



Net0Pathways through impRoved IAMs across Sectors, diMensions, and scAles

Deliverable 7.7

*Report and evaluation summary
of two Summer Schools*

Deliverable 7.7

30 June 2026



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Deliverable Title	Report and evaluation summary of two summer schools
Deliverable number	7.7
Brief Description	Report and evaluation summary of the two PRISMA summer schools by PBL and UNIGE
WP number	7
Lead Beneficiary	FONDAZIONE CMCC
Author(s)	Sofia Di Franco, Mathijs Harmsen, Constance Crassier, Evelina Trutnevyt, Ricardo Flores
Deliverable Due Date	June 30, 2026
Actual Delivery Date	June 30, 2026
Nature of the Deliverable	R – Document, report
Dissemination Level	PU - Public
KeyWords	Summer school, Report, Collaboration, Dissemination of results

Date	Vers.	Contributors	Pages
29/05/2026	1	Sofia Di Franco, Mathijs Harmsen, Constance Crassier	19
23/06/2026	2	Evelina Trutnevyte, Ricardo Flores	29
30/06/2026	3	Sofia Di Franco, Johannes Emmerling	36



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Table of Contents

Scope and Structure	4
Summary: Summer School 1	7
Overview	7
Minutes	11
Key take aways	17
Summary: Summer School 2	20
Overview	20
Minutes	24
Key Take aways	27
Evaluation	30
Participant satisfaction	32



Scope and Structure

The PRISMA project places a strong emphasis on capacity building and knowledge sharing, aiming to reduce the barriers to involvement in Integrated Assessment Modeling (IAM) activities.

This commitment is not incidental – it is formally embedded in the project's Grant Agreement, which identifies several compelling drivers for this strategic investment.

- Models developed within PRISMA are complex and require specialised knowledge. Transparency and reproducibility are identified as essential elements of trust-building for evidence-based policy assessment.
- The project follows the FAIR principles (Findability, Accessibility, Interoperability, and Reuse), and the summer schools are a hands-on mechanism to operationalise these principles.
- There is a recognised need to reach early career modellers and researchers in disciplines or regions where IAM capacity is limited – both within the EU and beyond.
- Increasing the user base of IAMs strengthens the scientific foundation for major international assessments such as IPCC, IPBES, and IRP reports, which several PRISMA partners contribute to.

The following sections outline the key components through which PRISMA planned to pursue these goals:

Scientific and Technical Capacity Building

- Provide basic and advanced knowledge on integrated assessment modelling (IAM) frameworks developed by the PRISMA consortium.
- Train participants in working with the PRISMA Scenario Explorer and associated databases.
- Introduce participants to open-source model codes, data processing workflows, and model documentation practices developed under Task 1.2 (Documentation) and Task 1.4 (Open Access).



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

- Offer hands-on sessions complementing online tutorials and video lectures developed within WP1.

Audience and Reach

- Target early career researchers and modellers, including those from regions/institutions with currently weaker in-house modelling capacities.
- Engage potential model users from both EU and non-EU countries to improve modelling capacity and lower the entry barrier to applying PRISMA tools.
- Complement broader dissemination activities including webinars and hands-on sessions at dedicated conferences (IAMC, EMP-E).

Community Building

- Foster networking between participants and PRISMA researchers, facilitating ongoing collaboration beyond the project lifetime.
- Create a community of researchers capable of applying and building upon the tools developed during the project.
- Obtain constructive feedback from participants to improve PRISMA methodologies and usability.

In summary, PRISMA's summer schools are designed to empower researchers and foster international collaboration in the field of integrated assessment modelling, delivered in the format of intensive, in-person workshops. The key structural elements are summarised in the table below:

Element	Description
Number of events	Two summer schools over the lifetime of the project
Format	Intensive workshops; in-person (one hosted by PBL and one by UNIGE)
Target Audience	Early career researchers, aspiring modellers; EU and non-EU participants; institutions with limited IAM capacity



Thematic Focus	Integrated Assessment Modelling (IAM); model data use and access; open-source tools; scenario analysis for net-zero pathways
----------------	--

This report evaluates the two summer schools in accordance with the monitoring and quality assurance mechanisms established under Task 7.3 and the Communication, Dissemination and Exploitation Plan (D7.2). The evaluation is structured around three interconnected dimensions: participation and geographic reach, learning outcomes, and participant satisfaction. Together, these dimensions provide a comprehensive and balanced picture of the extent to which the summer schools achieved their intended objectives.



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Summary: Summer School 1

1.1 Summer School on Climate Impacts and Equity. 7-11 July 2025, Utrecht, The Netherlands



Overview

Abstract

As climate impacts and equity become more central in policy discussions, there is a growing need for researchers to understand how integrated assessment models can capture and address these issues. To support this, the PRISMA project, supported by the European Union's Horizon Europe research and innovation programme, is hosting a Summer School for young international scholars, advanced PhD students, and early postdocs.

The school brought together a carefully selected cohort of young international scholars, advanced doctoral students, and early postdoctoral researchers for an intensive week of learning, exchange, and collaboration. Its overarching objective was to cultivate a community of early career scientists drawn from a broad range of disciplines – including climate science, ecology, economics, energy systems, and political science – who are actively



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

engaged in modelling human activities and Earth system dynamics within an integrated assessment framework. Participants explored a rich set of interconnected themes, with a particular focus on climate impacts, adaptation strategies, equity, and climate finance, and on how these topics can be meaningfully integrated into IAMs.

Structure of the week

- 10 lectures about IAMs, including an introductory presentation on IAMs and their role as input to global stock stake and policy analysis.
- Interactive poster sessions where the student will be invited to present their research or relevant work.
- Hands-on workshop sessions on 1) economic climate impacts in IAMs and on 2) data analysis and visualization.
- Group work on model development/analysis.
- Social events

Lecture topics

1. The need for representing and improving climate impacts and equity in models
2. Fair regional burden sharing in global climate policy
3. Climate impacts
4. Climate change adaptation, maladaptation and adaptive capacity
5. Climate litigation and influential climate court cases
6. Gender inequality in climate impacts and climate policy
7. Climate finance

Programme



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Sunday (July 6)	Monday (July 7)	Tuesday (July 8)	Wednesday (July 9)	Thursday (July 10)	Friday (July 11)
	Introduction	Impacts and adaptation	Equity	Finance, equity and mitigation	Applications for integrated assessment
8:00	Breakfast at hotel	Breakfast at hotel	Breakfast at hotel	Breakfast at hotel	Breakfast at hotel
8:30	Travel to school location	Travel to school location	Travel to school location	Travel to school location	Travel to school location
9:00	9:00-10:00 Welcome and Introduction "Need for representing impacts and equity", Detlef van Vuuren	9:00-10:00 Climate impacts in IAMs, Kaj-Ivar van der Wijst	9:00-10:00 Normative considerations in the models & actions for improvement Elina Brutchin	9:00-10:00 Cap & Trade, efficiency versus sovereignty, Nico Bauer	9:00-10:00 Climate litigation cases, Yann Robiou du Pont
9:30					
10:00	10:00-11:00 Deep dive in perspectives and challenges, Nico Bauer Elina Brutchin	10:00-11:00 Adaptation & adaptive capacity, Marina Andrijevic	10:00-11:00 Fairshares in climate action, Mark Dekker Yann Robiou du Pont	10:00-11:00 Equity impacts of climate mitigation, Panagiotis Fragkos	10:00-11:00 Group work
10:30					
11:00	Break	Break	Break	Break	Break
11:30	11:30-12:30 Poster presentations	11:30-14:30 Workshop: Economic climate impacts in IAMs Kaj-Ivar van der Wijst	11:30-12:30 Gender inequality and climate, Marina Andrijevic	11:30-12:30 Finance in IAM models, Bjarne Steffen	11:30-12:30 Group work presentations
12:00					
12:30	12:30-13:30 Lunch	12:30-13:30 Lunch	12:30-13:30 Lunch	12:30-13:30 Lunch	12:30-13:30 Lunch
13:00					
13:30	13:30-15:30 Poster presentations		13:30-15:30 Workshop: data visualisation Kaj-Ivar van der Wijst	13:30-17:00 Group work	13:30-15:30 Group work presentations
14:00					
14:30		14:30-17:00 Group work			
15:00					
15:30	Break	Break	Break	Break	Break
16:00	16:00-17:30 Group work		16:00-17:30 Group work		16:00-17:00 Closing session / feedback Detlef van Vuuren
16:30		17:00-19:00 Social event: Citybike ride		17:00-19:00 Social event: Canoeing through canals	
17:00					
17:30					
18:00					
18:30					
19:00	19:00 Social Dinner	19:00 Social Dinner	19:00 Social Dinner		
19:30	19:30 Social Dinner Sarban Afghaans, Oudegracht aan de Werf 161	19:30 Social Dinner Soia, Kanaalweg 199	19:30 Social Dinner Theehuis Rhijnauwen, Rhijnauwenlaan 16	19:15 Social Dinner Kitchen Bar Danel Vredenburgkade 11	

- Download the Presentations ([link](#))
- Watch the Recordings ([link](#))

Faculty

The summer school brought together a distinguished faculty of researchers from leading European institutions:

- Prof. Dr. Detlef van Vuuren – PBL Netherlands Environmental Assessment Agency (PBL) and Utrecht University



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

- Dr. Marina Andrijevic – International Institute for Applied Systems Analysis (IIASA)
- Dr. Nico Bauer – Potsdam Institute for Climate Impact Research (PIK)
- Dr. Elina Brutschin – International Institute for Applied Systems Analysis (IIASA)
- Dr. Mark Dekker – PBL Netherlands Environmental Assessment Agency (PBL) and Utrecht University
- Dr. Panagiotis Fragkos – E3 Modelling (E3M)
- Dr. Yann Robiou du Pont – Utrecht University
- Dr. Bjarne Steffen – ETH Zürich
- Dr. Kaj-Ivar van der Wijst – Utrecht University

The event was organised by **Dr. Mathijs Harmsen** and **Constance Crassier**, both from PBL Netherlands Environmental Assessment Agency.

Target Audience and Eligibility

The summer school was open to advanced doctoral students (typically from the second year of their PhD onwards) and early career scientists, including early postdoctoral researchers, affiliated with any university, research institute, or organisation – including private companies, government agencies, and NGOs. Eligible candidates were those whose research involves the use of computational methods to study environmental and climate-related issues, such as energy system models, climate models, ecological models, or macroeconomic models. A solid programming background in at least one of the following languages was required: Python, GAMS, Julia, R, MATLAB, or C++.

Participation was deliberately kept small-scale to maximise the quality of interaction: the cohort was capped at 22 individuals, drawn from both EU (8, or 36%) and non-EU (14, or 64%) countries, in line with PRISMA's commitment to international outreach and inclusion.

Criteria and Process for Selection

Students were selected based on the combined score of 3 selection categories, for each of which the candidates could score a maximum of 5 points: 1) Programming / Technical skills, 2) Knowledge/background and 3) Motivation. So, candidates could earn a maximum of 15



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

points. The assessment was performed by the faculty members and was based on the following documents provided by the students: 1) Curriculum Vitae, 2) Motivation letter, 3) A letter of reference from his/her supervisor (with original signature), 4) A transcript of the most recent grades and 5) The draft of the paper or scientific work the researcher will present during the summer school in the form of a poster presentation (no length constraint). Topic-wise, this could be anything related to the students' background. 114 students applied, of which 22 (all with 13-15 points) were selected.

Gender balance

Report on gender composition of both instructors and participants: consistent with PRISMA's gender management commitments (D7.4). The student group consisted of 18 females and 4 males.

Minutes

Monday, 7 July 2025 – Foundations: IAMs, Equity, and Impacts

The week opened with a welcome and introductory lecture by **Prof. Dr. Detlef van Vuuren**, who set the intellectual tone for the entire school. He provided an overview of IAMs and their function as key inputs to global climate policy analysis, before turning to the pressing question of why impacts and equity have historically been underrepresented in these models. Historically, climate impacts were excluded from IAMs in order to avoid double-counting and to contain uncertainty. However, van Vuuren argued that the field is now moving decisively towards "closing the loop" by incorporating impacts – a shift driven by three key rationales: the direct policy relevance of impacts, their influence on mitigation dynamics, and the importance of quantifying the benefits of avoiding climate change.

He then introduced the different dimensions of equity captured in the modelling literature, encompassing differences in historical contributions to emissions, varying capacities to reduce emissions, and the uneven consequences of both climate change and mitigation action. Drawing on Zimm et al. (2024), he outlined the key forms of justice – procedural, distributive, corrective, recognitional, and transformational – noting that distributive equity



can itself be operationalised in different ways, for instance through principles of responsibility, cost-effectiveness, or grandfathering. He also cautioned against narrowly focusing on climate change to the neglect of other environmental dimensions, and observed that current trajectories appear to be moving towards SSP3 – a scenario path associated with lower levels of justice and international cooperation.

This was followed by a deep-dive session delivered jointly by **Dr. Nico Bauer and Dr. Elina Brutschin**. Bauer offered a comprehensive conceptual overview covering topics including intragenerational and intergenerational equity, the representation of heterogeneity in models (across age cohorts, geographies, and sectors), discounting, the social cost of carbon, process-based versus econometric approaches to impact assessment, the modelling of economic damages and GDP persistence effects, and the role of finance and capital in the energy transition. Brutschin complemented this with a clarifying discussion of the conceptual distinctions between justice (grounded in moral principles), equity (as the practical implementation of justice), and fairness (as individual perception). She provided a structured overview of key justice frameworks and their relevance to IAM research.

Tuesday, 8 July 2025 – Climate Impacts and Adaptation

The second day focused on how climate change damages and adaptation are represented – and could be better represented – within IAMs. **Dr. Kaj-Ivar van der Wijst** opened with an examination of climate change damage modelling. He distinguished between market damages, which are more readily quantifiable and have thus dominated the literature, and non-market damages – such as health impacts beyond direct healthcare costs and biodiversity loss – which are considerably harder to monetise. He discussed two main modelling approaches: the sectoral market damage approach, which uses regional damage functions within computable general equilibrium (CGE) frameworks (as in the DICE model), and the empirical approach, which draws on historical correlations between climate conditions and economic outcomes (as in Burke et al., 2015). Both carry significant limitations: the former risks underestimating damages by omitting certain sectors and can become a "black box", while the latter struggles to disaggregate impacts by sector and to extrapolate reliably into unprecedented future climate conditions.



Dr. Mathijs Harmsen then presented findings from a systematic survey on the representation of climate impacts and adaptation across IAMs, situating his work within the broader context of the field's historical focus on mitigation rather than impacts. The survey revealed that economic and energy sectors are the most commonly represented in impact modelling, that sea-level rise and extreme events are the most frequently addressed adaptation categories, and that the majority of models treat adaptation in a stylised manner – typically assuming either no adaptation or optimal (i.e., full) adaptation – rather than capturing the wide spectrum of possible adaptive responses. Harmsen also flagged the risk of double-counting as one of the key methodological challenges in this area.

Dr. Marina Andrijevic then addressed the concept of adaptive capacity – the ability of societies to respond to climate change – and its integration into IAMs. Drawing on van Maanen et al. (2023), she described the spectrum of modelling approaches, ranging from cost-based IAMs that optimise adaptation against residual damage costs (such as the AD-DICE model), to process-based IAMs that represent adaptation in a more stylised fashion while accounting for socio-economic enablers and constraints. She introduced several higher-order dimensions of adaptive capacity – including institutional quality, information and awareness, and access to finance – and illustrated how these can be represented using indicators consistent with the Shared Socioeconomic Pathways (SSPs). A concrete example was provided through the concept of the "cooling gap", whereby regional adaptive capacity was assessed based on temperature exposure, access to cooling infrastructure, and a set of socio-economic covariates, and projected forward under RCP4.5 across different SSP scenarios. Andrijevic also introduced the concept of dynamic adaptation pathways (Haasnoot et al., 2024), which go beyond discrete adaptation options to explore sequenced, transformative pathways over time – with ongoing work aiming to embed these within the SSP framework.

The afternoon workshop sessions on Tuesday and Wednesday were led by **Dr. Kaj-Ivar van der Wijst**. Both sessions relied on the use of open-source content, openly licensed materials, and connections to public repositories. The Tuesday session focused on economic impacts of climate change and equity (using the publically available MIMOSA model, <https://utrechtuniversity.github.io/mimosa/>). Here, students could actively assess the interaction between climate impact and equity principles, by making updates to and running the MIMOSA model. The results from these model runs could also be used in the group work.



The workshop on Wednesday focused on the visualization of IAM modelling work, making use of the public AR6 database (<https://data.ene.iiasa.ac.at/ar6/>). Students were shown and allowed to experiment with a variety of expert visualizations for IAM scenario analysis, guiding participants through two core principles: first, showing the data effectively using perception-ranked visual encodings; and second, communicating a clear message through design choices informed by Gestalt principles, thoughtful use of annotations, consistent formatting, and accessible labelling conventions. Both workshops made use of open source Python code, using Anaconda (<https://www.anaconda.com/download>), which is a distribution of Python that simplifies the download and set-up process.

Wednesday, 9 July 2025 – Normative Dimensions, Fair Shares, and Gender Equity

The third day opened with a session by **Dr. Elina Brutschin** on the normative dimensions embedded in IAM research. She argued that modelling is never value-neutral: the research process involves a series of normative choices, and greater transparency about these choices – and the reasoning behind them – is essential. She also highlighted the importance of feasibility considerations in scenario work, noting that a clearer articulation of what is considered politically and socially feasible can enrich the exploration of different strategies and outcomes. Justice considerations, she argued, can enter the modelling process at multiple stages: in core model assumptions (for example, the treatment of bioenergy land use, which often implies large-scale land conversion in tension with biodiversity goals); in scenario narratives (for instance, through the integration of socio-economic development pathways with more explicit wellbeing and equity dimensions, or through low-energy-demand scenarios); and in post-processing, through tools designed to assess health impacts, air pollution mortality, and other justice-relevant indicators from model outputs.

Dr. Mark Dekker and **Dr. Yann Robiou du Pont** then co-led a session on fair shares in climate action. They traced the intellectual and political history of fair-shares research, from the post-Rio 1992 debates on differentiated emission reduction responsibilities through to the Paris Agreement's principle of "common but differentiated responsibilities and respective capabilities". They examined how different allocation principles – including cost-optimality, continuity (grandfathering), equality, capability-based approaches (linked to GDP or mitigation costs), and historical responsibility – yield very different implications for individual



countries. For example, Europe faces its least stringent allocation under equality-based principles, while countries such as Zambia face greater stringency under responsibility-based approaches. Dekker presented findings from a recent paper (Dekker et al., 2025) exploring how different sources of uncertainty – normative, strategic, and physical – affect each country's fair share of the global carbon budget, and introduced the interactive carbonbudgetexplorer.eu platform as a tool for exploring these dynamics. The session also addressed unresolved tensions and limitations in fair-shares research, including the legal contestability of grandfathering, the challenge of accumulating carbon debt, and the field's current focus on mitigation to the relative neglect of adaptation.

The afternoon featured a lecture by **Dr. Marina Andrijevic** on gender inequality in the context of climate change. She opened with a conceptual discussion of the distinctions between gender equity and gender equality, before presenting the Gender Inequality Index (UNDP) and the EU Institute for Gender Equality Index as key measurement frameworks. She highlighted that progress towards SDG targets on gender equality remains severely off track. Introducing the concept of intersectionality – coined by Kimberlé Crenshaw – she situated gender inequality within a broader web of overlapping and reinforcing forms of discrimination. She presented projections of gender equality across SSPs by 2050 (Andrijevic et al., 2020), showing that SSP3 pathways risk entrenching existing inequalities, while SSP1 – driven by higher education levels and demographic transitions – produces substantially more gender-equal outcomes. She then presented original research demonstrating that a 5% increase in the share of female researchers is associated with approximately four additional environmental patents per capita, suggesting that gender inequality in research carries real costs for innovation and sustainability outcomes. The session concluded with a discussion of the differential climate vulnerabilities faced by women and men – including women's disproportionate exposure to climate extremes and their limited access to adaptive resources – and the potential implications of gender (in)equality for demand-side behavioral change in the context of mitigation.

Thursday, 10 July 2025 – Equity in Mitigation, Finance, and Policy

The fourth day addressed equity and finance from a more explicitly policy-oriented perspective. **Dr. Nico Bauer** returned to discuss equity in international climate policy



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

scenarios, using the metaphor of sharing a global cake to illustrate the trade-offs between uniform and differentiated carbon pricing. He engaged critically with recent literature (Kantitkar et al., 2025) and argued that claims that IAMs are not centred on equity principles are misplaced: equity principles are, in his view, at the core of IAM design. He discussed the role of technology in reducing carbon prices and mitigating interregional tensions, and highlighted the scale of permit transfers between regions in model scenarios, which raises important questions around national sovereignty. He concluded by arguing that while the carbon budget framework defines an analytically tractable zero-sum game, such games are politically difficult to negotiate – partly because the carbon budget logic fails to capture the positive motivations countries have to avoid climate change. He proposed the inclusion of willingness-to-pay to avoid warming as one promising alternative framework, alongside issue linkage with the SDGs and broader political arguments.

Dr. Panagiotis Fragkos then explored the equity implications of climate mitigation pathways in greater depth. He stressed that while climate policies are necessary, they frequently generate negative distributional consequences across countries, sectors, and households – consequences that must be taken seriously both for ethical reasons and because public acceptance of climate action depends on perceptions of fairness. He mapped out the different dimensions of justice in IAMs – distributional, procedural, corrective, and transitional (following Zimm et al., 2024) – and presented a range of inequality indicators used to assess distributional impacts in modelling studies. He concluded that equity in IAMs is not merely a moral imperative but also a practical one: better integration of justice considerations improves the legitimacy, feasibility, and policy relevance of model-based assessments.

Dr. Bjarne Steffen closed the day's lectures with a session on climate finance in IAMs, arguing forcefully that the cost of capital is one of the most consequential – and most frequently underappreciated – parameters in integrated assessment modelling. The energy transition requires the replacement of fossil infrastructure with highly capital-intensive clean energy technologies before the end of their operational lifetimes, implying enormous and sustained capital needs. Steffen demonstrated how heterogeneity in the cost of capital – across time, countries, and technologies – significantly affects model outcomes for renewables deployment and overall mitigation pathways, and questioned why this heterogeneity is so often disregarded in IAMs. He illustrated how policy interventions at



multiple levels – from energy sector regulation to green state investment banks and multilateral development banks – can substantially lower the cost of capital and thereby alter the economics of the energy transition. He presented a convergence scenario in which the cost of capital for renewables is brought down globally, showing its potentially transformative effects on the pace and distribution of the transition.

Friday, 11 July 2025 – Climate Litigation and Closing

The final day of the school opened with a session by **Dr. Yann Robiou du Pont** on climate litigation and influential climate court cases. As this session contained confidential information drawn from live legal proceedings, detailed notes cannot be included. However, a revised version of the presentation has been made available on the PRISMA website.

The school closed with a brief plenary session led by **Dr. Mathijs Harmsen** and **Prof. Dr. Detlef van Vuuren**, in which heartfelt thanks were extended to all participants and faculty for their engagement and contributions throughout the week.

Key take aways

The first PRISMA Summer School left participants with a set of cross-cutting insights that reflect both the current state of the IAM field and the directions in which it is - and must continue to be - moving. Materials from the week have been publicly available on the [website](#), and shared on social media via a dedicated LinkedIn post.

IAMs are evolving to incorporate not just mitigation, but also impacts, adaptation, and equity lenses

IAMs are broadening their scope beyond mitigation. A central theme running through the week was the recognition that integrated assessment models have historically been developed and used primarily as tools for analysing mitigation pathways. This is changing. The field is increasingly embracing the full complexity of the climate challenge by incorporating climate impacts, adaptation dynamics, and equity considerations into model structures and scenario frameworks. "Closing the loop" – connecting mitigation efforts to



the damages they prevent and the distributional consequences they entail – is no longer an aspiration but an active area of model development.

A growing emphasis on justice and feasibility in scenario development is reshaping research priorities

Across multiple sessions, speakers emphasised that the normative dimensions of IAM research can no longer be treated as secondary or external concerns. Decisions about model assumptions, scenario narratives, and post-processing choices all embed value judgements – and making these explicit is both a scientific and an ethical responsibility. At the same time, a growing body of work is integrating feasibility considerations into scenario design, acknowledging that technically optimal pathways are only meaningful if they are also politically and socially navigable.

Adaptive capacity and finance are key levers for just transitions

The school underscored that achieving a just transition is not simply a matter of redistributing the costs of mitigation more equitably. Adaptive capacity – shaped by institutions, access to information, and financial resources – determines which communities and countries are able to respond effectively to climate change, and must therefore be treated as a core variable in integrated assessments. Similarly, the cost of capital emerged as a powerful and underappreciated driver of the pace and geography of the energy transition, with significant implications for global equity and the feasibility of ambitious climate targets.

Fairness is not just a normative question—it shapes policy relevance and societal acceptance

A recurring argument throughout the week was that equity considerations are not simply matters of moral principle to be addressed after the modelling is done. Perceptions of fairness fundamentally shape the political acceptability of climate policies and, ultimately, whether ambitious mitigation and adaptation action can be sustained over time. IAMs that fail to account for distributional consequences risk producing scenarios that are analytically elegant but politically unrealisable.



Gender, governance, and inequality are crucial, quantifiable factors in model-based climate analysis

Gender, governance, and inequality are quantifiable, model-relevant factors. The school challenged any remaining tendency to treat social dimensions – such as gender inequality, institutional quality, and broader socio-economic heterogeneity – as qualitative context rather than as variables amenable to rigorous quantification and integration. Evidence presented during the week demonstrated that gender equality, governance structures, and distributional dynamics can be meaningfully represented in scenario frameworks and that doing so materially improves the quality, legitimacy, and policy relevance of model-based assessments.

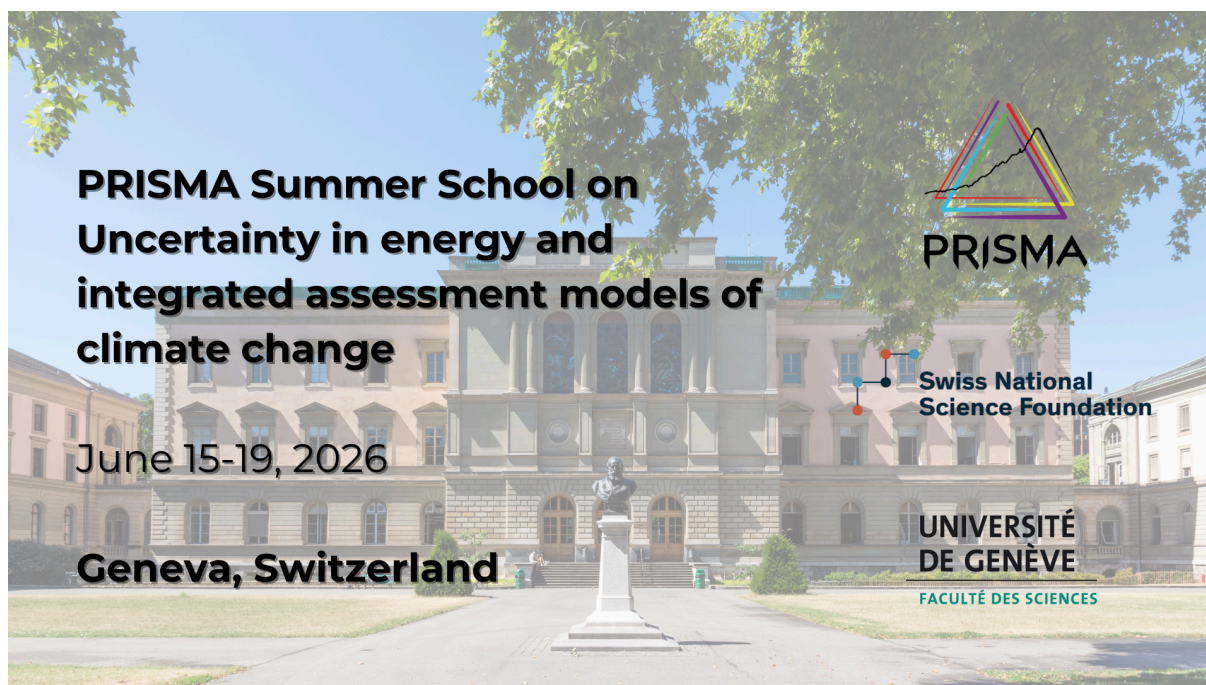
Taken together, these takeaways point towards a more inclusive, transparent, and socially grounded generation of integrated assessment models – one that is better equipped to inform the complex, contested, and urgently consequential decisions that climate policy demands.

Summary: Summer School 2



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

1.1 Summer school on uncertainty in energy and integrated assessment models of climate change. 15-19 June 2026, Geneva, Switzerland



Overview

Abstract

Uncertainty is inevitable when modeling and analyzing long-range energy and emissions trajectories to inform policy. To support uncertainty consideration in modeling, Renewable Energy Systems group of the University of Geneva organized a summer school on uncertainty in energy system models and integrated assessment models of climate change. The summer school targeted advanced PhD students and early postdocs with modeling experience.



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Structure of the week

- Six lectures covering key uncertainty methods (global sensitivity analysis, probabilistic methods, robust decision making and scenario discovery, decision tree approaches, explainable machine learning, expert elicitation), two broader conceptual lectures on uncertainty, and a decision under uncertainty game.
- Five structured hands-on sessions applying five methods on a case study (global sensitivity analysis, probabilistic methods, robust decision making and scenario discovery, decision tree approach).
- Multi-day group work project in which teams synthesised multiple uncertainty methods on a shared scenario dataset from Scenario Compass Initiative (SCI), culminating in final presentations on the last day and a short 2-page report.
- Participant poster presentations and a speed-dating networking session, enabling participants to showcase their own research and connect across disciplines.
- Evening social activities, including a social dinner and optional visits to Geneva Beach, the Old Town, the UN Palais des Nations, and the Botanical Gardens.



Programme

	Sunday (14th June)	Monday (15th June) Room M R150	Tuesday (16th June) Room M R150 / M 6077	Wednesday (17th June) Room M R150 / M 6077	Thursday (18th June) Room M R150 / M 6077	Friday (19th June) Room M R150 / M 6077
08:00		Breakfast at hotel	Breakfast at hotel	Breakfast at hotel	Breakfast at hotel	Breakfast at hotel
08:30		Travel to school location	Travel to school location	Travel to school location	Travel to school location	Travel to school location
9:00		9:00-09:30 Welcome Evelina Trutnevte	9:00-10:00 Robust decision making and scenario discovery	9:00-10:00 Global sensitivity analysis	9:00-10:00 Expert elicitation	9:00-10:00 Uncertainty, accuracy, and uncertainty reduction
09:30		9:30-10:00 Decision game Céline Guivarch	Céline Guivarch	Andrea Saltelli	Evelina Trutnevte	Evelina Trutnevte
10:00		10:00-11:00 Uncertainty from different perspectives	10:00-11:00 Hands-on scenario discovery	10:00-11:00 Hands-on global sensitivity analysis	10:00-11:00	10:00-11:00
10:30		Andrea Saltelli	Céline Guivarch	Andrea Saltelli	Group work	Group work
11:00		Break	Break	Break	Break	Break
11:30		11:30-12:30 Presentations by the school participants	11:30-12:30 Decision tree approach	11:30-12:30	11:30-12:30	11:30-12:30
12:00			Stefano Moret	Group work	Group work	Group work
12:30		12:30-13:30	12:30-13:30	12:30-13:30	12:30-13:30	12:30-13:30
13:00		Lunch	Lunch	Lunch	Lunch	Lunch
13:30		13:30-14:30 Interpretable machine learning	13:30-14:30 Hands-on decision tree approach	13:30-15:30	13:30-15:30	13:30-15:30
14:00		Giacomo Marangoni	Stefano Moret	Group work	Group work	Group work presentations
14:30		14:30-15:30 Hands-on machine learning	14:30-15:30			
15:00		Giacomo Marangoni	Group work			
15:30		Break	Break	Break	Break	Break
16:00		16:00-17:00 Probabilistic methods	16:00-18:00	16:00-18:00	16:00-18:00	16:00-16:30 Closing session and feedback
16:30		Francois Lafond	Group work	Group work	Group work	16:30-17:30
17:00		17:00-18:00 Hands-on probabilistic methods				Group work
17:30		Francois Lafond				
18:00						
18:30						
19:00		19:00 Social dinner	19:00 Optional social activity	19:00 Optional social activity	19:00 Optional social activity	
19:30	Arrival to the hotel					

All lecture slides and hands-on session materials were made available to participants via a shared folder throughout the week. Theory sessions were recorded and will be made available to participants and to the public after the school.

Faculty

The summer school brought together an interdisciplinary faculty of researchers from leading European institutions:



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

- Prof. Dr. Evelina Trutnevyte – University of Geneva (Welcome; Expert elicitation; Uncertainty, accuracy and uncertainty reduction)
- Dr. Céline Guivarch – CIRED, Paris (Robust decision making and scenario discovery)
- Prof. Andrea Saltelli – Universitat Pompeu Fabra (UPF) Barcelona (Uncertainty from different perspectives; Global sensitivity analysis)
- Dr. Giacomo Marangoni – TU Delft (Interpretable machine learning)
- Dr. François Lafond – University of Oxford (Probabilistic methods)
- Dr. Stefano Moret – Politecnico di Milano (Decision tree approach)

The school was organised by Prof. Evelina Trutnevyte (Head of the RES Group, University of Geneva) with support of Dr. Nik Zielonka (Postdoc, University of Geneva) and Ricardo Flores (Communication and KTT, University of Geneva). The school and the adjacent expert workshop were also co-funded by the Swiss National Science Foundation project "Accuracy of long-range national energy projections" (grant no. 186834).

Target Audience and Eligibility

The summer school was open to advanced doctoral students (typically from the second year of their PhD onwards) and early career scientists, including early postdoctoral researchers, working in the field of energy system modelling or integrated assessment modelling. Eligible candidates were expected to have hands-on experience with at least one IAM or energy system model. The cohort was deliberately kept small to maximise interaction quality, with 29 participants selected from approximately 90 applications.

Participants

The school brought together 29 participants representing 16 nationalities and 23 institutions worldwide. The cohort included 23 PhD students and 6 early career researchers at other levels. In terms of gender, 11 participants identified as female and 18 as male. Geographically, the cohort spanned Europe, the Americas, Africa, and Asia, in line with PRISMA's commitment to broad international outreach.



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.



Minutes

Monday, 15 June 2026 – Opening, Perspectives on Uncertainty, and Probabilistic Methods

The week opened with a welcome and framing session by Prof. Evelina Trutnevyte, who introduced the school's intellectual ambitions: to equip participants with a range of complementary methods for handling and communicating uncertainty in energy system and integrated assessment models, and to foster a community of researchers capable of applying these methods rigorously in their own work.

The first substantive session took the form of a structured decision game co-led by Dr. Céline Guivarch, designed to surface participants' intuitions about uncertainty before any formal methods were introduced. Afterwards, Dr. Andrea Saltelli presented various contrasting and complementary perspectives on what uncertainty means in practice, in particular stressing that uncertainty analysis is not merely a technical exercise but a reflection of the values and assumptions embedded in models, and that greater transparency about model inputs and their ranges is an ethical as much as a scientific imperative.

The afternoon featured back-to-back lecture and hands-on sessions by Prof. Giacomo Marangoni and Dr. François Lafond. Marangoni introduced interpretable machine learning as



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

a lens for uncertainty analysis in IAMs, showing how methods such as SHAP values can illuminate which model inputs drive output variation. Lafond then presented probabilistic methods for capturing uncertainty in long-run technological change and energy transition scenarios, drawing on historical data and stochastic modelling approaches. The day closed with an evening social dinner, which provided participants and faculty with an informal setting for continued discussion.

The evening closed with a social dinner.

Tuesday, 16 June 2026 – Robust Decision Making, Decision Tree Approach, and Group Work

The second day focused on two related but distinct frameworks for navigating deep uncertainty in policy-relevant modelling. Dr. Céline Guivarch opened with a two-hour lecture on robust decision making (RDM) and scenario discovery, explaining how these approaches reframe the modelling problem: rather than seeking to identify a single optimal policy pathway, RDM asks which strategies perform acceptably across a wide range of plausible futures. She introduced the PRIM (Patient Rule Induction Method) algorithm as a tool for scenario discovery – identifying combinations of uncertain inputs that lead to policy-relevant outcomes – and walked participants through a set of illustrative applications from IAM contexts. The lecture included a hands-on demonstration of the method.

Dr. Stefano Moret then presented the decision tree approach, which combines scenario analysis with sequential decision logic to identify strategies that are both robust and adaptive. Rather than committing to a single pathway at the outset, decision trees allow modellers to represent staged decision-making under uncertainty, selecting actions based on how conditions evolve. Moret followed his lecture with a hands-on session in which participants applied the decision tree method to a shared energy system dataset, gaining direct experience with its implementation.

The afternoon transitioned into the first extended group work session, during which participants began defining their team’s analytical problem, identifying key uncertain parameters, and exploring the shared SCI dataset. An optional social activity at Geneva Beach was offered in the evening.



Wednesday, 17 June 2026 – Global Sensitivity Analysis and Group Work

Wednesday began with a two-hour lecture by Prof. Andrea Saltelli on global sensitivity analysis (GSA). Saltelli provided both conceptual grounding and hands-on practical guidance on how to quantify the contribution of individual input uncertainties to overall model output variance, contrasting global approaches (which examine the entire input space simultaneously) with local sensitivity analysis (which considers one parameter at a time). He introduced the Sobol' indices as the canonical measure of first order and total-order sensitivity, and discussed the conditions under which simpler screening methods such as Morris' OAT design are appropriate alternatives. Saltelli emphasised that sensitivity analysis is not simply a technical check box but a fundamental tool for improving model transparency, credibility, and policy relevance.

The remainder of Wednesday was given over to intensive group work. Teams worked through their chosen research questions using the methods introduced during the week, supported by faculty members who circulated between groups to offer guidance. The day closed with an optional excursion to the Old Town of Geneva.

Thursday, 18 June 2026 – Expert Elicitation and Extended Group Work

The day opened with a lecture by Prof. Evelina Trutnevyte on expert elicitation – the structured process of formally eliciting and encoding expert judgement as a probability distribution for use in models and elsewhere. Trutnevyte traced the historical development of elicitation methods, discussed key cognitive biases that affect expert judgement (anchoring, overconfidence, and availability bias among them), and presented formal protocols that have been developed to mitigate these biases. She illustrated the method with an example on geothermal energy (from the perspective of natural sciences), showing how expert elicitation can be used to characterise uncertainty in parameters for which empirical data are scarce or absent.

The afternoon was again devoted to group work, with teams continuing to develop and refine their analyses. By end of day, groups were expected to have completed their main analytical



runs and begun structuring their findings for the final presentation. An optional social activity – a visit to the Palais des Nations and the Botanical Gardens – was offered in the evening.

Friday, 19 June 2026 – Uncertainty Reduction and Closing

The final morning began with a broader lecture by Prof. Evelina Trutnevyte on uncertainty, accuracy, and uncertainty reduction. Drawing on her own research programme (including PRISMA project and SNSF project Accuracy that co-funded the school), Trutnevyte examined the question of how modellers can reduce uncertainty in a principled and policy-relevant way – distinguishing between uncertainty reduction through better data, through model improvement, and through the design of more targeted scenario ensembles. She also addressed the important question of model accuracy and how modellers can test and compare model performance even in the face of deep uncertainty about the future.

The morning session also included a final period of group work, during which teams completed their analyses and prepared their presentations. After lunch, each of the eight groups presented its findings to the full cohort and faculty, with lively discussion following each presentation. The school closed with a formal closing session led by Prof. Trutnevyte, in which participants were invited to reflect on the week and to think through next steps for applying uncertainty methods in their own research. Heartfelt thanks were extended to all participants and faculty for their engagement and contributions throughout the week.

Key Take aways

The second PRISMA Summer School left participants with a set of cross-cutting insights drawn directly from the week's lectures and hands-on sessions. These insights reflect both the state of the art in uncertainty analysis for energy and integrated assessment models and the directions in which the field is - and must continue to be - moving. All lecture slides and materials from the week are publicly available [here](#) (a few slides and recordings are still missing as of June 30, 2026, but will be added as soon as approval to share them is received).



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Uncertainty in integrated assessment models is not merely a technical nuisance – it is a political and epistemic condition that demands transparency

Prof. Andrea Saltelli's opening lecture situated uncertainty within a rich intellectual tradition running from Frank Knight's distinction between risk and uncertainty, through Funtowicz and Ravetz's post-normal science, to Rayner's analysis of "uncomfortable knowledge" in policy. The core argument was that models deployed in policy contexts are not neutral tools: they have a telos – shaped by who commissions and uses them – and they can "displace" attention from the real problem onto the model itself, creating the illusion of control. As Saltelli argued, "pretending precision where there is none corrupts the science-policy interface." Participants were invited to think of their own models not just as computational artefacts but as political and epistemic objects whose assumptions, framings, and omissions deserve the same critical scrutiny as their outputs.

Under deep uncertainty, robustness is a more appropriate target than optimality

Two complementary sessions by Dr. Céline Guivarch and Dr. Stefano Moret converged on this central insight. Guivarch's Robust Decision Making (RDM) framework draws a fundamental distinction between risk-type uncertainty – where probability distributions can be assigned – and deep uncertainty, defined as the condition in which analysts cannot agree on the appropriate models, the probability distributions of key parameters, or even how to value different outcomes. Under deep uncertainty, seeking an optimal strategy is a category error: RDM instead seeks strategies that perform acceptably across the widest possible range of plausible futures, and that can adapt as new information arrives. Moret's decision tree approach addressed the complementary challenge of making large scenario ensembles interpretable: by combining k-means clustering with a trained decision tree classifier, hundreds of model runs can be condensed into a small number of representative strategies, distinguishing "low-regret" choices that hold across futures from "must-avoid" paths that foreclose options. As Moret put it: "saying no means saying yes to something else."

One-at-a-time sensitivity analysis is geometrically insufficient: global methods are essential for high-dimensional models

Prof. Saltelli's Wednesday session on global sensitivity analysis (GSA) opened with a deceptively simple geometric proof: as the number of uncertain input factors grows, the



volume of input space that one-at-a-time (OAT) analysis can ever explore – the inscribed hypersphere – vanishes to near zero relative to the total input space. OAT also fails to capture interactions between factors, making it structurally non-conservative. Variance-based sensitivity methods, anchored in Sobol’ indices, address this limitation by exploring the full joint input space and decomposing total output variance into contributions from individual factors and their interactions. In the hands-on session that accompanied the lecture, participants applied these methods to over 1,300 scenarios from the Scenario Compass Initiative database using the Exploratory Modelling Workbench – gaining direct experience of the contrast between narrow OAT analysis and the richer picture that global approaches provide.

Probabilistic forecasting, machine learning interpretability, and expert elicitation offer complementary tools for uncertainty characterisation

Three sessions addressed the uncertainty toolkit from distinct but complementary angles. Dr. François Lafond showed how empirically grounded probabilistic forecasts – built on a random walk with drift, validated through backtesting with rolling windows, and tested against surrogate datasets – can produce well-calibrated prediction intervals for long-run technology cost trajectories. The key criterion is calibration (events assigned probability p should occur fraction p of the time), balanced against sharpness (narrower intervals are more informative, given calibration). Dr. Giacomo Marangoni introduced interpretable machine learning as a complementary lens: methods including partial dependence plots and SHAP (SHapley Additive exPlanations) values allow modellers to attribute output variation to specific inputs, debug potential biases, and communicate model behaviour transparently to non-specialist audiences. Prof. Evelina Trutnevyte’s expert elicitation session addressed the case where empirical data is genuinely absent: structured two-hour interviews following protocols designed to mitigate anchoring bias, availability bias, and overconfidence – tested against a “clairvoyant test” to ensure questions are in principle answerable – can yield quantitative probabilistic estimates that rigorously complement model-based evidence.

Scenario diversity, near-optimal analysis, and preference integration extend the reach of model-based uncertainty assessment



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Prof. Trutnevyte's closing lecture brought the week's threads together through her own research on model testing and model diversity. Meta-analysis of over 1,550 IPCC and non-IPCC energy scenarios revealed systematic patterns: scenario ensembles have grown dramatically in size but remain biased in their coverage of the full solution space, with projections of technologies such as solar PV consistently underestimating real-world deployment trajectories over time. The Modelling to Generate Alternatives (MGA) approach addresses this by identifying the near-optimal solution space around cost-optimal scenarios – revealing a wide range of technically and economically viable alternatives that conventional least-cost analysis excludes. Methods for working with large ensembles – including diversity metrics, clustering, cross-impact balance, scenario discovery, and global sensitivity analysis-like approaches – enable modellers to map and interrogate that space systematically. The integration of societal preferences into scenario selection, illustrated by the riskmeter.ch platform developed at the University of Geneva, points towards a future in which model-based uncertainty analysis is not only technically rigorous but also democratically legitimate. Finally, Trutnevyte has shown how historical data could be used with models to help test and refine model algorithms, uncertainty outcomes, and scenarios selections to overcome the challenges mentioned above.

Evaluation

Taken together, the two PRISMA summer schools represent a substantive and successful contribution to the project's capacity-building objectives. By bringing together a carefully selected cohort of early career researchers from diverse disciplinary and geographic backgrounds, both events demonstrated that intensive, in-person formats remain a powerful vehicle for building not only technical skills but also the collaborative relationships and critical perspectives that underpin rigorous, policy-relevant research. The first school deepened participants' understanding of how equity, impacts, and justice can be meaningfully integrated into IAMs; the second equipped them with a complementary toolkit for navigating and communicating uncertainty – a challenge that sits at the heart of all model-based policy assessment. Across both events, the commitment to open-source tools, publicly available materials, and inclusive selection processes ensured that the benefits of



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

participation extend well beyond the cohort itself. The constructive feedback gathered throughout both schools will inform ongoing improvements to PRISMA's methodologies and dissemination activities, while the networks formed during the weeks in Utrecht and Geneva are expected to generate collaborative benefits that outlast the project itself.

Gender balance

In line with PRISMA's gender management commitments (D7.4), the schools monitored gender composition across both faculty and participants. In the first summer school, the student group consisted of 18 females and 4 males. In the second, among the six faculty members, two identified as women and four as men. Among the three members of the organising team, one identified as a woman and two as men. Among the 29 participants, 11 identified as female and 18 as male. This represents a female participation rate below parity, which reflects the wider gender imbalance in the IAM and energy modelling research communities from which applicants were drawn.

The project remains committed to improving gender balance in future capacity-building activities, recognising that increasing the representation of women in these communities is both a matter of equity and, as evidence presented during the first school demonstrated, a meaningful driver of scientific innovation.

Participant background

Both summer schools successfully reached their intended target audiences of advanced early career researchers with hands-on modelling experience. At the first school, the 22 participants were drawn from a mix of advanced doctoral students and early postdoctoral researchers whose work spans computational approaches to environmental and climate-related challenges, selected through a rigorous scoring process from a pool of 114 applicants. At the second school, the participant profile was similarly well-matched to the school's objectives: 65% of respondents were PhD students in their second year or beyond, with a further 17% early postdocs and 17% at other early career levels. Almost all respondents at the second school described themselves as either regular users of or active researchers in IAMs or energy system models (78%), with a further 13% reporting some



practical experience – confirming that the technical prerequisites of the programme were well calibrated to the cohort. In terms of institutional context, 70% of second school respondents reported that their institution's in-house IAM or energy modelling capacity was well-established, with the remaining 30% describing it as moderate. Across both events, participants represented a wide range of nationalities and institutions, with the second school alone bringing together 29 researchers from 16 nationalities and 23 institutions spanning Europe, the Americas, Africa, and Asia – reflecting PRISMA's commitment to broad international outreach and to lowering the barriers to IAM engagement beyond the European research community.

Participant satisfaction

Three participants from the **first school** shared unsolicited positive feedback following the event:

- Participant 1 described the summer school as "an amazing experience," highlighting its value for her as a beginner in Integrated Assessment Modelling. She noted the breadth of applications she discovered for her research, the quality of expert interactions, and the opportunities for future collaboration.
- Participant 2 called it "a fantastic experience" and the most well-structured and rewarding summer school she had attended – noting she had attended several others for comparison. She specifically praised the balance of lectures, group work, and informal exchanges as making the program "truly enriching."
- Participant 3 described it as "an exemplary learning experience both professionally and personally," highlighting the connections formed with fellow participants and expressing enthusiasm for future collaboration "towards a just and equitable transition."

A structured evaluation survey was distributed to all participants on the final day of the **second school** (on Friday, 19 June 2026). Twenty-three valid responses were received, representing a response rate of 79% (29 participants). The survey covered four dimensions: participant background and experience, learning outcomes, satisfaction with specific school components, and open-ended feedback, as described below.



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Learning outcomes

Respondents were asked to rate five statements about learning outcomes on a scale of 1 (strongly disagree) to 5 (strongly agree). Mean scores were uniformly high, as reported in the table below:

- *I now have a clearer understanding of key uncertainty concepts and presented methods: mean 4.35 / 5*
- *The five hands-on sessions gave me skills I can apply in my own research: mean 4.52 / 5*
- *The group work sessions helped me practice methods in a realistic modelling context: mean 4.39 / 5*
- *I am now more aware of open-source tools and openly licensed materials: mean 4.30 / 5*
- *The school's materials are sufficient for me to continue learning independently: mean 4.78 / 5*

The highest-rated learning outcome was the adequacy of materials for independent continued learning (4.78), reflecting the school's strong emphasis on providing reusable code notebooks, slides, and reading lists. The hands-on sessions were also particularly well-received (4.52), consistent with participants' qualitative feedback emphasising the value of immediately applying methods after each lecture.

Component satisfaction

Respondents were also asked to rate specific school components on a 1–5 scale. Results were as follows:

- *Quality and depth of the lectures: mean 4.70 / 5*
- *Relevance of content to research: mean 4.52 / 5*
- *Quality and accessibility of the faculty: mean 4.48 / 5*
- *Organisation and communication: mean 4.70 / 5*
- *Venue, accommodation, and catering: mean 4.04 / 5*
- *Balance between lectures, hands-on sessions, and group work: mean 4.30 / 5*
- *Networking opportunities: mean 4.74 / 5*



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

- *Likelihood of staying in touch with peers and faculty: mean 4.61 / 5*
- *Overall rating: mean 4.70 / 5*

The highest-rated dimensions were networking opportunities (4.74), lecture quality and organisation (both 4.70), and overall satisfaction (4.70). The venue, accommodation, and catering dimension received the lowest score (4.04), with several participants specifically noting that the heat in the lecture rooms (due to a heat wave) was a source of discomfort during the June week. The balance between lectures, hands-on sessions, and group work (4.30) also generated some discussion: while strongly positive overall, a subset of respondents would have preferred more lecture time relative to group work.

Recommendation and overall rating

Twenty of the 23 respondents (87%) said they would “definitely” recommend the school to a colleague; two said “probably yes”; and one was unsure. Eighteen of 23 respondents (78%) gave the school the highest possible overall rating of 5 out of 5; three gave 4 out of 5; and two gave 3 out of 5.

Qualitative feedback

Open-ended responses highlighted a number of recurring themes. On what worked particularly well, the most frequent themes were:

- The immediate sequencing of lectures and hands-on sessions, which allowed participants to apply new methods directly. As one respondent put it: “I was able to apply/directly understand what I learnt – also the material was well prepared/easy to access.”
- The quality, dedication, and accessibility of the faculty. Multiple respondents described the faculty as “fantastic”, “approachable”, and “super helpful” both during sessions and in the evenings.
- The organisation and logistics of the school, which were widely described as smooth, well-structured, and well-communicated.



- The social activities and the informal networking they enabled: “the organizing team was super welcoming and networking was super easy and natural.”
- The participant poster sessions, which were described as encouraging “deeper discussions” and a “richer exchange of ideas”.

On areas for improvement, the most common suggestions were:

- Shorter days, particularly given the heat: several respondents suggested finishing earlier in the afternoon, especially on days with extended group work.
- More structured group work, with clearer tasks and tighter guidance, so that participants could focus on applying uncertainty methods rather than on logistical coordination. Some suggested smaller group sizes and the option to work with participants’ own datasets.
- Better air conditioning or ventilation in the working spaces and accommodation, which were noted as affecting concentration during afternoon sessions.
- Pre-school preparatory exercises to help participants arrive with a shared baseline of technical knowledge.

These suggestions will be taken into account in case of any future edition of the school.

Overall, the evaluation evidence gathered across both summer schools points to a strong and consistent record of delivery against PRISMA's capacity-building objectives. Participant satisfaction at the second school was high across all measured dimensions, with an overall mean rating of 4.70 out of 5 and 87% of respondents indicating they would definitely recommend the school to a colleague. Learning outcomes were similarly well-received, with participants particularly valuing the hands-on sessions, the quality and accessibility of the faculty, and the availability of materials for independent continued learning. Where areas for improvement were identified, these have been noted and will inform the design of any future editions. Taken across both events, the two schools reached a combined cohort of over 50 early career researchers from more than 20 countries, generated publicly available lecture materials and recordings, and fostered a growing community of researchers equipped to apply and build upon the tools and frameworks developed within the PRISMA project. These outcomes affirm the value of sustained investment in intensive, in-person capacity-building as a complement to the project's broader dissemination and open-access activities.





This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101081604 - PRISMA. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.