Support to Member States in the implementation of the Regulation on Governance of the Energy Union and Climate Action

Summary of stakeholder interviews

[6th December 2024]

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Summary of stakeholder interviews

A note submitted by ICF S.A.
in association with

Adelphi, Artelys, Cambridge Econometrics, CSD and Eclareon

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List of Acronyms

Acronym	Definition
CESAR	Centre of Economic Scenario Analysis and Research
CPB	Central Planning Bureau
DENIO	Dynamic Econometric Input-Output model
GEORG	Greenhouse Gas Emissions from Road Transport
ICF	International Consulting Firm
INVERT/EE-Lab	Integrated Model for the Evaluation of Energy Demand
MARS	Model for Passenger Transport, Housing Development, and Migration
MITECO	Ministry of Ecological Transition and the Demographic Challenge
MS	Member State
NECP	National Energy and Climate Plan
NEMO	National Emission Model
OECC	Spanish Climate Change Office
Öko-Institut	Institute for Applied Ecology
PaMs	Policies and Measures
PAMs	Policy and measures
PBL	Environmental Assessment Agency
RIVM	National Institute for Public Health and the Environment
RVO	Netherlands Enterprise Agency
TIMES-SINERGIA	Integrated MARKAL-EFOM System
TM5-FASST	Transport Model - Fast Scenario Screening Tool

Introduction

1.1 Objectives

As per the agreed work plan, Cambridge Econometrics held brief interviews with Member State (MS) administrations with the purpose of obtaining information that can offer insights to Belgium with respect to the following:

- Modelling framework used to quantify the impacts of energy policy, with particular attention to macroeconomic assessment models.
- Regional cooperation between national and federal administrations
- Renovation policies impact assessment
- Development of rail (public and freight) transport impact assessment
- Development of investment needs estimates

These interview objectives were developed and validated with the administration during the early stage of the project. Based on the findings of review of the methodological framework employed by Belgium for NECP impact assessment, this list of objectives was expanded in order to address the challenges listed below.

- Lack of coordination across regions and at the federal level to produce national outcomes.
- Lack of macro-economic modelling and connection with techno-economic assessment.
- Desire to expand modelling capabilities on renovation and rail transport policies.
- Lack of investment needs estimation and disaggregation of investment needs to private and public investment needs.

This note synthesises the key takeaways of the different interviews. The purpose of these interviews was to discuss the approach of different MSs to impact assessment as part of NECP, noting to serve as inspiration and example for Belgium's approach to future NECP impact assessments.

This note summarises the key takeaways of the interviews between CE and the 4 MSs that responded positively to a request for an interview – Spain, The Netherlands, Austria, and Germany. The Table below presents the MSs that were invited to an interview and the response status.

Table 0.1 Member States invited for an interview.

Austria	Interview conducted
France	Following three attempts from ICF and 2 attempts from Belgium, no response was received. No interview was conducted.
Germany	Interview conducted
Netherlands	Interview conducted

Spain	Interview conducted In light of rising interest from the Belgian administration in the TIMES model, the team attempted to schedule a second interview which would focus on Spain's use of this model. The administrations provided some additional information via email to help complement the findings of the previous interviews.

The remaining of this note develops in four parts.

- **Part 1** - Brief overview of the approach to NECP impact assessment that the different interviewed MSs follow. This focuses on the contextualisation of the NECP update progress by MS, discusses the role of external parties in the modelling exercise, the collaboration and joint modelling with different regions and the collaboration between different governmental institutions.
- **Part 2** - Elaboration of the models used for impact assessment studies. This involves key inputs and outputs, modelling types and how joint and individual impacts of different policies and measures (PaMs) are assessed.
- **Part 3** - Presentation on the main challenges and lessons discussed by different MSs during the NECP update process.
- **Part 4** - Discussion of how and if investment needs assessment, renovation assessment methodology and rail transport assessment methodology are explicitly employed.

2 Overview of NECP update

2.1 Context

Belgium's NECP modelling framework has four main challenges, as identified by Cambridge Econometrics in the previous report produced under of this project[1]. The four challenges are as follows: lack of transparency in modelling practices across regions and federal authorities; limited consistency of modelling assumptions resulting from a decentralised approach; no integrated impact assessment, including considerations for macro-economic and social variables; missing investment needs calculations. The following consultations aim to share some insights on how best to address these challenges.

The framework implemented to track the performance of NECP differs across Member States (MSs). Belgium performs impact assessments of its policies and measures (PAMs) individually at both federal and national levels, and an aggregation exercise combines and consolidates all inputs. Spain adopts a different approach which focuses on modelling all PAMs together (in one scenario as opposed to separate scenarios per PaM) in a centralised way at the national level, and a public consultation process is used for collaboration across all stakeholders. Germany and Austria also perform their impact assessments at national levels and work closely with external collaborators to develop and align their models to the national law. The Netherlands adopts a collaborative framework which involves multiple ministries and agencies, ensuring sectoral policies are well-represented.

Different MSs reflected that the NECP update and other EU-wide policies are not always their priorities as they have other national obligations for reporting progress on climate policies and plans. For instance, the German national climate protection law expects the annual recalculation of the base of the national baseline, which is more frequent than at the EU level. This also means additional work for the responsible institutions, which can hinder the progress of updating the NECP. In the case of the Netherlands, it was mentioned that NECP functions as a long-term strategy, but they have different strategies and institutions which are responsible for the more recent and operational update of policies (unlike in some MSs which joined the EU later – they often reflect the NECP as their key strategy and document summarising all the key climate policies).

2.2 External collaborators

All MSs interviewed work closely with external institutions to improve their modelling. For example, Germany works very closely with the Öko-Institut to develop their modelling tools and capabilities. The Netherlands also work with external collaborators, for instance, to develop and maintain their building renovation model or model impact in agriculture. Spain mentioned that they hold regular stakeholder consultations and collaborate closely with the Basque Centre for Climate Change. They help measure the outputs of the energy system and assess the impacts. Austria also closely collaborates with social partners, NGOs, and various universities to develop and update its models.

[1] ENER-Energy Union Support_ BE TA_ Note on methodological transparency consistency and reporting.docx

Overall, collaboration with external institutions is considered essential within the NECP impact assessment. Across the interviews with all MSs, their collaboration with different institutions was highlighted as an essential component to overcome the lack of internal modelling capabilities and the tight timeline for submitting NECP impact assessment results. This collaboration helps leverage an efficient and timely approach, which is able to accurately measure a complex range of impacts.

When involving external institutions, close collaboration during the model refinement phase, as well as interim results review sessions, are important. All the interviewed MSs, who work closely with external institutions, highlighted their involvement in the model refinement phase. This means that although the development of the model is outsourced, there is some coordination and collaboration to ensure the models are well-fitted to the impact assessment needs. Additionally, to ensure consistency of the whole impact assessment exercise and follow the guidance provided by the European Commissions[2], it is important to ensure these outsourced models remain consistent with any other modelling tools that the country uses. For example, Germany mentioned that it provides annual projections for emissions to its collaborators to ensure the underlying assumptions of the model are consistent. Aside from being involved in model developments, Austria implements an interim result review session. In this session, parameters and results from outsourced models are reviewed to receive feedback and input from all stakeholders. This process has proven essential for reflecting on the PAMs implemented and modelling assumptions to take quick action before final delivery.

2.3 Collaboration between the regional and federal level

The regional administrative structure and the degree of impact assessment devolution differ among interviewed MSs. **In Spain**, autonomous communities have relatively large independence and space for implementing their own policies. The interviewee representing Spain's administration mentioned that the national government receives regional climate and energy plans and provides feedback to ensure consistency with their emission levels at the national level. Regardless of the regional responsibilities in implementing PAMs, NECP reporting is conducted and coordinated at the national level. This process brings data inputs together from both national and regional sources despite the challenges of collecting inputs from several sources. Additionally, a public consultation process is conducted to ensure all stakeholders come together to provide their input for the NECP. Regional governments are invited to participate in this consultation process. In the latest iterations of Spain's NECP, regional impact assessments have been introduced. Using the provided regional data, these assessments mainly focus on quantifying of targeted policies that address energy poverty and regional disparities in energy transition impacts. This approach remains centralised and carried out at a national level, showing how a centralised approach.

The Netherlands operates a national system for projections and policies, functioning at the national level without distinguishing between regions or provinces. The Netherlands' institutional structure is fundamentally different from Belgium's federal system, making coordination with provinces less complex. There is no explicit spatial modelling in the assumptions behind the input for projections; however, spatial aspects are considered in policy assumptions and when gathering inputs. Some regional data is used for emission inventories, particularly related to

[2] Environmental Impact Assessment - European Commission

agriculture and nitrogen policies, but it is not very structured and mainly considers the most impactful provinces.

Germany strictly focuses on the national level when assessing the impacts of different climate policies and does not consider regional results. Data inputs are from and prepared at the national level, and no disaggregation is provided for the regional level. However, the main model incorporates some spatial disaggregation for infrastructure implicitly. It is also relevant to mention that the regions do some parallel modelling work in order to introduce their own policies. While they often ask for additional help from the federal level, in the lack of resources, this support cannot always be provided.

In Austria, federal and regional coordination is limited, impacts are assessed at the federal level, and federal policies are prioritised. While the regions are represented as part of the feedback and working group committees, collaboration with them is identified as a main area of improvement: due to the lack of time and resources, they are not involved in each step. However, all regions, among other entities, are represented in the National Climate Change Committee. The impacts of policies are only calculated at the federal level, but the regions are well subsidised from the federal budget to implement different policies (many of these responsibilities, for example, in the case of building renovation and change of heating systems, were previously regional responsibilities, but have recently been significantly subsidised by the federal state). While different regions often set their targets for different sectors, they are not consistent at the national level. Therefore, their aggregation is challenging and not done by the federal institutions.

In summary, the interviewed MSs focus on the federal level when assessing the impact of different climate policies, regardless of the power of their regions. Regions can and are expected to contribute to the national climate targets, but their role is secondary to that of the national or federal government. This stands out as a main difference from the framework implemented in Belgium, where both federal and regional administrations have a modelling role, and an aggregation exercise brings all inputs together. As a result, Belgium is able to provide some impact assessment at the regional level, which adds granularity to the presented results. However, because of this, Belgium also lacks consistency and coordination in the modelling frameworks, as they are all independently designed and implemented by different authorities. This represents a trade-off between having granular results able to provide impacts at regional levels and maintaining the consistency of aggregated modelling results

3 Models used by Member States

All interviewed MSs use models which are developed and maintained with external collaborators. The different models used and the impacts covered by each MS are presented below.

3.1 Spain

Spain employs a large set of models to assess the impacts of its energy and climate policies as part of its NECP. At the core of this framework is the DENIO model, a Neo-Keynesian Econometric Dynamic Input-Output model designed specifically for Spain's economic and policy analysis. DENIO examines the economic impacts of various scenarios across 74 sectors, 88 products, and 16 consumption categories, taking into account 22,000 household types and the public sector. It provides insights into socio-economic variables such as employment, gross domestic product (GDP), trade balance, household income and wealth distribution, savings, government accounts, and inflation. This comprehensive model supports the evaluation of macroeconomic outcomes of energy and climate policies.

Complementing DENIO, the TM5-FASST model is employed to estimate the health-related benefits of policy measures[3]. TM5-FASST, sourced from external literature, focuses on analysing the health impacts of different emission pathways. It quantifies the effects of air pollutants and their consequences for premature deaths.

The TIMES-SINERGIA model also plays an important role in modelling Spain's energy system for the NECP offering robust scenario planning for energy transitions and sectoral impacts. This model provides detailed energy balances and energy price forecasts, encompassing the entire energy system. It connects to electricity models developed by Red Eléctrica, Spain's electricity system operator, which add depth to the analysis of renewable energy use, electricity capacity, and dispatch scenarios. TIMES-SINERGIA also incorporates cross-border energy considerations with neighbouring countries like Andorra, Morocco, France, and Portugal, ensuring that Spain's energy policies align with regional dynamics. The model is used to perform an overall socio-economic impact assessment for a unique complete scenario, given the high computational cost of running individual scenarios for the different PaMs.

The Ministry of Ecological Transition and the Demographic Challenge (MITECO) utilises outputs from the TIMES-SINERGIA model to estimate air pollutant emissions for 2030. These emission projections feed into the TM5-FASST model to evaluate the associated health impacts, creating a seamless connection between energy modelling and public health analysis.

For the estimation of investment needs, specific agencies are involved: IDEA, an international intergovernmental organisation, focuses on energy savings and efficiency, the Spanish Climate Change Office (OECC) handles investments in non-energy-related non-ETS sectors, and TIMES-SINERGIA provides insights on renewable energy and electrification investments, supported by data from Red Eléctrica.

[3] The Spanish NECP report includes a diagram of how all their models interact.

The results of these all the above models are presented in aggregate terms, often without regional or local disaggregation. Investments are categorised by financing sources and types of measures, but the distribution of costs among local governments is not provided. Health impacts are expressed as total reductions in pollutants and premature deaths, while GDP effects are summarized in overall figures. Employment impacts are detailed by sector, and social impacts are assessed at a national level.

Together, these models create a robust system for evaluating the economic, social, and environmental impacts of Spain's energy and climate policies, providing critical insights to inform decision-making.

3.2 Netherlands

The Netherlands employs several key models for impact assessment and projections. The Environmental Assessment Agency (PBL) is responsible for making greenhouse gas projections using various models. These models incorporate inputs from multiple stakeholders and institutions, including policies and measures from different ministries. For example, emission inventories are produced by the National Institute for Public Health and the Environment (RIVM).

The Central Planning Bureau (CPB), along with several other institutions, provides crucial input on macroeconomics and sectoral development for modelling purposes. Wageningen University, specializing in agriculture, contributes to emission inventories and modelling capacities. Additionally, RIVM provides essential statistics on emissions for these models.

These models are adapted to the national circumstances of the Netherlands, taking into account specific factors like the building stock and sectoral policies. The models are also used in conjunction with inputs from various stakeholders and institutions to ensure comprehensive and accurate projections.

The key inputs of the modelling include emission inventories (sectoral and type-specific emissions) from various institutions; energy statistics on energy consumption, the number of houses, and some social demographics; and some information on policy measures, such as insulation sales and heat pump sales.

The key outputs are primarily the emission inventories. These are detailed notes of emissions by sector and type, primarily managed by PBL and other institutions depending on the sector. It is key to mention that macroeconomic projections are usually not driven by the impact of climate change on economic development. Instead, other factors are dominant, such as demographic developments, expenditures, and the evolution of added value.

It is also important to mention that the Netherlands Enterprise Agency (RVO) conducts ex-post impact analysis based on policy monitoring and data on subsidies, adding value to the projections.

3.3 Germany

Germany uses a model developed in collaboration with an external partner (Öko-Institut) to project greenhouse gas emissions. This model aligns with national laws and provides annual emission projections at the national level. The projections also take into account some spatial aspects, allowing for a more detailed analysis of

emissions. The calculations are carried out in coordination between the national administration and the external institute that developed the model.

Although Germany's emissions projections do not include macro-economic impacts, a separate impact assessment was conducted to evaluate these effects. The results of this assessment have not yet been incorporated into the draft updated National Energy and Climate Plan (NECP). Still, they are planned to be included in the final version. The assessment is currently published independently of the NECP and is available to the public. It was conducted for the first time and is expected to be expanded in future updates.

All policies and measures (PaMs) are modelled together. However, additional calculations are performed for certain significant or hard-to-quantify measures, such as renovation investments. A research agency carries out these calculations, focusing on the most impactful and relevant measures. Despite this effort, separating the effects of multiple PaMs that influence the same indicators has been challenging. The Öko-Institut and the federal bureau are responsible for these calculations, specifically focusing on sectors like buildings and industry.

Some measures, such as infrastructure development or grid expansion, are difficult to measure and capture in the models. Their impact is often not considered meaningful or measurable. Additionally, integrating energy systems, emissions, and economic impacts into a single model remains a significant challenge for Germany's approach to climate policy assessment.

3.4 Austria

Austria's key macroeconomic model is the MIO-ES model, an input-output-based model developed by the Centre of Economic Scenario Analysis and Research (CESAR). This model follows a bottom-up approach and includes energy balances, though it does not cover all energy carriers. Austria also relies on sector-specific models to complement the MIO-ES model.

Examples of these sector-specific models include the INVERT/EE-Lab for buildings, which estimates heating, hot water supply, and district heating demand; the MARS model for passenger transport, housing development, and migration; and the NEMO and GEORG models, which simulate transport fuel demand, fuel export, and vehicle fleet composition. These transport models, developed by TU Graz, use outputs from the MARS model. They also estimate GHG emissions and air pollutants from the transport sector. Additional models address agriculture and the iron and steel sectors. Efforts are ongoing to improve the connection between these models.

Following the European Commission's guidance, all models align on population and energy demand assumptions. However, there are differences in assumptions for energy prices across households, transport, and industry.

Investment needs are calculated across sectors with high transparency. The process begins with binding budgetary amounts, uses literature reviews and estimations, and sums the investments as inputs for the MIO-ES model. The methodology for estimating investment needs is being refined further. While public and private investment splits are estimated, this decision often becomes a political matter.

3.5 Impact assessment of separate and joint PaMs

The Netherlands put a special focus on how to assess the individual and joint impact of policies. Methodological challenges when assessing the impact of policies as a package rather than individually include avoiding double counting, making arbitrary attribution decisions, considering complex interactions, and facing scientific limitations. To address these challenges, the Netherlands' approach involves coordinating the inputs for policies and measures, integrating statistics and emission inventory data, collaborating with multiple institutions, and incorporating policy developments into the modelling exercise. A variety of sectoral and cross-sectoral models are used to project the climate and energy impacts of the policies. For more details, see Section 5.2.

In Germany, most policies are modelled jointly, but individual impact assessments are available for some measures, such as renovation-related policies. These individual assessments are mainly delivered by external collaborators (such as Öko-Institut).

In Spain, the impact of policies is assessed individually in some cases, but the interviewee was unsure which policies and what the process of it is (as they collaborate closely with an external partner).

In Austria, the impact assessment is done in aggregate for all PAMs. However, as for other MSs, some PAMs can be estimated individually, especially those of the transport sector. Austria's transport model allows for independent impact assessments by PAM, considering both GHG emissions and air pollutants.

4 Main challenges and lessons learned

The MSs interviewed mentioned a few key takeaways about the NECP update process that may be useful for different MSs.

4.1 Spain

- **Importance of public consultation process:** The importance of public consultation in obtaining inputs from stakeholders (e.g., regions, companies, institutions,…) and the need for ample time to review and respond to inputs were emphasised. Review and response to inputs require iterative work.
- **Investment needs calculation:** The interview pointed out the challenges in calculating investment needs, especially regarding the disaggregation between public and private needs.
- **Adjusting to new regulations**: As new regulations are released at the European level, the interviewee suggested they experience difficulties aligning all measures and impact assessments to include these changes. As a result, they learned that modelling and impact assessments have to be done in iterations to help include new regulations and PAMs.
- **Coordination with regions:** The coordination efforts with autonomous communities and the integration of regional laws and plans into national assessments were also discussed as key challenges.
- **Alignment of timelines:** Spain's experience highlights the importance of aligning NECP timelines with other reporting obligations (such as those of the UNFCC). This facilitates the process, and allows sufficient time for environmental assessments.
- **Complete impact assessments:** Spain also highlights the added value of including cross-cutting elements within the NECP impact assessments. The mention that being able to capture socio-economic impacts and industrial competitiveness enhances policy relevance and stakeholder engagement.

4.2 Netherlands

- **Coordination challenges:** The importance of coordinating policy measures and statistical inputs was discussed. Moreover, as it is closely linked to the coordination of inputs, there is a need for collaboration among various institutions to provide statistics, emission inventories, and other inputs necessary for modelling.
- **Sectoral organisation:** The emission inventories are organised by sector, with different institutions involved in estimating their projections depending on the type of emission sources. The coordination of these inputs was highlighted as a main challenge.
- **Policy developments:** Capturing and structuring policy developments to model their impacts is particularly challenging. The difficulty in aligning national policy cycles with EU processes is also mentioned.

4.3 Germany

- **Calculation of investment needs:** This was also mentioned as a key challenge (see Section 5) in Germany. This involves the evaluation of aggregated costs of green transition. Unfortunately, the disaggregation of investment needs for the public and private sectors is not possible.
- **Resource constraints:** Different German regions also contribute to introducing climate policies and contributing to national targets, doing some parallel work with the federal institution. While they ask for assistance from the federal level, it cannot always be provided, as national-level modelling is prioritised.

4.4 Austria

- **Timelines**: Delivering all the assessment in time for the NECP submission deadline was highlighted as a main challenge. They explain that one of their main lessons is the importance of starting as early as possible, given the number of different stakeholders and the time needed to coordinate with them. Collaboration with different institutions and efficient task outsourcing are also regarded as key to overcoming time constraints.
- **Clear guidance to stakeholder**s: The interviewees highlighted the need for clear guidance to the various actors involved in the NECP process, including expectations for outputs and the level of detail required for policy submissions
- **Issues around dealing with policies with unclear timelines:** It was mentioned that several PaMs, such as subsidies, although they have a clear starting date, have an unclear overall timeline, which complicates their inclusion in an impact assessment exercise. This is driven by the lack of clarity on how and when these policies will end (e.g., whether they will be phased out completely or reduced gradually). Additionally, it can be time-consuming to gather all the necessary information to inform the decision on how best to include these policies (especially from the regional level). This poses a challenge when conducting the NECP impact assessment, as PaMs need to have a predefined timeline.
- **The NECP update is linked to the political cycle:** Given that the NECP is not a binding agreement, stakeholders stressed the importance of raising political awareness about the NECP process, its significance, and the tasks involved. Early communication with political leaders is crucial for gaining commitment and support. Additionally, the political structure changes every five years, and the new government may have different expectations concerning the NECPs; as such the NECP review is linked to political/electoral cycles.
- **Better coordination with regions:** The interviewees reiterated the need for better coordination with regions in the next round of NECP updates, acknowledging that more could have been done regarding cooperation and detailed coordination in the NECP update process.

5 Model specifications

When discussing the models, three main areas of the model specifications were in focus, on which Belgium plans to further enhance its modelling. The first includes expanding its investment calculations, to capture the private and public costs of PaMs. The second involves expanding the current models which capture renovation policies. Finally, the third area involves developing a robust methodology for capturing the impacts of rail infrastructure policies, which leverages information from all regions.

5.1 Investment needs

The MSs interviewed had different approaches to calculating the investment need. In the case of **Germany**, the assessment of investment need and its disaggregation into public and private was mentioned as a key challenge. Their modelling team uses external sources to assess the scale of investment need, which is not directly connected to each PaMs in their NECP. Public-private disaggregation is not possible currently.

Spain's investment needs are calculated in the DENIO model, which BC3 maintains. However, no detailed information about its assessment was provided during the interview.

The investment need of policies in the **Netherlands** is calculated using a structured approach that considers various cost characteristics, such as capital, human resources, insulation capacities, and financial costs. The calculation is conducted by the PBL, the CPB, and ministers who consult with external partners. Costs are collected from various sources, including offers and annual discussions, to ensure up-to-date and relevant data. Special models, such as the SAWEC model (used for assessing the impact of renovation policies), are supplemented by separate research. An agency collects the costs, and these costs are used to calculate the number of measures needed to meet national objectives. Also, the importance of a careful procedure and the structured evaluation of costs for various sectors was emphasised, particularly for industry, where assumptions are more challenging to make. For more information, please visit the following page (in Dutch): Kostenkentallen | RVO.

Austria has provided estimates about the investment needs for different sectors and policies. These are collected through a literature review, consultation with stakeholders, and other methods. Despite the transparency in the draft NECP, the key challenge comes from the lack of consistency between different sectors (i.e., no single methodology and different assumptions).

5.2 Renovation policies

The **Netherlands** assess renovation policy impacts through three different models, whose descriptions can be found attached to their draft updated NECP (in Dutch)[4]. It outlines the methodology for calculating energy savings in buildings, focusing on the following models:

[4] Draft Integrated National Energy and Climate Plan 2021-2030 – The Netherlands. Available at: 79b49e0a-a8c8-4eff-ad1c-e4ae475bde88_en

- SAWEC (Sectoral Approach with Energy Consumption): This model calculates energy savings by considering the entire sector's energy consumption (the impact of energy efficiency improvements of the residential buildings stock). It does not rely on individual policy measures but looks at the collective impact of all policies and market actions.
- EVA (Energy Value Analysis): EVA aims to calculate and analyse electricity consumption by appliances and lighting in homes for the past and the future.
- SAWE - Services (Sectoral Approach with Energy - Services): Similar to SAWEC, this approach calculates energy savings in the service sector by evaluating the overall impact of energy-saving measures and policies rather than attributing savings to specific actions. Not all non-residential buildings are included in it.

These models produce several outputs, including final energy savings, investment costs and environmental impact (i.e., reduction of CO2 emissions).

The description of models also outlines several strategies to avoid double-counting of energy savings in the building sector.5:

- *Sectoral approach:* The models (SAWEC and SAWE—Services) calculate energy savings at the sector level rather than for individual policy measures. This approach ensures that the sector's total energy savings do not exceed its actual total energy consumption.
- *Deduplication of measures:* When multiple policy measures influence the uptake of the same energy-saving measure, the energy savings are attributed to these policies based on their individual contribution. This prevents the same energy savings from being counted multiple times.
- *Reference scenario:* The models use a reference scenario to determine the energy consumption in the absence of any policy measures. The energy savings are then calculated as the difference between this reference scenario and the actual energy consumption, ensuring that only the additional savings achieved due to policy interventions are counted.
- *Lifetime of measures:* The models take into account the lifetime of energy-saving measures. This ensures that energy savings from measures that have reached the end of their lifetime are not included in the calculations.

In the case of **Austria**, the impacts of the renovation policies are included in the INVERT EE/LAB model. It is a simulation tool designed to evaluate the impacts of building renovation, particularly in terms of energy mix, CO2 reductions, and costs associated with renewable energy support policies. It assesses construction, renovation, demolition activities, and investment decisions for renovations and heating system replacements using a nested logit approach. The model allows for scenario testing – including price and insulation variations and consumer behaviour – which helps predict future trends in renewable and conventional energy use. Developed by the Vienna University of Technology, it models buildings in detail and includes an agent-based module to account for diverse investor profiles and decision-making criteria.

[5] The document also discusses that the built environment has long had high policy pressure in various price incentives, legislation and incentive programmes. A major consequence of this is that almost nothing happens autonomously anymore. For example, there is hardly any savings potential left that would be profitable without the high energy taxes. Overcoming barriers other than cost, such as split incentives, also almost always requires policy intervention.

In the case of **other MSs**, less information was provided during the interviews. The **Spanish** representative mentioned that the impact of building renovations is assessed in their DENIO model. The renovation policies captured within Spain's NECP relate to tax incentives and public-private partnerships. In **Germany**, the impact assessment of renovation policies was not discussed in detail.

5.3 Rail infrastructure

The modelling of the potential impacts of investment in rail infrastructure seemed to be the most challenging area among interviews. None of the interviewed MSs could provide details on this topic. Both the **Netherlands** and **Germany** mentioned that the direct impact of this investment cannot be fully assessed. For instance, the Netherlands has a detailed transport model (similar to their building models), but it does not include rail infrastructure (rather focuses on private vehicle ownership). The **Spanish** representative mentioned that rail transport could be included in their model but was unsure which format to use. The rail policies currently captured within Spain's impact assessment are those fostering modal shifts from road to rail, supported by investment in infrastructure.

6 Conclusions

The following four overarching conclusions were derived from the interviews that could be considered to help with the refinement of future NECP processes.

6.1 Further coordination across Member States would be beneficial

Enhanced collaboration among MSs can be useful in addressing common challenges in NECP processes, such as calculating investment needs, fostering regional cooperation, and determining whether to model all PAMs together or separately. Many MSs, such as Germany and Austria, have highlighted the need for standardised methodologies and consistent data to improve modelling and impact assessment. Collaborative efforts can facilitate the creation of shared frameworks, making it easier to assess PaMs and integrate macroeconomic and social impacts within the extensive techno-economic assessment currently performed. By participating in regional and EU-wide forums for data-sharing and best practices, MSs can learn from each other's experiences and improve their NECP modelling approaches.

6.2 The importance of collaborating with external institutions

Engaging external institutions such as research centres, universities, and private sector experts has proven essential for MSs developing complex modelling capabilities and meeting the deadline of the NECP report. MSs such as the Netherlands and Austria employ these partnerships to expand their capacity for complex modelling and detailed impact assessments. These collaborations allow MSs to incorporate specialised knowledge and advanced methodologies into their processes. For example, working with universities and research firms can improve modelling related to rail and renovation policies in Belgium. Collaborations with economic research institutes can also help integrate comprehensive economic assessments into NECPs modelling and expand the macro-economic considerations of its exercise.

However, it is important for MSs to be involved in model development stages to ensure the objective of the model is well assumed and the assumptions are aligned with any other models used internally.

6.3 Centralised vs De-centralised frameworks

A trade-off exists in deciding between a centralised approach to NECP (where one central authority coordinates all inputs and modelling work) or a decentralised approach (where each authority conducts its relevant modelling work and an aggregation is performed to add all inputs together).

A centralised approach, where one main authority coordinates all modelling activities, offers benefits like increased consistency, simplicity, and transparency. It also removes the need for an aggregation phase, which facilitates the overall reporting of aggregated results. However, a centralised approach can limit the ability to assess regional impacts, which might be a drawback for MSs with diverse regional needs. However, there are ways to address this, like the approach taken by Spain, by performing individual regional assessments where most needed to

complement the aggregate picture. Additionally, within this framework, the interviews have shown that frequent consultation sessions involving regional stakeholders should be carried out. This allows MSs to capture regional insights and priorities within the NECP impact assessment, which expands upon the information and context provided by the regional data.

Conversely, a decentralised approach allows for detailed regional assessments, which can be valuable for understanding localised impacts. However, this method requires careful coordination to align model assumptions and maintain transparency and consistency. Within this approach, the aggregation phase is essential to ensure consistency of the results and alignment of modelling assumptions.

MSs need to decide which approach best suits their needs, but regardless, they need to ensure that the transparency and consistency of the models are preserved.

6.4 The NECP's exposure to political factors

Since NECPs are not legally binding, they are vulnerable to changes in the political landscape, which can lead to shifts in policy priorities and modifications in the PaMs outlined in the plans. These changes pose a challenge to maintaining stability in the modelling process, as political changes can make modelling for long-term planning challenging. It is, hence, important to consider these risks within the NECP reporting exercises.