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WHO SET THE RULES IN CLIMATE CHANGE GOVERNANCE? THE CASE OF CORSIA AS AN INNOVATIVE SECTORAL POLICY FOR INTERNATIONAL AVIATION

Brasília, 15 de dezembro 2023

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Orientadora: Professora Dra. Ana Flávia Barros

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ABSTRACT

Despite the remarkable achievement of air travel, the steady expansion of the aviation sector has raised concerns about its impact on global warming. This dissertation aims to analyze the sectoral governance framework designed to address Greenhouse Gas (GHG) emissions from aviation, leading to the approval of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The research adopts a case study approach utilizing process tracing, comprehensive document analysis, and stakeholder interviews to identify the factors contributing to creating this pioneering global sectoral market-based scheme for addressing climate change. The history of international cooperation on climate change has shown that instead of developing a hierarchical overarching regime, as intended through the UNFCCC, the governance framework ended up fragmented, constituting a regime complex. In 2016, a year after the Paris Agreement approval, marking a move to a bottom-up approach, the ICAO Assembly agreed to establish CORSIA as a top-down policy. This study seeks to understand the intriguing factors that enabled the design and approval of CORSIA as a dense and innovative sectoral regime. Analyzing through the lens of global governance, the inquiry mapped a combination of factors that led to this output, including pressures from competing regimes - notably the UNFCCC and the EU-ETs - and the agency of private stakeholders. In addition, ICAO`s decision-making rules proved to be a necessary feature for explaining CORSIA`s approval. A central contribution of this research is to demonstrate that studying sector-by-sector is critical for comprehending the political dynamics and practical challenges each industry faces in discovering and implementing solutions to climate change. In essence, climate change presents diverse challenges marked by distinct patterns of technological obstacles, political and economic interests, power dynamics, information disparities, and belief systems. This complexity calls for tailored institutional designs, and deep case studies on specific sectoral governance frameworks can contribute to that endeavor.

Keywords: regime complex, international aviation, climate change, CORSIA, sectoral governance.

RESUMO

QUEM DEFINE AS REGRAS DA GOVERNANÇA CLIMÁTICA? O CASO DO CORSIA COMO UMA INOVATIVA POLÍTICA SETORIAL PARA A AVIAÇÃO INTERNACIONAL

Voar é uma notável conquista. No entanto, a expansão do transporte aéreo tem suscitado preocupações sobre seu impacto no aquecimento global. Esta dissertação tem como objetivo explorar o arcabouço de governança setorial desenvolvido para lidar com o aumento das emissões de gases de efeito estufa (GEE) provenientes da aviação, que culminou na aprovação do CORSIA. A pesquisa é um estudo de caso que adota o método de *process tracing* para identificar os fatores que contribuíram para a criação deste primeiro esquema global baseado em mercado para enfrentar as mudanças climáticas. A história da cooperação internacional em relação às mudanças climáticas mostrou que, ao invés de desenvolver um regime global hierárquico, como pretendido pelo UNFCCC, o arcabouço de governança acabou fragmentado, constituindo um complexo de regimes. Em 2016, um ano após a aprovação do Acordo de Paris, marcando uma mudança para uma abordagem *bottom-up*, a Assembleia da OACI concordou em estabelecer o CORSIA como uma política *top-down*. É intrigante entender os fatores que possibilitaram a aprovação do CORSIA como um regime setorial denso e inovador. Analisando através da perspectiva das abordagens da governança global, a pesquisa identificou uma combinação de fatores que levaram a esse resultado, incluindo pressões de regimes concorrentes - especialmente o UNFCCC e o EU-ETS - e a agência de atores privadas. Além disso, as regras de tomada de decisão da OACI figuram como condição necessária para explicar a aprovação do CORSIA. Uma contribuição central desta pesquisa é demonstrar que o estudo de arcabouços setoriais de governança internacional é crucial para compreender as dinâmicas políticas e os problemas práticos que cada indústria enfrenta para descobrir e implementar soluções para as mudanças climáticas. Em essência, as mudanças climáticas envolvem muitos desafios marcados por padrões distintos de obstáculos tecnológicos, interesses políticos e econômicos, dinâmicas de poder, disparidades de informação e sistemas de crenças. Essa complexidade demanda desenhos institucionais específicos, e estudos de caso aprofundados em arcabouços de governança setoriais podem contribuir para esse esforço.

Palavras-chave: Complexo de regimes, aviação internacional, mudança do clima, CORSIA, governança setoria

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LIST OF ABBREVIATIONS

AAU – Assigned Amount Units

AACC – Airport Associations Coordinating Council

ACI – Airport Council International

AECMA – Aerospace and Defense Industries Association of Europe

ASA – Air Services Agreement

AIA – American Institute of Aeronautics

AOC – Airports Operators Council

AOCI – Airports Operators Council International

ATAG – Air Transport Action Group

ATM – Air Traffic Management

BASIC – Brazil, South Africa, India and China

CAEP – Committee on Aviation Environmental Protection

CANSO – Civil Air Navigation Services Organization

CBDR – Common but Differentiated Responsibilities

CBDRRC – Common but Differentiated Responsibilities and Respective Capabilities

CDM – Clean Development Mechanism

CNG – Carbon Neutral Growth

CORSIA – Carbon Offsetting and Reduction Scheme for International Aviation

CPM - Convention of the Parties to the Kyoto Protocol

CPR – Common Pool Resources

CER – Certified Emission Reduction

CO2 – Carbon Dioxide

COP – Conference of the Parties to the UNFCCC

CSR – Corporate Social Responsibility

ET – Emissions Trading

ETS – Emissions Trading Scheme

EU – European Union

ERU – Emission Reduction Units

ESG – Environmental and Social Governance

GHG – Green House Gases

IATA – International Air Transport Association
ICAA – International Civil Airports Association
ICAO – International Civil Aviation Organization
IMO – International Maritime Organization
IPCC – International Panel on Climate Change
ICCAIA – International Coordination Council of Aerospace Industries Associations
ICSA – International Coalition for Sustainable Aviation
INDC – Intended National Determined Contribution
ITMO – Internationally Transferred Mitigation Outcomes
IR – International Relations
IEL – International Environmental Law
IBAC – International Business Aviation Council
JI – Joint Implementation
LDC – Least Developed Countries
LLDC - Landlocked Developing Countries
LULUCF – Land Use, Land-use Change and Forestry
MBM – Market Based Measures
MOU – Memorandum of Understanding
NGO – Non-Governmental Organization
NDC - Nationally Determined Contribution
RPK – Revenue Passenger Kilometer
RTK – Revenue Tonne Kilometer
RMU – Removal Units
SAF – Sustainable Aviation Fuels
SARP – Standards and Recommended Practices
SID - Small Island Developing States
TWA – Trans World Airlines
UN – United Nations
UNCED – United Nations Conference on Environment and Development
UNFCCC – United Nations Framework Convention on Climate Change
US – United States
WEAA - Western European Airports Association
WP – Working Paper

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PART II - THE EMPIRICAL RESEARCH

Introduction

Flying is a remarkable achievement. It has changed our societies in incommensurable ways. It is fair to say that air travel introduced a paradigm shift in the history of connecting peoples, cultures, and goods. Aircraft technologies experienced significant advancement during the Great World Wars. It was almost two hundred years from the hot air balloons to the first powered and controlled heavier-than-air flight, performed at the beginning of the 20th century. Shortly after that, in 1933, Boeing produced the first all-metal structure airplane, and today we have an aircraft capable of transporting more than 800 people in a single flight across the ocean[1]. During the last five decades, the total number of people transported by commercial aviation globally has jumped from 310 million in 1970 to 4.56 billion passengers in 2019[2]. It became easier to do business internationally, exchange scientific knowledge, and learn about new cultures and ways of living. Aviation has also enabled the quick transport of products with added value and perishables, as well as essential goods such as medicines and vaccines. However, the steady expansion of air transport has raised concerns about its impact on global warming fostering discussions on the adoption of appropriate mitigation policies. International aviation is a global network. Thus, addressing its impact on climate change demands governance arrangements beyond national frontiers.

Humanity - despite not being a single category and incorporating many worlds (Inoue, 2020) with distinct socioeconomic and cultural realities - faces a great common challenge: the acceleration of human pressure on the planet threatens its systemic balance. The Earth has transitioned from the stability of the Holocene to entering the frontiers of the Anthropocene, in which human action becomes a driving force influencing its physical, chemical, and biological processes (Rockström t al., 2009; Steffen et al., 2015). The planet's average temperature is increasing due to the accumulation of greenhouse gases – GHG in the atmosphere as a consequence of industrial activities based on fossil fuels, including international transportation. Therefore, how

[1] The Airbus model A380 typically transports around 500 passengers but has a certified capacity to transport 853 passengers. https://www.airbus.com/en/products-services/commercial-aircraft/passenger-aircraft/a380.

[2] That exponential growth was interrupted by the COVID pandemic when air travel dropped dramatically coming close to zero during a few weeks. IATA report from June 2023 indicated that air transport activity measured in RPK (revenue passenger-kilometers (RPKs) is still under the pre-pandemic levels but is likely to achieve 87.8% of the 2019 level for 2023 as a whole. https://www.iata.org/en/iata-repository/publications/economic-reports/global-outlook-for-air-transport----june-2023/.

societies and production processes are organized will be decisive for maintaining a safe operating space (Rockström et al. 2009) that allows human and non-human life to flourish. It is important to highlight that the ones most impacted by climate change consequences are the low-income population with less access to the goods and services that consume fossil fuels. Hence, they are less responsible for the problem and have lower capabilities to adapt to its consequences, which raises issues of climate justice. In addition, as it is a planetary problem, the actions of each country can have global impacts, and no country alone can solve it, without the participation of private actors. In a nutshell, climate change is a complex problem involving transnational socioeconomic structures that demand levels of cooperation never achieved in the global governance of international society (Franchini, Viola, and Barros-Platiau, 2017).

The United Nations Framework Convention on Climate Change – UNFCCC, created in 1992, is the multilateral forum dedicated to advancing global action on that matter. However, a growing number of scholars have shown skepticism about the capacity of multilateral institutions to promote fundamental on-the-ground change to tackle climate change. Considering the multiplicity of divergent interests and the requirement for consensus on deliberations, the results have been thin agreements representing the minimum common denominator between the Parties. National and regional authorities could be better equipped to establish policies to drive the low-carbon transition, such as fiscal incentives, market mechanisms, taxes, and regulatory standards. Still, there is a pervasive understanding that – due to the complexity of climate change and the scope of the necessary economic-ecological transformations - international cooperation efforts are vital to avoid competitive distortions and to pull knowledge and resources to find and implement solutions in a coordinated and tempestive way. Hence, there is a robust understanding that developing and strengthening international institutions is fundamental, but what kind of institution would be more effective remains a subject of discussion (Oberthür and Rayner, 2021; Gössling and Lyle, 2021; Cullenward and Victor, 2020; Sabel and Victor, 2022; Bodansky, 2010[3]).

A strain of academic work argues that international sectoral organizations can be suitable bodies for advancing the climate change topic as they gather the necessary expertise and have a deeper comprehension of the sectoral challenges and possible solutions (Rayner, Oberthür, and Hermwille 2021; Victor, , Geels and Sharpe, 2019). In addition, reaching agreements in a sectoral

3 https://www.belfercenter.org/sites/default/files/legacy/files/Bodansky-VP-October-2010-3.pdf

organization could be more feasible, as the number of divergent interests is smaller than in forums that engage multiple sectors. In other words, breaking the climate change problem into tractable or sectoral parts may facilitate the generation of knowledge, innovation, and new technologies, as well as the achievement of international agreements on standards and policies. On the other hand, critics highlight that sectoral arrangements may not properly address the possible synergies and conflicts between sectors. Furthermore, if sectoral governance evolves in silos, protected from transversal climate discussions, the industry's interests in continuous growth may supersede the climate change objective, reducing ambition and the incentives for mitigation action (Oberthür and Rayner, 2021).

Notwithstanding academic normative prescriptions, the reality is that climate change developed into a regime complex composed of several initiatives, including private governance frameworks, clubs of countries aiming to advance specific actions, and sectoral regimes, such as the ones developed within the International Civil Aviation Organization - ICAO and the International Maritime Organization - IMO, among others.

In this sense, the primary objective of this research is to contribute to the efforts of understanding the international regime complex for climate change. The premise is that specific studies on these multiple governance frameworks – including how they were developed, the strategies they adopted to cope with climate change, and their political economy dynamics – can help build a broader understanding of the current international institutional framework to tackle climate change crisis. More specifically, this dissertation aims to contribute to that endeavor by conducting a case study on the aviation climate change multilateral regime developed within ICAO.

Broadly, research in this realm has delved into three primary areas: i) the role of private actors who have crafted self-regulated private regimes, ii) the dynamics between public and private regulatory regimes, and, finally, iii) how public and private entities interacted within specific governance spheres to regulate distinct sectors. This dissertation concentrates on the third facet, employing the `governance sphere` concept to characterize the regulatory regime developed in ICAO regarding climate change. According to Cashore et al. (2021), governance spheres are sectoral areas populated by public and private actors that develop and manage specific types of regulation to govern their behavior and solve common problems.

ICAO's climate change regime began formally in 1997 when the UNFCCC approved the Kyoto Protocol. The Protocol specified emission reduction targets for industrialized (Annex I) countries and proposed market-based instruments (also called flexibilization mechanisms) that could be used to help implement those targets. During the Kyoto negotiations, there was a deadlock over to whom the GHG emissions from international transportation should be attributed. There were multiple possible ways of allocating those emissions. They could be attributed to the country of origin, destination, or both (half and half). But they could also be allocated according to the passenger's nationality or the company's principal place of business. Without a consensus on the allocation issue, it was decided that GHG emissions from international transportation should be addressed by the respective UN specialized agencies, the International Maritime Organization – IMO and the International Civil Aviation Organization – ICAO. The Kyoto Protocol was ratified in 2005 and determined in its article 2.2 that Annex Parties should pursue limiting or reducing GHG from aviation and marine bunker fuels, working through ICAO and IMO, respectively.

From that moment, ICAO had the formal mandate and the responsibility to propose solutions to the impact of aviation on climate change. ICAO's work started with scientific investigations on aviation's impact on climate change and the possible mitigation measures to address it. Following the Kyoto Protocol's rationality, it evolved into a process of negotiating emissions reduction targets. Initially, those targets were related to fuel efficiency improvements, but in 2010, ICAO agreed on an absolute target of capping international civil aviation GHG emissions at the 2020 level. From that year, any increase in international aviation activity should be decoupled from increased GHG emissions. Because there were no technological solutions to achieve that target, ICAO member states agreed that a market-based measure would be necessary.

Emissions Trading – ET is a market-based measure formalized internationally in the Kyoto Protocol. In a nutshell, it is a mechanism that allows emissions reduction to occur where it is most cost-effective. In other words, if a sector (or a country) doesn't have the capacity – or it is too expensive - to reduce its emissions with internal measures, it can pay for others to do so. Thus, buying and selling certified GHG emissions reduction credits is possible. The rationality is that, considering that the GHG concentrations in the atmosphere do not depend on where emissions take place, emissions trading can offer temporary solutions to hard-to-abate sectors and main emitters countries. It can also enable financial flows to mitigation activities, many of them in developing

countries. Within this mindset, ICAO approved, in 2016, the first sectoral global market-based scheme for addressing climate change, the Carbon Offsetting and Reduction Scheme – CORSIA. Emission trading can involve offsetting credits generated by emission reduction projects and/or the trade of allowances based on emission permits conferred by regulatory regimes[4].

CORSIA is an offsetting scheme, which means that international airlines must buy offsetting credits to compensate for any GHG emissions increase beyond 2020 to achieve the ICAO 2020 carbon-neutral growth (2020CNG) aspirational goal. Technically, the baseline for capping the emissions should be established using the 2019 and 2020 emissions averages to avoid deviant numbers reflecting temporary oscillations in air travel activity. However, the COVID-19 crisis generated a profound deviation from the expected emissions volume, as commercial air travel almost ceased for a few weeks and returned very slowly, particularly for international aviation, as many borders were closed for foreign aircraft. Thus, the ICAO Council approved a new baseline calculated using the 2019 pre-COVID air traffic numbers. Besides the baseline definition, CORSIA is a regulatory regime that defines which airlines shall compensate for emissions - according to the countries of origin and destination of their flights -the offsetting credits that are eligible for complying with CORSIA's obligations; the possibility of using some sustainable fuels for reducing offsetting obligations; the transparency rules of GHG emissions monitoring, reporting, and verification; between others. In sum, CORSIA is a dense and innovative multilateral sectoral regime designed to cope with international aviation's impact on climate change.

The history of international cooperation on climate change has shown that instead of developing a hierarchical overarching regime, as intended through the UNFCCC process, the governance framework ended up fragmented, constituting a regime complex (Keohane & Victor, 2011; Abbot, 2012; Ostrom, 2014; Bulkeley Newell, 2015; Bodansky, 2017). Since climate change is commonly framed as a collective action problem[5], the theoretically prescribed solution would be an integrated governance framework capable of coordinating efforts and avoiding free-riding incentives (Olson, 1965). Nonetheless, despite three decades of negotiations under the UNFCCC auspices, it was not possible to establish a hierarchical overarching regime that could significantly contribute to steering action toward decarbonizing the economy. The attempt to deepen the regime

[4] Chapters 1 and 6 elaborate on those different types.

[5] Appendix I brings an explanation about the concept of collective action problem and a literature review about the characterization of the nature and structure of the climate change problem.

by defining concrete top-down obligations to developed States under the Kyoto Protocol reduced its coverage as the United States, the major emitter by then didn't join. The multilateral negotiation process was mostly gridlocked until it moved to a hybrid architecture consolidated by the Paris Agreement, which combined top-down methodologies for emissions reporting with a bottom-up approach, in which member states establish their own obligations and mitigation policies and communicate them to the UNFCCC through the Nationally Determined Contributions – NDCs (Bodansky, 2017).

In 2016, a year after the approval of the Paris Agreement, marking a move toward a bottom-up approach where countries define their own responsibilities to cope with climate change, the ICAO Assembly agreed upon Resolution A39-3, establishing CORSIA as a top-down market-based mechanism. In this top-down framework, actions for coping with the impacts of international aviation on climate change are defined by ICAO and implemented by member states and airlines. CORSIA is a policy that prescribes detailed top-down rules for States and obligations of results for international air transport operators. It is instigating how, in 2015 and 2016, the UNFCCC and ICAO evolved in such different directions.

After years of depositing a tremendous amount of hope in multilateral negotiations to cope with the climate crisis, the Paris Agreement represented a rebalancing of expectations about what can be achieved in multilateral organizations. The UNFCCC kept its relevance but has focused on i) maintaining the topic high in the international political agenda; ii) offering a place for information sharing and networking; iii) establishing goals; iv) increasing overall awareness regarding the problem's urgency, and; v) creating transparency and accountability rules and mechanisms. The executive role of designing and implementing mitigation policies was left to the States. Conversely, ICAO took a different route. The Organization created a centralized global policy to offset CO2 emissions from international aviation.

Therefore, this research seeks to explore the factors that facilitated the development and approval of CORSIA within ICAO, with a specific focus on understanding how this achievement was reached. In essence, it aims to answer the question: What were the key factors that enabled the design and approval of CORSIA? To address this crucial question, the dissertation is founded on two primary hypotheses.

The first hypothesis pertains to international inter-organizational bargaining. It asserts that:

H1: CORSIA was developed and approved by ICAO due to external pressures from two main regimes: the UNFCCC and the European Union.

According to the first hypothesis, horizontal interactions between the UNFCCC and ICAO and vertical interactions between the European Union and ICAO exerted pressures leading to the approval of CORSIA. In fact, this broader hypothesis contains two specific ones:

H1.1: A competitive horizontal governance framework, instigated by the UNFCCC attempts to regulate international aviation's GHG emissions, led ICAO to develop its own regulatory climate change regime, resulting in the CORSIA approval;

H1.2: There was a conflictive multilevel interaction between ICAO and the EU that led ICAO to approve CORSIA.

In this sense, the research investigates the main patterns of interaction between the organizations and how these interactions prompted ICAO to act more incisively in creating CORSIA.

The second hypothesis revolves around the role of private stakeholders in shaping ICAO's climate change regime. It posits that:

H2: CORSIA was approved due to a successful strategy of the aviation industry to shape its own international climate change regulation without damaging sectoral economic interests.

By analyzing this second hypothesis, the research aims to promote a systematic investigation of how private stakeholders have participated in the governance processes within ICAO and how they have influenced the approval of CORSIA.

The inquiry employs process tracing within a single case study to investigate the hypotheses. It involves assembling specific pieces of evidence and identifying the causal mechanisms that connect them (Bennett and Checkel, 2014). The case study relies on contextual evidence and deductive and inductive reasoning to reconstruct the causal processes within a single case – namely, the evolution of the international civil aviation climate change regime, leading to the approval of CORSIA. The primary research method involved an extensive documentary analysis using the publicly available database on the ICAO website.[6] This analysis encompassed

[6] https://www.icao.int/publications/Pages/assembly-archive.aspx

the period from 1947, when the inaugural ICAO Assembly convened, until 2016[7], when CORSIA was approved. The research delved deeply into primary-source materials: Assembly working papers, meeting minutes, reports, and Assembly Resolutions.

Comprehensive scrutiny was given to all Assembly working papers dating back to 1947 to discern when and how environmental and climate change concerns integrated ICAO's agenda. Search tools were utilized to identify instances of keywords such as 'environment,' 'pollution,' 'noise,' 'emissions,' and 'climate change.' Documents containing these keywords underwent a meticulous content analysis to uncover details about what was under discussion, who initiated the topics, how the issues and potential solutions were framed, and the observable consequences. The documentary analysis also sought evidence relating to the decision-making processes within ICAO. Other documents, especially those produced by industry associations, and supplementary sources such as academic articles, policy papers, and newspaper articles were also incorporated into the analysis.

Furthermore, semi-structured interviews with eighteen senior civil aviation stakeholders from public and private organizations across seven countries helped enhance contextual knowledge. Most of these interviews took place online and lasted approximately one hour each[8]. Our interviewees encompassed a broad spectrum, including individuals from the aircraft industry, airlines, airport management, international associations of airlines and airports, members of the ICAO Secretariat and the UNFCCC Secretariat, as well as representatives from governmental agencies in Brazil, the United States, the European Union, Japan, India, China, and Saudi Arabia. While some interviews were recorded for transcription purposes, others preferred not to be recorded. It's important to note that all interviewees were subject to a confidentiality agreement, ensuring that their identities and opinions would not be publicly disclosed in this dissertation.

It is crucial to emphasize that this dissertation will not provide a summary report of the interview results, and this decision is based on two key factors. Firstly, all interviewees currently represent their respective organizations or countries in ICAO negotiations related to climate change. The researcher gained access to these individuals through her role as the co-lead of an

[7] The research also investigated the main documents on climate change presented and approved during the 2019 and 2022 Assemblies, to verify if the corroborate with some of the study conclusions. However, it was not a systematic investigation of all documents.

[8] Appendix II details the interview script.

ICAO technical group and her connections as a representative of the Brazilian government. To create a summary of the interviews, it would be necessary to, at the very least, identify the country of origin or the type of organization, as this information is essential to support the arguments presented. However, doing so would carry a significant risk of exposing their identities, which raises ethical concerns for the research. The second reason is that most of the interviewees, while they currently play a role in ICAO negotiations, they were not directly involved in the creation and evolution of the climate change regime. Consequently, their contributions provided valuable insights into how the aviation industry perceives the challenges posed by climate change, the significance of ICAO's role, and the potential reasons behind the adoption of CORSIA. Nevertheless, their perspectives were not particularly illuminating in terms of comprehending the historical progression of the regime. In short, the interviews offered valuable contextual knowledge and insights but were not pivotal to achieving the research objectives, that is, to explain the factors that contributed to the approval of CORSIA.

The dissertation is structured into two parts. Part I sets the broader institutional and theoretical context within which the case study unfolds. It starts with a descriptive section narrating the history of the climate change regime, from its inception on the international political agenda until the Paris Agreement that established the current international institutional framework. The second chapter presents the aviation industry's main actors and governance structures. To conclude Part I, chapter III delves into the key concepts and theoretical approaches scholars and academics have adopted to make sense of global climate change governance. Part II of the dissertation presents the case study, outlining the methodology, the empirical research results, and their analytical implications. It begins with Chapter Four, detailing the research design and methodology. Chapter five is dedicated to presenting the results and analysis for hypothesis one, which pertains to inter-organizational bargaining, and is subdivided into two sections—one for each of the sub-hypotheses, addressing the UNFCCC and the EU. Chapter Six delves into the results and analysis for hypothesis two, examining the role of private stakeholders. Finally, Chapter Seven outlines how various factors interconnect to form a coherent narrative explaining the adoption of CORSIA. In the concluding chapter, the author provides closing remarks, offering insights into the main findings, highlighting the research's limitations, and pointing towards promising avenues for further investigation.

PART I – Institutional and Theoretical Backgrounds

Chapter 1. The International Climate Change Regime Evolution

This Chapter aims to describe the history of the multilateral climate change institutional evolution and the parallel creation of the aviation climate change regime within ICAO. It is important to place ICAO developments within the broader context of the U.N. climate change regime, considering that it affected the aviation framework through direct institutional links as well as through the propagation of ideas, principles, and practices. Thus, the Chapter describes what happened in the 90s with the attempts to create a comprehensive top-down global governance arrangement and how expectations were redesigned, leading to the 2015 Paris Agreement. Within this broader context, the Chapter also describes the key milestones of climate change discussions within ICAO, resulting in CORSIA. The goal here is to depict the international institutional developments to establish the background scenario necessary for better understanding the discussions presented in the second part of the dissertation. For heuristic purposes, the research adopts Rajamani and Bodansky's (2017) approach that divides the climate change regime evolution into six phases: 1) foundational, 2) Agenda-setting, 3) Pre-negotiation, 4) Constitutional, 5) Regulatory, and 6) Second Constitutional phase (Rajamani and Bodansky, 2017).

The *Foundational Phase* occurred during the '70s and the '80s and was characterized by the gradual strengthening of scientific concern about climate change. The *Agenda-setting* phase (between 1985 and 1988) was a period in which the issue gained prominence, mainly due to the activism of a small group of influential Western scientists. The *Pre-negotiation Phase* marked the transition of the climate change issue from the scientific to the political realm (1988-1990). These first three phases are briefly described in one section because this research focuses on the institutional developments after the approval of the UNFCCC.

The *Constitutional Phase* (1990-1995) was when the UNFCCC was negotiated, approved, and entered into force. The second section of this Chapter further explores this period. The third section described the *Regulatory Phase* when detailed international regulations were developed and incorporated into the climate regime (1995-2005). It was also the period when ICAO started developing its own regime to cope with aviation's impact on climate change. Finally, the fourth section discusses the *Second Constitutional Phase* from 2005 to 2015, characterized by a gradual transformation of the climate change regime architecture from a top-down to a bottom-up (or

mixed) approach. During this phase, discussions on climate change gained traction within ICAO, and, especially after 2010, the Organization negotiated the critical elements of a global market-based measure for aviation that was finally approved in 2016.

1.1 The Foundational, agenda-setting, and pre-negotiation phases

The foundational and agenda-setting phases took place in the '70s and '80s when scientists recognized that human action could alter the atmosphere patterns, including the Ozone Layer and the climbing concentrations of GHG that were warming the planet. With the rise of industrial production, urbanization, and transportation powered by fossil fuels, political bodies started to discuss environmental matters such as air pollution, noise, and water and soil contamination, among others. For example, multilateral deliberations on environmental issues were initially related to transboundary pollution through rivers and acid rain. A nascent conservationist movement acknowledged the need to protect ecosystems from human intervention. Likewise, the growing concerns around the quality of the environment and its impact on human health led to the first multilateral meeting on environmental matters: the United Nations Conference on the Human Environment, held more than fifty years ago, in 1972, in Stockholm. The Conference established principles related to rights and responsibilities to protect the environment, conserve wildlife, preserve natural resources, manage pollution, and control overpopulation using appropriate urban planning (Pattberg et al., 2022).

The Stockholm Declaration included social and economic development as relevant pillars in promoting a better living and working environment and stressed the need for the appropriate exploration of renewable and non-renewable natural resources. Regarding international cooperation, the document acknowledges its relevance while also reaffirming sovereignty principles by determining the full authority of each country to manage its natural resources. The text of the Stockholm Declaration mentioned the issue of climate change for the first time, cautioning governments that some activities could lead to global warming and that scientific research should evaluate the likelihood and magnitude of climatic effects. However, despite growing environmental concerns in the 1970s and 80s, it was only by the beginning of the next decade that talks about climate change transitioned from the scientific to the political realm. The World Conference on the Changing Environment, held in 1988, and the IPCC First Assessment

Report, published in 1990, consolidated scientific knowledge on the dangerous consequences of GHG accumulation in the atmosphere. From that moment, the problem of climate change rose in prominence within the global political agenda (Bodansky, 2001).

1.2 The Constitutional Phase

The *Constitutional phase* comprehends the negotiation of the UNFCCC, its approval, and entry into force (1990-1994). Negotiations began in 1990; the UNFCCC was approved in 1992 and entered into force in 1994. It was an extremely quick process led by Western countries, while most UN member states were not aware of the dimension of the problem and its consequences. At the United Nations Conference on Environment and Development held in 1992 in Rio de Janeiro, 154 countries signed the United Nations Framework Convention on Climate Change. The document was considered the first significant milestone in the history of climate change diplomacy, setting the objective of "avoiding dangerous interference in the climate system." However, the UNFCCC was just an umbrella Convention, leaving negotiations on more intricate topics - such as the burden-sharing of responsibilities and obligations - to the forthcoming Kyoto Protocol.

The primary purpose of the UNFCCC was to progressively create a legally binding regime to regulate greenhouse gas (GHG) emissions (Bodansky, 2010). The UNFCCC provided an institutional framework for political discussions and deliberations on climate change. It emulated the architecture of the Ozone Regime, agreeing first on a broad Convention that established the nature of the problem and general principles, followed by specific Protocols defining the commitments and strengthening them over time (Bulkeley and Newell, 2010; Bodansky, 2011). Therefore, the idea was that gradually, as uncertainties were reduced and political consensus reinforced, States could agree on protocols defining more precise obligations (Bodansky, 2017).[9] The authors argue that the UNFCCC agreement was shallow due to uncertainties regarding the climate change issue, its consequences, and the mitigation measures available to cope with it. Nonetheless, it is important to recognize that, besides these uncertainties, there was a deep information asymmetry between developed and developing countries. The UN negotiations to

[9] In the case of the Ozone Regime, the Montreal Protocol superseded the Vienna Convention, finalized in 1987, approving the commitment to phase out the most damaging ozone-depleting chemicals. The Ozone Regime is a successful case as it effectively eliminated most of the emissions of gases that were causing the ozone hole (Sabel and Victor, 2022). The climate regime story unfolded differently.

agree on the UNFCCC were highly complex, as the issue had been introduced in the agenda by Northern countries, and states from the so-called Global South had little information about the social and economic consequences of those negotiations, particularly its impact on development needs.

The UNFCCC represented a choice of comprehensiveness over stringency. In 1992, when it was approved, the draft reached a delicate balance in which no specific targets were established. Still, the framework/ protocol strategy created a broad umbrella convention, indicating the elements that should be further refined and specified in superseding protocols. Thus, besides defining the main objective of stabilizing concentrations of GHG in the atmosphere, the UNFCCC listed some policies and measures that the Parties could adopt to achieve that goal. Recognizing the differences between the countries regarding historical responsibility to the problem and capacity to address it, the Convention established the innovative principle of "common but differentiated responsibilities (CBDR)." This principle recognizes that developed countries -which had experienced intense industrialization processes based on fossil energy and contributed the most to the high concentration of GHG in the atmosphere - should commit themselves to GHG emissions reduction targets. In addition, developed countries should provide aid and technology transfer to support developing countries in their efforts to tackle the issue (Bodansky, 2012). However, developing countries like Brazil are also considered big emitters now, due to the historical deforestation rates.

Bodansky (2010) argues that regimes often start shallow, defining weak obligations and progressively becoming deeper over time. A regime's strength is a function of the authority of its institutions, legal form, stringency and commitment precision, and the strength of its review and compliance systems. The author also affirms that there is a trade-off between the comprehensiveness and stringency of international agreements. This means that the attempt to incorporate a broad set of States with different interests and necessities into comprehensive regimes tends to result in shallow commitments. On the other hand, regimes can start narrow and deep, involving a small group of like-minded countries that can adopt more stringent rules and expand progressively to include other countries. Naturally, reaching agreements with specific obligations is more complicated than agreeing on general rules.

However, the power dynamics are missing in Bodansky's narrative. Developing countries acted as a block and managed to introduce the principles of historical responsibilities, remaining

outside the scope of the Kyoto Protocol's mandatory obligations. Without the exemption for developing countries, the UNFCCC would not achieve the consensus required for deliberations. European Countries and the United States were the most influential countries in the negotiation process leading to the Kyoto Protocol. Still, they had different views on the structure of a multilateral arrangement for addressing climate change. While Europe envisaged a framework similar to the Ozone Layer regime, with legally binding instruments and mandatory targets, the US conditioned those targets to the adoption of flexibility mechanisms based on market strategies. The flexibility mechanisms allowed carbon-intensive activities to continue by buying emission reduction units generated in other countries or sectors. This rationality enabled the business-as-usual behavior, increasing the uncertainties about who should be responsible for mitigating GHG emissions.

1.3 The regulatory phase

Regarding the climate change regime, the emergency and evolution of regulation encompassed the following landmarks: i) negotiations of the Kyoto Protocol, according to the Berlin Mandate agreed in COP-1 in 1995; ii) The approval of the Kyoto Protocol in 1997; iii) The Marrakesh Accord, adopted in 2001, which established the detailed rules for Kyoto's implementation; and, finally, vi) The entering into force of the Kyoto Protocol, in 2005, with the Russian ratification (Rajamani and Bodansky, 2017).

However, it is important to recognize that while the UNFCCC established the overall objectives and general principles, the attempts to deepen the cooperation and agree on specific commitments faced challenges. The Kyoto Protocol intended to strengthen the climate change regime by defining commitments on GHG emissions reduction. Nonetheless, according to the CBDR principle, the reduction targets applied only to Annex I countries (industrialized countries and economies in transition, such as Russia and other European countries). While in the Ozone Regime, for example, the same control measures applied to all nations, and the differentiation between states happened in terms of timing[10], the Kyoto Protocol took differentiation the furthest,

[10] Developing countries got an additional ten years to comply.

reflecting development concerns that permeated the discussions and had an impact, from the outset, on the designing of the climate regime.

The idea that industrialized countries were responsible for the problem of high atmospheric GHG concentrations[11] and, therefore, should bear responsibility for leading the responses, reflected in the CBDR principle, shaped the cleavages between developed and developing countries (Kopela, 2013). Nonetheless, the initial division of the negotiations was among the developed countries themselves. The delegates had to reach a consensus between two different views: i) the first defended a top-down binding agreement adopting targets and timetables to reduce emissions, and ii) the second argued for a bottom-up approach characterized by creating a non-binding system of pledge and review. While European countries favored the former, the United States, Japan, and the previous Soviet Union had preferences for the latter, as it was mentioned above. Furthermore, developing countries did not form a concise block. Small islands urged for ambitious action due to their vulnerabilities to climate impacts, while other countries were reluctant to negotiate, such as oil producing powers.

On the other hand, big developing countries like Brazil, India, and China were mainly concerned with their ability to develop socially and economically, maintaining autonomy and reaffirming the sovereignty principle (Bodansky, 2001; Rajamani and Bodansky, 2017). Those countries reinforced the principle of historical responsibility, arguing that highly industrialized countries were responsible for the GHG concentration in the atmosphere and, therefore, should bear the obligation to solve the problem. Developing countries, on the other hand, still needed to industrialize and tackle profound economic and social challenges. Therefore, their right to development should not be impaired by the need to cope with climate change. Thus, climate change considerations should be part of a broader set of sustainable development goals, which include environmental, social, and economic aspects.

The historical responsibility rationality justified the application of the CBDR principle to the Kyoto Protocol first period of compromise, exempting developing countries from mandatory obligations until 2012. Furthermore, the content of the Kyoto Protocol indicates that the preference for a top-down agreement based on the definition of specific targets and timetables prevailed, that is the E.U. project. It was an attempt to create a comprehensive and stringent regime backed by a

belief that it would be the most effective way to reduce atmospheric GHG concentrations. The U.S. concerns with such a top-down regime were softened by introducing flexibility mechanisms based on carbon markets. Those market-based mechanisms aimed to give countries the flexibility to achieve their commitments cost-effectively and stimulate technology transfer and the engagement of the private sector and developing countries. The Kyoto Protocol included means of meeting the reduction targets through three kinds of market-based mechanisms (flexibility mechanisms): Clean development mechanism (CDM), Joint Implementation (J.I.), and Emissions trading (E.T.). The first two are project-based mechanisms only for developed countries, but CDM involves investments that reduce emissions in developing countries. Conversely, J.I. enables developed countries to carry out projects in other advanced economies (Stephan and Paterson, 2012).

The Emissions Trading-ET was grounded in the emissions targets expressed as levels of allowed emissions over the 2008-2012 Kyoto Protocol commitment period. The permitted emissions were divided into assigned amount units (AAUs). Emissions trading would enable countries - with emission units to spare (permitted, but not "used") - to sell this excess to countries that had not achieved their targets. Thus, it intended to create a new commodity called emission reductions or removals, known as the "carbon market." Besides AAUs, other units could be transferred under the scheme, each equal to one ton of CO2, which were: i) removal units - (RMU) based on land use and forestry (LULUCF) activities such as reforestation; ii) emission reduction units (ERU) - generated by a J.I. project, and iii) certified emission reduction (CER) – generated from a CDM project activity[12]. Additionally, the Kyoto Protocol introduced new governing technologies for performance monitoring, including the requirement to calculate emissions in terms of tonnes of CO2-equivalent, the need to have in place a national system for estimating emissions and removals of GHG, and a national registry to record and track the creation and movement of Emissions Units. It also required an annual report of such information to the UNFCCC Secretariat (Clearing House Mechanism).

Despite being the leading proponent of the flexibility mechanisms, the United States President signed the Kyoto Protocol, but Congress did not ratify it. The U.S. allegation for not approving was that - as its economic competitors in the developing world did not have commitments to reduce their emissions - there would be an uneven competitive environment.

[12] https://unfccc.int/process/the-kyoto-protocol/mechanisms

According to this rationale, rapidly industrializing competitors could free-ride on the sacrifices made by Annex 1 parties. Furthermore, industries could be relocated to areas not covered by the provisions of the Kyoto Protocol, resulting in "carbon leakage." Without the involvement of the U.S., many considered that the Kyoto Protocol had failed as it covered only about a quarter of global emissions (Pattberg et al., 2022).

There is a pervasive consensus on the Kyoto Protocol's ineffectiveness. However, there are also some considerations on relevant developments that have spawned from it. First, despite general expectations about others' reciprocated defeat after the U.S. refusal, the European Union and G77 + China took further action. With the Russian ratification of the Kyoto Protocol in 2005, it entered into force (Bulkeley and Newell, 2010). In addition, the Kyoto Protocol policies and technologies of government based on market mechanisms have influenced the crafting of many national and regional policies and private schemes and, with adaptations, were incorporated into the UNFCCC Paris Agreement (Bodansky et al., 2017). These government technologies include performance methods such as GHG monitoring, reporting, and verification and agency methods, like GHG emissions reduction projects and emissions unit trading. They have enabled the involvement of various public and private actors working across borders in multiple activities dedicated to measuring and pricing GHG emissions and removals (Newell and Bulkeley, 2010; Green, 2013).

Another relevant development of the Kyoto Protocol was the creation of international regimes to reduce GHG emissions from bunker fuels used for international aviation and maritime navigation. The Protocol directs Annex I parties to address emissions from international transportation at the relevant U.N. specialized agencies - IMO and ICAO, prompting the development of parallel regimes to cope with the impacts of maritime navigation and air transportation, respectively, on climate change. Therefore, despite the low direct effectiveness of the Kyoto Protocol in achieving emissions reduction, it had an indirect effect of shaping new institutions in a path-dependent process, as previous regimes can constrain and channel the processes of creating new rules (Victor and Raustiala, 2004). Conversely, there are arguments that the development of parallel regimes emptied the climate change agenda, resulting in a race to the bottom regarding the global governance effectiveness to tackle the issue (Bows-Larkin 2015). This debate is central to this research and will be further discussed in Part II of the dissertation.

In sum, with its prescriptive top-down approach, the Kyoto Protocol ended up narrow and did not create the comprehensive international agreement with the stringency necessary to address climate change. The limitations of Kyoto are often attributed to an attempt to deepen the regime too fast before political consensus matured. Nonetheless, others argue that the hierarchical, legally binding architecture is unsuitable for dealing with climate change as a complex, wicked problem. According to new governance approaches, several initiatives encompassing public and private regulations coexist in a regime complex. Thus, considering the diversity of economic sectors and the country's different circumstances and capacities, a bottom-up governance approach could be more feasible to cope with climate change.

1.4 The second constitutional phase

The Second Constitutional phase goes from 2005 to 2015 when the climate change regime gradually transformed towards a bottom-up approach. It differs from the previous period in two main aspects: the international instruments' scope and legal nature. In terms of coverage, Rajamani and Bodansky (2017) argue that the attempt to deepen the regime with prescriptive top-down rules of the Kyoto Protocol resulted in a narrow regime. Concerning the legal nature of the instruments, during this period (from 2005 to 2015), it was possible to notice that multiple instruments with various legal statuses (resolutions, informal political accords, binding agreements, and so forth) composed the building blocks that enabled the institutional evolution of the climate change U.N. regime.

When the Kyoto Protocol entered into force in 2005, it established commitments regarding the industrialized countries' emissions targets from 2008 until 2012. In 2005, the Convention of the Parties to the Kyoto Protocol (CPM-1) began negotiations on commitments for a second period of the Protocol, post-2012. Nonetheless, it was only in 2007, with the Bali Action Plan, that the Parties adopted a process to reach an agreement and advance the climate regime. The Action Plan defined that the agreement should be reached during the COP-15 in Copenhagen in 2009. Despite intense high-level negotiations, getting a consensus during COP-15 was not possible. In Copenhagen, there was a pervasive perception that the political conditions for adopting a new legally binding instrument were absent. The United States did not admit mandatory targets that did not include

China, a growing competitor in the international arena. In fact, both countries resisted the E.U. pressures for a top-down regime (Zhang, 2017).

Considering that the prescriptive and mandatory targets that characterized the Kyoto architecture were no longer viable politically, a small group of countries worked on advancing an alternative approach to the climate governance framework. The United States and the BASIC countries (Brazil, South Africa, India, and China) drafted a text and reached an agreement alongside twenty-three other countries, including all major emitters and economies. Nonetheless, the Accord was rejected by the COP plenary because a group of states was not satisfied with the substance of the text and the procedures adopted in the negotiations, which violated the UN rules and excluded many countries. As COP decisions demand consensus, the UNFCCC only took note of the Accord. Thus, the Copenhagen Accord became a Political Agreement with no legal stance under the U.N. climate regime. Besides lacking legal status, the Copenhagen Accord was highly influential, building new grounds on which the regime would develop from then.

The Copenhagen Accord introduced radical changes in the regime's architecture, moving from the top-down targets and timetables of the Kyoto Protocol to a bottom-up approach based on a system of pledge and review. In this system, states select their targets and actions according to the specific national circumstances and report them to the UNFCCC, following transparency provisions. Therefore, COP 15 can be considered a turning point in the evolution of the climate regime, when the European leadership was strongly contested by Washington and the BASIC members. In 2010, COP-16 adopted the Cancun Agreements, which incorporated the elements of the Copenhagen Accord into the UNFCCC process and set the foundations for the Paris Agreement. A year later, at COP-17 in Durban, Parties agreed on the details to implement the Cancun Agreements and started a new process, called the Durban Platform, that aimed to negotiate, until 2015, a post-2020 climate agreement applicable to all (Rajamani and Bodansky, 2017).

In parallel, Parties to the Kyoto Protocol (CMP-8) finally agreed on a second commitment period from 2012 until 2020. Even with the agreement, there was a political sense that the Kyoto system, which did not encompass the main GHG emitters (the U.S. and China), was ineffective and should not prevail after 2020. The Kyoto Protocol gradually lost its relevance after 2012. A new internationally binding agreement should be negotiated following the pledge and review framework introduced by the Copenhagen Accord and the Cancun Agreements. In preparation for

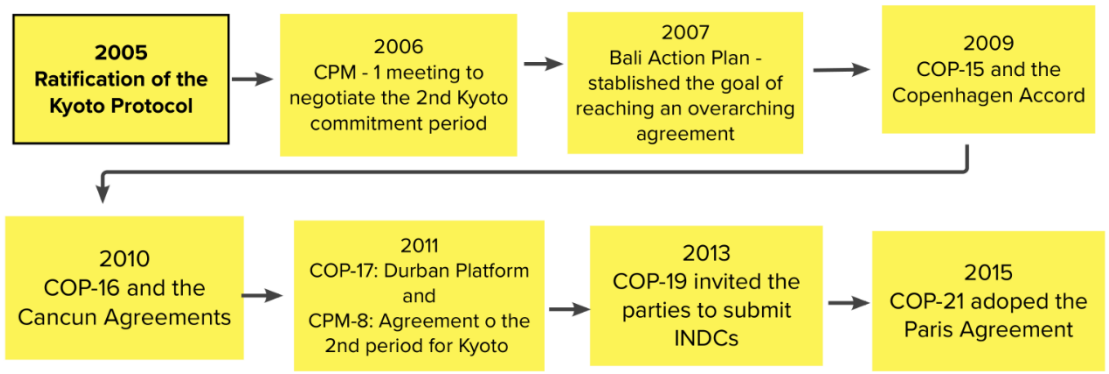
that new agreement, COP-19, held in 2013, invited the Parties to submit their Intended Nationally Determined Contributions -INDCs in 2015. By the end of 2015, COP-21 adopted the Paris Agreement (Rajamani and Bodansky, 2017).

According to Rajamani and Bodansky (2017), the Paris Agreement reflects a hybrid architecture based on a bottom-up approach for defining state's commitments – or Nationally Determined Contributions (NDCs) - and a top-down set of rules introduced to enhance transparency, accountability, and ambition. Despite the agreement's binding nature, the commitments' legal character is flexible, respecting states' autonomy and special circumstances by allowing self-differentiation and the self-selection of targets. Therefore, the agreement did not define the obligations of result nor establish a penalty for non-cooperative parties. Nonetheless, the Paris Agreement introduced detailed obligations of conduct, requiring that the Parties submit periodic reports on their efforts to achieve the NDCs using internationally recognized methodologies. In addition, it requires that NDCs represent progressive ambitions over time and create a global “Stocktake process” for monitoring the implementation of the Paris Agreement and their efficacy in achieving the proposed goals. Therefore, it became a flexible agreement with few internationally agreed obligations.

Another relevant feature of the Paris Agreement is the innovative way it deals with the issue of differentiation. The text includes the CBDR principle but adopts it more nuancedly. Historically, while developing countries have focused on 'responsibilities' – emphasizing the historical emissions of industrialized countries -developed countries, especially the United States, concentrated their arguments on the concept of `capabilities` when negotiating the agreement. The result differed from the traditional approach because it did not split the Parties into two groups to define mitigation targets. The Paris Agreement defined a standard set of obligations for all parties, designing a tailored approach to differentiation based on the specificities of each issue area. The transparency provisions, for example, consider the capabilities of each country in implementing the monitoring and reporting methodologies. Conversely, on provisions related to financial assistance, capacity-building, and technology, there are clear statements regarding the responsibility of developed countries to take enhanced action. This tailored approach to differentiation was fundamental to engaging the United States while keeping emerging economies committed to the regime, notably China and India.

Finally, the Paris Agreement incorporated Kyoto market-based mechanisms. Article 6 of the agreement includes the possibility of adopting cooperative approaches involving the use of Internationally Transferred Mitigation Outcomes – ITMOs for implementing the NDCs. The use of ITMOs is voluntary, and robust accounting must be in place to ensure that the emission reduction credits that are transferred to another country are deducted from the country of origin's NDC to avoid double-counting. The rationality for this market-based approach is very similar to the one that enabled the Kyoto Protocol. It is based in the idea that, for the overall result, it does not make a difference where the emissions' reduction occurs. Also, this approach considers rational to provide mechanisms for emissions' reduction to occur where it can be most cost-effective. Arguably, it could also prompt mitigation actions in developing countries and foster the engagement of private actors in project-related activities that would reduce the impact of human activity on climate change.

Figure 1. Climate Regime Institutional Development milestones



Source: own elaboration.

1.5 The International Aviation Climate Change Regime

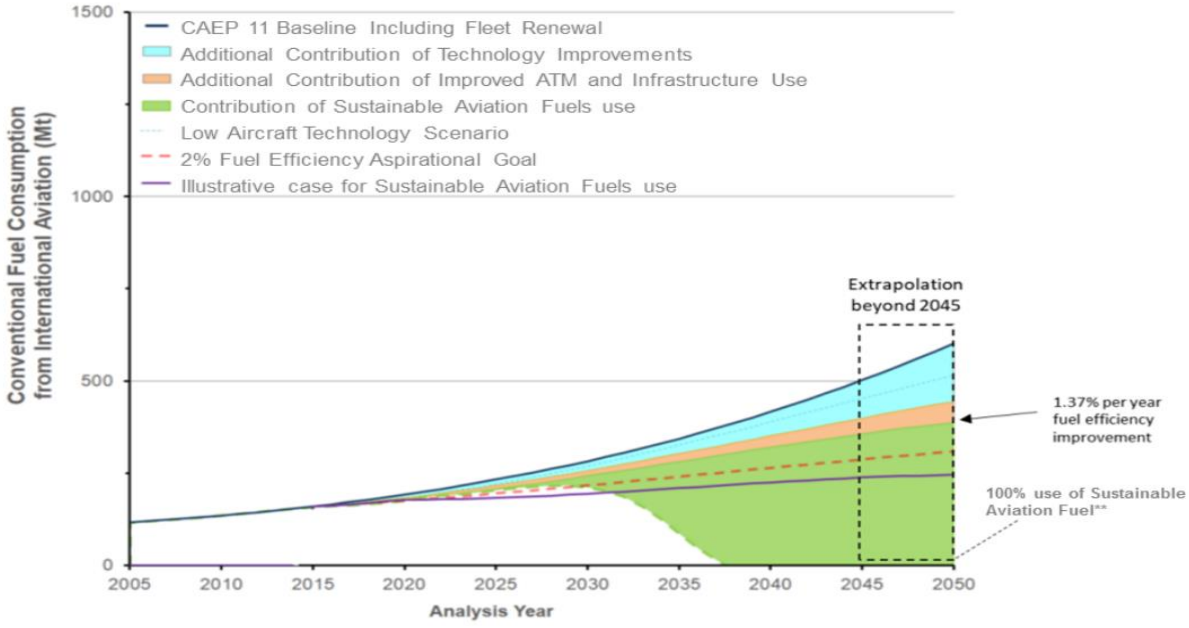
The climate change regime for international aviation evolved parallel to the broader negotiations at the UNFCCC. Article 2.2 of the Kyoto Protocol affirms that Annex I Parties should pursue limiting or reducing GHG from civil aviation working through ICAO. Therefore, the Kyoto Protocol represented an inflection point on the emergence of the climate change regime for international aviation, as ICAO received the mandate and the responsibility to address GHG emissions from aviation (De Mestral et al., 2018).

The UNFCCC and ICAO's regimes progressed in different paths but were connected through formal and informal interactions. From the start, the UN IPCC influenced, as a scientific and technical body, the structuring of ICAO's work on the matter. In 1999, the IPCC[13] issued a report on aviation and the global atmosphere, including the current and projected impacts of subsonic and supersonic flights and the possible measures to cope with them. This body of information set the basis for the discussions within ICAO[14]. The following IPCC reports did not address aviation, as ICAO opted to do its own analysis through the Committee on Aviation Environmental Protection – CAEP. Yet, CAEP periodically reported its analysis to the UNFCCC competent bodies[15]. Based on the 1999 IPCC report and subsequent work conducted by CAEP, ICAO proposed a basket of measures to be considered by member states to address the impacts of aviation on climate change[16].

The basket of measures to address GHG emissions from international aviation included operational procedures, aircraft technology improvements, sustainable fuels, and economic or market-based measures. CAEP started to produce trend analysis to evaluate scenarios for GHG emissions from international aviation and the projected potential of different mitigation measures to address those emissions. ICAO presented its first global environmental trends at the 37th Section of the Assembly, held in 2010. Since then, CAEP has developed and updated the trends to support decision-making in every ICAO Assembly. Figure 2 demonstrates, for example, a GHG emissions scenario elaborated by CAEP in 2010 in which, by 2050, it would be physically possible to meet 100% of international aviation jet fuel demand with sustainable aviation fuels - SAF. In 2023, SAF still represents less than 0.1% of all aviation fuel consumed,[17] which indicates the 100% SAF use in 2050 scenario would demand a quick technological and commercial revolution.

[13] Intergovernmental Panel on Climate Change- https://www.ipcc.ch/site/assets/uploads/2018/03/av-en-1.pdf.
[14] Aviation and the Global Atmosphere. https://www.ipcc.ch/report/aviation-and-the-global-atmosphere-2/.
[15] SBSTA – Subsidiary Body for Scientific and Technical Advice.
[16] https://www.icao.int/environmental-protection/pages/climate-change.aspx.
[17] https://www.iea.org/energy-system/transport/aviation.

Figure 2. Net CO2 Emissions from International Aviation, 2005 to 2050, Including Sustainable Aviation Fuels Life Cycle CO2 Emissions Reductions



Source: https://www.icao.int/environmental-protection/pages/climatechange_trends.aspx

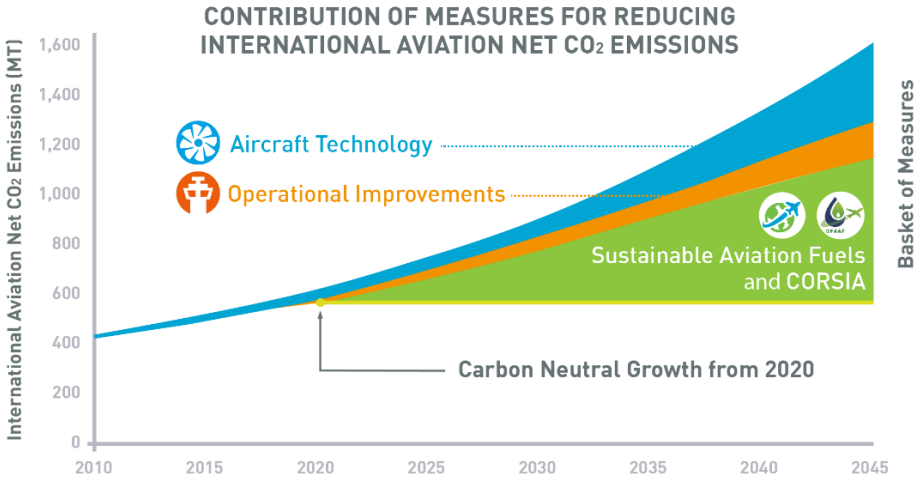
Also, in 2010, ICAO agreed on two global aspirational goals for international aviation. The first and less controversial was a 2% annual fuel efficiency improvement through 2050, and the second – that raised significant disagreements – was the carbon-neutral growth from 2020 onwards (CNG-2020)[18]. Despite the considerable technological advances in aircraft and operations, which led to continuous fuel efficiency improvements, the absolute amount of GHG emissions per year rose steadily due to substantial growth in international air traffic. It soon became evident that international aviation would not meet the CNG-2020 goal without the commercial use of sustainable fuels. However, alternative fuels for aviation are not yet commercially available at viable prices. Therefore, without feasible technologies for reducing GHG emissions, the discussions within ICAO revolved around possible economic measures. The argument was that international aviation, as a hard-to-abate[19] sector, would need market-based measures as flexibility instruments to address its impact through offsetting credits. In other words, while reducing GHG

[18] https://www.icao.int/environmental-protection/37thAssembly/A37_Res19_en.pdf.

[19] The concept of hard-to-abate sectors refers to economic activities that faces technological challenges to find solutions for decarbonization.

emissions through in-sector measures was not feasible (due to technological and economic viability constraints), aviation could temporarily offset its emissions by buying offset credits generated by GHG emissions reduction or removal projects. In 2016, ICAO finally agreed on a Global market-based measure dubbed CORSIA – Carbon Offsetting and Reduction Scheme for International Aviation.

Figure 3. ICAO's basket of measures to address international aviation GHG emissions.



Source: https://www.icao.int/environmental-protection/pages/climate-change.aspx

It is important to highlight that ICAO approved CORSIA as a complementary and temporary economic measure to offset international aviation GHG emissions, whilst in-sector measures lack technological and economic viability. The scheme is supposed to be in place until 2035 and is divided into three phases: i) the pilot phase (2021-2023), ii) the first phase (2024-2026), and iii) the second phase (2027-2035). In order to implement the scheme, ICAO member states began to monitor, report, and verify -MRV emissions from their airlines[20] in 2019. However, offsetting is voluntary in the first two phases and only becomes mandatory in the second phase, starting in 2027. Furthermore, a de minimis approach exempted airlines from countries with less than 0.05% of international air traffic in 2016. Nonetheless, every country can participate in the

[20] The country airlines are those that have their principal place of business in the country`s territory and are subjected to the regulatory control of its national aviation authority.

scheme voluntarily in the pilot and first phases. In January 2023, the list of countries that had announced voluntary participation in CORSIA comprised 115 countries[21], including many small developing countries.

Figure 4: CORSIA implementation phases.

Source: CorsiaBrochure_8Panels-ENG-Print.indd (icao.int)

The division of CORSIA into phases was motivated by a discussion on how to address differentiation between developed and developing countries. This had been an issue in the Kyoto process, particularly for the United States. In ICAO, the U.S. argued that the prevailing principle should be the Chicago Convention principle of non-discrimination[22] between airlines. However, big developing countries, especially China, Brazil, India, and Russia (and South Africa to a lesser extent), affirmed that different countries' capabilities and responsibilities should be reflected in CORSIA's Resolution. In 2016, the political cleavage between developed and developing countries, including China as a developing country, was hard to sustain.[23] Thus, the diplomatic solution was to divide ICAO member states according to their share of the international aviation market. Countries with airlines under their regulatory control that represented more than 0.5% of total international air travel (measured in RTK[24] using data from 2018) would be included in CORSIA in the second phase after 2027. Small developing countries and states with low

[21] Ten more countries announced intention to participate after January 2024. Thus, the total number of CORSIA participating states will be 125. Source: https://www.icao.int/environmental-protection/CORSIA/Documents/CORSIA%20States%20for%20Chapter%203%20State%20Pairs_3Ed_web.pdf.

[22] This principle was addressed by a `route based approach` that affirms that participation in CORSIA is route based, that is, only flights operating in routes included in the scheme are accounted for offsetting purposes. For a route to be included in CORSIA, both countries of origin and destination must be part of CORSIA.

[23] Despite having very small per capita aviation GHG emissions, China is the second largest national aviation CO2 emitter in volume. Per capita annual GHG aviation emissions in China is 0.09 ton, while in the US is 0.57 and the UK 0.86. Data from 2018.https://www.carbonbrief.org/emissions-from-chinese-aviation-could-quadruple-by-2050/.

[24] Revenue Ton Kilometer – RTK is a common metric in aviation to measure the total distance flown and the total paid passenger and cargo transported.

international aviation activity were excluded from CORSIA. Despite Chinese insistence that developed countries should join the scheme first, agreement on language was complex due to political sensibilities. Thus, it was decided that the pilot and first CORSIA phases would be voluntary, with developed countries taking the lead. Paragraph 9 of Resolution A39-3[25] states that:

> "a) Pilot phase applies from 2021 through 2023 to States that have volunteered to participate in the scheme. States participating in this phase may determine the basis of their aircraft operator's offsetting requirements from paragraph 11 e) i) below;
>
> b) First phase applies from 2024 through 2026 to States that voluntarily participate in the pilot phase, as well as any other States that volunteer to participate in this phase, with the calculation of offsetting requirements in paragraph 11 a) below;
>
> …
>
> e) Second phase applies from 2027 through 2035 to all States that have an individual share of international aviation activities in RTKs in year 2018 above 0.5 per cent of total RTKs or whose cumulative share in the list of States from the highest to the lowest amount of RTKs reaches 90 per cent of total RTKs, except Least Developed Countries (LDCs), Small Island Developing States (SIDS) and Landlocked Developing Countries (LLDCs) unless they volunteer to participate in this phase.

Many small developing countries have volunteered to participate in CORSIA from the pilot and first phases. However, it is important to highlight that this doesn't have practical effects for those countries, as most don't have national airlines operating internationally or, when they do, the volume of operations is minimal.[26] Conversely, big developing countries, such as China, Brazil, India, Russia, and South Africa, have not volunteered to participate in the pilot and first phases, considering that the phase-in approach was part of the negotiating package for introducing differentiation in CORSIA's framework. It doesn't mean that those countries are not implementing CORSIA. They have implemented the CO2 monitoring, reporting, and verification (MRV) requirements but will only be submitted to offsetting obligations after 2027.

[25] https://www.icao.int/environmental-protection/documents/resolution_a39_3.pdf.

[26] Airlines with less than 10.000 metric tons of CO2 per year are also exempted from CORSIA.

Conclusion

This Chapter described the overarching climate change regime centered in the UNFCCC that produced parallel ramifications in the U.N. specialized agencies: ICAO and IMO. Additionally, it has introduced the main features of the international aviation climate change regime, which is the object of this research. It is evident that the UNFCCC developments influenced the discussion within ICAO in several aspects. However, history also shows that these two regimes followed divergent paths. Instead of moving to a bottom-up approach based on nationally determined contributions, ICAO approved CORSIA as a top-down scheme that prescribes specific obligations. Additionally, the political ways to address differentiation between developed and developing countries were different in both regimes.

The research aims to understand how CORSIA was developed and approved. However, CORSIA did not develop in a governance vacuum. It was designed and approved within a broader context of multilateral climate change negotiations. Understanding this general institutional background scenario is crucial. Moreover, it is also relevant to better understand the specificities of the aviation industry's political and economic ecosystem. This is the next Chapter's endeavor.

Chapter 2. Who is who in the kingdom of aviation?

This Chapter aims to provide a brief presentation about the international civil aviation sector, particularly its main actors, political and economic dynamics, and governance arrangements. The text first tells the story of the aviation industry emergence, describing how it relates to the post-war political movements of consolidating national sovereignty and, at the same time, developing an international governance system. In sequence, the Chapter describes the international governance structure of civil aviation composed of two main arrangements: i) a centralized global governance institution in the scope of the United Nations, that is, the International Civil Aviation Organization -ICAO; and ii) a network of bilateral Air Services Agreements - ASAs. Finally, the Chapter discusses the main private organizations within the governance sphere[27] of international aviation and how they have participated in the processes of building and managing international aviation governance. The conclusion stresses the relevance of understanding the aviation industry for contextualizing the research on sectoral governance within the climate change international regime.

2.1 The Political and Economic Dynamics

The progress of commercial aviation has brought about political and economic processes relevant to understanding the arts and crafts of the aviation industry today. On the one hand, international aviation can be seen as a representation of globalization, with over a hundred thousand daily flights forming a network that connects virtually every country worldwide. On the other hand, the development of aviation was interviewed with sovereignty affairs, considering the strategic nature of international air connections and air might. Every day, 12.5 million passengers and 18 billion worth of goods are transported by air.[28] In 2019, aviation's total economic impact was USD 3.5 trillion, including 4.5 billion passengers transported and USD 6.5 trillion worth of cargo

[27] The concept of governance sphere is discussed in Chapter 3, item 3.7.

[28] https://www.iata.org/en/iata-repository/pressroom/fact-sheets/fact-sheet-benefits-aviation-statistics/

handled in 46.8 million commercial flights[29]. However, the bulk of these numbers is concentrated in some countries and companies. Figure 5 reproduces a map showing the density of air transport routes especially in Europe – that is a geographic hub for international air connections -, the United States and China.

Figure 5. World flight paths and airports in 2022.

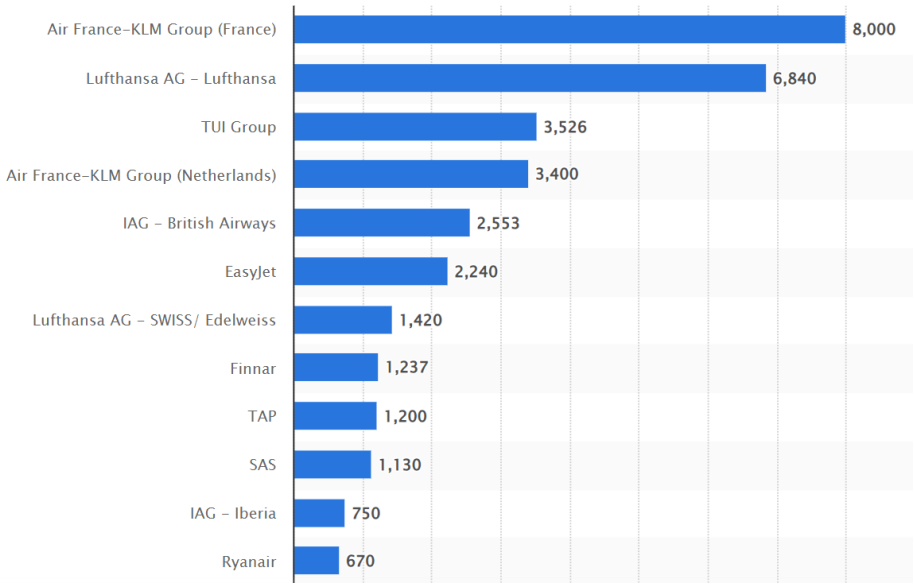
Source: https://www.visualcapitalist.com/cp/mapping-airways-the-worlds-flight-paths-and-airports/

Considering the networked structure of the aviation industry, international institutions are relevant for providing public goods, such as harmonized standards for air navigation and communication infrastructures. Thus, it is the countries' and airlines' political and economic interest to develop globally harmonized rules to govern the system. On the other hand, airlines have historically been regarded as national symbols, established and supported with substantial governmental subsidies, and considered strategically important in times of both war and peace. During the COVID-19 pandemic, for instance, governmental aid for airlines, particularly in the U.S. and Europe reached billions of dollars. Figure 6 shows data regarding European governmental

[29] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8690046/

aid for airlines in 2021. The numbers in the U.S. for loans and loans guarantees for airlines are also high[30].

Figure 6. European government aid to airlines amid COVID-19 as of April 2021, by airline (in million euros)



Source: https://www.statista.com/statistics/1189278/government-aid-airline-europe-covid/

Clearly, aviation is considered a relevant sector for governments and concerns regarding its connections to national sovereignty have always been vital. To better understand this political dichotomy between global governance and national sovereignty, as well as the economic incentives that shape stakeholders' behavior within this sector, it is helpful to delve into the period when commercial aviation first emerged.

During World War I, aviation technology quickly developed as nations sought to gain an advantage in aerial warfare. Aircraft designs have improved, leading to faster, more reliable planes. The demand for airplanes during the war stimulated the growth of the aircraft and engine industry. The pioneers were the French (1911), followed by the Germans and the British (1914). The US also started developing its industry a few years later (1917). Manufacturers scaled up production and adopted assembly line techniques. Additionally, the war demanded extensive pilot training

[30] The US Congress approved $54 billion in three rounds covering much of U.S. airline payroll costs for 18 months. Source: https://www.reuters.com/business/aerospace-defense/us-airlines-defend-54-billion-covid-19-government-lifeline-2021-12-15/

programs, leading to a skilled workforce of aviators. When the First World War ended, a surplus of aircraft and pilots fostered commercial aviation. Governments recognized the potential of aviation for mail and cargo transport, leading to the establishment of subsidized early airmail services and the growth of aviation infrastructure, notably in the West.

With the advent of World War II, there was a second wave of technological advancements in aviation. Jet engines, radar systems, pressurized cabins, and long-range bombers were developed. By the end of World War II, governments had invested heavily in airports, runways, and air traffic control systems to support military operations. The need for long-range bombers during the war pushed the boundaries of aviation, leading to the development of transatlantic flight capabilities and laying the groundwork for commercial transatlantic routes. Overall, the World Wars acted as catalysts for the advancement of aviation technology, pilot training, infrastructure development, and the recognition of aviation's potential for civilian use. These developments formed the basis for the rapid growth and transformation of civil aviation in the post-war era, contributing to the demilitarization of economic activities (Dobson, 2017).

Regarding the international system, the post-war period witnessed the consolidation of a new international order based on the protection of Westphalian principles of sovereignty and, simultaneously, on the development of international institutions to govern the emerging system. In the aviation context, a prolonged legal debate ensued about the prevalence of a global governance liberalized framework founded on principles of air freedom versus the defense of air territorial sovereignty and support for national airlines (Dobson, 2017). For those arguing for air freedom rights, commercial airlines should be allowed to overfly multiple countries and offer their services in several territories. The ones defending the principles of sovereignty saw national airlines as strategic assets and national symbols. They sought to promote their economic interests by protecting their primary right to offer services to and from their country's territory.

Besides guarding their airline's commercial advantages, there was a security concern to protect the countries' territories from international overflights. The Great Wars had shown the destructive capacity of air might, fostering nationalist positions and underscoring the strategic significance of aviation for national security and international projection. Notably, Winston Churchill once asserted that a civilian aircraft could be converted into a weapon of war within a mere fifteen minutes (Dobson, 2017). Even long after the World Wars, the tragic attacks of

September 11th of 2001, served as a grim reminder of Churchill's prescient words. Therefore, the history of commercial aviation cannot be comprehensively understood solely from a business and economic standpoint. International politics, geopolitics and security considerations were central in shaping the birth and expansion of this industry and its governance arrangements.

Nonetheless, the development of commercial aviation, encompassing routes connecting passengers from various countries and continents, needed the provision of public goods such as safety and security oversight and communicable air navigation infrastructure. By the end of the Second World War, two main airlines had the ambition to use the aircraft and pilot surplus generated to offer air services to multiple countries and continents: Pan American, in the United States and British Airways, in the United Kingdom (Dobson, 2017). For that, they needed the provision of radars, communication services, and adequate airport infrastructure worldwide. Furthermore, they needed harmonized safety and security standards and market access rights. All of these factors, in turn, called for stable and long-term cooperation among nations, prompting the negotiation of international agreements and the creation of international organizations to govern this new globalized industry.

2.2 The Institutional Governance Framework

During the World Wars, the regulation of international air transport had been developed separately in the United States and European countries. As mentioned, there was strong interest in developing commercial aviation to use the surplus of aircraft and pilots after World War II. Thus, countries saw the need to create a global governance framework to regulate this new industry. In 1944, fifty-four countries met in Chicago to discuss the regulation of international air transport. The meeting resulted in a document called the Chicago Convention and the creation of the International Civil Aviation Organization – ICAO a year later. ICAO became the United Nations specialized agency responsible for setting international standards and regulations for aviation safety, security, efficiency, and, more recently, environmental protection. The Organization also sets standards and procedures for air traffic management, including air traffic control, communication systems, navigation aids, and airspace design, to ensure safe and efficient air travel. The main ICAO objective is to provide a harmonized regulatory system for the aviation sector,

aligning national aviation legislation with international standards and facilitating safe and efficient air transport.[31]

There was an attempt at the Chicago Conference to negotiate a broad set of rules to regulate international aviation not only in its technical aspects but also in commercial terms, creating a global multilateral agreement with liberalized market access rights for the provision of international air services. Nonetheless, the negotiations in Chicago could not advance on market access provisions, and the determination of commercial rights for each airline and the modalities thereof were left to bilateral agreements. The Bermuda Agreement of 1946, between the United States and the United Kingdom, served as the first benchmark for numerous subsequent agreements. Since then, over four thousand bilateral air transport agreements have been signed and registered with the ICAO. Until recently, most of these agreements were characterized by detailed and restrictive regulations that governed various commercial activities. These regulations encompassed elements such as the frequency of flights permitted per week, aircraft size, designated destinations (including specific cities), tax exemptions, and even ticket pricing.

In summary, the international aviation governance framework became divided into two primary components: a network of bilateral agreements (ASAs) and a central regulatory body (ICAO) that establishes rules for international civil aviation's safe and organized progress. The network of ASAs forms the legal basis for the exploration of international commercial air services (market access rules), while ICAO defines centralized rules on safety, security, and air navigation creating the harmonized technical standards required for operating international air transportation (Fichert, Forsyth, and Niemeier 2020). These two components are interconnected, as ICAO provides a template for ASAs widely adopted by many countries, particularly concerning operational aspects, safety, and security. Furthermore, ICAO convenes committees to address economic matters and market access liberalization. These economic matters include not only market access rights but also ownership and control of airlines, flight tariffs, and charges and taxes.

Despite numerous efforts, progress on economic issues within ICAO has been minimal. Countries still have to negotiate bilateral agreements to acquire market access rights and to define provisions regarding ownership and control of airlines that operate the routes covered by the

[31] https://www4.icao.int/icao75/History/ICAOAndChicagoConvention.

agreement. Regarding pricing, the International Air Transport Association – IATA, which is a private organization, initially determined the flight tariffs. The ASAs also usually have provisions on tariffs, defining if the prices should be approved by both countries, by only the country of origin of the flight, or if airlines are free to establish their prices.[32] During the last decade, there was a process of international air services liberalization, which included broader market access rights and the free definition of air ticket tariffs based solely on commercial considerations.

Regarding taxation, ICAO has adopted initiatives to limit or avoid the incidence of taxes and charges to international air travel. Deliberations on that matter go back to the Chicago Convention, which introduces equal treatment and transparency principles for airport and air navigation charges[33]. According to ICAO policies[34], charges shall aim exclusively to recover the costs of providing the associated services. On taxation, ICAO has been adopting policies since the early 1950s with guidance for member states to avoid taxation on international air transport. Most bilateral Air Services Agreements also bring provisions limiting the incidence of taxes and charges.

The newest body of regulations established by ICAO concerns environmental matters that include noise, local air quality, and climate change. Environmental discussions within ICAO encompassed technical discussions aimed at setting standards, such as noise, polluters, and GHG emissions from aircraft engines. However, those discussions also involved economic measures, such as the establishment of environmental taxes and charges, which was a controversial topic disregarded by ICAO, and the creation of market-based measures to address climate change, which went forward, resulting in the approval of CORSIA. It is important to highlight that CORSIA is the only economic standard approved by ICAO. Policies regarding taxation and general guidance for the liberalization of international air transport were also discussed and approved, but none of them have the normative force and obligations' specificity of CORSIA. The empirical part of this thesis will discuss this topic in detail.

2.3 The Main Actors in the Civil Aviation Governance Sphere

As introduced in the first section, commercial aviation developed in close connection with the technological advances resulting from war efforts. Hence, countries with greater involvement

[32] https://www.icao.int/sustainability/pages/eap_ep_tasa.aspx.

[33] Article 15 of the Chicago Convention.

[34] ICAO Doc 9082; Doc 7100, Doc 10022. https://www.icao.int/sustainability/pages/eap-im-policies.aspx.

in those efforts, particularly the victorious ones, were quite prominent in the early developments of civilian air transportation. For instance, the United States and the United Kingdom have been major players in the history of commercial aviation. Airlines like Pan American World Airways (Pan Am), Trans World Airlines (TWA) in the U.S., and Imperial Airways and British Airways in the U.K. pioneered commercial scheduled flights. France and Germany[35] also established their national airlines after the Second World War, which were Air France and, later on, Lufthansa, respectively. The Soviet Union created its airline in 1923 called Aeroflot, which became one of the world's largest airlines during the Soviet era and is still an important company.

National air carriers were also created in Canada (Trans-Canada Airlines, now Air Canada), Japan, China, Australia, and Brazil, among others. Notice that, despite being dedicated to commercial activities, those national carriers received great governmental investments, and most of them were state-owned, at least initially. Thus, maybe due to the intricated relationship between civilian air transport and State strategic and security concerns, there was no clear separation between public and private actors in this nascent industry. The aircraft manufacturing industry also progressed with high public investments in the U.S. (Boeing), France (Airbus), Canada (Bombardier), the Soviet Union, and Brazil (Embraer), among others.

From the outset, one private institution has played a significant role in advancing civil aviation and its governance arrangements: the International Air Transport Association (IATA). IATA is an association of airlines that was established before ICAO. IATA's scope was limited to Europe until 1939 when Pan American joined the Association. After 1945, IATA transformed into a robust organization with clear objectives. Its primary goals were to promote safe, regular, cost-effective air transport, foster air commerce, and collaborate with the newly formed ICAO and other international bodies. Initially, IATA worked to harmonize European conventions with air transport laws that had been developed separately in the United States during the war period. These early cooperative efforts aimed to create a unified framework for international aviation regulations to enable transatlantic flights. When countries met in Chicago in 1944 to negotiate the Chicago Convention and create ICAO, IATA was present supporting negotiations with data and technical information[36]. Furthermore, IATA worked closely with governmental officials on drafting the

[35] Germany was forbidden by the Treaty of Versailles to develop powered aircraft. They have invested in sport aircraft and rockets and, a few years after WWII, in 1953, they created their national carrier, Lufthansa.

[36] https://www.iata.org/en/about/history/.

Chicago Convention Annexes, which contain the Standard and Recommended Practices – SARPs[37] that, until now, govern the operation of international flights.

Regarding commercial matters, IATA has also been highly influential. During the industry's early days, governments had to approve the prices charged by international airlines. IATA was responsible for organizing the so-called Traffic Conferences, where they presented propositions of fares and rates for final government approval. It is relevant to see how international air travel, until very recently, did not follow liberalized market practices, with prices being defined by concertation between public and private stakeholders. Until the 1980s, most consumers traveled on fares defined in IATA conferences. During the 1990s, increased demand led to higher competition between the airlines and the formation of alliances between groups of airlines. Governments began to deregulate air services and negotiate liberalized bilateral agreements. The development of anti-trust regulations in several countries also made it difficult to justify IATA's leadership in defining tariffs, and gradually, that system was replaced by fares freely established by airlines.

However, IATA's regulations were not restricted to pricing, and the Association remained extremely relevant in structuring the business of international air transport. Their functions include: i) ticket specifications, ii) guidelines for the relationships between airlines and their agents, iii) an important debt settlement Clearing House for the member airlines,[38] and others. After 1979, IATA also strengthened its role as a trade association, representing the airlines in domestic governmental relations and international organizations. In public policy relations, one topic that was of particular interest to IATA was taxation. IATA extensively advocated with governments about the counter-productive effect of excessive taxation, including customs duties[39], airfare taxes, fuel taxes, and others. Charges for using airports and air navigation services were also subjected to IATA's attention. IATA strived to minimize the financial impacts of those charges on airlines by ensuring

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[37] Standards and Recommended Practices (SARPs) are technical specifications endorsed by the Council of ICAO in accordance with Article 38 of the Convention on International Civil Aviation. The objective is to attain "the highest practicable degree of uniformity in regulations, standards, procedures, and organization concerning aircraft, personnel, airways, and auxiliary services, wherever such uniformity can enhance and advance air navigation."

ICAO publishes SARPs in the form of Annexes to the Chicago Convention.

[38] The clearing house began operations in January 1947 and today has an annual turnover of around 56 billion USD. Source: https://www.iata.org/en/services/finance/clearinghouse/.

[39] Considering that airlines enter and leave foreign territories frequently the incidence of import and export taxes on products related to those services (aircraft, fuel, cabin provisions, equipment, maintenance parts, etc.) could rase significant economic and logistic problems.

that they were for facilities or services actually required, cost-related and that productivity improvements were built into cost projections. Therefore, IATA has a declared goal of assisting the industry in achieving adequate levels of profitability by optimizing revenues while minimizing costs. Avoiding taxation and reducing the incidence of charges has been a decisive part of that strategy.

Over the years, IATA has consolidated its position as the industry's voice, with strong advocacy and lobbying to advance aviation's interests. Despite their observer status, they have participated in all ICAO Assemblies with active engagement in multiple propositions and discussions. IATA is a central institution but not the only influential private Association in international aviation. Other associations representing the airports (ACI), aircraft manufacturers (ICCAIA), air navigation providers (CANSO), business aviation (IBAC), and others were created and strengthened throughout the years[40]. IBAC, for instance, was founded in 1981 and assembled fifteen associations dedicated to representing the specific niche of business aviation companies worldwide. Besides participating in the ICAO debates, IBAC works on governmental advocacy in multiple countries and offers voluntary safety standards programs.[41]

Regarding the airports, in 1948, nineteen U.S. commercial airports gathered in New York to form the Airports Operators Council - AOC aimed at addressing mutual challenges facing airports in the U.S.[42] The AOC recognized that, unlike the airlines represented by IATA, airports didn't have an international body and were not participating in ICAO deliberations. To gain an observer seat in ICAO proceedings, Europe's two airport organizations, the Western European Airports Association (WEAA) and the International Civil Airports Association (ICAA), agreed to form an umbrella group with the North American AOCI. In 1970, the Airport Associations Coordinating Council (AACC) was formally established, congregating those three organizations, and in 1971 the Association was invited to participate in ICAO, representing the airport industry with an observant status. The initial name AACI was changed in 1992 to Airports Council International-ACI. Today, the Organization is based in Montreal but integrates members from five regions - Africa, Europe, Latin America/Caribbean, Asia-Pacific, and North America. The ACI

[40] https://www.icao.int/about-icao/pages/invited-organizations.aspx.

[41] https://ibac.org/.

[42] https://aci.aero/about-aci/.

mandate is to develop unified visions about the main challenges facing airport infrastructure for international aviation while concurrently supporting the services and programs of their members. After IATA, the ACI has been the second most vocal Private Organization in the ICAO Assemblies.

The aeronautical industry also developed an international organization to share information and coordinate advocacy efforts. The International Coordinating Council of Aerospace Industries Associations - ICCAIA was formally established in 1972. Originally, ICCAIA was constituted by the Aerospace Industries Association of America - AIA and the Association Européenne des Constructeurs de Matériel Aérospatial - AECMA. The AECMA, the European Defence Industries Group, and EUROSPACE merged in 2004 to form the Aerospace and Defence Industries Association of Europe -ASD. In 2013, ICCAIA included aircraft manufacturing associations[43] from Brazil, Canada, Europe, Japan, and the United States. However, the chairs of the Organization are still their founding members, the U.S. and Europe. ICAO recognizes ICCAIA as the aircraft manufacturing industry representative and participates in multiple ICAO forums as an observer[44].

Another institution founded more recently, in 1996, was the Civil Air Navigation Services Organization – CANSO, representing the companies that provide air traffic control and navigation services. Those services were initially provided solely by public institutions. Nowadays, each country has its own model, and private and non-profit organizations are dedicated to offering air navigation services. Thus, CANSO gathers governmental and private institutions to improve air navigation services and represent their member's views in the ICAO processes[45]. Finally, ATAG, the Air Transport Action Group, is a unique organization because rather than representing specific activities, it brings together experts from several parts of the air transport value chain. Its main goal is to produce information about the benefits of aviation in supporting economic and social development. ATAG has focused on sustainability matters, particularly on strategies to commit to the necessary climate action underlined by the Paris Agreement, driving the industry towards net-zero carbon emissions for air transport by 2050[46].

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[43] The Union of Aviation Industrialists - UAI, in Russia, was accepted to ICCAIA with an observer status.

[44] https://iccaia.org/about-us/history/.

[45] https://applications.icao.int/postalhistory/canso_civil_air_navigation_services_organisation.htm.

[46] https://atag.org/.

Therefore, it is important to highlight that the aviation governance sphere involves, beyond the traditional governmental representatives, various private stakeholders, including airlines, airline associations, aircraft manufacturers, airport associations, ground facility services, and more. Additionally, the countries' representations are not a unified black box as they usually include officials from foreign policy ministries and representatives from governmental civil aviation agencies. Due to the deliberations' technical nature, the latter officials' participation has been more prominent in ICAO and other international technical bodies. This is important because those actors usually have views more aligned with the aviation industry's interests when compared to the foreign minister's officials, who have a broader perspective of the countries' objectives and interests. In a nutshell, the civil aviation governance sphere is a vast ecosystem in which private and public actors navigate building the structure and the processes that allow for the transportation of billions of passengers every year[47].

Conclusion

This Chapter provided a brief picture of the international civil aviation constellation of stakeholders, institutions, and some of the interest structures that drive action and processes. The intention was not to provide an exhaustive list of stakeholders and institutions but to explore the ones that were most significant for the advancement of international civil aviation as an economic activity as well as its international governance arrangements. It is possible to notice that there is not a sharp distinction between public and private organizations. There are multiple cases in which private airlines, for example, are seen as relevant state instruments and, conversely, in which governmental organizations such as ICAO are permeated by commercially driven decisions, like the ones avoiding taxes and limiting charges. There are also arrangements in which IATA, acting as a private authority, creates standards and practices affecting airline operations worldwide, a function that one could think would be primarily governmental. Furthermore, with the recent COVID-19 pandemic that had an enormous financial impact on the airlines, there was a new surge of governmental support and subsidies to national airlines, particularly in the United States and European countries.

[47] In 2019 4.5 billion passengers were carried on scheduled flights. The World of Air Transport in 2019 (icao.int).

Understanding the aviation governance sphere - particularly the permeability between public and private institutions throughout history - is relevant for making sense of this research's main arguments regarding the factors that have influenced the development of a climate change regime within ICAO, culminating in the approval of CORSIA. The investigation's main findings are presented in Part II of the dissertation. Before that, the next chapter elaborates on the main concepts and theoretical approaches related to international climate change governance that have influenced the analytical frameworks developed for this study.

Chapter 3 - Theoretical Framework

This chapter discusses the primary theoretical perspectives that informed the concepts and ideas of the analytical framework presented in the second part of this thesis. The research aims to understand the emergence and development of the climate change regime in the governance sphere of international aviation. It departs from International Relations theories dedicated to explaining cooperative arrangements between countries, transnational actors, and international organizations. The chapter starts by describing the traditional regime theories largely used to explain international cooperation after the World Wars, particularly with the intensification of the globalization trends during the 1980s and 90s. During this period, there was strong optimism about international cooperation and International Organizations' role in providing overarching governance functions (Weiss and Wilkinson 2018, page 79). Contractualism was seen as central to establishing and maintaining international relations. Thus, several bilateral and multilateral agreements were signed. Regarding climate change, there was a pervasive belief that a top-down multilateral agreement was the most adequate answer to cope with the human impact on climate balance.

By the end of the 1990s and the beginning of the twenty-first century, practitioners and academics increasingly acknowledged the complexity of climate change as a super-wicked[48] problem that permeates all aspects of the social-ecological system (Keohane and Victor 2011). Many international and transnational initiatives were attempting to address issues related to climate change, involving public and private agents. The regime theory was short on recognizing the diversity of actors and processes involved in governing the transition to a decarbonized society. Therefore, broader approaches based on governance beyond traditional inter-state regimes emerged. Section 2 of this chapter describes the main shortfalls of the regime theories and the contributions of the global governance approach to understanding the diversity of actors, processes, and institutions dealing with climate change. Section 3 discusses the implication of this fragmentation and introduces the idea of regime complex proposed by Keohane and Victor (2011) Orsini et al. (2013).

While there was a growing concern about institutional fragmentation due to the conflicts and inefficiencies it could entail, new analytical approaches shed light on governance alternatives

[48] See Appendix 1.

to navigate coherently through the complexity of this multi-actor and multi-sphere system (Keohane and Victor 2011; Ostrom and Meserve, n.d.; Abbott, 2012). One of them is the polycentric approach presented in the fourth section, which explores how climate policies and measures can be developed and implemented in multiple levels of governance with the possibility of creating synergies and complementarities. Still, the polycentric and regime complex perspectives are mainly focused on state actors.

The fifth section elaborates on theories that place non-state actors in the center of the analysis, such as the ones exploring transnational networks and the role of private authorities in the governance sphere of climate change. Considering this prominent agency of non-state actors, new bodies of thought also aimed to understand the patterns of interactions between public and private authorities. The sixth section explores that topic, describing the ideas of orchestration, governance spheres, and others. Finally, the seventh section brings the sectoral approach and the experimentalist governance applied to climate governance. These two lenses of analysis focus on a problem-solving paradigm that proposes a combination of institutional models and types of actor's agency to address the challenge of transitioning to a low-carbon society.

As will be seen during this chapter, a rich body of theories and concepts aimed to make sense of the governance arrangements created globally to deal with the climate change problem. It is possible to notice a co-evolution mechanism where ideas helped to shape institutional frameworks and, at the same time, the observation of ontological facts regarding governance arrangements and their different designs inspired new analytical approaches.

3.1 Regime Theory

This research draws mainly on International Relations - I.R theories. I.R. scholarship emerged as a study field in the early twentieth century after World War One (Dobson, 2017). The consolidation of the Westfalen system of Nation-states and the desire to control or eliminate war fostered new bodies of theories within Political Science eager to understand the structure of the security problem and the power relations amongst States. Realism and Idealism were the two broad schools of thought that historically organized the debates in the I.R. Field. Realists understood the structure of the problem as an anarchy of states with a focus on power relationships, their shifting and balancing over time (Carr, 1961). The emphasis was on the security dilemma, which asserts

that one State's security through the buildup of military power (defensive weapons) is perceived by others as the power to attack (offensive weapons). Idealists also recognized the relevance of power politics. However, they emphasized the mutual benefits of trade. They argued that a shared system of norms and customs, enabled through diplomacy and dialogue, was the bulk for an international society capable of organizing itself using international institutions to manage conflicts and restrict power. (Kant, 2017; Keohane and Nye, 1977; Dobson, 2017).

The Realist research agenda did not offer adequate analytical tools to explain the growing international cooperation, multilateralism, and even the U.N. system-building amid the Cold War. In an endeavor to describe this new order without resorting to classical Idealism and legal-philosophical normativism, John Gerard Ruggie and Oran Young, among others, in the late 1960s and early 1970s, introduced a new body of theories called International Regime Theories. Keohane (1982) defines a regime as institutions with explicit rules agreed upon among governments that pertain to thematic areas of international relations. Krasner's definition (1982, p.185) encompasses the implicit and explicit principles, norms, rules, and procedures of conduct and decision-making. Young (1980) also agreed that formalization was not a necessary condition and that there were wide variations amongst regimes. In his proposition, all international regimes were constructed social institutions characterized by the maintenance of convergent expectations among actors.

According to regime theory, institutions govern the interaction between States in particular issue areas and can significantly influence the outcomes achieved and the incentives for cooperation. The main objectives of the Regime Theories were to explain the construction of multilateral agreements on specific themes (issue area), with their own agendas (agenda setting), composed of hundreds of actors (stakeholders), and that, above all, would limit States range of action (sovereignty). The concept of complex interdependence, proposed by Keohane and Nye (1977), was essential to explain the need for international regimes. According to this pluralistic perspective, power could be dispersed among multiple actors to operate coalitions within shared understandings regarding procedures and desirable outcomes in different subject areas. International Regimes are the governing structures responsible for regulating interdependence in a given thematic area.

Theories of regimes have become widespread in the following decades and were applied to describe environmental, finance, human rights, security, technology, and trade institutional

development. They seek to explain the emergence, stability, and effectiveness of international institutions and agreements. Regarding the environment, they have focused on regulating states' behavior to avoid the so-called tragedy of commons[49], control incentives to free-riding, and respond to the distributive questions arising from the collective response to global environmental challenges[50] (Newell and Bulkeley, 2010). In a nutshell, the research agenda on international regimes has sought to answer the following questions: How do you explain the origins and continuity of international regimes? How do you explain the constitution and design of specific regimes? How do you evaluate the effectiveness of a regime? We can say that the answers to these questions have organized this field of studies into large groups, associated with the explanations of three schools of thought: power-based (realism), interest-based (neoliberalism), and knowledge-based (cognitivism and, later, constructivism), (Hasenclever, 1997).

According to power-based regime theories, states are concerned with relative gains. The distribution of power resources among actors affects the possibility of regimes emerging and persisting and the nature of the regimes created. Interest-based theories of regimes, in turn, are grounded in economic theories of institutions, focusing on reducing information asymmetries and transactional costs, thus reducing incentives for noncompliance with international agreements. Therefore, they argue that states can benefit from cooperation and mutual trust and that they care more about absolute than relative gains. Finally, knowledge-based regime theories have paid greater attention to the role of ideas in shaping the international system. They fill a gap in interest-based approaches by adding a theory of preference formation. Some cognitivists further suggest that institutionalism informed by a sociological - rather than rational choice - perspective would be more appropriate for analysis of the international system (Newell and Bulkeley, 2010; Hasenclever,1997).

Hence, explaining regime formation can involve pluralistic approaches that encompass multiple perspectives. Keohane and Victor (2011) argue that States build international regimes according to their interests, which reflect the interests of the major constituencies that exert influence over state leaders under conditions of complex interdependence. The capacity of these

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[49] The tragedy of the commons, or tragedy of common goods, refers to a situation in which individuals, acting independently, rationally, and according to their own interests, act against the interests of a community, depleting common-use goods (Hardin, 1968).

[50] See Appendix 1 that discusses the nature and structure of the climate change problem.

interests to determine international outcomes depends on the distribution of power resources relevant to the issue area (asymmetrical interdependence). According to Keohane and Victor (2011), the power to negotiate and achieve the desired outcome (bargaining power) depends on two main factors: i) the impact of one's own decisions on others (a reflection of size), and ii) better default (no-agreement) positions for the State.

As described above, multiple factors can impact the emergence of regimes, such as interests, power, information, and beliefs. Considering that those factors vary over time and in different issue areas, the progression of every regime is unique (Bodansky, 2010; Keohane and Victor, 2011; Young, 1980; Pierson, 2000). Despite particular policy needs and political constraints, broad patterns can be seen in the formation of regimes. The main one is that regimes do not start wholly formed due to a singular conference, for example. Usually, they emerge over time, codifying informal rights and rules. They gradually become broader, deeper, and more fully integrated as parties gain confidence in one another and the regime itself. Additionally, regime formation tends to be path-dependent, shaped historically by previous arrangements and institutions (Keohane and Victor, 2011; Bodansky, 2010).

3.2 Regime Theories *versus* Global Governance approaches.

Despite significant contributions, traditional regime theories faced shortfalls in explaining climate change international arrangements, such as: i) many times, they reflected a view of international relations based on contractualism, focusing on formal international hard laws[51] and paying less attention to the impact of informal political arrangements; ii) they usually did not appropriately acknowledge the increasing participation of non-state actors in global politics[52]; and iii) adopted a reductionist and static conception of power based mostly on material and military resources. In addition, regimes were seen as linear constructions with a tendency to be reinforced in the future, without thinking about the alternative of total failure, blockage by some power,

[51]Hard laws are the formal instruments that need to be incorporated in national juridical frameworks and be accompanied by enforcement power to be effective. Soft norms, in turn, are the ones that despite the lack of traditional enforcement power can enable and fostering action (Bodansky, 2010).

52 Or only did it in a marginalized way, observing how they impact international decisions by influencing state representatives.

conflicts or overlapping between regimes, or their "emptying," in the case of forum shopping for instance (Keohane and Victor, 2010).

Regarding the first shortfall, the traditional approach to International Environmental Law - IEL is centered on defining which norms have the status of international law and verifying how they may apply to specific situations. In fact, the legal definition of a regime is different from the IR definition aforementioned. While in IR there is a need to explain how the regime was formed and how it evolved in a given political context, in law the regime has clearer boundaries and only exists when it is based on binding instruments. Bodansky (2010) suggests that the traditional IEL approach should be supplemented by a different perspective based on public policies, objectives, and processes. This perspective explores what the law should be, in other words, the public policy objectives, the most appropriate instruments to achieve these objectives, and how the approval processes should unfold. Thus, Bodansky (2010) proposes an expanded concept of IEL that encompasses not only traditional sources such as treaties but the entire set of documents (declarations, guidelines, and action plans, among others) that encourage cooperation between states.

In addition, the author criticizes the presumption of an exclusive coercive model of the law that seeks to impose obligations and establish applicable sanctions. Within this coercive perspective, International Institutions would need enforcement power, which, in practice, is not a reality because countries are reluctant to cede sovereignty. Bodansky proposes an approach that sees IEL as a process of encouraging and enabling rather than demanding. This approach allows for analyzing multiple governance frameworks capitalized by public and private authorities at various levels. Therefore, the conception of IEL as public policy proposed by Bodansky (2010) goes beyond the regime theory traditions and dialogues with global governance approaches when analyzing the governance strategies or instruments adopted to achieve desired public outcomes.

The second shortfall of the regime theories concerns the role of non-state actors. Empirical studies indicated that a wide variety of actors, including non-governmental ones, impacted the performance of regimes, providing means by which states could achieve their international goals or by directly achieving those goals. Therefore, Rosenau differentiates the concepts of government, which involves state affairs, from governance, a broader concept that includes coordination between states and a set of formal and informal rule systems that exercise authority beyond regular

national jurisdictions. Newell and Bulkeley (2010) have also observed this shift from government to governance, noting that governance tools have broadened from law and regulation to voluntary standards, codes, and partnerships. They highlight, for example, how some large transnational firms can impact GHG emissions with their daily management decisions. Private actors also played key roles in different arenas: scientific research, academic debate, advocacy networks, lobbying, among others (Porter et al., 2000; Hurrell, 2008; Haas, 2015; Franchini et al., 2017).

Non-state actors' initiatives have affected how academics conceptualize and understand the nature of global climate governance (Okekere, 2009). Rather than focusing only on climate institutions (UNFCCC, Kyoto Protocol, e.g.), new governance approaches comprise all mechanisms and measures to direct social systems toward preventing, mitigating, or adapting to the risks posed by climate change (Rosenau, 1995). Global governance encompasses multiple processes that aim to establish international rules and shape policy, including the agency of stakeholders that might not be imbued with formal authority and their relations with governmental institutions (Pattberg et al., 2022).

Another set of criticisms of regime theories is related to conceptions of power (Okekere et al., 2009). In the logic of regimes theory, notably neo-institutionalists, the cooperative response would be a rational calculation based on well-defined interests (Paterson et al., 2014). However, global environmental governance is not an arena that assumes relative harmony among different social actors but a political arena that involves struggles around who leads the process of adopting and implementing norms. Post-regime theories - including political economy approaches - view cooperation from a more critical standpoint, considering the role of power relations in the interaction processes between agents (Paterson, 2021).

In that sense, Okekere et al. (2009) propose that aspects of neo-gramscian and Foucauldian theories can help deepen our understanding of the conceptual issues involved in climate change governance beyond regimes, with renewed attention to questions regarding the nature of power. Foucault's characterization of the multiple natures of power makes an analytical distinction between sovereignty and government. Sovereignty refers to the functions of the State related to territorial control, application of sanctions, and law enforcement. Conversely, government refers to the totality of specific mechanisms, techniques, and procedures that political authorities use to enable and carry out their programs. The neo-gramscian approach draws attention to how

knowledge and power constitute each other in ways that leverage specific actors, policies, and practices and ultimately privilege particular rationalities in the governance of the social order. Moreover, dominant rationalities and discourses must be concretized through government technologies (Dean, 1999; MacKinnon, 2000).

Thus, rationalities and technologies involved in governing processes deserve attention (Okekere et al., 2009). Rationalities define both the object (what is to be governed) and the nature (how it is to be governed) by making reality manageable through collecting and framing knowledge. Government technologies, in turn, make rationalities visible and enable their operationalization. Two forms of technologies of government are considered central. The first is performance technologies, which seek to determine what can be regarded as relevant knowledge and provoke actions on the ground, such as targets, monitoring, and auditing processes. The second type is agency technologies that determine the nature of the subject and its participation in governance and include different forms of participation and partnership.

In summary, new governance approaches adopt a dynamic and relational concept of power based on the capacity to enact specific rationalities by framing the problem and the ability to implement government technologies that can channel action in the desired direction. The notion of power as relational means that it is not a permanent characteristic of specific entities but rather a configuration of relative forces that derive from social identities and structural forces (Okerere, 2009). These concepts allow one to escape the temptation to perpetuate certain actors with specific power measures in the analysis of global governance and to predict political outcomes. It thus enables a more sensitive stance toward socio-political factors and dynamics that may confer varying power on actors at different stages of the development of governance mechanisms.

In addition, several authors question the nature of the State and the boundaries between public and private and domestic and international, so well delineated in traditional regime approaches (Okekere et al., 2009; Cashore et al., 2021). Global governance approaches seek to understand how governance processes work by recognizing the complexity of states, intending to transcend the premise that considers them static entities. In other terms, States are analyzed as a dynamic system with strategic selectivity. For Foucault, `government` is understood not as the State's coercive apparatus but as the sum of processes and activities that seek to shape, guide, and affect the conduct of a set of people (Apud Okekere et al., 2009). The concept of governance refers

to the systems of authoritative norms, rules, institutions, and practices through which any collectivity, from the local to the global, manages its everyday affairs (Ruggie, 2014).

Global Governance offers a flexible theoretical framework encompassing the enormous diversity of social interactions that define the contours of global politics. According to Young (1997), governance involves establishing and operating social institutions - in other words, the set of rules, decision-making procedures, and programmatic activities that define social practices and guide the interactions of those participating in those practices. Therefore, governance denotes new forms of regulation that go beyond traditionally hierarchical state activities. It typically implies self-regulation by social actors, public-private cooperation to solve societal problems, and new forms of multilevel politics (Biermann, 2009). In Global governance approaches, the agency is exercised not only by states but also by international organizations, global social movements, NGOs, transnational networks of scientists, business organizations, multinational corporations, and other forms of private authority. (Porter et al., 2000; Hurrell, 2008; Haas, 2015; Franchini et al., 2017). Therefore, while regime theories focus on institutions, governance approaches address social processes and functions (Pattberg et al., 2022, Okereke and Bulkeley, 2007; Okekere et al., 2009; Orsini and Falkner, 2012; Green, 2013).

3.3 Regime complex and global governance fragmentation in the issue-area of climate change

Following the post-war period, particularly after the '90s, the international system has developed two dominant features. The first one was a growing institutional density. Due to the strengthening of globalization trends and the necessity to regulate different aspects of international interactions, multiple systems of rules emerged. A second dominant feature was the fragmentation of international law[53] into specialized and autonomous spheres, including trade, human rights, environment, health, and intellectual property, but also in subsets within the same thematic area (Ruggie, 2014). Legal consistency became a challenge in an international system characterized by high institutional density and no formal hierarchy between rules. In other words, the growing legalization of global interactions, coupled with a fragmented legal system, created norm structures

[53] International Law Commission (ILC) report to the UN General Assembly in 2006. https://legal.un.org/ilc/documentation/english/reports/a_61_10.pdf.

that were not always consistent and could even conflict on some occasions. (Victor and Raustiala, 2004).

The climate change issue has transitioned from the scientific to the political realm, framed as a global problem that necessarily demands globally coordinated action. The prevailing argument that permeates the debates until today is that climate change is a classic collective action problem. As such, it demands an overarching and formal international regulatory regime to drive action toward decarbonization to avoid free-rider behavior and prevent the tragedy of the commons (Hardin, 1968)[54]. Therefore, coping with climate change demands International Organizations as political forums and multilateral agreements as instruments to manage global affairs. On that token, states agreed on a worldwide convention with high hopes that it would promote further institutional developments, paving the way for a widespread behavioral change, backed by radical technological transformation, in the direction of a decarbonized society.

However, after thirty years of the UNFCCC approval, the climate regime failed to deliver the necessary GHG emissions reduction to avoid dangerous levels of global warming. Unlike the Ozone Regime, the attempts to develop an international arrangement to change the production and consumption systems to reduce GHG emissions were not successful. The hierarchical-wide contractual strategy, which sustained the design of the Kyoto Protocol during the 90s, proved incapable of tackling climate change effectively. Particularly after the Kyoto Protocol, several responses to climate change emerged inside and outside the U.N. system at different levels, in several forums across levels, involving various actors. Thus, the climate change regime evolved in a non-linear, multistakeholder, and fragmented way (Biermann et al, 2009; Asselt and Zelli, 2014).

In the UN system, for example, specialized agencies such as the International Civil Aviation Organization - ICAO and the International Maritime Organization – IMO developed their own regulatory regimes to address, respectively, GHG emissions from international aviation and international maritime transportation. Other International Organizations, like the World Bank and the International Monetary Fund, developed specific governance mechanisms related to climate change. In addition, many initiatives to discuss the problem emerged, some in forums explicitly dedicated to the climate issue, like the Major Emitters Forum, and others in more comprehensive forums – such as the Asia Pacific Partnership and the G8 and G20 clubs. Countries and regional

[54] See Appendix 1.

organizations, mainly the European Union, also adopted their own governance mechanisms related to climate change. It is important to notice that those multiple initiatives had no clear hierarchy or coordination strategies.

Keohane and Victor (2011) concluded that despite the government's efforts to create a comprehensive and integrated regulatory system to address climate change, the result was a set of specific regimes with different focuses, which the authors termed a regime complex. One partial explanation for the overlapping regulatory systems is that climate change results from production chains and consumption patterns involving virtually every aspect of socioeconomic structures. Additionally, the transformation required to decarbonize diverse societies creates winners and losers. Therefore, adopting policies to cope with climate change involves political struggles in which the configuration of power, interests, and rationalities define the governance framework design, which problems they address, when, where, by whom, and for whom. Based on political economy accounts, studies broadened previous approaches centered on diplomatic negotiations between states in multilateral fora to include considerations about multiple actors (public and private), their interests, and relative powers that define the responses to the climate change issue (Paterson, 2020).

Summarizing Keohane and Victor (2010) arguments, the "regime complex" represents a set of specific regulatory regimes interconnected in a fragile manner with no clear hierarchy between them. This structure tends to persist in the climate change arena, considering that initiatives to build a comprehensive and effective regime have shown low political viability. The authors believe climate change is challenging for three main reasons. First, it is a global problem to which the solution cannot be achieved by the efforts of one country or a small group of countries. Second, its adverse effects are not readily observable in the present and, therefore, require intergenerational commitment (Levin et al., 2012). Third, changing the practices that cause climate change demands changes in the behaviors and habits of billions of people and organizations. Keohane and Victor (2010) note that the issue involves many problems - characterized by diverse political patterns of interest, power, information, and beliefs - requiring tailored institutional designs.

According to the authors, regime complexes are more politically feasible and have greater flexibility and adaptability when compared to comprehensive regimes. However, it doesn't mean that regime complexes are necessarily superior. They demand standards of coherence (among the norms of the complex), effectiveness (compliance with the norms), assertiveness (effective

direction of the commands), sustainability (robustness to sustain itself over time), transparency (in the sense of accountability), and epistemic quality (suitable scientific formulation, internal logic, and consistency among its norms). Moreover, regime fragmentation has the potential to generate conflicting frameworks since the existence of different forums can lead to shifts in the regulatory agenda from one organization to another, the abandonment of an organization, or the simultaneous treatment of the issue in different organizations, which the authors called forum-shifting (Keohane and Victor, 2010). Therefore, excessive fragmentation can result in a kind of "race to the bottom," in which agents favor the forums that benefit them most, adopting a behavior called *forum-shopping* which reduces the effectiveness of climate response (Keohane and Victor, 2010; Anselmi, 2018). On the other hand, cooperation across the whole landscape of climate agreements, institutions, and actors may also help to fill gaps, complementing each other and bolstering the implementation of international climate change laws and policies (Bodansky, 2017).

3.4 Polycentric Climate Change Governance

Climate change governance is not only fragmented but can also be understood as polycentric (Abbot, 2012). Activities related to creating rules, funding public goods, and implementing projects are undertaken by multiple organizations with diverse memberships that operate at different levels. Departing from the diagnosis that policies at a global scale have not been sufficient to promote collective action to reduce global warming, Eleonor Ostrom (2010) proposes an alternative approach to address the complex problems of climate change. She argues that reducing GHG emissions can be best addressed at multiple scales and levels through a polycentric governance framework.

Traditional collective action theory argues that, without a global agreement, countries would not adopt domestic policies and regulations due to the fear of other countries' free riding, as the atmosphere is a common pool resource where exclusion of non-compliers is impossible[55]. Nonetheless, Ostrom and Meserve (2014) state that it might not be a *wise scientific strategy* to frame climate change only as a collective action problem for two main reasons. First, there is abundant empirical evidence of the collaborative efforts of social groups on many scales that succeeded in managing shared resources with no mandatory top-down comprehensive regulatory

[55] See Appendix 1 – Nature and structure of the climate change problem.

framework (Poteete et al., 2010). Second, despite the global effects of climate change, there are externalities on local, national, and regional levels that can foster action in multiple spheres. Reducing air pollution, for example, can generate positive externalities on the local population's health quality while reducing GHG emissions. In this example, local externalities could drive action regardless of international agreements.

For these reasons, Ostrom and Meserve (2014) suggest that behavioral theories can be relevant to supplement the traditional collective action approach. Behavioral theories recognize that context is essential because it can affect the levels of trust and reciprocity between actors, which, in turn, are fundamental pillars for any cooperative endeavor. Thus, it is not only the particular structure of the problem that affects the probability of cooperation but also the specificities of the context and the individuals involved. The Behavioral theory considers that individuals don't have perfect information but can learn as they interact in specific arenas. They also assume that self-benefit is not the only driver for action, as the perception of the appropriate action in particular social contexts is also relevant.

According to the polycentric approach, there is a set of broad design principles that can increase the likelihood of cooperation and compliance, such as i) the availability of reliable information regarding the costs and benefits of action, ii) communication and long-term engagement between actors based on the reputational gains of being trustworthy; iii) agreement on the relevance of protecting or achieving a common good; v) feasibility and legitimacy of monitoring and sanctioning; and vi) presence of social capital and leadership sustained by previous experiences. This approach is particularly suitable for complex issues and social dilemmas because it allows for experimental efforts at different governance levels, learning from the benefits and costs of diverse strategies. In fact, the real solutions for climate change will be materially implemented in the daily activities of individuals, families, firms, communities, and governmental institutions.

Finally, Ostrom and Meserve (2014) argue that it is simpler to coordinate action at small or medium scales of governance, as policy preferences tend to be more homogeneous. Furthermore, those decentralized centers of authority can be linked by information networks and operate coherently as a system facilitating mutual monitoring at all levels (Abbot, 2012). The polycentric governance approach does not suggest that global policies related to climate change are unnecessary, but instead that the literature should consider other strategies for coping with the

climate change crisis, as the reliance on a single global solution can be too risky (Pritchett and Woolcock, 2003). The polycentric approach opens perspectives for different thinking and immediate action rather than waiting for the perfect global diplomatic response. (V. Ostrom, 2008a, 2008b). Moreover, multilateral climate treaties, such as the Paris Agreement, will only be effective if supported by actions at smaller scales where experimentation and innovation can actually occur. (Cole, 2011; Ostrom, 2010b, Victor and Sabel, 2022).

3.5 Transnational networks, non-state actors, and private authorities

The Regime Complex and Polycentric governance studies usually center primarily on the agency of States. A substantial body of literature has emerged to bridge this gap, notably the global governance (explored earlier in the chapter) and transnational networks approaches, which will be described in this section. Challenging the assumption that states alone can effectively tackle the vast array of societal challenges, these approaches shed light on the pursuit of public goods through governing processes that involve non-state actors across various spheres of governance. This involvement results in transnational relationships that extend beyond the confines of interstate procedures (Ruggie, 2014; Abbot, 2012; Falkner, 2011; Widerberg and Pattberg, 2015; Hale et al., 2021). Exploring cross-border networks outside conventional national governmental systems, Keohane and Nye (1977) pioneered the notion of complex interdependency (Bulkeley and Newell, 2010). Nevertheless, the early investigations into transnational relationships were primarily linked to economic and commercial activities.

Over time, the literature concerning transnational networks broadened its scope to encompass additional areas of concern, such as human rights and the environment. Regarding climate change, there was an urge to explore the multiple governance arrangements that emerged outside the traditional international regime. Abbot's concept of `transnational` refers to organizations that operate in more than one country and include private actors or subnational units, in contrast with interstate relations. Green (2013) speaks of an `increasingly complex institutional landscape, with hundreds (if not thousands) of institutions at global, national, and local levels that seek to address various facets of the climate change problem.` She highlights that while there are many analyses of the ill effects of institutional complexity (forum shopping, competition, etc.), there are fewer discussions on the positive effects of complexity, including innovation, experimentation, and the ability to avoid deadlock. Moreover, Bulkeley et al. (2012) analyzed a

database of sixty transnational initiatives involving public and private actors related to climate change governance, indicating a highly dense institutional scenario.

According to this literature, transnational organizations can steer action toward collective goods and thus have authority (Andonova et al., 2009). However, they typically do not possess formal authority that rests on the premise of adopting and enforcing bidding rules. They are usually voluntary schemes that govern by framing ideas about appropriate norms and goals, shaping the behavior of their constituents (Bulkelley and Newell, 2010). Therefore, climate change transnational arrangements comprehend a range of "soft" mechanisms and instruments that provide governance functions such as i) information-sharing (which impacts issue-framing, agenda setting, and benchmarking, for example); ii) provision of resources (access to expertise, funding, and technologies; and iii) regulation or standard setting (emissions reduction targets, certification schemes, monitoring performance, between others). Furthermore, they can be hybrid, including public and private actors who adopt a mixed array of soft and hard legal instruments, such as public-private partnerships.

Cashore et al. (2021) define private authority by contrasting it with public policy and public governance concepts. While the latter is characterized by the authoritative measures taken by governments and their delegates to achieve public ends, the former is the performance of those functions by private actors (Cashore, 2021, Bernstein, 2014; 2010; Ruggie, 2014; Andonova et al., 2009). Public ends are those that, directly or indirectly, benefit the population or society in general or are understood as a shared value that must be achieved, as opposed to private ends, which are for the advantage or profit of a few members or groups. Public authority is exercised by elected or appointed officials. In contrast, private authorities aim to achieve public ends by performing traditional public governance functions – such as regulation and distribution of resources – by private actors. Green (2013) conceptualizes private authority as how `private actors make rules and set standards which others adopt. They tend to rely on non-compulsory steering to modify the behavior in the desired direction and are usually characterized mainly through network governance architectures and less on hierarchical structures. The term private is used in a broad sense to refer to stakeholders with very distinct natures, like businesses (private firms) and non-profit organizations (NGOs) - including transnational networks and civil society institutions (Green, 2013).

Firms have always been involved in climate governance. Acting as supporters, acceptors, or challengers, they impacted global climate governance by i) providing resources (technological innovation included), ii) acting as communicators (lobbying), and iii) acting as regulators (developing standards for themselves or in cooperation with other stakeholders, in certification and labeling schemes, for example). Many firms behaved as challengers within the climate change regime complex. Newell and Bulkeley (2010), for instance, describe a multi-pronged political strategy used by firms to stall climate agreements, such as i) challenging the science, ii) creating business-funded environmental NGOs that underlined the relevance of fossil fuels, downplaying climate risks, iii) emphasizing the competitive disadvantages (carbon leakage) and economic costs of tackling climate change; iv) using double-edged diplomacy to create a stalemate in negotiations[56]; v) using domestic politics to stall international progress; and, finally, iv) directly influencing climate change negotiations. On the other hand, Newell and Bulkeley (2010) state that some firms have recognized opportunities - low-carbon technologies and carbon markets, for example – leading them to engage positively with climate governance initiatives. Consequently, there was a proliferation of Corporate Social Responsibility - CSR practices, now rebranded as Environmental and Social Governance-ESG[57] (Dauvergne, 2011).

NGOs, in turn, include a variety of institutions performing several functions, such as organizing boycotts to pressure corporations and damage brands' identities in a new form of "civil regulation" of business (Tienhaara and Newell 2001). Some NGOs acquired administrative functions, performing two main governance types: governance by price and governance by information. Governance by price includes activities that aim to put a price on carbon (carbon markets and offsetting projects). Governance by information consists of measuring, monitoring, and publicly disclosing the GHG emissions profile or emission reduction of each activity or production process (Betsil et al., 2015). These modes of governance, based on private regulation, create new avenues of action. Some authors argued that they could contribute to achieving faster and deeper GHG mitigation results compared to traditional state-based international agreements.

[56] For instance, former chief executive of Exxon arguing in the US that no action should be taken there unless China and other developing countries also undertook actions, in China they encouraged to resist calls from the US to take action on climate change since this was a problem that China had contributed very little to (Newell and Bulkeley, 2010).

[57] Environmental, social, and corporate governance is an approach that assesses the extent to which a corporation works towards social objectives beyond the sole goal of maximizing profits for its shareholders.

Voluntary standards can be quicker to approve and may generate significant results when adopted by large corporations and extensive supply chains[58] (Newell and Bulkeley, 2010).

However, despite the supposed advantages of speed and flexibility, the private governance of fundamentally public issues has raised concerns regarding legitimacy and accountability regarding how decisions on governance processes will be conducted, by whom, and for whom can be very different from state practices. Therefore, partial accountability poses issues of transparency, procedural equity (representation and legitimacy), and distributive equity (Cashore, 2002; Bernstein and Cashore, 2007; Bernstein, 2011; Mena and Palazzo, 2012; Bernstein and van der Ven, 2017).

3.6 Interactions between State and private authorities

The fragmented nature of global climate governance is considered by some academics as a factor that reduces its effectiveness because the lack of hierarchical institutions to order transnational schemes can create overlapping and conflicting processes. Conversely, some authors have argued that partial endeavors may complement the broader international regime, producing positive synergies (Newell and Bulkeley, 2010). Studies have tried to understand how the vast array of institutional arrangements interact within the regime complex for climate change. They have attempted to explain how public and private regulatory frameworks compete or complement each other and the possible implications of this dense and fragmented institutional environment for implementing effective mitigation measures. While some suggest a particular hierarchy, where public authorities (International Organizations) could exert a coordination role of multiple private initiatives, others offer a more networked approach inspired by complex theories and policy convergence literature (Orsini et al, 2020).

Abbott et al. (2011) claim that there is a need for managing or `orchestrating` transnational climate governance to maximize its benefits and minimize its harmful effects (Abbott and Snidal, 2009b; 2010; Abbott et al., 2011). The concept of `orchestration` means a light coordination mechanism that could be exercised by international organizations using their legitimacy to act as focal points and design norms to promote synergies and catalyze transnational action. They could also foster learning and experimentation by assessing the results of different schemes through peer

[58] Transnational firms, for example, develop climate governance and regulation in large scale and, many times, manage resources greater than those under governmental control.

review processes, diffusing knowledge, and supporting those of the most promising outcomes. (Abbott and Snidal, 2010; Abbott et al., 2015). Ruggie (2014), in turn, says that most efforts to achieve convergence among standards were not planned; in other words, they were not orchestrated. Hence, the author sees orchestration as a proposal to achieve the desirable normative coherence and large-scale effects, not as an explanatory approach. Knudsen and Moon (2017) add another musical metaphor to the analysis, arguing that private and public authorities can respond and accommodate one another, more like jazz music than a centrally coordinated orchestra.

Betsil et al. (2015) adopt the notions of complex systems to characterize a global climate governance landscape where the UNFCCC is - not an authority attempting to govern the system - but a coordinating node where informal, networked interactions generate new connections between actors, complementarities, and synergies. The authors mapped the linkages in place using social network analysis and demonstrated that several initiatives, but not all, defined themselves in relation to the UNFCCC. In that regard, they questioned how an effective division of labor - regarding the functions that needed to be performed - could be facilitated by different kinds of linkage between the UNFCCC and other governance arrangements. They have noticed that the *division-of-labor linkages* are more frequent between the UNFCCC and other intergovernmental organizations (such as ICAO, for example) and that they can be designed to address inconsistencies between regimes.

The authors introduced the concept of *catalytic linkages,* informal interactions where one actor helps to enable the performance of others` governance tasks. This linkage is more common between the UNFCCC and transnational governance arrangements (international rules shaping investments in low-carbon economic activities, for example). Betsil et al. (2015) question if the effectiveness of this vast array of initiatives could be harnessed by designing more explicit links with the UNFCCC. They conclude that participation in shared networks is the main factor in creating these linkages. The idea is that enabling environments can promote innovation and experimentation.[59] Thus, the UNFCCC shall strive to provide opportunities for direct interactions between state and private authorities.

[59] A notable illustration can be found in the evolution of project methodologies under the Clean Development Mechanism. Instead of attempting to establish a singular standard, the Executive Board opted to encourage project participants to propose methodologies for approval. In this instance, the Executive Board played a crucial role as a "boundary organization," bridging the gap between the UNFCCC and the realm of project development.

Green (2013) also conducted a network analysis to examine if the proliferation of institutions contributes to or undermines effective regulation. She found out that in the case of carbon credit standards, there was clear evidence of policy convergence mainly around public rules – particularly the UNFCCC Clean Development Mechanisms - CDM standards. A select subset of rules created by leading private authorities - stricter than the ones established by the UNFCCC – have also shown influence on others' behavior. The author defines policy convergence as the increased similarity between one or more characteristics of a certain policy across a given set of political jurisdictions." But what could explain the phenomenon of convergence or continued divergence? Explanations range from market incentives to ones based on material and political power. The former is where laggards must follow the leaders to maintain market access, also well-known as the California effect. The latter explanations include the emergence of globally harmonized standards that align with great powers' preferences (Drezner, 2007) and the material incentives to emulate the most influential actors.

Policy convergence can also result from hierarchical processes, in which standards are imposed by international law and international organizations (Knill, 2005). Concerning private standards, the author's main argument is that convergence is demand-driven. In other words, it occurs to meet the demands of customers and suppliers that aim to maximize environmental and reputational benefits and avoid naming and shaming campaigns. Repeated interactions between stakeholders may also enable the exchange of knowledge regarding appropriate practices, creating a dynamic learning process and spontaneous convergence. In sum, Green (2013) states that there is an emerging order in the climate change institutional landscape, with the public authority functioning as the hub for carbon rules. Thus, through network analysis, she recognizes the centrality of the Kyoto Protocol in framing ideas and technologies of government and concludes that private authorities can serve as a means for entrenching public rules, providing long-term residual effects.

It is possible to consider that the theoretical debates regarding interactions between private and public authorities have focused on two main perspectives. The first one is centered on collaboration, acknowledging the functional potential of private governance to complement public policies, filling the gaps for missing or inadequate regulation (Overdevest and Zeitlin, 2014; Campbell, 2007; Matten and Moon, 2008). This perspective is prevalent in the studies adopting the concepts of orchestration, division-of-labor linkages, catalytic linkages, and policy convergence described above. However, there is also a second strain or work exploring the competitive

interactions between governance arrangements, wherein private authority constrains public policy and can substitute, anticipate, or weaken public rules (Kaplan, 2014). Within this second perspective, the threat of stricter state regulation may stimulate private actors to create their regulatory framework to anticipate government measures on their own terms. Authors have called this phenomenon the `State shadow` or `the gorilla in the closet` (Verbruggen, 2013).

Moreover, Cashore et al. (2021) call attention to the influence of public regulation on private authorities' activities. They highlight that non-state actors do not operate in a policy vacuum and are deeply impacted by the design of public climate governance (Cashore et al., 2021). Carbon markets, for instance, involve many functions provided by private authorities but they are created and maintained by complex public regulatory frameworks. In addition, research indicates that participation in private forms of climate governance is higher when robust national policies on climate change are in place (Andonova et al., 2017). Therefore, it is imperative to understand the dynamic interactions that constitute the legitimacy and authority configurations in specific governance spheres.

3.7 Governance spheres and sectoral approach

The `governance sphere` concept introduced by Cashore et al. (2021) includes three main characteristics: a population of actors, a regulatory framework, and a problem orientation. Governance spheres are sectoral or problem-specific areas populated by public and private actors that administer specific modes of regulation to govern their behavior and seek to solve specific common problems. Focusing on governance spheres allows analysts to capture the fluid interactions across blurred public and private governance boundaries, overcoming the traditional approach that treats private authorities and public policy as separate entities (Cashore, Bernstein, Newell and Bulkeley, 2010). Frequently, those entities are mutually connected and try to shape private and public rules and standards to advance their ultimate goals. This approach offers valuable tools for theorizing about empirical events and understanding the dynamics involved in constructing sectoral climate regulatory frameworks, such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

Hence, the notion of the governance sphere intersects with sectoral approaches. The latter posit that breaking down the climate change problem into tractable parts can facilitate advancing

practical solutions on the ground and the transformation of socioeconomic systems. According to sectoral approaches, each sector has specific political and economic dynamics and is structured around well-established technologies, infrastructures, and institutions. Consequently, the obstacles to achieving decarbonization—technological, economic, and political—vary sector by sector. Affordable low-carbon technologies, such as power generation and land-based transportation, are readily available in specific sectors. However, in other sectors, the technological barriers to decarbonization are incredibly high, as seen in aviation and heavy industries like cement and steel—the challenging-to-address sectors often referred to as "hard-to-abate sectors" (Oberthür and Rayner, 2021).

Even when there are available technologies, economic barriers may impede their deployment. For instance, if the marginal costs of a new technology are higher than the incumbent one, it will lack economic feasibility, and without policy support, no transition is expected. In some cases, like wind power, for example, despite low marginal costs, upfront investments may be prohibitive in regions with restricted access to financial capital. Furthermore, the perceived risks can detract financial flows to low-carbon enterprises, demanding policies to de-risk investments. Another economic barrier to decarbonization is the pattern of investment decisions based on short-term returns, which may favor less sustainable technologies. Those investments can build infrastructures and institutions that generate long-term lock-in effects, rendering the transition to deep decarbonization more difficult (Levin et. al., 2012).

There is a pervasive consensus that the industrial transition necessary to cope with climate change won't happen without policy support, especially at the speed needed (Sabel and Victor, 2022). Those policies tend to generate distributive effects and may put at risk whole economic sectors, like the fossil fuel extractive industry, for instance. Particularly in energy-intensive industries exposed to international markets, the costs of national regulations designed to cope with GHG emissions can endanger international competitiveness (e.g., international aviation). Hence, powerful incumbents will work through lobbying to protect their established business models, using political influence to avoid transformation that would hamper their vested interests. Considering that they usually have close ties with governments, the political ability of the State to handle pressures and (when possible) adopt compensation strategies may be crucial to guarantee the long-term sustainability of the mitigation policy (Cullenward and Victor, 2020). Thus, the

political barriers are contingent on the organization and power of the incumbent industries and differ from sector to sector.

Furthermore, bearing in mind that each sector has its own technological, economic, and political challenges, the institutions and governance functions needed, and the prospect for international cooperation also varies sector by sector (Victor and Sabel, 2022). In globalized sectors with concentrated industries, such as international aviation, cooperation is needed for setting international standards. In sectors where production is destined mainly for domestic markets - e.g., construction and power grids - cooperation is less urgent but still relevant to diffuse new, more efficient technologies. Finally, in hybrid cases when inputs are local, but markets are international -e.g., forestry products, palm oil, agricultural commodities - a combination of international cooperation and placed-based solutions is crucial. While international cooperation can promote experimentation and learning, local action provides contextualization, tailoring solutions to specific local needs. According to the authors, poorly designed international efforts - incompatible with the problem's characteristics - lead to gridlock or watered-down agreements. Hence, choosing the cooperation strategy crafted to solve each sectoral problem is fundamental.

3.8 An effort toward synthesis

The thesis presents the research results on CORSIA from two main analytical perspectives: one focused on institutions and the other on actors. Regarding institutions, the research evaluates how the development of international regimes and their interaction have influenced the process of designing and approving CORSIA. The second perspective is centered on actors, analyzing the role of private actors and the patterns of interactions with public stakeholders in approving CORSIA. Therefore, the research departs from the traditional neo-institutionalist lens of international relations, focused on regime theories, but it expands to a global governance approach that incorporates the multitude of actors and processes that govern certain aspects of international interactions.

The research question regarding the emergence of CORSIA is based on regime theory lenses that aim to understand how regimes are formed and acquire their specific design. However, the search for answers, that is, the dissertation hypothesis, expand the scope of analysis by incorporating new insights from global governance approaches. For instance, ideas of the regime

complex approach are incorporated to evaluate how multiple regimes dealing with the same problem can overlap, creating inconsistencies and forum shopping behavior. Polycentric governance is used to think of the multilevel system of aviation climate governance and the interactions between ICAO and the EU-ETs. Additionally, the investigation of the patterns of interaction between the UNFCCC and ICAO incorporates the concepts of forum shopping to describe a competitive pattern of interaction and the concepts of division-of-labor and catalytic linkages to describe cooperative patterns of interactions.

The theories about non-state actors, especially firms, and the dynamic relationships between public and private actors are important to evaluate the second hypothesis concerning the role of private actors in the process of approving CORSIA. Moreover, the sectoral approach helps to justify the relevance of the research choice to study the aviation sector, considering that it advocates for a problem-solving strategy centered on each sectoral political, economic, and technological challenges. Along the same line, sectoral governance offers a novel way of thinking about international cooperation and climate change, tailoring the institutional design and the actors' strategies to the sectoral specificities. According to this approach, international aviation - a highly globalized industry – needs cooperation to define common rules and standards. Therefore, international organizations play a relevant role.

In a nutshell, this study departs from an analytical eclecticism paradigm (Sil and Katzenstein, 2010; Lake, 2011; Cavalcante, 2021), combining different aspects of multiple theoretical frameworks to make sense of a specific real-life phenomenon, that is, the approval of CORSIA - a unique agreement for the offsetting of GHG emissions from international flights. The goal is not to achieve a parsimonious theory about how things work but to combine analytical tools to explain the phenomenon in all its complexity, encompassing its multiple dimensions.

PART II – The Empirical Research

Chapter 4. Research Design and Methodology

Part II of the thesis is dedicated to presenting the primary findings of the inquiry, as well as providing an interpretation and analysis of the collected data. Before delving into the results and analysis, it is essential to reiterate the specific research objectives and elucidate the epistemological and methodological choices as well as the research design. This chapter endeavors to accomplish these goals by outlining the research objectives and elucidating the strategies to attain them. It is a qualitative case study driven by theoretical considerations, employing process tracing to explain a specific outcome—the establishment of CORSIA. The central question guiding this study is as follows: What factors can account for the emergence of a climate change regulatory framework within ICAO and the subsequent approval of CORSIA?

Case studies enable scientific research to retain real-life events' significant and holistic characteristics, examining in detail a case embedded in a phenomenon (Yin, 2002). According to Gerring (2004, page 19), "a case connotes a spatially delimited phenomenon (a unit) observed at a single point in time or over some period of time. It comprises the type of phenomenon that an inference attempts to explain." The case selection was intentional and considered the originality of CORSIA as the first global market-based scheme of a specific sector for reducing its impact on climate change. This inquiry adopts a pragmatic and eclectic epistemological stance, which considers that problem-centric studies can generate pieces of partial knowledge that, combined, may get closer to offering explanations that integrate the complexities of real-world dilemmas. Analytical eclecticism is described by Sil and Katzenstein (2010) as an intellectual stance toward the pragmatic understanding of global phenomena and politics. In other words, pragmatism and analytical eclecticism leave parsimony aside and privilege complex causal stories, incorporating multiple analytical and theoretical tools (Lake, 2013).

As mentioned in the Introduction of the Dissertation, this study aims to understand the mechanisms that led to developing a sectoral regime within ICAO, in parallel to the UNFCCC, to address GHG emissions from international aviation. More precisely, the goal is to analyze how

CORSIA was designed and approved by ICAO and what factors help explain this result. Based on the existing literature on the topic, the study evaluates two main hypotheses which are:

H1: CORSIA was developed and approved by ICAO due to external pressures from two main regimes: the UNFCCC and the European Union.

According to the first hypothesis, horizontal interactions between the UNFCCC and ICAO and vertical interactions between the EU-ETs and ICAO exerted pressure, leading aviation stakeholders (public and private) to support the approval of CORSIA. In fact, this broader hypothesis contains two specific ones:

H1.1) A competitive horizontal governance framework, instigated by the UNFCCC attempts to regulate international aviation's GHG emissions, led ICAO to develop its own regulatory climate change regime, resulting in the approval of CORSIA.

H1.2) There was a conflictive multilevel interaction between ICAO and the EU-ETs that led ICAO to approve CORSIA. Therefore, the research investigates the main patterns of interaction between the organizations and if and how those interactions prompted ICAO to act more incisively in creating CORSIA.

H2: CORSIA was approved due to a successful strategy of the aviation industry to shape its own international climate change regulation without damaging sectoral economic interests.

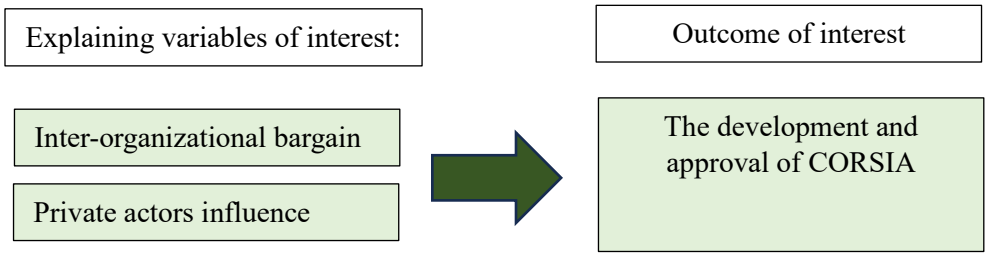
The second hypothesis is centered on the role of private stakeholders in developing ICAO's climate change regime. The goal was to promote a systematic investigation of how private stakeholders have participated in the governance processes and how they have influenced the outcome under analysis. It aims to answer the following questions: Has the aviation industry shaped its own international regulatory environment to cope with climate change? The hypothesis asserts that the answer is yes; private stakeholders were highly influential in ICAO's deliberations that led to the development of CORSIA's main design elements and the approval of the scheme.

4.1 Method and research design

To investigate the hypotheses, the inquiry adopts process-tracing to a single case study to assemble specific pieces of evidence and identify the causal mechanisms that connect them. The

case study relies on contextual evidence and deductive logic to recreate causal processes within a single case, which here is the development of the international civil aviation climate change regime and the approval of the Carbon Offsetting and Reduction Scheme for International Aviation - CORSIA. In a case study, the inquiry searches for patterns of covariation between the causal variables of interest and the outcome of interest. The causal variables of interest are the inter-organizational bargains (between ICAO and the UNFCCC and between ICAO and the EU-ETS) and the influence of private stakeholders in ICAO's deliberations on climate change. The outcome of interest is the development of a climate change regime within ICAO and the approval of CORSIA.

Figure 7. Research Design



Source: Own elaboration.

It is essential to acknowledge that observing the covariation between two factors is not enough to define a causal relationship due to the confounding factors that cannot be eliminated by this qualitative research design. While quantitative techniques have instruments to eliminate confounding factors - such as control variables, instrumental variables, matching estimators, and others - qualitative studies rely on detailed contextual knowledge to eliminate all other plausible explanations and establish convincing causal stories about a specific result. Additionally, in a case study, other types of analysis, such as process tracing, can be used to provide more consistent explanations by observing the evidence and describing the causal mechanisms.

4.2 Process Tracing

Process tracing is similar to detective work, where pieces of evidence from individual observations are assembled, forming long causal chains that are not necessarily linear and may

involve switches and feedback loops. Like in a juridical investigation, the goal is to demonstrate proximal relationships between key factors. Furthermore, the general explanatory theory is disaggregated into steps, opening the black box between the explaining variables and the result to look for observable manifestations of the causal mechanisms that connect them. Thus, the report of a process-tracing study usually adopts diagrams to depict those relationships and mechanisms.

Process tracing is a tool for making within-case inferences about the presence or absence of causal mechanisms in a single-case research design. According to Bennett and Checkel (2008b, page 207), causal mechanisms are "processes through which agents with causal capacities operate in specific contexts to transfer energy, information, or matter to other entities." Concerning the nature of causality, Beach and Pedersen (2012) state that social science holds two central ontological positions. The first understands causality as patterns of regular empirical associations.[60] Thus, causes should be defined in terms of constant correlations between factors. The second position holds a mechanismic understanding of causality, which is interested in the theoretical process of the particular transmission of causal forces. Correlation is not always causation. Hence, mechanismic approaches do not necessarily entail regular association. What matters in this latter approach is identifying that a factor actually generated the other and understanding the causal mechanisms linking them and the series of interconnecting parts that contributed to producing an outcome. Therefore, the mechanismic ontology is the substratum of process tracing (Beach, 2016).

There are distinct types of process tracing that can be used for theory-testing, theory-building, and explaining outcomes (Beach and Pedersen, 2013). The first two are theory-centric approaches that aim to generalize by testing or developing theories beyond the research context. Theory-testing process tracing tries to confirm (or disconfirm) a hypothesized causal mechanism by analyzing whether it was present or absent within the case according to the theory's predictions. With this strategy, it is not possible to make claims that the mechanism was the only cause of the outcome[61]. Theory-building process tracing, in turn, seeks a generalizable theoretical explanation from a particular case's empirical evidence. The explaining-outcome process tracing, in turn,

[60] It is based on Hume`s philosophical view (Hume, 1975) which, in summary, argues that the causal mechanisms is unobservable, so causal explanations should be made according to regular correlation between factors. For instance, it is possible to observe that things fall to the ground, but the gravitational forces are unobservable.

[61] In situations where the chosen case is of the least-likely or most likely type, it can be possible to make generalizations about the strength of the theory. In the former case, if the hypothesized causal mechanism is present, the theory is confirmed and in the latter case if it is absent, the theory is disconfirmed (Bennet and Checkel, 2014).

attempts to craft a minimally sufficient explanation of a puzzling outcome in a specific historical case. This type of process tracing is a case-centric or problem-centric approach where the goal is not to build or test general theories but to craft a (minimally) sufficient explanation for the outcome of a particular case.

4.3 Applying process tracing to explain the approval of CORSIA

This research adopts the third type of process tracing to explain an outcome. Considering that accounting for an outcome usually requires an eclectic combination of different mechanisms, this type of process-tracing reverberates the ideas of eclectic theories and pragmatism as a research strategy (Beach and Pedersen, 2013; Sil and Katzenstein 2010; Lake, 2013; Cavalcante, 2021; Friedrichs and Kratochwill, 2009). Eclectic theorization combines different mechanisms to develop a minimally sufficient explanation of a particular outcome, generating complex causal stories. Therefore, eclectic theorization is not searching for synthetic grand theories; instead, it is problem-oriented research that uses a "pragmatic strategy aimed at capturing the multiplicity of mechanisms that produce particular historical outcomes" (Beach and Pedersen, 2013: 72).

In explaining outcome process tracing, the explanation cannot be disconnected from the particular case, and theories are instruments to help construct the best possible explanation of a particular outcome. Beach and Pedersen (2013) indicate two paths that can be used separately or combined to conduct the explaining-outcome process-tracing: deductive and inductive. The deductive path is proper when previously hypothesized causal mechanisms exist for the phenomenon under study. In this case, the research will look for the presence or absence of those causal mechanisms. However, the researchers must also ask if the hypothesized causal mechanisms explain the outcome sufficiently. If not, an inductive investigation is necessary to look for alternative or complementary causal mechanisms.

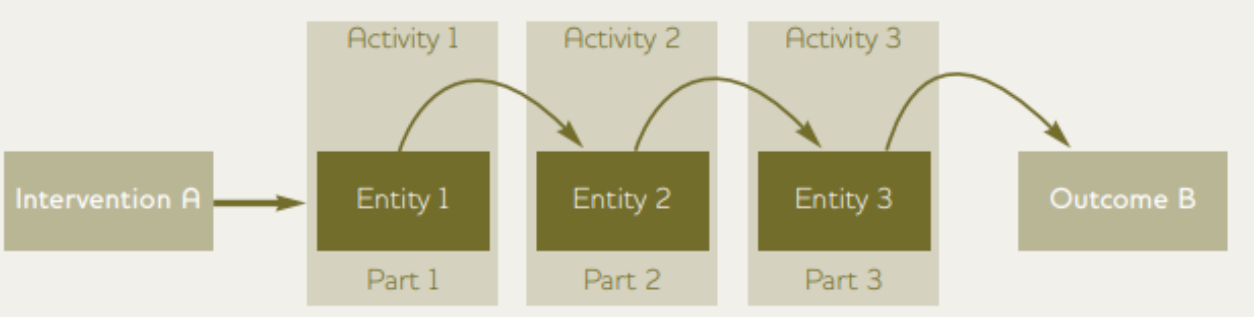
The inductive path is usually employed to investigate little-studied phenomena when the existing explanations seem insufficient to account for the outcome. It is similar to historical methodology or `detective work`, "working backward from the outcome by sifting through the evidence to uncover a plausible sufficient causal mechanism that produced the outcome" (Beach and Pederson, 2013). A key challenge is to assess if the explanation has reached minimal

sufficiency. According to the authors, this is achieved by a comprehensive analysis to check if the most critical facets of the outcome were covered and if there is, at the moment, no other composite of causal mechanisms that can better explain the phenomenon.

Therefore, using the deductive path, this research aimed to identify if the hypothesized mechanisms were present and if they worked as predicted. However, it is not enough to understand if the hypothesized explanations were present; it is also necessary to evaluate if they offer minimal sufficient explanation to the result. In other words, the research evaluated if the hypnotized explanatory mechanisms were present, if they worked as predicted, and if they were sufficient to explain the outcome of interest. Considering that the research indicated that the hypothesized mechanisms were insufficient, an inductive investigation led to identifying complementary causal mechanisms, particularly ICAO's decision-making rules of procedure.

Regarding the first hypothesis, the research evaluated i) if inter-organizational bargaining to regulate international aviation existed between ICAO and the UNFCCC and between ICAO and the EU-ETs; ii) if this bargaining exerted pressure for ICAO to regulate international aviation and climate change; iii) if this pressure has influenced the approval of CORSIA and, finally, iv) if this influence seemed sufficient to explain the result under analysis. Concerning the second hypothesis, the research investigated: i) if the industry attempted to shape its own regulatory framework related to climate change, ii) if they were successful in their endeavor, and iii) if the industry influence offers sufficient explanation for explaining the results.

Figure 8: A causal mechanism in process tracing.



Source: Beach and Pedersen (2013).

4.4 Background Knowledge

Process tracing relies mainly on inferential reasoning to reach conclusions. Unlike the quantitative analysis, the quality of the observations and how they are analyzed are more critical than the number of observations (Beach, 2016). Consequently, background knowledge, contextual information, and consistent experience in the field are particularly relevant for implementing process-tracing research. This contextual knowledge is relevant not only to investigate the hypothesis but also to identify viable alternatives (what may be other options) and to think of different scenarios (counterfactual logic). Therefore, in this research, it is important to highlight that the Ph.D. candidate had eleven years of experience working in international aviation and climate change negotiations within ICAO. This experience has contributed to applying process tracing in this inquiry endeavor.

The researcher participated in climate change discussions within ICAO since 2012 and attended, as a Brazilian delegate, the 2016 and 2019 Assembly Sections. Additionally, she has been taking part in technical groups within the Committee of Aviation Environmental Protection – CAEP that discuss the designing elements of CORSIA from 2013 until 2020. Thus, the participant observant method was also part of the research strategy. It is crucial to highlight that although being part of the process can help with relevant insights, the research only used evidence from publicly available sources for ethical reasons. As confidentiality clauses usually protect CAEP discussions, CAEP documents, presentations, and information on representatives' positions were not used in this work.

4.5 Data gathering strategies

The primary research method for searching for evidence was a detailed documental analysis using a rich public database on the ICAO website. The analysis contemplated the period from 1947, when the first ICAO Assembly took place, until 2016, when CORSIA was approved. It was an in-depth work with primary-sources texts, mostly Assembly working papers and meeting minutes, besides other technical documents, information papers, and press releases. All the Assembly working papers since 1947 were checked to determine when and how environmental and climate change issues took part of ICAO's agenda.

For conducting this investigation, search instruments looked for the words `environment`, `pollution`, `noise`, `emissions` and `climate change`. Documents containing those words were selected for detailed content analysis to search for evidence on what was being discussed, who had proposed the topic, how the problem and possible solutions were framed, and the observable implications. The documental analysis also looked for evidence regarding the decision-making processes within ICAO, aiming to identify if decisions on climate change were made by consensus or by the majority of member states. Other documents, particularly resolutions and reports produced by international aviation industry associations, were also included in the analysis. Additional sources, like academic articles, policy and institutional papers, and newspapers, supplemented the study (see Appendix C for information on the data analysis protocol).

Furthermore, in-depth semi-structured interviews with eighteen senior civil aviation stakeholders from public and private organizations in seven countries helped enhance contextual knowledge. The interviews were mainly online, with a duration of around one hour. They included representatives from the aircraft industry, airlines, airport managers, international associations of airlines and airports, members of the ICAO Secretariat and the UNFCCC Secretariat, and representatives from governmental agencies from Brazil, the United States, the European Union, Japan, India, China, and Saudi Arabia. Some interviews were recorded for transcription purposes, but others asked not to be recorded. The interviews were submitted to a confidential clause that indicated that information on the interviewee and their opinions would not be publicly disclosed in this report.

Considering that some CORSIA elements were still under negotiation during this research, talking about the topic was sensitive to most of the interviewees. Therefore, as detailed in Appendix B, the interview script was broad, searching for overall impressions on the process of addressing GHG emissions from international aviation, the role of the private sector, the relevance of ICAO versus the UNFCCC, and the centrality of CORSIA in the overall strategy of coping with climate change. Asking direct questions about the factors that led to CORSIA approval could generate social desirability bias as the interviewees and the Ph.D. candidate were part of the same group that has negotiated CORSIA. However, an exploratory conversation about the topic gave many insights into the actors' perceptions of the issue. Thus, the interviews were crucial for informing the documental inquiry and the data analysis of this research.

The following two chapters are dedicated to presenting the primary research findings. Chapter 5 delves into the results of the documentary analysis of the first hypothesis concerning inter-organizational bargaining. This chapter is extensive because we divided the first hypothesis into two specific components to investigate ICAO's interactions with the UNFCCC and the EU-ETS separately. Moving forward, Chapter 6 provides an in-depth examination of the research results pertaining to the second hypothesis, which focuses on the role of private stakeholders. The conclusion of this dissertation summarizes the causal mechanisms identified by the investigation of these two hypotheses and adds complementary causal mechanisms that were identified inductively during the research and are considered necessary to complement the explanation.

Chapter 5. Bargaining Between Regimes and the Approval of CORSIA

Introduction

This Chapter explores the hypothesis that ICAO approved CORSIA due to external pressures coming from two main regimes: the UNFCCC and the European Union. Given that global climate governance developed into a regime complex (Keohane and Victor, 2004), academic work has investigated the interaction between regimes and how they can cooperate and complement each other, increasing efficacy, or how they can compete, weakening the overall climate change governance capacity to reach its goal of promoting the transition to a decarbonized society.

Concerning international aviation, three main regimes sought to address its impact on climate change. The first one was the UNFCCC, which promoted political and technical discussions on how to reduce emissions from international bunker fuels (air transport and maritime navigation), especially during the 90s. The second was the ICAO, which, particularly after the Kyoto Protocol's signature in 1997, became the main forum for multilateral discussions on that topic. Finally, the European Union developed a comprehensive market-based policy called the European Union Emissions Trading Scheme – EU-ETs to complement its overall mitigation strategy. The EU-ETs included domestic aviation in 2012 and aimed to regulate international flights to and from Europe.

Thus, the objective of this Chapter is to investigate how those two regimes interacted with ICAO and if those interactions have influenced the approval of CORSIA. The first part presents the theoretical framework that guided the documental analysis. It describes the main concepts and how existing theories were integrated to create the research analytical framework. Acknowledging that there is no single international regime for climate change but a regime complex, section one explores how those multiple regimes can cooperate or compete. The second and third sections present the results of the empirical work regarding the relations between the UNFCCC and ICAO and between the EU-ETs and ICAO, respectively. Those two sections follow a similar structure, beginning with a brief literature review of what has already been studied about the topic and restating the prevailing hypothesis. Then, they present the main findings of the research and an analysis of those findings.

5.1. Conceptual and Theoretical Background

Regime Complex

Following the post-war period, and particularly after the 90s, the international system went through a gradual process of increasing institutional density and legal fragmentation. Due to globalization trends and the necessity to regulate different aspects of international interactions, many systems of rules emerged. International law[62] developed into specialized and autonomous spheres, including trade, human rights, environment, health, and intellectual property, but also in subsets within the same thematic area (Ruggie, 2014). Legal consistency became a challenge in an international system characterized by high institutional density and no formal hierarchy between rules. In other words, the growing legalization of global interactions - coupled with a fragmented legal system - created norm structures that were not always consistent and could even conflict on some occasions (Victor and Raustiala, 2004). Regarding climate change, several responses emerged inside and outside the United Nations at multiple levels, in diverse forums across levels, involving public and private actors.

Therefore, despite governmental efforts to create a comprehensive and integrated regulatory system to address climate change through the UNFCCC, the result ended up as a group of specific regimes with different focuses, which Victor and Raustiala (2004) termed as `regime complex` (Bodansky, 2017; Keohane and Victor, 2011). A regime complex is a set of specific regulatory regimes interconnected in a fragile manner with no clear hierarchy between them. Keohane and Victor (2011) stated that this structure tends to persist in the climate change arena, as it is a complex issue involving multiple types of challenges. Each specific challenge (from agriculture to air transport, for example) is characterized by diverse political patterns of interest, power, information, and beliefs - requiring tailored institutional designs to cope with them. In fact, history has already shown that the endeavor of building a comprehensive and effective regime has had low political viability (Sabel and Victor, 2022).

Conflicting frameworks: forum shopping and the competing Regime shadow

The regime complex can generate conflicting frameworks since the existence of different forums may lead to shifts in the regulatory agenda from one Organization to another, the

[62]International Law Comission Report to the UN Assembly in 2006. https://legal.un.org/ilc/documentation/english/a_cn4_l702.pdf.

abandonment of an organization, or the simultaneous treatment of the issue in different organizations (Keohane and Victor, 2010). Thus, excessive fragmentation can result in a kind of "race to the bottom," in which agents favor the forums that benefit them most, a phenomenon called *forum shopping* that reduces the effectiveness of climate response (Keohane and Victor, 2010; Anselmi, 2018). Beyond the actor`s behavior of choosing the forum that better suits them, observing the competitive strategies between the International Organizations themselves is relevant.

The concept of `Organizations` comprises the idea of structure - organizations as substantive rules and institutional apparatuses - as well as agency - referring to organizations as strategic actors that strive for substantial and organizational goals and need to adapt to the interests of their member states to maintain their function (Faude, 2015). Inter-organizational relations are seen as "systems of functionally overlapping international institutions that continuously affect each other's operations" (Gehring and Faude, 2013), frequently forming regime complexes (Raustiala and Victor, 2004; Orsini, Morin and Young, 2013). Therefore, the actors' forum shopping strategies can increase the pressure on international organizations to address their member states' interests to keep their functions and power in that specific thematic area. Notice that there is a reinforcing mechanism where actors tend to choose the forum that best suits their interests and, on the other hand, the administrative apparatus (Secretariat) of that Organization is pressured to effectively address their member states' needs to keep its relevance and leadership.

Academic work on the relations between public and private regulatory frameworks has brought the ideas of `state shadow` and `gorilla in the closet` referring to a phenomenon where the threat of stricter governmental regulation stimulates private actors to create voluntary regulatory frameworks aiming to anticipate government measures on their own terms (Kaplan, 2014; Verbruggen, 2013). Those studies explored how the threat of governmental regulation were important factors to explain the development of private regulatory frameworks. It is possible to see a similar phenomenon in inter-organizational bargaining. In other words, the threat of other Organizations occupying the policy space creates incentives for advancing regulation on the preferred forum in a way that satisfies the member states prevailing interests. The research uses the term '*the competing regime shadow*` to refer to that phenomenon. In this case, the Organization threatened by the competing regime not only attempts to regulate the topic considering the

prevailing interests of their member states but also tries to block the development of the agenda in other forums.

Cooperative frameworks: division-of-labor linkages and polycentric governance.

Many studies argue that initiatives within a regime complex may also complement each other and, through synergistic interactions, promote more effective climate governance. These studies usually go beyond state actors and incorporate private regulatory frameworks developed to address climate change and their relationship with governmental arrangements (Green, 2013). For instance, Betsil et al. (2015) adopt the notion of complex systems to characterize global climate governance as a network of interactions that generate new connections between actors, complementarities, and synergies. This study characterizes the UNFCCC as a coordinating node that establishes two main types of linkages with other governance arrangements: *division-of-labor linkages* and *catalytic linkages*.

The *division-of-labor linkages* are more frequent between the UNFCCC and other intergovernmental organizations - such as ICAO, for example - and can be designed to address inconsistencies between regimes. Catalytic linkages are interactions where actors participating in one regime also help to improve the performance of another regime`s governance tasks. According to the study, this kind of linkage is more common between the UNFCCC and transnational governance arrangements (international rules shaping investments in low-carbon economic activities, for example).

Furthermore, complementarity can come not only from horizontal linkages in the international system but also through the development of multilevel governance frameworks in a polycentric way (Ostrom, 2010). According to the polycentric approach, the real solutions for climate change are materially implemented in the daily activities of individuals, families, firms, communities, and governments at multiple levels. Ostrom (2010) argues that it is simpler to coordinate action at small or medium scales of governance, as policy preferences tend to be more homogeneous. Furthermore, those decentralized centers of authority can be linked by information networks and operate coherently as a system facilitating mutual monitoring at all levels (Abbot, 2012). The polycentric approach has the advantage of opening perspectives for different thinking and immediate action, which is less risky than waiting for the appropriate global diplomatic response (Ostrom, 2010).

5.2 The research theoretical framework

Therefore, the research departs from the central concept of *regime complex* to investigate the interactions between the three main intergovernmental regimes involved in the process of governing the GHG emissions reduction from the aviation sector. It aims to evaluate if horizontal interactions between the UNFCCC and ICAO and the vertical interactions between the EU-ETs and ICAO were *complementary,* characterized by division-of-labor linkages and polycentric governance, respectively*,* or *competitive*, based on horizontal and multilevel conflictive governance, including forum shopping strategies and the competitive regime shadow phenomenon. Table 1 summarizes this theoretical framework.

Table 1. Argumentative framework for investigating Hypothesis 1.

	ICAO	
	Cooperative (complimentary)	Competitive (conflictive)
UNFCCC	**Division-of-labor** (With catalytic linkages)	**Horizontal conflictive governance** (Forum shopping and competitive regime shadow)
EU-ETs	**Polycentric governance** (With catalytic linkages and information networks)	**Multilevel conflictive governance** (Forum shopping and competitive regime shadow)

Source: Own elaboration.

Hence, from a cooperative/complementary perspective, the relationship between ICAO and the UNFCCC would be characterized by the division of labor with catalytic linkage. In other words, considering the issue's complexity, the UNFCCC delegated part of the job to ICAO, which, being

the specialized agency, was better qualified to find appropriate solutions and develop effective regulations. The catalytic linkages are created when the development of ICAO`s aviation and climate change regulations contribute to the UNFCCC's overall governance goal of stabilizing global warming. The other way around is also true. Instruments developed inside the UNFCCC, such as market-based instruments, may contribute to or enable ICAO to perform its governance tasks better.

Conversely, a competitive/conflictive framework between the UNFCCC and ICAO indicates that the UNFCCC's attempts to discuss measures related to aviation`s impacts on climate change have led the ICAO to strive to develop its own international regulatory response, considering aviation interests. Thus, the threat of the UNFCCC occupying the policy space created incentives for ICAO to advance aviation and climate change regulation to keep control of the agenda and the Organization`s functional relevance. In other words, the competitive UNFCCC shadow prompted ICAO to act.

Regarding the relationship between ICAO and the EU-ETs, in a cooperative/complementary perspective, the inclusion of aviation in the European initiative would contribute, in a polycentric framework, to achieving ICAO`s overall governance goal of managing GHG emissions from international aviation. From a polycentric standpoint, national and regional initiatives can work as building blocks and, having synergistic links, complement multilateral measures in the scope of ICAO. Hence, there is no need to wait for a global agreement. Local and regional governments can and should act, resulting in a more robust global climate change governance framework capable of achieving quicker and better results.

On the other hand, ICAO and the EU-ETs can be characterized as competitive or conflicting regimes. From this perspective, including international aviation in the EU-ETs would compete with the initiatives discussed within ICAO. The main argument is that international aviation, as a global and interconnected industry, should be regulated only multilaterally within ICAO to enhance efficacy and avoid a complex and inefficient patchwork of schemes. Therefore, the expectation of including international aviation in the EU-ETs induced a forum shopping strategy, with aviation stakeholders (public and private) concentrating negotiations within ICAO while blocking the advancement of the topic at a regional scale.

This Chapter not only evaluates the main patterns of interaction between the organizations but also investigates the argument that inter-organizational bargaining prompted ICAO to act more incisively in approving CORSIA. Thus, the research focuses on two specific hypotheses. The first one is that a competitive horizontal governance framework, instigated by the UNFCCC attempts to regulate international aviation`s GHG emissions, led ICAO to develop its own regulatory climate change regime, which resulted in the approval of CORSIA. The second hypothesis is that a conflictive multilevel interaction between ICAO and the EU-ETs led ICAO to approve CORSIA. Section two (2) below elaborates on the former hypotheses, while section three (3) presents the investigation results about the latter.

5.3 Taking the parallel route: UNFCCC - ICAO interactions and the development of a sectoral climate change regime

Several studies have examined the interactions between ICAO and the UNFCCC, focusing on conflicts arising from divergent core objectives. While the UNFCCC was established to coordinate the global response to climate change, ICAO's mission is to facilitate international aviation's safe and orderly growth (Lyle, 2018). In addition to the fundamental clash between 'growth' and 'emissions reductions' as core objectives, there are also disagreements concerning the principles of differential and equal treatment. Discussions within the UNFCCC are guided by the principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDRRC), which stipulates that developed countries should take the lead in climate action, considering their historical responsibility for causing the problem and their greater capacity to address it. In contrast, the Chicago Convention (ICAO's founding document) upholds the principle of non-discrimination, which requires that operators from different countries receive equal treatment to promote the harmonious functioning of the international flight network and prevent competitive distortions. These differences have led to conflicting interactions between these two institutions (Alselmi, 2018; Romera, 2016).

However, Romera (2016) argues that these interactions can be effectively managed to prevent contradictions and foster synergies. She points out that the omission of international aviation and maritime navigation from the Paris Agreement creates an opportunity for a multilateral regulatory shift. This shift could solidify the roles of ICAO and IMO in addressing climate change

issues and encourage unilateral measures and industry initiatives. Recent studies also suggest that establishing coordination mechanisms between the UNFCCC and ICAO would improve governance and prove essential for aligning CORSIA with the directives of the Paris Agreement. Furthermore, it would facilitate the integration of more ambitious actions within ICAO (Romera and Rayner, 2021).

These studies primarily adopt a cooperative perspective, advocating for a division of labor between the two organizations to achieve better governance outcomes. However, there are alternative views suggesting that the UNFCCC should assume a more significant role in regulating international aviation. Lyle (2018), for instance, contends that the ICAO mandate was initially defined by the Kyoto Protocol, which is no longer the governing instrument on this issue, and that international aviation could potentially fall under the purview of the Paris Agreement. Others propose including international aviation and shipping emissions in the Nationally Determined Contributions (NDCs) of the Paris Agreement (Fichert et al., 2020).

From an international law perspective, these studies closely examine both regimes' distinct rules and principles to determine whether they clash or complement one another. Furthermore, they often adopt a normative perspective to assess which governance arrangement might yield superior outcomes. Some of these studies also incorporate a political economy viewpoint, asserting that airlines employ the forum shopping strategy to lobby for ICAO as the primary forum, aligning more closely with their interests of continued growth with minimal regulatory costs (Anselmi, 2018). However, there has been no systematic study on the interaction process between ICAO and the UNFCCC. This work aims to fill that void by investigating how the interaction process between ICAO and the UNFCCC has resulted in establishing a parallel sectoral climate change regime within ICAO, ultimately culminating in the approval of CORSIA. Throughout this analysis, the study seeks to identify whether the predominant interaction pattern has been cooperative or conflictive. Finally, it assesses whether these interactions help elucidate the rationale behind CORSIA.

Main Findings

This section presents the findings of an investigation that looked through ICAO Assembly documents to identify references to environmental discussions in general and climate change issues in particular. The search aimed to identify pieces of evidence of linkages between ICAO

discussions and the United Nations processes. Documents from the United Nations related to the environment and climate change were also included in the analysis. The environmental impacts of civil aviation are usually divided into three groups: noise, polluters affecting the air quality, and global impacts related to the ozone layer and global warming. The results of this investigation found that debates about noise in ICAO came from within the sector, with airports leading the introduction of the topic in ICAO`s agenda. The other two groups of topics – polluters and global warming – were introduced in ICAO`s agenda due to pressures coming from the United Nations deliberations.

The first environmental topic mentioned in ICAO`s documentation was aircraft noise. The Council report to the 6th Assembly in 1952 (doc 7270) highlighted an increasing concern about noise from airplanes and helicopters that disturbed the population living in the vicinity of airports. In the following years, mainly after 1959, many documents presented proposals to cope with that issue (Assembly documents number A6-7367, Doc. 7367, Doc, 7788, doc. 7866). In 1965, besides jet aircraft, there was the issue of noise from supersonic aircraft and the impact of the sonic boom. Discussions were around how disruptive technologies, such as jet and supersonic aircraft, brought economic and social problems and how to address them. In 1968, ICAO approved Resolution A16-3 about noise in the vicinity of airports. The discussions about noise were brought into ICAO`s agenda by airport operators initially in New York City and other regions in the US. It was an attempt to raise awareness among other industry stakeholders (airlines and aircraft manufacturers) and the government to share responsibilities for adopting measures to cope with it.

While the noise issue came from within the sector, the topics of local pollution and climate change were introduced in the ICAO agenda and evolved due to pressures arising from the United Nations, more precisely, from i) the Stockholm Conference on the Human Environment in 1972, ii) the Conference on Environment and Development – UNCED (1992) and iii) the successive Conferences of the Parties to the UNFCCC, including the Kyoto Protocol, the Copenhagen Accord and the Paris Agreement. The first time the word `environment` was used in an ICAO Assembly document was in 1971, referring to the UN Conference about the Human Environment that would be held in Stockholm the following year. The ICAO Council presented a report suggesting that the Organization should prepare a statement to the Stockholm Conference emphasizing the ICAO`s prerogative on dealing with the impacts of civil aviation on the human environment while also

expressing the benefits of civil aviation (Res. A18-11 and Doc ex1-16). At the 21st ICAO Assembly in 1974, the council summarized ICAO`s participation in the Stockholm Conference, informing that they had argued for the need to maintain the maximum compatibility between the safe and orderly development of aviation and the quality of the human environment and reaffirmed the ICAO`s authority, as the international regulatory body for civil aviation, to deal with the problem (WP A21-32).

Documentation from the 1971, 1974, and 1977 Assemblies (Res. A18-11, WP A21-32, WP A22-38) clearly demonstrates the concern about ICAO losing policy space and delegating regulatory authority to other international bodies (ICAO Assembly Resolution A22-12 and A22-13). To occupy that space, in 1977, under the request of the United States, the ICAO Assembly included a new agenda item named `Civil Aviation and the Human Environment`. It consolidated all the documents on the issue. The Assembly created the Committee on Aviation Environmental Protection – CAEP to advance technical work on the topic and approved Resolutions A22-12 and A22-13[63] on international aviation and the world environment (Doc. 9275). In Resolution A22-12, the ICAO Assembly:

> "1. Declares that ICAO is conscious of **the adverse environmental impacts** that may be related to aircraft activity and of **its responsibility** and that of its Contracting States to achieve maximum compatibility between the safe and orderly development of civil aviation and the quality of the human environment.
>
> 2. Requests the **Council to maintain its vigilance in the pursuit of aviation interests** related to the human environment and also maintain the initiative in developing policy guidance on all aviation matters related to the human environment, and **not leave such initiatives to other organizations;**

Henceforth, the ICAO agenda expanded to include other factors that impacted the local environment, such as aircraft engine emissions that caused pollution and "may be a cause of concern in relation to the human environment" (Res. A22-13). However, during the 70s and 80s, the main environmental topic under discussion within ICAO remained aircraft noise (from jets and supersonic aircraft).

It was only in the 90s that engine emissions, especially those affecting global warming, came into the ICAO`s agenda, pressured by the movements coming from the preparation for the

[63] Development of Standards, Recommended Practices and Procedures and/or guidance material relating to the quality of the human environment.

UN Conference on Environment and Development – UNCED, the so-called Earth Summit, held in Rio de Janeiro, in 1992 (Assembly Resolution A29-12). The Earth Summit expanded the Stockholm Conference's environmental agenda to include planetary consequences of human activities, such as the degradation of the Ozone Layer and Global Warming. It also created a specific body to discuss climate change, the United Nations Framework Convention on Climate Change – UNFCCC. The 29th ICAO Assembly,[64] held in September 1992, a few months after the Earth Summit (which took place in June), called attention to the `new environmental problems` in the multilateral framework. Following the UN discussions, ICAO approved Resolution A29-12[65] encompassing emissions in the upper atmosphere (Green House Gases-GHG emissions). It was the first ICAO Assembly Resolution that mentioned global warming. It is worth reproducing parts of the Resolution text demonstrating the expansion of ICAO`s agenda and its efforts to be the primary Organization responsible for aviation and environmental-related matters. The Resolution A29-12 says that:

> "Whereas there are growing concerns about environmental problems in the upper atmosphere such as **global warming** and depletion of the ozone layer;
>
> …
>
> Whereas ICAO is recognized as the primary Organization responsible for providing information on international civil aviation operations and developing policy guidance on possible means of minimizing any undesirable effects of international civil aviation on the environment; and
>
> Whereas Resolution A22-12 requests the council to maintain the initiative in developing policy guidance on all aviation matters related to the human environment and **not leave such initiatives to other organizations**;
>
> The Assembly:
>
> 1. Endorses the Council's decision to expand its activities and those of its Committee on Aviation Environmental Protection accordingly, stressing the urgency that must be given to these activities, within the limits of the existing budget;
>
> 2. Requests the Council to cooperate closely with other organizations involved in the definition of environmental problems in the upper atmosphere, in particular with the United Nations Environment Programme, with the World Meteorological Organization and with the Conference of the Parties to the United Nations Framework Convention on Climate Change; and
>
> 3. Invites Contracting States and international organizations to keep ICAO informed of developments in this field."

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[64] See Assembly Working papers: WP40, WP 68, WP82, WP85,WP87, WP99, WP106, WP224.

[65] https://www.icao.int/assembly-archive/Section29/A.29.RESOL.9600.EN.pdf, page 72.

Furthermore, the UNCED introduced the "polluter pays principle (Principle 16 of the UNCED Report)[66], indicating that environmental externalities should be priced to drive economic agents' behavior towards sustainable practices. This principle sets the basis for considering economic measures, such as environmental and energy taxes, to cope with climate change. The UNCED Secretary-General report also mentioned that States should encourage using transport modes with less environmental impact[67]. The possibility of reduced demand and the application of environmental taxes were seen as threats to aviation. The ICAO Secretary gave a speech at the UNCED highlighting the specificities of air transport as a global interdependent network (WPs A29-39 e A29-40). Norway's position at the ICAO`s 29th Assembly summarizes the pervasive feeling at the occasion. The delegation from Norway said that if ICAO did not address those new environmental problems, others would do it, and without taking aviation interests into account (WP106 presented by Norway in the 29th Assembly).

At the 31st Assembly in 1995, the `new environmental problems` occupied the center of the agenda[68]. The ICAO Council had been tasked to follow closely the developments of other International Organizations that could impact aviation, such as the International Panel on Climate Change – IPCC and the Montreal Protocol that regulated ozone-depleting gases. The Council report indicates a growing interference of the Conference of the Parties - COP to the UNFCCC on aviation-related issues. For instance, the COP decided that its subsidiary body should address the issue of allocation and control of emissions from international aviation in cooperation with ICAO. Furthermore, the UNFCCC Commission on Sustainable Development recommended a study on environmental user charges in air transport. CAEP was also conducting a study on that matter. States, private stakeholders, and the ICAO Secretariat expressed concerns with the duplication of efforts between the UNFCCC and ICAO, advocating that the ICAO, as the specialized UN Agency for Civil Aviation, should lead those discussions. (A31- Executive Committee Report).

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[66]https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf

[67] https://www.un.org/esa/dsd/agenda21/Agenda%2021.pdf Page 85, Item7.52 (a); Page 86, Item 7.54 (b).

[68] See Assembly Working Papers WP1, WP57, WP22, WP23, WP86, WP114, WP121, WP35, WP51, WP76, WP41, WP119, WP177, WP160, WP109, WP103, WP125, WP188, Reports Executive Committee presented in the 31th ICAO Assembly.

In 1997, the COP-UNFCCC approved the Kyoto Protocol, which consolidated ICAO`s prerogative as the competent forum to address emissions from international aviation. The Kyoto Protocol stated in its article 2.2 that Annex I countries should reduce their emissions from international air transportation by working through ICAO. At the 32nd Assembly in 1998, the council welcomed the clarification offered by the Kyoto Protocol on the roles of ICAO and the UNFCCC (WP A32-23 presented by the council). The Council report reaffirmed ICAO`s responsibility and stressed that the Organization, from that moment, had the challenge of "*finding means to reduce emissions or explain to the UNFCCC why that could not be achieved*" (WP A32-23 presented by the council, page 5). Notice that exempting international aviation from mitigating its impact is presented as a possibility in this first ICAO document after the Kyoto Protocol delegation.

Between ICAO`s 32nd and 33rd Assemblies (1998-2001), CAEP analyzed market-based tools that could reach environmental goals at a lower cost than regulatory measures. CAEP analyzed charges, fuel taxes, carbon offsets, and emissions trading. Fuel taxes were considered inconsistent with the ICAO policies, the Chicago Convention, and bilateral agreements. Regarding Emissions Trading[69], CAEP indicated that they were compatible with ICAO policies and could be a cost-effective solution in the long run after the implementation of the UNFCCC Kyoto Protocol. In the short run, voluntary measures - based on agreed targets and sets of actions between industry and governments – were presented as an available option. CAEP stated that the voluntary measures alone would not achieve ambitious targets and could be combined with MBMs.

In 2004, during the 35th ICAO Assembly, the UNFCCC Secretariat presented a statement informing that the Kyoto Protocol would likely come into force soon and that ICAO should provide regular updates to the SBSTA on the work developed to mitigate aviation`s GHG emissions. The UNFCCC also pointed out the need to develop better quality and compatible emissions inventories from air travel. In response, ICAO`s Resolution A35-5 reaffirmed the need to keep the Organization`s leadership stressed the relevance of the aviation industry to social and economic development while recognizing the growing concern about emissions and the need for action. The document tasked the council, with the technical support from CAEP, to i) develop a template of a Memorandum of Understanding MoU and Guidance for the agreement on voluntary measures

[69] With and open systems where permits can be traded with other sectors.

between the States and industry stakeholders; ii) to support the development of a voluntary trading scheme; iii) and produce guidance for incorporating aviation in States and Regions` Emissions Trading systems.

During the 36th and the 37th Assemblies (2007-2010), there were intense negotiations at ICAO aiming to agree on more ambitious emissions reduction goals for aviation. ICAO already had the goal of a 2% annual improvement in fuel efficiency until 2050 and was negotiating a carbon-neutral growth goal. The president of the Council created an informal group[70] that held high-level meetings and developed a Programme of Action on International Aviation and Climate Change. The main objective was to draft a resolution focused on three central aspects: a definition of more ambitious goals, a framework for MBM, and measures to assist States. In its 190th section, the council discussed the draft but could not agree on the Resolution. The main controversial topics were the agreement on a carbon-neutral growth goal and the development of a global MBM. Despite all the controversy, the topic was brought to the attention of the Assembly Section, which approved Resolution A37-19, establishing, in Article 6, the medium-term goal of Carbon Neutral Growth – CNG after 2020. The resolution text says that:

> "Also resolves that, without any attribution of specific obligations to individual States, ICAO and its member States with relevant organizations will work together to strive to achieve a collective medium term global aspirational goal of keeping the global net carbon emissions from international aviation from 2020 at the same level."

Moreover, Res. A37-19 requests the council to develop a framework for market-based measures (MBMs) in international aviation, which would be crucial for achieving the CNG-2020 goal. The Resolution also indicates in its preamble that UNFCCC Kyoto flexibility instruments, such as the Clean Development Mechanism - CDM, could be cost-efficient for the airlines while benefiting projects involving developing countries. At that point, ICAO was already picturing a global offsetting mechanism as the most feasible market-based measure in the short run for the aviation sector. For example, the resolution text affirms that the Assembly:

> "19. Recognizes that in the short term voluntary carbon offsetting schemes constitute a practical way to offset CO2 emissions, and invites States to encourage their operators wishing to take early actions to use carbon offsetting, particularly through the use of credits generated from internationally recognized schemes such as the CDM; 20. Requests the council to collect information on the volume of carbon offsets purchased in relation to air transport, and to continue

[70] Named Group on International Aviation and Climate Change – GIACC.

> to develop and disseminate best practices and tools, such as the ICAO Carbon Emissions Calculator, that will help harmonize the implementation of carbon offset programmes."

A year before the 37th Assembly, in 2009, the Conference of the Parties to the UNFCCC (COP-15) had been held in Copenhagen. At COP-15, ICAO presented the outcomes of the high-level meetings organized to advance the Organization`s actions on climate change. During the COP-15, no decision was made regarding aviation and climate change, but the UNFCCC urged the ICAO to provide meaningful contributions to the climate change discussions. COP-15, in general, couldn`t achieve a formal agreement. Still, a group of leaders reached the Copenhagen Political Accord[71], which set the basis for the bottom-up approach that resulted in the Paris Agreement a few years later. Therefore, there was a shift in the UNFCCC climate change architecture, moving away from the ambition of agreeing on top-down emissions reduction targets to a framework based on bottom-up nationally determined contributions. ICAO did not follow that path. On the contrary, the agreement on the CNG-2020 entailed an implementation strategy based on a highly institutionalized top-down offsetting scheme dubbed CORSIA.

In 2013, at the 38th Assembly, ICAO Resolution A38-18 requested the council to:

> "finalize the work on the technical aspects, environmental and economic impacts, and modalities of the possible options for a global MBM scheme, including on its feasibility and practicability, taking into account the need for development of international aviation, the proposal of the aviation industry and other international developments, as appropriate, and without prejudice to the negotiations under the UNFCCC;"

The proposal of the aviation industry was a single offsetting scheme, as they believed it would be the quickest to implement, the easiest to administer, and the most cost-efficient. Multiple passages of the A38-18 resolution text indicate that the pervasive proposition was the development of a global MBM based on offsetting credits. Interviews with stakeholders also confirm that view, as they signal their beliefs that there was no other feasible alternative. Regarding the UNFCCC, in 2015, the Paris Agreement was approved, consolidating the move of the multilateral climate change regime toward a bottom-up approach based on the nationally determined contributions - NDCs. During that period (2014-2016), ICAO worked on the technical aspects of the first global market-based measure to cope with climate change, and CORSIA was approved in 2016 during the 39th ICAO Assembly.

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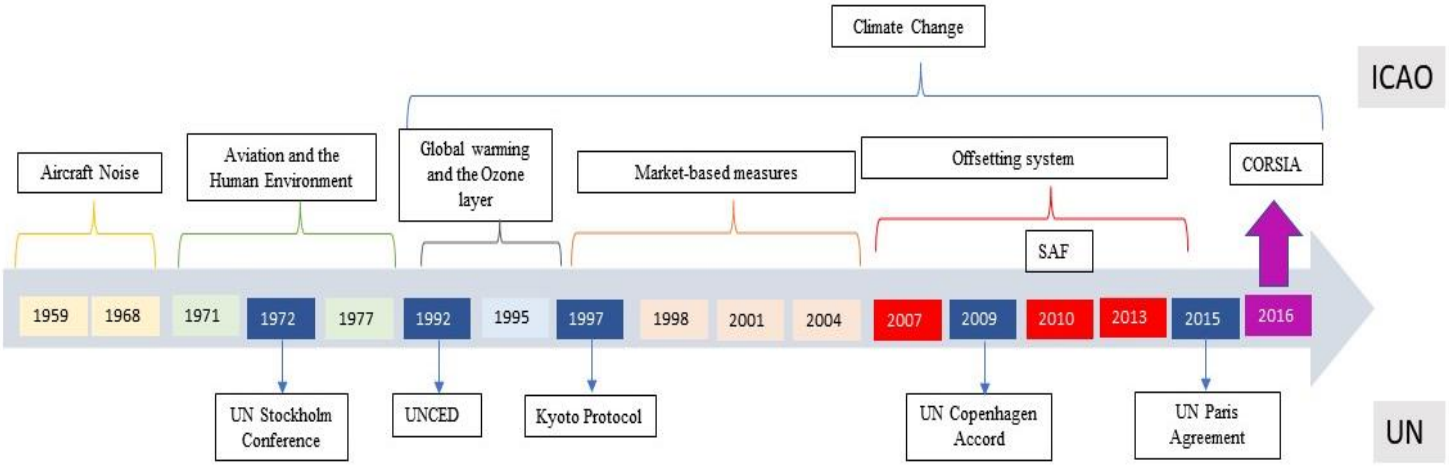
[71] The US and China presidents invited BASIC leaders for a political dinner, excluding European leaders.

Figure 9 below demonstrates graphically the documental findings regarding the evolution of environmental discussions within ICAO and the developments in the broader UN regime on environment and climate change. Above the arrow are the main topics discussed in ICAO's Assembly Working Papers on environmental matters in each period. Below the arrow are the leading UN conferences and agreements on environment and climate change.

Figure 9. ICAO and the UN linkages on environmental and climate change topics



Source: Own elaboration.

It is possible to notice that besides aircraft noise, a specific aviation-related problem, other issues were introduced and discussed in the UN and ICAO in similar periods. Documents make it evident that the UN discussions, first on the human environment in general and then on climate change, provoked ICAO to advance on these topics regarding international aviation to keep control of the policy agenda. However, it is interesting that ICAO did not follow the UNFCCC move to nationally determined contributions, maintaining the efforts to achieve a globally agreed mitigation measure.

There is clear evidence that many governing technologies of the UNFCCC and its Kyoto Protocol were incorporated into CORSIA`s design, such as establishing targets and timetables, introducing flexibility mechanisms based on emissions reduction trading, and defying transparency mechanisms for GHG emissions measurement, report, and verification (MRV). Nonetheless, documentation shows that ICAO developed a tailored approach to incorporate sectoral aviation interests. First, unlike the Kyoto Protocol, CORSIA encompasses developed and developing

countries. Second, ICAO did not move to a bottom-up approach because it would result in multiple national regulatory frameworks forming a patchwork of schemes which, most aviation stakeholders (public and private) have stated, would be detrimental to the functioning of the international aviation system.

Analysis

Documental analysis demonstrated that the introduction of environmental topics in the ICAO agenda, especially air quality and global warming, was directly influenced by the United Nations processes, namely, the 1972 Stockholm Conference and the 1992 United Nations Conference on Environment and Development – UNCED. During this agenda-setting stage, documents presented at the ICAO Assemblies explicitly reference the UN initiatives, manifesting that ICAO should take the lead on aviation environmental regulation, not leaving the initiative to other organizations. By observing the actor's behavior manifested in the working papers, it is possible to notice the adoption of a forum shopping strategy by which member states and private stakeholders worked to maintain ICAO as the central forum for international aviation regulation, including climate change matters.

Private stakeholders – namely IATA and ACI – were strongly vocal about the relevance of keeping ICAO as the competent UN body to regulate civil aviation in all its aspects. During the 90s, documental analysis showed that the United States and European Countries were the most engaged member states in the aviation and climate change discussions. The US position was to keep the topic under the ICAO`s responsibility. The European Countries' arguments were more in the line that climate change was an important issue, and that ICAO should provide general guidance for adopting policies at multiple levels to cope with the impacts of Civil Aviation on global warming.

At this early stage of the regime (the 90s), ICAO documents also bring evidence of constant attempts of the UNFCCC technical bodies to discuss alternatives for coping with the impact of civil aviation on climate change. The documents demonstrate a reaction from ICAO`s Secretariat and technical groups developing studies to foster technical and political discussions within ICAO while avoiding advancing the topic in the UNFCCC. For instance, the ICAO Secretariat directly asked member states to coordinate with their delegations at the UNFCCC to support keeping the ICAO as the main forum for discussion. Only after 1997, with the signature of the Kyoto Protocol,

ICAO was legitimized as the central forum for addressing the issue. The literature describes the Kyoto Protocol article 2.2 delegation to ICAO as a type of division-of-labor between international organizations, where ICAO, as the UN specialized agency for civil aviation, becomes responsible for limiting or reducing international air transport GHG emissions.

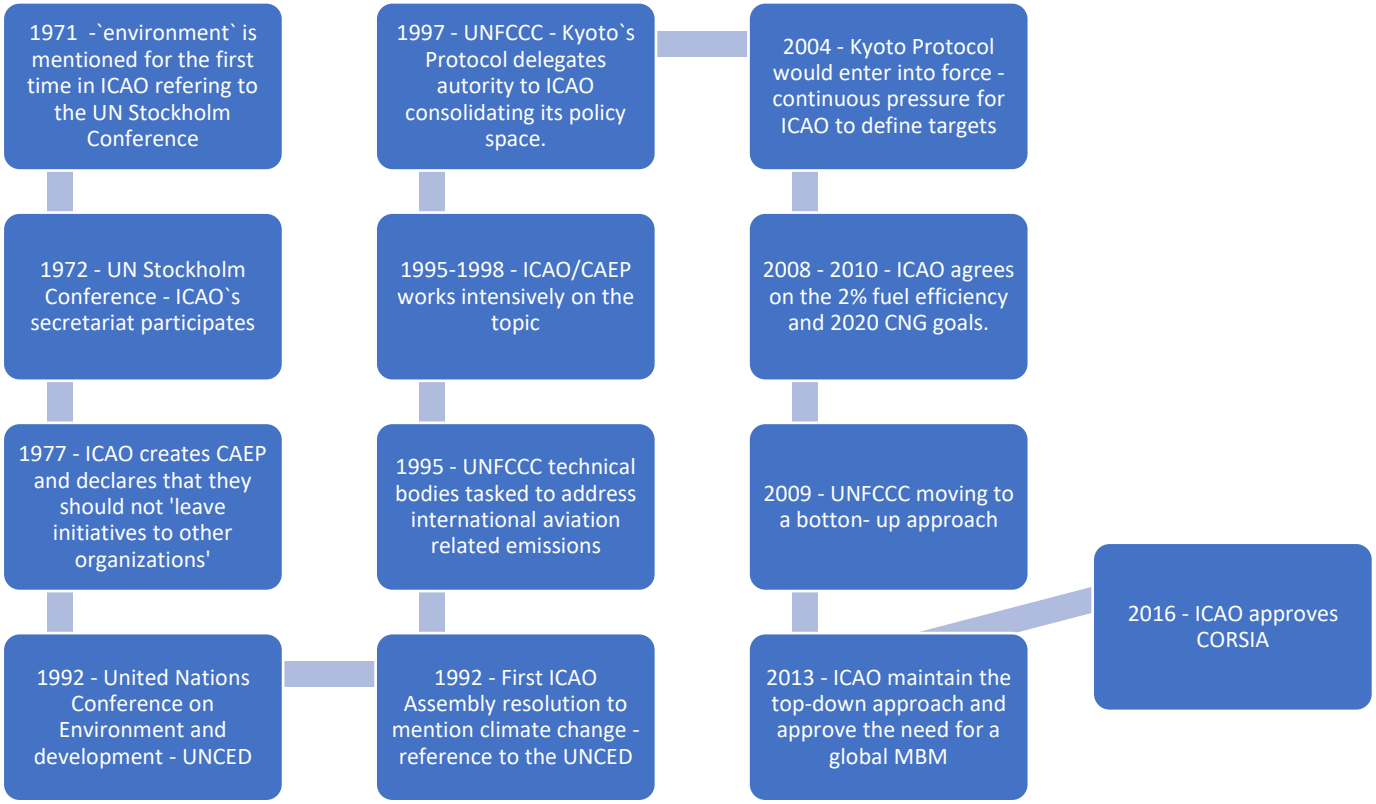
After 2005, when the Kyoto Protocol entered into force, pressures for ICAO to deliver solutions to the problem increased. Therefore, during the regime formation stage, the competitive regime shadow from the UNFCCC was a constant reminder that ICAO had to present alternatives for addressing the international aviation impact on climate change to maintain policy control. Catalytic linkages were also present, as the rationalities of the Kyoto Protocol were reflected in ICAO`s agreement on a global target and the inclusion of flexibility mechanisms as a necessary component to achieve that target – at least while decarbonizing technologies were not available or not economically viable to the sector.

Thus, we can say that during the agenda-setting stage (the 90s), the UNFCCC exerted direct influence on ICAO on climate change matters. In the second stage of regime formation (the 2000s), after the delegation of the Kyoto Protocol, ICAO followed a more independent path, being influenced indirectly by the UNFCCC competitive regime shadow threat and by the government technologies and rationalities from the Kyoto Protocol. This independent path is evidenced when the UNFCCC moved away from the top-down framework based on globally established targets and timetables and ICAO, rather than following the same path, kept the strategy of developing a globally harmonized policy based on the common target of 2020 carbon neutral growth to be implemented with the support of a global offsetting scheme, dubbed CORSIA.

Therefore, documental analysis shows that the prevailing pattern of interactions between the ICAO and the UNFCCC was conflictive, as the competitive regime shadow from the UNFCCC exerted considerable pressure on the ICAO to regulate the matter. In addition, there is abundant evidence of the forum shopping strategy by which aviation stakeholders (public and private) and the ICAO Secretariat worked to keep ICAO as the central forum for regulating aviation and climate change. However, evidence has not fully confirmed the hypothesis that UNFCCC pressures based on conflictive horizontal governance have prompted ICAO to approve CORSIA. There is a longer causal chain when we analyze interactions between the organizations and how it has influenced the approval of CORSIA. First, conflictive horizontal interactions were relevant to introducing climate

change into ICAO's agenda. This conflictive interaction is evident in the actor's forum shopping strategies of maintaining ICAO's preeminence while blocking the development of the topic within the UNFCCC. Second, after the Kyoto Protocol delegation, a division-of-labor dynamic prevailed between ICAO and the UNFCCC with catalytic linkages by which the Kyoto Protocol governing technologies and rationalities influenced the policy design within ICAO. In addition, it is important to consider the UNFCCC regime shadow threat that signaled to ICAO that if they didn't deliver results, others would regulate the matter. Therefore, the UNFCCC has influenced ICAO's processes leading to CORSIA. Still, this hypothesis doesn't explain the result sufficiently, and a more nuanced description is necessary to account for the study's result. Figure 10 below details the chain of events leading to the development of CORSIA.

Figure 10. The detailed chain of events connecting the UN and ICAO on environment and climate change matters



Source: Own elaboration.

5.4. Conflictive multilevel climate governance: the EU-ETs and the approval of CORSIA

Regarding the relations between the EU-ETs and ICAO, political discourse and academic work have indicated a competitive perspective between regimes (Gonçalves 2013). The European Union set up its own cap-and-trade mechanism in 2005 to support its member states' achievement of the Kyoto Protocol targets.[72] Aviation was brought into the EU-ETs in January 2012, but it only included national and inter-European flights[73]. International flights that connected European countries to other regions were suspended from the EU-ETs due to a strong reaction from many relevant States such as the US, China, India, and Brazil, among others.[74] The main argument was that including extra-European flights would transcend the EU jurisdiction, affecting other countries. Thus, the issue of international aviation emissions should not be regulated unilaterally. Multilateral negotiations under ICAO should decide on the appropriate environmental regulations for international aviation.[75]

For instance, the International Air Transport Association – IATA affirmed that including international flights in the EU-ETs violated customary international law and bilateral air services agreements, the Kyoto Protocol, and the International Civil Aviation Convention[76] (Goncalves, 2013). The EU decided to temporarily suspend the application of the EU-ETs to international extra-European flights, `stopping the clock` while urging ICAO to approve a global policy for coping with international aviation emissions[77]. Scholars have argued that the EU-ETs pressure was decisive in the approval of CORSIA (Gonçalves, 2013; Martinez Romera, 2017; Rayner et al., 2021). Gonçalves (2017), claimed that the EU exerted normative pressure, pushing for more ambitious climate action in the scope of civil aviation. According to Gonçalves and Anselmi

[72] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32003L0087.

[73] https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/development-eu-ets-2005-2020_en.

[74]https://pib.gov.in/newsite/PrintRelease.aspx?relid=77104;
https://archives.greenairnews.com/www.greenaironline.com/newsb627.html?viewStory=1344.

[75] https://www.timesaerospace.aero/news/air-transport/iata-expresses-disappointment-at-eu-legal-decision-over-ets

[76] The argument was that the EU-Ets violated customary international law and bilateral agreements because it was a unilateral measure affecting the other parties' airlines. Regarding the Kyoto Protocol, the alleged legal flaw was that the EU-Ets did not differentiate between developed and developing countries. Finally, in relation to the Chicago Convention, one of the legal arguments was that the EU-Ets was in breach with article 1 of the Convention about sovereignty rights.

[77] https://ec.europa.eu/commission/presscorner/detail/fr/MEMO_12_854.

(2019), "the prospect of including all international flights overpassing the European territory in the EU-ETS, from 2016 onwards, prompted the ICAO to act more incisively".

Thus, based on the literature on the topic, the hypothesis investigated in this section is that ICAO approved CORSIA due to external pressures from the European regime. In this case, a conflictive multilevel interaction between ICAO and the EU-ETs, grounded on the competition between both regimes, led to the approval of CORSIA. More precisely, the EU's threat to include international aviation in the EU-ETs prompted the ICAO to design and approve CORSIA. It is important to highlight that this research does not investigate the processes within the European Union regarding the deliberations on the EU-ETS.

The scope of analysis is the ICAO Assemblies. Therefore, departing from the documentation presented and the meeting minutes, the study investigated how the European economic policies regarding climate change were reflected in ICAO`s discussions. The EU-ETS was only established in 2005, and discussions about including aviation came about in 2009. However, the research opted for an expanded timeframe, starting in 1992, to have a broader understanding regarding the European positions on market-based measures and how those positions might have influenced ICAO processes on aviation and climate change and, ultimately, the agreement on CORSIA.

Main Findings

The EU-ETS is an economic measure that aims to put a price on carbon, just like taxes and charges. The difference is that an Emissions Trading Scheme – ETS establishes a limit for emissions (a cap) and lets the market define the price of the tradable emissions reduction units[78]. Conversely, charges and taxes put a direct price on the carbon tone; according to that price, the market decides on the volume of emissions. GHG emissions will drop when carbon prices are higher than the cost of adopting decarbonized processes and technologies. On the other hand, if the carbon price is lower than the abatement cost, the economic agent will choose to buy emissions units or pay taxes and keep emitting GHG. There are many academic and political debates regarding which economic measure would be effective (Stavins, 2022). However, the general understanding is that putting a price on carbon would be important to drive economic agents'

[78] Representing a ton of CO2.

behavior toward adopting decarbonized technologies and processes. That is the rationale behind economic measures such as environmental levies (taxes and charges), the EU-ETS, and CORSIA.

Within the UN system, the debate on environmental economic measures gained traction in 1992, when the UNCED introduced the "polluter pays" principle, indicating that environmental externalities should be priced to drive economic agents' behavior towards sustainable practices[79]. This principle sets the basis for considering economic measures to cope with climate change. Regarding aviation, since 1992, documental research has demonstrated extremely active behavior from European countries within ICAO on topics related to economic measures. Interventions from European member states were initially centered on taxes and charges (A29-WP85, A29-WP106).

ICAO`s policy exempts international aviation from taxes and restricts the use of charges (Chicago Convention, Article 24a; and Doc 8632-c/968). The European States raised discussions, from 1992 until 2001, on possible changes in ICAO policies to legitimize the use of taxes and charges for member states to cope with climate change (Working Papers: A29-WP85, A29-WP106, A31- WP70, A31-WP82, A31-WP81, A32-WP74, A33-WP77, A33-WP42). After 2001, the scope of European interventions within ICAO expanded not only to support environmental economic measures on a multilateral basis but also to legitimize the adoption of emissions trading schemes at national and regional levels (A35-WP139, A35-WP223). Around 2005, the new instruments introduced by the Kyoto Protocol and the beginning of the discussions for creating the EU-ETs stimulated the debate within ICAO about adopting emissions trading schemes (A35 WP223; A36 WP70).

The results of the documental analysis demonstrate that, since 1992, European countries have faced intense reactions against their attempts to develop economic policies (taxes, charges, and the EU-ETS) to tackle aviation emissions at local and regional levels. Therefore, the research found a pattern of reiterated proposals in ICAO Assemblies from European member states aiming to legitimize the use of national and regional economic measures (first charges and later the EU-ETs) to address the impacts of aviation on climate change. At the same time, evidence demonstrated constant responses, especially from IATA and many other member States, against economic

[79] UNCED, Principle 16.
https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf.

measures for international aviation, aiming to block their adoption by national and regional governments (see tables 2 and 3 and 4 for documental references).

During ICAO`s Assembly in 1992, the council proposed a study on whether charges could effectively eliminate or reduce the environmental effects of aircraft engines (A29-WP40, page 4, presented by the Secretariat). Norway defended that environmental charges should be cost-based, and the Netherlands supported duty on fuels based on the principle that polluters should pay for their damages (A29-WP106, presented by Norway, and A29-WP85, presented by the Netherlands). In turn, IATA and ACI were emphatic in supporting that ICAO should be the principal forum for regulating the matter and manifested concern about the proliferation of national and regional regulatory initiatives impacting aviation (A29-WP 68 and 87 presented by IATA and A29-WP 99, presented by ACI). The Assembly decided that only when CAEP had identified the environmental problems associated with engine emissions and had considered what possible technologies or other solutions existed would it be possible to draw conclusions about specific measures. By the end of the Assembly, there was broad support for the statement that ICAO should be at the forefront, but no consensus was reached on charges (Doc 9595 and A29-EX[80]).

In 1995, ICAO`s preliminary conclusions sustained that countries that decide to adopt charges should follow the principles of no fiscal aim, no distortion of competition and that charges should be efficient and cost-related (A31-WP233 presented by the chairperson of the Executive Committee). The Netherlands reiterated the need to study the cost and benefits of charges, affirming that ICAO should find a solution to applying economic instruments to cope with the increasing share of international aviation emissions (A31 WP80, 81, and 160). Switzerland highlighted that air transport was exempted from fuel taxes due to ICAO policies. They proposed that the ICAO review those policies and suggested a worldwide agreement on fuel taxes for international aviation (A31 WP 82). IATA argued that ICAO should retain the leadership on policies related to the matter (A31 WP59). The Assembly decided that taxes were complex and that there were many views for and against them. Hence, further studies should be conducted, and member states should refrain from adopting unilateral actions that could damage civil aviation (Res. A31-11).

[80] https://www.icao.int/Meetings/AMC/Pages/Archived-Assembly.aspx?Assembly=a29.

In 1997, the Kyoto Protocol was approved, consolidating the use of market-based instruments as flexibility mechanisms to help States reduce their emissions cost-effectively. Those market-based mechanisms influenced the discussions within ICAO on how to cope with aviation's impact on climate change. At the 32nd ICAO Assembly in 1998, the European Community - EC affirmed that it was necessary to have a consistent position between the Kyoto rules and ICAO. The EC also defended that ICAO should accelerate work to develop guidelines for implementing national and regional fuel levies (A32 WP74).[81] Norway affirmed that aviation was not meeting the costs it imposed on the environment and that levies could be an efficient measure (A32, WP243).

IATA, in turn, insisted that ICAO should be the main forum for regulating the matter and even suggested a discussion on whether domestic fuels should be in national inventories for Kyoto`s obligations or wait for ICAO`s deliberations. ACI also showed concern that levies could have adverse effects in reducing traffic and affirmed that ICAO policies and principles should be followed. ICAO`s 1998 Assembly concluded that "aviation benefits the economy and should not be endangered by levies. However, the sector should shoulder its part of the burden". After a lot of debate, with Europe supporting the adoption of fuel taxes and air ticket taxes, the Assembly did not reach a consensus and, again, affirmed that ICAO would promote further studies and reach a conclusion on the guidance for levies before the next Assembly meeting. Until then, no unilateral action should be taken. Many European States were unsatisfied and presented reservations about that topic on the Resolution (A32, WP243 – report on agenda items 20 and 21 of the Executive Committee). Table 02 summarizes the main findings for this period and indicates the Working Papers that provided the evidence.

[81] The European Civil Aviation Commission – ECAC had a more conservative approach, arguing that ICAO should further examine the economic effects of different levies applied to different groups of states.

Table 02: Patterns of behavior when the economic instruments under discussions were taxes and charges

Economic Instruments	1992	1995	1998
PROACTIVE ROLE The EU and European Countries on levies The USA introduced the issue of emissions trading.	A29-WP 85 – The **Netherlands** A29-WP 106 - **Norway**	A31 - WP82 **Switzerland** A31- WPs 80, 81 and 160 -**The Netherlands** A31-WP70-Sweden	A32 WP 74 and WP 120- Austria speaking for the **European Community** - EC A32 188 – **the USA** – emissions trading as an option
DEFENSIVE ROLE Manifesting concern about environmental levies and/or policies outside ICAO.	A29-WP 68 from **IATA and** A29 WP-99 from **ACI.**	A31 WP 59– I**ATA**	A32 WP78 - **IATA** A32 WP 114 **ACI**
ASSEMBLY DECISIONS Discouraging the adoption of environmental charges by member states.	Res. A29-18/1 and previous Res. A22-12	Res. A31-11	A32 WP 35 – Council A32 WP 22 – Council Appendix H of Res.A32-8 and ICAO Doc. 8632

Source: Own elaboration based on ICAO documents available at the website: https://www.icao.int/publications/pages/assembly-archive.aspx

During the following Assemblies after 1998, a new dynamic occurred regarding the discussions of economic instruments for coping with emissions from international aviation. More actors got engaged in discussions about the topic, including the United States, China, and several developing countries (see table 3). Until then, records demonstrate participation from European countries, the European Union, IATA, ACI, and ICAO`s Secretariat.

At the 35th Assembly in 2001, the council reported on CAEP`s work on market-based measures. CAEP indicated that market-based tools could contribute to reaching environmental goals at a lower cost than regulatory measures. They analyzed three options: levies (taxes or charges), emissions trading, and voluntary measures. According to them, levies faced legal issues

because they were forbidden by 97% of the bilateral air services agreements. Regarding Emissions Trading – ET, CAEP concluded that it could be cost-effective if designed properly. An effective MBM design should consider: i) an open system, allowing trading between sectors (not only within the aviation sector), ii) distribution of permits through grandfathering[82] (because auctioning would increase the costs for airlines and raise issues of how to spend the revenue); iii) finally, a robust administrative infrastructure would need to be created. In the case of voluntary measures, industry and governments could agree on targets and a set of actions. CAEP indicated that voluntary measures alone would not achieve ambitious targets but could be combined with MBMs (A33 WPs 16, 43, and 56).

The USA affirmed that ICAO was the proper forum to develop market-based instruments for international aviation and supported the technical work developed by CAEP, including its conclusions on the cost-effectiveness of an emissions trading scheme (A33 WP. The US had been active in negotiating the so-called `flexibility mechanism` within the UN - Kyoto process. However, they had not ratified the Kyoto Protocol due to domestic politics and geopolitical issues. Thus, the US Working Paper to the 34th ICAO Assembly adopted and ambiguous approach, supporting the technical work on ETS within ICAO while also saying that they do not necessarily agree with the mechanism. The WP wording is: "The US position regarding ICAO efforts to define and ETS did not constitute support for such an ETS, but whether support for continued work on this issue."

The European Commission supported an open ETS, voluntary measures, and levies and asked ICAO to develop guidance on policies to internalize environmental costs[83]. Some European states supported worldwide fuel charges (A33 WP92), but more states were against it, affirming that it would be detrimental to the economy and civil aviation. Developing countries such as Russia, Egypt, Armenia, Moldova, and Tajikistan also discussed economic measures during this Assembly (A33 WPs 183, 122, 172, 111 and 82). The main message from these countries was against adopting unilateral measures to cope with climate change, referring to the European Union initiatives. Once

[82] Grandfathering means distributing emissions permits free of charge, taking into account the aviation activity and emission`s level of each aircraft operator. In an auctioning systems the permits are sold in the market and those willing to pay more acquire the permits.

[83] ECAC – Maintain ICAO policies on environmental charges.

again, the ICAO conclusion in 2001 was that there was overwhelming support for emissions reduction but different views on how to do it. Finally, ICAO`s Assembly restated that no unilateral action should be taken on MBMs (Assembly Res.A33-7, Appendix I).

In 2004, at the 35th ICAO Assembly, the Council report stated that CAEP was working on the topic following its principles of technical feasibility, economic reasonableness, environmental benefits, and interdependencies. There was still no consensus on emissions charges due to cost-effectiveness, legal, policy, and implementation aspects (A35 WP76). The USA, Canada, and Mexico were against charges and supported the development of voluntary measures and an open multilateral emission trading system (A35 WP177). Developing countries argued they should not be included in a global MBM for the aviation sector and were also against unilateral charges (A35 WPs 123, 115, 132, 182). IATA also manifested its position against local, national, or regional taxes or charges, arguing that they would harm voluntary and operational measures (A35 WP85).

The Assembly concluded that, despite divergent views, there was majority support for discouraging charges, avoiding unilateral action, and promoting a multilateral solution. Additionally, the primary focus should be on technological and operational measures, not MBMs. The EU was against the Resolution, stating that considering the precautionary principle, all options should be allowed. This 2004 ICAO Assembly decision represented a clear statement from the ICAO against polycentric climate governance for civil aviation, which was detrimental to the EU strategy of developing its own regional emissions trading scheme. The Resolution delegitimized market-based measures for international aviation at the national and local levels (Res. A35-5).

In 2005, the Kyoto Protocol entered into force, strengthening the appeal for using MBMs. During the 36th Assembly in 2007, the council proposed a basket of measures to cope with the aviation impact on climate change that included market-based-measures (trading-schemes and offsets), besides technologies and standards (e.g., more efficient engines) and operational measures (better routes and descend and taking-off procedures). CAEP`s technical analysis showed that technological and operational improvements would not be enough to stabilize and reduce emissions. Hence, discussions on MBMs strengthened within ICAO, and emissions trading was considered the most suitable alternative. The ICAO Council, backed by CAEP`s technical work, presented the concept of compensating aviation emissions by purchasing offsetting credits during this Assembly as a viable and simple measure. This approach had high acceptance among industry

stakeholders, particularly airlines, as some were already buying offset credits in the voluntary market to accomplish self-regulated sustainability targets (A36 WP39).

Additionally, on a provisional basis, the council had approved guidance for integrating international aviation into the State`s emissions trading schemes. This guidance was essential for the European Union, which intended to include international aviation in its EU-ETS. However, different views remained, particularly regarding the issue of mutual consent. Most countries (and IATA) argued that including international flights into national or regional market-based schemes would demand a bilateral agreement expressing the mutual consent of the parties involved (A36 WP39).

The topic was brought to the ICAO Assembly in 2007, but no agreement was reached. Portugal presented a paper in the name of the EU explaining that EU policies would consider the principle of non-discrimination (A36 WP70). Besides, the document clarified that the EU was ready to accommodate the concerns of developing countries and that most airlines from third countries would be very little affected. However, many countries[84] reacted by presenting working papers with their positions against unilateral action, highlighting the need for finding solutions based on mutual consent (A36 WPs 166, 285, 235, 88, 251, 24, 130, and 236). Thus, integrating international flights into national or regional trading schemes remained controversial. ICAO`s Resolution approved the need for mutual consent (through the negotiation of bilateral agreements) for integrating international aviation into national and regional trading schemes (Res. A36-22). It means that the EU, for example, could not include international aviation in their climate change regulation without negotiating with all countries that had airlines flying to Europe. The European States were unsatisfied with the results and expressed reservations, preserving their rights to adopt their own environmental policies for international aviation (A36-MIN. P/9[85]).

After that Assembly, the president of the Council created and informal group to draft a resolution on aviation and climate change focusing on three main issues: more ambitious goals, a framework for a global MBM, and measures to assist States. The proposal was presented at the 190th section of the council, but there was no agreement on the Resolution. The text was brought

[84] China, USA, Chile, Argentina, Brazil, Colombia, Ecuador, Panama, Canada, Mexico, Pakistan, Singapur, UAE, Egypt, Nigeria.

[85] https://www.icao.int/Meetings/AMC/MA/Assembly%2036th%20Section/A36_MIN_P_9_en.pdf.

to the Assembly in 2010, even without consensus in the council, and raised many discussions (A37WP25). The European Union argued that adopting medium and long-term goals was necessary and that the MBM would be indispensable to achieving the goals. They also indicated that the EU-ETs would adapt to the ICAO`s agreement. The EU affirmed in its working paper that they envisaged a future global framework developed by linking state and regional measures (A37 WP108). Therefore, the ICAO's global framework should be a facilitator and not an impediment to effective action on multiple levels.

IATA supported the global framework but had a different view regarding multilevel governance. They presented a working paper in the name of ACI, CANSO, IATA, IBAC, and ICCAIA, urging ICAO to agree on a single global framework to avoid conflicting unilateral policies that would cause inefficiencies (A37 WP217). It was the first time the industry spoke together, and they presented collective targets[86] and the principles for implementing an MBM for international aviation. The USA, Canada, and Mexico agreed on the 2020 CNG and the global MBM as a package, considering the flexibility mechanism would be crucial to achieving carbon-neutral growth (A37WP186). China stated that a carbon-neutral growth goal was unrealistic due to air traffic increase prospects and unfair to developing countries (A37WPs 181, 272, and 304). Russia also stated that an MBM for international aviation would be problematic (A37WP275). African and Latin American states affirmed that an MBM should consider the principle of common but differentiated responsibilities – CBDR and were against unilateral action (A37WP 187, A37WP271, respectively).

Despite multiple areas of disagreement, Resolution A37-19 was approved by the 2010 ICAO Assembly, setting the base for what would be CORSIA six years later. The Resolution reaffirmed the 2% annual fuel efficiency improvement goal and establishes the medium-term goal of keeping global net carbon emissions from international aviation from 2020 at the same level (CNG-2020). In addition, the Resolution requested the council to develop a framework for market-based measures (MBMs) in international aviation. Finally, Res. A37-19 included a `de minimis

[86] Industry collective targets – 1.5% annual fuel efficiency; CNG 2020; 50% reduction on net CO2 emissions by 2050 when compared to 2005 (WP 217).

approach` exempting countries with less than 1% of the international aviation market to participate in the MBM.

However, many countries presented reservations on core paragraphs. China, Brazil, Argentina, Cuba, Saudi Arabia, Libya, and other developing countries posed reservations to paragraph 6 that established the Carbon Neutral Growth (CNG-2020) goal. According to their statement, carbon neutrality should be a goal only for developed countries because, in their words:

> "We do not want to seal the fate of our future generations and deprive them of the economic benefits of aviation for a problem solely created by the developed countries. We would like our future generations to reap the benefits of development as enjoyed by certain developed nations; we must find more innovative solutions to the problem of climate change rather than putting a cap on our growth".

The European Union, Canada, the United States, and Australia presented reservations to different resolution topics. All of them were against the differentiation between developing and developed countries (paragraph 6 – c of Res. A37-19). They disagreed with the `de minimis` clause that exempted countries with a small share (less than 1%) of the international aviation market. European countries argued that a `de minimis` clause should be adopted by operators (small airlines would be exempted) and not discriminate between countries. The European Union also presented a reservation regarding the CNG2020 goal, considering that it was not ambitious enough because:

> "Allowing aviation emissions to peak only in 2020 would result in ten years of considerable growth in emissions and would not see aviation contributing adequately to attain the maximum 2°C temperature rise, which requires global emissions to peak well in advance of 2020."[87]

The European Union also posed reservations to paragraph 14 of the Res. A37-19 that, once again, required mutual consultation between countries for the establishment of ETS affecting international aviation. The reservation text says that:

> " From 1 January 2012, airlines' carbon dioxide emissions are included in the EU emissions trading system, which will be applied by 30 European states. In relation to Paragraph 14 on market-based measures, the EU emphasizes that the EU ETS allows it to take into account measures adopted by third countries in relation to incoming flights to the EU with a view to exempting them from the system. Such exemptions would follow consultations with these States, and the EU is ready to engage constructively in such consultations so as to reach an agreement. It is important also to make

[87] https://www.icao.int/meetings/amc/assembly37/documents/provisionaledition/a37_res_prov_en.pdf

> clear that in no way can paragraph 14 be construed as requiring that market-based measures may only be implemented on the basis of mutual agreement between States."[88]

Considering those multiple disagreements, negotiations within ICAO technical bodies between 2010 and 2013 focused on i) the review of the `de minimis` threshold` for exempting countries from the MBM, ii) the analysis of the feasibility of a global MBM, iii) the collection of information on the volume of carbon offsets available in the market; and iv) the discussion about geographical coverage and how to accommodate the differentiation between developed and developing countries (CBDR). Notice that, despite all disagreements, ICAO technical bodies kept working to develop a global market-based measure for international aviation characterized by the purchase of emission reduction units to offset aviation`s emissions (offset credits).

During the 38th ICAO Assembly, the parties approved Resolution A38-18, which requested the council to make recommendations on an MBM for international aviation. The Resolution advanced on aspects of the MBM framework, suggesting, for instance, a route-based approach to address the need to differentiate developing countries. The document received broad support, especially from the United States (WP/ 234), the European Union (WP/ 83), the industry (WP/68) and ICSA (WP/288). Developing countries and the European Union posed reservations[89] to the paragraph related to the CNG2020 goal. Developing countries argued that it was unfair to limit their aviation market growth, and the EU for the opposite reason, as they believed the CNG2020 was not ambitious enough to tackle the climate change problem. The EU also posed reservations to the clause requiring that bilateral consultations precede any MBM applied at domestic or regional levels.

We can notice that between 2004 and 2013, the proposal for developing and MBM scheme within ICAO gained support, especially from the European Union, the United States, and IATA. Nonetheless, Europe, the US, and IATA did not fully agree on the topic. The EU continued to work to keep its freedom to develop environmental-economic policies at local and regional levels. At the same time, the US and IATA supported a single global market-based measure. They were against national and regional policies that would create a complex and costly patchwork of schemes. Developing countries also got active in the debate, adopting a defensive attitude and manifesting

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[88] https://www.icao.int/Meetings/AMC/Assembly37/Documents/ReservationsResolutions/10_reservations_en.pdf.

[89] https://www.icao.int/Meetings/a38/Documents/Resolutions/summary_en.pdf.

concerns about unilateral actions and the impacts of a global MBM on their market development. They also were against the CNG2020 goal, which was considered unfair and unrealistic for developing countries.[90]

Despite the multiple divergencies, between 2013 and 2016, CAEP developed intense technical work to define the details of the MBM design, including the monitoring, reporting, and verification standards. European experts participated actively in that process, considering the expertise they have acquired implementing the EU-ETS. In 2016, during the 39th ICAO Assembly, many discussions took place as there were multiple areas of disagreement regarding specific design elements of CORSIA. However, there was broad support for adopting a global MBM, particularly by the US, the EU, Canada, and IATA. The `de minimis` approach included in the Resolution exempted countries with a small share of the international aviation market from CORSIA. Therefore, most developing countries were exempted, which reduced their engagement in the discussions.

The main dissonant voices were China, India, and Russia, which disagreed with core aspects of the scheme, and Brazil, which was against a specific design feature related to the individual approach for the distribution of obligations. Even without consensus, resolution A39-3 was approved, establishing the Carbon Offsetting and Reduction Scheme for International Aviation - CORSIA. Paragraph 19 of the Resolution determines that "CORSIA or any other scheme decided by the Assembly is to be "the" market-based measure applying to CO2 emissions from international aviation…". Many member states and observers interpreted this paragraph as prohibiting the adoption of domestic or regional MBMs for international aviation, as the word "the" could be understood as "the only" market-based measure. Naturally, the EU further manifested its disagreement with this interpretation.

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[90] Achieving Carbon Neutral Growth (CNG) beyond 2020 involves establishing an absolute cap on emissions. However, this approach may pose challenges, especially considering that in developing countries, a significant portion of the population is not engaged in air transportation. As per capita income rises in these regions, there is a notable increase in the number of flights and, consequently, a surge in emissions. On the contrary, developed countries, being mature markets with already high per capita flight rates, experience less pronounced growth in air transport demand despite increases in per capita income. In essence, implementing a uniform absolute cap for all countries may grant developed nations, which already contribute substantially to emissions, the leeway to maintain their emissions levels. Simultaneously, it could constrain the growth rights of developing countries.

Table 03: Patterns of behavior when the economic instruments under discussions was a Market Based Measure - MBM

Economic Instruments	2001	2004	2007
PROACTIVE ROLE **POLYCENTRIC GOVERNANCE** **European Countries and the EU**	A33-WP 77– European Community - EC A33-WP 92 - Switzerland	A35 – WP 223 – ECAC (European Civil Aviation Authorities)	A36 WP70 – Portugal speaking for the EU
PROACTIVE ROLE **ONLY FOR POLICIES IN ICAO – AGAINST UNILATERAL MEASURES** **IATA and the US**	A33- WP – The USA A33 – WP138 – IATA A33 – WP 144- ACI	A35 – WP 153 – ACI A35 – WP 85 – IATA A35- WP 95 – IATA A35 – WP 177 – The USA, Canada and Mexico.	A36 WP 166 – The USA (with Argentina, Brazil, Canada, Colombia, Ecuador, Japan, Mexico, Pakistan, Panama, Saint Lucia, Singapure) – multilateral agreement
DEFENSIVE ROLE **AGAINST UNILATERAL MEASURES AND CONCERNED WITH MBM IN ICAO** **Developing countries**	A33- WP183 – Arabic Countries (ACAC) A33- WP 122 – African Countries (AFCAC) A33 – WP 172 – Latin American Countries (LACAC) A33- WP 111 – Armenia, Moldova, Russia and Tajikistan. A33 – WP 82 - Egypt	A35 – WP123 – Russia A35- WP 115 Arabic countries (ACAC) A35- WP 132 – African Countries (AFCAC) A35 – WP 182 Latin American countries (LACAC)	A36 WP285 Chile A36 WP 235 China A36 WP 88 Egypt A36 WP 251 Nigeria speaking for AFCAC A36 WP24 Bahrain and Egypt speaking for ACAC A36 WP130 LACAC A36 WP 236 Arabic Council
ASSEMBLY DECISIONS Arguing for a global policy and delegitimizing the adoption of domestic and regional economic measures.	A33 – WP16 – Council A33- WP 43 – Council A33- WP 56 – Council Assembly Res.A33-7, Appendix I	A35 – WP 76 – Council Assembly Res. A35-5 – review res. A33-7, Appendix I	A36 WP 39 – Council Assembly Res. A36-15 and Res. A36-22

Source: Own elaboration - research on the website: https://www.icao.int/publications/Pages/assembly-archive.aspx

Table 4: Patterns of behavior when the economic instrument under discussions was an MBM (and probably an offsetting scheme)

Economic Instruments	2010	2013	2016
PROACTIVE ROLE **POLYCENTRIC GOVERNANCE** **European Countries and the EU**	A37-WP 108– Belgium on behalf of the EU	A38 – WP 83– Lithuania on behalf of the EU A38 – WP288 - ICSA	A39 WP414 – Slovakia on behalf of the EU
PROACTIVE ROLE **ONLY FOR POLICIES IN ICAO – AGAINST UNILATERAL MEASURES** **Mostly IATA and the US**	A37- WP 186– The USA, Canada and Mexico A37 – WP217– IATA on behalf of ACI, CANSO, ABI and ICCAIA	A38 – WP 234 – the USA A38 – WP 68 – IATA on behalf of ACI, CANSO, ABI and ICCAIA.	A39 WP 411 – Canada A39 WP448 – The USA A39 WPs 153, 154, 413 and 163 – IATA A39 WP155 – IATA on behalf of ACI, CANSO, ABI and ICCAIA.
DEFENSIVE ROLE **AGAINST UNILATERAL MEASURES AND CONCERNED WITH MBM IN ICAO** **Developing countries**	A37 WP188 –Bahrain A37 WPs 181, 272 and 304 – China A37 WP 271 – Latin American Countries (LACAC) A37 WP 109 – Colombia A37 WP 275 - Russia A37 WP 187 – African Countries (AFCAC) A37 WP 251 – South Africa	A38 – WP250 and 275 – Russia A38- WP 176 Saudi Arabia A38- WP 350 – VietNam A38 – WP 272 AFCAC	A39 WP412 India, China and Russia A39 WPs 233 and 234 Brazil A39 WP 182 – Qatar A39 WP 387 and 428 Russia
ICAO COUNCIL, Secretariat AND ASSEMBLY DOCUMENTs Arguing for a global policy and delegitimizing the adoption of domestic and regional economic measures.	A37 WP25 A37 WP 262 Assembly Res. A37-19	A38 – WP 29 A38 – WP 34 Assembly Res. A38-17 Asembly Res. A38-18	A38 WP 52 Assembly Res. A39-2 and Assembly Res. A39-3 (creating CORSIA)

Source: Own elaboration - research on the website: https://www.icao.int/publications/Pages/assembly-archive.aspx

Analysis

This section presented the results of an investigation focused on the role of the European countries and the European Union in the discussions within ICAO about economic measures to cope with the aviation impact on climate change. Based on the literature, the hypothesis was that there was a conflictive multilevel interaction between ICAO and the EU characterized by the adoption of the forum shopping strategy and the competitive regime shadow threat. Stakeholders, including IATA and some member states, imposed pressure to keep ICAO as the main forum for deliberations on the matter, considering that it was the most aligned with the aviation industry interests, using the forum shopping strategy. This strategy aimed to delegitimize the adoption of domestic and regional economic measures in Europe to address international aviation GHG emissions. Regarding the competitive regime shadow threat, the argument is that the threat of including international aviation in the EU-ETS encouraged ICAO to occupy the policy space regulating the matter on its own terms by developing and approving CORSIA.

Documental analysis between 1992 and 2001 has shown a reiterated dynamic in the discussions about the topic within ICAO Assemblies. On the one hand, European Countries and the European Union tried multiple times to discuss the revision of ICAO`s taxation policies and the elaboration of ICAO guidelines for adopting economic instruments to address aviation`s environmental externalities based on the principle of the polluter pays. On the other hand, IATA (and sometimes ACI) reacted to those propositions, alleging incompatibility with international law (the Chicago Convention and bilateral agreements). The study has also shown that the strategies of forum shopping and blocking polycentric governance succeeded, as the Assembly decisions during this period affirmed the need for further studies while also urging member states to refrain from adopting unilateral action until those studies were concluded. In 2004, Assembly Resolution A35-5 consolidated ICAO`s position, discouraging states from adopting environmental-related charges for international aviation due to legal issues and lack of information about the costs and benefits of such measures. That was the first loss of the European Union's attempts to develop a polycentric cooperative framework to regulate the impact of civil aviation on climate change.

After 2004, environmental charges for aviation were out of the scene, at least within multilateral discussions. However, the possibility of adopting Emissions Trading Schemes - ETS for international aviation was getting concrete as the EU was creating an ETS. The UN Kyoto

Protocol introduced this flexibility mechanism as a promising way of coping with GHG emissions cost-effectively. Flexibility mechanisms were especially relevant for hard-to-abate sectors, like civil aviation, that could contribute to reducing emissions in other sectors by purchasing emissions reduction units, while low carbon technologies for aviation remained unfeasible.

Thus, documental analysis of the period between 2007 and 2016 revealed a renewed dynamic in the discussions about economic measures. The main measure under analysis became emissions trading, not taxes and levies. Furthermore, the debate revolved around a single global instrument versus a system of linked regimes. Emissions trading generally had the sympathy of the European Union, the United States, and the airlines. ICAO evolved in its technical work on elaborating guidelines for integrating international aviation into national and regional emissions trading schemes. The European Union, once again, tried to introduce a cooperative polycentric governance framework, through which they would include international aviation and its EU-ETS but could exempt airlines that were already submitted to a similar scheme in its home country on a case-by-case basis. They envisaged national and regional schemes linked, forming the building blocks for a global framework.

Nonetheless, IATA, the US, and developing countries had different views. IATA feared a costly and inefficient patchwork of schemes and argued for creating a single global MBM within ICAO (where they were more influential and had higher control). The US did not accept the idea of submitting its airlines to a policy framework defined by the European Union. Developing countries, including China, followed the same position. They argued that the submission of foreign parties to the European legislation would require bilateral agreements expressing mutual consent of the countries involved. The European Union kept trying to maintain its right to adopt an emission trading scheme, including international aviation. The EU manifested that they would accommodate countries` specific needs and circumstances but disagreed with the need for previous mutual consent. The US, IATA, and developing countries argued that mutual consent was a requirement and that no unilateral action should be taken without it. Once again, Europe failed to develop the polycentric multilevel governance framework[91] for aviation and climate change since the

[91] For a in depth theoretical framework about polycentric and multilevel governance, see Ribeiro (2022). http://repositorio2.unb.br/jspui/handle/10482/45927.

Assemblies' resolutions during this period reaffirmed the need for mutual consent. European countries reacted by presenting reservations to those paragraphs of the resolutions.

The European Union also tried reaffirming its position, announcing that, despite the successive ICAO resolutions against it, they would include international aviation in the EU-ETS starting in 2012. However, this announcement caused intense reactions from powerful actors such as the United States and China. The US Congress, for instance, passed a bill prohibiting U.S.-based aircraft operators from participating in the EU-ETs, and China threatened commercial retaliation on the purchase of Airbus aircraft. Many other developing countries signed letters against the measure. Due to those overwhelming pressures, the European Union was strained to move back on its decision, announcing a `stop the clock` measure[92], where international aviation would be suspended from the EU-ETS until the ICAO Assembly in 2013, "a gesture of good faith" to "create a positive atmosphere around the negotiations in ICAO." The "stop the clock" was extended to 2016. Even after the approval of CORSIA, the European Union persisted with the "stop-the-clock" measure as there were discussions about the effectiveness of CORSIA, considering that it was an MBM based on offsetting credits. In a recent decision, the EU extended the "stop-the-clock" until 2026[93], applying the EU-ETS only to intra-European flights. Therefore, international flights to and from Europe remain out of the EU-ETS until then.

The research evidence has demonstrated that European countries and the European Union have exerted constant pressure for the adoption of economic measures to address the impact of international aviation on climate change. The EU goal was for the ICAO to provide general guidance to legitimize the adoption of economic measures by member states in a harmonized and orderly manner. While there was strong pressure from aviation private stakeholders and most member states to maintain ICAO as the only legitimate forum for adopting international aviation and climate change regulations, the EU strived repeatedly to maintain its rights to implement more ambitious policies. However, by analyzing the Assembly Resolutions, we can see that the EU attempts were not successful, as the prevailing results discouraged the adoption of any economic measures (taxes or emissions trading) unilaterally.

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[92] https://ec.europa.eu/commission/presscorner/detail/fr/MEMO_12_854.

[93]https://www.verifavia.com/greenhouse-gas-verification/vn-eu-ets-stop-the-clock-to-be-extended-to-2026-free-allowances-to-be-phased-out-in-2026-2077.php.

The EU political measures of suspending the application of the EU-ETS to international aviation temporarily and conditioning the maintenance of this suspension to advances on ICAO deliberations to approve a global MBM have led some academic work to conclude that the EU-ETS was crucial for the approval of CORSIA. The literature on the topic indicates that the relationship between ICAO and the EU-ETs would be the `competitive regime shadow` type, where the risk of the EU-ETs occupying the policy space pressured ICAO to agree on CORSIA. However, detailed documental analysis has shown that the European political stance to approve its propositions within ICAO was historically weak. Along the same line, it is evident that the European Union stopped the clock due to the intense political pressures from virtually every non-European country worldwide, especially the USA and China.

Therefore, contextual analysis and the study of the Assembly meetings from 1992 until 2016 demonstrate that the European Union has unequivocally exerted strong normative pressure to advance economic measures to cope with aviation`s environmental impacts. However, there is no evidence that CORSIA would not have been approved without the pressure from the EU-ETS. There is also not enough evidence that the EU would have been able to implement the threat of including international aviation in the EU-ETS in the absence of CORSIA. The extension of EU-ETs to international flights is contingent upon a more complex set of factors, encompassing power politics and the legitimacy of unilateral measures to address the climate crisis[94].

However, it is undeniable that the European positions regarding economic measures in general and the EU-ETs, in particular, influenced the development and approval of CORSIA through catalytic linkages and forum shopping. While catalytic linkages favored the creation of CORSIA`s design elements, the threat of a patchwork of domestic and regional schemes led private stakeholders to adopt a forum shopping strategy, avoiding the development of polycentric governance and concentrating action within ICAO.

[94] Such as the Carbon Board Adjustments, for instance.

Conclusion

This Chapter explored the hypothesis that ICAO approved CORSIA due to external pressures from the UNFCCC and the European Union. Within the context of a climate change regime complex, this study explored the horizontal interactions between the UNFCCC and ICAO, as well as the vertical interactions between the EU-ETS and ICAO. The primary objective was to identify whether these interactions exhibited complementary patterns such as division-of-labor linkages and polycentric governance or competitive dynamics, including forum shopping and the competitive regime shadow threat. Ultimately, the research aimed to elucidate how these interaction patterns may have influenced the development of a climate change regime within ICAO, leading to the approval of CORSIA.

Empirical findings indicate that, particularly during the initial agenda-setting and regime formation stages, the UNFCCC exerted pressure on ICAO to address climate change issues. As the regime evolved, both public and private aviation stakeholders strived to maintain ICAO as the central regulatory forum for aviation and climate change. The Kyoto Protocol legitimized this ICAO`s role, reducing conflictive interactions while maintaining accountability linkages. Furthermore, the rationalities introduced by the Kyoto Protocol impacted ICAO's processes by introducing the concept of flexibility mechanisms. Finally, regarding the approval of CORSIA, the Paris Agreement's move to nationally determined contributions raised concerns about the multiplicity of domestic regulatory frameworks to cope with aviation and climate change. As detailed in Chapter 6, the fear of a fragmented and costly patchwork of schemes played a pivotal role in gaining support from private stakeholders for the approval of CORSIA.

Concerning multilevel relations between ICAO and the European Union, the research findings also validate that the predominant interaction pattern was conflictive - primarily characterized by forum shopping strategies - and not cooperative - through polycentric governance, despite several European Union attempts. It is essential to acknowledge the presence of catalytic linkages between ICAO and the EU-ETs, as the expertise of EU professionals in crafting elements for the EU-ETS played a crucial role in defining CORSIA`s implementation elements.

In summary, it can be asserted that both cases' prevailing interaction patterns were conflictive, driven by competition between regimes. However, cooperative elements rooted in technical collaboration with catalytic linkages positively influenced the development of CORSIA's

implementation elements. Nevertheless, the available evidence does not entirely confirm the hypothesis that these conflictive horizontal and multilevel governance dynamics alone provide sufficient explanations for the approval of CORSIA. There exists a more extended causal chain leading to the outcomes under study, which will be expounded upon in Chapter 7.

Chapter 6. The agency of the aviation industry in developing CORSIA

This chapter presents the results of a systematic investigation of the aviation industry's role in developing international economic regulations to address climate change. Drawing from a political economy lens and global governance approaches, the chapter aims to understand how private stakeholders were influential in creating their own regulatory regime to tackle climate change, that is, in creating CORSIA within ICAO. Therefore, the objective is to evaluate the hypothesis that CORSIA was approved due to a successful strategy of the aviation industry to shape its own international climate change regulation without damaging sectoral economic interests.

Initially, the chapter presents a few examples of recent literature that has explored the argument of the industry's prominent role in designing and approving CORSIA. In sequence, it discusses the theoretical lens that provides the main concepts and conceptual structures guiding the research. After that, the chapter presents a sketch of the research's analytical framework, pointing out the central arguments that explain how industry stakeholders worked throughout the ICAO negotiations on climate change economic instruments. The following sections summarize how the research's empirical findings sustain the explanatory argument. Finally, the conclusion brings the main research results and analyzes their implications for confirming or disconfirming the investigated hypothesis.

This chapter also contributes to the analysis of one key limit of the complex regime’s theory, since it reinforces the statement that private actors were so focused on their own interests that the nexus with other climate regimes (maritime transportation, clean energy, deforestation, and so on) were rather irrelevant.

6.1 Letting the Fox Guard the Henhouse

Historical analysis has identified a central participation of representatives from the aviation industry in building the international institutions that define rules and standards for international

air transport, particularly ICAO (see Chapter 2). IATA, for instance, was fundamental in designing the post-war multilateral framework governing air transport, as discussed in Chapter 2. This study investigates the construction of the climate change regime for international aviation, which culminated with the approval of CORSIA. Recent literature has indicated that private actors were as relevant in shaping their regulatory regime for climate change as they had been in building the aviation multilateral framework centered in ICAO and a network of bilateral agreements. For instance, Anselmi (2018) asserts that an agreement on CORSIA was only possible because ICAO, influenced by private stakeholders, proposed the most cost-benefit alternative, reducing the economic burden on the aviation industry. The choice of a flexible market-based mechanism received full support from the industry because it represented an alternative to preserve air traffic growth while proposing a response to climate change (Gonçalves and Anselmi, 2019).

Likewise, Kallbekken and Victor (2022, page 674) stated that CORSIA is a "triumph of industrial interests over reality." In their view, ICAO reflected what governments and firms were willing to do, opting for the least disruptive technological options, particularly drop-in cleaner fuels and a carbon offsetting scheme that faces fundamental challenges. Furthermore, Gonçalves (2016) was even more incisive, arguing that the airlines were the central governors in defining CORSIA's scope through lobbying and orienting the countries` positions at ICAO to avoid harming the aviation business. She supported that as the airlines perceived the growing pressures for regulating GHG emissions from international aviation, they advocated for an offsetting scheme and worked on developing the technical aspects of its design (Gonçalves, 2016).

Despite the strong assertions about the industry's role, the literature on the issue is scarce. It does not fully account for the mechanisms through which private stakeholders have influenced the approval of CORSIA. This chapter aims to fill this gap and address the specific objective of understanding the industry's role in building the international regulatory framework for coping with aviation's impact on climate change. More precisely, it goes beyond the broad assertions and presents the results of a systematic investigation of how private stakeholders have participated in the governance processes and how they have influenced the outcome under analysis. In sum, it aims to answer the following questions: Has the aviation industry shaped its own international regulatory environment to cope with climate change? And, if yes, how have they influenced those processes?

Theoretical framework

For conducting this investigation, the research departs from the Political Economy lens, aiming to understand who designed the rules and what the purpose was, acknowledging that the policy choices have distributional consequences, which, in turn, can help to explain actors` preferences. For instance, Newell and Bulkeley (2010) argue that firms have been involved in climate governance, acting as supporters, acceptors, or challengers. According to the authors, firms that behaved as challengers adopted multiple political strategies to stall climate change agreements, such as i) doubting climate change science, ii) creating business-funded NGOs that underlined the relevance of fossil fuels, and downplaying climate risks, iii) emphasizing the competitive disadvantages and economic costs of tackling climate change; iv) using double-edged diplomacy and domestic politics to stall international negotiations[95]; or v) directly influencing climate change negotiations.

However, despite a long history of opposition, some firms recognized possible opportunities - related to low-carbon technologies and carbon markets, for example – which led them to a more positive engagement with climate governance initiatives, acting as acceptors and supporters (Newell and Bulkeley, 2010). As challengers or supporters, firms have impacted global climate governance using multiple instruments, like i) providing resources (technological innovation included); ii) acting as communicators (lobbying governments and international institutions, directly writing official documents, sharing ideas, and framing the public debates) and; iii) acting as regulators (developing standards for themselves or in cooperation with other stakeholders).

The theoretical debate has focused on two main visions regarding public-private relations in policymaking. The first one is centered on collaboration, acknowledging the functional potential of private governance to complement public policies or fill the gaps for missing or inadequate

[95] For example, Newell and Bulkeley (2010) tell that a former executive of Exxon argued in the US that no climate action should be taken there unless China and other developing countries also undertook actions, while in China they encouraged to resist calls from the US to take action on climate change since this was a problem that China had contributed very little to.

regulation (Overdevest and Zeitlin 2014; Campbell, 2007; Matten and Moon, 2008). The second explores the competitive role, wherein private authority constrains public policy and can substitute, anticipate, or weaken public rules (Kaplan, 2014). This research argues that distinguishing between collaboration and competition is not always straightforward when analyzing private actors' positions regarding climate change mitigation measures. Identifying if the private sector's activities collaborate or compete with public regulation demands a deeper analysis of the potential results of different policy alternatives, which is not the goal of this study.

This research adopts a more nuanced perspective inspired by global governance approaches, which consider that the line between public and private regulatory framework may not be so clear. Thus, it adopts the governance sphere concept proposed by Cashore (2021) and aims to understand how public and private actors interact within the governance sphere of international aviation in designing and approving CORSIA. In other words, rather than investigating if private stakeholders' regulations collaborated or competed with public initiatives, the goal is to investigate the political dynamics of public and private actors in defining climate change regulation within the international aviation governance sphere.

This study analyzed private stakeholders` attitudes towards international regulation of air transport and climate change using two categories: challengers and supporters. Challengers represent a consistent behavior to avoid any kind of regulation on international aviation and climate change, particularly economic measures. Supporters encompass a more proactive approach toward developing internationally agreed targets and mitigation measures. On top of evaluating the overall attitude of industry stakeholders as challengers or supporters, the research analyzed the actor's strategies (what they were doing) and instruments (how they were doing) to pursue their objectives in different moments of the evolution of aviation's climate change regime.

Documental analysis indicated that private actors` role in developing international climate change governance for civil aviation changed over time. Different types of attitudes toward the development of international regulation characterized two broad periods. In the first one, the patterns of interaction pointed to a challenger attitude. It started in 1992 - when the issue of climate change became relevant in the international political agenda, and ICAO mentioned the topic for

the first time in its Assembly (A29 – WP40, page 3)[96]- and went on until 2004 - when there was a progressive shift in the industry's approach to the problem (A36, WP/85 presented by IATA). From 2007 until the approval of CORSIA in 2016, the industry's attitude was supportive, adopting a proactive behavior by establishing targets, developing technical assessments, and proposing alternative measures to cope with climate change.

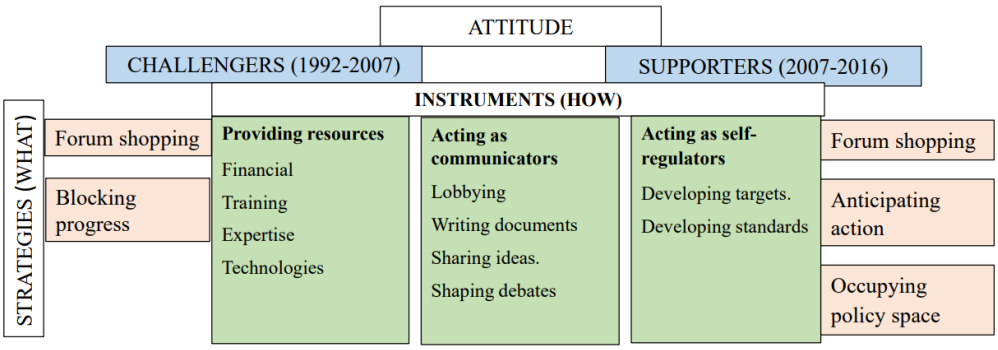
During the period that the industry stakeholders acted as challengers (1992-2004), the main strategy was blocking the progress of any economic measures directed at reducing the impact of aviation on climate change. When they were supporters, the primary strategy was to anticipate action occupying the policy space and framing the debate toward a climate economic measure that could represent less harm to the industry. In both periods, the research analyzed four common patterns of interaction, which are:

i) *Institutional pattern*: Forum shopping – choosing the international forum most suitable for the industry's objectives.
ii) *Technocratic pattern*: using technical expertise and the asymmetry of information between industry and governmental actors to block or shape policies;
iii) *Legal pattern*: evocating international aviation law to block or shape proposals of environmental mitigation measures;
iv) *Ideational pattern*: Strengthening the rationality of aviation exceptionalism – as a sector with singular specificities and needs, strategic relevance, and low impact on climate change.

These patterns of interaction are seen in both periods. Still, in the first one, they are used as strategies to block progress on developing any international economic measure to cope with aviation's impact on climate change. In the second period, they are adopted to frame the debate, anticipating action and influencing the policy choice. Aviation stakeholders had multiple instruments for implementing the blocking (challenger) or policy framing (supportive) strategies, such as providing resources, acting as communicators, and acting as self-regulators (Newell and Bulkely, 2010). Figure 11 below summarizes the research analytical scheme.

[96] WP 40 refers to the working paper presented by the Secretariat to report on the Council`s work on Environmental matters. Doc 9558 brings the resolutions in force in 1992, demonstrating that the topic of climate change had not yet being included.

Figure 11. The aviation industry's role in the design and approval of CORSIA.



Source: Own Elaboration.

The terms private actors and industry stakeholders are used interchangeably in the text to refer to the industry representatives who have participated in the governance process that culminated in the approval of CORSIA. Documental analysis has shown that mainly IATA, representing the airlines, but also ACI, representing the airports, were historically the main organizations participating in ICAO's deliberations. As described in Chapter 2, other organizations were formed and participated in ICAO processes more recently, such as IBAC (business aviation), ATAG (overall industry), and ICCAIA (aeronautical industry), to name a few. However, documental analysis has also shown that IATA maintained its leadership and that the industry positions tended to be coordinated and presented as a block in ICAO's negotiations.

That doesn't mean different industry stakeholders had a unified position. They probably didn't. For instance, an interviewee representing the aeronautical industry affirmed that previous negotiations to establish the industry's positions for ICAO's meetings were not easy, but they always sought consensus. Another interviewee from the aeronautical industry said that the airlines were their customers, so it was hard to go against their positions. Nevertheless, this research does not aim to analyze the political dynamics between industry stakeholders, although this is certainly an interesting and important topic. This research analyzed the final positions presented by industry stakeholders in ICAO's working paper, acknowledging that they represent mostly the positions of the airlines, more precisely, of the International Air Transport Association – IATA.

The following two sections report on the main empirical findings drawn from documental analysis and supplemented by interviews. The first section summarizes the results of the documental analysis of the Assemblies that were held between 1992 and 2004. It also briefly presents the findings of the documental analysis that started in 1947[97] , searching for evidence of when and how environmental issues in general and climate change specifically became part of ICAO's agenda. The second section brings the analysis results between 2007 and 2016, when the industry became proactive in framing the discussions and shaping the regulatory scheme for international aviation and climate change. The semi-structured interviews added relevant inputs about the perceptions of state and industry representatives in ICAO negotiations regarding the role of the industry in designing and approving CORSIA.

6.2 Private stakeholders as challengers of international climate change regulation

Climate change was officially included in ICAO debates in its 29th Assembly Section, held in 1992. Until then, environmental topics were restricted to aircraft noise and engine polluters. The first environmental issue discussed in ICAO was aircraft noise that disturbed local communities. The topic was introduced in ICAO's agenda in 1952 (Doc 7270), and the debates on how to manage the impact of aircraft noise on the quality of the living environment in the vicinities of airports continued in 1953 (Doc 7367), 1956 (Doc 7636), 1958 (Doc 7788) and in 1959 (Docs 7996 and 7060). The advent of jet and supersonic aircraft increased concerns about noise impact, and ICAO approved resolutions on supersonic aircraft (A14-7, 1962) and aircraft noise in the vicinity of airports (A16-3, 1968).

In the beginning of the 70s, within the context of the preparation for the UN Conference on the Human Environment (the 1972 Stockholm Conference), ICAO documents indicated a concern to keep environmental topics under their competence, not losing space for other UN bodies (Resolution A18-11, 1971). That led to an expansion of ICAO's agenda from a focus on noise to an approach that encompassed the broad topic of `civil aviation and the human environment`, including engine polluters (Resolution A21-19, 1974; Resolution A22-12 and A22-13, 1977 and Resolution A23-10, 1980).

[97] The first ICAO meeting was held in Montreal in 1947.

However, it was only twenty years later, in 1992, that the issue of global warming became formally part of ICAO's work (A29 – WP40, page 3; Doc 9558)[98]. The ICAO Assembly occurred in September, a few months after the United Nations Conference on Environment and Development - UNCED, which took place in Rio de Janeiro in June of the same year. UNCED represented a milestone in international environmental governance and, especially, in climate change governance. It went beyond traditional environmental matters discussed in Stockholm in 1972, introducing planetary issues, such as the ozone layer and global warming (Le Preste, 2001). The UNCED had important diplomatic results, such as the conventions on biodiversity and desertification and the establishment of the United Nations Framework Convention on Climate Change – UNFCCC, which is the main multilateral forum for discussion of climate change until today.

The new topics introduced by the UNCED prompted the ICAO to act. In ICAO's 29th Assembly, Member States and industry observers began discussions about the impact of emissions from aircraft on global warming. In the period between 1992 and 2004, documental analysis has shown a consistent behavior of industry actors to avoid the development of an international regulatory regime for aviation and climate change[99]. It was a new topic, and there was not a significant amount of information about the impacts of aviation on global warming and how to avoid them. As there was no technological solution for reducing air travel GHG emissions, the policy proposition was the use of economic measures, notably environmental taxes and charges to internalize environmental costs, "taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment" (`polluter pays` Principle 16 of the Rio Declaration, 1992).

As discussed in Chapter 2, IATA has been historically against taxes in international transportation and, therefore, also strongly reacted against any international regulatory regime for climate change that could lead to the imposition of levies generating an extra financial burden to the airlines (ICAO WP76/ IATA, 1998). Therefore, this association has worked to avoid the advancement of the discussions within the UNFCCC lobbying to keep ICAO as the only

[98] WP 40 refers to the working paper presented by the Secretariat to report on the Council`s work on Environmental matters. Doc 9558 brings the resolutions in force in 1992, demonstrating that the topic of climate change had not yet being included.

[99] Documental references: 1992, WP68 and WP 87/ IATA, and WP 99/ACI; 1995, WP59/IATA; 1998, WPs78 and 76/IATA; 2001, WP153/ACI and WP85/IATA.

appropriate forum for regulating civil aviation environmental matters[100]. IATA had been highly influential in ICAO deliberations from the outset; thus, it is understandable that they worked to maintain the debate where they could participate more actively and avoid other organizations, such as the UNFCCC representatives, to advance on aviation-related matters.

This strategy of choosing the arena that better suits specific preferences was dubbed by Keohane and Victor (2011) as `forum shopping`. The overwhelming majority of working papers proposed by the industry between 1992 and 2004 express the position that the ICAO should lead and prevent others, especially the UNFCCC, from advancing the regulation of aviation and climate change. Table xx below lists the working papers analyzed indicating forum shopping behavior. It is important to highlight that these documents are only the `tip of the iceberg` of a much more complex process between Assemblies in technical groups and the Council. However, considering that all that work culminates at the Assembly, the analysis of WPs can provide evidence about the overall stakeholders' preferences during that period. Some pieces of evidence are stronger than others, and the analysis of them together indicates the forum shopping behavior during this period.

Table 5. Evidence of forum shopping behavior favoring ICAO.

Assembly/Year	Organization	WP	Evidence of forum shopping
1992	IATA	68	Page 2, Item 7.
1995	IATA	59	Page 3, Item e.
1998	IATA	78	Pages 1 and 2 – whole text – strong evidence.
2001	IATA	138	Page 1, item c.
2004	IATA	85	Page 2, items 1.6, 2.1, 2.2; Page 4, item 4

Source: Own elaboration.
Data: https://www.icao.int/publications/Pages/assembly-archive.aspx

Despite advocating for ICAO's centrality (forum shopping), the industry has also worked within ICAO to avoid decisions on adopting environmental levies for the sector (WP68/IATA, 1992; WP76/IATA, 1998). Hence, acting as challengers, they have used mainly communication

instruments (such as lobbying and shaping ideas and debates) but also their unique expertise resources to promote the overall strategy of blocking the progress of climate change regulation through the adoption of three specific and interconnected strategies:

i) keeping the GHG emissions allocation impasse (WP78/ IATA, 1998);
ii) using the legal framework to avoid levies (WP68/IATA, 1992; WP76/IATA, 1998);
iii) adopting the aviation exceptionalism discourse (WP85/IATA, 2004).

Keeping the GHG emissions allocation impasse

The allocation impasse concerns the difficulty in agreeing on a methodology for defining who is responsible and should be held accountable for the flight's GHG emissions - the country, the airline, or the passenger. Considering that the UNFCCC is an international organization composed of member States, it organized its allocation system in national inventories. It defined that each member State should measure the GHG emissions that took place in its territory. Within this logic, it became challenging to allocate the emissions of international air transport and maritime navigation, taking into account that these modes of transport entail emissions in international territories (overseas) and in at least two countries, possibly involving many others in cases of overflights, scales, and connections.

One alternative was to allocate emissions according to the airline's nationality, for example. In this case, each airline would report its total emissions to the aviation regulatory authority of its country, which is defined according to the nationality of the owners and/or the airline's principal place of business. However, many international airlines carry passengers from multiple nationalities, flying daily from and to several countries, not always serving their own country. For instance, a flight from a French airline operating between two third countries would be engaged in the service economy of those two countries, not France. Thus, the national allocation approach adopted by the UNFCCC was hard to implement in international transportation. It was hard but not impossible. For instance, calculating the emissions from departing international flights could have been an alternative solution for accounting for GHG emissions nationally, with no duplication[101].

[101] This methodology was used by the IPCC to account for civil aviation domestic emissions.

This research identified that the allocation impasse was instrumental in preventing the UNFCCC from advancing the discussions on the topic, moving the center of the debate to ICAO, where the industry held higher control[102]. In that context, IATA adopted communication strategies such as lobbying with governments and using double-edge diplomacy[103] (Evans et al, 1993) to avoid the definition of GHG emissions allocation methodologies. On the one hand, they participated in the UNFCCC technical bodies as observers, reaffirming the complexity and specificities of civil aviation matters and the need to leave its regulation to ICAO, the specialized UN Agency. On the other hand, they worked in ICAO to keep the organization's leadership and avoid others from regulating aviation matters while stalling discussions on allocation methodologies and economic measures (WP68/IATA, 1992; WP78/IATA, 1998).

IATA had expertise in managing many aspects of international aviation and could have offered suitable technical solutions for the allocation impasse. However, it seems not to be in their interest, as solving this impasse would open the doors for allocating responsibility, which, at the time, was strongly associated with the imposition of environmental levies. Thus, this first strategy was associated with forum shopping behavior, where actors used the allocation impasse to transfer the discussions on climate change from the UNFCCC to ICAO, especially after the signature of the Kyoto Protocol in 1997.

Using the legal framework to avoid levies (taxes and charges)

The second strategy associated with the challenger behavior was to work directly within ICAO to circumvent the deliberations on environmental levies. For that, two main factors were critical: the legal impasse for adopting taxes and the implementation impasse for using environmental charges. According to ICAO rules, there are two types of levies: taxes and charges. A charge is a levy that is designed and applied specifically to recover the costs of providing facilities and services for civil aviation, and a tax is a levy that is designed to raise national or local government revenues, which are generally not applied to civil aviation (Doc 8632, ICAO).[104] Considering that environmental levies were becoming a popular policy alternative, particularly in

[102] A mentioned in the previous chapter, in 1997, the Kyoto Protocol - which aimed at deepening the UNFCCC commitments – couldn`t agree on how to deal with international aviation matters, mainly due to the allocation impasse. Thus, Article 2.2 delegated to ICAO the responsibility to pursue limitations or reduction of GHG from "aviation bunker fuels" of developed countries (Annex I parties).

[103] Acting both, at the international negotiations and through lobbying with national authorities.

[104] See Chapter 3.

Europe, the ICAO Council proposed, in 1995, a study of whether charges could effectively eliminate or reduce the environmental effects of aircraft engines (WP 223, 1995, presented by the Council).

IATA has expressed strong opposition to adopting taxes (WP68, 1992). As described in Chapter 2, international aviation has obtained tax exemptions worldwide and codified this practice in international law through ICAO and the more than four thousand Air Services Agreements, which, in turn, are incorporated into national jurisdiction[105]. Therefore, tax exemption rights are entrenched in the legal systems and, consequently, are hard to modify. Regarding charges, IATA officially supported the studies proposed by ICAO. However, due to ICAO rules, the imposition of charges faced, by design, significant implementation barriers. According to ICAO rules (Doc 8632), charges must be cost-related and applied only to recover those costs. ICAO Resolution A35-5 (2004, Appendix I, page 47), for instance, states that:

> "charges should be based on the costs of mitigating the environmental impact of aircraft engine emissions to the extent that such costs can be properly identified and directly attributed to air transport."

Despite methodological improvements, especially in calculating carbon social costs, climate change impacts are diffuse and often projected into the future. Thus, isolating the causal factors needed to calculate a specific cost-related charge for climate change impacts from international flights is not feasible. Additionally, the resources of charges must be recycled for the aviation industry and not incorporated into national general funds, which raised discussions on how to properly distribute those funds without generating competitive distortions.

Hence, there was no significant progress within ICAO on developing mitigation measures during this period, as clean technologies were not available and economic measures were blocked by those legal (taxes) and implementation (charges) impasses. In 2004, the 35th ICAO Assembly concluded that there was no consensus on the cost-effectiveness, legal, policy, and implementation aspects of charges and approved a Resolution discouraging States from imposing environmental charges on civil aviation[106]. A group of European States was strongly against that Resolution as it not only indicated that ICAO would no longer pursue that kind of economic measure but also

[105] https://www.icao.int/sustainability/pages/Doc9511.aspx.

[106] Appendix I to Assembly Resolution A35-5.

hindered the country's or the region's legitimacy to adopt their own environmental taxes or charges for civil aviation. Despite the lack of consensus, the Resolution was approved, with reservations from many European countries (A35 - WP283, Assembly resolution A35-5)[107].

The aviation exceptionalism discourse

Finally, the third strategy with the challenger attitude was the discourse of aviation `exceptionalism`. The term `exceptionalism ` is used to describe a belief of an exceptional nature ascribed to a nation, culture, or organization and regarded as giving it a special role in history and world affairs[108]. It is used in the literature to discuss American exceptionalism, referring to the special character of the United States as a uniquely free nation based on democratic ideals and personal liberty. Here, the research proposes the term "aviation exceptionalism" to describe a pervasive underlying perception that aviation holds unique characteristics that differentiate it from other industries and require special treatment and exemptions. First, aviation is a scientific phenomenon representing the human ability to break barriers and fly. Second, it was a symbol of the nation's power in war - due to the destroying capacity of air attacks - and in peace - as a vector for integration, trade, and progress. Finally, aviation is strategic and complex from technological, operational, and financial standpoints. Thus, due to the industry's strategic relevance and the information asymmetry between public and private stakeholders, governmental authorities tend to be careful and sensitive to the industry's inputs when defining standards and regulations.

For example, one interviewee from an aviation authority of a developing country argued that, not only on environmental matters but in general, the regulator should walk a few steps behind the industry to avoid creating regulatory anomalies because the chances of committing mistakes are high. He believes creating a too-heavy standard can derail new technologies and operational advances. Conversely, defining standards that are too soft may generate serious problems in terms of safety, for example. Therefore, it is complicated for aviation to take any regulatory action before the development of the activity.

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[107] In fact, it was an evolving process that begun in 1996 with the Council decision on environmental levies. Gradually, ICAO became more emphatic first about the inadequacy of environmental taxes, for legal reasons, and on the need to observe ICAO principle while considering environmental charges for civil aviation. In 2004, we can see a change in the focus of the discussions from environmental taxes and charges to emissions trading.

[108] Exceptionalism definition and meaning, Collins English Dictionary (collinsdictionary.com).

These ideas are reflected in the ICAO's Committee on Aviation's Environmental Protection - CAEP working principles, which state that it is necessary to observe the technical feasibility, economic reasonableness, and environmental benefit to be achieved. In the opposing direction of the precautionary principle[109], in civil aviation in general and in ICAO specifically, the practice is to adopt policies only after clear evidence about technical and economic feasibility and data-driven cost-benefit analysis. Thus, it is hard to move forward under uncertainty scenarios, which is an intrinsic feature of climate change as a super-wicked problem. In a nutshell, aviation exceptionalism justified inaction by building a rationality that, considering the complexity, sensibility, and relevance of the aviation industry, no policy should be adopted without information about the specific aviation environmental harms and the costs and benefits of tackling them (WP85/ IATA, 2004).

In conclusion, the evidence shows that private stakeholders, primarily IATA, have systematically influenced the structuring of the international climate change regulatory framework for aviation during this period. Acting as challengers, they have followed four main interconnected strategies to block progress on the topic. First, the technocratic strategy uses information asymmetry between the industry and government stakeholders to maintain the allocation impasse. Second, the institutional strategy, using this allocation impasse to move the center of climate change and aviation discussions to ICAO, the forum where the industry is more influential (forum shopping), while preventing the UNFCCC from advancing on the topic. Third, the legal strategy was used to block the development of environmental taxes and charges within ICAO[110]. Finally, the ideational strategy was present throughout the period, strengthening the rationality of aviation exceptionalism – as a sector with singular specificities and needs, strategic relevance, and low impact on climate change. These ideas sustained the arguments for maintaining the discussions in ICAO, a specialized forum, and for avoiding taxes and charges, considering the relevance and sensitivity of the sector.

[109] Article 3 of the United Nations Framework Convention on Climate Change (UNFCCC) mandates that "parties shall take precautionary measures to anticipate, prevent, or minimize the causes of climate change and mitigate its adverse effects.

[110] WP39 presented by the ICAO Council at the 36th Assembly summarizes the legal arguments that impeded CAEP`s work on the analysis of charges as an alternative of economic measure to cope with climate change.

6.3 Private stakeholders as supporters of international climate regulation

Between 2007 and 2016, the industry's proposals demonstrated a proactive behavior of anticipating action and framing the debate to cope with growing pressures regarding aviation's impact on climate change. As described in the last section, industry stakeholders were successful until 2004 in blocking multilateral regulation on aviation and climate change. However, in 2004, there was an expectation that the Kyoto Protocol would come into force with the ratification of Russia, which meant that a group of countries would have mandatory emission reduction targets. On top of that, the EU was designing its emissions trading scheme – ETS as an economic measure that intended to include civil aviation (Resolution A35 -5, Appendix I, page 11). These new scenarios indicated that states could adopt domestic or regional economic measures for civil aviation to contribute to meeting their Kyoto Protocol targets. Within this context, documental evidence confirmed that aviation industry stakeholders acted more incisively by adopting two main strategies: framing the debate and anticipating action to direct policy choices[111].

The framing strategy included a communication campaign highlighting technological advances that reduced emissions per passenger per kilometer flown (RPK). This main message was that aviation was already thriving to give its contribution to fighting climate change. In 2007, for instance, IATA argued that while demand was expanding at about 5% per year on a worldwide basis at that time, the growth of aviation CO_2 emissions was approximately half that rate because of technological improvements, fleet modernization, infrastructure improvements and gains in operational efficiency.[112]

The framing strategy also included introducing a debate on emissions trading and offsetting, which were presented as better policies than taxes and charges (IATA 2010 AGM Resolution)[113]. According to the aviation industry stakeholders, emissions trading based on carbon offsetting credits could be cost-efficient as it allowed investments in reducing emissions in sectors and places in which it was last costly to do so. The industry argued that a single global market-based measure within ICAO would be necessary to avoid the proliferation of regional and national schemes or environmental taxes that would create a patchwork of regulatory frameworks. IATA defended that

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[111] http://www.icao.int/EnvClq/CLQ07/Documentation.htm

[112] https://www.iata.org/contentassets/c81222d96c9a4e0bb4ff6ced0126f0bb/iata-annual-report-2008.pdf

[113]http://www.icao.int/EnvClq/CLQ07/Documentation.htm;
https://www.iata.org/contentassets/e8a7f8d96c554acd8e5fbbc09eb56559/agm69-resolution-cng2020.pdf

as international airlines can operate to and from several countries, complying with multiple regulatory schemes would be extremely costly and complex[114]. Finally, the discursive strategy introduced the concept of a `basket of measures` to cope with aviation and climate change. This basket included an enhanced focus on technological and infrastructural measures. While previous discussions on environmental levies concentrated the burden on the airlines, the proposal of a comprehensive approach based on a basket of measures was a way of sharing the burden with other aviation stakeholders such as aircraft manufacturers, airports, and governmental agencies.

In 2007, IATA's position (WP-85) in ICAO's 36th Assembly demonstrated the framing strategy regarding aviation and climate change. In previous Assemblies, the narrative was the idea of aviation exceptionalism, by which aviation was a complex, unique, and strategic sector and, therefore, should be exempted from environmental economic measures (namely taxes and charges) that could hinder its growth. In the same way that the industry had succeeded in establishing a consolidated legal framework for general tax exemptions to air transport, at the climate regime, they managed to reduce the space for adopting environmental charges, not only on a multilateral basis but also discouraging member states to do so on a unilateral basis, without mutual consent between the Parties involved (see ICAO Resolution A35-5, page 12, items 3 and 4)[115]. In 2007, when the threat of environmental levies had been eased, IATA changed its approach, adopting a purposeful attitude using its technocratic expertise to introduce the debate on emission trading schemes.

IATA's WP-85, presented at the 36th ICAO Assembly in 2007, proposed four pillars to "decouple CO_2 emissions from traffic growth, " demonstrating the discursive and expertise instruments adopted. The pillars were:

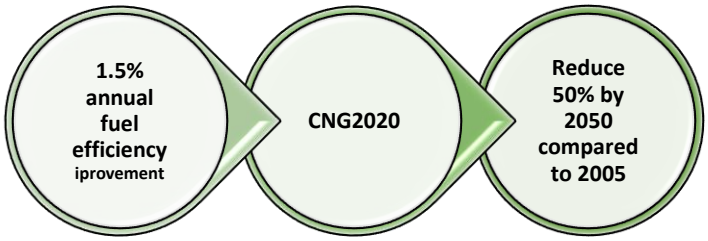
1) Fuel-efficient operations: IATA's work on fuel-efficient operations and route optimization has identified potential savings of up to 15 million tonnes of CO2 emissions each year;
2) Efficient infrastructure: Constraints - whether from insufficient runway capacity or inefficient air traffic management (ATM) procedures-add up to 12% to fuel inefficiencies and CO_2 emissions, according to the IPCC;

[114] https://www.iata.org/contentassets/713a82c7fbf84947ad536df18d08ed86/fact-sheet-climate-change.pdf

3) Avoid governmental punitive taxes and charges: Instead, positive economic measures should be preferred over punitive ones to stimulate innovation and accelerate technological research, development, and deployment;
4) Emissions trading.

The second main strategy adopted by aviation stakeholders during this period was to anticipate action to occupy the policy space and influence policy choices. In 2009, IATA went beyond the pillars of action and developed a self-regulatory scheme, defining targets for addressing carbon emissions[116]. They set out three targets: i) 1.5% average fuel efficiency improvement between 2009 and 2020; ii) Carbon neutral growth from 2020 and; iii) a reduction of 50% in net emissions by 2050 compared to 2005 levels.[117]

Figure 12. Industry self-determined targets



Source: Own elaboration.

By anticipating action, IATA signaled to governmental stakeholders that such commitments were acceptable to the industry. They also aimed to foster multilateral global decisions within ICAO to occupy the policy space, preventing the creation of a `patchwork` of national and regional regulatory schemes that would be costly and inefficient. Besides cost-efficiency concerns, the industry preferred to maintain deliberations at ICAO, where they had more control, not at national or regional levels (such as in the European Union, for example). That is the dubbed forum shopping

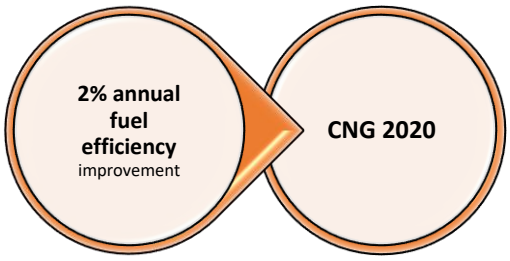
[116] https://www.iata.org/en/pressroom/pressroom-archive/2009-releases/2009-06-08-03/.
[117] 2010 IATA AGM Resolution on Climate Change.

behavior, by which industry actors strived to maintain ICAO as the only legitimate forum for creating economic measures in order to avoid local measures.

During the 37th ICAO Assembly in 2010, the self-determined targets were presented not only by IATA but as a compromise of the international civil aviation industry as a whole (WP 217). Working Paper A37-217 was presented by IATA on behalf of ACI (airports), CANSO (air navigation providers), IBAC (business aviation), and ICCAIA (aircraft manufacturers), demonstrating a higher degree of coordination between these players that represent multiple activities involved in the aviation system. The results of ICAO's 37th Assembly in 2010 reflect most aspects of the industry's propositions. Resolution A37-19[118] defined ICAO's aspirational goals, introducing in the public sphere the same rationale designed during the previous years by private stakeholders. The ICAO aspirational goals included in the Resolution and valid until today are:

i) to achieve a global annual average fuel efficiency improvement of two percent until 2020 and an aspirational global fuel efficiency improvement rate of two percent annum from 2021 to 2050, and;
ii) to achieve a collective medium-term global aspirational goal of keeping the global net carbon emissions from international aviation from 2020 at the same level (carbon-neutral growth – CNG 2020).

Figure 13. ICAO targets



Source: Own elaboration.

[118] https://www.icao.int/environmental-protection/37thAssembly/A37_Res19_en.pdf.

However, the 37th ICAO Assembly did not agree on a long-term goal, such as the industry's 50% emissions reduction by 2050 target[119]. Actually, it was tough to reach an agreement even on the medium-term goal of Carbon Neutral Growth beyond 2020 (CNG 2020). China, for instance, stated that it was an unrealistic and unfair goal (Assembly resolutions A37 – 181, 272 and 304). Developing countries, in general, were concerned that such a target could represent a disproportionate burden on the markets with higher growth potential (WP275 presented by Russia, WP251 by South Africa, WP271 by Latin American Countries – LACAC[120], WP187 by 53 African Countries – AFCAC[121]). To reach a compromise, the Resolution's text stated that those were global collective aspirational goals and that no specific obligations would be attributed to individual States (ICAO Resolution A38-18, item 7). The Resolution was approved with reservations from several countries, including China, Brazil, Argentina, and Australia (Res. A38-18, page 16).[122]

After 2010, the ICAO's framework for working on climate change matters was well defined. The organization had agreed, without consensus[123], that beyond 2020, the growth in air traffic could no longer be accompanied by an increase in CO2 emissions. Considering that the available technologies wouldn't grant that decoupling, carbon-neutral growth meant adopting a market-based-measure-MBM (A37 - WP25 presented by the ICAO Council). The three years after the Assembly were of intense technical and political work in CAEP, the Council, ad hoc groups, and High-level Meetings. The task was to advance on the request made by the Assembly regarding the assessment of an MBM that would be suitable for a global scheme. The assessment started with six possible MBM options, narrowed to four and further reduced to three: i) a global mandatory offsetting, ii) global mandatory offsetting with revenue, and iii) global emissions trading[124].

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[119] During the last Assembly (41th Section, 2022), ICAO member stated also agreed on a long term goal of net-zero carbon emissions from aviation until 2050. It is important to notice that before the ICAO assembly commitment industry representatives had already declared their goal of 2050 net-zero emissions (see: https://atag.org.)

[120] LACAC – Is the Latin American Civil Aviation Comission that gathers civil aviation authorities from the region for cooperation in multiple matters, including in trying to reach common positions at ICAO meetings.

[121] AFCAC – African Civil Aviation Commission.

[122] https://www.icao.int/meetings/glads-2015/documents/a38-18.pdf

[123] ICAO rules of procedure do not require consensus for approving resolutions. A simple majority is enough. Usually the Assembly tries to reach consensus, but voting is very common.

[124] https://www.icao.int/meetings/glads-2015/documents/env_report_mbms_2013.pdf

Table 6. Market-based measures analyzed by CAEP

TYPE	DESCRIPTION
Global Mandatory Offsetting	Creation of emissions units that quantify the reductions achieved. These emissions units can be bought, sold, or traded. A global mandatory offsetting scheme for international aviation would require participants to acquire emissions units to offset CO2 above an agreed target. Emissions units would need to conform to agreed eligibility criteria to ensure adequacy of emissions reductions. No specific aviation allowances or revenues would be created under this scheme.
Global Mandatory Offsetting with Revenue	Complemented by a revenue generation mechanism would generally function the same way as the mandatory offsetting scheme. A key difference would be that in addition to offsetting, revenue would be generated by applying a fee to each tonne of carbon, for instance, through a transaction fee. The revenue would be used for agreed purposes, such as climate change mitigation or providing support to developing States to reduce GHG emissions.
Global Emissions Trading (ETS)	Would use a cap-and-trade approach, where total international aviation emissions are capped at an agreed level for a specified compliance period. Specific aviation allowances (one allowance is equivalent to one tonne of CO2) would be created under this scheme for all the emissions under the cap within the international aviation sector. These allowances would then be distributed for free or auctioned to participants using an agreed method. At the end of each compliance period, participants would need to surrender allowances or other emission units equal to the emissions generated during that period, including those above their allocation.

Source: Assessment of Market-based Measures - MBM (ICAO Doc 10018)[125].

The ICAO Secretariat and MBM experts[126] performed a deeper study, including qualitative and quantitative assessments of the three options, and presented the results to the Council. The quantitative assessment evaluated the impacts of the MBM in the aviation industry, and the qualitative assessment evaluated the differences between institutional features for each of the three MBM options. Regarding the impacts, the study indicated that in 2020-2036, traffic growth would be 1.2% lower, and the industry profits would decrease US $ 0.4 billion in a scenario with the adoption of an MBM, compared with a scenario without the MBM. Additionally, the study indicated that an MBM in 2036 would be approximately $10 dollars per seat for a flight of 10,000-12,000 kilometers and $1.50 per seat on a flight of 900-1,900 kilometers. This study was crucial to

[125] https://www.icao.int/Meetings/GLADs-2015/Documents/10018_cons_en.pdf.

demonstrate to State representatives that the MBM was economically feasible and wouldn't endanger the sustainability of the countries` international air connectivity.

Experts working in the technical groups of CAEP were nominated by member states, observers, and international organizations. Industry representatives, mainly from the airlines (IATA) but also from the aeronautical industry and airports, participated heavily in those groups. Therefore, Industry representatives knew an MBM would be a `low-cost` solution as they were part of the technical groups doing the analysis. Furthermore, the qualitative assessment compared the main features of the three schemes to evaluate the feasibility of their global implementation in administrative terms. The ICAO's assessment (ICAO Document 10018) concluded that:

i) A global mandatory offsetting scheme could be less complex since existing emissions units can be used and tracked through a simple registry;

ii) A global mandatory offsetting scheme complemented by a revenue generation mechanism could be more complex due to the need to determine how revenues will be collected and used;

iii) A global emissions trading scheme could increase complexity and have higher upfront costs due to the need to administer specific aviation allowances. However, it should offer more flexibility for participants due to the creation of emissions units, which can be traded in the marketplace.

IATA supported the first alternative. In its General Assembly meeting in June 2013, they had already `strongly endorsed` the proposition to develop, within ICAO, a comprehensive proposal towards a single global MBM mechanism to address CO2 emissions from aviation instead of a patchwork of unilateral national or regional policy measures. They also had `urged` ember airlines to `strongly encourage` their countries to adopt, "at the 38th ICAO General Assembly, a commonly agreed, single global MBM mechanism to be applied to offsetting the industry's growth in emissions post-2020, which could play a complementary role with technology, operations and infrastructure measures."[127] In October 2013, ICAO's 38th Assembly approved Resolution A38-18[128] within the guidelines suggested by IATA a few months earlier. This Resolution consolidated

[127] https://www.iata.org/en/pressroom/pressroom-archive/2013-press-releases/2013-06-03-05/.
[128] https://www.icao.int/meetings/glads-2015/documents/a38-18.pdf.

the framework that led to the approval of CORSIA. The document expresses the ICAO Assembly's decision to develop a global market-based measure for international aviation (Res. A38-18, paragraph 18) and recognizes that a carbon offsetting scheme constituted a practical way to offset CO_2 emissions (paragraph 25).

The period between 2013 and 2016[129] was the time of establishing CORSIA's governance design elements, defining agency technologies - who would participate and how – and performance technologies – the relevant information and actions needed for the policy implementation (Okekere et al., 2009). Concerning the agency technologies, the main challenge was finally resolving the allocation impasse determining the accountable entities responsible for offsetting the GHG emissions. To move away from the UNFCCC political discussions about differentiated responsibilities between developed and developing countries, ICAO technical groups proposed that the accountable entities should be international aircraft operators. It is an innovative governance framework where an International Organization, mediated by member states, sets obligations to private actors. While the accountable entities were the air carriers, the responsibility for enforcement and compliance with transparency provisions remained with the States.[130]

Regarding performance technologies, during this period, ICAO technical bodies and the Council decided on the detailed rules for monitoring, verifying, and reporting - MRV emissions from aircraft operators to States and from the States to ICAO. They have also worked on the rules for airlines to comply with the scheme by purchasing offsetting credits or using sustainable aviation fuels. Finally, they started to develop a technical body within ICAO that would be responsible for deciding on the eligible offsetting units, that is, which offsetting credits would be allowed within CORSIA. SAF eligibility under CORSIA is based on life cycle assessments and sustainability credentials.

Experience acquired from the UNFCCC Kyoto Protocol design and implementation, the European Union Trading Scheme, and voluntary markets were crucial for developing this new MBM design features. As expected, IATA participated actively in the technical groups defining the implementation aspects of CORSIA. Considering that the airlines would have to implement the

[129] There was already work underway within the ICAO Secretariat and technical groups to define the MBM design features. However, it was after 2013 that there was a strong mandate to design the new scheme. See Appendix A of WP 52 of the 39th Assembly for a summary of the technical work during this period.

[130] https://www.icao.tv/navigating-corsia

protocols for monitoring, reporting, and verifying emissions - MRV, they offered the necessary inputs based on the day-to-day operational processes necessary to understand what was feasible and what was not. At the 39th ICAO Assembly in 2016, the ICAO Council presented a working paper (WP 49 and WP-52) with the proposed design elements for creating the first sectoral offsetting scheme applied globally[131]. As expected, it was not an easy Assembly; forty-four working papers were presented by States and observers on this particular topic[132]. There were many disagreements on the design elements of the scheme (e.g., WPs 412 from India, China, and Russia; WPs 233 and 234 from Brazil; and WP 182 from Qatar). Nonetheless, Resolution A39-3[133] was approved, creating CORSIA as the global offsetting scheme for international aviation, following the industry preference. It is important to highlight that there was no consensus on the approval of resolution A39-3, and many countries posed reservations to central aspects of the text[134].

Conclusion

This chapter presented the results of a detailed documental analysis of ICAO Working Papers from the first ICAO Assembly in 1947 until the 39th Assembly when CORSIA was approved. The documental analysis initially aimed to identify when and how environmental topics and climate change, in particular, were introduced in ICAO's agenda. However, the central goal of the analysis was to understand the aviation industry's role in the overall process of developing the international civil aviation climate change regime. The analysis also included documentation from IATA's meetings and other industry reports. Finally, interviews were relevant to indicate the perceptions of knowledgeable actors deeply involved in international aviation and climate change discussions.

As described in this chapter, evidence confirmed that the aviation industry has significantly influenced the process that led to the policy choice of a global offsetting scheme for international

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[131] Appendix B of WP52 – A39 presented the Draft Resolution Text.

[132] WPs 91, 138, 152, 153 (Revision No. 1), 154 (Revision No. 1), 155 (Revision No. 1), 163, 170, 181, 182, 206, 207, 208, 209, 211 (Revision No. 1), 212 (Revision No. 1), 222, 227, 232, 233, 234, 248, 262, 321, 343, 363, 364, 377, 387, 411, 412, 413, 414, 415, 426, 427, 428, 429, 431, 443, 448, 449, 455 and 465.

[133] https://www.icao.int/Meetings/a39/Documents/Resolutions/a39_res_prov_en.pdf (page 25).

[134] https://www.icao.int/Meetings/a39/Documents/Resolutions/summary_en.pdf.

aviation and, finally, the design and approval of CORSIA. The research identified two distinct patterns of industry attitude in different periods: challengers and supporters. From 1992 until 2004, the prevailing attitude was as challengers, blocking the progress of any economic measures proposed to reduce international aviation GHG emissions. During this period, private actors adopted the forum shopping strategy, lobbying to keep ICAO the main forum to deliberate on the topic. On top of that, they have used legal arguments and technical expertise to hamper the negotiations on environmental taxes and charges within ICAO.

From 2004, and especially after 2007, until 2016, the prevailing industry attitude was as `supporters` of international aviation and climate change deliberations. Due to growing pressures from the implementation of the Kyoto Protocol and the European Emissions Trading Scheme – EU-ETs, the aviation industry changed its strategy, adopting a purposeful behavior in an attempt to frame the debate and anticipate action in order to influence the policy choice. The framing strategy encompassed a communication campaign on the advances of the aviation industry regarding technological development leading to increasing fuel efficiency. The small share of international aviation GHG emissions in the global overall emissions was also constantly highlighted, as well as the economic and social benefits of civil aviation.

More central to this research, the framing strategy introduced the idea of offsetting credits as an alternative for ICAO to fulfill its Kyoto Protocol mandate to address GHG emissions from international aviation. The Kyoto Protocol has introduced carbon offsetting as a cost-efficient alternative to reduce GHG emissions. Aviation industry stakeholders embraced that idea and lobbied within ICAO to prioritize the development of a global carbon offsetting scheme for international aviation. According to the industry, it should be a single global scheme to avoid the multiplication of local economic measures that would create an overlapping and costly patchwork of schemes.

In addition to framing the debate, the aviation industry adopted the strategy of anticipating action by establishing self-regulated GHG emission reduction targets. They proposed a basket of measures for achieving those targets, including the purchase of offsetting credits while decarbonized technologies were unavailable to international flights. By anticipating action, the aviation industry shaped the way, indicating to governments and the ICAO bureaucracy the alternatives to answer to the challenge of reducing the aviation impact on climate change while

maintaining the social, cultural, and economic benefits of international aviation. The supportive attitude was also evident in the industry's contributions to the development of CORSIA's technical design elements and the detailed standards for its implementation. On top of the technical contributions, industry stakeholders worked consistently on lobbying strategies to influence member states' positions in approving the Assembly Resolution that created CORSIA.

This research was driven by the hypothesis that CORSIA was approved due to a successful strategy of the aviation industry to shape its own international climate change regulation without damaging sectoral economic interests. Evidence has confirmed that the aviation industry was successful in the strategy of shaping its own international climate change regulatory regime. However, while this seems to be the strongest explaining factor drawn from documental evidence, it is still not sufficient to fully explain the approval of CORSIA. By an inductive approach, empirical research demonstrated that other factors are needed to compose the explanatory story leading to the approval of CORSIA. The next chapter summarizes the research's main findings and how these multiple pieces of evidence can be combined to form a plausible explanatory framework.

Chapter 7. A Comprehensive Explanation for CORSIA`s approval

This research was conducted within the epistemological framework of pragmatism and analytical eclecticism. By employing multiple analytical instruments, the aim was to comprehensively elucidate a real-life phenomenon in all its complexity. The study leaves parsimony aside, striving to offer a nuanced and intricate causal narrative of the phenomenon under examination, that is, the design and approval of CORSIA. This final chapter aims to summarize the research main findings indicating how they connect forming a logical explanation that helps to elucidate the dynamics that resulted in the development of CORSIA.

Two main hypotheses guided the investigation. The first hypothesis revolved around inter-institutional interactions, positing that CORSIA's development and approval by ICAO were influenced by external pressures stemming from two principal regimes: the UNFCCC and the European Union (H1). Actually, this broader hypothesis was divided into two specific ones to investigate the interactions between ICAO and the UNFCCC (H1.1) and between the ICAO and the EU-ETs (H1.2). The second hypothesis places its focus on the industry stakeholder's agency. It asserts that CORSIA's approval was achieved through a successful strategy of the aviation industry to shape its own international climate change regulation while safeguarding sectoral economic interests (H2). It is worth noting that both hypotheses were partially validated; nevertheless, neither of them, on its own, offers a comprehensive explanation for the development and approval of CORSIA.

7.1 The interorganizational bargaining

UNFCCC

In regard to the interactions between ICAO and the UNFCCC, the research findings highlighted that the United Nations Conferences in 1972 and 1992 directly influenced the introduction of environmental and climate change issues on ICAO's agenda. Throughout this agenda-setting stage, the prevailing interaction pattern was conflictive, and there were clear indications of a forum shopping strategy designed to maintain ICAO as the primary platform for

discussions concerning aviation and climate change. During the '90s, it became evident that the UNFCCC made multiple attempts to regulate this matter. These attempts prompted the ICAO to foster discussions on economic measures for mitigating aviation`s GHG emissions to occupy the policy space and prevent the UNFCCC from taking the lead on the issue. However, particularly after the ratification of the Kyoto Protocol, the influence of UNFCCC processes on ICAO's deliberations, which ultimately led to the approval of CORSIA, was indirect and marked by a mix of conflictive and cooperative interactions.

The Kyoto Protocol introduced a cooperative arrangement based on the division of labor delegating to ICAO the responsibility of addressing the impacts of international air transportation on climate change. Another form of cooperative arrangement identified - particularly after the Kyoto Protocol ratification - involved catalytic linkages between both organizations. ICAO proposed targets along with a basket of measures to achieve them, with a key component being a carbon offsetting scheme, which evolved into CORSIA. The design elements of CORSIA drew from the flexibility mechanisms introduced by the Kyoto Protocol. Consequently, catalytic linkages enabled the integration of the rationales and governance technologies of the Kyoto Protocol into the ICAO regime.

In terms of conflictive interactions, the ICAO secretariat and the Council were required to periodically report their progress on international aviation and climate change to the UNFCCC. This created an accountability link between the two organizations, exerting ongoing pressure on ICAO to produce results. Consequently, vestiges of forum shopping and competition persisted, as there remained a risk of ICAO losing its policy space to the UNFCCC in regulating international aviation. Some authors have suggested, for instance, that international aviation should be included in countries' Nationally Determined Contributions (NDCs), following the principles of the Paris Agreement, especially as the Kyoto Protocol, which conferred competence to ICAO, is no longer in effect.

In summary, concerning Hypothesis 1.1, the evidence reveals that interactions between ICAO and the UNFCCC can account for the introduction of the climate change topic on ICAO's agenda and partially elucidate the development of CORSIA's design elements as an offsetting scheme, following the policy rationale of the Kyoto Protocol's flexibility mechanism. However, these interactions cannot fully explain why ICAO opted for an offsetting scheme or how ICAO

managed to approve CORSIA as a top-down global sectoral policy— an accomplishment that had proven unachievable within the UNFCCC.

EU-ETs

The research also explored if interactions between the ICAO and the European Union pressured the ICAO to act and approve CORSIA (Hypothesis 1.2). The main argument investigated was that a conflictive multilevel interaction between the ICAO and the EU - characterized by the adoption of the forum shopping strategy and the competitive regime shadow threat - led to the CORSIA`s approval. The findings indicate a deliberate forum shopping strategy aimed at maintaining ICAO as the exclusive legitimate forum for regulating international aviation economic measures to cope with climate change, thus avoiding polycentric governance.

Research reveals that in the early 1990s, European countries sought to legitimize the implementation of environmental charges and taxes by local authorities. European representatives consistently maintained that the ICAO's role was to provide guidance on developing such measures in a harmonized and orderly manner without infringing on states' authority to define their policies. After the ratification of the Kyoto Protocol, there was a shift from discussions on environmental taxes and charges to the development of emissions trading schemes. During this period, the EU's efforts aimed to legitimize the inclusion of international aviation in their regional emissions trading scheme. According to the EU, ICAO's role during that time was to offer guidance on incorporating international aviation into regional and domestic schemes, which could subsequently be linked, forming the building blocks of a global framework.

There is abundant evidence indicating that European countries and the EU actively pursued a polycentric governance approach to address the impact of international aviation on climate change. However, there is also substantial evidence demonstrating their lack of success in this endeavor. ICAO Assembly decisions initially declared that environmental taxes were incompatible with international laws governing the aviation sector and discouraged member states from adopting environmental charges. Concerning emissions trading, ICAO decisions consistently reaffirmed the necessity of mutual consent, based on bilateral agreements, for the inclusion of international flights in national or regional schemes. Therefore, the conflictive interaction between the ICAO and the EU-ETs, based on forum shopping, was corroborated by the research findings, undermining the development of a polycentric governance framework for international aviation and climate change and consolidating the responsibility within ICAO.

Regarding the notion of a competitive regime shadow threat, the argument posited that the possibility of international aviation being included in the EU-ETS pressured ICAO into occupying the largest possible policy space by creating and endorsing CORSIA. However, the research did not find compelling evidence to fully support this argument. It is true that Europe has exerted normative pressure for the ICAO to advance on climate change issues and that European experts have contributed to fostering the discussions. However, it remains unclear whether the threat of inclusion in the EU-ETS was feasible due to power dynamics in the international arena. The first EU attempt to include international aviation prompted strong opposition from nearly all non-European countries, particularly the USA and China. The European Union subsequently had to backtrack on its decision, introducing the "stop the clock" measure. Therefore, despite the normative pressure, the political stance of the EU to include international aviation in its scheme did not seem influential enough in 2016 to pressure ICAO member states into approving CORSIA.

On the other hand, many countries and private stakeholders expressed during the Assemblies that a single market-based measure should be developed within ICAO to prevent the implementation of a costly patchwork of schemes. These declarations indicate that the EU-ETS had raised concerns about the possibility of local economic measures, which were deemed undesirable by IATA, the USA, and developing nations. Since the failure to reach an agreement on a global MBM within the ICAO could potentially legitimize local actions, most ICAO member states and the ICAO Secretariat considered a non-agreement outcome as the worst-case scenario. Therefore, while robust evidence linking the role of the EU-ETS threat to the approval of CORSIA is lacking, indirect references to the possibility of a costly "patchwork of schemes" that could hamper the international aviation system suggest the influence of the EU-ETS in the process. In conclusion, the threat of international aviation being included in the EU-ETS is part of the causal chain, primarily through normative pressures. Still, it is not a sufficient explanation for the development and approval of CORSIA.

7.2 The aviation industry agency

The second hypothesis posits that CORSIA was approved due to a successful strategy of the aviation industry in shaping its own regulatory regime to cope with climate change without damaging sectoral economic interests. The research uncovered abundant and robust evidence of

the industry's active role in this process, which included i) keeping ICAO as the legitimate forum for decision-making on the matter (forum-shopping); ii) Obstructing the progression of regulations related to environmental taxes and charges for international aviation, iii) framing the discussions that ultimately led to ICAO's selection of an offsetting scheme, and, finally iv) lobbying with member states for approving CORSIA. Aviation stakeholders, particularly IATA, employed various strategies that followed i) institutional patterns - forum shopping; ii) technocratic patters - using asymmetry of information to frame the policy alternatives; iii) legal tactics - invoking international law to hinder polycentric governance on economic measures, iv) and ideational methods - utilizing the aviation exceptionalism to shape debates.

Between 1992 and 2004, industry stakeholders mainly acted as challengers, blocking discussions on taxes and charges. In the subsequent period, from 2007 to 2016, during the ICAO Assemblies, they transitioned to a more supportive role, framing discussions and anticipating action to occupy the policy space. During this second period, the industry agency was crucial in framing the debate by defining the narrative regarding the nature of the problem, the possible solutions to it, and which alternative would be more feasible and cost-effective, that is, the adoption of an offsetting scheme. By setting self-regulated targets and suggesting a basket of mitigation measures, including offsetting, the aviation industry exerted a direct influence on ICAO's policy response. Furthermore, IATA consistently lobbied with national governments to secure support for a global scheme. Therefore, the statement that aviation industry stakeholders successfully shaped their climate change regulatory regime is consistent with the analyzed documentation. They achieved this by directly participating in international negotiations and engaging in lobbying efforts with national governments. In fact, documental analysis and the interviews indicated that industry stakeholders played a central role in developing and approving CORSIA. However, while this can be considered a consistent explanatory factor, it is still not possible to affirm that it is sufficient to explain the approval of CORSIA.

7.3 New pieces of evidence: The USA agency and the ICAO`s decision-making process

The two hypotheses initially served as guiding instruments for the empirical research. However, in addition to deductively testing the hypotheses, the inquiry adopted an inductive approach that remained open to account for other factors that might have influenced the design and

approval of CORSIA. Process tracing emerged as a valuable method, facilitating the identification of various pieces of evidence and the causal mechanisms connecting them. Two significant factors, not initially encompassed by the hypothesized explanations, played essential roles in explaining CORSIA: i) the involvement of the United States (US) and; ii) the decision-making process within ICAO, including the agency of ICAO's Secretariat.

In terms of the United States, documentary research reveals that they began participating more actively in discussions on the topic during ICAO Assembly in 1998. Before this, only European countries, IATA, and ACI were involved in climate change and environmental economic measures conversations. In 1998, the US presented Working Paper A32-WP188, which advocated for referencing market-based options like emissions trading. They emphasized that the issue of GHG allocation needed resolution before emissions trading could be viable. By studying the Kyoto Protocol process, it becomes evident that the US played a pivotal role in proposing flexibility mechanisms, including market-based mechanisms. Their refusal to ratify the Kyoto Protocol stemmed primarily from domestic political reluctance to accept the differentiation between developed and developing countries (Hovi et al, 2012). Within ICAO, the US maintained support for a market-based scheme, considering it a cost-effective approach to GHG mitigation. However, they did not accept the same type of differentiation introduced in the Kyoto Protocol.

Naturally, countries like China, Brazil, India, Russia, and other developing nations strongly emphasized the need for differentiated commitments based on their respective responsibilities and capabilities (Hallding et al, 2011)[135]. While ICAO's resolutions incorporated the UNFCCC principle of common but differentiated responsibilities (CBDR), they also upheld the Chicago Convention Principle of non-discrimination between airlines. This divergence of viewpoints led to a dynamic in which developing countries insisted on introducing the CBDR principle, while the US posed reservations to these principles in the resolutions. The elements of CORSIA's implementation demonstrate that the US was successful in avoiding the practical application of the CBDR principle, at least as it was introduced in the Kyoto Protocol. While the Kyoto Protocol mandated certain countries to take on specific obligations, CORSIA defined a threshold based on international aviation activity. Beyond this threshold, all countries are obligated to participate in the scheme after 2027, whereas participation is voluntary from 2021 to 2027.

[135] https://www.diva-portal.org/smash/get/diva2:702841/FULLTEXT01.pdf

In a nutshell, the US consistently supported a global market-based measure over the years. Their positions were aligned with the aviation industry and the developing countries against the European Union's attempts, first to impose taxes and charges and then to include international aviation in the EU-ETs. However, they were in favor of a single global MBM within ICAO, while reserving the CBDR issue that was sensitive to them politically. Given the significant influence of the US in ICAO`s processes, their backing of a global MBM should be regarded as one of the factors contributing to the approval of CORSIA. It is crucial to note that the US support was made possible by the ICAO`s rules of procedure that allow member states to pose reservations to specific provisions of the Assembly Resolutions.

The rules of procedure and decision-making processes in ICAO were essential for the approval of CORSIA. ICAO`s rules of procedure do not require consensus for decision-making. While consensus is preferred, the minutes of the Assemblies demonstrate that voting is a common practice and has been used in various contexts, including discussions related to climate change. When a clear majority of countries express support for a proposed resolution through working papers or speeches at the Assembly, the document is approved. Voting may be requested when there is uncertainty about majority support. The meeting minutes consistently reference disagreements regarding approved decisions, often noting that "several states" supported the resolution while "some other states" disagreed. These minutes also document the voting procedures, including the number of countries in favor and against each document.

The approved resolutions are accompanied by a document listing reservation, which historically reflect varying viewpoints among countries. In general, for climate change matters, the United States reserved references to the Common, but Differentiated Responsibilities (CBDR) principle, developing countries reserved references that established common targets and commitments for all parties, and the EU reserved topics that limited their ability to progress on local mitigation measures, among other issues.

The combination of voting procedures and the ability to pose reservations to the final text allowed ICAO to make significant decisions, including defining targets such as the 2020 Carbon Neutral goal, determining that a Market-Based Measure (MBM) would be necessary to achieve that goal, and approving CORSIA as a carbon offsetting scheme. In 2013, the ICAO Assembly voted to decide on the global implementation of an MBM for international aviation. In 2016, the decision on CORSIA was reached by a majority, and no voting was required. However, in 2019,

China requested a voting procedure in the Assembly to decide on the continuation of CORSIA. Prior to this, China maintained a low-profile stance, with discussions primarily led by the European Union, the United States, and IATA in an effort to impede the progress of sectoral regulation within the UNFCCC.

It's worth noting that these rules of procedure grant significant authority to the Secretariat, as the document they prepare, with the support of technical groups and after the Council's approval, serves as the foundational document for Assembly deliberations. Given this dynamic, only minimal changes were made to the initial proposed documents regarding climate change during the Assemblies. Instead, countries' influence on the text was primarily exercised in the technical groups between Assemblies, where private stakeholders and the ICAO Secretariat played active roles. The Council also serves as a crucial forum for shaping the resolution's text, functioning as the main political arena for negotiations before Assemblies. The Council president usually presides over high-level meetings where ICAO member States can discuss the proposed provisions, and these meetings are also influenced by the Secretariat, which is responsible for presenting technical proposals for deliberations.

In summary, it can be asserted that the decision-making process, based on approval by majority vote and the allowance of reservations, was a necessary condition for the approval of CORSIA. In other words, CORSIA would not have been approved if consensus had been required. This is the primary distinction between the ICAO and UNFCCC processes, which necessitates consensus and, consequently, introduces the possibility of veto players obstructing negotiations. Another significant aspect is that, as international aviation operates within a network, once a multilateral decision is made in ICAO, it becomes costly for states not to adhere to it.

Consequently, ICAO Resolutions often prompt the adoption of national regulations aligned with them, even though they do not constitute formal agreements requiring ratification. Airlines benefit from national regulations aligned with international ICAO resolutions, as this facilitates their operations abroad. Thus, they frequently pressure their governments to adopt the harmonized practices established by ICAO. This is important because decisions made by majority vote could potentially raise legitimacy and implementation challenges. However, due to this networked configuration of the international aviation system, this is typically not the case for the aviation sector. Even countries that express explicit disagreement with ICAO resolutions tend to implement them. This is illustrated by China, which has consistently voiced opposition to CORSIA during the

Assembly while simultaneously implementing its Monitoring, Reporting, and Verification (MRV) requirements.

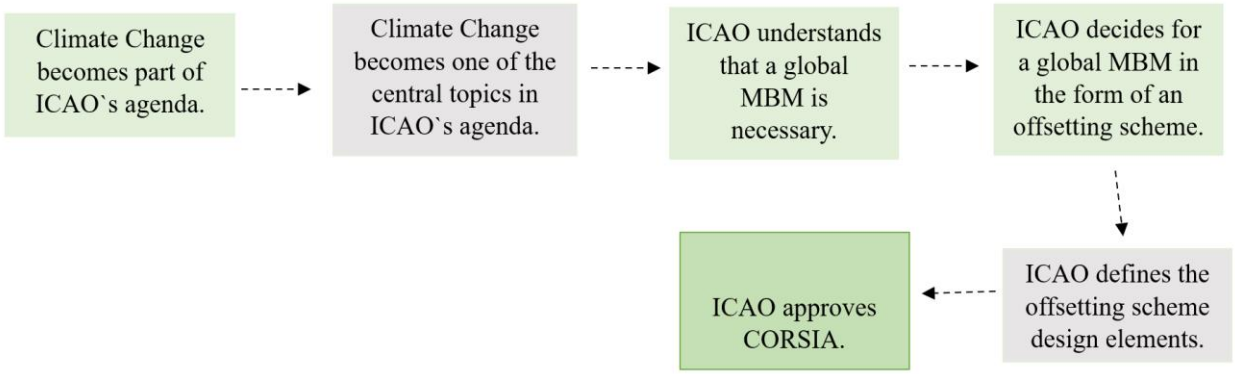
7.4 The comprehensive explanation

As anticipated, the development and approval of CORSIA were contingent on multiple explanatory factors contributing to understanding the process's different stages. To simplify the analysis, the process that led to the approval of CORSIA can be divided into four main stages:

i) the introduction of the climate change topic in the ICAO`s agenda;
ii) the decision that an MBM would be necessary to address aviation`s impact in climate change;
iii) the decision that this MBM should take the form of an offsetting scheme; and
iv) the approval of the ICAO Assembly resolution that established CORSIA.

Figure 14 illustrates these stages, including two intermediary moments. The first intermediary stage marks when the climate change topic became central in ICAO's deliberations. The second intermediary stage highlights the crucial process of defining the parameters for policy implementation, known as the CORSIA design and implementation elements.

Figure 14. Sequence of the main events leading to the approval of CORSIA

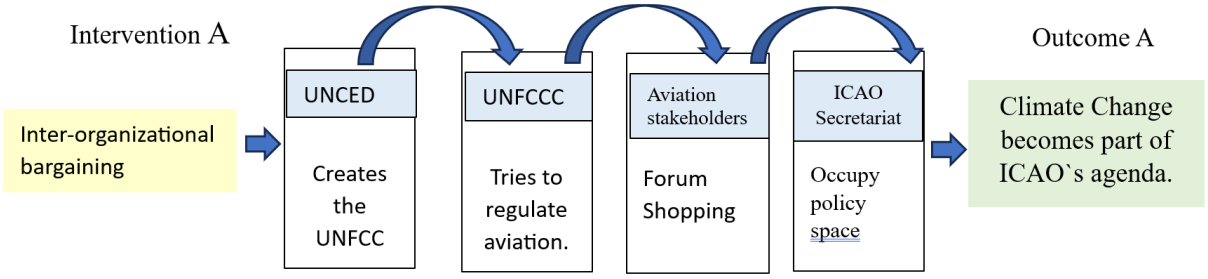


Source: Own elaboration.

Concerning the first stage, the evidence has demonstrated that UNFCCC processes played a crucial role in the inclusion of the climate change topic on ICAO's agenda. Additionally, until the approval of the Kyoto Protocol, the UNFCCC`s threat of regulating international aviation was a significant factor driving ICAO's progress on this issue. In the early stages of the regime, European

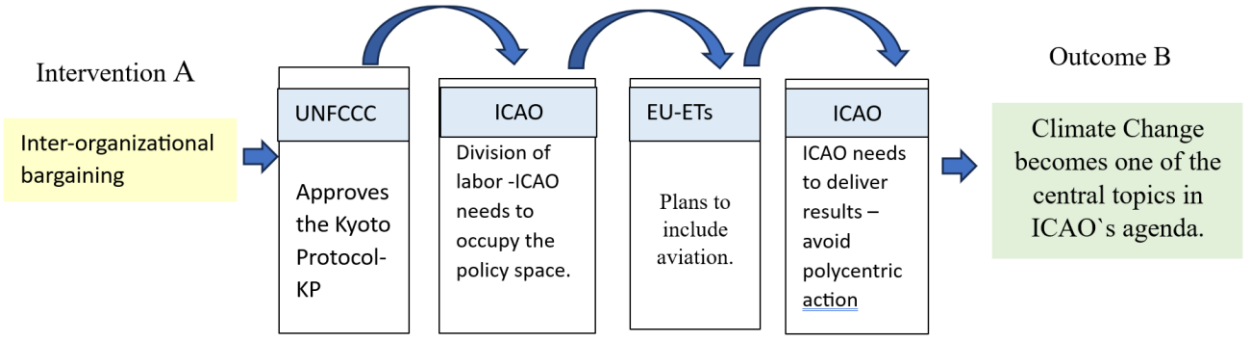
countries exerted normative pressures by introducing the UNCED principle that the polluter should pay within ICAO. This action prompted discussions on economic measures such as taxes and charges. Moreover, during this period, private stakeholders employed strategies to circumvent environmental economic regulations, particularly levies, in Europe and the UNFCCC. Their goal was to concentrate discussions within ICAO, a strategy commonly referred to as "forum shopping."

Figure 15. The insertion of climate change in ICAO`s agenda.



Source: Own elaboration.

Figure 16. The development of ICAO`s climate change agenda



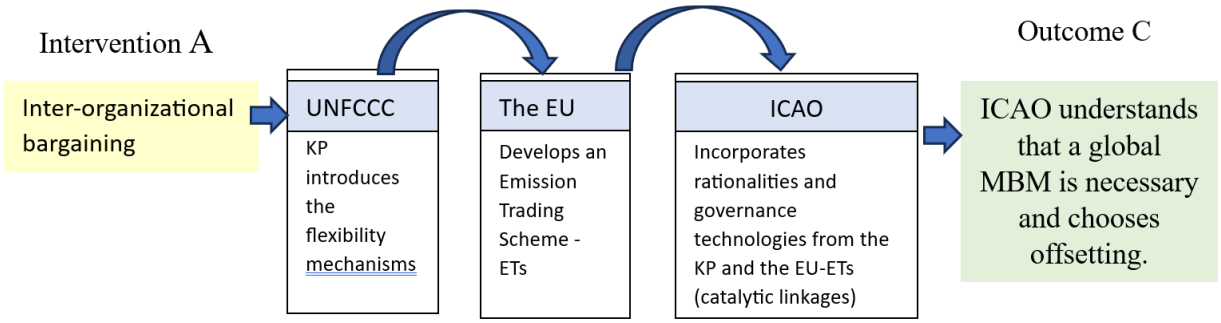
Source: Own elaboration.

The second significant development was when ICAO determined the necessity of a global Market-Based Measure (MBM) to address international aviation's impact on climate change. Here, the interactions between the UNFCCC and ICAO played a crucial role in incorporating the rationalities of the Kyoto Protocol into the ICAO's processes. The EU-ETs also played a pivotal role in shaping these rationalities and governance technologies through catalytic linkages. More importantly, the EU-ETs applied pressure for the development of a multilateral scheme since

polycentric governance was perceived as a threat by the US, developing countries, and IATA. Such a governance approach was believed to lead to a costly patchwork of schemes. During this stage, the aviation industry and the support from the US for a global MBM were also instrumental in advancing this multilateral policy. The third milestone was the decision to adopt an MBM in the form of an offsetting scheme. For this specific decision, the agency of private stakeholders, led by IATA, was central in explaining the outcome. Offsetting is one of the flexibility mechanisms introduced by the Kyoto Protocol. However, offsetting has faced increasing criticism over the past decade, with studies revealing that many offset credits did not genuinely represent additional emissions reductions.

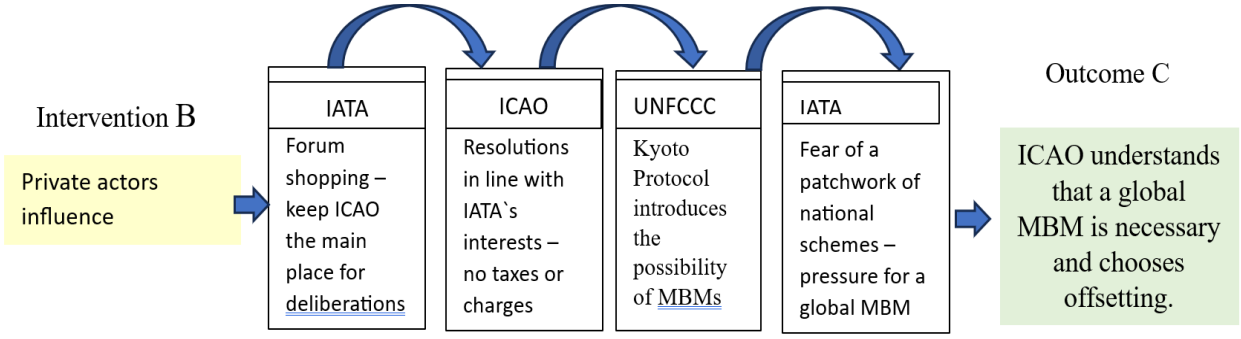
Despite these criticisms, the industry perceived purchasing offset credits to compensate for emissions increases beyond 2020 as the simplest and least costly alternative. IATA's goal was to provide a response to the problem by adopting an alternative that would result in the least outflow of revenue from aviation to other sectors. Economic measures such as carbon taxes and emissions trading would generate revenues and introduce the political challenge of administering and distributing those revenues. Therefore, IATA engaged in technical and political discussions and lobbied with governmental authorities to approve a global MBM in the form of an offsetting scheme. By 2016, most countries were convinced that the administrative and political burdens associated with carbon taxes and an emissions trading scheme were exceptionally high and that an offsetting scheme was the only feasible solution. Numerous interviews confirmed the notion that CORSIA was approved because it was the only viable solution, considering that aviation is a hard-to-abate sector and other MBMs were administratively and politically unattainable.

Figure 17. The need for a Market-Based Mechanism.



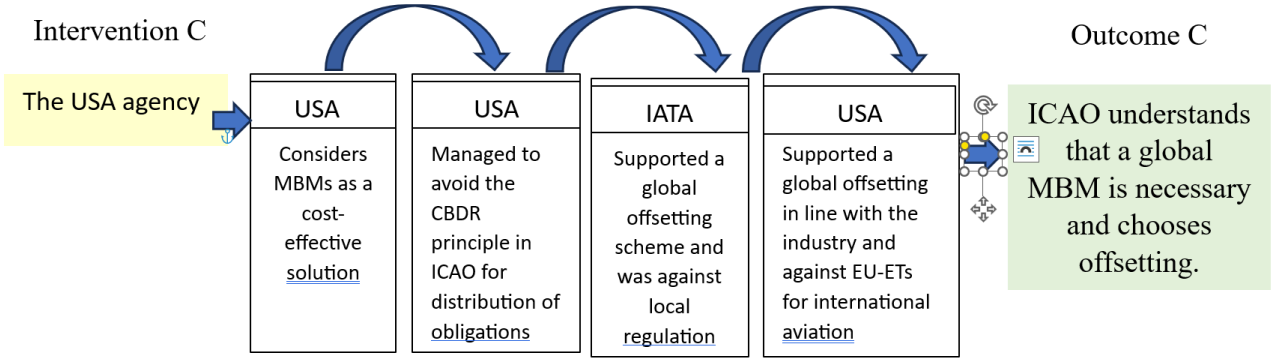
Source: Own elaboration.

Figure 18. Private actors and the choice of an offsetting mechanism.



Source: Own elaboration.

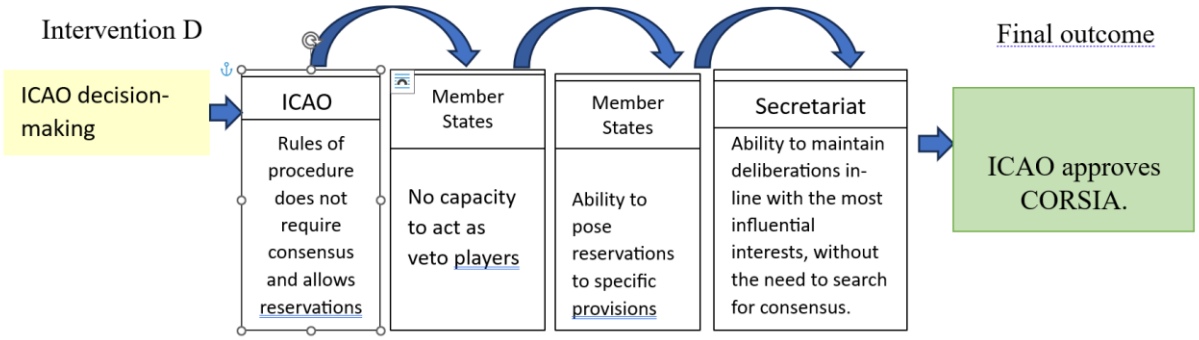
Figure 19. The US agency and the choice of an offsetting mechanism.



Source: Own elaboration.

The final milestone is the approval of the resolution that created CORSIA. As previously described in this chapter, the central explanation for this approval lies in ICAO's decision-making process, where documents are approved by a majority with the possibility of posing reservations for specific provisions. This decision-making process was critical not only for the approval of the resolution that established CORSIA but also for the previous milestones leading to this final outcome, namely the agreement on the 2020 Carbon Neutral Growth (CNG) target and the agreement on the need for a global MBM to achieve that target.

Figure 20. The ICAO decision-making process and the approval of CORSIA



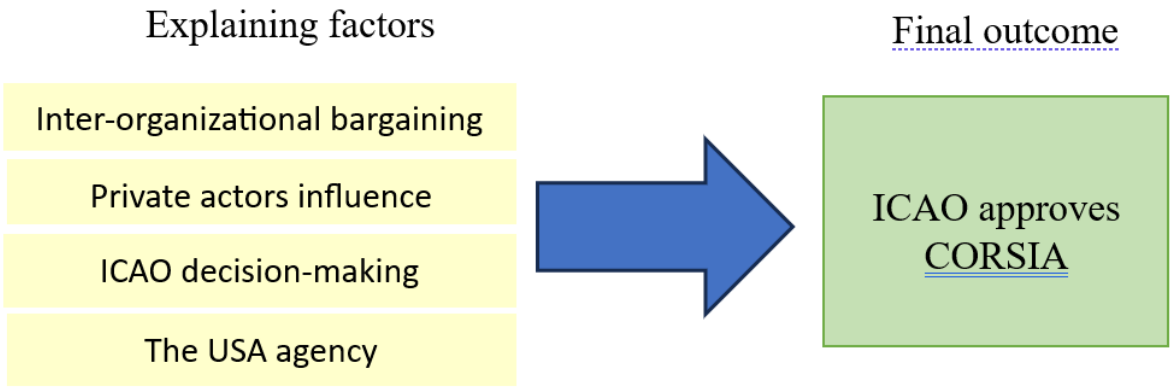
Source: Own elaboration.

In summary, multiple factors compose the causal chain that led to the approval of CORSIA. These pieces of evidence contribute to understanding the emergence of the regime and its evolution which culminated in this specific policy choice. As described during this research, they have influenced different stages of the process in diverse ways. While inter-organizational bargaining was crucial for introducing and keeping the topic high in ICAO`s agenda, aviation stakeholders' agency was decisive for the avoidance of polycentric action and for the policy choice of an MBM.

The United States' support for a global MBM is also relevant because, without that support, the political configuration within ICAO would have resulted in the lack of majority and the EU isolation in this topic. The US influenced Canada's and Mexico`s support. Japan and Australia have also joined the group. As most developing countries were exempted from the MBM through the de minimis approach, they did not participate much in discussions. Big developing countries - mostly China, India, Russia and Brazil -, and some Arabic countries -Egypt and Saudi Arabia- became the main resisting voices.[136] As consensus is not required, despite the growing power of China in the international arena in general and in ICAO specifically, they were not able to stop the ongoing wave that led to the approval of CORSIA. Therefore, ICAO`s rules of procedure for decision-making is a necessary factor for explaining CORSIA`s approval.

[136] Some other developing countries such as Chile, Argentina, Colombia, Cuba, and others, have also expressed concerns with the impacts of CORSIA on the development of their international aviation.

Figure 21. A comprehensive explanation of CORSIA`s development and approval



Source: Own elaboration.

Final Remarks

This research aimed to identify the factors that explain the constitution of a sectoral climate change regime within the governance sphere of international aviation in parallel to the UNFCCC. Its overarching goal is to contribute to the body of knowledge concerning diverse governance structures and their efficacy in addressing climate change. Since 1992, there has been a prevailing recognition that climate change transcends national boundaries and requires a global regulatory framework to propel nations into concerted action. The UNFCCC laid the foundation for such a regime in 1992. While initially designed as a broad framework, the intention was to achieve specific agreements on targets and mitigation measures through protocols, which would be agreed by the Conferences of the Parties – COPs to bolster the effectiveness of the regime. However, this regime's evolution did not follow the anticipated trajectory.

Three decades later, it is evident that mitigation efforts remain insufficient, and the world finds itself in a state of climate emergency, which manifests through an increasing frequency of extreme climate events, such as heatwaves, droughts, wildfires, and intense rainfall, impacting ecosystems and human lives, particularly the most vulnerable communities. Given that the UNFCCC has failed to achieve its crucial objective of halting climate change, numerous studies have explored alternative governance frameworks to address this pressing issue. Scholars have put forth various analytical frameworks to comprehend the fragmentation of global environmental climate governance, the implications of this ontological reality, and how to deal with it, bearing in mind the urgency of tackling the climate crisis.

Research in this realm has delved into three primary areas: i) the role of private actors who have crafted self-regulated private regimes; ii) the dynamics between public and private regulatory regimes and, finally; iii) how public and private entities interacted within specific governance spheres to regulate distinct sectors. This dissertation concentrates on the third facet, employing the `governance sphere` concept to characterize the regulatory regime developed in ICAO regarding climate change. Both public and private stakeholders have played active roles in shaping this regulatory regime. While formal decision-making authority rests solely with the public actors - the

member states of ICAO - private stakeholders hold observer status and lack voting privileges. Nonetheless, as this research underscores, private stakeholders have held a pivotal position in ICAO's deliberations across various issue areas, including climate change.[137]

One of the main contributions of this research is to demonstrate that studying sector-by-sector is crucial for comprehending the specific political dynamics and practical challenges of each industry in finding and implementing solutions to address climate. Using the idea of Cullenward and Victor (2021), civil aviation is a hard-to-abate sector not only from the technological standpoint, but also from its political and institutional structure.

Developing technology to decarbonize aviation is indeed challenging. A huge amount of energy is needed for flight propulsion systems, and storing such energy in a safe way is not easy. Liquid fuels that don't freeze in low temperatures are the only feasible alternative so far. Batteries are heavy and have not achieved the technological level necessary to store energy for long-range flights. Hydrogen, which seems to be the new frontier, also faces challenges of storage and safety. The nearest solution is sustainable liquid fuels [138] which can be produced by crop biomass, waste and residues or electricity[139]. However, these solutions face sustainability issues, particularly in the case of crop-based fuels, but also in electric fuels, considering the sources of electricity. Moreover, having a commercial supply of SAF is contingent upon the availability of abundant biomass and energy, which is not the reality in most countries.

On top of those compelling technological barriers, aviation is a hard-to-abate sector due to political and institutional reasons. As mentioned throughout the dissertation, civil aviation commercial interests are deeply intricated with the governmental notion of national interest. It is important to highlight that the persons involved in policy decisions - directly through governmental affairs or indirectly through lobbying – are politicians, policymakers and business stakeholders who are interested in the continuity and strengthening of air connectivity, as they are big users.

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[137] The central relevance of private stakeholders, especially ICAO is evident in the documental analysis and was also almost unanimous between the interviewees. Only one interviewee (out of eighteen), from India, manifested the opinion that ICAO was an organization of States and private stakeholders only had influence through their memberstates. It is important to clarify that the representative was new in ICAO processes, which might explain this outlying opinion. The other seventeen interviewees were emphatic to affirm the central role of the aviation industry in ICAO processes.

[138] Sustainable Aviation Fuels. https://www.icao.int/environmental-protection/pages/SAF.aspx.

[139] The power to liquid technology which also needs a source of carbon from crops, waste and residues or through air capture.

More importantly, low air connectivity has strategic impacts on trade of high value goods and services, businesses partnership and scientific exchange. Thus, beyond individual stances, developing and strengthening international aviation is an important policy objective for economic and social reasons. Considering that air travel is an activity with low profit margins, governments are usually reluctant to implement policies that represent additional financial burdens to the industry. Actually, it is more frequently observed policies to bailout airlines in difficult circumstances[140], as in the case of the COVID-19 crisis, for instance.

Moreover, international aviation is highly exposed to foreign competition, and therefore, the adoption of isolated policies can generate competitive distortions. Thus, international coordination is crucial. This coordination is conducted internationally by a governmental authority (ICAO) and a private authority (IATA). IATA provides relevant services for the well-functioning of the international aviation network. In addition, they – not only IATA but also regional and national associations - usually have close ties with national agencies and ministers responsible for regulating the sector. ICAO is the UN specialized agency formally in charge of establishing harmonized rules for international air transportation. As described during the research, ICAO is not only a governmental forum, but a hub of the civil aviation governance sphere, where public and private actors interact to develop the rules.

The study of the long negotiation process that resulted in CORSIA revealed that ICAO is not the most suitable forum for introducing transformative changes that will offer solutions to decarbonize the sector. Inter-organizational bargaining led to the introduction and maintenance of the climate change topic in ICAO`s agenda. Moreover, the agency of private stakeholders paved the way in the direction of a global offsetting scheme and ICAO`s institutional design and decision-making rules enabled CORSIA`s approval. In fact, the dominant interest configuration in ICAO – including public and private stakeholders - rests in the preservation of the incumbent industry and, consequently, in a conservative aversion to uncertainty. However, once a solution achieves feasibility - from the technological, commercial, and political perspectives -, ICAO can be a powerful place for entrenching the solution in the international aviation system. This is true, due

[140] The list of government – owned airlines is extensive. Most of the time they are in small developing countries and in countries with centralized economic models. However, there are also examples in Europe such as TAP (in Portugal) and ITA (in Italy) which are now in process of privatization. In the past, almost every country had state-owned airlines. After the liberalization process, most companies became private owned.

to its deliberation capacity – not requiring consensus- and due to the costs of not following ICAO`s standards – penalty default – which generates high compliance rates with the approved rules.

However, the approval of rules in ICAO by majority can also aggravate inequalities. The decarbonization of the aviation sector demands substantial investments in research and development, which is being undertaken mainly by the EU and the United States.[141]This research involves essentially the aircraft industry and the production of SAF. The likely scenario is that technological solutions to decarbonize the aviation sector will come from the developed countries that are capable of investing on them, and, once feasible, will be incorporated into the international aviation network through ICAO`s institutional framework. Two main concerns arise from this scenario. The first one is that developing countries tend to remain in the margins of the process, aggravating the inequality trends. The second – and inter-related aspect - is that the focus is on technological improvements, without due regard to consumption patterns. Air travel is highly concentrated in Europe and the US, and international regulations that do not consider these inequalities tend to protect the frequent flyer consumption behavior while hampering the access of a big part of the global population to air travelling. Consequently, the civil aviation regime will most likely remain very far from any kind of "climate justice" (Robinson et al., 2021).

CORSIA was a remarkable achievement as the first global sectoral market-based measure to address climate change. Nonetheless, when it was approved back in 2016 there was already criticism concerning the effectiveness of carbon offsetting to address the aviation impact on climate change. Now, seven years later, the climate crisis presents its urgency more than ever. It thus became clear that a global market-based measure – that allocates emission`s reduction where it is most cost-effective - may not be enough in a context where all countries and economic sectors must strive for net-zero emissions to avoid catastrophic consequences.

In summary, studying the emergence and development of the international aviation climate change regime was important to understand the political and institutional dynamics within this governance sphere, as well as ICAO`s roles and limitations. However, a few aspects could have been further explored and could be relevant subjects for future research. For instance, the two explanatory factors that were identified inductively during the investigation can bring relevant

[141] China, Russia, Japan and Brazil also have important aeronautical industries and are investing in research on aviation, but there is not much information available on the topic.

insights for explaining CORSIA and for better understanding the sectoral climate change governance framework. Concerning the US's role in the process, an analysis of all working papers presented in ICAO's Assemblies since 1998 was conducted. However, the research report could have delved into this topic more extensively. Given the USA's significant political influence in ICAO, a more detailed exploration of their positions and strategies during the process would have been beneficial. The same holds true for China and, to a lesser extent, other developing countries.

Regarding the examination of ICAO's decision-making process, documental analysis investigated whether decisions on environmental and climate change issues were made by consensus or by a majority. In cases where a majority was involved, the research examined whether there was a voting procedure or if the section's president declared the majority. However, the role of the ICAO Secretariat was not thoroughly explored as it should have been, primarily due to resource and time constraints. Still, documental analysis and interviews indicated the fundamental role of the Secretariat in the process. Nonetheless, investigating the ICAO's Secretariat in-depth is challenging, as CORSIA remains an active and evolving topic. Some design elements and, especially, the extension of CORSIA beyond 2035 are still under negotiation. Furthermore, the Secretariat primarily engages in technical work, and confidentiality clauses protect the associated meetings and documentation.

Therefore, a more extensive investigation into the roles of the US, China, and the Secretariat could provide additional insights into the analysis. Initial document analysis on these issues suggests that while these factors may not be determinative in explaining CORSIA itself, they could offer important analytical perspectives regarding the impact of power politics between China and the US on climate change multilateral negotiations and the role of international organizations' bureaucracies in the development of international regimes.

Changing the practices that cause climate change demands a transformation in the behaviors and habits of billions of people and organizations. In essence, climate change encompasses a multitude of challenges marked by distinct patterns of technological obstacles, political and economic interests, power dynamics, information disparities, and belief systems. This complexity calls for tailored institutional designs. Deep case studies on specific sectoral governance frameworks can contribute to that endeavor.

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Appendix I

Nature and Problem Structure of the Climate Change Issue

The nature of the climate change problem has been characterized using concepts such as *"global," "multidimensional," and "super-wicked*." There is also a second group of concepts that relates to the structure of the problem and, therefore, to how institutions and governance mechanisms can restructure incentives to foster change in actors' behavior toward decarbonizing production and consumption pathways. Three types of problem structure are discussed in this section: i) "*collective action*," ii) "*distributional*," and iii) "*intergenerational exchange*." Understanding these different approaches to the problem's nature and structure is essential to analyzing the evolution of the international climate governance mechanisms and the various arguments on why they have failed to deliver effective results. Most importantly, it is necessary to imagine governance arrangements that may foster the profound transformations needed.

Nature of the problem

Climate change is a *global problem* because the consequences of increasing GHG concentration in the atmosphere are planetary regardless of where the GHG emissions occur. It also incorporates a profound element of social justice (or injustice), considering that the most affected areas tend to be in developing countries, especially small islands, which usually have low CO2 emissions per capita. Therefore, the most responsible for the problem tend to be the ones to suffer less from its consequences (developed countries) due to their ability to adapt to environmental changes. The second characteristic attributed to climate change is *multidimensional,* meaning that it is not actually one problem but multiple problems that, combined, cause harmful changes in the planet's atmosphere. Thus, despite the global consequences, the causes of the problem are related to the day-to-day activities of individuals, national governments, and industries, including transnational companies (which are responsible for production and trade chains that mobilize resources and emit GHG in magnitudes superior to many U.N. countries).

Finally, climate change has been categorized as a super-wicked problem. The concept of super-wicked problem has its origin in the idea of *wicked problem* developed by Rittel and Webber in 1973, and is characterized by four main features: i) urgency - the time for coping with the problem is running out; ii) agency - those who are causing the problem are the ones that need to

end it; iii) coordination - there is no central authority capable of steering solutions; iv) time-inconsistent preferences - policies discount the future irrationalities. Climate change falls neatly into this concept as an urgent and complex problem that demands action from numerous stakeholders, involves a wide range of production systems, poses intergenerational trade-offs, and requires multiple axes of coordinated policy responses while permeated by deep uncertainties about courses of action and possible results.

The structure of the problem

Whereas the nature of the problem refers to its intrinsic features, the structure of the problem defines the incentives environment it creates and the kinds of behavior it tends to encourage in the involved agents. This section discusses three types of problem structures attributed to climate change. The first and most diffused one is based on the *collective action* theory (Olson, 1965). The second is the *distributional approach*, based on Political Economy accounts (Newell, 2020). Finally, the last is *time-inconsistent preferences*, drawn from behavioral economics (Levin et. al, 2012)).

Many scholars have used the collective action theory (Olson, 1965) to explain the climate change problem's structure and propose suitable paths for action (Keohane and Victor, 2016; Ostrom, 2009; Stern, 2007). Following this wisdom, emissions control involves common pool resources – CPRs or `global commons,` that is, a resource in which it is difficult to exclude others and is degraded by use – in this case, the CPR is the atmosphere with low concentrations of GHG (Keohane and Victor, 2011). This kind of resource usually faces the so-called `collective action` problem, in which, in the absence of regulatory institutions, each actor will have incentives to deplete as much as possible the global common, considering that if they don't, others will do it anyway. Therefore, while every country desires a stable climate, they will have incentives to free ride on other countries' efforts, driving all countries to exploit the global atmospheric commons in an unsustainable way (Aklin and Mildenberger, 2020).

According to these approaches, as CPRs are not self-managing, coping with climate change is a global collective action problem that requires international institutions to promote sustained cooperation to overcome free-riding incentives. Institutions are needed to provide relevant functions, like producing and disclosing credible information (transparency) and setting, monitoring, and enforcing rules and policies. Thus, in the absence of international rules and

regulations, most benefits of mitigation measures would be available even to the ones not taking any action; in other words, they would be non-excludable. Moreover, international cooperation is deemed critical since no country, even the highest emitters, can solve climate change only by individual action. This string of thought was highly pervasive during the 90s and has influenced the design of the Kyoto Protocol and successive attempts to agree on an overarching binding international agreement within the UNFCCC (Keohane and Victor, 2011).

There is also the concept of *public goods*, akin to CPR, as both are non-excludable and tend to generate free-rider behavior. While CPR refers to the depletion of a common resource (in this case, the atmosphere), public goods are the ones that everyone can enjoy, even those who are not contributing to its supply (e.g., public lightning, security). Examples of public goods in the climate change sphere include institutions, reliable information, and R&D on new technologies to reduce emissions and adapt to climate change[142] (Keohane and Victor, 2011). In these kinds of goods, there is no threatened common resource, but incentives to free-ride are strong as the benefits are usually not excludable. Hence, CPR and public goods problems must be managed by well-crafted rules and governance systems to avoid the free-ride behavior that otherwise would lead to the depletion of the CPR or incentives for not providing the public good.

The collective action account is the dominant paradigm in the climate change literature. Aklin and Mildenberger(2020) affirm that empirical analysis does not confirm some of its claims. The central claim of this paradigm is that, in the absence of regulation, every player has the incentive to free-ride and let others bear the costs. The game theory defines this incentive structure as the prisoner's dilemma game, where two actors are better off if they cooperate. Nonetheless, each actor is best off if he defects while the other cooperates. As the other's behavior is unknown in a one-shot game, the most rational choice for each actor individually is to defect, leading to the worst possible scenario. In a repetitive game, each actor would be incentivized to reciprocate the other's defection (especially if those who defect are pivotal players), not to bear alone the costs of others' free-riding on the benefits generated by the measure. According to this theory, climate policy is necessarily reciprocal, and unilateral cooperation would be irrational.

However, some events throughout the climate change regime evolution do not support the claim of reciprocated defection. For instance, as the United States is a pivotal actor, its withdrawal

[142] Some technologies may come from private R&D investments and, therefore, generate short and medium-term private benefits. However, ideas usually diffuse broadly (Keohane and Victor, 20xx).

from the Kyoto Protocol and the Paris Agreement should have led others to reciprocate, and this did not happen. Therefore, adopting a richer theoretical model placing free-riding concerns alongside other variables is necessary to understand the climate change problem better. Misdiagnosing the problem can lead to flawed policy designs and governance arrangements. Aklin and Mildenberger (2020) argue that although climate outcomes are global and characterized by negative externalities, climate policy responds to a different logic, as the government's primary concern is often about keeping the support of its constituencies.

Considering that climate policy may involve dramatic reallocation of resources and redistribution of costs and benefits - creating new economic winners and losers - it entails conflicts between political coalitions in favor of and opposed to climate reform (Aklin and Mildenberger, 2020). According to the distributional approach, countries act when pro-climate domestic coalitions are stronger than the opponents, regardless of other countries' reciprocity. Therefore, the primary driver of action is the domestic configuration of power and interests. In addition, the authors conclude that climate action can occur even without reciprocity or international institutions to monitor cooperation and punish non-cooperation, as exemplified by multiple unilateral climate policies adopted, especially by European countries.

The third type of incentive structure attributed to the climate issue is labeled by behavioral economists as *time-inconsistent preferences* and was (and still is) traditionally used to analyze consumption and spending patterns. Numerous studies have demonstrated that individuals give greater weight to present consumption, applying a declining discount rate to long-term gratification, in opposition to the constant social discount rate that would signal a rational behavior, according to the models (Strotz 1955; Elster, 2000; Rabin, 1998; Karp 2005; Ascher, 2009).

In issues of high uncertainty, this behavioral trait is even more pervasive. Concerning climate change, for instance, although it is broadly recognized that adverse effects will occur, the particular consequences for each individual are unclear, which creates incentives to push responses into the future. Governance institutions tend to adopt a similar stance, mainly responding to short-term goals (e.g., following electoral cycles), ignoring that the future harms of doing so are superior to the present benefits of inaction. Thus, even when aware of overwhelming evidence of

catastrophic risks, stakeholders opt for courses that disregard this information, reflecting short-term preferences (Levin et al., 2012).[143]

It is undeniable that climate change incorporates the collective action problem structure. Nonetheless, it is necessary to acknowledge that it is also permeated by deep distributional dynamics and time-inconsistent preferences that contribute to shaping action (or inaction) throughout the diverse dimensions of the climate issue.

[143] The authors make an analogy with smokers that chose to ignore the long-term health risks to satisfy immediate gratification. I prefer the analogy with the seatbelt use because I believe the smokers involve an additional consideration related to physical addiction. In the seatbelt case, even with widespread information about the risks of riding a car without a seatbelt, the behavioral change only took place, at least in Brazil, when the government stablished regulation imposing a fine.

Appendix II

Semi-structured interview script

Research: Climate change international governance in the aviation sector.

PhD Candidate – International Relations Ana Paula Machado Cavalcante | UnB/Visiting Student GPS-University of California – San Diego.

Initial Remarks

a. Explain the research objectives: To understand the role of international cooperation in fostering actions towards the decarbonization of the aviation sector (multilateral and narrower initiatives). Explore the functions and limitations of ICAO in this process and if, besides ICAO, other international initiatives play an essential role in this issue area (aviation and climate change). Finally, analyze how public and private actors interact to design international rules to cope with the problem.

b. Clarify who will be interviewed: i) governmental experts involved in ICAO negotiations; ii) representatives of airlines; iii) representatives of aircraft producers – OEMs; iv) SAF producers and traders; v) NGOs; vi) airports.

c. Reassert that the answers will be anonymous and that there will be no personal or organizational identification of the respondents in the report.

A – Interviewee introduction

1. Could you speak briefly about your current work, especially on aviation and climate change topics? Have you been involved in international discussions related to aviation and climate change in ICAO or another forum?

B – Aviation and climate change: the role of international cooperation

2. How do you perceive the risks to the aviation industry related to climate change? In the short term (up to 2035), medium (up to 2050), and longer run (after 2050)? And what would be the strategies to deal with those risks?

3. What is the role of international cooperation in the challenge of reducing the impact of aviation on climate change? What are the most relevant forums or cooperation mechanisms on that subject, in your opinion?

C– Multilateralism contributions and limitations – the ICAO functions

4. On climate change, do you believe that the processes within ICAO signal a demand for decarbonization? Or do you think other factors (domestic policies, consumers' and shareholders' demands, or investors' requirements) are more influential?

5. Why was CORSIA the chosen policy for international aviation, in your opinion? Is CORSIA central to the general strategy of the aviation industry to cope with the climate crisis? Or do you think there are other policies with higher prospects of generating change?

6. Do you believe that **ICAO is designed to drive innovation or not**? In other words, are ICAO standards used as instruments to prompt new technologies according to specified desirable results, or, on the contrary, do they reflect what is already possible according to feasibility analysis based on the available technologies?

D– Interactions between public and private stakeholders on building the climate change governance sphere of the aviation sector.

7. Documental analysis has shown that industry representatives have participated in ICAO from its outset. In climate discussions specifically, what are the main contributions of the industry representatives to the process? How is their participation?

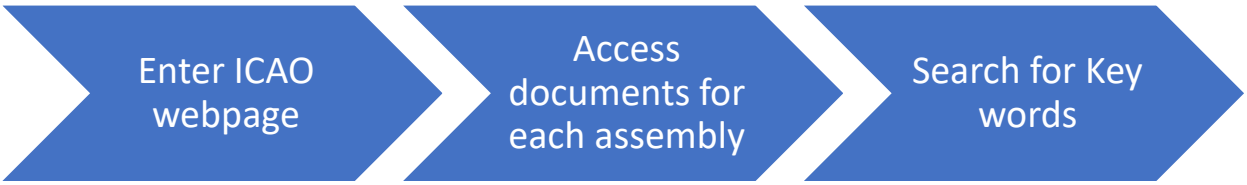
Conclusion/ Open question

a. Any additional comments that you would like to share?
b. Thank you for your time and contributions. I will share the final work with all the interviewees.

Appendix III

Documental Analysis Protocol

1) First Stage



- ICAO Webpage: https://www.icao.int/publications/Pages/assembly-archive.aspx;
- Documents from Assemblies from 1947 until 2016.
- Key works: as 'environment,' 'pollution,' 'noise,' 'emissions,' and 'climate change..

2) Stage: analyze the selected documents registering the following information

ICAO Assembly Section year and place
Documents analyzed (number of each document)
Was there voting procedures during the Assembly? yes/no
Were environmental issues discussed? Yes/no and Which?
Were climate change issues discussed? Yes/ no, Which? By whom?
Did industry representatives participate? How?
How was the participation of European Countries and the European Union.
References to the UNFCCC.
Additional comments relevant to the research