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EQUITAS: Swiss Energy Equity Atlas

Closing the loop between theory, policy, and practice

Source: own design

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Summary

This project aims to apply the conceptual framework of energy justice (recognition, distributional, procedural, restorative) to Swiss energy policies. To this end, we first propose equity metrics and indicators based on interdisciplinary methodologies: i) conceptualizing energy justice with desk research, expert interviews and co-creation workshops, and ii) leveraging existing datasets and conducting modelling analyses. We then develop an 'energy equity atlas' coupled with a GIS tool to identify, analyse, and visualize the energy justice and equity implications of Swiss energy policies supported with tangible social and spatial indicators. This conceptual, systematic, and data-driven approach will provide objective knowledge regarding energy justice and therefore instrumental to those intermediaries who design clean energy policies, programmes, and pilots.

Zusammenfassung

Dieses Projekt verfolgt das Ziel, das Konzept der Energiegerechtigkeit (Anerkennungsgerechtigkeit, Verteilungsgerechtigkeit, Verfahrensgerechtigkeit, Wiederherstellungsgerechtigkeit) auf die Schweizer Energiepolitik anzuwenden. Zu diesem Zweck werden zunächst Metriken und Indikatoren in Bezug auf Gerechtigkeit entwickelt, die auf interdisziplinären Methoden beruhen: i) Konzeptualisierung von Energiegerechtigkeit durch Literaturrecherche, Expert:inneninterviews und Co-Creation-Workshops; ii) die Nutzung von bereits vorhandenen Datensätzen und Modellierungsanalysen. Aufbauend darauf wird ein "Energy Equity Atlas" mit Hilfe von GIS-Tools erstellt, um die Folgen und Implikationen der Schweizer Energiepolitik für Energiegerechtigkeit und –fairness anhand sozialer und räumlicher Indikatoren zu identifizieren, zu analysieren und zu visualisieren. Dieser konzeptionelle, systematische und datengestützte Ansatz ermöglicht es, objektives Wissen über Energiegerechtigkeit zu kommunizieren und ist somit ein essenzielles Instrument für jene Akteur:innen, die Energiepolitiken, -programme und –pilotprojekte gestalten.

Résumé

Le projet vise à appliquer le cadre conceptuel de la justice énergétique (dimensions de reconnaissance, distributive, procédurale, restaurative) aux politiques énergétiques suisses. A cette fin, nous proposons d'abord des mesures et des indicateurs d'équité basés sur des méthodologies interdisciplinaires : i) en conceptualisant la justice énergétique à travers des recherches documentaires, des entretiens avec des experts et des ateliers de co-création, et ii) en exploitant les données existantes et en menant des analyses de modélisation. Nous développons ensuite un "Atlas de l'équité énergétique" couplé à un outil SIG afin d'identifier, d'analyser et de visualiser les implications des politiques énergétiques suisses en termes de justice énergétique et d'équité, avec l'appui d'indicateurs sociaux et spatiaux tangibles. Cette approche conceptuelle, systématique et fondée sur des données fournira des connaissances objectives sur la justice énergétique et sera donc utile aux intermédiaires qui conçoivent des politiques, des programmes et des projets pilotes en matière d'énergie propre.

Contents

List of abbreviations

SFOE	Swiss Federal Office of Energy
EQUITAS	Swiss Energy eQUIty aTIAS
EV	Electric Vehicle
GIS	Geographic information systems

1 Introduction

1.1 Context and motivation

The crux of energy research has long been centred around the implementation of renewable sources and efficiency measures. However, the specific effects of the energy transition on diverse population groups and territories remain largely unexplored. While questions of social justice are frequently viewed through the lens of political discourse and partisan negotiations, this project delves into the concept of energy equity from a scientific perspective, aiming to provide objective knowledge on the social conditions of a "just transition". Equity is, in the long term, a condition for the social license and acceptance of clean energy policies (Abram et al. 2022). With dozens of cantons planning millions of Swiss francs in new infrastructures, programmes and investments, the energy equity consideration arrives at a critical moment. Specifically, with the current energy crisis, notably with the increasing energy prices, citizens have disproportionately felt the burden of an inequitable energy system. With this widening of social inequalities, equity is even more of a key matter if the policy measures envisaged in response to this situation are to be accepted.

1.2 Purpose of the project

In this project, we therefore will develop an "energy equity atlas" for Switzerland, that is a national framework, for comprehensively defining, measuring, and advancing energy equity to support a just transition to a safe, sustainable, and economical energy provision. We will develop equity metrics and indicators for energy that measure the justice and equity implications of current and future energy policy programmes in Switzerland that is structured around four tenets of energy justice, namely recognition, procedural, distributive and restorative justice. Our project strives to develop tangible social and spatial indicators therefore in numerous ways, the project constitutes a useful foundation for decision making by: *first*, helping to identify opportunities for building more effective, sustainable, inclusive, and legitimate decision-making processes around clean energy policies with the developed energy equity atlas; *second*, by bringing the energy justice aspects, it involves improving the transparency of energy markets and setting up consultation and participation procedures in order to bring citizens closer to the decisions taken on energy transition, addressing the procedural justice.

1.3 Project objectives

There are three objectives for this project. First, we aim to conceptualise energy (namely recognition, procedural, distributive and restorative justice) within Swiss context, by exemplifying how the four dimensions of energy justice and apply to Swiss energy policies. To explicate our adopted conceptualisation of energy justice in Switzerland, we begin by highlighting the plurality of possible—and at times even conflicting—interpretations of energy justice within the Swiss context. Our aim is to demonstrate the diverse reasonings, assumptions, normative positions, and underlying political and philosophical foundations that inform claims about justice. In other words, we seek to clarify the grounds on which actors consider a policy unjust or, conversely, articulate what a just policy should entail and how they substantiate these claims.

Second, our objective is to develop equity metrics and indicators for energy that measure the justice and equity implications of current and future energy policy programmes that is structured around four tenets of energy justice. We will develop indicators for the Atlas based on different conceptions of justice, since these determine both what counts as a "just" outcome and how data should be interpreted. For example, an efficiency perspective may view the concentration of EV charging stations in wealthy areas

as appropriate to demand, whereas an equity perspective highlights exclusion of poorer areas and deems it unjust. Clarifying justice conceptions is therefore essential for setting the goalposts and selecting the analytical lens through which indicators are defined. Both quantitative and qualitative data points needed to calculate each metric will be listed, and potential resources through which to acquire the necessary data will be shared. A compilation of energy equity best practices including their measurement tools, community engagement and procedural processes, programme and policy design, and communications will be created.

Our third objective is to visualise this data using an 'energy equity atlas' coupled with a GIS tool that will encompass population identification with diverse energy profiles (e.g. socio-economic profile), energy programme accessibility, energy burden and many more metrics with spatialised information.

2 Research approach and methods

Developing an energy equity atlas involves an interdisciplinary approach with conceptual, systematic, data-driven applications to analyse and visualise disparities in energy justice based on socio-territorial information,

We start with ***Conceptualisation*** work package where we conceptualise energy justice based on the energy justice matrix of the four dimensions: distributive, procedural, recognition, and restorative and we will provide substantiations to these four tenets with normative stances. We will then focus on the **Data collection and modelling** starting from the second where we gather relevant data from various existing resources for the above-mentioned dimensions. Finally, for the ***Spatial analysis and visualisation,*** we will utilise geographic information systems (GIS) to analyse and visualise the calculated equity outcomes spatially in order to identify patterns, disparities, and area of need related to energy equity. We will create maps, overlay different datasets and energy equity measures for a development of an **'energy equity atlas'**, and perform spatial analysis to understand the geographical distribution of energy equity. The atlas will entail different (thematic) maps, charts as well as textual information on qualitative indicators and best practices.

In the first year, the WP1 focuses on the conceptualization of energy justice was undertaken through a mixed-methods approach, combining a systematic literature review, expert interviews, and a co-creation workshop. To gain a first understanding of the existing literature, a bibliometric analysis was conducted through the *Biblioshiny* feature in the *Bibliometrix* package for *R*.

Following our bibliometric analysis of the energy justice literature, we mapped relevant stakeholders across the quadruple helix framework (citizens/NGOs, industry, public administration/politics, and academia). From this process, we identified 104 key actors to be considered for qualitative interviews and for invitations to our upcoming co-design workshop. To date, nine interviews have been conducted, primarily with representatives from academia and politics, and the analysis of these interviews is ongoing. In the coming months, and until the end of the year, we plan to expand our sample by engaging more systematically with actors from industry and NGOs, to ensure a balanced representation of perspectives across all sectors. The interviews were guided by the following research goals:

1. Gaining an insight into how energy justice in the energy transition is understood by different stakeholders in the Swiss energy sector.

2. Conceptualising an energy justice framework, concentrated on the specific case of Switzerland.

3 Results and discussion

Bibliometric analysis was used since it “enables us to unpack the evolutionary nuances of a specific field, while shedding light on the emerging areas in that field” (Donthu et al. 2021). This analysis was conducted with the search prompt “*energy justice” OR “energy equity” in Title-Abs-Key* (Title, abstract, or keywords) in the Scopus database. On the day of the search, 17. February 2025, 1635 publications fit this description. After screening all the available abstracts, the number of publications used in the analysis reduced to 1482.

Growth Trajectory and Disciplinary Anchoring

The literature on “energy justice” has grown exponentially since 2013, with notable peaks in publications corresponding with heightened political attention on energy transitions, such as the Paris Agreement (2015) and the COVID-19 pandemic (2020-2021), which spurred renewed focus on resilience and equity in energy systems. The research for these publications was mostly done before these events, but the rise in publications during these times might indicate that journals and publishers were focused on these topics as a response. The surge in publications reflects the maturation of the field but also reveals a pattern of potentially reactive scholarship or publishers. Publications tend to emerge in response to specific crises or policy windows, rather than as part of long-term empirical programs. This could also be because the field, while maturing, is still relatively young, so many long-term empirical projects are still underway or have just recently finished.

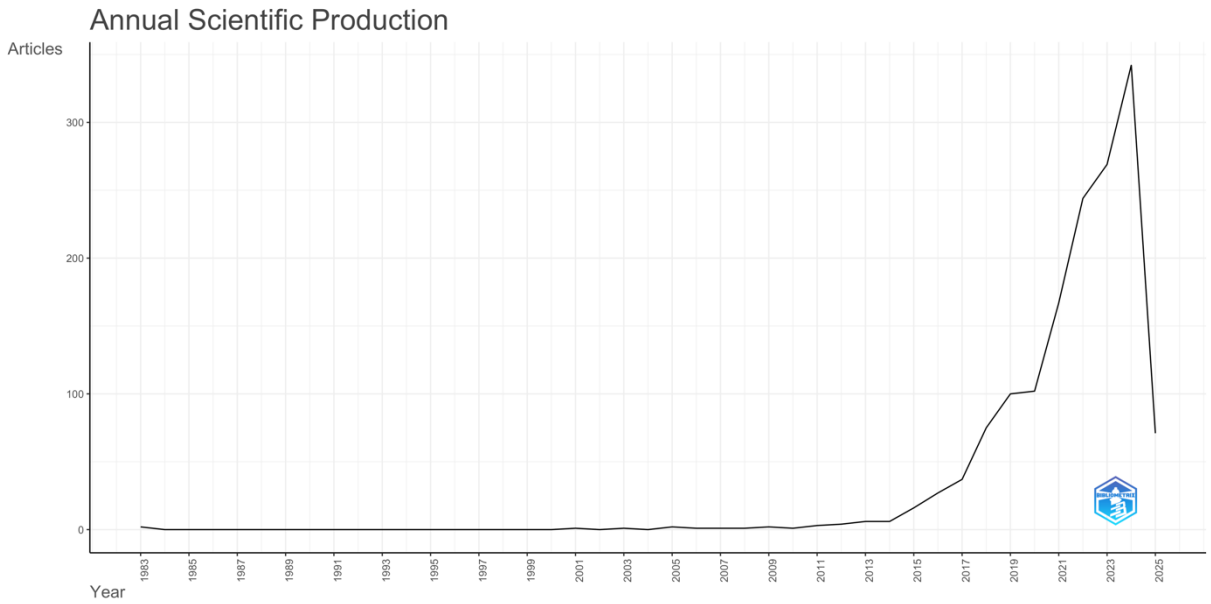

Figure 1: Publication Trend

One critical finding of the bibliometric analysis is the concentration of energy justice publications within a narrow range of journals. The majority of articles are published in 2-3 journals related to energy policy for example. While this reflects the thematic coherence of the field and fosters concentrated dialogue, it also points to limited interdisciplinary integration. While fields such as law, anthropology, political philosophy, and public health are part of the literature, the “main journals” in these fields are not really active in this regard. This disciplinary siloing risks narrowing the methodological toolbox of energy justice

and excluding important perspectives on lived experiences, historical structures, normative stances and institutional dynamics.

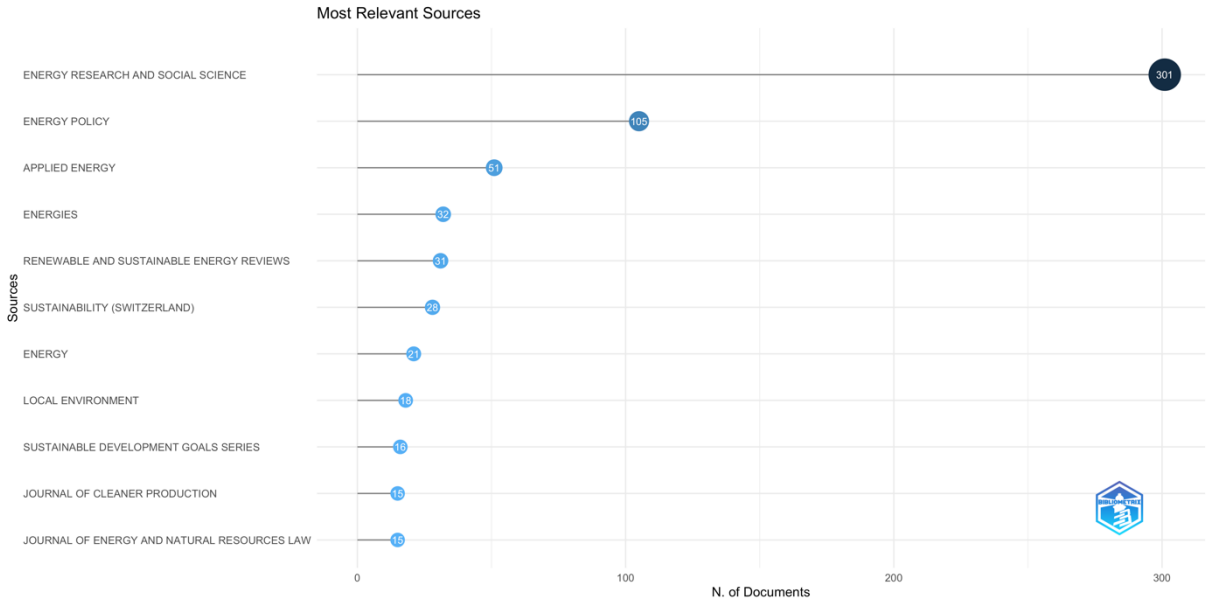

Figure 2: Publications by Journal

Geographic Biases and Underrepresented Regions

A major gap in the literature is the uneven geographic distribution. Empirical case studies are heavily concentrated in the Global North, particularly the United States, the UK, Germany, and the Netherlands. These countries serve as reference points for much of the theoretical development in the field, reinforcing a Eurocentric and Anglophone bias. This is not due to the sampling of the data, since other languages were included in the dataset as long as there was also an English abstract available. In contrast, regions such as Latin America, Sub-Saharan Africa, Central Asia, and Eastern Europe are underrepresented. This imbalance limits the generalisation of findings and risks reproducing epistemic injustices by privileging certain knowledge systems over others.

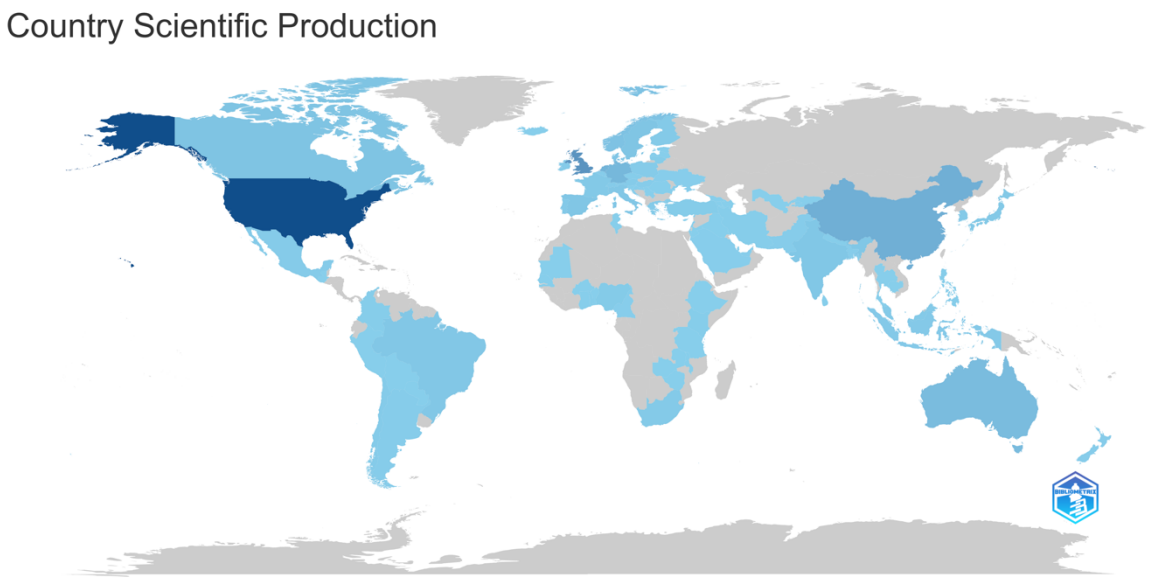

Figure 3: Publications by Country

Switzerland itself is relatively underexplored in the energy justice literature currently. This is surprising given it complex governance structures, participatory democratic mechanisms, and ambitious climate targets. Publications explicitly addressing energy justice in the Swiss context tend to focus on energy vulnerability, public acceptance of renewables, or the socio-political dimensions of grid infrastructure. This suggests a significant empirical and conceptual opportunity.

For instance, studies could examine the justice implications of Switzerland's Energy Strategy 2050, particularly in connection to how costs are distributed across cantons and social classes. Similarly, the siting of large-scale solar and wind projects in alpine regions raises questions of land use, cultural recognition, and ecological compensation. These are not just technical or environmental issues, they are deeply justice-laden and need scholarly attention within the energy justice framework.

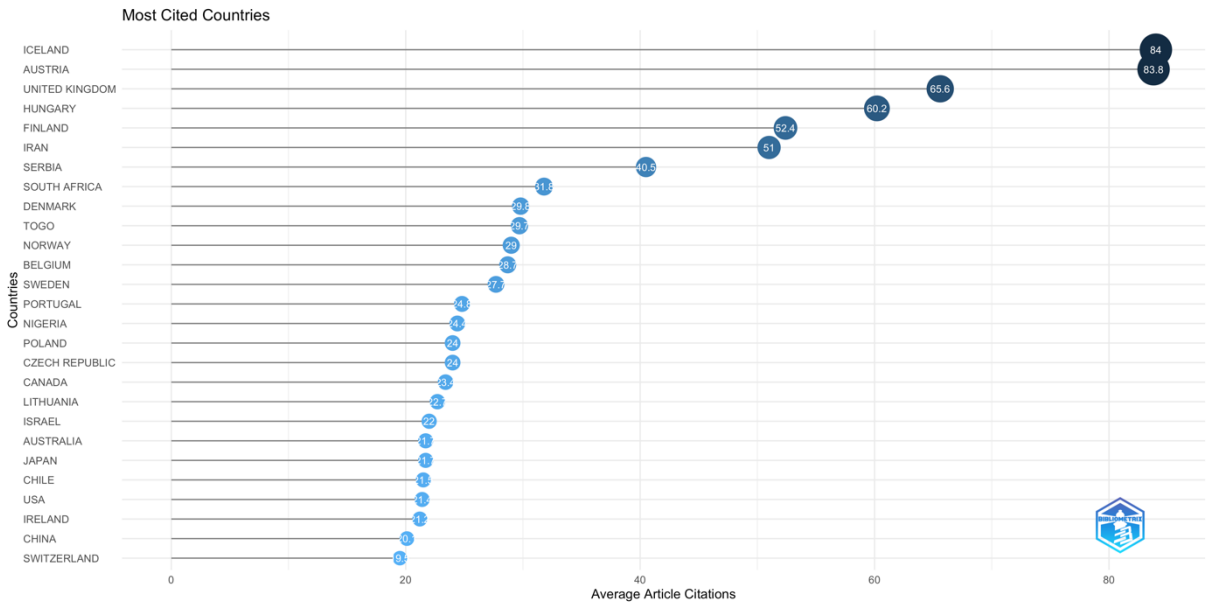

Figure 4: Average Citations by Country

Thematic Priorities and Emerging Subfields

The bibliometric data also reveals thematic trends that shape current research agendas. Key areas of focus include:

- Just transition, sustainable development and energy policy
- Decision making and energy democracy
- Justice in low carbon-transitions

While these themes are central to the field, some critical issues remain on the margins. Notably, there only limited engagement with the role of finance and investment regimes, and the long-term governance of decommissioned energy infrastructure. Similarly, the literature pays insufficient attention to gender and intersectionality, often treating vulnerable populations as homogenous categories rather than exploring the complex interplay of identities that shape energy experiences.

As the fourth tenet, restorative justice is beginning to gain traction but remains conceptually vague and empirically thin. Few studies operationalise restorative justice in a concrete way and even fewer engage with it beyond postcolonial or Global South contexts. This presents a clear research gap of how restorative justice might be meaningfully pursued in affluent states like Switzerland, where historical injustices might be less visible but may still be embedded in infrastructure legacies or regional disparities.

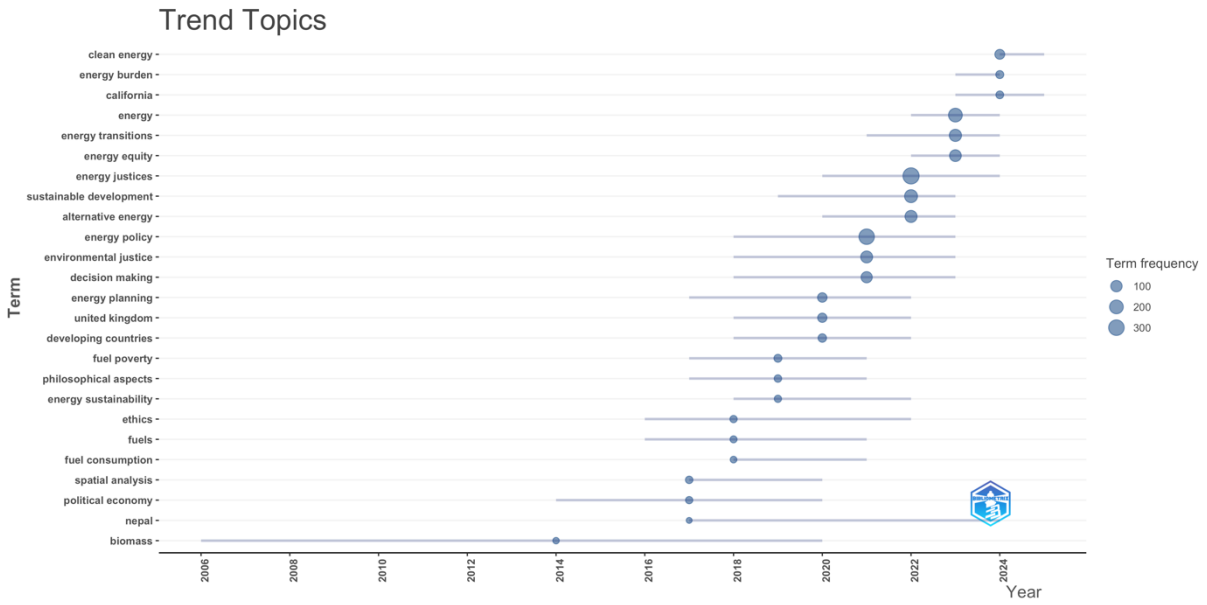

Figure 5: Topic Development

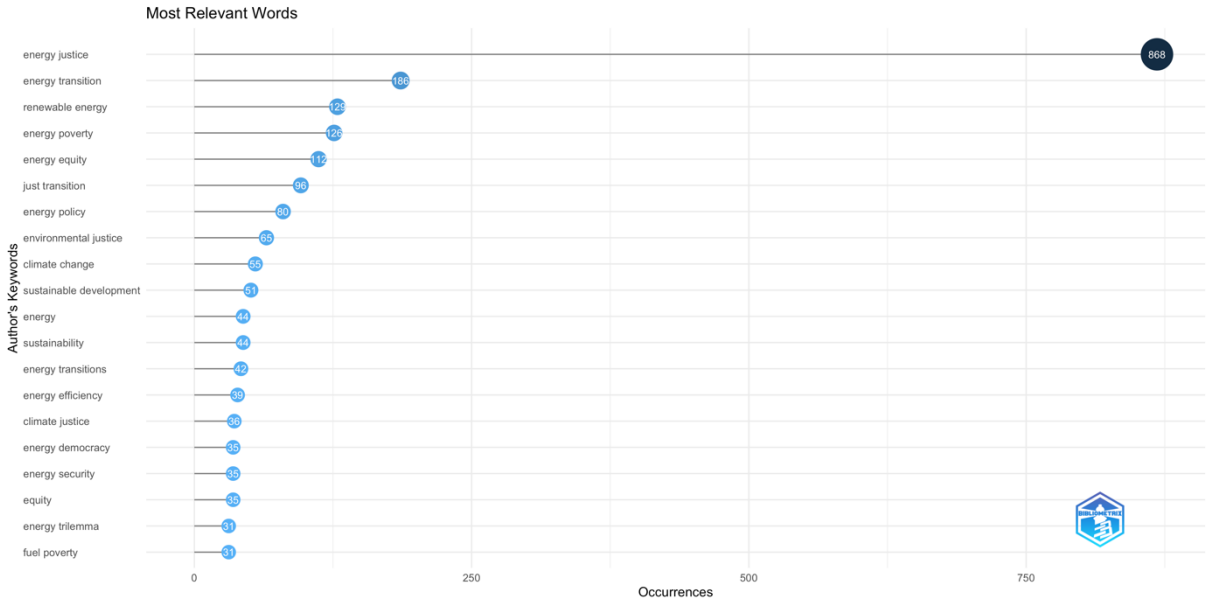

Figure 6: Most Relevant Keywords

Author Networks and Institutional Leadership

The bibliometric analysis shows that a relatively small number of highly productive authors and institutions dominate the field. These include research centres in the UK, the US, and the Netherlands, with notable outliers. While such clustering might facilitate the development of robust theoretical frameworks, it also risks intellectual monocultures and the marginalisation of dissenting or alternative paradigms.

In Switzerland, key academic contributors to the energy justice literature are scattered across universities and applied research institutes, often working under different terminologies such as “socio-technical transitions” or “energy democracy”. This fragmentation may contribute to the lack of visibility of Swiss case studies in the global energy justice discourse and in this specific dataset. Building a more

comprehensive national research community around energy justice could facilitate more robust, policy-relevant, and interdisciplinary contributions.

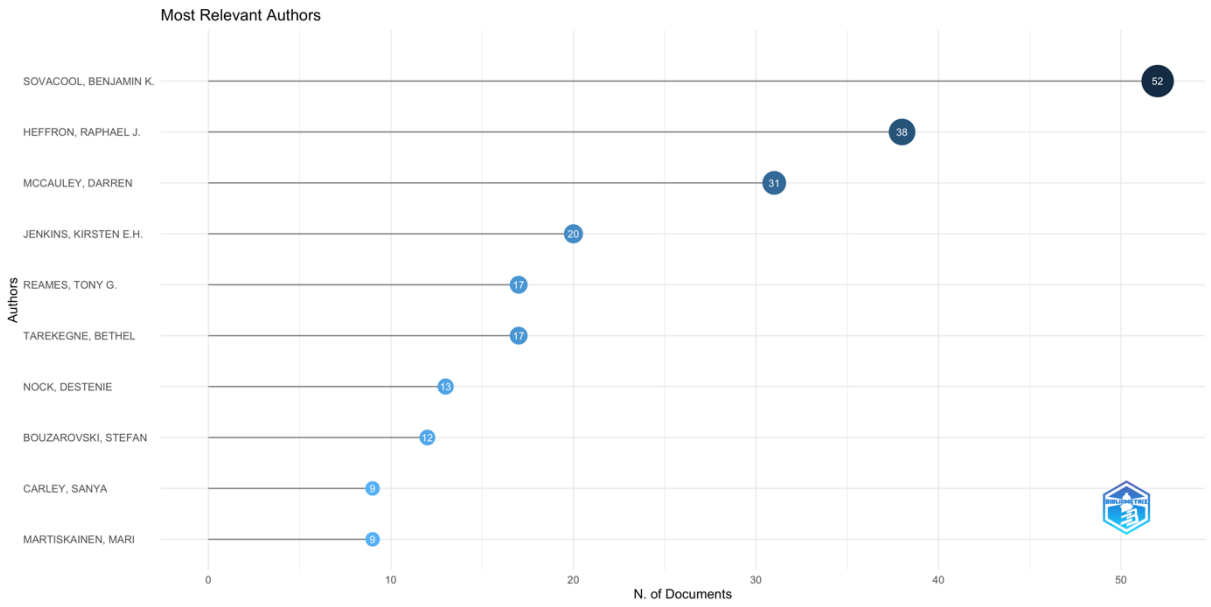

Figure 7: Most Relevant Authors

Critical Reflections and Future Directions

Overall, the bibliometric landscape of energy justice reflects both the dynamism and limitations of a rapidly evolving field. On the one hand, the proliferation of studies, the emergence of thematic clusters, and the diversification of methods signal intellectual activity. On the other hand, the field remains constrained by geographic, disciplinary, and conceptual boundaries that limit its transformative potential.

From a critical standpoint, bibliometric indicators alone cannot capture the quality or impact of research. Citation counts and keyword frequencies say little about the normative commitments or real-world effects of the scholarship. There might be risks that the growing institutionalisation of energy justice through special issues, conferences, and funding calls, may promote conformity rather than real critical reflexivity.

For Swiss researchers and policymakers, the current state of the literature should offer both caution and inspiration. There is a need to avoid importing frameworks wholesale from other contexts and to instead build grounded, empirically rich accounts of justice in the Swiss energy transition. This entails interdisciplinary collaboration, engagement with marginalise voices, and the willingness to confront questions about power, history, and responsibility.

After the bibliometric analysis, interviews were conducted with energy researcher throughout Switzerland. The interviews were guided by the following research goals:

1. Gaining an insight into how energy justice in the energy transition is understood by different stakeholders in the Swiss energy sector.
2. Conceptualising an energy justice framework, concentrated on the specific case of Switzerland.

In total, 9 interviews were conducted. While the research goals were closely related to energy justice specifically, many of the interviewees were not closely familiar with it. Therefore, it was important to understand their conceptions of justice and how this relates to their research in the energy sector.

The disciplinary background of the interviewees was very diverse, ranging from political science and sociology to economics. While the precise analysis of the interview data is yet to be finished, the conceptions of justice that were brought up explicitly or implicitly can be categorised into four groups, namely utilitarian justice, Rawlsian justice, recognition justice, and the capabilities approach. This closely reflects the “main camps” in the broader literature as well. To summarise, utilitarian Justice: Predominantly emphasized by economists, this perspective holds that a just energy policy maximizes overall benefits and promotes “the greatest good for the greatest number.” The moral claim is that policies achieving this outcome are ethically justified; Rawlsian Justice: Focused on fairness and equality, this approach prioritizes the needs of the least advantaged to ensure equitable distribution of resources. It is inspired by the work of John Rawls and serves as a common philosophical foundation for energy justice frameworks; Recognition Justice: This conception emphasizes the importance of respect, dignity, and inclusion. Policies can be fair or efficient but still unjust if they fail to recognize diverse identities, voices, and lived experiences. A just energy policy, therefore, meaningfully incorporates these perspectives in decision-making processes; Capabilities Approach: This perspective highlights that even when energy resources are distributed fairly, individuals may have differing abilities to use them effectively due to factors such as age, health, or social conditions. A just policy focuses on enhancing people’s genuine capabilities to access and benefit from energy services, addressing inequities in actual opportunities.

4 Conclusions and outlook

Our first-year work shows that energy justice is a relatively recent research field, emerging over the past decade and closely linked to broader discussions of Just Transition and social justice. Much of the existing literature is descriptive rather than normative, often lacking explicit philosophical foundations.

We show that engaging with multiple conceptions of justice is essential, because before evaluating whether a policy or situation is ‘just’ or ‘unjust,’ it is necessary to understand the underlying reasons for considering it unjust. This clarification will determine which outcomes are valued, what counts as fairness, and which indicators are prioritized—whether maximizing efficiency, reducing inequality, or guaranteeing basic needs for all. Finally, applying justice frameworks allows researchers and policymakers to make ethical assumptions explicit. By stating the normative principles underpinning policy evaluation, discussions regarding trade-offs, priorities, and appropriate interventions can be conducted transparently and systematically. This supports more robust, evidence-informed, and ethically grounded decision-making.

Integrating these insights into the Energy Equity Atlas will ensure that evaluations of energy policies are both data-driven and normatively informed. Considering multiple conceptions of justice allows for a more comprehensive and transparent assessment of energy systems, facilitating ethical, inclusive, and socially responsible policy design.

5 National and international cooperation

From April 9th-11th, the PhD student Nils Grolimund attended “The International Early Career Writing & Research Skills Workshop” at the United Nations University Institute on Comparative Regional Integration Studies in Brugges, Belgium. This workshop was designed to equip early career researchers with the skills and guidance necessary to conduct sound research and publish, to promote a strong network of collaboration between early career researchers and to promote an interdisciplinary research exchange on the topics of sustainability, energy justice, climate justice and a just transition.

While the content of the workshop was not so much focused on energy justice as originally advertised, I nonetheless gained valuable insights into the research and publication processes from researchers, professors, and editors. The output of the workshop (not communicated before the workshop) is a book titled “The Just Transition through Life-Cycle Assessments and the Circular Economy”, published by Springer Nature. The 8 book chapters were already set (sustainable fashion, gender issues, critical minerals, nuclear energy, energy and digitisation – the use of AI, renewable energy waste management and justice solutions, accelerated renewable energy investment, urban regeneration – challenges and solutions for cities) and the selection of who would be in which group was somewhat arbitrary. I ended up as part of the sustainable fashion group, a topic where I had close to no knowledge before. I was chosen to be the main author by the rest of the group and the ideas for the chapter were pitched on the last day of the workshop. The final version of the chapter was submitted to the editors on August 21st, the book is scheduled for publication in December 2025.

Focusing back on the project, on August 25th, 2025, a co-creation workshop was organised at the University of Lausanne. This workshop brought together 23 researchers, policymakers, industry professionals, and civil society actors to explore how energy justice principles can inform a more just energy transition in Switzerland. Through moderated sessions, the workshop aimed to advance understanding of energy justice and foster mutual learning by exchanging insights, encouraging critical reflection, and co-developing perspectives to support more inclusive and equitable energy transitions. The event offered space for cross-sector dialogue, collaborative knowledge building, and policy-relevant exchange

The workshop was structured around three short sessions:

- Opening keynote by Prof. Raphael J. Heffron, a leading international academic and policy expert on energy justice: “Improving National Energy Performance: Utilising Energy Justice as a Risk Management Tool”

- Session 2: Exploration and discussion of different conceptions of justice in guiding energy transitions and energy policies facilitated by the EQUITAS team.

- Session 3: Early co-design and collaborative visualisation of Energy Equity Atlas considering the Swiss energy policies

6 Publications and other communications

Publications are planned to be prepared by middle of 2025 on the conceptualisations of the energy justice in Switzerland based on the mixed-methods, namely literature review and the interviews.

7 References

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