



Expanding Integrated Assessment Modelling:  
Comprehensive and Comprehensible Science  
for Sustainable, Co-Created Climate Action

## **D2.3 – Scoping policy relevant Research Questions - Update**

WP2 – Listening – Ensuring policy  
relevance and ownership

29/07/2024



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## EC Summary Requirements

### 1. Changes with respect to the DoA

No changes with respect to the work described in the DoA.

### 2. Dissemination and uptake

This deliverable will be used by the project to shape its research agenda, providing input to the next steps of the stakeholder engagement process, which will refine the first cycle studies discussed and the second cycle research questions scoped, as well as scenario studies for modelling. It is, therefore, offered for use by both the different stakeholder groups of the project (including the policy steering groups and the core working groups) and researchers interested in identifying and addressing policy-relevant questions.

### 3. Short summary of results (<250 words)

IAM COMPACT incorporates the views of stakeholders in its modelling work throughout the project via a structured stakeholder engagement strategy. The discussions and outcomes of a series of meetings with high-level policymakers are summarised in this deliverable. The goal of the meetings was to get feedback from stakeholders on the first round of modelling carried out in the project, as well as discuss the policy priorities and associated policy-relevant research questions that IAM COMPACT should explore in the second cycle of the policy response mechanism.

### 4. Evidence of accomplishment

This report.



## Preface

IAM COMPACT supports the assessment of global climate goals, progress, and feasibility space, and the design of the next round of Nationally Determined Contributions (NDCs) and policy planning beyond 2030 for major emitters and non-high-income countries. It uses a diverse ensemble of models, tools, and insights from social and political sciences and operations research, integrating bodies of knowledge to co-create the research process and enhance transparency, robustness, and policy relevance. It explores the role of structural changes in major emitting sectors and of political, behaviour, and social aspects in mitigation, quantifies factors promoting or hindering climate neutrality, and accounts for extreme scenarios, to deliver a range of global and national pathways that are environmentally effective, viable, feasible, and desirable. In doing so, it fully accounts for COVID-19 impacts and recovery strategies and aligns climate action with broader sustainability goals, while developing technical capacity and promoting ownership in non-high-income countries.

|                                                                                       |    |                                                                                       |
|---------------------------------------------------------------------------------------|----|---------------------------------------------------------------------------------------|
| <b>NTUA</b> – National Technical University of Athens                                 | EL |    |
| <b>Aalto</b> – Aalto Korkeakoulusäätiö SR                                             | FI |    |
| <b>AAU</b> – Aalborg Universitet                                                      | DK |    |
| <b>BC3</b> – Asociacion BC3 Basque Centre for Climate Change – Klima Aldaketa Ikergai | ES |    |
| <b>Bruegel</b> – Bruegel AISBL                                                        | BE |    |
| <b>CARTIF</b> – Fundacion CARTIF                                                      | ES |   |
| <b>CICERO</b> – Cicero Senter for Klimaforskning Stiftelse                            | NO |  |
| <b>E3M</b> – E3-Modelling AE                                                          | EL |  |
| <b>KTH</b> – Kungliga Tekniska Högskolan                                              | SE |  |
| <b>POLIMI</b> – Politecnico di Milano                                                 | IT |  |
| <b>UPRC</b> – University of Piraeus Research Center                                   | EL |  |
| <b>UVa</b> – Universidad De Valladolid                                                | ES |  |
| <b>WI</b> – Wuppertal Institut für Klima, Umwelt, Energie GgmbH                       | DE |  |
| <b>IIMA</b> – Indian Institute of Management                                          | IN |  |
| <b>THU</b> – Tsinghua University                                                      | CN |  |
| <b>USMF</b> – University System of Maryland                                           | US |  |
| <b>AAiT</b> – Addis Ababa University                                                  | ET |  |
| <b>KEI</b> – International Civic Organisation Kyiv Economics Institute                | UA |  |
| <b>RUSL</b> – Raja Rata University of Sri Lanka                                       | LK |  |
| <b>TUM</b> – Technical University of Mombasa                                          | KE |  |
| <b>UNIGE</b> – Université de Genève                                                   | CH |  |
| <b>Imperial</b> – Imperial College of Science, Technology and Medicine                | UK |  |



## Executive Summary

IAM COMPACT aims to place collaborative, co-created modelling at the centre of its research agenda. Through a structured stakeholder engagement strategy, named the policy response mechanism, IAM COMPACT incorporates the views of policymakers in its modelling work throughout the project. The discussions and outcomes of a series of meetings with policy steering groups (consisting of high-level policymakers) are summarised in this deliverable. The goal of the meetings was to get feedback from stakeholders on the first round of modelling carried out in the project, as well as discuss the policy priorities and associated policy-relevant research questions that IAM COMPACT should explore in the second cycle of the policy response mechanism.

The deliverable revolves around the policy response mechanism approach, setting out how the stakeholders are categorised by theme, a summary of the discussion and outcomes of 13 meetings with high-level stakeholders, before then outlining key takeaways for the project and the next steps.



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# 1 Policy Response Mechanism in the first and second cycles

By directly integrating stakeholder views and ideas into the modelling process through the policy response mechanism (PRM), IAM COMPACT delivers collaborative and legitimised research output. The PRM elicits structured stakeholder input at several points throughout the project. Stakeholders including policymakers, industry representatives, and civil society advocates are involved in the project, both in high-level discussions and in technical workshops. The ultimate goal is to produce co-created policy-relevant modelling insights. This deliverable captures the outputs from discussions between IAM COMPACT partners and stakeholders at the intermediate stage of the project, with the aim to provide an outline of a policy-relevant research agenda for the second cycle of modelling. IAM COMPACT includes modelling teams both in the EU and around the world, yet this deliverable focuses on the output of discussions between EU teams and EU policymakers. The non-EU meetings, taking place later this year, will be captured in D2.5 'Proceedings of Stakeholder Interactions – Update', due in month 36 at the end of the project.

IAM COMPACT is divided into two cycles of stakeholder engagement and modelling. The first cycle began at the start of 2023 with a series of meetings with policy steering groups. The policy steering groups comprised high-level policymakers across European institutions and national governments, who can provide a strategic view of energy and climate policies, organised into four themes. The four themes were determined through internal project discussions, aiming to coherently cover the main areas of climate and energy policy. These stakeholders were asked what they perceived to be policy-relevant research questions for IAM COMPACT modellers to investigate. Research questions provided by stakeholders were then discussed within the consortium, in terms of the feasibility of using the modelling suite in the project to assess them, and then sorted into seven studies. The studies, organised by the four themes, were then presented to the core working groups (technical policy staff, industry representatives, and civil society advocates) at a set of online workshops. The aim of these workshops was to co-create the study scenario design and core assumptions, as well as to identify what outputs would be most relevant for stakeholders. Following the conclusion of the workshops in late 2023, the modelling teams proceeded with the refined studies from a (modelling) research lens. The details of each of these stakeholder interactions are captured in D2.4 'Proceedings of Stakeholder Interactions'. The PRM is therefore the overall process for continuous engagement between IAM COMPACT partners and key stakeholders on important policy questions, modelling studies to explore them, and the results of those modelling studies. So far, the PRM has successfully facilitated the design and implementation of a policy-relevant integrated assessment modelling research agenda, with the questions raised at the beginning of the first cycle having proven to be still relevant for policymakers 18 months later.

The conclusion of the first cycle overlapped directly with the start of the second cycle, through another round of meetings with the policy steering groups during June and July of 2024. The policy-relevant research questions for the second cycle that emerged from those discussions with the policy-steering groups are detailed in the sections below. At the meetings, project partners presented the high-level results from the first cycle studies to inform stakeholders about the work delivered in the project up to that point. Stakeholders were then asked how relevant the first cycle studies are for their work, if they had any suggestions for improvements, and if they saw any ongoing policy discussions, against which the study results could be appropriately framed. Moreover, stakeholders were requested to suggest any further developments of the first cycle studies, if they thought such contributions would be relevant. Finally, more broadly, the policymakers were asked what research questions not already discussed that IAM COMPACT could explore in the second cycle, especially considering the new context of EU policy priorities—i.e., what is relevant from the perspective of the newly elected European Commission. Through this approach, the policy steering groups provided feedback on the first cycle research, proposed some refinements and developments for the second cycle, and offered new policy-relevant research questions. Each aspect of these discussions is captured in this deliverable.

## 1.1 Themes

Four themes are used to categorise the EU-based stakeholder engagement in IAM COMPACT. The four themes



set out in Table 1 are a continuation of the themes used in the first cycle (although the themes were slightly renamed from the corresponding ones used in D2.2 'Scoping policy relevant research questions' that captured the output of the first round of policy steering group meetings, aiming to better cover the research agenda that emerged from these discussions). The themes were collaboratively determined within the consortium at the outset of the project.

**Table 1:** Stakeholder Engagement Themes

| Theme                            | Details                                                                                                                                                                                                                |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Optimal Transition</b>        | <i>Investigating how to best manage the energy transition in Europe, through national and European climate and energy targets, decarbonisation of electricity generation, and electrification of energy services .</i> |
| <b>Industry &amp; Innovation</b> | <i>Exploring the impacts of the energy crisis on European industry.</i>                                                                                                                                                |
| <b>Global Effects</b>            | <i>Examining the distributional implications of investments in decarbonisation from a global perspective.</i>                                                                                                          |
| <b>Behavioural Change</b>        | <i>Researching the role of behaviour in the energy transition and its potential representation in modelling.</i>                                                                                                       |

## 1.2 Identifying stakeholders

Stakeholders for the policy steering groups in the second cycle were a combination of those who participated in the first round with some new additions. Stakeholders were selected on the basis of their expertise for a relevant theme, and their role in national or supranational organisations with an oversight of European policy priorities. The aim was to provide some continuity with stakeholders that had contributed at the outset of the project, while ensuring that new voices had an opportunity to express alternative views and ideas regarding (emerging/new) energy and climate policy priorities and the related policy-relevant research questions. Out of 13 stakeholders, 7 participated directly in the first round of meetings with stakeholders.

The rest of the deliverable is structured as follows: Section 2 provides details of the meetings with stakeholders in the *policy steering groups* under each of the four EU themes, noting the recommended improvements to the first cycle studies and the suggested research questions for the second cycle, while Section 3 sets out key takeaways from the meetings for the project. Section 4 concludes with the next steps to be taken in the second cycle.



## 2 Research Questions by Theme

### 2.1 Optimal Transition

The Optimal Transition theme focuses on national and European climate and energy targets, decarbonisation of electricity generation, and electrification of energy services, and seeks to identify and discuss policy priorities related to these issues. In the first cycle, two modelling studies investigated questions under this theme: Study 1 compared the implementation of the Fit-for-55 policy package to a “cost optimal” approach driven by only carbon prices, while Study 2 developed security, resilience, and flexibility metrics to assess energy system model results on a broader set of criteria than just emissions and cost. Project partners met with stakeholders from the European Commission, the Agency for the Cooperation of Energy Regulators (ACER), Ireland’s Department of Energy, Climate and Communications (DECC), and the European Network of Transmission System Operators (ENTSO-E). A clear signal that emerged from discussions was the importance of better understanding how demand side response and flexibility can be incentivised through different policy instruments, as well as capturing evolving electricity market dynamics in modelling results.

#### 2.1.1 Chief Economist Unit, DG ENER, European Commission

**Date:** 20/06/24

##### Attendees

*IAM COMPACT*

Conall Heussaff (Bruegel)

Ugne Keliauskaite (Bruegel)

Rasmus Johannsen (Aalborg University)

Dirk-jan van de Ven (BC3)

*DG ENER*

Derck Koolen, Chief Economist Unit

Clement Serre, Chief Economist Unit

##### Discussion

Colleagues from Aalborg and BC3 presented an overview of Study 1, assessing the EU’s Fit-for-55 policy package against a cost-optimal pathway, and Study 2, which developed novel metrics for assessing energy system model results against security, resilience, and flexibility criteria. The stakeholders provided positive comments after the presentation of the first cycle studies, noting that they were in line with expectations and certainly useful contributions. A number of questions about the studies were raised, including more detail about the supply-side focus in IAMs compared to the demand-side focus in policy and the extent of the supply-chain dependency in the analysis.

The discussion then switched to future research questions. A major point raised by the stakeholders was the need to understand which market mechanisms and instruments can incentivise flexibility technologies in electricity systems. Further interest related to the investment needs for different system configurations (e.g., that are resilient/secure/flexible) as well as the impact of the evolving geopolitical context on the feasibility of the energy transition in Europe. The social aspect of the energy transition was also emphasised, such as the evolving consumer costs by category, and the effectiveness of various redistribution tools for carbon revenues. Three key points from the discussion were:

1. The need to understand the costs of energy system transformation with different characteristics such as resilience and flexibility.
2. The impacts of trade disruptions on the European energy transition.
3. How redistribution mechanisms affect social outcome and system operation incentives.



## Suggested Improvements to 1<sup>st</sup> Cycle Studies

- Expand Study 1 to a set of scenarios that compare cost-optimal vs. NECPs vs. EU targets.
- Explore the costs associated with maximising various system configurations that score highly on the metrics developed in Study 2.

## Suggested Research Questions for the 2<sup>nd</sup> Cycle

- What are the investment needs associated with different energy system solutions/configurations? Can the cost of security/resilience/flexibility be estimated?
- How does the evolving geopolitical context affect energy system security/resilience/flexibility/cost?
  - E.g., scenarios with high trade tariffs, disrupted supply chains, reduced supply of critical raw materials
- How do different redistribution instruments affect market outcomes?
  - E.g., windfall tax and redistribution or carbon dividends
- How do energy system investments change the costs paid by different consumer types?
  - E.g., energy costs, network costs, taxes, etc.
- How do model outputs at the national level in Europe compare to the derived 2030 RES and EE targets?
  - Compare model results to NECP plans to determine which countries appear to be on track
- What are the transmission capacity needs both within countries and between countries?
  - E.g., which countries need to invest most in transmission, distribution and cross-border connections
- What market mechanisms are suitable to incentivise the energy system components needed for a decarbonised system?

### 2.1.2 Agency for the Cooperation of Energy Regulators (ACER)

**Date:** 24/06/24

#### Attendees

*IAM COMPACT*

*ACER*

Georg Zachmann (Bruegel)

Francois Beade, Strategy Lead

Ugne Keliauskaite (Bruegel)

Patrick Luickx, Team Leader Market Monitoring

Rasmus Johannsen (Aalborg University)

Dirk-jan van de Ven (BC3)

#### Discussion

The IAM COMPACT researchers presented both studies under the Optimal Transition theme. ACER stakeholders pointed out the importance of focusing on the Social Climate Fund needs in the context of the “optimal” approach, as well as the importance of exploring long-term flexibility. The stakeholders positively commented on the range of energy technologies represented in the EnergyPLAN model, noting that it is richer than that used internally at ACER (using other sectors in addition to electricity). Further discussions related to the trade-offs between different technology options, such as steel consumption and district heating. In terms of future research questions, the stakeholders emphasised understanding the changing price and volume of electricity, as well as long-term/seasonal flexibility needs.

Further comments were provided by email, noting that the studies are relevant to policy priorities, although some



scepticism was expressed regarding the “cost optimality” in Study 1, given that we cannot know ex-ante what the optimal approach is.

### **Suggested Improvements to 1<sup>st</sup> Cycle Studies**

- Estimate the “cost of non-Europe” under Study 1, by comparing the outcomes of a coordinated EU-wide transition with European targets and investments vs. parallel national transitions with uncoordinated targets and disaggregated investment (e.g., with uncoordinated targets).
- Emphasise long-term flexibility in the modelling under Study 2, exploring what technologies other than hydrogen could provide seasonal storage.
- Gap analysis: quantify the difference between the current level of certain technologies (storage, electrolyzers, district heating) and the levels needed to decarbonise.

### **Suggested Research Questions for the 2<sup>nd</sup> Cycle**

- How much is electricity demand expected to increase compared to other energy carriers to reach net zero, and what are the implications for grid investment?
- How are the average prices going to change (up/down), and how will electricity prices change in this optimal and non-optimal scenario? How will the variation/volatility in prices change (especially given storage concerns)?
- What are the expected levels of renewable curtailment?
  - Explore why curtailment happens is especially relevant in the future. If it is curtailed because of the market (not offering renewables), which is okay, versus congestion management (cannot reach consumption), which is problematic.
- Can we build grids at the required speed to meet our renewable targets?
- What governance framework could enable a more coordinated planning and funding of infrastructure across Member States (as a prerequisite for a more integrated EU energy system)?
- How to make it more (socially and economically) acceptable to consume electricity more flexibly?
  - E.g., which practical kinds of electricity contracts should be offered (is peak/off-peak enough? Should peak hours be redefined? Could peak hours be more dynamic, with some guarantee that e.g., there are at least 10 off-peak hours per day?)
- How best to spread the costs of CAPEX-heavy investments, e.g., network investment costs, over time and over consumers so that they remain acceptable?
- If necessary to ensure global competitiveness, how to subsidise electricity costs for some consumers while ensuring a cost-efficient power system?
  - i.e., incentivise consumption that is energy efficient and flexible, avoiding a subsidy race among Member States
- How to enable decentralised flexibility models (e.g., demand response) successful in one Member State to thrive and scale through the EU?

## **2.1.3 Department of the Environment, Climate and Communications (DECC), Ireland**

**Date:** 28/06/24

### **Attendees**

*IAM COMPACT*

*DECC*



Georg Zachmann (Bruegel)

Paul Kenny, Special Adviser to Minister Eamon Ryan

Conall Heussaff (Bruegel)

Rasmus Johannsen (Aalborg University)

Russell Horowitz (BC3)

Claudia Rodes (BC3)

## Discussion

Several clarification comments were made regarding both studies, particularly Study 2, which employed the EnergyPLAN model. Mr. Kenny noted he had worked with several researchers from Aalborg using the model in the past. Questions focused on the representation of energy efficiency and demand-side measures in the IAMs available in the IAM COMPACT suite. The role of carbon removals in meeting mitigation targets was also discussed. The concept of a flexibility stack (across daily, seasonal, and annual flexibility) was raised and it was asked whether the model results in Study 2 gave any indication of investment needs and associated policy support.

When considering future research questions, the importance was emphasised of understanding successful policy support schemes and instruments, both through case studies of real-world implementation, and through any modelling insights. Specifically, any models that could model energy market dynamics (such as deployment based on expected prices) could make a significant contribution. Finally, it was noted that understanding how to best utilise carbon revenues would be a useful, policy-relevant contribution. For example, which policies lead to the best welfare outcomes or incentives for mitigation (e.g., by using carbon revenues to support home renovations).

## Suggested Improvements to 1<sup>st</sup> Cycle Studies

- Greater focus on energy efficiency and demand side measures in mitigation pathways, such as those in Study 1.
- To provide policy insights, the technology stack set out to meet the security, resilience, and flexibility metrics in Study 2 could be complemented with case studies of countries that successfully provided the incentives to deploy such technologies or similar. For example, if models suggest huge electrolyzers are needed, the project could explain where they have been deployed and what the policy and economic conditions were that led to such deployment.

## Suggested Research Questions for the 2<sup>nd</sup> Cycle

- Are the European energy efficiency targets feasible and what technologies/policies are needed to achieve them?
- Can energy market dynamics be captured in integrated assessment models?
  - The aim would be to provide insights on what policy instruments are most suitable for incentivising investments in clean tech and flexibility solutions.
- What policy instruments and economic conditions best facilitate the deployment of key clean technologies like electrolyzers, batteries, and EVs?
- What is the most efficient method to redistribute carbon revenues to achieve both societal welfare and decarbonisation goals?

### 2.1.4 ENTSO-E

**Date:** 28/06/24

#### Attendees



*IAM COMPACT*

Conall Heussaff (Bruegel)

Georg Zachmann (Bruegel)

Russell Horowitz (BC3)

*ENTSO-E*

Alban Joyeau, Adequacy Manager

**Discussion**

Following the presentation of the first cycle studies, questions were asked about the technology representation in the model under Study 2, including whether the hydrogen network is also modelled and how well demand-side response is included. The importance of both explicit (direct payments) and implicit (response to market prices) demand-side response was noted. Furthermore, the discussion moved to the role of seasonal flexibility, which was emphasised as being a difficult technical problem and an area in which modelling might shed some light on. Electricity demand growth, which is inherently uncertain, was observed as playing a big role in determining the flexibility needs.

**Suggested Improvements to 1<sup>st</sup> Cycle Studies**

- In both studies, the suggestion was to focus on the potential of demand-side response in providing system benefits.

**Suggested Research Questions for the 2<sup>nd</sup> Cycle**

- What technology mix can best provide long-term seasonal flexibility?
- What are the potential benefits from a system point of view from both explicit (based on direct payments) and implicit (based on price signals) demand-side response, and how do each type vary according to their benefits to the system?
- What are the offshore grid investment needs to meet the EU's 2030 targets?



## 2.2 Industry & Innovation

As the Industry and Innovation theme discusses questions related to industrial competition, carbon pricing, and public investment, project partners met with stakeholders from DG COMP, DG CLIMA, and DG BUDG to understand what the key questions are for policy in relation to green industrialisation and innovation. From the first cycle, Study 4 was presented to stakeholders, which looked at the effects of CBAM and protectionist steel subsidies on the decarbonisation of Europe's steel sector. Discussions about the second cycle research questions focused on having a better representation of different policy instruments, exploring the steel sector at a national level, and how to drive innovation in industrial decarbonisation.

### 2.2.1 Chief Economist Unit, DG COMP, European Commission

**Date:** 03/07/24

#### Attendees

*IAM COMPACT*

*DG COMP*

Georg Zachmann (Bruegel)

Philipp Dimakopoulos, Economist

Ugne Keliauskaite (Bruegel)

Georg Holtz (Wuppertal)

Alexander Juelich (Wuppertal)

#### Discussion

The modelling teams from IAM COMPACT presented the details from Study 4 on the trade impacts on steel production and decarbonisation in Europe. Mr. Dimakopoulos raised several questions about the form of subsidy that was modelled, the implications for competitiveness from the study results, and the potential path dependency aspects of the modelling results. Furthermore, the stakeholder asked how electricity costs were modelled in the study. In terms of research questions for the second cycle, Mr. Dimakopoulos emphasised the importance of looking at subsidy types and at the potential import of intermediates.

#### Suggested Improvements to 1<sup>st</sup> Cycle Studies

- Focus on the modelling of actual policy instruments or types of subsidies to provide policy recommendations.
- Make explicit what ramping limits on certain technologies are in place, such as how fast hydrogen can be scaled up based on labour and capital availability.
- Carry out Member State level analysis by diving deeper into national outcomes rather than focusing solely on the EU as a whole to understand spatial transformation better.

#### Suggested Research Questions for the 2<sup>nd</sup> Cycle

- Member State Analysis: How could spatial relocation of the steel industry occur within the EU based on the use of different policy instruments/subsidies in support of green steel?
- Intermediate Product Imports: What are the potential imports of intermediate products and their impact on steel transformation within the EU?
  - E.g., quantities of green hydrogen or direct reduced iron.
- How much steel production should we have in Europe for security vs. competitiveness vs. cost reasons?
  - How much steel production relocation makes sense from an economic efficiency standpoint (both



within and outside the EU)?

## 2.2.2 Innovation for a Low Carbon, Resilient Economy Unit, DG CLIMA, European Commission

**Date:** 04/07/24

### Attendees

*IAM COMPACT*

*DG CLIMA*

Conall Heussaff (Bruegel)

Stefaan Vergote, Adviser

Georg Holtz (Wuppertal)

### Discussion

Following the presentation of Study 4, questions were raised about the design of the subsidies implemented in the study, especially whether there was explicit support for low-carbon steel. In addition, it was questioned whether the import of intermediates was represented in the study, such as direct reduced iron produced outside of Europe using cheaper renewable hydrogen.

The conversation then turned to the practical application challenges with the carbon border adjustment mechanism (CBAM) versus its representation in modelling. For example, it is unclear exactly how CBAM will apply to products like electric arc furnace steel, which depends on the emissions intensity of electricity generation. More broadly, the issue of how to deal with electricity-based technologies in CBAM was discussed.

In terms of important industries to address in modelling, it was said that much work had been done on cement, but that the chemicals sector could do with more investigation, as it is highly diverse with many carbon-intensive processes. Finally, the discussion focused on the location of green steel production in Europe and around the world, considering factors like energy cost, skills, and incumbency.

### Suggested Improvements to 1<sup>st</sup> Cycle Studies

- Model explicit support for low-carbon steel instead of even support for all steel.
- Model the trade of green steel intermediates.

### Suggested Research Questions for the 2<sup>nd</sup> Cycle

- What are the effects of explicit support for low-carbon steel compared to even subsidies for European steel?
- How does the import of cheaper produced intermediaries affect the European green steel value chain?
- How does steel sector decarbonisation differ by EU countries, depending on the factors above?
- What are the potential benefits of more circular solutions in green steel production?

## 2.2.3 DG BUDG, European Commission

**Date:** 05/07/24

### Attendees

*IAM COMPACT*

*DG CLIMA*

Conall Heussaff (Bruegel)

Peter Zapfel, Energy and Climate Policy Adviser



Georg Zachmann (Bruegel)

Georg Holtz (Wuppertal)

## Discussion

Questions about how CBAM was represented in Study 4 were posed, and, echoing other stakeholders, how the steel industry was subsidised and whether more targeted steel supports could be included. The key point was made that noting whether the model assumes that other countries do not react to CBAM by introducing their own carbon pricing schemes is an important part of the policy framing, as this outcome is part of the underlying intention of CBAM.

In terms of future research questions, the discussion focused on the role of public policy in spurring innovation. An important question is understanding what the best policy instruments are to drive innovation, especially in the industrial sector, and how they could be incorporated in the next EU budgetary framework. Furthermore, the role of the EU vs. member states in driving innovation is critical to understand.

## Suggested Improvements to 1<sup>st</sup> Cycle Studies

- Model more targeted steel subsidies for low-carbon steel.
- Representation of carbon prices in other jurisdictions (e.g., China, USA).

## Suggested Research Questions for the 2<sup>nd</sup> Cycle

- What are the energy demands of a decarbonised industrial sector in Europe?
  - Electricity and other energy carriers like renewable fuels of non-biological origin (RFNBOs)
- What are the best instruments for driving innovation in the steel sector in Europe?
- How would faster experience curves in clean energy technologies change our public policy priorities?
  - Would we support more deployment with faster learning?
- What are the implications of a global scenario with high tariffs between China and the USA?
  - Are EU policy frameworks (such as CBAM) resilient to such a scenario?



## 2.3 Global Effects

The Global Effects theme considers trade and macroeconomic issues and their effects on European decarbonisation. In the first cycle, Study 3 investigated the consequences of increased geopolitical disruptions and supply-chain constraints on the achievement of Europe's net zero goals. Study 6 looked at how heterogeneous interest rates could affect decarbonisation pathways in Europe and around the world. IAM COMPACT met with stakeholders from DG Trade, the European Central Bank, and the National Bank of Belgium to explore these questions. In terms of research questions for the second cycle, stakeholders proposed refining the global studies to investigate different scenarios of trading, both between major powers and between Europe and potentially viable trading partners.

### 2.3.1 (Formerly) DG TRADE

**Date:** 11/07/24

#### Attendees:

*IAM COMPACT*

*DG TRADE*

Conall Heussaff (Bruegel)

Ignacio Garcia Bercero, Former Director at DG TRADE

Panagiotis Fragkos (E3M)

Natasha Frilingou (NTUA)

Shivika Mittal (CICERO)

#### Discussion

Following the study presentations, questions were asked about Study 3, specifically whether the main impacts of the trade tariffs were focused on just the EU or also on other countries, to which the IAM COMPACT team clarified that the focus was on the EU. Exploring different trade scenarios was suggested, such as free trade, full decoupling between USA + EU and China, and some intermediate scenario. Regarding Study 6, the broader question was asked about the implications of such results for Europe's policies towards certain other large emitters, like India and Indonesia.

It was proposed to frame the policy implications in terms of our medium-term derisking targets, such as those set out in the Net Zero Industry Act. A major current research area was raised, relating to how CBAM can be used to build international trading agreements in green technologies and commodities, especially with countries that are not ready to implement a carbon pricing scheme. In particular, what other policy instruments can be used to incentivise green production, such as progressively increasing carbon standards in the steel sector.

#### Suggested Improvements to 1<sup>st</sup> Cycle Studies

- Degrees of Free Trade: Model different trade scenarios, like 1) free trade, 2) increasing tariffs, 3) full decoupling.
- Phased-in Derisking: model a long-term 2050 derisking from China strategy vs. a more aggressive 2030 derisking strategy.
- Lower Cost of Capital with Partners: model the effects on global decarbonisation if the EU provides financial support to lower cost of capital to its trading partners.

#### Suggested Research Questions for the 2<sup>nd</sup> Cycle

- How can the EU play a role in reducing the cost of capital in the developing world?
- What other countries are best suited to partnering with the EU on green technology?
  - In other words, who else is suitable for supplying key green technologies?



- Suggested countries to explore are Latin American countries, India, and Indonesia.
- Are countries that are closer geographically more suitable partners?
- How realistic are the Net Zero Industry Act targets for European manufacturing?
- What are the effects on Europe's decarbonisation of increasing trade tariffs depending on the sector?
  - In other words, are solar panels, EVs, or green steel more important from an emissions standpoint?
- What is the effect of heterogeneous carbon prices around the world on carbon leakage from Europe and on global decarbonisation efforts?
  - (note: a World Bank study found that there is no major effect)
- What other tools (excl. CBAM) can be used to incentivise low-carbon production of important goods and technologies?

### 2.3.2 Climate Change Centre, European Central Bank (ECB)

**Date:** 15/07/24

#### Attendees:

*IAM COMPACT*

Ugne Keliauskaite (Bruegel)

Natasha Frilingou (NTUA)

Shivika Mittal (CICERO)

*European Central Bank (ECB)*

Carolin Nerlich, Senior Lead Economist

John Hutchinson, Principal Economist

#### Discussion

Policymakers stressed that research on the cost of capital perspective is of particular relevance from the central bank's point of view. The discussion started on how the cost of capital is differentiated across technologies and countries. Policymakers asked if the model could capture this, or whether this is a static assumption. There was interest in a variation of the cost of capital in different countries. It was noted that climate risk further increases the cost of capital. Policymakers were also interested in the scenario of a uniform carbon tax to create an incentive to invest in clean technologies.

A point was raised that critical minerals could potentially hinder the transition even going beyond the green transition. Further discussion focused on the assumption for the carbon tax modelling, such as when the carbon tax is supposed to kick in, how to calibrate it, what is needed to get to net zero, and technological aspects and running the models on different scenarios. Policymakers also pointed out the question of what should be done with carbon investments. Finally, the comparison between the global dimension and just the Euro area and advanced economies, and the impact on domestic economies was suggested as particularly interesting. Even in the Euro area, industries and geographical areas are affected differently.

#### Suggested Improvements to 1<sup>st</sup> Cycle Studies

- Is there a diffusion of technologies taking place, given the increased pace of globalisation?
- What is driving the cost of capital? In addition to financial factors, policy certainty, and institution stability, trade conflicts are also a dimension of risk. In particular, modelling could add human-related trade risk.
- Given that we are moving to a higher interest rate environment, adding a scenario where inflation persists



high for the longer term and interest rates remain high longer even for high-income countries would be relevant.

- What would that mean for these types of investments?
- Are these sectors more sensitive to interest rate developments than more traditional sectors? Especially given that the database used in the analysis was pre-high inflation.

### **Suggested Research Questions for the 2<sup>nd</sup> Cycle**

- Considering the timing of EU policy implementation, if there is pushback on policies, they are slower to be implemented. What are the implications of smooth versus abrupt implementation of policies?
- How would the completion of the capital union change the perception of risk and facilitate these investments? Perhaps lower uncertainty would help facilitate the investment.
- How much money will flow from more developed economies to less developed economies? How could this money be channelled in the best way to accelerate the transition?

### **2.3.3 National Bank of Belgium**

**Date:** 24/07/24

#### **Attendees:**

*IAM COMPACT*

*National Bank of Belgium (NBB)*

Conall Heussaff (Bruegel)

Thomas Stoerk, Climate Economist

Shivika Mittal (CICERO)

Natasha Frilingou (NTUA)

#### **Discussion**

Following the study presentations, points were raised about clarifying the research questions in both studies, as well as the territorial scope in both studies. Furthermore, it was asked how the geopolitical constraints were implemented in Study 3 and how the model constraints were designed. On the second study, a clarification was asked regarding whether the study focuses on central bank interest rates or cost of capital for specific projects, as well as the political plausibility of the Study 6 scenario associated with channelling windfall profits of large energy firms to developing countries. It was suggested that Study 6 could be linked to Just Energy Transition Partnerships (JETPs) and ongoing COP discussions related to climate finance. In terms of second cycle research questions, the role of climate finance and the macroeconomic context in the developing world was emphasised as an important area to explore.

### **Suggested Improvements to 1<sup>st</sup> Cycle Studies**

- Clarify in Study 6 that the focus is on Cost of Capital for renewable projects rather than on central bank determined interest rates.
- Link Study 6 to discussions on climate finance in relation to COP and JETPs.

### **Suggested Research Questions for the 2<sup>nd</sup> Cycle**

- How do the macroeconomic conditions around the world affect renewable investments?
  - Factoring in currency risk, central bank determined interest rates, and potential limits on capital flows in and out of developing countries.
  - How do these factors affect mitigation costs?



- What are the best practices here for derisking clean energy projects in developing countries? (e.g., green hydrogen deals between EU and Chile as an example of good practice)
- How would a European investment fund to investment in decarbonisation in the developing world affect decarbonisation?
- How could derisking of clean energy technologies in specific Western/European partner countries aid the energy transition?

## 2.4 Behavioural Change

The theme of Behavioural Change explored how the behavioural changes needed to decarbonise the economy—in transport, diets, and buildings—can be represented in the IAMs available in IAM COMPACT. The first cycle Study 7 looked at the environmental and economic changes arising in the models from preference changes in the three sectors. Stakeholders were met from DG ENER, the International Energy Agency (IEA), and the Joint Research Centre (JRC)

For the second cycle, stakeholders suggested providing a more realistic representation of behavioural change in the modelling studies, for example by implementing different degrees of behavioural change, as well as varying preferences by demographic and regional groups. An interest in modelling evolving energy consumption profiles based on behavioural changes was also expressed by multiple stakeholders.

### 2.4.1 Consumers, Local Initiatives, Just Transition Unit, DG ENER, European Commission

**Date:** 03/07/24

#### Attendees:

*IAM COMPACT*

*DG ENER*

Conall Heussaff (Bruegel)

Tadhg O'Briain, Deputy Head of Unit, Consumers, Local Initiatives, Just Transition

#### Discussion

Due to the unavailability of IAM COMPACT researchers, the first cycle study was not presented in detail to Mr. O'Briain. Nonetheless, important considerations about the real-world policy efforts were raised, especially the need to stimulate behavioural change and the possibility of linking empirical data on this topic to the modelling work done in Study 7.

Regarding research questions of the second cycle, the importance of understanding the effects of new energy consumption patterns on the broader energy system was emphasised. For example, through the establishment of energy communities or flexible household consumption, and their potential effects on system cost and emissions. Furthermore, framing such changes in the context of policy measures like pushing for two part tariffs (part fixed, part variable) that could incentivise flexible consumption while protecting consumers was suggested. The share of flexible vs. inelastic consumption in households would be important to appropriately model.

#### Suggested Improvements to 1<sup>st</sup> Cycle Studies

- Can the magnitude of behavioural change implemented in Study 7 be linked to empirical studies about the nudges and policy measures required to drive said change?
  - E.g., if a certain modal shift is assumed, what does the empirical literature say about the level of policy effort required to deliver such an outcome.

#### Suggested Research Questions for the 2<sup>nd</sup> Cycle

- What is the effect of the energy consumption associated with energy communities at scale on the energy



system, in terms of emissions and cost?

- Can these benefits be quantified in terms of benefits to the consumer and benefits to the system? (To stress the importance of i-frame vs. s-frame)
- Similarly, what are the emissions and cost savings benefits of widespread efficient usage of heat pumps and electric vehicles charging in households?
  - What are the emissions, cost savings, and resilience benefits of implicit vs explicit demand-side response?

## 2.4.2 Energy Efficiency, International Energy Agency

**Date:** 08/07/24

**Attendees:**

*IAM COMPACT*

*IEA*

Ugne Keliauskaite (Bruegel)

Emma Mooney, Energy Analyst

Jon Sampedro (BC3)

### Discussion

The IAM COMPACT team presented the Study 7 results, which looked at implementing various behavioural change sector-oriented and climate mitigation policies, focusing on transport, buildings, and diet to reduce carbon emissions. The importance of framing the modelling results in the context of the target of doubling energy efficiency by 2030 was noted. To increase the policy relevance of the studies, the IEA policymaker also suggested considering the feasibility of the studied policies in terms of potential backlash from consumers following the implementation of behavioural changes through policies and socioeconomic implications. In essence, the realism (or perhaps lack of realism) of such modelled behavioural changes should be recognised in any policy document.

For the second cycle, it was recommended to explore the socioeconomic dimension and cost of implementing such measures, for example through subsidies for renovating housing or exploring the use of non-energy modes of transport in the modelling.

### Suggested Improvements to 1<sup>st</sup> Cycle Studies

- Challenge of policy implementation: several of the modelled behavioural changes are hard to push from a policy perspective (especially diet), so a framing in the policy brief that considers the realism of these measures should be considered.
- Include degrees of behavioural change to quantify the benefits of different levels of social changes.
- Classifying policies into those that reduce utility and those that do not imply a loss in quality of life, i.e., achieving an equal level of satisfaction with fewer resources, would help to make results more policy-relevant.

### Suggested Research Questions for the 2<sup>nd</sup> Cycle

- What are the costs of supporting behavioural change in buildings, such as through providing grants, and how does this change the affordability of behavioural change for citizens?
  - How does this differ by socioeconomic group?
- Compare building fabric improvements to technology replacement (e.g., heat pumps) in terms of broader emissions and costs benefits.



- Put the different behavioural change requirements in context.
- Deep dive on transport modes: explore the emissions and costs benefits from modal switching to different modes (walking, cycling, public transport, EVs).
- In terms of food consumption, model not only dietary changes, but also land use and agricultural changes needed to provide food for such diets.

### 2.4.3 Competence Centre on Behavioural Insights, Joint Research Centre

**Date:** 11/07/24

#### Attendees:

##### *IAM COMPACT*

Conall Heussaff (Bruegel)

Dirk-Jan van de Ven (BC3)

Gonzalo Parrado Hernando (UVA)

##### *JRC*

Emanuele Ciriolo, Head of Competence Centre on Behavioural Insights

Hendrick Bruns, Competence Centre on Behavioural Insights

Mario Scharfbillig, Science for Policy Analyst, European Commission

#### Discussion

Following a presentation of Study 7, stakeholders requested some clarifications about whether the study focused on the EU or on global outcomes, and whether expected demographic changes are included, to which the IAM COMPACT team confirmed that it was EU-focused and used UN estimates on demographic changes. Constructive criticism of the study results was then provided by the stakeholders, noting that much of Study 7's conclusion is not new information, as lower energy demand in sectors can be expected to lead to less emissions. The important question for such results is whether the behavioural change modelled in the study is realistic or not. Stakeholders suggested implementing different degrees of behavioural change in modelling to account for such realism.

Furthermore, stakeholders expressed an interest in refining the modelling from a demographic (different ages and income group) and regional perspective. Implementing different behavioural changes by such categories might shed some light on the important groups to target from a policy perspective. Another point about modelling the different energy profiles of households, again by demographic and region, was suggested as a way to provide new information about the effects of behavioural change. Finally, JRC colleagues noted that the correct framing of results about the impacts of behavioural change is essential. The realism of the results should be explicitly stated, as well as whether it is incumbent upon the individual (i-frame) or on society (s-frame) to drive the changes.

#### Suggested Improvements to 1<sup>st</sup> Cycle Studies

- Degrees of Behavioural Change: mild, moderate, extreme behavioural change scenarios and their impact on environmental indicators
- Different Behavioural Change by Group/Region: can different preferences amongst the population and in different geographic regions be modelled?

#### Suggested Research Questions for the 2<sup>nd</sup> Cycle

- What are the environmental and economic effects of new energy usage profiles by households and businesses?



- How do different preferences in diet, transport and buildings by European demographic and region affect the environmental outcomes of green behavioural changes?



## 3 Key Takeaways

A number of consistent points in each theme and for each study were raised by policymakers across most of the meetings. To aid the internal process of translating the research questions from these meetings to model-ready policy-relevant studies, the following section provides a summary of the key takeaways from the various discussions. Although there was no direct discussion of new policy priorities emerging after the European elections of 2024, the implication was that many of the new questions discussed partly reflected such new priorities.

Overall, the policy steering group meetings provided helpful constructive criticism of the first cycle studies and provided a set of consistent recommendations for the second cycle research agenda. Stakeholders in general were positive about the work carried out so far and expressed their interest in continued engagement with IAM COMPACT.

### 3.1 Optimal Transition

Stakeholders across the board noted the importance of better understanding system flexibility, especially two characteristics: **demand-side response and long-term/seasonal flexibility**. In particular, stakeholders requested to better quantify the system benefits of implicit vs. explicit demand-side response, as well as the technology options that could provide seasonal flexibility. Another point that was raised consistently was on the policy instruments that could provide the incentives to deploy these technologies, and their cost. Stakeholders expressed an interest in providing cost estimates of technology mixes that score well on the security, resilience, and flexibility metrics developed in the first cycle.

### 3.2 Industry & Innovation

A clear message received from stakeholders after the presentation of Study 4 was the need to a) have better representation of different **policy instruments and subsidy levels for supporting low-carbon steel** (and other technologies) in the modelling, and b) account for the possibility of **importing green steel intermediates** as an economically efficient means to meet European steel demand sustainably. The request for a **member state level analysis** was also consistent across the discussions.

### 3.3 Global Effects

Exploring how **partnerships between the EU and specific countries** would affect both European decarbonisation (through the import of clean energy technologies, materials and fuels) and developing countries' decarbonisation (through derisking of clean energy investments). The **role of the EU in derisking** investments in partnering countries was heavily discussed by all stakeholders. A topic particularly relevant for the next political cycle in Europe is **the effect of CBAM on global trade**, particularly in terms of carbon leakage if other countries have different carbon pricing schemes.

### 3.4 Behavioural Change

Stakeholders emphasised the importance of providing some **empirical basis** for validating the modelled behavioural change. Any modelled behavioural change should be framed in terms of the real-world outcomes needed to deliver it, said all stakeholders. Furthermore, an interest in **modelling novel energy consumption profiles** was also expressed by several stakeholders.



## 4 Next Steps

The policy-relevant research questions based both on further developing existing studies and addressing new questions, which were identified in collaboration with the Policy Steering Groups in the meetings documented in this deliverable, will next be discussed internally by project partners, with the aim of translating them to model-ready studies that capture the core policy priorities communicated by the stakeholders—also in consideration of actual modelling capacity. The studies will then be developed in a co-creative fashion with the Core Working Groups in a series of workshops by the end of 2024, including scenario building and policy framing.

The outcomes of all stakeholder interactions in the second modelling cycle, including those between non-EU modelling teams and stakeholders, will be included in project deliverable '*D2.5 - Proceedings of Stakeholder Interactions – Update*'.

