CHAPTER 6

Environmental Policies in European Aviation: A Stakeholder Management Perspective

Marina Efthymiou and Andreas Papatheodorou

1 Introduction

Air transport improves accessibility and social inclusion, thus enhancing direct investment and generating positive spill-over impacts on the production capacity of an economy (Papatheodorou and Lei 2006; Liasidou 2017). Interestingly, the number of flights in Europe has risen by 80% between 1990 and 2014 and is forecasted to expand by a further 45% between 2014 and 2035 (EASA et al. 2016); in this context, Boeing (2017) also forecasts the need for a total of about 40,000 aircraft over

M. Efthymiou (✉)
Business School, Dublin City University, Dublin, Ireland
e-mail: marina.efthymiou@dcu.ie

A. Papatheodorou
Department of Business Administration,
University of the Aegean, Chios, Greece
e-mail: a.papatheodorou@aegean.gr

Department of Business and Law Studies,
University of Bari Aldo Moro, Bari, Italy

T. Walker et al. (eds.), *Sustainable Aviation*,
https://doi.org/10.1007/978-3-030-28661-3_6

the next 20 years, 23,470 of which will provide additional seat capacity in the market.

At the same time, the rapid air transport growth has created serious environmental concerns ranging from noise pollution to climate change; this may substantially undermine aviation development in the future. The estimated regional share of Europe's carbon dioxide (CO_2) aviation-related emissions without a regulatory intervention is expected to reach 36.60% in 2020 (ICAO Doc 10018, 2013). Moreover, the European Commission (2018) states that by 2020, global international aviation emissions are projected to be around 70% higher than in 2005, and by 2050, they could grow by a further 300–700%.

Many climate change mitigation policies (e.g. the 2015 Paris Agreement) are currently implemented throughout the world and become an integrated part of the wider policymaking agenda. Nonetheless, aviation is not regulated in comparison with other industries in terms of its negative environmental externalities. The gas emission problem is aggravated by air traffic delays and congestion that extend the flying time and route, which in many cases relate not only to limited airport infrastructure, but also to airspace fragmentation as experienced at least in Europe. Efthymiou et al. (2016) highlight the environmental implications of such delays for the travel business ecosystem, which may build on airport-related delays to affect negatively the overall passenger experience and satisfaction (Efthymiou et al. 2019). Surprisingly, however, there has been little academic discourse on the management aspects of aviation environmental regulation, especially regarding Air Navigation Service Providers (ANSPs), i.e. public and/or (semi-)private entities in charge of air traffic management (ATM) usually at a national level.

In his state-of-the-art discussion of environmental ethics in tourism, Holden (2018) stresses the importance of active stakeholder engagement in shaping a new Weltanschauung and morality vis-à-vis mobility; at the same time, he acknowledges that dealing with air travel and the right to fly is 'ethically complex' as environmental taxes on aviation (just like hotel eco-taxes) may end up hurting the lower socio-economic classes to the detriment of democratisation of travelling. Therefore, issues of power and interests in the context of multi-stakeholder governance become of essence especially when the various policy schemes, aiming at alleviating the problem, are characterised by significant transaction costs in their implementation and verification.

On these grounds, this paper aims to contribute to the aviation literature by investigating and addressing governance failure in the target-setting and the implementation process of both demand- and

supply-oriented environmental schemes in aviation. More specifically, the EU Emissions Trading Scheme (EU ETS) in aviation and the Single European Sky (SES) initiative are examined. The former aims at regulating civil aviation operations by internalising negative external economies related to climate change: essentially, the scheme manages demand by creating a new market for tradable emission permits. As a result, the EU ETS poses several challenges (but also potential opportunities) for airlines, which now see their costs rising. The latter, i.e. the SES reform, focuses on restructuring the airspace system and reshaping the Air Navigation Service Providers (ANSP) sector. SES deals with congestion problems and traffic inefficiencies in aviation from a supply-side perspective. In fact, reduced inefficiencies lead to shorter flight times and lower levels of fuel consumption and CO_2 production thus having positive environmental effects. Unlike the EU ETS, its introduction has been welcomed by the airlines, but as expected, it raises new challenges and possibly resistance to change from other stakeholders especially within the ANSP sector.

To the best of the authors' knowledge, this is the first research attempt to consider SES and EU ETS simultaneously. A joint policy approach is followed to investigate the standpoints of the different stakeholders and consider managerial implications regarding the environmental regulation of aviation. This is because a potential misalignment between the EU ETS and SES may prove problematic. For example and as discussed later in the chapter, airlines may decide to fly longer routes to avoid airspace segments characterised by high air navigation charges thus increasing fuel consumption and CO_2 emissions: this could make financial sense if the cost of acquiring CO_2 permits is low but undoubtedly has negative repercussions on the environment thus cancelling the very introduction of the EU ETS scheme. Therefore, an effective communication between those managing and regulating the two schemes is necessary to streamline operations and avoid negative side effects.

Section 2 of the chapter provides background information on EU ETS and SES. From a theoretical perspective, Sect. 3 discusses the appropriateness of stakeholder analysis supported empirically by the focus group study, the observation of participants and the conduct of interviews. Section 4 then reports and discusses the empirical results and their policy and stakeholder management connotations while Sect. 5 summarises and concludes.

2 EU ETS in Aviation and SES: An Overview

2.1 EU ETS in Aviation

The EU ETS is based on the requirements set by the Kyoto Protocol (KP). The EU ETS is a 'cap and trade' scheme. The carbon trading involves trading of rights (permits, allowances, credits) to emit a certain amount of emissions. Because of this commercial dimension, an economic incentive is created (Preston et al. 2012). A quantity of allowances (also called permits) to emit one metric tonne (MT) of CO_2 is given for free and excess permits need to be bought by each market participant. At the end of each year, each entity must return allowances at least equal to its level of emissions for that particular year. In case the entity does not return enough allowances, it incurs a fine. As time passes by, the emissions ceiling will be reduced and fewer allowances will be issued, causing CO_2 emissions to be reduced too (Leggett et al. 2012; Meleo et al. 2016). In 2008, the European Parliament and the Council adopted Directive 2008/101/EC, amending the EU ETS (Directive 2003/87/EC) to include aviation activities. The EU ETS in aviation includes only CO_2 emissions from aircraft (Kantareva et al. 2015). Every MT of CO_2 emitted by a source should be covered by a corresponding right/allowance. Allowances are initially allocated through a benchmarking system regarding the tonne-kilometre (tKm) distance flown by an aircraft from, to or within the EU. Every participant receives 0.6797 free allowances (baseline) for every 1000 tKm of flight. The smaller the quantity of free allocated allowances is, the bigger the associated cost for aircraft operators (IATA 2013). Moreover, to minimise compliance costs and to provide flexibility to airlines, the EU ETS permits allowances to be traded (Schleich et al. 2006; Tietenberg 2010). Airlines requiring more allowances can purchase them from EU auctions, other carriers and other entities within EU ETS or other international emissions' trading mechanisms. In 2012, 85% of emission allowances in aviation were offered free-of-charge to aircraft users and 15% were auctioned (European Commission 2016). For the period 2013–2020, the free allocation is further reduced to 82% and 3% of the allowances are banked for new entrants in the market and/or rapidly expanding airlines (European Commission 2016; Anger and Kohler 2010). The EU ETS excludes certain flight types from the cap-and-trade system, such as flights from airports located outside the EU, military aircraft, and Public Service

Obligation (PSOs) routes (Directive 2008/101/EC). Furthermore, flights under the de minimis criteria are excluded (Kantareva et al. 2015). In February 2018, EC Regulation 2018/208 amended Regulation 389/2013 to prepare for the case of a hard Brexit and ease the possible withdrawal or auctioning of allowances.

From a theoretical perspective, the application of EU ETS in aviation has both neo-liberal and interventionist facets. The former is based on the Coase Theorem in welfare/environmental economics, while the latter is typically related to Pigouvian taxation aiming at correcting negative production externalities (Stabler et al. 2010). The Coase Theorem essentially argues that when property rights are well defined, markets are competitive, and transaction costs do not exist, then the level of the externality (i.e. emissions) is set irrespective of the actual allocation of property rights (i.e. tradeable emissions permits) as agents with quasi-linear preferences reach a mutually beneficial outcome (Coase 1960, 1992). In the case of the EU ETS, the total level of emissions is capped externally (i.e. by the European Union) and not determined by market forces. In other words, a new market for emissions is created and the EU allocates tradeable permits and intervenes, as in the case of other environmental taxes, to ensure that airlines internalise their externality. The entire EU ETS mechanism is rather decentralised implicitly assuming that the very assumptions of the Coase Theorem are met to ensure an optimal outcome. Nonetheless, property rights in aviation may not be as well defined as originally thought, and transaction costs in carbon offset schemes may occur for various reasons. In particular, the rising concentration of the European airline market may not only raise concerns about the competitive conduct (Németh and Niemeier 2012), but also lead to protracted bargaining between the leading airlines and the EU ETS competent authorities. Moreover, local communities may resist against new airport developments (Santos et al. 2017) and also challenge the regulator's competence to oversee the scheme. All the above may possibly challenge the relevance of the Coase Theorem in the EU ETS leading to the conclusion that '...compensation through initial allocation would no longer be emissions neutral' (Abrell et al. 2011, p. 2).

From an interventionist standpoint, fuel taxation could be a simpler measure to monitor compliance with lower transaction costs, as fuel consumption is easy to measure and therefore tax, whereas EU ETS is a more complex system with free allocation, carbon offsetting principles and permits trading. Nevertheless, international aviation fuel taxes

are not permitted under various bilateral agreements and under Council Directive 2003/96/EC (Korteland and Faber 2013). The latter allows EU member states to tax aviation fuel for domestic flights and by means of bilateral agreements. Taxation levels should be below the minimum set out in the Directive. According to Korteland and Faber (2013), an imposition of aviation fuel tax of €330–350 per MT by the EU would generate revenues between €20 and 32 billion. If a VAT of 20% on jet fuel were introduced, there would be revenues between €10 (based on current fuel prices) and €14–16.5 billion (prices plus fuel tax). In any case, if VAT were imposed, airlines could deduct it against the VAT receipts from airline tickets (Korteland and Faber 2013). As with the case of the Balearics ecotourism tax introduced in 2016 (and modified later in 2017), airports and local communities have adopted, or tried to adopt, measures to regulate airline operations regarding local air quality by implementing Pigouvian taxes. Such taxes (like the Catalonian NO_x tax) are not well received by airlines which often threaten airport authorities and/or local governments of moving their operations to other airports in the vicinity governed by a more relaxed tax regime. Pigouvian taxes aim at bringing marginal private costs in line with social costs that cannot be accurately measured. Accurate measurability, which is usually missing, leads to improper corrective steps. Therefore, taxes are not a very successful example of environmental regulation in the European aviation market.

The implementation of the EU ETS policy in aviation has raised tension among the government and industry stakeholders at an international level. Representatives of the US government and of other countries (such as fast-developing countries like China) claimed that the horizontal implementation of the EU ETS to non-European carriers violates the 1944 Chicago Convention of the International Civil Aviation and its bilateral agreements and that the issue should be resolved by ICAO (Havel and Sanchez 2012). Some US airlines and Airlines for America (A4A) appealed to the European Court of Justice (ECJ). However, the latter concluded that the EU ETS did not infringe the Chicago Convention, the KP, the US-EU Open Skies Agreement, the principle of territoriality or the sovereignty of third-party states (Court of Justice of the European Union 2011). There are countries that are positive towards the full implementation of the EU ETS scheme because they have a commercial interest in biofuels. Brazil is one of them, since Boeing and Embraer opened in 2015 a Joint Aviation Biofuel Research

Centre in Brazil (Embraer 2015). This example illustrates that among stakeholders, there are subgroups that are either supportive or against the scheme according to their interests. As a result of this tension, the EC decided to 'stop-the-clock' (Decision No. 377/2013/EU) regarding the EU ETS in 2013. According to this Decision, air carriers that depart or land to a non-European Economic Area (EEA) airport are not obliged to surrender any allowances back and are exempted from the EU ETS. Moreover, in 2016, ICAO established the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), aiming to stabilise CO_2 emissions at 2020 levels. According to ICAO Assembly Resolution A39-3 (2016), CORSIA will become operational in 2021; the pilot (2021–2023) and the first phase (2024–2026) will be voluntary (all EU countries will join in 2021), while participation in the second phase (2027–2035) will become mandatory for all ICAO states. CORSIA is an offset scheme with no cap that does not aim to achieve reduction of emissions below their 2020 level (Scheelhaase et al. 2018) while the EU ETS aims to reduce further its cap. The geographical scope as well as the ambition for reducing CO_2 emissions is substantial differences of CORSIA and EU ETS. The EC decided to retain the current intra-EEA system at least until 2021.

2.2 Single European Sky

The European ANS system covers 37 ANSPs, 60 control centres and a territory of 10.8 million km^2, and according to the European Commission (2017), the estimated costs of fragmentation of airspace amount to 4 billion EUR a year. The European sky is fragmented in small inefficient blocks that use a wide variety of Air Traffic Control (ATC) technology (European Commission 2017). For instance, a flight from Athens to Rome is serviced by the Greek ANSP and the Italian ANSP Traffic that follows different rules and operational requirements and use different equipment/systems and support functions. This fragmentation results in mis-coordination and mis-management of the airspace and therefore in safety risks, delays in flights and increased cost. Thus, better coordination for transferring the responsibility of an aircraft between two ATC sectors in Europe is needed. Increased traffic, capacity problems, climate change and the necessity of developing a more cost-efficient system led to an ambitious initiative to reform the ATM. This initiative was first launched by the European Commission in 1999 and is called Single European Sky (SES).

One of the core elements of the SES initiative is the Functional Airspace Blocks (FABs). According to Regulation (EC) No. 1070/2009, a FAB is an airspace sector based on operational requirements. It reflects the need for integrated management of the airspace regardless the existing boundaries of Flight Information Regions (FIRs), where the provision of air navigation services and related functions is oriented towards performance and is optimised to implement a cooperative relationship between the ANSPs in each FAB.

According to the European Commission (2012), SES aims to improve safety by ten times, triple the capacity of airspace and reduce the cost of ATM by 50% and the impact on the environment by 10%. The performance in SES focuses on four Key Performance Areas (KPAs), i.e. safety, capacity, cost-efficiency and environment. The implementation of the Performance Scheme aims at setting and implementing binding targets for EU member states through the adoption of EU-wide performance targets and approval of consistent national or FAB performance plans.

The main metric of the environment KPA is the average horizontal en-route flight efficiency indicator, which is the difference between the distance of the en-route part of the trajectory and the optimum trajectory, that is, on average, the Great Circle Distance (GCD) (Guastalla 2014). Thereby, 'en-route' is defined as the distance flown outside a circle of 40 Nautical Miles (NM) around the airport. Flight efficiency can be measured horizontally or vertically, and during the last decade, more efficient routes have been implemented. Currently, the European route network distances are 3.6% longer than the GCD (IATA et al. 2008).

Better route network design as well as airspace availability and utilisation can improve flight efficiency (Efthymiou and Papatheodorou 2018). Restrictions imposed on the European route network utilisation create approximately 0.4% airspace utilisation inefficiency defined as deviation from the GCD. For instance, a DANUBE FAB Environmental Impact Assessment Study was carried out in 2011 using the System for traffic Assignment and Analysis at a Macroscopic level (SAAM) fast-time simulation tool to calculate the changes in fuel use and CO_2 emissions (Kantareva et al. 2015). The study concluded that the annual fuel saving due to the FAB implementation would be 45,000 tonnes by 2020 and 80,000 tonnes by 2030. The annual CO_2 savings are expected to be 143,000 tonnes by 2020 and 255,000 by 2030 (Kantareva et al. 2015). The environment KPA regulates all aircraft emissions that have an impact on climate change in comparison with EU ETS that regulates only CO_2 emissions.

In contrast to EU ETS, airlines welcome the introduction of SES as this does not increase their production costs; nonetheless, changes in the European ATM are often resisted by the powerful ANSP labour unions who fear that the unification of the European skies may potentially lead to significant job losses in a sector characterised by high levels of specialisation (Blondiau et al. 2016). The very decision of the European Union to head for the creation of different FABs instead of a 'real single sky' is consistent with an effort to balance the conflicting interests of different stakeholders. However, such an approach inevitably raises transaction costs in the system thus also endangering the attainment of environmental objectives as also discussed in the empirical sections of this chapter.

3 Empirical Methodology

The implementation of environmental regulation poses significant challenges for the various involved parties. For this reason, a stakeholder analysis is deemed appropriate to understand and analyse the issue holistically (Farmaki and Papatheodorou 2015); after all, managing relationships to ensure that stakeholders behave according to the SES and EU ETS objectives is of critical importance for social welfare. Stakeholder analysis is conducted to assist institutional and policy reform processes by elucidating and often addressing the demands of those who have an interest in the reforms under question (Moloney 2006; Pigman 2007). Freeman et al. (2010, p. 29) argue that 'this approach is consistent with the main ways in which we understand capitalism', namely neoliberal economics (Friedman 1962), principal-agent issues (Jensen and Meckling 1976), strategic management (Porter 1985) and transaction costs theory (Williamson 1975). In fact, the essence of both EU ETS and SES relies on market regulation principles, which accept the need to secure a decentralised equilibrium based on the comparative and competitive advantage of the aviation supply chain participants (and predominantly of airlines) albeit in the presence of monitoring, reporting and verification costs as well as constraints related to information asymmetry. Moreover, to encapsulate the stakeholder mindset from an empirical point of view, a combination of methods involving focus group, participant observation and the conduct of interviews is pursued here. Such a combination steps beyond the traditional positivist approach and delves into interpretivism and social constructionism (Saunders et al. 2015),

which are of essence when trying to understand the background behind the expressed (expert) opinions.

The current focus group analysis is part of a wider research project and is conducted in two-round interviews to encapsulate policy complexity at an in-depth level. The target population comprises stakeholders involved in SES and EU ETS. To select candidates, a purposive and snowball sampling was used. Thus, the sample of the wider research consists of thirty-nine (39) senior managers/experts from Civil Aviation Authorities (CAAs), ANSPs, aviation-related organisations and institutions and airlines. This research approach reinforces the literature review and leads to the identification of related transaction costs and the development of a stakeholder power vs. interest grid (Eden and Ackermann 1998) regarding environmental regulations in aviation.

Participant observation at EUROCONTROL was conducted in 2015. Seven (7) semi-structured interviews were conducted that contributed also to the development of some of the focus group research questions. The seven interviewees had different backgrounds. One senior expert worked at EUROCONTROL; another at European Commission; one expert worked in the Non-Governmental Organization (NGO) Transport and the Environment; two others were senior consultants/academics in aviation and environment; and finally, two senior experts worked for the International Air Transport Association (IATA). The interviewees requested their profile to remain anonymous without stating their specific roles within their organisations.

The stakeholders face four major attributes (Stoney and Winstanley 2001), the stakeholders' position on the reform issue, i.e. SES and EU ETS; the influence (negotiation power) level; the interest level; and the group/coalition to which they are affiliated. These four attributes were determined via interviews with experts and via the actual stakeholders directly, as well as from literature review and public announcements. Moreover, the stakeholders have power over the potential formation and/or implementation of a regulation. The power is described as the capability to influence or compel the actions of others and can be coercive, utilitarian or normative (Johnson et al. 2010; Ihlen and Berntzen 2007). The level of influence depends on the stakeholders' power to promote their position on regulatory reforms. Based on the combination of the participant observation and the semi-structured interviews, the positions of the SES and EU ETS stakeholders are stated in the following section.

4 Discussion and Results

4.1 Key Stakeholders

According to interviewees from EUROCONTROL and IATA, it is of critical importance to understand first who the stakeholders and their positions are and then design a roadmap to effectively manage them. The main stakeholders in the EU ETS and SES reforms are the European Commission, the European Parliament and national governments, the airspace users, other organisations and institutions and the ANSPs. In this section, their positions, as interpreted from the participant observation and the semi-structured interviews, are presented.

4.1.1 Organisations and Institutions

The European Parliament is the ultimate decision-maker of the reforms and can approve, amend or reject a legislative proposal. The European Parliament recognises that it has a duty to make a positive contribution to welfare and sustainable development as a long-term goal, through both its political and legislative role. According to the European Commission interviewee, the European Commission's position coincides with the European Parliament's position. The interviewee from EC stated that the European Commission is asked to speed up the full implementation of SES and switch from a 'bottom-up' to a 'top-down' approach if needed. The interviewees from EUROCONTROL and IATA implied that the European Parliament is influenced many times by industry bodies in terms of its policy direction.

All the interviewees agreed that the regulation and oversight of SES are quite weak and argued that the member states have a 'vested interest' in maintaining monopolies of ANSPs and restraining competition. This statement is reinforced by a Performance Review Body (PRB) report (2016, p. 8) claiming that 'Unhelpful behaviours and gaming are observed. Not only in the regulated community but also in the operational elements of the legislation'. Since most ANSPs are government-owned and the charging scheme is such that the ANSP cannot make a loss, the national governments have a strong incentive to preserve the situation as it is in terms of ownership and competition. Thus, ministries retain control of the infrastructure and manage the interaction within regulating bodies leading to a clear conflict of interest. Hence,

the level of independence and credibility of the regulator is determined by the prevailing political economy that establishes the regulator, sets its goals and instruments and is always able to subsequently change the rules.

EUROCONTROL is self-defined as an independent organisation. It claims that it supports and follows the regulations promoting the efficiency and effectiveness of the aviation systems for all its forty-one (41) member states equally. The IATA has the mission 'to represent, lead, and serve the airline industry' as advocated on the organisation's website. The airlines follow the developments on SES, and they want the aviation system to become more efficient in terms of both charges and operations. Interviewees from IATA and the NGO state that due to the stop-the-clock initiative, the EU ETS has a negative impact on airlines operating on European routes. The NGO interviewee finds the reduced geographical scope of EU ETS unfair for European airlines and less environmentally effective.

4.1.2 Airspace Users

The term, 'airspace users', refers to aircraft operators and especially airlines. By regulating ANSPs, SES aims to lower navigation charges and shorten routes and make better use of the airspace altogether. Hence, airlines are in favour of the SES reform of ATM. This was also confirmed by interviewees from IATA and academia. Depending on the airline's business model, the direct cost for ANS represents between 6% and 20% of the total operating costs, excluding fuel (interviewees from IATA). In addition, there are costs for delays and flight inefficiencies (due to longer routes and higher levels of fuel consumption).

Fuel is the second or the third highest cost (depending on the fuel price), and the fuel consumption causes carbon emissions. Thus, by minimising its consumption, airlines minimise their carbon footprint. However, for the minimum consumption of fuel to be achieved, airlines need to invest in new aircraft, new technologies, trainings of pilots and other measures (interviewees from academia and consultancies). Thus, the EU ETS regulation causes concern to many airlines. Most airlines oppose the inclusion of aviation in EU ETS (NGO interviewee). Nevertheless, there are some airlines (e.g. Lufthansa) that have already been following a more environmentally friendly approach and are investing a lot of capital to the environmental improvement of their operations (interviewee from IATA). Thus, those airlines embrace the EU ETS

principles and concepts. Another condition that influences the position of the airline towards EU ETS is the size and ownership of the airline (interviewees from IATA). Airlines that have a small fleet and limited flight services end up spending more time and effort in EU ETS than the benefits they get back from selling unused allowances. Moreover, airlines that are government-owned need to have the approval of the related public authority in charge to introduce radical changes in their fleet or the management of their operations. This makes the compliance with EU ETS more difficult as the newer and more fuel-efficient fleets can have positive effect on emissions reduction. Finally, it is also a matter of available expertise and prevailing mentality according to all interviewees. Small airlines lack the necessary expertise to follow fuel-efficient strategies and operate sophisticated software for fuel planning operations.

4.1.3 Air Navigation Service Providers (ANSPs)

ANSPs have two diverse positions on SES and neutral position on EU ETS according to all interviewees apart from the NGO. Those ANSPs that are state enterprises/bodies, i.e. owned by the state, follow the position of the state, i.e. preservation of the natural monopoly. Other ANSPs, that are more profit-orientated like NATS in the UK, may be in favour of the reforms to be given the opportunity to grow in scale. Those services are mostly terminal control or approach control. According to the current national regulations in the EU, there is the requirement/limitation that the air traffic controllers speak the country's language especially in approach and terminal control (interviewee from academia). Moreover, to comply with the Performance Scheme rapid and drastic changes in the operations need to be undertaken and many times the ANSPs personnel are not willing to adapt (interviewee EUROCONTROL and EC). Finally, the SES requires investments in infrastructure (e.g. in communication and navigation systems) that the ANSPs budget cannot afford (all 7 interviewees).

5 Emerging Transaction Costs in SES and EU ETS

5.1 Transaction Costs in SES

In economics, a transaction cost is a cost incurred in making an economic exchange beyond the cost and price of the product or service involved. Williamson (1979) and Stavins (1995) suggest that transaction

costs make economic instruments function improperly. In environmental economics, such costs are usually associated with the management of emissions' trading and the use of incentive mechanisms in performance regulation (Williamson 1998). In the context of the SES and the EU ETS, transaction costs are expected to differ among stakeholders. For instance, an ANSP is expected to incur a significant cost related to compliance, i.e. the cost of considering and adopting new systems and infrastructure. Policymakers spend a lot of effort on developing alternative policies, evaluating options and deciding what is to be implemented. The development and implementation of the regulatory scheme also bear high transaction costs, primarily because experts from different fields need to convene, discuss and agree on specific targets. Monitoring, reporting and verification also generate transaction costs. Companies need to design internal guidelines related to compliance with the introduced regulatory framework. They also need to develop long-term strategies to enforce and abate the regulations. In a nutshell and based on the undertaken empirical research, Table 1 classifies transaction costs for policymakers/regulators emerging from the environment KPAs in SES.

The focus group participants were first asked to rate the importance of transactions costs for the effective functioning of the environment KPA in the SES Performance Scheme on a Likert scale ranging between 1 (not important) and 5 (very important). In the second round of the focus group process, the mean score was 3.83 with a standard deviation equal to 0.64; the Coefficient of Variation (i.e. standard deviation divided by the mean) was 0.17. Subsequently, the participants were asked to allocate 100 points over the different categories of transaction costs ranked in descending order of importance. Participants were also given the option to add a new category. In the second round, development and implementation of the regulatory scheme received on average about 27 percentage points, followed by monitoring; strategy; reporting and verification (13%); alternative policies; and compliance measures. A small number of participants also provided additional categories (Table 2).

5.2 Transaction Costs in EU ETS

Regarding the EU ETS, policymakers and regulators face similar challenges and transaction costs as in the case of SES. As for airspace users,

Table 1 Transaction costs categories for policymakers/regulators emerging from SES

Categories	*Description*
Development and implementation of the regulatory scheme	• Quantification of historic emissions • Development of emission outlooks • Decision for an application rule • Measures to overcome 'frictions' and negotiation with stakeholders • Assessment of participants • Adaptation or purchase of software • Material costs set-up of organisational structures and assignment of responsibilities • Fees for information, training
Monitoring	• Design of a monitoring concept • Implementation of an internal monitoring system • Ongoing monitoring
Strategy	• Design of the strategy for National Supervisory Authorities, ANSPs • Design of the regulation enforcement procedure • Design of the abatement strategy
Reporting and verification	• Quantification of annual emissions • Compilation of an emissions report • Verification of an emissions report • Delivery of data for ex-post control
Alternative policies	• Develop alternative solutions • Evaluate the alternative solutions • Decision for the implementing policy
Compliance measures	• Identification of compliance measures • Offering recommendations and support • Decision about imposing non-compliance penalties

Source Own elaboration

these must monitor and report their CO_2 emissions, ensuring that they hand in a sufficient number of allowances to the authorities to cover their emissions. Monitoring, reporting and verification result in transaction costs whose largest part is incurred by airspace users. To lower transaction costs, many airlines have chosen to outsource monitoring service to others, e.g. EUROCONTROL. Moreover, based on the de minimis criteria discussed earlier, several small carriers are protected from incurring transaction costs emerging from the EU ETS. In any case, such costs are also closely related to the spot price of emission permits.

Table 2 Relative importance of SES transaction costs (2nd round SES questionnaire)

Descriptive statistics					
	Min	*Max*	*Mean*	*SD*	*CV*
Development and implementation of the regulatory scheme	10	45	27.15	9.46	0.35
Monitoring	10	45	18.07	10.02	0.55
Strategy	5	60	17.69	11.09	0.63
Reporting and verification	10	35	13.19	5.90	0.45
Alternative policies	0	20	12.15	5.55	0.46
Compliance measures	0	17	9.20	4.29	0.47
Other	0	15	1.80	4.05	2.25

If the price of the emission permits is too low while at the same time the associated transaction costs are too high, then some airlines may abstain from reducing their emissions preferring to pay for extra permits instead. Based on the undertaken empirical research, Table 3 classifies transaction costs for airlines emerging from the EU ETS.

As in the case of SES, focus group participants were first asked to rate the importance of transactions costs for the effective functioning of EU ETS. In the second round of the focus group process, the mean score was 3.81 with a standard deviation equal to 0.49; the Coefficient of Variation was 0.13. Subsequently, and in terms of point allocation, implementation of emissions management category scored about 22%, followed by reporting and verification; application; and monitoring. Abatement measures received the lowest score (Table 4).

5.3 Stakeholder Power vs. Interest Grid in SES and EU ETS

The effective power of the industry, i.e. the degree of power that industry stakeholders hold over other groups in relation to a reform of the aviation environment, is very strong. As discussed earlier and based on the focus group analysis and semi-structured interviews, Table 5 depicts the power and interest grid of the stakeholders in the SES and EU ETS business ecosystem.

Regarding the EU ETS, airlines have high interest and relatively high power over the reforms. This was proven by the 'stop the clock' decision.

Table 3 Transaction costs categories for airlines emerging from the inclusion of aviation in EU ETS

Categories	*Description*
Implementation of emissions management	• Information, training • Assessment of obligation to participate in the EU ETS • Set-up of organisational structures and assignment of responsibilities • Adaptation or purchase of software • Material costs
Reporting and verification	• Quantification of annual emissions • Compilation of an emissions report • Verification of an emissions report • Delivery of data for ex-post control
Application (scheme design)	• Quantification of historic emissions • Development of emission outlooks • Decision for an application rule • Compilation of an application • Compilation of a benchmark where necessary • Verification of the application • Fees for annual allocation • Fees for emissions register
Monitoring	• Design of a monitoring concept • Implementation of an internal monitoring system • Ongoing monitoring
Trade	• Transactions fees (exchange fees, broker fees, clearing) • Trade and negotiation • Market observation
Strategy	• Definition of the risk strategy • Definition of the trade strategy • Definition of the abatement strategy
Abatement measures	• Identification of abatement measures • Decision about abatement measures

Source Own elaboration

Academia has high interest on EU ETS processes and outcomes, but relatively low power. The ANSPs have no interest and limited power over the EU ETS as the scheme does not regulate them. The regulators have high levels of interest and power. The airports have low power and low interest in EU ETS reforms as the regulation refers to operations outside of Landing and Take-Off (LTO) cycle. Several institutions and associations (e.g. IATA) also have high levels of interest and power regarding EU ETS due to their effective lobbying efforts. Fuel suppliers have quite

Table 4 Relative importance of EU ETS transaction costs (2nd round of EU ETS questionnaire)

	Descriptive statistics				
	Min	*Max*	*Mean*	*SD*	*CV*
Implementation of emissions management	0	50	22.66	11.09	0.49
Reporting and verification	0	45	16.86	10.28	0.61
Application	0	30	14.78	6.24	0.42
Monitoring	0	45	14.01	11.05	0.79
Trade	0	25	10.01	7.54	0.75
Strategy	0	30	9.40	6.23	0.66
Abatement measures	0	15	6.97	5.16	0.74
Other	0	10	1.40	3.07	2.19

Table 5 SES and EU ETS stakeholder power/interest grid

	High power and high interest		*Low power and high interest*		*High power and low interest*		*Low power and low interest*	
	SES	*ETS*	*SES*	*ETS*	*SES*	*ETS*	*SES*	*ETS*
Airlines	X	X						
Academia			X	X				
ANSPs	X							X
Airports			X					X
Regulators	X	X						
Organisations	X	X						
Fuel suppliers		X			X			
Manufacturers		X			X			
System providers	X							X

a high level of power due to their oligopolistic power, and high interest regarding the environmental targets set to airlines. Manufacturers have high power and high interest in EU ETS performance due to the possible impact that the scheme may have on the demand for aircraft and aircraft specifications by airlines. Finally, system providers have low interest and low power over EU ETS.

With respect to SES, airlines have high power and high interest as they are the ones benefited or harmed by the SES initiatives. The

academic community, as in the case of EU ETS, has low power, but high interest. The ANSPs have high interest in the SES reform as they are the regulated entity and quite high power too due to strong trade unions and natural monopolistic power. Regulators (in the form of either Civil Aviation Authorities/National Supervisory Authorities or EC/EP) have the highest level of power and interest in this scheme. Airports benefit in terms of on-ground ATC improvements, but their role is more of an observer than of an active participant in SES developments. Fuel suppliers have high power but low interest in SES. Manufacturers have higher power than fuel suppliers do, but lower interest compared to airports or airlines. Finally, system providers have high power and high interest in SES as any changes affect their sales to ATC companies and their research and development costs.

As also discussed by Eden and Ackermann (1998), the players that have high power and high interest need to be managed closely because they are catalysts for the success of the schemes. The players that have high power and low interest need to be kept satisfied by the policymakers. The stakeholders with low power and high interest need to be kept satisfied but also informed by the policymakers. Finally, for those stakeholders with low power and low interest, minimal effort needs to be provided; however, action must be taken by policymakers when necessary. The stakeholders can lead to amendments or changes in the reforms under consideration due to their interests and their power. The most important example with major effects on the aviation reform relates to the reactions of many airlines against the scope of the EU ETS.

5.4 Policy Interaction and Stakeholder Management

Several environmental issues in aviation have been highlighted in the empirical analysis. Regarding the operational aspects, the problems of the air transport industry are the high cost of ATM service provision, the delays and related costs, safety issues and the contribution to climate change caused by excess fuel burn and emissions. Those problems are caused by the fragmentation of the ATM sector, labour and social issues, economic difficulties faced by the States, outdated technology and lack of airspace capacity. The reforms currently implemented are the EU ETS for aircraft operator and the SES for the ANSPs.

Moreover, when the ICAO implements the Global MBM Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

for all airlines, the scope and MRV of EU ETS will need to be revised. As also suggested by Scheelhaase et al. (2018), the European Commission may need to keep EU ETS for domestic flights. These are subject to the emissions reduction commitments and are included in the nationally determined contributions of the Paris Agreement that does not explicitly refer to aviation (ICAO 2017). Policymakers should approach this option taking into consideration all the industries and addressing climate change holistically. The lack of collaboration and coordination in R&D at regional and multi-national levels as well as within and across industries should be understood and rectified accordingly.

The environmental aspects of aviation should be considered in parallel with the financial situation of the airlines, ANSPs and states, and societal needs. Moreover, research and development is very costly, and, when developing environmental policies in aviation (like the use of biofuels), the needs and policies for the other means of transportation should be jointly considered. Links should be formed within Europe but also with the rest of the world.

Finally, managing the stakeholders is one of the most critical points to achieve an effective reform. The interests of the different airlines, airports, ANSPs, States, CAAs, fuel suppliers, manufacturers and policy consultants should be taken into consideration when designing environmental policies. The next step is to develop more platforms, in addition to the National Supervisory Authorities (NSAs) Coordination Platform (NCP), and move beyond the consultation process. The NSAs have reported that they find the NCP very useful as it is the only established official platform where they can congregate and discuss related matters in person, promoting the exchange of information and lesson learning. Similar platforms can be developed to encourage each group to meet separately or with other groups and contribute their ideas or express their concerns to the regulators.

The processes should be adapted to the needs and capabilities of the stakeholders in all states. Apart from this recognition of efforts, the communication of benefits and burdens as well as the fair distribution of benefits should be a priority for policymakers. Improved communication, monitoring and reporting, incentive systems and third-party review are key elements for the sustainable development of aviation through SES and EU ETS. In this way, potential conflicts among airlines, airports, ANSPs, CAAs, suppliers, policy advisers and makers will be identified and addressed. The joint consideration of different schemes, rather than their individual function, can bring operational cost savings. However,

the linking should be done only if there are consistency and compatibility among the schemes in question.

6 Summary and Conclusions

This chapter presented two policy schemes that relate to the environmental performance of aviation in Europe, i.e. the EU Emissions Trading Scheme and the Single European Sky. These were evaluated in relation to the different stakeholders' point of view regarding the need and efficiency of the schemes. Although the primary data was collected in 2015, the results of the study are still regarded as topical given the European Commission's decision to retain the current intra-EEA system at least until 2021. In other words, even if new primary data was collected today (with the same panel of experts), results would most probably differ only marginally. On these grounds, the chapter provides a valid roadmap for policymakers to consider the different stakeholders' positions and influence the effective design and implementation of regulatory policies.

The implementation of SES and the inclusion of aviation to EU ETS have proven very challenging for regulators. The stakeholders of SES and EU ETS play a critical role in this context. Four major attributes determine the capability of a stakeholder to block, amend or promote regulations either alone or in collaboration with other stakeholders. Those are: (1) the stakeholders' position on the reform issue, i.e. SES and EU ETS; (2) the level of influence (i.e. negotiation power) they hold; (3) the level of interest they have in SES and/or EU ETS; and (4) the group/coalition to which they are affiliated. Hence, stakeholder analysis offers a detailed understanding of the aviation business environment taking into consideration political, economic and social elements that affect the groups' positions, the hierarchy of authority and the power among different groups.

There are big differences among the stakeholders, but also within the stakeholders. For instance, the European ANSPs operate in very diverse environments in terms of traffic complexity and variability as well as socio-economic conditions (e.g. cost of living, labour laws). The ANSPs size in Europe is also very diverse. The five largest ANSPs bear 57% of the total Pan-European ATM/Communication Navigation and Surveillance provision costs, while the five smallest represent less than 1%. Not surprisingly, therefore, the regulated parties resist to reforms. Nonetheless, if the policymakers and regulators understand better the

positions and standpoints of the different stakeholders, then the implementation of the reforms will prove smoother and more effective.

References

Abrell, J., Faye, A. N., & Zachmann, G. (2011). *Assessing the impact of EU ETS using firm level data* (Bruegel Working Paper 2011/08).

Anger, A., & Kohler, J. (2010). Including aviation emissions in the EU ETS: Much ado about nothing? A review. *Transport Policy, 17,* 38–46.

Blondiau, T., Delhaye, E., Proost, S., & Adler, N. (2016). ACCHANGE: Building economic models to analyse the performance of air navigation service providers. *Journal of Air Transport Management, 56,* 19–27.

Boeing. (2017). *Current Market Outlook 2017–2036.*

Coase, R. (1960). The problem of social cost. *The Journal of Law and Economics, 3,* 1–44.

Coase, R. (1992). The institutional structure of production. *American Economic Review, 82*(4), 713–719.

Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management.

Court of Justice of the European Union. (2011). *The directive including aviation activities in the EU's emissions trading scheme is valid.* Luxembourg: CJEU.

Decision 377/2013/EU of the European Parliament and of the Council of 24 April 2013 derogating temporarily from Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community.

Directive 2008/101/EC on amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community.

EASA, EEA, & EUROCONTROL. (2016). *European Aviation Environmental Report 2016.*

Eden, C., & Ackermann, F. (1998). *Making strategy: The journey of strategic management.* London: Sage.

Efthymiou, M., Arvanitis, P., & Papatheodorou, A. (2016). Institutional changes and dynamics in the European aviation sector: Implications for tourism. In N. Pappas & I. Bregoli (Eds.), *Global dynamics in travel, tourism and hospitality* (pp. 41–57). Hershey Pennsylvania: IGI Global.

Efthymiou, M., Njoya, E. T., Lo, P. L., Papatheodorou, A., & Randall, D. (2019). The impact of delays on customers' satisfaction: An empirical analysis of the British Airways on-time performance at Heathrow Airport. *Journal of Aerospace Technology and Management, 11.* https://doi.org/10.5028/jatm.v11.977.

Efthymiou, M., & Papatheodorou, A. (2018). Environmental considerations in the Single European Sky: A Delphi approach. *Transportation Research Part A: Policy and Practice, 118,* 556–566.

Embraer. (2015). *Boeing e Embraer inauguram centro de pesquisa em biocombustiveis no Brasil* (press release). Available from https://embraer.com/global/en/news?slug=2333-boeing-e-embraer-inauguram-centro-de-pesquisa-em-biocombustiveis-no-brasil. Accessed 11 August 2019.

European Commission. (2012). *Single European Sky—Frequently asked questions.* Brussels: European Commission. Available from http://europa.eu/rapid/press-release_MEMO-12-934_en.htm. Accessed 11 May 2017.

European Commission. (2016). *Structural reform of the EU ETS.* Available from http://ec.europa.eu/clima/policies/ets/reform/index_en.htm. Accessed 1 July 2016.

European Commission. (2017). *Single European Sky.* Brussels: European Commission. Available from http://ec.europa.eu/transport/modes/air/single_european_sky_hu. Accessed 11 May 2017.

European Commission. (2018). *Reducing emissions from aviation.* Available from https://ec.europa.eu/clima/policies/transport/aviation_en. Accessed 13 July 2018.

Farmaki, A., & Papatheodorou, A. (2015). Stakeholder perceptions of the role of low-cost carriers in insular tourism destinations: The case of Cyprus. *Tourism Planning and Development, 12*(4), 412–432.

Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B., & de Colle, S. (2010). *Stakeholder theory: The state of the art.* Cambridge: Cambridge University Press.

Friedman, M. (1962). *Capitalism and freedom.* Chicago: University of Chicago Press and Phoenix Books.

Guastalla, G. (2014). *Performance indicator—Horizontal flight efficiency.* Brussels: Eurocontrol/PRU.

Havel, B. F., & Sanchez, G. S. (2012). Toward an international aviation emissions agreement. *Harvard Environmental Law Review, 36*, 351–385.

Holden, A. (2018). Environmental ethics for tourism—The state of the art. *Tourism Review, 74*(3), 694–703. https://doi.org/10.1108/TR-03-2017-0066.

ICAO Doc 10018. (2013). *Report of the assessment of Market-based Measures.* Available from http://www.icao.int/Meetings/GLADs-2015/Documents/10018_cons_en.pdf. Accessed 12 July 2016.

IATA. (2013). *The cost of the EU emissions trading scheme.* Montreal: IATA. Available from https://www.iata.org/publications/economics/Documents/EUETS-cost-briefing-march-2013.pdf. Accessed 28 July 2015.

IATA, EUROCONTROL, & CANSO. (2008). *Flight efficiency plan: Fuel and emissions savings.* Available from http://www.EUROCONTROL.int/sites/default/files/article/content/documents/nm/reports/flight-efficiency-plan.pdf. Accessed 6 October 2016.

ICAO. (2016). *Resolution A39-3 (2016): Consolidated statement of continuing ICAO policies and practices related to environmental protection—Global Market-based Measure (MBM) scheme.*

ICAO. (2017). *Why were international aviation emissions not included in the Paris Agreement at COP 21?* Available from https://www.icao.int/environmental-protection/Pages/A39_CORSIA_FAQ1.aspx. Accessed 13 July 2018.

Ihlen, O., & Berntzen, O. (2007). When lobbying backfires: Balancing lobby efforts with insights from stakeholder theory. *Journal of Communication Management, 11*(3), 235–246.

Jensen, M. C., & Meckling, W. (1976). Theory of the firm: Managerial behavior, agency costs and capital structure. *Journal of Financial Economics, 3*(4), 305–360.

Johnson, G., Scholes, K., & Whittington, R. (2010). *Exploring corporate strategy: Texts and cases* (9th ed.). Harlow: Financial Times Prentice-Hall.

Kantareva, M., Angelova, A., Iliev, L., & Efthymiou, M. (2015). *ICAO action plan on emissions reduction: Republic of Bulgaria.*

Korteland, M., & Faber, J. (2013). *Estimated revenues of VAT and fuel tax on aviation.* Delft: Delft CE.

Leggett, J., Elias, B., & Shedd, D. T. (2012). *Aviation and the European Union's Emissions Trading Scheme* (Congressional Research Service Report R42392). Washington, DC.

Liasidou, S. (2017). Drafting a realistic tourism policy: The airlines' strategic influence. *Tourism Review, 72*(1), 28–44.

Meleo, L., Nava, C. R., & Pozzi, C. (2016). Aviation and the costs of the European Emission Trading Scheme: The case of Italy. *Energy Policy, 88,* 138–147.

Moloney, K. (2006). *Rethinking public relations: PR propaganda and democracy* (2nd ed.). London: Routledge.

Niemeier, H. M., & Németh, A. (2012). Airline Mergers in Europe: An overview on the market definition of the EU commission. *Journal of Air Transport Management, 22,* 45–52.

Papatheodorou, A., & Lei, Z. (2006). Leisure travel in Europe and airline business models: A study of regional airports in Great Britain. *Journal of Air Transport Management, 12*(1), 47–52.

Pigman, G. A. (2007). *The World Economic Forum: A multi stakeholder approach to global governance.* New York: Routledge.

Porter, M. (1985). *Competitive advantage.* New York: Free Press.

PRB. (2016). *PRB White Paper: RP3 performance objectives, version 3.6.* Available from http://www.eusinglesky.eu/Documents/PRB%20Reports/Reference%20Period%20Three/RP3%20White%20Paper.pdf. Accessed 4 October 2016.

Preston, H., Lee, D. S., & Hooper, P. D. (2012). The inclusion of the aviation sector within the European Union's Emissions Trading Scheme: What are the prospects for a more sustainable aviation industry? *Environmental Development, 2,* 48–56.

Regulation (EC) No 1070/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulations (EC) No 549/2004, (EC) No

550/2004, (EC) No 551/2004 and (EC) No 552/2004 in order to improve the performance and sustainability of the European aviation system.

Santos, G. S., de Arantes Gomes, R., & dos Santos, E. A. (2017). PPGIS as an urban planning tool around airports. *Journal of Air Transport Management, 69,* 269–278.

Saunders, M. N., Lewis, P., & Thornhill, A. (2015). *Research methods for business students.* Harlow: Pearson.

Scheelhaase, J., Maertens, S., Grimme, W., & Jung, M. (2018). EU ETS versus CORSIA–A critical assessment of two approaches to limit air transport's CO_2 emissions by market-based measures. *Journal of Air Transport Management, 67,* 55–62.

Schleich, J., Ehrhart, K. M., Hoppe, C., & Seifert, S. (2006). Generous allocation and ban on banking. In R. Antes, B. Hansjurgens, & P. Letmathe (Eds.), *Emissions trading and business.* Heidelberg: Springer.

Stabler, M. J., Papatheodorou, A., & Sinclair, T. M. (2010). *The economics of tourism* (2nd ed.). London: Routledge.

Stavins, R. N. (1995). Transaction costs and tradeable permits. *Journal of Environmental Economics and Management, 29*(2), 133–148.

Stoney, C., & Winstanley, D. (2001). Stakeholding: Confusion or utopia? Mapping the conceptual terrain. *Journal of Management Studies, 38*(5), 603–626.

Tietenberg, T. H. (2010). *Environmental and natural resource economics* (10th ed.). New York: HarperCollins.

Williamson, O. E. (1975). *Markets and hierarchies: Analysis and antitrust implications.* New York: Free Press.

Williamson, O. E. (1979). Transaction-cost economics: The governance of contractual relations. *The Journal of Law and Economics, 22*(2), 233–261.

Williamson, O. E. (1998). Transaction cost economics: How it works; where it is headed. *De Economist, 146*(1), 23–58.