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17/01/2020

**D3.3 – Proceedings of the 1st Regional EU
Workshop**

WP3 – Ongoing Stakeholder Dialogue

Version: 1.00

www.paris-reinforce.eu



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Grant Agreement Number	820846	Acronym	Paris Reinforce
Full Title	Delivering on the Paris Agreement: A demand-driven, integrated assessment modelling approach		
Topic	LC-CLA-01-2018		
Funding scheme	Horizon 2020, RIA – Research and Innovation Action		
Start Date	June 2019	Duration	36 Months
Project URL	https://www.paris-reinforce.eu/		
EU Project Officer	Frederik Accoe		
Project Coordinator	National Technical University of Athens – NTUA		
Deliverable	D3.3 – Proceedings on the 1 st Regional EU Workshop		
Work Package	WP3 – Ongoing Stakeholder Dialogue		
Date of Delivery	Contractual	31/01/2020	Actual 17/01/2020
Nature	Report	Dissemination Level	Public
Lead Beneficiary	Bruegel		
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Reviewer(s):	Alec K. Kelemenis, Alexandros Nikas, Haris Doukas (NTUA)		
Keywords	Proceedings		



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 serves as documentation of the proceedings of the first PARIS REINFORCE regional EU workshop. The deliverable reports particularly on attendance, agendas, and minutes. Links to all presentations are provided. The report is targeted internally within the consortium to aid the ongoing dialogue attempting to more precisely define research questions for the first set of modelling runs. The report is targeted publicly to all relevant stakeholders in order to provide a better understanding of the practicalities behind the nature of PARIS REINFORCE stakeholder engagement (outlined D3.1) and the current proceedings of this process.

3. Short summary of results (<250 words)

The first PARIS REINFORCE regional EU workshop was held in Brussels on the 21st of November 2019. The purpose of the event was to initially inform stakeholders as to the capabilities of the models: what they can and cannot do. Building upon this, the event facilitated the co-creation of both the online, open-access, data-exchange platform, I²AM PARIS, and the research topics into which models will be set to address.

The event consisted of five sessions. The first offered concise and clear presentations of modelling capabilities and particularly of what models are used to achieve in the sphere of climate policy support. The second session focused upon the co-design of the I²AM PARIS platform, while the final three sessions all revolved around discussion on and prioritisation of different research areas for models to look into and policy questions for the PARIS REINFORCE project to seek to address. In the spirit of co-creation, the format of the day was focused upon eliciting as much stakeholder/audience input as possible. In order to do so, a significant proportion of each session was spent in open discussion with the audience. Moreover, interactive voting tools were used to both allow stakeholders to prioritise topics for discussion as well as to provide their feedback toward shaping the subsequent modelling runs of PARIS REINFORCE.









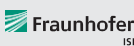









4. Evidence of accomplishment

This report.



Preface

PARIS REINFORCE will develop a novel, demand-driven, IAM-oriented assessment framework for effectively supporting the design and assessment of climate policies in the European Union as well as in other major emitters and selected less emitting countries, in respect to the Paris Agreement. By engaging policymakers and scientists/modellers, PARIS REINFORCE will create the open-access and transparent data exchange platform I²AM PARIS, in order to support the effective implementation of Nationally Determined Contributions, the preparation of future action pledges, the development of 2050 decarbonisation strategies, and the reinforcement of the 2023 Global Stocktake. Finally, PARIS REINFORCE will introduce innovative integrative processes, in which IAMs are further coupled with well-established methodological frameworks, in order to improve the robustness of modelling outcomes against different types of uncertainties.

NTUA - National Technical University of Athens	GR	
BC3 - Basque Centre for Climate Change	ES	
Bruegel - Bruegel AISBL	BE	
Cambridge - University of Cambridge	UK	
CICERO - Cicero Senter Klimaforskning Stiftelse	NO	
CMCC - Fondazione Centro Euro-Mediterraneo sui Cambiamenti Climatici	IT	
E4SMA - Energy Engineering Economic Environment Systems Modeling and Analysis	IT	
EPFL - École polytechnique fédérale de Lausanne	CH	
Fraunhofer ISI - Fraunhofer Institute for Systems and Innovation Research	DE	
Grantham - Imperial College of Science Technology and Medicine - Grantham Institute	UK	
HOLISTIC - Holistic P.C.	GR	
IEECP - Institute for European Energy and Climate Policy Stichting	NL	
SEURECO - Société Européenne d'Economie SARL	FR	
CDS/UnB - Centre for Sustainable Development of the University of Brasilia	BR	
CUP - China University of Petroleum-Beijing	CN	
IEF-RAS - Institute of Economic Forecasting - Russian Academy of Sciences	RU	
IGES - Institute for Global Environmental Strategies	JP	
TERI - The Energy and Resources Institute	IN	



Executive Summary

The 1st PARIS REINFORCE Stakeholder Council Dialogue workshop, entitled "Enhancing climate policy through co-creation", took place on the 21st of November 2019, at the premises of Bruegel, in Brussels, Belgium.

The workshop was a Pan-European initiative for the co-creation of research underpinning new climate policies at the EU and national levels, drawing from the results of six-month exhaustive consultations at national and European level, which followed innovative participatory processes, under the Talanoa Dialogue spirit adopted in the recent UN Climate Change Conferences.

High level staff of the EC Directorates-General (DGs) for Energy, Climate, and Research, Ministries and climate-related governmental bodies from EU Member States, representatives of international organisations, scientists, and researchers representing relevant projects and initiatives attended the workshop.

During the morning sessions, and after opening remarks from Mr. Lukasz Kolinski (Head of Unit, DG ENER.A.4) as well as an introduction to the project by the Coordinator Dr. Haris Doukas (Assoc. Prof., National Technical University of Athens), a detailed policy brief on what the PARIS REINFORCE models can and cannot do was handed out, presented and discussed with stakeholders. Furthermore, the I²AM PARIS platform was thoroughly presented and discussed with the audience, with the session showcasing the dynamic, detailed and comparative documentation component of the platform (to which the audience was provided access) and leading to a Q&A session, in which preferences over the content, design and directions for the modelling analyses visualisation were gathered.

The afternoon consultation, broken down into three thematic sessions, resulted in the main policy questions to be further investigated by the ensemble of Integrated Assessment Models of PARIS REINFORCE, by participating stakeholders prioritising the topics they would like to discuss in detail with the consortium members and, after discussions, selecting the particular policy questions they would like PARIS REINFORCE to seek to address, via a polling and voting platform. The lists of suggested topics for each session were put together after discussions with high-level policymakers at the EU and European-national level as well as included one question (per session) that drew from recommendations from the public, in a crowdsourcing platform that was set up for the purposes of the workshop.

At the global level, stakeholders appeared in favour of the project taking on topics and policy questions that revolved around potential failures of key technologies, lifestyle and behavioural changes, as well as just transitions in a climate emergency or extreme decarbonisation potential under a green new deal. At the EU level, the most interesting topics included carbon border adjustment and alternatives, capacity and flexibility of electrification in Europe, and EU-internal taxation policies (increasing ambition in terms of ETS coverage and expanding harmonisation of taxation in non-ETS sectors). Finally, on the socioeconomic and Sustainable Development Goals (SDG) front, participants voted in favour of the project taking on questions related to employment and other socio-economic dimensions resulting from removing public support on emissions-intensive sectors (e.g. coal); evolution in terms of sectoral redeployment and skill requirements; and increasing ambition in NDCs in consideration of various sustainability dimensions.

This workshop was the first of a series of stakeholder events to be held over the next three years.



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1 Overview

The first PARIS REINFORCE regional EU workshop took place at Bruegel, Brussels, on the 21st November 2019.

The purpose of the event was to initially inform attendees of the capabilities of the PARIS REINFORCE modelling ensemble and consortium more generally, before building an understanding of the demands and expectations of stakeholders, and particularly receiving guidance on the policy areas for models to be set to address. Stakeholders were invited to participate in co-creation of the research questions that the project shall address as well as co-design of the I²AM PARIS data-exchange platform.

The day was therefore structured to address this objective. The morning sessions began with introductory comments from Mr Lukasz Kolinski (Head of Unit, DG ENER.A.4) and Haris Doukas (NTUA). A presentation was then given by Ajay Gambhir (Imperial Grantham) offering an overview of what the models can deliver. A panel discussion was chaired by Ajay Gambhir (Imperial Grantham), Jorge Moreno (BC3), Georg Zachmann (Bruegel) and Dirk-Jan van de Ven (BC3) on what models can do. These presentations were designed to be as participatory as possible whilst offering a concise and intelligible overview of the models the project will work with, and followed handing out policy briefs on what these models are and can deliver.

A second morning session, chaired by Alevgul Sorman (BC3), Alexandros Nikas (NTUA), Ester Galende (BC3), and Vangelis Marinakis (HOLISTIC), was then spent thoroughly presenting, showcasing and discussing the I²AM PARIS platform. Here, the floor was opened to comments from sister and other research projects as well as the audience in general.

The afternoon was divided into three sessions all designed to offer a participative experience, allowing stakeholders to co-create the research questions for PARIS REINFORCE to prioritise. Three sessions were split according to the broad topics they looked to discuss.

- a. Global threat, global pathways: designing policy-relevant scenarios.

Chaired by Alexandre Koberle (Imperial Grantham), Alexandros Nikas (NTUA), Glen Peters (CICERO), Marc Vielle (EPFL).

- b. A Paris-consistent Europe: aligning national (NECPs), regional (EU NDC) & global action.

Chaired by Rocco de Miglio (E4SMA), Haris Doukas (NTUA), Andrea Herbst (Fraunhofer ISI), Joeri Rogelj (Imperial Grantham)

- c. Sustainable climate action: socioeconomic implications, distributional effects & SDGs.

Chaired by Baptiste Boitier (SEURECO), Lorenza Campagnolo (CMCC), Maurizio Gargiulo (E4SMA), Zsolt Lengyel (IEECP)

1.1 Objective of the event

This was the first Regional EU Workshop with policymakers and other stakeholders, occurring at a time in the project where the consortium is in the process of defining research questions for the first set of modelling runs to address. The core purpose of the workshop was therefore to give the floor to stakeholders, allowing them to express their thoughts and to help shape the research questions. The core goal was to allow stakeholders to express their concrete demands whilst promoting a sense of ownership over the project's process. It is hoped that beginning this process of stakeholder engagement so early in the project's lifetime will lead to high levels of engagement over the next 30 months.



1.2 Stakeholder Interaction

1.2.1 Pre-Workshop Stakeholder Engagement

In order to best achieve these objectives, a plan for stakeholder interaction was set out in project deliverable D3.1. This plan looked to most efficiently undertake a dynamic process of stakeholder engagement. The process began with 'core stakeholders', who were contacted for initial discussions beginning in Months 3-4 (August-September 2019) and concluded right before the workshop (November 2019). The PARIS REINFORCE project was presented to these core stakeholders, comprising European and national policymakers, who were asked to provide policy areas/research questions that they would be most interested in research being carried out within.

This process took place across Europe, with input gathered from multiple European agencies. The result was a list of potential research areas (see Annex, A1), as defined by core stakeholders. The motivation for such a strategy was both to receive an exhaustive list of policy questions, understanding the needs of highly relevant stakeholders, whilst also to spread the message of PARIS REINFORCE and develop a sense of ownership over the process.

Additional questions were also 'crowd-sourced' via the online platform. This meant that an opportunity was provided for any interested stakeholders to upload research questions they felt may be relevant for discussion onto the online platform; the crowd-sourcing process began 24 hours before the event itself and was finalised during the event.

This core list of questions then served as the basis for initiating extensive discussion at the regional workshop. The questions were first circulated around the project consortium for modelling teams to provide feedback on which areas may or may not be realistically approached by respective models. The result was a list of proposed 'policy packages' comprising an initial stakeholder-sourced research question and a first tentative suggestion at how a model could go about approaching such a question.

1.2.2 Stakeholder Engagement During the Workshop (via sli.do)

These initial packages were then split according to the categories describing the afternoon sessions. During each session, the chairperson spent the first 10 minutes explaining each of the potential research areas to our audience. We then allowed all participants to vote (via sli.do) on which questions they would be most interested in discussing during the forthcoming session. This process allowed the audience to very quickly prioritise the areas they would be most interested in discussing. Given the range of proposed questions, this process was important to enable discussions to be held over the most important topics to our stakeholders.

After topic selection, the floor was open for discussion between chairs and audience. Chairs spent 1-2 minutes introducing the discussion on each topic, and then stakeholders were able to raise any points or questions they had over the proposed research areas. Following the discussion, sli.do voting again allowed stakeholders to vote on a scale from 1 to 5 for each of the initially proposed research questions. They were asked to vote according to how relevant they would see it for PARIS REINFORCE to follow up on and conduct modelling research in this area.

By the end of each session, the project was therefore able to ascertain a large amount of both qualitative and quantitative information from attending stakeholders on the proposed research questions. This information is currently being fed into an ongoing dialogue within the consortium in order to more precisely define research questions for the first set of modelling runs. Both results of the initial 'discussion prioritisation' vote and 'final topic prioritisation' vote are presented in this document for each of the three afternoon sessions.



1.2.3 Quantitative feedback (voting)

Where participants were willing to provide such information, voting results were decomposed by occupation. The categories available for participants were as follows: EU Policymaker, National Government, International Institution, Private sector, NGO, Labour/trade union, and Academia. Since, a large portion of the audience were from academia (57%) we provide results conditional on academia vs non-academia. This is likely to be an imperfect proxy of modelling vs non-modelling preferences. It should also be noted that not all participants participated in voting. The day's attendance was 57 individuals whereas the number of maximum votes recorded for an individual question was 42.



2 Workshop Agenda

Below the workshop agenda is provided:

Enhancing climate policy through co-creation

First PARIS REINFORCE Stakeholder Council Dialogue

November 21, 2019

Location: Bruegel (Rue de la Charité 33, 1210 Brussels, Belgium)

Tentative agenda

8:30 – 9:00	Welcome and registration Coffee and breakfast available
9:00 – 9:20	Opening remarks <i>Łukasz Koliński (Head of Unit, DG.ENER.A.4)</i>
9:20 – 09:40	An introduction to PARIS REINFORCE <i>Haris Doukas (National Technical University of Athens)</i> Project scope and objectives
09:40 – 10:40	Can our models deliver what you need? <i>Session Chairs: Ajay Gambhir (Imperial College London), Georg Zachmann (Bruegel), Dirk-Jan van de Ven and Jorge Moreno (Basque Centre for Climate Change)</i> Interactive presentation of what the PARIS REINFORCE modelling ensemble can/cannot do (mitigation/adaptation technologies, policy instruments, sustainable development goals, etc.)
10:40 – 12:00	Co-designing the open-access, data-exchange I²AM PARIS platform <i>Session Chairs: Alexandros Nikas (National Technical University of Athens), Alevgul Sorman and Ester Galende (Basque Centre for Climate Change), Vangelis Marinakis (HOLISTIC)</i> <ol style="list-style-type: none">1. Presentation of motivation and initial concepts of the platform, as well as added value for (a) policymakers and other stakeholders, and (b) researchers/scientists (including mock-ups)2. Co-design of the final (documentation, analysis, visualisation) specifications of the platform
12:00 – 13:00	Lunch



	<p>Defining the policy questions</p> <p>Three afternoon sessions provide an opportunity for all stakeholders to engage in parallel discussions over the most pertinent climate policy questions, within the below fields. Guidelines for discussion will be provided; it is envisaged that, in the spirit of co-creation, these three sessions are stakeholder-led.</p>
13:00 – 13:55	<p>Global threat, global pathways: designing policy-relevant scenarios</p> <p><i>Session Chairs: Glen Peters (CICERO Centre for International Climate Research), Alexandre Koberle (Imperial College London), Marc Vielle (EPFL, Swiss Federal Institute of Technology), Alexandros Nikas (National Technical University of Athens)</i></p>
13:55 – 14:50	<p>A Paris-consistent Europe: aligning national (NECPs), regional (EU NDC) & global action</p> <p><i>Session Chairs: Joeri Rogelj, (Imperial College London), Andrea Herbst (Fraunhofer ISI), Rocco De Miglio (E4SMA), Haris Doukas (National Technical University of Athens)</i></p>
14:50 – 15:45	<p>Sustainable climate action: socioeconomic implications, distributional effects & SDGs</p> <p><i>Session Chairs: Baptiste Boitier (SEURECO), Lorenza Campagnolo (Euro-Mediterranean Centre on Climate Change), Zsolt Lengyel (Institute for European Energy and Climate Policy), Maurizio Gargiulo (E4SMA)</i></p>
15:45 – 16:15	<p>Wrap-up & Next steps</p> <p><i>Haris Doukas (National Technical University of Athens), Georg Zachmann (Bruegel), Zsolt Lengyel (Institute for European Energy and Climate Policy)</i></p>



3 Session 1 – Can our models deliver what you need?

The remainder of this deliverable offers an overview of the structure and content of each of the five sessions from the workshop.

The first morning session, "Can our models deliver what you need?" was chaired by *Ajay Gambhir (Imperial Grantham)*, *Jorge Moreno (BC3)*, *Dirk-Jan Van de Ven (BC3)*, and *Georg Zachmann (Bruegel)*.

The rationale behind the synthesis of the session panel was based on the background of each of the selected panellists:

- Before joining Imperial College, Ajay was the Team Leader for EU and International Climate Change Economics at the UK Government's Department of Energy and Climate Change; worked in the UK's Office for Climate Change, as part of the civil service team that prepared the initial draft of the Climate Change Act 2008, the world's first climate legislation; as well as in the UK Committee on Climate Change. His background as a modeller coming from the policymaking community was pivotal in explaining to stakeholders coming from different institutions and backgrounds what models can and cannot do.
- Jorge Moreno and Dirk-Jan Van de Ven represented the team responsible for putting together both the documentation template used in the project to gather the relevant information from all modelling teams; and the overall modelling documentation summary. They also represent the project partner principally responsible for the I²AM PARIS platform, in which the models are dynamically, thoroughly and comparatively documented, and which will then host the research questions and modelling results in respect to these questions.
- Finally, Georg Zachmann represented Bruegel, the project partner in charge of the stakeholder engagement module of the PARIS REINFORCE project, with which most attending stakeholders are tied. He was therefore well equipped to facilitate a discussion between the researchers and the non-expert stakeholders, following the presentations of the modelling capabilities.

This session began with Ajay Gambhir introducing the broad concept of what energy and integrated assessment models do, what types of inputs they require and why co-creation of scenarios and inputs is important. Jorge Moreno and Dirk-Jan Van de Ven then introduced the particular suite of models that will be used in the PARIS REINFORCE project, and their capabilities (using some examples of policy-relevant questions that can be addressed). During the session, the detailed policy brief (D3.2) on "what can our models deliver?" was handed out to the audience.

The presentation was followed by a Q&A session, facilitated by Georg Zachmann, and consisting of the following questions, comments and points:

- ***What should we make of the big range of carbon prices stemming from energy and integrated assessment models?***

In response to this question, Ajay Gambhir described how we tend to look at the median in the range but we can do better at understanding why there is such a large range in the first place. For example, this stems from the different models' assumed "stickiness" of how easy it is to substitute low-carbon for high-carbon technologies, the baseline emissions assumptions (and consequent level of effort required to mitigate) in different models, as well as ranges of assumptions on behavioural change and resource conservation. He further explained that many people intuitively know where these differences spring from, but that there's an opportunity in the PARIS REINFORCE project to get into some of the details, capitalising on the broad range of modelling approaches,



including energy system, partial equilibrium, general equilibrium and macroeconomic, and using least-cost optimisation and simulation approaches.

A stakeholder from the UK Government's Department of Business, Energy and Industrial Strategy further added to this point, by saying that the UK government has used energy and integrated assessment models to define what the UK's long-term ambition should be, and then sectoral models to look at the detail, without so much reference to carbon pricing. They referred to the carbon pricing guidance in the UK but noted that is out of date and noted the wide range of uncertainty on the carbon price.

- ***Do any of these models look at the behavioural side (from a qualitative angle) of how we can appeal to stakeholders to enable us to make changes in private companies?***

Jorge Moreno noted in response that some of our models do include quantitative representation of behavioural change, and that we are also including a consideration of the sustainable development goals (SDGs), which also include social aspects.

Haris Doukas added that, because we are talking about radical transformations, we need to consider bottom-up changes, and the PARIS REINFORCE project will use qualitative models and non-modelling approaches like fuzzy cognitive maps, multi-criteria analysis, group decision making and portfolio analysis, based on which we will try to capture some of these aspects, and create values/weights for specific parameters to be included in our models.

- ***How much capacity is planned in the project to do new modelling, as opposed to linking the models, leaving modelling gaps outside the scope of the project?***

In response to this, Dirk-Jan Van de Ven noted that improving models is outside the scope of the PARIS REINFORCE project call (as opposed to two of its sister projects, LOCOMOTION and NAVIGATE), and as such we are placing emphasis on linking the numerous models of the project together.

- ***How are you going to try to mitigate the fact that your models do not cover land use and agriculture to such a great degree, noting the importance of land use CO₂ removal?***

Jorge Moreno noted that there are a few models in the PARIS REINFORCE modelling armoury covering these sectors (like the global GCAM integrated assessment model, and the Brazilian SIGGEMA land-use model) and this will allow these processes to be taken into account.

- ***Would it be possible to use the modelling framework to quantify the energy climate package in the Czech Republic, especially the heating sector, which heavily uses domestic coal, and also the car production sector? Can you soft- or hard-link between energy and sectoral models to look at the implications of electric vehicle production on other sectors, macro variables, etc?***

In response to this question from a stakeholder representing the Czech Ministry of the Environment, Georg Zachmann noted that in the afternoon sessions we would analyse the detailed policy questions. Andrea Herbst (Fraunhofer ISI) added that an advantage of PARIS REINFORCE is that it can soft-link detailed sectoral models for specific industries to macro models of the energy and economy.

- ***Can you distinguish normative from technical questions when working with stakeholders in the co-creation exercise?***

Ajay Gambhir said in response that a key goal of PARIS REINFORCE is to learn from stakeholders which questions are more normative and which are technical and can be more objectively codified into models, before then thinking about what political and normative implications might follow.



- ***How will PARIS REINFORCE ensure that policymakers use the models and tools deployed?***

Georg Zachmann said in response that, during the first months of the project, the PARIS REINFORCE team reached out to key stakeholders (e.g. from Energy & Environment Ministries) to gauge important policy areas (and to make them aware of the importance of the project). Ajay Gambhir added that the I²AM PARIS platform is intended to be an interactive, long-term useful tool to help non-technical individuals engage with the models and analysis of the project.



4 Session 2 – Co-designing the open access, data exchange I²AM PARIS platform

This second session was chaired by *Alevgul Sorman (BC3)*, *Alexandros Nikas (NTUA)*, *Ester Galende (BC3)*, and *Vangelis Marinakis (HOLISTIC)*.

The rationale behind the synthesis of the session panel was again based on the background of each of the selected panellists:

- Alevgul Sorman and Ester Galende represented the project partner in charge of the co-design of the I²AM PARIS platform, including the determination of the specification requirements and the design of the protocol for interlinking the models in the platform.
- Alexandros Nikas, from the coordinating partner of the project, represented the team behind designing the user interface, the use case and user experience of the modelling documentation, and the dynamic documentation of the models.
- Vangelis Marinakis represented the project partner in charge of developing the platform.

The session began with a brief reminder of the importance of stakeholder engagement to the project. Ester Galende outlined the logic behind the project being so heavily centred on stakeholders. This included references to successful programmes of stakeholder engagement in the development of numerous National Energy and Climate Plans (NECPs) and Citizen Assemblies, for example in Ireland. Alevgul Sorman then attempted to apply this to I²AM PARIS. There already exist a “graveyard of tools”, which were established by previous projects but did not last beyond the project end-date. The I²AM PARIS platform aspires to be unique in describing a variety of modelling types and a variety of uses—beyond simply mitigation, into SDGs as well other emissions apart from CO₂, and focusing on the research questions and assumptions.

Vangelis Marinakis presented a few screenshots from the I²AM PARIS platform, explaining that it will feature two interfaces: one public interface and one scientific interface. Work so far has been carried out on presenting an expert- and non-expert-friendly documentation of all 21 models of the project. This documentation contains all information about the modelling characteristics, with insights into the areas that particular models can and cannot investigate, such as policy areas, pollutants and geographic granularity. Once modelling analyses are carried out, they will be added to the platform. Elements of how to make the platform’s design as user-friendly and policy-relevant as possible were to be taken from the discussion in this session.

Alexandros Nikas then presented a live showcase of the platform as it currently exists. This focused upon the detailed presentation of the dynamic documentation of models, as well as an introduction to the detailed and comparative documentation of the models, explaining the intuition behind each of the pages and/or elements and how to easily navigate around the platform. Time was spent particularly on explaining the interactive map. Links to the detailed, scientific documentation were made clear.

Feedback from similar projects

NAVIGATE: thoughts were given by the scientific coordinator of NAVIGATE, another EU-funded project of the same topic (different subtopic), also reliant on models but focusing on improving them rather than using them to support policy design. They plan to build a similar platform, to be called the ‘IAM NAVIGATOR’, comprising a scenario navigator (explaining the different scenarios that will be used), a methodology section (explaining the modelling methods), information from summer schools & webinars, as well as modelling documentation. The



project would be open for collaboration. One idea put forward was to try and coordinate the format of documentation as much as possible, in order to make it easier for non-modellers to understand the explanations of models offered by both platforms.

LOCOMOTION: different to PARIS REINFORCE, in that the project is centred on one integrated assessment model, which will be updated and improved as part of the project. The project's online database will therefore act mainly as a tool to display results. The LOCOMOTION consortium want to show clearly the inputs into the model for individual scenarios and then the outputs.

DRAWDOWN Europe: began in September, as an offshoot from the USA. Their goal is to bring together a lot of different models and initiatives; however, they consider themselves to be still looking for the specific area where they can add value. They have so far had a significant focus on land use, which is noted as relatively under-researched compared to energy. They are focused on creating a data commons that should be collaborative and transparent, and were particularly interested in the concept of co-creating the 'assumptions that go into models'. As they are still a relatively new project, they did not raise an explicit area for collaboration but were keen to hold ongoing discussions on the approach of both projects with the hope of learning from project experiences.

General Feedback

A stakeholder from the German Environment Agency asked how webinars are coordinated with the live events. Would we consider setting up a YouTube channel? This could contain specific videos that help inform stakeholders on particular concepts.

In response, the panel commented that all feedback is very useful as we are still in the process of designing the second (analysis) component of the platform. Therefore, the project will look to incorporate feedback, for instance further consideration of how best to use webinars to elicit useful feedback.

A stakeholder from the UK Department for Business, Energy and Industrial Strategy commented from experience that a push towards transparency in IAMs is very helpful. It would be better to have one place to go to where everything is coordinated (the entire modelling community in one place). He raised the point that documentation and input variables for particular modelling scenarios would be very useful. It can be challenging for modellers to keep input variables up to date.

Ajay Gambhir provided some context from attending the coordination day on new and existing Horizon2020 projects earlier this year. A particular point was of the INNOPATHS project, which has produced databases on technology costs as well as policies and it could be fruitful to use their findings. He reinforced the point that it can be very hard to keep track of inputs such as cost reductions and, to the extent that modelling colleagues have tried to do so, it would be good to draw on their knowledge.

Joeri Rogelj (Imperial Grantham) raised the question of whether there are measures in place for the platform to survive beyond the end of PARIS REINFORCE. How technician-intensive is the platform? Is it possible to run without a dedicated technician? Can data be added by new projects? Is it open?

Alexandros Nikas responded that the Grant Agreement provides a contractual promise to keep the platform running for five years after the end of the project. However, the collective consensus is to attempt to create a long-lasting 'I²AM PARIS' community, by issuing an open call to all climate-economy modelling teams across the globe, with specific and tailored templates, to upload their modelling information as easily as possible so that their model can be included in the platform. I²AM PARIS is seen as a flagship element of the project to hopefully survive the 'graveyard-of-tools' effect.



With regards the technical aspects, Vangelis Marinakis commented that a technician is always necessary; however, the code was designed so that the platform can be ready to host new models, i.e. it is ready to incorporate other data. At this stage, a new model can be included within a couple of hours.

Further feedback welcomed the presentation and the platform's relevance in attempting to uncover the black box of models. A suggestion was made to be selective in the inputs that are designed with stakeholders. As discussion surrounding assumptions could very quickly become extremely technical, the advice was to limit to a deeper dialogue on some assumptions. Moreover, in identifying a few assumptions to discuss, researchers may have more capacity to reach out to specific groups in society that may have expertise in this area whilst not being particularly model-literate.

At the end of the session, Project Coordinator Haris Doukas confirmed that it may be possible and interesting to create common modules with other projects in order to accommodate more models in the platform.

Co-design of platform

At the end of the session, the first online vote was given to the audience. This related to the selection of the design layout to be used in the dynamic documentation of the I²AM PARIS platform, serving as a trial question for the audience to familiarise with the voting experience offered by the sli.do software. Although the most favoured option of this vote pointed to a "single-page layout – less is better" direction, which can be partly attributed to the significant dominance of researchers among the audience, there was broad diversity in the results; as a result, a more inclusive approach will be sought in the project, by incorporating alternative layouts and the capacity for the user to select among them.



5 Session 3 – Global threat, global pathways: Co-designing policy relevant scenarios

The first afternoon session was chaired by *Alexandre Koberle (Imperial Grantham)*, *Alexandros Nikas (NTUA)*, *Marc Vielle (EPFL)*, and *Glen Peters (CICERO)*.

This session covered the global aspects of climate change and action. Alexandros Nikas introduced the concept of the voting sessions for all afternoon sessions as well as explained once more how the topics were selected. Glen Peters then introduced this session by presenting seven topics, which had been pre-selected by the consortium on the basis of bilateral interviews with key policy stakeholders, and one topic drawing from those suggested via the public crowd-sourcing (on *sli.do*). The eight topics were:

- **Where are we heading:** Given current policy, social, and technological understanding, what is the most likely emission pathway through to 2050, including raising ambition through the Paris Agreement emission pledges?
- **Regional mitigation scenarios:** How does regional mitigation change with different levels of emissions trading or financial transfers? How do the regional mitigation rates map back to different burden sharing schemes?
- **Potential failure of key technologies:** How do mitigation costs, energy mix, and feasibility of ambitious mitigation targets change if selected technologies do not reach their full potential?
- **Lifestyle and behavioural change:** What share of mitigation can realistically be achieved via lifestyle and behavioural change?
- **Climate migration:** How does climate migration affect future pathways?
- **Extreme decarbonisation:** Is it possible to model a climate emergency requiring net-zero emissions in 2030?
- **Game changers across the globe:** Globally, where may new low-carbon technological breakthroughs be achieved? And where will demand for such innovations emerge?
- **Green New Deal – Just transition (crowd-sourced question):** Is it possible to model a climate emergency or ambitious green new deal/package requiring drastic transformations by 2030? If so, how can we ensure that the associated transitions are just for all societal groups?

After the presentation of the eight topics, a voting session, via *sli.do*, took place allowing stakeholders to select the topics that they found most interesting to discuss (i.e. because they wanted to comment on, found interesting, or wanted further clarifications about). This resulted in a prioritisation of topics as follows¹:

- 57%: Lifestyle and behavioural change
- 50%: Green New Deal - Just transition
- 48%: Potential failure of key technologies
- 38%: Regional mitigation scenarios
- 33%: Extreme decarbonisation
- 24%: Game changers across the globe
- 14%: Climate migration

¹ Audience were permitted to select up to three topics for prioritisation which leads to the non-conforming percentages.



- 14%: Where are we heading

Discussion was then open according to the ordering of topics prioritised by the audience.

Lifestyle and behavioural change

Alex Koberle provided an overview of possible behavioural changes that have so far been considered in such modelling activities. A first question from the audience was on whether the emissions considered in behavioural change aspects were on a national basis or per capita (and included an example of Denmark, which has a good overall footprint but ranks very poorly per capita). Alex Koberle explained that this is a matter of consumption- vs. production-based accounting, saying that there have been studies looking at those. In terms of modelling, this poses some kind of complexity, and it certainly is a controversial area. Glen Peters also referred to equity and the possibility of technological uptake levels differing both within a country and across countries.

A second remark concerned the modelling capacity of policies in aviation: models usually assume what would happen in terms of emissions if there was less demand for flying, but can they also model mechanisms under which, for example, half the world has a carbon tax on aviation and the other half does not? Glen Peters says this is a challenge for the modellers (for example, behavioural change is usually modelled in terms of technological availability and diffusion scenarios). A follow-up question questioned whether the PARIS REINFORCE modelling ensemble includes any model that can represent the preferences on the consumer-side and see how changes to these preferences can propagate in terms of prices and volumes. Alex Koberle responded that MUSE does represent preferences explicitly (as an agent-based model), while other models do this implicitly. Models also examine cross-sectoral (carbon leakage) impacts of policies: if, for example, carbon taxation or awareness reduces demand for flying but demand for mobility is the same, this could mean that demand for (and emissions from) others means of transport will increase.

Another question focused on circular economy aspects and whether models can represent reusing products or using products longer. Alex Koberle responded positively, and Marc Vielle added that it is a good opportunity to do this in the models but it remains a challenge to completely include circular economy aspects (especially due to the lack of relevant databases); and then wondered what capacity lies in the sister research projects.

A stakeholder coming from DG RTD then highlighted the need to clarify voluntary behavioural change from changes due to policy implementation; as well as to delve into behavioural change to the level of understanding the drivers of such changes (e.g. of eating less meat or using bicycles) and modelling how these drivers develop. He then asked where the focus of PARIS REINFORCE is going to be in this respect. Alexandros Nikas responded that the typical integrated assessment model does not go into too much detail regarding drivers of behavioural change, but among the project models, we do have some agent-based models (like the MUSE energy model), thereby touching the surface of criticisms usually attributed to models for not being able to represent soft (behavioural change) measures but rather indirectly model such measures through energy efficiency, etc. We also have the ALADIN model that tries to look into driving behaviours, so we will try to use an alternative setup that sequentially interlinks sectoral with integrated assessment models. Glen Peters added that we need to have an understanding of the potential at the micro-level, what happens in particular cities; and this requires quite detailed background work to understand the context, calibrate models, etc.

Another remark, from a researcher representing the LOCOMOTION project, mentioned that models overwhelmingly focus on radical technological changes and raised the point of behavioural aspects in the demand



side also having macroeconomic implications for the supply side, and this is a cornerstone of the LOCOMOTION project.

A final question concerned behavioural changes at the residential building sector, where despite availability of smart metering and other options consumers still prefer not to change but rather to keep paying more. Glen Peters responded that we are getting different types of expertise and might use different methods to address these questions, in fact in some cases (like this one) without requiring models at all.

Green New Deal – Just transition

A first comment on this topic included an explanation of how this could be touched in terms of modelling, and mentioned a series of policy issues emerging from the need to look into a Green New Deal. Glen Peters also mentioned how a Green New Deal could actually have different dimensions and ‘flavours’ for different regions (e.g. the USA and the EU).

A different comment mentioned, in reference to the just transition, that a key question is what will happen in coal-intensive countries and cities. Models can typically assume decommissioning of some units, but how exactly can we calculate funds necessary to support local communities and employees or to consider environmental implications as well as other socioeconomic implications (e.g. loss of character, reputation, GDP, etc.) of a post-lignite era. Alex Koberle responded that we need to carefully select the right models from the PARIS REINFORCE modelling armoury, in order to represent different classes, and for example see what the impact of shifting and the need for reinvesting in skill development could be. Alexandros Nikas added the examples of Greece and Poland. ‘Just transition’ is not simply a buzz word, as a drastic energy transition actually affects the entire political scene for or against climate change and action: what kind of learning and adaptability for the millions of miners working in the coal sector can be modelled? Such issues can impact the entire political debate and narrative on climate change and policy.

A stakeholder then questioned whether, without touching the effort sharing issue of national plans and targets (ESR) and based on the ETS targets, we can calculate what could be achieved by raising the ETS target ambitions (e.g. from 43% currently to 50-55%). Alexandros Nikas mentioned that this question mostly falls upon the next session and Glen Peters added that this is mostly a matter of European-specific models that can represent such issues. Another question on the Green Deal revolved around a carbon price on CO₂ or credits and its link to a just transition; and Glen Peters replied that it is a matter of modelling implementation (harmonised prices across sectors, trading).

Finally, a stakeholder asked about investments needed, sustainable green finance, and new business models. Glen Peters responded that most models will output investment, but probably it is challenging to determine where those investments come from (public or private capital).

Potential failure of key technologies

Glen Peters mentioned, for example, that scenarios show we need a lot of bioenergy but maybe for biodiversity issues (thinking of the IPCC latest report and the biodiversity report) or for whatever reason maybe we do not want to use as much bioenergy, so what would the models say on how to achieve our mid-century targets; and clarified that such scenarios have already been examined but there are more nuanced ways of doing it, for example by not completely switching off a technology but limiting its use, examining cost changes, short- vs. long-term effects and technological mixes, etc.



A first comment concerned the financial costs and technological game changers and questioned how the cost of financing could enter the modelling exercise, and Glen Peters responded that there have been a few studies on this front.

A stakeholder from the International Renewable Energy Agency (IRENA) mentioned that technological pathways analysis usually contains three key factors: bioenergy, hydrogen and cheap renewable electricity, but they wanted to add another layer to this topic, which is the import of supply across geography and sectors; in all scenarios, we usually see everyone importing hydrogen and/or bioenergy, but no one seems to be exporting it. Could this be addressed as a potential failure in the PARIS REINFORCE modelling exercises? Another stakeholder from the UK Department of Business, Energy and Industrial Strategy added to the discussion the availability of carbon capture and storage, as bioenergy and CCS come up all the time but we are not seeing them develop as expected; we should aim for a structured assessment across the uncertainty and parameter space of the different technologies, as well as of which are the essential ones to meeting our climate targets and of which ones are 'nice to have'. Glen Peters returned the question by asking what about direct air capture (DAC), and the stakeholder clarified that they voted for this question instead of game changers because in terms of policy planning there is quite a conservative approach as people often opt for something reliable that everyone can believe in rather than relying on game changing aspects, so it is most important to see what would happen if one or more of these technologies (like bioenergy or hydrogen) are completely knocked out. They also added that there are other options that models do not yet (completely) represent, like DAC, and these run the risk of not being picked up just because the models do not represent them, in a self-fulfilling prophecy. A final comment concerned the issue of minerals and highlighted the need to keep track of the complete set of materials needed for new infrastructure, which could in turn lead to a technological failure.

Once the debate was closed, the audience were once again asked to vote via sli.do, by rating the topics based on their interest in the PARIS REINFORCE project taking them on and trying to address them (Table 1).

Table 1: Voting Results from Session 3

Proposed Topics	Score / 5	Non-Academia	Academia
Where are we heading	3.24	3.16 (n=15)	3.33 (n=21)
Regional mitigation scenarios	3.42	3.67 (n=15)	3.23 (n=21)
Potential failures of key technologies	4.16	4.31 (n=16)	4.05 (n=21)
Lifestyle and behavioural change	3.97	3.56 (n=16)	4.29 (n=21)
Climate migration	2.57	2.67 (n=15)	2.50 (n=20)
Extreme decarbonisation	2.74	2.93 (n=15)	2.60 (n=20)
Game changers across the globe	2.57	3.00 (n=15)	2.25 (n=20)
Green New Deal – just transition	3.65	3.75 (n=16)	3.57 (n=21)



6 Session 4 – A Paris-Consistent Europe: aligning national, regional & global action

This session was chaired by *Joeri Rogelj (Imperial Grantham)*, *Andrea Herbst (Fraunhofer ISI)*, *Rocco De Miglio (EASMA)*, and *Haris Doukas (NTUA)*.

The second afternoon session followed the same format as the first, with all research questions having been collected in the same way. Andrea Herbst briefly outlined each of the proposed research questions providing context on their relevance and how they could feed into a modelling run. There were six research areas provided for consideration:

- **Carbon Border Adjustment (CBA):** Do models provide economic justification for the implementation of CBA? Can losses/leakages be mitigated effectively by CBA? What are alternative measures?
- **EU Internal Taxation Policies:** What is the scope for increasing ambition in terms of coverage in the ETS (incl. non-ETS, reduction of permits)?
- **Robustness of NECPs:** Are the individual NECPs realistic? Do they hold true for different model? Do they conform to EU targets?
- **Electrification:** How can we provide enough renewable energy generation storage and distribution capacity in an extreme electrification scenario? What is the role for flexibility options in such a scenario?
- **Non-energy CO₂ sources:** What kind of mitigation options exist for the reduction of CO₂ sources?
- **Hydrogen (crowd-sourced question):** Can models investigate scenarios in which hydrogen plays a big role in the future? What would this mean for industry, transport, and energy?

The audience then prioritised topics according to those they would be most keen to discuss at length. This prioritisation gave the following results:

- 60%: Carbon Border Adjustment
- 60%: Electrification
- 60%: Robustness of NECPs
- 50%: EU Internal Taxation Policy
- 38%: Hydrogen
- 25%: Non-energy Sources

Carbon Border Adjustment

Joeri Rogelj offered an introduction and noted that multiple computable general equilibrium (CGE) models within the consortium are able to model a CBA. Effects could be investigated on certain sectors and the European economy as a whole. Baptiste Boitier raised the European-specific issue whereby the ETS already issues free permits. An important decision for modelling would therefore be whether to focus on a potential plan of redesigning the ETS or focusing CBA on non-ETS sectors.

Georg Zachmann commented that generally two proposals for CBA currently exist in Brussels: one is the implementation of a general CBA on a few highly carbon-intensive products, and the other one is on a detailed supply-chain intensive proposal (i.e. an investigation of all carbon emissions in production). The question is raised as to whether modelling would be able to show to which degree the first version could lead to trade diversion. That is, if CBA was applied to a few carbon-intensive products (e.g. steel), would the whole value chain of final



products (e.g. cars) shift abroad to avoid the initial CBA?

A stakeholder from Ukraine then asked whether modelling could also take account of the impact on neighbouring countries. The panel responded that this would hopefully be something that the project could take account of, given the very wide geographic coverage and granularity. Available models can look both at the EU national-level (JET and NEMESIS) but also at the EU as one region in the world economy. A final point was raised by Marc Vielle of taking into account the potential for the creation of incentives towards linking national/regional ETs.

Robustness of NECPs

Rocco de Miglio kicked off the discussion by explaining that the project has a wide variety of possibilities when looking at NECPs. Theoretically, three possible examples are offered:

1. Sensitivity analysis based on existing NECPs, stress-testing at the level of Member States and at the EU,
2. Linking tools (models) together for a deeper understanding of NECPs,
3. Extending the analyses of the NECPs by adding new policies to the existing plans.

Marc Vielle offers the view that it could be interesting to look at the consistency between NECPs. Perhaps some NECPs are inconsistent with one another, or with broad regional targets at the EU level, as they are developed individually by countries. The response is that the EU Commission will be running a similar exercise to this, but that PARIS REINFORCE could look to investigate along similar lines. Haris Doukas pointed out also that in many countries there exist local and regional sustainable energy and climate action plans with targets for 2030 which should also be taken into account.

A stakeholder asked whether we would wait for the Commission to translate NECPs into a database we can work with or we should do that ourselves. Rocco De Miglio answered that this would be an important consideration but that the process of finalising NECPs is very short, and that probably within three months a draft analysis will be released for consultation.

A stakeholder raised the issue of 'competition aspects' with any proposed energy policies. Expensive policies have the potential to handicap certain industries. They argued that 'capturing competitiveness effects' is a huge component that must be considered in modelling exercises, and that based on previous modelling runs there is the potential to add value to existing literature by enlarging the capturing of competition loss (or benefits). Another stakeholder agreed with this point and offered a further suggestion that models are also weak in picking up financial aspects—how are transitions and investments financed? Moreover, how do climate policies interact with financial markets and interest rates? Chairs responded that decisions about methodological approaches have not yet been made and so this feedback is appreciated.

Electrification

Rocco de Miglio again outlined that PARIS REINFORCE considers a number of potential approaches to explore electrification. One approach is to explore technology/sector-specific outlook with a technology-specific model, such as the ALADIN model dedicated to the transport sector. The coupling of models could be used to cover the energy system in detail alongside other sectors. Another approach would be sensitivity analysis where the response of certain sectors and other outputs could be analysed with respect to changes in key parameters. Rocco further highlighted an important modelling trade-off that exists between looking at long-run shifts toward electrification and short-term operational decisions (which models would struggle more to assess).

Georg Zachmann asked if models could investigate European decisions about whether/when to make



infrastructure investments in systems of electricity vs hydrogen. Such decisions clearly imply huge consequential outcomes.

Rocco de Miglio responded that it is difficult to give a concrete answer. The JRC-EU-TIMES model has previously been used for very hydrogen-specific analysis in the past, looking at complete electrification of the system. However, the process becomes extremely technical and there is a trade-off between time granularity and complexity. In principle, it would be possible but it is important to be very clear on the borders of what models can achieve.

Baptiste Boitier raised the link with this topic and technological failure. The future of the transport sector is often considered to be electric. If there is any sort of technological failure arising there this would have significant effects and could be something interesting to investigate.

Ajay Gambhir offered another perspective relating to the extent to which high electrification is economically advantageous for particular European countries. Could the project look at implications for the degree to which European countries become technology importers, e.g. cheap solar panels vs manufacturing technology domestically? Could Europe become a hub for storage and manufacturing? This would be an important point in the debate on competition effects. It is important not only to consider the short-run effect of policy but also to consider that the long-run effect and structural changes may imply very different competitive effects. Glen Peters offered the example of Norway, where electricity users do not want Norwegian electricity to be exported as they want their prices to remain low. At the country-level there may arise very different incentives over whether countries want to trade electricity or not. This could be a significant impediment to creating a unified and electrified Europe.

Andrea Herbst added a remark on the competition between direct electrification and the use of secondary energy carriers, such as the debate on green vs. blue hydrogen. Another question would be on hydrogen being produced within EU or in North Africa.

A stakeholder rose the issue of management of intermittency of renewables. IAMs cannot really look at this, which may be a concern, whereas energy system and electricity models can. A final question asked whether the project would focus on the charging side (relating to transport) or also on revenue use. Andrea Herbst commented that this depends on the model employed. With electric vehicles in the ALADIN model, for example, such vehicles can be modelled that are able to sell electricity back to the grid as a source of revenue.

EU Internal Taxation Policies

Andrea Herbst outlined what the project could propose. A set of models can analyse effects under different assumptions about future taxation of sectors outside of the EU ETS. These could be analysed on a sectoral, country, and/or regional level. Models such as NEMESIS, FORECAST, JRC-EU-TIMES could all be used and potentially linked together for a deeper understanding. As an example, a typical exercise could include simulating the extension of the ETS to the transport sector.

Georg Zachmann raised the issue of national fragmentation in taxation vs. uniform EU taxation. There is an efficiency vs. equity argument. Uniform price would be the most efficient but heavily opposed by poorer Member States. Can models look into this? Particularly, how large are the lost efficiency gains in a world where the current system of national fragmentation on the non-ETS side is allowed to continue. That is, are the efficiency losses so large that the EU should expend significant political capital in attempting to harmonise non-ETS sectors or are



they relatively small such that human and political capital would be better spent on alternative schemes, or other areas entirely? A stakeholder from the Czech Republic emphasised their experiences and the importance of better understanding uniform EU taxation with an automobile example from their country. They further asked whether models could look into uniform taxation in sectors where it does not currently exist. Another stakeholder re-enforced the point about burden sharing, and the fact that, if proposed, a uniform EU tax for the non-ETS sectors would lead to significant opposition from certain Member States.

However, it was pointed out that extending ETS is not the only answer for non-ETS sectors. Emission standards might be politically easier to implement. A question of whether such policies (outside of CO₂ taxation) could easily be modelled was added.

Following discussion, stakeholders were again asked to vote according to which topics they were most keen for the PARIS REINFORCE project to investigate. These results are provided below, in Table 2.

Table 2: Voting results from Session 4

Proposed Topics	Score / 5	Non-Academia	Academia
Carbon Border Adjustment	4.11	4.06 (n=17)	4.15 (n=20)
EU Internal Taxation Policies	3.54	3.35 (n=17)	3.70 (n=20)
Robustness of NECPs	3.42	3.50 (n=18)	3.35 (n=20)
Electrification	3.47	3.50 (n=18)	3.45 (n=20)
Non-energy CO ₂ sources	2.84	2.61 (n=18)	3.05 (n=20)
Hydrogen	3.41	3.76 (n=17)	3.10 (n=20)



7 Session 5 – Sustainable climate action: socioeconomic implications, distributional effects & SDGs

The final afternoon session of the event was chaired by *Lorenza Campagnolo (CMCC)*, *Baptiste Boitier (SEURECO)*, *Maurizio Gargiulo (E4SMA)* and *Zsolt Lengyel (IEECP)*.

Lorenza Campagnolo introduced the session by presenting seven topics that had been pre-selected by the consortium on the basis of bilateral interviews with key policy stakeholders and one topic drawing from the crowd-sourcing process. The eight topics were:

- **Air quality indicators:** what are the air quality/pollution co-benefits of regulating GHGs in transport & housing & other sectors? How significant are these co-benefits and what are the trade-offs?
- **Declining carbon intensive sectors:** Climate policies and removing public support on emission intensive energy sectors (e.g. coal). What will be the outcome in terms of employment and other socio-economic dimensions? How can adverse social effects of policies be mitigated in particular regions taking advantage of regional assets (energy resources, human resources)?
- **Cross-sectoral impacts:** In specific mitigation scenarios, and future worlds, how do prices and employment vary across sectors compared with today? How employment will/should evolve in terms of sectoral redeployment and skill requirements to support carbon neutral economies?
- **Impacts by EU Member State:** Will all countries within the EU benefit from a decarbonisation push? Or will there be some losers? What are the general heterogeneous effects of decarbonisation pushes for decarbonisation at the country-level?
- **NECPs and their societal acceptance:** How realistic is it that proposed NECPs can be implemented when taking into consideration societal consequences and concerns? What are the behavioural & value-system changes implied by NECPs?
- **Socioeconomic consequences of climate investment:** What are the range of socioeconomic impacts stemming from a range of investment scenarios aimed at achieving decarbonisation? What are the impacts from the most pessimistic to most optimistic scenarios?
- **Fair/Just transition:** for the current policy and decarbonisation scenarios what are the distributional, health, gender and ethnic impacts?
- **2°C with less cooperation (sli.do-crowdsourced):** How will mitigation cost be redistributed with major emitters (e.g. the USA) withdrawing from the Paris Agreement?

After the presentation of the eight topics, a voting session, via *sli.do*, took place so that stakeholders could select the topics they would be most interested to discuss leading to the following prioritisation:

- 44%: Cross-sectoral Impacts
- 38%: Impacts by EU Member state
- 36%: NECPs and their societal acceptance
- 36%: Fair transitions
- 36%: Socioeconomic consequences of climate investments
- 36%: 2°C with less cooperation
- 31%: Air quality indicators
- 23%: Declining carbon-intensive sectors

Based on the voting results, discussion began according to the prioritised order.



Cross-sectoral Impacts

Baptiste Boitier presented how modellers of the consortium could address this topic. They proposed using sector-detailed macroeconomic models to assess, *inter alia*, structural effects of climate change mitigation scenarios on employment, competitiveness and prices at the macro level as well as at a sectoral level. A first reaction from the audience included a question on whether models consider labour migration and skills transfers. Baptiste Boitier answered that, in the state of the art, models consider population as exogenous and so migration between countries is not explicitly taken into account but intra-country shifts are considered. Regarding skill transfers, some models consider not directly “skills” but the “level of educational attainment” (called qualification) of workers, and then some analysis on the distributional impacts on employment by sector and qualification can be carried out.

A second remark questioned the capability of macroeconomic models to depict emerging large economic sectors as the result of strong decarbonisation of an economy (e.g. DAC industry). Modellers responded that, in the state of the art, macroeconomic models are not well-designed to deal with not yet commercially mature technologies, because of the granularity of the models (given how they do not describe the economy at a technological level) but also because of deep uncertainties about these technologies, especially for their cost components (e.g. capital and labour). However, some models, in a scenario-design framework, can introduce such technologies using assumptions, based for instance on external expert assessments, about key characteristics of a technology.

The following question was about the capability of the models to forecast where some economic activities (e.g. manufacturing of electric vehicles) can take place geographically. Maurizio Gargiulo responded that, for energy system models, this is not really feasible, even if some detailed indicators (such as the total investment required to implement certain technology) can be assessed and provided to macroeconomic models. Baptiste Boitier responded that macroeconomic models are not well-versed to forecast the localisation of new manufacturing plants, even if models provide results on where the production will take place (according to the relative costs of capital and labour between countries and the domestic demand for such technologies). Scenarios analysis, playing on import shares for instance, could be tested in some models. Finally, Zsolt Lengyel confirmed that important factors not present in the models, such as geo-political aspects, are playing major roles in the localisation of new manufacturing plants and that “real” local implementation of such new manufacturing activities will not necessarily follow a least-cost (or optimal) approach, which is typically assumed by the models.

Impacts by EU Member State

Baptiste Boitier suggested that modellers may run different mitigation scenarios with different policy design to test the distributional effects between EU Member States, but also considering a set of SDG indicators pertaining to the economic, social and environmental pillars.

The audience asked if, in the models, the distributional impacts for Member States will be strongly correlated with the carbon intensity of the economy or if there are other surprising results that can emerge from modelling exercises. Baptiste Boitier noted that the importance of the economic impact is generally strongly related to the carbon intensity of economies but also on the level of GDP when considering homogeneous taxation in the EU. However, policies implemented to balance distributional impacts of decarbonisation pathways could significantly modify the results of the models. Lorenza Campagnolo confirmed that the recycling scheme of carbon revenues constitute a very important part of the policy design for macroeconomic models. Besides, Maurizio Gargiulo and Baptiste Boitier confirmed that, provided data availability, some energy system models can deal with technology lock-in aspects and early decommissioning of existing production capacities.



The second question regarded the possibility for the models to deliver information on what the financial support for some Member States could be to ensure a just transition. Maurizio Gargiulo responded that, in energy system models, it is possible to include subsidies and even cost limits to constrain the modelling exercise. Another question was about the capability of the models to deal with carbon leakages. Modellers responded that most of the models have some capability to consider carbon leakages and/or policy instruments aimed at avoiding carbon leakages.

The following question was about the capability of the models to investigate the investments needed to stimulate not yet mature technologies. Maurizio Gargiulo explained that, in some way, it is possible in energy models to accelerate the market penetration of some emerging technologies by introducing financial supports in the modelling runs, and that it is also possible to analyse what the conditions allowing the emergence of some particular technologies are. Baptiste Boitier also contributed by explaining that technical change is generally represented in the applied models, with the “learning-by-doing” principle, while the second main innovation principle, “learning-by-reaching”, is not considered endogenously in these models.

A question on the possibility to consider different interest rates was raised. Maurizio Gargiulo and Baptiste Boitier confirmed, as interest rates generally constitute inputs into the models, different interest rates between countries and sectors as well as according to technologies could all be incorporated.

A final question concerned the capability of the models to consider some impacts of the decarbonisation on SDGs, and especially gender issues. Lorenza Campagnolo confirmed the capability of some models to deal with some SDGs but with only one model being able to consider some (limited) gender aspects.

NECPs and their societal acceptance

Zsolt Lengyel introduced the topic and pointed out that many issues of this topic have already been touched during the previous discussions. He also mentioned that models are not the ideal tool to address societal acceptance of policies, but they can be coupled with other approaches such as the non-modelling ones also employed in PARIS REINFORCE. Baptiste Boitier suggested that, in some cases, the output of models can be insightful, highlighting policy outcomes that can trigger issues of societal acceptance.

A question about the cost effectiveness of investments to “go green” in 2035 (changing energy mix) with respect to continuing importing hydrocarbons was raised. Zsolt Lengyel acknowledged the long debate in the EU on this topic and recalled that an investment of 240-270 billion per year could replace the cost of importing fossil fuels. Shifting funds from import to investment is certainly an important decision to reduce the reliance on fossil fuels, but it is worth remembering that there will be effects within the EU, especially regarding jobs in mining and fossil fuel sectors.

The last question was about models and the two forces at work in them: supply/technological change and demand. Literature on endogenised technological change is wide. Regarding the latter, we know less, we use the substitution effect, but we do not know how to endogenise utility functions. This is an obstacle when we want to describe behaviour and social acceptance. A recent Nobel Prize winner, Daniel Kahneman, brought psychology into the economic theory, but at the moment it is very difficult to introduce these changes into models and we tend to assess the implications of an exogenous shift of preferences.

When the debate was closed, the audience were once again asked to vote via sli.do, by rating the topics based on



their interest in the PARIS REINFORCE project taking them on and trying to address them.

Table 3: Voting results from Session 5

Proposed Topics	Score / 5	Non-Academia	Academia
Air Quality Indicators	3.43	3.53 (n=19)	3.33 (n=18)
Declining carbon-intensive sectors	3.97	3.68 (n=19)	4.28 (n=18)
Cross-sectoral impacts	3.92	4.00 (n=19)	3.82 (n=17)
Impacts by EU Member State	3.78	3.68 (n=19)	3.89 (n=18)
NECPs and their societal acceptance	3.35	3.05 (n=19)	3.67 (n=18)
Socioeconomic consequences of climate investment	3.46	3.68 (n=19)	3.22 (n=18)
Fair/Just Transition	3.43	3.16 (n=19)	3.72 (n=18)
2°C with less cooperation	3.05	2.95 (n=19)	3.17 (n=18)

7.1 Stakeholder Multi-Criteria Prioritisation of SDGs

This fifth session and the event were ended by a stakeholder vote on the Sustainable Development Goals (SDGs). The PARIS REINFORCE project will look to incorporate effects on some SDGs in its modelling analysis. It was therefore useful to receive input from stakeholders on particular assessment criteria for the SDGs.

32 participants took part in the sli.do vote to offer an opinion/perception of the urgency, relevance, and progress trend of selected SDGs. This information will be informative for the modelling teams in prioritising SDGs in the analyses.

The terms Urgency, Relevance, and Trend were defined as follows:

- Urgency: How urgent do you find this SDG is to address?
- Relevance: How relevant to climate action do you think this SDG is?
- Trend: How do you perceive the trend of this SDG towards the end goal to be?

The highest score for urgency was *Goal 14: Life Below Water* (4.4), followed by both *Goal 12: Responsible Consumption and Production* (4.1) and *Goal 15: Life on Land* (4.1). The highest score for relevance was *Goal 7: Affordable and Clean Energy* (4.3), followed by *Goal 12: Responsible Consumption and Production* (4.2) and *Goal 15: Life on Land* (4.2). The highest scores for trend were *Goal 7: Affordable and Clean Energy* (3.0) and *Goal 8: Decent Work and Economic Growth* (3.0).



Table 4 Multi-criteria evaluation of SDGs against urgency, relevance to climate action and trend

SDG Goal	Urgency	Relevance	Trend
Goal 1: No Poverty	3.9	3.4	2.4
Goal 2: End Hunger	3.7	3.9	2.5
Goal 3: Good Health and Well-Being	3.5	3.6	2.6
Goal 4: Quality Education	3.4	3.3	2.5
Goal 5: Gender Equality	3.3	3.1	2.4
Goal 6: Clean Water and Sanitation	4.0	3.8	2.6
Goal 7: Affordable and Clean Energy	4.0	4.3	3.0
Goal 8: Decent Work and Economic Growth	3.4	3.4	3.0
Goal 9: Industry, Innovation and Infrastructure	3.6	3.8	2.8
Goal 10: Reduced Inequality	3.8	3.9	1.9
Goal 11: Sustainable Cities and Communities	3.9	3.7	2.8
Goal 12: Responsible Consumption and Production	4.1	4.2	2.8
Goal 14: Life Below Water	4.4	3.8	2.3
Goal 15: Life on Land	4.1	4.2	2.3
Goal 16: Peace and Justice Strong Institutions	3.6	3.6	2.2





Figure 1: Word Map based upon 'crowdsourced' questions



8 Presentations

The presentations can be found on the website, as follows:

- An introduction to PARIS REINFORCE (*PDF available [here](#)*)
- Session 1 – Can our models deliver what you need? (*PDF available [here](#)*)
- Session 2 – Co-designing the open-access, data-exchange I2AM PARIS platform (*PDF available [here](#)*)
- Session 3 – Global threat, global pathways: designing policy-relevant scenarios (*PDF available [here](#)*)
- Session 4 – A Paris-consistent Europe: aligning national (NECPs), regional (EU NDC) & global action (*PDF available [here](#)*)
- Session 5 – Sustainable climate action: socioeconomic implications, distributional effects & SDGs (*PDF available [here](#)*)
- Wrap-up & Next Steps (*PDF available [here](#)*)



ANNEX

A1: Potential Research Areas

Global threat, global pathways: designing policy-relevant scenarios

1. Helping to improve and **go beyond established NDCs** in non-EU countries with potentially weaker modelling capabilities and outdated (technology cost) assumptions. Facilitating and encouraging strong ambition. What role can our models play in improving NDCs of developing, or non-EU, countries?
2. How would **extreme decarbonisation scenarios** look like, such as net-zero by 2030.

Cross-border issues

1. How to ensure more effective global **cooperation**: mitigation costs are higher in developed countries than developing countries, yet developed countries have significantly improved financing options. How can effective mechanism and coordination measures be better designed on a global level to reduce emissions?
2. How does required **mitigation by each region** differ in a policy-realistic scenario? Under such a proposed scenario, is there a role for increased global emissions trading to facilitate it?
3. What **carbon prices** are needed to meet mitigation targets in 2030? How could different carbon prices across different regions look like?
4. How does climate **migration** affect future pathways? This will affect different parts of the world in a different manner and could have impacts for SDGs. In future scenarios of drastic climate change, migration could have huge economic implications for analysis at a country-level.
5. Globally, where will new low-carbon innovation and technologies emerge? Which regions can we expect to develop competitive advantages in particular technologies? On the other hand, where will demand for low-carbon technologies emerge?

Sectoral

1. Exploring the robustness of future pathways to **failures of key technologies**:
 - If CCS cannot be scaled up to its full potential, what are the implications, and what are the other technologies that will have to step forward and take its place? How much more expensive is it to reach targets if CCS is not implemented (or deployed at half the rate)?
 - How do 1.5/2.0 scenarios look with limits placed on land use?
2. **Freight transport**. What is the underlying potential of changing freight transportation (e.g. substituting for LNG in shipping) in mitigating global emissions?
3. **Heavy industrial sectors**. Which decarbonisation routes appear the most promising? (e.g. Hydrogen, CCS, synthetic fuels)
4. Regarding **CO₂ sinks**: which routes are the most promising, where will these appear in terms of type (nature-based, CCS) and geography. How can we expect LULUCF sinks to evolve in a changing climate? This would involve both mitigation and adaptation considerations.
5. In achieving future targets, what is the share of mitigation that will be achieved via **lifestyle/behavioural change** and what is the share that will be achieved via technological innovation? To the extent that lifestyle change is required, what policy measures (beyond taxation) should be pursued in order to stimulate these necessary lifestyle changes?
6. What are the **resource requirements** for the energy transition, in terms of biomass but also in terms of non-energy resources?



A Paris-consistent Europe: aligning national (NECPs), regional (EU NDC) and global action

1. Sensitivity/robustness analysis of **MS NECPs**. They have been created individually by Member States: Are they realistic? do they hold true when imposing different assumptions? Or when running them through different models?
2. Analysing NECPs from European perspective. Taken together, do they add up and conform to EU targets?
3. **Taxation**, EU-internal. Evaluation of the Energy Taxation Directive. Considering both the EU ETS and fragmented non ETS sectors (transport particularly topical).
 - a. What is the scope for increasing ambition in terms of coverage of the ETS – this can be both in terms of expanding it to cover sectors not currently under the ETS, as well as reducing permits and driving the price higher for existing sectors.
 - b. What are the potential implications of harmonisation of taxation across the EU in non-ETS sectors? Modelling policies to ensure that GHG reductions in non-ETS sectors become cost-effective.
4. **Carbon Border Adjustment**. Can models provide justification for the implementation of CBA. That is, model the European economy when more stringent climate policies are introduced and better understand the loss (leakage) suffered by industries. If this indeed exists, then can it be reduced by CBA?
 - a. Will such industries indeed suffer competitiveness disadvantages from climate policies?
 - b. What alternative, EU-regional or domestic, measures can be introduced to ensure that EU industries (particularly heavy, energy-intensive) remain competitive in a world where the EU pushes stringent climate action and other global regions do not?
 - c. What would the impact of CBA be on non-EU countries that we may consider within our consortium (suggested by *Ukraine* but can be extended to other countries).

Electricity

5. **Electrification**. Will there be enough renewable energy generation, storage, and distribution capacity for the electrification of transportation, building heating, and direct air capture.
 - a. Modelling scenarios in which electricity grids are able to manage future scenarios of extremely high electrification. Ensuring guarantee of supply from renewables important before phase-out of coal/nuclear.
 - b. How can we achieve 100% renewable electricity? What is the role for storage and demand management? (*Spanish question*)
 - c. Better understanding scenarios of electrifying everything. Considering scenarios of extensive electrification, e.g. heating, transport, and some industry all being electrified.
 - d. What is the future of hydropower in Europe, particularly in relation to an ever-drying climate? Thus, considering this as an adaptation mechanism.
 - e. If Europe proceeds to proposed coal-phase out, what are post-lignite regimes going to look like?

Other Sectors

6. Feasibility of **hydrogen/biogas** within the EU.
7. Measures that can be taken for **non-energy CO2 sources**, e.g. waste-incineration and cement plants (*Switzerland question*)
8. What is the role of **natural gas** within the EU as a transitional fuel? And until when?
9. What is the future of the **automotive** sector faced with the challenges of decarbonisation and potentially deep electrification?
10. How much mitigation should happen within the EU as opposed to financial/technological transfers to helping other regions decarbonise? Modelling to highlight the effectiveness of **EU financial flows to developing countries** in terms of reducing emissions, and potentially providing business opportunities for EU companies.



11. Imposition of standards/regulations (or other policy measures) on the **built environment**. Taking into account updated required resilience in a changing climate.
12. Developing a better understanding of a **smart integration strategy** within Europe. How can deep industry integration facilitate decarbonisation and squeeze out efficiency? This can be both physical infrastructure integration and on the demand side (sector coupling). Multi-modal electricity demand competition (e.g. EVs being incorporated into a smart electricity charging and storage network).
13. What is a realistic and sustainable contribution of biological carbon sink to zero emissions in 2050 within the EU?

Sustainable climate action: socioeconomic implications, distributional effects and SDGs

1. To what extent are current scenarios, based upon current policies, oriented towards '**just transitions**', in terms of distributional impacts and future local economies?
2. Within **declining carbon intensive sectors**, e.g. coal. How will removing public support, or indeed penalising such sectors result in terms of employment and other socio-economic measures? How can policies be designed to take advantage of regional assets (energy resources, human resources) in order to mitigate adverse social effects in particular regions following the introduction of climate policies?
3. **Cross-sectoral impacts**. How do prices and employment vary cross-sector? How employment will/should evolve in terms of sectoral redeployment and skill requirements to support carbon neutral economies.
4. Taking into account **air quality indicators** when assessing transport emissions. i.e. benefits are not only accruing from CO₂ reductions, but significant benefits in local air pollution would also arise.
5. Will all countries benefit within the EU from a decarbonisation push? Or will there be some losers? How can this best be addressed?
6. Exploring methods of implementing CO₂ taxation without regressively affecting lower income households.
7. What are the range of socioeconomic impacts stemming from a range of investment scenarios aimed at achieving decarbonisation? I.e. running from most pessimistic to most optimistic (*France*)
8. How realistic is it that proposed **NECPs** can be implemented when taking into consideration societal consequences and concerns?

