African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 37 Août 2026

Energy Transition, Structural Transformation, and Global Value Chains: A Bibliometric Analysis of the Scientific Literature (2001-2026).

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Pour citer cet article : NAOURI .M & EL ALAOUI .A (2026) « Energy Transition, Structural Transformation, and Global Value Chains:A Bibliometric Analysis of the Scientific Literature (2001-2026) », African Scientific Journal « Volume 03, Num 37 » pp: 001 – 037.

DOI : 10.5281/zenodo.22250920

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ISSN : 2658-9311
Vol : 03, Num 37 Août 2026

Abstract

Energy transition is increasingly framed not only as a climate imperative but also as a driver of structural economic change in developing and emerging economies. Yet research linking energy transition to structural transformation, economic diversification, and global value chains (GVCs) remains fragmented across disciplinary fields. This paper presents a bibliometric analysis of 455 English-language articles and reviews indexed in Scopus between 2001 and 2026. Using Python-based bibliometric tools, including pandas, NetworkX, and python-louvain, we examine publication trends, leading sources and authors, geographic distribution, collaboration patterns, and the conceptual structure of the literature through keyword co-occurrence, thematic mapping, and trend-topic analysis. The results show that research in this field remained limited until 2018 but expanded rapidly after 2021. Publication activity is concentrated in China, Saudi Arabia, and a group of Gulf and BRICS-related economies, while international collaboration remains fragmented. Four thematic clusters emerge: (i) energy transition and economic diversification in rentier economies; (ii) CO_2 emissions, economic growth, and structural transformation in African and Asian contexts; (iii) sustainable development and economic complexity; and (iv) renewable energy, industrial policy, and GVCs, which forms the most central and developed cluster. Morocco and the wider Euro-Mediterranean region remain largely absent. This reveals a specific research gap at the intersection of economic complexity, GVC governance, and non-rentier Euro-Mediterranean economies. The paper concludes by proposing a research agenda focused on this intersection and by discussing limitations related to database coverage and keyword homonymy.

Keywords : Energy transition ; structural transformation ; global value chains ; economic diversification ; economic complexity ; bibliometric analysis.

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ISSN : 2658-9311
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Introduction

The global energy system is undergoing a rapid transformation. Renewable electricity capacity has expanded strongly over the past decade, while climate commitments adopted since the 2015 Paris Agreement have reinforced the shift toward lower-carbon energy systems. Research on this transition has largely focused on decarbonization, emissions reduction, energy security, and technological deployment. A broader question has received less systematic attention: whether the energy transition can also contribute to structural economic change. For developing and emerging economies, this question is important because renewable-energy development may affect investment, industrial activity, employment, technological capabilities, and participation in domestic and international value chains.

Against this background, the subject of this study is the evolving relationship between energy transition and productive transformation, examined through the interconnected concepts of structural transformation, economic diversification, and global value chain (GVC) participation. This study examines this relationship through three concepts: structural transformation, economic diversification, and global value chain (GVC) participation. Structural transformation refers to the movement of labor and capital from low-productivity activities toward sectors with higher productivity and technological content (Lewis, 1954; Chenery, 1960). Economic diversification concerns the expansion of a country's productive base into new activities and products, reducing dependence on a limited number of sectors. GVC participation focuses on the position of firms and economies within fragmented production networks and their capacity to move toward higher-value activities (Gereffi, 1994; Gereffi et al., 2005; Humphrey & Schmitz, 2002). In the energy-transition context, these concepts raise a common question: can renewable-energy development generate productive capabilities that support broader economic upgrading?

Three strands of literature provide the main theoretical foundations. The first is the structural-transformation literature in development economics. From Lewis (1954) to Chenery (1960), development has been associated with a shift of labor and capital from low-productivity activities toward manufacturing and, at later stages, services. Applied to the energy transition, this perspective suggests that investment in renewable generation, grids, storage, and related infrastructure may create demand for equipment, installation, operation, maintenance, engineering, and specialized services. However, the extent to which these activities generate domestic

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capabilities depends on the productive structure and the capacity to retain value locally. The second strand concerns GVC governance and upgrading. Gereffi (1994), Gereffi et al. (2005), and Humphrey and Schmitz (2002) show that participation in international production networks does not automatically produce industrial upgrading. Countries may remain concentrated in resource extraction, basic processing, or assembly, while higher-value activities such as component manufacturing, technology development, design, and specialized services remain elsewhere. This issue is particularly relevant to renewable-energy and critical-mineral value chains. The energy transition may create opportunities for industrial development, but realizing them depends on domestic capabilities, technological learning, institutions, and industrial policy. The third strand is the economic-complexity approach developed by Hidalgo and Hausmann (2009). Economic complexity links development to the diversity and sophistication of productive capabilities embedded in an economy. Economies with broader capabilities are better positioned to produce more complex products and sustain long-term growth. This approach complements structural transformation and GVC upgrading by providing a measurable perspective on productive sophistication. Renewable-energy investment may contribute to economic complexity when it supports capabilities applicable to related manufacturing, engineering, technological, and service activities. Yet renewable-energy expansion alone does not guarantee such outcomes.

Despite the relevance of these perspectives, their interaction with energy-transition research remains insufficiently examined. Energy-transition studies have developed mainly within energy economics, environmental economics, engineering, and sustainability research. Work on diversification, structural transformation, GVC participation, and economic complexity is growing, but these streams often remain separated across disciplines and geographical contexts. This fragmentation points to a theoretical gap: limited research explicitly connects energy transition, productive transformation, GVC upgrading, and capability accumulation within a common framework. It also reveals an empirical gap, as existing evidence is concentrated in selected resource-rich and emerging economies, while non-rentier economies integrated into regional production networks receive less attention. Morocco is particularly relevant because its renewable-energy development is occurring alongside industrial integration with European markets and efforts to increase domestic value creation.

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A further methodological gap concerns the structure of the scientific field itself. Although individual studies examine specific links between renewable energy, diversification, industrial development, or GVCs, less is known about how these research streams have evolved collectively, which themes connect them, and where their conceptual boundaries remain. Bibliometric analysis is useful in this context because it enables systematic examination of publication trends, influential sources and authors, geographical patterns, collaboration networks, and thematic relationships within a large interdisciplinary literature. Accordingly, the main objective of this study is to provide a systematic and comprehensive mapping of the scientific literature at the intersection of energy transition, structural transformation, economic diversification, and GVC participation, while identifying its intellectual structure, thematic evolution, geographical distribution, and remaining research gaps. Against this background, this paper asks: How has the scientific literature connected energy transition with structural transformation, economic diversification, and GVC participation, and what gaps remain, particularly for non-rentier economies such as Morocco? Four subsidiary questions guide the analysis: (i) how has this literature evolved across time, countries, institutions, and journals?; (ii) what are its main conceptual and thematic clusters?; (iii) to what extent do structural transformation, GVC upgrading, and economic complexity converge?; and (iv) what gaps remain concerning Morocco and the wider Euro-Mediterranean region?

To answer these questions, the study analyzes 455 English-language articles and reviews indexed in Scopus between 2001 and 2026. The search combines “energy transition” OR “renewable energy” with “structural transformation” OR “economic diversification” OR “global value chain” in titles, abstracts, and keywords. Python-based tools, including pandas, NetworkX, and python-louvain, are used to examine publication trends, source and author productivity, geographical distribution, collaboration structures, keyword co-occurrence, thematic patterns, and emerging topics. This approach provides a systematic overview of the field and identifies areas requiring further research.

The contribution of this study is therefore threefold. First, it brings together research streams that have largely evolved separately, namely energy transition, structural transformation, economic diversification, GVC participation, and economic complexity. Second, it maps the intellectual and thematic structure of this emerging interdisciplinary field using a systematic bibliometric approach. Third, it identifies geographical and conceptual gaps, with particular attention to non-rentier

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economies and the underexplored Euro-Mediterranean context, thereby proposing directions for future empirical research.

The remainder of the paper is organized into four sections. Section 2 describes the data, search strategy, and bibliometric methodology. Section 3 presents the main empirical results, including publication trends, geographical and collaboration patterns, and thematic structures. Section 4 discusses the findings, highlights the main research gaps, and considers their implications for future research on energy transition and productive transformation. Finally, Section 5 concludes the paper by summarizing the main findings, acknowledging the study's limitations, and outlining directions for future research.

2. Data and Methods

2.1 Data source and search strategy

Bibliographic data were retrieved from Scopus (Elsevier) on 5 August 2026. Scopus was selected because of its broad coverage of journals in the social sciences and its structured metadata, including author keywords, institutional affiliations, and citation information. The search was conducted in the title, abstract, and keyword fields using the following Boolean query:

TITLE-ABS-KEY(("energy transition" OR "renewable energy") AND ("structural transformation" OR "economic diversification" OR "global value chain")) AND (LIMIT-TO(DOCTYPE,"ar") OR LIMIT-TO(DOCTYPE,"re")) AND (LIMIT-TO(LANGUAGE,"English"))*

The search initially returned 593 records. After applying the predefined eligibility criteria, the dataset was restricted to English-language research articles and review articles, resulting in a final corpus of 455 documents, comprising 422 articles and 33 reviews. The records cover the period from 2001 to 2026. Publications indexed in 2026 include early-access and in-press records available in Scopus at the time of data retrieval.

The screening and corpus-selection process is summarized in Figure 1. The flow diagram follows the main reporting principles of PRISMA, adapted to the specific requirements of a bibliometric review.

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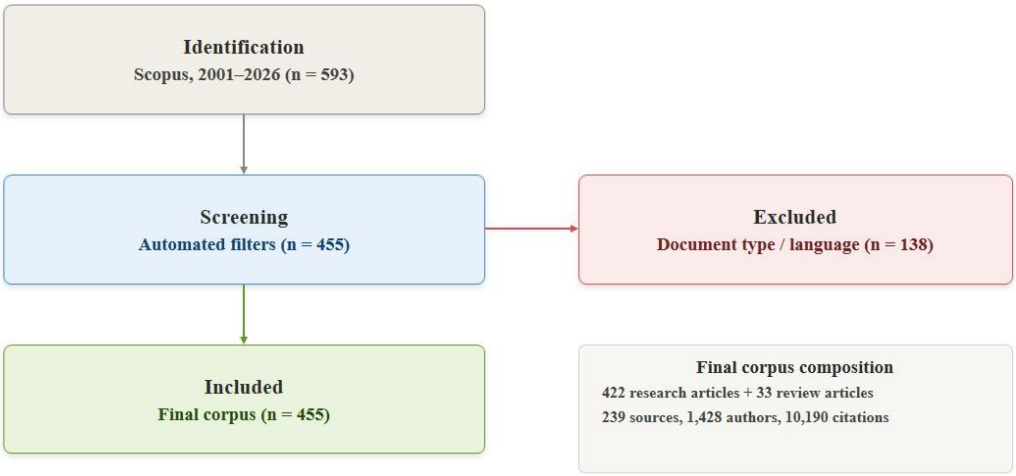
Fig. 1. Bibliometric corpus selection



Source: Authors' elaboration based on Scopus data (2001–2026)**.**

2.2 Analytical procedure

The bibliometric analysis was performed in Python 3.12. Data preparation and management relied on pandas, while NetworkX and the python-louvain package were used for network construction and community detection. Matplotlib was used to generate the graphical outputs. Country affiliations were extracted from the original Scopus affiliation strings by retaining the final comma-separated element of each affiliation record. Author keywords were converted to lowercase and standardized to reduce lexical variation. Commonly used variants were merged; for instance, "renewable energy sources" and "renewable energies" were grouped under the term "renewable energy."

The analysis examined publication dynamics, source productivity, authorship patterns, geographical distribution, citation impact, and thematic structures. Annual and cumulative publication output were first calculated to capture the evolution of the field. Journal productivity was then assessed using Bradford's Law to identify the core publication sources. Author productivity was examined alongside a co-authorship network restricted to the 60 most productive authors. At the country level, publication output and international collaboration were assessed through co-affiliation links among countries represented in the same document.

Citation counts were used to identify the most influential publications. The thematic structure of the literature was further examined through a keyword co-occurrence network based on the 45 most frequent author keywords. Communities were identified using the Louvain algorithm, with a

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resolution parameter of 1.0 and edge weights reflecting co-occurrence frequency. A Callon strategic map was subsequently constructed by plotting the centrality and density of each thematic cluster. Centrality reflects the strength of links between a theme and the wider thematic structure, whereas density captures the internal cohesion of the theme.

Finally, topic evolution was examined through a trend-topic analysis based on the ten most frequent keywords across five sub-periods. A three-mode Sankey diagram was also constructed to trace the relationships among the ten most productive authors, the ten most frequent keywords, and the ten most productive journals. Together, these procedures provide a combined view of the field's temporal development, intellectual structure, collaboration patterns, and thematic evolution.

2.3 Corpus overview

The final corpus comprises 455 documents retrieved from Scopus and published between 2001 and 2026. It includes 422 research articles and 33 review articles. As reported in Table 1, the corpus spans 239 source titles and includes contributions from 1,428 authors.

As of 5 August 2026, the documents had received 10,190 citations, corresponding to an average of 22.4 citations per document. These figures provide an initial indication of the size and scholarly impact of the literature covered by the analysis.

The initial screening also identified 27 records (5.9%) as potential domain noise. Most were associated with terminology shared with materials science and chemistry. These records were flagged for closer inspection rather than excluded automatically, allowing their relevance to be assessed at a later stage of the analysis.

The Scopus export further contained one in-press record with a 2027 publication date. Because the database search was conducted on 5 August 2026, this record was treated separately from the main dataset. It was consequently excluded from the 455-document corpus reported in Table1.

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Table 1. Descriptive overview of the analyzed corpus.

Indicator	Value
Number of documents	455 (422 articles, 33 reviews)
Time span	2001-2026 (+1 in-press record dated 2027)
Total citations (Scopus, as of 5 Aug. 2026)	10,190
Average citations per document	22.4
Distinct source titles (journals)	239
Distinct authors	1,428
Documents flagged as possible domain noise (materials science / chemistry homonyms)	27 (5.9%)

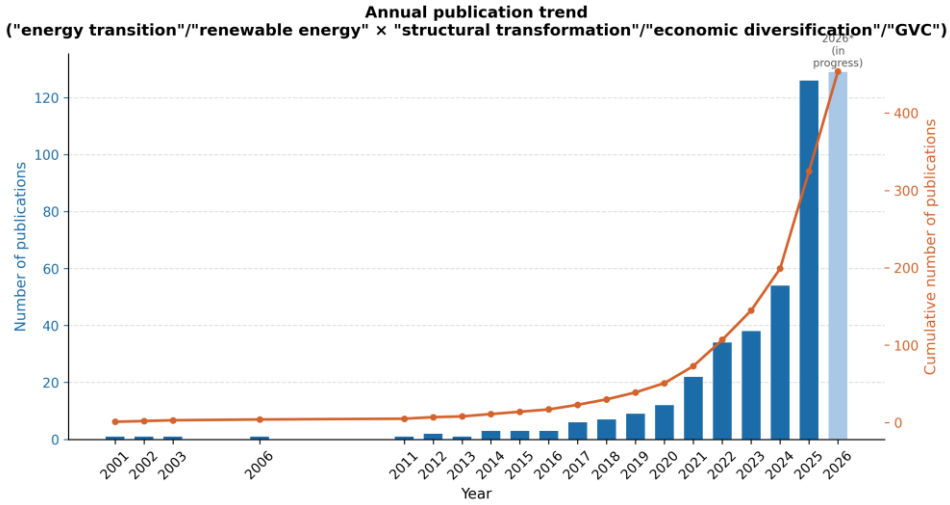
Source: Authors' elaboration based on Scopus data (2001–2026).

3. Results

3.1 Publication trends

Publication activity remained very limited during the first years of the period. Fewer than three documents were published annually before 2017. By 2020, the corpus had reached only 61 documents in total. Publication activity then increased rapidly. The number of documents rose from 22 in 2021 to 38 in 2023 and 54 in 2024, before reaching 126 in 2025, as shown in Figure 2. The years 2024 and 2025 alone account for nearly 40% of the corpus. This sharp increase points to a rapidly expanding research area. The strong rise after 2020 also coincides with growing policy attention to renewable energy, industrial policy, and economic transformation. The trend suggests that the literature is still developing and that its main research themes are not yet fully established.

Fig. 2. Annual and cumulative publication counts, 2001-2026.



Source: Authors' elaboration based on Scopus data (2001–2026)**.**

3.2 Source analysis and Bradford's Law

The publications are mainly concentrated in broad sustainability and energy-policy journals. *Sustainability* (Switzerland), *Energies*, and *Sustainable Development* are the three most productive sources, followed by *Resources Policy* and *Energy Strategy Reviews*, as shown in Figure 3. Bradford's Law of scattering provides a clearer picture of this concentration. Figure 4 divides the 239 sources into three zones. The core zone contains only 14 journals but accounts for 152 documents. Zone 2 includes 74 journals and a similar number of documents, while the remaining 152 journals form Zone 3 and account for the final 152 documents. Thus, a similar volume of publications is spread across an increasingly large number of journals. This pattern indicates a strong dispersion of the literature and suggests that the field has not yet consolidated around a small group of specialized journals. Research remains distributed across several areas, particularly sustainability, energy economics, and resource policy.

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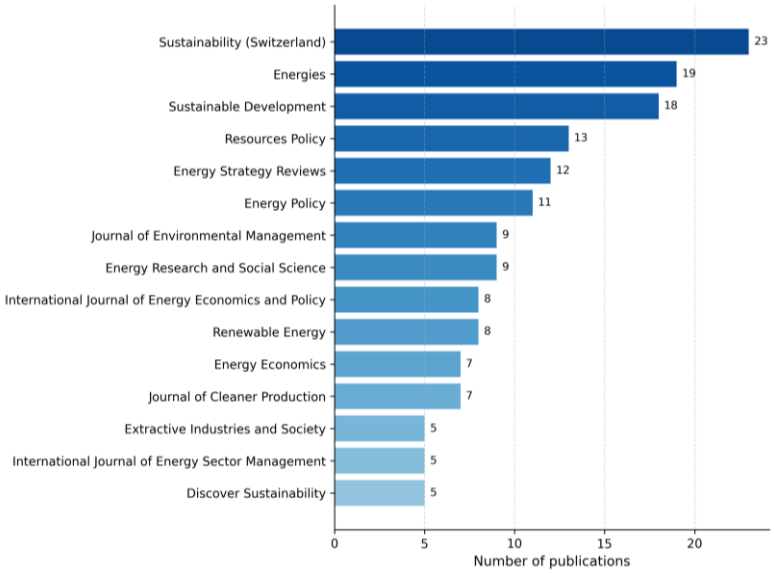
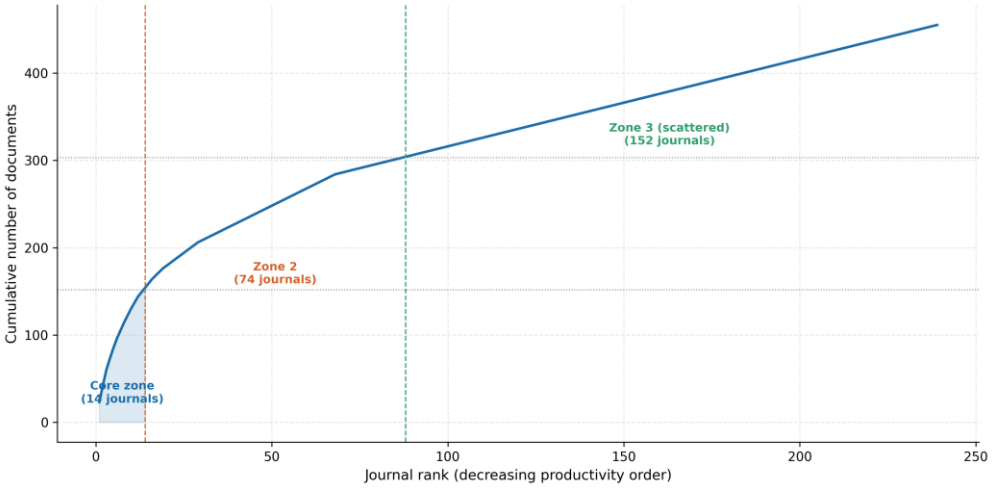
Fig. 3. Fifteen most productive journals.



Source: Authors' elaboration based on Scopus data (2001–2026).

Fig. 4. Bradford's Law core-journal analysis (239 journals, 455 documents).



Source: Authors' elaboration based on Scopus data (2001–2026).

3.3 Author productivity and collaboration structure

The author distribution shows no clear leading researcher. The most productive authors have each contributed only a small number of documents, among 1,428 distinct authors identified in the corpus. This pattern is visible in Figure 5. The co-authorship network provides a similar picture. As shown in Figure 6, the sixty most productive authors form several separate or weakly connected groups rather than one large and highly connected community. The field therefore remains

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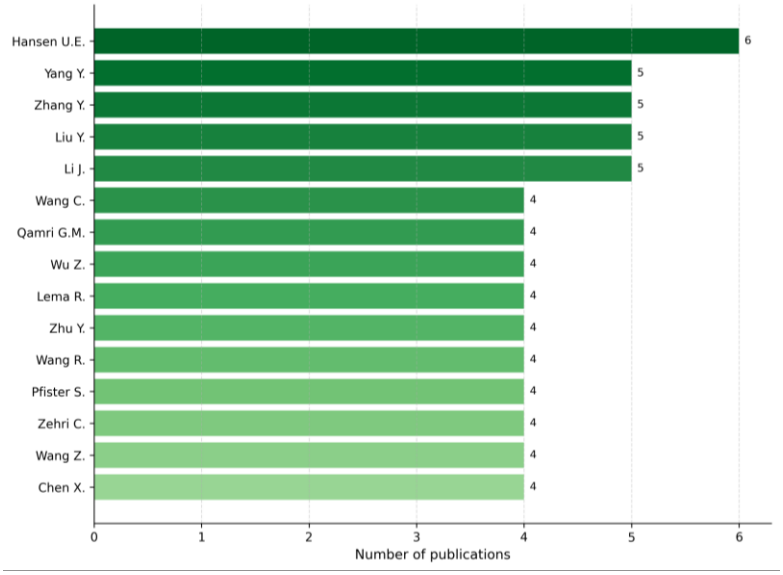
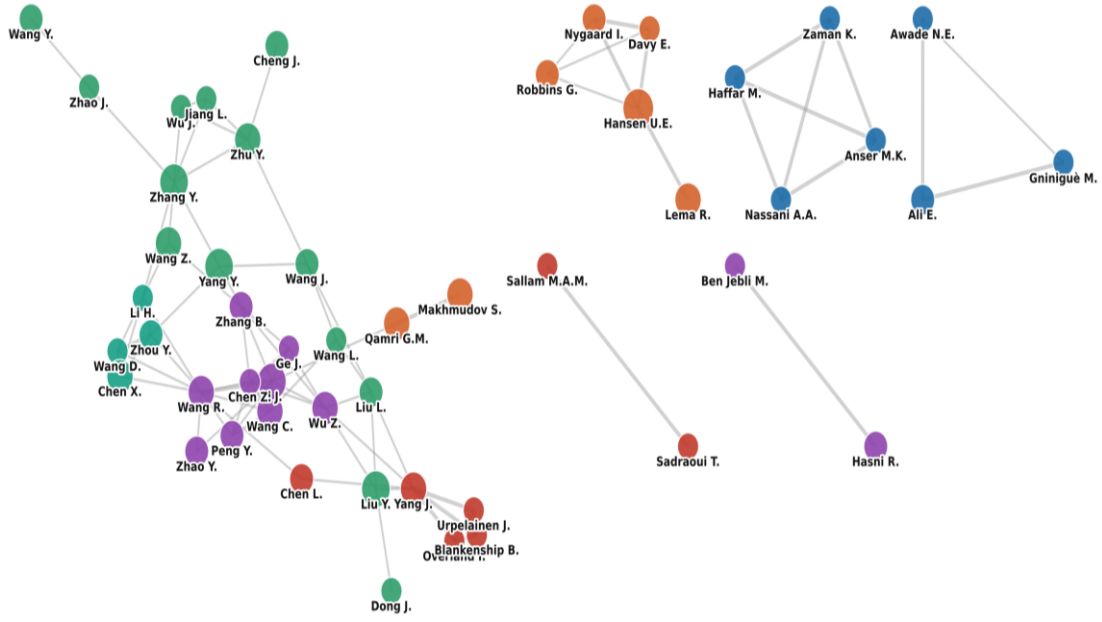
fragmented. Research is mainly organised around parallel national or regional groups, with limited links between them. This pattern is consistent with the recent growth of the field.

Fig. 5. Fifteen most productive authors.



Source: Authors' elaboration based on Scopus data (2001–2026)**.**

Fig. 6. Co-authorship network (sixty most productive authors; color denotes Louvain community).



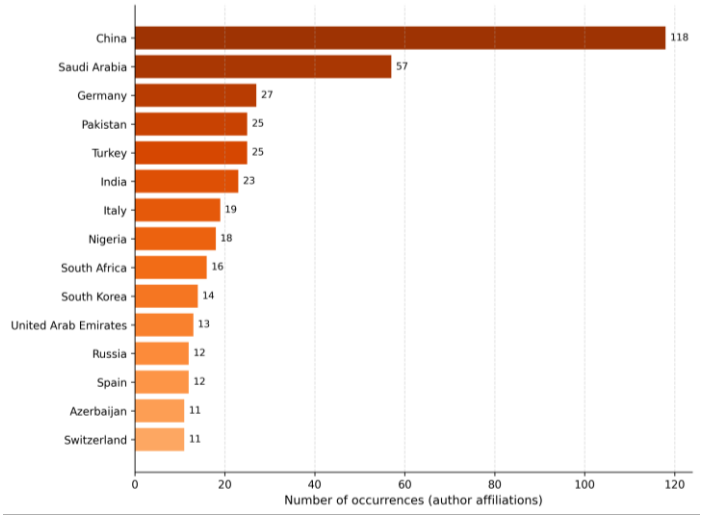
Source: Authors' elaboration based on Scopus data (2001–2026)**.**

3.4 Geographic distribution and international collaboration

Figure 7 shows the geographic distribution of the research corpus. China has the highest number of affiliation occurrences (118), followed by Saudi Arabia (57). Germany, Turkey, Pakistan, and India follow at a considerable distance. The country distribution also points to different research interests. In China, several studies focus on renewable-energy manufacturing, critical minerals, and global value chains. Examples include Lema et al. (2021), which examines China's renewable-energy investments in Africa, and Zhang et al. (2025), which links renewable energy, global value chains, and digitalization. In Saudi Arabia and other Gulf countries, research often focuses on economic diversification and the shift away from hydrocarbon dependence. Examples include Tagliapietra (2019), on the exposure of MENA oil and gas producers to the global energy transition, and Van de Graaf and Verbruggen (2015), on strategies of oil-exporting countries under carbon constraints.

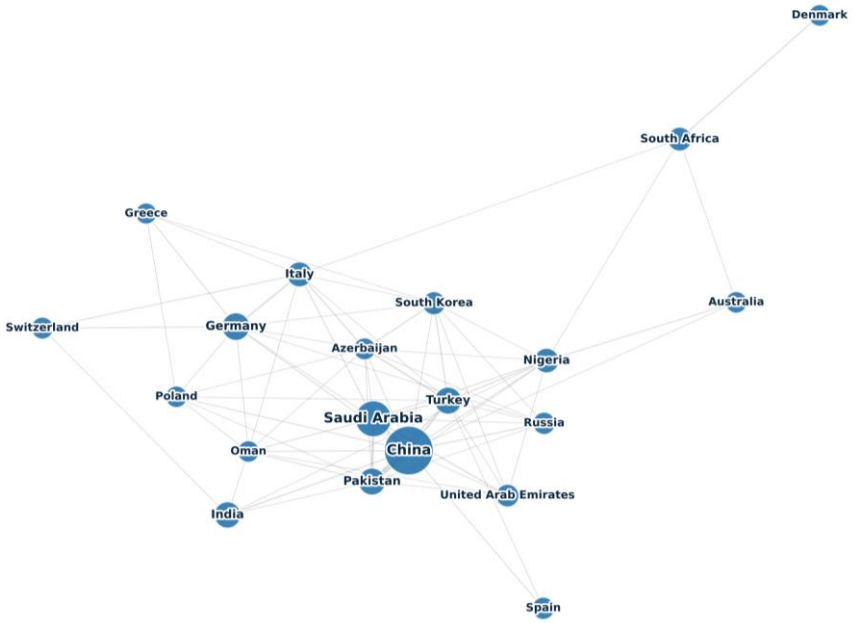
Morocco is not among the twenty most represented countries. Only a small number of documents in the corpus have a Moroccan affiliation. This result points to the limited presence of Moroccan research in this literature. Figure 8 shows the international collaboration network. China, Saudi Arabia, Pakistan, and India form the main connected group, together with several Gulf and emerging economies. Other countries, such as Denmark, Australia, and South Africa, have fewer and weaker connections. The network therefore shows that international collaboration is concentrated in a relatively small group of countries.

Fig. 7. Fifteen most contributing countries (affiliation occurrences).



Source: Authors' elaboration based on Scopus data (2001–2026).

Fig. 8. International collaboration network (top twenty countries, co-affiliation ties).



Source: Authors' elaboration based on Scopus data (2001–2026)**.**

3.5 Citation analysis

Table 2 presents the ten most-cited documents in the corpus. Barreto et al. (2003), which examines the twenty-first-century hydrogen economy, is the most cited study. However, the citation results require some caution. A keyword-based search may also retrieve studies from related but conceptually different fields. In this corpus, 27 documents (5.9% of the total) were identified through title screening as belonging to materials science or electrocatalysis. In these studies, "structural transformation" refers to a crystallographic or electrochemical process rather than an economic process. Some of these records were therefore excluded from Table 2 and from the reference list based on the corpus.

Among the economics-related studies, Doğan et al. (2021), which links economic complexity, renewable energy, and carbon emissions, is one of the most cited. Gozgor and Paramati (2022), which examines energy diversification and economic growth, also ranks highly. Both studies are closely related to the economic complexity and diversification themes identified in Clusters 1 and

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Table 2. Ten most-cited documents in the corpus (materials-science homonym false positives excluded).

Rank	Authors	Title	Year	Journal	Citations
1	Barreto L. et al.	The hydrogen economy in the 21st century: A sustainable development scenario	2003	International Journal of Hydrogen Energy	921
2	Doğan B. et al.	The mitigating effects of economic complexity and renewable energy on carbon emissions in developed countries	2021	Sustainable Development	484
3	Cabernard L. et al.	Growing environmental footprint of plastics driven by coal combustion	2022	Nature Sustainability	392
4	Bonsu N.O.	Towards a circular and low-carbon economy: Insights from the transitioning to electric vehicles and net zero economy	2020	Journal of Cleaner Production	302
5	Gozgor G. & Paramati S.R.	Does energy diversification cause an economic slowdown? Evidence from a newly constructed energy diversification index	2022	Energy Economics	158
6	Akinbami J.-F.K. et al.	Biogas energy use in Nigeria: current status, future prospects and policy implications	2001	Renewable & sustainable energy reviews	157
7	Sahoo M. & Sethi N.	The dynamic impact of urbanization, structural transformation, and technological innovation on ecological footprint and PM2.5: evidence from newly industrialized countries	2022	Environment, Development and Sustainability	145

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8	Islam M.T. & Ali A.	Sustainable green energy transition in Saudi Arabia: Characterizing policy framework, interrelations and future research directions	2024	Next Energy	140
9	Malik K. et al.	Renewable energy utilization to promote sustainability in GCC countries: policies, drivers, and barriers	2019	Environmental Science and Pollution Research	133
10	Luo F. et al.	Carbon emissions and driving forces of China's power sector: Input-output model based on the disaggregated power sector	2020	Journal of Cleaner Production	116

Source: Authors' elaboration based on Scopus data (2001–2026).

3.6 Keyword analysis: frequency, co-occurrence network, and thematic map

The keyword analysis shows which topics receive the most attention in the literature. "Renewable energy" is the most frequent keyword, with 99 occurrences. It is followed by "energy transition" (76), "global value chain" (51), "CO_2 emissions" (39), and "sustainable development" (28). These results are largely consistent with the search strategy used in this study. Other key concepts appear less often. "Economic diversification" occurs 25 times, while "structural transformation" and "economic complexity" occur 13 and 12 times, respectively. These concepts are central to the theoretical framework presented in Section 2. Their lower frequency suggests that links between energy transition and structural transformation, diversification, and economic complexity remain less developed in the literature. Figure 9 shows the main keywords and their co-occurrence clusters.

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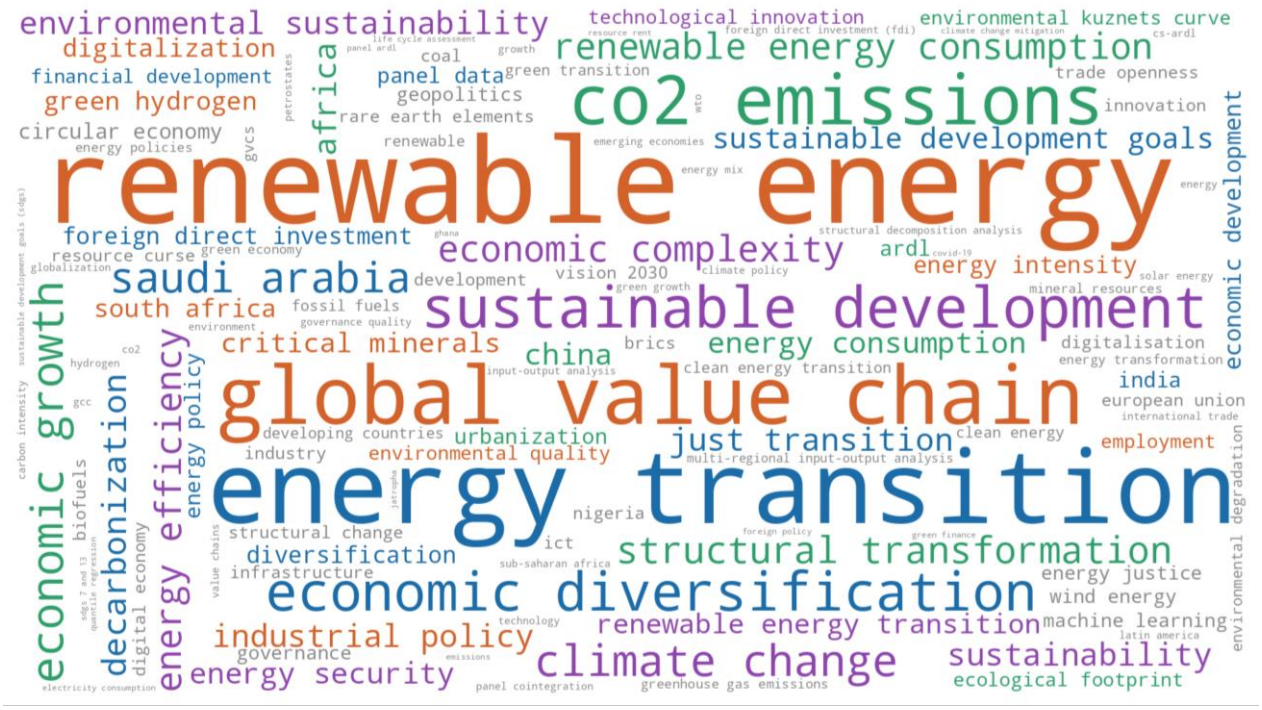
Fig. 9. Word cloud of author keywords, colored by co-occurrence cluster.



Source: Authors' elaboration based on Scopus data (2001–2026)**.**

The co-occurrence analysis of the 45 most frequent author keywords, using a co-occurrence threshold of 2 and the Louvain community-detection algorithm, identifies four main thematic clusters, as shown in Figure 10. The clusters reveal distinct but interconnected strands within the literature. Cluster 1 centers on energy transition and economic diversification, with a strong emphasis on rentier and oil-exporting economies. Cluster 2 brings together renewable energy, global value chains, critical minerals, and industrial policy. Cluster 3 links CO_2 emissions, economic growth, renewable energy consumption, and structural transformation, with a marked presence of econometric studies focused on Africa and China. Cluster 4 connects sustainable development, climate change, and economic complexity, alongside themes such as energy efficiency and technological innovation. The dominant keywords and the substantive interpretation of each cluster are reported in Table 3.

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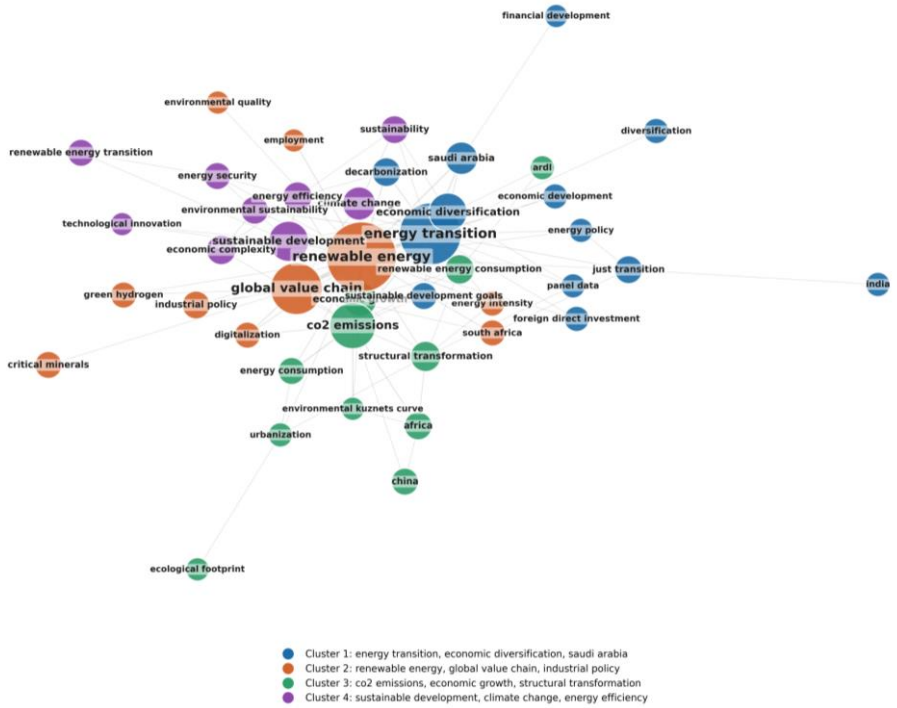
Fig. 10. Keyword co-occurrence network (top 45 author keywords, co-occurrence threshold ≥ 2, Louvain communities).



Source: Authors' elaboration based on Scopus data (2001–2026).

Table 3. Interpretation of the four-keyword co-occurrence clusters.

Cluster	Proposed label	Dominant keywords	Interpretation
Cluster 1	Energy transition & economic diversification (rentier economies)	energy transition (76), economic diversification (25), Saudi Arabia (16), decarbonization (11), just transition (10), SDGs, FDI, financial development	High centrality but comparatively low internal density ("emerging/diffusing" quadrant, Figure 11): a large, well-connected theme that has not yet consolidated into a dense, self-referential sub-field. Concentrated on rentier, oil-exporting economies (Gulf states).
Cluster 2	Renewable energy, industrial policy & global value chains	renewable energy (99), global value chain (51), industrial policy (10), critical minerals (9), green hydrogen (8), digitalization	The field's motor theme: highest centrality and highest density (Figure 11). The most mature and structurally integrated cluster, combining renewable-energy manufacturing, critical minerals, and industrial policy.

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		(8), South Africa, employment	
Cluster 3	CO2 emissions, growth & structural transformation	co2 emissions (39), economic growth (18), structural transformation (13), renewable energy consumption (12), Africa (10), China, ARDL, environmental Kuznets curve	A niche theme: high internal density but low centrality (Figure 11) — a self-contained, methodologically homogeneous econometric literature (ARDL, EKC models) with limited cross-referencing to the rest of the field.
Cluster 4	Sustainable development & economic complexity	sustainable development (28), climate change (17), economic complexity (12), energy efficiency (12), sustainability, energy security, technological innovation	A basic theme: both low centrality and low density (Figure 11) — the least structurally developed cluster, despite being the most directly relevant to the economic-complexity framework (Hidalgo & Hausmann, 2009) motivating this research.

Source: Authors' elaboration based on Scopus data (2001–2026).

The thematic composition of the four clusters becomes clearer when considering the studies associated with their dominant keywords. Cluster 1 is primarily concerned with energy transition and economic diversification in resource-dependent economies. The literature covers energy diplomacy and diversification in the Gulf region (Griffiths, 2019; Al-Badi & AlMubarak, 2019), digitalization and sustainability in GCC countries (Albreem et al., 2023), the European Union's external energy relations (Herranz-Surralles, 2024), and the shift from resource dependence toward green growth (Imran et al., 2025). It also includes broader discussions of energy-transition pathways in the Global South (Swilling et al., 2022). These contributions point to a common concern: how energy transition can be used to reduce dependence on resource-based growth. Cluster 2 is more closely associated with productive capabilities, industrial policy, and the organization of emerging energy value chains. Relevant studies examine value-chain upgrading and policy feedbacks in renewable energy (Eicke & Weko, 2022), the interaction between decarbonization and digitalization in Europe (Fouquet & Hippe, 2022), employment effects of decarbonization in South Africa (Hanto et al., 2021), renewable-energy systems and storage (He et al., 2021; Rasool et al., 2023), and the transformation of China's low-carbon power sector (Yao et

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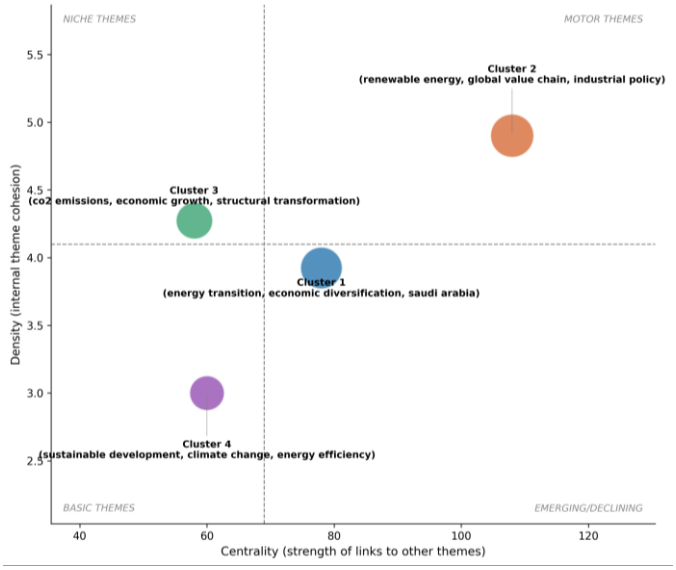
al., 2021). Other contributions address the mineral markets that underpin the energy transition (Yu et al., 2023) and the links between renewable energy, global value chains, and digitalization (Zhang et al., 2025). Taken together, these studies place greater emphasis on the industrial and technological dimensions of the transition. Cluster 3 is dominated by empirical work linking energy, economic growth, trade, and environmental outcomes. The literature includes studies of trade, resource wealth, and environmental-policy stringency in BRICST economies (Dai & Du, 2023), the effects of trade conflicts on African energy and resource sectors (An et al., 2020), and applications of the environmental Kuznets curve (Guo & Shahbaz, 2024; Onifade, 2022, 2023). Other studies examine industrialization and emissions in Sub-Saharan Africa (Mentel et al., 2022) and inequalities in renewable-energy productivity (Zhao et al., 2022). Compared with the other clusters, this strand is more strongly oriented toward econometric relationships between energy use, growth, and environmental performance. Cluster 4 forms a smaller thematic strand around sustainable development, technological change, and economic complexity. Its literature includes research on the links between the digital economy, renewable-energy transition, and green economic growth in Latin America and the Caribbean (Hwang, 2023). The relatively limited size of this cluster suggests that the connection between energy transition and economic complexity remains less developed than the other thematic strands identified in the corpus.

The Callon strategic map in Figure 11 provides a complementary view of these thematic structures by positioning each cluster according to its centrality and density. The two dimensions distinguish themes according to their external connectedness and internal development. Cluster 2 occupies the motor-theme quadrant, combining high centrality with high density. It therefore represents the most developed and structurally connected research area in the corpus. Cluster 3 appears as a niche theme, with strong internal cohesion but weaker connections with the broader thematic structure. This position is consistent with its relatively specialized econometric orientation. Cluster 1 combines high centrality with comparatively low density. It is therefore well connected to the wider field but remains less consolidated internally. Cluster 4 records relatively low values on both dimensions and occupies the basic-theme area. Its limited centrality and density point to a less developed research strand. At the same time, its focus on economic complexity and productive capabilities identifies an area where the relationship between energy transition and structural economic change remains comparatively open for further investigation.

Fig. 11. Callon strategic (thematic) map: cluster centrality versus density.



Source: Authors' elaboration based on Scopus data (2001–2026)**.**

3.7 Trend-topic analysis

The evolution of keyword frequency across the five sub-periods reveals a clear shift in the thematic emphasis of the literature, as shown in Figure 12. "Renewable energy" and "energy transition" remain the most persistent terms, with a strong presence from 2019 onward. By contrast, "global value chain" and "critical minerals" exhibit the sharpest recent increases, with their relative frequencies more than doubling between 2019–2021 and 2024–2026.

This pattern points to a growing interest in the productive and supply-chain dimensions of energy transition. While renewable energy and energy transition have remained established themes, value-chain and critical-mineral issues have gained prominence more recently. The trend therefore suggests a shift from a predominantly energy- and technology-oriented research agenda toward broader questions of industrial organization, supply security, and value creation.

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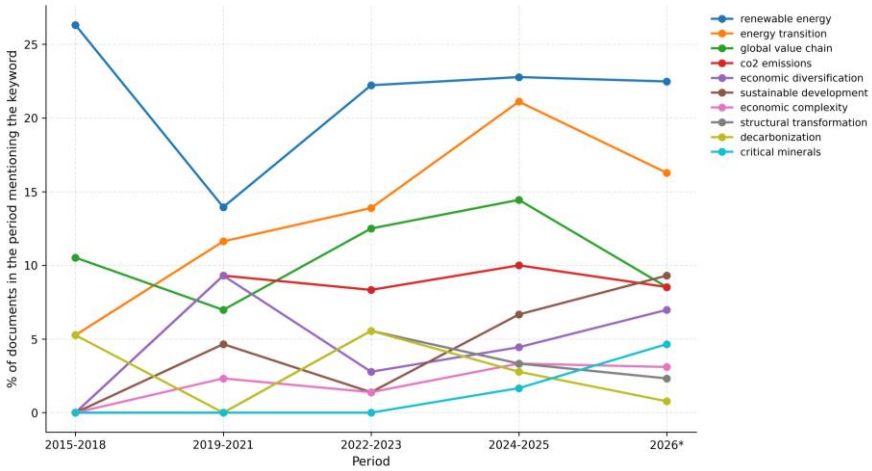
Fig. 12. Relative frequency of the ten most common author keywords across five sub-periods ("trend topics").



Source: Authors' elaboration based on Scopus data (2001–2026)**.**

3.8 Author-keyword-journal relationship

Figure 13 links the most productive authors with the most frequent keywords and the main journals in the corpus. Three terms carry most of the connections: "renewable energy," "energy transition," and "global value chain." They appear across the work of several leading authors and connect to a wide range of journals.

The flows are more dispersed on the journal side. The main authors do not publish around one specific outlet, and the three leading themes are not tied to a small group of journals. Instead, the same topics appear in outlets covering different areas of research.

The diagram also shows some separation between the research lines. Authors linked mainly to renewable energy form one visible stream, while others are connected more strongly to energy transition or global value chains. The links between these terms are present but less dominant.

The result points to a field with a relatively stable set of core topics but without a similarly concentrated journal structure. Energy transition research is therefore shared across several research communities and publication outlets.

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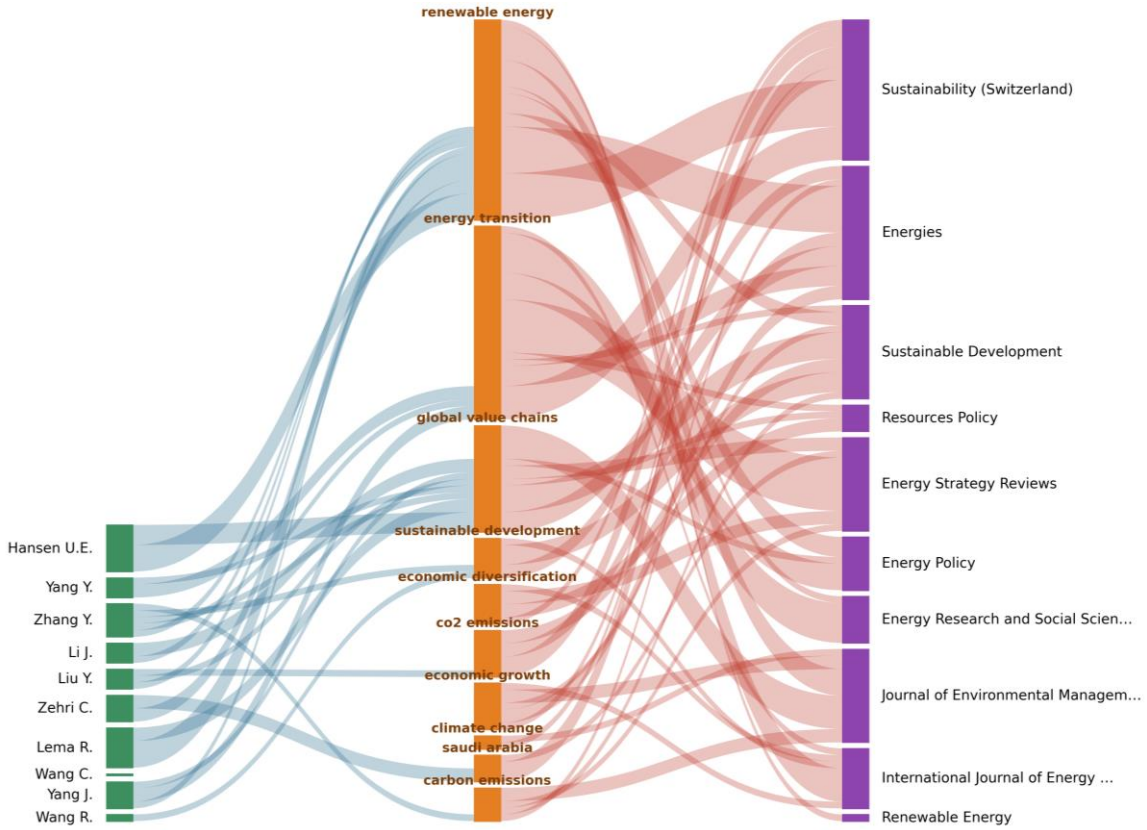
Fig. 13. Sankey diagram linking the ten most productive authors, keywords, and journals.



Source: Authors' elaboration based on Scopus data (2001–2026)**.**

4. Discussion

The results provide a clear picture of a research field that is expanding rapidly but remains fragmented across geographical, disciplinary, and conceptual lines. The bibliometric analysis does more than document the recent growth of research linking energy transition to structural economic change. It also reveals how several research traditions coexist without yet forming a sufficiently integrated analytical framework. Four thematic clusters were identified, while the geographical and collaboration analyses showed a strong concentration of research in China, Saudi Arabia, and other emerging and resource-rich economies. At the same time, the limited connection between structural transformation, economic complexity, and GVC research indicates that the productive implications of the energy transition remain insufficiently explored. These findings have important implications for the theoretical framework of the study and for the applicability of existing evidence to non-rentier economies such as Morocco.

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4.1. From energy transition to structural economic change

The first important finding concerns the evolution of the field. Publication activity remained limited until 2018 and increased substantially after 2021. This acceleration reflects the growing economic and policy importance of renewable energy, industrial decarbonization, energy security, green technologies, and new industrial strategies. However, the rapid increase in publications has not been accompanied by a comparable consolidation of the research community. The co-authorship network consists of several relatively disconnected communities, with a strong presence of Chinese and Gulf-based researchers. The field therefore appears to have developed around specific national and regional priorities rather than around a unified international research agenda.

This distinction is important. A rapidly expanding literature does not necessarily imply theoretical convergence. In this case, publication growth has been accompanied by specialization. Different research communities approach the energy transition from different perspectives, including energy security, diversification of resource-dependent economies, industrial policy, emissions reduction, green technologies, critical minerals, and economic complexity. Each perspective addresses an important dimension of the transition, but their limited interaction makes it difficult to determine whether a broader relationship exists between energy-system transformation and productive transformation.

The findings consequently support a broader interpretation of the energy transition. Renewable-energy development should not be assessed only through installed capacity, electricity generation, emissions reduction, or energy-system efficiency. For developing and emerging economies, it may also constitute a process of industrial and productive change. Renewable-energy projects can create demand for equipment, construction, engineering, maintenance, digital systems, storage technologies, and specialized services. These activities may generate employment and learning opportunities and may strengthen capabilities that can later be used in other sectors.

Such effects, however, cannot be assumed. An economy may expand its renewable-energy capacity while importing most equipment, technologies, and specialized services. In this situation, the environmental and energy-security benefits may be substantial, but the contribution to domestic structural transformation may remain limited. The relevant question is therefore not simply whether renewable energy expands, but which productive capabilities are created locally, how these capabilities spread across sectors, and whether domestic firms move toward higher-value activities.

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This interpretation connects directly with the structural-transformation literature. Lewis (1954) and Chenery (1960) emphasized the movement of labor and capital toward more productive activities. In the contemporary energy transition, however, structural transformation may not follow exactly the historical path from agriculture to manufacturing and then services. New opportunities can emerge in renewable-energy equipment, engineering, energy services, digital technologies, storage, green hydrogen, and other knowledge-intensive activities. The transition may therefore contribute to a new form of structural transformation in which technological capabilities and specialized services play a greater role.

4.2. GVC upgrading and the accumulation of productive capabilities

The second major finding concerns the limited integration of the three theoretical perspectives examined in this study. The keyword co-occurrence analysis shows a relatively visible presence of GVC-related concepts, while economic complexity and structural transformation occupy less prominent positions. This suggests that the literature increasingly addresses different dimensions of productive change but rarely examines them within a single analytical framework.

The GVC perspective is particularly useful for understanding this fragmentation. Participation in an international value chain does not necessarily imply substantial domestic value creation. As emphasized by Gereffi (1994), Gereffi et al. (2005), and Humphrey and Schmitz (2002), upgrading requires movement toward activities involving greater technological content, skills, knowledge, and value added. This distinction is especially relevant for renewable-energy industries. Countries may participate in solar, wind, battery, hydrogen, or critical-mineral value chains while remaining concentrated in extraction, basic processing, assembly, or project deployment.

The economic-complexity approach adds another dimension to this argument. Hidalgo and Hausmann (2009) associate economic development with the accumulation and combination of productive capabilities. From this perspective, the significance of renewable-energy investment lies not only in the amount of energy produced but also in the capabilities developed around the sector. Engineering expertise, manufacturing experience, digital technologies, research capacity, supplier networks, and project-management skills may support diversification into related activities.

The trend-topic analysis reinforces this interpretation. Global value chains, critical minerals, green technologies, and related industrial themes are increasingly visible in recent research. Yet their

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growing prominence has not produced a comparable integration with economic complexity and structural transformation. The field is moving toward questions of industrial capabilities and value-chain participation, but the mechanisms linking these developments to broader changes in productive structures remain insufficiently examined.

An integrated perspective can therefore assign a distinct role to each theoretical approach. GVC analysis helps explain where firms and economies are positioned within international production systems. Economic complexity provides a way to assess which productive capabilities are embedded in an economy and how sophisticated its productive structure is. Structural-transformation theory helps explain how these capabilities influence the allocation of resources across sectors. Their integration could consequently provide a stronger framework for evaluating whether energy transition contributes to development beyond its environmental effects.

4.3. Geographical concentration and external validity

The geographical distribution of the literature represents a third important finding. China and Saudi Arabia occupy prominent positions in the publication and collaboration networks, followed by several other large emerging and resource-rich economies. This concentration is understandable. China is a major producer and exporter of renewable-energy technologies, while Gulf economies face strong incentives to diversify their production structures in response to the changing role of hydrocarbons.

However, the dominance of these cases raises an issue of external validity. The structural conditions of resource-rich Gulf economies differ substantially from those of many developing economies. In Gulf countries, energy-transition research is often connected to the diversification of hydrocarbon-dependent economies. The central policy question is frequently how to develop alternative activities while managing the economic consequences of a gradual shift away from fossil fuels.

This context cannot simply be transferred to non-rentier economies. The diversification challenge is different when economic activity is not primarily based on hydrocarbon rents. Likewise, evidence from large Asian manufacturing economies may have limited applicability to smaller economies whose industrial development depends strongly on regional trade integration and foreign investment.

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Morocco illustrates this distinction. It is a non-rentier economy with a developing industrial base and strong commercial and production links with European markets. Its energy transition is occurring alongside industrial expansion, export-oriented manufacturing, and policies aimed at increasing domestic productive capabilities. The Moroccan case therefore differs from both the Gulf diversification model and the large-scale Asian manufacturing model.

This distinction is relevant to the transferability of the literature's findings. The thematic patterns identified in the bibliometric analysis are useful for understanding the main research directions, but they should not be assumed to apply uniformly across economic contexts. A finding established in a hydrocarbon-exporting economy may depend partly on fiscal resources, institutional arrangements, and existing energy-sector capabilities that are not present elsewhere. Similarly, the upgrading opportunities available to a large manufacturing economy may differ from those available to a smaller economy integrated into regional value chains.

The limited representation of Morocco and the Euro-Mediterranean region should therefore be interpreted as more than a simple geographical omission. It points to a potentially significant empirical gap. Research focused on Morocco could test whether the mechanisms identified in the dominant literature operate under different productive and institutional conditions. It could also contribute to the external validity of the proposed framework by examining a non-rentier economy whose development is strongly linked to regional and global production networks.

4.4. Implications for industrial policy and management

The findings have implications for both policymakers and firms. If the energy transition is expected to contribute to structural transformation, energy policy cannot be considered independently from industrial, trade, investment, and skills policies. Expanding renewable-energy capacity is necessary for decarbonization, but it does not by itself ensure domestic industrial upgrading.

For policymakers, the central issue is therefore the development of linkages between renewable-energy projects and the domestic productive system. Local firms can capture greater value when they participate in equipment supply, construction, engineering, maintenance, digital services, and other complementary activities. This requires an adequate skills base, supplier-development mechanisms, research and innovation capacity, access to finance, and institutional coordination.

The GVC perspective also highlights the distinction between participation and upgrading. Attracting foreign investment into renewable-energy projects can generate employment, exports,

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and knowledge spillovers, but these benefits may remain limited if domestic firms remain concentrated in low-value activities. Industrial policy should therefore focus not only on attracting investment but also on strengthening linkages between foreign investors and local suppliers.

This does not imply that domestic-content requirements should be applied without considering efficiency or competitiveness. Excessive protection may increase project costs and reduce the speed of renewable-energy deployment. A more balanced approach would combine market openness with targeted measures supporting skills, supplier capabilities, technology transfer, research partnerships, and access to finance. The objective would be to create conditions under which domestic firms can progressively enter more sophisticated segments of renewable-energy value chains.

For managers, the findings indicate that the energy transition creates opportunities beyond electricity generation. Firms operating in manufacturing, engineering, logistics, digital services, industrial maintenance, and specialized consulting may benefit from the expansion of green industries. The key challenge is to identify capabilities that can be transferred across related sectors. Companies that combine existing industrial knowledge with new green technologies may be better positioned to enter emerging value chains.

This perspective is particularly relevant for Morocco. The country's existing industrial capabilities provide a potential foundation for diversification into related green activities. The strategic question is therefore not simply how to increase renewable-energy production, but how to connect the energy transition with existing industrial ecosystems and emerging green value chains. Such an approach would shift attention from energy deployment alone toward domestic value creation, technological learning, and productive upgrading.

4.5. Toward an integrated analytical model

The bibliometric findings support the development of an integrated analytical model connecting energy transition with structural economic change. The proposed model combines the three theoretical perspectives examined in this study while recognizing the role of institutional and productive conditions.

The first component consists of energy-transition drivers, including renewable-energy investment, renewable electricity capacity, green infrastructure, technological deployment, and public policy. These factors create new economic activities and demand for goods and services.

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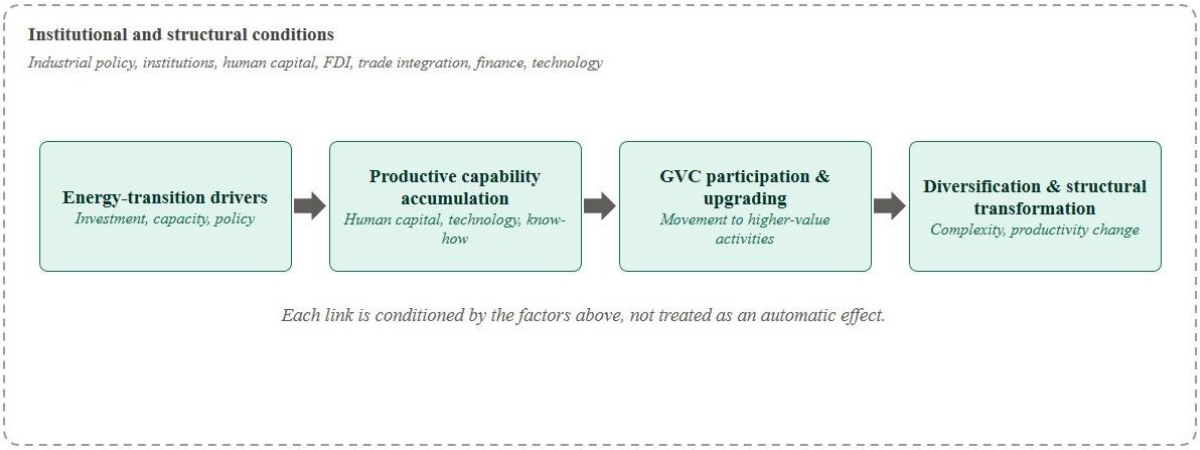
The second component is productive capability accumulation. The transition may contribute to human capital development, technological knowledge, infrastructure, supplier networks, research capacity, and managerial expertise. These capabilities determine whether renewable-energy investment produces effects beyond the energy sector.

The third component concerns GVC participation and upgrading. Improved domestic capabilities can allow firms to move from basic activities toward manufacturing, specialized services, technology-intensive production, and other higher-value segments. GVC participation therefore represents a potential transmission mechanism between energy-transition investment and productive transformation.

The fourth component is economic diversification and structural transformation. Successful upgrading can expand the range of products and services produced domestically, reduce dependence on a narrow set of activities, and increase the importance of higher-productivity sectors. Economic complexity provides a useful empirical perspective for assessing changes in the sophistication and diversity of these productive capabilities.

The relationship is shaped by several enabling or constraining factors, including industrial policy, institutional quality, human capital, foreign direct investment, trade openness, access to finance, technological capabilities, and regional market integration. These conditions can influence whether renewable-energy investment translates into domestic capability accumulation and subsequent upgrading. The proposed analytical logic can therefore be expressed as shown in Fig 14.

Fig. 14. Proposed integrated analytical model linking energy transition to structural transformation



Source: Authors' elaboration.

Note: The model combines the structural-transformation, global-value-chain, and economic-complexity perspectives reviewed in Section 1. Each arrow represents an empirical question rather than an assumed causal effect.

This model provides a basis for future empirical research without assuming that the proposed relationships are automatic. Each link represents an empirical question. Renewable-energy investment may increase capabilities, but the magnitude of this effect depends on domestic production and learning opportunities. Improved capabilities may facilitate GVC upgrading, but international competition and governance structures can constrain movement toward higher-value activities. Similarly, upgrading may contribute to diversification, but the broader structural effect depends on the scale and diffusion of new activities across the economy.

The model therefore shifts the analytical focus from a simple relationship between renewable energy and economic growth toward a capability-based explanation of structural transformation. It asks whether and under what conditions energy-transition investments create capabilities that can be mobilized across sectors and translated into higher-value participation in regional and global production networks.

4.6. Implications for Future Research

The findings point to several directions for future research. The first is to move beyond the separate treatment of energy transition, structural transformation, economic complexity, and GVC

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participation. The bibliometric structure shows that these perspectives are increasingly present in the literature but remain weakly connected. Future studies could therefore test whether renewable-energy development contributes to productive capability accumulation and, through this channel, to diversification and upgrading within value chains.

A second direction concerns geographical diversity. More research on non-rentier economies and the Euro-Mediterranean region would help assess whether the mechanisms identified in Gulf and Asian economies are transferable to other institutional and productive contexts. Comparative studies could examine differences in industrial policy, trade integration, technological capabilities, and domestic supplier development.

Morocco provides a particularly relevant setting for this agenda. Its renewable-energy transition is occurring alongside industrial expansion, export-oriented production, and integration into European and global value chains. Future empirical studies could therefore examine whether renewable-energy investment is associated with changes in export sophistication, economic complexity, productive diversification, or the position of domestic firms within GVCs.

A further avenue concerns the role of public and industrial policy. Future research could examine whether local-content strategies, technology-transfer mechanisms, skills development, foreign direct investment, supplier-development programs, and research partnerships affect the domestic value generated by renewable-energy projects. Such work would help distinguish between energy-transition strategies that primarily expand energy supply and those that also support longer-term productive upgrading.

Finally, future research could empirically test the proposed sequence linking energy transition, capability accumulation, GVC upgrading, economic diversification, and structural transformation. This would require moving beyond aggregate renewable-energy indicators and incorporating sectoral, trade, firm-level, and technological measures. Such research could provide a more precise assessment of whether the energy transition can become a source of structural transformation in developing economies and under which conditions these effects are most likely to occur.

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5. Conclusions and Perspectives

This study examined how the scientific literature has connected energy transition with structural transformation, economic diversification, and global value chains (GVCs). Using a bibliometric analysis of 455 English-language articles and reviews indexed in Scopus between 2001 and 2026, it addressed whether these research areas are converging around a common understanding of the productive implications of the energy transition. The findings indicate that the literature is expanding rapidly, but that its conceptual, geographical, and collaborative structures remain fragmented.

The temporal analysis shows that research activity was limited for much of the period under review and began to accelerate after 2018, with a particularly strong increase from 2021 onward. This expansion reflects the growing importance of renewable energy, green industrial development, energy security, and the restructuring of international production. However, the growth in publication output has not resulted in a fully integrated research community. The collaboration structure remains divided into several relatively disconnected groups, with China, Saudi Arabia, and other emerging economies occupying prominent positions.

The thematic analysis provides the main answer to the study's research problem. Four clusters structure the literature: energy transition and economic diversification in rentier economies; renewable energy, industrial policy, and GVCs; emissions, economic growth, and structural transformation; and sustainable development and economic complexity. These clusters confirm that the productive consequences of the energy transition are receiving increasing attention. At the same time, their limited conceptual overlap indicates that structural transformation, GVC upgrading, and economic complexity are still largely examined through separate research traditions. The literature therefore recognizes several components of productive change without yet fully explaining how they interact.

This finding represents the main theoretical contribution of the study. By mapping the relationships among these research traditions, the analysis highlights the need for a more integrated perspective in which energy transition is considered not only as an environmental or technological process but also as a potential mechanism of capability accumulation and productive upgrading. Such a perspective places greater emphasis on the conditions under which renewable-energy development can generate domestic capabilities, strengthen participation in higher-value activities, and

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contribute to broader structural change. The study also makes a methodological contribution. Bibliometric analysis provides a systematic means of examining a multidisciplinary field whose boundaries are not yet clearly established. The combined use of publication trends, source and author analysis, geographical distribution, collaboration networks, keyword co-occurrence, thematic mapping, and trend-topic analysis makes it possible to identify both established research areas and weakly connected themes. This approach complements conventional literature reviews by providing a quantitative representation of the intellectual structure of the field.

The geographical findings constitute the main empirical contribution. The literature is strongly concentrated in China, Saudi Arabia, and several other large emerging and resource-rich economies, whereas Morocco and the wider Euro-Mediterranean region remain largely underrepresented. This imbalance is important because the structural conditions observed in dominant cases cannot necessarily be generalized to non-rentier economies. Morocco combines an active renewable-energy transition with industrial development and strong integration into European production networks. Its limited presence in the literature consequently highlights an empirical dimension that remains insufficiently addressed.

Several limitations qualify these conclusions. First, the corpus relies exclusively on Scopus, which may exclude relevant publications indexed elsewhere. Second, the restriction to English-language documents limits coverage of research published in other languages. Third, the keyword-based search produced some domain noise, including records potentially associated with materials science and chemistry rather than economic structural transformation. Fourth, the absence of the References field in the Scopus export prevented co-citation and bibliographic-coupling analyses. Finally, the most recent publication counts, particularly for 2025 and 2026, should be interpreted cautiously because of possible indexing delays and early-access records. Despite these limitations, the study provides a structured assessment of an emerging research field and clarifies its current boundaries. Its central conclusion is that the literature has moved beyond a narrow focus on energy and environmental outcomes toward broader concerns with industrial development, value-chain participation, diversification, and productive capabilities. Yet these dimensions have not developed at the same pace or within a common analytical structure. The significance of the present review therefore lies in identifying this fragmentation and clarifying the conceptual space in which future empirical and theoretical work can develop. In this respect, the energy transition should be

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understood not only as a change in the energy system, but also as a potential component of a wider process of productive transformation in developing economies.

References

Akinbami J.-F.K. et al. (2001). Biogas energy use in Nigeria: current status, future prospects and policy implications. Renewable & sustainable energy reviews. https://doi.org/10.1016/S1364-0321(00)00005-8

Al-Badi A. & AlMubarak I. (2019). Growing energy demand in the GCC countries. Arab Journal of Basic and Applied Sciences. https://doi.org/10.1080/25765299.2019.1687396

Albreem M.A. et al. (2023). Towards green Internet of Things (IoT) for a sustainable future in Gulf Cooperation Council countries: current practices, challenges and future prospective. Wireless Networks. https://doi.org/10.1007/s11276-022-03133-3

An J. et al. (2020). Trade war effects: evidence from sectors of energy and resources in Africa. Heliyon. https://doi.org/10.1016/j.heliyon.2020.e05693

Barreto L. et al. (2003). The hydrogen economy in the 21st century: A sustainable development scenario. International Journal of Hydrogen Energy. https://doi.org/10.1016/S0360-3199(02)00074-5

Bonsu N.O. (2020). Towards a circular and low-carbon economy: Insights from the transitioning to electric vehicles and net zero economy. Journal of Cleaner Production. https://doi.org/10.1016/j.jclepro.2020.120659

Cabernard L. et al. (2022). Growing environmental footprint of plastics driven by coal combustion. Nature Sustainability. https://doi.org/10.1038/s41893-021-00807-2

Chenery, H. B. (1960). Patterns of industrial growth. American Economic Review, 50(4), 624-654.

Dai S. & Du X. (2023). Discovering the role of trade diversification, natural resources, and environmental policy stringency on ecological sustainability in the BRICST region. Resources Policy. https://doi.org/10.1016/j.resourpol.2023.103868

Doğan B. et al. (2021). The mitigating effects of economic complexity and renewable energy on carbon emissions in developed countries. Sustainable Development. https://doi.org/10.1002/sd.2125

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 37 Août 2026

Eicke L. & Weko S. (2022). Does green growth foster green policies? Value chain upgrading and feedback mechanisms on renewable energy policies. Energy Policy. https://doi.org/10.1016/j.enpol.2022.112948

Fouquet R. & Hippe R. (2022). Twin transitions of decarbonisation and digitalisation: A historical perspective on energy and information in European economies. Energy Research and Social Science. https://doi.org/10.1016/j.erss.2022.102736

Gereffi, G. (1994). The organization of buyer-driven global commodity chains: How U.S. retailers shape overseas production networks. In G. Gereffi & M. Korzeniewicz (Eds.), Commodity Chains and Global Capitalism (pp. 95-122). Praeger.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. Review of International Political Economy, 12(1), 78-104.

Gozgor G. & Paramati S.R. (2022). Does energy diversification cause an economic slowdown? Evidence from a newly constructed energy diversification index. Energy Economics. https://doi.org/10.1016/j.eneco.2022.105970

Griffiths S. (2019). Energy diplomacy in a time of energy transition. Energy Strategy Reviews. https://doi.org/10.1016/j.esr.2019.100386

Guo X. & Shahbaz M. (2024). The existence of environmental Kuznets curve: Critical look and future implications for environmental management. Journal of Environmental Management. https://doi.org/10.1016/j.jenvman.2023.119648

Hanto J. et al. (2021). Effects of decarbonization on the energy system and related employment effects in South Africa. Environmental Science and Policy. https://doi.org/10.1016/j.envsci.2021.06.001

He W. et al. (2021). Optimal analysis of a hybrid renewable power system for a remote island. Renewable Energy. https://doi.org/10.1016/j.renene.2021.07.034

Herranz-Surralles A. (2024). The EU Energy Transition in a Geopoliticizing World. Geopolitics. https://doi.org/10.1080/14650045.2023.2283489

Hidalgo, C. A., & Hausmann, R. (2009). The building blocks of economic complexity. Proceedings of the National Academy of Sciences, 106(26), 10570-10575.

Humphrey, J., & Schmitz, H. (2002). How does insertion in global value chains affect upgrading in industrial clusters? Regional Studies, 36(9), 1017-1027.

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 37 Août 2026

Hwang Y.K. (2023). The synergy effect through combination of the digital economy and transition to renewable energy on green economic growth: Empirical study of 18 Latin American and caribbean countries. Journal of Cleaner Production. https://doi.org/10.1016/j.jclepro.2023.138146

Imran M. et al. (2025). From resource curse to green growth: Exploring the role of energy utilization and natural resource abundance in economic development. Natural Resources Forum. https://doi.org/10.1111/1477-8947.12461

Islam M.T. & Ali A. (2024). Sustainable green energy transition in Saudi Arabia: Characterizing policy framework, interrelations and future research directions. Next Energy. https://doi.org/10.1016/j.nxener.2024.100161

Lema R. et al. (2021). China's investments in renewable energy in Africa: Creating co-benefits or just cashing-in?. World Development. https://doi.org/10.1016/j.worlddev.2020.105365

Lewis, W. A. (1954). Economic development with unlimited supplies of labour. The Manchester School, 22(2), 139-191.

Litterman, R. B. (1983). A random walk, Markov model for the distribution of time series. Journal of Business & Economic Statistics, 1(2), 169-173.

Luo F. et al. (2020). Carbon emissions and driving forces of China's power sector: Input-output model based on the disaggregated power sector. Journal of Cleaner Production. https://doi.org/10.1016/j.jclepro.2020.121925

Malik K. et al. (2019). Renewable energy utilization to promote sustainability in GCC countries: policies, drivers, and barriers. Environmental Science and Pollution Research. https://doi.org/10.1007/s11356-019-05337-1

Mentel U. et al. (2022). Industrialization and CO2 Emissions in Sub-Saharan Africa: The Mitigating Role of Renewable Electricity. Energies. https://doi.org/10.3390/en15030946

Onifade S.T. (2022). Retrospecting on resource abundance in leading oil-producing African countries: how valid is the environmental Kuznets curve (EKC) hypothesis in a sectoral composition framework?. Environmental Science and Pollution Research. https://doi.org/10.1007/s11356-022-19575-3

Onifade S.T. (2023). Environmental impacts of energy indicators on ecological footprints of oil-exporting African countries: Perspectives on fossil resources abundance amidst sustainable development quests. Resources Policy. https://doi.org/10.1016/j.resourpol.2023.103481

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 37 Août 2026

Rasool M.H. et al. (2023). Comparative assessment of multi-objective optimization of hybrid energy storage system considering grid balancing. Renewable Energy. https://doi.org/10.1016/j.renene.2023.119107

Sahoo M. & Sethi N. (2022). The dynamic impact of urbanization, structural transformation, and technological innovation on ecological footprint and PM2.5: evidence from newly industrialized countries. Environment, Development and Sustainability. https://doi.org/10.1007/s10668-021-01614-7

Swilling M. et al. (2022). Linking the energy transition and economic development: A framework for analysis of energy transitions in the global South. Energy Research and Social Science. https://doi.org/10.1016/j.erss.2022.102567

Tagliapietra S. (2019). The impact of the global energy transition on MENA oil and gas producers. Energy Strategy Reviews. https://doi.org/10.1016/j.esr.2019.100397

Van de Graaf T. & Verbruggen A. (2015). The oil endgame: Strategies of oil exporters in a carbon-constrained world. Environmental Science and Policy. https://doi.org/10.1016/j.envsci.2015.08.004

Yao X. et al. (2021). Low-carbon transformation of the regional electric power supply structure in China: A scenario analysis based on a bottom-up model with resource endowment constraints. Resources, Conservation and Recycling. https://doi.org/10.1016/j.resconrec.2020.105315

Yu D. et al. (2023). Navigating the global mineral market: A study of resource wealth and the energy transition. Resources Policy. https://doi.org/10.1016/j.resourpol.2023.103500

Zhang L. et al. (2025). Unleashing the critical role of renewable energy through global value chains and digitalization: A path towards environmental sustainability. Journal of Environmental Management. https://doi.org/10.1016/j.jenvman.2025.126688

Zhao J. et al. (2022). Does structural transformation in economy impact inequality in renewable energy productivity? Implications for sustainable development. Renewable Energy. https://doi.org/10.1016/j.renene.2022.03.050