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Tackling the income inequality, energy consumption, and decarbonisation nexus. Is the latest research "putting the last first"?

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Abstract

Income inequality, energy consumption, and carbon emissions are closely related. While it is certain that high-income groups consume more energy overall globally, it is less clear how this translates into different patterns of energy consumption, among and within countries. Yet, in the context of the climate crisis, the relationship between largely unequal income distribution and the resulting disparities in household energy consumption is central for co-generating pathways toward sustainable development, especially in developing countries. As such, designing policy based on energy consumption patterns per income group has the immense potential to target those who need it most, anywhere in the world.

Within this context, the current paper provides a brief overview of the latest research on the topic and addresses persisting gaps in knowledge of the income inequality, energy consumption, and decarbonisation nexus. The review explores whether suggested policy measures to tackle the nexus, are "putting the last first" while leaving no one behind. While much uncertainty regarding the nature, directionality, and internal dynamics of this interrelationship remains, there is a promising shift in research toward context-specific energy consumption patterns based on household income, with policy implications of the nexus findings being directly linked to sustainable development efforts.

Highlights

- Income inequality is closely linked to energy poverty and carbon inequality.
- Income significantly shapes energy consumption patterns, among and within countries.
- Redistribution from high- to low-income households can alleviate energy poverty and significantly reduce carbon emissions.
- Policy ought to jointly address these interlinkages if sustainable development is to be achieved.
- The role of digitalisation in energy consumption and income inequality, and its potential as a policy tool remain largely unexplored.

Keywords

Income inequality, Energy consumption, Redistribution, Decarbonisation, SDGs

1. Positionality

The following paper is a continuation of my thoughts on energy justice and the interrelationship between income distribution, the disparities of energy consumption patterns, and the potential this interrelationship may hold for (social, energy, climate, multispecies) justice in the face of an ever-deepening multidimensional crisis. I have been long fascinated by energy and its fundamental role in (re)shaping all aspects of both human and non-human life, across different spatial and temporal scales. While this paper was developed within a Research Master's course at the University of Amsterdam (late 2022) and continues thoughts prompted by Prof. Joyeeta Gupta, my reflections on the topic began during my final semester at the University of Vienna, where having lectures by researchers and activists Prof. Julia Steinberger, Dr. Shonali Pachauri, and Prof. Lisa Schipper inspired me to pursue this interest in greater depth.

2. Introduction

2.1. Background and relevance

Income inequality, energy consumption, and carbon emissions are coupled (see Oswald et al., 2020). In the context of exacerbated inequalities by COVID-19, the urgency of climate change, and the deepening energy and geopolitical crisis, it is vital to understand the complex interrelationship between income inequality, energy poverty, and increasing emissions. While it is certain that high-income groups consume more energy overall globally, it is less clear how the unequal distribution of income shapes the very patterns of energy consumption among and within countries. Reflecting on these injustices and their structural embeddedness, it becomes clear that to achieve sustainable development in an equitable and just way, policy design should consider the relationship between unequal income distribution, the resulting disparities of household energy consumption patterns, and the corresponding environmental footprints. Considering the urgency and relevance of this topic, the current paper aims to shed light on the latest research and how it addresses these gaps in knowledge. Two main questions guide the analysis:

> *How does the latest research understand the relationship between income inequality, energy consumption patterns, and carbon emission?*
>
> *Considering research findings, what are researchers' policy recommendations, and do they "put the last first", while also leaving no one behind?*

The current section proceeds with the methodology. *Section 2* encompasses the analysis of the material. Reflecting on the research questions of the paper, *Section 3* discusses whether the proposed policy measures are "putting the last first", namely prioritising the needs and concerns of the most vulnerable and marginalised, while leaving no one behind on the pathway to sustainable development. Lastly,

Section 4 highlights key findings, shortcomings and the persisting research gaps to be addressed in the future.

2.2. Methodology

The reviewed material was selected from Scopus, a "comprehensive […] database with enriched data and linked scholarly literature across a wide variety of disciplines"[1], adapting Fell's methodology (2017). Through a series of relevant key term searches and preliminary sample analysis, the final selection was arrived at using the following method: results were restricted to research articles from the period 2020-2023, based on the search terms *income*, *inequality*, *energy*, *distribution*, *demand*, and *consumption*. This (post-)COVID-19 period is considered highly relevant, marked by globally exacerbated inequalities, as well as the deepening climate, energy, and geopolitical crisis. Additionally, the subject areas included are *Environmental science*, *Energy; Economics*, *Econometrics*, *Finance*; *Social Sciences*, whereas the areas *Agricultural and Biological Sciences; Business, Management and Accounting*; and *Engineering* were excluded[2]. Lastly, I refined the analysis by including these exact keywords: *income inequality, income distribution, energy utilization, carbon emission, climate change, income, economic* and *social effects,* and *sustainable development*. The final search yielded 44 articles, out of which 26 constituted the final sample, based on relevance analysis with the search terms: *energy consumption*, *energy poverty*, *income inequity*, *social and energy justice*, *decarbonisation*, *ecological and energy footprint*. The final search code is in the Appendix.

3. The income inequality, energy consumption, and carbon emissions nexus.

Acknowledging its incomprehensiveness, the analysis reveals that scholarly interest in the relationship between income inequality, energy consumption, and carbon emissions has been increasing since 2020. Their interconnectedness, the very specificity of this relationship, is captured by the concept of *the nexus*. Thus, to capture this specificity, this paper utilizes *the nexus* as an analytical lens to address the research questions in an integrated and complexity-sensitive manner. Research has focused on different aspects of the nexus, attempting to understand 1) to what extent income inequality is a decisive factor for variation in energy consumption patterns, 2) the relationship between income inequality and carbon emissions, and 3) how income inequality relates to energy poverty. Importantly, nearly all articles formulate policy recommendations in relation to Agenda 2030, and the interlinkages with the Sustainable Development Goals[3].

[1] Scopus: https://www.elsevier.com/solutions/scopus
[2] A broader disciplinary bandwidth was beyond the scope of this paper due to limited resources, thus more specific energy-related research papers were deemed of higher priority after the preliminary scoping review of the literature.
[3] The Sustainable Development Goals (SDGs) are a set of 17 goals adopted by the United Nations in 2015, and are envisioned as "a shared blueprint for peace and prosperity for people and the planet, now and into the future" (UN Official website). Encompassed by the Agenda 2030, these goals seek to address various social, economic,

3.1. Approaching the nexus

3.1.1. Income inequality and energy consumption patterns

There has been a broad consensus that high-income households use more energy overall compared to low-income groups (Oswald et al., 2020, 2021). However, income is tightly coupled with lifestyle and consumption behaviours, and emerging research exposes the urgent importance to examine the very patterns of household energy consumption per income group, highlighting their implications for sustainable development efforts (de Abreu et al., 2021; Duarte et al., 2021; Oswald et al., 2020, 2021; Sánchez et al., 2020; Sharma & Rajpurohit, 2022; Vera et al., 2021). To address the structural differences in energy consumption among different income groups, Oswald et al. (2020) outline four distinct types of energy consumption, namely 1) food/subsistence, 2) heating and electricity, 3) technology, education, luxury[4], and 4) transport. They find that high-income households tend to consume more energy-intensive goods and services, with the largest share being luxury, highly intensive transport emissions. In turn, food, heat, and electricity form the biggest share of energy consumed by the poorest households. The sampled material confirms these findings (de Abreu et al., 2021; Oswald et al., 2021; Vera et al., 2021), emphasizing rich households' large carbon footprint due to the high emission intensity of transport. Thus, to deliver on Agenda 2030, it is central to focus on households and their consumption patterns per income class. Notably, some studies highlight the need to refine and decolonize the methodology for studying household energy consumption behaviours, especially for developing countries (de Abreu et al., 2021).

3.1.2. Income inequality and carbon emissions

The relationship between income inequality and carbon emissions is complex, and the ambiguity of research findings confirms the theoretical and methodological challenges to establishing causality between the two. Some consider rising income inequality as an outcome of increased carbon emissions (Ashenafi, 2022). Others stress that the unequal distribution of income leads to increases in different income groups' *direct* carbon emissions per household (Cheng et al., 2021; Vera et al., 2021), however, evidence for its effects on *indirect* emissions per income group is less clear (Cheng et al., 2021). Direct carbon emissions refer to the CO2 emissions generated in a household by the direct consumption of energy products, including using coal for heating, cooking by fire, and refuelling cars (Cheng et al., 2021). In turn, indirect carbon emissions are the result from the "*production process of these non-energy products or services used by households"* (see Mongelli et al. 2006; Fan et al. 2012; Qu et al. 2013;

and environmental challenges worldwide. The agenda reflects the commitment of UN member states to work towards achieving these goals by 2030.

[4]Here, the energy, and resulting energy externalities, of the highest income earners is considered luxury as it dramatically exceeds the decent living levels (Oswald et al., 2021).

Hubacek et al. 2017 as cited in Cheng et al., 2021). In keeping with the energy context, an example of indirect carbon emissions of a household would be the purchase of electricity, as the household itself is not directly generating the emissions to produce the purchased electricity.

Importantly, research confirms large disparities in carbon emissions based on household income (Oswald et al., 2020, 2021; Vera et al., 2021). Along with income inequality, many studies also consider stock market size (Zhang et al., 2022) or urbanisation (Cheng et al., 2021; Wang et al., 2022; Xu & Zhong, 2022) as accompanying factors, confirming that inequality leads to higher carbon intensity, with the negative impacts being most significant for low-income groups (Wang et al., 2022). Despite the inconclusiveness on the nature of the relationship, there is broad consensus on the simultaneous impact of carbon emissions, income inequality, and the consumption of renewable energy on each other (Hundie, 2021; Mehmood et al., 2022; Sharma et al., 2021; Sharma & Rajpurohit, 2022).

3.1.3. Income inequality and energy poverty

Research tackling the relationship between income inequality and energy poverty reveals that the two are causally interrelated (Lekavičius et al., 2020; Nguyen & Nasir, 2021; Oswald et al., 2021; Priesmann et al., 2022; Sánchez et al., 2020; Xu & Zhong, 2022, 2023). While the scope of the concept remains a subject of ongoing scholarly and political debate (see Nguyen & Nasir, 2021; Sánchez et al., 2020), energy poverty can be generally defined as:

> *the issue of a lack of access to energy or electricity, the lack of clean fuels and technologies for cooking, the lack of minimum energy for each people, or minimum income for energy spending on basic necessities* (Nguyen & Nasir, 2021, 2)

Increasing income inequality results in higher energy poverty, and reversely, more equal income distribution has positive effect on energy poverty reduction. This effect of redistribution is significant when redistributive measures are complemented with additional support for low-income households to shift to cleaner energy consumption patterns (Duarte et al., 2021; Oswald et al., 2021). In turn, other studies find that a decrease in energy poverty can reduce income inequality, except for electricity consumption which is found to exacerbate economic inequality (Nguyen & Nasir, 2021). Overall, findings align around the argument that household income levels are a central determinant of energy poverty levels, and hence this needs to be addressed in policy design (Duarte et al., 2021; Oswald et al., 2021; Sánchez et al., 2020). Conversely, others find the more unequal distribution of income to lower energy demand, as income inequality leads to restricted access to energy among the poorest (Sehrawat, 2021).

Redistribution of per capita income from rich to poor households would reduce both inequality and poverty (Duarte et al., 2021; Oswald et al., 2021). Addressing the nexus, research finds that increasing per capita income from redistributive policy, increases consumption of renewable energy (Mehmood et al., 2022; Sharma & Rajpurohit, 2022), especially when human capital development increases along with income (Sehrawat, 2021; Sharma & Rajpurohit, 2022).

3.2. Policy recommendations and the Sustainable Development Goals

Despite different approaches to the relationship between income, energy consumption, and carbon emission, there is general agreement that the government should play a central role in resolving the triple challenge that this nexus poses (Ashenafi, 2022; Cheng et al., 2021; de Abreu et al., 2021; Duarte et al., 2021; Dwi Cahyani et al., 2020; Lekavičius et al., 2020; Mehmood et al., 2022; Millward-Hopkins et al., 2020; Millward-Hopkins & Oswald, 2021; Muttitt & Kartha, 2020; Nguyen & Nasir, 2021; Oswald et al., 2020, 2021; Owen & Barrett, 2020; Sarkodie, 2022; Sehrawat, 2021; Sharma et al., 2021; Vera et al., 2021). In the context of the climate crisis and the changing geopolitical landscape, this recommendation is in line with previous research tackling sustainable development pathways (Gupta, 2014, 2016; Hickel, 2019; Muttitt & Kartha, 2020). The majority of the articles stress the high potential of income redistribution to alleviate both energy poverty and reduce carbon emissions – directly targeting the poorest households anywhere in the world and hence leaving no one behind (see de Abreu et al., 2021; Duarte et al., 2021; Dwi Cahyani et al., 2020; Oswald et al., 2020, 2021; Owen & Barrett, 2020; Pottier, 2022; Sharma et al., 2021).

Importantly, redistribution alone cannot alleviate extreme poverty, thus, tackling the nexus requires more drastic measures (Oswald et al., 2021). To ensure income redistribution results in sustainable consumption, it needs to be complemented by additional measures, such as building retrofitting programs (Oswald et al., 2020), accessible public transport (Duarte et al., 2021), targeted support for low-income households to shift to cleaner energy sources and so, consumption (de Abreu et al., 2021; Dwi Cahyani et al., 2020; Lekavičius et al., 2020; Nguyen & Nasir, 2021). Millward-Hopkins and Oswald (2021) show how redistributing resources from high- to low-income households and lowering of their energy consumption can decrease the overall environmental footprint. This redistributive shift can enable the upper-income groups to absorb the reduction in footprint while allowing the consumption of the poorest to reach equitable levels. The initial increase in carbon emissions caused by redistribution can be then offset by deploying cleaner technologies in low-income households (Duarte et al., 2021; Millward-Hopkins et al., 2020; Sharma et al., 2021), hence the essentiality of complementary measures.

General taxation is viewed as the most potent measurement to equitably address the interlinkages of the nexus, in line with the SDGs (Cheng et al., 2021; Oswald et al., 2020, 2021; Sharma & Rajpurohit, 2022), highlighting that this measure ensures is better equipped to overcome the perceived political challenge between policy instability and inequality, and so be consistent over the long-term (Owen & Barrett, 2020). It is stressed that the energy consumption caused by income inequality can be reduced through diverse pathways, meaning policies that are not explicitly redistributive can support the flattening of income inequality (Oswald et al., 2021). The recommendations range from sustainable agricultural reforms (Ashenafi, 2022), education and training (Sharma & Rajpurohit, 2022), increased support for digitalisation, information, and communication technologies (Sharma et al., 2021; Xu & Zhong, 2022, 2023), export diversification (Sharma et al., 2021) and household-income targeted policies (Cheng et al., 2021; Duarte et al., 2021; Sánchez et al., 2020; Vera et al., 2021).

Importantly, there is strong agreement that considering the variation in household energy consumption patterns caused by income inequality is central when designing (sustainable development) policy (Duarte et al., 2021; Vera et al., 2021) – this is essential to target specifically the lowest-income groups, anywhere in the world (Lekavičius et al., 2020; Millward-Hopkins et al., 2020; Millward-Hopkins & Oswald, 2021; Oswald et al., 2020, 2021; Owen & Barrett, 2020; Priesmann et al., 2022; Sánchez et al., 2020; Sharma & Rajpurohit, 2022; Vera et al., 2021). Support measures indiscriminate of household income and consumption behaviour not only benefit high-income groups disproportionately more but also seem to increase energy poverty, energy demand, and income inequality (see Nguyen & Nasir, 2021; Owen & Barrett, 2020; Priesmann et al., 2022). Dual policy goals to tackle both challenges are compatible with each other and can achieve double dividends (Ashenafi, 2022; Cheng et al., 2021; Duarte et al., 2021). "Triple-wins" (reduction of economic inequality, energy consumption, carbon emissions) may be possible if information and communication technology capital increases (Xu & Zhong, 2022).

4. Implications of unpacking the nexus: Is the latest research putting the last first?

The increasing shift in focus towards household consumption behaviours based on income is directly linked to sustainable development efforts. Crucially, the reviewed studies acknowledge the interlinkages within the nexus itself, but more importantly, they address the synergies and trade-offs within policy measures to simultaneously achieve the multiple Sustainable Development Goals, particularly SDG 1 (ending poverty in all forms), SDG 7 (affordable, sustainable, modern energy for all) and SDG 10 (reducing inequalities). Approaching the joint challenge of income inequality, energy consumption, and carbon emissions from an equity and justice perspective is essential for the success of sustainable development policies (Leach et al., 2018; Rammelt & Gupta, 2021; Sachs et al., 2019). The concept of energy justice is in line with this aim, as it encompasses the fight for social justice within energy systems in its distributional, recognitional and procedural dimensions (see Soriano-Hernández et al., 2022). The

reviewed material aligns with Agenda 2030's principle to put the last first while leaving no one behind. Three lessons were learnt:

Firstly, designing policy based on household energy consumption per income group can target those who need it most, anywhere in the world. Approaching the challenges of the nexus from the perspective of the Global North-South, the developing-developed country perspective would significantly obscure socio-economic disparities among and within countries. It would fail to recognise that poor households globally have distinct energy consumption patterns, largely different than those of rich families.

Secondly, directly tackling severe income inequality suggests an equitable, just, and effective approach to decarbonisation. This involves reducing "luxury" emissions and health-adverse energy consumption patterns through redistribution, benefiting the health not just of all income groups, but also the Earth system. This approach can ensure a good life for all within planetary boundaries (see Hickel, 2019).The suggested policy combination of redistribution from high- to low-income groups, complemented by low-income household targeted sustainability measures, can ensure that policy is putting the last first while leaving no one behind (including Nature) – targeting those who need it most, anywhere in the world, while improving the overall health of the planet.

Third, the complexities within the nexus require increased attention to the synergies and trade-offs of interventions to ensure equity, social and energy justice. Strategies integrating digitalisation and technological innovation to address the triple challenge, are due even more special attention given significant gaps in knowledge of their role (Xu & Zhong, 2022, 2023).

5. Conclusion

Income inequality, energy consumption, and carbon emissions all represent significant challenges for achieving sustainable development. The current review examined the latest research addressing the interrelationship between the distribution of income, the disparities in energy consumption behaviours of households, and the corresponding carbon footprints. Although multiple knowledge gaps on the nature and internal dynamics of this relationship remain, there is a promising shift in focus toward household consumption patterns based on income, and the policy implications of these findings are directly linked to sustainable development efforts. Notably, the paper discussed whether the policy recommendations proposed in the articles "put the last first", while leaving no one behind, on the pathway to sustainable development.

Yet, there is much uncertainty about the relationship between income inequality and climate change mitigation, and whether income redistribution is an adequate mitigation measure if the size of the

(regional/national/global) economy remains the same (Millward-Hopkins & Oswald, 2021). Further, research is needed to explore the implications of "radically alternative income and wealth distributions for energy demand" (Oswald et al., 2021). Considering the global (unpredictable) dynamics of digitalisation (including cryptocurrency), and the underlying inequalities and environmental costs which underpin them, it is essential to study how these also relate to the income-energy-emissions nexus. Finally, future studies can explore the association between carbon emissions, income inequality, and renewable energy consumption, as this has been marked by significant ambiguities (Ashenafi, 2022; Sharma & Rajpurohit, 2022).

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References and recommended reading

Papers of particular interest, published within the period of review, have been highlighted as:

- • of special interest
- •• of outstanding interest

Ashenafi, B. B. (2022). Greenhouse gas emission widens income inequality in Africa. *Environmental Science and Pollution Research*, *29*(31), 46691-46707. https://doi.org/10.1007/s11356-022-18925-5

Cheng, Y., Wang, Y., Chen, W., Wang, Q., & Zhao, G. (2021). Does income inequality affect direct and indirect household CO 2 emissions? A quantile regression approach. *Clean Technologies and Environmental Policy*, *23*, 1199-1213. https://doi.org/10.1007/s10098-020-01980-2

- de Abreu, M. W., Ferreira, D. V., Pereira Jr, A. O., Cabral, J., & Cohen, C. (2021). Household energy consumption behaviors in developing countries: A structural decomposition analysis for Brazil. *Energy for Sustainable Development*, *62*, 1-15. https://doi.org/10.1016/j.esd.2021.03.001

Duarte, R., Miranda-Buetas, S., & Sarasa, C. (2021). Household consumption patterns and income inequality in EU countries: Scenario analysis for a fair transition towards low-carbon economies. *Energy Economics*, *104*, 105614. https://doi.org/10.1016/j.eneco.2021.105614

Dwi Cahyani, A., Nachrowi, N. D., Hartono, D., & Widyawati, D. (2020). Modern residential energy inequalities in Indonesia: spatial and income analyses. *Energy Sources, Part B: Economics, Planning, and Policy*, *15*(6), 329-350. https://doi.org/10.1080/15567249.2020.1803450

Fell, M. J. (2017). Energy services: A conceptual review. *Energy research & social science*, *27*, 129-140. https://doi.org/10.1016/j.erss.2017.02.010

Gupta, J. (2014). "Grasping the essentials of the Climate Change problem" Chapter 1 in *The History of Global Climate Governance*, Cambridge: Cambridge University Press, 3-21. https://doi.org/10.1017/CBO9781139629072

Gupta, J. (2016). "Geopolitics of the New Earth: Towards Sharing Our Ecospace", in S. Nicholson and S. Jinnah (eds.), New Earth Politics, Cambridge: MIT Press, pp. 271-292. https://doi.org/10.7551/mitpress/9780262034364.001.0001

Hickel, J. (2019). Is it possible to achieve a good life for all within planetary boundaries?. *Third World Quarterly*, *40*(1), 18-35. https://doi.org/10.1080/01436597.2018.1535895

Hundie, S. K. (2021). Income inequality, economic growth and carbon dioxide emissions nexus: empirical evidence from Ethiopia. *Environmental Science and Pollution Research*, *28*(32), 43579-43598. https://doi.org/10.1007/s11356-021-13341-7

Leach, M., Reyers, B., Bai, X., Brondizio, E., Cook, C., Díaz, S., . . . Subramanian, S. (2018). Equity and sustainability in the Anthropocene: A social–ecological systems perspective on their intertwined futures. *Global Sustainability*, *1*, E13. https://doi.org/10.1017/sus.2018.12

Lekavičius, V., Bobinaitė, V., Galinis, A., & Pažėraitė, A. (2020). Distributional impacts of investment subsidies for residential energy technologies. *Renewable and Sustainable Energy Reviews*, *130*, 109961. https://doi.org/10.1016/j.rser.2020.109961

Mehmood, U., Agyekum, E. B., Tariq, S., Ul Haq, Z., Uhunamure, S. E., Edokpayi, J. N., & Azhar, A. (2022). Socio-Economic Drivers of Renewable Energy: Empirical Evidence from BRICS. *International Journal of Environmental Research and Public Health*, *19(8)*, 4614. https://doi.org/10.3390/ijerph19084614

Millward-Hopkins, J., Steinberger, J. K., Rao, N. D., & Oswald, Y. (2020). Providing decent living with minimum energy: A global scenario. *Global Environmental Change*, *65*, 102168. https://doi.org/10.1016/j.gloenvcha.2020.102168

- Millward-Hopkins, J., & Oswald, Y. (2021). 'Fair' inequality, consumption and climate mitigation. *Environmental Research Letters*, *16(3)*, 034007. https://doi.org/10.1088/1748-9326/abe14f

Muttitt, G., & Kartha, S. (2020). Equity, climate justice and fossil fuel extraction: principles for a managed phase out. *Climate Policy*, *20(8)*, 1024-1042. https://doi.org/10.1080/14693062.2020.1763900

Nguyen, C. P., & Nasir, M. A. (2021). An inquiry into the nexus between energy poverty and income inequality in the light of global evidence. *Energy Economics*, *99*, 105289. https://doi.org/10.1016/j.eneco.2021.105289

- Oswald, Y., Owen, A., & Steinberger, J. K. (2020). Large inequality in international and intranational energy footprints between income groups and across consumption categories. *Nature Energy*, *5(3)*, 231-239. https://doi.org/10.1038/s41560-020-0579-8

- Oswald, Y., Steinberger, J. K., Ivanova, D., & Millward-Hopkins, J. (2021). Global redistribution of income and household energy footprints: a computational thought experiment. *Global Sustainability*, *4*, E4. https://doi.org/10.1017/sus.2021.1

Oswald et al. present a radical seemingly naïve thought experiment where income is redistributed on a global scale, and explore the implications for household energy consumption (both quantity and composition).

Owen, A., & Barrett, J. (2020). Reducing inequality resulting from UK low-carbon policy. *Climate Policy, 20(10),* 1193-1208. https://doi.org/10.1080/14693062.2020.1773754

Pottier, A. (2022). Expenditure elasticity and income elasticity of GHG emissions: A survey of literature on household carbon footprint. *Ecological Economics, 192*, 107251. https://doi.org/10.1016/j.ecolecon.2021.107251

Priesmann, J., Spiegelburg, S., Madlener, R., & Praktiknjo, A. (2022). Does renewable electricity hurt the poor? Exploring levy programs to reduce income inequality and energy poverty across German households. *Energy Research & Social Science, 93*, 102812. https://doi.org/10.1016/j.erss.2022.102812

Rammelt, C. and J. Gupta (2021). Inclusive is not an Adjective, it Transforms Development: A Post-Growth Interpretation of Inclusive Development, *Environmental Science and Policy*, *124*, 144-155. https://doi.org/10.1016/j.envsci.2021.06.012

Sachs, J.D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N., & Rockström, J. (2019). Six Transformations to achieve the Sustainable Development Goals. *Nature Sustainability*, *2(9),* 805–814. https://doi.org/10.1038/s41893-019-0352-9

Sánchez, C. S. G., Fernández, A. S., Peiró, M. N., & Muñoz, G. G. (2020). Energy poverty in Madrid: Data exploitation at the city and district level. *Energy Policy*, *144*, 111653. https://doi.org/10.1016/j.enpol.2020.111653

- Sarkodie, S. A. (2022). Winners and losers of energy sustainability—Global assessment of the Sustainable Development Goals. *Science of the Total Environment*, *831*, 154945. https://doi.org/10.1016/j.scitotenv.2022.154945

Sehrawat, M. (2021). Modelling the nexus between human capital, income inequality, and energy demand in India: new evidences from asymmetric and non-linear analysis. *Environmental Science and Pollution Research*, *28(3)*, 3632-3643. https://doi.org/10.1007/s11356-020-10733-z

Sharma, R., Shahbaz, M., Kautish, P., & Vo, X. V. (2021). Analyzing the impact of export diversification and technological innovation on renewable energy consumption: Evidences from BRICS nations. *Renewable Energy*, *178*, 1034-1045. https://doi.org/10.1016/j.renene.2021.06.125

- Sharma, R., & Rajpurohit, S. S. (2022). Nexus between income inequality and consumption of renewable energy in India: a nonlinear examination. *Economic Change and Restructuring*, *55*(4), 2337-2358. https://doi.org/10.1007/s10644-022-09389-1

Examining the link between income inequality and renewable energy consumption in India, Sharma and Rajpurohit illustrate the interrelationship between SDG 4 (education) and SDG 7 (clean and sufficient energy for all), arguing that the success of sustainable energy policy depends on human capital development through education and training.

Soriano-Hernández, P., Mejía-Montero, A., & van der Horst, D. (2022). Characterisation of energy poverty in Mexico using energy justice and econophysics. *Energy for Sustainable Development*, 71, 200-211. https://doi.org/10.1016/j.esd.2022.09.005

- Vera, M. S., de la Vega Navarro, A., & Samperio, J. I. (2021). Climate change and income inequality: An IO analysis of the structure and intensity of the GHG emissions in Mexican households. *Energy For Sustainable Development, 60*, 15-25. https://doi.org/10.1016/j.esd.2020.11.002

  Exploring the relationship between income inequality and energy consumption patterns of Mexican household, Vera et al. pay specific attention to methodologies to capture the disparities caused by income, in the context of developing countries. They highlight the need to refine the analytical tools, decolonising the study of household energy consumption variation in specific contexts.

Wang, Q., Li, L., & Li, R. (2022). The asymmetric impact of renewable and non-renewable energy on total factor carbon productivity in 114 countries: Do urbanization and income inequality matter?. *Energy Strategy Reviews*, *44*, 100942. https://doi.org/10.1016/j.esr.2022.100942

Xu, Q., & Zhong, M. (2022). Shared prosperity, energy-saving, and emission-reduction: Can ICT capital achieve a "win-win-win" situation?. *Journal of Environmental Management*, *319*, 115710. https://doi.org/10.1016/j.jenvman.2022.115710

- Xu, Q., & Zhong, M. (2023). The impact of income inequity on energy consumption: The moderating role of digitalization. *Journal of Environmental Management, 325*, 116464. https://doi.org/10.1016/j.jenvman.2022.116464

Zhang, R., Sharma, R., Tan, Z., & Kautish, P. (2022). Do export diversification and stock market development drive carbon intensity? The role of renewable energy solutions in top carbon emitter countries. *Renewable Energy, 185*, 1318-1328. https://doi.org/10.1016/j.renene.2021.12.113

APPENDIX

Scopus final search code:

((TITLE-ABS-KEY (income AND inequality AND energy)) AND (distribution) AND (demand)) AND (consumption) AND (LIMIT-TO (PUBYEAR , 2023) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020)) AND (LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-TO (SUBJAREA , "ENER") OR LIMIT-TO (SUBJAREA , "ECON") OR LIMIT-TO (SUBJAREA , "SOCI")) AND (LIMIT-TO (EXACTKEYWORD , "Income Inequality") OR LIMIT-TO (EXACTKEYWORD , "Income Distribution") OR LIMIT-TO (EXACTKEYWORD , "Energy Utilization") OR LIMIT-TO (EXACTKEYWORD , "Carbon Emission") OR LIMIT-TO (EXACTKEYWORD , "Climate Change") OR LIMIT-TO (EXACTKEYWORD , "Income") OR LIMIT-TO (EXACTKEYWORD , "Economic And Social Effects")) AND (EXCLUDE (SUBJAREA , "AGRI") OR EXCLUDE (SUBJAREA , "BUSI") OR EXCLUDE (SUBJAREA , "ENGI"))