Energy and Climate Change' (2009) online available at <<http://www.pewclimate.org/docUploads/US-China-Roadmap-Feb09.pdf>> last accessed 24.05.10.; see also Elizabeth Burleson, (n. 166).

¹⁹⁰ In an earlier time, Hajer made the criticism that EMT is "basically a modernist and technocratic approach to the environment that suggests that there is a techno-institutional fix for the present problems." Maarten A. Hajer, *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process* (Clarendon Press, Oxford 1995), p. 32; When critiques became more focused on the components of ETM, Christoff warned that "there is a danger that the term may serve to legitimize the continuing instrumental domination and destruction of the environment and the promotion of less democratic forms of government, foregrounding modernity's industrial and technocratic discourses over its more recent, resistant and critical ecological components." Peter Christoff 'Ecological modernization, ecological modernities' in Stephen C. Young (ed.) *The Emergence of Ecological Modernisation: Integrating the Environment and the Economy?* (Routledge, London 2000), p. 209, pp. 227-28; more critiques on EMT from Martin Jänicke, 'Ecological modernization: new perspectives' (2008) 16 *Journal of Cleaner Production* 557; Jouni Korhonen, 'Reconsidering the economics logic of ecological modernization' (2008) 40 *Environment and Planning A* 1331; Dana R. Fisher & William R. Freudenburg, 'Ecological Modernization and Its Critics: Assessing the Past and Looking Toward the Future' (2001) 14 *Society and Natural Resources* 701.

¹⁹¹ Arthur P.J. Mol & David A. Sonnenfeld (eds.) *Ecological Modernization around the World: Perspectives and Critical Debates* (Frank Cass., London 2000), pp. 3, 5.

¹⁹² *Ibid.*; Arthur P. J. Mol, *The refinement of production: Ecological modernization theory and the*

environmental quality, Mol used EMT to present a balanced interpretation of the implications of globalization on environmental standards from a sociological perspective and argued that globalization has the potential to improve the quality of the environment.¹⁹³ However, discussions on EMT is clear that economic growth should not be an excuse for any country to withdraw from environmental responsibilities. Chinese scholars and many officials have embraced the concept of ecological modernisation,¹⁹⁴ but the Chinese interpretation is “limited to the technological-economic dimensions of sustainable development, without entering too much into relations with equity, equality, citizen empowerment and the like.”¹⁹⁵ China emphasised a primarily economic-technological approach to ecological modernization in China’s major production sectors, but did not refer to the more political innovations in EMT.¹⁹⁶ This Chinese interpretation of ecological modernization is linked to its implications for the concept of development. The development needs of developing countries should be considered in climate change negotiations,¹⁹⁷ but this does not mean treating economic growth as having priority over environmental protection nor considering economic development only.

Therefore, China’s understanding of the CBDR principle, which emphasises developed countries’ responsibility to take mitigation commitments and obligations on developing countries only to take account of environmental issues as they continue to ensure that their economies grow, is driven by its position that economic growth is a greater priority than environmental protection. China’s interpretation of CBDR principle actually becomes an obstacle to the global partnership in combating

chemical industry (Van Arkel, Utrecht, Netherlands 1995).

¹⁹³ Arthur P. J. Mol, *Globalization and Environmental Reform: The Ecological Modernization of the Global Economy*, *ibid.*

¹⁹⁴ Vic Li & Gramem Lang, ‘China’s “Green GDP” Experiment and the Struggle for Ecological Modernisation’ (2010) 40/1 *Journal of Contemporary Asia* 44.

¹⁹⁵ Lei Zhang, Arthur P.J. Mol & David A. Sonnenfeld, ‘The Interpretation of Ecological Modernisation in China’ (2007) 16/4 *Environmental Politics* 659, p. 665.

Chinese official opinion on ecological modernisation has been published in an official report — the China Modernization Report 2007: A Study on Ecological Modernization — by the Chinese Academy of Sciences, a high level Chinese research institution with close ties to Beijing policymakers. See *Ecological Modernization Report 2007*, Research Group for China Modernization Strategies, China Center for Modernization Research, Chinese Academy of Sciences (21 October, 2006) online available at < <http://chinagate.cn/english/reports/50007.htm> > last accessed 03.03.10.

¹⁹⁶ Lei Zhang, Arthur P.J. Mol & David A. Sonnenfeld, (n. 195).

¹⁹⁷ UNFCCC, (n. 1), preamble, art. 3.

climate change, especially the participation from the developing countries.

All in all, because there is no fixed meaning of CBDR principle, states were able to interpret the principle according to their self-interest and policy priorities. The examples of the U.S.'s domestic cost-effectiveness analysis on the climate issue and China's political standpoint on the priority of economic growth show how these two biggest emitters have become obstacles in climate change negotiations. I argue that simplistic and uncertain understandings of burden sharing are a barrier to reaching agreement on combating climate change. To overcome this obstacle, many proposals have been put forward to regroup the contracting Parties of the UNFCCC and amend the UNFCCC to include "Annex III", consisting of the fast-growing developing countries that emit large amounts of GHGs.¹⁹⁸ Although such an amendment cannot be found in the Copenhagen deal or the Cancun Agreements, the Accord refers especially to the least developed countries, the small island developing states. It opens the door to many possible future approaches that may include different types and degrees of mitigation commitments according to the development status of the countries. Behind the dispute on CBDR principle, the main challenge is to provide positive incentives for both developed and developing countries to use more low-emissions fuels and production processes, and to accelerate investment in low-emissions energy technologies.¹⁹⁹ The question of how to convince the U.S. and China that they do "have a great deal to gain from an international agreement" remains unanswered.²⁰⁰ In the international arena, the

¹⁹⁸ Lavanya Rajamani (2006), (n. 108), p. 248; Lavanya Rajamani, 'From Berlin to Bali and beyond: killing Kyoto softly?' (2008) 57/4 *ICLQ* 909; Anita M. Halvorsen, (n. 8); Albert Mumma & David Hodas, (n. 36); TWN Accra News Update, 'North floats idea of new climate regime, South warns this threatens Copenhagen outcome' (29 August 2008) Third World Network, online available at <www.twinside.org.sg> last accessed 20.07.09.

¹⁹⁹ Robert Pritchard, 'Climate policy on the road to Copenhagen' (2008) 7 *IELR* 257. See also Yvo de Boer, Executive Secretary of the UNFCCC, address to the Africa Carbon Forum, Dakar, Senegal, September 3, 2008.

²⁰⁰ Sustain has discussed two possible ways, through altering the perceived cost-benefit analysis for both countries and through an understanding that both nations are under a moral obligation not to inflict serious climate change harm on the world. Either way seems to "stem from an unruly mixture of confusion, hope, and a sense of moral obligation." Cass R. Sunstein, (n. 158), p. 1677. For discussions on moral considerations, see Julia Driver, 'Ideal Decision Making and Green Virtues' in Walter Sinnott-Armstrong & Richard B. Howarth eds., *Perspectives on Climate Change: Science, Economics, Politics, Ethics*, (Elsevier Ltd., the Netherlands 2005), p. 249; Dale Jamieson, 'Adaptation, Mitigation, and Justice' in Walter Sinnott-Armstrong & Richard B. Howarth (eds), *Perspectives on Climate Change*:

question of how to realize cooperative maxima in combating climate change is open-ended. These questions are expected to be answered in the development of the CBDR principle.

4.4. Conclusion

The weak mitigation commitments provided by Annex I countries and the absence of quantitative mitigation commitments from non-Annex I countries are barriers to the development of climate change regime. The inadequate mitigation targets are shaped in the division between Annex I and non-Annex I countries according to CBDR principle. CBDR principle was not intended to encourage such a division. This principle was aimed to encourage the participation of both developed and developing countries in combating climate change. The differentiated treatment is linked to the common responsibilities and focuses on the enhancement of substantive equality and international cooperation. However, there is no fixed meaning of CBDR. States have various interpretations on differentiated responsibilities to suit their self-interest and policy priorities. Simplistic and uncertain understandings of burden sharing are a barrier to reaching agreement. I am not of course suggesting that CBDR is the only reason that the U.S. and China disagree. However, its division of developing and developed countries is symbolic of a simplistic approach to the problem.

5. Moving Forward on Aviation

Moving on to aviation, this section argues that aviation emissions are best addressed through a sectoral approach in the UNFCCC system. Then, I examine how the controversial principle of CBDR has been an obstacle in designing burden

Science, Economics, Politics, Ethics (Elsevier, Amsterdam 2005), p. 217.

sharing in the aviation sector. I suggest a sophisticated application of CBDR to allow the international target for aviation to be shared between state Parties in an international agreement.

5.1. A Sectoral Approach

In this section, I argue that aviation emissions are best addressed through a sectoral approach rather than within general mitigation targets. A mitigation target on the aviation sector should be identified at the international level in the UNFCCC system for the following three reasons.

First of all, the UNFCCC must work on aviation emissions after the failure of ICAO which will be discussed in Chapter 4. As the aviation industry's own proposals outlined that "[i]t's better to have an efficiency target that everyone can work to up till 2020 and then at a global level set the carbon neutral growth target from 2020 and then head towards the 50% reduction target by 2050."²⁰¹ Copenhagen was the first time that UNFCCC has been urged to directly set reduction targets for the aviation sector instead of through ICAO. A sectoral approach was called for by airline and airport representatives at the Copenhagen climate change conference, although the negotiations did not reach a deal on bunker fuel emissions in the end.²⁰² In the negotiating text, a sectoral target was provided as "[g]lobal reduction targets for such emissions from aviation ... shall be set as equal to, ..., {X per cent}.... below {year XXXX} levels in the commitment period {20XX to 20XX}. Units from existing and potential new flexibility mechanisms may contribute towards achieving these targets."²⁰³ It is understandable that setting

²⁰¹ GreenAir, 'Hopenhagen turning to Nopenhagen as international aviation and shipping emissions fall victim to process' (n. 202). It has been argued that without a sectoral target policymakers would be less aggressive in controlling aircraft emissions than in other programs. See, Daniel M. Warner, 'Commercial Aviation: An Unsustainable Technology' (2009) 74 *J. Air L. & Com.* 553.

²⁰² GreenAir, 'Industry backs ICAO leadership in call for COP 15 to deliver a global agreement on international aviation emissions' (10 Dec. 2009); 'Hopenhagen turning to Nopenhagen as international aviation and shipping emissions fall victim to process' (17 Dec. 2009) online available at <www.greenaironline.com> last accessed 12.01.2010.

²⁰³ Revised negotiating text, Article 136, FCCC/AWGLCA/2009/INF.1 (22 June 2009) AD HOC Working Group on Long-term Cooperative Action under the Convention Sixth session, Bonn, 1-12

a genuine reduction target for this fast growing sector is difficult. It was after the failure of the industry-dominated ICAO over the last 13 years that environment ministers were called to take over ahead of the Copenhagen climate deal.²⁰⁴ Negotiations will take time. A sectoral approach on aviation emissions was on the agenda of Cancun conference but was not mentioned in the final decisions. So far, aviation has been identified as a critical area for global cooperation to accelerate the transition needed to address climate change. The occasion of wider negotiations is the opportunity for achieving a sectoral target on aviation emissions as a complement to the current regime.

Second, a sectoral approach is needed because international aviation is not being effectively addressed within the general targets in the conventional inter-state approaches. Under the climate change regime, emissions are attributable to a country if they result directly from activities that occur within its territory.²⁰⁵ However, international transport involves movement between countries, creating difficulties for allocating emissions to specific countries. Little of the fuel that is used in international transport is emitted in or over the territory of countries that are most directly involvement in the relevant transport movement (e.g., many of the emissions occur when planes transit through a country's airspace or fly over high seas). As discussed in Chapter 2, there are also difficulties in identifying the quantity of emissions involved in any flight and their atmospheric impact. The difficulties in identifying who should take the mitigation responsibility, rest on the unique characteristics of air transportation and its emissions. Therefore, international aviation is not being effectively addressed within general mitigation targets in the current climate change regime.

June 2009, online available on <www.unfccc.int> last accessed 10.12.2009.

²⁰⁴ GreenAir, 'Australia calls for UNFCCC to sidestep ICAO and set emissions reduction targets for international aviation' (12.06.2009) online available at <www.greenaironline.com> last accessed 12.01.10.

²⁰⁵ IPCC guidelines require that "The IPCC methodology subtracts the quantities delivered to and consumed by ships or aircraft for international transport from the fuel supply to the country. In this manner, the CO₂ emissions arising from the use of international bunkers are not included in the national total. To simplify the preparation of global estimates, these emissions should be brought together in a separate table." IPCC, *Revised 1996 IPCC Guidelines for National Greenhouse gas Inventories: Reference Manual* (IPCC,1996), pp.1.9-1.10.

Third, airlines want to avoid the risk of a “patchwork quilt” of policies which may hit airlines twice through a global treaty and then through a national/regional climate policy.²⁰⁶ For example, the European emissions trading scheme, which will be discussed further in Chapter 6, included international air transports. It is a good model of regional level efforts in terms of building multiple levels approach to regulate aviation emissions if a sectoral target on aviation cannot be agreed on the international level. But, multiple regional emissions trading schemes plus other national emissions trading systems are very likely to provide only fragmented markets and regulations on aviation emissions. My discussions in Chapter 6 will explore the limitations of multiple regional emissions trading schemes. However, these limitations can be avoided if there is a sectoral approach to aviation in the UNFCCC system. I will argue in Chapter 6 that regional emissions trading under a sectoral approach can provide an important market-based instrument to curb the growth of aviation emissions but within the context of an international agreement. A sectoral approach at the international level provides an opportunity to avoid the risk of the “patchwork quilt” of regulations on international aviation emissions.

For these three reasons, I argue that aviation emissions are best addressed through a sectoral approach in the UNFCCC system. A sectoral approach has been supported by some academics, airlines and NGOs.²⁰⁷ It has been argued that sectoral approach may establish politically acceptable mitigation targets in identified sectors and potentially engaging both developed and developing countries in combating climate change.²⁰⁸ A group of NGOs believe that the idea of raising a sectoral target on aviation is “to use the occasion of wider negotiations to break the political

²⁰⁶ GreenAir, ‘Copenhagen’s failure to deliver an aviation emissions deal leaves sector facing an uncertain future’ (22 December, 2009) online available at <www.greenaironline.com> last accessed 11.01.10.

²⁰⁷ Akihiro Sawa, ‘A Sectoral Approach as an Option for a Post-Kyoto Framework’ (December 2008) The Harvard Project on International Climate Agreements Discussion Paper Series 08-23, Harvard Project on International Climate Agreements, Belfer Center for Science and International Affairs, Harvard Kennedy School, online available at <http://belfercenter.ksg.harvard.edu/publication/18736/sectoral_approach_as_an_option_for_a_postkyoto_framework.html> last accessed 11.03.10.

²⁰⁸ Ibid.

deadlock” and to agree a global target.²⁰⁹ Airlines have put the idea of sectoral approach into their proposals as mentioned above.

To make it clear, I am suggesting the use of a sectoral approach on aviation only, but not a multi-sectoral restructuring of the climate change regime. Because regulating aviation emissions is especially complex as discussed in Chapter 2, the aim of this suggestion is to give greater attention to the aviation industry in the international climate negotiations,²¹⁰ and to deliver a sectoral mitigation target to lead the whole industry to work towards sustainable growth. It is important to identify the policy guidance and incentives which will underpin the shift to sustainable air transport growth or a low carbon aviation industry in combating climate change. It is also important to provide a vision of the way in which the structure of this industry or the whole transport industry and of our life associated with it will ultimately be different as a result. This vision “is needed to underpin planning and investment decisions by business and government, as well as the way in which individual behaviours may need to adapt.”²¹¹

5.2. Burden Sharing in Respect of Aviation Emissions

A sectoral approach to aviation emissions raises questions about how the country Parties could share the mitigation burdens. There are two key challenges in applying a sectoral target to the aviation sector. First is the difficulty of allocating aviation emissions by nationality, as discussed in Chapter 2. And secondly, the

²⁰⁹ Press release from group of NGOs (European Federation for Transport and Environment, WWF, Seas At Risk, The Ecological Council (Denmark), France Nature Environment, Sierra Club (USA), The Swedish Society for Nature Conservation), ‘Copenhagen close to failure on aviation and shipping emissions’ (17.12.2009) online available at <http://www.airportwatch.org.uk/news/detail.php?art_id=3808> last accessed 20.01.10. See also ‘UNFCCC must include international aviation and shipping emissions in measures on climate change’ (2009) Transportenvironment.org, online available at <www.transportenvironment.org/Publications/prep_hand_out/lid/538> last accessed 20.07.09.

²¹⁰ Co-operative sectoral solutions were suggested as “more plausible than a comprehensive global agreement” and that greater attentions should be given to particular industries. See Richard Baron et al., ‘Sectoral Approaches to Greenhouse Gas Mitigation: Exploring Issues for Heavy Industry’, IEA Information Paper, International Energy Agency, Paris, France, (November 2007).

²¹¹ Andrew Sentence, ‘Developing transport infrastructure for the Low Carbon Society’ (2009) 25/3 *Oxford Review of Economic Policy* 391, 394.

developed/developing country dichotomy that we find in most approaches to CBDR does not suit the sharing of mitigation responsibilities in the aviation sector. The aviation sector requires a reclassification of countries according to their different contributions to the expansion of aviation, and their changing emissions reduction capacities.

5.2.1. Allocating Emissions

In Chapter 2 I explored some of the difficulties of allocating aviation emissions nationally: for example, it is difficult to identify the emitters in a single journey due to the worldwide cooperation between airlines through code sharing; the structure of air transport business involves a highly heterogeneous array of actors (the major actors include airline companies, shippers, agents, forwarders, terminal operating companies and hinterland transport companies); and much of the fuel that is used in international transport is used in or over the territory of countries that have no direct involvement in the relevant transport movement. Market deregulation and liberalization in the aviation industry²¹² has compounded these practical difficulties. First, for example, the nationality of airlines is getting more ambiguous due to globalization in the air transport industry, which, again, makes it more difficult for policymakers to measure environmental obligations by country. Since air traffic rights are governed by bilateral agreements, the airlines of each nation must in principle be substantially owned and effectively controlled by its citizens.²¹³ The “substantial ownership and effective control” of airlines was not addressed in the Chicago Convention itself.²¹⁴ The only multilateral international

²¹² See Paul S. Dempsey & Andrew R. Goetz, *Airline Deregulation and Laissez-Faire Mythology*, (Westport, Conn u.a. Quorum Books, US 1992); Paul S. Dempsey, *European Aviation Law*, (Kluwer Law International, the Netherland 2004).

²¹³ Peter. P.C. Haanapel, ‘Multilateralism and Economic Bloc Forming in International Air Transport’ (1994) 19 *Ann. Air & Sp. L.* 211.

²¹⁴ In 1994, the examination of the issue by the ICAO Worldwide Air Transport Conference showed that there is no single agreed-upon definition of what is meant by substantial ownership and effective control. See ICAO, Working Paper ‘Worldwide Air Transport Conference on International Air Transport Regulation, Present, Future’ at Conf/4-WP47, p. 3.

agreement that actually addressed the issue of airline ownership restrictions is the *International Air Services Transit Agreement*. Article 1, Section 5, which provides that,

“[e]ach Contracting State reserves the right to withhold or revoke a certificate or permit to an air transport enterprise of another State in any case where it is not satisfied that substantial ownership and effective control are vested in nationals of a Contracting State, or in case of failure of such air transport enterprise to comply with the laws of the State over which it operates, or to perform its obligations under this Agreement.”²¹⁵

These ownership restrictions are designed to contribute to national security, economic security, safety, competition issues, bilateral issues and other legal issues.²¹⁶ Yet, the principle of the national substantial ownership and effective control of airlines has become a significant impediment to the air transport industry in the globalised economy. Bilateral agreements hamper the free market by restricting the ability of airlines to consolidate with foreign carriers through equity transfers. To circumvent such barriers, airlines enter into more indirect forms of cooperation, such as code sharing and joint market arrangements.²¹⁷ As discussed in Chapter 2, such cooperation between airlines is one more thing that makes it difficult to identify which country should bear environmental obligations. Furthermore, there are many deviations from the substantial ownership and effective control principle which have been developed by the changing of national laws or by the airline industry itself. The proliferation of foreign investment, for example, has almost completely removed the national restrictions in both developed and developing countries. Lelieur has examined the factors behind the increased foreign investment limits in 1990s and he found that some developing countries (including Brazil, Thailand, Peru and Bangladesh) did so in order to “obtain the financing needed to keep their national air transport activity operational,” while some

²¹⁵ *International Air Services Transit Agreement*, 7 December 1944, 84 U.N.T.S. 389, ICAO Doc. 7500.

²¹⁶ Commission on Air Transport, ‘Foreign in Airlines: An ICC View’ (November 8, 1994), online available at <www.iccwbo.org/home/statements_rules/statments/1994/foreign_investment.asp> last accessed 07.03.10.

²¹⁷ Cary Clyde Hufbauer & Christopher Findlay, (eds.) *Flying High: Liberalizing Civil Aviation in the Asia Pacific* (Institute for International Economics, Washing DC 1996), p. 21.

developed countries allowed 100 percent foreign investment in their airlines due primarily to their geographical setting, taking the example of Singapore in its emergence as a major transit hub in the Asian-Pacific region.²¹⁸ The creation of multi-national airlines is also a deviation from the substantial ownership and effective control principle. For example, the Scandinavian Airlines System (SAS), created in 1951, is a joint operating organization of the national airlines of Norway, Sweden and Denmark. Since it is “the holder of traffic rights in each of the three bilateral agreements concluded with third countries,”²¹⁹ the commercial opportunities are shared and, equally, it has become more difficult to specify their environmental obligations. In sum, the principle of “substantial ownership and effective control” has undergone considerable erosion, which means that the nationality of airlines, and of their emissions, is ambiguous.

A further challenge for the allocation of aviation emissions as a result of market deregulation and liberalization²²⁰ has been the change in airline network structure from “point-to-point” to “hub-and-spoke.” As Ian Humphreys has described:

“Hub-and-spoke networks minimize airline operating costs per seat kilometre flown in relation to the airports served in a network. A hub can be defined as a central airport location used as a transfer point for services from outlying spoke airports. Airlines schedule waves of flights into the hub and then back out to where they came from within a short time period. Passengers transfer between flights at the hub. This allows the airlines to maximize the number of marketable connections between points of the network for the lowest airline operating cost.”²²¹

Hub-and-spoke networks may attribute economically to the development of airlines, but they make it more difficult to attribute their environmental effects to particular countries. International air service is booming in big cities,

²¹⁸ Isabelle Lelieur, *Law and policy of substantial ownership and effective control of airlines* (Ashgate, UK, USA 2003), pp. 52-53.

²¹⁹ *Ibid.*, p. 51.

²²⁰ See Paul S. Dempsey & Andrew R. Goetz, *Airline Deregulation and Laissez-Faire Mythology*, (Westport, Conn u.a. Quorum Books, US 1992); Paul S. Dempsey, *European Aviation Law*, (Kluwer Law International, the Netherland 2004).

²²¹ Ian Humphreys, ‘Organizational and growth trends in air transport’ in Stefan Gössling and Paul Upham (eds.) *Climate Change and Aviation: Issues, Challenges and Solutions* (Edward Elgar, London 2009), p. 24.

agglomerations of cities and hub cities to feed the hub-and-spoke networks of the major carriers.²²²

Difficulties in allocating responsibilities for “emissions” are not unique to aviation. Lesson might be learned for example in the ways in which international law has allocated responsibilities in respect of oil pollution at sea. Although there is a general endorsement of the polluter-pays principle for marine pollution damage, “who is the polluter is not self-evident in a complex industry such as shipping.”²²³ The scope of possible polluters includes the operator of an oil or chemical tanker, the cargo owner, the ship owner or even a third party.²²⁴ The example of oil pollution illustrates that these questions are always a matter of policy choice rather than simple technical allocation. Aviation needs to be addressed on that basis. In any event, a multi-level approach is needed. The contribution to the expansion of international aviation should be considered at the regional (grouping of countries) and city level as well as at the national level. Allocating emissions by the regional or city level would be new but it would be sensible for aviation. The norm of differential treatment on the regional level has been accepted by the international community in the 1982 UN Convention on the Law of the Sea (UNCLOS).²²⁵ Article 207(4) (Pollution from land-based sources) provides that states, in endeavouring to establish regional and global approaches, shall “take into account *characteristic regional features*, the economic capacity of developing States and their need for economic development.”²²⁶ Some of the other articles (Article 197, Article 207(3) and 208(4)) provide that policies are to be harmonized on a regional basis for the protection and preservation of the marine environment. In terms of the

²²² Peter P.C. Haanappel, *The Law and Policy of Air Space and Outer Space* (Kluwer Law International, The Hague, London 2003), p. 153.

²²³ The preamble to the 1990 Oil Pollution Response Convention describes the polluter-pays principle as a “general principle of international environmental law”, and a number of regional seas treaties adopted or revised to apply this principle more generally to the costs of marine pollution and environmental damage caused by ships, land-based activities and dumping. Patricia Birnie, Alan Boyle, Catherine Redgwell, *International Law and Environment* (3rd ed., Oxford University Press, Oxford 2009), p. 432.

²²⁴ *Ibid.*, p. 433.

²²⁵ United Nations Convention on the Law of the Sea, Oct. 21, 1982, U.N.Doc.A/CONF.62/122, (1981).

²²⁶ *Ibid.*, art. 207(4), emphasis added. Its article 197 also includes “take into account characteristic regional features.”

city level, it is worth noting the special role of the hub cities discussed above. Because of hub-and-spoke networks, some airports receive a relatively large share of all take-offs and landings. Such networks might have environmental benefits, due to environmental economies of scale: large aircraft with lower emissions per seat can be used because passenger flows are concentrated on fewer links. However, the negative environmental effects tend to exceed the positive effects.²²⁷ The hub cities contribute more emissions than other cities and as such, to develop a comprehensive multi-level burden sharing system may be more suitable to the international aviation sector.

5.2.2. The Developed/Developing Country Dichotomy

As well as the difficulty of allocating emissions by nationality, it is particularly problematic to apply any simplistic dichotomy between developed and developing countries in aviation. So for example, the hub cities discussed above exist in both developed and developing countries, for example New York and Shanghai. The air transport service in these hub cities directly contributes to regional economic development and global atmospheric pollution. Neither the contribution of aviation to climate change, nor the contributions of aviation to economic and social welfare are necessarily or easily linked to the development status of countries.

In any event, aviation is necessary to most of the economies of the world, developed and developing. As within the railway a century ago, the global air transport system takes a role as a public transport system both in the developed and developing world, and “whether they travel or not, many people benefit from the facilities and services provided by aviation.”²²⁸ Air transport “has created a unique world of business connections, economic opportunities, travel and tourism.”²²⁹ Although the benefits of aviation may be assessed in terms of contribution to

²²⁷ OECD, *Globalisation, Transport and the Environment* (OECD, 2010), pp. 191-192.

²²⁸ Léonie Dobbie, ‘Key Issues in Aviation Environmental Policy-making’ in Stefan Gössling & Paul Upham, (n.221), p. 206.

²²⁹ Ibid.

regional and national economies and social welfare, as discussed in Chapter 2, these benefits are hard to measure in a way that is useful for policymakers.²³⁰ Indeed, aviation is necessary to almost all the countries in the world. It assists the agricultural and rural development of isolated economies. For example, aviation enables the production of specialized products such as fresh fruit and flowers from Africa.²³¹ Aviation contributes to developing countries in “promoting cultural unity within a country and allowing cultural, ethnic and educational links with the industrialized world.”²³² Developed economies also benefit from aviation in the form of tourism and trade, as in the UK.²³³ It is impossible to measure to what extent aviation is more necessary to some groups of countries than others.

A more sophisticated approach to burden sharing in respect of aviation emissions will need to break the developed/developing country dichotomy. It must be kept in mind that differential treatment should be a living norm which should “have the ability to constantly evolve and adapt to emerging realities.”²³⁴ This includes updating not only countries’ contributions to aviation emissions but also their capacity for the provision of cleaner facilities for international aviation.

First, distinctions need to be drawn between different developing countries. Lessons from the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer are suggestive of how this might work. In addressing “the needs and circumstances of the developing countries”,²³⁵ Article 2 (by reference to article 5), distinguishes between developing countries whose annual consumption of controlled substances is less than 0.3 kilograms per capita and all other countries. Although the countries not meeting the 0.3kg test include virtually all developing countries, this Convention treats countries quite differently based on their “annual consumption of controlled substances” rather than solely on their development status. This

²³⁰ Robert Caves, ‘The social and economic benefits of aviation’ in Stefan Gössling & Paul Upham, *ibid.*, pp. 36, 37.

²³¹ *Ibid.*, pp. 36, 41.

²³² *Ibid.*, p. 39.

²³³ Sarah Mander & Sally Randles, ‘Aviation Coalitions: Drivers of Growth and Implications for Carbon Dioxide Emissions Reduction’ in Stefan Gössling & Paul Upham, *ibid.*, pp.273, 274.

²³⁴ Lavanya Rajamani, *Differential Treatment in International Environmental Law* (Oxford University Press, Oxford 2006) p. 173.

²³⁵ Montreal Protocol on Substances that Deplete the Ozone Layer, Sept. 16, 1987, art. 10.

measurement method raise the idea of considering countries' contributions to the consumption of sources – the contribution to the expansion of air transport in the case of aviation emissions — in a way that provides a criterion for “differential treatment”.

Secondly, countries' capacity for the provision of cleaner facilities for international civil air navigation should be identified and updated. It is one of the distinctive features of the recent development of international aviation that airlines are increasingly focused on operational cost reductions with the rising price of jet fuel, and developed countries are by no means the only ones that are technically or financially able to enjoy the advanced operational system of air transport. China Eastern Airlines, for example, signed a \$1.2 billion order for Rolls-Royce Trent 700 engines in November 2010 which will enable China Eastern to enjoy a fuel management service for the airline's fleet of more than 300 aircraft provided by Reston, the Virginia-based Optimized System and Solution (OSyS).²³⁶ OSyS provides the fuel usage analysis, management and optimization that allow airlines to drive operational efficiencies, measure improvement initiatives and mitigate their environmental impact. This service is already in use by several other airlines including EasyJet, Qatar Airways and Thomson Airways.²³⁷ The China Eastern deal shows China's capability to import new technology on emissions reductions without any financial assistance. As such, differential treatment should be used in a meaningful way to identify the continuing relevance of the differentiated capability of countries. The changes in the identified differences of countries²³⁸ have been acknowledged by the World Trade Organisation (WTO) regime. In the WTO regime, an evaluation of whether the existing differential commitments broadly reflect the existing differences between countries and if any changes to the existing structure of commitments are necessary does occur.²³⁹ There is no definition of developed or developing countries, but an evaluation process labelled “graduation” was used to

²³⁶ ‘Rolls-Royce forms a Carbon Partnership with China Eastern to reduce fuel consumption and emissions’ Greenaironline, 15 Nov. 2010, online available at <<http://www.greenaironline.com/news.php?viewStory=976>> last accessed 08.02.2011.

²³⁷ See OSyS website at <<http://www.o-sys.com/civil-aviation.html>> last accessed 08.02.2011.

²³⁸ In the WTO regime, any consideration of differential treatment needs to differentiate among the various types of developing countries. Various categories of countries that are under-developed include transitional economies, middle-income countries, and the least developed countries. The capacities of these countries varies widely. See Michael Hart & Bill Dymond, ‘Special and Differential Treatment and the Doha “Development” Round’ (2003) 37/2 *Journal of World Trade* 395.

²³⁹ Lavanya Rajamani, (n. 108).

determine a particular country's industrial status.²⁴⁰ The WTO experience shows that the continuing relevance of differentiated commitments in environmental treaties must be conducted through a time-to-time evaluation. In the context of aviation, the actual capacity of countries to reduce aviation emissions must be identified and updated. An evaluation mechanism could be established by ICAO, which is a topic to which I will return in chapter 4.

5.2.3. Summary

To summarise, burden sharing in respect of aviation emissions should not be solely by reference to nationality but should also consider the contribution to the expansion of international aviation at the regional, and city level. It should also break the developed/developing country dichotomy, by considering changing contributions to aviation emissions and changing capacity for the provision of cleaner facilities for international aviation.

These criteria are likely to point in different directions in some cases. Any allocation will be complicated and sensitive, and will require the political will of country Parties in the negotiations of the UNFCCC system. Lack of political will is not only an obstacle to achieving a comprehensive multi-level burden sharing system on aviation emissions, but also a main obstacle in the general climate change negotiations.²⁴¹ Unfortunately, Copenhagen showed again that “[d]istrust... is the default.”²⁴² Whilst the Cancun Agreements are widely perceived as having restored faith in the multilateral climate change process under the UNFCCC, Cancun has left many important details open and the legal form of the future of post-2012 climate change regulation is still pending.²⁴³

It is beyond the scope of this thesis to explore the adequacy of the UNFCCC in detail. Whilst the adequacy of the UNFCCC system is clearly crucial, it is a central

²⁴⁰ See Kele Onyejekwe, ‘GATT, Agriculture and Developing Countries’ (1993) 17 *Hamline L. Rev.* 77.

²⁴¹ Benito Müller, (n. 20); Kati Kulovesi & María Gutiérrez, (n. 63).

²⁴² Benito Müller, (n. 20), p. 9; Rajamani discussed the lack of trust amongst developing countries that industrialized countries will take the lead in the new climate agreement before Copenhagen. Lavanya Rajamani, ‘Addressing the ‘post-Kyoto’ stress disorder: reflections on the emerging legal architecture of the climate regime’ (2009) 58/4 *ICLQ* 803.

²⁴³ Robert Stavins, ‘Why Cancun Trumped Copenhagen’, 1st January, 2011, online at <<http://belfercenter.ksg.harvard.edu/analysis/stavins/?p=913>> last accessed 08.02.2011.

part of the argument in this thesis that the conventional UNFCCC system cannot be the whole answer to aviation emissions. The UNFCCC system is needed to provide a legally binding mitigation target through a sectoral approach on aviation as argued above. The lack of political will in the international negotiations may make the suggested burden sharing system difficult in practice. The sectoral target might be easier to agree in the absence of allocated mitigation responsibilities. I will explore an alternative form of allocation through a global emissions trading scheme in Chapter 6. In Chapters 4 and 5, I will also explore multiple instruments and involving multiple parties. If the sectoral target cannot be agreed internationally, other measures at other levels of governance, for example national fuel taxes (Chapter 5), regional emissions trading (Chapter 6) may still contribute to curbing the growth of aviation emissions. Whilst not a focus of this thesis, voluntary initiatives from the industry (e.g. via IATA) coupled with pressing from NGOs may also be necessary. The argument that the traditional top-down UNFCCC system cannot be the whole answer is a subject to which I will return.

6. Conclusion

In this chapter, I argue that although the conventional top-down UNFCCC system cannot be the whole answer to the aviation emissions problem, it is part of the solution. Aviation emissions are best addressed through a sectoral approach in the UNFCCC system. I suggest an application of the CBDR principle which would allow the international target for aviation to be shared in an international agreement.

First of all, I identify two barriers to progress in the existing international climate change law regime. One is the vagueness of the “ultimate objective” as set out in Article 2 of the UNFCCC. This is because that the “ultimate objective” to stabilize all greenhouse gas concentrations in the atmosphere cannot help to explain how many and from where greenhouse gases emissions need to be cut. The arguable legal status of an “ultimate objective” of stabilization leads to difficulties in agreeing a specific long-term mitigation target in the subsequent negotiations. The other

barrier is the inadequate emissions reductions targets. I argue that the mitigation commitments given by Annex I countries are too weak to curb the growth of global emissions. The absence of quantitative mitigation commitment from non-Annex I countries, especially the strong economies of the non-Annex I countries, is a mistake. This is because the unlimited emissions that non-Annex I countries may produce would weaken the overall reduction efforts made by the developed countries. What is more, the current mitigation targets are shaped in the division between the Annex I and non-Annex I countries according to the CBDR principle. I argue that simplistic and uncertain understandings of burden sharing are a barrier to reaching agreement.

In the case of aviation emissions, I argue that aviation emissions are best addressed through a sectoral approach in the UNFCCC system for three reasons: the UNFCCC must work on aviation emissions after the failure of ICAO which will be discussed in Chapter 4; aviation is not being effectively addressed within the general targets in the conventional inter-state approaches; and airlines want to avoid the risk of a “patchwork quilt”²⁴⁴ of policies which may hit airlines twice through a global treaty and then through a national/regional climate policy. Under the sectoral approach, a sectoral mitigation target on aviation emissions is agreed at the international level. As discussed in section 5.2, the allocation of this target should address the multi-level nature of air transport and the changing contributions and capacities of developing countries.

I prefer an international allocation of mitigation responsibilities through a burden sharing arrangement. However, it is difficult to achieve a comprehensive multi-level burden sharing system on aviation emissions. An alternative form of allocation through a global emission trading scheme will be explored in Chapter 6.

²⁴⁴ GreenAir, ‘Copenhagen’s failure to deliver an aviation emissions deal leaves sector facing an uncertain future’ (22 December, 2009) online available at <www.greenaironline.com> last accessed 11.01.10.

Chapter 4. ICAO's Failure in Regulating Aircraft Engine Emissions

1. Introduction

Established by the Chicago Convention 1944,¹ the International Civil Aviation Organisation (ICAO), has contributed considerably to the extraordinary development of civil aviation for more than sixty years. Article 2.2 of the Kyoto Protocol stipulates that “[t]he Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases from aviation working through the International Civil Aviation Organization”² However, the organisation has failed to deliver efficient regulation. This chapter examines the extent to which ICAO is empowered by the contracting states³ to combat the new challenge of climate change and it seeks to reposition ICAO's role in the future.

The first step toward such an examination is to inquire why aviation emissions have been delegated to ICAO, given the absence of any explicit responsibility for environmental matters in the Chicago Convention. To answer this question, this chapter begins by exploring the features of ICAO from three perspectives: the universal participation in the organisation, its technical expertise and its experience in adopting international standards and recommended practices (SARPs) on aircraft engine emissions before Kyoto.

I argue that whilst there are apparently good reasons for asking ICAO to be the delegated authority, they are not unproblematic. In the second part of this chapter, I analyse the limitations of ICAO's potential for reducing aviation emissions from

¹ *Convention on International Civil Aviation* (adopted 7 December 1944, entered into force 4 April 1947) 15 UNTS 295 (Chicago Convention), art. 37.

² *Protocol to the United Nations Framework Convention on Climate Change* (adopted 11 December 1997, entered into force 16 February 2005) UN Doc. FCCC/CP/1997/7/Add. (Kyoto Protocol). See chapter 3 of this thesis for discussions of the failure of the climate change regime led by the UNFCCC.

³ The Contracting States are those which give official notification of ratification or other adherence to the Chicago Convention. In this thesis, the Contracting States of the Chicago Convention are the same as member States of the ICAO.

three points of view. First, as I have argued in Chapter 2, there is no available technical measure which can guarantee a particular emissions reduction target will be achieved for aviation. Given that the issue of reducing aviation emissions is in part about reducing flying, ICAO's advantage in technical knowledge is not enough to achieve emissions reduction. Second, the emissions related standards which are addressed as SARPs in Annex 16 Volume II of the Chicago Convention⁴ are not efficient in combating the climate change issues associated with aviation. This is because some of these standards are in place to address the facilitation of orderly traffic growth, with no concern for the climate change issue. Some other standards focus only on aircraft engine certification, but not on aircraft certification, which limits its effectiveness in controlling aircraft emissions.

Beyond these limitations to ICAO's advantages, this chapter argues that the organisation's failure has deeper roots in ICAO's aims and its rule-making function. First, ICAO's mandate is to ensure the safe, efficient and orderly evolution of international civil aviation.⁵ Climate change is not ICAO's major concern. However, the organisation provides aircraft emission standards and it set climate protection as one of its strategic objectives for the period 2005-10.⁶ Thus, it is necessary to examine the relationship between climate protection and ICAO's aims. Second, ICAO's rule-making function necessarily influences the extent to which it can amend or make new standards to control aviation emissions efficiently. The ICAO made rules are not legally binding and an environmental or climate change perspective is inadequately represented in the decision making process. Thus, the legal status of the rules made by ICAO and ICAO's rule-making procedure are examined in order to explain why ICAO is not the most appropriate body to develop a more efficient emissions standard on aircraft.

Understanding the nature of ICAO's past failures, I argue in this chapter that

⁴ International Standards and Recommended Practices: Environmental Protection; Annex 16 to the Convention on International Civil Aviation, Volume II: Aircraft Engine Emissions, 2nd ed. July 1993, (Annex 16 Volume II).

⁵ Chicago Convention, (n. 1), art. 44.

⁶ ICAO, 'Strategic Objectives of ICAO For 2005-2010' Consolidated Vision and Mission Statement, (2004) <http://www.icao.int/icao/en/strategic_objectives_2005_2010_en.pdf> accessed 27 August 2010. The strategic objectives of ICAO have not been updated at the time of writing.

the organisation in the future is not suited to being the sole regulator of aviation emissions. The final part of this chapter contributes to the repositioning of ICAO's role in the future. I argue that ICAO should continue to play a key role on the technical front, especially that it should be a focal point regarding the balancing of potential trade-off effects with reducing emissions in ensuring a safe, efficient and environmentally friendly development of the industry. In the light of its experience of collecting and processing emissions related data and its long-term service to the industry, ICAO may also have an important role regarding performance monitoring, reporting methods and auditing processes. Relying on the literature on environmental audit, I suggest that ICAO should establish a climate change audit programme to audit its member states' aviation emissions reduction actions. As an environmental regulatory tool, this audit programme may also help to fit ICAO into a multi-party, multi-level and multi-instrumental regulatory architecture to solve the issue of aviation's climate impact which will be discussed in Chapter 7.

2. Why did Kyoto Protocol Require ICAO to Work on Aviation Emissions?

At the end of the last century, the parties to UNFCCC had “protracted discussions” on aviation GHGs during the elaboration of the Kyoto Protocol, ultimately failing to allocate GHGs from international air transport to individual countries.⁷ In 1997, the parties to the Kyoto Protocol requested that ICAO address aviation GHGs.⁸ Thereafter, international aviation emissions were not subject to the national emissions targets agreed in the Kyoto Protocol, but the parties to the Protocol turned to ICAO as the body possessing authority in the aviation sector. However, over the past thirteen years, ICAO has failed to deliver any efficient

⁷ Sebastian Oberthür, ‘The Climate Change Regime: Interactions of the Climate Change Regime with ICAO, IMO, and the EU Burden-Sharing Agreement’ in Sebastian Oberthür & Thomas Gehring (ed.), *Institutional Interaction in Global Environmental Governance: Synergy and Conflict among International and EU Policies*, (the MIT press, Cambridge, 2006), pp. 53-78.

⁸ ICAO, ‘Kyoto Protocol Emphasizes ICAO's Role in Addressing Greenhouse Gas Emissions from International Aviation’, News Release PIO 25/97, (12 December 1997) online available at <<http://www.icao.int/icao/en/env/nrs.htm>> last accessed 10.03. 09.

regulation of emissions stabilisation or reductions.⁹ The following sections will examine why ICAO was granted such authority.

2.1. The Universal Participation in ICAO

The first reason which explains why ICAO was selected as the delegated regulator in the aviation sector is the universal participation in ICAO. The very complex climate impacts associated with international air transport and the difficulties of allocating emissions to a particular state, discussed in Chapter 2, require worldwide participation and cooperation in curbing aviation emissions. Aviation emission is also a very complex issue that cannot be treated alongside other sectors in the international climate change law regime. In this context, a universally participating inter-governmental organisation specific to the aviation sector – the International Civil Aviation Organisation – might be well suited to deal with the complex aviation emissions issue.

The first step toward explaining why ICAO is suitable to regulate aviation emissions would be to inquire into the nature of ICAO. Although ICAO was established by the Chicago Convention, there is no explicit description of the Organisation in the Convention, except for a short naming of the organisation in Article 43 and a description of its aims and objectives in Article 44 (which will be examined later in this chapter).

Under Article 43 of the Chicago Convention, ICAO was established and it came into being:

“Article 43

Name and composition

An organization to be named the International Civil Aviation Organization is formed by the Convention. It is made up of an Assembly,

⁹ EFTE, *No Flight Plan: How the International Civil Aviation Organization (ICAO) Has Blocked Progress on Climate Change for a Decade* (EFTE, Belgium 2007); “International aviation body comes to global agreement on emissions” (October 2010) 429 *ENDS Report* 29.

Most recently, ICAO announced to improve fuel efficiency by 2% annually to 2050, cap greenhouse gas emissions from international aviation from 2020 and set a global efficiency standard for aircraft engines in 2013. However, the 2% ICAO target “represents little above what is already happening”. And the target to cap aviation emissions from 2020 is “merely a non-binding, aspirational goal.” See “ICAO’s aviation emissions reduction plan heads for Cancun” (November 2010) online available at <<http://www.flightglobal.com/articles/2010/11/23/349973/icaos-aviation-emissions-reduction-plan-heads-for-cancun.html>> last accessed 01.03.10.

a Council, and such other bodies as may be necessary.”¹⁰

ICAO could be treated as an international intergovernmental organisation (IGO) because it has all the main features of an IGO: “a) it is set up by an international treaty; b) its members are sovereign States, and c) the organization possesses clearly defined aims of international nature.”¹¹ More importantly, ICAO is a central institution for global governance in international civil aviation,¹² described at the end of every ICAO News Release, as:

“A specialized agency of the United Nations, ICAO was created in 1944 to promote the safe and orderly development of international civil aviation throughout the world. It sets standards and regulations necessary for aviation safety, security, efficiency and regularity, as well as for aviation environmental protection. The Organization serves as the forum for cooperation in all fields of civil aviation among its 190 Contracting States.”¹³

This statement not only summarizes the responsibilities of the organisation arising from the Chicago Convention, but also identifies the role of ICAO, as part of the United Nations family, in the global governance of international civil aviation. What is more, the leading role of ICAO as “the central institution for global governance in international civil aviation”¹⁴ is reflected in the Preamble of the Chicago Convention, through descriptions in broad terms of the principles of and the rationale for international cooperation between contracting states.¹⁵ In addition, in Article 82 of the Convention, all contracting states which accept the Chicago Convention are treated as abrogating any obligations and understandings between themselves that are inconsistent with its terms:

“Article 82 Abrogation of inconsistent arrangements

The contracting States accept this Convention as abrogating all obligations and understandings between them which are inconsistent with its terms, and undertake not to enter into any such obligations and understandings. A contracting State which, before becoming a member of

¹⁰ Chicago Convention, (n. 1), art. 43.

¹¹ Michael Milde, *International Air Law and ICAO* (Eleven International Publishing, the Netherlands 2008), p. 122.

¹² Silvério Espínola, ‘Global Civil Aviation Governance’ (2002) 27 *Ann. of Air & Sp. L.* 313.

¹³ See ICAO News Release on ICAO website at < <http://www.icao.int/icao/en/nr/>> last accessed 20.05.10.

¹⁴ Silvério Espínola, (n. 12), p. 317.

¹⁵ Chicago Convention, (n. 1), Preamble.

the Organization has undertaken any obligations toward a non-contracting State or a national of a contracting State or of a non-contracting State inconsistent with the terms of this Convention, shall take immediate steps to procure its release from the obligations. If an airline of any contracting State has entered into any such inconsistent obligations, the State of which it is a national shall use its best efforts to secure their termination forthwith and shall in any event cause them to be terminated as soon as such action can lawfully be taken after the coming into force of this Convention.”¹⁶

Although the above evidence reflects the leading role of ICAO in global governance in civil aviation, there is no explicit description of the organisation in the Chicago Convention. This is mainly because that the notion of an international organization to handle international civil aviation was established during the Chicago Conference of 1944 before the establishment of the United Nations, of which ICAO later became a specialized agency.¹⁷ Thus, “the intention of the parties which led to establishing the meaning and purpose of ICAO” was to establish “an international technical organization – a permanent civil aviation agency.”¹⁸ Abeyratne has identified that ICAO was founded as an international organisation which must have “universality”,¹⁹ namely the wide participation of countries around the world. This is a distinguishing feature of ICAO, because “a non-participating State might not do as [much] harm to other States in its actions in the food and agriculture or monetary areas [in the examples of the International Monetary Fund or the Food and Agriculture Organization], as much as it would in the field of air navigation and transport.”²⁰ This argument could be supported by practical illustrations offered by Schenkman. “[I]f a non-member of ICAO were to operate an international air service that did not adhere to established ICAO rules of the air, the safety of operations of air services for all member States would be jeopardized.”²¹ If “a non-member State closing its air space to other nations,” the action by a non participating state might effectively preclude the economic progress

¹⁶ Chicago Convention, *ibid*, art. 82.

¹⁷ Ruwantissa Abeyratne, ‘The Legal Effect of ICAO Decisions and Empowerment of ICAO by Contracting States’ (2007) 32 *Ann. of Air & Sp. L.* 517.

¹⁸ Ruwantissa Abeyratne, *ibid.*, p. 518. See *Proceedings of the International Civil Aviation Conference*, Chicago, Illinois, 1 November – 7 December 1944, Department of State Publication 2820 (Washington, 1948), vol. II pp. 1317 – 1319.

¹⁹ *Ibid.*, p. 519.

²⁰ *Ibid.*

²¹ Captain Jacob Schenkman, *International Civil Aviation Organization* (Librairie E. Droz, Geneve 1955), p. 125. Cited from Ruwantissa Abeyratne, *ibid.*

of the air transport industry.²² Nevertheless, the universal acceptance of ICAO by its member states is a *sine qua non*, and this principle has been growing in tandem with the exponential growth of air transport and the vast technical advances made in air navigation.²³

Universal participation in climate change mitigation is crucial, especially in the international aviation sector. Universal participation in ICAO provides a preliminary explanation of why ICAO was selected as the “delegated authority” in this sector.

2.2. ICAO’s Technical Expertise

A second reason for the turn to ICAO to regulate aviation emissions is the organisation’s technical expertise. However, curbing aviation emissions is not only a technical problem, but also a political and economical one, a subject to which I will return in section 3 of this chapter. The focus of this section is that aviation emission is a highly technical area that requires technical expertise.

The need for technical expertise arises for two reasons. First, the role of expertise is to “[set] out the uncertainties, assumptions, and the probable consequences of action or inaction” in order to refine problem definition and to identify the range of response options.²⁴ Scientific or technical experts are generally believed to be able to contribute significantly to a deeper understanding of global environmental change.²⁵ Scientific/technical bodies have been established “concomitantly with the international management bodies” and “as more or less

²² Ibid.

²³ Ruwantissa Abeyratne, (n. 17) He argued universal acceptance of the ICAO by its member states was considered a *sine qua non* by the founding fathers of the Organisation.

²⁴ Patricia Birnie, Alan Boyle & Catherine Redgwell, *International Law and the Environment*, (Oxford University Press, Oxford 2009), p. 99; Lee Kimball, *Treaty Implementation: Scientific and Technical Advice Enters a New Stage* (ASIL, Washington 1996), p. 7; see also, William Edeson, ‘The Role of Technical Bodies’ in Rüdiger Wolfrum & Volker Röben (eds.), *Developments of International Law in Treaty Making*, (Springer, Berlin; Heidelberg; New York 2005), p. 63.

²⁵ Clark A. Miller & Paul N. Edwards, ‘Introduction: The Globalization of Climate Science and Climate Politics’ in Clark A. Miller & Paul N. Edwards (eds.), *Changing the Atmosphere: Expert Knowledge and Environmental Governance*, (MIT Press, Cambridge, Massachusetts; London, England 2001), p. 12; Steven Yearley, ‘The Environmental Challenge to Science Studies’ in Sheila Jasanoff et al. (eds.), *Handbook of Science and Technology Studies*, (Sage; Thousand Oaks, CA 1995), pp. 457-479; Steven Rayner & Elizabeth Malone, ‘Why Study Human Choice and Climate Change?’ in Steven Rayner & Elizabeth Malone (eds.), *Human Choice and Climate Change* (Battelle Press, Columbus, OH 1998).

integral parts of the decision-making system” in all of the international environmental regimes.²⁶ It has been argued that “[t]he ability to call on expert knowledge has become a key component of strategies for legitimating public policies and securing trust in public institutions.”²⁷ So, expert advice and expertise have become enmeshed in the making of environmental policies, including climate change policies. In the case of aviation emissions, technical expertise is needed in terms of assessing the present and future effects of air transport activity, given that the improvement of environmental regulations is “one of constant reassessment in the light of increased knowledge” of the potential environment impact.²⁸

Second, aircraft engine emissions cannot be considered separately from other concerns, including aviation safety, efficient air navigation and aircraft noise. For current technology engines, lower CO₂ emissions result in higher NO_x emissions and aviation noise.²⁹ A lighter weight aircraft could emit less GHGs but it may create associated challenges for aviation safety.³⁰ Initiatives in one area may “have knock-on effects in others”, and may “require the reconsideration of existing regulations under other regimes.”³¹ The proper institution should be able to understand and balance these different and often competing issues,³² in particular in the light of regulations in other areas. The fact that different aviation issues overlap suggests that a unified body comprising all the relevant technical expertise would be the optimum solution in tackling the complexities of aircraft design. Decision-making on curbing aviation emissions needs technical expertise that may

²⁶ Daniel Bodansky, Jutta Brunnée & Ellen Hey, *The Oxford Handbook of International Environmental Law*, (Oxford University Press, Oxford 2008), p. 190.

²⁷ Clark A. Miller & Paul N. Edwards, (n. 25), p. 14.

²⁸ The environmental quality standards can never be fixed, but are continually upgraded in accordance with the development of technology and against the background of economic conditions. Colin T. Reid, ‘Regulation in a Changing World: Review and Revision of Environmental Permits’ (2008) 67/1 *Cambridge Law Journal* 126, 128; The emission reductions we need to achieve in order to stop catastrophic climate change have changed over the last ten years. Emission limits must be set in accordance with the available technical measures, however, the achievements of such available techniques may not match to the perceived required environmental quality standards. In this case, reducing flying is necessary when technical measures do not work. See René Kemp, *Environment Policy and Technical Change* (Edward Elgar, UK 1997).

²⁹ See United States General Accounting Office, ‘Aviation and the environment: airport operations and future growth present environmental challenges’ report to the Ranking Democratic Member, Committee on Transportation and Infrastructure, House of Representatives (DIANE Publishing, Washington D.C. 2000).

³⁰ A Joeselzon, ‘Fuel Conservation: A manufacturer’s Perspective’ Presentation on ICAO Colloquium on Aviation Emissions with Exhibition (2007)

<<http://www.icao.int/envelq/CLQ07/Presentations/joeselzon.pdf>> accessed 10 April 2009.

³¹ Colin T. Reid (n. 28), p. 129-130.

³² Heather L. Miller, “Civil Aircraft Emissions and International Treaty Law” (1998) 63 *J. Air Law & Com.* 697.

cover all related trade-off problems and provide information for political judgement.

Because of its technical expertise, ICAO is *prima facie* an appropriate regulator in the area of climate change associated with aviation. ICAO is a UN special technical agency which is responsible for the setting of international standards, particularly in the fields of aviation safety and security. Since the 1940s, the organisation, through its Assembly³³ and Council³⁴, has taken numerous resolutions and issued statements of policy guidance on aviation activities. Many important decisions were formulated as Annexes to the Chicago Convention.³⁵ The standards on environmental protection will be discussed in the next section.

The technical expertise of ICAO can well be examined in considering how the Annexes to the Chicago Convention were adopted. To study and recommend to the Council the adoption and modification of the Annexes to the Convention has been the primary duty of the Air Navigation Commission (ANC) of ICAO. Articles 56 and 57 of the Convention address the appointment of ANC and its duties. This Commission is currently composed of nineteen members appointed by the Council from among persons nominated by the contracting states. The primary duty of ANC is to study and recommend to the Council the adoption and modification of the Annexes to the Convention. Over the years many leading experts nominated by states have contributed to the work of the committee and to the formulation of the principles embodied in the Standards, Recommended Practices and Procedures approved by the Council. What is worth notice is that the members of ANC do not represent the state or states that have nominated them, but should act in their expert capacity.³⁶ They are expected to have suitable qualifications and experience in the science and practice of aeronautics. This enables ICAO to be an independent agency to make political judgements on the basis of expertise.

In addition, ICAO has an appreciable understanding of the whole aviation industry's needs and it has sound knowledge of the interactions between different

³³ The ICAO Assembly, comprised of the Organisation's 190 Contracting States, meets once every three years. Article 49 of the Chicago Convention sets the powers and duties of the Assembly.

³⁴ The Council is a permanent body responsible to the Assembly. It is composed of 36 Contracting States. Article 54 and 55 of the Chicago Convention set the mandatory and permissive functions of the Council.

³⁵ The list of the Annexes is available online

<<http://www.infrastructure.gov.au/aviation/international/icao/annexes/index.aspx> > accessed at 22 June 2008.

³⁶ Michael Milde, (n. 11), p. 150; see also article 56 and 57 of the Chicago Convention which deal with the appointment of the Air Navigation Commission and its duties, the Chicago Convention, (n. 1).

departments of this industry.³⁷ Therefore, from a technical perspective, ICAO is considered as the proper regulator of aviation GHGs.

2.3. ICAO's SARPs on Aircraft Engines

The last reason which may explain why ICAO was selected to regulate the climate change issue in the aviation sector may be that the organisation has some experience of setting environmental standards.

ICAO has expressed its concern about environmental protection in the form of international standards and recommended practices (SARPs), namely, Annex 16 of the Chicago Convention. Volume II of this Annex deals with aircraft engine emissions. Through an engine/engine emissions certification scheme, Annex 16 Volume II contains SARPs for the control of smoke and gaseous emissions from aircraft engaged in international civil aviation.³⁸ It also contains SARPs that require the certification of aircraft engines for the purpose of preventing international fuel venting, a practice which involves the intentional discharge into the atmosphere of liquid fuel from the fuel nozzle manifolds of aircraft during the process of engine shut-down following normal flight or ground operations.³⁹ These standards relating to smoke and gaseous emissions certification are applicable to different classes of aircraft engines where such engines are fitted to aircraft engaged in international civil aviation.⁴⁰ Thus, ICAO provides a forum whereby the standardization of aircraft engines/engine emissions has been introduced.⁴¹

Furthermore, ICAO standards “are highly authoritative in practice.”⁴² So far, there is no single SARP which has been disapproved by a majority of ICAO contracting states, although not all of the member states comply with all the

³⁷ See the ICAO website for a brief structure of the organisation <www.icao.int>.

³⁸ John Crayston, ‘Civil Aviation and the Environment’ (1993) 16:1-2 *UNEP Industry and Environment* 51, 53; Leonie Dobbie, ‘ICAO Certification Standards for Aircraft Engine Emissions’ (1996) 21/2 *Air & Space L.* 62, 66; Heather Miller (n. 32), p. 713.

³⁹ Annex 16 Volume II (n. 4) part II; Heather L. Miller, (n. 32).

⁴⁰ Annex 16 Volume II, *ibid.* Foreword at v.

⁴¹ The ICAO website says: “The ICAO provides a forum whereby requirements and procedures in need of standardization may be introduced, studied and resolved.” ICAO website at <www.icao.int>.

⁴² Frederick L. Kirgis Jr., ‘Specialized Law-Making Processes’ in Oscar Schachter and Christopher C. Joyner (eds.) *United Nations Legal Order* (Cambridge University Press, Cambridge 1995) vol.1, pp. 109, 126.

standards in the 18 Annexes to the Chicago Convention.⁴³ Milde comments that the Chicago Convention, like “any other legal instrument, provides only a general legal framework” so as to achieve “true life only in the practical implementation of its provisions.”⁴⁴ “Active involvement of all contracting States, Panels, Regional and Divisional Meetings, deliberations in the Air Navigation Commission and final adoption of the standards by the Council”⁴⁵ support the rule-making function of the ICAO Council through the setting and implementing of SARPs. A more detailed analysis of this function of the ICAO Council and on the legal status of the Annexes to the Convention will be given below in section 4.2.

In addition, the ICAO standards on environmental protection, like any other ICAO standards, are based on scientific expertise (as was discussed in the last section), rather than purely made by diplomats.⁴⁶ Essentially, these standards seek to create a comprehensive “code of international air transport”⁴⁷ in order to “provide for uniform aviation practices around the world.”⁴⁸ They are “easily amended” and are “less threatening to States, who are likely to acquiesce [in] their adoption if indeed, State acquiescence is required”⁴⁹ due to their non-binding nature which will be discussed later in section 4.2.1. Therefore, through adopting and amending SARPs, ICAO provided a certain level of predictability to its members by promulgating norms for the aircraft engine emissions of its contracting states before the Kyoto Protocol. Annex 16 Volume II consists of *prima facie* valuable references to regulating aircraft emissions. As such, it was very sensible that the Kyoto Protocol required ICAO to work on the international aviation emissions issue.

2.4. Conclusion

ICAO has been treated as the delegated authority in combating climate change associated with aviation, according to the Kyoto Protocol, which required Annex I

⁴³ Ruwantissa Abeyratne (n. 17).

⁴⁴ Michael Milde, ‘The Chicago Convention – After Forty Years’ (1989) 9 *Ann. Air & Sp. L.* 203, 208.

⁴⁵ *Ibid.*

⁴⁶ Dieter Kerwer, ‘Rules That Many Use: Standards and Global Regulation’ (2005) 18/4 *Governance* 615.

⁴⁷ José E. Alvarez, *International Organizations as Law-Makers* (Oxford University Press, Oxford 2005), p. 254.

⁴⁸ Simon Brinsmead, ‘Rulemaking in ICAO, the ILO and the IMF: The Rise of Standards’ (July 25, 2007), p. 4, online available at SSRN <<http://ssrn.com/abstract=1002758>> last accessed 17.05.10.

⁴⁹ *Ibid.*, p. 2.

countries (i.e. the industrialized countries) to pursue emissions limitations through this organisation. The above sections provided three reasons for ICAO's role: the organisation's universal participation, its advantage in technical expertise and its experience of setting aircraft engine emissions related standards. There is no doubt that ICAO has advantages over other organisations which enable it to play a key role in regulating aviation emissions. However, there has been a notable lack of progress towards emissions stabilisation or reductions in the aviation sector. In more than a decade since Kyoto, ICAO has failed to deliver any binding policy to meet the limitation or reduction of emissions from international aviation that the Kyoto Protocol was seeking to achieve. The following sections will question the advantages expected from ICAO and will criticize its inherent limitations in order to identify what accounts for ICAO's failure.

3. ICAO's Advantages are not unproblematic

Whilst there are apparently good reasons for selecting ICAO as the delegated regulator on international aviation emissions, even those reasons are not unproblematic. The following two sections will examine the limitations of ICAO's technical competence and the shortcomings of Annex 16 Volume II. These discussions lead to the conclusion that the advantages of ICAO alone are not likely to provide any efficient regulation of aviation emissions.

3.1. Moving beyond Technical Competence

A proper regulator of aviation emissions must consider issues beyond technical innovations. Decision-making on curbing aviation emissions is apparently based on technical choices. However, such choices have political value based elements to them, as in the trade-offs with the benefits of aviation in policymaking discussed in Chapter 2 section 3.2. What is more, there is no absolute technical measure on the climate change issue at the current stage and in the near future, while the emergency of the climate changes hazard requires immediate reduction actions. This means that

demand constraint must be considered. In this context, the question needs to be raised as to whether ICAO would still be well suited to regulating aviation emissions beyond merely technical concerns.

Of course, technological progress might have a significant influence on the development of more fuel-efficient aircraft and air traffic procedures. Indeed, new aircraft are 70% more fuel efficient than those of 40 years ago and have improved 20% in the last decade.⁵⁰ Airlines are aiming for a further 25% fuel efficiency improvement by 2020;⁵¹ however, these are expected to be largely offset by the increase in the volume of activity in the sector.⁵² The argument that “efficiency without sufficiency is inadequate” has been made by the efficiency sceptics.⁵³ They have recognised that “conservation and action on consumption must also be part of an approach to the use of the earth’s resources.”⁵⁴ It certainly is good to increase fuel efficiency in air transport, but the industry may reach a stage when fuel efficiency is no longer enough.⁵⁵ So, the ethics of efficiency deserves further consideration along with the increasing demand of air transport. In this context, ICAO’s technical competence discussed above would not “have a catalytic effect on the reduction of the damaging effects of civil aviation upon the environment”⁵⁶ unless the total number of aircraft and engines engaged in international air navigation are regulated as well.

To constrain the total number of aircraft means reducing air transport activities worldwide. This is a difficult mission which is much more about political and economic concerns, as has been mentioned in Chapter 2. One of the political concerns might be that reducing flying conflicts with longstanding policy of developing the aviation industry worldwide. For example, ICAO was in fact

⁵⁰ IATA, ‘Debunking Some Persistent Myths about Air Transport and the Environment’ online available at <<http://www.iata.org/NR/rdonlyres/11804248-06A7-44A2-A160-62F1953D9E44/0/BedunkingsomePersistentMythsaboutAirTransportandtheEnvironment.pdf>> last accessed 20.03.09.

⁵¹ IATA website at <http://www.iata.org/whatwedo/environment/climate_change.htm>.

⁵² Lucas M Z Mendes & Georgina Santos, ‘Using Economic Instruments to address Emissions from Air Transport in the European Union’ (2008) 40 *Environment and Planning A* 189.

⁵³ Barry Barton, ‘The Law of Energy Efficiency’ in Donald N. Zillman, Catherine Redgwell, Yinka O. Omorogbe & Lila K. Barrera-Hernández (eds.), *Beyond the Carbon Economy: Energy Law in Transition*, (Oxford University Press, Oxford 2008), p. 68.

⁵⁴ Ibid. see also H Herring, ‘Energy Efficiency: A Critical View’ (2006) 31 *Energy* 10, p. 15.

⁵⁵ Andrew Rudin has argued that “our environment does not respond to miles per gallon; it responds to gallons.” P. Roberts, *The End of Oil: The Decline of the Petroleum Economy and the Rise of a New Energy Order* (Bloomsbury, London 2004), p. 233.

⁵⁶ Mendes de Leon, ‘Aviation and the Environment: Changing Perceptions’ (1997) 22/3 *Air & Space L.* 131.

established to foster the planning and development of international air transport.⁵⁷ Whilst this target was established at the end of World War II, when aviation was in its infancy, even the fostering of the growth of aviation is a policy that has never been changed, so that airport extensions are being undertaken worldwide. Economically, reducing flying may have a negative impact on international trade. Air cargo serves as “an indispensable” means of logistics for the manufacturing of modern merchandise, so that in the U.S. and Japan about 30% of internationally traded merchandise is transported by air.⁵⁸ Policies aimed to reduce flying must include air cargo transportation, the reduction of which would challenge those parts of international trade which require fast and secure transportation. Of course, reducing flying would partly change people’s lives, so as to stop them taking holidays abroad or turning to internet conferencing more often. It would also reduce the job opportunities provided by airlines, airports, air manufacturers and other related employers. All of these concerns go beyond technology and ICAO’s technical competence would not be able to contribute to them.

Given the strong projected growth of aviation industry, technological improvements (including energy efficiency in using renewable energy, advancing aircraft technology and managing operational practices etc., as discussed in Chapter 2 section 3.3) would not effectively offset the effects of aviation emissions.⁵⁹ Reducing flying is necessary, but it is an issue that is primarily about political and economic concerns. In these circumstances, ICAO’s technical competence cannot ensure that it is able to perform as a proper regulator working on aviation emissions.

3.2. The Effectiveness of Annex 16 Volume II

ICAO’s experience in setting environmental standards on aircraft engine emissions was considered as another advantage of the organisation. These standards, such as Annex 16 Volume II of the Chicago Convention, are organized into three parts. Part I contains the definitions and symbols used in the Annex and the

⁵⁷ Chicago Convention (n. 1), art.44.

⁵⁸ Katsuhiro Yamaguchi, ‘International trade and air cargo: Analysis of US export and air transport policy’ (2008) 44/4 *Transportation Research Part E: Logistics and Transportation Review* 653, 653.

⁵⁹ Jacqueline Etil Serrao, ‘Global versus Unilateral Measures to Protect the World’s Environment: implications for the Air Transport Industry’ (2002) 27 *Ann. of Air& Sp. L.* 551.

meanings ascribed to them. Part II contains standards relating to vented fuel and Part III contains standards relating to smoke and gaseous emissions certification, applicable to different classes of aircraft engines where such engines are fitted to aircraft which are engaged in international civil aviation.⁶⁰ The effectiveness of these standards in combating the climate change issues associated with aviation can be doubted for two reasons.

First, Part II of Annex 16 Volume II is clearly in place to address the facilitation of orderly traffic growth, with no concern for the climate change issue. This is not odd in the context of setting SARPs. Article 37 of the Convention vests ICAO with the authority to adopt and amend SARPs in dealing with:

- “a) Communications systems and air navigation aids, including ground marking;
 - b) Characteristics of airports and landing areas;
 - c) Rules of the air and air traffic control practices;
 - d) Licensing of operating and mechanical personnel;
 - e) Airworthiness of aircraft;
 - f) Registration and identification of aircraft;
 - g) Collection and exchange of meteorological information;
 - h) Log books;
 - i) Aeronautical maps and charts;
 - j) Customs and immigration procedures;
 - k) Aircraft in distress and investigation of accidents;
- and *such other matters concerned with the safety, regularity, and efficiency of air navigation* as may from time to time appear appropriate.”⁶¹

This is an umbrella article, which is intended to cater for the adoption of SARPs to meet the growing needs of civil aviation. It is, however, limited to matters concerning the safety, regularity and efficiency of air navigation. Although Annex 16 is named “Environmental Protection”, preventing international fuel venting or international pollution through aircraft certification is actually a regulatory activity carried out within the more narrowly conceived remit of safety. There is an absence of any specific power or duty to address environmental protection, and environmental protection is squeezed into a broader interpretation of the safety of air navigation. As such, ICAO’s standards on aircraft engine emissions are problematic in combating climate change issue.

Second, Part III of Annex 16 Volume II focuses on aircraft engine certification,

⁶⁰ Annex 16 Volume II (n. 4). Foreword at v.

⁶¹ Chicago Convention, (n. 1), art. 37, emphasis added.

but not on aircraft certification, which limits its effectiveness in controlling aircraft emissions. It is worth noticing that the engine is only part of the whole aircraft design. It is significant in terms of fuel efficiency but it is not sufficient to determine how clean the aircraft is in terms of controlling emissions. For example, the weight of an aircraft also matters for its emissions level. We may recall that whereas the standards relating to vented fuel require the certification of aircraft, the standards relating to smoke and gaseous emissions require the certification of aircraft engines.⁶² Then, the certification of the aircraft as a whole rather than only its engine would appear to make more sense from an environmental perspective, but this would raise considerable difficulties as to the choice of the parameters on the basis of which the certification could be issued.⁶³ Also a very wide variety of engine-airframe permutations would have to be certified, taking into account operational factors of all kinds. In view of these difficulties, the present system of certifying aircraft engines in relation to emissions seems reasonable. However, given the absence of concerns with other parts of the aircraft design (such as the aircraft's weight),⁶⁴ the aircraft engine certification scheme in Annex 16 Volume II cannot totally control aviation emissions. In October 2010, ICAO announced that it will develop a CO₂ standard for aircraft with a target date of 2013.⁶⁵ However, it is unclear of what would be the parameters on the basis of which the certification would be issued.

Therefore, from investigating the contents of Annex 16 Volume II, it is clear that ICAO's existing certification systems on aircraft engine emissions and aircraft engines would not effectively reduce aviation emissions.

3.3. Conclusion

The advantages of ICAO which were identified earlier cannot ensure that the organisation can deliver efficient regulations on aviation emissions. Its technical

⁶² Annex 16 Volume II, (n. 4), part III chapter 1 § 1.1.

⁶³ Leonie Dobbie, (n. 38), p. 68. It would be possible, in this regard, to carry out emissions certification of aircraft on the basis of features such as productivity, payload, mass or range of the aircraft.

⁶⁴ Alain Joselzon, 'Fuel Conservation: A manufacturer's Perspective' Presentation on ICAO Colloquium on Aviation Emissions with Exhibition (2007)

<<http://www.icao.int/envelq/CLQ07/Presentations/joselzon.pdf>> last accessed 10 April 2009.

⁶⁵ ICAO, Assembly resolution on international aviation and climate change (A37-19), para. 1.5.

competence is not sufficient to handle the climate change topic, which is a combination of issues arising from technical, economic and political perspectives at least. The organisation's experience in setting environmentally related standards may not be helpful either, because Annex 16 Volume II addresses the facilitation of orderly traffic growth rather than aviation's environmental impacts and has limited capacity to address aircraft, and so the limited certification issue of aircraft which cannot cover all the elements linked to producing emissions. Therefore, from a preliminary analysis, whether ICAO should be the delegated regulator on the aviation emissions issue is questionable.

4. Inherent Limitations of ICAO

Nevertheless, in 1997, the parties to the Kyoto Protocol agreed that GHGs from international civil aviation should be limited or reduced by working through ICAO. Since Kyoto, ICAO has failed to deliver an efficient international regulatory regime on emissions stabilisation or reductions.⁶⁶ This cannot simply be explained by the above shortcomings of ICAO's technical competence or its existing SARPs on aircraft engine emissions. The reasons should be sought deeper, arising from the organisation's inherent limitations and from ICAO's aims and its rule-making function.

4.1. ICAO's Aims

ICAO is not a body with an environmental focus, but it has been pushed into the climate change regime by the failure to reach an agreement on aircraft emissions under the Kyoto Protocol. This raises doubts as to whether ICAO's aims, listed in Article 44 of the Chicago Convention, limit the organisation's actions on climate

⁶⁶ EFTE, (n. 9); Chris Lyle, 'Aviation after Copenhagen: ICAO must now develop a bold strategic vision' (2010) online available at <<http://www.centreforaviation.com/news/2010/02/10/aviation-after-copenhagen-icao-must-now-develop-a-bold-strategic-vision/page1> > last accessed 15.05.10; Andrew Macintosh, 'Oversoming the Barriers to International Aviation Greenhouse Gas Emissions Abatement' (2008) 33/6 *Air & Sp. L.* 403; Allen Pei-Jan Tsai & Annie Petsonk, 'Tracking the Skies: An Airline-based System for Limiting Greenhouse Gas Emissions From International Civil Aviation' (1999-2000) 6 *Envtl. Law.* 763.

change. If so, an important step would be to revise the Chicago Convention and set the addressing of climate change as a new objective.

Examining the Chicago Convention, it appears that climate change is not a major concern for ICAO, as environmental protection does not exist as an explicit objective in the text of the Convention.⁶⁷ This is widely believed to be the “key hurdle in developing and implementing effective measures to address aviation emissions”⁶⁸ in the Chicago Convention and ICAO. However, ICAO states that one of the organisation’s strategic objectives for the period 2005-10 is “Environmental Protection—Minimize the adverse effect of global civil aviation on the environment.”⁶⁹ It aims to “develop, adopt and promote new or amended measures to.... limit or reduce the impact of aviation greenhouse gas emissions on the global climate.”⁷⁰ Thus, one may question whether combating climate change has been accepted as a new aim of ICAO. Clarifying the relationship between climate change and ICAO’s aims, must begin with an examination on ICAO’s aims as envisaged under the Chicago Convention.

The avowed aims and purposes of ICAO are set out in Article 44 of the Chicago Convention:

“Article 44
Objectives

The aims and objectives of the Organization are to develop the principles and techniques of international air navigation and foster the planning and development of international air transport so as to

- (a) Insure the safe and orderly growth of international civil aviation throughout the world;
- (b) Encourage the arts of aircraft design and operation for peaceful purposes;
- (c) Encourage the development of airways, airports, and air navigation facilities for international civil aviation;
- (d) Meet the needs of the peoples of the world for safe, regular, efficient and economical air transport;
- (e) Prevent economic waste caused by unreasonable competition;
- (f) Insure that the rights of contracting States are fully respected and that every contracting State has a fair opportunity to operate international airlines;
- (g) Avoid discrimination between contracting States;
- (h) Promote safety of flight in international air navigation;
- (i) Promote the development of all aspects of international civil

⁶⁷ Chicago Convention (n. 1) art. 44.

⁶⁸ Andrew Macintosh, (n. 66), p. 411.

⁶⁹ ICAO, ‘Strategic Objectives of ICAO For 2005-2010’, (n. 6).

⁷⁰ Ibid.

aeronautics.”⁷¹

These aims and objectives are also reflected in the Preamble of the Convention that “sets out the reasons for which the Parties concluded the Convention and that should serve as a tool for the interpretation of the Convention”.⁷²

“WHEREAS the future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world, yet its abuse can become a threat to the general security; and

WHEREAS it is desirable to avoid friction and to promote the cooperation between nations and peoples upon which the peace of the world depends;

THEREFORE, the undersigned governments having agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically;

Have accordingly concluded this Convention to that end.”⁷³

Accordingly, ICAO has a universally accepted role in the coordination and standardisation of international air transport in fields including air navigation, safety and operating procedures. The language in Article 44 and the Preamble is self-explanatory and it addresses in great detail the objectives of ICAO. It is obviously the case that the prominent objectives of ICAO are “safety”, “regularity”, “efficiency”, “economy” and “equality of opportunity.”⁷⁴ The concepts of general safety and security were related to international peace rather than to any concern for environmental damage.⁷⁵ These aims and objectives on which the Organisation was based in 1944 are fully valid at present. As such, ICAO which carries the responsibility for implementing these aims and objectives of the Convention has achieved remarkable records over more than 60 years. But the structured aims of ICAO are seemingly “weighed against the needs of the climate system.”⁷⁶

In that case, the revision of the Convention may be suggested as a suitable remedy. New aims emphasizing concern for those issues that could not be identified in 1944 should be added in any renewal of the Convention. Indeed, the Convention

⁷¹ Chicago Convention (n. 1) art. 44.

⁷² Michael Milde, (n. 11), p. 123.

⁷³ Chicago Convention, (n. 1), preamble.

⁷⁴ Michael Milde, (n. 11), p. 123.

⁷⁵ Ibid.

⁷⁶ Andrew Macintosh, (n. 66), p. 411.

set its aims in 1944 in the context of a world war; a time when nobody was aware of the dangers of climate change or could possibly envisage the growth of civil aviation. Over the years, both the world and civil aviation have profoundly changed. Michael Milde has clearly addressed the fact that “any future renewal of the Convention would likely add the aims and principles [which] emphasized concern for... the protection of the environment – issues that could not be identified in 1944.”⁷⁷

If ICAO needs a clearly addressed aim of climate change concern, the Chicago Convention could be revised and amended in line with the changed situation. However, this is likely to be a time-consuming process, which may ultimately not succeed, and conflicts with the urgency of climate change regulation. It is likely that the amendment process would be time-consuming. Gilbert Guillaume, the former representative of France on the ICAO Legal Committee, examined the Chicago Convention’s future in early 2008, and he advised a revision of the Chicago Convention from a strictly legal point of view.⁷⁸ Although Guillaume was not concerned with aviation emissions, he took examples from many important issues including aviation safety and security in Article 3 *bis*, the aircraft leasing issue in Article 83 *bis*, and other articles of the Convention.⁷⁹ He asserted the importance of revising these articles, but warned about the difficulties of gathering the political will of the contracting states, as any revision requires a high number of ratifications (not less than two-thirds of the total number of counteracting states according to Article 94(a) of the Chicago Convention) and prior consultation with key countries.⁸⁰ The need for the majority political will of 190 contracting states may remind us of the difficulties in achieving an international climate change regime led by the UN system, as I discussed in the last chapter. Therefore, it is predictable that the Chicago Convention’s responses to the climate change issue will not be quick enough, particularly in view of the urgency posed by the climate change challenge.

While the final verdict is still pending, ICAO has responded to the request of Kyoto by adopting climate protection as part of the strategy objectives for the period 2005-2010. Although this is not an alternative to the revision of the Chicago Convention’s aims, it may still work to guide the organisation in its attempts to

⁷⁷ Michael Milde, (n. 11), p. 123.

⁷⁸ Gilbert Guillaume, ‘ICAO at the Beginning of the 21st Century’ (2008) 33 *Air & Sp. L.* 313.

⁷⁹ It includes art. 3 *bis*, art. 83 *bis*, art. 94, art. 69, art. 86, art. 87 and 84. *ibid.*

⁸⁰ *Ibid.*

combat climate change. However, I will argue that the driving forces for adopting this strategy objective are not pointing towards climate protection from the following two perspectives.

First, the ICAO's mandates have not been modified by its strategic objective. The legal nature of this strategic objective is not expressly provided for in the Chicago Convention or ICAO's documents. This might suggest that ICAO takes climate concerns as secondary or subsidiary goals, with the management of air navigation and traffic its primary aim; or the passage of this strategic objective demands a broader interpretation of "safety" to include environmental concerns. However, the first possibility would seem to be in tension with ICAO's insistence that, in developing, coordinating and implementing its air navigation plans, it acts so as to facilitate increased air traffic, and that this is indeed another of its strategic aims.⁸¹ This strategic aim would seem to conflict with the fact that a likely solution to climate change in the aviation sector will be a reduction in (or stabilisation of) aircraft travel, rather than an increase. Indeed, with the currently available technology, aviation emissions are not likely to be reduced within a regime of unlimited increasing flying.⁸² Thus, ICAO's aims concerning the management of air navigation and traffic limits the organisation's ability to tackle climate change and this may go some way to explain the organisation's inactivity. Therefore, the primary function of ICAO's strategic objectives, and that of its legal framework, has been exposed as being to facilitate orderly traffic growth.⁸³ The second possibility is that the strategic objective reflects a broader interpretation of "safety" of air navigation, including climate change concern. It may be a very practical way to prioritise the climate change problem. However, it is not enough to ensure that the organisation makes good decisions to curb the aviation emissions, especially when reducing emissions have trade-offs to the narrow meaning of "safety" of air traffic. How to weight climate protection remains a question that requires political judgement. The organisation's concern with environmental issues is not a stand-alone commitment to abating climate change.

Second, the driving force for adopting this strategic objective is not climate

⁸¹ ICAO, (n. 69).

⁸² So far, there is no technical solution could provide an absolute clean aircraft. Therefore, the emissions reduced by introducing cleaner aircraft would not compensate the increased emissions from the increased total amount of air transportation. See more discussions in Chapter 2.

⁸³ ICAO, (n. 69).

protection. ICAO's concern on climate change may be driven by two reasons: regulatory competition, (that is the competition between regulators for jurisdiction and the consequent variance in standards), and the threat of unilateral action by the contracting states influenced ICAO's attitude.⁸⁴ The climate change regime has retained the general authority to regulate aviation GHGs in order to achieve effective climate protection. Under Article 2.2 of the Kyoto Protocol, developed countries were asked to pursue limitations or reductions of aviation GHGs, "working through" ICAO. This expression is somewhat ambiguous. There is no evidence that the Protocol excluded aviation GHGs from the climate change regime, nor that it would not authorise or permit another organisation to take over ICAO's work. The ICAO Assembly, which was desirous to avoid such implicit threats of regulatory competition, therefore called upon its Council not to leave the initiative on aviation matters related to the environment "to other organisations".⁸⁵ This attitude of ICAO is very sensible if we look back to my previous discussions on the universality of the organisation. Meanwhile, ICAO's attitude on seeking uniform aviation practices around the world rests on its aim of facilitating safe and efficient air traffic, and because international air transportation is characterised by a transnational organised and operated industry, it prefers internationally uniform regulation over a disparate regulatory environment with widely varying national standards.⁸⁶ The preference for uniform regulation has already led to a strong push towards ICAO to establish many other international standards on air navigation.⁸⁷

From the above discussions, it is clear that climate change is not among ICAO's aims as set out in Article 44 of the Chicago Convention. Considering regulatory competition and the universality characteristic of international air transportation, ICAO set climate protection as part of the strategic objectives for the period 2005-2010. However, this is not a revision of Article 44 and ICAO's driving forces are not pointing towards climate change. The absence of a specific aim of environmental protection, including a particular concern with climate impacts, is one of the inherent limitations of ICAO that account for its failure to provide an

⁸⁴ Sebastian Oberthür, (n. 7).

⁸⁵ Ruwantissa Abeyratne, 'ICAO: Some Recent Developments in Aviation and Environmental Protection Regulation' (2001) 32/1 *Environmental Policy and Law* 32.

⁸⁶ Sebastian Oberthür, (n. 7).

⁸⁷ See other Annexes to the Chicago Convention, a list of the Annexes is available online <<http://www.infrastructure.gov.au/aviation/international/icao/annexes/index.aspx>> last accessed 22.06.08.

efficient regulatory framework to reduce aircraft emissions.

4.2. ICAO's Rule-making Function

One more inherent limitation of ICAO that accounts for its failure to regulate aviation emissions is the nature of its rule-making function through setting international SARPs on air transport operations. Earlier in this chapter, ICAO's experience of setting environmentally related SARPs, as in Annex 16 Volume II, was considered to be one of its advantages that might make it suitable to be the delegated authority required by the Kyoto Protocol. The effectiveness of this Annex has been criticized above. I am not going to repeat the discussion of the problems of this Annex, but I will look at the value of the organisation's rule-making function, including the legal status of the SARPs and the procedure for making them. These problems which will be explored below will help to explain why ICAO should not continue to be the sole delegated authority in the climate change context, even if new standards focusing on climate change can be agreed.

4.2.1. The Concept of SARPs and their Legal Status

Given that SARPs are the cornerstone of ICAO rule-making,⁸⁸ the first step toward an exploration of this organisation's rule-making function is to identify the legal force of SARPs. Sceptics question the effectiveness of ICAO's standards, in particular as to whether they are legally binding on the contracting states, mainly because SARPs, adopted under the Annexes to the Chicago Convention, do not form an integral part of, or possess the same legal force as, the Convention.⁸⁹ This raises

⁸⁸ The ICAO produces some other regulatory documents that have a lower legal status than the SARPs, for example, the Procedures for Air Navigation Services (PANS) and Regional Supplementary Procedures (SUPPs) that for specific regions. See Michael Milde, (n. 11), pp. 163-164.

⁸⁹ Chicago Convention (n. 1), art 54 (1); Bin Cheng, *The Law of International Air Transport* (Oceana, New York 1962), p. 64; Roderick D. van Dam, 'Regulating International Civil Aviation: An ICAO Perspective' in Tanja L. Masson-Zwaan & Pablo M.J. Mendes-de-Leon (eds.), *Air and Space Law: De Lege Ferenda* (Martinus Nijhoff, Dordrecht 1992), pp. 11, 13; Ingrid Detter, *Law Making by International Organizations* (P.A. Norstedt & Söners Förlag, Stockholm 1965), p. 248. She notes that unlike the Technical Annexes to the Paris Convention of 1919, which formed part of, and had the same force as the Convention, the Annexes to the Chicago Convention do not have the same compulsory force as the Convention. They are placed on a more voluntary basis, being subject to a number of safeguards.

serious doubts about the legal status and effect of ICAO SARPs. Some scholars call them “legislative”,⁹⁰ others “quasi-legislative” competences,⁹¹ and others “a kind of delegation of legislative power”,⁹² and still others, administrative rule-making functions.⁹³ Before discussing the legal status of SARPs, one previous issue that ought to be addressed is the concept of SARPs.

There are two types of SARPs: “Standards” and “Recommended Practices.” The Chicago Convention does not define either of these terms. Definitions were subsequently provided by the ICAO Assembly in 1947.⁹⁴ A “Standard” is:

“Any specification for physical characteristics, configuration, material, performance, personnel, or procedure, the uniform application of which is recognized as *necessary* for the safety or regularity of international air navigation and to which Member States will *conform* in accordance with the Convention; *in the event of impossibility of compliance, notification to the Council is compulsory under article 38 of the Convention.*”⁹⁵

A “Recommended Practice” on the other hand is:

“Any specification for physical characteristics, configuration, material, performance, personnel, or procedure the uniform application of which is recognized as *desirable* in the interest of safety, regularity, or efficiency of international air navigation, and to which Member States will *endeavour* to conform in accordance with the Convention.”⁹⁶

Accordingly, both the Standards and the Recommended Practices concern specifications “for physical characteristics, configuration, material, performance, personnel or procedure.”⁹⁷ However, they are set apart due to a substantial

⁹⁰ Edward Yemin, *Legislative Powers in the United Nations and Specialized Agencies* (Leyden, Sijthoff 1969), pp. 114 – 160.

⁹¹ Michael Milde, (n. 11), p. 156; Nicolas Mateesco Matte, *Treaties on Air-Aeronautical Law* (Montreal, Toronto 1981), p. 212; Bin Cheng, (n. 89), p. 63.

⁹² Andreas Lowenfeld, *Aviation Law* (M. Bender, New York 1972), section 5.2, pp. V – 136.

⁹³ Tiago Fidalgo de Freitas, ‘From participation towards compliance: The role of private actors in the making of SARPs by ICAO’ (2007) paper presented at the Viterbo III Global Administrative Law Seminar, online available at <www.iilj.org> last accessed 20.05.10.

⁹⁴ ICAO, Definition of “International Standards” and “Recommended Practices”, Assembly Resolution A1-31, ICAO Doc. 4411 (Assembly Resolution A1-31); See Thomas Buergenthal, *Law-making in the International Civil Aviation Organization* (New York: Syracuse University Press, 1969), p. 60.

⁹⁵ Assembly Resolution A1-31, *ibid.*, emphasis added.

⁹⁶ *Ibid.*, emphasis added.

⁹⁷ ICAO Assembly Resolution A35 – 14, Appendix A; see also the Foreword to each of the Annexes to the Chicago Convention, and ICAO, Directives to Divisional-Type Air Navigation Meetings and Rules of Procedure for Their Conduct, Doc 8143 – AN/873/3, 1983, Part II, 2.1.1, 2.1.2, online available at <http://www.icao.int/icao/en/dgca/8143_3ed.pdf> last accessed 20.05.10.

difference: Standards are “necessary” to ensure “the safety or regularity of international air navigation”, whereas Recommended Practices are merely “desirable” to attain such objectives; and member states “will conform” with Standards, whereas they will merely “endeavour to conform” with Recommended Practices. The difference was believed to rest on the necessary character of the Standards to attain safety and regularity.⁹⁸ This difference reflects the ICAO directives, which determine the textual formulations of SARPs: “A *Standard* shall contain a statement specifying an obligation by means of ‘shall’.....A *Recommended Practice* shall contain the same elements as a Standard but ‘should’ shall be used instead of ‘shall’ in the main statement specifying the recommendation.”⁹⁹ Although the word “shall” has a mandatory flavour and has been used by ICAO, it by no means says that SARPs are legally binding. This is because of the ambiguity of the formulation of the relevant articles of the Chicago Convention.

According to Articles 37 and 38 of the Chicago Convention, contracting states are required to comply with SARPs to the “highest practicable degree of uniformity,” and to give immediate notification to ICAO of “the differences between its own practice and that established by the international standards,” should the state find it “impracticable to comply in all respects” with the promulgated SARPs.¹⁰⁰ Together, these articles deprive SARPs of binding force, at least before the end of the notification period.¹⁰¹ In other words, SARPs prescribed in an Annex are not binding legislative enactments as traditionally understood.¹⁰² The only duty incumbent upon a contracting state deciding to depart from an international SARP is to give immediate notification to ICAO of the differences between its own regulations or practices and those established by the international standard in question.¹⁰³

The reason for the “unconditional legal obligation of States to notify”¹⁰⁴ any

⁹⁸ Tiago Fidalgo de Freitas, (n. 93); Bin Cheng, (n. 89), p. 70.

⁹⁹ ICAO, Directives to Divisional-type Air Navigation Meetings and Rules of Procedure for their Conduct, Doc 8143-AN/873/3, (1983), Part II, 2.1.4 (a) and (b), emphasize original.

¹⁰⁰ Chicago Convention, (n. 1), art. 37 & 38.

¹⁰¹ Paul S. Dempsy, ‘Compliance & enforcement in international law’ (2004-2005) 30 *N.C.J. Int’l L. & Com. Reg.* 1; Thomas Buergenthal, (n. 94), pp. 76-88; Edward Yemin, (n. 90), pp. 139-144; Bin Cheng, (n. 89), pp. 64-67.

¹⁰² Thomas Buergenthal, *ibid.*, p. 77.

¹⁰³ Bin Cheng, (n. 89) p. 65.

¹⁰⁴ Michael Milde, (n. 11), p. 160.

differences from the international standards rests on the universality of air transportation, which has been discussed above. Milde has provided a clear explanation of this reason as follows:

“there must be full international transparency as to which standards are not implemented in a particular location and other States must receive a timely warning in the interest of safety of air navigation that certain standards, procedures, facilities or services are not available. Without such notification the flight safety of foreign aircraft could be seriously jeopardized if they were to rely on the existence of particular facilities and services which in fact were unavailable.”¹⁰⁵

The number of notifications has been “relatively low” since the adoption of the first Annexes in ICAO in 1947.¹⁰⁶ These notifications have been issued in supplements to the relevant Annexes.¹⁰⁷ One may argue that the standards are still legally significant, given that “States are strongly motivated to implement international standards by the sheer realities of international life: non-compliance with SARPs could eliminate the State concerned from any meaningful participation in international air navigation and air transport.”¹⁰⁸ However, this relationship between full compliance and participation works where the standards are minimum standards for safety reasons, but it may not work in the case of climate change concerns.

Therefore, the above examination of the concept and legal status of ICAO SARPs presents some intrinsic difficulties that may lead one to have doubts about the legal force of ICAO made rules. What we know for certain are that SARPs are not legally binding in theory and they are not equal to the legal force of the Convention itself. In practice, there might be powerful motivations for all states wishing to participate in international air transport to comply with such standards, although they are not necessarily as strong in relation to climate change as to narrow safety concerns. The non-binding legal status of SARPs partly explains why the ICAO’s rule-making function cannot provide an efficient regulation of aviation emissions.

¹⁰⁵ Ibid.

¹⁰⁶ Ibid., p. 165.

¹⁰⁷ The ICAO required that the differences should be promptly issued in Supplements to the relevant Annexes. See ICAO, ANC Procedural Guidebook, C-DEC 176/12, 4.3.4, 4.3.8, 4.3.9.

¹⁰⁸ Michael Milde, (n. 11), p. 161.

4.2.2. The Procedure of Creating SARPs

In exploring the limitations of ICAO rule-making in providing an efficient regulation of aviation emissions, the procedure of creating SARPs has to be addressed. The Council of ICAO is empowered by the Chicago Convention to adopt international SARPs.¹⁰⁹ The Chicago Convention itself is silent about most of the issues on the decision-making procedures of the Council. Gathering together many relevant documents,¹¹⁰ scholars have produced some consistent summaries of the procedure of the enacting of SARPs.¹¹¹ The most relevant stages, which may bring about new climate protection related standards, are the preliminary stage of formulating proposals for the creating of new SARPs, the development and review stage of proceeding with the proposals, and the adoption stage of approving the proposed SARPs. Examining these three stages, I argue that an environmental or climate change perspective is inadequately represented in the decision making process.

First of all, environmental interests are likely to be inadequately represented in the preliminary stage of formulating proposals for the creation of new SARPs. Proposals for the creation of new SARPs or amendments can be put forward by ICAO bodies, the contracting states or international organisations.¹¹² And so, environmentally related standards can be proposed by a broad range of entities, including ICAO's Committee on Aviation Environmental Protection (CAEP), bodies of ICAO which do not focus on environmental issues, ICAO member states, or aviation focused international organisations.¹¹³ There is no opportunity for environmental bodies, such as environmental NGOs, to contribute.

Second, the environmental interest is inadequately represented in the

¹⁰⁹ Chicago Convention, (n. 1), art. 56.

¹¹⁰ The relevant documents means ICAO published documents and unpublished working papers, including ICAO, *ANC Procedural Guidebook*, C-DEC 176/12; ICAO, *Directives for Panels of the ANC*, Doc 7984/4, (1980).

¹¹¹ Tiago Fidalgo de Freitas, (n. 93); Edward Yemin, (n. 90), pp. 125-136.

¹¹² ICAO, 'Making an ICAO Standard', online available at < <http://www.icao.int/icao/en/anb/mais/> > last accessed 21.05.10.

¹¹³ "Internatioanl organisations" in this context and the rest of this section mean outsiders of ICAO. For a list of such organizations see ICAO website at < http://www.icao.int/icao/en/m_links.html >. There is no environmental NGOs on the list.

development and review stage of proceeding with the proposals. Once the proposal has been presented the whole development and review procedure relating to it will be carried out by the Air Navigation Commission (ANC), in order to establish a final text of the proposed SARPs for consideration by the Council.¹¹⁴ The ANC is one of ICAO's subordinate bodies. It is composed of 19 members who "shall have suitable qualifications and experience in the science and practice of aeronautics."¹¹⁵ All of the ANC's functions are within the field of air navigation. In its activities, it is assisted by the ANC Panels, which are *ad hoc* temporary bodies composed of qualified experts.¹¹⁶ Panel members participate in their personal, expert capacity.¹¹⁷ As such, the review procedure under the ANC apparently is technically based. However, during the whole development procedure of the proposal, all the contracting states and other entities outside of ICAO (like international organisations) would be invited to comment on the proposals.¹¹⁸ Given that the comments are to be analysed in the ANC, taken into account and also attached to or in some way incorporated into its final document, even non-contracting states or entities which provided feedback are taken seriously as consultative or advisory bodies.¹¹⁹ It is not clear however that these entities (member states of ICAO and interested international organisations)¹²⁰ effectively represent environmental interests, so that the critical issues of climate protection can be identified and adequately pondered. The development and review procedure of the proposed SARPs may not delivery a final text with sufficient environmental perspective for consideration by the Council.

Finally, the adoption stage of approving the proposed SARPs may not adequately involve environmental interests. The Council adopts proposed SARPs by means of a Resolution of Adoption. As ICAO's executive committee, the Council is composed of experts from 36 states who are elected by the Assembly (the sovereign body of ICAO)¹²¹ and of a President elected by the Council.¹²² To approve a

¹¹⁴ Chicago Convention, (n. 1), art. 57; see also *Ibid.*; Tiago Fidalgo de Freitas, (n. 93).

¹¹⁵ Chicago Convention, (n. 1), art. 56.

¹¹⁶ ICAO, *ANC Procedural Guidebook*, C-DEC 176/12, 2.1.2; ICAO, *Directives for Panels of the ANC*, Doc 7984/4, (1980), 1, 2.1, 3.1 and 3.2.

¹¹⁷ ICAO, *Directive for Panels of the ANC*, *ibid.*, 4.1, 4.2,4.4, 4.5,5.2,5.3.1,5.3.3,6.2,7.2.

¹¹⁸ ICAO, *ANC Procedural Guidebook*, (n. 116), 4.2.13, 4.2.24.

¹¹⁹ Tiago Fidalgo de Freitas, (n. 93).

¹²⁰ Listed by ICAO on its website, (n. 113).

¹²¹ The Assembly is the sovereign body of ICAO. In the Assembly, every contracting State is represented according to an equality basis. (n. 33).

¹²² Chicago Convention, (n. 1), art. 50.

proposal requires the vote of two-thirds of the Council at a meeting called for that purpose.¹²³ So, the majority interests of those 36 member states who are represented determine whether and how the climate protection related standards may be produced. The 36 Council members, under the Chicago Convention, should represent: “1) the States of chief importance in air transport; 2) the States not otherwise included which make the largest contribution to the provision of facilities for international civil air navigation; and 3) the States not otherwise included whose designation will insure that all the major geographic areas of the world are represented on the Council.”¹²⁴ These three conditions imply that the Council members must contribute to the air transport industry in some way, but do not necessarily represent environmental interest. As the Council members are representing states, the same fractures may appear as my discussions in the previous chapter on the failure of the international climate change negotiations led by the UNFCCC. Even worse, the limited number of Council member means that many countries are under represented, especially those with less air transport activity but presumably plenty of interest in climate change. In addition, ICAO says that its rule-making procedure takes on average 2 years from the preliminary review by ANC to the applicability date.¹²⁵ This is very likely to be a costly and time-consuming process, which may ultimately not succeed.¹²⁶ So, the Council’s decision may not lead to effective standards being approved to combat climate change.

This examination of the three stages of ICAO rule-making procedure suggests that environmental interests are inadequately represented in the decision making progress. Making a new standard on aircraft engine emissions may be easier, faster and more flexible than an amendment of the Convention or negotiations on a new treaty.¹²⁷ It is possible that an environmentally related standard could be proposed by a contracting state, ICAO CAEP, or an international organisation. However, the proposed standard may not be effective to combat climate change or an effective standard may not be approved by the ICAO Council’s leading rule-making institute,

¹²³ Chicago Convention, (n. 1), art. 90 (a).

¹²⁴ Ibid., art. 50 (b).

¹²⁵ ICAO, ‘Making an ICAO Standard’, (n. 112).

¹²⁶ Chris Lyle, (n. 66)

¹²⁷ See discussions in previous section 1.3 of this chapter.

because an environmental or climate change perspective is inadequately represented in the creation of SARPs. This is the second limitation of ICAO rule-making function which has been identified after the criticisms of its non-binding legal status.

The primary way to improve the environmental sensibility of ICAO measures would be change the objectives of the organisation. However, improved representation of environmental NGOs, e.g. as observers at the ANC, would also be beneficial. The involvement of environmental NGOs as one of the multiple parties in regulating aviation emissions will receive closer attention in Chapter 7.

4.3. Conclusion

The above sections examined the inherent limitations of ICAO in terms of providing effective regulations to curb aviation emissions from two perspectives: the aim of ICAO and its rule-making function. ICAO's mandate is to ensure the safe, efficient and orderly evolution of international civil aviation. Climate change is not among ICAO's aims as set out in Article 44 of the Chicago Convention. Although the organisation has paid some attention to climate protection, the absence of a specific aim of environmental protection is one of the inherent limitations of ICAO that account for its failure to provide an effective regulatory framework to reduce aviation emissions. ICAO's second inherent limitation is the legal status and decision making procedure of SARPs. I argue that ICAO made rules are not legally binding on its member states and cannot provide an effective regulation of aviation emissions in terms of combating climate change. Moreover, an environmental or climate change perspective is inadequately represented in the rule-making procedure of ICAO. Therefore, apart from the shortcomings of the ICAO's technical competence or its existing SARPs on aircraft engine emissions as discussed in section 2, the organisation's inherent limitations due to its aims and rule-making functions mean that it would be inappropriate for it to be the sole regulator of aviation emissions. While it should not be the sole regulator, however, ICAO no doubt has a key role to play in regulating aviation emissions, notably on the technical front. The following sections will explore what role ICAO should play.

5. The Role of ICAO in the Future

This part aims to identify the possible role of ICAO in the regulatory architecture on aviation emissions. I will argue for a multi-party, multi-level and multi-instrument regulatory architecture in regulating aviation emissions in Chapter 7. ICAO is one of the multiple parties that should work together with other entities, public and private, in combating climate change in the aviation sector. The above discussion has suggested some reasons for the organisation's failure to provide an efficient regulatory framework to reduce aviation emissions and has argued that ICAO should not be the sole regulator. ICAO should not continue to be the "delegated authority" to control aviation emissions. The following sections will confirm that ICAO no doubt has to continue to play a key role on the technical front, and it may also have an important role regarding appropriate metrics, performance monitoring, reporting methods and auditing processes.

5.1. A Key Role on the Technical Front

There is no doubt that ICAO has to continue to play a key role in regulating aviation emissions, notably on the technical front. This is not only based on its emissions related SARPs but should be concerned with the fact that ICAO has been serving the industry for more than sixty years. Reducing aviation emissions is a comprehensive issue which has potential trade-offs between different aviation related hazards, e.g. concerning the complex relations between CO₂ emissions and non-CO₂ emissions from aircraft engines, between reducing emissions and controlling aircraft noise, and between reducing emissions and ensuring aviation safety. Such complex relations have not been part of the UNFCCC's concerns, but they rest in the different departments of ICAO. The organisation could provide a global forum which would enable emissions reduction related actions to be transparent in order to avoid risks in the trade-offs for the following reasons.

First of all, aviation's non-CO₂ impacts, compared to its basic CO₂ effects, are estimated to be "well above the average multiplier or ratio for all man-made

emissions.”¹²⁸ In designing a regulatory architecture, ICAO is a suitable place to deal with or at least advise on the transitional arrangements from the initial inclusion of CO₂ only to the coverage of the climate impacts of all aviation emissions, once there is a clear scientific basis for this. ICAO has conducted work relating to aviation non-CO₂ emissions for a long time. For example, ICAO has been proactive in proposing standards for Nitrogen Oxides (NO_x).¹²⁹ The organisation’s NO_x emission standards have effect on its member states’ domestic standards. The latest ICAO NO_x Emissions Standards became applicable in November 2005 and the US Environmental Protection Agency (EPA) applied ICAO’s NO_x emission standards for new commercial aircraft engines in the same year.¹³⁰ According to a policy paper from the US/EPA, the adoption of these NO_x emission standards was bringing US aircraft standards into alignment with the international standards; which would satisfy both the public and the manufacturers.¹³¹ The EU has pledged to offer a legislative proposal to limit NO_x emissions from aviation with tougher standards than those set by ICAO,¹³² which is at present under study. In addition, the launch of mid- and long-term technology goals for NO_x emissions from jet engines in its seventh meeting (CAEP/7) held in 2007¹³³ improved the whole package of ICAO’s NO_x emission regulations. Although its NO_x emissions regulation still needs more work to be complete,¹³⁴ ICAO’s work in this area has been very successful against the UNFCCC’s silence on non-CO₂ emissions.

Second, ICAO has already addressed different environmental impacts caused by aircraft engines, especially aircraft noise and emissions issues. As mentioned

¹²⁸ Chris Lyle, (n. 66). See also previous discussions in Chapter 1.

¹²⁹ For the impact of aircraft CO₂ and NO_x emissions on climate change, see R. Sausen & U. Schumann, ‘Estimates of the Climate Response to Aircraft CO₂ and NO_x Emissions Scenarios’ (2000) 44 *Climate Change* 27.

¹³⁰ United States Environmental Protection Agency, ‘Regulatory Announcement: New Emission Standards for New Commercial Aircraft Engines’, (November 2005), online available at <<http://www.epa.gov/oms/regs/nonroad/aviation/420f05015.htm#benefits>> last accessed 6 April 2009.

¹³¹ Ibid.

¹³² See the Commission’s legislative proposal to include aviation in the EU ETS: European Commission, Proposal for a directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community. See also Delft Report, ‘Lower NO_x at Higher Altitudes Policies to Reduce the Climate Impact of Aviation NO_x Emissions’ (2008) <http://ec.europa.eu/transport/air/environment/environment_en.htm> last accessed 6 April 2009.

¹³³ ICAO, *Report of the Seventh Meeting of the Committee on Aviation Environmental Protection, Montreal*, 5-16 February 2007, ICAO Doc. 9886, CAEP/7 (CAEP/7 Report); Independent Experts NO_x Review and the Establishment of Medium and Long Term Technology Goals for NO_x (Doc 9887).

¹³⁴ Louis Tsague & Thomas Tamo Tatietsé, ‘Aircraft cruise nitrogen oxides (NO_x) emissions prediction and environmental pollution factor’ (2007) 18/5 *Energy&Environment* 565.

above, reducing aircraft emissions has trade-off impacts on aircraft noise. ICAO is a suitable place to advise on such trade-off impacts, because of its long-term experience on aircraft noise management.¹³⁵ Much of the organisation's effort to reduce aircraft noise over the past 30 years has been aimed at reducing noise at source, which means improving aircraft engines and aircraft design.¹³⁶ It provided noise certification standards for contracting states, which are addressed in Annex 16 Volume I, entitled "Aircraft Noise," of the Chicago Convention.¹³⁷ In 2001, the ICAO Assembly endorsed the concept of a "balanced approach" to aircraft noise management,¹³⁸ which principle was reaffirmed in 2007.¹³⁹ Among different elements which may impact on aircraft noise, it analyses the various measures available to reduce noise through reduction at source (quieter aircraft). Under the aegis of ICAO, in 2006, a noise database, Noise dB, was developed in order to provide certification noise levels for each aircraft type guaranteed by the certification authorities.¹⁴⁰ This database is intended as a general source of information for the public. Thus, ICAO is well-placed to advise on potential trade-offs between aircraft noise and aircraft emissions impacts.

Third, improving aircraft or engine design for emissions purposes may have negative impact on safety. Given that the ICAO goals all relate to one primary concern with the safety of air navigation, the organisation is well placed to deal with or advise on the development of technical methods to reduce aviation emissions while ensuring air navigation safety. For example, alternative energy is one of the technical measures which might be scientifically and commercially available in the future. But, using alternative energy would require the adjustment of aircraft engine design, which may cause safety concerns about air navigation. ICAO has been working on the possibility of alternative fuels as part of the solution to climate change and leading the way to making aviation "the first mover for sustainable

¹³⁵ For literature on the ICAO's aircraft noise management, see Gerald L. Baliles, 'Aircraft Noise: Removing a Barrier to Aviation Growth' (2001) 66 *J. Air L. & Com.* 1333; Ruwantissa Abeyratne, 'Legal and regulatory aspects of aircraft noise' (2000) 25 *Ann. of Air & S. L.* 1; Jeffrey Goh, 'Problems of transnational regulation: a case study of aircraft noise regulation in the European Community' (1995) 23 *Transp. L. J.* 277.

¹³⁶ ICAO, 'Aircraft Noise', ICAO website at <<http://www.icao.int/icao/en/env/noise.htm>> last accessed 22.05.10.

¹³⁷ ICAO, Annex 16 to the Convention on International Civil Aviation, Volume I: Aircraft Noise, 4th ed. July 2005, (Annex 16 Volume I).

¹³⁸ Appendix C of Assembly Resolution A35-5.

¹³⁹ Appendix C of Assembly Resolution A36-22.

¹⁴⁰ DGAC, 'General Information on the NoisedB database', online available at <<http://noisedb.stac.aviation-civile.gouv.fr/>> last accessed 22.05.10.

alternative fuels.”¹⁴¹ In February 2009, ICAO organized a workshop studying the impact of alternative fuels on the sustainability of future aviation industry growth due to their potential to reduce aircraft engine emissions.¹⁴² Building upon the results of the workshop,¹⁴³ the organisation held a conference on aviation and alternative fuels in November 2009.¹⁴⁴ ICAO is expected “to stimulate a dynamic exchange of views and to establish a global roadmap to constitute an integral element”¹⁴⁵ of the response to the climate change challenge.

Therefore, ICAO should continue to play a key role in regulating aviation emissions on the technical front. It should be a focal point regarding balancing potential trade-off effects with reducing emissions in ensuring a safe, efficient and environmentally friendly development of the industry. ICAO’s technology-based standards should be involved as one of multiple regulatory instruments in regulating aviation emissions. In the process of making ICAO standards, there is also a need to increase the participation of environmental interest, which could be represented by environmental NGOs. The role of ICAO’s technology-based standards and NGOs are a subject to which I will return in Chapter 7.

5.2. Performance Monitoring, Reporting Methods and Auditing Processes

In addition to its work on the technical front, ICAO may have another important role providing performance monitoring, reporting methods and auditing processes in respect of member states’ reduction actions. When designing a legal architecture to control aviation emissions, it is important to consider “how to accurately measure and account for greenhouse gas reductions”, “how to make sure that durable, lasting, and real reductions are taking place”, and “how to ensure that the system of enforcing these reductions is fair and transparent.”¹⁴⁶ The auditing

¹⁴¹ ICAO, ‘Aircraft Noise’, (n. 136).

¹⁴² ICAO, Aviation and Alternative Fuels, ICAO Headquarters, Montreal, Canada, 10-12 February 2009. See ICAO website at < <http://www.icao.int/waaf2009/>>.

¹⁴³ A Summary of Research and Perspectives Presented at the ICAO Workshop on Aviation and Alternative Fuels (Montreal, 10-12 February 2009) Compiled by the ICAO Environment Section, <http://www.icao.int/waaf2009/WAAF2009_Summary_final.pdf> accessed 29 June 2009.

¹⁴⁴ ICAO Conference on Aviation and Alternative Fuels, Rio de Janeiro, Brazil, (16-18, November 2009), see its website at < <http://www.icao.int/CAAF2009/>> last accessed 22.05.10.

¹⁴⁵ Ibid.

¹⁴⁶ Stelios Pesmajoglou, ‘Measurement, Reporting, Verification and what they mean for international aviation’ Speech on ICAO Colloquium on Aviation and Climate Change, Montreal, Canada, 11-14 May

processes include monitoring, reporting and verification (MRV). In the context of general climate change commitments, the importance of MRV has been recognised, and they were included in the UNFCCC and Kyoto Protocol, in provisions relating to the measurement of and reporting on the parties' actions.¹⁴⁷ The Cancun Agreements outline a system to enable the measurement, reporting and verification of how countries are living up to their promises to take action on emissions. Developed countries should submit annual greenhouse gas inventories and inventory reports and biennial reports on their progress in achieving emission reductions.¹⁴⁸ For developing countries, internationally supported mitigation actions will be subject to domestic and international MRV in accordance with guidelines to be developed, while domestically supported mitigation actions will be measured, reported and verified domestically in accordance with general guidelines to be developed under the Convention.¹⁴⁹

MRV mechanisms are thought to be important in international institutions for a number of reasons. Monitoring ascertains the state's behaviour, reporting makes that behaviour transparent to the recipients of the reports, and verification contributes a system for quality and reliability checks of the reported data.¹⁵⁰ MRV mechanisms

2010, Powerpoint available online at <http://www.icao.int/CLQ10/Docs/2_Pesmajoglou_MRV.pdf> last accessed 23.05.10.

¹⁴⁷ *United Nations Framework Convention on Climate Change*, 9 May 1992, 1771 U.N.T.S. 107 (entered into force 21 March 1994), (UNFCCC), art. 12.

The Copenhagen Accord also provided that mitigation actions by developed countries should be measured, reported and verified, and provides a two track mechanism for mitigation actions in developing countries – with domestically supported actions to be subject to a domestic monitoring reporting and verification mechanism (to be reported every two years) and mitigation actions that receive international support to the subject to international monitoring, reporting and verification, *Copenhagen Accord*, Decision -/CP.15, found in Decisions adopted by COP 15, online available at <http://unfccc.int/meetings/cop_15/items/5257.php>, para 5, (Copenhagen Accord).

For discussions on MRV in international law, see Clare Breidenich & Daniel Bodansky, 'Measurement, Reporting and Verification in a Post-2012 Climate Agreement' (April 2009) the Pew Center on Global Climate Change, online available at <<http://www.pewclimate.org/docUploads/mrv-report.pdf>> last accessed 23.05.10.

¹⁴⁸ Decision 1/CP.16, which includes the outcome of work by the AWG-LCA and covers the main elements of the Bali Road Map. Decision 1/CMP.6 reflects the outcome of the work undertaken by the AWG-KP., para. 40.

¹⁴⁹ *Ibid.*, para. 61, 62.

¹⁵⁰ Jorgen Wettestad 'Monitoring and Verification' in Daniel Bodansky et al., *The Oxford Handbook of International Environmental Law* (Oxford University Press, Oxford 2008), p. 975. For an overview of MRV mechanism used in multilateral agreements, see generally Glenn M. Wiser, *Compliance Systems Under Multilateral Agreements: A Survey for the Benefit of Kyoto Protocol Policy Makers* (CIEL 1999), online available at <www.ciel.org/Publications/SurveyPaper1.pdf> last accessed 28/02/11; David G. Victor, Kal Raustiala, Eugene B. Skolnikoff (eds.), *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice* (MIT Press, Cambridge 1998); Sandrine Maljean-Dubois & Vanessa Richard, Mechanisms for monitoring and implementation of international environmental protection agreements (IDDRI 2004) online available at <http://www.iddri.org/Publications/Collections/Idees-pour-le-debat/id_0409bis_maljeandubois&richar>

are “important in building trust between and among cooperating parties, and in strengthening wider societal confidence.”¹⁵¹ The value of the “information-giving function”¹⁵² of audits is recognised. In addition, in the international environmental law context, MRV mechanisms are thought to contribute to compliance, creating transparent links between a state’s actions and its international commitments, allowing both the state itself and the broader community receiving the report to reflect upon performance and to identify improvements.¹⁵³ Bredenich and Bodansky have spelled out the significance of MRV in climate change generally. MRV “can provide an important means of tracking parties’ progress individually and collectively,” in respect of the ultimate mitigation objective. In addition, measurement “can facilitate parties’ actions by establishing baselines and helping to identify mitigation potentials.” International recognition is possible of actions properly reported. The verification stage “can enhance action through expert advice on opportunities for improvement”, with a particular role in support of developing countries’ actions. Finally, a good MRV system “can strengthen mutual confidence in countries’ actions and in the regime, thereby enabling a stronger collective effort.”¹⁵⁴

Clearly, the general MRV provisions in the international climate change agreements do not apply to aviation. But MRV of individual countries’ reduction actions is equally significant in the aviation sector. ICAO is well placed to take on such a role.

In particular, ICAO is well placed because of its experience collecting and processing data. Greenhouse gas emission data is the backbone of any legal regulation. Such data would be used for different purposes and at different levels, including identifying key sectors and gases in regulatory planning; designing appropriate activities at a national level; monitoring the effectiveness of reduction projects.¹⁵⁵ ICAO has already developed an emissions quantification method

d_eng.pdf> last accessed 28/02/11; Xueman Wang & Glenn Wiser, ‘The Implementation and Compliance Regimes under the Climate Change Convention and its Kyoto Protocol’ (2002) 11/2 *RECIEL* 181.

¹⁵¹ Ibid.

¹⁵² Nancy Kubasek et al., ‘Mandatory Environmental Auditing: A better Way to Secure Environmental Protection in the United States and Canada’ (1998) 18 *J. land Resources & Envtl. L.* 261, 262.

¹⁵³ Jorgen Wettstad, (n.). See also, Olav Schram Stokke et al. eds., *Implementing the Climate Regime: International Compliance* (Earthscan, London 2005).

¹⁵⁴ Clare Bredenich & Daniel Bodansky, ‘Measurement, Reporting and Verification in a Post-2012 Climate Agreement’ (2009) Pew Center on Global Climate Change, p. 1.

¹⁵⁵ See chapter 2 on the characteristics of aviation emissions.

through its Committee on Aviation Environmental Protection (CAEP).¹⁵⁶ This method is called the ICAO Carbon Emissions Calculator, which aims to develop a user-friendly, unbiased tool to compute carbon emissions from air travel. It is suitable for use with offset programmes and it applies the best publicly available industry data to account for various factors such as aircraft types, route specific data, passenger load factors and the cargo carried.¹⁵⁷ It has been available since June 2008. In April 2009, the UN Environmental Management Group adopted the ICAO Carbon Emissions Calculator as the official tool for all UN bodies to quantify their air travel CO₂ footprint.¹⁵⁸ It is expected that ICAO could develop a set of guidelines to “enable interested parties to develop a carbon calculator methodology for belly freight.”¹⁵⁹ I would suggest that ICAO’s experience in collecting and processing data through its carbon emissions calculator makes it well placed to carry out further work on measuring and accounting for greenhouse gas reductions from aviation.

What is more, ICAO may request its contracting states to report annually to the organisation, in an agreed format, in accordance with Article 67 of the Chicago Convention. This article provides that “[e]ach contracting State undertakes that its international airlines shall, in accordance with requirements laid-down by the Council, file with the Council traffic reports, cost statistics and financial statements showing among other things all receipts and the sources thereof.”¹⁶⁰ The purpose of these reports is for the ICAO Council to produce its Annual Report, which “provides the world aviation community with comprehensive insight into the programmes, activities and achievements of the Organization in support of its mission as defined by the Convention on International Civil Aviation, namely, the safe and orderly development of international civil aviation.”¹⁶¹

¹⁵⁶ ICAO, ‘Carbon Emissions Calculator’, ICAO website at <<http://www2.icao.int/en/carbonoffset/Pages/default.aspx>> last accessed 23.05.10.

¹⁵⁷ ICAO, ‘ICAO Carbon Emissions Calculator’, Version 2, (May 2009), online available at <<http://www2.icao.int/en/carbonoffset/Documents/ICAO%20MethodologyV2.pdf>> last accessed 23.05.10.

¹⁵⁸ United Nations, Greenhouse Gas Calculator, online available at <<http://www.unemg.org/sustainableun/Resources/FAQs/GreenhouseGasInventory/UnitedNationsGreenhouseGasCalculator/tabid/1916/language/en-US/Default.aspx>> last accessed 23.05.10.

¹⁵⁹ Tim Johnson, ‘The ICAO Carbon Emissions Calculator’ Speech on ICAO Colloquium on Aviation and Climate Change, Montreal, Canada, (11-14 May 2010), PowerPoint online available at <<http://www.icao.int/CLQ10/Docs.htm>> last accessed 23.05.10.

¹⁶⁰ Chicago Convention, (n. 1), art. 67, these reports could include data on fuel consumption.

¹⁶¹ ICAO, ‘Annual Reports of the Council’ on the ICAO website at <<http://www.icao.int/annualreports/>> last accessed 27.05.10.

In at least these two specific respects, ICAO has the experience and capacity in collecting and processing aviation emissions related data; however, these data are not at the moment gathered together in a specified programme aimed to combat climate change. In addition to these existing opportunities, which may support its monitoring of the member states' reduction actions, I suggest that ICAO should build a climate change audit programme to provide for MRV of its member states' reduction related actions. Such a programme would take advantages of experience with existing ICAO auditing programmes.

The Universal Safety Oversight Audit Programme (USOAP) and the Universal Security Audit Programme (USAP) are, at the time of writing, the only ICAO universal programmes to have articulated a clear philosophy with respect to aviation audit. The establishment of universal regulation of aircraft emissions is likely to result in a range of new regulatory mechanisms, including climate change audit. ICAO's existing experience provides considerable insight into any such future auditing programme.

USOAP, USAP and any future emissions auditing have common roots in the SARPs. The international standards that govern air safety and security are, like those that govern aircraft engine emissions, embodied in the Chicago Convention's Annexes. Membership in ICAO is based on the assumption that each contracting state adheres to the international standards established by the Organisation. However, not all contracting states have fully implemented the standards, in part because, as discussed above, SARPs are not binding legislative enactments as that concept is traditionally understood.¹⁶² Following widespread reports of failure to implement SARPs, the ICAO Assembly adopted Resolution A32-11,¹⁶³ in its 32nd ordinary session held in 1998, to call for establishment of a Universal Safety Oversight Audit Program (USOAP). The ICAO Assembly directed that such programme should include a systematic monitoring and reporting mechanism on the implementation of safety-related Standards and Recommended Practices.¹⁶⁴ The USOAP was established and came into effect on January 1 1999. It comprises "regular, mandatory, systematic and harmonized safety audits, to be carried out by ICAO" in

¹⁶² Thomas Buergenthal, *Law-making in the International Civil Aviation Organisation*, (n. 94), p. 77.

¹⁶³ ICAO, *Establishment of an ICAO Universal Safety Oversight Audit Programme*, Assembly Resolution A32-11 in Resolutions Adopted at the 32nd Session of the Assembly, Provisional Edition, ICAO website, online at <<http://www.icao.int/icao/en/assembl/a32/resolutions/pdf>> last accessed 01.02.11.

¹⁶⁴ *Ibid.*

all contracting states.¹⁶⁵ Performed by the ICAO staff or seconded experts, the scope of the audits has gradually been expanded up to the Annexes concerning pilot licensing, operation of aircraft and airworthiness.¹⁶⁶ The USOAP also identifies deficiencies and provides action plans to carry out corrective measures and direct assistance.¹⁶⁷ A second round of audits started in 2005 and is to be completed by December 2011. The results of audits are disclosed to all states and have been published on the ICAO website since 2006.¹⁶⁸

Following the successful introduction of the USOAP in almost all contracting states by 2001, and prompted by the terrorist events of September 11 2001, the ICAO Assembly, at its 33rd ordinary session, adopted another Resolution¹⁶⁹ on the consideration of a Universal Security Audit Programme (USAP). This programme was modelled along the lines of the USOAP to assess the implementation of SARPs relating to airport security arrangements and civil aviation security programmes. The ICAO Council was also directed to convene a High-Level Ministerial Conference on Aviation Security with the objective of strengthening ICAO's role in adopting SARPs in this field, and in the auditing of their implementation.¹⁷⁰ At the High-Level Ministerial Conference, convened in February 2002, a global strategy for strengthening worldwide aviation security was adopted, a central part of which was an ICAO Aviation Security Plan of Action. The Plan of Action proposed "regular, mandatory, systematic and harmonized audits to enable the evaluation of aviation security in all member states."¹⁷¹ The ICAO Council adopted the Aviation Security Plan of Action in June 2002 and the first security audit was carried out in November 2002.¹⁷² The second round of security audits commenced in January 2008, and is expected to conclude in 2013. "To promote transparency and mutual

¹⁶⁵ Ibid.

¹⁶⁶ Gilbert Guillaume, "ICAO at the Beginning of the 21st Century", (n. 78). ICAO, *Continuation and Expansion of the ICAO Universal Safety Oversight Audit Programme*, Assembly Resolution A33-8 in Resolution Adopted at the 33rd Session of the Assembly, Provisional Edition, ICAO website, online at <http://www.icao.int/icao/en/res/a33_8.htm> last accessed 01.02.11.

¹⁶⁷ Olga Barreto, "Safety Oversight: Federal Aviation Administration, International Civil Aviation Organization, and Central American Aviation Safety Agency" (2002) 67 *J. Air L. & Com.* 651.

¹⁶⁸ Safety oversight audit reports and other safety-related information are available at the ICAO Flight Safety Information Exchange (FSIX) website: <<http://www.icao.int/fsix/auditRep1.cfm>>.

¹⁶⁹ ICAO, *Declaration on Misuse of Civil Aircraft as Weapons of Destruction and Other Terrorist Acts involving Civil Aviation*, Assembly Resolution A33-1 in Resolutions Adopted at the 33rd Session of the Assembly, Provisional Edition, ICAO website, online at <http://www.icao.int/icao/en/assembl/a33/resolutions_a33.pdf> last accessed 01.02.11.

¹⁷⁰ Ibid.

¹⁷¹ See ICAO, *Universal Security Audit Programme—Background*, ICAO website, online at <<http://www.icao.int/icao/en/atb/asa/Background.htm>> last accessed 01.02.11.

¹⁷² Ibid.

confidence between States,” the results of audits are disclosed to all ICAO member states on a restricted website.¹⁷³

The two audit programmes constitute “a significant development in international practice and international law.”¹⁷⁴ ICAO’s role in improving safety and security has had success in the “elaboration of norms and in collecting and disseminating relevant information” in the audit programme.¹⁷⁵ By 2006, only four states had not been audited under USOAP.¹⁷⁶ The ICAO’s action under the USAP is thought to have significantly improved security.¹⁷⁷ There is of course no guarantee that these programmes will continue to be adequately resourced and supported. Nevertheless, ICAO certainly has a role to play.

The current universal audit programmes are confined to safety-related and security-related standards only. In particular, they do not cover the environment-related standards contained in Annex 16 Volume II. However, they provide a good model for the establishment of a programme for the audit of contracting states’ implementation of environmental standards. On the basis of this experience, a number of features would be necessary for an ICAO climate change audit programme in respect of its member states’ GHG emissions.

As Gunningham and Prest have argued:

“By virtue of a mandatory audit a regulated entity might be required to conduct an independent audit at its own cost or accede to the conduct of an audit by the [regulator authority]; to fully disclose the results; and to implement its recommendations by developing a remedial plan (or corporate management plan) to address the most serious problems identified by the audit.”¹⁷⁸

So the first requirement on the audit programme is that it should be mandatory, with three key implications attached to that: the regulated entity pays the cost of auditing; the auditing results are fully disclosed; and a remedial plan is developed if the audit identifies problems. These three elements determine the effectiveness of a mandatory audit.

¹⁷³ USAP, ICAO website at < <http://www2.icao.int/en/AVSEC/USAP/default.aspx> > last accessed 11.02.2010.

¹⁷⁴ Michael Milde, “Aviation Safety Oversight: Audits and the Law” (2001) 26 *Ann. Of Air and Space Law* 165, 175.

¹⁷⁵ Gilbert Guillaume, (n. 78).

¹⁷⁶ They are Afghanistan, Burundi, Iraq and Somalia. *Ibid.*

¹⁷⁷ *Ibid.*

¹⁷⁸ Neil Gunningham & James Prest, ‘Environmental Audit as a Regulatory Strategy: Prospects and Reform’ (1993) 15 *Sydney L. Rev.* 492, 518.

First, imposing the cost of audit on member states, who are the regulated entity in the proposed audit programme, will release the financial pressure from ICAO, and make it easier for ICAO to manage a universal or wide-ranging auditing programme.¹⁷⁹ Secondly, public disclosure of the audit results is one of the determining elements of the successful operation of mandatory audits. For example, ICAO started to develop an ongoing process to allow for the release of relevant information to the public on safety oversight audits from 2006, so that the travelling public can make an informed decision when using air transportation. To this end, member states were encouraged to provide ICAO their consent to publish safety oversight audit information. While some states have given ICAO authority to disclose an executive summary and critical element graph of the auditing system, others have agreed to the release of the audit summary report in its entirety.¹⁸⁰ Public disclosure of audit results places pressures and incentives on the states. They will be more serious and responsible in taking appropriate actions, since such actions “will be subject to public scrutiny.”¹⁸¹ In the environmental context, disclosure provides environmental groups with essential information, enabling them “to act as a countervailing force” and “put pressure” on, in this case, the state and ICAO, and even indirectly the airlines themselves.¹⁸² Thirdly, remedial plans have the potential to provide expert assistance and support, as discussed above. In addition, the mandatory audit itself is “an overlooked approach for increasing environmental compliance,”¹⁸³ in this case compliance with the sector specific mitigation target discussed in Chapter 3 or with the more general obligation to address transport related emissions. However, the focus of the ICAO scheme is not compliance but the “information-giving function”¹⁸⁴ of audits. Auditing would not be designed to focus on whether an individual carrier is green or not – the audited entities are member states of ICAO.

As well as being mandatory, the audit programme should be systematic and

¹⁷⁹ Under other auditing schemes of ICAO, the audited state pays the cost of audit. See ICAO website at <<http://www2.icao.int/en/AVSEC/USAP/default.aspx>> last accessed 11.02.2010.

¹⁸⁰ See ICAO Flight Safety Information Exchange website at <www.icao.int/fsix/AuditRepText.cfm> last accessed 11.02.2011. For obvious reasons, security details are not publicly disclosed.

¹⁸¹ Neil Gunningham & James Prest, ‘Environmental Audit as a Regulatory Strategy: Prospects and Reform’ (1993) 15 *Sydney L. Rev.* 492, 518.

¹⁸² *Ibid.*

¹⁸³ Nancy Kubasek et al, ‘Mandatory Environmental Auditing: A Better Way to Secure Environmental Protection in the United States and Canada’ (1998) 18 *J. Land Resources & Envtl. L.* 261, 262.

¹⁸⁴ Nancy Kubasek et al., (n. 183).

harmonized, including all aviation emissions related issues. The starting point must require each member state to provide a wide-ranging aviation emissions review. Such a review should be an initial comprehensive analysis of a country's contribution to aviation and of its ability to commit itself to any aviation GHG reduction target that might be established in international climate change negotiations. The initial review should be broader and more comprehensive than a compliance audit. It should not only examine compliance with existing climate change laws and with domestic environmental laws, but also should examine all aspects of the country's air transport operations and domestic policies that may impact on climate change. This would include issues such as any trade-offs involved in emissions reductions, including aircraft noise control, aircraft traffic management, aviation safety related issues and other issues related to aircraft design. After a comprehensive review, a climate change statement should be prepared by each member state and sent to ICAO. The state being audited would be visited by an ICAO audit team, including experts (either ICAO staff members or persons seconded from national administrations), to validate the information provided by the state and to conduct an on-site audit of the state's overall capacity for emissions reduction. A climate change audit report would then be developed and compiled by the audit team, including any necessary corrective action plan.

The climate change statements prepared by the member states should be more than a summary of the results of the audit, including an identification of all the problems discovered and a plan for correcting these deficiencies.¹⁸⁵ The purpose of this statement would be to provide the benchmark from which subsequent climate change audits could measure progress and especially provide the reference for balancing different trade-offs. This is the main difference between ICAO's audit programme proposed here and other types of environmental auditing. Generally, an environmental auditing report is a typical part of "postdecision monitoring" as an important part of environmental management.¹⁸⁶ The data generated by monitoring provides a disciplined basis for the agency to test, verify and revise specific decisions in the light of experience, improving the knowledge base upon which the

¹⁸⁵ Ibid.

¹⁸⁶ Bradley C. Karkkainen, 'Toward a Smarter NEPA: Monitoring and Managing Government's Environmental Performance' (2002) 102 *Colum. L. Rev.* 903, 937.

agency acts in the particular case and over the longer run.¹⁸⁷ However, under the proposed ICAO audit programme, the climate change statements from the contracting states would in addition serve ICAO's rule-making and allow outsiders to put informal pressure on all parties as mentioned above, but would also, and importantly, aim to enable "more enlightened decisions"¹⁸⁸ in respect of aviation under any future climate change negotiations improving transparency and accountability in the climate change negotiation process. It would provide different interest groups with information on the actual performance and capacity of each of the contracting parties. Over time, the systematic use of the proposed audit statement should contribute to improvements in the capacity of international decision makers to set reduction targets and manage regulatory mechanisms.

Cook and Hearn have argued for the importance of "a standardized auditing procedure" in conducting audits, which might guide how an audit would "be in good faith."¹⁸⁹ They have advocated using "clearer rules and more predictable standards" to govern auditing. ICAO should take the responsibility to create such rules and standards. This could be in the form of a model aviation regulatory document, which consists of sets of aviation laws, regulations and standards that may be used by a member state's civil aviation authority to review the country's present laws and regulations.¹⁹⁰ Such a model document would provide the basis for the review and modification of the existing civil aviation laws of a state, when ICAO comes to consider the modification of national regulations which will be necessary in order to comply with the international obligations under any future climate change deal. In addition, the proposed programme should investigate the level of compliance of the member states vis-à-vis the requirements of the aviation sectoral emissions target if there is one. Under the programme, ICAO should send teams of experts¹⁹¹ as mentioned above to member states to examine that nation's aviation laws and regulations, as well as the methods used for certifying and supervising air carriers.

¹⁸⁷ Ibid.

¹⁸⁸ Ibid. n. 47 cited Sinclair & Dideck, n.45, p. 228.

¹⁸⁹ Heather L. Cook & Robert R. Hearn, 'Putting Together the Pieces: A Comprehensive Examination of the Legal and Policy Issues of Environmental Auditing' (1994) 7 *Tul. Envtl. L. J.* 545, 590-593.

¹⁹⁰ See example from the FAA's model aviation regulatory document. Olga Barreto, (n. 167), n. 40 cited FAA, Model Civil Aviation Safety Act and Model Regulations, at <<http://www.faa.gov/avt/iasa/INTRO.doc>>.

¹⁹¹ Ensure the quality of the auditor is crucial to the auditing process. See Heather L. Cook & Robert R. Hearn, (n. 189). They argued three basic qualities of an auditor: the auditor must be proficient in auditing and analyzing the results; must exercise due care in performing the audit; and must be objective and independent.

The teams would also review the country's organizations which are involved in the control and supervision of flight operations and maintenance, as well as the development and use of market-based regulatory mechanisms. The audit programme should help member states identify the highest level of reduction of GHGs from aviation and enforce carrier compliance with ICAO aircraft engine standards to reach the sectoral reduction target.

This outlines the nature and contents of the proposed ICAO audit programme. We should also note that the proposed ICAO audit programme alone cannot solve the aviation emissions problem. It should be linked to baskets of regulatory measures and fitted to a multi-scalar regulatory architecture for reducing aviation emissions. A multi-scalar regulatory architecture, in short, means a multi-party, multi-level and multi-instrument regulatory system which I will discuss in Chapter 7. An audit programme, according to Gunningham's *Smart Regulation* theory and Osofsky's argument on the need of multi-scalar climate regulation, should be treated not as a single regulatory tool, but as just part of an effective combination strategy.¹⁹² This is partly because of the diagnostic nature of an environmental audit, which cannot by itself effectuate a cure for poor performance;¹⁹³ and partly because of the imperfection of any single regulatory mechanism in respect of aviation emissions.¹⁹⁴ So, the audit programme alone cannot solve the aviation emissions problem, but it could contribute a valid diagnosis of the problem within the complex environmental regulatory jungle.¹⁹⁵

There are of course major challenges associated with introducing an auditing programme to ensure the MRV of aviation GHG. The first challenge is getting every contracting state to agree to audit. One official has said that:

“... ICAO faces the same policy issues as emerged at Copenhagen, exemplified by [the] current struggle to establish a useful new data collection on fuel consumption and on the contribution of alternative fuels, against the insistence of some States, which do not wish third parties formally to measure their progress in reducing GHG emissions.”¹⁹⁶

¹⁹² Neil Gunningham et al., *Smart Regulation: designing environmental policy* (Clarendon Press, Oxford 1998); Hari M. Osofsky, 'Is Climate Change "International"? Litigation's Diagonal Regulatory Role' (2009) 49/3 *Va. J. Int'l L.* 585.

¹⁹³ David A. Chaumentte & William W. Cason, 'Auditing Environmental Audit Policies: Has Industry Been Hoisted On Its Own Petard?' (1997) 4 *Wis. Envtl.L.J.* 1.

¹⁹⁴ See discussions in Chapters 3 to 7 of this thesis.

¹⁹⁵ Terrell E. Hunt & Timothy A. Wilkins, 'Environmental Audits and Enforcement Policy' (1992) 16 *Harv. Envtl. L. Rev.* 365.

¹⁹⁶ Chris Lyle, (n. 59).

These states would be unwilling to allow third parties to access their emissions related data, because those countries which were found deficient would be put in a disadvantageous position in any international negotiations and this would frustrate their cooperation.¹⁹⁷ The success of the proposed audit programme and aviation emissions reduction requires a great deal of cooperation and negotiation between the ICAO and individual national aviation authorities. But there is real potential for development in this area.

The Chicago Convention does not contain the notion “climate change audit”, “environmental audit” or “audit.” However, its contracting states are required to report annually to the organisation, in an agreed format, data on fuel consumption and traffic in accordance with Article 67 of the Convention, as discussed earlier.¹⁹⁸ This article implies in principle an initial agreement of contracting states to audit. What is more, two mandatory audit programmes by ICAO on its member states have been successfully introduced as discussed above: the ICAO Universal Safety Oversight Audit Programme (USOAP) launched in 1999 and the ICAO Universal Security Audit Programme (USAP) launched in 2002. Although they are not environmental, they imply that mandatory audit is acceptable for contracting states as long as they have a common hazard to deal with – the main driving force to introduce USAP was the increased threat from world wide terrorism after 11 September 2001.¹⁹⁹ The threat from climate change needs to exert a similar impetus towards the climate change audit. Although the question remains as to whether the less immediate threat from climate change can exert the same pressure to cooperation as terrorism, it is certainly the case that is increased pressure on individual states and internationally to be seen to be taking action on aviation emissions might incentivise contracting state to agree on introducing an environmental audit.

In addition, experience from USOAP and USAP teaches us that any audit programme should respect the sovereignty of states. The audit missions could be

¹⁹⁷ Olga Barreto, (n. 167), n. 20 cited ‘Passenger Group Seeks Disclosure of DOT Unsafe Airline List’, *Aviation Daily*, (June 14, 1994), p. 424.

¹⁹⁸ Chicago Convention, (n. 1), art. 67.

¹⁹⁹ *Ibid.*, see also Gilbert Guillaume, ‘ICAO at the Beginning of the 21st Century’ (2008) 33 *Air & Sp. L.* 313.

undertaken on the basis of a Memorandum of Understanding (MOU) between ICAO and the state to be audited, as has happened under the safety oversight audit.²⁰⁰ MOUs have proved to be a good way to ensure compliance with auditing, confirming that every state has complete and exclusive sovereignty over the airspace of its territory²⁰¹ and that ICAO fully respects a sovereign state's responsibility and authority for emissions reduction, including its decision-making powers with respect to implementing corrective actions. It is sensible to believe that the use of MOUs would enhance member state acceptance of an environmental audit programme. Although in many circumstances mandatory audits are, as discussed above, preferable, in the current context, it is important that the sovereignty of the states be respected.

Secondly, the provision of financial assistance to an audited member state without adequate resources is likely to be important. For example, ICAO established an "International Financial Facility for Aviation Safety" (IFFAS) in 2001, outside the ICAO budget, funded by voluntary contributions from states. The aim of such fund is to provide low-cost loans to support safety-related projects identified by USAOP for the benefit of states without adequate resources.²⁰² The basic philosophy of IFFAS involves "identifying the most demonstrated need requiring financial support from the facility" in order to focus support and assistance toward the specific needs of member states.²⁰³ Like IFFAS, an environmental-related financial facility could be established as a mechanism to provide financial support both for the process of audit and for achieving the objectives of reducing aviation emissions through the implementation of the necessary measures mainly identified by the proposed environmental audit programme. Notwithstanding as in principle preference for, in may payment by the audited country, as discussed above, it is important an audited state without adequate resources receive financial assistance.

The other major difficulty is that following apparent agreement to auditing

²⁰⁰ A sample Memorandum of Understanding is in Appendix B of ICAO Doc 9735 AN/960 – Safety Oversight Audit manual. First Edition 2000.

²⁰¹ Chicago Convention, (n. 1), art. 1.

²⁰² ICAO, 'International Financial Facility for Aviation Safety' on ICAO website at www.icao.int/iffas/.

²⁰³ Ibid.

recalcitrant states will provide no statement, or an inaccurate or incomplete statement. As above, clear respect for national sovereignty will be important. There has been no recorded instance of a state refusing or deferring a safety oversight audit following the agreement of a MOU: “[e]ven the highly safety-conscious US has been audited by ICAO and several specific corrective actions were identified.”²⁰⁴ Technical and financial assistance will make an important contribution to proper compliance with the auditing procedure, in particular in respect of quality of data and reporting. And as discussed above, “it is important to establish a uniform format of reporting, with clear and precise requirements as to how and what to report.”²⁰⁵ While a group of experts will undertake the task of checking the reliability and accuracy of data as discussed above, “on-site monitoring with the consent of parties” may be an option to verify the reported information.²⁰⁶ In addition, some “moral” or “psychological” sanctions can be established.²⁰⁷ For example, publishing the auditing procedure to all the contracting states or online to public will provide peer pressure or public scrutiny to the ones who provide no statement. The “name and shame effect”²⁰⁸ indeed can be useful and efficient in ensuring the compliance of environmental audit.

6. Conclusion

The Kyoto Protocol places the responsibility for reducing emissions from international flights on state Parties working through ICAO, but ICAO has failed to provide efficient regulation. This chapter identifies reasons for ICAO’s failure and repositions this organisation’s role in regulating aircraft engine emissions.

ICAO has universal participation, technical competence in regulating aviation emissions and has adopted SARPs on aircraft engine emissions. However, climate

²⁰⁴ Michael Milde, (n. 174), p. 175. See also The Confidential Final Audit Report of the FAA of the United States was published on the FAA website at www.faa.gov.

²⁰⁵ Xueman Wang & Glenn Wisser, (n. 150), p.183.

²⁰⁶ Ibid.

²⁰⁷ Sandrine Maljean-Dubois & Vanessa Richard, (n. 150), p. 24.

²⁰⁸ Ibid.

change is an issue which involves much more than technical concerns and the effectiveness of the ICAO's technical standards on aircraft engine emissions are arguable in any event. In addition, a couple of inherent limitations of ICAO account for the organisation's inability to respond effectively to the calls for greater abatement of emissions from the aviation sector. This chapter identifies these inherent limitations as including at least: ICAO's mandate, which is restricted to the safety and the orderly development of international civil aviation; and ICAO's rule-making function, in which an environmental or climate change perspective is inadequately represented. It is questioned, therefore, whether ICAO should be the sole delegated authority to work on climate change associated with aviation.

It is certain that ICAO should not be "used as the standard excuse to postpone action to reduce aviation emissions."²⁰⁹ Although I argue that ICAO should not continue to be the sole delegated authority, the organisation certainly has a key role to play in regulating aviation emissions. Before the Copenhagen Accord, one argument from inside ICAO claimed that the organisation would like to break the two parallel streams which the UNFCCC and ICAO have been developing on combating climate change and would like to work more directly in cooperation with the UNFCCC in the post-Kyoto deal.²¹⁰ In the light of the tension between ICAO's advantages on aviation issues, together with its failure to provide an efficient response to climate protection, a revision of the role of ICAO has been suggested in this chapter. I argue that ICAO should continue to play a key role on the technical front and in performance monitoring, reporting methods and auditing processes on member states' reduction actions. Because of its technical competence and its long-term service to the industry, ICAO should be a focal point regarding the balancing of potential trade-off effects with reducing emissions in ensuring a safe, efficient and environmentally friendly development of the industry. Meanwhile, the organisation's experience in collecting and processing emissions related data means that ICAO is well placed to measure, monitor and audit its member states' reduction

²⁰⁹ T&E, 'Aviation and Climate Change', online available at <www.unfccc.int/cop9/se/present/krause.pps> last accessed 10.03.09.

²¹⁰ ICAO, 'Aviation and the Environment' (2008) 63/4 *ICAO Journal* 20.

actions. To perform such a role, I suggest that ICAO should build a climate change programme as a regular, mandatory, systematic and harmonized regulatory tool on aviation emissions. This is expected to be a regulatory tool which will help to fit ICAO for its role in the multi-scalar regulatory architecture on air transport emissions which I will be discussing in Chapter 7. The arguments in this chapter may provide a basis for ICAO to reposition its role on the issue of aviation emissions, if it is to sustain its credibility, by fitting into the more comprehensive architecture of the regulatory system which will be discussed in Chapter 7.

Chapter 5. Fuel Tax

1. Introduction

This chapter examines the legality of and practical barriers to taxing fuel on international flights and explores the role of a fuel tax in reducing aviation emissions. I argue that a fuel tax is an effective and a fair way to address prices in aviation, in order to affect demand and incentivise innovation. It cannot be a stand-alone solution to curbing the growth of aviation emissions, partly because of its uncertainty in ensuring a desired reduction in aviation emissions and because of practical difficulties. I argue that taxation could lawfully play an important role in reducing international aviation emissions and I suggest starting from introducing domestic national fuel taxes on short haul flights.

This chapter starts from positive arguments on the idea of a fuel tax as a price-based market-based instrument (MBI)¹ in environmental law. There are different ways to tax aviation, e.g., having a tax on the ticket, the journey or the fuel. I prefer a fuel tax because it is a better way to capture the carbon (and equivalent) cost of flying and so will best incentivise carbon efficiency in the airline industry. It should be noted that whilst the focus of this thesis is on the incentivisation of improved energy intensity in the industry, it is likely that responding fully to

¹ There is a large literature on addressing climate change through prices, see Richard Cooper, 'Toward a real treaty on global warming' (1998) 77 *Foreign Affairs* 66; Joseph Aldy, Scott Barrett & Robert Stavins, 'Thirteen plus one: A comparison of global climate policy architectures' (2003) 3 *Climate Policy* 373. For the literature on economic instruments in environmental law, see David Driesen, 'Economic Instruments for Sustainable Development' in Benjamin Richardson and Stepan Wood (eds.), *Environmental Law for Sustainability* (Hart Publishing, Oxford 2006); Jonathan B. Wiener, 'Global Environmental Regulation: Instrument Choice in Legal Context' (1999) 108 *Yale L. J.* 677; Jane Holder & Maria Lee, *Environmental Protection, Law and Policy* (2nd ed., Cambridge University Press, Cambridge) Chapter 11 'Regulatory techniques: beyond licensing.' For the literature on addressing economic instrument in the aviation sector, see Ruwantissa I.R. Abeyratne, 'The Fuel Tax and Emissions Trading As Market-based Options in Air Transport' (1999) 24 *Ann. of Air & Sp. L.* 1; Joyce E. Penner et al. (eds.), *Aviation and the Global Atmosphere: Special Report of the International Panel on Climate Change* (Cambridge University Press, Cambridge 1999), (IPCC 1999 Report), chapter 10 'Regulatory and Market-based Mitigation Measures.'

aviation emissions will require behaviour change, that is less flying or an avoidance of increased demand. Examining the purpose of pricing carbon through taxation, I argue that the value of a fuel tax is primarily as a way of constraining demand and secondarily as a way to incentivise innovation. I argue that price is an important way to affect demand and a tax is an effective and fair way to address the issue of price in the international aviation emissions case. A fuel tax could additionally provide an incentive for innovation and could be especially useful in respect of low cost air carriers. It cannot however be a stand-alone solution to curbing the growth of international aviation emissions, partly because such a tax cannot provide certainty of the desired reduction in aviation emissions. The inadequacy of any single regulatory tool to solve the complex aviation emissions problem is a subject to which I will return in Chapter 7.

In section 3 of this chapter, I examine the legality of a fuel tax on aviation from three perspectives: Article 24 of the Chicago Convention;² Article 15 of the Chicago Convention and related cases; and the International Civil Aviation Organisation's (ICAO) policy against taxation.³ I argue that a domestic fuel tax on international flights is lawful under the Convention. However, ICAO's policy against aviation fuel taxes results in governments reducing or eliminating taxes related to the sale or use of international air transport to the fullest practicable extent. I then explore the practical barriers to introducing a fuel tax on international aviation from three perspectives: "tanking" fuel under Article 24 of the Chicago Convention; price inelasticity for some flights; and the airline industry's opposition.

Finally, I argue that the policy and practical barriers to an aviation fuel tax can be overcome. I suggest starting from introducing a domestic aviation fuel tax on short haul international flights. This suggestion is presented with the specific purpose of reducing the artificially increased demand by low cost airlines. It will also incentivise some innovation to change low cost airlines into low carbon airlines. In this way, whilst a fuel tax cannot be a stand-alone solution to reduce aviation

² *Convention on International Civil Aviation* (adopted 7 December 1944, entered into force 4 April 1947) 15 UNTS 295, (Chicago Convention).

³ For discussions on the role of ICAO, see Chapter 4.

emissions, it might play an important role in the multi-scalar regulatory architecture which will be discussed in Chapter 7.

2. Contributions from a Fuel Tax

This section discusses some positive arguments on the idea of a fuel tax as a price-based market-based instrument (MBI) in environmental law. There are different ways to tax aviation, e.g., having a tax on the ticket, the journey or the fuel. I prefer a fuel tax because it is practically close to taxing the carbon (and equivalent) cost of flying and so will best incentivise carbon efficiency in the airline industry.⁴ I will examine the purposes of fuel taxes, explain the reasons supporting an aviation fuel tax and identify the limitations of taxing aviation fuel as well. I argue that a fuel tax on aviation should be introduced, although it cannot be a stand-alone solution to curb the growth of international aviation emissions.

Currently, international aviation fuel is not taxed. Before discussing the legal and practical barriers to taxing aviation fuel, it is necessary at this stage to examine the purposes of fuel taxes. In general, taxing fuel has varying but compatible purposes, including internalizing environmental externalities,⁵ producing correct price signals which may provide an incentive for consumers to change their behaviour, and also providing a source of governmental revenues.⁶ A basic rationale for the use of taxes in environmental policy is provided by the existence of

⁴ For literature on environmental tax, see Christina K. Harper, 'Climate Change and Tax Policy' (2007) 30 *B.C.Int'l & Comp. L. Rev.* 411; Michael J. Zimmer, 'Carbon Tax: Ready for Prime Time?' (2007-2008) 8 *Sustainable Dev. L. & Pol'y* 67; Richard A. Westin, 'Understanding Environmental Taxes' (1993) 46 *Tax Law.* 327.

⁵ From economists' perspective, carbon tax is a Pigouvian tax. For the theory on Pigouvian tax, see Arthur Cecil Pigou, *The Economics of Welfare* (4th ed., Macmillan and Co., Ltd., London 1932).

⁶ See David G. Duff, 'Tax Policy and Global Warming' (2003) 51 *Can. Tax. J.* 2063; William Nordhaus, 'To Tax or Not to Tax: Alternative Approaches to Slowing Global Warming' (2007) 1 *Rev. Envtl. Econ. & Pol'y* 26; Gilbert E. Metcalf & David Weisbach, 'The Design of a Carbon Tax' (2009) 33 *Harv. Envtl. L. Rev.* 499; Charles D. Patterson, 'Environmental Taxes and Subsidies: What is the Appropriate Fiscal Policy for Dealing with Modern Environmental Problems?' (2000) 24 *Wm. & Mary Envtl. L. & Pol'y Rev.* 121; Patricia Birnie, Alan Boyle, Catherine Redgwell, *International Law & the Environment* (3rd ed., Oxford University Press, Oxford 2009), Chapter 14 section 8 'Environmental Taxes' pp. 796-800.

environmental externalities: impacts on the environment are side-effects of processes of production and consumption and which do not enter into the calculations of those responsible for the processes.⁷ A fuel tax provides a way to internalize environmental externalities, negative external costs or hidden costs are paid for by the polluters in a way that conforms to the “polluter pays” principle.⁸ Another rationale for the use of fuel taxes is that, with a fuel tax, “fair and efficient” prices⁹ provides an incentive for consumers to use less of the taxed product and encourages producers to find more environmentally-friendly alternatives.¹⁰ In this case, provided the tax is levied on the fuel in such a way that a reduction in the use of fuel reduces the tax liability, then there will be an incentive for the use of fuel to be reduced. An airline facing a fuel tax will seek to reduce the use of fuel or change to alternative fuels. “Such a tax as is paid will increase the price of the relevant product, giving consumers the incentive to switch away from it.”¹¹ Another rationale of fuel tax is that the revenues raised can be used to improve environmental quality or to reduce other economic distortions, which is known as the “double dividend.”¹² Not surprisingly, many economists suggest that environmental regulations should use taxes as a tool to induce reduction in environmental harm.¹³ However, my concern is primarily the use of price-based MBIs to influence consumer demand for flights and incentivise innovation by airlines.

⁷ Paul Ekins, ‘European environmental taxes and charges: recent experience, issues and trends’ (1999) 31 *Ecological Economics* 39; David G. Duff, *ibid.*

⁸ See Organisation for Economic Co-operation and Development (OECD), *Economic Instruments for Environmental Protection* (OECD, Paris 1989); OECD, *Environmentally Related Taxes in OECD Countries: Issues and Strategies* (OECD, Paris 2001).

⁹ European Environmental Agency, Environmental Issues Series No. 1, Environmental Taxes: Implementation and Effectiveness, online available at <<http://org.eea.eu.int:80/documents/Issuerep/EnvTaxes/default.htm>> last accessed 24/10/09.

¹⁰ European Environment Agency, *Environmental Taxes: Recent Developments in Tools for Integration* (EEA, Copenhagen 2000). It said that environmental taxes “provide ‘soft signals’ that increase attention, awareness and concern about the environmental issues to which they relate”, p. 9.

¹¹ Paul Ekins, (n. 7), p. 42.

¹² See Jonathan B. Wiener, (n. 1); Ian W.H. Parry et al., ‘When Can Carbon Abatement Policies Increase Welfare? The Fundamental Role of Distorted Factor Markets’, (1997) National Bureau of Econ. Research Working Paper 5967; A. Lans Bovenberg & Ruud A. de Mooij, ‘Environmental levies and Distortionary Taxation’ (1994) 94 *Am. Econ. Rev.* 1085; Lawrence H. Goulder, ‘Environmental Taxation and the ‘Double dividend’: A Reader’s Guide’ (1995) 2 *Int’l Tax’n & Pub. Fin.* 157.

¹³ See, Arthur Cecil Pigou, (n. 5); William J. Baumol & Wallace E. Oates, *The Theory of Environmental Policy* (2nd ed., Cambridge University Press, New York, 1988).

The value of a fuel tax, in the case of reducing international aviation emissions, is primarily as a way of changing consumer behaviour and secondarily as a way to incentivise innovation. First of all, price is an important way to affect demand and tax is an efficient and fair way to address the issue of price in the aviation emissions case. Many economists tend to favour taxes as an efficient method of reducing carbon dioxide emissions.¹⁴ The existing experience from a few countries is too limited to provide any meaningful conclusions from a cost-benefit analysis of introducing carbon taxes.¹⁵ However, it has been argued that a tax could provide cost certainty because “the precise amount of the tax is set in advance” and thus it would be able to provide the needed “Benefit Certainty” (a certain environmental outcome) because the tax rate would be adjustable.¹⁶ Theoretically, economists have also argued that “a reasonable carbon tax would never impose unreasonable costs on the reduction of carbon emissions” and the tax should never be set at a rate that greatly exceed the benefits.¹⁷ The cost certainty of tax is attractive for both regulators and industries. When regulators levy a tax on fossil fuels at the point where these fuels enter the market, the price of CO₂ emissions would be clear to regulators, industry and the public.¹⁸ Setting a clearing price to capture the carbon (and equivalent) cost of the use of fossil fuels “that can be periodically evaluated for its effectiveness in achieving public policy and market performance” is claimed to be “a simpler and more economically efficient approach.”¹⁹ From the regulator’s perspective, the cost of a fuel tax is relatively lower than the cost of traditional regulation or emissions trading. This is because fuel taxes require a relatively

¹⁴ N. Gregory Mankiw, ‘One Answer to Global Warming: A New Tax’ (September 16, 2007) *The New York Times*, online < <http://www.nytimes.com/2007/09/16/business/16view.html> > last accessed 03/11/09; Reuven S. Avi-Yonah & David M. Uhlmann, ‘Combating Global Climate Change: Why a Carbon Tax is a Better Response to Global Warming Than Cap and Trade’ (2009) 28 *Stan. Envtl. L. J.* 3.

¹⁵ Reuven S. Avi-Yonah & David M. Uhlmann, *ibid.*; Daniel Pruzin, ‘Swiss Parliament OKs Carbon Tax but Delays Effective Date until 2009’ (December 20, 2006) *Daily Tax Report* (BNA), G-4; Christina K. Harper, (n. 4).

¹⁶ Reuven S. Avi-Yonah & David M. Uhlmann, *ibid.*

¹⁷ Martin A. Sullivan, ‘Economic Analysis: The Carbon Tax Name Game’ (2006) 113 *Tax Notes* 537.

¹⁸ *Ibid.*

¹⁹ Michael J. Zimmer, (n.4).

limited bureaucracy²⁰ which means it has “few technical problems for documentation or measurement,”²¹ and it is simpler to implement. From the industries’ perspective, the price certainty of carbon helps the industries to predict energy prices and make business decisions.²² As such, with a predictable and adjustable tax rate, a fuel tax is an efficient way to price the carbon (and equivalent) emitted in international air transport.

Fairness is also a good reason for putting tax on aviation fuel. This includes a fairer choice for the public between transport modes and a fairer revenue distribution between the poor and the rich. Both economic theory and the polluter pays principle suggest that aviation should pay the same rates of tax as motor fuel because air passengers “should make a fair contribution to the cost of running the health, education and police services” and polluters should pay for their hidden costs (environmental externalities) of flying.²³ The current situation of the exemption of aviation from fuel tax obviously contrasts with the position of the petrol used in other forms of public transportation, such as cars and trains.²⁴ The airline industry enjoys “high subsidies” that harm the competitive ability of alternative forms of transportations.²⁵ Thus, in the whole transportation system, introducing fuel tax on aviation would create a fairer situation between different transport modes.²⁶ From a social policy perspective, a fuel tax on aviation may help the poor a lot more than offering cheap flights.²⁷ “Subsidising aviation as a means to protect the interests of the poor or developing countries” has been described as “a waste of public money.”²⁸ The fuel tax paid by air travellers would make a contribution to the cost of public services such as health, education or police. It might also generate

²⁰ Gary E. Marchant, ‘Freezing Carbon Dioxide Emissions: An Offset Policy for Slowing Global Warming’ (1992) 22 *Envtl. L.* 623.

²¹ Michael J. Zimmer, (n.4), p. 68.

²² Christina K. Harper, (n.4); Michael J. Zimmer, *ibid.*

²³ Brendon Sewill, ‘The Hidden Cost of Flying’ (Aviation Environmental Federation, 2003) Online: <<http://www.aef.org.uk/?p=169>> last accessed 23/10/09.

²⁴ The current situation of aviation exempt from fuel duty is argued as “anomalous.” It is also argued that taxation “may be the most publicly acceptable ways to increase the cost of flying.” Sally Cairns & Carey Newson, *Predict and decide: Aviation, climate change and UK policy* (Oxford University Press, Oxford 2006), p. 76.

²⁵ ‘Taxing Times’ (2006) Airline Business, Online <<http://www.flightglobal.com/articles/2006/03/27/205595/taxing-times.html>>.

²⁶ T&E, ‘Cleaning the Air: The Myth and Reality of Aviation and Climate Change’ (2006), online available at <www.transportenvironment.org/Articles201.html>, last accessed 03/11/09.

²⁷ *Ibid.*

²⁸ *Ibid.*, p.29.

government revenues that could be used to reduce other taxes, like labour tax.²⁹ Considering that “the rich fly more than the poor,” putting tax on air travel is believed to be “socially inclusive.”³⁰

Given the values of a fuel tax discussed above, taxing aviation fuel is justified primarily as a way to influence demand by limiting the availability of cheap oil, and secondarily to incentivise fuel efficiency in the airline industry. That demand depends on price is a very basic lesson from economics. Since there is currently no viable energy substitute for commercial aviation, theoretically, increased fuel prices would have a negative effect on demand. A UK study concludes that a 10% increase in air fares would generate a 5% to 15% reduction in demand.³¹ However, it is worth noting that constraining demand for air travel by the use of tax may only work within a limited scope of price sensitive flights, including short-haul flights promoted by low-cost airlines, price sensitive leisure travel and parts of air cargo. In these cases, short-haul flights may turn to high-speed train or cars, some leisure travellers may choose domestic destinations, air cargo may switch to other transport modes. Some long-haul intercontinental flights (i.e. flights over 5,000 nautical miles)³² may not be affected by an increased air fare for two reasons. One of the reasons is that a fuel tax is assumed to “raise the cost of flying by only a limited amount.”³³ Although a very high fuel tax would be possible in order to substantially reduce aviation emissions, such emissions reduction, it is argued “can be had

²⁹ Lawrence H. Goulder, ‘Environmental Taxation and the “Double Dividend”’: A Reader’s Guide’ (2004) 2 *Int’l Tax & Pub. Fin.* 157; David Pearce, ‘Role of Carbon Taxes in Adjusting to Global Warming’ (1991) 101 *Econ. J.* 938; Lawrence Goulder et al., ‘Revenue-raising versus other approaches to environmental protection: the critical significance of preexisting tax distortions’ (1997) 28 *RAND Journal of Economics* 708, Goulder et al. discussed a revenue-recycling effect, which means using the revenues from the environmental regulations to reduce the distortionary taxes. Accordingly, the revenue from fuel taxes can be used to cut other distorting taxes, such as labour taxes and corporate income taxes.

³⁰ Brendon Sewill, (n. 23).

³¹ Sally Cairns & Carey Newson, (n. 24), section 11.9, p. 96.

³² According to UK Royal Commission on Environmental Pollution’s report, the most fuel-efficient flight distance is around 2,300 nautical miles (4,300 km or 2,700 miles). In this thesis, short haul flight means flights are less than 1,000 nautical miles, long distance flights are more than 5,000 nautical miles, the distances in between are treated as medium distances. See UK Royal Commission on Environmental Pollution, ‘The Environmental Effects of Civil Aircraft in Flight’ (November 2002) online available at <<http://www.rcep.org.uk/reports/index.htm>>.

³³ Richard S. J. Tol, ‘The Impact of a Carbon Tax on International Tourism’ (2007) Social Science Research Network Electronic Paper Collection, online <www.ssrn.com/abstract=979917>.

elsewhere for much less money.”³⁴ Another reason is that there is no alternative transport mode available when people have to travel very far. Some long-haul flights represent a market segment where demand is not sensitive to price, as “aviation has limited competition from other transport modes and only some competition from communication substitutes.”³⁵ Only when the tax is not low compared to the air fare, and the price elasticity is not small, would a fuel tax would affect demand on price sensitive flights.

Another objective of a fuel tax is to incentivise innovation in the airline industry. Taxing aviation fuel would encourage air carriers to innovate in reducing energy intensity or they could have to pass on the cost to consumers. To avoid effect on demand, air carriers could increase fuel efficiency though introducing new aircraft, improving air traffic management or introducing cleaner burning fuels as technical measures discussed in Chapter 2.³⁶ In this respect, a fuel tax is secondarily as a way to incentivise innovation. This innovation argument applies generally, but is especially useful for low cost air carriers (or the so-called budget airlines). For low cost airlines, fuel represents up to 25 percent of operating expenses.³⁷ If air carriers pass on the cost to consumers, the low-cost airlines lose their price advantage in the market. Alternatively, an increased fuel price would encourage low cost carriers to innovate in reducing energy intensity and turn into “ultra fuel efficient carriers.”³⁸ Low cost flying may have the potential to be reshaped into low carbon flying, discussed further in section 5 of this chapter.

A fuel tax is an efficient and fair way to address the price of international aviation fuel, in order to affect demand and to incentivise innovation. It cannot however be a stand-alone solution to curb the growth of aviation emissions. This is mainly because a fuel tax cannot ensure the desired reduction in aviation emissions.

³⁴ Ibid.

³⁵ Brendon Sewill, (n. 23).

³⁶ See also Paul Ekins, (n. 7);

³⁷ Anthony Perl & Judith Patterson, ‘Will Oil Depletion Determine Aviation’s Response to Environmental Challenges?’ (2004) 29 *Ann. Of Air & Sp. L.* 259. Regarding traditional airlines, according to EC working paper, on average fuel only constitutes 15% of the operating costs of intra-EU flights. CEC, ‘New sources of financing for development: a review of options’ Commission of the European Communities Staff Working paper, (2005) 467, 5/4/05, Brussels, p. 25.

³⁸ Ibid., p. 272.

According to “the instrumental approach”,³⁹ tax may be only an instrument that can be used “to achieve environmental objectives set according to other criteria.”⁴⁰ With a given tax rate, the tax itself cannot ensure a desired reduction in carbon emissions. Even if the tax rate is adjustable, rate rises will face political opposition in practice.⁴¹ The revenue raised by a fuel tax need not necessarily be used for environmental purposes.⁴² Because of the uncertainty of environmental outcome, a fuel tax cannot be a stand-alone solution to curb the growth of international aviation emission.

From the above discussion of the contributions of fuel taxes to reducing international aviation emissions, I argue that a fuel tax on aviation should be introduced primarily as a way of influencing demand in terms of reducing flying on price sensitive flights, and secondarily as a way to incentivise innovation in the airline industry. A fuel tax is one of the multiple instruments that should be involved in the multi-scalar regulatory architecture for international aviation emissions. This is a subject to which I return in Chapter 7. The next sections will examine the legal and practical barriers to introducing fuel taxes on international aviation.

3. Legality of Taxing Aviation Fuel

In this section, I argue that there is no legal barrier derived directly from the Chicago Convention to introducing a domestic fuel tax on international flights. I examine the legality of a fuel tax on aviation from three perspectives:⁴³ Article 24

³⁹ William J. Baumol & Wallace E. Oates, (n. 13).

⁴⁰ Paul Ekins, (n. 7), p. 43.

⁴¹ Benjamin J. Richardson, ‘The UK’s climate change levy: is it working?’ (2003) 15/1 *JEL* 39; Reuven S. Avi-Yonah & David M. Uhlmann, (n. 14); Sally Cairns & Carey Newson, (n. 24), section 6.2 ‘Why pricing mechanisms are seen as potentially ineffective.’

⁴² The first goal of tax is ordinarily to “raise revenues to pay for government services.” Whether environmental tax revenues should be used for environmental purpose is a debatable issue. See Richard A. Westin, (n. 4).

⁴³ The limited literature indicates that whilst the situation is extremely uncertain, WTO rules are not a primary concern in respect of aviation tax. The WTO rules applicable to aviation are found in the General Agreement on Trade in Services (GATS), which even applies to charges on emissions (Eckhard Pache, ‘On the compatibility with international legal provisions of including greenhouse gas emissions from international aviation in the EU emission allowance trading scheme as a result of the proposed changes to the EU emission allowance trading directive’ (15.04.2008) Legal opinion commissioned by

of the Chicago Convention; Article 15 of the Chicago Convention and related cases; and ICAO's policy against taxation.

Article 24 of the Chicago Convention regulates customs duty. However, I argue that this article does not form a legal barrier to introducing any national fuel taxes on international flights. Article 24 of the Chicago Convention states that:

“...fuel, lubricating oils and spare parts which are retained *on board*...shall be exempt from custom duties, inspection fees or similar national or local duties and charges.”⁴⁴

This article exempts “on board” aviation fuel only, and dates from a time when many governments were looking to develop the fledgling international aviation industry after the Second World War.⁴⁵ In other words, this article prohibits the taxation of aviation fuel which is on board an aircraft on arrival in the territory of a contracting state and retained on board on leaving. It does not actually prohibit the taxation of aviation fuel. ICAO's accompanying policy guidance recommended the reciprocal exemption of aviation from all taxes levied on fuels taken on board aircraft in connection with international air services, a policy which was implemented in practice through bilateral air services agreements. The principle of tax exemption has been enshrined in a huge number of bilateral agreements between member states.⁴⁶ ICAO also called on governments to reduce or eliminate taxes

the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, pp. 60-61, online available at <http://www.bmu.de/english/emissions_trading/doc/42364.php>) But GATS only applies to services listed in an Annex and coverage of aviation is very limited, covering only “aircraft repair and maintenance, selling and marketing of air transport, and computer reservation systems.” The actual transport service is not mentioned in the Annex. If, which is likely to be argued very strongly given the clearly limited extent of agreement to subject aviation to WTO disciplines, GATS applies, WTO rules are of limited impact on this area. If, however, which is also arguable, the tax on fuel is addressed as a tax on goods under the General Agreement on Tariffs and Trade (GATT), the tax will be analysed in the normal way under Articles III (national treatment) and Article XX (environmental objectives). The limited scholarly work on climate tax and the WTO suggests that the WTO rules are not an insurmountable obstacle to introducing aviation fuel tax. See for example: Francesco Sindico, ‘Climate Taxes and the WTO: Is the Multilateral Trade Regime a Further Obstacle for Efficient Domestic Climate Policies?’ (2006) 3/8 *Journal of Trade and Environment Studies* 1; Christopher Tran, ‘Using GATT, Art XX to justify climate change measures in claims under the WTO Agreements’ (2010) 27 *EPLJ* 346. See general on WTO law, Peter Van den Bossche, *The Law and Policy of the World Trade Organization* (2nd ed., Cambridge University Press, Cambridge 2008).

⁴⁴ Chicago Convention, (n, 2), art. 24, emphasis added.

⁴⁵ See general, I. H. Ph. Diederiks-Verschoor, *An Introduction to Air Law*, (8th ed., Kluwer Law International, Alphen aan den Rijn 2006).

⁴⁶ UK Royal Commission on Environmental Pollution, ‘The Environmental Effects of Civil Aircraft in Flight’ Special Report (November 2002), online available at

related to the sale or use of international air transport to the fullest practicable extent.⁴⁷ As a result, international aviation industry benefits from a wide range of tax exemptions, including fuel tax.⁴⁸ Although bilateral agreements are legal barriers to introducing aviation fuel taxes, and they should be renegotiated in order to introduce fuel taxes; they are not a substantial problem. Renegotiating bilateral agreements is less problematic than amending the Chicago Convention. In sum, from the development of fuel tax exemption in the aviation sector, it is clear that Article 24 of the Chicago Convention itself does not form a legal barrier.

Another related provision is the last sentence of Article 15 of the Chicago Convention, which provides that:

“No fees, dues or other charges shall be imposed by any contracting States in respect solely of the right of transit over or entry into or exit from its territory of any aircraft of a contracting State or persons or property thereon.”⁴⁹

This article relates to the legality of fuel taxes because fuel tax might be imposed by a contracting state as a condition for another contracting state’s aircraft to transit over or entry into or exit from its territory. However, this article emphasises on the purpose of the levy which may imposed on air travel. An environmentally directed fuel tax levied by nation states on international aviation does not violate this article. Two recent cases concern the legal understanding of Article 15 in domestic laws. They both concern ticket tax but the judgments contribute to my argument on the legality of fuel tax because they focused on the purpose of tax rather than the form of it.

One of the cases is *R (on the application of the Federation of Tour Operators and others) v. Her Majesty’s Treasury*,⁵⁰ in which the English High Court held that the Air Passenger Duty imposed by the UK Government is consistent with the meaning of Article 15 of the Chicago Convention. Air Passenger Duty (APD) has

<<http://www.rcep.org.uk/reports/sr-2002-aircraft/documents/aviation-report.pdf>>.

⁴⁷ ICAO’s Policies on Taxation in the Field of International Air Transport, Doc 8632.

⁴⁸ Although the aviation sector has become a popular mode of transport, the industry still benefits from a wide range of tax exemptions, including fuel tax. For discussions on the absence of fuel tax and exempt international tickets from VAT, see T&E, (n. 26). Aviation also benefits from duty free shopping, low landing fees, airport charges, and air passenger duty. See Brendon Sewill, (n. 23).

⁴⁹ Chicago Convention, (n. 44), art. 15.

⁵⁰ *R (on the application of the Federation of Tour Operators and others) v. Her Majesty’s Treasury*, [2007] EWHC 2062 (Admin).

been imposed, since 1994, on the operator of an aircraft in respect of the number of passengers carried by it when the aircraft first takes off from an airport in the UK.⁵¹ The amount of APD was doubled in 2007, which triggered the case.⁵² It indicates that APD is an efficient way to capture the carbon emitted from the aviation industry. More importantly, since 2008, APD has been restructured as an aviation duty to “ensure that the aviation industry makes a contribution towards its environmental impacts and to ensure that the aviation sector continues to contribute fairly and equitably towards the funding of public services.”⁵³ Looking at the judgment, the findings were made in respect of the applicable principles of interpretation of the Chicago Convention, the meaning of the last sentence of Article 15 and the consistency with it of a tax which was in the nature of an air passenger duty. The judge addressed the principles of interpretation which are applicable to the Chicago Convention according to the Vienna Convention on the Law of Treaties,⁵⁴ which said that a treaty shall be interpreted “in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose”⁵⁵ and that there shall be taken into account “any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation...”⁵⁶ The judge concluded that Article 15 does not concern taxes, as the phrase in that article is that it is “in respect solely of the right of transit over or entry into or exit from its territory.” This is to say, a duty imposed for something other than the transit or exit or entry of any aircraft, like the one for environmental purposes, is not a duty imposed solely in respect of the specified right. APD falls into this category and it is thus not prohibited by Article 15.⁵⁷ The judge’s conclusion was supported by a “substantial evidence of State practice” – which “establishes the agreement” of the parties regarding its interpretation.”⁵⁸ The “substantial evidence” was explained as in three fold:

“(1) Returns made to the ICAO Resolution, which indicated that

⁵¹ The Finance Act 1994, section 28.

⁵² Robert Lawson, ‘UK Air Passenger Duty held to be Consistent with the Chicago Convention’ (2008) 33/1 *Air & Sp. L.* 3.

⁵³ UK HM Treasury, ‘Aviation Duty: response to consultation’ (November 2008) online available at <http://www.hm-treasury.gov.uk/d/pbr08_aviationduty_395.pdf> last accessed 10.12.09.

⁵⁴ 23 May 1969: TS No. 58 (1980); Cmnd 7964.

⁵⁵ Article 31(1), *ibid.*

⁵⁶ Article 31(3)(b), *ibid.*

⁵⁷ Robert Lawson, (n. 52), p. 6.

⁵⁸ *Ibid.*, p. 7.

some 9 other States have imposed taxes of a similar nature⁵⁹ and, he held, there was an ‘absence of any suggestion that their doing so constituted a breach of Article 15’.

(2) The introduction to ICAO’s Policies on Taxation in the Field of International Air Transport⁶⁰ does not refer to Article 15 and, he held, suggests that Article 24 is the only provision of the Chicago Convention which deals with taxation. Furthermore, the ICAO Resolution refers to ‘taxes on the sale and use of international air transport’ but does not suggest that they have been imposed in breach of Article 15 or that their abolition is required by it.

(3) A large number of States support the imposition of the so-called ‘Chirac tax’⁶¹ and, he held, it is evident that none of those States considered the proposal to be unlawful under public international law, notwithstanding that it is inconceivable they would have overlooked the Chicago Convention or that ‘no other State, or the ICAO, would have raised the question of the breach of Article 15 if it thought that there had been one or that one was proposed’.⁶²

Although the judge’s findings focus on ticket taxes, this case may provide an example for other states seeking to impose similar taxes, or any environmentally oriented tax, since he concludes that Article 15 does not concern taxes at all.

The Dutch Supreme Court, in the case *Board of Airline Representatives in the Netherlands v. The State of The Netherlands (Ministry of Finance)*, confirmed the above interpretation of the final part of Article 15.⁶³ The court affirmed that this provision deals with charges for which a certain exchange of services is being offered and it does not prevent taxation for which no counter-service is provided. At the same time, with an environmental purpose, the Dutch ticket tax was not required to allocate its revenues specifically to fund particular environmental measures, but simply “for the benefit of the Dutch national exchequer.”⁶⁴ This ruling by the Dutch Supreme Court is described on as “a landmark decision” in which, for the first time, a national supreme court decides “the extent to which States are at liberty to secure funds for their national budgets through taxation of the aviation industry without the

⁵⁹ Namely Australia, Barbados, Hong Kong, Ecuador, India, Pakistan, Peru, Austria, Ireland and Norway.

⁶⁰ Third edition, 2000, Doc 8632.

⁶¹ The Declaration on Innovative Sources of Financing for Development signed in New York on 14 September 2005 by the Presidents of Chile, France and Brazil, which seeks the introduction of a levy on plane tickets to be used for humanitarian purposes.

⁶² Robert Lawson, (n. 52), p. 7.

⁶³ Brian F. Havel & Niels van Antwerpen, ‘The Dutch Ticket Tax and Article 15 of the Chicago Convention’ (2009) 34/2 *Air & Sp. L.* 141; Brian F. Havel & Niels van Antwerpen, ‘Dutch Ticket Tax and Article 15 of the Chicago Convention (Continued)’ (2009) 34/6 *Air & Sp. L.* 447.

⁶⁴ *Ibid.*, p. 141.

obligation to offer any services to the industry in return.”⁶⁵ Therefore, an environmentally oriented tax levied by the Government of the Netherlands on aviation does not violate Article 15 of the Chicago Convention. The Dutch ticket tax was however reduced to zero in the economic downturn in 2009.⁶⁶

The above two cases indicate that taxes with an environmental objective could be levied by nation states on international aviation, although they both concern on ticket taxes. Given that article 15 of the Chicago Convention is considered as not related to environmental taxes, this article is certainly not a legal barrier to introducing national fuel taxes on international aviation.

Although neither article 24 nor article 15 of the Chicago Convention prohibits an environmentally directed aviation fuel tax, international aviation has been exempted from fuel tax since the 1940s. It is ICAO’s opposition to taxation which confused the understanding of the legality of fuel tax in the aviation sector. I argue that ICAO’s position can only be treated as a political barrier rather than a legal obstacle. ICAO is a specialized agency of the United Nations. Its role in regulating aviation emissions has been discussed in Chapter 4. ICAO takes a strong position in opposing an incentivising tax. It recommends *inter alia* the reciprocal exemption from all taxes levied on fuel taken on board by aircraft in connection with international air services, a policy implemented in practice through bilateral air services agreements, and also calls on contracting states to the fullest practicable extent to reduce or eliminate taxes related to the sale or use of international air transport.⁶⁷ ICAO’s position was widely accepted along with the idea that such a tax was “an old-fashioned blunt instrument.”⁶⁸ This is mainly because ICAO has defined a tax as “a levy to raise general national and local governmental revenues that are applied for non-aviation purposes.”⁶⁹ This definition treats a tax as a revenue raising tool which is different from my argument for fuel tax as an incentive

⁶⁵ Ibid., p. 146.

⁶⁶ Ibid.

⁶⁷ ICAO’s Policies on Taxation in the Field of International Air Transport, Doc 8632, approved by the Council on 24 February 1999, published by direction of the Council.

⁶⁸ Timesonline, ‘Should aviation fuel be taxed?’ (October 24, 2005); T&E, (n. 26), environmental taxes imposed on aviation industry have been criticized as “a blunt and ineffective way to achieve emission reduction goals.”

⁶⁹ ICAO, Policies on Charges for Airports and Air Navigation Services, Doc 9082/7.

tool to affect on demand and encourage innovation. In this circumstance, ICAO's policy against tax should not be a legal obstacle to introducing fuel taxes. What is more, ICAO supports a cost-related levy, known as emissions charge, which is designed and applied specifically to defray the costs of providing facilities and services for civil aviation.⁷⁰ Emission charges are acceptable to ICAO, but there are difficulties with using charges. One of the difficulties rests on the nature of charge as being to compensate the cost of pollution damage. An emissions charge provides "ex-post control" on environmental recovery as it is a strictly compensation-related characteristic; while, a tax provides "ex-ante prohibition", which combats pollution behaviour rather than the damage caused.⁷¹ The key point is that a charge is a direct instrument that is used to compensate the cost of pollution damage; while, a tax is an indirect instrument to reduce pollution, through its impact on the polluters' action by setting a certain tax rate. Another difficulty with using charges rests in calculation in terms of monetary value. As ICAO defined, the charge should be "based on the costs of mitigating this impact, to the extent that such costs can be properly identified and directly attributed to air transport."⁷² ICAO has developed two types of emissions charges—en-route emissions charges and revenue-neutral aircraft efficiency charges.⁷³ An en-route emissions charge is charge "with revenues recycled to the aviation sector (e.g. to defray the costs of the harmful effects of emissions and to support air traffic modernisation, early retirement of aircraft, and research and development activities)."⁷⁴ A revenue-neutral charge is the one "based on aircraft

⁷⁰ ICAO WP/283 (2001) the 33rd General Assembly of the ICAO; Ruwantissa I.R. Abeyratne, (n. 1).

⁷¹ Anthony Ogus, 'Nudging and rectifying: the use of fiscal instruments for regulatory purposes' (1999) 19 *Legal Stud.* 245; S. Smith 'Taxation and the Environment: a Survey' (1992) 13 *Fiscal Studies* 21. Ogus comments on such linkage in market-based instruments, compared to which in coercive regulatory instruments. He argued that coercive regulatory instruments can build a point-to-point linkage, which is a complete correspondence between the undesired outcome and the proscribed activity. Under such system, the subject that is targeted as harm is what should be prohibited by the regulation. Under market-based regulations, these approaches may be economically justified on two grounds: the ex-ante prohibition and the ex-post control. Anthony Ogus, *ibid.*

⁷² ICAO Council Resolution on Environmental Charges and Taxes, adopted by the Council on 9 December 1996 at the 16th Meeting of its 149th Session, online available at <<http://www.icao.int/icao/en/env/taxes.htm>> last accessed 27.12.09.

⁷³ For the ICAO's work on emissions charge, see the Committee on Aviation Environmental Protection's (CAEP) market-based options working group, online available at <<http://www.icao.int/icao/en/env/caep.htm>> last accessed 27/10/09.

⁷⁴ ICAO, *Statement from the International Civil Aviation Organization (ICAO) to the Eleventh Session*

efficiency, with higher charges on less fuel-efficient aircraft offset by lower charges on more fuel-efficient ones.”⁷⁵ Yet, neither of them has become an effective tool for reducing aviation emissions; at least because of the difficulties of calculating environmental cost in terms of monetary value.⁷⁶ As such, ICAO’s emissions charge is unlikely to replace a fuel tax in terms of curbing the growth of aviation emissions. Even so, ICAO “strongly recommended that environmental levies that States may introduce should be in the form of charges rather than taxes and that funds collected should be applied in the first instance to mitigating the environment impact of aircraft engine emissions.”⁷⁷

This section has argued that there is no legal barrier to introducing aviation fuel taxes. It is ICAO’s policy of opposition to a fuel tax that results in governments reducing or eliminating taxes related to the sale or use of international air transport to the fullest practicable extent. ICAO’s position can only be treated as political barrier rather than legal obstacle. A fuel tax on international aviation has also encountered practical barriers which are discussed in the next section.

4. Practical Obstacles

In this section, I explore the practical barriers to introducing domestic fuel taxes on the international aviation from three perspectives: “tanking” fuel under Article 24 of the Chicago Convention; taxation’s limited effect on demand; and the airline industry’s opposition.

First of all, Article 24 of the Chicago Convention implies that there is a risk underlying a non-universal fuel tax – that airlines may simply fill up with cheaper

of the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA), Bonn, 25 October – 5 November 1999, online available at < <http://www.icao.int/env/sbsta-11.pdf>> last accessed 27.12.09.

⁷⁵ Ibid.

⁷⁶ Andrea Ricci, ‘Rainer Friedrich and others, Calculating Transport Environmental Costs—Final Report of the Expert Advisors to the High Level Group on Infrastructure Charging’ (1999) online available at <www.ec.europa.eu/transport/infrastructure/doc/env-cost.pdf> last accessed 26/10/09; Frank Ackerman, Lisa Heinzerling & Rachel Massey, ‘Applying Cost-benefit to Past Decisions: Was Environmental Protection Ever a Good Idea?’ (2005) 57 *Admin. L. Rev.* 155.

⁷⁷ ICAO website online at < <http://www.icao.int/icao/en/env/aee.htm>> last accessed 27.12.09.

untaxed fuel in other countries given that fuel on-board cannot be taxed under the Convention. This is practically described as “tankering.”⁷⁸ Recent research considers that the occurrence of tankering fuel “is likely to depend on the level of tax and the proximity of cheaper fuel.”⁷⁹ Tankering fuel is very likely to happen if aviation fuel tax would not be applied universally, because of the international nature of the aviation industry. Given the international nature of air transport and its emissions, in theory, a set of harmonized domestic fuel taxes could provide an alternative to an international fuel tax.⁸⁰ It requires that domestic fuel taxes are harmonized across countries based on an international climate agreement. Since there is no international law which can force countries to participate in such an agreement, every country may become a free rider that enjoys the same benefits of reduced emissions with no cost.⁸¹ The free rider incentive implies that each country may have little or no levy on its own carbon emissions in the interest of that country. Even if there is no free rider problem, the associated distribution of costs between countries is problematic. A harmonized domestic fuel tax requires setting equalized marginal costs across countries, but the total costs of reducing emissions would not be the same across countries.⁸² In this circumstance, such a tax would “be unacceptable to a large group of countries, and will therefore in practice be infeasible unless it is supplemented with some kind of side payments between countries.”⁸³ The EU’s failed attempts to introduce an aviation fuel tax in the 1990s have partly proved this point.⁸⁴ Clearly, the problem is that this optimal tax structure for aviation is difficult to achieve through an international agreement specifying a

⁷⁸ “Tankering” could be understood as a kind of legal evasion in this context. See Sally Cairns & Carey Newson, (n. 24), p. 79.

⁷⁹ Ibid., p. 80.

⁸⁰ Robert N. Stavins, ‘A Meaningful U.S. Cap-and-Trade System to Address Climate Change’ (2008) 32 *Harv. Envtl. L. Rev.* 293.

⁸¹ Michael Hoel, ‘Harmonization of Carbon Taxes in International Climate Agreements’ (1993) 3 *Environmental and Resource Economics* 221.

⁸² Michael Hoel, *ibid.* See also S. Kverndokk, ‘Global CO2 Agreements: A Cost Efficient Approach’, (1993) 14/2 *The Energy Journal* 1.

⁸³ Michael Hoel, (n. 81), pp. 222-223.

⁸⁴ The EU’s recommendation on introducing an aviation fuel tax at an international level wasn’t adopted due to a lack of unanimity among Member States. See *European Parliament resolution on the Commission communication to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions on taxation of aircraft fuel* (COM (2000) 110 – C5 – 0207/2000 – 2000/2144 (COS)).

harmonized fuel tax for all countries. In the absence of an international approach, tanking fuel is a practical barrier to the introduction of domestic aviation fuel taxes.

A second practical barrier to introducing aviation fuel taxes is that a fuel tax may have a limited effect on demand. In theory, a fuel tax could simply raise the cost of aviation, which could have an effect on consumers' choice and may result in a significant decrease in air travel and GHG emissions.⁸⁵ Given the fact that most of the cost would be passed on to consumers, the main question is whether the tax would be set high enough for it to impact on customers' behaviour, and whether air travellers can switch to other transport modes. If the idea is that passengers should be "nudged"⁸⁶ in the desired direction by the price signal from taxed aviation fuel, for example, the effectiveness of the incentive is a major concern. In other words, the tax rate should be set high enough for it to impact on the individuals' choice. Given the social and economic benefits of air travel, and the future uncertainties around the price of carbon, it is extremely difficult to achieve optimal tax rate on domestic aviation fuel taxes. Research on the impact of a tax on aviation fuel shows that the tax would have little effect on emissions, partly because the imposed tax was assumed to be small relative to the air fare, and also because the price elasticity is low on many flights⁸⁷. It is worth noting that, in some circumstance, there is no alternative transport mode, for example, "transatlantic travellers can't row from London to New York."⁸⁸ In short, an aviation fuel tax's function of changing consumers' behaviour and reducing flying is a contentious issue, partly because demand for some flights is not highly sensitive to price and many air travellers cannot easily switch.⁸⁹

A third practical barrier is the aviation industry's opposition to a fuel tax. The imposition of a fuel tax has been strongly resisted by the industry.⁹⁰ Representing

⁸⁵ David Driesen, (n. 1).

⁸⁶ See Anthony Ogus, (n. 71).

⁸⁷ Richard S.J. Tol, (n. 33).

⁸⁸ The Economist, 'The dirty sky - The dirty sky; Aircraft emissions' June 10, 2006, U.S. Edition.

⁸⁹ See my discussions on tax's contribution to effect on demand of price sensitive flying in section 2; see also, The Economist, 'The sky's the limit – Aircraft emissions; Aircraft emissions' June 10, 2006, U.S. Edition.

⁹⁰ IATA, 'Taxes Don't Reduce Emissions' IATA Press 16 July 2008, online

the airline industry, IATA likes to point out that “the demand for air travel is powered by economic growth and especially by increasing wealth”; and aviation’s “economic contribution is much greater than its share of carbon emissions.”⁹¹ This shows the industry’s opposition to reducing demand. In fact, the idea of a fuel tax is criticised for being “counterproductive” for the aviation industry, because “it takes money away from airlines and hampers investment in environmentally friendly technologies.”⁹² This may happen when demand is reduced or when the fuel price increase is not fully passed on to customers and parts of it would have to be borne by the airlines. Such an increased cost, for airlines, may “[affect] their profitability, cash flow, and retained earnings - which, in turn, could affect the ability of airlines to purchase more environmentally beneficial equipment.”⁹³ It has also been noted that fuel prices have already risen without tax, and this is already putting pressure on the aviation industry to improve fuel efficiency and to reduce emissions. In this case, the imposition of a fuel tax is very likely to further limit the growth of the airline industry and has been strongly resisted by the industry.⁹⁴

We can conclude that a domestic fuel tax on international aviation encounters practical barriers from the risk of “tanking fuels,” the uncertain and/or limited effect on demand, and the aviation industry’s opposition. As such, taxing on aviation fuel is legal, but it has encountered political and practical barriers. To overcome these barriers, I will suggest in the next section that introducing aviation fuel taxes may start from short haul international flights.

<<http://www.iata.org/pressroom/pr/2008-07-16-01.htm> > last accessed 23/10/09. See also my previous discussions on the uncertainty of fuel taxes in section 2 of this chapter.

⁹¹ The Economist, ‘The sky’s the limit – Aircraft emissions; Aircraft emissions’ June 10, 2006, U.S. Edition.

⁹² ‘The Great Green Debate’ (2006) *Airlines International* Special Report, online available at <http://www.environment.aero/00_summit2006_25Apr06_upgrade/modules/contentarea/crude_pages/files/ai%20may%20june%202006.pdf > last accessed 20.10.09.

⁹³ Joyce E. Penner et al, *Aviation and the Global Atmosphere: Special Report of the International Panel on Climate Change*, (Cambridge University Press, Cambridge 1999), section 10.4.3.

⁹⁴ ‘Aviation fuel tax shouldn’t take off’, (n. 90).

5. Aviation Fuel Tax on Short haul Flights

In this section, I argue that the political and practical barriers to an aviation fuel tax can be addressed. I suggest the need to apply this price-based mechanism on aviation emissions in a new form. The value of a fuel tax, as discussed in section 2, is primarily as a way of influencing demand and secondarily as a way to incentivise innovation. This argument applies generally, but is especially useful for short haul flight. This section argues that domestic aviation fuel taxes should be imposed on short haul flights with the specific purpose of reducing the artificially increased demand brought about by low cost airlines. It will also provide an incentive for innovation, especially incentivising innovation to change low cost airlines into low carbon airlines. Although such a fuel tax cannot be a stand-alone solution to reducing aviation emissions, it might play an important role in the multi-scalar regulatory architecture which is a subject I will return in Chapter 7.

I suggest that fuel taxes should be charged on short haul international flights, which means that domestic fuel taxes should be imposed on the international flights from a domestic airport to the destination within 1000 nautical miles.⁹⁵ The tax is proposed to be levied on fuel which would increase the operation cost of airlines but very likely to be passed on to the consumers in the form of increased ticket prices.⁹⁶ The primary aim of such fuel taxes is to incentivise airlines to discourage final consumers' choice of flying on short distance routes. These fuel taxes could also incentivise innovation in airlines. The prioritisation of domestic fuel taxes on short haul international flights can be explained from three perspectives.

The first reason is that short haul flights are relatively easier to switch into other transportation modes, like high speed trains. I suggested in Chapter 2 that although it is not a key part of this thesis, part of the solution to aviation emissions

⁹⁵ On the classification of short and long distance flights, see footnote (n. 32).

⁹⁶ "Very likely" is according to the UK experience on Air Passenger Duty. Most airlines have been estimated to choose pass the air passenger duty to their passenger in the case of UK air passenger duty. See HM Revenue&Customs, 2008 Pre-Budget Report, PBRN 20, 24 November 2008, online available at < <http://www.hmrc.gov.uk/pbr2008/pbrn20.pdf> > last accessed 20.07.10.

may need to be reduced demand. But it is hard to say which kinds of flights are unnecessary, and so should be reduced. According to a Canadian report, increased costs of air travel for Canadian families and businesses through fuel taxes would have a negative impact on visiting families, winter vacations, and on opening new markets and exporting Canadian products and services.⁹⁷ None of them can be easily condemned as unnecessary flights. Thus, the question has changed to which kinds of flight can be reduced, with least negative impacts. Both short haul flights and long distance flights are less energy efficient than medium distance flights. But long distance flights are difficult to change to alternative forms of transport. Most short haul flights can more easily be switched to alternative transport modes. In particular, the development of high speed trains and highways provide alternative forms of transportation for the consumers who used to take flights on short distance routes. Reduced flying on these routes would not reduce the benefits of globalization which we enjoy when the world is getting smaller. The infrastructure costs of high speed trains might be high, but is being supported by governments including some developing countries.⁹⁸

A second but most important reason for reducing flying on short distance routes is that demand for short haul flights has been artificially increased due to the development of low cost airlines. Artificial increased demand means that the demand is promoted by low price. The low price, in general, means the price lower than the true cost of flying. As I discussed earlier in this chapter, international aviation is the only form of transportation that does not pay tax on fuel. In fact, the aviation sector benefits from a wide range of tax exemptions, although it has become a popular mode of transport.⁹⁹ Externalising environmental costs means

⁹⁷ Jacobs Consultancy Canada Inc., 'Canadian Aviation and Greenhouse Gases' (2007) online available at <http://www.atac.ca/en/files/Jacobs_Enviro_Oct_25.pdf> last accessed 11.11.09.

⁹⁸ Ginés De Rus, 'The Economic Effects of High Speed Rail Investment' OECD, International Transport Forum, Discussion Paper No. 2008-16; 'High-Speed Rail in China' (January 12th, 2009) The Transport Politic, online available at <<http://www.thetransportpolitic.com/2009/01/12/high-speed-rail-in-china/>> last accessed 20.07.10.

⁹⁹ Discussions on the absence of fuel tax and exempt international tickets from VAT, see T&E and CAN-Europe, 'Clearing the Air: The Myth and Reality of Aviation and Climate Change' (2006) online <<http://www.transportenvironment.org/Article201.html>> last accessed 23/10/09. Aviation also benefits from duty free shopping, low landing fees, airport charges, and air passenger duty. See Brendon Sewill,

that the industry enjoys lower costs in running the business, in turn promoting demand. This explanation of artificial increased demand applies to international aviation generally. Low cost airlines or so called budget airlines are the fastest growing segment of civil aviation.¹⁰⁰ They emerged at the end of last century and led to a large extension in the number of air passengers, while the passenger number of traditional airlines did not decrease.¹⁰¹ Since fuel represents up to 25 percent of the operating expenses for low-cost airlines,¹⁰² a fuel tax is likely to reduce emissions by “stemming” this fastest growing segment of civil aviation.¹⁰³ So, fuel taxes on short haul flights are expected to raise the cost of low cost airlines, making them less attractive to customers relative to alternative modes of travel and the alternative of not travelling.

Third, although the main aim is to change passengers’ behaviour, fuel taxes could also incentivise fuel efficiency by airlines. Most short haul flights have the potential to be managed more efficiently, under price-based incentives. Short distance routes are “on average operated by less efficient aircraft and the capacity load is also not too high;” while the long distance routes “are operated by highly efficient aircraft with usually good capacity load.”¹⁰⁴ Taxing short haul flights provides an incentive for the adoption of cleaner aircraft and also for improved management, e.g. encouraging “the industry to fill their planes instead of flying half-empty jet liners around the world.”¹⁰⁵

A further question is whether a fuel tax on short haul flights may incentivise a shift from short haul to long distance travel. The extent to which such a risk may happen depends on how cheap the long distance flight and the alternative transport mode would be. In other words, to avoid that risk, the key is to set a proper price on

(n. 23).

¹⁰⁰ IATA, ‘Taxes Don’t Reduce Emissions’ (n. 90).

¹⁰¹ QUANTIFY, ‘Low cost carriers: Impacts’ online available at <http://www.atmosphere.mpg.de/enid/Information_2/Low_cost_airlines_-_impacts_61j.html> last accessed 01.09.10; Sally Cairns & Carey Newson, (n. 24), p. 55, 74.

¹⁰² Anthony Perl & Judith Patterson, (n. 37).

¹⁰³ IATA, ‘Taxes Don’t Reduce Emissions’, (n. 90).

¹⁰⁴ Ulrich Steppeler & Angela Klingmüller, ‘EU Emissions Trading Scheme and Aviation: Quo Vadis?’ (2009) 34 4/5 *Air & Sp. L.* 253, 257.

¹⁰⁵ ‘UK decision to extend passenger duty distance bands and scrap plan tax finds little support from industry’ online available at <www.greenaironline.com/news> last accessed 11.11.09.

high speed rail transport as an alternative to short-haul flights. It is beyond the remit of this thesis, but shows the importance of policymakers considering the aviation sector together with other transport modes. It is worth repeating that the proposed fuel tax on short haul flights is a limited instrument which cannot solve the whole problem and can only become part of the regulatory architecture on aviation emissions.

The next step in regulatory design should be to decide how to impose a tax on aviation fuel, including the tax authority, tax rate, point of application and a formula for allocating the tax revenues. Although the fuel tax on short haul flights is suggested as a domestic tax which should be introduced by nation states, ICAO could play an important role in administering the setting up of fuel taxes by its member states.¹⁰⁶ ICAO's member states include almost all of the countries contributing to the growth of aviation emissions. The participation of these countries in reducing greenhouse gas emissions for short haul flights would ideally be based on an international agreement. Under this agreement, these states should agree on the use of fuel tax as a way to adjust the total cost of short haul flights in order to ensure that short distance flying is not cheaper than alternative forms of transport. They should also agree on a uniform point of application, e.g. the countries of departure or destination of the air passengers/cargo transported. The tax could be set on the country of either departure or destination of the passengers or cargo; or shared by the country of departure and the country of arrival. Such an agreement should be easier to be achieved than negotiating an international fuel tax or a harmonised domestic tax. This is because the participating countries would not need to agree on a uniform tax rate for short haul flights; they would set their own rates. The role of ICAO in performance monitoring, reporting methods and auditing processes has been discussed in Chapter 4 section 5. Assisting its member states' in the administration of domestic fuel taxes could be treated as an example of how ICAO may play this role.

¹⁰⁶ For discussions on international agencies' role in administering carbon taxes, see Michael Hoel, (n. 81).

Once this tax system is in place, the choice of domestic fuel tax policies could be left to the individual countries. Each country will be able to, in this case, consider the tax policy on short haul air transport together with the policies on all the other transport sectors. It can be broadly applauded that the whole transport sector should be covered by the same regulatory system, because treating different modes of transportation differently may affect the competitiveness between the modes.¹⁰⁷ In addition, intuitively, we might expect that other price and policy instruments which have a significant impact on a country's CO₂ emissions would affect aviation emissions from short haul flight in a very similar way to taxes on automobiles or road pricing.¹⁰⁸ If this is the case, the absolute differences between tax rates in different countries will not be an obstacle to reducing the targeted short haul flights' emissions. While an international tax is "more of an 'all or nothing' option";¹⁰⁹ under domestic climate change duties, the countries can themselves decide how they want to tax short haul flights. At the same time, compared to an international tax, the necessary institutional arrangements for such a domestic fuel tax are simpler.

Regarding the formula for allocating the tax revenues, under a domestic fuel tax system, revenues would go to each government's tax funds that are used for public purposes. It is simpler than one under an international tax system that needs to "specify shares of the total international tax revenues that go to participating countries."¹¹⁰ The tax revenues should not refund to the aviation industry. Otherwise, the incentive by increasing the operation cost of low cost airlines via fuel tax would be reduced by the funding. Then, the objectives of domestic fuel taxes as discussed above would be impossible.

The above analysis outlines a possible way to impose a fuel tax on short haul flights by domestic governments in order to reduce artificial increased demand for flying and also incentivise fuel efficiency, especially by low-cost airlines. I argue that such fuel taxes on short haul flights can overcome the barriers to introducing an

¹⁰⁷ Fredrik Carlsson & Henrik Hammar, 'Incentive-based regulation of CO₂ emissions from international aviation' (2002) 8 *Journal of Air Transport Management* 365; Sally Cairns & Carey Newson, (n. 24), Chapter 7 'Would the Public Accept a Rise in the Cost of Flying on Environmental Grounds?'.
¹⁰⁸ Ibid.

¹⁰⁹ Michael Hoel, (n. 81), p. 226.

¹¹⁰ Robert N. Stavins, (n. 80), p. 308.

aviation fuel tax as discussed above. The first reason is the political advantages of a domestic fuel tax. For the above elements of domestic fuel tax, countries are given an incentive, but not a rigid instruction, to reduce their short haul flights. In this case it would be up to each individual country to decide by how much it should tax short haul flights, and to choose appropriate allocation of the tax revenues. In particular, designing such a tax in a regulatory system for the whole transport sector gives the individual government flexibility and a chance to restructure the industries for sustainable development in the long term. Given the flexibility that individual countries would have in allocating the tax and the contribution of the revenue to national budgets discussed above, one should not underestimate these political advantages of a domestic fuel tax system on international short haul flights. Second, considering the potential competition distortion, all countries should be encouraged to adopt such a fuel tax. The need of an international agreement on domestic fuel tax and the role of ICAO in administering its member states' setting up of such a domestic fuel tax on aviation have been discussed above. The proposed fuel tax is suggested as being a very practical mechanism to provide an incentive for global actions in avoiding the risk of tanking fuels. Third, the primary purpose of the proposed fuel tax in reducing artificial increased demand by low cost airlines has made it clear that the tax's limited effect on demand for long distance flights does not condemn the role of taxation altogether. Importantly, limited use of fuel tax on aviation provides a good chance to educate the public about the environmental purpose behind the taxes, and provide a measure to get public support for regulations on aviation emissions.¹¹¹ Four, from the industry perspective, there would be no enthusiasm for adopting a fuel tax which may reduce its profits in the short term. But their views should not block the introduction of a fuel tax,¹¹² as a restructuring of the whole transport sector is expected in the long term and the

¹¹¹ Environmental audit committee: fourth report pre-budget 2005: tax, economic analysis, and climate change, (2006, Sep) *Journal of Planning and Environmental Law* 1281; Sally Cairns & Carey Newson, (n. 24), Chapter 7 'Would the Public Accept a Rise in the Cost of Flying on Environmental Grounds?'

¹¹² The Advocate-General provided a similar opinion on ignoring the ICAO and IATA's industry-serving views in the terms of the Dutch air ticket tax. Brian F. Havel & Niels van Antwerpen, (n. 63).

important environmental contribution that would come along with this. Although the fuel tax proposed here cannot be a stand-alone solution to reducing aviation emissions, it might play an important role in the multi-scalar regulatory architecture discussed in Chapter 7.

6. Conclusion

In this chapter, I argue that a fuel tax could play an important role in reducing aviation emissions. A fuel tax is an effective and fair price-based market-based instrument which could have an effect on demand and incentivise innovation. A fuel tax alone cannot ensure the desired reduction in aviation emissions, but must be combined with other approaches. More certain environmental outcomes can be achieved by emissions trading, another market-based instrument which will be discussed in the next chapter.

While a fuel tax may be readily applied to domestic flights, it has been excluded from international air services. I argue in this chapter that there is no legal barrier derived directly from the Chicago Convention to introducing a domestic fuel tax on international flights. Article 24 of the Convention only exempted “on board” aviation fuel from taxation. Two case studies of the UK Air Passenger Duty and the Dutch ticket tax suggest that Article 15 of the Convention does not prohibit any tax when it is imposed for environmental purposes. It is ICAO’s policy of opposition to a fuel tax that results in governments reducing or eliminating taxes related to the sale or use of international air transport to the fullest practicable extent. What is more, Article 24 of the Convention implies a practical barrier to introducing an aviation fuel tax, since fuel on-board cannot be taxed, airlines may simply fill up with cheaper untaxed fuel in other countries, known as “tankering.” Another practical barrier is that a fuel tax has a limited effect on demand when the tax rate is not high enough to have an impact on the demand or the demand for many flights is

not sensitive to the price. A third practical barrier is the aviation industry's opposition to a fuel tax. As such, a fuel tax on international flights is legal, but it has encountered policy and practical barriers. To overcome these barriers, I suggest that introducing aviation fuel tax may start from short haul international flights. This may influence artificially increased demand from low-cost airlines, and provide an incentive for energy efficiency. To conclude whilst a fuel tax has a contribution to make, no single regulatory tool is adequate. Tax is simply one component of the necessary multi-instrument approach for the multi-scalar regulatory architecture discussed in Chapter 7.

Chapter 6. Emissions Trading

1. Introduction

This chapter explores the role of emissions trading in reducing international aviation emissions, exploring both regional schemes (especially the EU emissions trading scheme) and a possible global scheme. A key element of my thesis is that we need to move beyond total reliance on conventional international treaty making in our response to aviation's greenhouse gas emissions. Both legal scholarship and policy making relies heavily (not entirely) on this conventional "top-down" approach. The development of multiple regional emissions trading systems provides an element of a multi-level approach to curbing the growth of international aviation emissions, the idea being that regulation should be adopted at multiple levels as an alternative to the traditional top-down global negotiations on national emissions targets. This would be especially valuable if the sectoral target on international aviation emissions discussed in Chapter 3 cannot be agreed, but would contribute to implementation and improved norms in any event. However, multiple regional emission trading cannot be a stand-alone solution. We need multiple instruments, as will be discussed in Chapter 7. This chapter also explores the potential of a global emissions trading scheme as an alternative form for the allocation of mitigation responsibilities within a sectoral target agreed at a global level, if a comprehensive burden sharing system, as discussed in Chapter 3, is difficult to achieve in practice. The proposed global emissions trading system also constitutes a mitigation tool for incentivising the airline industry to improve energy intensity.

This chapter begins by examining the pros and cons of emissions trading in general. It discusses the advantages of emissions trading from three perspectives: the certainty of the environmental outcome compared to other market-based instruments; its efficiency compared to command and control regulation; and its political

advantages. It also examines the limitations of emissions trading from two perspectives: first, emissions trading may not reduce emissions from targeted sources because of the purchase of additional credits from other sources; and secondly, emissions trading may not provide sufficient incentives for innovation. As such, I argue that emissions trading could play an important role in curbing the growth of aviation emissions but that it cannot be the whole solution.

In section 3, I explore the role of regional emissions trading. Given that the EU ETS is by far the largest emissions trading scheme in the world and it will include emissions from foreign airlines in 2012, I begin with a legal analysis of the application of the EU ETS to aviation. I explore the legality of the application of the EU ETS to international aviation under the relevant international agreements, EU law and bilateral agreements. I argue that the EU's inclusion of foreign airlines in the EU ETS is lawful. I analyse the effectiveness of the application of the EU ETS to aviation from four perspectives: the greenhouse gases covered in the emissions trading; trading with other sectors; the allocation methods; and the restrictions on carbon offsetting. I argue that the EU ETS provides a good model for regional efforts to achieve regional emissions targets on international aviation. Then, I discuss the potential for developing multiple regional emissions trading schemes. Multiple regional emissions trading schemes contribute a multi-level approach, moving beyond a complete reliance on international treaty making to regulating aviation emissions. But it would be weaker than a global emissions trading scheme because of the possible carbon leakage and the complexity of monitoring.

In the final section, I propose a global emissions trading scheme for international aviation. Under the scheme, all of the airlines would be participants; IATA would be in charge of the initial allocation of emissions allowances; and the verification and compliance would be through ICAO. It would be a sectoral only emissions trading scheme unless and until a more comprehensive global scheme can be agreed. But airlines would be allowed to buy credits from carbon offsetting projects within a quantitative limit. There is also the option of negotiating a linking mechanism with regional schemes such as the EU ETS. I argue that a global

emissions trading scheme may serve as an alternative form of allocation under a sectoral approach to aviation in the UNFCCC system if the comprehensive multi-level burden sharing discussed in Chapter 3 cannot be realized. The proposed global emissions trading scheme is also a mitigation tool, for incentivising the airline industry to improve energy intensity.

2. Emissions Trading

This section examines the main claims made for emissions trading as a quantity-based market-based instrument (MBI) in environmental law. It identifies its pros and cons and argues that emissions trading could play an important role in curbing the growth of international aviation emissions, but that it cannot be the whole solution. The roles of emission trading will further be discussed in sections 3 and 4 at two levels: the role of regional emissions trading schemes and the role of a proposed global emissions trading scheme.

The essence of emissions trading is that a central authority (a government or international body) may regulate the overall quantity of access to the shared natural resource.¹ Under an emissions trading system, the total amount of a pollutant is decided and allowances in the form of permits to emit pollutants are allocated to operators. By contrast with an ordinary permitting scheme, these permits can be bought and sold on the market by the companies. Therefore the market establishes the price of the emissions certificates as those companies or industries that are able to reduce their emissions would sell their emission permits to other companies and industries that would prefer to buy these permits rather than reduce their emissions.²

¹ A booklet by the United Nations Environment Programme (UNEP), 'A Guide To Emissions Trading', gives a useful introduction to the subject. Online available at <http://www.unep.fr/energy/publications/files/emissiontrading.htm>.

² For the literature on emissions trading, see generally: Tom Tietenberg, *Emissions Trading: Principles and Practice* (2nd ed., Resources For the Future, Washington DC 2006); IATA, 'What You Need to Know About Emissions Trading', online available at <http://www.iata.org/NR/rdonlyres/95D34D98-7906-4A23-8884-1FA561709037/53257/EmissionsTrading.pdf>; Michael A. Mehling, 'Emissions Trading and National Allocation in the Member States –

Emissions trading comes in two major varieties, called “cap and trade” and “baseline and credit”.³ The former is an absolute regime, which creates a fixed number of permits and allocates or auctions these permits to firms which are able to trade them on the open market. As a relative regime, a baseline and credit regime often sets performance targets for companies as “baselines” and the companies may generate credits when they perform better than their baselines. These credits can be sold on the open market. These regimes are attractive to different interest groups. With a certainty of the environmental outcome, cap and trade is usually more attractive to policymakers and it is used in their domestic or regional trading regimes while baseline and credit is welcomed by industries.⁴ Emissions trading in this thesis means cap and trade, because it is a better tool concerning its environmental effectiveness, which is a subject I will discuss further in the following sub-sections.

2.1. Advantages of Emissions Trading

Emissions trading is attractive in the control of greenhouse gas emissions for several reasons. The first one is the certainty of the environmental outcome. A cap and trade system is more reliable as a way to predict the environmental outcome than other economic instruments, such as a taxation regime.⁵ Under a cap and trade system, the overall quantity of emissions is fixed; the market determines where the necessary reduction will take place. This certainty is of value in reducing GHGs to a

An Achilles' Heel of European Climate Policy?' (2005) 5 *Yearbook of European Environmental Law* 113; David Driesen, David Driesen, 'Economic Instruments for Sustainable Development' in Benjamin Richardson and Stepan Wood (eds.), *Environmental Law for Sustainability* (Oxford, Hart Publishing 2006); Denny Ellerman, 'Are Cap-and-Trade Programs More Environmentally Effective than Conventional Regulation?' in Jody Freeman & Charles Kolstad (eds.), *Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience* (Oxford University Press, New York 2007); Tom Tietenberg, 'Tradable Permits in Principle and Practice', in *Moving to Markets in Environmental Regulation*, in Jody Freeman & Charles D. Kolstad (eds.); Robert Baldwin, 'Regulation Lite: The Rise of Emissions Trading' (2008) 2/2 *Regulation & Governance* 193.

³ Robert Baldwin, *ibid.*; Jürgen Lefevere, 'Greenhouse Gas Emission Allowance Trading in the EU: A Background' 3 *Yearbook of European Environmental Law* 149.

⁴ Jürgen Lefevere, *ibid.*

⁵ There is a large literature on comparing emissions trade and emissions tax. See generally, John M. Volkman, 'Making Change in a New Currency: Incentives and the Carbon Economy' (2008) 29 *Pub. Land & Resources L. Rev.* 1; David Driesen, (n. 2).

predicted point.

The second key value of emissions trading is its efficiency compared to command and control regulations.⁶ As IPCC has stated, “an emissions trading regime would be likely to meet environmental objectives at the lowest cost.”⁷ This is because the trading of permits to pollute offers incentives for low cost companies to reduce emissions and sell permits to higher cost companies. When the trading programme includes enough buyers and sellers to create an international competitive market, the emissions can be controlled in the most cost-effective location.⁸

A third merit of emissions trading is its political advantages. A cap and trade system reduces the information burden on regulators, since the polluters themselves determine where the mitigation efforts are most cost-effective. The information needed for burden sharing is transmitted through the market for emission permits, so that trading “employs fixed quantity targets coupled with a financial reward for participation.”⁹ With such a financial reward, companies which reduce emissions are no longer pure losers, compared to those under direct regulations.¹⁰ It has no legislator to decide the costs; the prices of emissions permits are determined by the markets. The ones who play well in these markets would not be losers, but might even be winners.¹¹ As such, emissions trading is popular partly due to its political advantages.

According to the general value of emissions trading considered from the above three perspectives, I argue that emission trading could play an important role in curbing the growth of international aviation emissions. The roles of regional emission trading and global emissions trading will be further discussed in sections 3

⁶ There is a large literature on comparing direct regulation and economic incentive based regulation. See general: Jonathan B. Wiener, *ibid*; Richard B. Stewart, ‘Models for environmental regulation: Central planning versus market based approaches’ (1992) *Boston College Environmental Affairs Review* 547; Denny Ellerman, (n. 2).

⁷ Annie Petsonk *et al.*, *Market Mechanisms & Global Climate Change: An Analysis of Policy Instruments*, (Environmental Defense Fund in cooperation with the Pew Center on Global Climate Change, Washington D.C. 1998), p. 347.

⁸ Nicholas Stern, *The Economics of Climate Change* (H M Treasury, London 2006), p. 321.

⁹ Jonathan B. Wiener, ‘Global Environmental Regulation: Instrument Choice in Legal Context’ (1998-1999) 108 *Yale L. J.* 677, 764.

¹⁰ Literature on comparing direct regulation and economic incentive based regulation, (n. 6).

¹¹ John M. Volkman, (n. 5).

and 4.

2.2. Limitations of Emissions Trading

Although it has the above discussed values, emissions trading is a debatable mechanism.¹² This section examines the major limitations of emissions trading. I argue that emissions trading could play an important role but that it cannot be the whole solution to curbing the growth of aviation emissions, because of two limitations: emissions trading may not reduce emissions from targeted sources and may not provide an incentive for innovation.

One issue with emissions trading concerns its environmental effectiveness. In particular it may not reduce emissions from targeted sources. In a cap and trade system, it is a properly designed cap that will provide the opportunity for limiting emissions from a group of polluters to a level that is lower than current emissions.¹³ A trading device only provides the means to reach whatever targets are decided upon at the lowest cost.¹⁴ It is believed, in environmental terms, that the “cap” on pollution up to which permits will be allocated is more important than the allocation of allowances.¹⁵ If the cap is set too high, it will be no challenge to meet the cap and it will result in no improvement in environmental quality.¹⁶ On the other hand, if the cap is set too stringently, there may not be sufficient reduction options available to trade.¹⁷ The importance of the cap was illustrated in the EU ETS’s pilot stage, where the cap was set at a level such that carbon allowances were insufficiently scarce to drive the market.¹⁸ The subject of the EU ETS will receive closer attention in section 3.

The nature of emissions trading means that emissions trading itself does not

¹² See Robert Baldwin, (n. 2).

¹³ Stephanie L. Wilson, ‘Dog Days of Climate Change: Heating the Debate for Federal Cap-and-Trade’ (2008) 28 *J. Land Resources & Envtl. L.* 163.

¹⁴ Robert Baldwin, (n. 2).

¹⁵ Maria Lee, *EU Environmental Law* (Hart Publishing, Oxford, 2005), p. 201.

¹⁶ *Ibid.*

¹⁷ Jürgen Lefevere, (n. 3).

¹⁸ John M. Volkman, (n. 5).

reduce emissions from any targeted polluter.¹⁹ For example, there is a concern that airlines would be pure buyers in emissions trading schemes instead of cutting their own emissions.²⁰ This may happen when the cost of purchasing allowances from other industries or credits from offsetting projects to comply with the cap is cheaper than investing in new technology which leads to more efficient operations or in the use of fuel which produces fewer harmful emissions.²¹

Similarly, emissions trading may not provide an adequate incentive for innovation. Proponents of emissions trading claim that such instruments can encourage some of the polluters to reduce their emissions by adopting cleaner technology in order to receive allowances for trade.²² However, sceptics argue that, under certain circumstances, emissions trading may not encourage participants to adopt new technology.²³ This is because that innovation will depend on the relative cost of buying credits from offsetting projects and innovation. Driesen has also challenged the claim that emissions trading may foster technological innovation and has argued that this claim is based on mistaken economic theory. He has argued that emissions trading may only provide incentives for cheap innovations and it “discourages innovation by lowering the price at which innovation will become economically viable.”²⁴ It has also been argued that the incentives for adopting new technology “may increase or decrease, depending on the firm’s position in the

¹⁹ ALDE, ‘Extension of emissions trading to aviation: “More PR than practical”’ (20/11/2006) online available at [http://www.alde.eu/index.php?id=42&tx_ttnews\[tt_news\]=8293&tx_ttnews\[backPid\]=1&cHash=851fd13206](http://www.alde.eu/index.php?id=42&tx_ttnews[tt_news]=8293&tx_ttnews[backPid]=1&cHash=851fd13206) last accessed 02.10.09.

²⁰ Energy Intensive Industries Coalition (Eurofer, Cembureau and others), ‘Energy Intensive Industries reject the inclusion of aviation in the Emission Trading Scheme’ (Oct. 2005) online available at http://www.cembureau.be/Cem_warehouse/AVIATION%20-%20FINAL%20POSITION%20PAPER%20-%20EII.PDF last accessed 02/10/09.

²¹ Danielle Goodwin, ‘Aviation, climate change and the European Union’s emissions trading scheme’ (2008) 6 *J.P.L.* 742.

²² Bruce Ackerman & Richard Stewart, ‘Reforming Environmental Law’ (1985) 37 *Stanford Law Review* 1333; Robert Stavins, ‘Policy Instruments for Climate Change’ (1997) *U Chicago Legal F.* 293; Nathaniel Keohane, Richard Revesz & Robert Stavins, ‘The Choice of Regulatory Instruments in Environmental Policy’ (1998) 22 *Harv. Env. L. Rev.* 313.

²³ David A. Malueg, ‘Emission Credit Trading and the Incentive to Adopt New Pollution Abatement Technology’ (1989) 16 *J. Envtl. Econ. & Mgmt.* 52, 56; David Driesen, ‘Does Emissions Trading Encourage Innovation?’ (2003) 32 *Environmental Law Reporter*, available at SSRN <http://ssrn.com/abstract=336661> last accessed 29.07.10.

²⁴ David Driesen, *ibid.*

emission credit market before and after the adoption of the new technology.”²⁵ For example, if a firm is a buyer of emission credits both before and after investing in the new technology, or it buys relatively many credits under the old technology but sells only a few after the adoption of the new technology, the incentive to innovate would not be increased when trading is introduced.²⁶ As such, the introduction of emissions trading does not necessarily increase a firm’s incentive to adopt new emissions mitigation technology.

From the above, it is clear that emissions trading cannot be a stand-alone solution to curbing the growth of aviation emissions, because it does not ensure that emissions will be reduced from the airlines themselves and it does not necessarily provide adequate incentives for innovation. This argument may partly explain the need for the multiple instruments which will be discussed in Chapter 7.

3. Regional Emissions Trading

The Kyoto Protocol established emissions trading as a key mechanism in combating climate change.²⁷ Since then, as “the method of choice to price carbon,”²⁸ emissions trading markets have emerged around the world. Because of the scope of the European Union’s emissions trading scheme (EU ETS), which has been extended to the aviation industry,²⁹ discussions are becoming more frequent on how regional emissions trading will impact on the international aviation industry

²⁵ David A. Malueg, (n. 23), p. 56.

²⁶ Ibid.

²⁷ Protocol to the United Nations Framework Convention on Climate Change (adopted 11 December 1997, entered into force 16 February 2005) UN Doc. FCCC/CP/1997/7/Add. (Kyoto Protocol).

²⁸ Robert Baldwin, (n. 2), p. 3.

²⁹ Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community. The full text is online available at <<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0101:EN:NOT>> last accessed 07/10/09. See also T&E, ‘Including Aviation in the EU’s Emissions Trading Scheme (EU ETS): Background Briefing’ (2008) online available at <www.transportenvironment.org/Publications/prep_hand.../lid:480> last accessed 08.10.09.

and on reducing aircraft engine emissions.³⁰

This section explores the roles of regional emissions trading in curbing the growth of international aviation emissions. It begins by providing a legal analysis of the application of the EU ETS to international aviation. First of all, it addresses the legality of the application of the EU ETS to international aviation under the relevant international agreements, EU law and bilateral agreements. It also provides an analysis of the effectiveness of the EU ETS from four perspectives: the greenhouse gases covered in the emissions trading; trading with other sectors; the allocation methods; and allowing and restricting carbon offsetting. I argue that the EU ETS is a lawful mitigation tool which may contribute to emission reductions in the international aviation sector. Then, I examine the development of multiple regional emissions trading. Multiple regional emissions trading schemes would be weaker than a global emissions trading scheme, because of the possible carbon leakage and the complexity of monitoring. But regional emissions trading has two potential important roles: regional emissions trading acts as a mitigation tool within the global sectoral target; and it also provides an example of multiple levels approach in regulating international aviation emissions to move beyond a complete reliance on international treaty making. It is especially valuable if the sectoral target on international aviation emissions discussed in Chapter 3 cannot be achieved.

3.1. Legal Analysis of the Application of the EU ETS to Aviation

This section seeks to analyse the functioning of the EU ETS from a legal

³⁰ Danielle Goodwin, 'Aviation, climate change and the European Union's emissions trading scheme' (2008) 6 *J.P.L.* 742; Malte Petersen, 'The Legality of the EU's Stand-Alone Approach to the Climate Impact of Aviation: The Express Role Given to the ICAO by the Kyoto Protocol' (2008) 17/2 *RECIEL* 196; Janina D. Scheelhaase & Wolfgang G. Grimme, 'Emissions trading for international aviation – an estimation of the economic impact on selected European airlines' (2007) 13 *Journal of Air Transport Management* 253; Steven Truxal, 'Competitive distortions, carbon emissions efficiencies, or the green ultimatum?' (2008) 14/4 *Int. T.L.R.* 77; Steven Truxal, 'EU transport emissions compliance catch-up' (2008) 14/6 *Int. T.L.R.* 117; M.G.J. den Elzen, J. G. J. Olivier, M.M. Berk, 'An analysis of options for including international aviation and marine emissions in a post-2012 climate mitigation regime' Netherlands Environmental Assessment Agency (MNP) Report 500114007/2007, online available at <http://www.pbl.nl/en/publications/2007/analysing_options_including_international_transport_emissions_in_climate_regime.html> last accessed 29/09/09.

perspective and to explore how capable the scheme is of dealing with the climate change associated with international civil aviation. To this end, it examines the legality of the application of the EU ETS to international aviation and the effectiveness of the EU ETS. I argue that the EU ETS is a lawful mitigation tool which may contribute to emission reductions in the international aviation sector. In section 3.2, I will explore the future of the EU ETS in terms of becoming a blueprint for a global carbon market or leading a development of multiple regional emissions trading schemes.

3.1.1 The Legality of the Application of the EU ETS to International Aviation

The EU ETS was launched in 2005 and it is by far the largest emissions trading scheme in the world.³¹ More importantly for current purposes, the EU ETS is scheduled to be extended to the international aviation industry in 2012.³² This section examines the legality of the application of the EU ETS to international aviation from the relevant international agreements (the UNFCCC, the Kyoto Protocol and the Chicago Convention), EU law, and bilateral air services agreements.³³ I argue that the application of the EU ETS to international aviation is lawful.

First, there are no legal restrictions on the introducing of a regional emissions trading system in the UNFCCC system. The UN Framework Convention on Climate Change (UNFCCC)³⁴ “does not contain explicit restrictions that require the EU to

³¹ Cinnamon Carlarne, ‘Climate Change Policies and Ocean Apart: United States and European Union Climate Change Policies Compared’ (2006) 14 *Penn St. Envtl. L. Rev.* 435; Susan J. Kurkowski, Note, ‘Distributing the Right to Pollute in the European Union: Efficiency, Equity, and the Environment’ (2006) 14 *N.Y.U. Envtl. L. J.* 698.

³² Directive 2008/101/EC, (n. 29).

³³ On legality within the WTO regime, see Eckhard Pache, ‘On the compatibility with international legal provisions of including greenhouse gas emissions from international aviation in the EU emission allowance trading scheme as a result of the proposed changes to the EU emission allowance trading directive’ (15.04.2008) Legal opinion commissioned by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, pp. 60-61, online available at <http://www.bmu.de/english/emissions_trading/doc/42364.php>, section E.

³⁴ *United Nations Framework Convention on Climate Change*, 9 May 1992, 1771 U.N.T.S. 107 (entered into force 21 March 1994), (UNFCCC).

refrain from including aviation within the EU ETS.”³⁵ Among its major provisions is Article 4(2)(b) which requires developed countries to “adopt national policies and take corresponding measures on the mitigation of climate change” to “demonstrate that developed countries are taking the lead in modifying longer-term trends,” explicitly recognising that “these Parties may implement such policies and measures jointly with other Parties.”³⁶ This article together with Article 3(3)³⁷ and Article 4(1)³⁸, require that the parties can act individually or jointly when implementing measures to mitigate the climate change caused by the transport sector. Accordingly, the member states of the EU not only have a legal obligation under the UNFCCC to combat climate change, but also are permitted to do this jointly, acting as the EU.

Then, the Kyoto Protocol requires that developed countries “shall implement and/or further elaborate polices and measures such as (vii) measures to limit/or reduce emissions of greenhouse gases.... in the transport sector.”³⁹ It also requires cooperation with other countries in Article 2(1)(b), so as “to enhance the combined effectiveness of their policies and measures adopted under this Article.”⁴⁰ More importantly, Article 2(2) of the Protocol takes a step further than the UNFCCC, which states that “[t]he Parties included in Annex I shall pursue limitation or reduction of greenhouse gasesfrom aviation....working through the International Civil Aviation Organisation (ICAO)....”⁴¹ This article requires ICAO to work on the task of reducing aviation emissions, but it by no means authorizes ICAO to be the only delegated authority or excludes the EU from tackling the climate impact of the aviation sector.⁴² So far, there are no legal restrictions on the introducing of a regional emissions trading system in the climate change regime.

³⁵ Malte Petersen, (n. 30), p. 199.

³⁶ UNFCCC, (n. 34), art. 4 (2)(b).

³⁷ Article 3(3) states: “The parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects...” UNFCCC, *ibid*.

³⁸ Article 4(1) states they should: “... promote the cooperate in the development, application and diffusion, including transfer of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all relevant sectors, including the energy, transport...sectors.” UNFCCC, *ibid*.

³⁹ Kyoto Protocol, (n. 27), art. 2 (1)(a).

⁴⁰ *Ibid.*, art. 2(1)(b).

⁴¹ *Ibid.*, art. 2(2).

⁴² Malte Petersen, (n. 30).

Although the Chicago Convention⁴³ does not directly address emissions trading, it is relevant for the legality of the application of the EU ETS to foreign airlines because of the sovereignty principle addressed in Article 1 and the non-discrimination principle addressed in Article 11 of the Convention.⁴⁴ Article 1 of the Convention stipulates that every state has complete and exclusive sovereignty over the airspace above its territory.⁴⁵ Given that all of the EU member states are parties to the Convention, according to the above article, they are free to regulate their own airspace. Article 11 states that:

“.... subject to provisions of the Convention, the laws and regulations of contracting States relating to the admission to or departure from its territory of aircraft engaged in international air navigation, or to the operation and navigation of such aircraft while within its territory airspace, shall be applied to aircraft of all contracting States without distinction as to nationality, and shall be complied with by such aircraft upon entering or departing from or while within the territory of that State.”⁴⁶

Accordingly, the inclusion of international aviation within the EU ETS has to be non-discriminatory. In other words, the EU ETS must treat foreign aircraft as national aircraft. These provisions show that the Chicago Convention does not contain explicit restrictions that require the EU to refrain from including aviation within the EU ETS.⁴⁷

Second, EU law establishes the legal basis for including aviation within the EU ETS. Articles 192 and 193 of the Treaty on the Functioning of the European Union⁴⁸ refer to Union policy and measures regarding environmental protection.

⁴³ *Convention on International Civil Aviation*, 7 December 1944, 15 U.N.T.S. 295, art. 37 (entered into force 4 April 1947) [Chicago Convention].

⁴⁴ Malte Petersen, (n. 30); R.C.N. Wit et al., ‘Giving Wings to Emissions Trading’, (2005), Delft, Report for the European Commission, DG Environment No. ENV.C.2/ETU/2004/0074r, online available at <http://ec.europa.eu/environment/climat/pdf/aviation_et_study.pdf> last accessed 07.06.10.

⁴⁵ Chicago Convention, (n. 43), art. 1.

⁴⁶ *Ibid.*, art. 11.

⁴⁷ Article 15 “Airport and similar charges” and Article 24 “Customs duty” relates to economic instruments on aviation, but it not considered as relevant to provisions on emissions trading. See my discussions of these two articles in chapter 5, see also R.C.N. Wit et al., (n. 44); Malte Petersen, (n. 30).

⁴⁸ The Treaty on the Functioning of the European Union sets out the specific objectives of the EU’s various policies and the specific rules governing the EU’s external actions. It is part of the Lisbon Treaty which was signed on 13 December 2007, online available at

Then, Directive 2003/87/EC established the EU emissions trading system to tackle climate change.⁴⁹ It was amended as Directive 2008/101/EC⁵⁰ to include aviation activities in the EU ETS, which provides a direct legal basis for the application of the EU ETS to aviation. Many of the issues relating to the application of the EU ETS to aviation are identical or similar to those relating to its application to other activities, which will receive closer attention in the next section.

Third, as the emissions trading scheme is a new instrument, the bilateral agreements signed by the EU member states with other countries do not address it. Yet, some of the provisions of such bilateral agreements can be considered to be relevant. For example, in the case of the US airlines' opposition to including foreign airlines in the EU ETS in 2012,⁵¹ the US airlines argue that the EU's extending of ETS on US air carriers violates the Open Skies Agreement, which is a bilateral agreement which came into force in late March of 2008.⁵² It provides that "any airlines registered in the EU or US may fly to any airport within the other's borders, subject to the availability of takeoff and landing slots on both ends of the proposed route."⁵³ The EU's imposition of the ETS on US carriers will limit these open flights.⁵⁴ However, this provision, in fact, confirms Article 11 of the Chicago

<<http://www.lisbon-treaty.org/wcm/the-lisbon-treaty.html>>; The Treaty establishing the European Community, as amended, provides the objectives of the European Community and the legal basis for it to take legislative action. See Maria Lee, *EU Environmental Law* (Hart Publishing, Oxford and Portland, Oregon 2005).

⁴⁹ 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.

⁵⁰ Directive 2008/101/EC, (n. 29).

⁵¹ Case C-366/10 *The Air Transport Authority of America, American Airlines, Inc., Continental Airlines, Inc., United Airlines, Inc. v. The Secretary of State for Energy and Climate Change*, Reference for a preliminary ruling from High Court of Justice Queen's Bench Division (Administrative Court) (United Kingdom) made on 22 July 2010. IATA believed that the EU's including of non-EU airlines in its emissions trading scheme contravened the Chicago Convention. It has filed an amicus brief in London ahead of the hearing into the case brought by the Air Transport Association of America (ATA) and three major US airlines – American, Continental and United – over the Aviation EU Emissions Trading Scheme. This case has been sent to the ECJ in May 2010. See also 'US airline EU ETS case against the UK to be referred to European court as NGO coalition joins action' (28 May 2010) online available at <<http://www.greenaironline.com/news.php?viewStory=829>> last accessed 09.06.10; 'United States still formulating opinion on the EU ETS, says top US international aviation negotiator' online available at <<http://www.greenaironline.com/news.php?viewStory=410>> last accessed 08.10.09.

⁵² Steven Truxal, 'Competitive distortions, carbon emissions efficiencies, or the green ultimatum?' (n. 30).

⁵³ *Ibid.*, p.1.

⁵⁴ *Ibid.*

Convention, which requires that operators of aircraft must comply with domestic regulations regarding the admission to or departure from its territory of aircraft engaged in international air navigation, or to the operation and navigation of such aircraft while within their territory.⁵⁵ To enforce this provision, if the EU could make its ETS applicable to the US airlines, and if the US airlines did not comply with the scheme, a member state could ultimately refuse the non-compliant airline access into its airspace.⁵⁶ As such, such a bilateral agreement should not be treated as a legal barrier to the application of the EU ETS to foreign airlines.

From the above discussions on the relevant international agreements, the EU law and bilateral agreements, it seems that the application of the EU ETS to international aviation is lawful. The next section will provide an analysis of the effectiveness of the EU ETS.

3.1.2. The Effectiveness of the EU ETS

This section examines the effectiveness of the EU ETS from four perspectives: the greenhouse gases covered in the emissions trading; trading with other sectors; the allocation methods; and allowing and restricting carbon offsetting. I argue that the EU ETS is a good model for regional efforts to regulate international aviation emissions. The role of regional emissions trading in curbing the growth of international aviation emissions will further be discussed in section 3.3.

(a). Greenhouse Gases Covered in the EU ETS

One issue relating to the environmental effectiveness of the EU ETS in terms of curbing the growth of international aviation emissions is the gases that are covered by the scheme. I argue that the coverage of the EU ETS suits the

⁵⁵ Chicago Convention, (n. 43), art. 11. See also R.C.N. Wit et al., (n. 47).

⁵⁶ R.C.N. Wit et al, *ibid*.

requirements of controlling emissions from the international aviation sector because it covers mainly CO₂ emissions but is not limited to them.⁵⁷

Although aviation is a CO₂ intensive mode of transport, IPCC estimates the non-CO₂ effects as being about 2 to 4 times greater than those of CO₂ alone.⁵⁸ NO_x and H₂O are the most significant non-CO₂ emissions from air transport.⁵⁹ An efficient regulatory mechanism on aviation emissions should include at least both CO₂ and NO_x, as they are the main emissions from aircraft and have offsetting effects in between which have been discussed in Chapter 2. The current EU ETS only includes CO₂ from aircraft but it may be extended to NO_x.⁶⁰ This is because the measurability of the emissions decides the choice of the coverage of gases by a trading regime.⁶¹ However, given the current measurement uncertainty attached to H₂O and the problems arising in determining the liability for its effects, bringing H₂O into the emissions trading regime is still not possible and may only “complicate the trading system, and undermine its practical feasibility and political acceptability.”⁶² As such, the EU ETS is potentially effective in controlling the aviation emissions, as it could include both CO₂ and NO_x from aircraft, although certain problems have not yet been solved.

(b). Trading with Other Sectors

The scope of the EU ETS is of importance for assessing the effectiveness of

⁵⁷ See Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 as amendment to Directive 2003/97/EC, Annex I and II.

⁵⁸ Joyce E. Penner et al. (eds.), *Aviation and the Global Atmosphere: Special Report of the International Panel on Climate Change*, (Cambridge University Press, Cambridge 1999).

⁵⁹ Lucas M Z Mendes & Georgina Santos, ‘Using economic instruments to address emissions from air transport in the European Union’ (2008) 40 *Environment and Planning A*, 189.

⁶⁰ In EU ETS Phase III, the European Commission made a number of changes to the scheme. Inclusion of other greenhouse gases, such as N₂O emissions from the production of nitric, adipic and glycolic acid production and perfluorocarbons from the aluminium sector, is one of them. See EUROPA, ‘Questions and Answers on the revised EU Emissions Trading System’, MEMO/08/796, Brussels, 17 December 2008. online available at <<http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/796&format=HTML&aged=0&language=EN&guiLanguage=en>> last accessed 07.07.10.

⁶¹ Jürgen Lefevere, (n. 3).

⁶² *Ibid.*, p. 164.

the scheme in curbing the growth of aviation emissions, as a broader scope implies additional options for low-cost emission reductions. The EU ETS covers certain sectors and economic activities within those sectors.⁶³ By allowing airlines to trade with other sectors, the EU ETS acts as an efficient tool to mitigate greenhouse gas emissions⁶⁴ but mitigation may not necessarily occur in the aviation sector.

There is a possibility that airlines may become buyers in the EU ETS. However, the aim of expanding the coverage of the EU ETS by including more sectors is to increase its efficiency⁶⁵ rather than reduce its effectiveness in any single sector. Because greenhouse gases mix uniformly in the atmosphere, emissions reductions taken in any sector have much the same value. Large cost differences in different sectors increase trading opportunities. Increased trading opportunities imply that participants in the scheme may have more options for lower price allowances.

In fact, the scope of the EU ETS is limited, as is listed in Annex I of the revised Directive.⁶⁶ It implies some criteria for expanding the scope of the scheme.⁶⁷ Including new sectors should consider their abatement potential because a sector with relatively low abatement potential would be at risk of losing its competitiveness in the trading market.⁶⁸ There are also some other considerations in including new sectors, including practical feasibility, data availability, competitiveness effects and the existence of other policy instruments.⁶⁹ More importantly, it has been identified that the rationale of including new sectors in the EU ETS is “mainly on the share of greenhouse gas emissions.”⁷⁰ This means that including new sectors (e.g. aviation) must consider the actual reduction of emissions

⁶³ Annex I Categories of Activities to Which this Directive Applies, Directive 2009/29/EC, (n. 57).

⁶⁴ Climate change is an economy-wide global problem. The more sectors that are involved in the trading system, the more potential opportunities there are for effects on emissions, and the more cost-effective emissions reductions are likely to be. See John M. Volkman, (n. 5).

⁶⁵ The EU ETS is announced as an open scheme promoting global innovation, see EUROPA website at <http://ec.europa.eu/environment/climat/emission/index_en.htm>.

⁶⁶ Annex I, Directive 2009/29/EC, (n. 57).

⁶⁷ Harro van Asselt, ‘The EU ETS in the European climate policy mix: past, present and future’ (2009), p. 56, online available at <<http://ssrn.com/abstract=1596892>> last accessed 17.07.10.

⁶⁸ Ibid.

⁶⁹ Ibid., p. 35.

⁷⁰ Ibid.

in those sectors. The EU ETS should be an effective mitigation tool for such sectors, rather than only an efficient tool to provide incentives for airlines to buy allowances.⁷¹

In sum, by allowing airlines to trade with other sectors, the EU ETS provides flexibility for airlines to choose low-cost emissions reduction rather than cut emissions by themselves. Although there is a possibility that airlines may largely become buyers in the EU ETS, the aim of including more sectors is to increase the economic efficiency of the scheme rather than reduce its effectiveness in any single sector.

(c). Allocation Methods

The initial allocation of allowances is an important topic, since it “makes a big difference in terms of equity and the cost of reducing emissions, and the process is politically fraught.”⁷² The following paragraphs examine allocation methods under the EU ETS. The current EU ETS combines both grandfathering and auctioning for the initial allocation on aviation, which seems like a good compromise. I argue that it is a good first step to allocate allowances on aviation; however, the existence of free allocation risks the effectiveness of emissions trading. Through identifying the trend of the increased use of auctioning in the EU ETS in general, I argue that it is possible to move away from free allocation to the aviation sector in the future and that the EU ETS is potentially an effective tool in regulating aviation emissions on regional level.

Before discussing the allocation in the EU ETS, it is necessary to examine the types of allocation methods. Free allocation (grandfathering) and auctioning are generally agreed to be the two primary allocation methods. Considering “the

⁷¹ A. Endres & C. Ohl, ‘Kyoto, Europe? – An economic evaluation of the European emission trading directive’ (2005) 19 *European Journal of Law and Economics* 17. They have identified that the limited scope of the EU ETS brings about a lower economic efficiency of the system.

⁷² John M. Volkman, (n. 5), p. 12.

political hurdles,⁷³ grandfathering was preferred in the trial phase of the European emissions trading market.⁷⁴ Such free allocation is normally favoured by existing polluters in the markets.⁷⁵ But it may result in windfall profits for some companies, for example when energy producers partly pass on the market value of freely obtained emission rights to energy consumers.⁷⁶ In auction systems, everyone bids to purchase allowances. This requires new and existing entities to compete for allowances, avoids the risk of windfall profits, and generates revenue that can be used to “mitigate impacts on industry sectors that actually merit compensation, reduce other taxes, fund research and development of low-emissions technology, and [for] other purposes.”⁷⁷ Auctioning is favoured by those incumbent polluters who have the existing resources at the cost of the environment to make successful bids.⁷⁸ Either of the two allocation methods may bring about unfairness in competition.⁷⁹

The EU ETS, in bringing aviation into the trading scheme in two stages, suggested a combined measure: 82% of the cap (97% of the 2004 level of aviation emissions⁸⁰) will be allocated for free on the basis of historical aviation emissions; 15% will be subject to auction; and 3% of allowances will be reserved for new entrants and for those experiencing rapid growth.⁸¹ Allocation of allowances by grandfathering has a political advantage and has been accepted by most airlines.⁸²

⁷³ Robert Baldwin, (n. 28), p. 17.

⁷⁴ John M. Volkman, (n. 5).

⁷⁵ Nicholas Stern, (n. 8) p. 333.

⁷⁶ Edwin Woerdman, Oscar Couwenberg & Andries Nentjes, ‘Energy Prices and Emissions Trading: Windfall Profits from Grandfathering?’ (2009) 28/2 *E.J.L. &E.* 185; Institute for Public Policy Research, ‘Airlines stand to make £2.7 billion profit from EU climate scheme’ (18 December 2006) online available at <<http://www.ippr.org.uk/pressreleases/?id=2488>> last accessed 01.10.09.

⁷⁷ John M. Volkman, (n. 5), p. 13.

⁷⁸ Jürgen Lefevere, (n. 3); Robert Baldwin, (n. 28).

⁷⁹ Michael A. Mehling, (n. 2); Stefan Weishaar, ‘The European emissions trading system and state aid: an assessment of the grandfathering allocation method and the performance standard rate system’ (2007) 28/6 *E.C.L.R.* 371; Edwin Woerdman, Alessandra Arcuri, Stefano Clò, ‘Emissions Trading and the Polluter-Pays Principle: Do Polluters Pay under Grandfathering?’ (2008) 4/2 *Review of Law and Economics* 565.

⁸⁰ Directive 2008/101/EC, (n. 29), article 3c.

⁸¹ *Ibid.*; see also, Ulrich Steppeler & Angela Klingmüller, ‘EU Emissions Trading Scheme and Aviation: Quo Vadis?’ (2009) 34 4/5 *Air & Sp. L.* 253.

⁸² British Airways, ‘Evidence from British Airways for the Stern Review on the Economics of Climate Change’, (2005), HM Treasury, London, online available at <http://www.hm-treasury.gov.uk/media/FC6/16/climatechange_air.pdf>; EC, ‘Reducing the climate

Requiring some of the permits to be auctioned implies bigger incentives for the adoption of new and cleaner technology compared to a pure grandfathering system.⁸³ This combined measure reduces the entry barrier problem of grandfathering as well. So far, an initial allocation which combines both grandfathering and auctioning seems like a good first step.

However, an initial allocation which combines both grandfathering and auctioning is not perfect for curbing the growth of aviation emissions. It has been argued that airlines may gain many benefits from such an emissions trading system but not actually reduce their emissions.⁸⁴ The system may result in advantage for industry but not necessarily environmental effectiveness. This is because airlines are still likely to receive most of the allowances they will need for free; and they “would be fully able to pass on the cost of allowances to customers without creating significant negative impacts on demand.”⁸⁵ Then, in the event, like the economic crisis which started in 2008, of a big drop in the level of activity of the aviation sector, airlines may sell their unused allowances to other sectors. Since most of these allowances were received at no cost, airlines’ participation in emissions trading has been criticised as “a form of insurance”⁸⁶ with no environmental benefit.

What is more, the non-aviation sectors prefer to see a full auctioning system in aviation.⁸⁷ Mendes and Santos have discussed other energy-intensive sectors’ objections to the inclusion of aviation in the EU ETS. They found that the other sectors believed that airlines would be “a net purchaser of allowances” that this may “accelerate the increase in allowance price and reduce the amount of allowances

change impact of aviation’, (2005), report on the Public Consultation, March-May, Commission of the European Communities, Directorate-General Environment, Brussels, online available at <http://ec.europa.eu/environment/climat/pdf/report_publ_cons_aviation_07-05.pdf> ; J. Thompson ‘Public enemy?’ *Airline Business* (June 2006), pp 34-35.

⁸³ Ernst & Young and York Aviation, ‘Impact Assessment of the EC proposal to include aviation in the ETS’ (6 June 2007) online available at <http://www.aea.be/dbnetgrid2/htmleditor/UploadFiles/Impact_Assessment.pdf> last accessed 09.10.09.

⁸⁴ Lucas M Z Mendes & Georgina Santos, ‘Using Economic Instruments to Address Emissions from Air Transport in the European Union’ (2008) 40 *Environment and Planning A* 189.

⁸⁵ *Ibid.*, p. 204.

⁸⁶ *Ibid.*, p. 204.

⁸⁷ Harro van Asselt & Frank Biermann, ‘European emissions trading and the international competitiveness of energy-intensive industries: a legal and political evaluation of possible supporting measures’ (2007) 35 *Energy Policy* 497.

available to other sectors, impairing their competitiveness.”⁸⁸ In theory, after the initial allocation of permits, when the market is operating, the distribution of permits would be determined by the polluters trading in the market.⁸⁹ When trade between sectors is allowed, it is assumed that aviation would buy additional emissions permits from other sectors if aviation were to incur high abatement costs. Although Wit et al showed the possibility of there being no impact on the price of allowances even if airlines were not to abate at all⁹⁰, it is not safe to predict what will happen in practice.

Although the existence of free allocation risks the effectiveness of the EU ETS in curbing the growth of aviation emissions, I argue that by providing allocation allowances on the aviation sector it is possible to move away from free allocation in the future and that the EU ETS is potentially an effective tool in regulating aviation emissions on regional level. This is mainly because there is a trend of increased use of auctioning in the development of the EU ETS in general, which can provide a remedy for some of the main problems posed by free allocation in the EU ETS.⁹¹ Because of the opposition from both the member states and industry to the idea of auctioning allowances, free allocation was the standard approach to allocating allowances for the first two phases of the EU ETS (the first phase from 2005 to 2007 and the second phase from 2008 to 2012), and the states were allocated accordingly. Governments were allowed to auction 5% of their allowances in the first phase and 10% in the second.⁹² In *ex post* analyses of the first and second phases, Böhringer and Lange have observed that free allocation has trade-off impacts on the efficiency of the scheme.⁹³ It has also been argued that “the prospect of future allowance distribution being contingent upon recent emissions gives a direct incentive to

⁸⁸ Lucas M Z Mendes & Georgina Santos, (n. 84).

⁸⁹ Ben Daley & Holly Preston, ‘Aviation and Climate Change: Assessment of Policy Options’ in Stefan Gössling & Paul Upham, *Climate Change and Aviation: Issues, Challenges and Solutions* (Earthscan Climate; London, 2009).

⁹⁰ R.C.N. Wit et al., (n. 47).

⁹¹ Michael Grubb, Christian Azar & U. Martin Persson, ‘Allowance allocation in the European emissions trading system: a commentary’ (2005) 5/1 *Climate Policy* 127; R. Betz & M. Sato, ‘Emissions trading: lessons learnt from the 1st phase of the EU ETS and prospects for the 2nd phase’ (2006) 6/4 *Climate Policy* 351; C. Hepburn et al., ‘Auctioning of EU ETS phase II allowances: how and why?’ (2006) 6/1 *Climate Policy* 137; OpenEurope, ‘Europe’s dirty secret: why the EU emissions trading isn’t working’ (2007) online available at <<http://www.openeurope.org.uk/research/etsp2.pdf>> last accessed 20.09.10.

⁹² Directive 2003/87/EC, (n.49).

⁹³ C. Böhringer & A. Lange, ‘Mission impossible!? On the harmonization of National Allocation Plans under the EU emissions trading directive’ (2005) 27/1 *Journal of Regulatory Economics* 81.

industries to inflate actual emissions.”⁹⁴ Then, in the 2009 revised Directive on the EU ETS, the way that emission allowances are allocated has been drastically altered. It requires for the emissions trading from 2013, a full auctioning for the power sector and a gradual shift to auctioning for the other sectors, except for the sub-sectors that are deemed to be at “significant risk of carbon leakage” which will be eligible for 100% free allocation for the period 2013-2020.⁹⁵ The revised Directive does not provide important detailed rules about auctioning and free allocation through the use of benchmarks. The details of the auctioning process was arranged to be included in a separate regulation according to the 2009 revised Directive.⁹⁶ Its article 10.4 lists the requirements of such a regulation,⁹⁷ but the Directive does not foresee the end of free allocation. While it is still too early to give a definitive answer to the question when and how the EU ETS will move away from free allocation, the revised Directive does imply the trend of an increased use of auctioning. It therefore seems sensible to expect fully auctioning allowances on aviation in the EU ETS in the future.

From the above discussion, choosing the initial allocation method is a difficult topic. It is a difficult issue to decide how to allocate initially the permits among the airlines. I argue that the EU ETS’s approach of combining grandfathering and auctioning is a good first step, because it has political advantage, it implies incentives for innovation and reduces the entry barrier. However, because of the existence of free allowances, airlines may not actually reduce their emissions. Even so, I identified the trend of the increased use of auctioning in the development of the EU ETS. I argue that the initial allocation of allowances on airlines is possible to move away from free allocation in the future and the EU ETS is potentially effective in regulating aviation emissions.

⁹⁴ Michael Grubb, Christian Azar & U. Martin Persson, (n. 91), p. 134.

⁹⁵ Directive 2009/29/EC, (n. 57).

⁹⁶ The details of the auctioning process were arranged to be in a separate Regulation, according to Annex II.B of the adopted revised Directive 2003/87. The revised Directive already hints at some of the issues that need to be dealt with in this Regulation in its Article 10.4. On 14 July Member States in the Climate Change Committee unanimously voted in support of the Commission’s draft Auctioning Regulation. The Commission will now submit the draft Regulation to the European Parliament and the Council for a three-month scrutiny. See EUROPA website at

<http://ec.europa.eu/environment/climat/emission/auctioning_en.htm> last accessed 04.10.10.

⁹⁷ Ibid.

(d). Allowing and Restricting Offsetting

The effectiveness of emissions trading in an international market also relates to the use of credits from the Kyoto Protocol's project-based flexible mechanisms –the joint implementation (JI) and more importantly for current purposes the clean development mechanism (CDM), which are also known as carbon offsetting projects.⁹⁸ The EU ETS provides that “[a]ircraft operators shall be able to use credits up to an amount corresponding to a percentage, which shall not be set below 15%, of their verified emissions during the period from 2013 to 2020.”⁹⁹ It allows the airlines to use credits from offsetting projects and puts a ceiling on the quantity of such credits. I argue that the EU ETS's approach to the carbon offsetting provides a good model of guidance for airlines on the rules allowing and restricting access to CDM and JI.

In the early stages of the EU ETS, the member states diverged in the implementation of the Linking Directive,¹⁰⁰ which enables the use of credits from the CDM (CERs) and JI (ERUs). Since then, there have been various arguments for and against the use of carbon offsetting. Some of them treat the Linking Directive and offsetting projects as opportunities to increase the range of reduction possibilities for their industries. The industries that cannot or do not want to reduce their own emissions could import cheap credits from CDM projects in developing countries or JI projects in developed countries. Offsetting programmes are optimised as cost-effectiveness instrument because they provide cheaper options to reduce greenhouse gas emissions.¹⁰¹ The options of importing credits through CDM and JI may also “increase the liquidity of the carbon market.”¹⁰² It has been argued that “ultimately carbon prices would converge” through “increased access to CDM and

⁹⁸ The Kyoto Protocol, (n. 27), art. 6, 12.

⁹⁹ Directive 2009/29/EC, (n. 57), art. 11(a)(8).

¹⁰⁰ Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing the EU ETS.

¹⁰¹ Gernot Klepper & Sonja Peterson, ‘Emissions trading, CDM, JI, and more: the climate strategy of the EU’ (2006) 27/2 *The Energy Journal* 1; Jürgen Lefevere, ‘Linking emissions trading schemes: the EU ETS and the “Linking Directive”’ in D. Freestone & C Streck (eds.), *Legal aspects of implementing the Kyoto Protocol mechanisms: making Kyoto work* (Oxford University Press, Oxford 2005), p. 503.

¹⁰² Harro van Asselt, (n. 67), pp. 47-48.

JI” which “would lead to downward EUA prices.”¹⁰³ CDM has also been argued as being “an innovative mechanism that builds a bridge over the ‘North/South’ gap in the Kyoto Scheme”¹⁰⁴

There are also arguments criticising the use of carbon offsetting.¹⁰⁵ One argument is that using credits from offsetting programmes may reduce the incentives for domestic action and result in less technological innovation.¹⁰⁶ It arguably allows the industrialized countries (Annex I Parties to the Kyoto Protocol) to increase their accumulated emissions by obtaining emissions credits generated by investments in CDM projects in a developing country (non-Annex I Parties).¹⁰⁷ This means that developed countries fail to take responsibilities for their own environmentally damaging behaviour. Some others have warned of the risk of using cheaper credits which would put a downward pressure on the market, “leading to little reductions made within the EU and the bulk of those reductions purchased from the Kyoto mechanisms.”¹⁰⁸ There is also a question concerning the quality of the projects invested in through the project-based mechanisms, especially with respect to CDM.¹⁰⁹ Many commentators have questioned the extent to which CDM projects actually reduce emissions because the majority of CDM projects have been found to

¹⁰³ Ibid.

¹⁰⁴ Christina Voigt, ‘Is the Clean Development Mechanism Sustainable? Some Critical Aspects’ (2008) 7/2 *Sustainable Development Law & Policy* 15, 15.

¹⁰⁵ Joëlle de Sèpibus, ‘Linking the EU Emissions Trading Scheme to JI, CDM and post-2012 International Offsets’ (2008) online available at <<http://ssrn.com/abstract=1283523>> last accessed 17.07.10; see also Michael W. Wara, ‘Measuring the Clean Development Mechanism’s Performance and Potential’ (2008) online available at <<http://ssrn.com/abstract=1086242>>; Michael W Wara et al., ‘A Realistic Policy on International Carbon Offsets’ (2008) Stanford University wp 74, online available at <http://pesd.stanford.edu/publications/a_realistic_policy_on_international_carbon_offsets/>; Christina Voigt, (n. 104); Adrian Muller, ‘How to make the clean development mechanism sustainable – The potential of rent extraction’ (2007) 35/6 *Energy Policy* 3203; Ernestine Meijer & Jacob Werksman, ‘Keeping it Clean – Safeguarding the Environmental Integrity of the Clean Development Mechanism’ in David Freestone & Charlotte Streck (eds.), *Legal aspects of implementing the Kyoto Protocol mechanisms: making Kyoto work* (Oxford University Press, Oxford 2005).

¹⁰⁶ David Driesen, ‘Free lunch or cheap fix?: the emissions trading idea and the climate change convention’ (1998) 26/1 *Boston College Environmental Affairs Law Review* 1; Climate Action Network (CAN) Europe, ‘National Allocation Plans 2005-2007: do they deliver? Key lessons from member states 2008-2012’ (2006) Brussels: CAN-Europe; OpenEurope, *Europe’s dirty secret: why the EU emissions trading scheme isn’t working* (OpenEurope, London 2007).

¹⁰⁷ Christina Voigt, (n. 104).

¹⁰⁸ Jürgen Lefevere, (n. 101), p. 522.

¹⁰⁹ Christina Voigt, (n. 104).

be “non-additional”.¹¹⁰ “Additionality” means that a project activity should demonstrate that its investments generate fewer emissions than would have been the case according to business as usual and that the project activity is being implemented because of the financial support provided by the project mechanism.¹¹¹ Additionality addresses a challenge to the design of CDM which has to prevent projects that lead to a net increase in emissions in any sector or any country.¹¹² What is more, CDM projects were required to contribute to sustainable development in the host developing countries according to the Kyoto Protocol.¹¹³ However, it has been argued that “initial assessments of the mechanism show that the most cost-effective projects have the least benefits in terms of sustainable development, whereas projects that potentially hold the largest sustainability promise still face difficulties in being approved, pointing to a general tension between the mechanism’s two objectives.”¹¹⁴

Notwithstanding these various arguments for and against the use of carbon offsetting, the EU ETS has allowed aircraft operators to use credits from offsetting projects but only “up to an amount corresponding to a percentage, which shall not be set below 1,5%, of their verified emissions during the period from 2013 to 2020.”¹¹⁵ The EU ETS provides a good model of guidance for airlines on the rules allowing and restricting access to CDM and JI, because it includes quantitative

¹¹⁰ Barbara Haya, ‘Measuring Emissions Against an Alternative Future: Fundamental Flaws in the Structure of the Kyoto Protocol’s Clean Development Mechanism’ (2009), online available at <<http://ssrn.com/abstract=1562065>> last accessed 18.07.10; A. Michaelowa & P. Purohit, ‘Additionality determination of Indian CDM projects’ (2007) Zurich: University of Zurich, Institute for Political Science; Lambert Schneider, ‘Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement’ (2007) Berlin: Oko-Institut.

¹¹¹ Art. 12 (5)(c) of the Kyoto Protocol provides that CERs shall be certified if based on reductions that are additional to any that would occur in the absence of the project. See also para. 43 of the Modalities and Procedures for a Clean Development Mechanism, Decision 3/CMP.1

(FCCC/KP/CMP/2005/8/Add.1, 30 March 2006); Decision 1/CMP.2 (FCCC/KP/CMP/2006/10/Add.1).

¹¹² Christina Voigt, (n. 104).

¹¹³ The Kyoto Protocol, (n. 27), art. 12(2).

¹¹⁴ Harro van Asselt, (n. 67), p. 48. See also Karen Holm Olsen, ‘The Clean Development Mechanism’s contribution to sustainable development: a review of the literature’ (2007) 84 *Climate Change* 59; C. Sutter & J. C. Barreño, ‘Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects’ (2007) 84 *Climate Change* 75; David Driesen, ‘Sustainable development and market liberalism’s shotgun wedding: emissions trading under the Kyoto Protocol’ (2008) 83 *Indiana Law Journal* 21.

¹¹⁵ Directive 2009/20/EC, (n. 57), art. 11 (a) (8).

limits on the access to CDM and JI which contribute to ensuring the effectiveness of emissions trading.¹¹⁶ Fundamentally, carbon offsetting is built on the idea of neutralising the emissions caused by consumption in one sector through compensation in another sector. Airlines' access to carbon offsetting is built on a continuous process of reducing emissions in the non-transport sector (e.g. afforestation, renewable energy), implying two limitations. One is that there is no real reduction from aviation emissions, instead, allowing the flights to continue polluting at previous levels or higher.¹¹⁷ For airlines, carbon offsets become an excuse for business as usual with regard to pollution. Another limitation is that spatial constraints, or physical or economic constraints will ultimately present barriers to the availability of off-setting.¹¹⁸ What is more, there is a tension between the use of low-cost carbon offset projects and efforts to develop and deploy new technologies to reduce aviation emissions.¹¹⁹ Offset projects may reduce the incentives on airlines to increase their fuel efficiency or invest in research and development in alternative energy. Therefore, it is necessary to put a ceiling on the quantity of credits from offsetting projects that the aviation sector is allowed to access. This ceiling may ensure that airlines enjoy only limited flexibility in using cheap credits from offsetting and the cap on the aviation emissions means real reductions from this sector.

3.2. Potential of Developing Multiple Regional Emissions Trading

Through the above analysis of the application of the EU ETS to aviation, it is clear that the EU ETS provides a good model for regional efforts to curb the growth

¹¹⁶ Harro van Asselt, (n. 67).

¹¹⁷ James L. Olmsted, 'Carbon Dieting: Latent Ancillary Rights to Carbon Offsets in Conservation Easements' (2009) 29 *J. Land Resources & Envtl. L.* 121.

¹¹⁸ In examining voluntary carbon offsetting for aviation, Stefan Gössling et al. provided that "the area available for afforestation will be filled completely by aviation alone in 2050 if all aviation-related climate impacts are compensated through afforestation" or "efficiency improvements becoming increasingly difficult and costly." Stefan Gössling et al., 'Voluntary Carbon Offsetting Schemes for Aviation: Efficiency, Credibility and Sustainable Tourism' (2007) 15/3 *Journal of Sustainable Tourism* 223.

¹¹⁹ David Driesen, (n. 106).

of aviation emissions on a regional level. The following paragraphs examine the effects of the EU ETS on other countries in developing multiple regional emissions trading. Multiple regional emissions trading schemes are weaker than a global emissions trading scheme, and they cannot provide a stand-alone solution to curbing the growth of international aviation emissions. But multiple regional emissions trading schemes may contribute to a multi-level approach to regulating aviation emissions, a subject to which I return in section 3.3. I will also suggest a global emissions trading system in section 4.

Before exploring on the effects of the EU ETS on developing regional emission trading in other countries, it is necessary to discuss the possibility for the EU ETS to become a unified emissions trading system. Its further development will certainly not all be controlled by the EU, but will depend on many factors.¹²⁰ For example, the existence of a cap is the main precondition for emissions trading to function as a mitigation tool. It has been argued that “[i]n a world where all countries take on emission reduction targets and search for cost-effective solutions to the climate problem, the European Commission’s ideal of a global carbon market might materialise.”¹²¹ Also, international coordination is of importance for either integrating the EU ETS in an international trading scheme or linking emissions trading schemes through an international agreement. An international emissions trading scheme would entail at least that all the major emitters of greenhouse gases are included, allocation methods are determined at the international level and emissions reductions are comparable.¹²² Given the political and institutional uncertainties, it is too early to give a definitive answer to whether the EU ETS can become a blueprint for a global carbon market.

Although there is a relatively low availability of literature on the medium- or long-term development of the EU ETS as a blueprint for a global carbon market, the EU ETS has been leading the development of multiple regional emissions trading schemes. Interest in emissions trading has spread in many other countries. For

¹²⁰ Harro van Asselt, (n. 67).

¹²¹ *Ibid.*, p. 91.

¹²² *Ibid.*

example, major developments for new emissions trading markets can be found in the U.S. and Australia.¹²³ The U.S. launched the Chicago Climate Exchange (CCX) system in 2003 as the first voluntary U.S. cap-and-trade system and the Regional Greenhouse Gas Initiative (RGGI) as the first mandatory U.S. cap-and-trade system for reducing emissions from power plants.¹²⁴ In 2008, the Australian Government issued a Green Paper on the Carbon Pollution Reduction Scheme and confirmed its intention to introduce an Australian Emissions Trading Scheme (AETS) to commence in 2010.¹²⁵ Yet, following the failure of Copenhagen, the Australian government has put plans for a flagship emissions trading scheme on hold until 2013 at the earliest.¹²⁶ But there is no doubt that interest in emissions trading has spread, leading to the design and implementation of several programmes for greenhouse gases and conventional pollutants. As such, expecting the development of multiple regional emissions trading schemes is sensible.

I argue that multiple regional emissions trading systems cannot provide a stand-alone solution to curbing the growth of international aviation emissions. Apart from the limitations of emissions trading discussed in section 2.2, multiple regional emissions trading is weaker than a global emissions trading, because of the possible carbon leakage (the increase of emissions outside those areas covered by regional emissions trading schemes) and the complexity of monitoring. For ground based sectors, the concept of carbon leakage has been explained in two types of situation of the EU ETS: “either the EU manufacturer moves its activities outside the EU to

¹²³ New Zealand also passed an emissions trading bill in 2008, but the implementation was delayed. See Climate Change (Emissions Trading and Renewable Preference) Bill, at Parliament website <http://www.parliament.nz/en-NZ/PB/Legislation/Bills/c/0/4/00DBHOH_BILL8368_1-Climate-Change-Emissions-Trading-and-Renewable.htm> last accessed 05.10.10.

¹²⁴ Brian C. Murray & Heather Hosterman, ‘Climate Change, Cap-and-Trade and the Outlook for U.S. Policy’ (2008-2009) 34 *N.C.J. Int’L. & Com. Reg.* 669.

¹²⁵ Martijin Wilder & Louisa Fitz-Gerald, ‘Carbon Markets and Policy in Australia: Recent Developments’ (2008) 31 *U.N.S.W.L.J.* 838; Robert Pritchard, ‘Australia: climate change – greenhouse gas emissions’ (2008) 5 *I.E.L.R.* 144; Robert Pritchard, ‘Australia: Carbon Pollution Reduction Scheme – Green Paper issued’ (2008) 7 *I.E.L.R.* 246; Samantha Smart & Kristin Marciano, ‘An updated snapshot of emissions trading in Australia’ (2007) 8 *I.E.L.T.R.* 119; Adrew G. Thompson & Rob Campbell-Watt, ‘Australia and an emissions trading market – opportunities, costs and legal framework’ (2005) 4 *I.E.L.T.R.* 79; Andrew Thompson & Rob Campbell-Watt, ‘Carbon Rights – Development of the Legal Framework for a Trading Market’ (2004) 22 *J. Energy Nat. Resources L.* 465.

¹²⁶ ‘Australia shelve key emissions trading scheme’ BBC (27 April 2010) online available at <<http://news.bbc.co.uk/1/hi/world/asia-pacific/8645767.stm>> last accessed 07.17.10.

avoid EU ETS costs (supply driven carbon leakage) or it loses its market share/competitiveness due to high EU ETS costs and demand then shifts to a non-EU manufacturer (demand driven carbon leakage).”¹²⁷ In both cases, greenhouse gases will continue to be emitted into the atmosphere by operators not covered by the EU ETS. Although aviation is different from the ground based sectors in terms of its international nature, the produce offered by airlines (a seat offered on a given flight) cannot be stocked and EU carriers cannot realistically switch their activities away from the EU and move their fleet outside of the EU; although there is nothing that can stop passengers from shifting to non-EU carriers or using alternative routes if that is realistic.¹²⁸ Carbon leakage for airlines can always happen in the transferring of activities to routes not covered by the EU ETS. In fact, a shift to less carbon intensive forms of transport, such as high speed trains, would be desirable, as discussed in Chapter 5. The multiple emissions trading schemes will face the same risk given that there are only fragmented emissions trading markets rather than a unified international system which covers the whole world. What is more, multiple emissions trading schemes would face the challenge of the complexity of monitoring. Given that aviation is an international activity, the more states that participate in the trading system the less carbon leakage may happen and the smaller possibility there is of competition distortion.¹²⁹ However, the larger the market is “the greater the complexity, problems of transparency, and [the] likelihood of political resistance.”¹³⁰ This issue needs to be managed by “carefully choosing the point at which emissions allowances are distributed,” because there is a trade-off between the number of entities that are involved in the system and the complexity of monitoring.¹³¹ However, from a purely practical perspective, the aviation community must act as a whole to the greatest extent

¹²⁷ Ernst&Young and York Aviation, ‘Inclusion of Aviation in the EU ETS: Cases for Carbon Leakage’, (2008), p. v, online available at <<http://www.flightglobal.com/airspace/files/folders/eu/entry22203.aspx>> last accessed 08.10.09.

¹²⁸ Ibid.

¹²⁹ Ibid.

¹³⁰ John M. Volkman, (n. 5), p. 12.

¹³¹ Ibid.

possible and must choose global measures to protect the world's environment.¹³² Thus, the current regional approach to emissions trading represents a contentious issue, as the imposition of the scheme on aviation includes an emissions trading scheme by one region over the rest of the world.

3.3. The Role of Regional Emissions Trading

In the previous sections, I have argued that the application of the EU ETS to international aviation is lawful. It provides a good model for regional efforts to curb the growth of international aviation emissions and may lead to the development of multiple regional emissions trading schemes. I have also argued that multiple regional emissions trading schemes cannot provide a stand-alone solution to curbing the growth of international aviation emissions because of the possible carbon leakage and the complexity of monitoring. In this section, I further identify two roles of regional emissions trading in regulating international aviation emissions in a multi-scalar regulatory architecture, which will receive close attention in Chapter 7. If sectoral mitigation targets can be allocated to states and regions under the proposals in Chapter 3 (which suggests a comprehensive multi-level burden sharing system under a sectoral approach led by the UNFCCC), the EU ETS provides one mechanism by which those mitigation targets might be achieved on a regional level. In the absence of any global sectoral mitigation target, the multiple regional emissions trading schemes contributes to a multi-level approach to regulating international aviation emissions, moving beyond a complete reliance on international treaty making.

As mitigation tools within the global sectoral target under the UNFCCC system discussed in Chapter 3, the cap on emissions provides some certainty as to the environmental outcome, as discussed in section 2.1. If sectoral mitigation targets

¹³² Ruwantissa Abeyratne, 'The New Emissions Trading Scheme: Airlines' (2008) 38/3 *Environmental Policy and Law*, 155; Jacqueline Etil Serrao, 'Global Versus Unilateral Measures to Protect the World's Environment: Implications for the Air Transport Industry' (2002) 27 *Ann. Air & Sp. L.* 551.

on international aviation can be allocated to states and regions under the proposals discussed in Chapter 3, regional emissions trading may provide the regional targets and then ensure that the mitigation targets could be achieved on a regional level. However, mitigation does not necessarily occur in the aviation sector, and emissions trading may not provide sufficient incentive for innovation. It therefore seems a sensible strategy not to pin all our hopes on the functioning of this particular regulatory instrument alone, but to pursue a complementary mix of multiple instruments that address the international aviation emissions issue, including fuel taxes and technology-based standards on aircraft.

Second, in the absence of any global sectoral mitigation targets, I argue that multiple regional emissions trading systems provide contribution to the multi-level approach to regulating aviation emissions.¹³³ The basic idea is that regulations on multiple levels should be adopted as an alternative to the traditional top-down global negotiations on national emission targets. We need to move beyond a complete reliance on international treaty making for the regulation of international aviation emissions. In the case of international aviation emissions, a sectoral approach under the UNFCCC system would be the best way to curb the growth of aviation emissions as discussed in Chapter 3. However, the results of international negotiations on climate change are still pending. If a sectoral approach on international aviation emissions cannot be agreed, an alternative multiple levels approach through multiple regional emissions trading systems may still contribute to the mitigation of aviation emissions. This multiple level approach to regulating aviation emissions contributes to breaking the deadlock in international negotiation and avoids complete reliance on international treaty making. It is worth noting that the approach provided by regional emissions trading schemes is prepared for the

¹³³ The multiple regional approaches to the climate change problem can also be found in the political science literature. See Christian Egenhofer & Thomas Legge, 'After Marrakech: The Regionalisation of the Kyoto Protocol' CEPS Commentary (CEPS, Brussels 2001); Christian Egenhofer et al., 'Defining Europe's Near Abroad in Climate Change: A Russian-EU Alliance – Sub-global Bargaining to Further International Environmental Agreements' CEPS Discussion Paper (2001); Richard Stewart & Jonathan Wiener, *Reconstructing Climate Policy* (AEI Press, Washington, DC 2003); Robert A. Reinstein, 'A Possible Way Forward on Climate Change' (2004) 9/3 *Mitigation and Adaptation Strategies for Global Change* 245.

worst-case outcome, i.e. that climate negotiations on a sectoral approach break down. The caps of regional emissions trading schemes collectively may not be as demanding as the proposed sectoral target. To some extent, current policy already approves for this, e.g. by differentiating the EU's mid-term targets in cases with and without a new international agreement.¹³⁴ It therefore seems sensible to pursue a complementary mix of multiple instruments at multiple levels, including domestic fuel taxes.

4. Proposing a Global Emissions Trading System

In this section, I propose a global emissions trading scheme for international aviation. Before discussing its role, it is necessary at this stage to outline my proposal. A global emissions trading scheme for aviation should be a sectoral only emissions trading scheme unless and until a more comprehensive global scheme can be agreed. But airlines will be allowed to buy credits from carbon offsetting projects within a quantitative limit. There is also the option of negotiating a linking mechanism with regional schemes such as the EU ETS. Under the scheme, the cap equals the sectoral target on aviation emissions agreed through international negotiations led by the UNFCCC; all of the airlines would be participants; IATA would be in charge of the initial allocation of emissions allowances; and the verification and compliance would be through ICAO. The following paragraphs will further explain this proposed global emissions trading scheme.

First of all, the absolute cap equals the sectoral target on aviation emissions agreed through international negotiation as proposed in Chapter 3. Rather than allocating allowances within the cap to states, regions and cities, they would go to

¹³⁴ The EU has provided a mitigation commitment of 20% from 1990 unilaterally; which may move to 30% as part of a global and comprehensive agreement for the period beyond 2012 and provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities. See its official website at <http://ec.europa.eu/environment/climat/home_en.htm>.

airlines on the basis of auctioning. The purpose of suggesting that all of the airlines would be participants in the emissions trading is to cover all the emissions resulting from flights between two nations or more in the trading system. Broad participation would avoid possible carbon leakage and would build a healthy market in ensuring the effectiveness of the emissions trading, as has been discussed above. In designing a cap-and-trade system for aviation, it would be important to ensure non-discrimination between airlines,¹³⁵ and to ensure that the policy does not produce competition distortion.¹³⁶ It is also important to reduce “the likelihood that carriers would simply reflag or relocate as a means of avoiding regulation.”¹³⁷ The proposal is designed so that the airlines would become participants in the trading system and the allowances would be allocated directly to airlines. Allocating emissions limits to air carriers is “a logical way to apply an aviation emissions limitation policy,” because carriers have the greatest ability to respond to incentives to reduce emissions and such responses can be measured readily by means of information about their fuel consumption.¹³⁸ Additionally, broad participation by airlines is practical, because the concept of emissions trading, as the “least of the possible evils,” receives support from the industry.¹³⁹ More importantly, a global emissions cap and trade scheme was broadly suggested as applying initially to the transport sector, although the application of regional emissions trading schemes such as the EU ETS to international aviation was not supported by the industry.¹⁴⁰ IATA (International Air Transportation Association) Director General and CEO Giovanni Bisignani, at the 3rd Aviation and Environment Summit in 2008, said “IATA is not opposed to emissions trading provided that it is fair, global and effective...[but]

¹³⁵ “Non-discrimination principle” is the basic concept of the Chicago Convention, which insists that the development of international aviation should be in an equal and non-discriminatory manner. This declaration exists in the Preamble, Article 1, Article 11 and Article 15 of the Chicago Convention.

¹³⁶ Ulrich Stepler & Angela Klingmüller, (n. 81).

¹³⁷ Allen Pei-Jan Tsai & Annie Petsonk, ‘Tracking the Skies: An Airline-based System for Limiting Greenhouse Gas Emissions From International Civil Aviation’ (1999-2000) 6 *Envtl. Law.* 763, 782.

¹³⁸ *Ibid.*, p. 793.

¹³⁹ AEF, ‘Emissions Trading and Aviation’ online available at <<http://www.aef.org.uk/uploads/EmTradingBriefing.doc>>.

¹⁴⁰ Ben Block, ‘Collaboration Calls for New U.N. Agency to Oversee Transport Emissions’ (2008) online available at <www.worldwatch.org/node/5736>.

Europe's unilateral approach will only lead to legal battles and trade wars."¹⁴¹ Given that airlines have accepted the concept of emissions trading and they support the creation of a global cap and trade system including aviation, I suggest that all of the airlines rather than nation states should be the participants in emissions trading.

Regarding the allocation method, all permits should be allocated through auctioning. Although the EU ETS has adopted both grandfathering and auctioning for now, this is not a perfect choice, partly because the existence of free allowances enables airlines to play emissions trading as a game to make profits without truly achieving any GHGs reductions. For example, "airlines could sell all their allowances at the start of the year and, if the cost of allowances drops, purchase the necessary amount of allowances at the end of the year for less money, making a profit without making any changes to their business."¹⁴² Some scholars argue that a fully auctioned scheme "would not be optimal," if the revenues from the auction are refunded to the airlines.¹⁴³ However, even this is surely more acceptable to stakeholders and the public than grandfathering, if the revenue is treated as a funding for environmental protection that should be invested in new and cleaner technologies. The revenue refunded to the airlines may however also have a counterproductive impact on demand control, which is a necessary part of reducing aviation emissions. In any event, it is worth noting that refunding to the airlines is not the only positive option for using the revenue. The revenue may also be used in funding new entrants to reduce the entry barriers problem and to reduce the distortion of competition. In these circumstances, the initial allocation of allowances becomes simpler and a fully auctioned system might be optimal.

The next step is to identify the authority that may be put in charge of the initial allocation. I suggest that IATA is best equipped to manage the auctioning process with airlines. Although the UNFCCC Parties have committed themselves to limiting

¹⁴¹ 'Remarks of Giovanni Bisignani at Aviation and the Environment Summit' IATA Press, 22 April 2008, online <www.iata.org/pressroom/speeches/2008-04-21-01.htm>. See also IATA, 'IATA Blasts European Union ETS Decision' (24 October 2008) online available at <<http://www.iata.org/pressroom/pr/2008-10-24-02.htm>> last accessed 02.10.09.

¹⁴² Danielle Goodwin, (n. 30), p. 4.

¹⁴³ Fredrik Carlsson & Henrik Hammar, 'Incentive-based regulation of CO2 emissions from international aviation' (2002) 8 *Journal of Air Transport Management* 365, 368.

aviation emissions through ICAO, IATA has committed itself to cooperate with ICAO.¹⁴⁴ More importantly, IATA is preferred because of its relationship with the airlines. IATA enjoys an exceptionally broad membership, with some 230 airlines carrying 93% of the world's international scheduled traffic belonging to it.¹⁴⁵ These airlines operate over 120 countries from around the globe that include both developed and developing countries. IATA's membership truly covers the whole aviation sector. The mission of IATA is "to represent and serve the airline industry."¹⁴⁶ IATA is not only an industry association but also "the most significant private international economic regulator the world has seen."¹⁴⁷ IATA and ICAO (discussed in Chapter 4), together led the development of civil aviation after the Second World War. Two functions of the post-war IATA have been identified, which are:

"First, it was the industry association for airlines that represented their interests at ICAO as ICAO began globalizing flight standards and airworthiness regulations for aircraft. Second, IATA became a kind of global economic regulator after the war."¹⁴⁸

While ICAO has been responsible for technical regulation, IATA was responsible for regulating economic issues. For example, it "coordinated the setting of mutually acceptable prices for the same traffic corridors, in effect coordinating a series of geographic cartels."¹⁴⁹ Although this sort of cartel is no longer in place, IATA system of economic regulation once had widespread support from sovereign nations as well as the industry. IATA's power at its height, in terms of economic regulation, "reached extraordinary levels" when it "had a Compliance Office to

¹⁴⁴ IATA History, at IATA website <www.iata.org>.

¹⁴⁵ IATA, list of members online at <http://www.iata.org/membership/airline_members_list?All=true> last accessed 19.12.09.

¹⁴⁶ IATA, *Articles of Association*, art. IV. The Articles of Association regulate the activities and affairs of IATA. The Articles are amended from time-to-time by the Annual General Meeting. The most recent amendments were adopted by the 61st Annual General Meeting held in Tokyo 29-31 May 2005.

¹⁴⁷ John Braithwaite & Peter Drahos, *Global Business Regulation*, (Cambridge University Press, Cambridge 2000), p. 455.

¹⁴⁸ *Ibid.*

¹⁴⁹ *Ibid.*

check for ‘malpractices’ such as illegal discounting and to levy heavy fines.”¹⁵⁰ As such, representing the airline industry, IATA has experience of performing a rigorous regulatory role in the economic field. It seems a sensible strategy to suggest that IATA should extend its power to distributing emissions allowances to airlines.

IATA’s involvement in what was essentially pricing fixing in its early days provides some insight into IATA’s capacity to contribute to the emissions trading system. But IATA represents the airline industry, and there must be some concerns that its heavy involvement in regulation will undermine the environmental objectives of the regulation in the interests of the industry. It is important to note that the overall cap in the emissions trading system would be set by international negotiations through the UNFCCC-led sectoral approach on aviation as discussed in Chapter 3, rather than IATA. This means that the central environmental objective of the emissions trading mechanism is not decided by IATA and could not be undermined by the industry body. Emissions above the total cap will be subject to scrutiny decided by the UNFCCC. This ongoing scrutiny is crucial and could not be reduced for the interests of the industry. Furthermore, the public pressure on the airline industry to take further action in reducing emissions means that IATA has incentives to participate fully in environmental programmes.¹⁵¹ Public pressure has meant that IATA was in turn pushed by its member airlines and managed to bring about at least some positive words on the climate problem.¹⁵²

But most importantly, the proposed global emissions trading for aviation must consider verification and compliance.¹⁵³ An essential verification and compliance component of the trading system would be a proper authority to ensure its proper

¹⁵⁰ Ibid.

¹⁵¹ See for example, ‘The race to go green’ Business Traveller, (06/01/2011), online available at <<http://www.buinessstraveller.com/archive/2011/february-2011/special-reports/the-race-to-go-green>> last accessed 10.03.11.

¹⁵² Robert Wall, ‘Things With Wings’ Aviation Week (12/21/2009) online available at <http://www.aviationweek.com/aw/blogs/commercial_aviation/ThingsWithWings/index.jsp?plckController=Blog&plckScript=blogScript&plckElementId=blogDest&plckBlogPage=BlogViewPost&plckPostId=Blog:7a78f54e-b3dd-4fa6-ae6e-dff2ffd7bdbbPost:4cbb8679-889c-4360-abd3-830b4f880100> last accessed 10.03.11.

¹⁵³ For a discussion of compliance and accountability systems considered by the UNFCCC Parties, see Anni Petsonk & Chad Carpenter, ‘The Key to the Success of the Kyoto Protocol: Integrity, Accountability and Compliance’ (May 28, 1999) 4/2 *Linkages J.*

enforcement with low administrative, monitoring and transaction costs¹⁵⁴ and participants' "agreement on standards for monitoring, reporting and verification of emissions."¹⁵⁵ Gander and Helme have proposed a carrier-based system which was criticised as not workable in practice, because of the absence of monitoring and enforcement provisions.¹⁵⁶ The role of ICAO in performance monitoring, reporting methods and auditing processes on its member states' mitigation actions was discussed in Chapter 4; this organisation would also be suitable to take on the monitoring role in carrier-based emissions trading.¹⁵⁷ Under Article 12 of the Chicago Convention, every ICAO member state is the enforcement authority over "every aircraft flying over or maneuvering within its territory and every aircraft carrying its nationality mark."¹⁵⁸ They may require sufficient allowances for all anticipated emissions to be carried by aircraft landing in or taking off from their territories, registered in their territories, or operating aircraft flying their flags.¹⁵⁹ Although it cannot avoid the possibility that "some carriers might relocate, reregister, or re-flag,"¹⁶⁰ airlines cannot escape coverage by the proposed cap-and-trade system as long as it covers the whole of the international aviation sector. As such, ICAO is best equipped to take the role of verification and monitoring.

Whilst protections against the undermining of the environmental objectives of emissions trading by the industry are not perfect, any risks are outweighed by the benefits of involving IATA in the system, in particular its expertise and experience of air transport management. Furthermore, given the close relationship between IATA and ICAO, which have been working together to develop international civil aviation since their inception, conceived simultaneously at the Chicago Conference in 1944, both of them need to provide a consistent position on aviation emission

¹⁵⁴ For a discussion of the enforcement and transaction costs of emissions trading, see Robert Baldwin, (n. 28). See also Ben Daley & Holly Preston, (n. 89); Nicholas Stern, *The Economics of Climate Change: the Stern review*, (Cambridge University Press, Cambridge 2007); Robert N. Stavins, 'Transaction Costs and Tradable Permits' (1995) 29 *J. Env. Econ. And Mgt.* 133.

¹⁵⁵ Robert Baldwin, *ibid.*, p. 16.

¹⁵⁶ Chris Hewett & Julie Foley, *Plane trading. Policies for reducing the climate change effects of international aviation* (The Institute for Public Policy Research, London 2000).

¹⁵⁷ Allen Pei-Jan Tsai & Annie Petsonk, (n. 137).

¹⁵⁸ See also Article 12 of the Chicago Convention, also known as 'Rules of the Air'.

¹⁵⁹ Allen Pei-Jan Tsai & Annie Petsonk, (n. 137).

¹⁶⁰ *Ibid.*, p. 798.

mitigation. As such, the cooperation between ICAO and IATA would contribute an effective allocation of allowances in the implications for climate governance.

Apart from the key elements which have been explained in the foregoing analysis, I also suggest that airlines be permitted to buy credits from carbon offsetting projects up to a maximum quantitative limitation. There is also the option of negotiating a linking mechanism with regional schemes such as the EU ETS. In this way, airlines may have some cheaper options to reduce their greenhouse gas emissions, which will increase the efficiency of the scheme.

Having outlined my proposal, the remaining question is to identify the role of the global emissions trading scheme in curbing the growth of international aviation emissions. The proposed global emissions trading scheme is partly a tool for the allocation of mitigation responsibilities to airlines, in the absence of agreed allocation of sectoral mitigation targets under the proposed comprehensive multi-level burden sharing system proposed in Chapter 3. As discussed above, the cap on emissions within the trading scheme is equal to the sectoral target under the UNFCCC system. Rather than allocating allowances within the cap to states, regions and cities, they would be auctioned to airlines. These allowances could be bought and sold. The market would establish the price of the emissions permits as those airlines that are able to reduce their emissions would sell their emission allowances to other airlines that would prefer to buy these allowances rather than reduce their emissions. As discussed in section 2.1, a trading system reduces the information burden on regulators, since the polluters themselves determine where the mitigation efforts are most cost-effective. The information needed for burden sharing is transmitted through the market for emission permits. As such, the proposed scheme acts as an alternative form of allocation of sectoral mitigation targets if the comprehensive multi-level burden sharing system proposed in Chapter 3 is difficult to realize in practice.

The proposed global scheme is also a mitigation tool for incentivising the airline industry to improve energy intensity. As discussed in section 2.1, emissions trading offers incentives for low cost companies to reduce their emissions and sell

permits to higher cost companies. With a financial reward for participation, airlines who reduce emissions are no longer pure losers, compared to those under direct regulations. The prices of emissions permits are determined by the markets. The ones who play well in these markets would not be losers, but might even be winners. The scheme therefore may incentivise some airlines to improve their fuel efficiency and invest in cleaner technologies in order to trade additional allowances on the market. As it is a sectoral only trading scheme, the reductions taken by any airline would always count as reducing emissions from targeted international aviation, subject to limited access to carbon offsetting projects to provide some flexibility to airlines.

5. Conclusion

This chapter explores the role of emissions trading in curbing the growth of international aviation emissions. First of all, it examines the pros and cons of emissions trading in general. The advantages of emissions trading include the certainty of the environmental outcome; its efficiency compared to command and control regulation; and its political advantages. Its limitations include the fact that it does not ensure that emissions will be reduced from targeted sources and it does not necessarily provide adequate incentives for innovation. From a preliminary analysis, I argue that emissions trading could play an important role in curbing the growth of international aviation emissions, but it cannot provide a stand-alone solution. The role of multiple regulatory instruments is a subject to which I return in Chapter 7.

After an analysis of emissions trading in general, I explore the role of emission trading at two levels: the role of regional emissions trading and the role of a proposed global emissions trading scheme. I start from a legal analysis of the EU ETS, as it is by far the largest emissions trading scheme in the world. More importantly for current purposes, the EU ETS will include emissions from foreign

airlines in 2012. Examining the relevant international agreements, EU law and bilateral agreements, I argue that the EU ETS's inclusion of international aviation is lawful. I also argue that the EU ETS provides a good model for regional efforts to curb the growth of aviation emissions. The EU ETS covers mainly CO₂ emissions but it is not limited to them. It allows airlines to trade with other sectors, but the aim of expanding the coverage of the EU ETS by including more sectors is to increase its efficiency rather than reduce its effectiveness in any single sector. It has used both grandfathering and auctioning as allocation methods for now, but by using allocation allowances on airlines it is possible to move away from free allocation in the future. It also recognised the significance of putting a ceiling on the quantity of credits from offsetting projects when allowing the aviation sector to access CDM and JI. The EU ETS is thus potentially an effective mitigation tool to regulate international aviation emissions on a regional level.

I also explore the potential of multiple regional emissions trading if the EU takes on a leadership role in developing regional emissions trading schemes. Interest in emissions trading has spread in many other countries, including the U.S. and Australia. Regional emissions trading can make two potential contributions to the regulation of emissions from international aviation. If sectoral mitigation targets can be allocated under the proposals in Chapter 3, they provide one mechanism by which those mitigation targets might be achieved on a regional level. In the absence of any global sectoral mitigation target, the multiple regional emissions trading schemes provide a contribution to a multi-level approach to regulating international aviation emissions. However, multiple regional emissions trading is weaker than a global emission trading system in terms of curbing the growth of international aviation emissions, because of the possible carbon leakage and the complexity of monitoring. It cannot provide a stand-alone solution to reducing aviation emissions.

Finally, I suggest developing a global emissions trading system for aviation. This is partly a tool for the allocation of mitigation responsibilities to airlines in the absence of international agreement on allocation as discussed in Chapter 3. It is also a mitigation tool for incentivising the airline industry to improve energy intensity.

Chapter 7. Multi-scalar Regulatory Architecture

1. Introduction

Familiar legal approaches to regulating international aviation emissions have failed, both in the international climate change law regime under the UNFCCC and in ICAO, as discussed in Chapters 3 and 4. A key conclusion of this thesis is that curbing the growth of aviation emissions will not result from a focus only on traditional international-level approaches grounded in international organisations and treaty making. This chapter explores alternatives that take seriously the multi-scalar nature of the aviation emissions problem, leading to an innovative way of developing legal regulation to curb the growth of aviation emissions. This chapter places aviation in the context of the burgeoning new governance literature that has engaged with the complexities of regulatory scale and the appropriate role of different approaches. By contrast with much of the legal literature, I argue that legal regulation of international aviation emissions in the future should be in the form of a multi-scalar regulatory architecture, which would simultaneously engage multiple parties, multiple instruments and multiple levels of governance.

New governance provides the theoretical foundation upon which the failure of traditional regulatory approaches will be identified and the future of regulating aviation emissions will be explored. In addition, aviation emissions provide a “test” of new governance theory’s application to an actual regulatory dilemma. As such, the function of this chapter is two fold. First, it challenges the existing paradigm that focuses almost exclusively on a global solution to aviation’s greenhouse gas emissions. Secondly, it contributes to the solution identified in this thesis, a multi-level approach involving multiple parties and multiple regulatory tools.

This chapter begins by examining multi-scalar problems, and I explain the

regulatory difficulties of aviation emissions by looking at the problem through a scalar lens. I argue that the impact of aviation emissions on climate change is not solely an international problem, but rather it is a multi-scalar one that deserves a multi-scalar regulatory architecture.

Then, drawing on the scholarly literature on new governance theory, I explore the theoretical foundations of a multi-scalar regulatory approach to climate change associated with aviation before applying the theory on regulating aviation emissions in section 4. Given the failure of traditional international regulation of aviation emissions problem, regulatory design needs to break the barriers of traditional international approaches and introduce innovative ideas. The “governance turn”¹ of new governance theory, as discussed in Chapter 1, takes us beyond traditional forms of law making,² sharing power between many actors, public and private, at different levels of governance.³

Drawing on the key values of new governance theory – its emphasis on the participation of multiple public and private parties, on the use of a range of instruments, on multiple levels of governance, and on the non-hierarchical forms of decision making, the last section provides an exploration of the bearing of multi-scalar governance on international air transport emissions. Applying new governance theory, this section identifies the three pillars of a multi-scalar regulatory architecture for aviation emissions, including the need for a range of parties to be involved, the use of multiple instruments and the need for parties on different scales to be involved. In addition, a move away from hierarchy in decision-making may allow for gaps left by more traditional approaches to be filled.

¹ Beate Kohler-Koch & Berthold Rittberger, ‘Review Article: The ‘Governance Turn’ in EU Studies’ (2006) 44 *J. Common Mkt. Stud.* 27.

² Kenneth Armstrong & Claire Kilpatrick, ‘Law, Governance, or New Governance? The Changing Open Method of Coordination’ (2006-2007) 13 *Colum. J. Eur. L.* 649, p. 651.

³ Joanne Scott (ed.), *Environmental Protection: European Law and Governance*, (Oxford University Press, Oxford 2009); the special issue of the *European Law Journal* (Volume 8, 2002) on “law and new approaches to EU governance”, pp. vii.

2. The Need for a Multi-scalar Climate Regulatory Architecture

Chapter 2 explores the complexity of climate change and aviation emissions. I am not going to repeat that discussion, but rather I will approach the problem through a scalar lens and explore the possibilities for the next generation of climate governance. This view of future climate governance expresses the hope that it may be possible to move past some of the current battles by treating international aviation emissions as a multi-scalar problem needing multi-scalar regulations. In presenting this argument, this section explores the following questions: the nature of multi-scalar problems; the reasons why multi-scalar problems need multi-scalar regulations; and how aviation emissions relate to these sorts of problems.

The essence of multi-scalar problems is that the regulations that are currently in place are limited and the problems have dimensions far beyond the capacity of any single agency on any particular scale to manage effectively. They also appear “massive” for policymakers when seen from a distance.⁴ It requires a proper understanding of “not only who and what are causing them, but which policy responses will prove most effective.”⁵ Understanding the nature of multi-scalar problems must also address two possible mistakes: “scaling up” the problems as “larger-scale versions of small-scale problems” or “scaling down” the problems as an aggregation of smaller-scale problems.⁶

Multi-scalar problems should not be upscaled.⁷ For problems which can be upscaled, “policy models that work well at small scales and can be confidently ‘upscaled’ without loss of reliability in guiding policy design.”⁸ The “scaling up” approach to climate regulation emphasises the necessity of a top-down conventional approach and focuses on the mitigation efforts on the international level with no

⁴ J.B. Ruhl & James Salzman, ‘Massive Problems in the Administrative State: Strategies for Whittling Away’ (2009) Draft copy available online at: <<http://ssrn.com/abstract=1280896>> last accessed 07.06.10. In their article, climate change was taken as an example of “massive problems” that “have dimensions far beyond the capacity of any single agency to manage effectively,” and “are as much a challenge for legislatures as for agencies.” p. 9.

⁵ *Ibid.*, p. 14.

⁶ *Ibid.*, p. 14; Hari M. Osofsky, ‘Is Climate Change “International”? Litigation’s Diagonal Regulatory Role’ (2009) 49/3 *Va. J. Int’l L.* 585, 603.

⁷ *Ibid.*

⁸ J.B. Ruhl & James Salzman, (n.4), p. 14.

room left for state or local level actions.⁹ However, for multi-scalar problems, if regulatory strategies focus only on top-down, international-level approaches grounded in nation-state consent, the global/international nature of the problem constitutes an impediment to the “cross-cutting” efforts that are required in solving the problems.¹⁰ The conventional top-down approaches, which were examined in Chapters 3 and 4, when used to guide the design of regulatory institutions and instruments have proven deeply inadequate when confronted by the complexities of international aviation emissions.

Another mistake is to scale down the multi-scalar problems and treat them as simple aggregation phenomena. Regulators who treat massive problems as if they are simple aggregation phenomena will “have only limited success, potentially causing more problems than they solve.”¹¹ This is because the response of massive problems to different regulatory approaches might differ substantially, but “with the increases in scale also come increases in complexity of behaviour.”¹² In the case of massive problems, Ruhl and Salzman have argued that “policy models proven useful at smaller scales may be less effective, useless, or even counterproductive.”¹³

Given that such massive problems are “deeply embedded in our economy and way of life at multiple levels,”¹⁴ neither a “scaling up” nor a “scaling down” approach to regulating multi-scalar problems would seem adequate. Administrative law scholars have been struggling with the appropriate multi-scalar legal approaches to such massive problems.¹⁵ It has been argued that regulating these massive problems deserves multi-scalar, multi-agency coordination networks to address them effectively.¹⁶ Climate change has been treated as a massive problem, as it is not only a global issue, but also an individual, local, national and regional problem.¹⁷ Vandenberg and Cohen supported multiple strategies in the climate change context and they said that:

“No single strategy will be adequate on its own, and some may fail altogether, but if a sufficient number create incentives for emissions reductions there is reason for optimism. Some strategies will have direct

⁹ Ibid.; Hari M. Osofsky, (n. 6).

¹⁰ Hari M. Osofsky, *ibid.*

¹¹ J.B. Ruhl & James Salzman, (n.4), p. 37.

¹² *Ibid.*, p. 14.

¹³ *Ibid.*

¹⁴ Hari M. Osofsky, (n. 6), p. 587.

¹⁵ *Ibid.*; J.B. Ruhl & James Salzman, (n.4).

¹⁶ J.B. Ruhl & James Salzman, *ibid.*

¹⁷ Hari M. Osofsky, (n. 6).

effects on national incentives, and some will create indirect, hydraulic pressure [for joining the complying with legal regulations on climate change in the post-2012 era].”¹⁸

Osofsky, together with Ruhl and Salzman, has also argued that the scale of climate regulation must fit the scale of the problem.¹⁹ It seems simple to fit the “matching principle” from administrative law, which claims that a regulatory authority should “go to the political jurisdiction that comes closest to matching the geographic area affected by a particular externality.”²⁰ But the difficulty is that the climate change problem is “a contested topic with vigorous arguments made for matching climate change to regional, state, and local government scales, as well.”²¹ Osofsky has claimed that because greenhouse gas emissions and impacts are multi-scalar – “individual, local, state, national, regional, and international” – focusing predominantly on any one level of governance limits solutions. He has argued for exploring “diagonal” approaches in the context of climate litigation, which means cross-cutting approaches, including both vertical (multiple levels of government) and horizontal (branches of government or other entities functioning at the same level) divisions of governance.²² It is not clear what would satisfy the cross-cutting quality of governance and comprise diagonal interactions in regulation, but Osofsky has provided a creative approach to climate change regulation and a useful way of thinking about regulatory design on international aviation emissions. New ideas in designing a legal regulation for aviation emissions may be grounded in opportunities for much needed innovation and emissions reductions arising from multi-track coordination.

The impact of international aviation emissions on climate change is not solely

¹⁸ Michael P. Vandenbergh & Mark A. Cohen, ‘Climate Change Governance: Boundaries and Leakage’ (November 24, 2009) *NYU Environmental Law Journal*, Forthcoming, Vanderbilt Law and Economics Research Paper No. 09-25; Vanderbilt Public Law Research Paper No. 09-31, p. 2. Online available at SSRN: <<http://ssrn.com/abstract=1511797>> last accessed 07.06.10.

¹⁹ Hari M. Osofsky, (n. 6); J.B. Ruhl and James Salzman, (n. 4).

²⁰ Henry N. Butler & Jonathan R. Macey, ‘Externalities and the Matching Principle: The Case for Reallocating Environmental Regulatory Authority’ (1996) 14 *Yale L. & Poly Rev* 23, 25. See also Daniel C. Esty, ‘Good Governance at the Supranational Scale: Globalizing Administrative Law’ (2006) 115 *Yale L. J.* 1490, 1493.

²¹ J.B. Ruhl & James Salzman, (n. 4), pp. 10-11.

²² Hari M. Osofsky, (n. 6). In the context of climate change, Osofsky considered with different sources in explaining how climate change challenge should subject to different level of governance. His arguments apply especially to one single source, e.g. road transportation. (see pp. 592-595 of Osofsky’s article). He has argued that, for a broad range of single emissions sources, “current and future emissions are shaped through multiscalar regulatory dynamics.” See also his discussions focused on energy industry, Hari M. Osofsky, ‘The Geography of Climate Change Litigation: Implications for Transnational Regulatory Governance’ (2005) 83 *Wash. U. L. Q.* 1789.

an international problem, but rather it is a multi-scalar one that deserves multi-scalar regulations because of the following three considerations. First of all, the impact of international aviation emissions on climate change is a highly complex issue. Treating it solely as an international problem, with a top-down regulatory approach “fails to capture its complexity and the way in which it interacts with all different levels of governance.”²³ The current regulatory strategy of “being seen to do something” by the UNFCCC and then “passing on the tough choices” to ICAO, as has been discussed in Chapters 3 and 4, is “an all-too-common strategy in the face of policy problems of massive dimensions.”²⁴ It is becoming clear that the current dilemmas over climate regulation of aviation emissions reflect the limited capacity of the conventional international strategy. The problem with climate regulation of aviation emissions is therefore how to overcome deadlock and how to ensure effective solutions. Professor Mayntz has argued that there are several conditions for collaborative problem-solving. One of his most valuable messages is that “the level at which a problem manifests itself is not necessarily the level at which it can most effectively be solved.”²⁵ Curbing the growth of international aviation emissions is a global problem, but one that conventional top-down international regulations cannot effectively solve. In these circumstances, the potentials of national and regional level regulations on international aviation emissions imply the nuanced scale of the problem, which should not be ignored. For example, national fuel taxes on short haul international flights can reduce artificially increased demand for flying and can also provide incentives for innovation, as discussed in Chapter 5. Regional emissions trading is a tool for mitigation within the global sectoral target and also provides an example of multiple levels approach to the climate problem, as discussed in Chapter 6. And the international level has potentially crucial contributions to make, in setting global targets, but more modestly in, for example,

²³ Ibid., p. 632.

²⁴ See J.B. Ruhl & James Salzman, (n. 4), p. 9. See also Robert L. Glicksman, ‘Balancing Mandate and Discretion in the Institutional Design of Federal Climate Change Policy’ (2008) 102 *Nw. U. L. Rev. Colloquy* 196, 197. From a U.S. federal litigation perspective, it was argued that “[c]ongress should vest more discretion in agencies to decide how to address climate change than it does on the question of whether to do so.”

²⁵ Renate Mayntz, ‘From Government to Governance: Political Steering in Modern Societies’, Speech on International Summer Academy, (September 7-11, 2003), p. 7, Wuerzburg, Germany, Organised by the Institute for Ecological Economy Research (IOEW), Akademie Frankenwarte and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, online available at: <http://www.ceses.cuni.cz/CESES-136-version1-1A_governance_government_mayntz_2003.pdf>last accessed 15.04.10.

providing environmental auditing as discussed in Chapter 4. While the local or city scale is not a focus of this thesis, intervention at that level can be envisaged. For example, the expansion of airports is governed by local governments and may increase demand for flying. Regulating international aviation emissions is not only an international problem, but also a national, regional and local problem. Although there is no guarantee of success in the multi-scalar initiatives, Osofsky has argued that “the nuanced scales of the problem and the regulatory issues they pose suggest the value of openness towards strategies that treat the problem as multi-scalar rather than simple large scale.”²⁶

Second, curbing the growth of aviation emissions needs not only large-scale efforts but also smaller-scale ones. Even if an ideal treaty regime on aviation emissions with accompanying rigorous national policies is achievable, for the long term, “a predominantly larger-scale approach may not be able to address the details effectively and provide the innovativeness of these smaller-scale efforts.”²⁷ For example, the expansion of international aviation results from individual, local, national, regional and international decisions. At an individual level, each person makes choices to take a plane or travel by Eurostar from London to Paris. Cities are often more competent than larger-scale governments at deciding whether expansions of local airports are necessary and they are more aware of the nuances of the local environment. Although each individual’s choices or each city’s impacts have only a minor impact on total aviation emissions, trends in smaller-scale decisions add up, even at the global scale.²⁸ If the regulatory architecture does not incorporate these kinds of efforts, it will be less effective in reducing emissions.

Third, a rigid “scaling up” approach to climate change emphasises the necessity of top-down conventional approach which may also block creative solutions from non-governmental entities. Legal regulations should incentivise research and the use of technical measures by policymakers and industry. The impact of aviation on climate change is an issue where stakeholders “have the requisite knowledge to design an appropriate solution” in which “increased

²⁶ Hari M. Osofsky, (n. 6), p. 632.

²⁷ Ibid., p. 633.

²⁸ J.B. Ruhl & James Salzman, (n.4); Judith Resnik, Joshua Civin & Joseph B. Frueh, ‘Ratifying Kyoto at the Local Level: Sovereignism, Federalism, and Translocal Organizations of Government Actors (TOGAS)’ (2008) 50 *Arizona Law Review* 709.

participation becomes not only desirable, but also necessary.”²⁹ Law must find a way of flexibly moving among the governance of multiple agencies, including both public and private entities. Aviation emissions regulation may help to motivate that kind of innovation on the part of multiple agencies and to create emissions reductions and responses to impacts that might not have occurred otherwise. But if these regulations are created according to a “scaling up” model, they may become a way of blocking private agencies and putting all the regulatory efforts into a less effective approach to solving the problem.

In the light of the above discussions, when seen through a scalar lens, the impact of aviation emissions on climate change is simultaneously individual, local, national, regional and international, and legal regulation must find a way of flexibly moving among those levels of governance. The design of coordinated multi-scalar policy responses to aviation emissions may help to motivate innovation from both the public and the private sides and to create emissions reduction efforts from multiple levels of governance. The scale of the problem has much to say about which regulatory entities and methods of reduction are best to choose in the case of the aviation industry. The above discussions suggest the importance of exploring what effective multi-scalar governance might look like in more depth. To be sure, this is not the first example of the need to recognise multi-scalar problems as targets for law and regulation. The next section will examine the role of new governance theory as the theoretical foundations of multi-scalar governance and explore the potential of diagonal approaches to assist in the creation of more effective multi-scalar regulation architecture for international aviation emissions.

3. The Role of New Governance Theory

New governance theory is one of the approaches in the recent scholarship which has engaged with the complexities of regulatory scale and the appropriate role of traditional top-down approach and multiple levels approach in struggling with the

²⁹ David M. Trubek & Louise G. Trubek, ‘New Governance and Legal Regulation: Complementarity, Rivalry, and Transformation’ (2007) 13 *Colum. J. Eur. L.* 539, 542.

appropriate design of cross-cutting efforts to solve global problems³⁰ – which sets out some promising strategies to consider.³¹ Chapter 1 drew a brief picture of the nature of new governance theory and how it emerged. Although there is no specific definition, new governance theory is generally accepted as “a new model of collaborative, multi-party, multi-level adaptive, problem-solving.”³² The emergence of new governance with its many motivations may be attributed to very complex problems which are hard to solve and about which we have limited experience.³³ Some scholars have also argued that new governance theory has arisen “spontaneously, largely to fill the vacuum” left by the persistent failures of traditional legal approaches.³⁴ As mentioned at the beginning of this chapter, it is worth noting that new governance theory is used in this thesis to shed theoretical light on the conclusions arrived at in Chapters 1 to 6; in addition the contribution of new governance theory to the regulation of aviation emissions provides a means of testing its ability to account for the real-life failure of traditional, top-down regulation. The function of introducing new governance in this thesis is two-fold, both to challenge existing paradigms of global solution and to provide an alternative solution.

Before discussing the specific values of new governance for regulating aviation emissions, it is necessary at this stage to understand to what extent new governance contributes a theoretical perspective on the failure of traditional regulatory approaches and a solution for the failure of traditional regulation. This requires a brief examination of the relationship between new governance and law.

In examining the relationship between new governance and law, I need to start with a specific conception of law in mind. This may require no less than the writing of an entire book.³⁵ Given the preliminary understanding of new governance that I

³⁰ Hari M. Osofsky, (n. 6).

³¹ New governance has been used as a theoretical foundation for multi-scalar problem solving, see Hari M. Osofsky, *ibid.*; J.B. Ruhl & James Salzman, (n.4).

³² Bradley C. Karkkainen, ‘“New Governance” in Legal Thought and in the World: Some Splitting as Antidote to Overzealous Lumpiness’ (2004) 89 *Minn. L. Rev.* 471, p. 473.

³³ David M. Trubek & Louise G. Trubek, (n. 29), p. 542.

³⁴ Kenneth W. Abbott & Duncan Snidal, ‘Strengthening International Regulation Through “Transnational New Governance”’ (2008) online available at:

<http://works.bepress.com/kenneth_abbott/1>, p.1.

³⁵ There are many different concepts of law, see general Ronald Dworkin, *Justice in Robes* (Belknap

arrived at in Chapter 1, the concept of law which will be discussed here will be approached in terms of its different values or functions from those of the new governance – being harder, more coercive, more hierarchical, less flexible, etc. This dichotomy may be too sharp, but it helps us to distinguish new governance from conventional legal regulations. It follows that I need to think about the softness of new governance.

A first point that I need to make is simply to underline that there are many controversial answers to the question of the relationship between law and new governance, because both law and new governance are contested concepts.³⁶ Some initial sense of what the relationship might look like may be found by comparing the different approaches to law and new governance. The first approach emphasises the difference or “gap” between them. Examining the possible relationship between law and new governance, Walker and de Búrca have argued that law and new governance are different species of normative ordering, each of which achieves some kind of overarching balance between universalizability and reflexivity; but the tendency of law is to give priority to the meta-value of social regularity and that of new governance is to give priority to the meta-value of social responsiveness.³⁷ The “gap” thesis takes two standard forms: “law resists the new governance phenomenon” and “law is confronted with a reduction in its capacity.”³⁸ Following this thesis, Tamara Hervey has argued that there is a significant gap in practice between constitutional law and emerging new governance processes in the health care field in the EU.³⁹ The existence of such a gap is embedded in the lack of constitutional visibility.⁴⁰ Many examples in health care, safety regulation and employment policy, even in race and

Press of Harvard University Press, Cambridge, Mass.; London 2006).

³⁶ See generally, Grainne de Búrca & Joanne Scott, Grainne de Búrca & Joanne Scott, ‘Introduction: New Governance, Law and Constitutionalism’ in Grainne de Búrca & Joanne Scott (eds.), *Law and New Governance in the EU and the US* (Hart, Oxford 2006).

³⁷ Neil Walker & Grainne de Búrca, ‘Reconceiving Law and New Governance’, (2006-2007) 13 *Colum. J. Eur. L.* 519.

³⁸ Grainne de Búrca & Joanne Scott, (n. 36), p. 4; Joanne Scott & David M. Trubek, ‘Mind the Gap: Law and New Approaches to Governance in the European Union’ (2002) 8/1 *Eur. L.J.* 1.

³⁹ Tamara K Hervey, ‘The European Union and the Governance of Health Care’ in Grainne de Búrca & Joanne Scott, (n. 36), p. 178.

⁴⁰ Joanne Scott & Jane Holder, ‘Law and New Environmental Governance in the European Union’ in Grainne de Búrca & Joanne Scott, *ibid.*, pp. 211, 235.

gender issues, have shown that law may impede the emergence and functioning of new governance.⁴¹ None of these issues can compare with climate change “either in terms of the acuteness of the problem or the political salience of the policy response.”⁴² New governance provides an opportunity to address climate change when international laws fail.

A second approach to the relationship between law and new governance argues that they can co-exist in a variety of ways, including complementing each other, rivalling each other, or acting in a transformative way which leads to a shift from law to regulation and then to governance.⁴³ These different forms of co-existence can directly be approached through the “hybridity thesis.”⁴⁴ This acknowledges the interaction between law and new governance. In this context, new governance is not totally outside old style legal instruments.⁴⁵ Looking at the legal history, Neil Gunningham has claimed that “if one looks at either the Anglo-Saxon jurisdictions or the Directives of the EU, there is evidence that substantial pockets of command and control regulation are alive and well, and that even neo-liberal governments continue to favour this approach in some areas.”⁴⁶ According to Gunningham’s argument on transformation, new governance may involve “a shift from regulation to governance” and may “overstate the significance of” the changed roles of private actors.⁴⁷ However, in another dimension of the transformation, it happens in “a less thorough-going and more gradual or piecemeal fashion.”⁴⁸

Both of these approaches to the relationship between law and new governance point to the softness of the new governance in terms of involving multiple parties in decision-making, but provide no specific understanding of what kind of softness is appropriate in new governance and why. This is important because it may not only help us to better understand the relationship between new governance and law but

⁴¹ Louise G Trubek, ‘New Governance Practices in US Health Care’ in Grainne de Búrca & Joanne Scott, *ibid.*, p. 245; in the same book, Orly Lobel, ‘Governing Occupational Safety in the United States’ p. 269; Claire Kilpatrick, ‘New EU Employment Governance and Constitutionalism’, p. 121; Susan Sturm, ‘Gender Equity Regimes and the Architecture of Learning’, p. 323.

⁴² Joanne Scott, ‘The Multi-level Governance of Climate Change’, in Paul Craig & Grainne de Burca (eds.), *The Evolution of EU Law* (Oxford University Press, Oxford, 2010).

⁴³ See generally, David M. Trubek & Louise G. Trubek, (n. 29).

⁴⁴ Grainne de Búrca & Joanne Scott, (n. 36), pp. 6-9.

⁴⁵ Charles Sabel & Jonathan Zeitlin, ‘Learning from Difference: The New Architecture of Experimentalist Governance in the EU’ (2008) 14 *Eur. L. J.* 271.

⁴⁶ Neil Gunningham, ‘Environmental Law, Regulation and Governance: Shifting Architectures’ (2009) 21/2 *JEL* 179, p. 207.

⁴⁷ *Ibid.*

⁴⁸ Grainne de Búrca & Joanne Scott, (n. 36), p. 10.

also to identify the role of public and private actors and the impact and effectiveness of a range of different institutional designs for problem solving. Questioning the softness of new governance is actually a way of asking what kind and degree of soft mechanisms may be preferable to hard regulation and to what extent the soft mechanisms may contribute to regulatory design on aviation emissions.

New governance scholars have written many works which have contributed to our understanding of the softness of new governance, but sometimes they make it even more confused. Attempts to characterize the softness of new governance may deliver only a more “muddled identity” of the softness in new governance.⁴⁹ For example, Lobel has explained the softness in new governance in terms of various criteria, including flexibility, non-coerciveness, informalism, less rigid procedural requirements and nonenforcement or nonenforceability.⁵⁰ Apart from this long list of soft legal forms, she summarizes key differences between the “New Governance Model” and the “Traditional Regulatory Model” and she characterizes the “power of law” under the New Governance Model as “soft”, “aspirational”, providing “guidance”, being “voluntary” and “structured but unsanctioned,” whereas law in the Traditional Regulatory Model was said to be “hard”, “coercive”, consisting of “rules”, being “mandatory” and “sanctioned.”⁵¹ Yet, her contribution was criticised by Karkkainen for being only “collectively desperate to latch onto some, perhaps any form of ‘softness’, without being able to articulate a coherent rationale for doing so or to agree upon what form such ‘softness’ should take.”⁵² What’s more, Karkkainen examined the complex interactions between hard and soft measures in the area of environmental law,⁵³ and warned of the risk of misunderstanding

⁴⁹ Kenneth Armstrong & Claire Kilpatrick, ‘Law, Governance, or New Governance? The Changing Open Method of Coordination’ (2006-2007) 13 *Colum. J. Eur. L.* 649, p. 660.

⁵⁰ Orly Lobel, ‘The Renew Deal: The Fall of Regulation and the Rise of Governance in Contemporary Legal Thought’ (2004) 89 *Minn. L. Rev.* 342, pp. 388-89.

⁵¹ *Ibid.*, pp. 405-06 table 2; Borrás and Jacobsson also produced a work that identified the OMC is based on “voluntarism, subsidiarity, flexibility, participation, policy integration, and multi-level integration.” Susanna Borrás & Kerstin Jacobsson, ‘The Open Method of Coordination and New Governance Patterns in the EU’ (2004) 11 *J. Eur. Pub. Pol’y* 185.

⁵² Bradley C. Karkkainen, ‘“New Governance” in Legal Thought and in the World: Some Splitting as Antidote to Overzealous Lumping’ (2004) 89 *Minn. L. Rev.* 471, p. 486.

⁵³ Bradley C. Karkkainen, ‘Adaptive Ecosystem Management and Regulatory Penalty Defaults: Toward a Bounded Pragmatism’ (2003) 87 *Minn. L. Rev.* 943; Bradley C. Karkkainen, ‘Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism’ (2001-2002) 21 *Virginia Environmental Law Journal* 189; Bradley C. Karkkainen, ‘Environmental Lawyering in the Age of Collaboration’ (2002) *Wis. L. Rev.* 555; Bradley C. Karkkainen, ‘Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New Paradigm?’ (2001) 89 *Geo. L. J.* 257; Bradley C. Karkkainen, ‘Toward a Smarter NEPA: Monitoring and Managing Government’s Environmental Performance’ (2002) 102 *Colum. L. Rev.* 903.

flexibility as voluntarism, which may equate governance approaches with merely voluntary guidance and provide less than conventional legal approaches.⁵⁴ In replying to Karkkainen, Lobel has emphasised that “what is new in the governance model is not the existence of soft aspects of law, but rather their recognition. Governance cannot and should not replace conventional, sanctioned approaches in all contexts.”⁵⁵ Indeed, an easy characterization of new governance as implying a move from hard to soft was rejected by many other scholars as well. Schelkle has examined how hard law can operate “in the shadow” of soft law, and has argued for a hybridity of soft law and hard law moving in non-parallel tracks as soft law obligations may serve to reinforce the acceptance and enforcement of hard law.⁵⁶ Tamara Hervey and Louise Trubek have supported the theme of hybridity and they have argued for the need to combine traditional law-based regulation with more experimentalist institutions and processes of implementation.⁵⁷ Sabel and Zeitlin have clearly argued that “the new architecture of EU governance is not ‘soft law’, but neither is it traditional ‘hard law’ of a form that grows out of and is reducible to principle-agent rule making.”⁵⁸ Therefore, to distinguish between different forms of soft law may result in “conflated” categories of soft law and new governance,⁵⁹ that which may become an obstacle to identifying the softness of new governance. At a certain extreme, it may lead to a significant misconception that new governance is such that “it is wholly reliant on ‘soft law’ mechanisms, and therefore ultimately dependent on the good intentions and voluntary actions of parties who heretofore have shown little inclination toward acting in the desired directions.”⁶⁰

Nevertheless, new governance includes both soft and hard mechanisms. As it is in its early stages, new governance is not yet ready to provide a clear answer to the question how far the soft nature of new governance is appropriate and how far it may deliver effectiveness in problem-solving. There are many uncertainties hiding in the

⁵⁴ Bradley C. Karkkainen, (n. 52).

⁵⁵ Orly Lobel, ‘Setting the Agenda for New Governance Research’, (2004-2005) 89 *Minn. L. Rev.* 498, 506.

⁵⁶ Waltraud Schelkle, ‘EU Fiscal Governance: Hard Law in the Shadow of Soft Law?’ (2006-2007) 13/3 *Columbia J. of European L.* 705.

⁵⁷ Tamara Hervey & Louise Trubek, ‘Freedom to Provide Health Care Services within the EU: An Opportunity for a Transformative Directive’ (2006-2007) 13/3 *Columbia J. of European L.* 623.

⁵⁸ Charles F. Sabel & Jonathan Zeitlin, ‘Leaning from Difference: The New Architecture of Experimentalist Governance in the European Union’ (2007) La Follette School of Public Affairs at the University Wisconsin – Madison, Working Paper No. 2007-020, p. 54.

⁵⁹ Kenneth Armstrong & Claire Kilpatrick, (n. 49), p. 660.

⁶⁰ Bradley C. Karkkainen, (n. 52), pp. 488-89.

“stakeholder label” of the new governance, the words borrowed from Karkkainen to describe the nature of the new governance.⁶¹ This label described the collaboration among a diverse group of stakeholders who are engaged in decision-making processes, but did not give answers to many significant questions, e.g., “how are the appropriate groups and their ‘representatives’ to be selected, and how do we ensure the quality and fairness of the representation that occurs?”⁶² What blocks the answering of these questions is the unique situation of each case, which means that even the most successful policy experiment will be ambiguous and will be contested in a changed situation and this means that it cannot be replicated widely.⁶³ The innovations in certain fields of new governance practice may become narrow and subject-specific experiences that may not fit into the broader sweep of the emerging new governance scholarship.⁶⁴ Although there is a need to identify its various components within a general framework, the need to call more attention to the commonalities of the new governance scholarship is outside the concerns of this thesis. In order to be applied properly to the issue of climate change associated with aviation, I will explore the core values of new governance only for the current purposes in the next section.

4. Applying the Theory to Explore a Multi-scalar Regulatory Architecture

In the previous discussion, it has been clear that the impact of aviation emissions on climate change is a multi-scalar problem that is “far beyond the capacity of any single agency to manage effectively.”⁶⁵ New governance theory provides “a new model of collaborative, multi-party, multi-level, adaptive, problem-solving.”⁶⁶ I find the new governance theory to be a positive theoretical foundation to challenge the conventional search for a global response, and contribute to an innovative solution. This section applies the theory in exploring the

⁶¹ Bradley C. Karkkainen, ‘Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism’ (2001-2002) 21 *Virginia Environmental Law Journal* 189, p. 238.

⁶² *Ibid.*, p. 239.

⁶³ Bradley C. Karkkainen, (n. 52).

⁶⁴ *Ibid.*

⁶⁵ J.B. Ruhl & James Salzman, (n. 4), p. 7.

⁶⁶ Bradley C. Karkkainen, (n. 52), p. 473.

potential of the creation of a more effective multi-scalar regulatory architecture for international aviation emissions. It discusses the elements of new governance theory that are of most interest to my thesis: the participation of multiple public and private parties; the use of a range of instruments; the multiple levels of governance; and the non-hierarchical form of decision-making. I argue that the primary value of new governance in compensating for the failure of a traditional international legal approach on regulating international aviation emissions is the multi-party, multi-instrumental and multi-level approaches, and many of the solutions discussed in this thesis look relatively hierarchical. New governance's emphasis on non-hierarchical solutions is of interest, however, especially if non-traditional approaches are able to fill gaps left by more traditional approaches. During my discussions on the value of new governance, this section also turns from each discussion to an exploration of the bearing of multi-scalar governance on international air transport emissions. It uses these four pillars of a multi-scalar regulatory architecture on aviation emissions, i.e. the need for a range of parties to be involved, the use of multiple instruments, the need for different scales to be involved, and the role of non-hierarchical solutions.

4.1. The Participation of Multiple Public and Private Parties

A core value of new governance is the involvement of multiple parties in decision-making. New governance has suggested “an approach based on ‘societal steering’ in its broadest sense with decision-making involving the totality of interactions between public and private actors, and the state no longer playing a central role in decision-making.”⁶⁷ The coexistence of public and private actors in decision-making is necessary “to secure the on-going coordination and integration of responses among multiple parties,” because “what is required can never be fully specified in advance.”⁶⁸ “Conventional inter-sovereign cooperative agreements” or

⁶⁷ Neil Gunningham, (n. 46), p. 203.

⁶⁸ Bradley C. Karkkainen, ‘Post-Sovereign Environmental Governance’ (2004) 4/1 *Global*

“rules of obligation” are not adequate to the task.⁶⁹ New governance also provides private parties with a central role in problem solving through “operating singly and through novel collaborations,” while the role of the state becomes “correspondingly modest and largely indirect.”⁷⁰

I argue that regulating international aviation emissions should not rely exclusively on states or on international organisations like the UNFCCC or ICAO, but on multiple parties’ efforts towards a common but multifaceted goal. Both public and private parties should be involved in the decision-making on curbing the growth of aviation emissions. This argument includes two perspectives: involvement of a range of parties in any decision making procedure and involvement of private regulations.

The private actors in this context include “(a) firms and industry groups whose own practices are the targets of regulation; (b) NGOs and other civil society groups, including labor unions and socially responsible investors; and (c) combinations of actors from these two categories.”⁷¹ They represent different functional and socio-economic interests as Professor Mayntz has put it “organizations like labor unions, business associations, organizations of health care providers, of scientists and scientific research institutes, and organizations representing consumer interests or ecological values.”⁷² The involvement of multiple groups brings a range of information, knowledge and perspectives into decision making. For example, airlines have direct information and knowledge on the possible measures to improve fuel efficiency and reduce flying. Environmental NGOs contribute experience relating to the environmental effects of aviation; they may also contribute a perspective on the urgency of this problem. This will be counterbalanced by other NGOs and businesses that may be concerned by the social and economic impacts of reductions in flying.

Environmental Politics 72, 76.

⁶⁹ Ibid.

⁷⁰ Kenneth W. Abbott & Duncan Snidal, (n. 34), p. 2.

⁷¹ Ibid.

⁷² Renate Mayntz, (n. 25), p. 5. He used the term of “corporate actors” to refer to private actors and argued that for the emergency of modern governance, there must be corporate actors.

The main concern about private actors is the role of industry groups and business associations, such as airlines and IATA, in the case of regulating aviation emissions. It was IATA suggested that be put in charge of the initial allocation in a global emissions trading scheme discussed in Chapter 6. The involvement of IATA in regulating aviation emissions would put airlines in the position of being one of the regulators while their own practices are the targets of regulation. The involvement of regulated parties in regulation would not be wholly innovative. It may be positive in some respect: “[l]aw can rarely hope to be meaningful and effective without the cooperation, indeed the normative accord, of the vast majority of the populations it hopes to control.”⁷³ Examining regulation and business behaviour, Gunningham and Kagan have emphasised that:

“For while governments promulgate laws and regulations, it is business corporations that must test the safety of products and vehicles, devise ways of reducing workplace hazards, and institute accurate accounting systems. Environmental regulation depends almost entirely on business firms to develop, finance and install pollution measurement and prevention technologies. The day-to-day effectiveness of regulatory compliance measures depends on the training and diligence of the corporate employees assigned to maintain equipment, monitor quality-control systems, train operatives, and take appropriate action when problems occur.”⁷⁴

The involvement of industry groups and business associations in new governance is attractive, as it brings in “private regulations” as part of the solution to multi-scalar problem.⁷⁵ Under private regulations, states or intergovernmental

⁷³ Neil Gunningham & Robert A. Kagan, ‘Regulation and Business Behavior’ (2005) 27/2 *Law & Policy* 213, 213.

⁷⁴ Ibid.

⁷⁵ Kenneth W. Abbott & Duncan Snidal, (n. 34). They used the term “regulatory standard-setting” instead of “private governance” referring to the “novel private, public-private and intergovernmental organization initiatives.” To emphasis its private character, the author choose the term of “private governance” in this thesis. Other scholars use different words. See, e.g., Tim Bartley, ‘Institutional Emergence in an Era of Globalization: The Rise of Transnational Private Regulation of Labor and Environmental Conditions’ (2007) 113 *Am. J. Sociol.* 297. (“transnational private regulation”); Benjamin Cashore, Graeme Auld & Deanna Newsom, *Governing Through Markets: Forest Certification and the Emergence of Non-State Authority* (Yale University Press, New Haven 2004) (“private governance systems” and “non-state market driven governance systems”); Thomas Biersteker & Rodney Bruce Hall, *The Emergence of Private Authority in Global Governance* (Cambridge University Press, Cambridge 2002) and Cashore, Auld & Newsom, (“private authority” regimes).

organisations play only minor roles, although they may participate in some largely private governance.⁷⁶ The private parties may operate “largely free of state orchestration or support.”⁷⁷

The role of NGOs is crucial. It has been argued that the participation of NGOs in law-making has “changed the face of international environmental law.”⁷⁸ This is because the development of international environmental law has been partly influenced by those NGOs which were established purely for the purpose of environmental protection.⁷⁹ Environmental NGOs have some advantages that formal regulators may lack.⁸⁰ For example, NGOs are believed in some cases to have scientific expertise that governmental authorities may lack.⁸¹ NGOs have also been argued to play an important role in “monitoring negotiations, distributing negotiation-related materials, providing technical data, drafting proposed treaty language, lobbying negotiators, acting as observers at treaty-related meetings, and monitoring treaty compliance.”⁸² From a purely pragmatic point of view, NGOs may also help in the implementation of laws.⁸³ However, NGOs “cannot

⁷⁶ Kenneth W. Abbott & Duncan Snidal, (n. 34). They used the term “regulatory standard-setting” instead of “private governance” referring to the “novel private, public-private and intergovernmental organization initiatives.” To emphasize its private character, the author choose the term of “private governance” in this thesis. Other scholars use different words. See, e.g., Tim Bartley, ‘Institutional Emergence in an Era of Globalization: The Rise of Transnational Private Regulation of Labor and Environmental Conditions’ (2007) 113 *Am. J. Sociol.* 297. (“transnational private regulation”); Benjamin Cashore, Graeme Auld & Deanna Newsom, *Governing Through Markets: Forest Certification and the Emergence of Non-State Authority* (Yale University Press, New Haven 2004) (“private governance systems” and “non-state market driven governance systems”); Thomas Biersteker & Rodney Bruce Hall, *The Emergence of Private Authority in Global Governance* (Cambridge University Press, Cambridge 2002) and Cashore, Auld & Newsom, (“private authority” regimes).

⁷⁷ Kenneth W. Abbott & Duncan Snidal, (n. 34), p. 6.

⁷⁸ David Tolbert, ‘Global Climate Change and the Role of International Non-Governmental Organizations’ in R Churchill & D Freestone (eds.), *International Law and Global Climate Change* (Graham & Trotman, London 1992), p. 95.

⁷⁹ Patricia Birnie, Alan Boyle & Catherine Redgwell, *International Law and Environment* (3rd ed., Oxford University Press, Oxford 2009), pp. 100-101.

⁸⁰ One commentator explained the role of environmental NGOs in the US climate policy context, see Gary Bryner, ‘Failure and Opportunity: environmental groups in US climate change policy’ (2008) 17/2 *Environmental Policies* 319.

⁸¹ Jonas Ebbesson, ‘The Notion of Public Participation in International Environmental Law’ (1997) 8 *Yearbook of International Environmental Law* 51.

⁸² George R Pring & Susan Y Noé, ‘The Emerging International Law of Public Participation Affecting Global Mining, Energy and Resources Development’ in Donald M. Zillman, Alastair Lucas & George Pring (eds.), *Human Rights in Natural Resource Development: Public Participation in the Sustainable Development of Mining and Energy Resources* (Oxford University Press, Oxford 2002), p. 69, n. 475.

⁸³ Barry Barton, ‘Underlying Concepts and Theoretical Issues in Public Participation in Resources Development’ in Donald M. Zillman, Alastair Lucas & George Pring (eds.), *ibid.*, p. 100. He argues other reasons include the NGOs’ advantage in professional expertise, information on local environment,

themselves remedy the whole range of weaknesses” in regulatory systems, as “their activities are necessarily issue-oriented.”⁸⁴ It has been argued that “[t]he extent to which NGOs can participate in and influence the work of international organizations depends on the constitution and practice of each organization, and varies considerably.”⁸⁵ The effectiveness of NGOs in terms of bringing more environmental interests to the decision-making procedure on regulating multi-scalar problems also depends on the nature of the NGOs (including “their seriousness of purpose, funding, depth of research, skills in political advocacy, means of exercising pressure, and narrowness of focus”⁸⁶). Whilst NGOs cannot themselves remedy the regulatory weaknesses, they may bring more environmental interests in the decision making procedure. This will to some extent compensate for any self interest of the airline industry. It seems a sensible strategy to encourage NGOs’ participation in the UNFCCC, ICAO and other governmental authorities’ decision making procedure.

The participation of private parties (airlines and NGOs) is necessary. However, as is common in new governance, notwithstanding the participation of a variety of stakeholders collaborating on multiple levels, the sovereign authorities, especially the state, retain certain important functions in the decision-making process. Jody Freeman has argued that

“the goals of efficacy and legitimacy are better served by a model that views the administrative process as a problem-solving exercise in which parties share responsibility for all stages of the rule-making process, in which solutions are provisional, and in which the state plays an active, if varied, role.”⁸⁷

The question raised here is how the different parties share responsibility in decision-making or what role the sovereign authorities (including state and international governmental organisations representing groups of states) play. Of course, new governance does not mean just putting a diverse group of stakeholders

etc.

⁸⁴ Patricia Birnie, Alan Boyle & Catherine Redgwell, (n. 79), p. 105.

⁸⁵ Ibid., p. 101.

⁸⁶ Ibid.

⁸⁷ Jody Freeman, ‘Collaborative Governance in the Administrative State’ (1997) 45 *UCLA L. Rev.* 1, p. 6.

into a room and expecting that they will automatically achieve a “win-win” solution. Whatever the softness in new governance means, it is a very complex task to sort out what kinds and levels of participation, by what group of actors may be necessary. I believe that how different parties share the power in decision-making should vary in different cases, because the success of the way that any policy has been created “depends upon factors unique to their own time, place, and fortuitous circumstances.”⁸⁸ In regulating aviation emissions, sharing responsibility among different parties should consider the difficulties of regulating aviation emissions as discussed in Chapter 2 and the capability of each party.

However, in any case, the role of the sovereign authorities in new governance should not be understated.⁸⁹ There has been a preliminary agreement that non-hierarchy is a key feature of new governance. It means that the role of the states would no longer be that of the sole decision-makers, if they ever were, and their power might be weaker than it was in the old style environmental regulation. Under new governance, sovereign states and non-state parties would collaboratively operate as partners in dealing with highly complex problems that appear to be beyond the capacity of sovereign states alone to solve. Climate change is one of the examples that cannot be, or has not yet been, solved through straightforward exercises of conventional international agreements or national/regional legislation. The collaborative arrangement of multiple parties, in this context, is an exercise in “task-specific” rather than “general-purpose” governance.⁹⁰ States have a number of crucial roles in my scheme of climate regulation, although the situation is complicated by the dominance of international regulatory arrangements. The states alone or through international cooperation within international governmental organisations, like the UNFCCC, have three key roles. First of all, “definitional guidance” refers to “the state describing and defining the nature of the collaborative

⁸⁸ Bradley C. Karkkainen, (n. 52), p. 477.

⁸⁹ The importance of state’s role has been acknowledged by other scholars as well. See e.g., Jon Pierre, ‘Conclusions: Governance Beyond State Strength’ in Jon Pierre (ed.) *Debating Governance: Authority, Steering and Democracy* (Oxford University Press, Oxford 2000), p. 242; Bradley C. Karkkainen, (n. 68).

⁹⁰ Liesbet Hooghe & Gary Marks, ‘Unraveling the Central State, But How? Types of Multilevel Governance’ (2003) 97/2 *American Political Science Review* 233, 236.

governance arrangement.”⁹¹ Although the definitional guidance role of the state can be interpreted widely, in the case of international aviation emissions, it includes what performance outcomes are expected (e.g. the sectoral mitigation target on aviation emissions and the cap for regional emissions trading) and what principle should be used to guide the regulations (focusing on improving energy intensity in the aviation sector although measures to encourage behaviour change may also be necessary, as discussed in Chapter 2). Second, the state in my scheme provides incentives for targeted actors (e.g. companies, communities, individuals or NGOs) to participate in the particular regime that is being established.⁹² The domestic fuel taxes proposed in Chapter 5, for example, demonstrate the potential of states to provide incentives both for individuals to change their behaviour and for airlines to innovate. Third, there is an important role for the state in enforcement.⁹³ For example, the technological standards established by ICAO are enforced by its member states in terms of a formal performance evaluation of their airlines’ operations. The essence of all of these three roles is in requiring governments to encourage “policy coordination” in “encouraging, facilitating, rewarding and shaping” the governance architecture.⁹⁴ Nevertheless, “matters are almost always more complex than politicians and policy-makers would prefer them to be.”⁹⁵

It is now necessary to explore the role of the multiple parties engaged in climate change regulation in more detail. I argue in this thesis that regulating aviation emissions should involve a range of parties, including both public (formal regulators like the UNFCCC, ICAO and nation states) and private (airline industry and NGOs) actors. I now set out the five main actors in my scheme. The first one is the UNFCCC. As discussed above, new governance, in a domestic context, “requires significant state capacity” as it is “a tool deployed and orchestrated by

⁹¹ Neil Gunningham, (n. 46), p. 207. Gunningham is concerned with collaborative governance schemes but his approach is useful in the current context.

⁹² Ibid.

⁹³ Ibid.

⁹⁴ Ibid., p. 208.

⁹⁵ Ibid.

governments.”⁹⁶ But, there is no global “state” to manage new governance on the international level. However, in the case of curbing the growth of international aviation emissions, the states acting together in the UNFCCC should take the role of providing “definitional guidance,”⁹⁷ specifically to establish a sectoral climate change mitigation target for aviation, as discussed in Chapter 3. Individual states would agree to share that overall sectoral mitigation target on aviation, and make cooperative efforts to achieve it.

Second, as discussed in Chapter 4, ICAO as a special agency of the UN certainly has a role to play in solving this industry specific problem. Although it is not suitable to be the sole delegated authority to regulate aviation emissions, ICAO has a technical role in setting emissions standards on aircraft. It could provide a global forum which would enable emissions reduction related actions to be transparent and trade-offs to be addressed, for example trade-off actions between CO₂ emissions and non-CO₂ emissions from aircraft engines, between reducing emissions and controlling aircraft noise and between reducing emissions and ensuring aviation safety. In ensuring a safe, efficient and environmentally friendly development of the industry, ICAO may also play an important role regarding appropriate metric, performance monitoring, reporting methods and auditing processes on member states’ reduction actions. To fulfil this role, I have advocated an environmental audit programme build by ICAO in Chapter 4.

Third, nation states should continue to engage in “policy coordination” in “encouraging, facilitating, rewarding and shaping” the governance architecture.⁹⁸ They are the formal regulators and the parties most able to put the sectoral approach on aviation emissions into action, responsible for achieving mitigation action through domestic laws, including traditional command and control regulations and market-based instruments. National level fuel taxes as discussed in Chapter 5, would make an important contribution.

Four, industry groups are important private actors in new governance theory,

⁹⁶ Kenneth W. Abbott & Duncan Snidal, (n. 34), p. 6.

⁹⁷ Neil Gunningham, (n. 46).

⁹⁸ Ibid.

acting as regulators while their own practices are the targets of regulation. In regulating aviation emissions, the principal subjects of regulation are the airlines. The participation of airlines may be represented by IATA, an industry association. In Chapter 6 above, I outline the ways in which a global emissions trading system could provide an alternative form of allocation of mitigation obligations, if burden sharing cannot be achieved more formally as described in Chapter 3. This global emissions trading needs IATA to lead the initial allocation of allowances and ICAO to monitor it. What is more, IATA's role in representing the airline industry and in developing the industry's vision of environmental policies may contribute non-traditional regulatory schemes in the absence of state action. IATA has undertaken many initiatives to minimize the impacts of aviation emissions on climate change. Representing the industry, in 2007, IATA laid out a vision to achieve carbon neutral growth in the mid-term (from 2020).⁹⁹ This would be achieved through a four-pillar strategy to reduce emissions: investment in technology; effective operations; efficient infrastructure and positive economic instruments (including emissions trading and carbon offsetting).¹⁰⁰ At its annual general meeting in June 2009, IATA launched a new and ambitious target for emissions reduction, as it committed itself to reduce the growth of aviation emissions from 2020 and to halve emissions by 2050 compared to 2005 levels.¹⁰¹ This target has been criticized, as it may not compensate for the growth angle because IATA ranks do not include the low cost carriers such as Ryanair, Easyjet or Southwest.¹⁰² A comprehensive climate change regime for aviation needs to go beyond IATA but IATA's initiatives do suggest that there is some motivation for environmental improvements in the

⁹⁹ IATA, 'A Global Approach to Reducing Aviation Emissions. First Stop: carbon-neutral growth from 2020', online available at <http://www.iata.org/SiteCollectionDocuments/Documents/Global_Approach_Reducing_Emissions_251109web.pdf> last accessed 16.04.10.

¹⁰⁰ IATA, *Building a Greener Future* (3rd ed., IATA October 2008).

¹⁰¹ IATA, *Annual Report 2009* (IATA, 2009).

¹⁰² James Farrar, 'Airlines on Climate: Don't blame us blame the Banks' (June 9, 2009) online available at <<http://www.zdnet.com/blog/sustainability/airlines-on-climate-dont-blame-us-blame-the-banks/673>>; The Climate Group, 'Airlines set out global targets for aviation emissions reductions' (June 9, 2009) online available at <<http://www.theclimategroup.org/our-news/news/2009/6/9/airlines-set-out-global-targets-for-aviation-emissions-reductions/>> last accessed 10.06.10.

airline industry.

Five, environmental NGOs should be involved. They are expected to bring more environmental interests to the decision-making procedure on regulating aviation emissions. The participation of NGOs should be on multiple levels. For example, NGOs should participate in the international negotiations under the UNFCCC system and ICAO's rule-making procedure. They may play an important role in lobbying local governments on airport expansion. They may also provide information and education to the public.

The above discussions have identified the multiple parties that should be included in the multi-scalar regulation of aviation emissions, in the light of new governance theory. Drawing on new governance theory, both public and private parties, including formal regulators (the UNFCCC, ICAO and nation states) and the airline industry (represented by IATA), should have a role in regulating aviation emissions. The coexistence of public and private actors in decision-making is necessary "to secure the on-going coordination and integration of responses among multiple parties"¹⁰³ in solving the aviation emissions problem.

4.2. The Use of a Range of Instruments

The use of a range of regulatory instruments is another value of new governance which may compensate for the failure of traditional international legal approaches on aviation emissions. New governance recognises the inherent limitations of conventional regulatory instruments, as well as the inadequacies of a legal regime based solely on market incentives.¹⁰⁴ As can be seen in the co-existence of new governance and law discussed above, traditional command and control regulations are alive in new governance, while soft mechanisms grow alongside them. Most new governance scholars acknowledge the necessity for both hard instruments and soft instruments in legal strategies, but they hold different

¹⁰³ Bradley C. Karkkainen, (n. 68), p. 76.

¹⁰⁴ Orly Lobel, (n. 50).

opinions on how the different instruments should be mixed. Some of them advocate that the incentive-based instruments should rely on “self-initiated improvements in environmental performance undertaken within an incentive system created by a mandatory legal framework.”¹⁰⁵ Some others try to blend hard and soft instruments into different mixes.¹⁰⁶ These different approaches to the way of choosing and mixing multiple instruments may lead to the simple explanation that there is no fixed role for any single instrument among a range of different institutional designs for problem-solving in different areas. I argue in this thesis not for “soft law” mechanisms – although methods such as information provision could play a role, that is beyond the scope of my thesis. However, I do argue that a range of regulatory instruments is required.

Another theoretical term referring to a new form of regulation that “seeks to harness not just governments but also business and third parties to provide policy alternatives that include, but often go beyond, direct regulation” is “smart regulation” or “regulatory pluralism.”¹⁰⁷ Apart from the introduction of a broader range of regulatory actors, the essence of smart regulation is that the use of multiple rather than single policy instruments should produce better regulation than single instrument approaches.¹⁰⁸ The implementation of tailor-made combinations of instruments would meet the imperatives of specific environmental issues. It represents a more flexible, efficient and effective approach to environmental regulations.¹⁰⁹

Regulatory design should ensure that multiple instruments are “mutually reinforcing, rather than being duplicative, or worse, conflicting.”¹¹⁰ The aim of using combinations of instruments in terms of achieving effectiveness and efficiency is to compensate for the weakness of stand-alone environmental policies. Given that

¹⁰⁵ Bradley C. Karkkainen, (n. 52), p. 488.

¹⁰⁶ Ibid.

¹⁰⁷ Neil Gunningham, (n. 46).

¹⁰⁸ Neil Gunningham et al., *Smart Regulation: Designing Environmental Policy* (Oxford University Press, 1998).

¹⁰⁹ Ibid.

¹¹⁰ Neil Gunningham, (n.46), p.201. Neil Gunningham et al., *ibid.*, ch 6.

not all instrument combinations will automatically be complementary,¹¹¹ the method of choosing multiple instruments is important. Gunningham et al. have argued that it is not practical to provide for the full implications of all instrument combinations, but they divided the plethora of potential instrument combinations into the following four categories:

- “(i) mixes that are inherently complementary;
- (ii) mixes that are inherently incompatible;
- (iii) mixes that are complementary if sequenced; and
- (iv) mixes the complementarily or otherwise of which is essentially context specific.”¹¹²

Policymakers can be “confident” in choosing the first category of combinations over others.¹¹³ This is because inherently complementary instruments include those used to target different aspects of a common environmental issue. The effectiveness and efficiency of certain inherently complementary instruments will be significantly enhanced by using them in combination, irrespective of the circumstances of the relevant environmental issues.

To put the concept of using a range of instruments in the aviation context, I argue that the legal regulation of international aviation emissions should involve multiple instruments, including conventional regulatory mechanisms and multiple market-based instruments. Different instruments might contribute to regulating aviation emissions from different perspectives. First of all, traditional command and control type of regulations are still needed. For example, a sectoral target on international aviation emissions under the UNFCCC system is suggested in Chapter 3. ICAO’s technology-based standards, as discussed in Chapter 4, might contribute to the balancing of potential trade-off effects with reducing emissions in ensuring a safe, efficient and environmentally friendly development of the industry. Second, I argue that fuel taxes should be introduced by nation states in Chapter 5. Although this cannot provide certainty in relation to the level of emission reduction, a fuel tax is an effective and fair way to address prices in the aviation case in order both to

¹¹¹ Neil Gunningham et al., *ibid.*, p. 422.

¹¹² *Ibid.*, p. 423.

¹¹³ *Ibid.*, p. 427.

affect demand and to provide incentives for innovation. Third, I argue that emissions trading should be used to curb the growth of international aviation emissions. Compared to command and control regulation, emissions trading is a more efficient way to encourage airlines to take mitigation actions. The cap of emissions trading provides certainty in environmental outcome, although in a scheme such as that provided by the EU ETS, initial reductions are not necessarily from the aviation sector. Regional emissions trading could be used as a tool for achieving regional mitigation targets within the global sectoral target under the UNFCCC system. The development of multiple regional emissions trading schemes may contribute an example of multiple levels response to the climate problem associated with aviation. This is especially valuable if the sectoral target on international aviation emissions discussed in Chapter 2 cannot be agreed. I also suggest a global emissions trading scheme for aviation in Chapter 6. This is partly a tool for the allocation of the mitigation responsibilities if a comprehensive multi-level allocation system under the UNFCCC cannot be achieved. It is also a tool for incentivising the airline industry to take mitigation actions.

These instruments should be used in combination, because they “target different aspects of a common environmental issue.”¹¹⁴ The sectoral target leads cooperative efforts towards a clear environmental outcome in regulating aviation emissions. The ICAO standards contribute to the balancing of potential trade-off effects with reducing emissions in ensuring a safe, efficient and environmentally friendly development of the industry. A fuel tax is proposed to put a price on short haul flights that would lead them to become more expensive in order to influence consumers’ behaviour, e.g. to provide incentives to take the train rather than to fly. Emissions trading aims to provide incentives for airlines to take mitigation action and to ensure that there is a cap on the total emissions. These different policy approaches complement each other since “by addressing different contributory aspects of the aviation emissions, they provide the market with

¹¹⁴ Neil Gunningham et al., (n. 108), p. 435.

mutually supportive signals.”¹¹⁵ The effects will be complicated, but broadly, the technology based standard is directed at the aviation manufacturer, while the fuel tax is directed at the consumer and the global emissions trading system is directed at the airlines. To this extent, the multi-instrumental mixes in regulating aviation emissions are complementary. This may assist policymakers to achieve multi-scalar regulation in encouraging both technical measures to improve energy intensity in the aviation sector as well as some degree of demand management as discussed in Chapter 5.

4.3. Multiple Levels of Governance

New governance is useful for solving multi-scalar problems also because of its emphasis on multiple levels of governance.¹¹⁶ As Scott and Trubek have explained, multi-level integration is one of the characteristics of new governance, which means that “new governance mechanisms may include machinery that brings actors from various levels of government (localities, subnational regions, national, European) together in ways that facilitate dialogue and coordination.”¹¹⁷

The concept of multi-level governance emphasizes that different levels of governance (including the sub-national, national and supranational levels) are interconnected, “while national arenas remain important arenas for the formation of national government preferences, the multi-level governance model rejects the view that subnational actors are nested exclusively within them. Instead, subnational actors operate in both national and supranational arenas ... National governments ... share, rather than monopolize, control over many activities that take place in their respective territories.”¹¹⁸ Thus, the essence of multi-level governance is “the

¹¹⁵ Ibid.

¹¹⁶ Multi-level governance has been well discussed in the EU. See Beate Kohler-Koch & Berthold Rittberger, ‘The ‘Governance Turn’ in EU Studies’ (2006) 44 *JCMS* 27; Maria Lee, ‘Multi-level governance of GMOs in the EU: ambiguity and hierarchy’ in Michael Cardwell & Luc Bodiguel, *Regulation of GMOs* (Oxford University Press, Oxford 2010); Joanne Scott, (n. 42).

¹¹⁷ Joanne Scott & David M. Trubek, (n. 38), pp. 5-6.

¹¹⁸ Liesbet Hooghe & Gary Marks (2001), *Multi-level Governance and European Integration* (Lanham, MD: Rowman & Littlefield), p. 4.

interdependence of actors operating at different territorial levels,”¹¹⁹ including local, national, regional, and international level.

The collaboration of multiple levels of governance intervening in decision making on complex problems could avoid recourse to single levels of authority. It enables the new model of regulation to overcome the deadlocks of using traditional legal approaches. This is crucial because, whilst much of the existing scholarship focuses on the international level, the international aviation emissions issue cannot be addressed effectively through the UNFCCC alone. The failure of the UNFCCC to regulate international aviation emissions, given the overwhelming focus on that body until very recently, means that the problem has remained largely unaddressed. Effective regulation should avoid recourse to the UNFCCC alone. Furthermore, the simplistic and uncertain understandings of the burden sharing principle in the UNFCCC system and the inherent limitations of ICAO deny international organisations the chance to experiment with potentially more efficient and effective governance forms on aviation emissions. However, we see areas in which efforts by multiple actors may contribute to the mitigation of the aviation sector, e.g. the role of ICAO in terms of performance monitoring, reporting methods and auditing processes, the role of regional authorities like the EU in terms of putting regional emission targets into action through regional emissions trading, the role of states in terms of incentivising behaviour change and innovation through fuel taxes. We also see the use of overlapping powers in a range of instruments for curbing the growth of aviation emissions, e.g. the introduction of aviation fuel taxes by states, and their monitoring at the international level by ICAO as discussed in Chapter 5. Each of these roles and instruments raises important issues about the distribution of regulatory power in a system of multi-level governance and legal pluralism, a system which includes not only international treaties and international organisations but also EU and national laws.

Although my preference is for a sectoral approach to aviation emissions within the UN system together with a multi-level burden sharing approach under that same

¹¹⁹ Beate Kohler-Koch & Berthold Rittberger, (n. 116), p. 34.

UN system, putting this into practice clearly requires multi-level governance. This includes ICAO's technology-based standards and environmental audit programme, nation states' efforts in allocating and implementing reduction targets on aircraft operators, nation states' aviation fuel taxes and regional emissions trading schemes (e.g. EU ETS). And whilst it has not been a focus of this thesis, it should be noted that sub-state level governance in planning airport expansion and providing information and education to the public will also be significant. In the worst case where a sectoral approach cannot be achieved, market-based instruments (domestic fuel taxes and regional emissions trading) at different levels, together with the role of private actors such as IATA and NGOs will be even more important in the regulation of aviation emissions.

Although I prefer a sectoral approach, and many of the other arguments in this thesis (e.g. burden sharing approach under the UNFCCC, and a global emission trading scheme) are based on the achievement of a sectoral target on aviation emissions, the legal regulation discussed in this thesis is not dependent on agreement. For example, without a sectoral approach, a domestic fuel tax on international flights and regional emissions trading may still contribute to examples of multiple levels approach to curb the growth of aviation emissions; ICAO's technology-based standards and environmental auditing programme could also make a significant contribution even in the absence of the UNFCCC system. This is a crucial departure from the bulk of legal analysis of this problem.

4.4. Non-hierarchical Form of Decision-making

New governance also emphasizes a non-hierarchical form of decision-making. Although new governance refers to a broad family of innovative modes of governance, as described in the discussion of the characteristics of new governance in Chapter 1, it is generally moving away from the old model of hierarchical, fixed top-down regulations. It is argued by proponents of new governance that the old regulatory

model is less effective than new governance,¹²⁰ partly because it “tended to produce an impossibly complex and tangled web of rigid, uniform one-size-fits-all rules that in truth did not quite fit anyone.”¹²¹ In contrast, new governance breaks with the hierarchical decision-making model and leads to a changed role for the state which has “moved substantially away from top-down command-and-control regulation to a much more decentralized and consensual approach which seeks to coordinate at multiple levels, and which is distinctively polycentric.”¹²²

The shift from hierarchical to heterarchical forms of decision-making enables more gains to be made through cooperation, dialogue and learning at non-international levels of governance. For example, the existence of local level governance may lead to responses which better take account of local circumstances, build on local knowledge and capacities, as it is thus “more likely to be sensitive to the complexities of an environmental problem and its local context than centralized regulatory decision-making.”¹²³ In facing complex issues, it has been argued that “non-hierarchical forms of decision-making can produce more effective solutions.... to process more information and to take a greater variety of values into accountmake for higher flexibility and adaptability.”¹²⁴

Rather than requiring a completely separate analysis, the move away from hierarchy (particularly in the sense of top-down international law decision-making) necessary in a response to the climate change contribution of aviation is implicit in the discussion above. The proposals above are a mixture of the traditionally hierarchical (e.g. a sectoral approach within the UN system) and the less hierarchical (e.g. the role of IATA). Non-hierarchical methods will contribute to implementing the changes needed to respond to climate change mitigation: spontaneous improvement by airlines, different levels of governance operating together to put this into practice, rather than

¹²⁰ Neil Gunningham, ‘The New Collaborative Environmental Government: The Localization of Regulation’ (2009) 36/1 *Journal of Law and Society* 145.

¹²¹ Bradley C. Karkkainen, (n. 52), p. 474.

¹²² Neil Gunningham, (n. 120), p. 146.

¹²³ *Ibid.*, p. 149.

¹²⁴ Fritz W. Scharpf, ‘Coordination in Hierarchies and Networks’ in Fritz W. Scharpf (ed.), *Games and Hierarchies and Networks: Analytical and Theoretical Approaches to the Study of Governance Institutions* (Westview, Boulder 1993), pp. 125-165.

responding to commitments from those ahead on the hierarchy. In addition, alternative methods fulfil the gaps when hierarchy fails.

Given that “[t]he need for and extent of any shift from hierarchy to heterarchy may be directly related to the nature and complexity of the environmental challenge,”¹²⁵ non-hierarchical forms of decision-making are clearly useful to climate change governance on aviation emissions. In particular, the hierarchical model of traditional top-down legal regulations, as led by the UNFCCC or ICAO, cannot be the whole answer to the current problem. But curbing the growth of international aviation emissions is so economically sensitive that some hierarchical models would be preferable in an ideal world. So, in Chapter 3, I argued for the need of a sectoral mitigation target on aviation emissions under the UNFCCC and then suggested a comprehensive multi-level burden sharing system or a global emissions trading system as possible ways of allocation. However, there are always practical difficulties in achieving a comprehensive global regulatory system. So if, for example, a sectoral mitigation target for the aviation sector or a global emissions trading system cannot be agreed, a non-hierarchical form of decision-making provides a chance to tackle the aviation emissions issue which needs to be tackled with widely dispersed resources of information or knowledge and of authority and legitimacy. Non-hierarchical form of decision-making enables multiple parties to be involved in the move away from a complete reliance on international treaty making in combating climate change associated with aviation. Cooperation through multi-regional emissions tradings or multiple national fuel taxes on aviation as discussed in Chapter 5 and 6 is different from an international treaty making approach, but is especially valuable when a sectoral approach on aviation emissions cannot be achieved at the international level. Perhaps more important in the context of non-hierarchical forms of decision-making is the participation of non-traditional actors in the cooperation, e.g. the airline industry representing by IATA and environmental NGOs, as discussed above. In regulating aviation emissions, the voluntary guidance provided by IATA contributes an example of multiple levels approach to fill gaps left by more traditional approaches. A global

¹²⁵ Ibid.

emissions trading system for the allocation of the sectoral mitigation target needs IATA to lead the initial allocation of allowances and ICAO to monitor it. NGOs are important at all levels of governance and can contribute to top-down or bottom up approaches. They can contribute to international negotiations, to national or regional approaches. They may also provide information and education to the public, creating demand for action.

Whilst heterarchy is a crucial part of new governance, its key role in my thesis is in its overlap with ideas of multiple levels of governance and multiple parties. My thesis relies largely (although not exclusively) on formal regulatory mechanisms (e.g. taxing and emissions trading) to counter the problems of industry self interest and externalities. Non-hierarchical approaches may however have a role to play given the practical difficulties of more formal regulations. Therefore, the emphasis of new governance on non-hierarchical solutions is of interest, filling gaps left by more traditional approaches.

5. Conclusion

This chapter examines the international aviation emissions issue through a scale lens and, in the process, it focuses on the importance of exploring multi-scalar approaches. It emphasises that the impact of aviation emissions on climate change is not only an international problem, but also a local, national and regional problem. As such, any efficient legal regulation should not be limited to conventional inter-state approaches, rather it requires a re-scaling of the legal regulations on aviation emissions.

Among the burgeoning literature that has engaged with the complexities of regulatory scale and the appropriate role of top-down and multiple levels approaches, I find that new governance theory is best suited to solving multi-scalar problems. Introducing new governance theory in regulating aviation emissions provides a theoretical explanation of the failure of traditional regulatory approaches. In addition,

aviation emissions provides a test for the ability of new governance theory to account in a real life situation for failure and to provide a solution.

Drawing on the new governance theory, I argue that regulating aviation emissions should involve a full range of parties, including both public (formal regulators like the UNFCCC, ICAO and nation states) and private (airline industry and NGOs) parties. It should also involve multiple regulatory instruments, including a sectoral mitigation target, technology-based standards, fuel taxes and emissions trading. Multiple scales of action are required, including international targets, multi-level allocation of mitigation obligations, national fuel taxes, regional efforts on emissions trading, and (whilst not a focus of this thesis) some sub-state level governance. In this way, I draw a picture of a multi-scalar regulatory architecture of international aviation emissions. Recognising climate change as a multi-scalar problem that needs multi-scalar regulatory approaches might be able to move the international aviation emissions problem beyond the deadlock of conventional international inter-state approaches.

Chapter 8 Conclusion

Neither the UNFCCC nor ICAO has made adequate progress in responding to the contribution of international aviation to climate change. And yet much legal scholarship contributes to focus on this conventional top-down international governance model. By contrast, in this thesis I look for ways to move beyond the deadlock in international arenas. The regulation of international aviation emissions needs to be approached through a scalar lens. When seen in this way, the impact of aviation emissions on climate change is simultaneously local, national, regional and international, and legal regulation must find a way of flexibly moving among those levels of governance. This does not involve a complete rejection of traditional international treaty making. But I conclude that neither conventional top-down international legal regimes, nor any single regulatory instrument can solve the problem of aviation emissions' impact on climate change. New governance theory provides a theoretical framework within which to identify the failures of traditional regulatory approaches and explore the future of the regulation of aviation emissions. New governance theory provides a response to the failure of the international approach to aviation's contribution to climate change, grounded in both a realistic analysis of the nature of the problem, and a solid theoretical framework. As well as providing a theoretical explanation of the failure of traditional regulatory approaches, new governance theory is tested in this thesis in its ability to account for the failure of traditional, top-down regulation, and to provide a solution. The design of coordinated multi-scalar policy responses to aviation emissions may help to motivate innovation from both the public and the private sides and to create emissions reduction efforts from multiple levels of governance.

In this thesis, I argue that we should regulate aviation emissions in the following way. First of all, legal regulation of aviation emissions should involve multiple parties, including the United Nation's Framework of Climate Change (UNFCCC), the International Civil Aviation Organisation (ICAO), nation states, the

airline industry (represented by the International Air Transport Association (IATA)) and non-governmental organisations (NGOs). Although the UNFCCC system cannot totally solve the problem, I argue that international aviation should be subject to a legally binding mitigation target through a sectoral approach in the UNFCCC system on climate change. But although I prefer this sectoral approach, and many of the other arguments in this thesis are based on the achievement of a sectoral target on aviation emissions, the legal regulations discussed in this thesis are not dependent upon it. For example, even in the absence of an international sectoral agreement, a domestic fuel tax on international flights and regional emissions trading will contribute to curbing the growth of aviation emissions, as will ICAO's technology-based standards and environmental auditing programme.

It is central to this thesis that ICAO is unable to play the role allocated to it by the Kyoto Protocol, (and in much of the literature), of sole delegated authority in the regulation of aviation emissions. A legal analysis of ICAO's aims and law-making functions under the Chicago Convention¹ shows the limitations of ICAO. However, it certainly has a role to play in solving this industry specific problem. ICAO provides technology-based standards on a broad range of aviation activities, including aircraft engine design, aircraft noise, aircraft safety and security. On the technical front, ICAO could provide a global forum which would enable emissions reduction related actions to be transparent, in particular in respect of trade-offs between CO₂ emissions and non-CO₂ emissions from aircraft engines, between reducing emissions and controlling aircraft noise, and between reducing emissions and ensuring aviation safety. In ensuring a safe, efficient and environmentally friendly development of the industry, ICAO can play an important role regarding performance monitoring, reporting methods and auditing processes on member states' reduction actions. To fulfil this role, I have advocated a climate change audit programme by ICAO.

Apart from their roles within the UNFCCC and ICAO, nation states are also

¹ *Convention on International Civil Aviation* (adopted 7 December 1944, entered into force 4 April 1947) 15 UNTS 295 (Chicago Convention).

formal regulators which certainly have a role to play. In this multi-level governance regime, my preference is for mitigation responsibilities to be allocated between states, not solely by reference to nationality but through a multi-level approach. Regional, national, and city levels are more informative on contribution and capacity in respect of aviation than the national level. And rather than focusing on the developed/developing country dichotomy, differential treatment should consider the contribution to the expansion of international aviation at the regional, and city level as well as at the national level; consider changing contributions to aviation emissions; and consider changing capacity for the provision of cleaner facilities for international aviation. Nation states will respond to their mitigation obligations through domestic laws, including traditional command and control regulations and market-based instruments. Aviation fuel taxes on international flights would influence demand and provide incentives for innovation, whether or not a sectoral target is agreed through the UNFCCC.

Apart from the formal regulators, private parties (especially the airline industry and NGOs) should play important roles in the regulatory system. I suggested in Chapter 6 that a global emissions trading scheme would provide an alternative form of allocation of the sectoral mitigation target if comprehensive multi-level burden sharing cannot be agreed. IATA would lead the initial allowances allocation, and ICAO would monitor it. In addition, IATA's role in representing the airline industry and in developing the industry's vision of environmental policies may contribute regulatory schemes. NGOs should be involved to ensure environmental interests are fully taken into account at every level.

Second, legal regulation of aviation emissions should involve multiple instruments, including conventional command and control type of regulatory mechanisms and multiple market-based instruments. Different instruments might contribute to regulating aviation emissions from different perspectives. A sectoral target on international aviation under the UNFCCC system leads cooperative efforts towards a particular environmental outcome. ICAO's technology-based standards, as discussed above, might contribute to the balancing of potential trade-off effects with

reducing emissions in ensuring a safe, efficient and environmentally friendly development of the industry. Regional emissions trading schemes such as the EU ETS ensures that there will be a clear mitigation target which has to be achieved, albeit that some of the emissions cuts will come from outside the aviation sector. Although fuel taxes cannot provide certainty in relation to the outcome of reducing emissions, they could provide incentives for the industry to improve energy intensity and for airline customers to modify their behaviour. None of these instruments could be a stand-alone solution to curb the growth of aviation emissions, but multiple instruments should contribute to the reduction of aviation emissions.

Third, legal regulation of aviation emissions should involve parties at different scales. My preference is for a sectoral approach within the UNFCCC system, put into practice by multi-level governance, including ICAO's technology-based standards and environmental audit programme, nation states' efforts in allocating and implementing reduction targets on aircraft operators, nation states' aviation fuel taxes, regional emissions trading schemes (e.g. EU ETS). In the absence of an international agreement on burden sharing, a global emissions trading system would be an alternative form of allocation, as well as incentivising the airline industry to improve energy intensity. In the absence of international agreement on a sectoral mitigation target, market-based instruments (domestic fuel taxes and regional emissions trading) and the role of IATA and NGOs discussed above may contribute a less traditional approach to regulating aviation emissions.

Putting the above three points together, the preferred response to the contribution of international civil aviation to climate change would be to agree an international sectoral target on reducing aviation emissions. Burden sharing needs to be highly sophisticated, requiring multiple parties at multiple levels of governance to contribute to the sectoral mitigation target. If it is impossible to agree to burden sharing in practice, a global emissions trading system provides an alternative form of allocation of the sectoral mitigation target. As a second best response, in the absence of an agreed sectoral target at the international level, market-based instruments (domestic fuel taxes and regional emissions trading schemes) at national

and regional level will need to contribute to the regulation of aviation emissions. IATA, representing the airline industry, should also make a contribution as a response to failures of governmental action.

It is crucial to break the deadlock of conventional legal approaches and overcome the barriers to international aviation greenhouse gas emissions abatement. Drawing on the scholarly literature on new governance theory, this thesis has explored the theoretical foundations of a multi-scalar regulatory approach to climate change associated with aviation. In the way that has been described above, the international aviation emission problem might move beyond the deadlock of conventional inter-state approaches and come to recognise climate change as a multi-scalar problem that needs multi-scalar regulatory approaches.

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