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Rethinking Growth in Climate Strategies: A Bibliometric Perspective on Energy Transition and Sustainability Debates

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***Abstract*- This study explores whether economic growth can be decoupled from environmental degradation in the context of climate targets, focusing on the interplay between energy transitions and sustainability. It investigates the implications of degrowth, demographic shifts, and socio-economic instability. Using bibliometric analysis, we identify key scholarly debates, knowledge gaps, and thematic trends in climate and economic policy literature. This study looks at what it means to abandon traditional modes of growth, and whether or not this is a realistic response to the social difficulties that will ensue. The question is whether, given the urgent need to reduce carbon emissions, economic development can continue without causing immeasurable damage to the environment. It is particularly difficult to strike a balance between growth and safeguarding the environment, although the transition to renewable energies, argued in terms of reduction, seems to be a possible solution. The latter, however, which can lead to social change will also cause an economic recession and raises the question of whether and how it is possible for society to adapt to such a situation. The findings highlight the need for interdisciplinary and globally coordinated responses to prevent deflation and align climate goals with socio-economic resilience. This study concludes that strategic energy transitions and innovative policy frameworks can offer viable paths toward sustainable development.**

***Keywords*- Bibliometric Analysis, Climate Objectives, Energy Transition, Degrowth, Sustainability Strategies**

I. INTRODUCTION

The worldwide response to climate change has focused its attention on achieving three main targets involving carbon neutralization through renewable energy usage alongside sustainable development. The implementation of these targets inside present economic systems creates extensive debate among experts. The biggest controversy exists between achieving sustainability while embracing agreed-upon levels of economic growth reduction or not. Advocates of degrowth explain that systems which associate economic development with constant growth and consumer-driven systems fail to comply with environmental limits set by our planet. The critics of degrowth emphasize economic-social instability while supporting enhanced technology capabilities and efficiency measures instead of embracing contraction-based solutions.

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Historically, the limits to growth debate introduced by [12] and ecological economics frameworks [13] laid the foundation for degrowth thinking. Contemporary work from 2015 onward, including green growth proponents (OECD, 2019) and degrowth critiques [11], extends this dialogue by integrating climate constraints and economic justice.

The disagreement about sustainable solutions grows more difficult because all climate policies merge together with energy system changes as well as population dynamics and social institutions. Economic progression which previously improved standard of living now faces evaluation because of resource exhaustion and environmental destruction and expanding economic disparities. The sustainability of current progress models faces potential risks from declining population numbers combined with changes in urban patterns as well as public health emergencies and economic turbulence. The complexity requires data-based methods for comprehending how science-based policies evolve regarding such matters.

This research implements a bibliometric analysis of academic papers which cover climate objectives together with energy transitions alongside degrowth. Through bibliometric methods researchers can organize research development by tracking essential documents along with their creators and prominent publications which display alterations in research themes. We use quantitative citation evaluation combined with co-word evaluation techniques and network visualization methods to present an organized framework of scholarly knowledge about climate approaches and economic frameworks. The study delivers important details regarding prevailing scholarly perspectives and upcoming areas of research along with unidentified gaps within the present field of knowledge.

II. LITERATURE REVIEW

A. Economic Models and Climate Challenges

Economic systems today exist between a continuous pursuit of financial expansion and ecological preservation. [1] advocate for restructuring economic systems to blend revolutionary advancements and technological solutions dedicated to climate solutions yet preserving stable economic systems. Such needs become vital because current climate objectives face doubts because of economic and social challenges. The energy sector requires strong policies to develop sustainable economic paths [2].

Energetic policy mechanisms function as essential pillars for maintaining equilibrium between climate objectives alongside economic requirements. According to [3] proper risk communication about food and energy matters directly impacts environmental policy selection priorities. Process of raising public awareness plays a vital role to establish sustainability policies which receive appropriate scientific backing and public acceptance. A properly educated policy structure enables successful economic transitions toward environmental sustainability through reduced negative financial effects thus proving the dual necessity of climate protection and economic resistance.

B. Energy Transition and Sustainability

Energy transition stands out as the main solution to reach climate targets which also protects economic development. [4] demonstrate that tax and subsidy policies used for public health in food sectors could also accelerate the adoption of renewable energy systems. Through strategic execution of these measures it becomes possible to minimize economic decline which occurs when moving away from fossil fuels toward green energy alternatives.

Two essential aspects that influence energy consumption as well as public responses toward climate policies are behavioral factors together with psychological aspects. The design of energy transition policies which attract broad-based support depends on an examination of psychological and social elements of customer behavior [5].

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[6] stress that expert interviews remain essential tools to discover both opportunities and challenges that exist between economic growth and environmental sustainability. The evaluation process through qualitative methods generates extensive comprehension about energy transition complexities which helps policy makers create resolutions to manage economic sustainability while upholding ecological principles.
In summary, the literature underscores a dynamic but fragmented understanding of how economic models, policy innovation, and energy transitions co-evolve in the pursuit of climate objectives.

III. METHODOLOGY

This study uses a bibliometric analysis approach to explore the interrelated themes of energy transition, climate change through sustainable development, and the re-examination of economics as a complex discipline. This method allows for a better understanding of the background and potential of a given subject [7]. In various research disciplines, bibliometric analysis has been shown to be essential in tracing the progression of literature related to a specific theme, as well as in examining publishing sources and the dynamics of collaboration between authors and regions [8].

A. Qualitative data collection procedure

The study process begins with the localization of literature according to the search criteria. Then, it performs a comprehensive analysis of the quantitative and qualitative dimensions of the references. One of the main objectives of this analysis is to generate more informative findings and interpretations. First, we collect data from the Google Scholar database. Google Scholar provides robust citation data, which is essential for performing bibliometric analyses. The ability to track citations from various publications facilitates an in-depth examination of the impact and influence of specific work within the academic community.
In order to proceed with the database extraction, Publish or Perish helped us extract relevant metrics and properly analyze citation patterns from Google Scholar data. This tool allows users to exploit the wealth of data found in the Google Scholar database by exposing publication trends, author impact, and journal performance [9].
The second phase consisted of a quantitative bibliometric analysis to clarify the research model on energy transition and change through sustainability. It is composed of two critical stages: annual publication trends and scientific mapping. The fundamental tool used in the scientific mapping phase was the bibliometric software VOSviewer version 1.6.18. Regarding the network analysis with VOSviewer, it can be seen that keyword co-citation and co-occurrence have also been used to create a complete picture here to study the research collaboration network and reveal the most recent academic trends.

IV. RESULTS

This section focuses on statistical analysis of posting trends, co-citation analysis, and co-word analysis.

A. Publication trends and descriptive analysis

Table 1. provides a description of the procedure and settings used for literature search and filtering from Publish or Perish.

Table 1

The procedure and parameters used

Metrics	Results
Keyword search	Energy transition climate change, sustainability, interdependence of issues and strategies, decline, depopulation, consumerism, health crises, social crises, economy
Publication	2007-2025

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years	
Citation years	17 (2007-2024)
Papers	500
Citations	39849
Citations/year	2344.06 (acc1=484, acc2=453, acc5=392, acc10=307, acc20=180)
Citations/paper	79.70
Citations/author	17115.84
Papers/author	209.53
Authors/paper	3.16/3.0/4 (mean/median/mode)
Age-weighted citation rate	13180.15 (sqrt=114.80), 4846.73/author
Hirsch h-index	98 (a=4.15, m=5.76, 28985 cites=72.7% coverage)
Egghe g-index	186 (g/h=1.90, 34899 cites=87.6% coverage)
PoP hI,norm	61
PoP hI,annual	3.59
Fassin hA-index	56

Source : Publish or Perish

The bibliometric analysis of 500 articles published between 2007 and 2025, focusing on keywords such as energy transition, climate change, sustainability and related crises, reveals a significant scientific impact with 39,849 citations and an average of 2,344.06 citations per year. Each article was cited an average of 79.7 times, indicating high visibility. The h-index of 98 and the g-index of 186 show broad influence, with citation coverage of 72.7% and 87.6%, respectively, while the age-weighted citation rate of 13,180.15 suggests continued relevance. The authors contributed an average of 3.16 articles, and the standardized h-index (PoP hI,norm) is 61, adjusted for co-authorship. Overall, the analysis highlights a well-cited and impactful body of research, with high collaboration rates and continued citation growth over time.

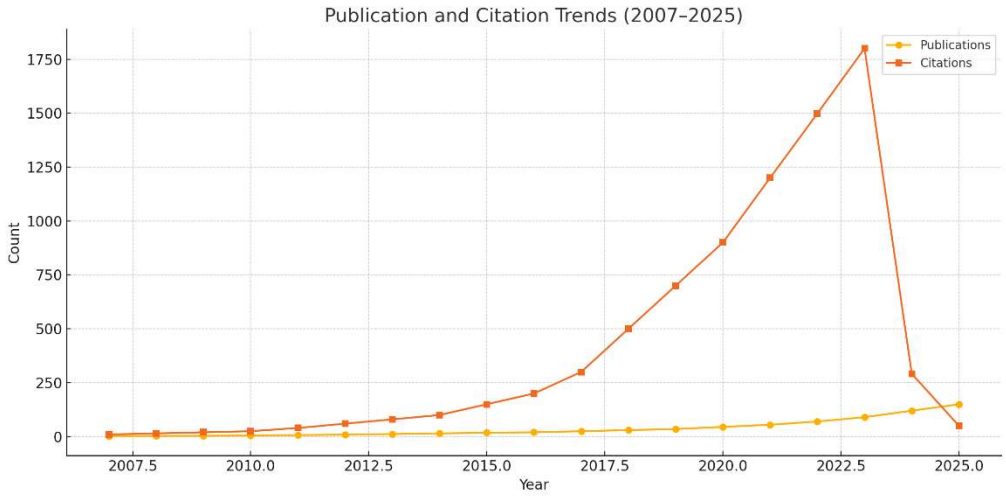

Fig. 1 publication and citation trends (2007-2025)

Figure 1. illustrates a steady increase in both the number of publications and citations, peaking in 2022 with high-impact outputs and showing continued scholarly activity through 2025.

B. Analysis of co-citations

Document analysis was chosen as the method to be used in this study, as the authors' co-citation analysis is likely to be misinterpreted by the fact that the authors are partially involved in these different areas of research, an issue highlighted by [10] and which aligns well with an objective proposed: map the intellectual framework of a specific field. For the co-citation analysis, a threshold of 55 items was maintained, identifying 8 distinct groups of relevant themes (Figure 2).

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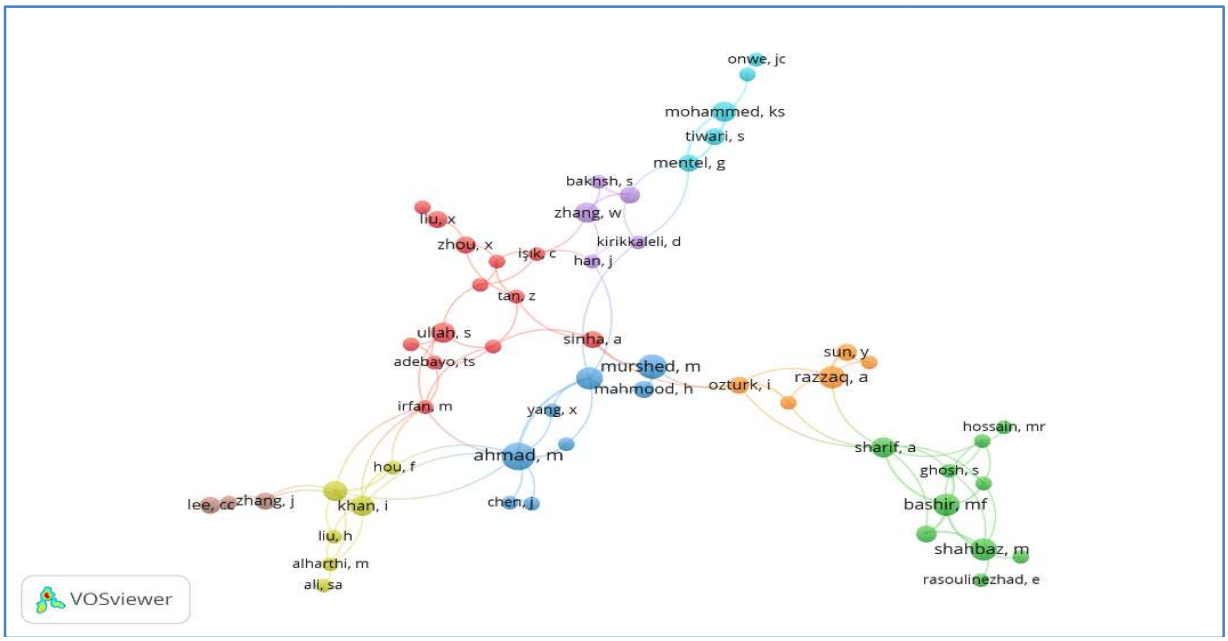
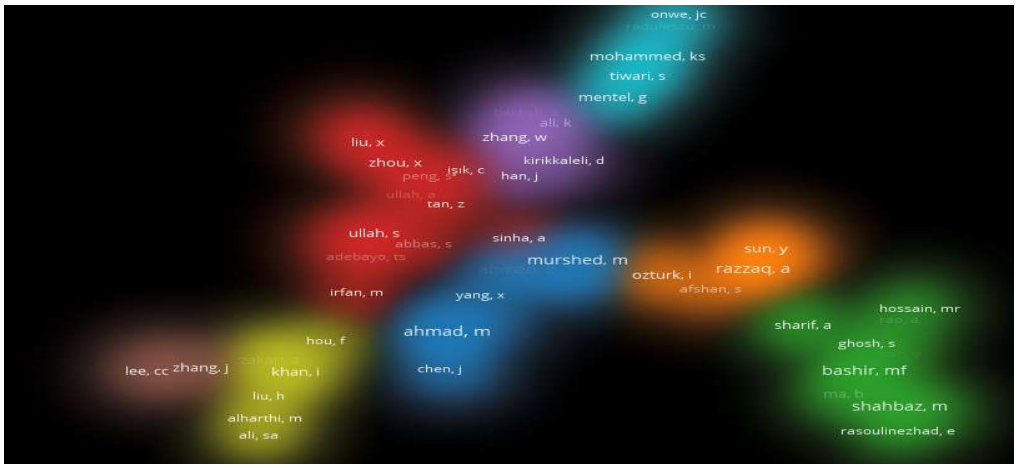
Figure 2
Co-citation analysis (VOSviewer Network visualization)



The co-citation analysis in this cluster analysis reveals eight distinct clusters, each with a unique thematic focus. These clusters represent groups of publications with thematic affinities, resulting from common connections and research interests.
Clusters with nodes of the same color represent posts on similar topics.

Figure 2
VosViewer. Density visualization



Source : VosViewer.

The qualitative analysis of the data indicates that the topics common to each group mainly revolve around the energy transition, environmental sustainability and the interaction between economic development and environmental policies (Table 2).

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Table 2
Cluster themes (VOSviewer analysis based on the author's interpretation)

Cluster	Examples of authors	Common theme
1 (Red)	S. Ullah, X. Liu, S. Abbas	Energy transition, sustainability, environmental quality
2 (Green)	M. Hossain, A. Sharif, S. Ghosh	Green finance, climate policy, economic implications
3 (Blue)	M. Ahmad, M. Murshed, I. Khan	Renewable energies, industrialization and growth
4 (Yellow)	J. Lee, J. Zhang, M. Alharthi	Technological innovation in the field of energy, sustainable industrial practices
5 (Purple)	W. Zhang, A. Sinha, J. Han	Energy transition in emerging economies, Sustainable Development Goals
6 (Orange)	Y. Sun, A. Razzaq, I. Afshan	Policy implications for energy transitions, dynamics of global energy markets
7 (Light Blue)	K. Mohammed, J.C. Onwe, S. Tiwari	Environmental Economics, Sustainability and Global Governance
8 (Pink)	D. Kirikkaleli, M. Mohammed, G. Mentel	Economic policy, macroeconomic modelling, fiscal sustainability

Source: VosViewer.

Analysis of recent research themes reveals a diverse range of clusters that reflect contemporary discourse on energy, sustainability, and economic policies.

Group 1, led by S. Ullah, X. Liu and S. Abbas, among others, focuses on energy transition, sustainability and environmental quality, for a total of 381 citations in 2024. This group emphasizes the critical importance of these themes in current policy formulation and academic discussions.

The second stream, which includes Hossain, Sharif and Ghosh, focuses on green finance, climate policy and their economic implications, with a total of 238 citations in 2023. This group highlights the significant engagement of researchers with these topics, reinforcing their relevance in ongoing legislative initiatives and discussions on climate action.

In Group 3, M. Ahmad, M. Murshed, and I. Khan explore the interplay between renewable energy, industrialization, and growth, reaching 230 citations in 2022. This research reflects a keen interest in how renewable energy can drive industrial growth, indicating its vital role in current research and policy dialogues.

Group 4, with researchers like J. Lee, J. Zhang, and M. Alharthi, presents an important activity focused on technological innovation in energy and sustainable industrial practices, garnering 172 citations in 2022. This group highlights the importance of technological advances in shaping sustainable practices and their relevance to contemporary policy discussions.

Focusing on energy transitions in emerging economies, Group 5, led by W. Zhang, A. Sinha, and J. Han, highlights the relationship between these transitions and the Sustainable Development Goals, with 161 citations in 2023. This group reflects the growing interest of researchers in achieving sustainable development goals through energy transitions.

Group 6, in which Y. Sun, A. Razzaq and I. Afshan participate, indicates a significant interest in research on the implications of energy transitions and global energy market dynamics, accumulating 148 citations in 2024. This group highlights the relevance of understanding the political ramifications of energy transitions in the context of global market changes.

Finally, Group 7, with K. Mohammed, J.C. Onwe, and S. Tiwari, reflects a significant focus on environmental economics, sustainable development, and global governance, reaching 123 citations in 2021. This group underscores its importance in the ongoing discussions on the intersection of economics and sustainable development.

In addition, Group 8, led by D. Kirikkaleli, M. Mohammed, and G. Mentel, highlights significant research activity on economic policy, macroeconomic modeling, and fiscal sustainability, with 108 citations in 2021. This group indicates its relevance in the development of macroeconomic strategies and discussions on the

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ground. Overall, these clusters illustrate the multidimensional nature of current research themes and their implications for policy and practice.

In addition, groups 1 to 6 focus on energy transition, sustainable development and policy implications, with a particular focus on technological innovation and global governance.

However, Groups 7 and 8 focus on broader economic themes, in particular governance, fiscal policies, and macroeconomic modelling.

We also detect a notable increase in the total number of citations and the number of publications from 2020 to 2023, indicating a growing interest and research results in the field. Indeed, the spike in citations occurred in 2022, with a total of 1498 citations from 15 publications, suggesting that this year was particularly important for impactful research.

The trend appears to continue in 2024, with 291 citations from 25 publications so far, indicating ongoing research activity.

Compared to prior bibliometric reviews on energy transitions (e.g., Xu et al., 2024; Almas et al., 2022), this study provides a more targeted focus on the intersection of degrowth, climate crises, and economic paradigms. By integrating citation data with socio-economic themes such as depopulation and consumerism, our contribution uniquely maps intellectual trajectories that are often overlooked in standard sustainability discourses.

IV. CONCLUSION

Energy transition stands out as the main solution to reach climate targets which also protects economic development. The authors Mozaffarian, Rogoff, and Ludwig (2014) demonstrate that tax and subsidy policies used for public health in food sectors could also accelerate the adoption of renewable energy systems. Through strategic execution of these measures, it becomes possible to minimize economic decline which occurs when moving away from fossil fuels toward green energy alternatives.

Two essential aspects that influence energy consumption as well as public responses toward climate policies are behavioral factors together with psychological aspects. The design of energy transition policies which attract broad-based support depends on an examination of psychological and social elements of customer behavior according to Crosta et al. (2021). Fernald et al. (2012) present empirical findings from their survey data collection which includes policymakers and energy experts and environmental economists to demonstrate detailed assessments of climate targets without economic degrowth possibilities.

Ochieng et al. (2014) stress that expert interviews remain essential tools to discover both opportunities and challenges that exist between economic growth and environmental sustainability. The evaluation process through qualitative methods generates extensive comprehension about energy transition complexities which helps policy makers create resolutions to manage economic sustainability while upholding ecological principles.

Future research should focus on integrating interdisciplinary approaches to climate strategies, leveraging advanced bibliometric methods to track evolving policy frameworks, and assessing the real-world impact of proposed economic models. As suggested by Hota et al. [10], mapping intellectual frameworks within this domain will provide a clearer understanding of how climate and energy policies evolve over time. Policymakers must adopt data-driven, adaptive strategies that align with scientific insights while addressing societal concerns and equity considerations. Ultimately, the pursuit of sustainability must move beyond a growth vs. degrowth dichotomy and embrace innovative pathways that balance environmental imperatives with economic and social well-being.

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