

Strengthening National Governance Systems

Exploring Current Practices and Innovations for Reporting on Policies and Measures and Greenhouse Gas Projections



Authors:

Annabel Vella (VITO), Kelsey van Maris (VITO), Tom Dauwe (VITO)

EEA project manager:

Magdalena Jóźwicka-Olsen



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European Topic Centre on
Climate change mitigation
<https://www.eionet.europa.eu/etcs/etc-cm>
etccm@vito.be

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Summary

This report explores the state of the national governance systems for reporting on integrated policies and measures (PaMs) and anthropogenic greenhouse gas (GHG) emission projections in European countries, including EU Member States, Iceland, Norway, and Switzerland. The so-called national systems comprise institutional, legal, and procedural arrangements established within each country to ensure compliance with reporting obligations under the Governance Regulation (EU) 2018/1999. By understanding the current state of play of these national systems, the study aims to highlight established procedures and arrangements while identifying key areas that remain less mature. It also aims to emphasise good practices adopted by various countries, offering examples that can be adapted to other countries to enhance their governance structures. In turn, this study aims to support EU Member States and the neighbouring countries in building governance systems that go beyond compliance with reporting rules to ensure progress toward common sustainability and climate neutral targets. The study is guided by the following main questions:

1. What is the current state of play of national systems in the frame of reporting on integrated PaMs and GHG emission projections? What key challenges do countries face in this reporting process?
2. What good practices have countries adopted to address these challenges?
3. How can innovation and digitalisation be leveraged to enhance monitoring, evaluation, and reporting processes while overcoming these challenges?

The study also summarises the role and structure of the European Union system for reporting on PaMs and GHG emissions projections (the 'Union system'), as outlined in Article 39 of the Governance Regulation. The **Union system**, established under the Governance Regulation, provides an overarching framework that clarifies roles and responsibilities within the EU, ensuring alignment and coherence between national, European, and global climate governance efforts. Managed by the European Commission, with support from the European Environment Agency (EEA), the system ensures the collection, quality control, and dissemination of data on PaMs and GHG projections. Quality of reporting is ensured through a combination of automated quality checks and manual reviews. *Reportnet 3*, the primary online platform, facilitates streamlined data submission and validation. Quality-checked data is publicly disseminated via, inter alia, the [Climate and Energy in the EU Platform](#) and used for EU-level reporting, including the [Climate Action Progress Report](#), the [State of the Energy Union Report](#), and the EEA's annual [Trends and Projections in Europe](#) report. By standardising reporting requirements and supporting Member States with technical tools, the Union system fosters coherence and alignment within the EU's climate governance framework.

To assess the national systems' state of play, this study uses the national system reports submitted under the Governance Regulation as the primary data source. These are complemented by surveys and interviews conducted with national lead reporters and governance experts. A comprehensive data collection framework was developed to identify the characteristics and arrangements established in national systems, which are categorised in five core elements: **institutional and procedural robustness**, **legal formality**, **alignment with other frameworks**, **accountability and transparency**, and **public participation**. The extent of arrangements and procedures established in each country are presented by the heatmap in Table S-1.

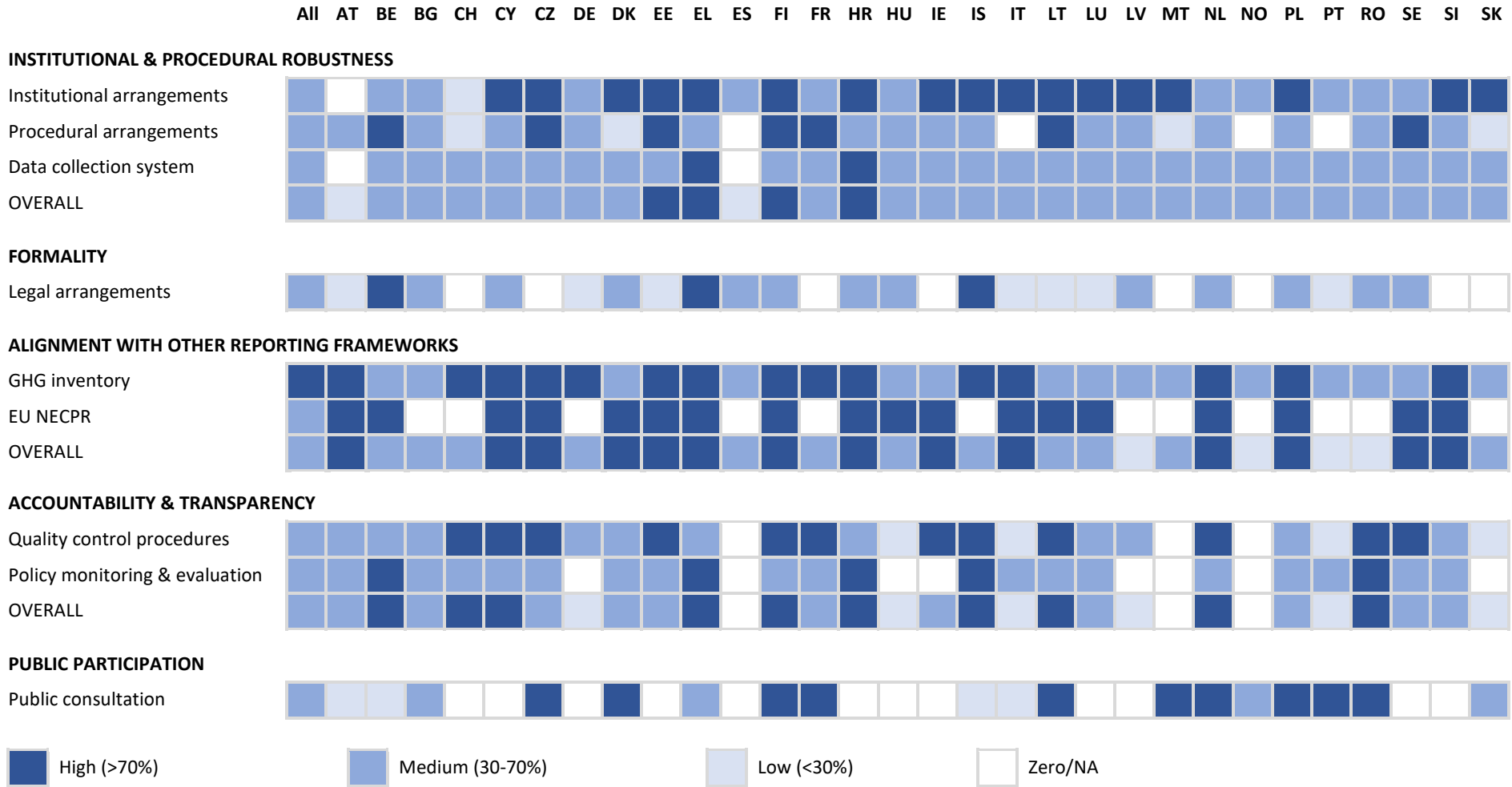
The assessment of the national systems' state of play identifies the following key findings.

1. **Robust and well-defined national (and Union) systems** with clear legal frameworks, formalised roles, and integrated responsibilities enhance the quality of reporting, streamline processes, reduce overlaps and burdens, and align national policies with broader climate goals while promoting inclusive stakeholder engagement.

2. Most countries demonstrate **well-established institutional arrangements**, with defined institutional responsibilities and involvement of a diverse range of policy areas and experts in the reporting process. Data collection procedures are also robust in many countries.
3. **Various countries face capacity constraints** which hinder the maintenance of robust reporting mechanisms. **Resource constraints** are observed to limit countries' ability to meet quality requirements.
4. **Strengthening networks of sectoral experts** is crucial for improving stakeholder input, policy integration, and coordination across ministries. Despite existing arrangements for inter-ministerial collaboration, many countries lack formalised expert networks, face delays in data provision, and encounter challenges aligning climate reporting with national and EU policy goals.
5. **Countries generally lack sufficient procedures for the consideration, approval, and review of reporting.** Strengthening these procedures could enhance the robustness and effectiveness of national systems.
6. **Countries without legal frameworks for reporting could benefit from formalising their national systems** to enhance accountability and ensure consistent long-term practices. Robust legal arrangements facilitate inter-ministerial collaboration, improve data exchange, and ensure timely reporting. Less formal systems tend to face challenges in coordinating and securing input from relevant ministries.
7. PaMs and emission projections reporting is generally **aligned with the GHG inventory and the EU national energy and climate progress reporting (NECPR)**. The good alignment with the GHG emission inventory, is largely attributable to the long-standing arrangements for the inventory systems, which often serve as a robust foundation for reporting projections.
8. While many countries have established quality control procedures, **significant deficiencies remain in the quality and timeliness of PaMs and emission projections reporting**, with some countries lacking established QA/QC systems.
9. **Formalised policy monitoring and evaluation practices remain insufficient** in most countries, **resulting in low reporting of PaMs impacts**.
10. **Public consultation practices in climate policymaking and reporting vary significantly** between countries, highlighting the need for enhanced practices to improve transparency and aligning with participatory governance principles.

Based on the identification of existing challenges, the report presents key recommendations for countries and the EU institutions to improve the robustness of national (and Union) systems. **Countries are strongly encouraged not only to set up and maintain, but also to continuously improve their national systems, as they provide the foundation for reliable data that informs climate policy, tracks progress toward goals, and aligns with international commitments.** Legal frameworks must be underpinned by political will, adequate financial resources, and standardised procedures. Tailored training programs, and structured cross-border learning initiatives, supported by the EU and EEA, are useful to foster innovation and build long-term institutional capacity across Member States. This will also contribute to solutions for capacity constraints. Member States may improve the objectivity and transparency of reporting through independent advisory councils or formalised policy monitoring tools. Innovative digital solutions, such as the use of Big Data and Artificial Intelligence, can play a role in bridging existing gaps in quality of reporting and equipping national systems to meet future challenges. Public participation mechanisms, such as citizen assemblies, can enhance transparency and trust in governance systems. Effective framing of climate issues is also essential to garner broader support for climate governance. Therefore, it is important to emphasise co-benefits, like clean energy access, health improvements, or economic gains, to enhance public and political engagement through.

Table S-1 The prevalence of governance arrangements and procedures in place across the European countries.



Note: These results are based on the national systems reports submitted by countries under the Governance Regulation (EU) 2018/1999.

1 Introduction

The European Union (EU)'s commitment to climate action is grounded in its ambitious goals, including achieving climate neutrality by 2050 and reducing greenhouse gas (GHG) net emissions by at least 55% by 2030 compared to 1990 levels. These objectives are enshrined in the European Climate Law and operationalised through climate legislation adopted under the European Green Deal in 2021-2024. **The legal framework for monitoring and reporting of EU climate and energy policies is provided by Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, hereinafter referred to as the Governance Regulation.** At the core of this approach are the National Energy and Climate Plans (NECPs) and long-term strategies, which ensure that Member States align their national policies with the overarching EU goals and international commitments. In this way, the **Governance Regulation integrates multiple planning and reporting obligations by streamlining reporting processes and improving coherence** across Member States.

The Enhanced Transparency Framework of the UNFCCC Paris Agreement sets out the reporting requirements to enable the availability of regular data on countries' GHG emissions, policies and measures (PaMs), progress towards targets, climate change impacts and adaptation, levels of support, and capacity-building needs (UNFCCC, n.d.). Thanks to the Governance Regulation, **the EU has developed a comprehensive reporting system, which standardises reporting formats and timelines across Member States.** This structure integrates various dimensions of monitoring, from emissions inventories to the evaluation of policy impacts, supporting both national and EU-level decision-making processes.

Monitoring, reporting and verification (MRV) mechanisms are essential components of climate and energy governance, providing the critical data and analytical foundation needed to evaluate progress, identify deficiencies, and implement corrective actions (Bellassen et al., 2015). These processes enhance transparency and accountability by offering a clear and consistent framework for tracking performance against established targets and ensuring that resources are allocated effectively (Singh et al., 2016). Moreover, they facilitate stakeholder trust and ensure compliance with international commitments, such as the Paris Agreement, which underscores the necessity of robust monitoring frameworks to measure progress (Bellassen et al., 2015; Wiener, 2015).

Within the EU climate and governance framework, **national systems serve as the backbone for planning, monitoring, and reporting processes, aligning national efforts with global and European targets.** Their effectiveness, however, depends on several critical attributes that ensure coherence and operational efficiency. Governance systems must provide certainty and direction by establishing a clear long-term vision and robust national targets aligned with the EU's 2050 climate neutrality goals (Evans et al., 2024; Oberthür et al., 2023). This clarity facilitates the integration of short- and long-term planning efforts and ensures consistency with overarching objectives (Evans et al., 2023; Oberthür et al., 2023). Accountability mechanisms are equally important, as they ensure transparency and compliance through robust monitoring and reporting processes (Oberthür et al., 2023). Independent advisory bodies, such as national climate councils, play a pivotal role in evaluating progress and providing evidence-based recommendations to maintain policy alignment and make timely adjustments (Chandran et al., 2018; Evans & Duwe, 2021; Oberthür et al., 2023). Furthermore, governance systems require sufficient capacity and strong coordination across institutions (Duwe et al., 2016). Clear allocation of responsibilities and enhanced inter-ministerial collaboration are critical, particularly given the integrated and cross-sectoral scope of NECPs (Duwe et al., 2016; Oberthür et al., 2023). Effective governance also depends on transparency attained through stakeholder engagement, where inclusive and participatory processes build trust and legitimacy, fostering societal consensus on climate action (Duwe et al., 2016; Oberthür et al., 2023). Governance systems need to also exhibit adaptability and a learning-oriented approach (Duwe et al., 2016), to enable

them to adjust to emerging priorities, such as evolving EU regulatory requirements, while integrating lessons from previous planning and reporting cycles.

1.1 The EU framework for national governance systems for reporting on Integrated PaMs and GHG emission projections

EU Member States are obligated to report on their climate PaMs and anthropogenic GHG emission projections under a detailed legislative framework. This framework sets structured and comprehensive reporting requirements, which demand effort and resources from Member States to ensure compliance and accuracy. These obligations are grounded in several key legislative instruments that collectively ensure the provision of standardised and reliable information.

The foundation for structured climate reporting beyond the reporting of greenhouse gas emissions was initially established by the Monitoring Mechanism Decision (Decision No 280/2004/EC) and its successor known as the Monitoring Mechanism Regulation (Regulation (EU) No 525/2013). This regulation required Member States to submit detailed information on their PaMs and GHG emission projections. While the MMR provided a solid foundation, it has since been replaced by the Governance Regulation, which provides a more comprehensive regulatory framework to meet evolving climate and energy governance needs. An important objective of the Governance Regulation was to integrate and streamline reporting under EU climate and energy legislation.

The Governance Regulation mandates the submission of integrated NECPs (Article 3), annual reporting on national inventory data (Article 26), and biennial integrated national energy and climate progress reporting (NECPR) (Article 17), and detailed integrated reporting on GHG PaMs and anthropogenic GHG emission projections (Article 18). From 2023, reporting on 'Integrated policies and measures' is part of the national energy and climate progress reports (Article 17), integrating the reporting requirements of Article 18. According to Article 17, each Member State shall report to the Commission on the status of implementation of its integrated NECP by means of integrated NECPRs covering all five dimensions of the Energy Union. The dimensions are decarbonisation (greenhouse gas reduction and renewables), energy security, energy efficiency, internal energy market, and research, innovation and competitiveness. Additionally, the Governance Regulation requires Member States to establish, by 1 January 2021, national and Union systems for reporting on PaMs and for reporting on projections of GHG emissions (Article 39).

The reporting structure, format, submission processes and review of information reported under the Governance Regulation are further specified in three implementing regulations. An overview of the link between relevant Articles of the Governance Regulation and the implementing acts is given in Table 1-1.

The first implementing regulation (Implementing Regulation (EU) 2020/1208), laid down the reporting format and structure for a limited number of Articles of the Governance Regulation. This included among others the reporting on Member States' national system for policies and measures and projections, the reporting on GHG policies and measures and GHG emission projections (Article 18 of the Governance Regulation).

The second implementing regulation (Implementing Regulation (EU) 2022/2299), laid down the reporting requirements for, among others, the reporting of the biennial progress reports (Article 17 and 20 to 25 of the Governance Regulation). The implementing regulation introduced updated tables aimed at streamlining reporting and improving the clarity and comprehensiveness of the data reported on integrated national PaMs. The reporting tables cover various aspects of PaMs, including the main PaMs characteristics, quantitative data on *ex-ante* and *ex-post* impacts, characteristics of new PaMs reported under the national energy efficiency obligation scheme or alternative measures, PaMs for renovation of public buildings and their impacts, progress towards financing of PaMs, and PaMs' impacts on air quality and emissions to air. The level of reporting obligation varies from mandatory, mandatory if available, mandatory if applicable, and voluntary.

Table 1-1 The link between different reporting elements of the Governance Regulation connected to policies and measures and projections reporting and corresponding Implementing Regulation Articles and Annexes specifying reporting structure, and format.

| GOVERNANCE REGULATION (EU) 2018/1999 | COMMISSION IMPLEMENTING REGULATION (EU) | | |
|--|---|-----------------------|-----------------------|
| | 2020/1208 | 2022/2299 | 2024/1281 |
| Integrated NECPR (Art 17) | | | |
| progress accomplished towards reaching the objectives, including progress towards the Union’s climate neutrality objective set out in Article 2(1) of Regulation (EU) 2021/1119, targets and contributions set out in the integrated NECP, and towards financing and implementing the policies and measures necessary to meet them, including a review of actual investment against initial investment assumptions | | Art 7; Annex IX | |
| impact on air quality and on emissions of air pollutants | | Art 11; Annex XIV | |
| cover the information on policies and measures and projections of anthropogenic greenhouse gas emissions by sources and removals by sinks in the reports referred to in Article 18 | Refer to Art 18 below | Refer to Art 18 below | Refer to Art 18 below |
| Integrated reporting on greenhouse gas policies and measures and on projections (Art 18) | | | |
| National policies and measures or group of measures | Art 37, Annex XXIV | Art 7; Annex IX | |
| National projections of anthropogenic greenhouse gas emissions by sources and removals by sinks | Art 38, Annex XXV | | Annex XX |
| Renewable Energy (Art 20) | | | |
| Objectives, targets and contributions | | Art 2; Annex II | |
| Policies and measures | | Art 7; Annex IX | |
| Their impact on air quality and on emissions of air pollutants | | Art 11; Annex XIV | |
| Progress towards financing | | Art 10; Annex XIII | |
| Additional reporting | | Art 13; Annex XVI | |
| Energy Efficiency (Art 21) | | | |
| Objectives, targets and contributions | | Art 3; Annex IV | |
| Policies and measures | | Art 7; Annex IX | |
| Their impact on air quality and on emissions of air pollutants | | Art 11; Annex XIV | |
| National energy efficiency obligation scheme and alternative measures pursuant to Article 7a and 7b of Directive 2012/27/EU | | Art 7; Annex X | |
| Amount of energy savings achieved under Article 7 of Directive 2012/27/EU | | Art 8; Annex XI | |
| Article 5 of Directive 2012/27/EU | | Art 9; Annex XII | |
| Progress towards financing | | Art 10; Annex XIII | |
| Additional reporting | | Art 14; Annex XVI | |
| Energy Security (Art 22) | | | |
| Objectives, targets and contributions | | Art 4; Annex V | |

| GOVERNANCE REGULATION (EU) 2018/1999 | COMMISSION IMPLEMENTING REGULATION (EU) | | |
|--|---|------------------------------|-----------|
| | 2020/1208 | 2022/2299 | 2024/1281 |
| Policies and measures | | Art 7; Annex IX | |
| Their impact on air quality and on emissions of air pollutants | | Art 11; Annex XIV | |
| Progress towards financing | | Art 10; Annex XIII | |
| Internal Energy Market (Art 23) | | | |
| Objectives, targets and contributions | | Art 5; Annex VI | |
| Policies and measures | | Art 7; Annex IX | |
| Their impact on air quality and on emissions of air pollutants | | Art 11; Annex XIV | |
| Progress towards financing | | Art 10; Annex XIII | |
| Energy Poverty (Art 24) | | | |
| Policies and measures | | Art 7; Annex IX | |
| Their impact on air quality and on emissions of air pollutants | | Art 11; Annex XIV | |
| Additional reporting on energy poverty and just transition | | Art 15; Annex XVIII, XIX, XX | |
| Research, Innovation & Competitiveness (Art 25) | | | |
| Objectives, targets and contributions | | Art 6; Annex VII & VIII | |
| Policies and measures | | Art 7; Annex IX | |
| Their impact on air quality and on emissions of air pollutants | | Art 11; Annex XIV | |
| Progress towards financing | | Art 10; Annex XIII | |
| National System (Art 39) | Art 36; Annex XXIII | | |

Note: Member States must report this information biennially, in uneven years, together with all other information that make up the National Energy and Climate Progress Reports. In addition, Member States must also report any substantial changes of the information of Article 18 of the Governance Regulation in even years.

In 2024, an amendment was published, Implementing Regulation (EU) 2024/1281, which affected the reporting on GHG emissions inventory and projections.

These legislative instruments highlight the administrative and technical efforts required from Member States to comply with the detailed and structured reporting obligations that underpin the EU's commitment to addressing climate change. The recent Commission evaluation of the Governance Regulation (European Commission, 2024a) found that the Regulation reduced redundancies and promoted policy coherence across EU climate and energy legislation by consolidating previously scattered obligations into integrated frameworks such as the NECPs, long-term strategies, and NECPRs. The evaluation notes that administrative efficiency has improved through standardised templates, digital tools, and a unified reporting platform. These measures have simplified data management, increased transparency, and enhanced collaboration among national authorities. Improved links between reporting entities have fostered better data consistency and supports long-term policymaking and ensure that reporting contributes to evidence-based decision-making.

The Commission's evaluation highlights that preparing the NECPs has been a complex and resource-intensive process for Member States, requiring extensive coordination across multiple national authorities. Many stakeholders emphasised that sufficient financial and human resources are key to ensuring that reporting obligations translate into meaningful contributions to climate governance. While initial reporting cycles involved a learning curve, future cycles are expected to become more efficient as national systems mature and reporting tools improve. In some cases, misalignment between national planning cycles and the Governance Regulation created additional administrative demands, but over time,

the Regulation has helped strengthen national planning capacities, align reporting with policy development, and facilitate more structured long-term decision-making.

Ensuring well-functioning national systems is essential to maximising the return on these investments. Well-designed, robust and efficient systems not only streamline coordination and reduce redundancies but also enhance the value of reporting as a tool for evidence-based policymaking. The ability to track progress in a structured and comparable manner contributes to better decision-making, supports the achievement of climate and energy goals, and ultimately strengthens the EU's collective response to climate change.

1.2 Research objectives, methodology and report structure

This study report provides an overview of the key elements of national governance systems for reporting on integrated PaMs and anthropogenic GHG emission projections in European countries, so-called national systems. It includes the EU-27 Member States as well as Iceland, Norway, and Switzerland. By explaining the current state of play of these national systems, the study aims to highlight established procedures and arrangements while identifying key areas that remain less mature. It also aims to **emphasise good practices adopted by various countries**, offering examples that can be adapted to other countries to enhance their governance structures. In addition to national governance systems, the study also **summarises the role and structure of the European Union system for reporting on PaMs and GHG emissions projections ('Union system')**, as outlined in Article 39 of the Governance Regulation. The Union system provides an overarching framework that clarifies roles and responsibilities within the EU, ensuring alignment and coherence between national, European, and global climate governance efforts.

The study is guided by the following main questions:

1. What is the **current state of play of national systems** in the frame of reporting on integrated PaMs and GHG emission projections? What **key challenges** do countries face in this reporting process?
2. What **good practices** have countries adopted to address these challenges?
3. **How can innovation and digitalisation be leveraged to enhance monitoring, evaluation, and reporting** processes while overcoming these challenges?

To address these questions, the study reviewed national system reports submitted by the relevant countries to the European Environment Agency (EEA) under the Governance Regulation. The review was combined with surveys and targeted interviews with national lead reporters to provide an understanding of the status and good practices in national systems. Insights from governance experts in climate and environmental systems were integrated with the findings of the review to propose approaches for addressing challenges in climate governance.

1.2.1 Methodology

For this study, a comprehensive data collection framework was established aimed at identifying the various characteristics and elements of national systems for reporting on PaMs and GHG emission projections. The framework was developed based on the reporting obligations outlined in Article 36 of Implementing Regulation (EU) 2020/1208. The framework consists of questions to assess arrangements for PaMs and projections separately. These questions were categorised under **five core elements for national systems**, each containing further sub-elements, as demonstrated in Table A2-1. The core elements include **institutional and procedural robustness, formality** through legal arrangements, **alignment with other reporting frameworks, accountability and transparency**, and **public participation**. The categorisation of questions into core and sub-elements closely adheres to the language of the reporting obligations.

The questions within the framework are intended to serve the following purposes:

1. Assessing the specific arrangements and procedures in countries, in line with the reporting obligations.
2. Understanding the different setups of specific arrangements and procedures through open-ended questions.
3. Identifying 'good practices' in countries.
4. Highlighting areas for improvement.

The questions were formulated under each core element in the framework to assess whether the various arrangements or procedures are in place or not, hence obtaining 'yes' (Y), 'no' (N) or 'not available' (NA) answers for each framework question, for each country. Y and N replies were used when a country specifically stated that the arrangement in question is or is not in place, respectively. NA was assigned when a country did not provide any information on the arrangement, making it impossible to verify its existence based on the report. Additional open-ended questions were included in the framework to gather any relevant information that could support more detailed data collection where necessary. Each framework question required responses separately for PaMs reporting and projections reporting, due to possible separate arrangements adopted by countries. For several questions input was necessary for either PaMs or projections reporting due to lack of relevance. The framework also featured three additional questions for each core element, allowing for (i) additional comments, (ii) identification of good practices, and (iii) indications of areas where countries planned for improvements or changes. Each framework question was assigned a reporting element number to assist the reviewers in locating the relevant information in the national systems reporting.

Annex 2 of this report provides a comprehensive description of the methodological steps together with the template used for the framework questions. It also discusses limitations of the methodology.

Table 1-2 Framework for collecting information on the national governance systems for reporting on PaMs and projections.

| Core Element of National Systems | Sub-Element | Collection of information |
|--|--|--|
| INSTITUTIONAL & PROCEDURAL ROBUSTNESS | Institutional arrangements | <ul style="list-style-type: none"> - Overall responsibility of reporting - Organisational structure - Inter-ministerial collaboration - Network groups |
| | Procedural arrangements | <ul style="list-style-type: none"> - Approval procedures of assumptions, methodologies, and models - Approval procedures of reporting - Review procedures of previous reporting cycle - Approval procedures of changes to the national system |
| | Data collection system | <ul style="list-style-type: none"> - Procedures for data/information collection for reporting - Collection of data/information for the development of new PaMs |
| FORMALITY | Legal arrangements | <ul style="list-style-type: none"> - Legal arrangements for reporting - Different elements of legal arrangements |
| ALIGNMENT WITH OTHER REPORTING FRAMEWORKS | GHG inventory reporting | <ul style="list-style-type: none"> - Alignment of the institutional arrangements - Alignment of methodologies and assumptions |
| | Article 17 of the Governance Regulation (EU) 2018/1999 (NECPR) | <ul style="list-style-type: none"> - Alignment of reported information |
| ACCOUNTABILITY & TRANSPARENCY | Quality control procedures | <ul style="list-style-type: none"> - Availability of defined timeline - Arrangements for timeliness, transparency, completeness of PaMs list, and gases and activities in projections, accuracy, and consistency - Arrangements for consistency between PaMs and projections reporting - Arrangements for consistency of energy projections across sectors |
| | Policy monitoring & evaluation | <ul style="list-style-type: none"> - Arrangements for tracking progress and monitoring of PaMs - Arrangement for PaMs evaluation - Arrangements for corrective actions for PaMs |
| PUBLIC PARTICIPATION | Public consultations | <ul style="list-style-type: none"> - Procedures for public engagements for reporting - Engagement of different stakeholder groups |

Surveys and interviews were conducted with several country reporters to supplement the data collected from the national system reports. They provided further insights into good practices, innovative approaches, areas requiring improvement, and challenges encountered by countries in relation to the establishment of their national systems and the reporting of PaMs and projections. An online survey was disseminated among national lead reporters for dataflows concerning national systems, PaMs, and GHG emission projections reporting. The survey questions, detailed in Annex 2 of this report, were developed to gain insights regarding the perceived strengths of the national systems, procedural arrangements for the review of these systems, opportunities for enhancement, technologies and tools utilised in reporting, and PaMs evaluation arrangements.

Out of 30 countries, 12 provided responses to the survey, and 6 of these expressed interest in participating in follow-up interviews. The selection of countries for interviews was limited to three. The primary objective of the interviews was to gain a more profound understanding of good practices in relation to

institutional and procedural arrangements in place, and practices of PaMs evaluations. Interviews also covered challenges faced, and potential solutions for the enhancement of the national system from a national perspective. Interviews were conducted with country reporters for Ireland, Germany, and Bulgaria, following semi-structured interviews based on questions tailored for each country. The interview questions are available in Annex 2.

There are several limitations to in the research approach employed in this study. The methodology is aimed towards obtaining a representation of the diverse practices within national systems for reporting on PaMs and projections by integrating information from national system reports, surveys, and interviews. At the same time, while this report provides valuable insights, it cannot capture the full complexity of the subject. The interviews conducted with three national lead reporters offered a detailed perspective on the existing procedures and challenges, thereby complementing the other sources of information. Conducting interviews with all reporting countries would achieve a more comprehensive understanding of the dynamics present in each country. Moreover, the findings derived from the national system reports and survey responses revealed inconsistencies between these two data sources, which may indicate areas that require improvement in reporting. Consequently, the findings of this study should be regarded as illustrative examples of national system arrangements, procedures, best practices, and challenges encountered by reporters.

1.2.2 Report structure

This report is organised as follows:

Chapter 2 describes the data collection framework designed to analyse the state of play of Union and national systems for reporting on PaMs and GHG emission projections. It includes an overview of quality checks on the respective reporting systems, which provides context on the quality in the national reports. The chapter then presents key insights on the strengths, weaknesses, and challenges of the national systems.

Chapter 3 explores good practices in national systems for reporting on PaMs and GHG emission projections, by including specific examples and case studies to illustrate these approaches.

Chapter 4 looks toward the future of climate governance and MRV systems, focusing on opportunities for innovation at both technical and procedural levels.

Chapter 5 concludes the study by summarising key findings and offering recommendations based on interviews conducted with governance experts, shedding light on the pathways towards more effective, transparent, and accountable governance systems.

The full **methodological approach of the study is available in Annex 2** of this report.

2 State of play of Union and national systems for reporting on policies and measures and projections

In the year 2021, Member States and the European Commission were required to provide a full description of the relevant institutional, legal, and procedural arrangements for reporting on PaMs and anthropogenic GHG emissions, in accordance with Article 39 of the Governance Regulation¹. For subsequent reporting years, only modifications to the national system are required to be reported.

Norway and Iceland, as member countries of the European Free Trade Association (EFTA), are legally required to report on PaMs and GHG emission projections under the European Economic Area Agreement. Parts of the Governance Regulation, including Articles 18 and 39, apply to them. They report information to the European Environment Agency for processing, but their reporting is formally addressed to the EFTA Surveillance Authority instead of the European Commission. Switzerland participates in the European Economic Area-Eionet network under a bilateral agreement with the EU. Switzerland provides information voluntarily. Thus, Norway and Iceland have legal obligations for reporting, while Switzerland's participation is cooperative and voluntary.

The submitted information on national systems (EEA, n.d.)² shall provide up-to-date and comprehensive information on the Union and national systems. For this reason, this study uses the reported information in the national system reports as the primary source of information for assessing the status of national systems in the 30 countries.

This chapter is organised as follows. **Section 2.1 provides a description of the Union System** according to the established institutional, legal and procedural arrangements for reporting on PaMs and GHG emission projections. This provides the legal framework and context for national systems and reporting. **Section 2.2 then provides an overview of the findings of the quality checks** conducted by EEA/ETC CM regarding the reporting of GHG emission projections and PaMs, providing a status of the quality of reporting on PaMs and projections. **Section 2.3 describes the characteristics of the national systems in the 30 assessed countries**, offering an overview of practices in the core and sub-elements of national systems. This analysis is informed by the data collection framework for national system reports and includes examples from the same reports and the surveys. The **concluding section presents a heatmap illustrating the arrangements and procedures established in these countries**. The heatmap, complemented by the findings of the surveys and interviews, are utilised to derive key insights regarding the strengths, and challenges of the national systems for reporting on PaMs and projections.

¹ As mandated by Article 36 of the Implementing Regulation (EU) 2020/1208, reporting must adhere to the template provided in Annex XXIII, which is available in Annex 1 of this report.

² National systems reports are published in [Reportnet 3](#) and are made available on the [Climate and Energy in the EU](#) website.

2.1 A description of the Union System for reporting on policies and measures and GHG emission

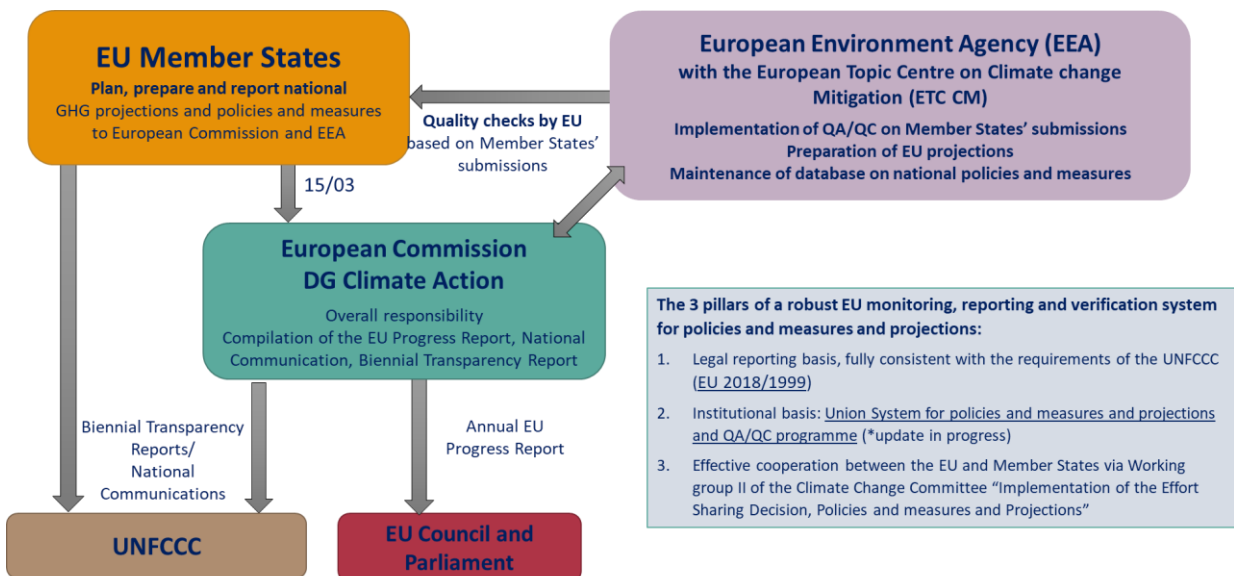
The Union system for PaMs and GHG emission projections represents the institutional, legal and procedural arrangements established for reporting on PaMs and projections of anthropogenic emissions by sources and removals by sinks of GHG. It seeks to ensure the timeliness, transparency, accuracy, consistency, comparability and completeness of the information on PaMs and projections compiled by the Commission based on the information reported by Member States pursuant to Article 18 of Regulation (EU) No 2018/1999, the Governance of the Energy Union and Climate Action.

This section builds on and updates the information in in the document "*Elements of the Union System for policies and measures and projections and the quality assurance and control (QA/QC) programme as required under Regulation (EU) No 525/2013*", prepared by DG CLIMA in 2015³. The document provides detailed insights into the development and implementation of the Union system, which continue to inform its current structure and operation. The information below is organised according to the structure of national systems reporting, as outlined in the template provided in Annex XXIII of the Implementing Regulation (EU) 2020/1208.

The entities with overall responsibility for the Union System for policies and measures and projections.

Overall responsibility for the Union system for PaMs and projections of anthropogenic GHG emissions by sources and removals by sinks rests with the European Commission, more specifically its **Directorate-General for Climate Action**. Figure 2-1 illustrates the Union system for reporting policies and measures and GHG emission projections. It shows the main actors and their responsibilities.

Figure 2-1 Union System with roles and responsibilities.



³ [Elements of the Union System for policies and measures and projections and the quality assurance and control \(QA/QC\) programme as required under Regulation \(EU\) No 525/2013](#)

Legal arrangements in place for preparation of reports on policies and measures and of projections.

Since 2018, the legal arrangements on all matters related to Union climate and energy policy are laid down in **Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action**.

The Governance Regulation establishes a governance mechanism, among others, to:

- implement strategies and measures designed to meet the objectives and targets of the Energy Union and the long-term Union greenhouse gas emissions commitments consistent with the Paris Agreement, and for the first ten-year period, from 2021 to 2030, the Union's 2030 targets for energy and climate,
- ensure the timeliness, transparency, accuracy, consistency, comparability and completeness of reporting by the Union and its Member States to the UNFCCC and Paris Agreement secretariat.

The integrated reporting on GHG PaMs and on projections is laid down in Article 18 and Annex VI and VII of the Governance Regulation. By 15 March 2021, and every two years thereafter, Member States must report to the Commission information on their national PaMs and their national projections of anthropogenic GHG emissions by sources and removals by sinks. Any substantial changes to the information reported during the first year of the reporting period must be communicated by 15 March of the year following the previous report.

Member States must publish (in electronic format) their national projections and any relevant assessment of the costs and effects of national policies and measures on the implementation of Union policies relevant for limiting GHG emissions along with any relevant underpinning technical reports. Those projections and assessments should include descriptions of the models and methodological approaches used, definitions and underlying assumptions.

Institutional arrangements in place for preparation of reports on policies and measures and of projections as well as for reporting on them.

Overall responsibility rests with the **Directorate-General for Climate Action**.

As laid down in Article 42 of the Governance Regulation, the European Commission is assisted by the **European Environment Agency (EEA)** for various climate and energy reporting tasks. The EEA is an agency of the European Union and its Member States that was set up in 1994. Its member countries, in addition to the EU Member States include Iceland, Liechtenstein, Norway, Switzerland and Turkey. The EEA is governed by a Management Board consisting of one representative of each of the member countries, two representatives of the Commission and two scientific experts designated by the European Parliament.

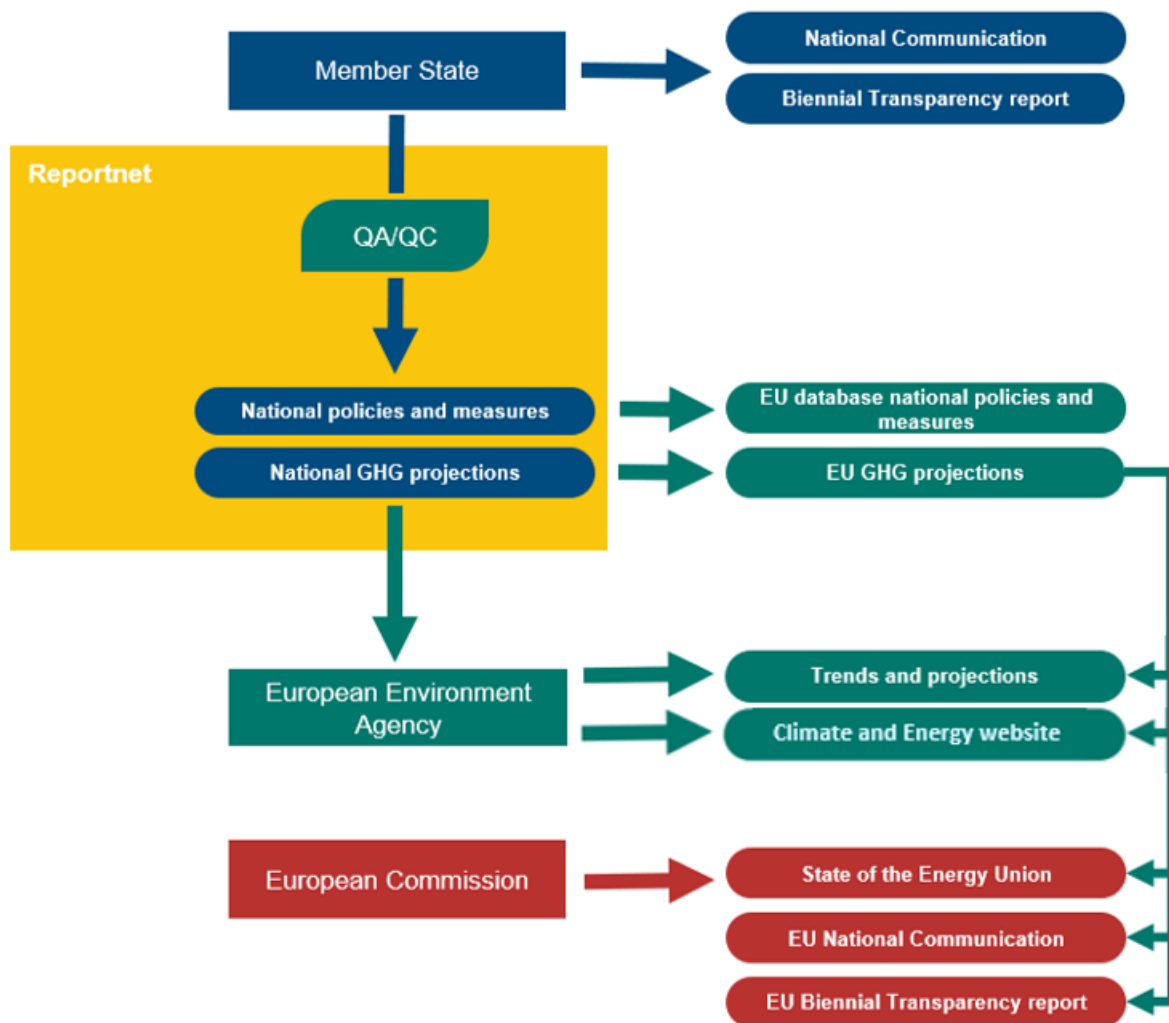
The EEA assists the European Commission in several areas of climate legislation, including on PaMs and GHG emission projections reporting, by:

- compiling the information reported by Member States on PaMs and projections,
- performing quality assurance and quality control procedures on the information reported by Member States,
- preparing estimates or complementing those available to the Commission for data on projections not reported by the Member States,
- disseminating information collected under this Regulation, including maintaining and updating a database on Member States' mitigation PaMs.

The EEA is assisted by the **European Topic Centre of Climate Change Mitigation (ETC CM)** in these activities. European Topic Centres are consortia of research organisations specifically entrusted with the task of cooperating with the EEA on certain topics of particular interest. The ETC CM assists the EEA with the

activities detailed in Article 42 of the Governance Regulation. Activities of the ETC CM are detailed each year in an annual work programme.

Figure 2-2 Reporting workflow for national policies and measures and GHG emission projections in the EU.

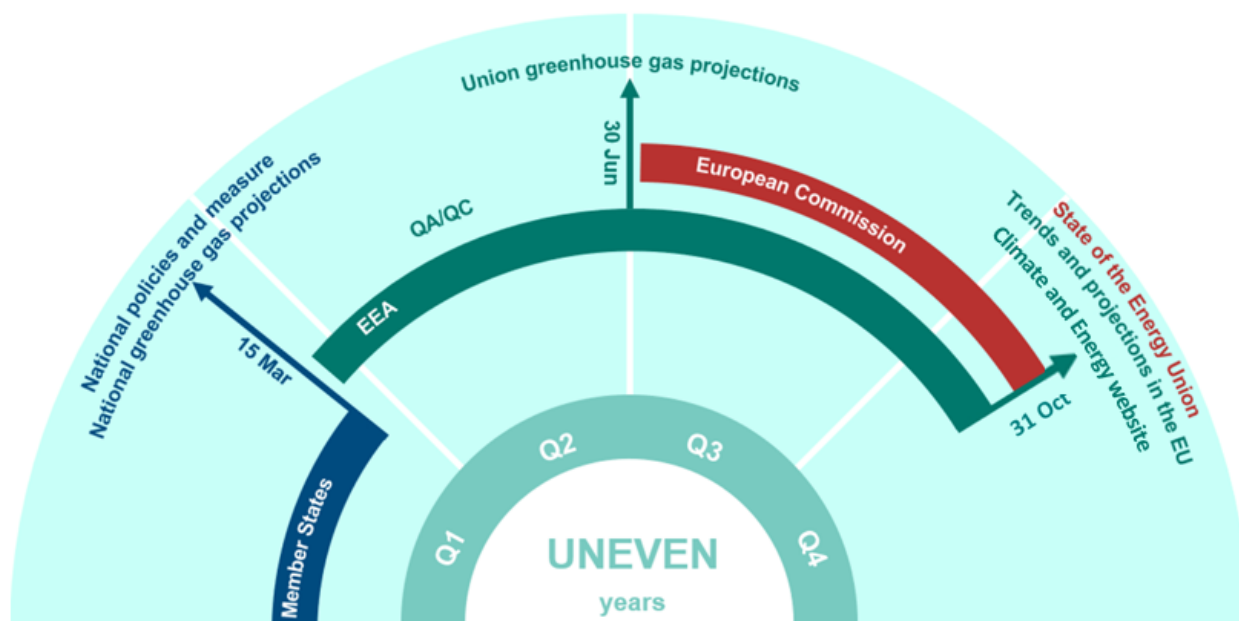


Note: The left-hand side of the figure shows the actors involved in the reporting process for PaMs and projections under the Governance Regulation and the UNFCCC Enhanced Transparency Framework. The right-hand side shows the main outputs and publications per actor. The objects in blue refer to activities carried by the EU Member States, objects in green refer to activities and outputs conducted by the EEA, and objects in red refer to the publications of the European Commission.

Procedural and administrative arrangements and timescales in place for the preparation of reports on policies and measures and of projections, to ensure the timeliness, transparency, accuracy, consistency, comparability and completeness of the information reported.

The timeline and roles involved in the preparation of reports on PaMs and projections are shown in Figure 2-3, and explained in more detail below.

Figure 2-3 The key dates and roles involved in the PaMs and projections reporting under the Governance Regulation.



Submission of information

The reporting requirements laid down in the Governance Regulation are further specified in Implementing Regulation (EU) 2020/1208 of 7 August 2020 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) 2018/1999 of the European Parliament and of the Council (Implementing Regulation). This regulation provides supplemental and more detailed information on procedural and administrative arrangements. Article 35 to 38 deals with the reporting on national PaMs and GHG emission projections.

Member States must report the information on their national **policies and measures**, or groups of measures, in a format laid out in a reporting table. The reporting tables include information on national PaMs and on the implementation of Union policies and measures that limit or reduce GHG emissions:

- A short description and the objective of the policy or measure.
- Affected sectors and GHGs or group of gases (HFCs and PFCs).
- The type of policy instrument.
- The status of implementation of the policy or measure.
- Indicators used to monitor and evaluate progress over time.
- Where available, quantitative estimates of the effects on emissions by sources and removals by sinks of GHGs broken down into:
 - the results of ex ante assessments of the effects of individual or groups of PaMs on the mitigation of climate change. Estimates shall be provided for a sequence of four future years ending with 0 or 5 immediately following the reporting year, with a distinction between GHG emissions covered by the Emission Trading System (ETS) Directive, Effort

Sharing Regulation (ESR) and Land Use, Land-Use Change and Forestry (LULUCF) Regulation⁴.

- the results of *ex post* assessments of the effects of individual or groups of PaMs on the mitigation of climate change where available, with a distinction between GHG emissions covered by the ETS Directive, Effort Sharing Regulation and LULUCF Regulation.
- Available estimates of the projected and realised costs and benefits of PaMs.
- All existing references to the assessments of the costs and effects of national PaMs, to information in the implementation of Union PaMs and to the underpinning technical reports.

In addition, Member States shall report in textual format information on updates relevant to their long-term strategies, planned additional PaMs with a view to reduce GHG emissions beyond their commitments under the Effort Sharing Regulation, and the links between the different PaMs and the contribution of those PaMs to different projection scenarios.

Similarly, Member States must report the information on their **national projections of anthropogenic greenhouse gas emissions** by sources and removals by sinks in tabular format. Information to be included in the tables:

- Projections without measures where available, projections with measures, and, where available, projections with additional measures.
- Total GHG emission projections and separate estimates for the projected GHG emissions for the emission sources covered by the ETS Directive, the Effort Sharing Regulation and the LULUCF Regulation.
- The impact of PaMs. Where such PaMs are not included, this shall be clearly stated and explained.

Member States shall provide additional information on their national projections of anthropogenic GHG emissions in textual format, specifying:

- The projection results for total GHG emissions, emissions covered by the Effort Sharing Regulation and the ETS Directive respectively, and the projected emissions by sources and removals by sinks under the LULUCF Regulation.
- The results of the sensitivity analysis performed for the projections and information on the models and parameters used. This has to be done for the total reported GHG emissions, together with a brief explanation of which parameters were varied and how. And for the split on total emissions covered by the ETS Directive and by the Effort Sharing Regulation respectively and the projected emissions by sources and removals by sinks under the LULUCF Regulation when this information is available.
- The year of the inventory data (base year) and the year of the inventory report used as a starting point for the projections.
- The methodologies used for the projections, including a brief description of the models used and their sectoral, geographical and temporal coverage, references to further information on the models and information on data sources, key exogenous assumptions and on the parameters used.

Member States must use an online platform (Article 35 of the Implementing Regulation) and any linked tools and templates of the European Commission, assisted by the EEA for submitting the information. Information on policies and measures and projections is submitted via the online platform *Reportnet 3*,

⁴ These three regulations cover GHG emissions from the following sectors:

- ETS Directive: power and heat generation, energy-intensive industries, intra-EU aviation, and maritime,
- ESR: transport (excluding aviation and international shipping), buildings (residential and commercial heating), agriculture (excluding LULUCF), waste management, small industrial installations not covered by ETS, and
- LULUCF Regulation: GHG emissions and removals from forest land, cropland, grassland, wetlands (optional inclusion under certain conditions), settlements, harvested wood products.

hosted by the EEA for collecting climate and environment related data from EU Member States and EEA member countries. The online reporting tool mirrors the reporting tables of the Implementing Regulation.

Quality assurance and quality control for reporting of policies and measures and projections.

After submission by the Member States, information is quality checked by the EEA, assisted by the ETC CM. This quality assurance and control (QA/QC) procedure consist of a number of checks against the quality criteria completeness, consistency, comparability, accuracy and transparency. They involve a combination of automated and manual quality checks. After the QA/QC, individual feedback is sent to the Member States with recommendations, questions for clarification, or requests for adjustments to the submission. Member States can amend their submission on PaMs and/or GHG emission projections after the QA/QC if needed. The QA/QC process closes end of June.

There are various levels to assure and check quality:

- Following article 39 of the Governance Regulation, each Member State must establish a national system to report on national PaMs and GHG emission projections. This system should also include national quality assurance and quality control procedures. These vary with national circumstances and have to be described and reported.
- The information on national PaMs and GHG emission projections has to be reported by EU Member States via the online reporting system, Reportnet 3. This reporting systems allows the integration of automatic quality checks that checks reported information on completeness, consistency and transparency. The automated checks can block the submission of information in case critical quality criteria are not met. Potential errors and warnings are given automatically to reporters of non-critical quality criteria when submitting information.

After the submission of information, both PaMs and greenhouse gas projections are quality checked by expert reviewers of the European Topic Centre on Climate Change Mitigation. Elaborate quality checks are defined, written down in a reviewer guidance document, and encoded in tools (such as data viewers) to support reviewers in quality checking submissions in a complete and consistent way. Findings are communicated to the Member States' reporters who can clarify and/or adjust the reported information.

Gap-filling

Timely reporting of national GHG emission projections is especially important as the national projections are aggregated to create the total EU GHG emission projections used for subsequent EU and international reporting requirements. Article 18 of the Governance Regulation therefore mandates that if Member States do not submit complete projection estimates by 15 March every second year and that these gaps in the estimates cannot be filled, the Commission may prepare estimates as required to compile Union projections, in consultation with the Member State concerned.

Publication and use of the information

The quality checked and aggregated information on policies and measures and GHG emission projections is made available to the public by the EEA and the European Commission.

The ETC CM prepares a greenhouse gas projections database, based on Member States' submissions. Information reported by Member States might be corrected for the reference year or gap-filled by the ETC CM to have a consistent dataset for the EU. The EU database for [Member States' greenhouse gas emission projections](#) is also available at the [EEA greenhouse gas projections - Data Viewer](#), and the [Climate and Energy in the EU – Data Viewer](#).

The latest Member States' submissions on PaMs are available as a dataset and data viewers. Unlike GHG emission projections, no corrections or gap-filling are done by the ETC CM. The EU dataset for the

[Integrated national climate and energy policies and measures](#), is also available at the [EEA database on greenhouse gas policies and measures in Europe](#), and the [Climate and Energy in the EU – Data Viewer](#).

The information on PaMs and GHG emission projections is used for subsequent analysis and published in assessment and progress reports by the European Commission:

- The Commission publishes an annual [Climate Action Progress Report](#) on progress towards the EU's emission reduction targets. The report covers actual emissions and projected future emissions for the EU and for every EU Member State. It also includes information on different climate policy areas, EU legislative progress, climate finance and adaptation.
- In 2015, the Commission adopted "A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy". The publication of this strategy created a new momentum to bring about the transition to a low-carbon, secure and competitive economy. In the annual [State of the Energy Union Report](#), the European Commission takes stock of the progress made towards building the Energy Union and to highlight the issues where further attention is needed.
- The EU is a Party to the UNFCCC and to the Paris Agreement and therefore prepares its own EU [National Communication](#) (every fourth year), and starting from 2024, [Biennial Transparency Report](#). For the National Communication and the Biennial Transparency Report, GHG emission projections data is used to report on EU's progress to achieve its nationally determined contribution.
- In addition to the mandatory progress reports prepared by the European Commission, the EEA prepares a yearly [Trends and projections in Europe](#) report that explores the historical trends, most recent progress and projected future progress on climate change mitigation through reduced GHG emissions, renewable energy gains and improved energy efficiency.

Information collection process.

As mentioned above, Member States report information using the online reporting platform *Reportnet 3* to the European Commission and the EEA. To ensure they report qualitative information on time, Member States must operate and continuously improve a national system for reporting on PaMs and GHG emissions. Those systems shall include the relevant institutional, legal and procedural arrangements established within a Member State for evaluating policy and making projections of anthropogenic greenhouse gas emissions. According to Article 36 of the Governance Regulation, Member States had to provide a description of their national system on 15 March 2021 (or information on any changes made to that system where such a description has already been provided). This covers information on the institutional, legal and procedural arrangements for reporting on PaMs and on GHG emission projections. The structure of reporting requirements is available in Annex 1 of this report.

Alignment with the national emission inventory system.

Alignment with the national inventory system is particularly relevant for GHG emission projections. Member States must report the year of the inventory data (base year), and the year of the inventory report used as a starting point for the projections. Alignment with the national inventory is also checked during quality assurance and quality control procedures. Consistency checks conducted in this process, among other, ensure alignment of the reference year of the sectoral projections with the reference year of the emission inventory. For PaMs, alignment with the national emission inventory is checked by comparing estimated GHG emission savings with sectoral GHG emissions, as reported in the inventory and projections, to check if reported savings for PaMs are plausible.

The process for selecting assumptions, methodologies and models for making projections of anthropogenic greenhouse gas emissions.

To improve consistency of Member States national projections, the European Commission provides Member States with recommendations of what and how EU measures should be considered when preparing national projections.

To ensure consistency of the aggregated Union projections, the Commission, in consultation with the Member States, also provides Member States recommended harmonised values for key EU-wide determined parameters, including carbon prices under the EU Emission Trading System (EU ETS), international oil and coal import prices. In the case Member States do not follow these recommendations and use different national assumptions for national projections, Member States are encouraged to provide a sensitivity analysis based on the recommended values provided by the Commission.

Information on relevant institutional, administrative and procedural arrangements for implementation of the EU's nationally determined contribution, or changes to such arrangements.

In October 2023, the EU submitted an updated nationally determined contribution to the UNFCCC, containing an enhanced reduction target of at least 55% by 2030 compared to 1990.

According to Article 29(5) of the Governance Regulation, every year on 31 October, the Commission assesses whether the Union and its Member States have made sufficient progress towards meeting their international and Union targets. This includes the international commitments under Article 4 of the UNFCCC and under Article 3 of the Paris Agreement, and the EU-specific obligations of the Effort Sharing Regulation and the LULUCF Regulation. The objectives set out in the National Energy and Climate Plans to achieve the Unions 2030 targets for energy and climate. This assessment is largely based on the information reported pursuant the Governance Regulation, including on PaMs and GHG emission projections.

Procedures for the official consideration and approval of the Union system for policies and measures and projections.

According to Article 39 of the Governance Regulation, the European Commission shall operate a Union System for reporting on policies and measures and for reporting on GHG emission projections. The Union System should include the relevant institutional, legal and procedural arrangements for evaluating policy and making projections. These arrangements are largely defined in the Governance Regulation and its Implementing Regulation.

Stakeholder engagement undertaken of the European Union in relation to the preparation of policies and measures and projections.

To exercise the implementing powers laid down in the Governance Regulation, the European Commission is assisted by a Climate Change Committee and by an Energy Union Committee.

Working Group 2 "Implementation of the Effort Sharing Legislation, Policies and Measures and Projections" was established under the Climate Change Committee as a regular body for exchange of information on projections and policies and measures between the Commission, the 27 Member States and the EEA. The related objectives and tasks of the working group include:

- a. promotion of the timely and complete delivery of national submissions of GHG emission projections and information on policies and measures as required under the Governance Regulation;

- b. improvement of the quality of the reported data on policies and measures and GHG emission projections by the Member States (transparency, consistency, comparability, completeness, accuracy and timeliness); and
- c. exchange of practical experiences on projections estimates and on reporting on policies and measures implemented.

2.2 An overview of the quality of reporting on GHG emission projections and PaMs

This section presents the quality of Member States' reporting in 2023. The EEA, supported by the ETC CM, is responsible for quality-checking the reported information for the anthropogenic GHG emission projections and integrated national PaMs through a manual quality assurance and quality control (QA/QC) procedures. The feedback provided by the QA/QC team to Member States reporters is intended to highlight areas that require additional attention according to the so-called TTACCC criteria, covering checks for timeliness, transparency, accuracy, completeness, comparability, and consistency and coherence.

The findings of the QA/QC procedures for 2023 are reported in [ETC CM report 2023/06](#) (Dauwe et al., 2023), and [ETC CM report 2023/08](#) (Martín Ortega et al., 2024).

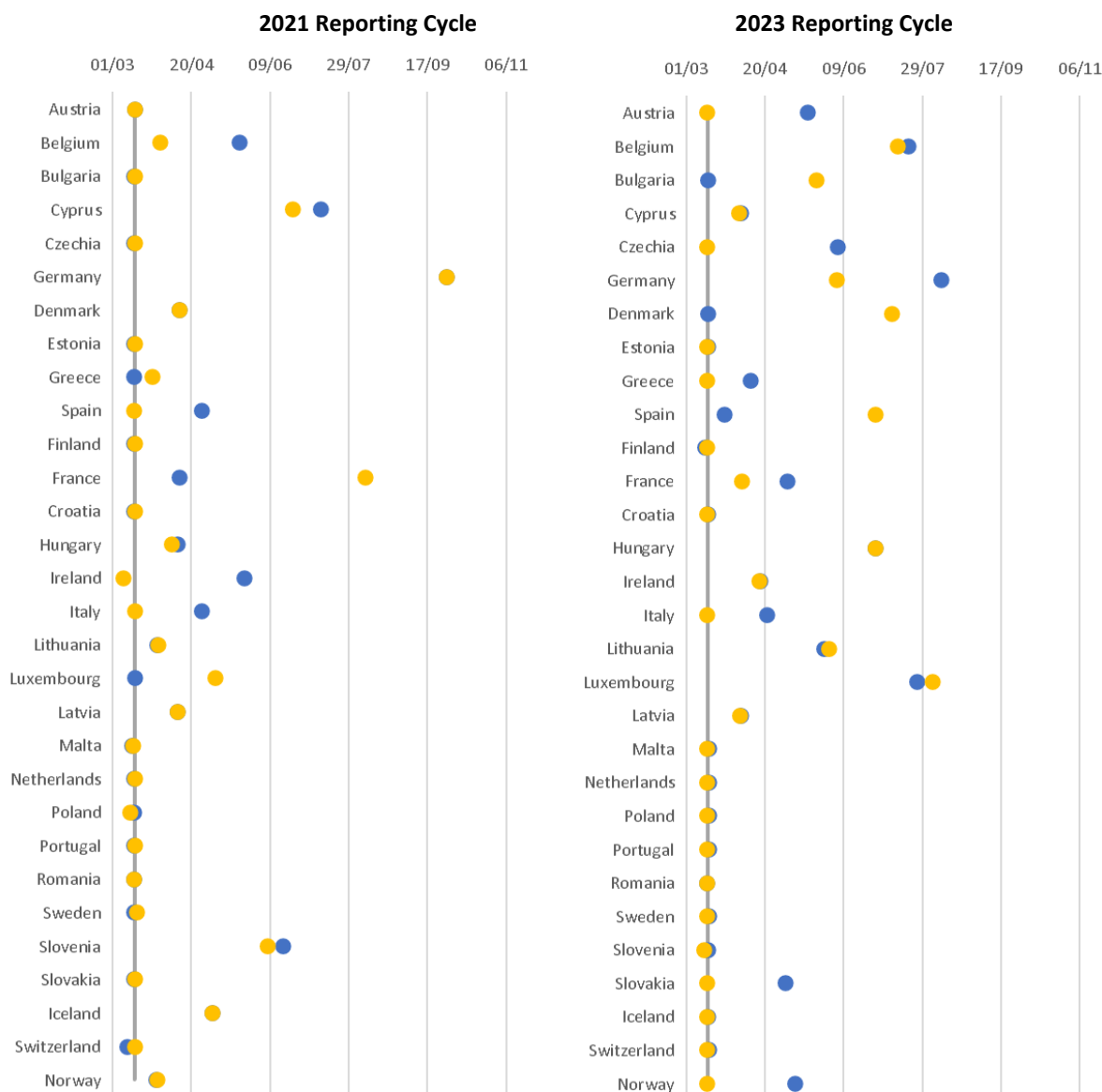
In 2023, the 27 EU Member States, and Iceland, Norway, and Switzerland completed their second reporting of **GHG emission projections** under the Governance Regulation (EU) 2018/1999. Compared to previous years, the number of findings during the QA/QC process that were communicated to participating countries decreased significantly. Since 2019, there has been a clear trend of fewer questions for countries from ETC CM reviewers, with the most notable drop in 2023; around 30% fewer questions than in the mandatory reporting years of 2019 and 2021, indicating that countries improved their projections reporting. The main future challenge is to ensure timely reporting, which is key for enabling QA procedures and meeting EU and Member States reporting obligations.

The year 2023 was the first complete NECPR submission cycle, introducing substantial changes to the **reporting requirements for PaMs**, including integrated reporting on the five climate and energy dimensions. While climate change mitigation-related PaMs were reported in 2021 (and for many years prior under the Monitoring Mechanism Decision and the Monitoring Mechanism Regulation), 2023 saw the first time that these were supplemented by, and integrated with, new reporting on PaMs related to the energy dimensions of the Governance Regulation. This occurred under Annexes X, XI, and XII via a new webform in *Reportnet 3*. When comparing to the previous years, the completeness, consistency, accuracy, transparency, and comparability of the qualitative and quantitative information was lower in 2023, following many years of observed improvement in the climate-related PaMs. The increased complexity of PaMs reporting in this year, in addition to the increasing number of reported PaMs, may have led to the introduction of more errors. Moreover, PaMs reporting coincided with the submission of the draft updated NECP, and in some countries, reporters had less time to engage in QA/QC and may have been impacted by the political or procedural bottlenecks occurring at Member State level.

The following sections provide more detailed findings on the quality of the 2023 reporting in relation to the TTACCC criteria, and, where relevant, providing a comparison with the previous 2021 reporting cycle.

2.2.1 Timeliness

Figure 2-4 Submission date for PaMs (yellow) and projections (blue) in 2023 and 2021 reporting cycles.



Source: Dauwe et al. (2023) and Martín Ortega et al. (2024).

In 2023 many Member States submitted information after the reporting deadline of 15 March for both integrated PaMs and GHG emission projections reporting. In **GHG emission projections reporting**, 17 countries submitted their projections before or on the official deadline of 15 March 2023. The last submission was at the beginning of August. The **PaMs reports** were submitted on time by 15 countries, with the last submission occurring on 4 September. In 2023, slightly more countries experienced delays in submitting their reports compared to the 2021 reporting cycle. In 2021, projections were submitted on time by 19 countries, and 17 countries met the deadline for PaMs reports.

The 2023 reporting cycle required more extensive and integrated reporting on the five climate and energy dimensions and on new Annexes compared to previous years through a new, integrated webform. Countries tend to link the reporting of PaMs and projections, visible by the close submission date of both reports for more than half of the countries, as shown in Figure 2-4. Furthermore, EU Member States had to submit their NECPR by mid-March and draft updated NECP by end of June 2023, which may have

impacted the political process of some countries for the submission of data under these two reporting dataflows. Together, the above-mentioned factors help explain the substantial delays in reporting in 2023.

2.2.2 Completeness

The completeness of mandatory information on **GHG emission projections** has remained relatively consistent for most Member States in the 2023 reporting year compared to 2021. All Member States submitted the mandatory “with existing measures” (WEM) scenario. All Member States provided an updated projection, as well as a comprehensive sector and gas split for the WEM scenario. 19 Member States provided information on sensitivity analysis in 2023, whereas all Member States provided detailed land use, LULUCF projections.

PaMs reports lacked completeness of various mandatory reporting elements in Annex IX (of the Implementing Regulation 2022/2299) on PaMs attributes and progress. 14 Member States reported on all dimensions in the first submission, whereas two Member States reported on the GHG dimension only. With regards to the objectives, targets and contributions of the reported PaMs, 14 Member States provided information on almost all of them or covered the most important ones per dimension. In terms of the relevant provisions for PaMs contributing to the Energy Efficiency and Renewable Energy dimensions, only four Member States reported sufficiently. Reporting on target sectors is generally complete across all Member States, with 22 countries reporting on all sectors. However, only 11 Member States covered the most important sector objectives in their submission. For aspects of reporting that require extensive inputs (such as dimensions or relevant Union policies), Member States attributed incomplete reporting to insufficient time for completion.

In terms of submission of data under non-mandatory aspects of Annex IX (i.e., the level of reporting obligation is mandatory if applicable, mandatory if available or voluntary), 18 countries reported indicators for at least one PaM. As illustrated in Table 2-1, reporting on *ex-ante* and *ex-post* GHG emission savings remained relatively low: 18 Member States reported *ex-ante* savings, and 7 Member States reported *ex-post* savings for at least one PaM. This represents a decline in reporting compared to 2021. Three countries reported quantitative data on *ex-ante* energy savings, and no Member State reported *ex-post* energy savings. Similarly, three countries reported on renewable energy production. Five Member States reported data on costs and benefits for at least one PaM. For the other Annexes, eight EU Member States reported information on their energy efficiency obligation scheme in Annex X. All Member States, except 2, reported information on energy savings in Annex XI, whilst 21 countries reported on Articles 5(1) or 5(6) of Directive 2012/27/EU in Annex XII. With regards to the last two Annexes, 23 countries reported information for 836 PaMs in Annex XIII and 20 countries reported on air quality for 679 PaMs in Annex XIV. While these reporting aspects show relatively low submission rates, it is important to note that these elements are reported on a voluntary basis, or when applicable or available, meaning that the lower figures do not necessarily indicate non-compliance but rather reflect the inherent flexibility of these reporting requirements.

Table 2-1 EU Member States reporting quantitative data (marked in green) on at least one policy or measure.

| | <i>Ex-post</i> GHG emissions savings | <i>Ex-ante</i> GHG emissions savings | <i>Ex-post</i> energy savings | <i>Ex-ante</i> energy savings | <i>Ex-post</i> renewable energy production | <i>Ex-ante</i> renewable energy production | <i>Ex-post</i> costs and/or benefits | <i>Ex-ante</i> costs and/or benefits |
|--------------------------------------|---|---|-------------------------------------|-------------------------------------|---|---|---|---|
| Number of reporting countries | 7 | 18 | 0 | 3 | 3 | 1 | 1 | 4 |
| Austria | | | | | | | | |
| Belgium | | | | | | | | |
| Bulgaria | | | | | | | | |
| Cyprus | | | | | | | | |
| Czechia | | | | | | | | |
| Germany | | | | | | | | |
| Denmark | | | | | | | | |
| Estonia | | | | | | | | |
| Greece | | | | | | | | |
| Spain | | | | | | | | |
| Finland | | | | | | | | |
| France | | | | | | | | |
| Croatia | | | | | | | | |
| Hungary | | | | | | | | |
| Ireland | | | | | | | | |
| Italy | | | | | | | | |
| Lithuania | | | | | | | | |
| Luxembourg | | | | | | | | |
| Latvia | | | | | | | | |
| Malta | | | | | | | | |
| Netherlands | | | | | | | | |
| Poland | | | | | | | | |
| Portugal | | | | | | | | |
| Romania | | | | | | | | |
| Sweden | | | | | | | | |
| Slovenia | | | | | | | | |
| Slovakia | | | | | | | | |

Source: Dauwe et al. (2023).

2.2.3 Consistency

Consistency of **GHG emission projections** reporting comprises various aspects; consistency between the units used and those required by the reporting template, consistency of the timeseries between projections and historical data (i.e., having projections anchored in the latest inventories), consistency of the timeseries themselves (i.e., when no projections are reported, no data for historical years should be reported), scenario consistency, and finally consistency between Emissions Trading System (ETS) and Emissions Sharing Regulation (ESR) emissions.

In the 2023 reporting, issues were mainly identified with unit deviations, timeseries consistency (where all Member States provided data for historical years in categories or sectors where projections were absent),

and inconsistencies between ETS and ESR emissions (changing trends). Additionally, issues relating to consistency between WEM, WAM and WOM scenarios were raised with 16 countries. Most issues identified during the QA/QC process were addressed through resubmissions; the issues identified concerning ETS and ESR emissions were often solved by explanations by Member States.

In **PaMs reporting**, common inconsistency issues were identified between the implementation status and period or projections scenarios, and between the PaM name, or description, and the other reported information (such as reported dimension, sector, policy instrument, relevant objective, GHGs, etc.). Various errors were resolved through resubmissions.

2.2.4 Accuracy

Regarding accuracy of **GHG emission projections**, an important and persistent challenge consisted of sum errors, with 19 countries facing issues in 2023. These issues were typically resolved through identification of the issues during QA/QC, exchange with the Member States, followed by subsequent resubmission of corrected datasets. For outliers and deviating trends, a limited number of potential issues could not be resolved by inspection of the data or consultation of the technical report, and this resulted in a total of 26 questions to the Member States. A total of 18 questions concerning substantial recalculations were directed to 18 different Member States. Most of the outlier, trend and recalculation issues were clarified during the QA/QC by the responses from the Member States.

In general, accuracy issues in **PaMs reporting** were related to quantitative data reported on GHG emissions savings, energy savings and investment financing, with the most common mistakes relating to the sum of the parts not being equal to the reported total, cumulative values not corresponding to annual savings, or values reported in the wrong sign. Furthermore, accuracy of GHG impacts was also assessed based on expert judgement where reported impacts of PaMs were compared to the corresponding WEM or WAM projection scenarios and to previous reporting. For example, significantly high reported emission savings from PaMs compared to projected GHG emissions could indicate potential errors or double counting. Based on the accuracy checks conducted, the quality review process identified issues in data of 15 countries relating to potential errors or need for clarifications.

2.2.5 Coherence

Since information on **GHG emission projections and PaMs** must be reported at the same time, information is expected to be coherent with one another. This is difficult to assess, because accounting of PaMs in GHG emission projections is a complex exercise; impacts of PaMs must be translated into changes in key drivers of GHG emissions over time. One way to check for this is to consider planned PaMs or PaMs that are included in the WAM scenario. Planned PaMs contributing to emission reductions in a certain sector should therefore be associated with a difference between the sectoral WEM and WAM projections. For the nine Member States that did not report a WAM scenario, this assessment could not be performed. For the other countries, various issues or requests for clarification were identified across 13 Member States and one non-Member State. Issues mainly related to differences between WEM and WAM scenarios which could not be explained by planned PaMs. Other issues related to occurrences where countries reported planned PaMs, however their impact was not reflected in the difference between WAM and WEM scenarios.

2.3 Characteristics of national systems for reporting on PaMs and GHG emission projections

This section provides an assessment of the characteristics of national systems based on Member States' national system reports, complemented with information gathered through a survey conducted among national reporters. This assessment identifies the specific arrangements and procedures established in countries in line with the reporting obligations. The characteristics, including concrete examples of established procedures and arrangements, are grouped into the five core elements of a national systems:

institutional and procedural robustness, formality through legal arrangements, alignment with other reporting frameworks, accountability and transparency, and public participation. The final part of this section presents a heatmap with the characteristics across countries, along with key insights into the strengths and challenges of national systems for reporting on PaMs and projections.

The full methodology of this assessment and survey is available in Annex 2 of this report.

2.3.1 Institutional and procedural robustness

2.3.1.1 Institutional arrangements

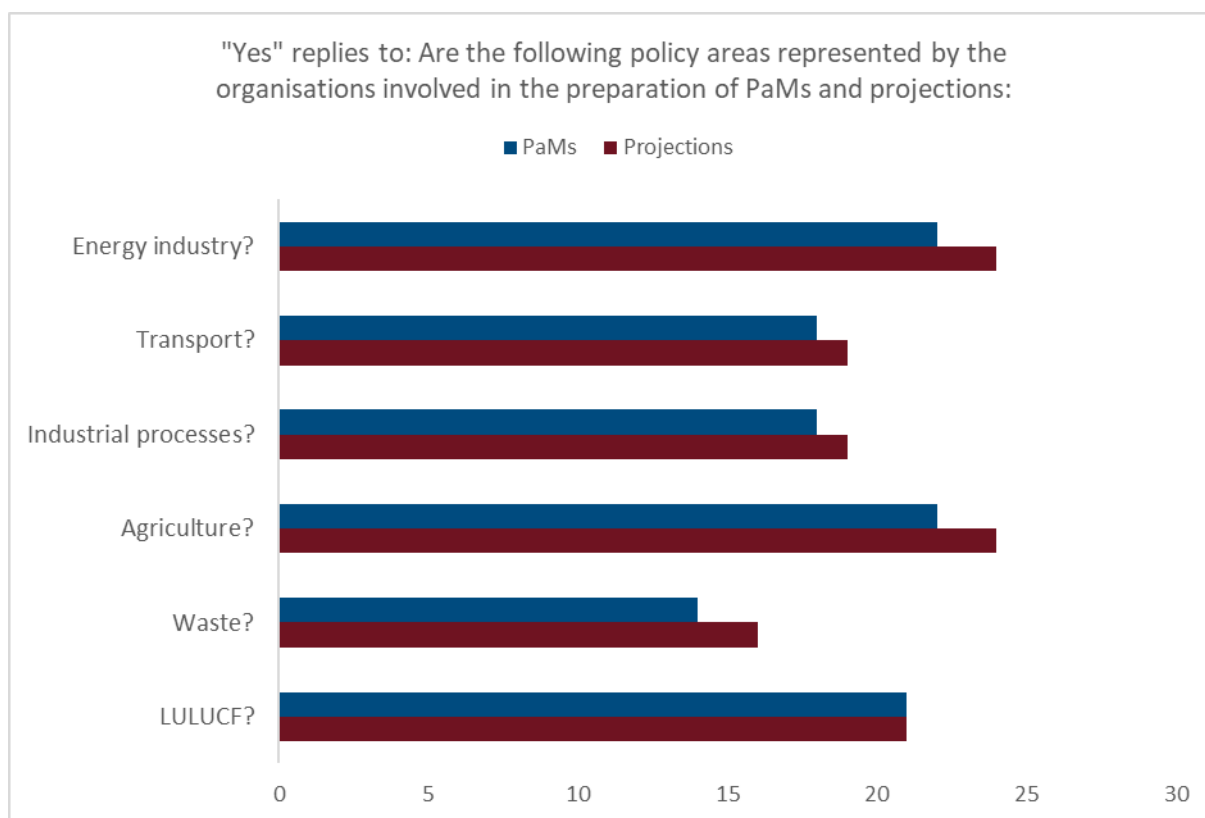
In most countries, the **overall responsibility for reporting** on PaMs and emission projections is assigned to a single organisation. This applies to 24 countries, including 23 EU Member States and one non-EU country. Portugal, Italy, Switzerland, and Norway did not report which institution holds overall responsibility regarding reporting. Germany and Spain indicated that more than one entity shares this responsibility. In **the Netherlands**, the overall responsibility over the national system lies with one entity, the Ministry of Economic Affairs and Climate Policy (EZK), while the task of reporting is delegated to another organisation, the Netherlands Enterprise Agency (RVO).

In 21 Member States, a ministry typically holds overall responsibility for reporting. Most often, this will be the Ministry for Climate or Environment, however, the responsibility is also held by other ministries. For example, in **Finland**, the Ministry of Economic Affairs and Employment is responsible for compiling and reporting information collected from various sectoral ministries. In six countries, other entities such as agencies (e.g., in Germany, Ireland, the Netherlands, and Iceland), research institutes (e.g., in Estonia), or commissions (e.g., in Belgium) also play a lead role in reporting.

The study assessed the extent to which key policy areas or sectors are represented in the preparation of PaMs and emission projections. The sectors considered include energy, transport, industry, agriculture, waste, and LULUCF. The number of countries involving different sectoral organisations in the preparation of PaMs and emission projections reporting is shown in Figure 2-5. The energy sector received the highest level of representation, with 24 countries indicating involvement, while the waste sector had the lowest representation, with 14 countries. It should be noted that the assessment only tracked involvement through explicit referencing in the country reports. There might be cases where involved institutions might have a more general name, e.g., 'Ministry of Environment', and are competent for certain sectors, e.g., the waste sector, without explicitly reporting this fact.

Nevertheless, the relatively high level of representation across sectors suggests that institutional cooperation is well-established in most countries. In 13 countries for PaMs and 12 countries for emission projections, this cooperation is further strengthened by formal networks of organisations, which contribute to the preparation of PaMs, strategies, and plans. This occurs at the ministerial level in the form of inter-ministerial working groups on the political level (e.g., in Cyprus, Finland, Portugal and Slovakia) and/or on the level of experts in intersectoral or technical working groups (e.g., in Bulgaria, Denmark, Greece, Iceland, Slovenia, Romania).

Figure 2-5 The number of countries involving different sectoral organisations in the preparation of PaMs and projections reporting.



2.3.1.2 Procedural and administrative arrangements

Regarding **procedural robustness**, several aspects were examined for the purpose of this study. The first was whether the assumptions, methodologies, and models used are verified or approved by the relevant organisations involved in reporting. In other words, whether a(n) (expert) **validation process** is in place to confirm the accuracy and reliability of these elements. Such established procedures were indicated by 21 countries.

Assumptions were the most frequently addressed element, while methodologies and models were mentioned less often. In Slovenia and France, broader consultations on assumptions took place, while in other cases, sectoral experts determined them, with or without the consultation or validation of the responsible authority. For example, in **Estonia**, assumptions are explicitly reviewed and approved by experts from relevant ministries before projections are developed. In contrast, **Belgium** follows a different approach, where approval is sought at the highest level—specifically from the National Climate Commission—prior to the preparation of regional and federal projections. The selection of models and methodologies is left to the discretion of the different entities. In **Croatia** sectoral experts, through a technical working group, provide the technical foundation for projections, but the contractor retains the freedom to choose the methodology and model. Ireland and **Cyprus** exemplify good practices in this area, for which data sources, methods, and assumptions are well-documented, and opportunities for improvement are identified and similarly recorded. This list of improvements is regularly reviewed, prioritised, and implemented. Any changes are formally documented in the methodology report.

A **second aspect** of procedural robustness is whether countries have **arrangements in place to review the previous reporting cycle**. This helps in improving accuracy and consistency and could also contribute to increased accountability and transparency. Additionally, it would facilitate improving the reporting by identifying inefficiencies or unforeseen challenges during the process, that possibly impact the quality or

timeliness of the submissions. Three countries indicated they review their previous reporting cycle for PaMs and four for emission projections. **Sweden** demonstrated the most elaborate and transparent example, where the reporting cycle is finalised with a meeting where the process is discussed, QA/QC activities analysed and evaluated, and areas of improvement are identified. An assessment of models and methodologies used for projections is also performed to identify areas of improvement, or to assess the need for changing the models used. The outcome of such a meeting serves as input to the planning of the next reporting cycle. **Estonia** also reviews the previous reporting cycle with the goal of identifying challenges that arose during the previous process and suggesting possible improvements to enhance the quality of the next reporting cycle. The review is carried at the start of the new reporting cycle, in two separate kick-off meetings with experts in one and relevant stakeholders in the other.

Furthermore, through the survey conducted with national reporters, another 3 countries (Cyprus, Latvia, and Germany) out of the 12 responding countries indicated that they have arrangements in place to review their national system. **Cyprus** indicated that the institutional arrangements only are reviewed. For **Latvia and Germany**, reviewing is relatively comprehensive, comprising almost all elements of their national system.

Evaluating the performance of the previous reporting cycle might lead to the identification of possible improvements to the national systems and warrant changes to that system. There is a reporting requirement concerning the official consideration and approval of the national system. However, this is often interpreted as the official consideration and approval of reporting. Nevertheless, from a procedural arrangements' perspective, it is useful to have an insight in both types of procedures. 12 countries indicated they have a procedure in place for **approving and updating the national system**. In most cases, the institution with the responsibility of official consideration and approval is often the same entity that holds overall responsibility for the national system. In many countries the national system is defined in a law, order or ministerial agreement and therefore changes can only be made with changes in the legal arrangements. In such instances, a decision by the entire government might be required (e.g., in Finland, Hungary, Latvia, and Poland). In **Denmark**, the national system for PaMs and emission projections reporting is founded on the general responsibilities of the different ministries. In its national system report, Denmark explained that no formal or official approval of changes to the national system is needed.

With respect to the **official approval of reporting**, 21 countries indicated to have procedures in place for PaMs and 20 for GHG emission projections. This approval generally happens on the level of the reporting institution or entity responsible for the national system, as observed for Czechia, Greece, Malta, and Romania. The responsibility for approval of reporting can be shared between ministries or at government level (e.g., in Germany, France, and Poland). However, it is also possible that this approval is given on a more technical, i.e. non-political level. This is the case in **Bulgaria**, where national experts involved in the national system for PaMs and emission projections give the final approval concerning the information in the reporting tools and final report to be submitted. Other examples comprise Cyprus, Lithuania, and Slovenia, which have a more technical level of approval.

2.3.1.3 **Data collection system**

28 countries reported to have arrangements in place for the **collection and exchange of data** or information between organisations for reporting on PaMs and emission projections. For Spain and Austria, this information was not clear from the report. For reporting there is an overlap with the information included under institutional arrangements, and under procedural and administrative arrangements. Often, countries describe the coordination and/or collaboration that exists between the different entities involved. The data collection can be organised in a more hierarchical fashion, where one entity, usually the ministry responsible for reporting, coordinates the data collection process, so information flows from sectoral ministries to the responsible entity. This is the case in **Hungary**, for example, where the legal basis empowers the minister responsible for energy policy to request data required for the preparation of the

reports from public bodies in possession of the needed information. These institutions then have 15 days to provide the requested data.

Data exchange often extends beyond government institutions, involving universities and research institutes as well. Additionally, the preparation of projections and development of the consequent report can be outsourced to an external contractor. In general, data collection processes benefit of clear institutional arrangements, and this is especially the case when external parties are involved. The **Irish** Environmental Protection Agency, which coordinates the data collection, checking and compilation, established specific Memoranda of Understanding or Service Level Agreements with key data providers. In **Latvia**, the information collection process has a legal basis (determined in the Regulation laying down the national system for projections). The Ministry of Climate and Energy coordinates the data collection process and the cooperation of the involved entities, comprising governmental and research actors. The legal arrangement defines the data or information input that is expected by each partner, along with the deadline for data provision.

However, arrangements concerning data collection do not always have to take such a formal shape to be clear and contributing value to the process. In **Germany**, the preparation of the reports on emission projections and PaMs is awarded to a contractor via a research project. This consists of a five-stage-process, which involves a very close collaboration between the public authorities (i.e. the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the Federal Environmental Agency) on the one hand, and the contractor (i.e. the research participants) on the other. In four of those stages, iterations between the ministry, the agency and the contractor are foreseen “until all three parties involved agree”. This concerns the policy instruments to be analysed, the key parameters to be used, comments on the draft, and final reports.

Another way of facilitating the exchange of information regarding PaMs and emission projections is the creation of special bodies or working groups. **Croatia** has established a Committee for Intersectoral Coordination for Policies and Measures for Climate Change Mitigation and Adaptation to oversee and evaluate the planning and implementation of policies aimed at addressing climate change. This committee is designed to ensure efficient horizontal and vertical coordination: there is the Coordination Working Group, which includes Assistant Ministers to provide political support for reducing emissions and meeting annual greenhouse gas quotas. Two specialised technical working groups focus on low-carbon development and climate adaptation. These groups should “participate in all phases of data preparation and submission, report review and reviews by the UNFCCC Secretariat and the European Commission”. Another example is **Belgium**, where the National Climate Commission is supported by a permanent secretariat and several thematic working groups. Among these, two thematic working groups focus on “policies and measures” and “projections.” The Working Group on Projections plays a critical role in harmonizing greenhouse gas emission projections developed by federal and regional authorities. National GHG emission projections are prepared within this group using a bottom-up approach that compiles regional projections. Through cooperation within the Working Group on Projections, methodologies and models are made compatible to ensure consistency. Additionally, the Working Group is responsible for preparing official reports, contributing, for example, to specific sections of the UNFCCC Biennial Report and National Communication.

In two countries there are procedures for information exchange to develop new PaMs. In **Greece**, an inter-ministerial technical working group is assigned the task of recommending the design of new PaMs to the Inter-ministerial Committee on Energy and Climate. The second example is **Croatia**, where the Committee for Intersectoral Coordination for Policies and Measures for Climate Change Mitigation and Adaptation has the responsibility of making proposals for PaMs to the government. This intersectoral coordination is composed of a coordination working group and two technical working groups.

The national reports also indicate planned changes or improvements to the national systems concerning data collection. The **Czech Republic** plans to further formalise cooperation between ministries and make

more specific arrangements concerning data provision. **Estonia** is working towards a system where sectoral experts can cover cross-sectoral topics to back up the work of a co-expert if needed. **Croatia** has set up a project to improve the data collection process. In **Slovenia**, the Climate Law that is being prepared also has the purpose of improving cooperation between ministries.

The survey that complemented the information in Member States' national systems reports, aimed to get an understanding of what technology countries are using during the various stages of the reporting progress, and whether digital or technological innovations are supporting them in this task. The question asked respondents to indicate which digital tools and/or software are used to conduct each the various activities of reporting, distinguishing between planning and development of PaMs, data collection, aggregation of information, quality control checks, and dissemination of information to stakeholders. The responses indicate that commonly available applications are the most used tools. Countries are not yet taking advantage of more advanced digitalisation tools and artificial intelligence for their reporting obligations. Excel has been indicated to be the most widely used software for planning and development of PaMs, data collection, aggregation of data, and QA/QC activities, followed by Word for documentation purposes. Other tools mentioned include database software, such as Access and SharePoint, used for planning and development of PaMs, data collection, and aggregation of data. An example worth mentioning is the dashboard system that was created in **the Netherlands**. The Climate Policy Dashboard is used by the government to report annually to the Parliament on the progress of the climate plan and the progress of the implementation of PaMs. During the preparation of reports, the dashboard serves as a tool for data collection and aggregation purposes.

2.3.2 Formality through legal arrangements

Countries are required to report information on their **legal arrangements** concerning the preparation of reports on PaMs and GHG emission projections. As shown in Figure 2-6, 22 countries indicated reporting on PaMs is supported by a legal arrangement, six countries indicated not to have national legislation on this matter, and for two countries the status was unclear. **Switzerland** referred to many legal arrangements, for example for policy making, monitoring of progress, and institutional cooperation; however, it remains unclear whether preparing reports and reporting is included in those legal arrangements.

Among the countries that described the legal arrangements in place, there is a broad variety with respect to type of arrangement and content covered. There are cooperation agreements specifying the required collaboration between actors involved, coexisting with other forms of legal arrangements, such as regulations, resolutions, decrees, acts, and ministerial or governmental decisions. Legal arrangements tend to focus on establishing institutions' roles and responsibilities: most often, the organisation with overall responsibility is specified (15 countries for PaMs, and 14 for emission projections), followed closely by institutional cooperation (mentioned in 13 countries for both PaMs and emission projections). Another aspect reported to be covered by the legal arrangements is the development of climate and/or energy plans, for example the NECP (mentioned by seven countries for PaMs and projections). Equally often, the monitoring of progress towards energy and climate targets is mentioned as another element (by seven countries for PaMs, and six for emission projections). Timelines is generally not part of the legal arrangements (reported by only four countries), and procedures for official consideration and approval of reporting are not mentioned by any reporting country.

Figure 2-7 shows how the different aspects of legal arrangements are covered in the countries' reporting.

Figure 2-6 The number of countries that have legal arrangements for PaMs (left) and projections (right) reporting.

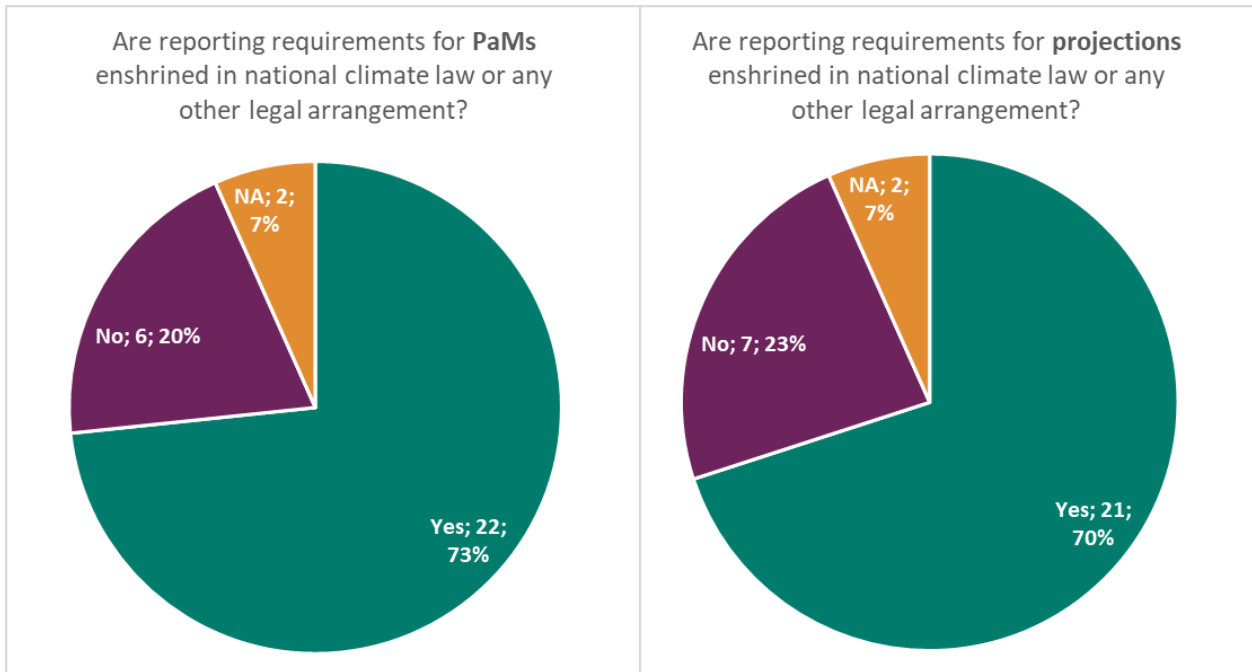
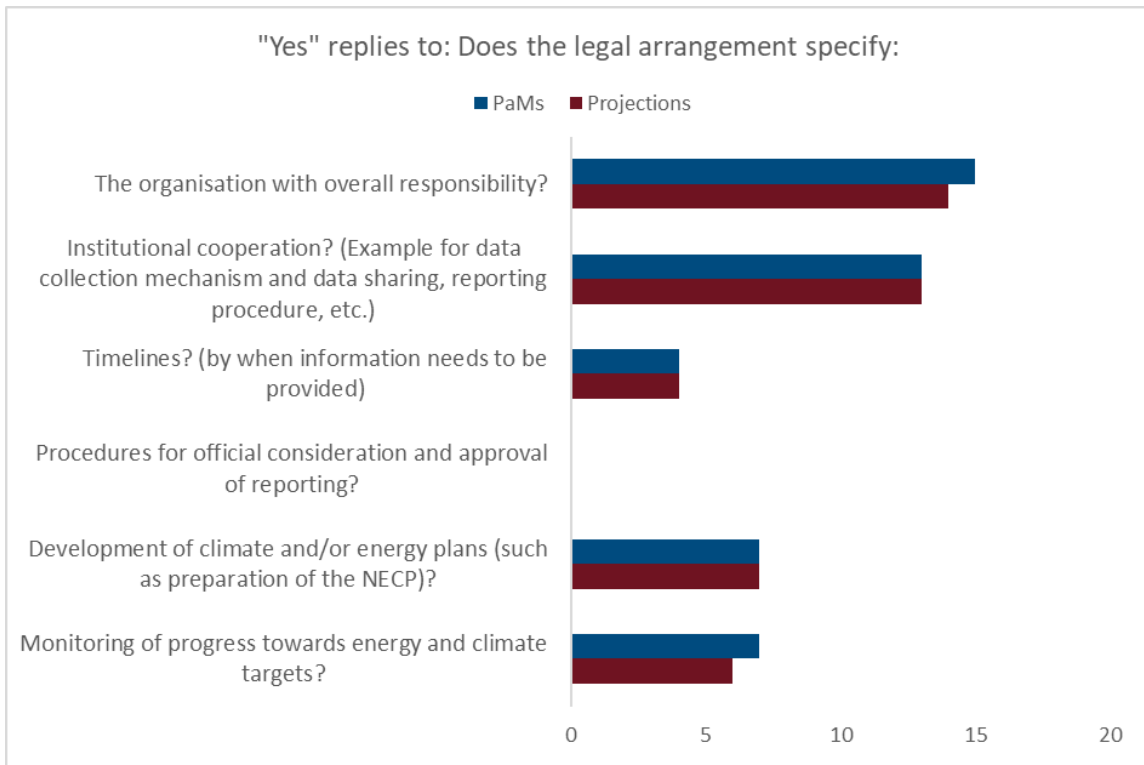


Figure 2-7 The number of countries that have reported that on the coverage of aspects in their legal arrangement.



The **Netherlands'** legal framework appears to be extensive and describes various aspects mentioned above. The reporting process is established by the National Climate Act of 2019. This legislation sets the national target for reducing GHG emissions and requires the government to adopt a national climate policy

plan every five years, with a ten-year outlook. The act also includes provisions for monitoring and evaluating the progress of the climate plan, including annual reporting to the Parliament on implemented PaMs and GHG emission projections.

In several countries the legal framework includes requirements for specific (sub-)sectors. In **Finland**, for example, the Clime Act (423/2022)⁵ stipulates the development of a separate climate plan for the land use sector. Also, in **Romania**, separate legal arrangements exist for the LULUCF sector, covering responsibilities regarding monitoring, analysing, and reporting on PaMs and emission projections. Similarly, **Poland** and **Iceland** established a legal basis regarding the ETS sector and consequent reporting. Finally, some countries also formalised the coordination and cooperation for reporting by including these topics in a legal arrangement. This is the case in **Belgium**, where various coordination bodies are set up for different topics (concerning, for example, the reporting regarding energy, climate, NECP, NECPR). Also, in **Croatia**, the Committee for Intersectoral Coordination for Policies and Measures for Climate Change Mitigation and Adaptation is formally established by the Act on Climate Change and Ozone Layer Protection. A final example is **Denmark**, where collaboration between the ministries is based on 'common understanding', captured in royal resolutions defining the overall responsibilities of the different ministries.

National reports also indicate planned improvement with regards to legal arrangements. In **Croatia**, a new regulation will be drafted to improve the national system and align further with Governance Regulation (EU) no. 2018/1999. **Iceland** indicated it is revising its Regulation on GHG inventory in accordance with the new legislation for the Paris Agreement period. In Romania legislation is being modified with regard to the implementation of the Fit-for-55-package. Institutional responsibilities regarding elaboration and submission of the reporting according to the Governance Regulation will also be part of this. **Slovenia** reported it is drafting a Climate Law, which should also improve cooperation between ministries. **Slovakia** indicated it is preparing a new Act on Climate Change with strong mechanisms for setting national legal arrangements for reporting on policies and measures and of projections.

2.3.3 Alignment with other reporting frameworks

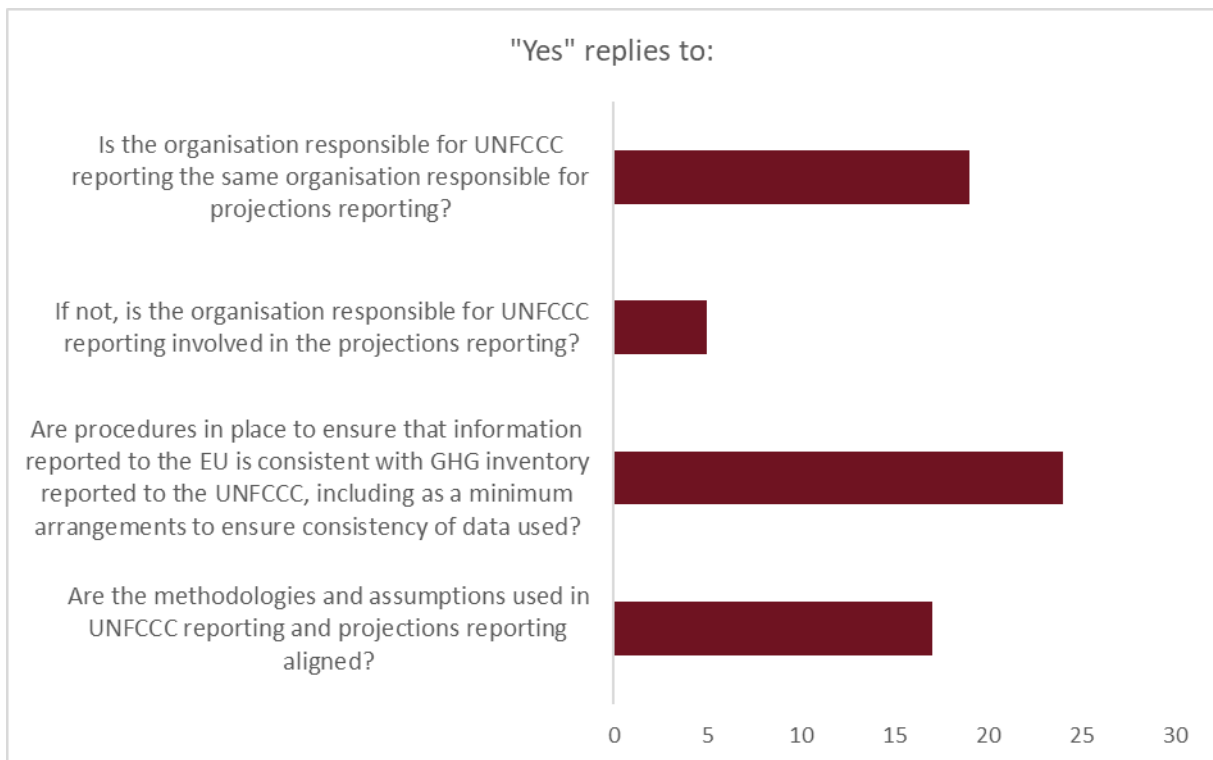
2.3.3.1 Alignment with the national GHG inventory reporting

Countries are required to ensure **alignment of reporting on the GHG emission projections and GHG emission inventories**. Alignment is addressed on three distinct levels. The first is the institutional arrangements put in place to ensure alignment. In 19 countries, the organisation responsible for reporting to the UNFCCC is the same entity responsible for projections reporting. In another five countries, the organisation in charge of UNFCCC reporting engages in projections reporting, while information on the organisation responsible for UNFCCC reporting is not provided for the remaining six countries. The second level of alignment concerns the data utilised, with 24 countries having established procedures to ensure the consistency of the data used, marking it the highest reported alignment among countries. The third concerns the methodological aspects. 17 countries ensure that the methodology and assumptions employed in UNFCCC and EU projections reporting are aligned, while the remaining 13 countries do not provide information on this aspect of alignment. The number of countries that report on each arrangement is illustrated in Figure 2-8.

For 14 countries the institutional and procedural arrangements for GHG emissions reporting to UNFCCC and the EU are harmonised across the three levels, namely at institutional, data utilisation and methodological levels. The remaining countries exhibit alignment at two levels (seven countries), or at least one of these levels (nine countries).

⁵ More information can be found at: <https://ym.fi/en/climate-change-legislation>.

Figure 2-8 The number of countries that reported having arrangements to ensure alignment of GHG inventory and EU GHG emission projections reporting.



2.3.3.2 Alignment with Article 17 of the Governance Regulation (EU) 2018/1999 on the reporting on the implementation of National Energy and Climate Plans (NECPR)

In accordance with Article 17 of the Governance Regulation (EU) 2018/1999, Member States **are required to submit reports** (NECPR) to the European Commission **regarding the implementation of their NECP** by 15 March 2023, and subsequently every two years. These reports are expected to provide a comprehensive overview of the progress made towards the objectives and targets set out in the NECP. They also contain information on financing and implementation of PaMs, including investment reviews and their impact on air quality. The integrated NECPR must cover various elements, such as data included in the annual GHG inventory report, details on integrated PaMs, and projections of anthropogenic GHG emissions from various sources and removals by sinks. These obligations, which apply to Member States only, must be fulfilled by ensuring consistency of their reporting under both Article 17 and 18.

Under the national systems reporting, **two-thirds (18) of EU Member States report that they have established arrangements for reporting in accordance with Article 17 to facilitate harmonisation of information.** Alignment is primarily demonstrated by the corresponding arrangements that are common to both reporting obligations. This includes harmonised institutional arrangements (e.g., Finland, Ireland, Italy, Poland, and Hungary), legal arrangements (e.g., Finland, and Luxembourg), coordination of data collection (e.g., Denmark, Finland, Netherlands, Croatia, Czechia, and Hungary), and stakeholder involvement through working groups (e.g., Greece, and Slovenia).

In the remaining nine Member States, the links are not clear, mainly due to the reporting being based on the alignment of PaMs and projections reporting with the NECP rather than the NECPR. In these instances, information regarding alignment with the NECPR was considered as being unavailable. Two countries (Spain, and Portugal) indicated that, since the integrated national system on climate and energy was still under development, procedures for streamlining the two reports have yet to be established.

2.3.4 Accountability and transparency

2.3.4.1 Quality assurance and control of reporting

Countries are required to check their reporting before submission, primarily in accordance with the TTACCC criteria. Countries are therefore required to establish their own **quality assurance and quality control procedures** and checks. The EEA and ETC CM provides support to reporters to assist countries with improving and ensuring quality of reporting through webinars, tutorials, guideline documents, checklists, and templates with embedded quality checks. Additionally, automatic QA/QC checks are embedded in *Reportnet 3* to ensure quality on a number of parameters, which include “blockers” that require data adjustments before submission.

Figure 2-9 illustrates the number of countries that report to have QA/QC arrangements for PaMs and projections reporting. Around two-thirds of the countries (20 countries for PaMs, and 21 for projections) have established mechanisms to ensure the timeliness of reporting. 17 of these countries ensure timeliness by developing of a timeline of activities (refer to Figure 2-10). When a timeline is available, the total months allocated for the necessary reporting activities range from 6 to 15 months, with an average of 10 months. Only seven countries allocate specific time for the execution of QA/QC activities, with an average allocated period of two months. **Lithuania** acknowledges that their seven-month timeline does not sufficiently allow for QA/QC activities and intends to address this in the future. Furthermore, seven countries also indicate that their timeline includes a consultation period with the relevant Ministries and government bodies to provide their feedback on draft PaMs and projections reporting.

Figure 2-9 The number of countries that have reported having arrangements in place to ensure quality of reporting on PaMs and projections.

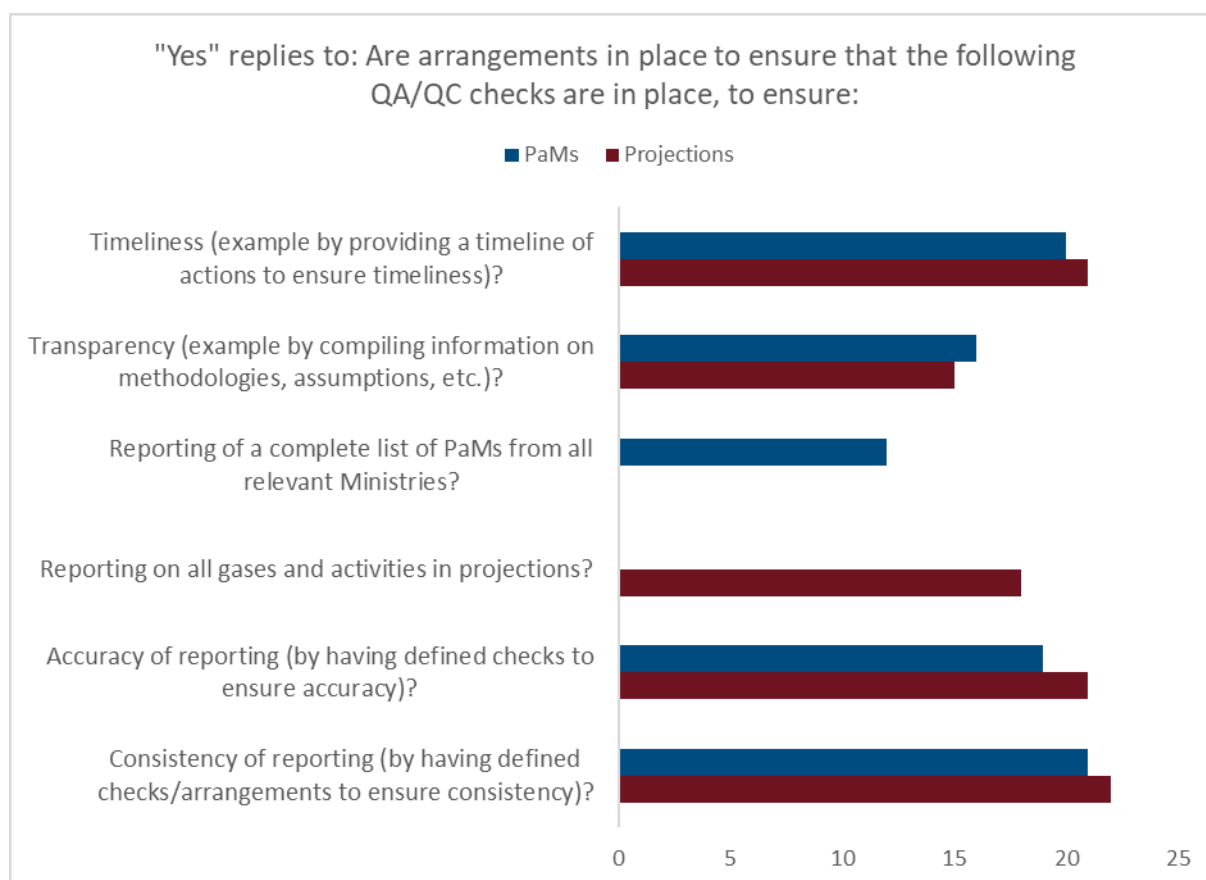
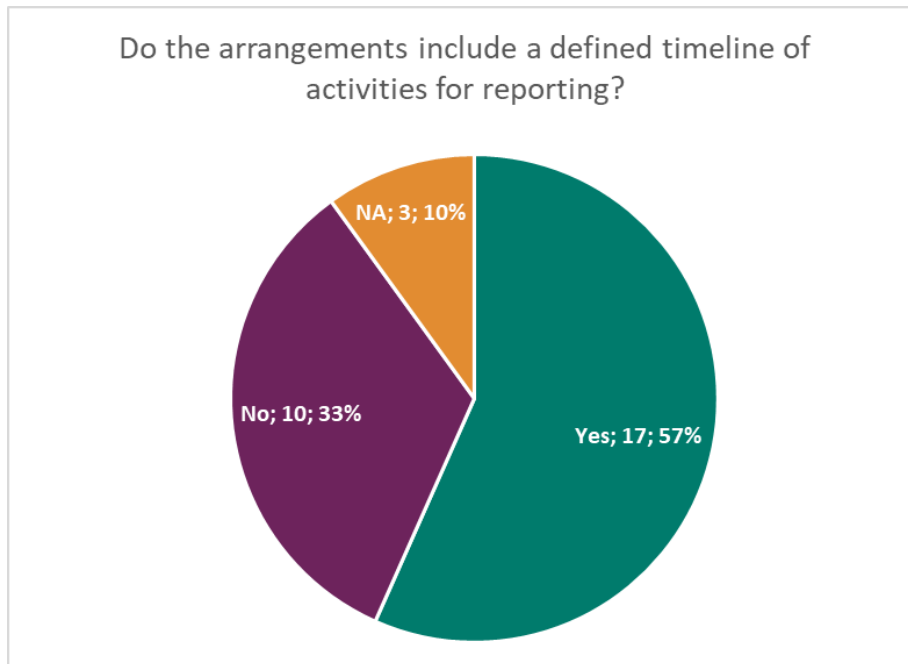


Figure 2-10 The availability of a timeline of activities for reporting on PaMs and projections.



Half of the countries have established procedures to ensure transparency in reporting by documenting the relevant information, for example on methodologies and assumptions used to estimate PaMs impacts and projections. Regarding completeness of reporting, 12 countries implement measures to ensure reporting on a complete list of PaMs, and 18 countries have established arrangements to ensure that projection reports encompass all gases and activities. 20 countries have procedures in place to ensure accuracy of reporting for both PaMs and projections, and 21 countries have arrangements in place to ensure overall consistency of reporting. 15 countries have more specific checks to ensure consistency in the data used for reporting, such as on assumptions made in the baseline and socio-economic scenarios. Furthermore, 11 countries report having checks to ensure consistency in energy projections across different sectors.

Based on national system reports, **the robustness of the QA/QC procedures vary among countries**. None of the countries report on all the reviewed QA/QC arrangements. 18 of the countries have at least four out of the seven reviewed arrangements in place to conduct QA/QC for PaMs, and an equal number of countries have at least five out of the eight reviewed arrangements for projections. The disparity in robustness is also demonstrated by the level of detail in the defined QA/QC tasks and approaches, the assignment of roles and responsibilities, the allocation of time for activities, and the level of formality of procedures.

On the one hand, good practices encompass well-defined QA/QC processes with clearly assigned responsibilities embedded within the reporting cycle (e.g. **Cyprus, Finland, Netherlands, Romania, and Slovakia**), and establishing procedures for reviewing the QA/QC activities for future improvements (e.g. **Netherlands, Ireland, and Slovakia**). On the other hand, two countries explicitly report that they have no formal QA/QC procedures in place for a number of, or all, the QA/QC criteria, and one country does not provide any information on such processes. One country reports that checks for completeness and coherence for PaMs is completely dependent on the QA/QC checks available in *Reportnet3*, and another country reports to rely entirely on the QA/QC feedback received from the EEA/ETC team for their quality checking.

Despite these national QA/QC arrangements in place, the ETC CM review of PaMs reporting in 2023 found the quality to be lower than observed in earlier years. This highlights the **need for further improvements**

in the robustness of the QA/QC framework across all countries alongside their growing familiarity with the newer, more comprehensive PaMs reporting requirements. Taking the reporting under Annex IX of PaMs as an example, the higher number of QA/QC arrangements did not lead to any noticeable reduction in reporting issues. Even among countries that report to have established arrangements to address the full TTACCC criteria, the number of raised issues by reviewers were not statistically different when compared to countries with fewer or no such measures in place.

In contrast, the availability of a timeline seems to improve timeliness of reporting. Nevertheless, there remains room for improvement. Among the 20 countries with established timeline, submissions were late for 9 PaMs reports and 5 GHG emission projections reports. However, almost all of these countries (seven countries for PaMs, and four countries for projections) submitted with a slight delay before end of May.

The national system reports also indicate that the **need for improvements in QA/QC procedures are already identified by several countries**. For example, **Belgium** expects an improvement in the consistency of the projections of WEM and WAM scenarios for the Walloon region, as the two scenarios are planned to be performed using the same tool in the next reporting cycle. In terms of timeliness, **Lithuania** recognised that the schedule for reporting needs to be amended in the future to allow for sufficient time for QA/QC activities. **Spain** also highlighted that a new law on climate change and energy transition, will include provisions for QA/QC activities in future reporting. **Latvia** also planned to update their QA/QC program in line with the changes in the institutional and legislative arrangements.

2.3.4.2 Monitoring and evaluation of PaMs

A monitoring mechanism to track progress towards climate and energy targets, along with the **evaluation of progress in meeting commitments**, are fundamental components of an effective governance framework for assessing efforts to address climate change. The reporting on PaMs under the Governance Regulation (EU) 2018/1999 requires the carrying out of quantitative assessments. As explained earlier in section 2.2.2, in the 2023 reporting cycle, **reporting of “mandatory if available” quantitative data**, such as policy effects or costs and benefits, **was limited across countries**. 18 countries provided quantitative data on at least one indicator, an equal number of countries reported on *ex-ante* GHG emission savings, and seven countries reported on *ex-post* savings. Reporting on *ex-ante* and *ex-post* data concerning energy savings, renewable energy, and the costs and benefits of PaMs remains notably low. The assessment of PaMs’ impacts is also crucial for projections reporting, as the impact of PaMs on GHG emission trends should be outlined in the report.

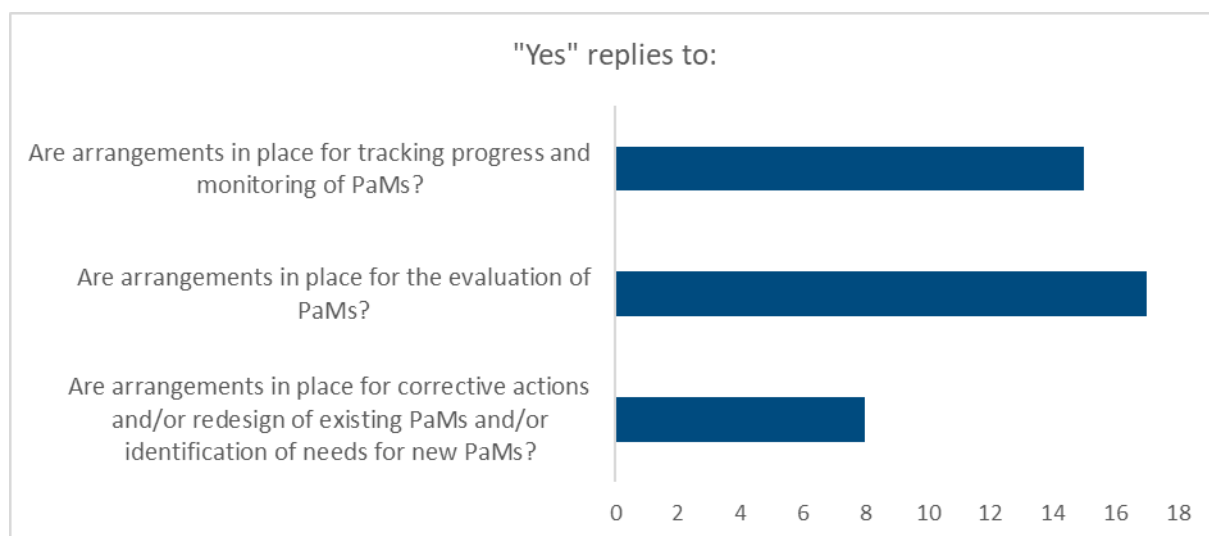
In the context of the national systems reporting, there is no specific requirement for reporting information regarding the established arrangements for monitoring and evaluation of PaMs. However, countries are required to report on “relevant institutional administrative and procedural arrangements for domestic implementation of the EU’s nationally determined contribution”, which broadly captures monitoring and evaluation. Various countries report activities or arrangements for monitoring and evaluating PaMs. However, the level of detail provided in the information is generally limited and varies across countries.

15 countries have indicated in the national system reports to have some form of arrangements for tracking progress and monitoring of PaMs, and **17 countries have established arrangements for the evaluation of PaMs**. Based on the survey results, 7 out of the 12 responding countries indicated to have arrangements in place to conduct *ex-ante* and/or *ex-post* evaluations of PaMs, which is similar to that noted in the national systems reports. The survey results shows that two more countries, **Ireland and Germany**, have procedures in place for evaluation.

Examples of reported monitoring and evaluation arrangements include institutional arrangements, such as committees (e.g., **Iceland**, and **Switzerland**), or working groups (e.g., **Greece**) responsible for the monitoring of implementation of PaMs and evaluating progress, thereby closely aligning with the arrangements for the preparation of the NECPR. Other arrangements pertain to data collection systems

and procedures for monitoring and evaluation, such as the development of platforms for continuous collection and periodic updates of PaMs monitoring (e.g., the **Netherlands**).

Figure 2-11 The number of countries that reported having arrangements to carry out monitoring and evaluation of PaMs.



Moreover, the national system reports show that **at least eight countries have established arrangements to determine the need for corrective actions for PaMs**. Through the utilisation of monitoring tools or arrangements, a limited number of countries have implemented procedures to detect deviations from plans, assess the need for improvements, and provide corresponding recommendations (e.g., **Denmark, Iceland, and Romania**). In such cases, procedures for monitoring, evaluation, and corrective actions are integrated within the policy cycle defined by legal, institutional, and procedural frameworks.

While various countries have established arrangements for monitoring and evaluation, others recognise that although monitoring and evaluation activities are conducted to some extent, they have no comprehensive and established system in place to carry out monitoring and evaluation in a systematic and coherent manner across PaMs. In the national systems reports, four countries have indicated their plans to implement changes in the near future aimed at improving the accountability and transparency of their national systems. **Belgium** has reported that a preliminary draft law, which will legally formalise the policy cycle, is currently being finalised, and envisages the establishment of an independent expert committee tasked with reviewing and providing feedback on federal climate PaMs. **Spain** has expressed plans to incorporate a provision on PaMs evaluation in the forthcoming climate and energy law. **Estonia** and **Lithuania**, both have indicated their plans to improve their monitoring and evaluation processes for PaMs.

2.3.5 Public participation

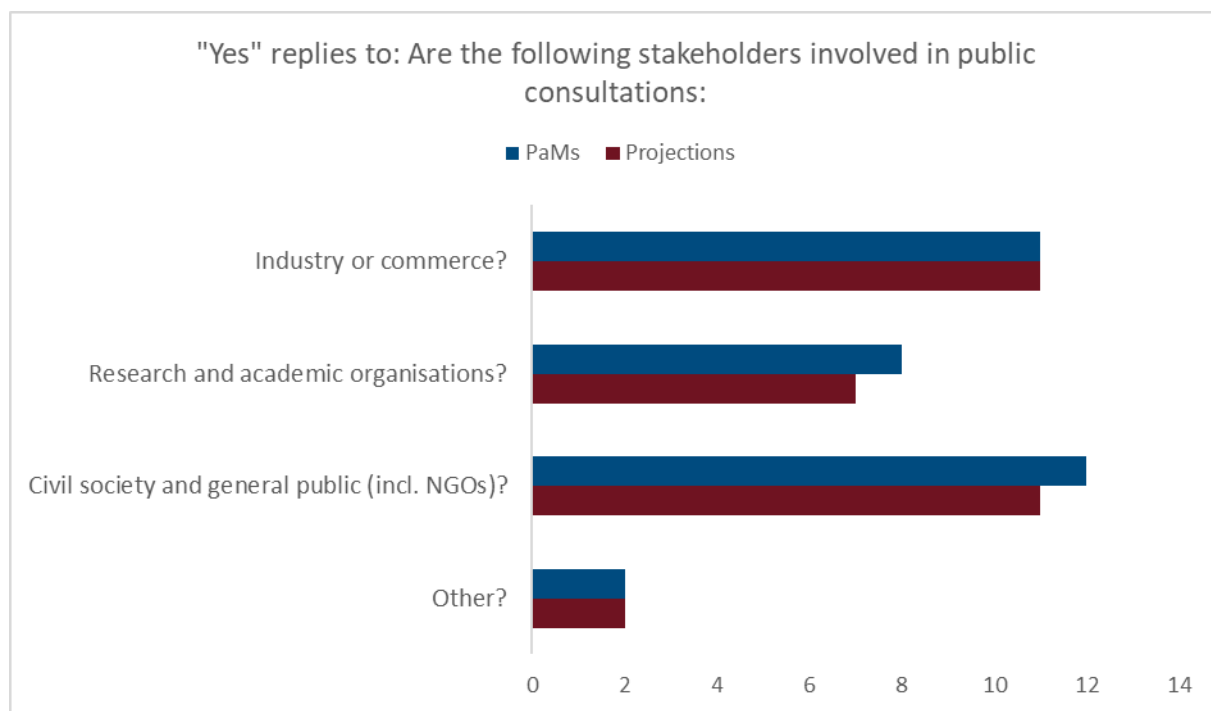
It was challenging to use the national system reports to assess the extent of **public consultation** for PaMs and emission projections reporting, because countries approached this reporting element in different ways. Twenty-five countries reported on the broader stakeholder engagement within climate and energy policymaking, including stakeholders from the public administration sector. With respect to public participation, this appears to occur in two main ways. Firstly, for the reporting of PaMs and projections, and secondly, for the broader context of climate policy formulation, and for climate strategy development and planning.

Eighteen countries indicated that they conduct public consultations during the climate policymaking process. In 15 countries they are conducted in the frame of PaMs and projections reporting. Various

countries conduct public consultations specifically for the development of the NECP (e.g., Austria, Belgium, Bulgaria, Greece, Italy, Malta, and Portugal), while others engage stakeholders in the broader climate policymaking (e.g. Denmark, Finland, France, Netherlands, Norway, and Poland). Public consultations typically involve formal procedures such as public hearings, workshops (e.g., Hungary), or technical groups (e.g., Croatia, Lithuania, and Romania). These engagements include various public stakeholders, such as civil society, research and academic institutions, industry and commerce representatives, social partners, and members of parliament (e.g. Denmark).

The three main stakeholder groups engaged by countries are (1) industry and commerce, (2) research and academic organisations, and (3) civil society and the public. As illustrated by Figure 2-12, the primary stakeholders involved in these consultations typically consist of civil society and the public, followed closely by industry and commerce operators. Research and academic organisations are the least mentioned stakeholder group. As part of their public consultations, two countries report to engage with other type pf stakeholders: external experts (Iceland) and an independent science advisory body (Finland). On average, countries engage with two different stakeholder groups in their consultations.

Figure 2-12 The number of countries conducting engagements with different stakeholder groups.



The findings of the evaluation of the Governance Regulation (EU) 2018/1999 (European Commission, 2024a) indicates that most Member States have set up consultation processes in accordance with the requirements of Article 10 on public consultations for NECP and long-term strategies. However, the evaluation also finds that the draft updated NECPs generally lack detailed descriptions of these processes. It notes that some consultations lacked available draft texts or provided limited opportunities for stakeholder feedback. Some Member States plan to conduct thorough consultations before finalising their NECPs (European Commission, 2024a).

Article 11 of the Governance Regulation mandates that Member States must establish a multilevel climate and energy dialogue involving all relevant stakeholders, including the public. This innovative approach requires engagement with sub-national authorities. However, as noted in the preliminary evaluation of the Governance Regulation (DG ENER & DG CLIMA, 2024), the non-prescriptive nature of this requirement has resulted in varied interpretations by Member States, with most countries reporting in their NECP

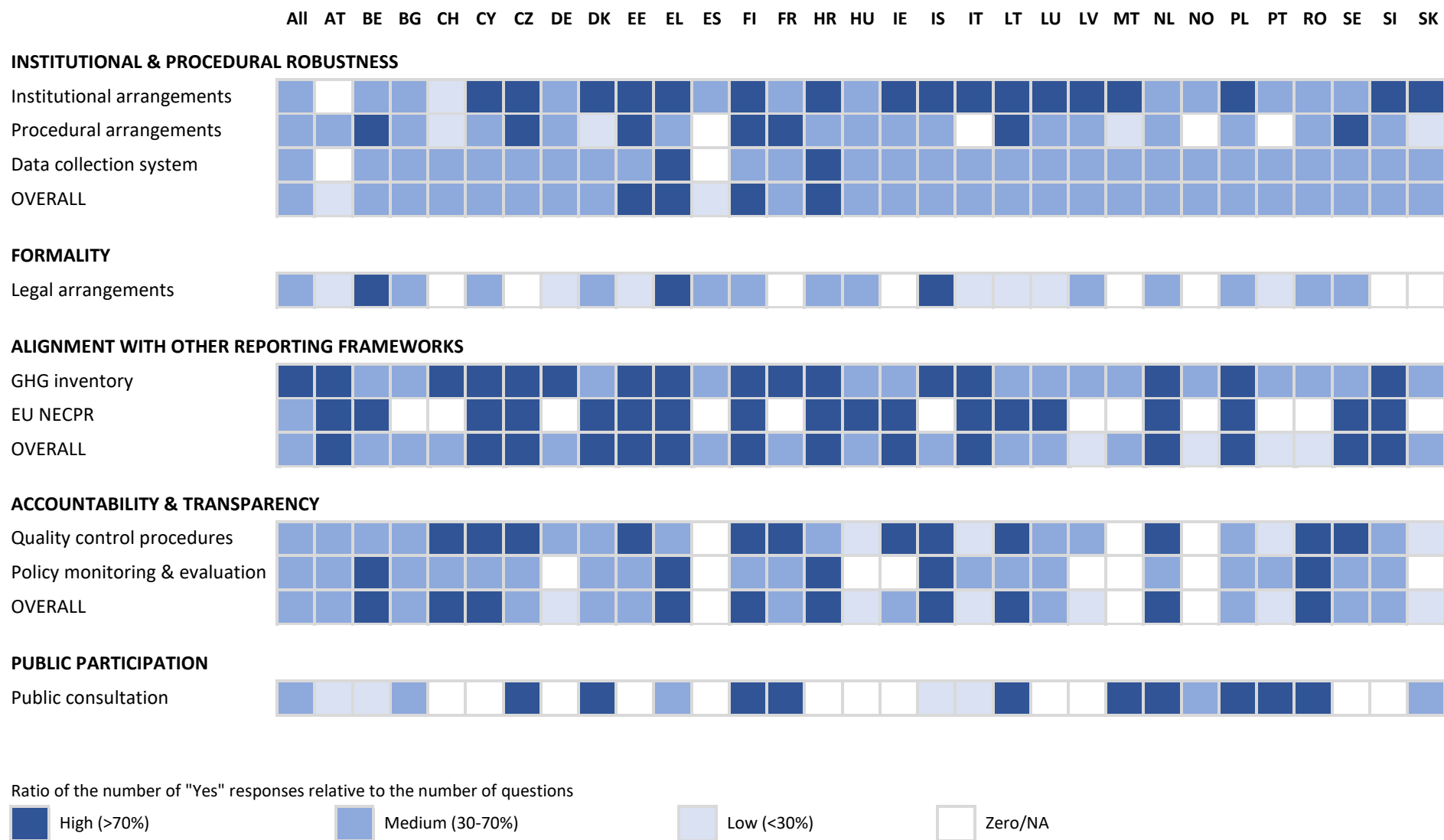
efforts to set up or enhance structures for their dialogues. The preliminary evaluation also suggested that the dialogue process poses more challenges in federal countries, where the final document is drafted at the national level while consultations typically occur at the regional level.

2.4 Key findings of the state of play and challenges of national systems

Figure 2-2 presents a heatmap visualising the results of the study's data collection framework for national systems reports. This heatmap depicts the variation in the number and comprehensiveness of arrangements across the countries' national systems. The darker colour indicates stronger or more comprehensive arrangements, while lighter colours indicate gaps, missing arrangements, or lack of information in the national systems reports on specific arrangements.

The main findings from the data collection framework are summarised below, outlining both the strengths and weaknesses of the current national systems for reporting on PaMs and GHG emission projections. These key findings are supported by insights gathered from the surveys and interviews, which provide additional information on the main challenges identified when assessing the national systems.

Table 2-2 The prevalence of governance arrangements and procedures in place across the European countries.



Ratio of the number of "Yes" responses relative to the number of questions

High (>70%)
 Medium (30-70%)
 Low (<30%)
 Zero/NA

Note: These results are based on the national systems reports submitted by countries under the Governance Regulation (EU) 2018/1999.

Key finding 1: Robust governance systems enhance climate and energy reporting and policy alignment.

Robust and well-defined national (and Union) systems with clear legal frameworks, formalised roles, and integrated responsibilities enhance the quality of reporting, streamline processes, reduce overlaps and burdens, and align national policies with broader climate goals while promoting inclusive stakeholder engagement.

Key finding 2: Many countries have well-established institutional and data collection arrangements for PaMs and GHG emission projections reporting.

Most countries demonstrate well-established institutional arrangements, with defined institutional responsibilities and involvement of a diverse range of policy areas and experts in the reporting process. Data collection procedures are also robust in many countries. Survey results confirm this, with 11 out of 12 responding countries identifying their institutional arrangements as one of the strongest elements of their national systems. The reasons for this robustness vary across countries. **Ireland** attributes its strength to its well-established inventory system, which serves as a solid foundation for projections reporting. The **Netherlands** highlights the integration of projections into the policy cycle as a driver of institutional robustness. **Denmark** and **Slovakia** emphasise the role of multi-stakeholder collaborations, which support institutional resilience and facilitate efficient data exchange. 5 out of the 12 responding countries considered their information collection systems to be the most robust element of their national systems. For instance, **Switzerland** credits its long-standing information collection framework, which ensures familiarity among data providers. Estonia values the transparency of its information collection system, emphasising its importance for decision-making and institutional robustness.

Key finding 3: Capacity and resource constraints undermine the effectiveness of national reporting systems.

Interviews revealed significant capacity challenges in developing and maintaining robust reporting mechanisms. Survey responses from three countries highlighted the need for improvements in institutional arrangements to enhance the efficiency and capacity of national systems. In the 2023 reporting cycle, resource constraints were identified as a key factor limiting countries' ability to fully meet QA/QC requirements for PaMs reporting (Dauwe et al., 2023). Various countries rely on outsourcing of reporting tasks to external contractors, mostly sectoral projections, due to limited in-house capacity. While this practice addresses capacity issues, it limits the competence of national institutions. Interviews with **Bulgaria's** and **Germany's** lead reporters indicated that reliance on external consultants for sectoral projections can delay reporting processes. The reliance on external competence and externally developed models can limit the transparency of reporting and complicates oversight and accountability.

Key finding 4: Strengthening the network of sectoral experts is essential to enhance stakeholder input, and policy integration and consistency.

Within the institutional arrangements, the national system reports show that most countries do have arrangements in place to engage stakeholders from the relevant ministries and governmental bodies. However, less than half of the assessed countries have formalised network of inter-ministerial experts in place. The survey and interview responses also indicated that in practice, inter-ministerial coordination often proves inadequate. Despite having arrangements for collaboration with ministerial and administrative bodies, various countries face challenges with delayed data provision and limited formal mechanisms to ensure regular input from relevant departments. Furthermore, lack of inter-ministerial coordination limits climate and energy policy integration across sectoral ministries, as well as alignment of climate reporting with national and EU policy goals. Survey responses indicated that legal arrangements may be needed to formalise the institutional and data collection systems to streamline data inputs and strengthen the network of sectoral experts.

Key finding 5: Procedures for the consideration, approval, and review of reporting and national systems are insufficient in many countries.

The national system reports reveal that less than half of the countries have established arrangements for the official consideration and approval of changes to their national system. Moreover, only about one-fifth of the 30 countries conduct a formal review of the previous reporting cycle. This suggests that, while institutional structures are generally in place, the robustness of the national systems may benefit from further formalisation of procedures.

Key finding 6: Countries with no legal arrangements could benefit from formalising their national systems to enhance long-term accountability of reporting practices.

The assessment results on the extent of formality in national systems show considerable variation between countries. Countries that have a robust formal basis for reporting tend to formalise their institutional, procedural, data collection, and monitoring arrangements. In contrast, several countries do not have any of the reporting arrangements enshrined in legal frameworks. Among the twelve countries that participated in the survey, three indicated that their legal arrangements are regarded as one of the most robust elements of their national system. These legal frameworks are perceived to facilitate inter-ministerial collaboration, enhance data exchange, and improve the timeliness of reporting. Countries with less formal or non-existent legal frameworks acknowledge that legal arrangements could be strengthened to formalise inter-governmental efforts. This would ensure that the relevant ministries are accountable for providing necessary input.

Key finding 7: PaMs and emission projections reporting is highly aligned with the GHG inventory and the EU NECPR. However, the reporting on these elements in the national system could be improved by several countries.

Several countries have reported on their alignment with the NECP rather than with the NECPR (Article 17 of the Governance Regulation). This may have affected the results of this assessment. Nevertheless, many countries demonstrate a high degree of alignment with reporting under Article 17, particularly regarding data consistency. This outcome is not surprising since in the 2023 reporting cycle, PaMs and emission projections reporting has been integrated within the NECPR.

There is generally a good alignment with the GHG emission inventory, particularly regarding institutional arrangements and data consistency. This alignment is largely attributable to the long-standing arrangements for the inventory systems, which often serve as a robust foundation for reporting projections. However, the data provided by several countries is inadequate for a thorough comprehension of the alignment at both the institutional and procedural levels.

Key finding 8: While quality control procedures are relatively extensive in many countries, there are still deficiencies in the quality of PaMs and emission projections reporting.

Quality control procedures are well-established in many countries, including activities to ensure adherence with the TTACCC criteria. However, a small number of Member States have no QA/QC procedures in place or rely exclusively on the QA/QC checks performed by the EEA/ETC CM. Findings from the quality checks conducted by the EEA/ETC CM identified several areas that require improvement, particularly concerning PaMs reporting, despite most countries reporting to have established QA/QC procedures. According to the survey results, only 3 out of the 12 responding countries identified their QA/QC procedures as one of the strongest elements of their national system. The survey respondents also highlighted several areas for potential improvement within their QA/QC procedures, such as the establishment of a QA/QC template to standardise checks and the improvement of inter-organisational collaboration to enhance the QA/QC process. Another issue is timeliness. Only around half of the countries submitted their PaMs and/or projections on time, reflecting the need for countries to adopt more formal schedules for reporting.

Key finding 9: Policy monitoring and evaluation practices are still not sufficient in most countries for complete reporting on PaMs impacts.

There is a general inadequacy in the reporting of the impacts of PaMs, particularly with respect to ex-post impacts. Most of the countries lack formalised procedures for the monitoring and evaluation of PaMs, whether at the individual or grouped PaM level. This might be a reason for the limited extent of reporting by countries on *ex-ante* and *ex-post* GHG emission impacts of PaMs, which was lower in the 2023 reporting cycle compared to 2021 (Dauwe et al., 2023). While 18 Member States reported impacts of at least one PaM, only 7 Member States reported on *ex-post* impacts of measures. Countries that report impacts generally do not provide such information for all of their reported PaMs. Reporting on energy savings and renewable energy, and associated costs and benefits was almost non-existent in 2023. The lack of reporting potentially indicates an absence of formalised procedures for the monitoring and evaluation of PaMs.

Key finding 10: Public consultation practices in climate policymaking and reporting vary widely, with some countries demonstrating strong stakeholder involvement while others have little or no involvement.

Significant discrepancies exist among countries in the extent of public consultation during reporting on PaMs and GHG emission projections and the broader climate and energy policy making. Approximately half of the countries demonstrate relatively robust public consultation practices, while the others have minimal or no public involvement. Some countries do not report on these practices. Despite these disparities, only 2 out of 12 survey respondents identified stakeholder engagement as an area requiring improvement in their national systems. This suggests that public participation may be perceived as a lower priority area in several countries, potentially limiting its integration into national systems. These findings highlight the need to enhance public involvement in climate policymaking and reporting processes to foster greater transparency and align national procedures with participatory governance principles.

3 Good practices in national systems

This chapter explores good practices in national systems for PaMs and GHG emission projections reporting. These practices are categorised under the defined five core elements of a national system that were assessed in the previous chapter. The insights presented in this chapter are drawn primarily from the national system reports submitted under the Governance Regulation. Three case studies are also presented based on the findings of the three interviews conducted with national lead reporters from Ireland, Germany, and Bulgaria.

These sources provide valuable examples of how countries have developed and implemented distinctive approaches to strengthen their reporting systems. The examples presented in this chapter highlight the diverse strategies employed across countries to enhance the governance robustness, formalising processes, ensuring integrated frameworks, and improve the transparency and accountability of the reporting mechanisms. While not exhaustive, these examples are selected to illustrate the variety of good practices that countries have adopted in building and refining their systems. It also underscores the importance of public engagement in climate reporting, to foster inclusivity and accountability in climate action. By showcasing these practices, the chapter aims to offer guidance for other countries in enhancing their own national systems.

3.1 Institutional and procedural robustness

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| Good practice | Involvement of advisory bodies |
| Countries | Germany, Denmark, the Netherlands, and Romania |
| Description | <p>In Germany, the Federal Climate Protection Act establishes the ‘Expertenrat für Klimafragen,’ an independent expert council. This body plays an official role in reviewing national projections and environmental data, offering assessments on methodology and transparency, while equally encouraging the public debate about these issues.</p> <p>Denmark has set up the Council on Climate Change, which is an independent body of experts, to advise and keep the Government accountable on climate efforts. The Climate Act strengthens this role by requiring the Council to annually assess the Government’s climate efforts and make recommendations on the action going forward. In each year’s climate programme, the Minister for Climate, Energy and Utilities must report on these recommendations and state the Minister’s position on the recommendations. The Council on Climate Change must also assess whether the Government’s climate efforts make it probable that the climate targets will be reached.</p> <p>In Romania, the advisory body is more integrated with the public administration while also incorporating members from beyond governmental circles. The National Commission for Climate Change, established under Government Decision 1026/2014, is an inter-ministerial advisory body coordinated by the central authority for environmental protection and climate change. It promotes coherent national implementation of international agreements like the UNFCCC, Kyoto Protocol, and Paris Agreement, along with European and national climate legislation. The Commission is chaired by the head of the central environmental authority, with the state secretary for environmental protection as vice-president. Supported by a technical working group of experts from government, academia, civil society, and the private sector, the Commission facilitates consultations and</p> |

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| | <p>input on technical climate issues. Meetings are organized as needed, ensuring informed and coordinated climate policies across sectors.</p> <p>In the Netherlands, the Council of State serves an important advisory role in the national climate framework. As the highest legal advisor to the government, the Council reviews draft climate policy plans before their adoption, ensuring legal soundness and alignment with national objectives. This includes reviewing the draft Climate Policy letter before its submission to Parliament, as part of the broader climate plan's progress reporting. By providing expert advice and oversight, the Council contributes to the to the government's reporting and strategy development.</p> |
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| Good practice | Involvement of local actors |
| Countries | Iceland and Slovakia |
| Description | <p>In Iceland, local actors are explicitly involved in the national climate framework, particularly through their inclusion in the Interministerial Steering Committee (ISC), which oversees the implementation of the Climate Action Plan. By including a representative from the Association of Icelandic Local Authorities (Samband íslenskra sveitarfélaga), the ISC ensures that local perspectives and priorities are integrated into national climate policy decisions, fostering alignment between the local and national policy levels.</p> <p>In 2021, the Council of the Government of the Slovak Republic for the European Green Deal (CG EGD) was established. The CG EGD acts as an expert, advisory, and coordinating body, guiding the Slovak Republic's transition to a carbon-neutral economy by 2050 and aligning national policies with the European Green Deal and Sustainable Development Goals. Importantly, the Council includes representatives from local government authorities and local governments, highlighting the role of local actors in shaping and implementing climate policies.</p> |

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| Good practice | Internal review of reporting to improve next reporting cycle |
| Countries | Cyprus and Ireland |
| Description | <p>Both Ireland and Cyprus emphasise the importance of identifying and documenting possible improvements to the methodologies used in GHG emission projections. In Ireland, the Environmental Protection Agency maintains an improvement plan that is regularly reviewed and prioritised, with updates noted in the methodology report.</p> <p>Similarly, Cyprus' Department of Environment maintains a list of improvement opportunities, incorporating input from external experts, and records implemented changes in its methodology report. These processes support ongoing refinements.</p> |

Case study 1 The independence of the institutional arrangements of Ireland's national system.

Ireland's national system for GHG emissions and energy reporting operates through a collaborative structure under the Environmental Protection Agency (EPA). Although lacking a national legislative mandate, the system functions effectively through institutional arrangements and memoranda of understanding (MoUs) with government departments and agencies. The EPA, an independent body, is the main authority responsible for compiling and reporting emissions inventories and projections. This independence allows it to operate with minimal political influence, which contributes to the objectivity of data reporting.

The reporting structure includes partnerships with organisations such as the Sustainable Energy Authority of Ireland (SEAI) and the Central Statistics Office (CSO). These agencies provide data inputs crucial for energy efficiency and macroeconomic forecasts, respectively. Annual formal communication with these partners ensures that data needs and timelines are clear, even though collaboration can sometimes extend beyond formal MoU arrangements. This network-based approach allows Ireland's system to maintain high data quality and integrity, despite the absence of binding legal obligations.

Ireland's national system for reporting GHG emissions and energy use is unique in its apolitical structure. This structural independence means that the EPA is not directly influenced by government policy priorities or election cycles, which allows the agency to focus on scientifically sound data collection, unbiased reporting, and evidence-based projections. The EPA's independence facilitates clear separation between data-driven environmental assessments and government-mandated targets. For example, while the EPA collaborates with government departments and considers national and EU targets, it produces emission projections based on realistic scenarios. This approach enables the EPA to objectively highlight where projections or measures may fall short of policy expectations. By maintaining an apolitical position, Ireland's system strengthens trust among stakeholders, including government entities, international organisations, and the public. This transparency can improve international standing and compliance credibility with EU regulations. Moreover, the EPA is empowered to identify gaps in data or methodological improvements independently, such as verifying economic growth rates or updating MoUs with agencies without awaiting political approval. This autonomy allows for responsive improvements year-over-year. However, since the EPA operates independently, it receives minimal direct input on policy effects from government departments, limiting the EPA's ability to fully integrate policies effects into GHG emission projections.

Case study 2 Efforts to strengthen the inter-ministerial collaboration of Bulgaria’s national system.

Bulgaria's national system for climate change reporting and policy implementation is divided into two key components: the GHG inventory system and the system for reporting on PaMs and projections. The GHG inventory system, established under the monitoring requirements of the Kyoto Protocol and EU regulations, forms the backbone of data collection on emissions. It is managed by the Executive Environmental Agency, which consolidates data from various ministries and institutions, ensuring quality assurance and control before submission. The second component, related to PaMs and emission projections, operates at a higher institutional level, with different ministries responsible for sectoral policies. An inter-ministerial working group, composed of experts from these ministries, coordinates the preparation of national climate strategies, such as the NECP and the long-term strategy for climate change. This group relies heavily on data from the GHG inventory system to inform policy decisions and project future emissions.

Bulgaria has also engaged external consultants, especially for generating sectoral projections in areas where ministries lack capacity, such as agriculture, waste, and energy. This dual structure allows the country to meet its international reporting obligations, though challenges in coordination, data availability, and capacity remain significant.

Bulgaria has outlined several planned improvements to enhance its national climate reporting system. First, the government aims to build capacity within ministries by involving sectoral experts in workshops and seminars to improve their understanding of climate policies and how they align with sector-specific responsibilities. This effort is intended to address knowledge gaps and foster better cooperation among ministries. Second, there is a plan to expand the inter-ministerial working group to include external stakeholders such as NGOs, business organisations, and scientific institutions. This expansion will enable more comprehensive input into the development of climate strategies and projections. Third, Bulgaria aims to develop templates for emission projections, which would simplify the data collection process and reduce reliance on external consultants. Lastly, efforts are being made to reinvigorate the National Council on climate issues, a body that includes diverse stakeholders, by leveraging increased staffing and capacity within the Ministry of Environment. This council will enable earlier-stage engagement of external stakeholders and improve public consultations for policy development. Together, these initiatives aim to address existing challenges in coordination, expertise, and data availability, to strengthen the effectiveness of Bulgaria’s national system.

3.2 Formality through legal arrangements

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| Good practice | Legal basis for progress reporting to Parliament |
| Countries | Germany, the Netherlands, and Finland |
| Description | In Germany , the Federal Climate Protection Act legally mandates the Federal Government to report to Parliament on climate-related measures and projections. First, it requires an annual climate protection report, detailing greenhouse gas emissions, the implementation status of climate programs, and expected reductions, to be submitted to the Bundestag by June 30. Second, a biennial report on GHG emission projections (according to Article 18 of the Governance |

Regulation), including the national policies and measures for emission reduction, is legally required to be presented by March 31.

In the **Netherlands**, the Dutch Climate Act stipulates that the government must adopt a national climate policy plan every five years. Additionally, the monitoring and evaluation of the progress of the climate plan is also legally enshrined. The government is required to report annually to Parliament on the plan's progress, incorporating updated projections from the Netherlands Environmental Assessment Agency (PBL), which evaluates the ex-ante impact of policies and measures. These findings are addressed in the Climate Policy letter, which is submitted to Parliament in October. The timing also allows the government to use the results to inform Parliament during the annual budget discussions for the relevant ministries.

Also in **Finland**, the involvement of Parliament is legally embedded. The Climate Act includes a provision for the government to adopt a Medium-term Climate Change Policy Plan once per term and to submit an annual progress report to Parliament. Further, the Climate Act also requires negotiations with the Sámi Parliament when preparing climate change policy plans.

3.3 Alignment with other reporting frameworks

3.3.1.1 Alignment with national GHG inventory

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| Good practice | Alignment of GHG inventory and projections through a legal framework |
| Country | Latvia |
| Description | <p>Latvia reports on having strong alignment between its GHG inventory system and GHG emissions projections, by applying consistent principles and methodologies for both. Projections are based on the IPCC 2006 Guidelines and the IPCC 2013 Wetland Supplement, ensuring compliance with international standards. The alignment between GHG inventory and projections is enshrined in the updated legal framework for reporting, Regulation No. 675 (25 October 2022), “The Procedure for Development and Management of the Greenhouse Gas Inventory System, the Projections System, and the System for Reporting on Adaptation to Climate Change”. By regulating reporting under the Paris Agreement and the Governance Regulation (EU) 2018/1999, the updated legislation aligns the legal arrangements for reporting on PAMs and GHG emission projections, and GHG inventory. Regulation No. 675 establishes a comprehensive framework that:</p> <ul style="list-style-type: none"> - Determines the institutions responsible for GHG inventory and projections preparation, - Regulates institutional cooperation for establishment and management of the national GHG inventory and projections system, including data collection mechanism and the reporting procedure. - Includes procedures for QA/QC for the GHG inventory and projections preparation, and - Includes the system for reporting on adaptation to climate change. |

3.3.1.2 Alignment with Article 17 of the Governance Regulation (EU) 2018/1999 (NECPR)

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| Good practice | Intersectoral collaboration for enhanced alignment in reporting |
| Country | Slovenia |
| Description | The intersectoral working group in Slovenia plays a critical role in aligning PaMs and projections reporting with Article 17. This group, established during the initial phase of the reporting process, includes representatives from relevant ministries and ensures coordination between data collection for PaMs, projections, and the NECPR. |

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| Good practice | Integrated institutional, procedural and legal framework for EU climate and energy reporting |
| Country | Finland |
| Description | The reporting under Article 17 in Finland is conducted with the same institutional, legal and procedural arrangements that are in place for the PaMs and projections reporting. Additionally, the same arrangements also apply to the preparation of the NECP, ensuring alignment between the different reporting obligations. |

3.4 Accountability and transparency

3.4.1.1 Quality assurance and control of reporting

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| Good practice | Comprehensive QA/QC framework for the TTACCC criteria |
| Country | Cyprus |
| Description | <p>Cyprus has comprehensive QA/QC arrangements, which clearly define responsibilities for each task. The QA/QC framework involves several layers, including:</p> <ul style="list-style-type: none"> - Sector-specific QA/QC: each ministry and expert organisation involved has its own QA/QC protocols to ensure data reliability. - Cross-sectoral consistency and validation: At an early stage of preparing the PaMs, a common framework is determined for the baseline scenario. The framework is determined in a collaborative manner between the relevant ministries and is approved by the ministerial committee of the national energy and climate governance system. The framework comprises several key parameters and assumptions for the modelling work, on the future use and drivers of different sources of energy and waste treatment. The common framework is used by all ministries for reporting ensuring consistency and comparability of the assumptions and results across sectors. Additionally, the Department of Environment compares sectoral projections with the latest NECP scenarios and evaluates the compatibility of WEM and WAM projections against PaMs effects. - Completeness checks: To ensure completeness, early on the decarbonisation working group members provide a list of their respective |

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| | <p>PaMs to be included in the reporting, along with a division between the WEM and WAM scenarios, to the Ministry of Employment and the Economy. The Department of Environment then checks the lists to ensure completeness and that there are no overlaps. Furthermore, the projections follow the GHG source and sink categorisation.</p> <ul style="list-style-type: none"> - Approval process: After quality checks, reports are sent to the decarbonisation working group and the network of officials for final approval. |
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| Good practice | Embedding QA/QC activities throughout the reporting cycle |
| Country | Ireland |
| Description | <p>Ireland's QA/QC procedures for reporting on PaMs and GHG emissions are centred on robust institutional arrangements and detailed processes led by the Environmental Protection Agency (EPA).</p> <p>The EPA uses memoranda of understanding and service level agreements with key data providers to guarantee timely and high-quality data submissions. Regular interactions with these providers include detailed QA/QC queries to ensure data reliability. QA/QC is embedded throughout the reporting process, from the collection and validation of primary and secondary data to the final compilation of projections.</p> <p>Ireland also highlights the competencies of its national system to understand in detail the reporting requirements, mainly resulting from its in-house capacity and strong links to national networks and experts. These enable the national system to apply reliable methods and realistic assumptions, while undertake QA/QC procedures at every step of the reporting process.</p> |

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| Good practice | Designated QA/QC programme and manager |
| Countries | Latvia, and Slovakia |
| Description | <p>Latvia has developed a QA/QC programme (Order No. 1-2/160 (03.10.2018) of MEPRD), which determines specific tasks and timetable for the preparation of reports on PAMs and GHG emission projections. The Latvian Environment, Geology and Meteorology Centre (LEGMC) is entity that is assigned the role of quality control manager and compiler, which is responsible for a developing a biennial QA/QC plan for PAMs and GHG emission projections reporting. This allows the QA/QC plan to be aligned with institutional and legislative changes, and forms the foundation for multi-sector collaboration, and quality checks.</p> <p>Similarly, Slovakia develops biennial QA/QC plans, both internal and external, overseen by a QA/QC manager. This role is designated within the National Inventory System (NIS) structure, to ensure that quality control measures are applied to all phases of the reporting process, including the compilation of emissions projections and sectoral data. This involves filling out QC forms for projections, conducting reviews of methodologies, and validating assumptions.</p> |

Additionally, the QA/QC manager is responsible for coordinating with sectoral experts and relevant ministries to address feedback and incorporate improvements. The manager's role extends to supervising quality assurance activities performed by independent experts, ensuring that all reports meet the required national and international standards.

3.4.1.2 Monitoring and evaluation of PaMs

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| Good practice | Inter-ministerial coordination for monitoring and implementation of PaMs |
| Countries | Greece and Iceland |
| Description | <p>The Inter-ministerial Technical Working Group in Greece plays a pivotal role in monitoring PaMs under the NECP. Established by the Ministry of Environment and Energy (MEEN), this group coordinates the implementation and monitoring of proposals from the Inter-ministerial Committee for Energy and Climate. Its responsibilities include developing a governance framework for monitoring, controlling, and supervising the implementation of PaMs, evaluating progress toward national objectives, and preparing both progress reports for EU reporting requirements and internal updates. Additionally, the group advises the Inter-ministerial Committee on the redesign of existing policies and the design of new measures, aiming to maximise synergies between cross-sectoral policies and ensure progress toward Greece’s mitigation targets.</p> <p>A similar group is established in Iceland. The Inter-ministerial Steering Committee (ISC), established under the Climate Act, is tasked with formulating proposals for climate measures and overseeing their implementation. It includes representatives from key ministries, such as those responsible for governance, public finances, industry, education, transport, and fisheries, as well as a representative from the Association of Icelandic Local Authorities. The ISC reports annually to the Minister of the Environment, Energy, and Climate, reviewing emissions trends, assessing alignment with the Climate Action Plan, and making recommendations for improvement.</p> |

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| Good practice | Legal basis for monitoring of policies and measures |
| Countries | Poland |
| Description | <p>The Act of 17 July 2009 on the System to Manage the Emissions of Greenhouse Gases and Other Substances, is the fundamental legal document in Poland regulating the issues related to the fulfilment of obligations, monitoring, reporting, archiving of information, and evaluation of progress in achieving the GHG emission reduction targets. The national system for reporting on PaMs and projections is the entity responsible for tracking progress in the implementation of reduction targets. This ensures alignment of roles and responsibilities for monitoring and reporting on PaMs.</p> |

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| Good practice | A comprehensive online platform for monitoring and reporting climate progress⁶ |
| Country | The Netherlands |
| Description | <p>In the Netherlands, the Dutch Climate Policy Dashboard Klimaatbeleid, developed and maintained by the Netherlands Enterprise Agency (RVO), serves as a critical tool for tracking and monitoring the implementation and progress of climate PaMs. It is part of the country's comprehensive system for evaluating PaMs under the framework of the Dutch Climate Act.</p> <p>The dashboard aggregates data from various sources, including monitoring information on implemented PaMs, statistical data, and projections. It enables the government to analyse progress toward national climate targets, while providing transparent, up-to-date information that feeds into annual reporting to Parliament. The dashboard plays a dual role in the monitoring process. First, it facilitates the ex-ante assessment of policy impacts by integrating data from the annual National Climate and Energy Outlook (KEV), prepared by the Netherlands Environmental Assessment Agency (PBL). Second, it supports ex-post evaluations by storing monitoring data on PaMs.</p> |

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| Good practice | A structured annual cycle for tracking and monitoring measures |
| Country | Denmark |
| Description | <p>Denmark has developed a "year wheel" process, which is a structured annual cycle established under the Danish Climate Act to track and monitor progress, adapt policies, and achieve its ambitious climate targets. The year wheel consists of the following key milestones:</p> <ul style="list-style-type: none"> - February: The Danish Council on Climate Change provides annual recommendations to the government. These include an evaluation of the government's climate efforts and advice on future actions. The Minister for Climate, Energy, and Utilities must respond to these recommendations in the climate programme. - April: The Ministry of Climate, Energy, and Utilities publishes the annual climate status and projection. This report evaluates the overall state of Danish GHG emissions, incorporating new measures, technological developments, and updated knowledge about emission impacts. It also includes a global perspective on Denmark's climate efforts. - September: The annual climate programme is presented to the Danish Parliament by the Minister for Climate, Energy, and Utilities. This programme outlines the government's climate initiatives and progress toward meeting climate targets. - Autumn: During the Finance Act process, the climate programme is discussed in Parliament to ensure it informs budget deliberations. - December: The Minister for Climate, Energy, and Utilities delivers a report to Parliament on the effects of the government's climate policies. This |

⁶ Sweden has a similar online platform, [Panorama - Climate transition 2045](#), that visualises the pathway for Sweden's climate transition.

includes answering questions in an interpellation debate, enabling Parliament to assess whether the government is meeting its obligations.

The involvement of the Danish Parliament and Climate Council enhances oversight and encourages informed decision-making. The integration of climate considerations into the Finance Act process aligns fiscal policy with climate goals, fostering a holistic approach to climate governance.

(To note, that no policy effects have been reported to the EEA by Denmark in 2023.)

Case study 3 Germany's national system.

The German national system for PaMs and GHG emission projections is structured around collaboration among governmental agencies, ministries, and specialised research institutions, coordinated by the German Environment Agency (UBA). UBA, under the oversight of the Ministry of the Environment, partners with the Ministry of Climate and Economic Affairs to meet reporting and projection requirements. However, UBA operates independently from other government agencies, focusing specifically on environmental matters.


Historically, Germany has relied on a consortium of research institutions to conduct modelling and projections for GHG emissions, partly due to limited in-house capacity at UBA. This consortium specialises in various sectors like agriculture, transport, and buildings. The institutes bring modelling expertise, while supporting UBA in meeting reporting obligations to the EU and international bodies. The use of external contractors in reporting causes challenges for transparency, making it difficult for UBA to independently verify or adapt these models. However, to enable accountability and transparency, the reporting process follows a five-stage approach, including identifying measures, refining assumptions, conducting modelling, drafting reports, and inter-ministerial review and approval. Each stage is concluded by a review or consultations, which are iterated until the UBA, the contracting party, and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, reach an agreement.

Transparency and accountability are further reinforced by the expert council on climate issues, called 'Expertenrat für Klimafragen', and established under the 2019 Climate Law. This independent body plays an official role in reviewing national emission projections and environmental data, providing feedback on methodology and transparency. Furthermore, the German government annually submits a Climate Protection Report to the federal parliament (the German Bundestag) by June 30, detailing GHG emissions, the status of climate protection programs, and forecasts of expected emission reductions. Additionally, since 2021, the government also submits a Climate Protection Projection Report to the Bundestag, in line with Article 18 of the Governance Regulation (EU) 2018/1999, setting out the projections of GHG emissions, and the national policies and measures to mitigate them.

3.5 Public participation

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| Good practice | Supporting NGOs to influence climate policy nationally and globally |
| Countries | Norway |
| Description | The Ministry of Climate and Environment in Norway supports NGO participation by providing financial assistance for their involvement in international meetings and negotiations. NGOs are not only involved in preparatory discussions but are also part of the official Norwegian delegation under UN Climate Negotiations, enabling them to contribute actively. Additionally, Norway's integration with European legislation through the EEA Agreement includes an environmental reference group where civil society and governmental organisations collaborate. This group participates in the consultation process before environmental legislation is implemented, ensuring that diverse voices contribute to shaping climate policies. |

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| Good practice | Inclusive stakeholder engagement through collaborative stakeholder networks |
| Country | Finland, and the Netherlands |
| Description | <p>In Finland, stakeholder engagement is deeply integrated into the preparation of PaMs and projections, with multiple platforms and mechanisms ensuring inclusive participation. The process includes seminars, stakeholder meetings, consultations, and citizen surveys during the formulation of key policy documents like the Energy and Climate Strategy, the Medium-term Climate Change Policy Plan, and the Climate Plan for the Land Use Sector. These engagements aim to gather diverse perspectives and fulfil legal requirements for stakeholder inclusion.</p> <p>The Climate Policy Roundtable in Finland, established in 2020, acts as a collaborative network that brings together trade unions, municipalities, scientists, industrial sectors, young people, NGOs, and other interest groups. Although it does not make decisions, it supports national processes by contributing ideas and fostering dialogue. Additionally, the Ministry of the Environment's Climate Arena provides a platform for other ministries, NGOs, research institutes, and labour unions to express their views on climate policy-related matters. This multi-layered approach ensures that Finland's climate policies are informed, inclusive, and widely supported.</p> <p>The Netherlands employs a multifaceted approach to stakeholder engagement in climate policy, prominently featuring the role of the National Climate Platform (NKP). The NKP, established in 2022, builds on the Climate Agreement of 2019, which involved over 150 parties, including companies, civil society organisations, and local governments, to develop measures aimed at reducing GHG emissions. The NKP acts as a forum for dialogue with societal stakeholders, such as companies, NGOs, and citizens, including youth. Its primary role is to gather and provide insights from society, offering both solicited and unsolicited advice on climate policies to the government.</p> <p>In addition to the NKP, citizen participation in the Netherlands is emphasised through initiatives like the Regional Energy Strategies, which aim to involve the</p> |



public in the development of wind and solar projects. Efforts include citizen assemblies and policies supporting local ownership, with a goal of achieving 50% local ownership in renewable energy projects by 2030. Public engagement is further supported through a broad public communication strategy, including National Climate Week, campaigns highlighting the urgency of climate policy, and efforts to connect civil society organisations and local governments.

4 Future perspectives

4.1 Introduction

The EU and its Member States have a long-standing tradition of reporting on GHG emissions, projections and PaMs. Over decades and numerous reporting cycles, procedures have evolved aimed to provide this information in a more timely, transparent, accurate, complete, comparable, and consistent manner. Despite these advancements, reporting continues to face quality challenges. Issues are varied and include incomplete and inaccurate projections (e.g. incomplete reporting on sensitivity analysis, indicators and WAM scenarios), unavailable quantitative data (e.g. *ex-ante* and *ex-post* impacts of PaMs), and outliers and inconsistent sectoral projections trends. Moreover, the time-intensive nature of reporting and QA/QC procedures, coupled with challenges in unlocking and utilising valuable information, underscores the need for further innovation and refinement in the EU's climate governance systems.

This chapter provides a **forward-looking perspective on potential improvements of the systems for reporting** within the European Union, by exploring (i) innovative approaches in governance procedures, (ii) in the use of data, and (iii) in artificial intelligence for more effective and transparent governance. While AI and machine learning offer promising avenues for enhancing climate governance, their effectiveness depends on how they are designed, implemented, and integrated within existing governance structures. The way these tools are applied is critical in determining whether they contribute meaningfully or introduce new challenges. Rather than presenting them as a replacement for existing efforts and investments, this discussion considers them as complementary instruments that require careful implementation to maximise their benefits.

4.2 Participatory governance

Citizen science, where citizens actively participate in scientific research, provides significant opportunities to gather additional and localised data that can enhance and validate official national statistics. This is especially valuable in contexts where traditional data collection methods are constrained by limited reach, insufficient detail, or high costs (Fraisl et al., 2020; Fritz et al., 2019). Through the active involvement of communities, citizen science not only fills critical data gaps but also brings a unique, bottom-up perspective to scientific inquiry. By leveraging local knowledge and the diverse participation of citizens, it democratises data collection and fosters a sense of shared responsibility for addressing societal challenges. This collaborative approach has proven to be particularly effective in areas such as environmental monitoring, public health, and climate action, where diverse, timely, and detailed data are essential for crafting robust policies and solutions (Proden et al., 2023).

Citizen science can offer opportunities to enhance governance in reporting policies and GHG emission projections on two levels: collecting additional data and validating existing data. First, citizen science can fill data gaps by providing granular, localised insights that complement official data sources (Fritz et al., 2019). This bottom-up data collection process enriches national statistics with details that are often inaccessible through traditional methods. Second, citizen science can validate existing data and indicators by serving as an independent, alternative data stream (Campbell et al., 2020). This validation role is essential for ensuring the accuracy and reliability of, for example, GHG emission impacts. By integrating citizen-driven initiatives—such as smart meter data or renovation rates—official systems can cross-check and refine their methodologies, leading to more adaptive and context-sensitive monitoring frameworks. This dual role of data collection and validation underscores citizen science's potential in national monitoring and reporting frameworks.

With regards to the reporting of energy savings, for example, a contradictory situation arises where national policy officers indicate the lack of (detailed) data, while ever more advanced data sources, such as smart meters, Building Automation and Control Systems (BACS), electric vehicle charging data, and

digital building logbooks, become available. Citizen science could support in addressing this persistent challenge of obtaining detailed, context-specific data for energy policy monitoring and reporting. The data sources mentioned offer frequent and granular updates, enabling dynamic and precise monitoring of energy savings and behavioural measures. Citizen science can enhance these efforts by involving communities in data collection and validation, validating smart meter data, reporting on renovation rates, or even logging energy-efficient behaviours within households, thereby improving data quality and ensuring local or target group relevance. Integrating citizen-driven insights into structured frameworks can help Member States address national data challenges, align with European reporting obligations, and improve the accuracy of impact estimations for policy implementation.

4.3 Unlocking data for policy

In the public sector, (environmentally relevant) data can generally be applied to create or increase public value through three types of activities: anticipation and planning, delivery, and evaluation and monitoring (OECD, 2019).

In 2020, the European Commission published the European Strategy for Data (European Commission, 2020). This strategy outlines the policy measures and investments needed to enable the data economy for the subsequent five years. It is presented at the same time as the Commission's Communication on "Shaping Europe's digital future" and a White Paper on artificial intelligence (AI), that indicates how the Commission will support and promote the development and uptake of AI across the EU (European Commission, 2024b). The strategy captures the benefits of better use of data can offer across different domains, including improvements in health and well-being, environment, and transparent governance.

The strategy resulted in the EU Data Act (2024) which is designed to enhance the EU's data economy and foster a competitive data market by making data (such as industrial data) more accessible and usable, encouraging data-driven innovation and increasing data availability. To achieve this, the Data Act clarifies who can use what data and under which conditions. The Data Act complements the Data Governance Act, the first deliverable under the European strategy for data. The Data Governance Act became applicable in September 2023. While the Data Governance Act increases trust in voluntary data-sharing mechanisms, the Data Act provides legal clarity regarding the access to and use of data.

The EU has rolled out 14 Common European Data Spaces, which will be interconnected in future to create a single market for data. These Common European Data Spaces (described in Annex 3 of this report) cover various sectors and domains, directly related to the Green Deal, including energy, agriculture, and mobility sectors. This aim of these initiatives is to create a single market for data, where data can flow within the EU and across sectors, for the benefit of all, including policy makers. Not all projects have a clear link to policy, but it is evident that unlocking data could benefit monitoring, evaluation and steering of climate change mitigation policies.

For example, the DIVINE project has one of its core objectives to analyse and adapt the data-sharing governance models to enable the use by public and governmental services. In this project, they focus on the mechanisms it provides for enabling agriculture policies monitoring based on smart farming data sharing and analytics, as well as adoption of various Internet of Things technologies. The project also establishes an assessment framework for cost-benefit analysis of agriculture data-sharing (economic, societal, environmental, climate-related, etc.), and based on these provide transparent awareness and decision support facilities to farmers and other stakeholders in the agriculture sector.

The DeployEMDS project has several use cases on how enhanced access to data can support policy. Stockholm has established a zero-emission zone regulation that will be effective in 2025. To evaluate and monitor this policy, existing datasets are fragmented and lack standardisation and crucial data necessary for comprehensive evaluation of the zero-emission zone is either not being collected or not available in a usable format, requiring further data inventory and collection efforts. The project supports the evaluation

of Stockholm's zero-emission zone by integrating and sharing high-quality data through the Stockholm Mobility Data Space (SMDS). It achieves this by combining and enhancing existing datasets and collecting new data for comprehensive analysis that are shared through the SMDS (and broader European Mobility Data Space).

There are several initiatives at local, national and European level to improve the collection, harmonisation, and accessibility of environmentally relevant data to support policy makers at the local and national level. Accessibility of data to monitor and evaluate national policies and measures is one of the barriers for more complete reporting on the impacts of PaMs.

The connection between the European Green Deal and the Digital Agenda of the EU could be further strengthened. The new data access and sharing regimes developed under the DGA and the Data Act do not make special provisions for data that could be used for environmental purposes. This creates limitations on the ability of these digital EU policies to improve the availability of data in view of promoting environmental sustainability. To be more impactful, specific sectorial amendments would be needed to facilitate the access to data for the environment (Finck & Mueller, 2023).

4.4 Artificial intelligence in climate governance

Climate governance today is facing increasing demands due to changing technologies and large volumes of data (Big Data) which need to be processed and analysed (Coglianese, 2020). The analysis of environmental and economic data is central to tracking the countries' progress towards their mitigation targets, monitoring and evaluation of actions, reporting, and planning corrective actions. Traditionally, decision makers have been assisted by conventional statistical tools employing simple series of computational steps. However, the emergence of machine learning and artificial intelligence (AI) technology is offering new opportunities for analysing Big Data to produce highly accurate predictions (Coglianese, 2020).

Machen & Nost (2021), through a literature review, found that the application of algorithms in climate mitigation and adaptation is spread across four main areas: localisation of impact and interventions, simulation of outcomes, climate predictions for the future, and assisted delivery of policy programmes (for example through robotics). More specifically from the perspective of governance functions, AI can contribute to improvement in automated data collection, providing more relevant real-time data to support adaptive decision-making and enforcement of environmental regulation (Scoville et al., 2021).

Within the EU, the Coordinated Plan on artificial intelligence (AI) was published in 2018. It is an agreement between Member States and the Commission to enhance Europe's competitiveness related to AI and all Member States agreed to establish an AI strategy. Despite this, in 2021 (Gailhofer et al., 2021) there was significant variation in the integration of AI into relevant climate and environmental strategies among Member States. While some countries explicitly align their AI policies with the European Green Deal objectives, others demonstrate limited focus on energy and environmental applications. Commonly prioritised sectors include renewable energy, precision agriculture, and urban mobility. Despite progress, challenges remain in harmonising AI strategies across Europe and addressing technical and operational barriers to implementation.

The following sections explore the applications of AI and machine learning in climate governance frameworks, from processing data for the tracking of countries performance to targets, to monitoring the performance of measures, and to the development of policy actions and enforcement.

4.4.1 Tracking progress and monitoring

4.4.1.1 Monitoring, Reporting, and Verification

Digital Measurement, Reporting, and Verification (dMRV) systems represent a significant evolution in tracking environmental and climate-related metrics (Soini et al., 2022). Unlike traditional MRV methods, which are often resource-intensive and prone to inefficiencies, dMRV leverages advanced digital technologies to streamline the collection, processing, and reporting of sustainability data. These systems are essential for monitoring activities like industrial emissions, deforestation, and ecosystem changes, providing a foundation for timely and informed climate action.

Artificial intelligence (AI) can play a transformative role in enhancing dMRV systems. By processing large and complex datasets with remarkable speed and accuracy, AI allows for precise tracking of environmental indicators. For instance, AI can be used to monitor industrial carbon emissions in near real-time or analyse satellite imagery to detect patterns of deforestation. These capabilities enable stakeholders to identify critical areas and respond swiftly to emerging challenges.

Applications of AI-driven dMRV systems extend across various sectors. In forestry, AI can be used to analyse satellite imagery to assess deforestation trends, while in industrial contexts, it can help monitor emissions to ensure compliance with regulatory standards.

The benefits of AI-enhanced dMRV systems in MRV are far-reaching. Automation can reduce the inefficiencies associated with manual data handling, ensuring greater accuracy and consistency. Additionally, AI can enable adaptive systems that evolve alongside new environmental challenges, delivering real-time insights that inform decision-making processes. For example, AI tools can optimise resource allocation by highlighting areas with the highest potential for impactful intervention, such as regions most affected by deforestation or industries with significant emissions.

4.4.1.2 Predictions and forecasts

Machine learning has become a pivotal tool in forecasting within energy and climate systems, offering enhanced accuracy and efficiency over traditional methods (Franco et al., 2022; Tudor & Sova, 2021). In the energy sector, machine learning algorithms are employed to predict renewable energy generation, such as solar and wind power, by analysing historical weather data and identifying patterns that influence energy output. Additionally, AI can be applied in natural resource management, combining deep learning with statistical techniques to assess deforestation impacts and optimize low-carbon material production. The adaptability of machine learning algorithms allows for continuous learning from new data, improving forecasting precision over time and providing valuable insights for policymakers and stakeholders in the energy and climate sectors.

Recent studies have demonstrated the application of various machine learning algorithms in the domain of GHG emissions forecasting. An example is a hybrid model combining Discrete Wavelet Transform (DWT) with Support Vector Regression (SVR) (Djeddou et al., 2023). It has been developed to forecast GHG time series, effectively capturing complex patterns in emission data. The hybrid DWT-SVR model processes the GHG emission data to decompose complex time series into simpler components. Through the application of regression analysis of these components, temporal patterns in emissions are captured. This approach has been shown to outperform conventional statistical models by effectively handling irregularities and noise in the dataset.

Another example is given by the use of Artificial Neural Networks (ANNs) (Ulku & Ulku, 2022). By integrating socio-economic variables such as population growth, energy production, and waste generation, ANNs generate comprehensive emission projections. For example, they process input data across multiple layers of interconnected nodes (neurons), adjusting weights through backpropagation to

minimize errors. This iterative learning enables the model to uncover subtle dependencies between predictors and emissions. ANNs are particularly valuable for identifying multi-factorial impacts on emissions, providing nuanced insights for policy formulation.

Machine learning is also applied in a study to develop GHG emissions projections for cities under the Global Covenant of Mayors (GCoM) initiative (Franco et al., 2022). The machine learning methodology uses city-level GHG emissions inventories reported within the GCoM framework and addresses the challenge of sparse and irregularly submitted data. The study applies techniques to fill gaps in emissions time series data. Furthermore, each city's emissions behaviour is uniquely modelled, allowing for individualised forecasts of target-year emissions (e.g., 2020 or 2030 commitments). This customisation ensures predictions align with city-specific action plans and emissions reduction trends.

4.4.1.3 Tracking progress toward targets and policy evaluation

The application of artificial intelligence and machine learning is evident in the research domain on policy evaluation. Machine learning algorithms have been employed to classify and analyse climate adaptation policies (Biesbroek et al., 2020). For example, models trained on policy documents can identify dominant themes and assess the comprehensiveness of new policies. This systematic approach allows policymakers to evaluate and compare policy designs, ensuring alignment with climate adaptation goals. Another research (Yang et al., 2023) uses Singapore, London, and California as case studies of metropolitan regions at distinctive stages of energy transition. The study employs artificial neural networks to model factors such as renewable energy adoption and economic indicators, to help policymakers understand the potential effectiveness of proposed policies. The study shows that in addition to forecasting renewable energy generation and capacity, the tool is effective in formulating future policy scenarios.

A study (Abrell et al., 2022) examining the effectiveness of carbon pricing employs a machine learning approach to address gaps in understanding the performance from *ex-post* perspective of such policies. The research focuses on the UK's carbon price, a tax applied to all fossil-fuelled power plants, analysing its impact on emissions and associated costs. To address the challenge of missing control groups, the study integrates economic theory with machine learning techniques for counterfactual predictions.

On a broader level, machine learning techniques have also been used to evaluate the progress of countries toward meeting the European Union's net-zero GHG emissions targets for 2030 and 2050. One study (Tudor & Sova, 2021) analyses nine Central and Eastern European countries to generate reliable forecasts of aggregate GHG emissions and assess whether these countries are on track to meet binding pollution reduction goals under the European Green Deal. The study employs automated forecasting algorithms to project long-term GHG emissions trends using historical data. The generated forecasts and other statistical models were compared against the EU's emissions reduction targets. By pinpointing the countries and regions falling behind these goals, the study aimed to identify areas requiring additional policy interventions, serving as a tool for policymakers to track progress toward net-zero targets effectively.

4.4.1.4 QA/QC procedures

The quality of reporting on policies and measures and greenhouse gas projections is checked by experts on its transparency, accuracy, completeness, consistency and comparability. Both for policies and measures and greenhouse gas projections, checking the accuracy of quantitative data is complex.

Hsu et al. (2022) developed a machine learning based framework to predict more than 90,000 European cities' emissions on an annual basis from 2001 to 2018 to examine likely mitigation performance trends. This framework not only provided a basis for understanding city-level climate emissions mitigation performance, but it also provided a method of evaluating and validating cities' self-reported emissions. The framework allowed to spot outliers or potential reporting issues in cities' greenhouse gas inventories.

4.4.2 Making data actionable

4.4.2.1 Steering policy

Machine learning has emerged as a transformative tool in the development, support, and exploration of planning policy actions and development of policy scenarios for climate governance. Drawing insights from three studies, this synthesis illustrates how machine learning technologies contribute to climate policy through predictive modelling, strategic decision-making, and the evaluation of policy scenarios.

Machine learning enables governments to develop robust climate policies by analysing large volumes of environmental and socio-economic data. As highlighted by Coglianesi (2020), machine learning can provide precise predictions for environmental outcomes, enabling policymakers to allocate resources efficiently. For example, predictive models can determine high-risk areas for climate-related disasters, such as flooding, and guide infrastructure investments. Furthermore, machine learning aids in the identification of facilities most likely to violate environmental regulations, as demonstrated in studies of regulatory inspection targeting.

The application of machine learning in integrated assessment models can enhance the exploration of policy scenarios. Zhang et al. (2022) introduced a framework, which uses multi-agent reinforcement learning to simulate global climate negotiations. This approach allows policymakers to assess the impacts of different negotiation strategies and cooperation mechanisms on long-term climate outcomes. Machine learning-driven simulations offer insights into strategic behaviours of nations, fostering the design of more effective and inclusive agreements. By modelling economic and climate dynamics, these tools enable the testing of various policy scenarios under complex, real-world conditions.

In the study by Lee and Tae (Lee & Tae, 2020), machine learning was utilised to assess the effectiveness of GHG reduction technologies. A machine learning-based decision support model analysed 1,199 renewable energy projects in Korea to optimise technology selection based on both economic and environmental benefits. The study demonstrated how machine learning can quantify and compare the impacts of different technologies, supporting policymakers in selecting the most effective interventions for emission reductions.

4.4.2.2 Enforcement

Apart from financial incentives, governments heavily rely on regulatory policy instrument to reduce GHG emissions, such as building regulations, and consumer goods labelling. This in turn requires compliancy to these regulations and public authorities enforcing them. Public agencies tasked with enforcing environmental regulations often face resource limitations, which challenge their ability to meet their objectives effectively (Hino et al., 2018). Machine-learning techniques can support the efficient allocation of these scarce resources while addressing practical considerations such as institutional constraints and the risk of system manipulation. A case study on water pollution (Hino et al., 2018), predicts the likelihood of facilities failing water-pollution inspections and proposes alternative inspection strategies that prioritise high-risk facilities. Using a data-driven approach, utilising electronic data, this approach was found to identify seven times the expected number of violations compared to current practices.

These advances in detection can further promote compliance when communicated. Alerting facilities that they are at risk of a violation can signal that they are being observed and can increase the perceived likelihood of detection. Field experiments demonstrate that regulated entities respond to messages conveying an increased probability of detection, especially in combination with information about enforcement activities (Benami et al., 2020).

4.4.2.3 Climate policy integration

The integration of climate change mitigation into broader policy frameworks is essential to ensure that climate concerns are embedded across all sectors and levels of governance, moving beyond standalone adaptation strategies (Evans et al., 2023). Effective integration reduces policy silos, fosters synergy across departments, minimizes resource misallocation, and ensures coherence in actions aimed at mitigating climate impacts. However, achieving comprehensive integration remains challenging due to the complexity of climate issues, the broad range of stakeholders involved, and the varying interpretations of what constitutes adaptation within different contexts (Biesbroek et al., 2020).

Machine learning offers transformative potential in enhancing policy integration by addressing data management and analysis challenges. The study of Biesbroek et al. (2020) applied machine learning to policy documents from the UK, utilising a model trained to classify text blocks as "adaptation," "mitigation," or "non-climate." This process allowed for a detailed analysis of policy integration by identifying departments and organisations that included climate adaptation in their strategies. The model achieved significant accuracy and revealed insights into how adaptation policies were distributed across sectors and evolved over time. For instance, shifts in reporting responsibilities from departments such as DEFRA to the Environment Agency illustrated how adaptation concerns were institutionalised in governance structures.

Case Study 4 Eco-algorithmic governance in Chile

Chile implements AI in environmental governance through its Environmental Intelligence Strategy 2020-2023, developed by the Superintendence of the Environment (SMA) (Chile's Superintendency for the Environment, 2021). The strategy focuses on improving environmental monitoring, compliance, and decision-making by leveraging data science, AI, and advanced analytics. More specifically, AI is introduced in three main levels: (i) data capture, including consistency and validation processes; (ii) advanced analytics to generate information; and (iii) actions to facilitate management and decisions. In this way, the strategy focuses on the generation of predictive capabilities, which allow deviations or irregularities to be identified early to activate alerts and timely measures, through data science and AI, enhancing baseline capabilities for analysis. This transformation of environmental oversight and policy implementation is termed (Tironi & Rivera Lisboa, 2023).

The strategy includes the development of a Data Intelligence Platform (PID) for integrating environmental data from various sources, including sensors, satellite images, and reports from regulated entities. It automates data collection, validation, and analysis, supporting predictive and prescriptive analytics to anticipate environmental risks and guide decision-making. The platform uses machine learning models for predictive insights, such as air quality forecasting and identifying irregularities in environmental compliance.

For environmental monitoring, Chile employs remote sensors, the Internet of Things (IoT), and satellite data to monitor environmental parameters like water quality, biodiversity, and industrial emissions. For example, the SMA collaborates with the Adolfo Ibáñez University on projects to predict critical air quality episodes using emissions data, weather conditions, and AI models. Another application of AI is adopted through automated compliance systems, which help verify compliance with environmental regulations by automating the review of emissions standards and Environmental Qualification Resolutions. The system generates alerts for deviations, enabling timely enforcement actions.

The SMA engages with academic institutions and international organizations to advance AI applications in climate governance. For instance, it participates in projects like the Satellite Alert and Monitoring System for Areas of Environmental Relevance (SAMSARA) to monitor ecosystems using AI-driven satellite imagery.

5 Conclusions and recommendations

This study examined the characteristics of the existing national governance systems for reporting on PaMs and GHG emission projections under the Governance Regulation (EU) 2018/1999. It identifies the strengths, challenges, and opportunities within the current national systems in the EU Member States, Iceland, Norway and Switzerland. The results of the study offer insights into how national systems can be strengthened to better align with governance obligations.

Robust national systems are paramount to achieve effective reporting and governance. These systems act as the cornerstone of sustainable reporting and are crucial for ensuring the timeliness, transparency, accuracy, consistency, comparability, and completeness of reported information. **Countries can benefit substantially from setting up, maintaining and continuously improving their national systems, as they provide the foundation for reliable data that informs climate policy, tracks progress toward goals, and aligns with international commitments.** Establishing clear roles and responsibilities, fostering collaboration among stakeholders, and adopting advanced data management practices are essential steps to strengthening these systems.

To understand the current state of play, this study mainly draws from the country reports for national systems submitted under the Governance Regulation, supplemented with survey responses from 12 countries and 3 interviews conducted with national lead reporters. The surveys and interviews showed that several countries have arrangements in place that are not reported in the national systems report. This study, therefore, does not provide a complete picture of the established arrangements and procedures in the examined countries' national systems. Further research into specific national cases is necessary to gain a full understanding of the dynamics in each country. Since Member States are required by the Governance Regulation to report modifications to the national system in reporting years, the information on national systems should be regularly updated. It is therefore important that **countries regularly update the information on their national systems report, and report more comprehensively.**

The analysis shows there is a significant variability in institutional, procedural, and legal arrangements of national systems. Many countries have developed mature systems while others have notable gaps. Countries with **strong institutional frameworks** often benefit from well-defined roles, inter-ministerial collaboration, and dedicated legal arrangements that formalise processes. Resource constraints and dependence on external consultants for reporting tasks undermine capacity building and strengthening of national systems.

While several countries have commendable practices for engaging stakeholders and integrating data collection processes, others face challenges in ensuring timely, accurate, and comprehensive submissions of PaMs and emission projections. **Quality assurance** remains a particularly problematic area, with inconsistencies persisting in the completeness, coherence, and accuracy of PaMs and projections reporting, despite the existence of QA/QC frameworks in many countries.

The study also showed a lack of formalised mechanisms for monitoring and evaluating PaMs in most Member States, which leads to limited reporting on the *ex-ante* and *ex-post* impacts of the reported measures. The study finds that the adoption of advanced technologies for reporting, including artificial intelligence and predictive analytics, remains limited in Member States. Most countries continue to rely on traditional tools like spreadsheets for managing reporting activities, which may restrict their ability to handle complex datasets efficiently. Public consultation remains uneven across countries, with some countries have established robust participatory approaches.

Based on the common gaps and challenges identified in existing national systems and drawing on insights from key experts on governance⁷, the following recommendations outline potential approaches address these challenges.

1. Legal frameworks are critical to ensure transparency and accountability in climate reporting in EU Member States. **The EU's strength lies in its ability to create robust legislative structures, but these frameworks must be underpinned by political will, adequate financial resources and standardised procedures.** Member States should integrate international and EU reporting obligations into national laws to enhance alignment. Binding frameworks should enforce compliance and include mechanisms for robust implementation, monitoring and quality checks. Successful examples in some Member States include frameworks that integrate national and EU-level reporting, as observed in some MS. **The disparity in national legal traditions calls for a differentiated governance approach, respecting national and institutional contexts, while maintaining shared EU-wide objectives.**
2. Interministerial coordination is a persistent challenge that requires innovative approaches to overcome 'silos' in governance. Establishing **coordination bodies within key ministerial offices or other central governance structures can enhance collaboration** and improve political prioritisation. **The EU may support this by providing tailored training programmes and facilitate sharing of experience on national level that encourage inter-ministry dialogues and peer learning to break down silos.** EIONET can play a significant role in supporting such initiatives, building on EEA's extensive experience in overseeing the reporting process on PaMs and projections.
3. **Capacity building** is essential to address resource constraints that hinder effective climate governance. The EU can play a role in promoting better governance systems by **incentivising evidence-based policymaking and providing resources for institutional capacity building.** On the national level, efforts could be made to provide targeted education and training programmes for public officials, focusing on using innovative digital solutions and AI, and on harmonising reporting systems to improve national data management and reporting. **Peer review processes and multi-level dialogues can supplement national efforts,** ensuring that the quality of reporting meets EU standards without undermining national ownership.
4. Structured **cross-border learning** initiatives are necessary to help countries adapt and implement best practices. Peer-learning networks, where countries with advanced systems mentor those with less mature frameworks, can drive improvements in areas such as QA/QC processes, digital innovation, and citizen engagement. These initiatives not only facilitate **knowledge transfer** but also foster innovation and build **long-term institutional capacity** across Member States, simultaneously contributing to solutions for capacity constraints.
5. While independent reporting bodies foster objectivity and reduce risks of bias, their establishment may not be feasible in all countries due to practical constraints, such as lack of funding and capacity limitations. However, Member States **may improve the objectivity and transparency of reporting through independent advisory councils or formalised policy monitoring tools.** Such initiatives could be implemented without any major institutional changes.
6. Innovative practices can help addressing the challenges of national governance systems for PaMs and GHG emission projections reporting. Digital tools and platforms, such as policy dashboards, demonstrate the transformative potential of technology in improving data collection, aggregation, and dissemination processes. **Expanding the use of innovative digital solutions can bridge existing gaps in timeliness, accuracy, and consistency,** thereby laying the foundation for more streamlined governance systems that are better equipped to meet future challenges. **The EU can play a pivotal**

⁷ Refer to Annex 2, section '**Interview questions with governance experts**' for the list of experts interviewed and interview questions.

role by funding digitalisation and automation projects, such as leveraging satellite data for land use monitoring or investigating AI-driven reporting systems. Centralising certain technical processes at the European level could reduce the administrative burden on Member States while ensuring uniformity in data collection and reporting.

7. Misalignments between national and EU reporting systems contribute to inefficiencies and data gaps. **Strengthening the communication between national and Union reporting systems** could contribute to remedy this barrier. Improved integration mechanisms, such as **real-time data-sharing platforms, standardised reporting protocols, and compatible EU-UN reporting tools** can reduce redundancies and streamline processes. This would enable seamless communication, ensuring that data flows efficiently and accurately between national and Union systems.
8. **Public participation** is essential for inclusive governance. **Effective engagement requires dedicated resources and mechanisms to incorporate input from NGOs, businesses, and civil society.** Participatory approaches, such as citizens' climate assemblies, can enhance transparency and trust in governance systems. By promoting collaboration with external stakeholders and citizen science initiatives countries can enhance fairness in policy design and increase public understanding of national policies and measures.
9. Given the evolving framework of EU climate legislation, the dynamic nature of climate policy and the rapid pace of technological and societal changes, Member States **may benefit from adopting rolling action plans in their climate policy framework.** Rolling action plans offer a flexibility to adapt their policies and reporting mechanisms to the evolving EU regulatory landscape. This approach also allows for the continuous refinement of strategies, ensuring that reporting reflects the latest scientific insights, technological advancements, and policy priorities. Replacing static long-term plans with rolling action plans, can provide a mechanism for iterative improvement. Rolling plans enable the incorporation of ex-post evaluation findings into ongoing policy cycles, thus bridging gaps between policy implementation and evaluation.
10. **Effective framing of climate issues** is essential to garner broader support for climate governance. Shifting from problem-focused narratives, such as viewing climate change solely as an emissions issue, to **solution-oriented frameworks that emphasise co-benefits**, like clean energy access, health improvements, or economic gains, can enhance public and political engagement through demonstrating the broader value of climate policies.

This study highlights the importance of continued collaboration, innovation, and knowledge-sharing for strengthening national governance systems for monitoring and reporting of climate policies. Drawing on the good practices identified in this study, such as building strong institutional foundations, involvement of advisory bodies, and integrated data systems, countries can enhance their reporting processes and overall governance frameworks. At the same time, addressing systemic challenges by improving inter-ministerial coordination, leveraging digitalisation, and ensuring robust evaluation mechanisms, will be crucial in meeting EU and international commitments for complete and transparent reporting of policies and measures and GHG emission projections. Ultimately, the conclusions and recommendations in this study aim to support EU Member States and the neighbouring countries in building governance systems that go beyond compliance with reporting rules to ensure progress toward common sustainability and climate neutral targets.

List of abbreviations

| Abbreviation | Name | Reference |
|--------------|--|---|
| AI | Artificial Intelligence | |
| EEA | European Environment Agency | www.eea.europa.eu |
| EEA | European Economic Area | |
| EEOS | Energy Efficiency Obligation Scheme | |
| EFTA | European Free Trade Association | |
| EGD | European Green Deal | |
| ESR | Emissions Sharing Regulation | |
| ETC CM | European Topic Centre on Climate change mitigation | https://www.eionet.europa.eu/e-tcs/etc-cm |
| ETF | Enhanced Transparency Framework | |
| ETS | Emissions Trading System | |
| EU | European Union | |
| GHG | Greenhouse gas | |
| HFC | Hydrofluorocarbon | |
| IPCC | Intergovernmental Panel on Climate Change | |
| LULUCF | Land Use, Land-Use Change and Forestry | |
| MMR | Monitoring Mechanism Regulation | |
| MRV | Monitoring, reporting and verification | |
| NECP | National Energy and Climate Plan | |
| NECPR | National Energy and Climate Progress Report | |
| NGO | Non-governmental organisation | |
| NIS | National inventory system | |
| PaMs | Policies and measures | |
| QA/QC | Quality Assurance and Quality Control | |
| TTACCC | Timeliness, transparency, accuracy, completeness, comparability, consistency/coherence | |
| UNFCCC | United Nations Framework Convention on Climate Change | |
| WAM | With additional measures | |
| WEM | With existing measures | |
| WG | Working group | |
| WOM | Without measures | |

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Annex 1. Dataflow for national systems

Reporting elements in the dataflow for reporting on national systems for PaMs and GHG emission projections

The format for reporting on national systems for PaMs and GHG emission projections is established in Annex XXIII of the Implementing Regulation (EU) 2020/1208 pursuant to Article 36. Reporting by countries is performed through the designated dataflow in Reportnet3, which consists of the following reporting elements.

1. Name and contact information for the entities with overall responsibility for the National System for policies and measures and projections.
 - List the responsible entity or entities, and their specific roles responsibilities. Identify the lead entity.
2. Institutional arrangements in place for preparation of reports on policies and measures and of projections as well as for reporting on them, including an organogram.
 - Define the overall structure/set-up of your national system. List all organisations involved in the preparation of the report on policies and measures and projections and in the archiving of information, their responsibilities, and their interactions.
 - Provide a description of the organogram to show the organisational structure of the National System for policies and measures and projections, including the functional and hierarchical inter-relationships between organisations.
3. Legal arrangements in place for preparation of reports on policies and measures and of projections.
 - Are there any legal arrangements in place to ensure reporting is completed, and/or data provided, report the legislation and its scope?
4. Procedural and administrative arrangements and timescales in place for the preparation of reports on policies and measures and of projections, to ensure the timeliness, transparency, accuracy, consistency, comparability and completeness of the information reported.
 - Report the cycle for preparation of report on policies and measures and of projections.
 - Summarise the methodologies and mechanisms how timeliness, transparency, accuracy, consistency, comparability and completeness of the information reported are ensured.
 - Report on assurance of consistency with preparation of reports on policies and measures, where relevant, and of projections under Directive (EU)2016/2284.
 - Optionally, provide diagrams that show the processes involved in the national system. These diagrams could include the information flows through the system, and at which points QC and QA measures are applied.
5. Description of the information collection process.
 - Provide a summary of the process for collecting information for developing policies and measures, evaluating policies and measures and for developing projections. Explain if and how consistent processes are used for collecting and using information for policies and measures and projections.
6. Description of the alignment with the national inventory system.
 - Provide information on the alignment with the national system for the GHG inventory, such as processes to ensure consistency of the data used.
 - Option to provide details of links to other climate reporting systems if relevant.
7. Description of the links to arrangements on integrated national energy and climate reports pursuant to Art. 17 of Regulation (EU) 2018/1999.
 - Provide a summary of the linkages between the processes used to collect data related to policies and measures and projections, and relevant processes to report on progress other dimensions of

- the Energy Union, e.g. processes to foster consistent use of energy-related data for the development of policies and measures and projections and for integrated progress reporting.
8. Description of the quality assurance and quality control activities for reporting of policies and measures and projections.
 - Provide a summary of the Quality Control activities applied to help ensure accuracy and completeness in the policies and measures and Projections reports. Report the Quality Assurance activities in place.
 9. Description of the process for selecting assumptions, methodologies and models for making projections of anthropogenic greenhouse gas emissions.
 - Describe the process behind the selection of assumptions, methodologies and models used. Member States may also report the reasons for their choices, or cross reference to other reports providing this information.
 10. Description of procedures for the official consideration and approval of the Member States national system for policies and measures and projections.
 - Describe the process for officially approving the national system or changes to the national system.
 11. Information on relevant institutional administrative and procedural arrangements for domestic implementation of the EU's nationally determined contribution, or changes to such arrangements.
 - Refer to the arrangements for implementing policies and measures as means of domestic implementation and to the arrangements for national projections of anthropogenic greenhouse gas emissions by sources and removals by sinks as means to track domestic progress.
 12. Description of the stakeholder engagement undertaken in relation to the preparation of policies and measures and projections.
 - Report a description of the stakeholder engagement undertaken in relation to the preparation of policies and measures and projections. Indicate which stakeholders were consulted, and any changes or improvements made.

Annex 2. Methodologies

Data collection and analysis of national systems reporting

Development of a data collection framework

The primary goal of the data collection process was to systematically extract and organise relevant information reported by each country within the *Reportnet 3* dataflow on national systems for PaMs and projections pursuant to Article 39 of Governance Regulation (EU) 2018/1999 and Article 38 of Implementing Regulation 2020/1208. This was accomplished by developing a data collection framework to ensure consistency, accuracy, and completeness in capturing the necessary data elements for the 30 countries under assessment.

The first step in the data collection process was the creation of a data collection framework. This was designed after conducting a review of the reporting elements of the dataflow for national systems, and a preliminary screening of countries' reports, identifying key information points that needed to be captured.

The reporting elements in the dataflow are listed in Table A2-1. The framework included questions for each of the 12 reporting elements in the dataflow, ensuring a comprehensive coverage of the relevant aspects. The framework questions were grouped into the following **five core elements of national systems**:

1. Institutional and procedural robustness,
2. Formality,
3. Alignment with other reporting frameworks,
4. Accountability and transparency, and
5. Public participation.

The questions were formulated under each core element in the framework to assess whether the various arrangements or procedures are in place or not, hence obtaining 'yes' (Y), 'no' (N) or 'not available' (NA) answers for each framework question, for each country. Y and N replies were used when a country specifically stated that the arrangement in question is or is not in place, respectively. NA was assigned when a country did not provide any information on the arrangement, making it impossible to verify its existence based on the report. Additional open-ended questions were included in the framework to gather any relevant information that could support more detailed data collection where necessary. Each framework question required responses separately for PaMs reporting and projections reporting, due to possible separate arrangements adopted by countries. For a number of questions input was necessary for either PaMs or projections reporting due to lack of relevance. The framework also featured three additional remark questions for each core element, allowing for (i) additional comments, (ii) identification of good practices, and (iii) indications of areas where countries planned for improvements or changes. Each framework question was assigned a reporting element number to assist the reviewers in locating the relevant information in the national systems reporting.

Given the varying levels of detail in the national system reports, and the inconsistent interpretation of several reporting questions from different countries, the assessment of these reports was conducted in strict accordance with the framework template and standardised interpretation. This approach aimed to ensure objectivity despite the inherent limitations of the data. The specific steps taken for the collection of data are explained in the next section.

Data collection execution

The data collection was conducted in a phased manner as follows.

Phase 1: Testing and iterative refinement of the framework

In this phase, the framework was tested for five countries by populating it with available data sourced from the reported information in the dataflow for national systems. This process enabled an iterative refinement of the framework, whereby feedback from initial data collection rounds was used to improve its effectiveness in capturing relevant data.

Phase 2: Populating the framework template

This process entailed a thorough review of the reported information and the manual input of data into the corresponding fields. Special emphasis was placed on ensuring the completion of all required fields and verifying that the data entries were consistent with the reports from national systems.

Phase 3: Quality control

After a preliminary collection of data, the data was checked to ensure that questions were addressed consistently for all countries. To minimise the risk of inconsistent interpretation of questions, information for each question was collected by the same reviewer for all countries. There were ambiguities in reported information relating to arrangements for climate reporting in general, rather than specifically for PaMs and projections reporting. If it was not explicitly stated that such arrangements also applied to PaMs and projections reporting, the reported information was deemed irrelevant to the framework applied for this study.

Another ambiguity was found in the interpretation of stakeholder engagements. Some countries reported on consultations with the public, while others mentioned engagements with governmental bodies, typically conducted during report preparation. In such cases, only engagements with non-governmental bodies were considered relevant under the category 'Public Participation' (inter-ministerial collaborations were assessed under the element 'Institutional and Procedural Robustness'). Public consultations were predominantly reported within the context of NECP and climate and energy policymaking, both of which were deemed relevant to the analysis as they inform on the integration of PaMs and projections reporting into the policymaking process.

Consistency was also verified concerning the identification of good practices, aiming to identify distinctive practices.

Phase 4: Finalisation of data collection

After the verification process, the data collection was finalised. This process entailed a final review of the completed template to ensure that all necessary information was accurately captured and properly organised. Subsequently, the final dataset was then prepared for analysis, with all entries being validated and confirmed.

Limitations of data collection

Reporting by countries is overall detailed, with some countries exceeding the minimum reporting requirements by including additional information. This may include reporting on planned improvements for the subsequent reporting cycle or a more in-depth description of the arrangements in relation to the NECP and NECPR. However, the varying levels of detail in reporting have introduced a potential bias during the data collection process. Countries that provide more detailed reports may inadvertently create the impression that their arrangements represent good practices. Furthermore, challenges during data collection have emerged due to ambiguities in the reporting requirements themselves, leading countries to focus on different aspects when reporting. For example, under reporting element 10 on the approval of the national system, various countries reported on the approval of the reporting of PaMs and projections,

rather than on the approval of the national system itself. Similarly, under reporting element 11, which concerns the arrangements for the domestic implementation of the EU's nationally determined contributions, countries have reported on diverse aspects, thereby constraining the use of responses in this study. Given these challenges, the data collection process was conducted as objectively as possible to ensure that the questions were consistently addressed across all countries.

Table A2-1 Framework for collection of data from national systems for PaMs and projections reporting

| INSTITUTIONAL AND PROCEDURAL ROBUSTNESS | Reporting Item(s) no. | PaMs | Projections |
|---|------------------------------|-----------------------------------|-----------------------------------|
| Institutional and procedural arrangements | | | |
| Who has overall responsibility of reporting policies and measures and projections? | 1 | Name of organisation/s | Name of organisation/s |
| Does reporting fall under the responsibility of one or more organisations? | 1 | number organisations | number organisations |
| Is an organogram (or equivalent in text) provided? This should, as a minimum, show the organisational structure of the National System for PaMs and projections, including the functional and hierarchical inter-relationships between organisations. | 2, 4 | Y/N/NA | Y/N/NA |
| Are the following policy areas represented by the organisations involved in the preparation of PaMs and projections: | | | |
| Energy industry? | 2, 4 | Y/N/NA | Y/N/NA |
| Transport? | 2, 4 | Y/N/NA | Y/N/NA |
| Industrial processes? | 2, 4 | Y/N/NA | Y/N/NA |
| Agriculture? | 2, 4 | Y/N/NA | Y/N/NA |
| Waste? | 2, 4 | Y/N/NA | Y/N/NA |
| LULUCF? | 2, 4 | Y/N/NA | Y/N/NA |
| Is there a network of different organisations for the preparation of climate and energy policies, strategies, and plans? (Such as an inter-Ministerial working group) | 7, 2 | Y/N/NA | Y/N/NA |
| If yes, specify name and / or type of network | 7, 2 | name/type of network | name/type of network |
| Procedural arrangements | | | |
| Are assumptions, methodologies and models verified and/or approved by the relevant organisations? | 9 | | Y/N/NA |
| Is there a procedure in place for official consideration and approval of reporting? | 10, 2 | Y/N/NA | Y/N/NA |
| Which organisation is responsible for official consideration and approval of reporting? | 10, 2 | Name of organisation/s | Name of organisation/s |
| Are arrangements in place to carry out a review of the previous reporting cycle? | 4, 10 | Y/N/NA | Y/N/NA |
| Is there a procedure in place for the official consideration and approval of (or changes to) the national system of PaMs and projections reporting? | 10, 2 | Y/N/NA | Y/N/NA |
| If yes, specify the name of the institution who has the responsibility of official consideration and approval of (or changes to) the national system of PaMs and projections reporting | 10, 2 | Name the institution | Name the institution |
| Data collection system | | | |
| Are arrangements in place for the collection and exchange of data / information between organisations for reporting on PaMs and projections? | 5, 2 | Y/N/NA | Y/N/NA |
| Are arrangements in place for the collection of data / information for the development of <u>new</u> PaMs? | 5 | Y/N/NA | Y/N/NA |
| Comment | | | |
| Good practices (e.g. participation of multi-level governance, established data collection system / archiving / documentation) | | if yes, state the good practice | if yes, state the good practice |
| Plans for improvements / changes for institutional and procedural arrangements | | if yes, state the changes planned | if yes, state the changes planned |

| FORMALITY | Reporting Item(s) no. | PaMs | Projections |
|---|-----------------------|-----------------------------------|-----------------------------------|
| Are reporting requirements for PaMs and projections enshrined in national climate law or any other legal arrangement? | 3 | Y/N/NA | Y/N/NA |
| If yes, specify name of law. (Provide link if available) | 3 | name of law + URL | name of law + URL |
| Does the legal arrangement specify: | | | |
| The organisation with overall responsibility? | 3 | Y/N/NA | Y/N/NA |
| Institutional cooperation? (e.g. for data collection mechanism and data sharing, reporting procedure, etc.) | 3 | Y/N/NA | Y/N/NA |
| Timelines? (e.g. by when information needs to be provided, etc.) | 3, 4 | Y/N/NA | Y/N/NA |
| Procedures for official consideration and approval of reporting? | 3, 10 | Y/N/NA | Y/N/NA |
| Development of climate and/or energy plans (e.g. preparation of the NECP)? | 3, 7 | Y/N/NA | Y/N/NA |
| Monitoring of progress towards energy and climate targets? | 3, 7, 11 | Y/N/NA | Y/N/NA |
| Comment | | | |
| Good practices | | If yes, state the good practice | If yes, state the good practice |
| Plans for improvements / changes for legal formality | | If yes, state the changes planned | If yes, state the changes planned |

| ALIGNMENT WITH OTHER REPORTING FRAMEWORKS | Reporting Item(s) no. | PaMs | Projections |
|---|-----------------------|-----------------------------------|-----------------------------------|
| GHG inventory reporting | | | |
| Is the organisation responsible for UNFCCC reporting the same organisation responsible for projections reporting? | 6, 2 | | Y/N/NA |
| If not, is the organisation responsible for UNFCCC reporting involved in the projections reporting? | 6, 2 | | Y/N/NA |
| Are procedures in place to ensure that information reported to the EU is consistent with GHG inventory reported to the UNFCCC, including, as a minimum arrangement, to ensure consistency of data used? | 6 | | Y/N/NA |
| Are the methodologies and assumptions used in UNFCCC reporting and projections reporting aligned? | 6 | | Y/N/NA |
| Comment | | | |
| Good practices | | if yes, state the good practice | if yes, state the good practice |
| Number of Y for GHG inventory | | | |
| Article 17 of the Governance Regulation (EU) 2018/1999 (NECP) | | | |
| Are procedures in place to ensure that information reported in the <u>NECP</u> is consistent with PaMs and projections reporting? | 7 | Y/N/NA | Y/N/NA |
| Comment | | | |
| Good practices | | if yes, state the good practice | if yes, state the good practice |
| Plans for improvements / changes for alignment with other reporting frameworks | | if yes, state the changes planned | if yes, state the changes planned |

| ACCOUNTABILITY AND TRANSPARENCY | Reporting Item(s) no. | PaMs | Projections |
|--|-----------------------|------------------|------------------|
| Quality control procedures | | | |
| Do the arrangements include a defined timeline of activities for reporting? | 4 | Y/N | Y/N |
| How many months are allocated for all activities involved in PaMs and projections reporting? | 4 | number of months | number of months |
| How many months are allocated for the following activities in the timeline: | | | |
| QA/QC? | 4 | number of months | number of months |
| Consultations? | 4 | number of months | number of months |

| | | | |
|--|------------|-----------------------------------|-----------------------------------|
| Are arrangements in place to ensure that the following QA/QC checks are in place, to ensure: | | | |
| Timeliness (example by providing a timeline of actions to ensure timeliness)? | 4, 8 | Y/N/NA | Y/N/NA |
| Transparency (example by compiling information on methodologies, assumptions, etc.)? | 4, 8 | Y/N/NA | Y/N/NA |
| Reporting of a complete list of PaMs from all relevant Ministries? | 4, 8 | Y/N/NA | |
| Reporting on all gases and activities in projections? | 4, 8 | | Y/N/NA |
| Accuracy of reporting (by having defined checks to ensure accuracy)? | 4, 8 | Y/N/NA | Y/N/NA |
| Consistency of reporting (by having defined checks/arrangements to ensure consistency)? | 4, 8 | Y/N/NA | Y/N/NA |
| Are arrangements in place to ensure consistency between data used in PaMs and projections reporting? (Example, baselines, underlying socio-economic assumptions) | 4, 5, 8, 9 | Y/N/NA | Y/N/NA |
| Are arrangements in place to ensure consistency of energy projections across the different sectors? | 4, 5, 8 | | Y/N/NA |
| Comment | | | |
| Good practices (e.g. external QA/QC review, review of data submitted in previous reporting cycle) | | if yes, state the good practice | if yes, state the good practice |
| Policy monitoring & evaluation | | | |
| Are arrangements in place for tracking progress and monitoring of PaMs? | 11, 7 | Y/N/NA | |
| Are arrangements in place for the evaluation of PaMs? | 11 | Y/N/NA | |
| Are arrangements in place for corrective actions and/or redesign of existing PaMs and/or identification of needs for new PaMs? | 11 | Y/N/NA | |
| Comment | | | |
| Good practices (e.g. periodical reporting, beyond Governance Regulation requirements, on progress tracking, or PaMs status updates, setting up of governing bodies/working groups for monitoring progress / evaluation, etc.) | | if yes, state the good practice | if yes, state the good practice |
| Plans for improvements / changes for accountability and transparency | | if yes, state the changes planned | if yes, state the changes planned |

| PUBLIC PARTICIPATION | Reporting Item(s) no. | PaMs | Projections |
|--|------------------------------|-----------------------------------|-----------------------------------|
| Public consultation | | | |
| Are procedures in place for public engagement? | 12 | Y/N/NA | Y/N/NA |
| Specify if public engagement is conducted in the context of reporting on PaMs and projections; development of strategic policy instruments, or broader climate and energy policy | 12 | mention the context | mention the context |
| Are the following organisation involved in stakeholder engagements: | | | |
| Industry or commerce? | 12 | Y/N/NA | Y/N/NA |
| Research and academic organisations? | 12 | Y/N/NA | Y/N/NA |
| Civil society and general public (including NGOs)? | 12 | Y/N/NA | Y/N/NA |
| Other? | 12 | mention type | mention type |
| Describe the stakeholder engagements (frequency, format, etc.) | 12 | short description | short description |
| Comment | | | |
| Good practices | | if yes, state the good practice | if yes, state the good practice |
| Plans for improvements / changes for public participation | | if yes, state the changes planned | if yes, state the changes planned |

Data analysis

The collected data was analysed to obtain a score per core element, per country. The analysis of country responses was conducting by counting the number of Y replies for the questions which required a Y, N or NA reply. The count of Y replies was normalised based on the number of relevant questions within each

core element, so that questions have equal weightings resulting in a score ranging between 0 and 1 for each core element. Initially, scores were computed separately for PaMs and projections reporting, and then merged by allocating equal weight of 50% each to PaMs and projections' scores. The score of each core element per country was determined using the following equation.

$$s_c = 0.5 \cdot \frac{Y_{PaMs_c}}{Q_{PaMs_c}} + 0.5 \cdot \frac{Y_{Projections_c}}{Q_{Projections_c}}$$

Where:

- s is the score for each of core element $c \in [1, 2, 3, 4, 5]$,
- Y is the count of Y replies to questions per core element c , for *PaMs* and *Projections* separately,
- Q is the count of questions per core element c , for *PaMs* and *Projections* separately,
- 1 represents core element Institutional and procedural robustness,
- 2 represents core element Formality,
- 3 represents core element Alignment with other reporting frameworks,
- 4 represents core element Accountability and Transparency,
- 5 represents core element Public Participation.

Survey on the national systems for reporting on PaMs and GHG emission projections reporting

An online survey was distributed among national lead reporters under the Governance Regulation (EU) 2018/1999 for the dataflows on (i) national systems for reporting on PaMs and anthropogenic GHG emission projections, (ii) PaMs reporting, and (iii) anthropogenic GHG emission projections reporting. The survey was also shared with members of Working Group 2 operating under the Climate Change Committee for 'Implementation of the Effort Sharing Decision, Policies and Measures and Projections'. The purpose of the survey was to collect supplementary data on the arrangements and good practices of governance systems concerning the following key areas:

1. The strengths of the national systems,
2. Review of the national system arrangements,
3. Opportunities for improving the national systems,
4. Technology and tools used in reporting, and
5. Evaluation of policies and measures.

The survey was developed using EU Survey platform in the following manner.

Title: Survey on the National Systems for reporting on policies and measures and greenhouse gas projections reporting

Introduction: The EEA-ETC CM is conducting a study on the key features of the national governance systems for reporting on policies and measures and anthropogenic greenhouse gas projections. It covers the EU-27 Member States and Iceland, Norway and Switzerland. The study aims to examine the effective features of national governance systems and to identify good practices in addressing the key challenges of reporting obligations.

To complement the information available in the reports submitted under the requirements of Article 36 of the Implementing Regulation 2020/1208, this survey aims to gather additional information on National Systems' arrangements and practices. Its results will feed in an EEA-ETC CM report to enhance our understanding of national governance systems and to share identified good practices across European countries.

The survey will take approximately 15 minutes to complete.

Questions

Name and Surname _____

Name of organisation _____

Country _____

Email _____

1. Strengths of the National System

a. If you had to give a presentation on the most robust element of the National System, which of the following element(s) would you choose to present?

- Institutional arrangements
- Legal arrangements
- Procedural arrangements involved in the reporting cycle
- Quality assurance and quality control procedures
- Information collection system
- Stakeholder engagement
- Other (*e.g. integrated reporting across sectors and dimensions*). Specify the other element(s).

b. Specify the reason for your choice. _____

2. Review of the National System

a. Are there processes in place to review the arrangements of the National System?

- Yes
- No

b. Which of the following elements of the National System are reviewed?

- Institutional arrangements
- Legal arrangements
- Procedural arrangements involved in the reporting cycle
- Quality assurance and quality control procedures
- Information collection system
- Stakeholder engagement
- Other. Specify the other element(s).

c. Which institution is responsible to review the National System arrangements?

3. Opportunities for improving the National System and reporting

a. In which of the elements of the National System are there opportunities for improvement?

- Institutional arrangements
- Legal arrangements
- Procedural arrangements involved in the reporting cycle
- Quality assurance and quality control procedures
- Information collection system
- Stakeholder engagement
- Other. Specify the other element(s). _____

b. How can the selected element(s) be improved? Describe briefly for each element.

c. For which elements, selected in question 3.a., are there plans to implement these improvements?

- Institutional arrangements
- Legal arrangements
- Procedural arrangements involved in the reporting cycle
- Quality assurance and quality control procedures
- Information collection system
- Stakeholder engagement
- Other
- None

4. Technology and digital tools used in reporting

a. Which digital tools and/or software are used to conduct each of the following activities?

| Activities | Indicate the tools and / or software used (E.g. Microsoft excel for data collection, website for dissemination) |
|---|---|
| Planning and development of policies and measures | |
| Data collection for policies and measures and projections | |
| Aggregation of information and data for policies and measures and projections | |
| Quality control checks for policies and measures and projections | |
| Dissemination of information to stakeholders | |

b. Specify any other use of technology in reporting, if applicable. _____

5. Evaluation of policies and measures

a. Are there procedures/arrangements in place to conduct evaluations of individual or group of policies and measures? (E.g. guidance for the selection of policies and measures to be evaluated, governing bodies in place to make decisions on which policies and measures to be evaluated, frameworks to guide the evaluation criteria.)

- Yes
- No

b. What are the current procedures to evaluate policies and measures? Please describe shortly.

c. If available, provide a URL for information on these arrangements. _____

6. Follow-up interview

Are you interested in participating in a follow-up online interview? The interview will take around 45 minutes to follow up on the survey questions.

- Yes
- No

By submitting this survey, I agree that EEA-ETC collects, saves and processes my personal data for the sole purpose of conducting this study.

Interview questions with country reporters

A total of three interviews were conducted with country reporters due to time and resource limitations. Following the collection of survey responses, 6 out of 12 responding countries expressed interest in

participating in a follow-up interview. The selection of countries for interviews was restricted to those that indicated they had procedures in place for the evaluation of PaMs, which reduced the number of potential candidates to five. The final selection was based on a geographical distribution of the countries, as well as a diversification of the maturity level of their national system, which was assessed based on the country reports. This process resulted in the selection of Ireland, Germany, and Bulgaria. The interview questions were tailored for each country based on the reported information in the national system report and survey responses.

Ireland

Interview with representatives of the Environmental Protection Agency (EPA) of Ireland

Legal and institutional arrangements

Question 1: Under 'legal arrangements in place', Ireland indicates "there is no relevant national legislation in place in Ireland". The institutional and procedural arrangements seem robust and the system functions well. How does Ireland achieve that level of performance without a legal framework?

Question 2: Regarding institutional cooperation, could you elaborate on the system with the service level agreements and memoranda of understanding? How was this established and did it evolve historically?

Question 3: The national system and involved processes seem very apolitical. Was this a conscious decision or a more natural evolution? Can this be considered as a positive or negative element, or does it not really have an impact?

Monitoring and evaluation

Question 4: Ireland has a strong integration of ex-ante and ex-post policy evaluation, contributing to the completeness and effectiveness of reported policies. How is this evaluation embedded into the policy cycle? Could you share insights on how this process was developed and maintained over time?

Question 5: For countries looking to implement a similar approach to policy evaluation, particularly incorporating both ex-ante and ex-post analysis, where would you recommend starting? Are there key elements or steps that should be prioritised to ensure successful integration into their national systems?

Improvements in the national system

Question 6: In the organigram included in the national system report, the activities of the national system include the identification of improvements needed in relation to the data collection. Are there other established procedures to identify and prioritise needs for improvements within the national system as a whole?

Germany

Interview with representatives of the German Environment Agency (UBA)

Institutional and legal arrangements

Question 1: The survey indicates that the institutional arrangements can be considered as a strong aspect of the German National System, and the National System report indicates a well-established cooperation, both internally among ministries, and with external research partners. Could you elaborate on the establishment of this cooperation and its historical evolution? To what extent does the legal framework play a role in this?

Question 2: The survey also indicates that procedures are in place for the reviewing of the National System. What is meant by 'review' in this context? Are reviews carried out for improving the reporting process?

Also, the review by the expert council (for projections) was not mentioned in the report. Could you elaborate on this aspect?

Question 3: The National System report mentions that modelling is outsourced through a tendering process, presenting various challenges, including lack of budget, lack of transparency, and delays. The survey indicates that potential improvements may be made in the institutional and procedural arrangements related to collaboration with contractors and research partners. What factors have contributed to the decision to outsource modelling work, and could you elaborate on the nature of this collaboration and how it evolved overtime? Are there elements to mitigate the challenges associated with outsourcing modelling?

Evaluation of policies and measures

Question 4: The survey also indicates that procedures are in place for the evaluation of policies and measures. How are evaluations embedded in the policy cycle? Could you share insights on how this process was developed, and whether there are procedures to prioritise the evaluation of certain actions?

Bulgaria

Interview with representatives of Bulgaria's Ministry of the Environment and Water

Institutional and legal arrangements

Question 1: The National System report for Bulgaria describes the overarching procedures and systems in place associated with climate change policy in general and the management of the GHG inventories. However, it is not clear to us how the National System for reporting on Policies and Measures and GHG emission projections is embedded within this overarching system. Could you elaborate on how the specific institutional arrangement and procedures for these two reporting elements are embedded within the broader climate change policy arrangements?

Question 2: Institutional cooperation is an element mentioned as a strength in the survey, but also as a possible improvement "to create a suitable network of sectoral experts". Can you clarify how the interinstitutional commission on climate change plays a role in this? Additionally, it is also mentioned that "institutional arrangements between MOEW and the main data providers for GHG inventory were signed in 2010". How do these arrangements contribute to the institutional cooperation, and can you provide more insight on missing elements to create the suitable network of sectoral experts you describe in the survey?

Question 3: It is mentioned in the report that "the functions and the members of the existing Inter-ministerial Working Group on the National Plan for Allocation of Greenhouse Gas Emission Allowances are to be extended in order to expand the existing coordination mechanism between the institutions concerned, including business organisations and NGOs, on issues related to the national climate change policy." Could you elaborate on those plans and how they are expected to improve the national system and reporting?

Question 4: Institutional cooperation seems to have a legal basis. To what extent do the legal arrangements contribute to the functioning of the institutional cooperation?

Data collection system

Question 5: The survey mentions that the 'information collection system' is both a good example and requires a possible improvement ("to create the database on the national level with the required information in different sectors"). Can you elaborate on the data collection system as it is today (for policies and measures and projections) and what challenges arise from it?

Evaluation of policies and measures

Question 6: The survey also mentions that there are procedures in place for the evaluation of policies and measures. How is the evaluation process embedded into the policy cycle? Could you share insights on how this process was developed, and whether there are procedures to prioritise the evaluation of certain actions?

Interview questions with governance experts

Semi-structured interviews were conducted with key governance experts to gain high-level insights from a broad EU perspective. The questions were developed based on the challenges identified in the national systems reports and the survey responses, with the objective of identifying potential solutions and exploring innovative perspectives for the enhancement of governance systems in the future. Considering the diverse expertise of the interviewees, the questions served to frame the discussion, but enabling the experts to elaborate on their experiences and insights.

Three interviews were conducted with:

- Louis Meuleman (Vice Chair of the Scientific Committee of the EEA),
- Claire Dupont (Chair of the Scientific Committee of the EEA), and
- Matthias Duwe (Head of Climate at Ecologic Institute) and Nick Evans (Fellow at Ecologic Institute at Ecologic Institute, Research & Policy Analysis).

The following questions were formulated to guide the interviews.

1. Legal frameworks and accountability in climate reporting

Binding legal frameworks and formal structures can greatly enhance data reliability and transparency.

Question: What role do legal frameworks play in ensuring transparency and accountability in national climate reporting? Are there successful models the EU could encourage Member States to adopt?

2. Independence and objectivity of climate and energy reporting

Question: How crucial is the independence of national reporting bodies in ensuring objective climate data? What best practices exist to balance independence with effective policy alignment?

3. Enhancing inter-ministerial cooperation

Effective climate reporting requires robust collaboration across agencies and ministries. Many countries rely on inter-ministerial groups or formalised agreements to facilitate data sharing. However, inter-ministerial coordination is often hindered by limited resources or conflicting political priorities. Improving this collaboration could streamline data exchange and policy alignment.

Question: What policy tools or incentives could the EU recommend strengthening inter-ministerial cooperation, especially in countries with limited formalised structures for inter-ministerial climate data sharing?

4. Capacity building and reducing external dependency

Capacity limitations often lead to a reliance on external consultants for sectoral projections, which can introduce delays, inconsistencies, and lack of transparency.

Question: What are effective mechanisms the EU can use to support capacity building in climate reporting, particularly in smaller Member States with fewer resources?

5. Integration of evaluation data in climate policy development

Some countries find it difficult to integrate GHG data with national and EU targets, resulting in a potential disconnect between reporting and policy implementation.

Question: What approaches could the EU advocate to help Member States integrate GHG and policy evaluations data in reporting to improve their relevance to national climate targets?

6. Sector-specific reporting challenges and tailored governance

Sectors like agriculture, waste, and LULUCF present unique challenges for data collection and emissions reporting.

Question: How can governance strategies be adapted to address sector-specific reporting difficulties while maintaining overall consistency?

7. Encouraging public and stakeholder engagement in climate policy development

Engaging stakeholders, including NGOs and the business sector, early in policy development can enhance policy legitimacy and public buy-in.

Question: What models or frameworks can support Member States in effectively engaging NGOs, businesses, and scientific communities earlier in the climate policy development process?

8. Adapting reporting systems for long-term flexibility and sustainability

Question: Given the evolving nature of EU climate law, how can the EU encourage flexible yet sustainable national reporting frameworks that can adapt reporting structures to new climate regulations or targets?

9. Innovation in governance systems

Do you see any emerging trends or innovations in governance structures that could improve transparency and effectiveness in climate reporting, for example, novel approaches, technologies, or frameworks?

Annex 3. The Common European Data Spaces

Table A3-1 Description of Common European Data Spaces, organised by sector.

| Sector | Common European Data Spaces | Description |
|-------------|-----------------------------|---|
| Energy | Omega-X | Relying on European common standards, the OMEGA-X project aims to implement an energy data space. This will include federated infrastructure, data marketplace and service marketplace, involving data sharing between different stakeholders and demonstrating its value for concrete energy use cases while guaranteeing scalability and interoperability with other data space initiatives. |
| | intNET | The energy transition towards a carbon neutral European future in 2050 affects many other sectors than just energy, such as transport, building, agriculture and industrial production. Therefore, not only connectivity in the energy sector is needed but energy related processes and products in all sectors need to be aligned. The intNET project has as objective to link these domains and improve joint standardisation and interoperability. |
| | EDDIE | The Clean Energy Package establishes customer rights to access energy data and share it with chosen eligible parties. The lack of standardized procedures across the EU poses a significant obstacle to the implementation. This project introduces a decentralized, distributed, open-source Data Space to reduce data integration costs, allowing energy service companies to operate in a unified European market. |
| | Enershare | Enershare wants to define a Data-Driven Reference Architecture for the energy domain. It creates a marketplace based on Blockchain and Smart Contracts with the aim of increasing the security of the shared data. It also enables a compensation system of assets and resources related to data (e.g., datasets, algorithms, models) with energy assets and services (e.g., maintenance of heating system, surplus transfer of locally self-produced energy). |
| | Synergies | Synergies promotes the creation of a data-driven intelligence ecosystem that supports energy operators in improving efficiency in supply operations and enables prosumer inclusiveness in market transactions. The main objective consists in promoting an innovative solution based on knowledge sharing and data intelligence integration that includes all energy actors of a complex value chain, considering diverse data sources, heterogeneous energy systems and spanning different socio-economic characteristics. |
| | Data cellar | This project aims to create a federated energy dataspace that will support the creation, development and management of local energy communities in the EU. The data space population will be facilitated via a private metering approach, with a focus on an easy onboarding and interaction, guaranteeing integration with other EU energy data spaces. |
| Mobility | PrepDSpace4Mobility | PrepDSpace4Mobility wants to contribute to a secured and controlled pooling and sharing of mobility data across Europe. It contributes to the development of the common European mobility data space by mapping existing data ecosystems, identifying gaps and overlaps within, and proposing common building blocks and governance frameworks found in existing data space architectures. |
| | deployEMDS | DeployEMDS will support policymaking by enabling data sharing and reuse for efficient multimodal mobility and traffic management, as well as for measuring progress of sustainable urban mobility across Europe. |
| Agriculture | AgriDataSpace | AgriDataSpace project contributes to a European data space for agriculture that facilitates data sharing, processing, and analysis in a secured, trusted, |

| | | |
|------------|-------------------------|---|
| | | transparent and responsible manner to create new opportunities for monitoring and optimising natural resource use stimulating data-driven innovations. |
| | Divine | This project will develop an agri-data ecosystem that combines data already commonly shared while also using industry-led pilots that are devised on data-sharing plans. The results would support policy makers, technology providers, farm representatives and other agri-data stakeholders. |
| | CrackSense | Fruit cracking is a costly and persistent challenge for farmers, with limited options for mitigation measures. CrackSense wants to shift from manual monitoring to high-throughput, real-time, proximal, and remote sensing tools integrated with advanced agri-environmental monitoring. |
| | ScaleAgData | The EU's Green Deal sets clear targets for a more competitive and sustainable agriculture. The ScaleAgData project aims to bridge the data gap of observations at the local level by unlocking, integrating and upscaling the data from in-situ sensors on farms. |
| | AgDataValue | AgriDataValue contributes to strengthening the smart-farming capacities, competitiveness and fair income of farmers by introducing an open source, intelligent and multi-technology data space. This project combines big data and dataspace technologies with agricultural knowledge, monetization, new business models and agri-environment policies. |
| | 4Growth | Not available |
| | Dig4Live | Not available |
| Green Deal | GREAT | The GREAT project aims to establish the Green Deal Data Space Foundation and its Community of Practice. The Green Deal Data Space is an infrastructure that will allow data providers and initiatives to openly share their data to tackle climate change in a multidisciplinary manner. |
| | AD4GD | AD4GD's wants to co-create and shape the European Green Deal Data Space as an open hub for FAIR data and standards-based services that support the key priorities of pollution, biodiversity and climate change. |
| | B-Cubed | The magnitude and dynamics of the global biodiversity crisis are hard to quantify and require rapid, reliable and repeatable biodiversity monitoring data which decision makers can use to evaluate policy options. B-Cubed wants to transform biodiversity monitoring into an agile and responsive process. It leverages the concept of data cubes to standardise access to biodiversity data. These cubes are the basis for models and indicators of past, current and future biodiversity. |
| | FAIRiCUBE | FAIRiCUBE wants to enable players from beyond classic Earth Observation domains to provide, access, process and share gridded data and algorithms in a FAIR and TRUSTable manner. The project's goal is to leverage Machine Learning operating on multi-thematic data cubes for a broader range of governance and research institutions from diverse fields, who are at present cannot easily access and utilize these potent resources. |
| | USAGE | USAGE (Urban Data Space for Green Deal) provides solutions and mechanisms for making city-level environmental and climate data available based on FAIR principles, like innovative governance mechanisms, consolidated arrangements, AI-based tools, and data analytics to share, access, and use city-level data from Earth Observation, Internet of Things, authoritative and crowdsources, leveraging on standards for data and service interoperability. |
| | DS4SSCC and DS4SSCC-DEP | Data Spaces for Sustainable and Smart Cities and Communities (DS4SSCC) created a cross-sectorial data space for governments on all levels and their providers to deliver services to their citizens by enabling interoperability to reach critical goals, including the Green Deal. |

European Topic Centre on
Climate change mitigation

<https://www.eionet.europa.eu/etcs/etc-cm>

The European Topic Centre on Climate change mitigation (ETC-CM) is a consortium of European institutes under contract of the European Environment Agency.