PARIS REINFORCE

IISA2021

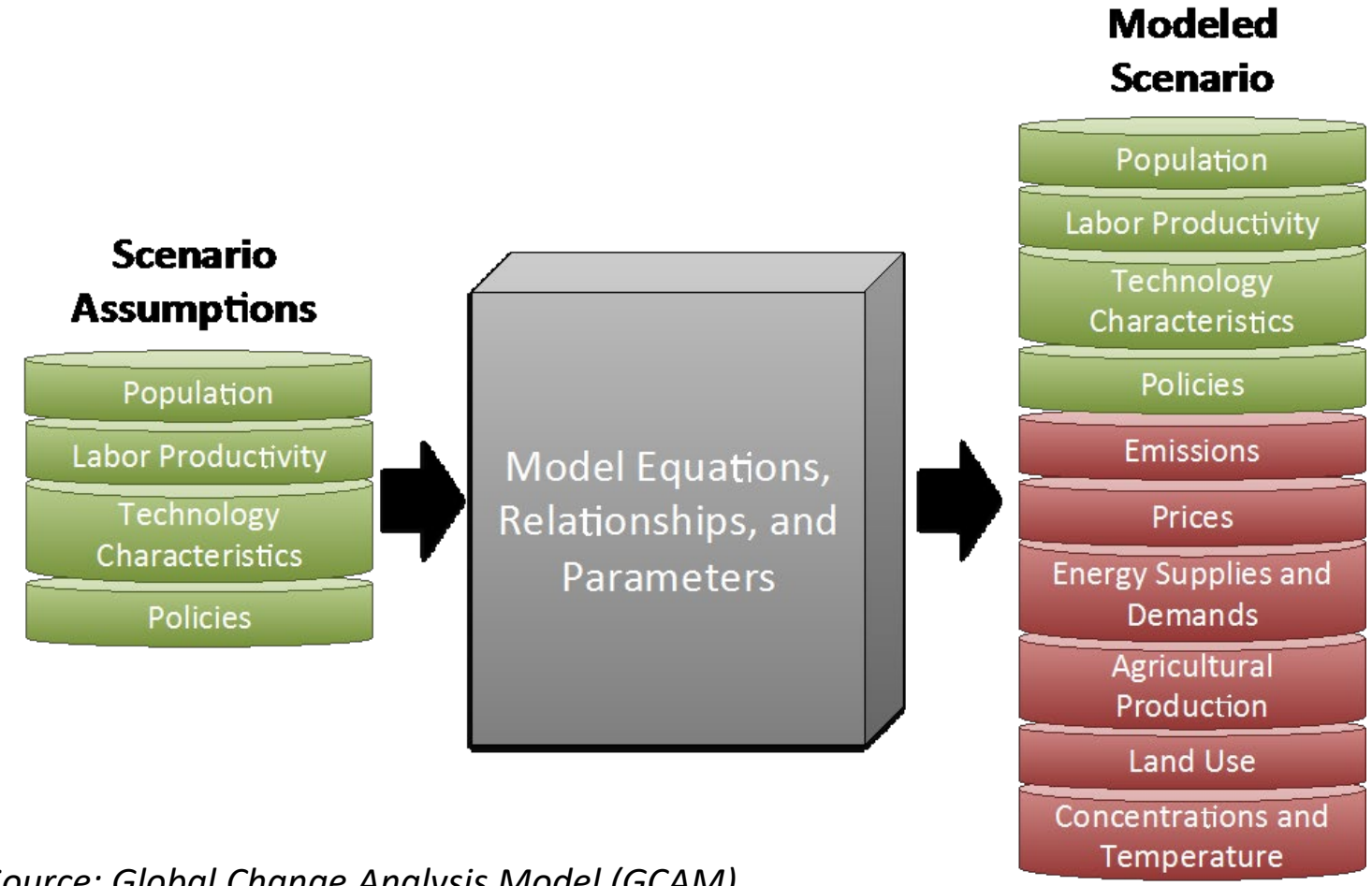
The Twelfth International Conference on Information, Intelligence, Systems and Applications (IISA 2021)
12-14 July 2021, Athens, Greece
Big Data Analytics in the Energy Sector

Integrating Integrated Assessment Modelling in Support of the Paris Agreement: The I2AM PARIS Platform

Dr. Alexandros Nikas *(National Technical University of Athens)*

www.paris-reinforce.eu

A typical IAM (GCAM)



Source: Global Change Analysis Model (GCAM)

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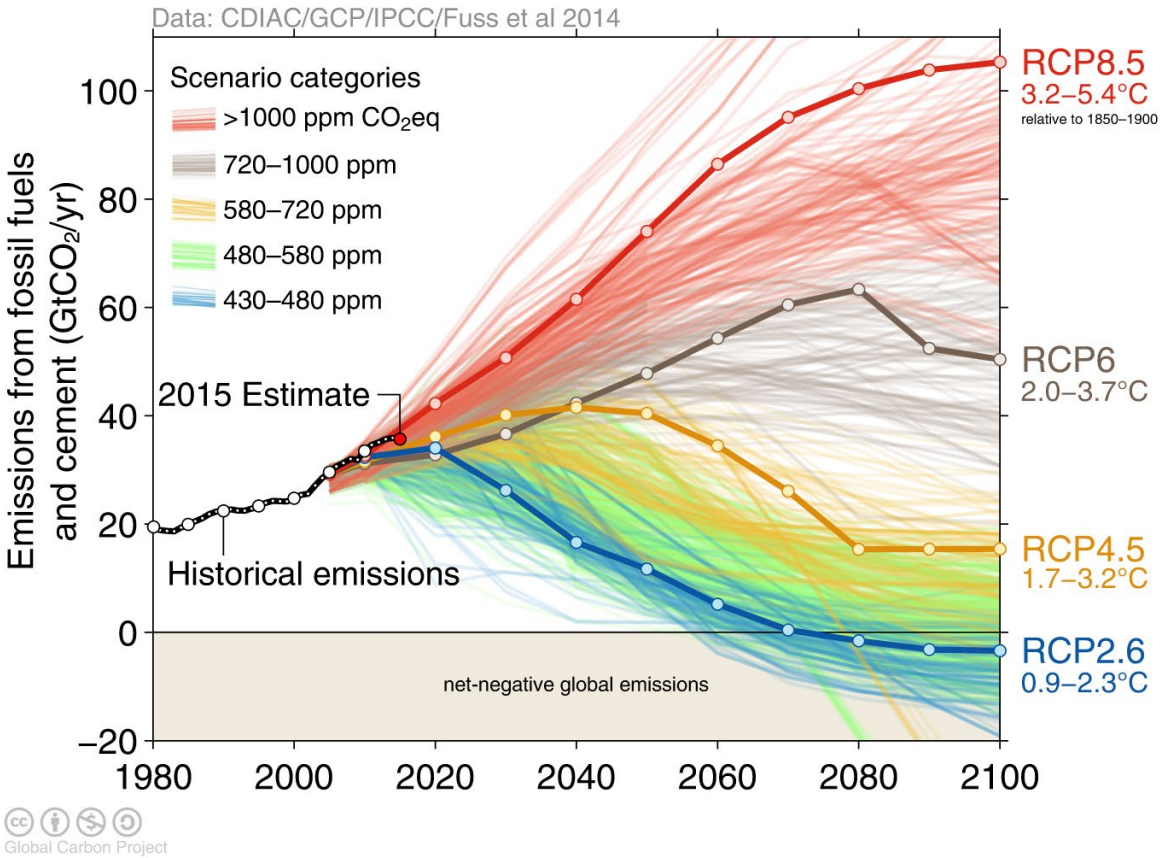
What happens when you have more runs?



Source: The Global Carbon Project

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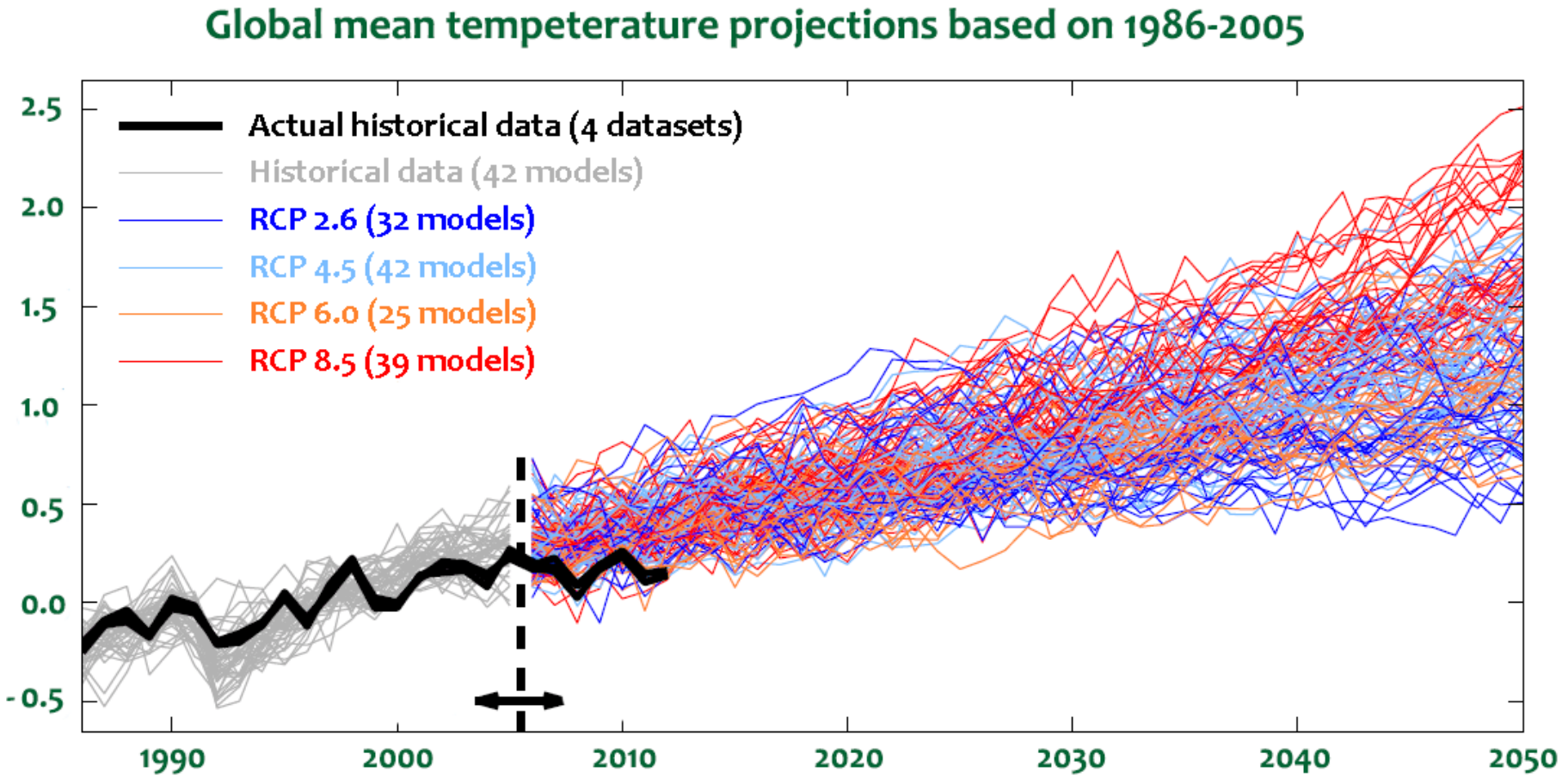
What happens when you have more IAMs?



Source: IPCC 5th Assessment Report (2014)

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- Integrated assessment models: undoubted contribution to climate policymaking (‘best available science’)
- However: extent of this support frequently debated

- Too many, diverse (different) models
- Too many input assumptions
- Too many outputs

- How to present, summarise, visualise, and tie policy prescriptions to the modelling mechanisms and assumptions underpinning them?

- Calls “to do science differently” and democratise data and the research process.

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Hence, the I²AM PARIS platform

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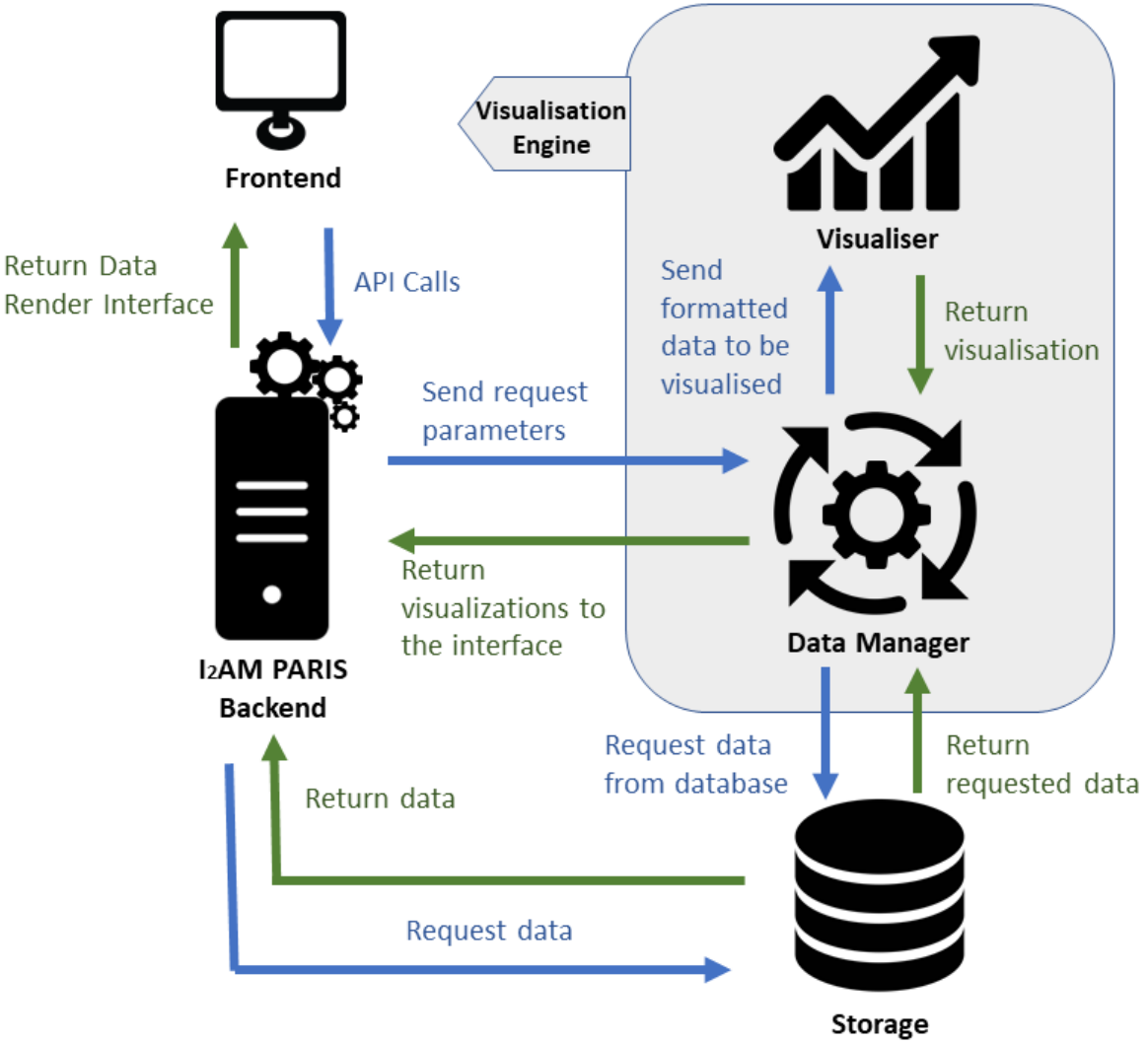
High-level platform architecture



- **Parsers:** extracting data from files; processing and storing info in Database
- **Backend:** mediator that orchestrates all operations executed for all end-to-end scenarios; and facilitates integration (interfaces/APIs)
- **Data Manager:** create, store and execute queries; process data returned and convert in visualisable form
- **Visualiser:** chart and map visualisation generator

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Model Dynamic Documentation

An interactive library of the models , in the form of a responsive "infographic", for all models, with regard to their features.

Overview and Comparative Assessment

- Global Models
- National/ Regional Models for Europe
- National/ Regional Models for countries outside Europe

Detailed Model Documentation

A detailed documentation of each one of the global, regional and national models of the PARIS REINFORCE modelling ensemble

Variable Harmonisation Heatmap

This tool creates on-demand heatmaps that indicate how different variables are handled across the different models within the Paris Reinforce consortium.

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Model Dynamic Documentation

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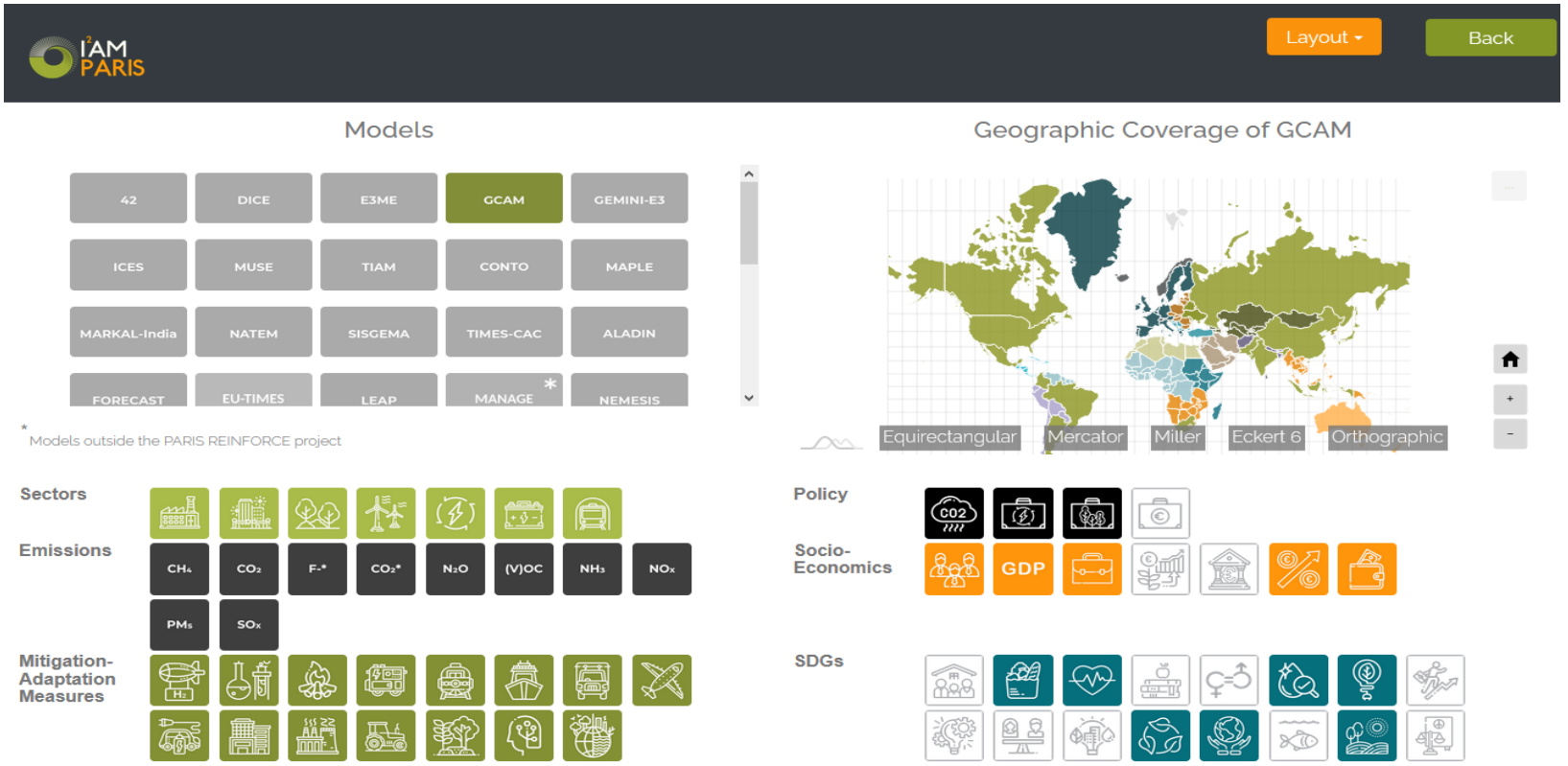

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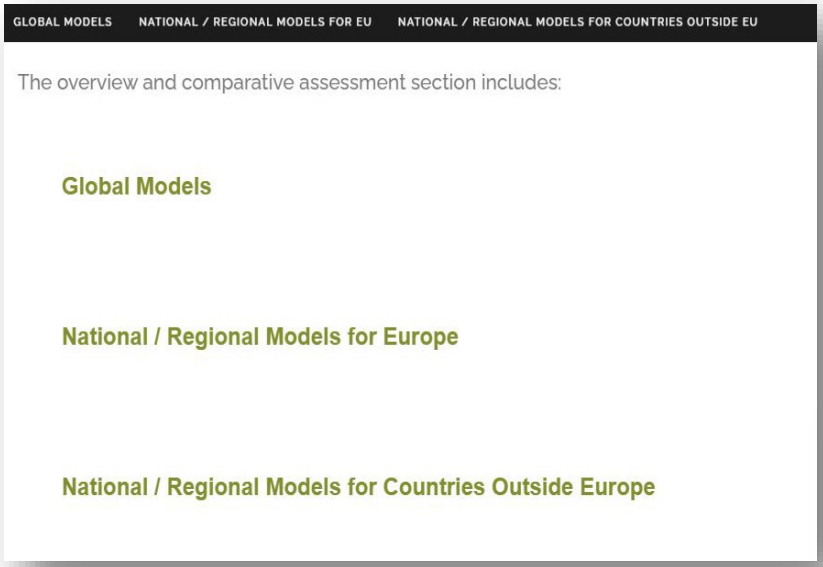
Comparative Assessment

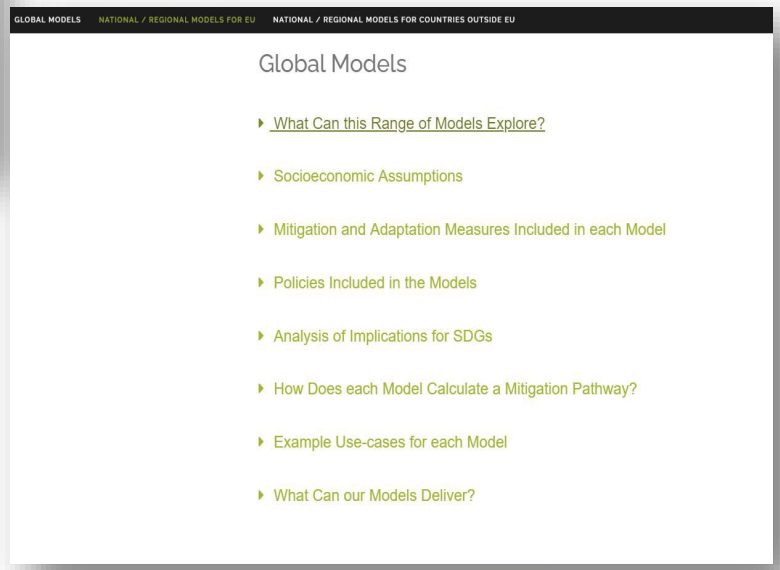
Overview and Comparative Assessment

- Global Models
- National/ Regional Models for Europe
- National/ Regional Models for countries outside Europe



Models are separated in 3 categories:

- Global Models
- National/Regional Models for Europe
- National/Regional Models for countries outside Europe



The user can select one subsection and more details are displayed (expanding headings)

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Detailed Documentation

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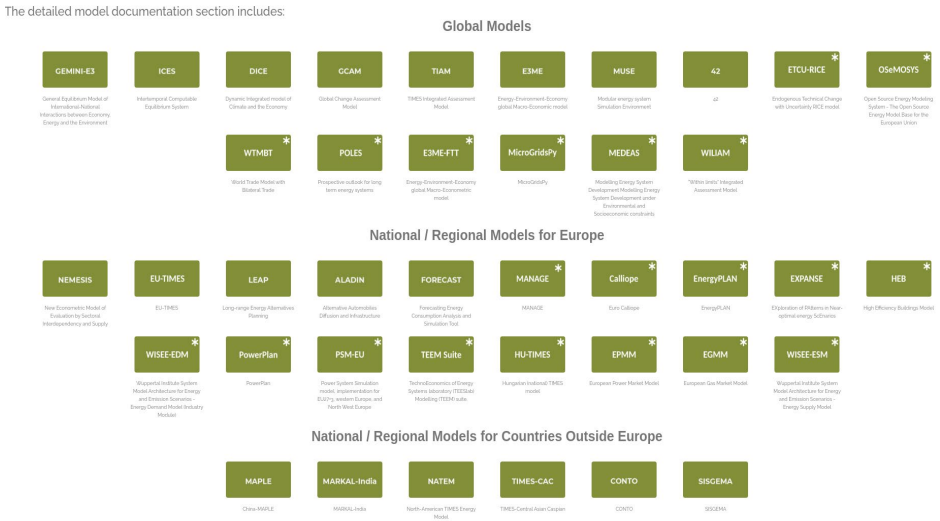
Detailed Model Documentation

A detailed documentation of each one of the global, regional and national models of the PARIS REINFORCE modelling ensemble



Models are separated in 3 sections:

- Global Models
- National / Regional Models for Europe
- National / Regional Models for Countries Outside Europe

When the user selects a model, a new page is shown that displays more details about the model.

Navigation among models

Navigation among documentation sections

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On-demand harmonisation heatmap

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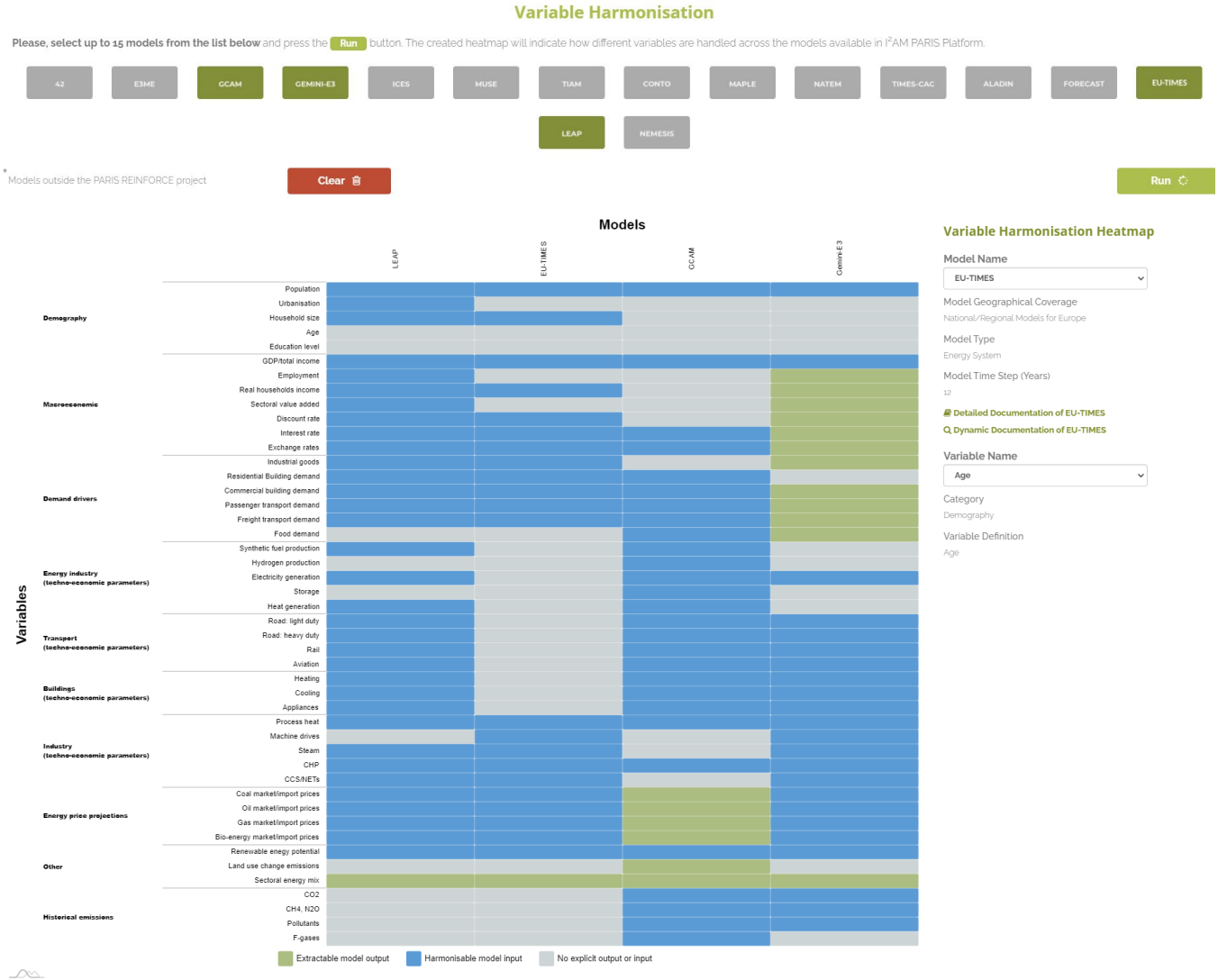
Variable Harmonisation Heatmap

This tool creates on-demand heatmaps that indicate how different variables are handled across the different models within the Paris Reinforce consortium.



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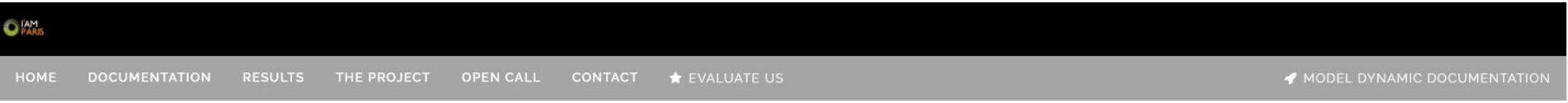

RESULTS

Choose among the following workspaces

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Where are we headed?

These are the results produced by the analysis made using the models of the Paris Reinforce project.

EU Recovery Policy DB

EU Recovery Policy DB

This workspace includes the CINEA Climate Neutrality WGII Shared EU Recovery Policy Database for modelling research.

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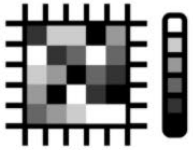
Workspace: Four components



Variable Harmonisation Heatmap

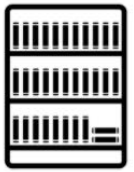
A heatmap that indicates how different variables are handled across the models within the Paris Reinforce consortium. The rows present the different socio and techno economic variables. The columns indicate the 16 PR models. Variables are either considered as outputs from models, inputs to models or are not represented by the models as any explicit output or input

Where are we headed? (Advanced Scientific Module)

These are the results produced by the analysis made using the models of the Paris Reinforce project used in scientific research and this service provides tools to explore the available data.

Cool... what does that mean?

This section presents the outcome of the analysis process along with meaningful conclusions about it and other insightful information.



Virtual Library

This section essentially includes scientific publications, policy briefs, databases (probably direct download links, input data sources information i.e. IEA WorldBank EDGAR etc.) relevant to Paris Reinforce workspace run.

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E.g., WWH (Advanced)

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IAM PARIS

Back

SUMMARY | DETAILED CONFIGURABLE ANALYSIS

FOSSIL ENERGY CO2 | PRIMARY ENERGY | PRIMARY ENERGY BY FUEL | GLOBAL CARBON CAPTURE & STORAGE | GLOBAL APPROXIMATE TEMPERATURE

Fossil Energy CO_2 emissions

The chart on the right will present the Fossil Energy CO_2 Emissions to 2100 for all selected models, scenarios and region. Only three of our models (TIAM, GCAM, MUSE) run to 2100, 42 runs to 2045, ICES, GEMINI-E3 and E3ME run to 2050.

Models

All selected

Scenario

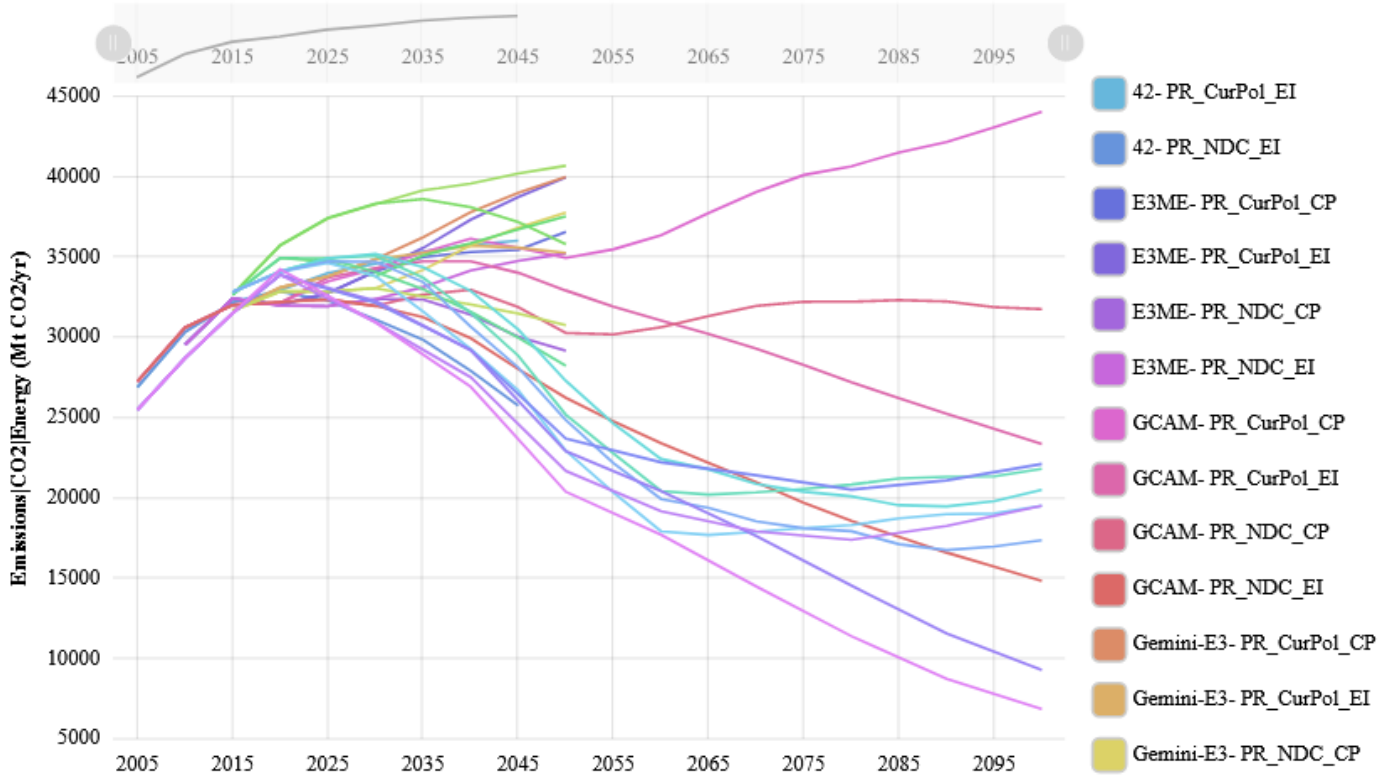
All selected

Region

World

Run

Show Legend



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E.g., WWH (Heatmap)

Variable Harmonisation Heatmap

You can also create on-demand variable harmonisation heatmaps **here** .

Order Columns By:

Default

Model Name

ICES

Model Geographical Coverage

Global IAMs

Model Type

General Equilibrium

Model Time Step (Years)

1

Detailed Documentation of ICES

Dynamic Documentation of ICES

Variable Name

Population

Category

Demography

Variable Definition

Total number of people living in the specific country or region

Sources

1. OECD Population Projections (short- and mid-term)
   - OECD Population Projects, 2020
2. Europop (short- and mid-term)
   - Europop, 2020
3. SSP2 Population (long-term)
   - KC and Lutz, 2017
4. UN (short-term)
   - United Nations 2019

Unit

Million people, Growth rate

Timespan

3

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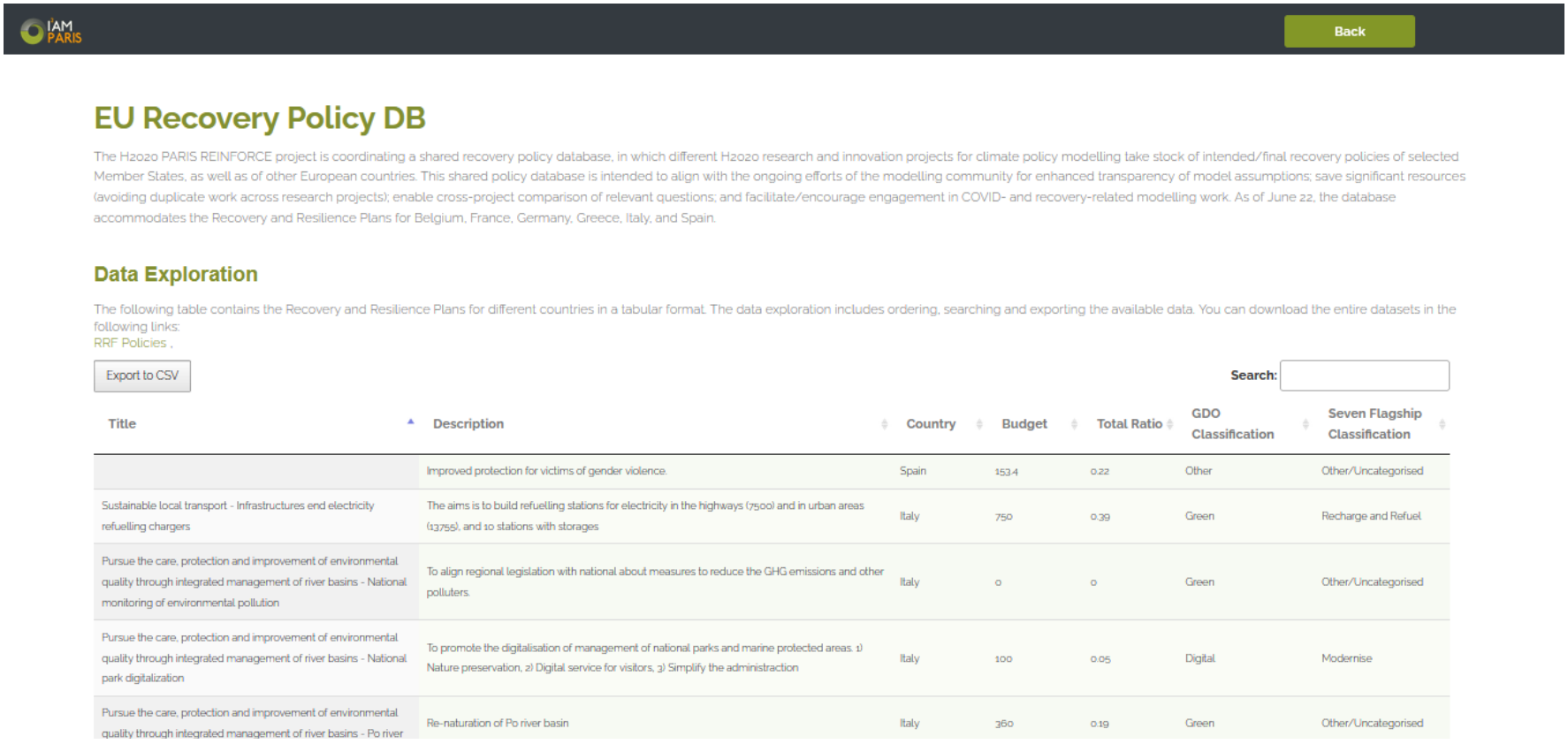
E.g., EU Recovery DB (Data)



IAM PARIS

Back

EU Recovery Policy DB

The H2020 PARIS REINFORCE project is coordinating a shared recovery policy database, in which different H2020 research and innovation projects for climate policy modelling take stock of intended/final recovery policies of selected Member States, as well as of other European countries. This shared policy database is intended to align with the ongoing efforts of the modelling community for enhanced transparency of model assumptions; save significant resources (avoiding duplicate work across research projects); enable cross-project comparison of relevant questions; and facilitate/encourage engagement in COVID- and recovery-related modelling work. As of June 22, the database accommodates the Recovery and Resilience Plans for Belgium, France, Germany, Greece, Italy, and Spain.

Data Exploration

The following table contains the Recovery and Resilience Plans for different countries in a tabular format. The data exploration includes ordering, searching and exporting the available data. You can download the entire datasets in the following links:
RRF Policies ,

Export to CSV

Search:

Title	Description	Country	Budget	Total Ratio	GDO Classification	Seven Flagship Classification
	Improved protection for victims of gender violence.	Spain	153.4	0.22	Other	Other/Uncategorised
Sustainable local transport - Infrastructures end electricity refuelling chargers	The aims is to build refuelling stations for electricity in the highways (7500) and in urban areas (13755), and 10 stations with storages	Italy	750	0.39	Green	Recharge and Refuel
Pursue the care, protection and improvement of environmental quality through integrated management of river basins - National monitoring of environmental pollution	To align regional legislation with national about measures to reduce the GHG emissions and other polluters.	Italy	0	0	Green	Other/Uncategorised
Pursue the care, protection and improvement of environmental quality through integrated management of river basins - National park digitalization	To promote the digitalisation of management of national parks and marine protected areas. 1) Nature preservation, 2) Digital service for visitors, 3) Simplify the administraction	Italy	100	0.05	Digital	Modernise
Pursue the care, protection and improvement of environmental quality through integrated management of river basins - Po river	Re-naturation of Po river basin	Italy	360	0.19	Green	Other/Uncategorised

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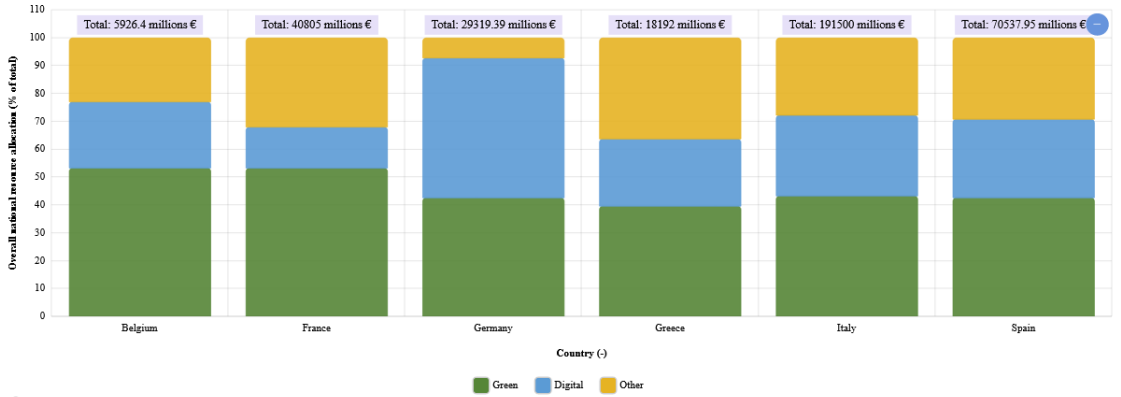
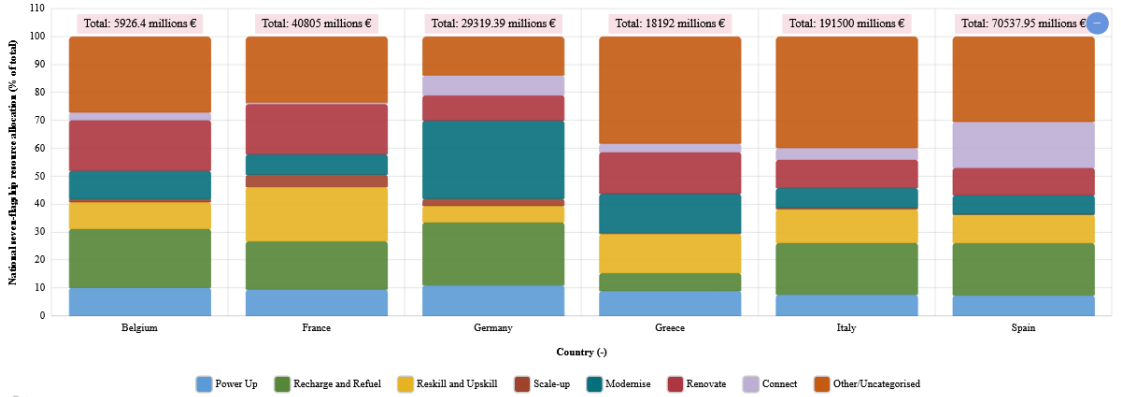
E.g., EU Recovery DB (Visuals)

Overall resource allocation in national recovery and resilience plans
(% of total and € millions)



Composition of recovery plans according to the flagship areas defined by the Commission
(% of total and € millions)



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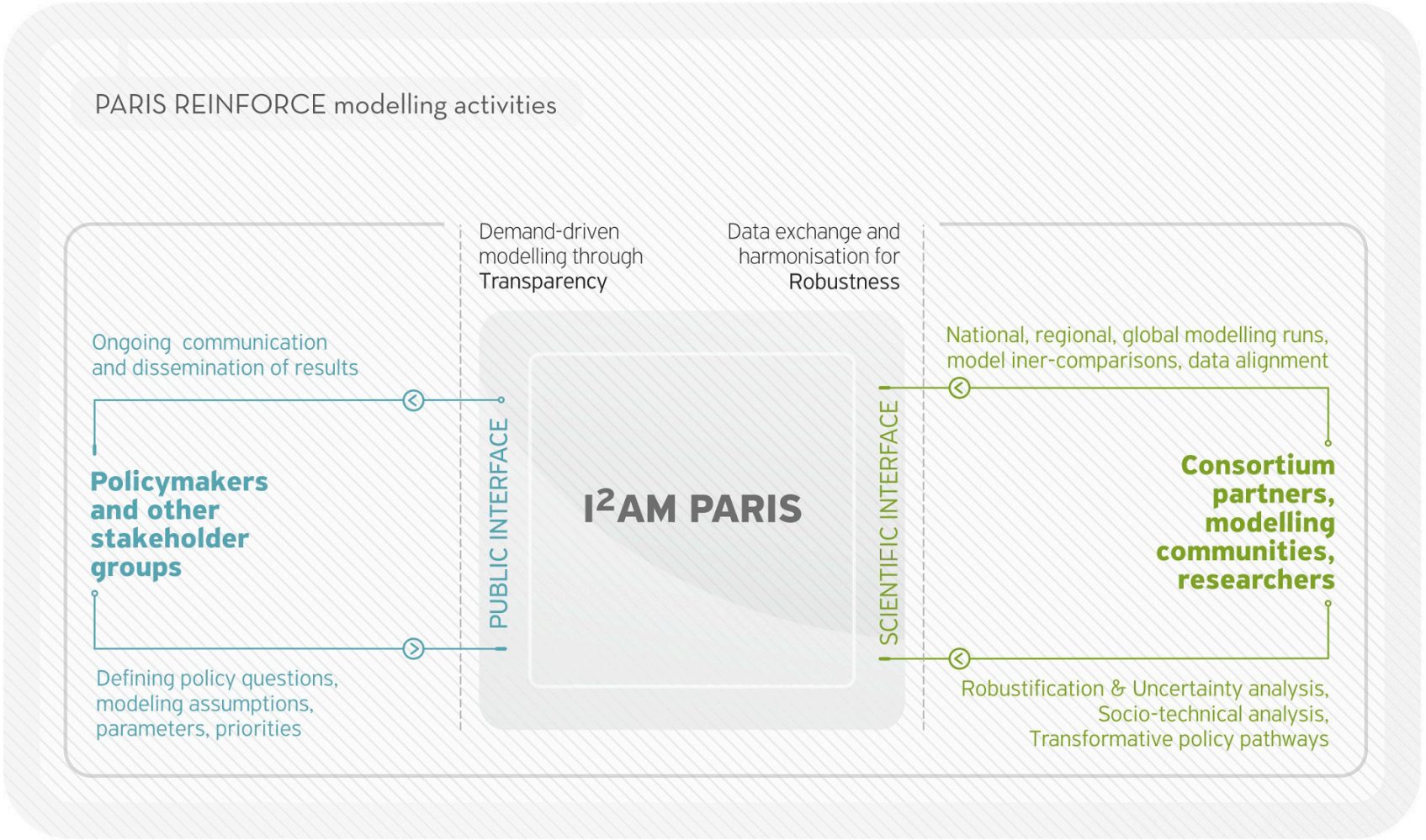

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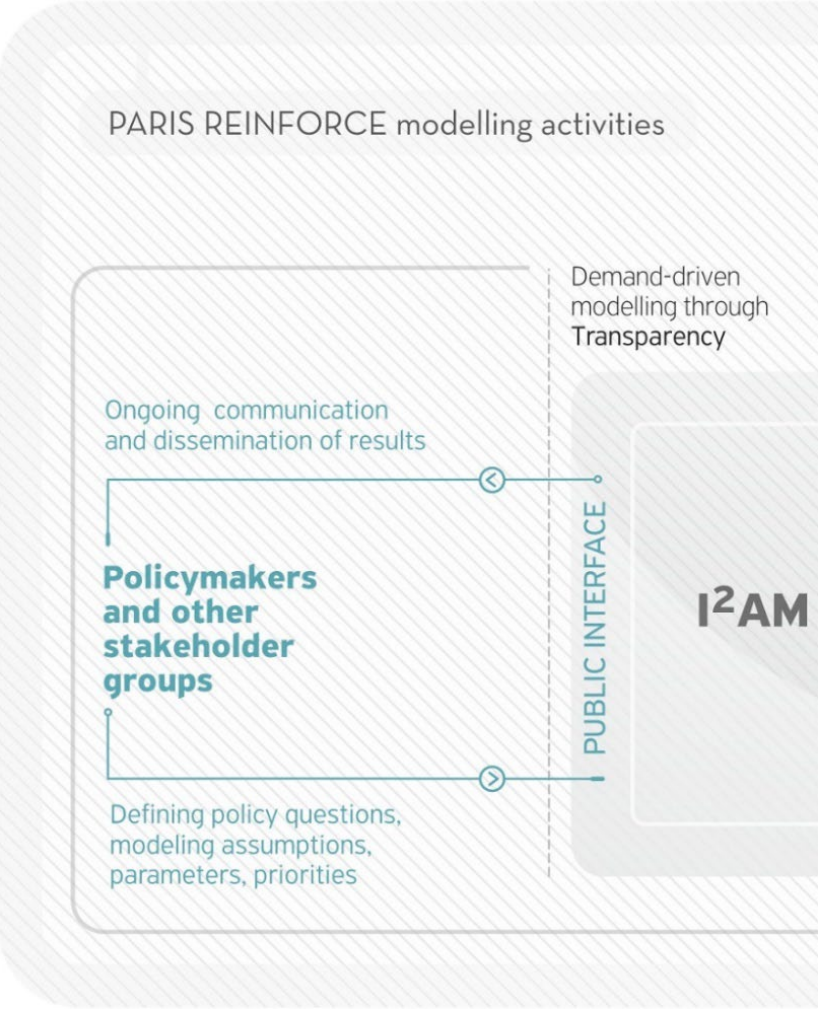
Public interface



- Allows the presentation of a detailed, dynamic, & comparative documentation of models & harmonisation heatmaps across models shedding light into 'What can models do?'.
- Theme-specific workspaces can provide a user-friendly presentation and visualisation of policy-relevant results and policy prescriptions, in response to co-created policy/research questions, as well as libraries with relevant papers and policy briefs.

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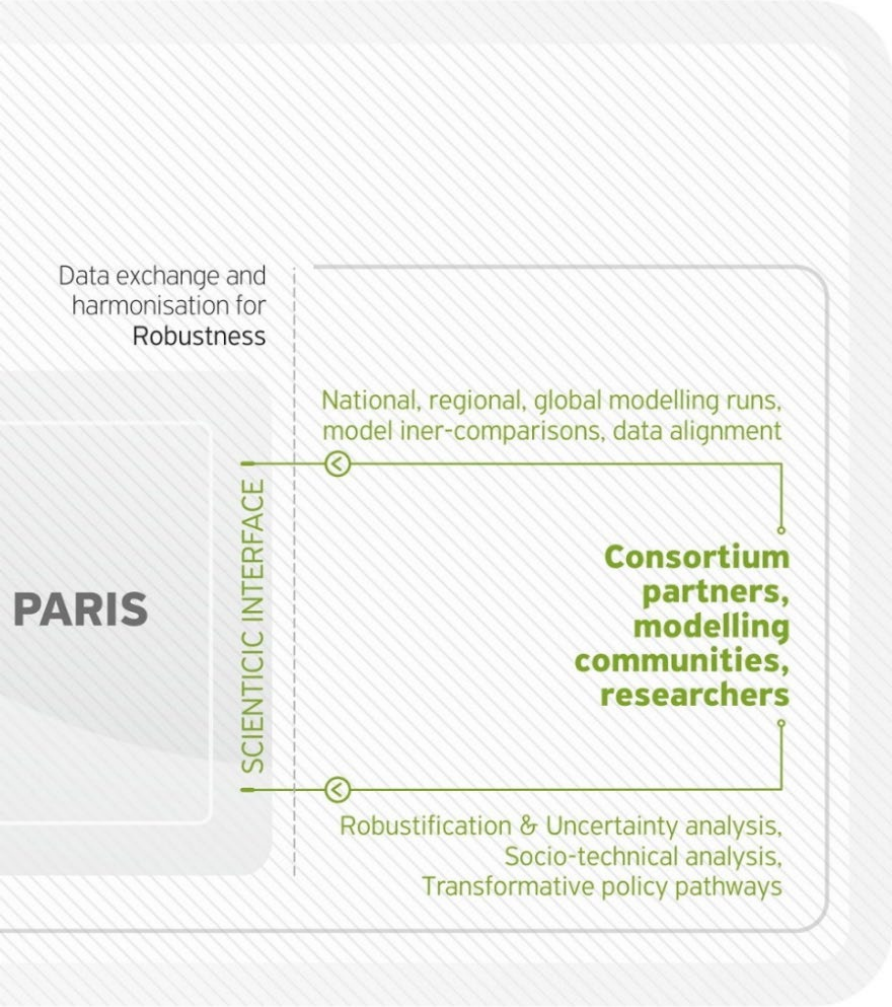
- Modelling teams around the world can provide a detailed documentation of their model(s), so that we can include it in a common database and documentation.
- Like the public interface, experts can also view the advanced scientific presentation of modelling results, databases, etc.; as well as access similar templates to provide with the topics (research questions) they have addressed, as well as their modelling inputs and results.



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Video Presentation

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- I²AM PARIS: dedicated to hosting **finding, accessible, interoperable, and reusable data**, and delivering on *comprehensive* and *comprehensible* scientific information in support of climate policymaking.
- Scientific knowledge is served and visualised in a way that **promotes exploitation** and allows policy prescriptions to be transformed into policy action
- **Documentation of modelling characteristics and capabilities** will enable scientists coming from different disciplines and viewpoints to share a *common language*.
- Non-expert stakeholders can be informed on the capabilities and coverages of models, presenting **a channel for stakeholders** to acknowledge assumptions going into models and **trust results**, in an attempt to promote *legitimacy* and *transparency*.
- The platform encourages scientists to develop and implement **open protocols** for interpreting scenarios and parameters.

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Thank you!

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On behalf of all authors (Skalidakis, Sorman, Galende-Sanchez, Koasidis, Serepas, Van de Ven, Moreno, Karamaneas, Koutsellis, Kanellou, Doukas):

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