

Datasets and time series for energy policy research and modelling

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1. Introduction

To reach the Paris Agreement's goal to limit global warming to 1.5°C, a crucial system-wide transformation, and relevant public policies are required to push toward a sustainable, innovative, and inclusive future for different sectors, including the energy sector [1]. Interdisciplinary energy models have become essential tools to support the policy-making process of the low-carbon transition, as discussed in [2], [3]. However, most empirical analyses rarely focus on integrating social and political factors into their studies. Moreover, published open-access energy policy research datasets are scarce or not in machine-readable formats [4]. As a result, we aim to develop practices for collecting datasets for energy policy-related research that could support more efficient research in the field and enable the quantitative analysis of energy policy/social and political factors into energy modelling.

The three pilot datasets we plan to develop are (1) renewable energy policy support, (2) climate/renewable energy target and performance, and (3) energy infrastructure regulation. The policy typology will be adapted from [5], [6], [7] and our addition. These three datasets will be generated, verified, and stored under the FAIR data management principles, meaning that we will make them open-access, machine-readable, and securely stored in the repository. Regarding data formats, we aim to reach out to the Konsortium für die Sozial-, Verhaltens-, Bildungs- und Wirtschaftswissenschaften (KonsortSWD) to adopt the social science data formats and match them with the intended use of our energy research communities. Moreover, our developed datasets will be continuously expanded over time. The metadata/user manual will also be created as a guideline for further use.

The following sections (Sections 2, 3, and 4) discuss each pilot dataset's details.

2. Dataset I: Renewable energy policy support

- **What to collect**
 - o Detailed data on policy instruments including:
 - Feed-in tariffs
 - Feed-in premiums
 - Investment subsidies
 - Accelerated depreciation
 - Emissions trading
 - Soft loans
 - Loan guarantees

- Tax rebates
- Auctions with subsequent fixed tariff or premium
- Tradeable green certificates
- For each policy, further detailed data are recorded including:
 - Level of support
 - Duration
 - Cap on support
 - Minimum prices
 - Interest or loan rates
- **Time resolution:** annual basis (such as from 19xx-present)
- **Geographical coverage:** Global
- **Format:** CSV (Comma-Separated Values) or others that are in line with the use of energy research communities

3. Dataset II: Climate/renewable energy target and performance

- **What to collect**
 - Climate (GHG emissions) target (% emissions target compared to a base case such as 1990 emissions level)
 - Renewable energy target (% targeted share of renewable electricity compared to total electricity generation)
 - Climate performance (GHG emissions; kton-CO₂)
 - Renewable energy performance (% share of renewable electricity compared to total electricity generation)
- **Time resolution:** annual basis (such as from 19xx-present)
- **Geographical coverage:** OECD and/or G20 countries (as well as some developing countries/regions that contribute to high emissions)
- **Format:** CSV (Comma-Separated Values) or others that are in line with the use of energy research communities

4. Dataset III: Energy infrastructure regulation

- **What to collect:** Regulations on where we can build what energy assets. This includes energy production, transmission, and distribution infrastructure.
- **Time resolution:** annual basis (such as from 19xx-present)
- **Geographical coverage:** Germany and a set of further European countries
- **Format:** CSV (Comma-Separated Values) or others that are in line with the use of energy research communities

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