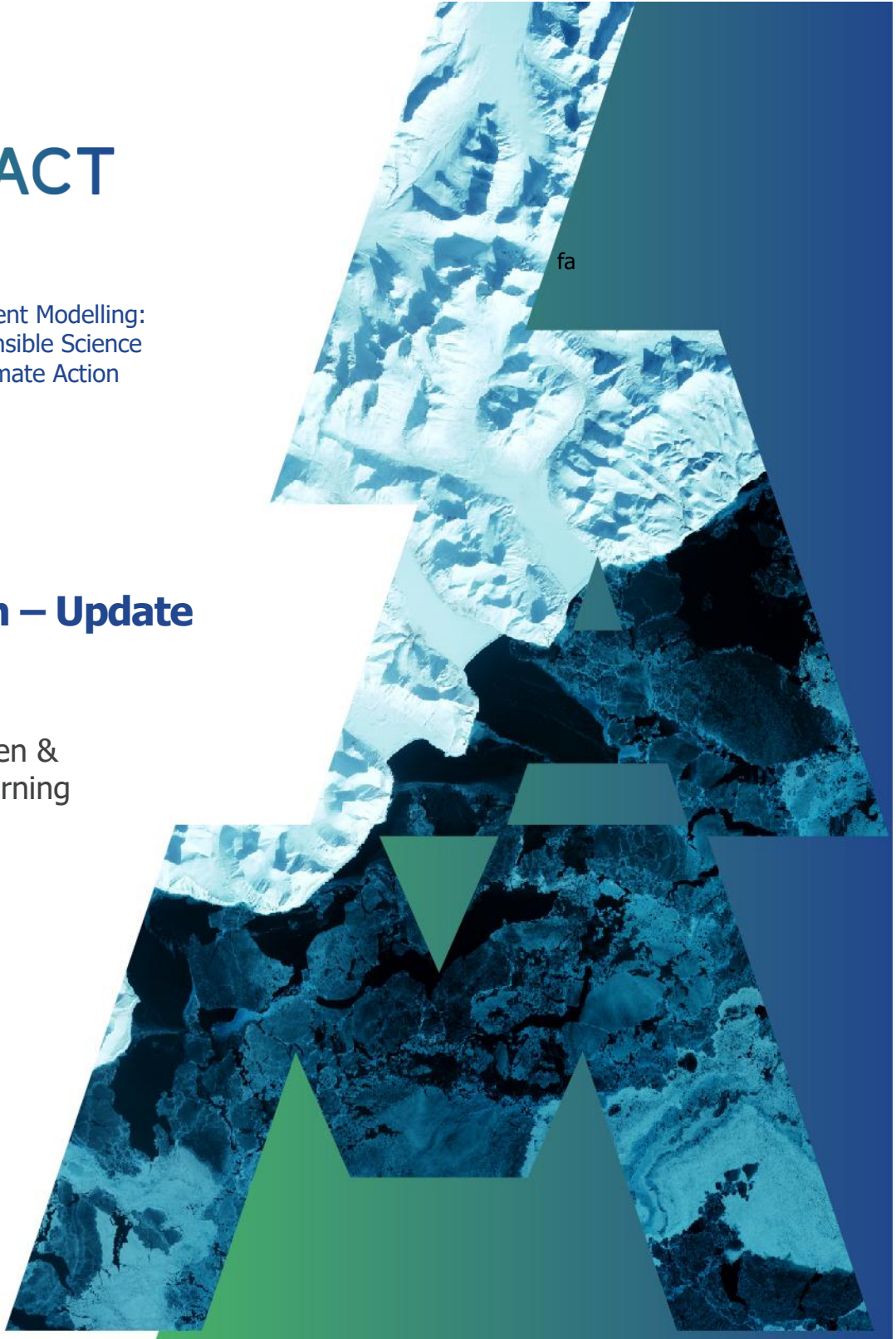
IAM COMPACT

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



D3.3 – Open data management plan – Update

WP3 – Exchanging – Open & FAIR science, mutual learning

25/08/2025

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Grant Agreement Number	101056306	**Acronym**	IAM COMPACT
Full Title	Expanding Integrated Assessment Modelling: Comprehensive and Comprehensible Science for Sustainable, Co-Created Climate Action		
Topic	HORIZON-CL5-2021-D1-01-04		
Funding scheme	HORIZON EUROPE, RIA – Research and Innovation Action		
Start Date	September 2022	**Duration**	36 Months
Project URL	https://www.iam-compact.eu		
EU Project Advisor	Andreas Palialexis		
Project Coordinator	National Technical University of Athens – NTUA		
Deliverable	D3.3 – Open data management plan – Update		
Work Package	WP3 – Exchanging – Open & FAIR science, mutual learning		
Date of Delivery	**Contractual** 31/08/2025	**Actual**	25/08/2025
Nature	Report	**Dissemination Level**	Public
Lead Beneficiary	Imperial College London (Imperial)		
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Keywords	Data Management; Open source; Open access; FAIR data		

EC Summary Requirements

1. Changes with respect to the DoA

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

2. Dissemination and uptake

This deliverable provides an update on the project's Open Data Management Plan (DMP) and serves as both a documentation of the newly developed IAM PARIS platform scenario filtering capabilities—which showcases our enhanced approach to data management—and a guide for consortium partners and external stakeholders on utilising these functionalities. The integration of scenario metadata filtering directly enables targeted analysis of climate mitigation pathways. The report demonstrates the continued efforts within the IAM COMPACT project to ensure its data is organised, stored, and disseminated to satisfy the Findability, Accessibility, Interoperability, and Reusability (FAIR) principles compliance. The platform enhancement can be utilised by policymakers, researchers, and industry stakeholders to identify scenarios relevant to their specific contexts and feasibility concerns. The implementation demonstrates how the vetting and validation tool developed in D4.4 can be operationalised within a user-accessible platform.

3. Short summary of results (<250 words)

This report documents the update to IAM COMPACT's Open Data Management Plan, focusing on the enhancement of the IAM PARIS platform with metadata-based scenario filtering capabilities. Building upon the foundational data management framework established in D3.2, this update operationalises the project's commitment to FAIR data principles through platform development. The key achievement is the integration of scenario metadata filtering, enabling users to identify and analyse scenarios based on specific indicators relevant to different stakeholder groups. Using data from a model inter-comparison supported by the IAM COMPACT project, the platform allows filtering across emissions and energy system indicators. The implementation employs selection-based filtering by model, scenario type, and region, for specific years and change rates compared to pre-defined base year. Additionally, the machine-actionable Data Management Plan in ARGOS—an open, machine-actionable tool that helps researchers create, link, and share Data Management Plans—previously hindered by technical issues, is now operational. The platform development represents a concrete advancement in making complex IAM outputs accessible and actionable for diverse stakeholders, thereby fulfilling the project's objective of enabling directed enhancement through stakeholder-specific analysis pathways. The deliverable includes snapshots demonstrating these new filtering capabilities on the IAM PARIS platform.

4. Evidence of accomplishment

This report, the IAM PARIS platform (link), as well as the machine-actionable version of the DMP alongside its datasets in ARGOS (link) and Zenodo (link).

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Preface

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

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

Executive Summary

This report presents a new update to the Open Data Management Plan (DMP) for IAM COMPACT, documenting the evolution from establishing data management frameworks (D3.2) to implementing platform-based solutions for enhanced data accessibility and stakeholder engagement (D3.3), specifically through the development of metadata-based scenario filtering capabilities for the IAM PARIS platform. The primary achievement documented in this update is the design and implementation of scenario metadata filtering functionality, which addresses the task requirement to "map pathways for analysis across stakeholder groups, enabling directed enhancement" of the platform.

By benefiting from the scenario vetting and validation tool developed in D4.4, the platform now enables users to filter scenarios from the multimodel post-Glasgow climate targets analysis based on indicators most relevant to their specific contexts. The filtering system encompasses two primary approaches: selection-based filtering allowing users to choose specific models, scenarios, and regions; and variables filtering based on emissions and energy system indicators, for specific years and change rates compared to pre-defined base year. This dual approach ensures both accessibility for non-technical users and analytical depth for researchers and modellers. A significant technical achievement is the resolution of longstanding issues with the ARGOS machine-actionable DMP service.

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1 Introduction

The previous version of this deliverable (D3.2[1]) established the foundational Open Data Management Plan for IAM COMPACT, providing comprehensive guidelines for data collection, processing, and sharing in accordance with FAIR principles. That initial version (a) detailed data types and formats, (b) outlined procedures for ensuring findability, accessibility, interoperability, and reusability of project outputs, and (c) introduced the machine-actionable DMP through ARGOS. It successfully established the framework for managing diverse data types including model inputs and outputs, stakeholder engagement data, and capacity building materials, whilst ensuring security and ethical compliance throughout the data lifecycle.

This updated deliverable (D3.3) represents a significant evolution in our approach to data management and knowledge exchange. We have focused on operationalising the data management principles through concrete platform enhancements. The centrepiece of this update is the development of metadata-based scenario filtering capabilities for the IAM PARIS platform[2] (formerly I^{2}AM PARIS), directly addressing the task requirement to assess and improve knowledge exchange methods whilst mapping pathways for analysis across stakeholder groups. The platform enhancement leverages the scenario vetting and validation tool developed as part of D4.4 (Broad scenario logic deliverable) to create a user-accessible interface for filtering and analysing scenarios based on stakeholder-relevant indicators. Using data from the "multimodel analysis of post-Glasgow climate targets and feasibility challenges" study (van de Ven et al., 2023[3]), the platform enables users to identify scenarios that meet specific criteria across multiple dimensions including emissions and sectoral transformations.

Additionally, this update documents the successful resolution of technical challenges with the ARGOS service, which had prevented the creation of a functional machine-actionable DMP for over a year. With these issues now resolved, the project can fully implement its vision of automated data management processes that enhance both efficiency and compliance with FAIR principles.

[1] DOI 10.5281/zenodo.10849068
[2] https://iamparis.eu
[3] van de Ven, DJ., Mittal, S., Gambhir, A. *et al.* A multimodel analysis of post-Glasgow climate targets and feasibility challenges. *Nat. Clim. Chang.* **13**, 570–578 (2023). https://doi.org/10.1038/s41558-023-01661-0

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2 IAM PARIS Platform Enhancement: Technical Design

2.1 Overview of Platform Enhancement

The enhancement of the IAM PARIS platform represents a significant advancement in making complex integrated assessment model outputs accessible to diverse stakeholder groups. The development focuses on implementing metadata-based scenario filtering capabilities that enable users to identify and analyse scenarios most relevant to their specific contexts and requirements. The technical design builds upon the scenario vetting and validation tool developed in D4.4, transforming it from a backend analytical tool into a user-accessible interface.

2.2 Data and Metadata Structure

The implementation enhances the IAM PARIS platform with new metadata-based scenario filtering functionality. For the purpose of this deliverable, the functionality is demonstrated using data from the study "A multimodel analysis of post-Glasgow climate targets and feasibility challenges" (van de Ven et al., 2023), specifically the dataset available at Zenodo (https://zenodo.org/records/7767193; file global_ite2_allmodels.csv). This dataset was chosen because it provides a consistent multimodel ensemble with harmonised variables and metadata suitable for testing and showcasing the new filtering capabilities. In future iterations, the same functionality will be applied to display and analyse results generated within IAM COMPACT, thereby integrating the platform more directly with the project's modelling toolkit and outputs.

The data sources for the development of this part of the platform are all contained in one excel file called "global_ite2_allmodels_with_metadata_8a7d6e7_20250301T2224". The indicators in the "meta" sheet are meant to be used for the numerical filtering functionality of the platform. The displayed data is sourced from the "data" sheet. The rows in the "meta" sheet are mapped to the relevant ones in the "data" sheet using model name and scenario name columns, in both sheets (See Table 1 below).

The platform supports filtering based on change in CO_2 emissions and energy indicators relative to a pre-defined base year, which have been processed and prepared by the vetting tool.

2.3 Filtering Functionality Design

The dual filtering approach accommodates different user needs and analytical approaches:

Selection-based Filtering provides intuitive access through:

- Model selection: Enables comparison of results across different modelling frameworks
- Scenario selection: Allows focus on specific policy assumptions (current policies, NDCs, long-term targets)
- Region selection: Facilitates geographical analysis and country-specific assessments

Range-based Filtering enables quantitative analysis through:

- Flexible comparison operators (>, <, =, between)
- Direct numeric entry for precise thresholds
- Multiple criteria combination with AND/OR logic

This design reflects extensive consideration of user workflows. Policy analysts might start with selection-based filtering to identify relevant scenarios, then apply range-based filters to find those meeting specific targets. Researchers might use range-based filtering to identify scenarios exhibiting particular characteristics for further analysis.

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3 Background of the Model Inter-Comparison Study and Scenario Framework

3.1 Study Context and Rationale

The data underpinning the IAM PARIS platform enhancement derives from the study "A multimodel analysis of post-Glasgow climate targets and feasibility challenges" (van de Ven et al., 2023), which represents a comprehensive assessment of global climate pledges following COP26. This study was selected as the data source for the platform development due to its unique characteristics: it employs a diverse ensemble of integrated assessment models, provides standardised reporting of key variables across models, and explicitly addresses feasibility concerns relevant to different stakeholder groups. The study emerged from the need to assess whether the strengthened 2030 emissions reduction targets and net-zero pledges announced during the Glasgow process could limit future warming to below 2°C. Unlike previous single-model assessments, this multi-model approach enhances robustness by capturing structural uncertainty across different modelling paradigms whilst reducing unwanted response heterogeneity through harmonised inputs.

3.2 Model Ensemble

The study utilises four global integrated assessment models, each representing different modelling paradigm and solution approaches:

- GCAM-PR (Global Change Analysis Model): A partial equilibrium model operating on a recursive dynamic cost-optimisation basis, solving for the least-cost energy system in each period before progressing to the next.
- GEMINI-E3 (General Equilibrium Model of International-National Interactions): A general equilibrium model featuring detailed multi-sector economic representation, allowing for analysis of how policy impacts cascade across economic sectors and regions.
- MUSE (Modular energy systems Simulation Environment): An agent-based energy system model that simulates investment and operational decision-making based on realistic representations of actor behaviour in each geographical region.
- TIAM-Grantham (Times Integrated Assessment Model): A partial equilibrium model operating with perfect foresight welfare cost-optimisation, considering all consequences of technology deployments and energy price changes over the entire time horizon.

This diversity in model structure, spanning from least-cost optimisation to agent-based modelling, ensures that the resulting scenarios capture a wide range of potential decarbonisation pathways and feasibility challenges.

3.3 Scenario Design

The study employs three scenarios representing different levels of climate action based on policies and pledges announced by June 2022:

- Current Policies with Energy Intensity extrapolation (CP_EI): This scenario models the implementation of current emissions reduction policies until 2030, with post-2030 action extrapolated by maintaining the 2020-2030 emissions intensity trends. It represents a baseline of continued policy implementation without additional ambition.
- NDCs with Energy Intensity extrapolation (NDC_EI): This scenario implements stated 2030 NDC targets, applied on top of current policies where these are less ambitious. Post-2030 action follows the same energy intensity extrapolation method, representing a world where countries achieve their near-term pledges but do not accelerate action thereafter.

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- NDCs with Long-Term Targets (NDC_LTT): The most ambitious scenario combines NDC targets until 2030 with stated long-term targets (typically net-zero commitments for 2050-2070). Emissions constraints decline linearly from 2030 levels towards the long-term targets, representing full implementation of both near-term and long-term pledges.

3.4 Input to the Platform Enhancement

The data and metadata from the van de Ven et al., (2023) study are utilised as follows for the filtering approach in the platform:

Table 1: Data and/or Metadata Filtering Input

Filtering Approach	Data Sheet	Metadata Sheet	Description
Selection-based filtering			
Model selection	✓	✓	Filter by model name (GCAM-PR 5.3, GEMINI-E3 7.0, MUSE, TIAM_Grantham)
Scenario selection	✓	✓	Filter by scenario type (CP_EI, NDC_EI, NDC_LTT, Baseline)
Region selection	✓	✓	Filter by geographical region
Range-based filtering			
Emissions and energy indicators		✓	Numeric filtering (>, <, =, between) on relevant values
Variable selection			
Variable display	✓		Select variables to view after initial filtering

3.5 Relevance for Platform Development

The study's outputs provide an ideal dataset for the platform enhancement for several reasons. First, the standardised reporting across models using IAMC (Integrated Assessment Modelling Consortium) variable nomenclature. The IAMC data format is a standardised template developed to harmonise the reporting of scenario results from integrated assessment models, ensuring consistency, transparency, and comparability across model intercomparison projects. Second, the study explicitly calculates feasibility indicators across multiple dimensions (socioeconomic, technological, and physical), providing ready-made metadata that directly addresses stakeholder concerns about the achievability of climate targets. While these are not used for the current platform implementation, they could serve as strong bases for further extension. Third, the scenario structure allows users to explore the implications of different policy ambition levels, from current policies through to long-term net-zero targets, enabling analysis of implementation gaps, ratcheting requirements, and ambition shortfalls. Fourth, the regional disaggregation in the model outputs supports country-specific and regional analysis, crucial for national policymakers and regional stakeholders. The processed metadata indicators—covering emissions reductions, and energy system indicators—were specifically selected to represent key policy-relevant metrics that emerged from IAM COMPACT's stakeholder engagement activities. These indicators enable users to quickly identify scenarios that align with specific policy objectives or feasibility constraints, thereby fulfilling the project's aim of making complex model outputs accessible and actionable for diverse user groups.

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4 User Interface

4.1 Overview

The platform (https://iamparis.eu/datastories/result_indicators) provides users with a curated selection of preconfigured graphs based on stakeholder requirements and includes the following key features:

Information Panel

- Provides detailed information about indicators and scenarios
- Includes user guidance and tutorials for optimal tool utilisation

Profile Management

- Stakeholder Profile dropdown functionality
- Dynamic graph configuration based on selected stakeholder type

Indicator Categories

- Organised categorisation of preset graphs
- Variable-based grouping for improved navigation

GraphMaker Interface

- Left panel: Configuration tools and settings
- Right panel: Real-time graph visualisation

Data Tab

- Scenario selection
- Regional filtering
- Variable selection
- Model parameters
- Year range customisation

Options Tab

- Visualisation type configuration
- Basic display settings

Numeric Filters

- Base year selection for percentage and share calculations
- Filter application for data highlighting and narrowing
- Generate function for real-time graph updates

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4.2 Platform Snapshots

Tool Overview

The Metadata Scenario Filtering Tool helps users explore climate scenarios by showing how emissions, energy systems, electrification, and carbon capture change over time under different policy choices.

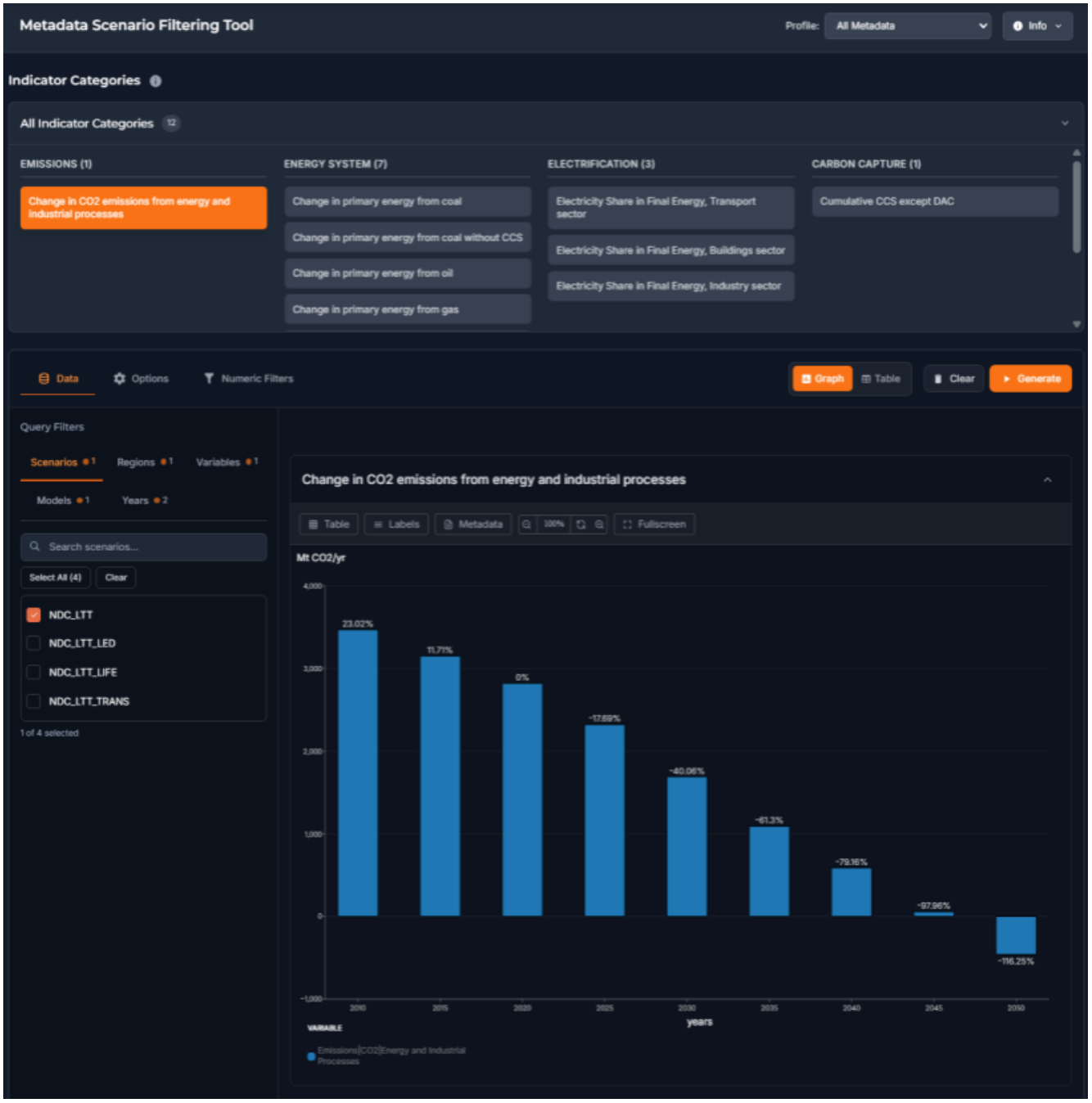

Figure 1: IAM PARIS Platform Landing Page

Users select indicator categories at the top, use filters on the left to narrow down specific scenarios and regions, then view results as interactive charts showing percentage changes from baseline years.

The tool supports different stakeholder profiles (Energy Sector, National Policy, or All Metadata) to display relevant indicators for each audience, with an Info button providing guidance on interpreting the data.

Charts can be clicked for detailed analysis in GraphMaker, and all data can be exported as CSV files for reports and further analysis.

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Information Panel

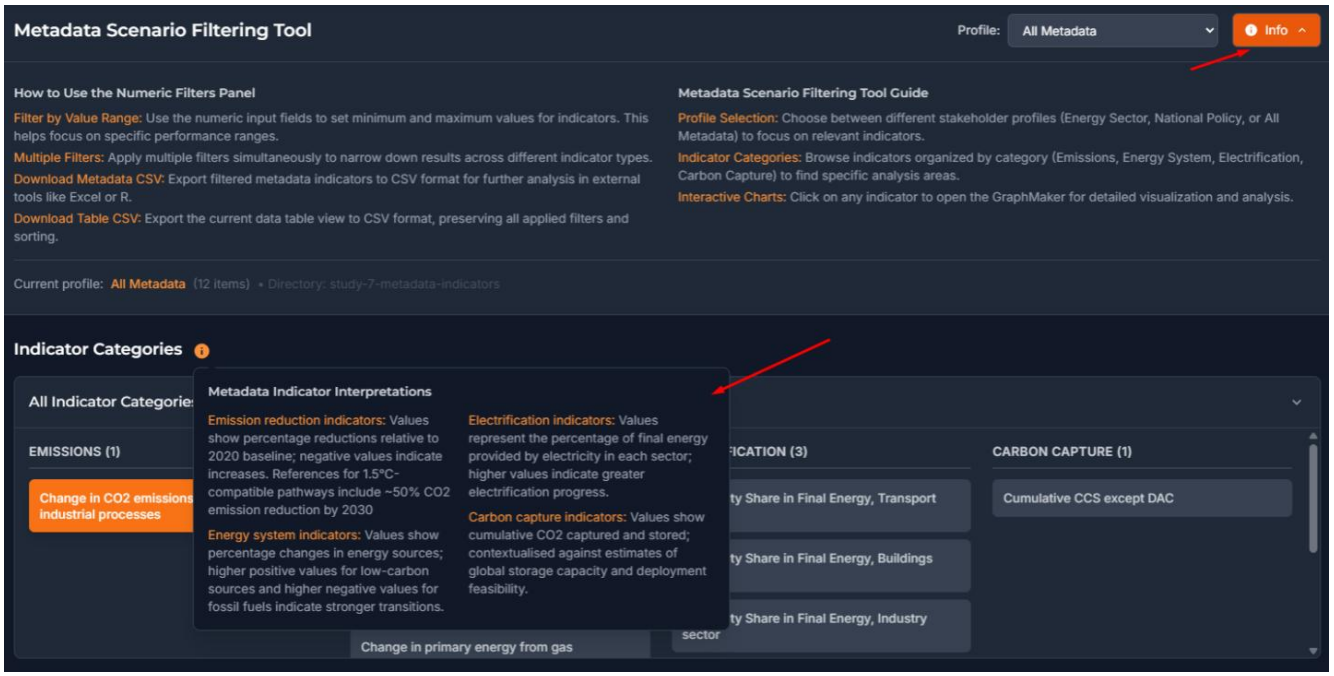

Figure 2: IAM PARIS Platform Landing Page with Explanatory Information

There are two information panels, assisting the user learn about the tool and individual categories.

Stakeholder Groups

The tool supports different stakeholder profiles (Energy Sector, National Policy, or All Metadata) to display relevant indicators for each audience.

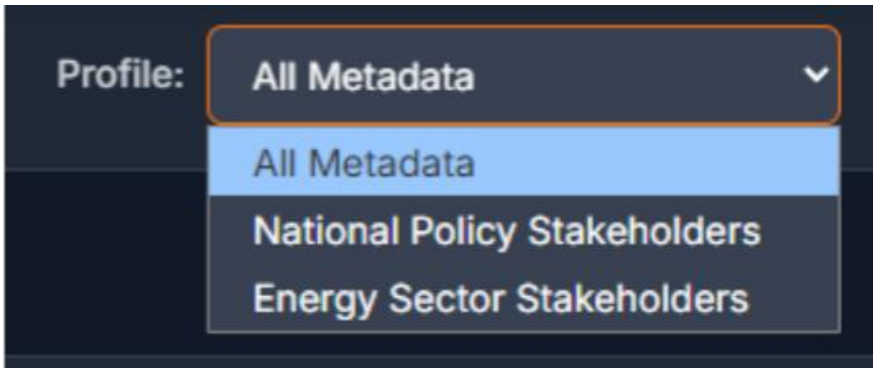

Figure 3: Stakeholders Groups

User Interface Elements

1) Primary filters panel

Users can filter through:

Scenarios

Regions

Variables

Models

Years (to customise range)

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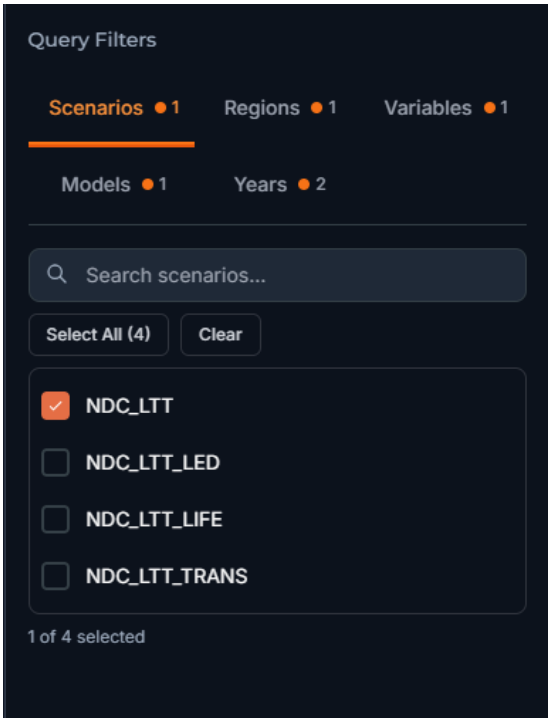

Figure 4: User Interface Elements

2) Numeric range filters

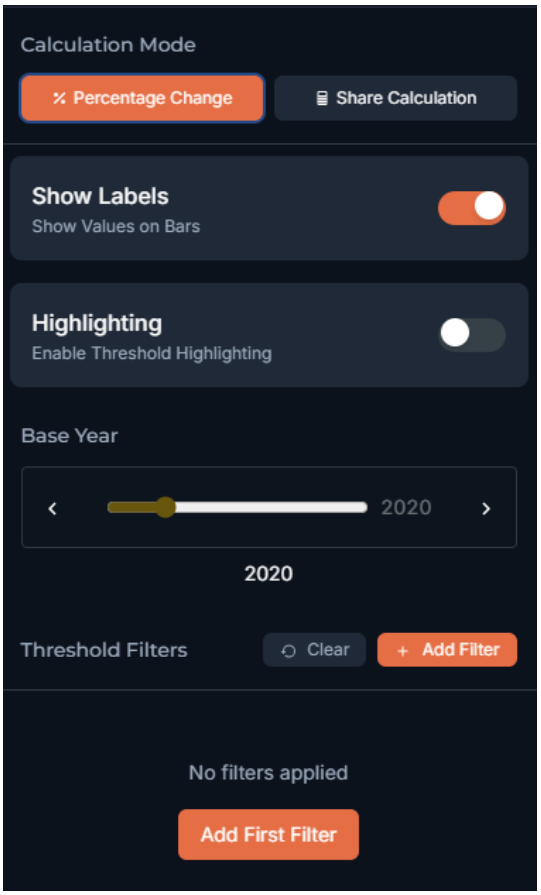

Figure 5: Numeric range

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Threshold Filters example:

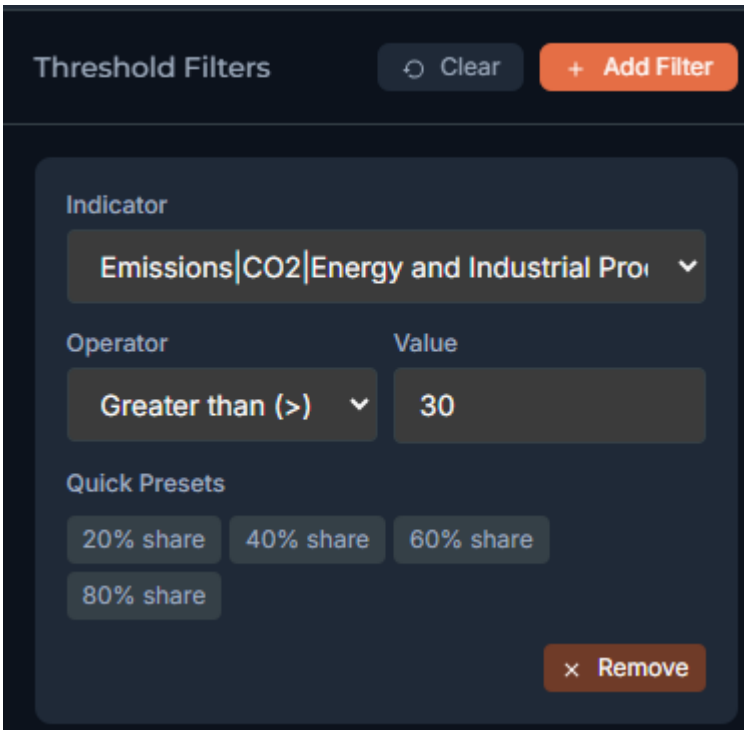

Figure 6: Threshold Filters

Example of analysing Change in CO_2 emissions from energy and industrial processes with Base Year 2020 and logical expression: (Emissions|CO2|Energy and Industrial Processes Less than (<) -30)

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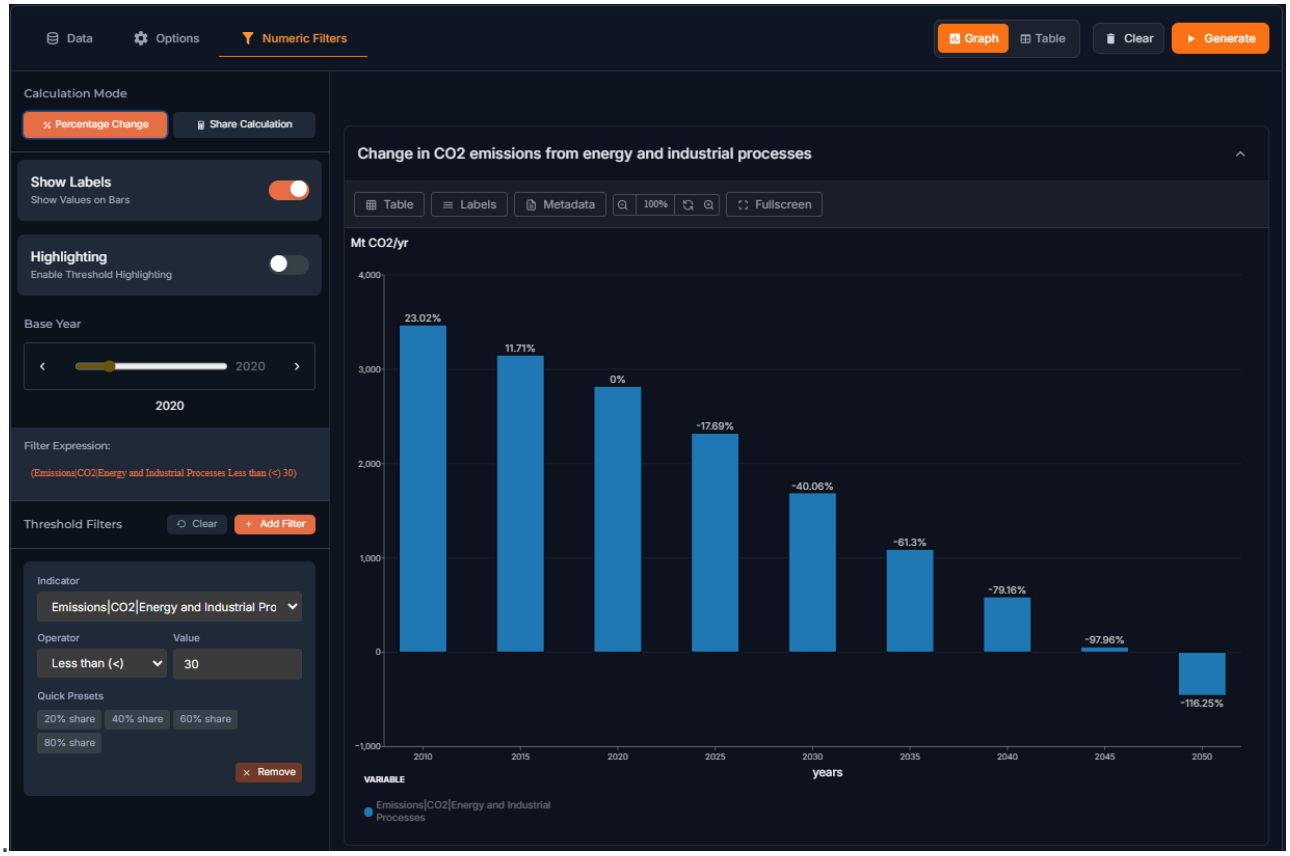

Figure 7: Example

3) Results display

We chose to show results and highlighting in Graphs and Table format that the user is able to download.

Graph Component toolbar:

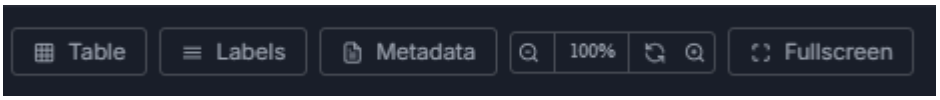

Figure 8: Graph Components Toolbar

In Table we can see our results, independently from metadata, in tabular form and export them as csv

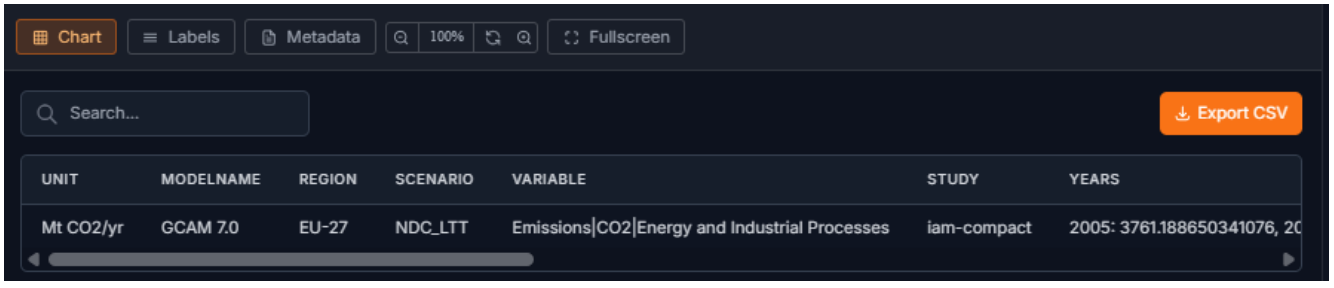

Figure 9: Metadata

Labels show the selected fields, and metadata shows selected metadata fields and export as csv.

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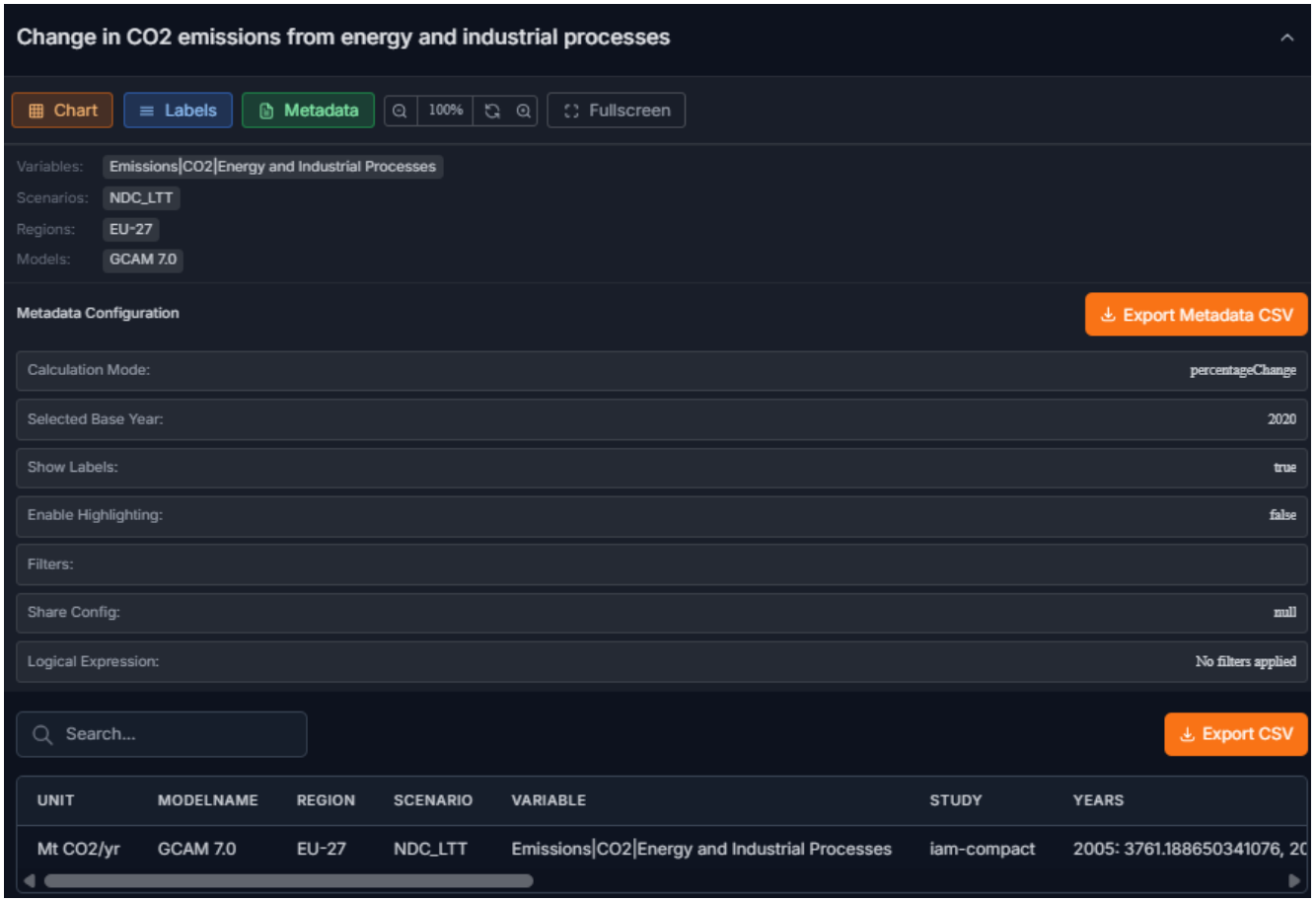

Figure 10: Label and Metadata

5 Machine actionable DMP in ARGOS

ARGOS is an open, machine-actionable tool that helps researchers create, link, and share Data Management Plans (DMPs), implementing the Research Data Alliance (RDA) Common Standard to ensure semantic and technical interoperability, enabling seamless exchange of machine-actionable DMPs (or maDMPs) across platforms without information loss. The tool supports the full DMP lifecycle by integrating with Zenodo, allowing users to openly publish DMPs in a FAIR-compliant manner. This includes the assignment of persistent identifiers (DOIs), licensing, and support for versioning, thereby enabling DMPs to function as dynamic, living documents.

A distinguishing feature of ARGOS is its capacity to document multiple datasets within a single DMP. Each dataset can be described independently using tailored templates, allowing for flexibility in addressing the specific requirements of different data types or disciplinary communities. These dataset descriptions can be reused across DMPs, and are aggregated into a single, shareable plan. Particular emphasis is placed on supporting the reuse of data, facilitated through integration with OpenAIRE APIs. The OpenAIRE API is a set of web-based interfaces provided by OpenAIRE that allow programmatic access to the OpenAIRE Graph—a large, interlinked database of research products (publications, datasets, software, and other outputs), projects, and related metadata.

The open maDMP guides all data collection, processing, production, and storage of the IAM COMPACT project. The maDMP in ARGOS describes all datasets that will be created, managed, and curated in the context of the project. All datasets are stored in the project's community in Zenodo[4] and linked to the maDMP in ARGOS. In parallel, a report has been published in December 2023 with general guidelines for all project datasets, including a description of expected project data, FAIR data handing, data security, resources, and ethical aspects. Another report (Deliverable 3.2 of the project[5]) served as a guide for all consortium partners on how to manage datasets and how to update the maDMP in ARGOS with adequate descriptions and metadata for these datasets and the current report served as its final update.

ARGOS functionality was restored in June following extensive liaison with the service provider. A complete ma-DMP has since been generated and deposited in the IAM COMPACT Zenodo community[6].

[4] https://zenodo.org/communities/iam-compact
[5] DOI 10.5281/zenodo.10849068
[6] DOI 10.5281/zenodo.16937965

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