# PARIS REINFORCE

30/11/2020

## D8.7 DATA MANAGEMENT PLAN – UPDATE 1

WP8 – Communication, Dissemination & Exploitation
Version: 1.00

## Disclaimer

## Copyright Message

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|---|---|---|---|---|
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# 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 constitutes an update of the report (D8.6 Data Management Plan) analysing the procedures for data collection, processing, production, and storage within the H2020 PARIS REINFORCE project, as put together and submitted in November 2019. Thus, it will keep enabling project partners to make the aforementioned data Findable, Accessible, Interoperable, and Reusable (FAIR). Moreover, as with its predecessor, it may be used by any other party interested in data management within the Open Data Research Pilot of the Horizon 2020 programme.

## 3. Short summary of results (<250 words)

This report is the first update to the PARIS REINFORCE Data Management Plan (DMP) that was submitted at the end of the first semester. It outlines the procedures that will be applied regarding the collection, processing, production, and storage of research data within the project. More specifically, the DMP includes information regarding the following questions: (i) how research data will be handled during and after the end of the project; (ii) what data will be collected, processed and/or generated; (iii) which methodology and standards will be applied; (iv) whether data will be shared/made open access; and (v) how data will be curated and preserved (including after the end of the project). To note the most notable changes/updates to the original DMP submitted in Month 6, the data sources used in the first 'Where are We Headed' global modelling runs have been included, and the (ten) datasets and (twenty-two) publications uploaded onto, and provided access to in, the project's Zenodo community page have been outlined in a new section. The DMP is considered as a "living document" and therefore revised over the course of the project whenever significant changes arise, such as: new data; changes in consortium policies (e.g. new innovation potential, decision to file for a patent, etc.); changes in consortium composition and external factors (e.g. new consortium members joining or old members leaving). The final official update of the DMP is scheduled to be submitted at the end (M36 - May 2022) of the project.
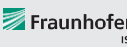
## 4. Evidence of accomplishment

This report.

# Preface

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

| | | |
|---|---|---|
| **NTUA** - National Technical University of Athens | GR | EPU NTUA |
| **BC3** - Basque Centre for Climate Change | ES | bc³ BASQUE CENTRE FOR CLIMATE CHANGE |
| **Bruegel** - Bruegel AISBL | BE | bruegel |
| **Cambridge** - University of Cambridge | UK | UNIVERSITY OF CAMBRIDGE |
| **CICERO** - Cicero Senter Klimaforskning Stiftelse | NO | °CICERO |
| **CMCC** - Fondazione Centro Euro-Mediterraneo sui Cambiamenti Climatici | IT | CMCC |
| **E4SMA** - Energy Engineering Economic Environment Systems Modeling and Analysis | IT | E4SMA |
| **EPFL** - École polytechnique fédérale de Lausanne | CH | EPFL |
| **Fraunhofer ISI** - Fraunhofer Institute for Systems and Innovation Research | DE | Fraunhofer ISI |
| **Grantham** - Imperial College of Science Technology and Medicine - Grantham Institute | UK | Grantham Institute Climate Change and the Environment |
| **HOLISTIC** - Holistic P.C. | GR | HOLISTIC |
| **IEECP** - Institute for European Energy and Climate Policy Stichting | NL | IEECP |
| **SEURECO** - Société Européenne d'Economie SARL | FR | SEURECO ERASME |
| **CDS/UnB** - Centre for Sustainable Development of the University of Brasilia | BR | Centro de Desenvolvimento Sustentável UnB |
| **CUP** - China University of Petroleum-Beijing | CN | |
| **IEF-RAS** - Institute of Economic Forecasting – Russian Academy of Sciences | RU | IEF RAS |
| **IGES** - Institute for Global Environmental Strategies | JP | IGES Institute for Global Environmental Strategies |
| **TERI** - The Energy and Resources Institute | IN | teri |

# Executive Summary

This report is the first update to the PARIS REINFORCE Data Management Plan (DMP) that was submitted at the end of the first semester. It outlines the procedures that will be applied regarding the collection, processing, production, and storage of research data within the project. More specifically, the DMP includes information regarding the following questions: (i) how research data will be handled during and after the end of the project; (ii) what data will be collected, processed and/or generated; (iii) which methodology and standards will be applied; (iv) whether data will be shared/made open access; and (v) how data will be curated and preserved (including after the end of the project). To note the most notable changes/updates to the original DMP submitted in Month 6, the data sources used in the first 'Where are We Headed' global modelling runs have been included, and the (ten) datasets and (twenty-two) publications uploaded onto, and provided access to in, the project's Zenodo community page have been outlined in a new section.

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# 1   Introduction

This report is the second version of the PARIS REINFORCE Data Management Plan (DMP). It outlines the procedures that will be applied regarding the collection, processing, production, and storage of research data within the project. This update to the DMP maintains information regarding the following questions: (i) the handling of research data during and after the end of the project; (ii) what data will be collected, processed and/or generated; (iii) which methodology and standards will be applied; (iv) whether data will be shared/made open access; and (v) how data will be curated and preserved (including after the end of the project).

The ultimate purpose of the DMP, and of its updates, is to ensure that the research data produced by PARIS REINFORCE as well as the data on which the project's results are based on are Findable, Accessible, Interoperable, and Reusable (FAIR). Moreover, that these data are comprehensively and transparently stored and shared within the modelling community, as well as comprehensibly disseminated across and exploited by the policymaking community and other stakeholder groups.

In order to be up to date, the DMP is considered as a "living document". This is the first revision of the DMP, which will be revised over the course of the project, in May 2022 (at the end of the project) or earlier, whenever significant changes arise, such as: new data; changes in consortium policies (e.g. new innovation potential, decision to file for a patent, etc.); changes in consortium composition and external factors (e.g. new consortium members joining or old members leaving).

Sections 2-6 remain as were in the original DMP, with modifications where necessary. A new Section (Section 7) has been added in this update, reflecting the datasets and publications produced and provided access to, via the Zenodo repository.

# 2  Data Summary

## 2.1  Purpose of the data collection/generation and its relation to the objectives of the project

The main objective of PARIS REINFORCE is to support evidence-based climate policy formulation for low-carbon transitions in the context of the Paris Agreement. Such approach will result in a lot of research data being collected and processed, at the various stages of the project, that shall all be stored.

PARIS REINFORCE has been developing a novel, demand-driven, IAM-oriented assessment framework for effectively supporting the design and assessment of climate policies in the European Union as well as in other major emitters and selected less emitting countries, in respect to the Paris Agreement. This assessment framework is being applied through the use of the I$^2$AM PARIS platform, which is an open-access and transparent data exchange platform supporting the modelling work towards effective update and subsequent implementation of Nationally Determined Contributions, preparation of future action pledges, development of 2050 decarbonisation strategies, and reinforcement of the 2023 Global Stocktake. These activities generate, and will keep generating until the end of the project, vast amounts of data that require a logically structured, transparently accessible data management system.

## 2.2  Types and formats of data to be generated/collected

As previously described, within PARIS REINFORCE several data are gathered in order to (i) develop an IAM-based assessment framework; (ii) co-create the I$^2$AM PARIS platform; and (iii) co-produce climate policies supporting the achievement of the goals of the Paris Agreement. Towards the implementation of these outcomes, three main types of data are gathered/generated. First, the data collected via stakeholder engagement; second, the already available data that have been or will be extracted from appropriate databases; and, last but not least, the data that have been and will be generated via the models and by post-processing model results. The data will be available in one or more of the following formats: .pdf, .docx, .xlsx, .csv, .txt, .mp3, .mp4.

The following sections present the models used in the project, the data required by the models, and the policy options to be analysed and assessed.

### 2.2.1  Data Processing Tools (Models & Methodologies) used within PARIS REINFORCE

Within PARIS REINFORCE, a total of twenty-two models were expected to be used in the production of climate policies. In particular, five national or regional models to be applied for analyses in European countries and Europe (or the EU) as a whole; nine national or regional models to be used to analyse selected countries outside Europe; and eight global models to be applied to identify policy-related implications at the global level (but also used for national and regional analyses in countries of interest, for which they feature the required geographic granularity).

Since the first version of the DMP, some modifications of the modelling armada have taken place in PARIS REINFORCE, reflecting new knowledge as well as emerging availability of the modelling tools. In particular, and as discussed in deliverables D5.2, D6.2, and D7.2, (a) the JRC-EU-TIMES model has now been renamed to EU-TIMES, after discussions with the JRC team behind it, following their stated interest in submitting modelling scenarios for the IPCC AR6 cycle; (b) and two models, namely TIMES-India for India and MUSE-Brazil for Brazil, have been added to the modelling ensemble of WP6, so as to both reinforce the WP6 modelling analyses and make up for the possibility of not using the MARKAL-India (India) and SISGEMA (Brazil) models in said analyses.

The models that have been used and are envisaged to be used in the processing of the data, in order to develop

decarbonisation policies, are presented in the following table (Table 1).

**Table 1: Models used in PARIS REINFORCE**

| Global Models[1] | National/Regional Models (Europe)[2] | National/Regional Models (outside Europe)[3] |
|---|---|---|
| GCAM https://github.com/JGCRI/gcam-core | ALADIN https://www.aladin-model.eu/ | CONTO |
| TIAM http://bit.ly/2JziuFe | NEMESIS https://frama.link/r_Upbulb | MARKAL-India |
| MUSE http://bit.ly/2NpY42F | FORECAST http://www.forecast-model.eu/ | MAPLE |
| 42 | LEAP https://frama.link/rTynpKFy | GCAM-China |
| GEMINI-E3 https://www.epfl.ch/labs/gemini-e3/ | EU-TIMES https://frama.link/hunjKQmf | GCAM-SOUSEI |
| ICES https://www.icesmodel.org/ | | GCAM-USA https://jgcri.github.io/gcam-doc/gcam-usa.html |
| E3ME https://www.e3me.com/ | | NATEM |
| DICE http://bit.ly/2MWL8Ca | | SISGEMA |
| | | TIMES-CAC |
| | | MUSE-Brazil |
| | | TIMES-India |

Apart from the models outlined above, a series of robustification techniques and tools have hitherto been and will be applied to understand, assess, and reduce associated uncertainties that may be present in the developed policy recommendations. As PARIS REINFORCE progresses and the use of these methodologies becomes clearer, the DMP will keep being updated to present more precisely the data involved in the process.

### 2.2.2 Data used as input for the models & the robustification toolbox

The development of climate policies is being based on accurate data that may be divided in three categories: (i) stakeholder-generated data; (ii) already available data; and (iii) real life policy/impact observations. The former are collected via the stakeholder consultation process, which consists among others of bilateral interviews, focus groups, workshops, etc., as described in the PARIS REINFORCE report "D3.1 Stakeholder engagement plan". The second category are populated by exploiting existing databases. These are shown in more detail in the relevant section of this report "2.3 Re-use of existing data". The final category are obtained from literature review and monitoring of current affairs. All data in the aforementioned three categories are used either in the creation of the

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[1] As described in PARIS REINFORCE report D7.2 "Interlinkages of global IAMs with the I²AM PARIS platform"

[2] As described in PARIS REINFORCE report D5.2 "Interlinkages of national/regional level models for Europe with the I²AM PARIS platform"

[3] As described in PARIS REINFORCE report "D6.2 Interlinkages of national/regional level models for countries outside Europe with I²AM PARIS"

policies, or in their validation.

Table 2 presents the main data types that tend to be used (non-exhaustive list) as inputs to the models comprising the entire PARIS REINFORCE modelling ensemble.

**Table 2: Input Data to Models and Robustification Methodologies (non-exhaustive list)**

| Input Data to Models | | |
| --- | --- | --- |
| Socio-economic related data | | |
| GDP | Public debt | Number of households |
| Private consumption or households' disposable income | Population | Households size |
| Demand in transports services (passenger-kms, tonne-kms) | Population by age groups and educational attainment level | Interest rates |
| Gross value added | Energy markets in physical units | Sectoral economic activity growth (agriculture, etc.) |
| Sectoral production growth | Physical production growth in the industrial sectors | Indirect taxation |
| Labour participation and productivity | International sectoral statistics | Detailed social accounting matrices |
| Government expenditures | International transactions among governments and transactions/flows between government and private households | Number of employees in service sectors and industry |
| Square meter per employee in service sector | | |
| Energy technology data | | |
| Fossil fuel proven/possible reserves (mainly oil and gas) and expected production rates | Information about under construction/planned/possible energy projects/infrastructures | Policies (emissions constraints, renewable portfolio standards, regional emissions reduction goals, etc.) |
| Energy efficiency improvements rates | Fuel efficiency for electricity and heat plants | Transport infrastructures (charging) |
| Structure of electricity and heat production | Exchanges rates | Fuel efficiency for cars and trucks |
| Sectoral energy intensities | Industrial production for energy-intensive industry sectors | Technology characterisation |
| Power generation technology specification | Degree to which energy demand and demand for other goods and services resulting in GHG emissions change over the time horizon | Agricultural technology crop yields, costs, carbon contents, water requirements, fertiliser requirements |

| Input Data to Models | | |
|---|---|---|
| Resources (fossil fuels, wind, solar, uranium and groundwater) | Overall savings rate for physical capital | Vehicle fleet and structure |
| Drivers profiles (including trips purpose, length of route, departure and arrival time, etc.); | | |
| Price data | | |
| Cost of drive technologies (battery electric vehicles -BEV, range-extended vehicles - REEV, plug-in hybrids - PHEV, etc.) | Energy efficiency improvements costs/limits (from the supply side to the demand side) | Fuel prices |
| Biomass prices | Fossil fuels prices | Fossil energy prices |
| End-consumer energy prices (electricity, coal, oil, natural gas, biomass, district heating) | Renewable energy and CCS costs/potentials | Economic flows related to fuel-specific energy production and consumption |
| Technology availability and costs | Energy technology costs, performance, water requirements | |

### 2.2.3 Created Data, Policy Recommendations

The policies recommended by PARIS REINFORCE are formulated from data derived from the models after the consideration of several policy options that are and will be explored, and the application of the robustification methodologies. An indicative list of considered policy options, to be further enhanced as these are tied to the co-defined research priorities and capacity needed from the stakeholder engagement process (cf. Deliverable D7.3 "Report on stakeholder needs and research capacity needed"), are presented in the following table.

**Table 3: Considered Policy Options (non-exhaustive, to be refined)**

| Policy Options that can be considered in PARIS REINFORCE modelling activities | | |
|---|---|---|
| The emissions targets or constraints consistent with different regions' contributions to different long-term, Paris-compliant temperature goals (i.e. well below 2℃, 1.5℃); | Emissions financial supports; | Carbon border supports on exports; |
| The mix of policies that can be implemented to aim to achieve these emissions targets; | Energy tax; | Trade regulations policies; |

| Policy Options that can be considered in PARIS REINFORCE modelling activities | | |
|---|---|---|
| The interactions of different resulting mitigation pathways with other policy goals, in particular the sustainable development goals (SDGs) and adaptation goals; | Energy subsidies; | Standards (building, fuel economy, etc.) |
| Emissions tax (carbon tax / carbon price); | Energy mix target; | Investment in the construction of cross-national new pipelines; |
| Emissions target / quota (annual); | Energy efficiency target; | Maintenance of free exchange in the energy sector across the region; |
| Emissions target / quota (cumulative); | Energy & Energy efficiency regulations; | Creation of regional joint $CO_2$ emission permit systems; |
| Synthetic fuel production | Carbon sink pricing; | Land use change emissions tax; |
| Behavioural changes | Emissions regulations; | Afforestation targets; |
| Building technologies | Hydrogen production | Carbon border tax on imports; |
| Financial supports | Coal and biomass to liquids production | Carbon capture and storage/sequestration (CCS) |

For a better elaborated overview of what types of policies PARIS REINFORCE modelling tools can be used for, the reader is referred to Deliverable D3.2 "Policy Briefing on What can 'our models' deliver", the respective policy brief, as well as the interactive, dynamic documentation of each model in the I²AM PARIS platform (link).

## 2.3  Re-use of existing data

In order to increase research efficiency and avoid waste of resources, data from already existing and reliable sources are exploited. In particular, reputable databases such as the Wold Bank's Databank[4], EUROSTAT's database[5], etc. are used among others.

The following table concentrates the existing data sources that the PARIS REINFORCE models normally use.

Table 4: Existing data sources used in the PARIS REINFORCE models

| Data Sources used in Models | Purpose / Data | Publicly Accessible (P) or Restricted Access/Subscription Fee (SF) | Model(s) using the Source |
|---|---|---|---|
| REM2030-Fahrprofile | Driving profiles of vehicles | | ALADIN |
| Mobility Panel | Driving profiles of vehicles | | ALADIN |
| KiD 2010 vehicle survey for Germany | Driving date for medium and heavy-duty vehicles | | ALADIN |

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| Data Sources used in Models | Purpose / Data | Publicly Accessible (P) or Restricted Access/Subscription Fee (SF) | Model(s) using the Source |
|---|---|---|---|
| EUROSTAT | Vehicles transport performance and annual mileage data; socioeconomic data: National accounts (GDP, private consumption, GFCF, production, value added, etc...), interest rates, exchange rates, population, population projection (EUROPOP), labour force survey, energy quantities and prices, etc. | | ALADIN, JRC-EU-TIMES, NEMESIS |
| National Statistical Authorities databases (Russian Federal State Statistics Service, China's energy statistical yearbook 2006-2011, national Chinese data sources, etc.) | Same as EUROSTAT | | CONTO, CHINA-MAPLE |
| UN's System of National Accounts | Same as EUROSTAT | | CONTO |
| United Nations (United Nations 2018) | ASDI indicators for ICES base year (2007) | | ICES |
| United Nations (United Nations 2019) | Population growth in GEMINI-E3 | P | GEMINI-E3 |
| World Income Inequality Database (WIID3.4), United Nations 2017 | ASDI indicators for ICES base year (2007) | | ICES |
| Buildings Performance Institute Europe (BPIE) | Technology-related data not available in EUROSTAT | | FORECAST |
| TABULA IEE project | Technology-related data not available in EUROSTAT | | FORECAST |
| IEA Building Energy Efficiency Policies (BEEP) | Technology-related data not available in EUROSTAT | | FORECAST |
| IEA Energy Balances (1990-2016) | Energy production and consumption; ICES: ASDI indicators for base year (2007) and historical calibration in the baseline; Calibration of 42 (depending on the country/region) | | JRC-EU-TIMES, TIMES-CAC, TIAM, ICES, 42 |
| IEA world energy statistics (year 2005) | Calibration of TIAM | | TIAM |
| IEA world energy statistics (year 2010) | Calibration of MUSE | | MUSE |

| Data Sources used in Models | Purpose / Data | Publicly Accessible (P) or Restricted Access/Subscription Fee (SF) | Model(s) using the Source |
|---|---|---|---|
| IEA world energy statistics (year 2012) | Calibration of TIAM (projections for energy, installed technology capacity and emissions) | | GCAM-CHINA, GCAM-SOUSEI, GCAM-USA, GCAM, TIAM |
| IEA world energy statistics (year 2015) | Calibration of TIAM (potentially); Calibration of MUSE (projections for energy, installed technology capacity and emissions); Calibration of NEMESIS (prices and taxes) | | NEMESIS, TIMES-CAC, TIAM, |
| IEA World Energy Outlook (2018) | Economic growth and international energy prices in GEMINI-E3; Calibration of TIAM to post-2015 | SF | TIMES-CAC, TIAM, GEMINI-E3 |
| GTAP 8 database | Energy volumes, CO2 and non-CO2 emissions, fluorinated gases, and National social accounting matrices for behavioural equations in ICES | P | ICES |
| GTAP-Power database | Economic flows related to fuel-specific energy production and consumption in ICES | SF | ICES |
| GTAP-10 database | Calibration of GEMINI-E3 | SF | GEMINI-E3 |
| GTAP Non-CO2 GHG emissions (NCGG) dataset | Representation of non-CO2 emissions in GEMINI-E3 | SF | GEMINI-E3 |
| EPA abatement curves (EPA 2013) | Calibration of GCAM models | | GCAM-CHINA, GCAM-SOUSEI, GCAM-USA, GCAM |
| EPA abatement curves (EPA 2019) | Computation of abatements by gases in GEMINI-E3 | P | GEMINI-E3 |
| OECD | Calibration of GEMINI-E3 (specific data i.e. indirect taxation and government expenditures); Calibration of NEMESIS (complementary to Eurostat) and long-term projection of GDP in non-EU countries | P | NEMESIS, GEMINI-E3 |
| International Monetary Fund (IMF) | Calibration of GEMINI-E3 (specific data i.e. indirect taxation and government expenditures); ICES: ASDI indicator on Public Debt (2007); NEMESIS: short-medium term GDP projections for non-EU countries | P | NEMESIS, GEMINI-E3, ICES |

| Data Sources used in Models | Purpose / Data | Publicly Accessible (P) or Restricted Access/Subscription Fee (SF) | Model(s) using the Source |
|---|---|---|---|
| World Bank 2012 | | | CHINA-MAPLE |
| World Development Indicators (World Bank 2016) | Indicators on R&D expenditure over GDP, private and public health expenditure and total education expenditure (for the year 2007) | | TIMES-CAC, ICES |
| World Development Indicators (World Bank 2018) | Population and employment trend for ICES baseline (from 2017 to 2015); ASDI indicators for ICES base year (2007) | | ICES |
| OECD Main Science and Technology Indicators (OECD 2016) | Attributing R&D to the different economic agents in ICES via the indicator "share of R&D financed by Government, Firms, Foreign Investment and Other National" | | ICES |
| EPISCOPE IEE project | | | FORECAST |
| ODYSSEE database | | | FORECAST |
| Ecodesign Directive preparatory studies | | | FORECAST |
| Individual technology studies | Heating and cooling technologies, hydrogen, storage | | JRC-EU-TIMES |
| GfK | Market research data | | FORECAST |
| World Steel Association | Market research data | | FORECAST |
| CEPI | Market research data, NEMESIS: alternative to OECD long-term GDP projections for non-EU countries | | FORECAST, NEMESIS |
| Cembureau | Market research data | | FORECAST |
| Eurochlor | Market research data | P | FORECAST, JRC-EU-TIMES |
| Other industry organisations | Market research data | | FORECAST |
| US Geological Survey | | P | JRC-EU-TIMES |
| UNFCCC | | | FORECAST |
| UN commodity production database | | | FORECAST |
| PRODCOM | | | FORECAST |
| IPPC BREF studies | | | FORECAST |

| Data Sources used in Models | Purpose / Data | Publicly Accessible (P) or Restricted Access/Subscription Fee (SF) | Model(s) using the Source |
|---|---|---|---|
| IPCC Shared Socioeconomic Pathways (SSPs) | NEMESIS for population qualification projections (and potentially in PR for GDP and population) | | NEMESIS, GCAM-CHINA, GCAM-SOUSEI, GCAM-USA, GCAM |
| EU Energy Roadmap 2050 reference scenario | Potential calibration of NEMESIS to nuclear and hydro PG share in electricity mix and exogeneous energy efficiency | | NEMESIS |
| European Environment Agency – EEA 2019 | | | NEMESIS |
| DG TAXUD 2019 | | | NEMESIS |
| World Input-Output Database (WIOD) 2016 | NEMESIS: to complete EUROSTAT (imports and exports) | | NEMESIS |
| FAOSTAT balances | Food demand, agriculture | | GCAM-CHINA, GCAM-SOUSEI, GCAM-USA, GCAM |
| EIA (2014) | State Energy Data System | | GCAM-USA |
| U.S. Census Bureau | | | GCAM-USA |
| Energy Balance Sheet | | | CHINA-MAPLE |
| Industrial Statistics Yearbook | | | CHINA-MAPLE |
| Industrial Statistical Yearbook 2010-2013 | | | CHINA-MAPLE, TIMES-CAC |
| China Steel Statistics 2011 | | | CHINA-MAPLE |
| China Chemical Industry Yearbook | | | CHINA-MAPLE |
| China Nonferrous Metals Industry Yearbook | | | CHINA-MAPLE |
| China Energy Statistical Yearbook 2006-2013 | | | CHINA-MAPLE |
| China's Medium and Long-Term Development Strategy on Traffic and Transportation | | | CHINA-MAPLE |
| Automotive Energy Outlook 2012 | | | CHINA-MAPLE |

| Data Sources used in Models | Purpose / Data | Publicly Accessible (P) or Restricted Access/Subscription Fee (SF) | Model(s) using the Source |
|---|---|---|---|
| China Transport Yearbook | | | CHINA-MAPLE |
| China Bulletin on Motor Vehicles Pollution Prevention | | | CHINA-MAPLE |
| The Annual Development and Research Report on Building Energy Efficiency in China (2008-2013) | | | CHINA-MAPLE |
| Energy Supply and Demand Projections to 2040. National Energy Board (NEB) - Canada | Driver projections, energy trade and electricity generation, Canada | P | NATEM |
| Trottier Energy Futures Project (TEPF, 2016). Trottier Energy Institute. | Model structure and assumptions, Canada | P | NATEM |
| Annual Energy Outlook Database. Energy Information Administration (EIA) - United States | Drivers and energy projections, electricity generation, technology stocks and techno-economic attributes, various data, USA | P | NATEM |
| Proyecciones de la Población 2010-2050. Consejo Nacional de Poblacion (CONAPO) - Mexico | Driver projections, Mexico | P | NATEM |
| Prospectiva de Energía Renovable 2014 – 2028. Secretariat de Energia (SENER), Mexico | Renewable energy projections, Mexico | P | NATEM |
| PRODESEN – Programme de Desarrollo des Sistema Electrico Nacional - Mexico | Energy projections, electricity generation, various data, Mexico | P | NATEM |
| Report on Energy Supply-Demand in Canada. Statistics Canada | Regional energy balances, Canada | P | NATEM |
| Numerous technology/sectoral studies | | | FORECAST |
| A diverse database included in the LEAP model | GHG emissions of energy and non-energy sectors | | LEAP |
| The Technology and Environmental Database (TED) | | | LEAP |
| ENTRANZE Database | Dwelling stock characterisation, Characterisation of retrofit measures | P | JRC-EU-TIMES |

| Data Sources used in Models | Purpose / Data | Publicly Accessible (P) or Restricted Access/Subscription Fee (SF) | Model(s) using the Source |
|---|---|---|---|
| JRC-IDEES Database | Disaggregated energy balances by energy service, technology efficiencies, load factors for dispatchable electricity generation | P | JRC-EU-TIMES |
| EMISIA TRACCS Database | Vehicle stocks, Fuel consumption, Average occupancy/tonnage, Average efficiency in road transport | P | JRC-EU-TIMES |
| ETRI Database | Energy Technology Reference Indicators | P | JRC-EU-TIMES |
| ENSPRESO Database | Wind, solar and biomass energy potentials | P | JRC-EU-TIMES |
| EMHRES (European Meteorological derived High Resolution RES) Database | Parametrisation of variable RES | P | JRC-EU-TIMES |
| EU Reference scenario 2016 | Demand projections | P | JRC-EU-TIMES |
| FAO Aquastat database | Water resources, uses, withdrawals | P | JRC-EU-TIMES, TIMES-CAC |
| Country-Specific DB (Local - Central Asia) | Economic indicators, technology data, reserves, pipelines, etc. | | TIMES-CAC |
| BP, Statistical Review of World Energy (Central Asia) | Reserves, production, trades | | TIMES-CAC |
| WRI | GHG emissions for ASDI database (2007) | | ICES |
| SSP database (IIASA) | Projections of GDP, population, employed population | | ICES |
| AR5 emission scenario (IIASA) | emission projections | | ICES |
| GMWD SERI/WU Global Material Flows Database | Material flow for ASDI database (2007) | | ICES |
| Comprehensive Energy Use Database. Office of Energy Efficiency, Natural Resources Canada (RNCan) | Energy consumption data, Canada | P | NATEM |
| National Inventory Report. Environment and Climate Change Canada (ECCC) | GHG inventory and methodology, Canada | P | NATEM |
| Global Power Plant Database. | Electricity capacity by plant, Worldwide | P | NATEM |
| FIGARO (Eurostat, experimental statistics) | Calibration of NEMESIS (potentially) | | NEMESIS |
| The 2018 Ageing Report: Economic and Budgetary Projections for the EU Member States (2016-2070) | Calibration of NEMESIS (potentially - EU GDP and population projections) | | NEMESIS |

| Data Sources used in Models | Purpose / Data | Publicly Accessible (P) or Restricted Access/Subscription Fee (SF) | Model(s) using the Source |
|---|---|---|---|
| OECD/ITF. ITF Transport Outlook 2017 | Transportation data for TIAM | | TIAM |
| Global Energy Assessment - GEA (2012) | Energy end-use in transport and buildings for TIAM V4 | | TIAM |

However, as envisioned and promised in the Grant Agreement, towards leading to meaningful model inter-comparisons where all intra-model differences can be discussed as a reflection of their specificities and theory alone, PARIS REINFORCE modelling exercises undertake a very thorough harmonisation process. For the first 'Where are We Headed?' runs, the following table (Table 5) reflects the harmonisation of the modelling inputs across the models, as also reflected in the I[2]AM PARIS platform "Where are We Headed?" workspace (link).

**Table 5: Model variable harmonisation table for the 'Where are We Headed?' model inter-comparison**

| Population | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OECD Population Projections (short- and mid-term) (OECD Population Projects, 2020) | | | | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Europop (short- and mid-term) (Europop, 2020) | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| UN (short-term) (United Nations 2019) | | | | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SSP2 Population (long-term) (KC and Lutz, 2017) | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **GDP/total income** | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |
| OECD (Economic Outlook No. 103 and 106) (short- and mid-term) (OECD, 2018) (OECD, 2019) | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Ageing Report 2018 (short- and mid-term) (EC, 2017) | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IMF (short-term) (IMF, 2019) | | | | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SSP2 (long-term) (Dellink et al, 2017) | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Sectoral value added** | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |
| Eurostat GDP growth indicator (Eurostat, 2020) | | | | | | ✓ | ✓ | ✓ | | | | ✓ | | | | | ✓ |
| **Interest rate** | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |
| OECD Economic Outlook No. 103 (July 2018) (OECD, 2018) | | | | | | | | ✓ | | ✓ | | | | | | | ✓ |
| **Exchange rates** | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |
| OECD Economic Outlook No. 103 (July 2018) (OECD, 2018) | | | | | | | | | ✓ | ✓ | | | | | | | ✓ |
| **Electricity generation** | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |
| TIAM (Napp et al., 2019) | | | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| NECPs (Mantzos et al., 2017) | | | | | | | | ✓ | ✓ | ✓ | | | | | | | |
| **Road: light duty** | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |

| | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NREL Electric futures report (NREL, 2017) | | | | | ✓ | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| NECPs (Mantzos et al., 2017) | | | | | | ✓ | | ✓ | ✓ | | | | | | | | |
| TIAM (Napp et al., 2019) | | | | | | ✓ | | ✓ | ✓ | | | | | | | | |
| **Road: heavy duty** | | | | | | | | | | | | | | | | | |
| NREL Electric futures report (NREL, 2017) | | | | | ✓ | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| NECPs (Mantzos et al., 2017) | | | | | | ✓ | | ✓ | ✓ | | | | | | | | |
| TIAM (Napp et al., 2019) | | | | | | ✓ | | ✓ | ✓ | | | | | | | | |
| **Heating** | | | | | | | | | | | | | | | | | |
| NECPs (Mantzos et al., 2017) | | | | | | | | ✓ | ✓ | | ✓ | | | ✓ | ✓ | | ✓ |
| TIAM (Napp et al., 2019) | | | | | | | | ✓ | ✓ | | ✓ | | | ✓ | ✓ | | ✓ |
| **Cooling** | | | | | | | | | | | | | | | | | |
| NECPs (Mantzos et al., 2017) | | | | | | | | ✓ | ✓ | | ✓ | | | ✓ | ✓ | | ✓ |
| TIAM (Napp et al., 2019) | | | | | | | | ✓ | ✓ | | ✓ | | | ✓ | ✓ | | ✓ |
| **Appliances** | | | | | | | | | | | | | | | | | |
| NECPs (Mantzos et al., 2017) | | | | | | | | ✓ | ✓ | | ✓ | | | ✓ | ✓ | | ✓ |
| TIAM (Napp et al., 2019) | | | | | | | | ✓ | ✓ | | ✓ | | | ✓ | ✓ | | ✓ |
| **Process heat** | | | | | | | | | | | | | | | | | |
| NECPs (Mantzos et al., 2017) | | | | | | | | ✓ | | | ✓ | | | ✓ | ✓ | | ✓ |
| TIAM (Napp et al., 2019) | | | | | | | | ✓ | | | ✓ | | | ✓ | ✓ | | ✓ |
| **Machine drives** | | | | | | | | | | | | | | | | | |
| NECPs (Mantzos et al., 2017) | | | | | | | | ✓ | | | ✓ | | | ✓ | ✓ | | ✓ |
| TIAM (Napp et al., 2019) | | | | | | | | ✓ | | | ✓ | | | ✓ | ✓ | | ✓ |
| **Steam** | | | | | | | | | | | | | | | | | |
| NECPs (Mantzos et al., 2017) | | | | | | | | ✓ | | | ✓ | | | ✓ | ✓ | | ✓ |
| TIAM (Napp et al., 2019) | | | | | | | | ✓ | | | ✓ | | | ✓ | ✓ | | ✓ |
| **CHP** | | | | | | | | | | | | | | | | | |
| NECPs (Mantzos et al., 2017) | | | | | | | | ✓ | | | ✓ | | | ✓ | ✓ | | ✓ |
| TIAM (Napp et al., 2019) | | | | | | | | ✓ | | | ✓ | | | ✓ | ✓ | | ✓ |
| **CCS/NETs** | | | | | | | | | | | | | | | | | |
| NECPs (Mantzos et al., 2017) | | | | | | | | ✓ | | | ✓ | | | ✓ | ✓ | | ✓ |
| TIAM (Napp et al., 2019) | | | | | | | | ✓ | | | ✓ | | | ✓ | ✓ | | ✓ |
| **Coal market/import prices** | | | | | | | | | | | | | | | | | |
| IEA WEO 2019 (IEA, 2019) | | | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | ✓ |
| **Oil market/import prices** | | | | | | | | | | | | | | | | | |
| IEA WEO 2019 (IEA, 2019) | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | ✓ |
| **Gas market/import prices** | | | | | | | | | | | | | | | | | |
| IEA WEO 2019 (IEA, 2019) | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | ✓ |
| **CO2** | | | | | | | | | | | | | | | | | |
| CMIP6 (Hoesly et al 2018) (van Marle et al, 2017) | | | | | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **CH4, N2O** | | | | | | | | | | | | | | | | | |
| CMIP6 for CH4 (Hoesly et al, 2018) | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (van Marle et al, 2017) | | | | | | | | | | | | | | | | | |
| PRIMAP for N2O (Gütschow et al, 2016) | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| **F-gases** | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |
| NOAA: WMO Ozone Assessment 2018 (NOAA, 2018) | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | | | | ✓ |
| **Pollutants** | CONTO | MAPLE | NATEM | TIMES-CAC | GCAM-USA | ALADIN | FORECAST | EU-TIMES | LEAP | NEMESIS | GCAM | ICES | Gemini-E3 | TIAM | MUSE | 42 | E3ME |
| CMIP6 (Hoesly et al, 2018) (van Marle et al, 2017) | | | | | | | | | | | ✓ | ✓ | | | | | ✓ |

## 2.4 Origin of the data

The data used in the project is either gathered directly via stakeholder engagement (i.e. experts' opinions, knowledge, insights, question-driven scenarios, etc.) or via already existing databases and statistical data as described in the previous section. Stakeholder engagement is carried out via interviews, small meetings and focus groups, online surveys, as well as regional and national workshops.

## 2.5 Expected size of the data

The data expected to be collected, processed, and produced within PARIS REINFORCE are less than 250GB.

It must be noted that this figure is a rough estimate, and a more accurate number will be available with the progress of the project.

## 2.6 Data utility

The produced data are envisaged to be useful to various stakeholder groups, primarily including policymakers and modelling scientists, as also reflected in the main objectives of the project, i.e. to support policy processes regarding the update of NDCs and the informed support of the 2023 Global Stocktake on the one hand, and to inform major scientific assessments (like the IPCC AR6 cycle) on the other. Other potential users of the data are other academics/scientists, industry representatives, NGOs, financial institutions, and civil society.

# 3 FAIR Data

## 3.1 Making Data Findable

To ensure that data are easily findable in a consistent way, all data are or will be associated with a persistent digital object identifier and will be described with rich metadata. In the case of scientific publications, DOIs are provided from the publisher, while for other literature (e.g. reports, policy recommendations, etc.) DOIs have been and will be assigned via the repository in which they will be archived. For the purposes of the PARIS REINFORCE project, the Zenodo repository is being used to share both the publications and the datasets supporting these publications and other research activities (link).

As described in "D1.1 Quality Management Plan", a clear naming and versioning system has been established for the identification of the following project documents:

- Deliverables
- Project/WP Meetings agendas and minutes
- Project events agendas
- Official reports to the EC
- Documents, such as mailing lists and internal effort reporting, which are regularly updated
- Documents used for internal project management and monitoring purposes
- Materials/Publications produced by the project, such as commentaries, policy briefs, working documents, presentations, newsletters

Moreover, each document is accompanied with adequate keywords (e.g. Data, Data Management, FAIR Data, Data Processing, etc.) so that potential users are facilitated in searching for and retrieving the document that they are interested in.

## 3.2 Making Data Openly Accessible

### 3.2.1 Data envisaged to be distributed in open access

All reports and data that are not confidential are being licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0)[6]. Exceptions to this rule may apply if needed (e.g. conflict of IPRs, desire to exploit the project's results, etc.). Currently the only exceptions are the reports shown in the following table.

**Table 6: Confidential data/reports & respective reason**

| Non-Open access data / report | Reason for exception |
|---|---|
| D4.2 First portfolio analysis of technological and policy mixes | Scientific publication potential |
| D4.5 Index decomposition analysis and sectoral benchmarking of IAM scenarios | Scientific publication potential |
| D4.7 Transformative policy mixes: comparing national case studies | Scientific publication potential |
| D5.3 Global pathways & EU response: A 1st European Regional, National and Sectoral assessment | Scientific publication potential |

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[6] https://creativecommons.org/licenses/by/4.0/

| | |
|---|---|
| D5.4 Study on EU climate policy, SDGs and the EU policy framework | Scientific publication potential |
| D6.3 First round of nationally modelled low-carbon pathways outputs | Scientific publication potential |
| D6.4 Ancillary impacts, including SDGs, of national low-carbon pathways outputs | Scientific publication potential |
| D6.5 Game-changing innovation across the globe | Scientific publication potential |
| D7.4 1st Report on Model Inter-Comparisons: Informing scientific assessments and the GST | Scientific publication potential |
| D9.1 H - POPD - Requirement No. 1 | Need for confidentiality in connection with security issues |
| D9.2 POPD - Requirement No. 3 | Need for confidentiality in connection with security issues |
| D9.3 GEN - Requirement No. 4 | Need for confidentiality in connection with security issues |
| D9.4 GEN - Requirement No. 6 | Need for confidentiality in connection with security issues |
| D9.5 POPD - Requirement No. 5 | Need for confidentiality in connection with security issues |

The aforementioned reports will have restricted access since their dissemination level is confidential. It is worth mentioning that, as previously stated, the DMP is a living document and if further exceptions are decided for significant reasons it will be updated to reflect these changes.

### 3.2.2   Ways to ensure open access

The data produced will be provided in open access: they will be available via the I$^2$AM PARIS open access exchange platform, and deposited in the PARIS REINFORCE community in the Zenodo repository (link), in order to ensure that they are available to all interested parties. As mentioned before, data is stored in widely used and established formats, namely .pdf, .docx, .xlsx, .csv, .txt, .mp3, .mp4. Several programs capable to open these file formats are distributed freely.

## 3.3   Making Data Interoperable

Interoperability of provided data is ensured by depositing in the Zenodo repository that uses appropriate data and metadata vocabularies; in particular, Zenodo uses the JSON Schema for internal representation of metadata and offers export to other popular formats, such as Dublin Core or MARCXML.

## 3.4   Making Data Reusable

As already mentioned, all reports and data that are not confidential will be licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). Most reports are made available as soon as they are accepted by EASME. In case scientific publications are envisaged to be produced from certain data and/or reports, then an embargo period will be applied until the scientific publication has been accepted by the publisher.

After the publication of data in open access, these will be exploitable by third parties, and it is intended that the data remain re-usable for as long as possible.

# 4 Allocation of Resources

To ensure data accessibility and preservation, the free-of-charge Zenodo repository is used. Thus, the only necessary resources for making data FAIR is the process of depositing the data in the repository, as well as any fees for publishing in open access (either gold or green). Both these expenditures have already been budgeted in the PARIS REINFORCE Grant Agreement. IEECP and NTUA staff are responsible for depositing the data in Zenodo. Ideally, the cost of long-term preservation will be covered by the Zenodo repository. According to the H2020 requirements open access must be ensured to all peer-reviewed scientific publications within a period of at most six months. The following table presents the available open access options.

**Table 7: Open Access Options**

| Open Access Type | Definition | Options | Access | Fees | License |
|---|---|---|---|---|---|
| Gold Open Access | Providing free online access to the published scientific paper for any user. | Publish in an open access journal. Publish in a journal that supports open access. | Free to everyone. | Article Processing Charges (or APCs), ranging range between 130€ and 5,400€ | CC BY 4.0 CC BY-NC-ND 4.0 |
| Green Open Access | Depositing the published article or the final peer-reviewed manuscript in an online repository | Publishing in an embargo journal. | Free to everyone after an embargo period. | Fees may be required in order to achieve the embargo period of 6 months. | CC BY-NC-ND 4.0 |
| | | Self-archiving the final accepted manuscript in an appropriate repository (e.g. arXiv, RePEc, etc.) | Free to everyone immediately. | No fees required. | CC BY-NC-ND 4.0 |

# 5 Data Security

Within the project's lifetime, in order to enhance the effective collaboration among partners, data is and will be stored in a project-specific implementation of the Alfresco Community document management system. The employed Alfresco server has full version control and a backup of previous versions (full backups rather than differential), as well as retaining a backup copy for every deleted or overwritten piece of content in its repository. This allows instant recovery of documents, through either the Alfresco interface or the administration interface. In addition, certain data produced by the models of the project will be stored in or linked to from the I$^2$AM PARIS platform, more information on which is available in "D2.2 – Protocol for model use, scenarios and stakeholder engagement" (Month 7) and "D2.3 – I$^2$AM PARIS platform" (Month 12, with updates in Months 24 and 36). The structure and technical details of the platform have been decided, and good practices of data storage and recovery are applied in its design and development. It is envisaged that the platform will be maintained for a period of at least five years after the end of the project.

The PARIS REINFORCE implementation of Alfresco is located on a Windows Server 2008 R2 Datacenter Hyper-V Virtual Machine, on a Dell Poweredge R710 Server owned by EPU-NTUA (Project Coordinator) and operated in the EPU-NTUA premises. Data redundancy on a server-wide scale is achieved by the use of four SAS 600GB hard disk drives on a RAID 10 configuration—this ensures that no data is lost if one drive fails. In addition, offsite backups of the server are taken on a weekly basis. More information about Alfresco can be found at the Alfresco website[7].

After the project's end, the collected data will be stored in an appropriate repository so as to achieve data reservation. It is envisaged that these data will also be archived in the Zenodo PARIS REINFORCE community, which is provided by CERN and has a lifespan of at least 20 more years. Moreover, even in case of closure of Zenodo, best efforts will be made by its staff to integrate all content into suitable alternative institutional and/or subject based repositories. According to Zenodo's policy, the data files are stored in the central server located in CERN Data Centres, Geneva, while two more replicas of a file located on different disk servers, in Budapest, are created. Thus, loss of data is highly improbable to occur. Regarding specific files, other repositories apart from Zenodo may be chosen in case they are more suitable to the file in question.

Finally, the outcomes of PARIS REINFORCE will be maintained in NTUA's servers for a period of at least ten years after the end of the project, thus further increasing data preservation.

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[7] https://www.alfresco.com/solutions/document-management

# 6 Ethical Aspects

Regarding the data already available in existing databases (see Section 2.4), there are no ethical aspects, apart from the respect of the licence under which these databases are provided, namely a database with restricted access cannot be available with open access even if PARIS REINFORCE has used it.

Regarding data gathered via stakeholder consultation (e.g. stakeholders' opinions, etc.) several ethical procedures apply in regards with data collection, handling, and further availability to the public. For the collection of the data, as described in "D9.1 H - POPD - REQUIREMENT No. 1", informed consent procedures have been established and appropriate templates have been created. Moreover, in case data gathered via stakeholder consultation is decided to be made public (e.g. if the data are used in an open access scientific publication), then suitable anonymisation techniques will be applied prior to the archiving of data.

# 7 Datasets and publications produced, as of November 2020

## 7.1 Datasets

| | |
|---|---|
| **Name:** | Van de Ven et al._2019_ERL_DATASET |
| **Description:** | This dataset contains the underlying data for the following publication: Van de Ven, D. J., Sampedro, J., Johnson, F. X., Bailis, R., Forouli, A., Nikas, A., … & Doukas, H. (2019). Integrated policy assessment and optimisation over multiple sustainable development goals in Eastern Africa. Environmental Research Letters, 14(9), 094001, https://doi.org/10.1088/1748-9326/ab375d. |
| **Partner(s):** | BC3, NTUA |
| **Zenodo DOI:** | https://doi.org/10.5281/zenodo.4099722 |
| **Zenodo link:** | https://zenodo.org/record/4099722 |
| **Publication Date:** | August 20, 2019 |
| **Name:** | Song_et_al_2020_ERSS_DATASET |
| **Description:** | This dataset contains the underlying data for the following publication: Song, L., Lieu, J., Nikas, A., Arsenopoulos, A., Vasileiou, G., & Doukas, H. (2020). Contested energy futures, conflicted rewards? Examining low-carbon transition risks and governance dynamics in China's built environment. Energy Research & Social Science, 59, 101306., https://doi.org/10.1016/j.erss.2019.101306 |
| **Partner(s):** | NTUA |
| **Zenodo DOI:** | https://doi.org/10.5281/zenodo.4088569 |
| **Zenodo link:** | https://zenodo.org/record/4088569 |
| **Publication Date:** | September 23, 2019 |
| **Name:** | van_vliet_et_al_2020_EIST_DATASET |
| **Description:** | This dataset contains the underlying data for the following publication: van Vliet, O., Hanger, S., Nikas, A., Spijker, E., Carlsen, H., Doukas, H., & Lieu, J. (2020). The importance of stakeholders in scoping risk assessments—Lessons from low-carbon transitions. Environmental Innovation and Societal Transitions 35, 400-413. https://doi.org/10.1016/j.eist.2020.04.001. |
| **Partner(s):** | NTUA |
| **Zenodo DOI:** | https://doi.org/10.5281/zenodo.4099682 |
| **Zenodo link:** | https://zenodo.org/record/4099682 |

| | |
|---|---|
| **Publication Date:** | May 12, 2020 |
| **Name:** | Nikas_et_al_2020_ORIJ_DATASET |
| **Description:** | This dataset contains the underlying data for the following publication: Nikas, A., Fountoulakis, A., Forouli, A., & Doukas, H. (2020). A robust augmented ε-constraint method (AUGMECON-R) for finding exact solutions of multi-objective linear programming problems. Operational Research, in press, 10.1007/s12351-020-00574-6. |
| **Partner(s):** | NTUA |
| **Zenodo DOI:** | https://doi.org/10.5281/zenodo.4099564 |
| **Zenodo link:** | https://zenodo.org/record/4099564 |
| **Publication Date:** | May 24, 2020 |
| **Name:** | Babacan_et_al_NATEN_2020_DATASET |
| **Description:** | This dataset contains the underlying data for the following publication: Babacan, O., De Causmaecker, S., Gambhir, A., Fajardy, M., Rutherford, A. W., Fantuzzi, A., & Nelson, J. (2020). Assessing the feasibility of carbon dioxide mitigation options in terms of energy usage. Nature Energy, 5(9), 720–728. https://doi.org/10.1038/s41560-020-0646-1. |
| **Partner(s):** | Grantham |
| **Zenodo DOI:** | https://doi.org/10.5281/zenodo.4104432 |
| **Zenodo link:** | https://zenodo.org/record/4104432 |
| **Publication Date:** | July 6, 2020 |
| **Name:** | Neofytou_et_al_2020_RSER_DATASET |
| **Description:** | This dataset contains the underlying data for the following publication: Neofytou, H., Nikas, A., & Doukas, H. (2020). Sustainable energy transition readiness: A multicriteria assessment index. *Renewable and Sustainable Energy Reviews, 131*, 109988., 10.1016/j.rser.2020.109988. |
| **Partner(s):** | NTUA |
| **Zenodo DOI:** | https://doi.org/10.5281/zenodo.4084765 |
| **Zenodo link:** | https://zenodo.org/record/4084765 |
| **Publication Date:** | July 6, 2020 |
| **Name:** | Forouli_et_al_2020_ENVSOFT_DATASET |
| **Description:** | This dataset contains the underlying data for the following publication: Forouli, A., Nikas, A., Van de Ven, D.-J., Sampedro, J. & Doukas, H. (2020). A multiple-uncertainty analysis framework for integrated assessment modelling of several sustainable development goals. Environmental Modelling & Software, 131, 104795, https://doi.org/10.1016/j.envsoft.2020.104795. |
| **Partner(s):** | NTUA, BC3 |
| **Zenodo DOI:** | https://doi.org/10.5281/zenodo.4091763 |

| | |
|---|---|
| **Zenodo link:** | https://zenodo.org/record/4091763 |
| **Publication Date:** | July 21, 2020 |
| **Name:** | Labella_et_al_2020_IJCIS_DATASET |
| **Description:** | This dataset contains the underlying data for the following publication: Labella, Á., Koasidis, K., Nikas, A., Arsenopoulos, A., & Doukas, H. (2020). APOLLO: A Fuzzy Multi-criteria Group Decision-Making Tool in Support of Climate Policy. *International Journal of Computational Intelligence Systems, 13*(1), 1539-1553, https://doi.org/10.2991/ijcis.d.200924.002. |
| **Partner(s):** | NTUA |
| **Zenodo DOI:** | https://doi.org/10.5281/zenodo.4084747 |
| **Zenodo link:** | https://zenodo.org/record/4084747 |
| **Publication Date:** | October 1, 2020 |
| **Name:** | Vielle_2019_EEPS_DATASET |
| **Description:** | This dataset contains the underlying data for the following publication: Vielle, M. (2020). Navigating various flexibility mechanisms under European burden-sharing. Environmental Economics and Policy Studies, 22(2), 267-313., 10.1007/s10018-019-00257-3. |
| **Partner(s):** | EPFL |
| **Zenodo DOI:** | https://doi.org/10.5281/zenodo.4085245 |
| **Zenodo link:** | https://zenodo.org/record/4085245 |
| **Publication Date:** | October 13, 2020 |
| **Name:** | Babonneau_et_al_2020_EMA_DATASET |
| **Description:** | This dataset contains the underlying data for the following publication: Babonneau, F., Bahn, O., Haurie, A. & Vielle, M. (2020). An Oligopoly Game of CDR Strategy Deployment in a Steady-State Net-Zero Emission Climate Regime. Environmental Modeling & Assessment, in press, 10.1007/s10666-020-09734-6. |
| **Partner(s):** | Grantham |
| **Zenodo DOI:** | https://doi.org/10.5281/zenodo.4120615 |
| **Zenodo link:** | https://zenodo.org/record/4120615 |
| **Publication Date:** | October 22, 2020 |

## 7.2 Publications

For more information on the scientific publications that have been produced by the PARIS REINFORCE project, please see Deliverable D8.11 "Report on Scientific Publications".

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| **Citation (APA):** | Van de Ven, D. J., Sampedro, J., Johnson, F. X., Bailis, R., Forouli, A., Nikas, A., … & Doukas, H. (2019). Integrated policy assessment and optimisation over multiple sustainable development goals in Eastern Africa. *Environmental Research Letters, 14*(9), 094001. |
| **DOI:** | https://doi.org/10.1088/1748-9326/ab375d |
| **Zenodo link:** | https://zenodo.org/record/4022245 |
| **Publication Date:** | August 20, 2019 |
| **Access:** | Gold (Open) |
| **Citation (APA):** | Song, L., Lieu, J., Nikas, A., Arsenopoulos, A., Vasileiou, G., & Doukas, H. (2020). Contested energy futures, conflicted rewards? Examining low-carbon transition risks and governance dynamics in China's built environment. *Energy Research & Social Science, 59*, 101306. |
| **DOI:** | https://doi.org/10.1016/j.erss.2019.101306 |
| **Zenodo link:** | https://zenodo.org/record/4061008 |
| **Publication Date:** | September 23, 2019 |
| **Access:** | Gold (Open) |
| **Citation (APA):** | Gramkow, C., & Anger-Kraavi, A. (2019). Developing Green: A Case for the Brazilian Manufacturing Industry. *Sustainability, 11*(23), 6783. |
| **DOI:** | https://doi.org/10.3390/su11236783 |
| **Zenodo link:** | https://zenodo.org/record/4022583 |
| **Publication Date:** | November 29, 2019 |
| **Access:** | Gold (Open) |
| **Citation (APA):** | Vielle, M. (2020). Navigating various flexibility mechanisms under European burden-sharing. *Environmental Economics and Policy Studies, 22*(2), 267-313. |
| **DOI:** | https://doi.org/10.1007/s10018-019-00257-3 |
| **Zenodo link:** | https://zenodo.org/record/4088158 |
| **Publication Date:** | December 19, 2019 |
| **Access:** | Green (Embargoed until December 19, 2020) |
| **Citation (APA):** | Hausfather, Z., & Peters, G. P. (2020). Emissions–the 'business as usual' story is misleading. *Nature, 577*, 618-620. |
| **DOI:** | http://dx.doi.org/10.1038/d41586-020-00177-3 |
| **Zenodo link:** | https://zenodo.org/record/4118610 |
| **Publication Date:** | January 29, 2020 |
| **Access:** | Green (Embargoed until January 29, 2021) |
| **Citation (APA):** | van Vliet, O., Hanger, S., Nikas, A., Spijker, E., Carlsen, H., Doukas, H., & Lieu, J. (2020). The importance of stakeholders in scoping risk assessments—Lessons from low-carbon transitions. *Environmental Innovation and Societal Transitions, 35*, 400-413. |

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| **DOI:** | https://doi.org/10.1016/j.eist.2020.04.001 |
| **Zenodo link:** | https://zenodo.org/record/4022683 |
| **Publication Date:** | May 12, 2020 |
| **Access:** | Gold (Open) |
| **Citation (APA):** | Le Quéré, C., Jackson, R. B., Jones, M. W., Smith, A. J., Abernethy, S., Andrew, R. M., De-Gol, A., Willis, D. R., Shan, Y., Canadell, J. G., Friedlingstein, P., Creutzig, F., & Peters, G. (2020). Temporary reduction in daily global $CO_2$ emissions during the COVID-19 forced confinement. *Nature Climate Change, 10*, 647–653. |
| **DOI:** | https://doi.org/10.1038/s41558-020-0797-x |
| **Zenodo link:** | https://zenodo.org/record/4118105 |
| **Publication Date:** | May 19, 2020 |
| **Access:** | Green (Embargoed until November 19, 2020) |
| **Citation (APA):** | Nikas, A., Fountoulakis, A., Forouli, A., & Doukas, H. (2020) A robust augmented ε-constraint method (AUGMECON-R) for finding exact solutions of multi-objective linear programming problems. *Operational Research*, https://doi.org/10.1007/s12351-020-00574-6 |
| **DOI:** | https://doi.org/10.1007/s12351-020-00574-6 |
| **Zenodo link:** | https://zenodo.org/record/4023114 |
| **Publication Date:** | May 24, 2020 |
| **Access:** | Gold (Open) |
| **Citation (APA):** | Nikas, A., Neofytou, H., Karamaneas, A., Koasidis, K., & Psarras, J. (2020) Sustainable and socially just transition to a post-lignite era in Greece: a multi-level perspective, *Energy Sources, Part B: Economics, Planning, and Policy*, https://doi.org/10.1080/15567249.2020.1769773 |
| **DOI:** | https://doi.org/10.1080/15567249.2020.1769773 |
| **Zenodo link:** | https://zenodo.org/record/4088144 |
| **Publication Date:** | May 27, 2020 |
| **Access:** | Green (Embargoed until May 27, 2021) |
| **Citation (APA):** | Grant, N., Hawkes, A., Napp, T., & Gambhir, A. (2020). The appropriate use of reference scenarios in mitigation analysis. *Nature Climate Change, 10*, 605–610. |
| **DOI:** | https://doi.org/10.1038/s41558-020-0826-9 |
| **Zenodo link:** | https://zenodo.org/record/4088256 |
| **Publication Date:** | June 29, 2020 |
| **Access:** | Green (Embargoed until December 29, 2020) |

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| **Citation (APA):** | Babacan, O., De Causmaecker, S., Gambhir, A., Fajardy, M., Rutherford, A. W., Fantuzzi, A., & Nelson, J. (2020). Assessing the feasibility of carbon dioxide mitigation options in terms of energy usage. *Nature Energy, 5*(9), 720-728. |
| **DOI:** | https://doi.org/10.1038/s41560-020-0646-1 |
| **Zenodo link:** | https://zenodo.org/record/4088221 |
| **Publication Date:** | July 6, 2020 |
| **Access:** | Green (Embargoed until January 6, 2021) |
| **Citation (APA):** | Neofytou, H., Nikas, A. & Doukas, H. (2020). Sustainable energy transition readiness: A multicriteria assessment index. *Renewable and Sustainable Energy Reviews, 131*, 109988. |
| **DOI:** | https://doi.org/10.1016/j.rser.2020.109988 |
| **Zenodo link:** | https://zenodo.org/record/4088194 |
| **Publication Date:** | July 6, 2020 |
| **Access:** | Green (Embargoed until July 6, 2022) |
| **Citation (APA):** | Koasidis, K., Karamaneas, A., Nikas, A., Neofytou, H., Hermansen, E.A.T., Vaillancourt, K. & Doukas, H. (2020). Many Miles to Paris: A Sectoral Innovation System Analysis of the Transport Sector in Norway and Canada in Light of the Paris Agreement. *Sustainability, 12*, 5832. |
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| **Publication Date:** | July 20, 2020 |
| **Access:** | Gold (Open) |
| **Citation (APA):** | Forouli, A., Nikas, A., Van de Ven, D.-J., Sampedro, J. & Doukas, H. (2020). A multiple-uncertainty analysis framework for integrated assessment modelling of several sustainable development goals. *Environmental Modelling & Software, 131*, 104795. |
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| **Publication Date:** | July 21, 2020 |
| **Access:** | Gold (Open) |
| **Citation (APA):** | Fuss, S., Canadell, J. G., Ciais, P., Jackson, R. B., Jones, C. D., Lyngfelt, A., ... & Van Vuuren, D. P. (2020). Moving toward Net-Zero Emissions Requires New Alliances for Carbon Dioxide Removal. *One Earth, 3*(2), 145-149. |
| **DOI:** | https://doi.org/10.1016/j.oneear.2020.08.002 |
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| **Citation (APA):** | Nikas, A., Lieu, J., Sorman, A., Gambhir, A., Turhan, E., Baptista, B.V., & Doukas, H. (2020). The desirability of transitions in demand: Incorporating behavioural and societal transformations into energy modelling. *Energy Research & Social Science, 70*, 101780. |
| **DOI:** | https://doi.org/10.1016/j.erss.2020.101780 |
| **Zenodo link:** | https://zenodo.org/record/4061526 |
| **Publication Date:** | September 21, 2020 |
| **Access:** | Gold (Open) |
| **Citation (APA):** | Koasidis, K., Nikas, A., Neofytou, H., Karamaneas, A., Gambhir, A., Wachsmuth, J., & Doukas, H. (2020). The UK and German Low-Carbon Industry Transitions from a Sectoral Innovation and System Failures Perspective. *Energies, 13*(19), 4994. |
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| **Citation (APA):** | Babonneau F., Bahn O., Haurie A., & Vielle M. (2020). An oligopoly game of CDR strategy deployment in a steady-state net-zero emission climate regime. *Environmental Modeling & Assessment*, in press. |
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| **Citation (APA):** | Nikas A., Gambhir A., Trutnevyte E., Koasidis K., Lund H., Thellufsen J.Z., Mayer D., Zachmann G., Miguel L.J., Ferreras-Alonso N., Sognnaes I., Peters G.P., Colombo E., Howells M., Hawkes A., van den Broek M., Van de Ven D.J., Gonzalez-Eguino M., Flamos A., & Doukas H. (2021). Perspective of comprehensive and comprehensible multi-model energy and climate science in Europe. *Energy, 215*, 119153. |
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