



Intermediaries and complexity: assessing emissions-based governance in the European Union's EU-ETS

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Accepted: 4 October 2024 / Published online: 3 December 2024
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Abstract

Scientists have specified that, by the year 2030, aggregate global greenhouse gas (GHG) emissions must be halved to have at least a 67% chance of meeting the Paris Agreement. A key challenge is the governance of GHGs. This article investigates the evolution of the EU's Emissions Trading System using the Regulatory–Intermediary–Target (RIT) framework. Specifically, we outline the role of “emissions governance” intermediaries to monitor, report, and verify (MRV) emissions reductions. This comes with both pros and cons. First, there are a multitude of public and private actors, rules and regulations, that exist within this system. Yet, as the RIT framework makes clear, this can lead to opportunities for capture of regulatory *targets* and *regulators*. On the other hand, given that public institutions and governance actors have yet to succeed in significantly driving down emissions, non-state and private actors are increasingly being relied on to plug climate governance gaps—especially as *intermediaries* with important MRV responsibilities. The application of the RIT and findings have important implications for climate governance scholarship and related climate governance mechanisms.

Keywords Climate governance · Emissions regulation · NDCs · Global Stocktake

Abbreviations

CH ₄	Methane
CMM	Climate Monitoring Mechanism
CO ₂	Carbon dioxide
CO ₂ -e	Carbon dioxide equivalents
CLRTAP	Convention on Long-Range Transboundary Air Pollution
CM	Compliance Mechanism
COP UNFCCC	Conference of Parties
EC	European Commission
EEX	European Energy Exchange
ESD	Effort Sharing Directive
ETC/CME ETC	European Topic Centre Climate Change Mitigation and Energy

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ETF	Enhanced Transparency Framework
EU-ETS	European Union Emissions Trading System
FAR IPCC	First Assessment Report
GHGs	Greenhouse gas emissions
GS	Global Stocktake
IPCC	Intergovernmental panel on climate change
KP	Kyoto protocol
MMR	Monitoring and Reporting Regulation (EU)
MRV	Monitoring Reporting and Verifying
NAB	National Accreditation Bodies
NCA	National Competent Authorities
NDCs	Nationally Determined Contributions
PA	Paris Agreement
RIT	Regulatory Intermediary Target
SAR IPCC	Second assessment report
TFI	Task force on national greenhouse gas inventories
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change

1 Introduction

The latest assessments by the Intergovernmental Panel on Climate Change (IPCC) warns that emissions must be halved by 2030 to have a fair chance of keeping global mean temperatures from rising less than two degrees Celsius (IPCC, 2022a, 2022b, 2023). Because climate change is largely attributed to anthropic greenhouse gas (GHG) emissions (IPCC, 2019), the mitigation of GHGs has become a central feature of climate change governance (Bailey et al., 2011; Ibikunle & Okereke, 2014). Consequently, *emissions-based* governance systems have emerged as a main component of climate governance (Biermann, 2010). The challenge, however, is to ensure that these governance mechanisms can effectively maintain transparent and consistent mechanisms to monitor/measure, report, and verify (MRV) emissions reductions.

Multi-country emissions-based governance systems such as the EU Emissions Trading System (EU-ETS) have encountered both successes and failures, though important lessons have been learned, especially for MRV actors and mechanisms (Hoffmann, 2011; Jordan et al., 2018; Turnheim et al., 2018). Importantly, and what stands as the main motivation for this article, by examining emissions-based governance systems, climate governance mechanisms—particularly for emissions reductions—might be re-calibrated to help achieve emissions reductions goals for 2030 and 2050 (Holz et al., 2018).

We develop a case study of the EU-ETS—the first international, cap-and-trade system of its kind (Andersen & Ekins, 2009; Ellerman et al., 2016). It was launched on the 1st of January 2005, covering 11,500 installations in 28 Member States, and initially developed absolute emissions targets for industrial sectors with the intention to incorporate flexible market mechanisms to drive emissions reductions (Spaargaren & Mol, 2013). By grounding this study in Regulator–Intermediary–Target (RIT) framework (Abbot et al., 2017), we explore a complex ecosystem of actors across the public and private emissions governance domains. Our aim is to understand the evolution of the EU-ETS—including the roles of regulators, intermediaries, and targets—over its four Phases.

We find that, despite efforts by the European Commission and other regulators, emissions governance in the EU requires further revision. The growth of intermediaries, private and non-state actors further complicates matters. The assessment of these actors, and their relationships with regulators and targets—as outlined in the RIT model (Abbot et al., 2017)—can provide an understanding of potential instances of “regulatory capture.” The contribution of this article is twofold: first, we develop a framework based on the RIT model to explore the myriad actors within the EU’s emissions governance system. After doing so, we show the extent to which *intermediaries* exert influence over this system. Considering that some intermediaries are so close to the private sector, there is evidence for potential regulatory capture. Both the “Cambrian explosion” of non-state actors in climate and emissions governance (Jordan et al., 2018), as well as the many potential instances for regulatory capture, suggest that significant reductions of country-level GHGs might be further delayed.

This article is structured as follows. The next section provides an historical overview of emissions-based climate governance. Section 3 grounds the case study in the regulator-intermediary-target (RIT) framework. Section 4 presents a case study of EU emissions governance. Section 5 provides the results and synopsis, and Sect. 6 provides a conclusion and scope for future research.

2 The evolution of emissions-based climate governance

The IPCC’s First Assessment Report (1990) provided compelling scientific evidence that global climate change can largely be attributed to human-induced GHGs (Stern, 2006). The United Nations Framework Convention on Climate Change (UNFCCC), adopted in 1992, sought to integrate these scientific findings into a global climate agreement, with particular focus on emissions mitigation at the country level (Hansen et al., 2000; Nielsen et al., 2021), and that the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (UN, 1992, 2). At the country-level, emissions inventories should ideally provide timely “information on greenhouse gas (GHG) emissions and actions to reduce them” (UNFCCC, 2024). Consequently, the governance of emissions has emerged as a central tenet of multilateral, state-level, and private-sector climate change governance systems. These agreements helped to establish “emissions-based” climate change governance (Biermann, 2010; Biermann & Pattberg, 2008).

2.1 Emissions governance under the Kyoto protocol (KP) and the Paris agreement (PA)

The UNFCCC’s Kyoto Protocol (KP)—which entered into force in 2005 (with Russia ratifying to bring 55 parties accounting for 55% of global emissions)—focused on climate governance mechanisms that revolved around emissions reductions, technology development and diffusion, and multilateral or international collaboration. ‘Annex I’ parties¹ to the

¹ *Annex-I parties*: Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czechia, Denmark, Estonia, European Union, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye, Ukraine, United Kingdom of Great Britain and Northern Ireland.

KP agreed to mandatory emissions reductions, though other parties were not subject to this (Depledge, 2022; Harris & Lee, 2017). The KP further established that Annex I countries submit annual emissions inventories to track country-level progress. While a global emissions trading system was attempted during the KP negotiations, it failed to develop outside of European countries (discussed in more detail below).

Somewhat differently, the governance of emissions was given prominence above all other matters within the Paris Agreement's (PA) framework. Unlike the KP—which also focused on climate technology collaborations—the PA specified that all ratifying countries must report on national GHG inventories (Article 13.7a). The PA rightly drew attention to the potential “interactions between the inventory compilers and stakeholders [and is the] most time-consuming part of the emission inventory compilation process [...]” (IPCC, 2019: chapter 2). In addition, Article 4.13 stipulates that climate plans must include clearcut emissions reduction plans—and be delivered as part of their Nationally Determined Contributions (NDCs) (Weikmans et al., 2020).² The PA's Enhanced Transparency Framework (ETF) and the Global Stocktake have guided emissions inventory compilation and reporting processes (Milkoreit & Haapala, 2019). Last, the PA stipulated that emissions data from all countries are subject to technical review (under Article 13.11). This consideration is an important advancement especially since developing countries are now responsible for the majority of GHG emissions worldwide (Herman, 2024).

2.2 Emissions-based governance intermediaries

Progress on emissions reductions must be monitored by appropriate institutional, legal, and procedural arrangements to guarantee sufficient capacity and technical competence (Nukushewa et al., 2021). Despite calls for greater transparency, the IPCC has recently recognized that GHG data repositories are likely to have underlying issues of consistency (IPCC, 2022a), attributable to diversity of approaches to monitor, report, verify, and respond to reviews of GHG estimates (IPCC, 2018). To mend these inconsistencies, it has called for *intermediaries* to assist with the compilation of country-level GHG inventories. Specifically, several international *intermediaries* are called on to help “meet the criteria for validating national emissions” (IPCC, 2019: pg. 2.17).

These *intermediaries* largely cover Measurement (M), Reporting (R), or Verification (V), and may include “national statistical agencies, ministries, international organizations, academia, economic sectors such as industries, trade, transport, service sector, and others depending on national circumstances” (IPCC, 2019: 2.5). MRV intermediaries may help “support activities related to data collection include maintaining data flows, improving estimates, generating estimates for new categories and/or replacing existing data sources when those currently used are no longer available”(ibid). In addition, countries must designate a “lead organisation with the responsibility for reporting official national GHG estimates [and] [...] an international point of contact on climate reporting” (IPCC, 2019: 1.4).

² “Parties normally have to report on seven GHGs (carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and nitrogen trifluoride (NF₃)) in their national inventory reports (UNFCCC, 2019a, Annex, paragraph 48). However, developing country Parties that need it in the light of their capacities have the flexibility to instead report only three GHGs (CO₂, CH₄ and N₂O) as well as any of the additional four gases (HFCs, PFCs, SF₆ and NF₃) that are included in the Party's NDC”.



Fig. 1 Global emissions-based governance system. *Source:* Authors

A central MRV monitoring *intermediary* is the UNFCCC’s Task Force on National Greenhouse Gas Inventories. The Task Force ensures that reporting methodologies are consistent and transparent. The International Assessment and Review focuses on verification and includes a “technical review” conducted by Expert Review Teams. And last, the IPCC’s Consultative Group of Experts acts as a measurement *intermediary* and puts forth recommendations to improve the quality of emissions data. These recommendations are submitted to the IPCC Emission Factor Database,³ with the purpose to streamline the “calculation of anthropogenic emissions by sources and removals by sinks of greenhouse gases” (IPCC, 2023).

3 RIT model for emissions-based climate governance

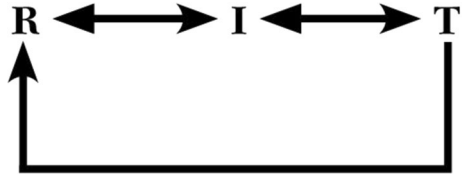
The discussion above outlined the complex emissions governance arrangements that were established under the UNFCCC—including different institutions, actors, and governance intermediaries. Bäckstrand and Kuyper (2017) draw attention to these myriad actors, and the key orchestrating roles they play in climate governance. Others similarly focus on the orchestrating roles of private, non-state actors to mend climate governance gaps (Betsill et al., 2015; Hale & Roger, 2014; Hermwille, 2018). To analyse similarly complex governance systems, and orchestration of public and private actors, Abbot et al. (2017) develop the RIT (Regulator–Intermediary–Target) model. In what follows we discuss related literature that applies the RIT model before applying it to our case study of the EU-ETS (Emissions Trading System) (Fig. 1).

3.1 Regulator–intermediary–target framework

The RIT framework is previously used to explain instances of complexity in regulatory governance by introducing the important but often overlooked role of the *intermediary*. Whereas much of the broader regulatory literature tends to focus on the binary relationship between ‘R’ (*regulator*) and ‘T’ (*target*), or otherwise ‘P’ *principal* and ‘A’ *agent*, the inclusion of ‘I’ *Intermediaries* captures other important nuances of “complex governance relationships in

³ <https://www.ipcc-nggip.iges.or.jp/EFDB/main.php>.

Fig. 2 The RIT framework.
 Source: Abbot et al. (2017)



regulatory regimes” (Havinga & Verbruggen, 2017: 59). In this manner, the RIT captures an important “dimension to study the various roles of NGOs, trans-governmental networks or international organisations” (Abbot et al., 2017: 15). Figure 2 depicts the influence bi-directional relationship of *regulators* and *intermediaries*, as well as *targets* and *intermediaries*. Importantly, it also shows how the *target* can in turn influence the *regulator*—e.g., through corporate lobbying or political activities (Abbot et al., 2017).

The integration of *intermediaries* into the RIT framework, moreover, helps to shed light on hidden layers of regulatory governance (Black, 2008). Since *intermediaries* often fill gaps left by a “nascent regulator” this relationship is referred to as “intermediary co-regulation” (Auld & Renckens, 2017). Nevertheless, through this process, the *Intermediary* may “deploy their own extant regulatory procedures and interpretations due to a lack of structured guidance” (Auld & Renckens, 2017: 97). The implication is that the “relationship with that regulator” oftentimes empowers the *intermediary* (ibid). Furthermore, *vis-à-vis* this relationship, the *target* can capture the *intermediary*, which has become increasingly more prevalent in hybrid climate governance systems (Bäckstrand, 2008). In other instances, an *intermediary* can directly capture a *regulator*; in addition, a *regulator* or *target* can capture an *intermediary*. Finally, in rare occasions, the *target* can capture the *regulator* using the *intermediary* (Pegram, 2017).

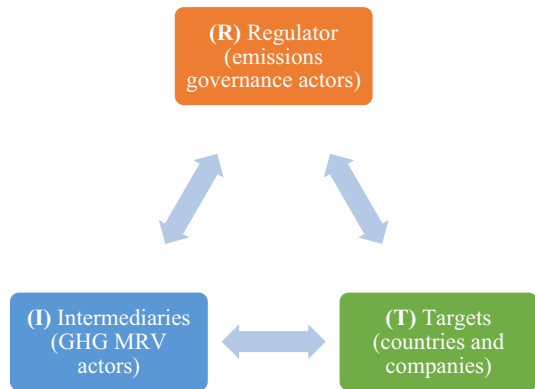
The RIT has enabled deeper investigation of these actors and relationships in recent studies. For example, Loconto and Busch (2010) as well as Auld and Renckens (2017) use the RIT model to look at the role of private certification schemes and related technologies. Havinga and Verbruggen (2017) focus on the I–T (*intermediary–target*) relationship to explore food safety regulations in the EU. Others have empirically shown, in similar vein, that there can be ulterior motives behind the actions of *intermediaries* (Havinga & Verbruggen, 2017; van der Heijden, 2017). These studies indeed demonstrate the extent to which the *target* can capture the *intermediary*, and in turn affect the regulatory stringency. Exposing potential regulatory capture is consequently a main strength of the RIT model. Considering these strengths, the RIT model is particularly well-suited to examine emissions governance since climate regulations permeate multiple governance domains, the subject we now turn to.

3.2 RIT models for emissions-based climate governance

As outlined in Sect. 2, the reduction of greenhouse gas emissions is, ultimately, the goal of emissions-based governance (Biermann, 2010). Such governance systems involve not only state actors, but also non-state and private actors involved in regulating, monitoring, reporting, and verifying (Pattberg & Strippel, 2008; Stern, 2011). Indeed, the UNFCCC has in some instances directly catalyzed the development of intermediaries—for example by introducing the Global Climate Action Portal (Mai & Elsässer, 2022)—which now includes over 5000 organizations and over 20,000 companies. Recent studies uncover key relationships between non-state actors and the UNFCCC secretariat (Hickmann & Elsässer, 2020).

Consequential to emissions governance are the active and inactive roles played by *intermediaries*, first because they govern the timeliness of inventory reporting, and second

Fig. 3 Emissions-based climate governance and the RIT framework. *Source:* Authors



because they predominantly ensure the transparency and accuracy of emissions reporting (IPCC, 2019). The RIT can help to further explore emissions-based governance intermediaries dealing with both ‘soft’ and ‘hard’ governance mechanisms (Abbot, 2012). Soft governance mechanisms, moreover, involves “actors as rule-makers, intermediaries, and targets, often in complex private governance regimes” (Abbot et al., 2017: 17). Figure 3 depicts a simplified diagram of the RIT model for emissions-based climate governance.

4 Case study: emissions-based governance in the EU

This section presents the case study EU emissions governance by analyzing the EU-ETS using the RIT framework. We develop a supranational case study based on prior literature (Gerring, 2004), drawing on prior case studies of the EU-ETS (Demailly & Quirion, 2008; Genovese & Tvinnereim, 2019). Though case studies come with certain methodological tradeoffs (e.g., they are unable to determine statistical significance), they are helpful in demonstrating how complex systems function in practice, and also indicate causal inference (Gerring, 2004, 2005) (Fig. 4).

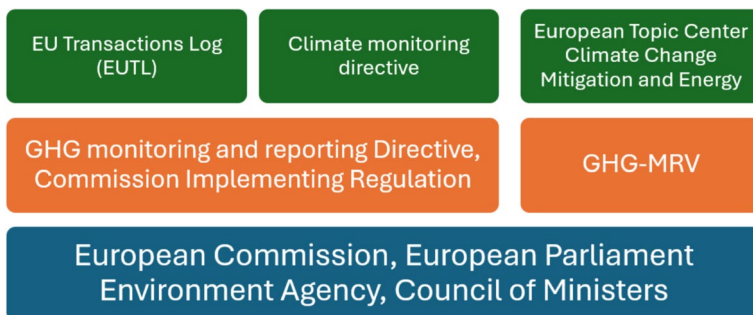


Fig. 4 EU ETS emissions-governance framework. Author’s rendition of EU-ETS

4.1 The development of the EU-ETS governance framework

While stipulations under successive UNFCCC conferences laid the groundwork for MRV *intermediaries*—specifically for measuring, reporting, verifying, and trading GHGs at the country-level—the EU-ETS directly connected industry and industrial emissions to regulation. The European Commission initially expressed interest for emissions trading in a Green Paper wherein it proposed that “the Community could set up its own internal trading regime by 2005” (European Commission, COM/2000/0087). Previous EU-wide experiences also weighed in, such as the Concerted Action on Market Based Instruments (1996–1998), the Convention on Long-range Transboundary Air Pollution, as well as the Concerted Action on Tradable Emission Permits (Sorrell & Skea, 1999). Given that the US failed to ratify the KP, “In a very short space of time,” the EU ensured that “emissions trading [...] [would] become the cornerstone of EU climate policy” (Convery, 2009: 404).

The Burden Sharing Agreement (1998) tied EU Member State emissions reduction goals, specifically 8% by 2012 against 1990 levels, to the KP (Skjaerseth & Wettestad, 2008). The Linking Directive and the EU Monitoring Mechanism ensured that the EU-ETS was further intertwined in the KP—subsequently reinforced by the Effort Sharing Directive (ESD) under the Paris Agreement. The ESD is based on the principle of cost effectiveness—calculated on GDP per capita—and distributes responsibilities equitably across Member States. The Implementing Regulation (EC 749/2014) and the Delegated Regulation (EU 666/2014) also detail further national GHG reporting requirements. Compliance cycle rules are set forth in the Commission Implementing Regulation (EU) 2018/2066 and the GHG monitoring and reporting Directive 2003/87/EC as well as (EU) No 601/2012. The emissions data must be independently verified by a designated intermediary, and the number of allowances surrendered by end of April each year.

When the EU-ETS was launched in January 2005 it was the world’s first multi-country, multi-industry-focused emissions governance system (Andersen & Ekins, 2009). Built on the idea that emissions trading can lead to dynamic efficiency and induce carbon reducing innovations (Crocker, 1966; Nordhaus et al., 1992; Opschoor & Vos, 1989), it has evolved to become the most advanced emissions governance system in the world (Andersen & Ekins, 2009). It now has a well-developed mix of hard and soft regulations, spanning regulatory oversight over companies, industries and countries. In comparison to the UNFCCC or individual country-level emissions governance schemes, moreover, the EU-ETS has the highest level of enforcement authority—sometimes referred to as climate regulatory “teeth” (Coen et al., 2022).

Table 1 provides an overview of the RIT actors within the EU-ETS system. As we map out below in greater detail, notwithstanding the promising regulatory oversight of these hard and soft regulations, the relationship between actors within this emissions-based governance is highly complex, and merits both policy and scholarly attention.

4.2 Evolution of the EU-ETS

The EU-ETS has been rolled out in four phases: Phase 1 (2005–2007), Phase 2 (2008–2012), Phase 3 (2013–2020), and the current Phase 4 (2021–2028). It includes absolute emissions targets for industrial sectors as well as flexible market mechanisms to drive reduction in emissions (Spaargaren & Mol, 2013), initially covered 11,500 installations in 28 Member States, and was the first international cap-and-trade system of its kind (Ellerman et al.,

Table 1 RIT Actors, Regulations, and Policies in the EU-ETS

Actor/regulation/policy	Acronym	R–I–T focus
Burden Sharing Agreement (between the KP and the EU)	BSA	<i>Policy</i>
Clean development mechanisms (KP)	CDM	<i>Institutional-R</i>
EU Climate Monitoring Mechanism Directive (EU 525/2013)	CMM	<i>Policy</i>
Commission Implementing Regulation (EU 2018/2066)	N/A	<i>Policy</i>
Committee on Environment, Public Health and Food Safety	ENVI	<i>R/I</i>
Council of Ministers	CM	<i>Regulator</i>
Delegated Regulation (EU 666/2014)	N/A	<i>Policy</i>
DG Environment	DGE	<i>R/I</i>
EU Member States	MS	<i>Target</i>
European Commission	EC	<i>Regulator</i>
Effort Sharing Directive	ESD	<i>Policy</i>
EU 20-20-20 Directive	EU2020	<i>Policy</i>
EU-ETS Directive 2003/87/EC	N/A	<i>Policy</i>
The European Scientific Advisory Board on Climate Change	ESABCC	<i>Intermediary</i>
European Topic Centre Climate Change Mitigation and Energy	ETC/CME	<i>Intermediary</i>
EU Monitoring and Reporting Regulation (EU 601/2012)	MMR	<i>Policy</i>
EU Transactions Log	EUTL	<i>Intermediary</i>
European Environment Agency	EEA	<i>Regulator</i>
Implementing Regulation (EU 749/2014)	IR	<i>Policy</i>
Installations (highest emitting firms and industries)	N/A	<i>Target</i>
The Industry, Research and Energy Committee	ITRE	<i>Intermediary</i>
Intergovernmental Panel on Climate Change	IPCC	<i>Institutional-R</i>
Joint Implementation	JI	<i>Institutional-R</i>
Kyoto Protocol	KP	<i>Policy</i>
EU Member States	MS	<i>Policy</i>
Paris Agreement	PA	<i>Policy</i>
United Nations Economic Commission for Europe	UNECE	<i>R/I</i>
United Nations Framework Convention on Climate Change	UNFCCC	<i>Institutional-R</i>

Table 1 depicts the RIT actors within global emissions governance systems. Institutional regulator denotes a global emissions governance actor within the UNFCCC framework

2016). With respect to monitoring and reporting different GHGs, in Phase 1, only CO₂ emissions were included. At the discretion of Member States, the voluntary inclusion of nitrous oxide (N₂O) emissions was permitted in Phase 2. Phase 3 included governance and reporting of N₂O and Perfluorocarbons (PFC) emissions (European Commission, 2015); Phase 4 includes CO₂ emissions, N₂O emissions from all nitric, adipic and glyoxylic acid production and PFC emissions from aluminum production (Herman, 2024).

The 1st Phase of the EU-ETS was considered a pilot stage, initially covering power and heat, iron, steel, cement and oil refining sectors. During the development phases of the EU-ETS “the European Parliament lost the battle but won the war. It had unsuccessfully advocated for more auctioning, tighter cap, more centralized control, and wider coverage” (Convery, 2009: 408). Through National Allocation Plans, Member States were given the option to determine the number of permits to supply to the industrial installations within their borders. It is estimated that 200 million tons of carbon

equivalents (CO₂-e) were verified and reduced during this initial pilot phase (Anderson & Di Maria, 2011). Non-compliant companies were fined 40 euros per ton of CO₂ emitted (Directive 2003/87/EC).

The 2nd Phase drew-in non-EU countries such as Iceland, Norway and Liechtenstein. Penalties for non-compliance were increased to 100 euros per ton of CO₂-e. Importantly, in Phase 2, the CDM and JI (two key Kyoto instruments) were integrated into the regulatory system. They could be used to obtain CO₂ offset credits through the Linking Directive, amendment to Directive 2003/87/EC. Unfortunately, the first two phases witnessed widespread fraud (Abrell et al., 2022). Indeed, evidence of fraud was published by “Regulatory Assistance Project” which found that slightly more than half of EU-ETS revenues were being redirected towards non-climate related projects. The expected rapid transition to renewable energy usage, moreover, was not effectively catalyzed in these phases (Demailly & Quirion, 2006; Hintermann, 2016).

Nevertheless, important policy learnings were carried forward into the 3rd and 4th Phases (European Commission, 2020). To meet the EU’s collective 20% reduction in GHGs by 2020, indeed, regulators agreed that the EU-ETS required substantial revision. The 3rd Phase underwent several significant regulatory changes (Directive 2008/101/EC). The aviation sector was also included, while monitoring and reporting GHGs were required to align with EU Monitoring and Reporting Regulation (MRR) (EU 601/2012). A uniform emissions cap was applied to all EU Member States in the 3rd Phase, set to increase 1.74% annually (Directive 2009/29/EC). While auctioning continued to take place at the national level, the EU supervised the multinational trade and auctions. To do this, it introduced the Linear Reduction Factor to determine the context of the overall 20% reduction target by 2020.

Due largely to excess allowances and grandfathering that occurred in the first two phases—as well as the unforeseen financial crisis in 2008—numerous EU Emissions Allowances (EUAs) remained unused or unreported, and the price per ton of emissions collapsed (from 30 to 7 euros). The over-allocation of permits remained a perennial issue during the 3rd Phase. In response, grandfathering and auctioning of emissions permits (or ‘rights to pollute’) were revised to align with benchmarks and future emissions reduction targets under the EU’s 2020 Directive—i.e., the 20% EU-wide GHG reduction target. A related decision was made to backload emissions auctions going forward and, importantly, the Commission introduced a Market Stability Reserve to be implemented in the following Phase (European Parliament, 2014). The current Phase 4 began on the 1st of January 2021 and runs until the 31st of December 2028. Smaller installations are excluded in Croatia, France, Germany, Italy, Slovenia, Spain, Portugal, and Iceland (European Commission, 2020).

5 Findings: the EU-ETS emissions-based governance system

Having discussed the evolution of the EU-ETS governance framework, we now use the RIT framework for deeper analysis of the EU-ETS as the world’s foremost emissions governance system.



Fig. 5 Regulatory actors involved in the EU-ETS. *Source:* Authors

5.1 The regulators

The European Commission and the European Environment Agency produce the total GHG inventory for the EU-27. These inventories are submitted to the UNFCCC as a collective GHG inventory for the EU and subsequently used as a baseline for the EU-ETS. Consistency and transparency of GHG emissions' inventories are also covered in Articles 10–12 of the EU-ETS (fluorinated GHGs and energy data, respectively). Since the European Commission has “has unique powers to set policy agendas, organize DGs, initiate legislations, and initiate lawsuits against non-complying Member States” (Convery, 2009)—we consider the EC as the primary *regulator* for the EU-ETS.

Nevertheless, there are six other *regulatory* actors that are also relevant. These include DG Environment, the Council of Ministers, the European Environment Agency (EEA), UNECE (United Nations Economic Commission for Europe), the Ministers for Environment, and the European Parliament (see Fig. 5). Last, three somewhat obscure regulators also exert regulatory authority for the EU-ETS: Committee on Environment, Public Health and Food Safety (ENVI); The European Scientific Advisory Board on Climate Change; and the Industry, Research and Energy Committee (ITRE).

Phase-1	Phase-2	Phase-3	Phase-4
• Power/heat generation • Oil refineries • Coke ovens • Iron and steel plants • Cement kilns • Glass manufacturing • Lime production • Brick, ceramics, and tile manufacturing • Pulp and paper production	• Power/heat generation (all plants above 20MW) • Aviation (arriving or departing from EU airports) • Nitrous oxide emissions	• Petrochemicals • Ammonia production • Aluminium production • Nitrous oxide from chemical industries • Perfluorocarbons (PFCs) from aluminium production • Expanded MRV system	• Increased stringency of emissions reduction targets (steep decline in total cap on emissions) • Revision to allocation rules on auctioning, carbon leakage, and benchmarks with respect to technological advancements • Innovation fund for renewable energy, and carbon capture and storage • Market Stability Reserve to address surplus allowances

Fig. 6 The evolution of regulatory targets in each Phase of the EU-ETS. *Source:* Authors

5.2 The targets

The basic procedure of GHG reporting through the EU-ETS is as follows. Each plant or installation governed by the EU-ETS must submit an EU Emissions Allowance (EUA). Should a company or plant exceed its allowed emissions in a certain year, it is able to buy a permit from a company that has not exceeded its allowable GHG allocation. In addition, as previously mentioned, EUAs were initially allocated for free; this means that large industrial plants were “grandfathered” in.

As discussed above, to meet the EU’s collective emissions reduction target, the EU ETS emissions trading platform was enlisted as a central emissions governance tool, especially for energy and industrial sectors. This implies that an emissions ‘cap’ from firm’s operations are set to a ‘ceiling’ (Article 1, Directive EC/87/2003). Therefore, a main *target* of the EU-ETS are firms and industries—even though, ultimately, Member States are the *target* when the Commission is understood as the *regulator*. Indeed, though specific sectors are regulated by the EU-ETS, Member States must ensure that their own industrial sectors and companies oblige to EU-ETS regulations. Therefore, the target of the EU-ETS are the 27 EU Member States, as well as Iceland, Lichtenstein, and Norway. The evolution of *targets* throughout the four Phases of the EU-ETS are depicted in Fig. 6 below.

5.3 The intermediaries

As argued above, the main role of *intermediaries* in any emission-based governance system is for monitoring, reporting, and verifying emissions (MRV). For the EU-ETS, the MRV *intermediaries* include the European Energy Exchange (EEX), Accredited Verifiers, National Accreditation Bodies, National Competent Authorities (NCAs), the European Topic Centre Climate Change Mitigation and Energy (ETC/CME), and UNECE (see Fig. 7).

Their respective roles and responsibilities, sometimes overlapping, are outlined in what follows, with greater detail provided in Table 2. Importantly, it is evident that there are many overlapping responsibilities, which also suggests opportunity for *intermediaries* to be captured.

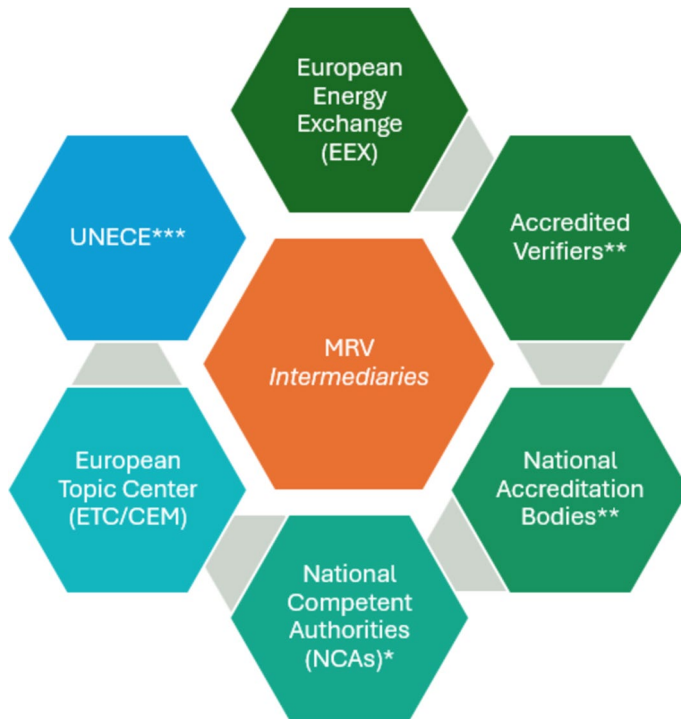


Fig. 7 MRV *Intermediaries* in the EU-ETS emission governance system. *National competent authorities are unique to each Member State (National Competent Authorities (NCAs): Austria: Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology; Belgium: Flanders: Flemish Agency for Care and Health; Wallonia: Walloon Agency for Air and Climate; Brussels: Brussels Environment; Bulgaria: Executive Environment Agency; Croatia: Ministry of Economy and Sustainable Development; Cyprus: Department of Environment, Ministry of Agriculture, Rural Development and Environment; Czech Republic: Ministry of Environment; Denmark: Danish Energy Agency; Estonia: Ministry of the Environment; Finland: Energy Authority; France: Ministry for Ecological Transition; Germany: German Emissions Trading Authority (DEHSt) at the Federal Environment Agency (UBA); Greece: Ministry of Environment and Energy; Hungary: Ministry for Innovation and Technology; Ireland: Environmental Protection Agency (EPA); Italy: Ministry of Ecological Transition; Latvia: Ministry of Environmental Protection and Regional Development; Lithuania: Environmental Protection Agency; Luxembourg: Environment Agency; Malta: Malta Resources Authority; Netherlands: Netherlands Emissions Authority (NEa); Poland: National Centre for Emissions Management (KOBiZE) under the Institute of Environmental Protection – National Research Institute; Portugal: Portuguese Environment Agency (APA); Romania: National Environmental Protection Agency; Slovakia: Ministry of Environment; Slovenia: Slovenian Environment Agency; Spain: Ministry for the Ecological Transition and the Demographic Challenge; Sweden: Swedish Environmental Protection Agency) **Accredited Verifiers/National Accreditation Bodies are also unique to each Member state: Germany: Deutsche Akkreditierungsstelle (DAkkS); France: Comité Français d'Accréditation (COFRAC); Italy: Ente Italiano di Accreditamento (ACCREDIA); Spain: Entidad Nacional de Acreditación (ENAC); Netherlands: Raad voor Accreditatie (RvA); Belgium: Belgian Accreditation Body (BELAC); Sweden: Swedac (Swedish Board for Accreditation and Conformity Assessment); Denmark: Danish Accreditation Fund (DANAK); Finland: Finnish Accreditation Service (FINAS); Austria: Akkreditierung Austria; Portugal: Instituto Português de Acreditação (IPAC); Poland: Polskie Centrum Akredytacji (PCA); Ireland: Irish National Accreditation Board (INAB); Greece: Hellenic Accreditation System (ESYD); Czech Republic: Czech Accreditation Institute (CAI); Hungary: National Accreditation Authority (NAH); Romania: Romanian Accreditation Association (RENAR); Slovakia: Slovak National Accreditation Service (SNAS); Slovenia: Slovenska Akreditacija (SA)) ***Since UNECE carries out both regulatory and intermediary efforts, it is both an *intermediary* and a *regulator*

Table 2 Details of the EU-ETS intermediaries and their MRV roles *Source* respective intermediary websites and publications

Intermediary	M–R–V	Funded by (type)	Main roles
The European energy exchange	V	Private organization founded in 2002, funded by trading fees, membership fees, and data services. Part of the Deutsche Börse Group, a publicly listed company (private)	Facilitates the efficient trading of emission allowances, ensuring that the EU ETS functions as a cost-effective and transparent market mechanism for reducing greenhouse gas emissions. As one of the central trading platforms for the EU ETS, the EEX enables the buying and selling of EU Allowances (EUAs), which are the permits that companies need to cover their greenhouse gas emissions. This market mechanism is crucial for the effective functioning of the cap-and-trade system. Its main roles are: Auctioning of EU Allowances (EUAs); Secondary Market Trading; Market Price Discovery ^{*,*} ; Through trading activities on the EEX, the market determines the price of EUAs based on supply and demand; Providing Liquidity and Transparency; Ensuring Compliance
The accredited verifiers	V	Funded by the companies that they verify (private), and also consisting of private enterprises	To ensure that the emissions data reported by operators (such as companies in energy-intensive industries and aviation) are accurate, complete, and comply with the EU ETS regulations; to verify GHG emissions reports submitted by these operators before the reports are sent to the national authorities for compliance purposes. Several of these include: DNV GL, which is a private certification body providing verification services for GHG emissions reporting under the EU ETS; SGS, which provides inspection, verification, and certification companies offering MRV services; TÜV SÜD, which is a German-based provider of technical inspection and verification services, including those related to the EU ETS; Bureau Veritas, which is a multinational company specializing in testing, inspection, and certification, offering verification services for EU ETS compliance

Table 2 (continued)

Intermediary	M-R-V	Funded by (type)	Main roles
National Accreditation Bodies	M and V	Funded by governments and the organizations seeking accreditation (hybrid)	Overseeing and accrediting the independent verifiers responsible for verifying greenhouse gas emissions reports. Their main responsibilities include ensuring that the verifiers meet specific standards of competence, impartiality, and performance. Once a verifier is accredited, NABs are responsible for monitoring and overseeing their activities to ensure continuous compliance with the required standards (such as ISO 14065 and EU ETS regulations). Should an Accredited Verifier fails to meet the required standards, NABs have the authority to suspend or revoke their accreditation. Examples include: UKAS (UK), Dakks (Germany), COFRAC (France), ENAC (Spain), ACCREDIA (Italy)
The European Topic Centre on Climate Change Mitigation and Energy	M	Mainly funded by the European Environment Agency (which itself is funded by the European Union, Partnerships, and other unspecified grants)	Supports the implementation and enhancement of the EU-ETS by providing expert analysis, data, and technical support related to climate change mitigation and energy. Its main roles are: Data Collection and Analysis; Monitoring and Reporting; Providing Technical Expertise; Supporting Policy Development; Capacity Building; Assessment of Mitigation Measures

Table 2 (continued)

Intermediary	M-R-V	Funded by (type)	Main roles
UNECE (UNECE.org)	M	Receives funding from the United Nations' regular budget, which is financed by the assessed contributions of all UN member states. Some private companies, involved in sectors like energy, transportation, trade, or technology, may fund UNECE projects aligned with their CSR objectives	Harmonizing Environmental Standards and Reporting; Facilitating Regional Cooperation on Climate Policy; Promoting Energy Efficiency and Clean Energy; Providing Technical Assistance and Capacity Building; Supporting Sustainable Development Goals (SDGs); Facilitating Access to Environmental Data and Policy Frameworks. Through initiatives such as the Convention on Long-Range Transboundary Air Pollution (CLRTAP), the UNECE helps track air pollutants and greenhouse gas emissions across its member states. This data is critical for the EU ETS and other emissions trading systems, as it allows policymakers to design informed, evidence-based climate policies
EU-ETS Climate Monitoring Mechanism	MRV	Funded by EU member states, EU budget allocations, contributions from national governments, revenues from EU-ETS auctions, and fees paid by companies for verification services	It plays a critical role in ensuring the effective implementation of the EU ETS by overseeing the monitoring, reporting, and verification of GHG emissions. Part of the broader Monitoring Mechanism Regulation (MMR), it helps to track and report greenhouse gas (GHG) emissions and assess progress toward the EU's climate targets. Its main roles are: Monitoring Greenhouse Gas Emissions; Data Collection and Reporting; Verification and Compliance; Tracking National and EU Climate Targets; Providing Transparency and Accountability; Supporting Policy Design and Adjustments; Contributing to International Reporting Obligations; Mechanism adjustments to the EU ETS as needed

Table 2 (continued)

Intermediary	M–R–V	Funded by (type)	Main roles
Consultancies	R and V	Private enterprises	Ricardo Energy & Environment provides support for emissions monitoring, reporting, and verification under the EU ETS. Carbon Trust helps businesses develop strategies for carbon emissions reduction and ensures compliance with carbon regulations. ERM (Environmental Resources Management) is a global consultancy that provides advisory services on environmental compliance, including emissions monitoring for the EU ETS. EcoAct is a climate strategy consultancy that offers services related to carbon reporting and verification for the EU ETS. Carbon Clear helps companies measure their carbon footprints, align with the EU ETS, and develop emissions reduction strategies. South Pole offers MRV services and advice on carbon offsetting, emissions trading, and regulatory compliance under the EU ETS. ClimatePartner provides end-to-end carbon management services, including emissions tracking, carbon reduction strategies, and compliance assistance for EU ETS participants. KPMG offers carbon management services, including advisory on EU ETS compliance, carbon accounting, and regulatory strategy. PwC provides advisory services for energy and carbon management, particularly helping clients comply with EU ETS and other emissions regulations. Deloitte offers comprehensive advisory services on compliance with emissions trading systems like the EU ETS, with a focus on carbon risk management and sustainability reporting. These consultancy firms assist companies in developing accurate and compliant emissions monitoring systems, preparing emissions reports, and ensuring that data is gathered according to EU ETS guidelines. Examples:

Table 2 (continued)

Intermediary	M-R-V	Funded by (type)	Main roles
Emissions trading	R	Private enterprises	ICE Futures Europe provides an emissions trading platform with advisory services related to the EU ETS and compliance strategies. Vertis Environmental Finance is a broker specializing in emissions trading that also offers compliance support and advisory services for companies under the EU ETS. Redshaw Advisors provides emissions trading services along with compliance advisory for companies involved in the EU ETS. Carbon Market Exchange (CMX) is a trading platform offering services related to EUA trading and compliance. Lloyd's Register provides independent verification services for emissions under the EU ETS

The European Energy Exchange oversee monitoring and verifying, including: (1) auctioning of emission allowances; (2) trading markets; (3) clearing and settlements; (4) market supervision and compliance; (5) provision of data and transparency; (6) policy implementation and support; (7) and stakeholder engagement.

The Accredited Verifiers oversee both reporting and verification, including: (1) the verification of emissions reports; (2) compliance with monitoring plans; (3) assessment of data quality; (4) site visits and inspections; (5) risk analysis; (6) reporting verification findings; (7) assurance of compliance; (8) support for regulatory oversight; (9) continuous improvement of monitoring and reporting practices.

The National Accreditation Bodies oversee monitoring and verification procedures such as: (1) accreditation of verifiers; (2) maintenance of standards in line with the ISO 14065 and the GHG Protocol; (3) periodic assessments and technical competence; (4) ongoing surveillance for reliability; (5) dispute resolution; (6) training and guidance; (7) coordination and harmonization across the EU; (8) regulatory oversight of installations; (9) public accountability of both regulators and installations; (10) enhancement of market confidence. The role of the National Competent Authorities covers much of the same as the National Accreditation Bodies, with the addition of (1) issuance of permits; (2) allocation of allowances; (3) registry management; (4) and policy development and advice.

The European Topic Centre on Climate Change Mitigation and Energy (ETC/CME) oversees all three MRV duties as a key nonstate *intermediary* through ten different roles and responsibilities, including: (1) data analysis and reporting, and compliance with the EU from all installations; (2) technical and scientific support for MRV of emissions; (3) monitoring and system support to improve monitoring and reporting systems; (4) policy analysis and development; (5) capacity building and training; (6) research and innovation to improve the EU-ETS; (7) stakeholder engagement and communication with policymakers, industry representatives, and civil society; (8) supporting compliance and enforcement, in tandem with the National Competent Authorities; (9) evaluation and reporting to the European Environment Agency; (10) collaboration and coordination across the EU.

UNECE has an indirect role as an *intermediary* for the EU-ETS by overseeing and enhancing the following: (1) standard-setting and best practices for energy efficiency; (2) related environmental agreements such as the CLRTAP; (3) data and reporting on GHGs; (4) capacity building and technical assistance; (5) sustainable energy, energy efficiency, and renewable energy guidance and guidelines; (6) facilitating international cooperation; (7) policy dialogue and knowledge sharing.

Beyond the direct role of EU-ETS intermediaries, it is worth mentioning several other directives and procedures that are relevant to the MRV procedures of *intermediaries*. The Climate Monitoring Mechanism (CMM)—developed under the GHG Monitoring and Reporting Directive precipitated in the creation of (EU 525/2013)—mandates that Member States use a common reporting format table. Emissions data are reported by Member States through CMM and are regularly checked for quality and consistency by intermediaries such as UNECE, the NCAs, and the ETC/CEM (Jaroszewski et al., 2010). The emissions inventories are also checked for alignment to the UNECE Convention on Long-range Transboundary Air Pollution against submissions on GHG estimates (Article 7). However, the CMM was revised by the Regulation on the Governance of the Energy Union and Climate Action in 2021, ceding powers back to the European Commission.



Fig. 8 Synopsis of the EU-ETS R–I–T Framework. *Source:* Authors

5.4 Discussion and synopsis

Based on the discussion above, a panoply of *intermediaries* exists within the EU’s emissions-based governance system. Given that emissions governance *intermediaries* are responsible for MRV activities, and for delivering emissions inventories to the *regulatory actors*—their roles and responsibilities are crucial to the EU-ETS emissions-based governance system (Hoch et al., 2019). Figure 8 provides an overview of the EU-ETS RIT system, while Table 2 digs deeper into the funding, responsibilities, and MRV remit of the *intermediaries*.

Although here we have simply scratched the surface in responding to this question, modelling the EU-ETS emissions-based governance using the R–I–T helped to unpack three key findings. First, it identified the respective roles of each type of actors. Second, it drew attention to *intermediaries* which are often led by private rather than public actors. Third, given the growing role of private actors, the potential for regulatory capture is a real risk, writ large by regulators underwriting the key governance roles for *intermediaries* (Green, 2019; MacLean, 2020).

The question is, given this complex system—with growing reliance on intermediaries—is emissions-based governance intractable? Though an estimated 1.4 billion tons of CO₂-e were reduced through these Kyoto instruments and the EU-ETS—and the EU’s overall GHGs have fallen by 25% compared to 1990 levels (Bel & Joseph, 2015)—much of those emissions reductions are the result of offshoring heavy industry (Lohman, 2012; Peters et al., 2011). Substantively, the EU-ETS system is still marred in flaws, is considered by some to be an successful emissions governance experiment (Flachsland et al., 2020), and remains highly susceptible to regulatory capture (Genovese & Tvinnereim, 2019). Simply stated, the world needs to move away from its dependence on fossil fuel extraction, production and combustion, and it remains unclear if emissions-based governance is a solution to that (Carton, 2019).

Future research lies in more thorough scrutiny of the interests of MRV *intermediaries*. For example, which actors are pushing for a scientific focus counting and trading—with the most recently added framing and growing expectation of “negative emissions” (Anderson & Peters, 2016). By some accounts, this is based on a “neo-liberal” regulatory logic to address climate change (Stevin and Barry, 2024). In addition, the growing concern over imports of carbon-embodied goods will necessitate reflection on emissions governance in the EU and elsewhere (Grubb et al., 2022; Mehling et al., 2019). The carve-outs for some sectors in the 4th Phase of the EU-ETS—e.g., Croatia, France, Germany, Italy, Slovenia, Spain, Portugal, and Iceland (European Commission, 2020)—indeed demonstrate the capacity of the *target* to capture the regulatory, and in turn reduce the effectiveness of MRV *intermediaries*. Future work could, lastly, investigate the extent to which climate

governance intermediaries can be captured through various MRV-based emissions governance systems.

6 Conclusion

This article explored *emissions-based* climate governance, which involves a multitude of public and private actors, rules and regulations, and MRV *intermediaries*, with the goal to significantly reduce GHGs. We applied the Regulatory-Intermediary-Target framework to investigate the EU-ETS, the world's foremost emissions governance system. The framework applied here can be used to explore other climate governance systems (e.g., for renewable energy support, industrial decarbonisation, energy trading, and other emissions trading platforms) (Morseletto et al., 2017). We unpacked the actors and their constituent role and responsibilities using the RIT, finding that the role of *intermediary* actors largely revolves around MRV, but also that the majority of these actors are privately-led or funded. This draws attention to the potential for political capture—in this case the “I-intermediary” can capture the “R-regulator”, or the “T-Target.” Evidence of regulatory capture can already be located on the widespread fraud during the first three phases of the EU-ETS, but also that many MRV *intermediaries* are funded by the private sector.

Despite the complexity, it isn't all bad news. Drilling down into the EU emissions governance system, much experimentation and learning have occurred (Hoffmann, 2011). Industrial sectors and companies covered under the EU-ETS have, for example, garnered expertise in measuring their industrial emissions. Such expertise has provided EU-ETS covered companies with first-mover advantages: they have garnered much experience incorporating climate risks into their operations (Joltreau & Sommerfeld, 2019). EU companies, as a result, are seen as becoming more climate competitive in contrast to companies not yet subjected to similar emissions regulations (Evans et al., 2021). Nevertheless, should emissions-based governance systems provide the grounds for rapid and significant emissions reductions, attention needs to be placed on the existing framework, actors and their (often overlapping) MRV roles and responsibilities (Winkler et al., 2018). What will be important is that, as emissions-based governance systems continue to evolve, concerted research efforts are made to understand the interacting elements, especially the relationships between *intermediaries* and *regulators*, as well as *intermediaries* and *targets*.

Appendix

See Figs. 9 and 10.

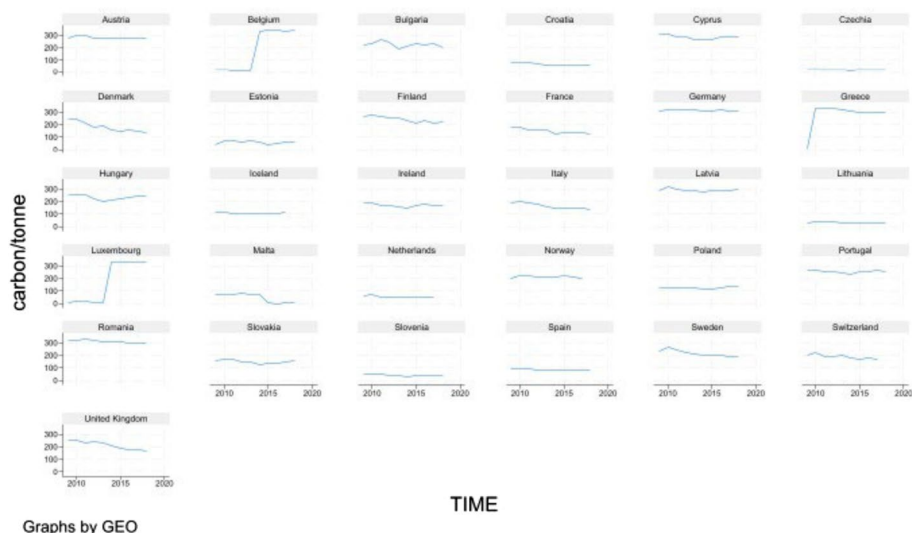


Fig. 9 EU Member State Carbon Emissions (2000–2019). *Source:* Author's analysis of UNFCCC emissions inventory data

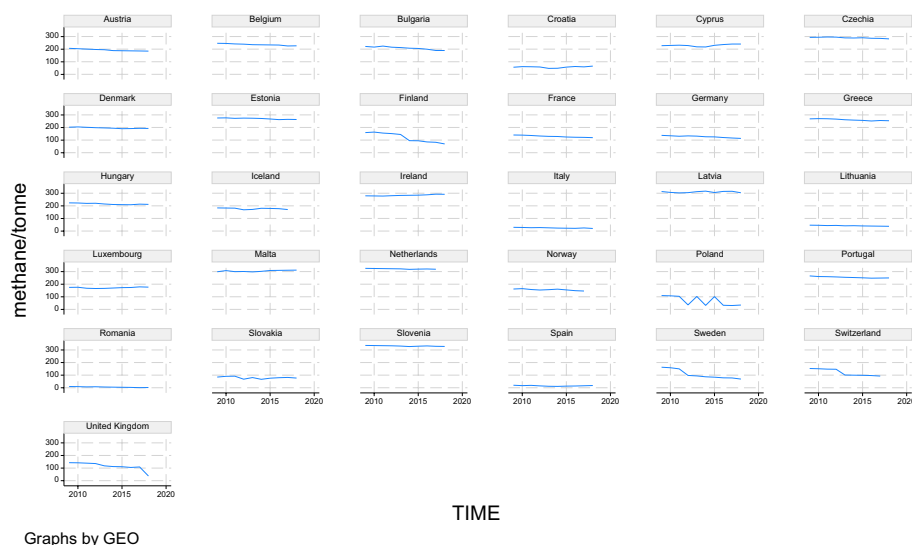


Fig. 10 EU Member State Methane Emissions (2000–2019). *Source:* Author's rendition of UNFCCC emissions inventory data

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