EUROPEAN
CLIMATE + ENERGY
MODELLING
FORUM

Participating in ECEMF

How to join the modelling comparison exercise to build a more robust evidence base for European policy

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101022622.

Agenda

ECEMF

Welcome and Introduction to ECEMF, Code of Conduct (5 minutes)

Why do we need to compare models? (15 minutes)

How do you conduct a model comparison? (45 minutes)

Engaging with ECEMF (30 minutes)

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Welcome

Introduction to ECEMF & Code of Conduct

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Who are we?

ECEMF

- Will Usher, Assistant Prof. KTH, wusher@kth.se
- Hauke Henke, Doctoral Student
- Emir Fejzić, Doctoral Student

https://energy.kth.se
https://ecemf.eu
https://github.com/ecemf

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Code of Conduct

ECEMF

The following behaviours are expected and requested of all community members:

- Participate in an authentic and active way.
- Exercise consideration and respect in your speech and actions.
- Attempt collaboration before conflict.
- Refrain from demeaning, discriminatory, or harassing behaviour and speech.
- Be mindful of your surroundings and of your fellow participants. Alert community leaders if you notice a dangerous situation, someone in distress, or violations of this Code of Conduct, even if they seem inconsequential.
- Remember that community event venues may be shared with members of the public; please be respectful to all patrons of these locations.

Read more: https://github.com/ecemf/policies

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Tools used in the workshop

ECEMF

Miro

- https://tinyurl.com/ecemfopenmod
- Password openmod2023

Zoom

- Please remain muted
- Hand up if you wish to ask a question, or ask in the chat
- Self organise in breakout rooms…

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Why do we need to compare models?

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Diverse Models

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- CGE e.g. GEM-E3 - whole economy - global
- Carbon cycle e.g. MAGICC – emissions, temp - global
- Energy system optimisation e.g. Calliope – supply & demand – EU/global
- Integrated assessment e.g. REMIND-EU – energy & land-use – global
- Optimal Dispatch and Expansion e.g. ENERTILE - electricity and heat – EU + MENA
- Techno-socio-economic bottom-up e.g. EDGE-x – transport/buildings/industry - global

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Exercise 1

ECEMF

- Go to Miro
- https://miro.com/app/board/uXjVMbtc054=/?share_link_id=596888017947 or https://tinyurl.com/ecemfopenmod
- Password openmod2023
- Spend 10 minutes mapping the relationship between your institution, models and stakeholders

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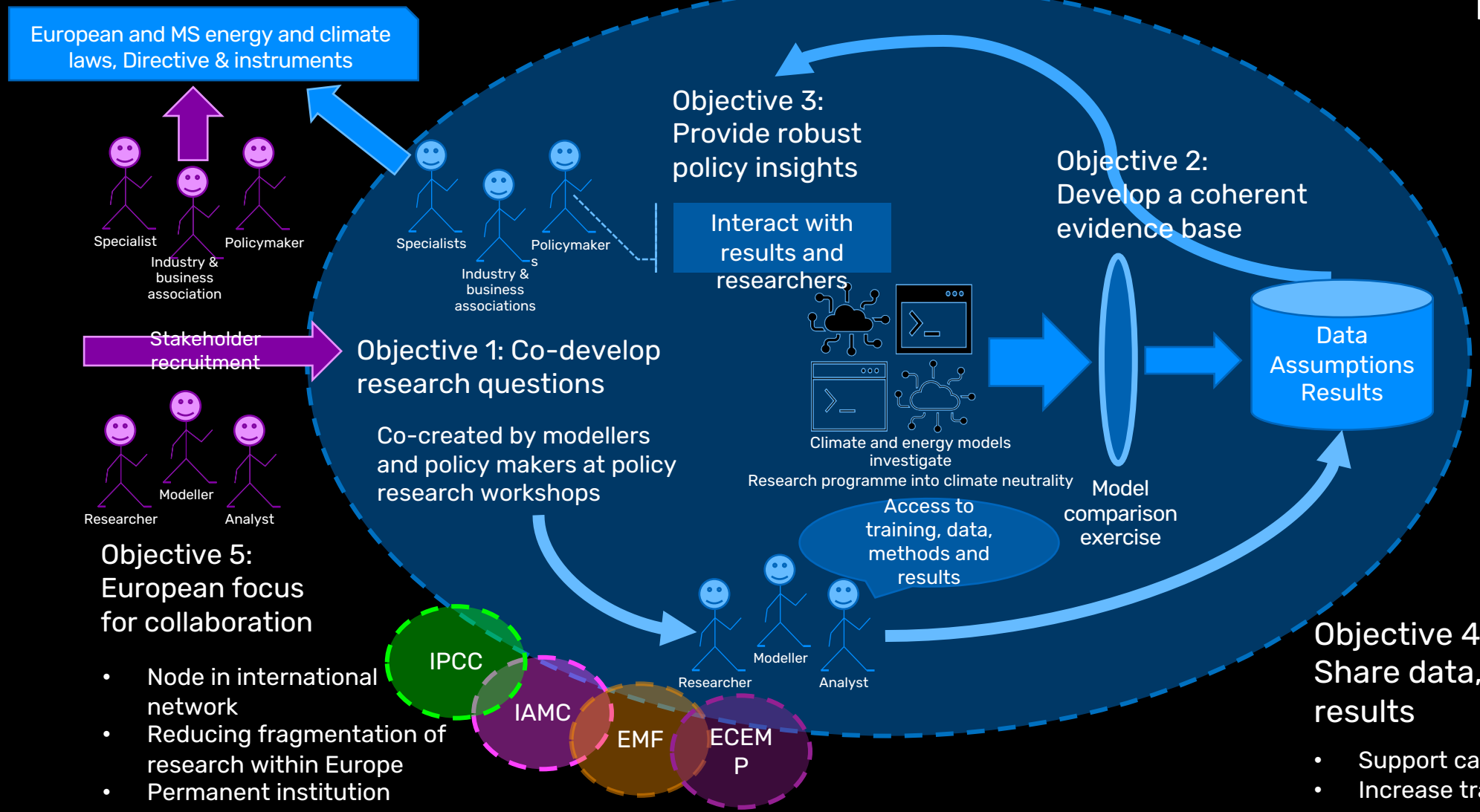
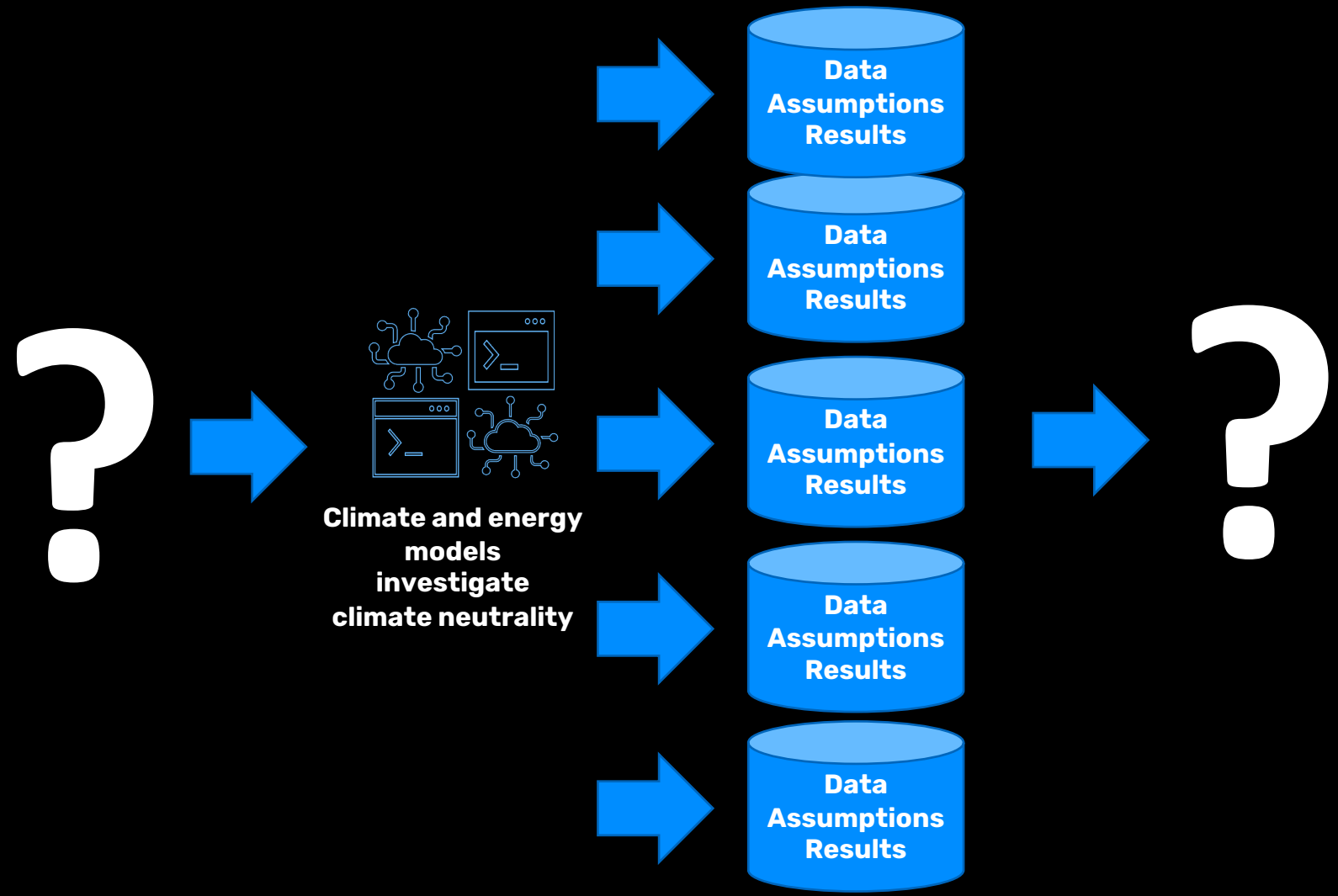
Objectives

ECEMF



- Node in international network
- Reducing fragmentation of research within Europe
- Permanent institution

- Support capacity building
- Increase transparency



ECEMF

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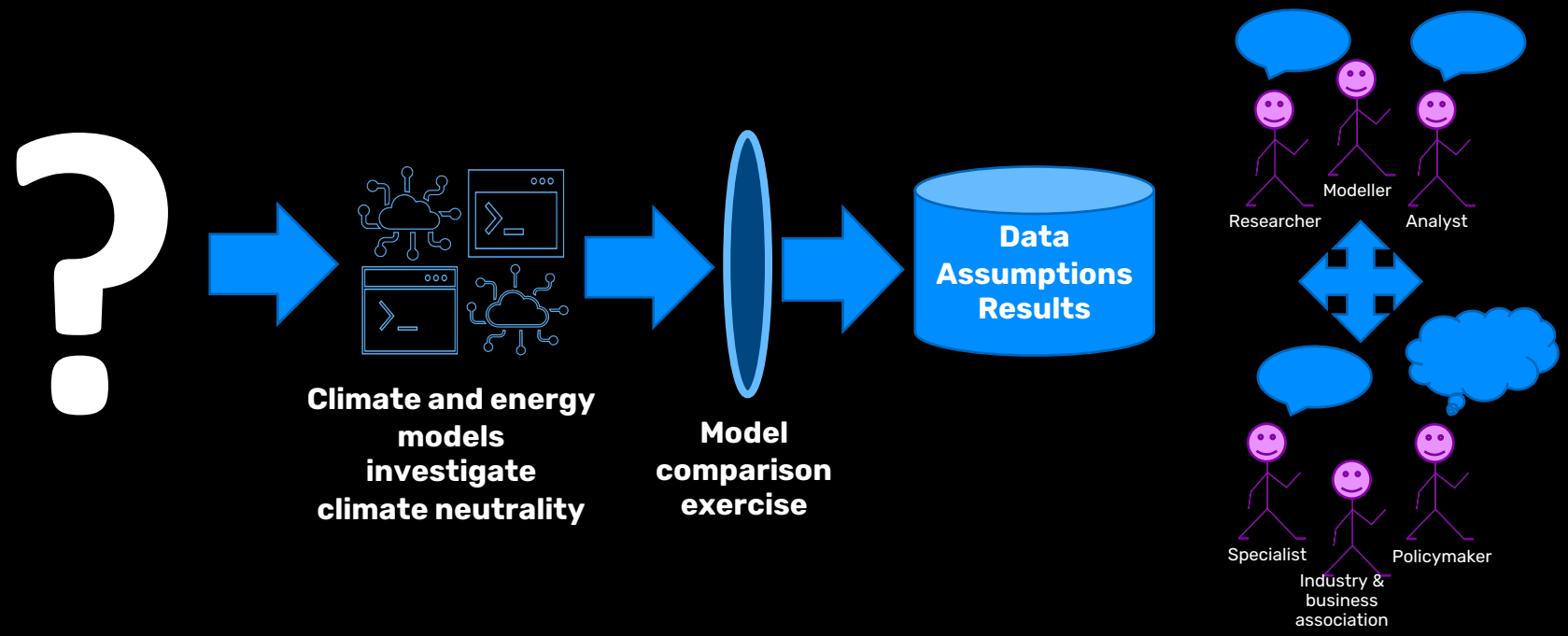
ECEMF



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Summary

ECEMF

- Many stakeholders who gain value from model insights
- Many different institutions who develop models
- Many different types of models

- ECEMF provides one focal point for untangling assumptions, scenarios and results through model comparison

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What is a model comparison?

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Types of Model Comparison

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- Technical focus - differences between modelling frameworks, formulation, model behaviour
- Data focus – differences in assumptions, role of modeller decisions, data sources
- Result focus – differences in model outputs
- Combinations of the above

Attributes:

- harmonisation, semantic agreement, shared scenarios etc.

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Case Study: Stanford EMF

ECEMF

- Annual/long-term studies with a policy focus
- North America focus, but often global scope
- Normally result in a special issue
- Huge! – working group has 100 members with monthly meetings
- Long history of comparison (37 studies)
- https://emf.stanford.edu/

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Case Study: Nordic Forum

ECEMF

- Set up seed funding from KTH
- ~50 members with bi-monthly meetings, LinkedIn group
- Currently, 8 modelling groups working on a joint publication using existing model results and different models e.g. energy systems, dispatch models and network models
- Regional focus: Nordic countries with an emphasis on resources (e.g. biomass), hydropower, hydrogen and renewables

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Case Study: MODEX projects

ECEMF

- Structured model comparison using harmonised data inputs
- Results of 6 projects exploring different aspects of detailed energy models
  - Model type – e.g. vehicle diffusion, energy system, network models
  - Thematic scopes - policy instruments, flexibility, sector coupling

Gils, Hans Christian, Jochen Linßen, Dominik Möst, and Christoph Weber. 'Improvement of Model-Based Energy Systems Analysis through Systematic Model Experiments'. *Renewable and Sustainable Energy Reviews* 167 (1 October 2022): 112804. https://doi.org/10.1016/j.rser.2022.112804.

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The ECEMF model comparison

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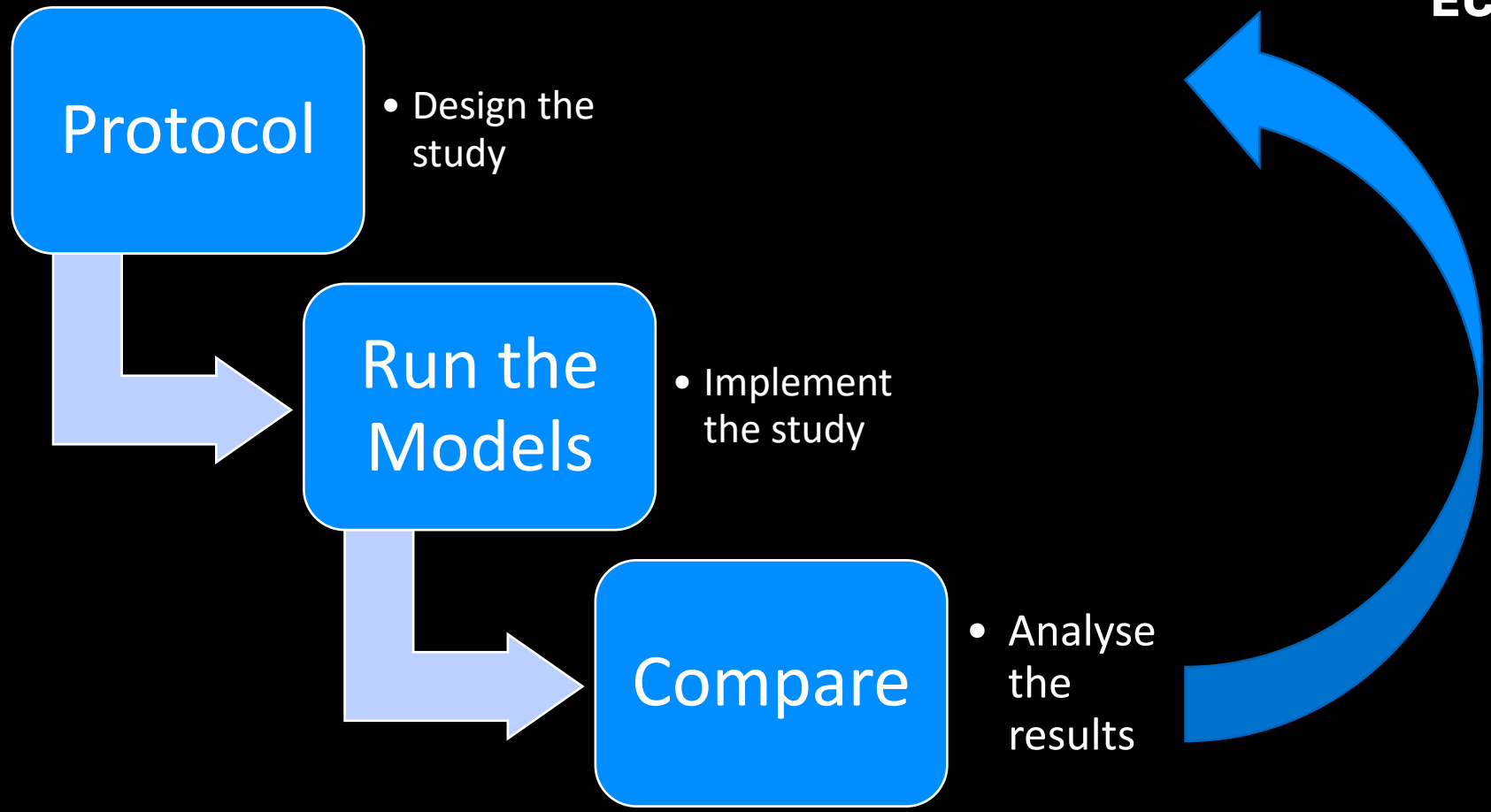
Overview



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Model Comparison Protocol

ECEMF

ECEMF. (2022). Model Comparison Protocol (2.2). Zenodo. https://doi.org/10.5281/zenodo.6811317

- Lists 14 diagnostic scenario definitions
- Defines 680 result variables - 182 prio1, 189 prio2 and the remainder prio3.
- Regions – models are compared at EU27 aggregation…

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Shared Result Template

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- IAMC results template
  - Tooling to convert to IAMC e.g. https://github.com/OSeMOSYS/osemosys2iamc
  - pyam – for processing and visualising results

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Uploading Results

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- Public IIASA Scenario Explorer - https://data.ece.iiasa.ac.at/ecemf
- Contact us to obtain an account
- Upload your results

- Use the API to conduct result comparison

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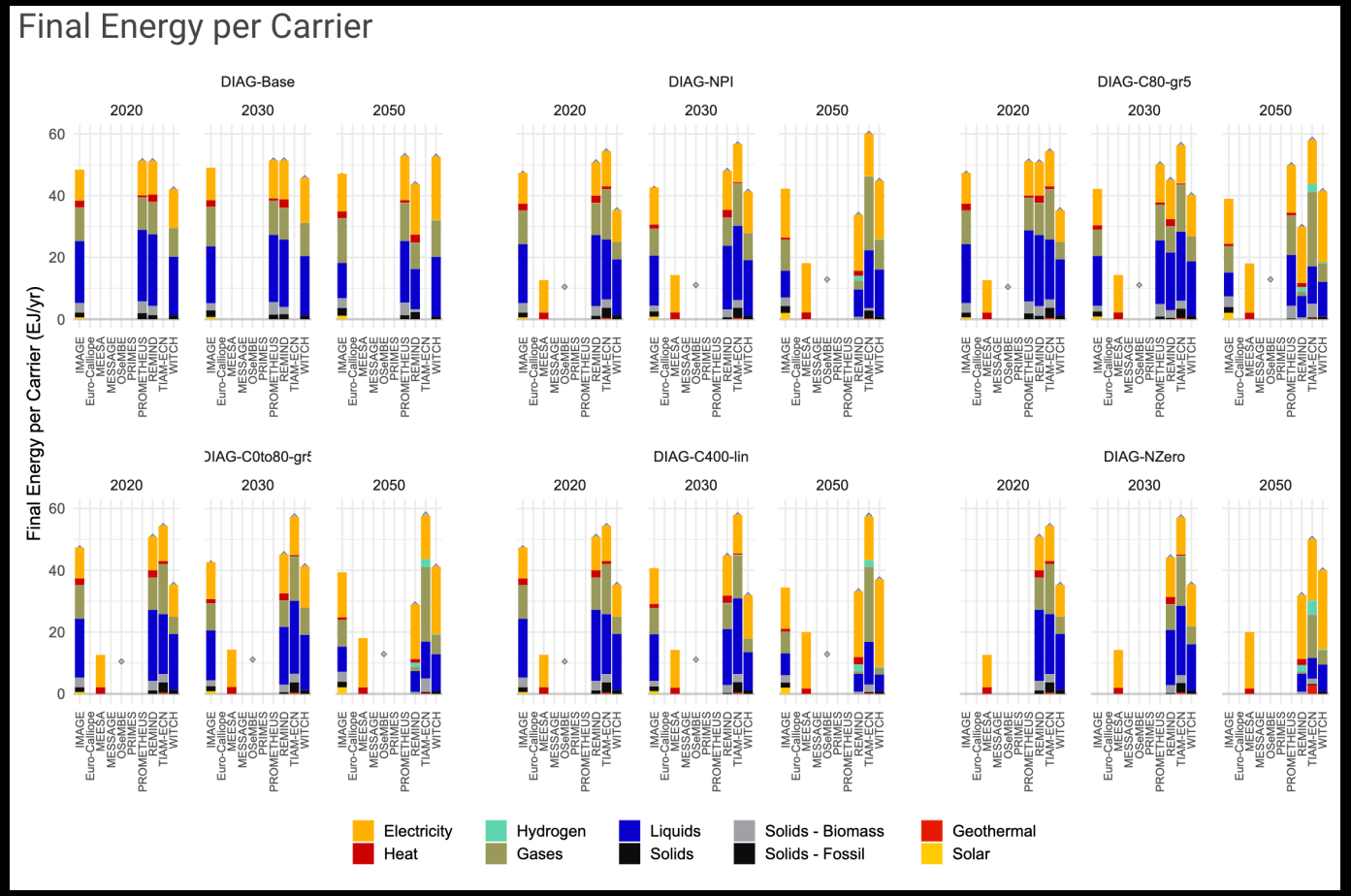
Comparing Results - scenarios



https://github.com/ecemf/model_comparison

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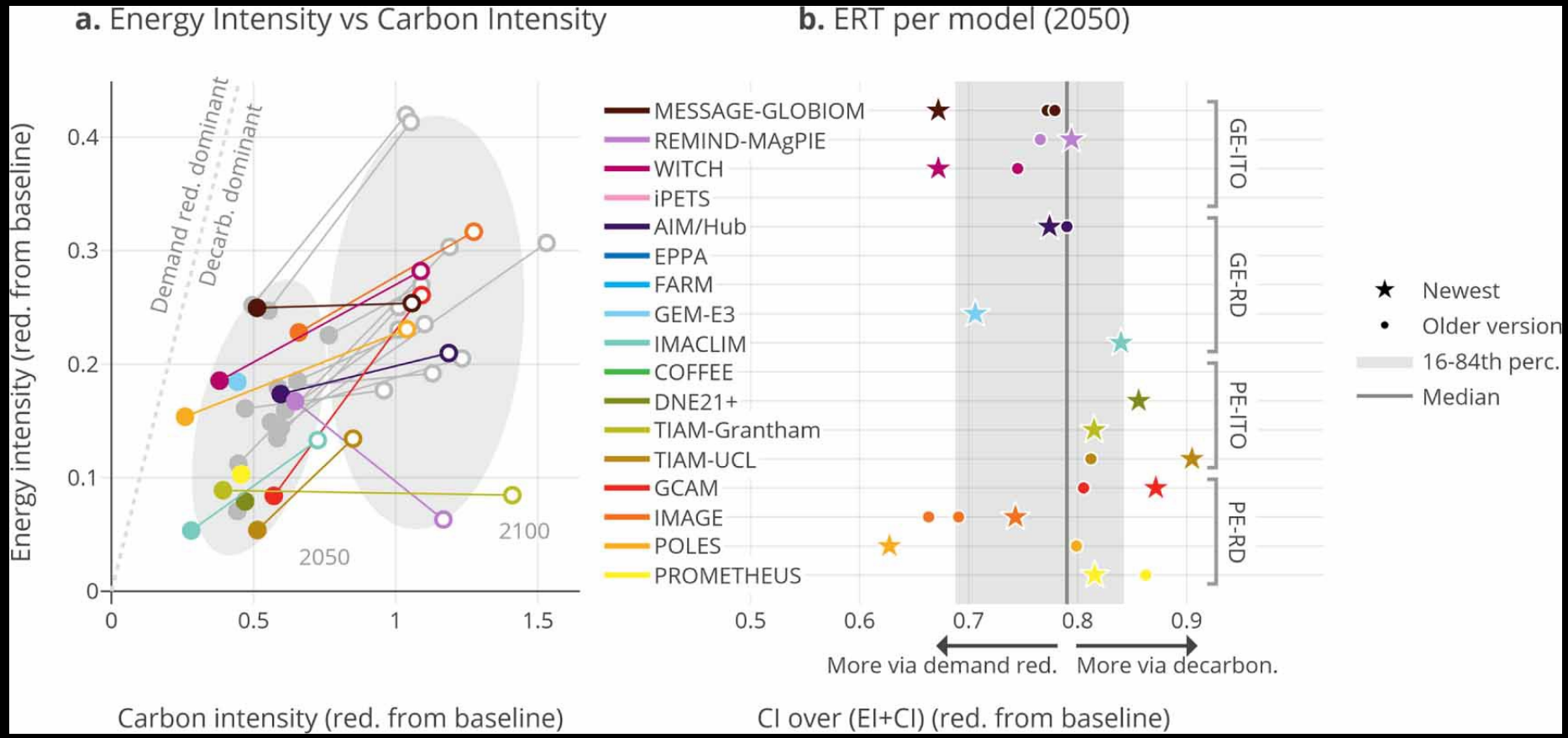
Comparing Results - indicators



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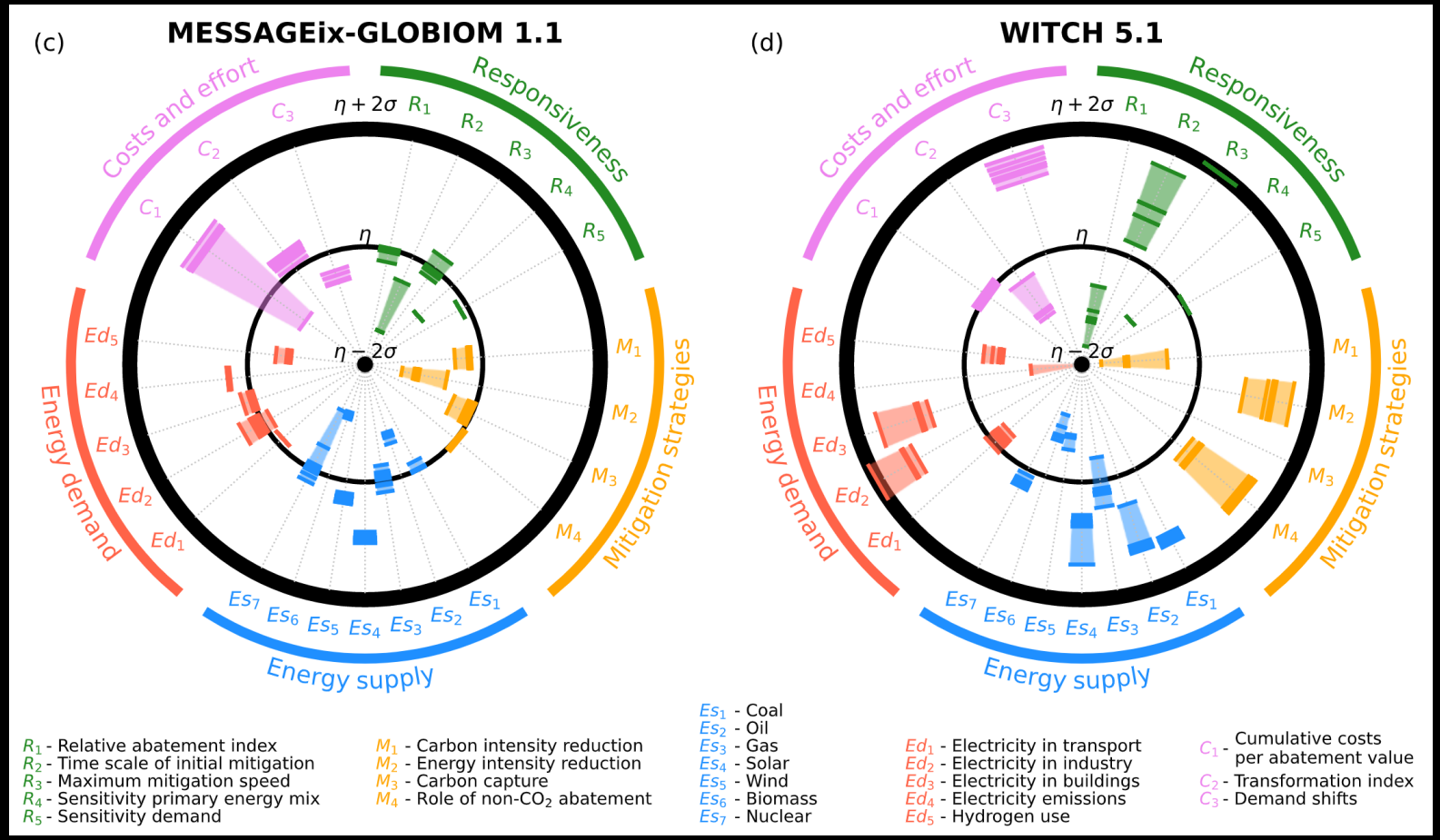
Comparing Results - indicators



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Exercise 2

ECEMF

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Engaging with ECEMF

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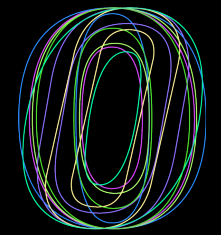
Visit ECEMF online



- Ask questions and suggest answers at our community forum: https://community.ecemf.eu
- Follow the project progress at our website: https://ecemf.eu
- Building a results dashboard using the Scenario Explorer: https://data.ece.iiasa.ac.at/ecemf

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References

Gils, Hans Christian, Jochen Linßen, Dominik Möst, and Christoph Weber. 'Improvement of Model-Based Energy Systems Analysis through Systematic Model Experiments'. *Renewable and Sustainable Energy Reviews* 167 (1 October 2022): 112804. https://doi.org/10.1016/j.rser.2022.112804.

Harmsen, Mathijs, Elmar Kriegler, Detlef P. van Vuuren, Kaj-Ivar van der Wijst, Gunnar Luderer, Ryna Cui, Olivier Dessens, et al. 'Integrated Assessment Model Diagnostics: Key Indicators and Model Evolution'. *Environmental Research Letters* 16, no. 5 (May 2021): 054046. https://doi.org/10.1088/1748-9326/abf964.

Mark Dekker, Vassilis Daioglou, Robert Pietzcker et al. Identifying energy model fingerprints in mitigation scenarios, 16 March 2023, PREPRINT (Version 1) available at Research Square [https://doi.org/10.21203/rs.3.rs-2638588/v1]

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